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CSX/VAUGHN LAND[illegible] AND BRA[illegible]LETTE ROAD [illegible]TES

PHASE III INVESTIGATION AND SITE ASSESS[illegible]NT REPORT

VOLUME I

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AND
BRAMLETTE ROAD MGP SITES

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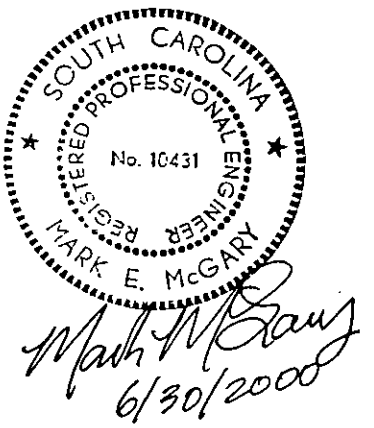

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PHASE III
INVESTIGATION AND SITE ASSESSMENT REPORT

1.0 Introduction

This report documents the results of a Phase III Site Investigation of the Bramlette Road Manufactured Gas Plant and CSX/Vaughn Landfill sites in Greenville, South Carolina. This report also summarizes the results and conclusions of previously conducted site investigations.

The Phase III Site Investigation was conducted as a follow up to a Phase II Site Assessment Report previously submitted to the South Carolina Department of Health and Environmental Control (SCDHEC). SCDHEC provided comments to the Phase II report, and provided suggestions for additional assessment work, via letter dated December 6, 1996 from Tom Knight to Charles Bristow (Appendix A). Further guidance was provided by SCDHEC in a December 18, 1996 meeting held between SCDHEC and representatives from CSX Transportation, Duke Power Company, Applied Engineering & Science (AES), and the Army Corps of Engineers (ACE). Specifically, SCDHEC requested additional work to complete the following:

- Evaluate the potential impact to the fauna from the site contaminants
- Determine the horizontal and vertical extent of groundwater contamination
- Determine the extent of free product coal tar
- Resample wells and surface waters, and include analyses for Fe and Mn

Duke Power submitted a Phase III Workplan to SCDHEC in March 1997 outlining the various assessment activities necessary to provide SCDHEC with the requested information (Appendix B). SCDHEC approved the workplan via letter dated November 13, 1998 (Appendix A). Phase III assessment activities were initiated in February 1999.

2.0 Site Description and History

The CSX/Vaughn Landfill and Bramlette Road MGP sites are located in the community of City View in Greenville County, South Carolina as indicated on Figures 1 and 2. The Bramlette Road MGP site covers 3.69 acres and is located at 400 South Bramlette Road in the western quadrant of the intersection of Bramlette Road and West Washington Street (Figure 4). The CSX/Vaughn Landfill site covers approximately 7

acres and is located approximately 800 feet west of this intersection across and south of Bramlette Road (Figures 5 and 6). Both sites lie just outside of the Greenville City limits.

Both the Bramlette Road MGP and the CSX/Vaughn Landfill sites are owned by CSX Transportation (CSXT). The two sites are part of more extensive CSXT property holdings in the Bramlette Road area that total approximately 40 acres and contain rail lines and an office for crew transfers and scheduling activities. The majority of these properties lie within the floodplain of the Reedy River located to the west. Land use immediately east of the MGP and Landfill sites is primarily residential with the exception of the property located in the southern quadrant of the intersection of Bramlette Road and West Washington Street. This property contains a school building and is owned by the Greenville County School District. The property bordering the MGP site to the north is owned by Suburban Propane as described below.

The Bramlette Road MGP site was originally developed as a manufactured gas plant by Southern Public Utilities in 1917. The Bramlette Road plant was constructed as a replacement for an existing gas plant located at Broad Street in Greenville; and was a larger plant that produced gas using the more economical coal gas process. The site eventually contained a retort house, 3 gas holders, a water gas plant, tar and ammonia washer tanks, purifiers, a tar extractor and holder, and an underground heating oil tank. Locations of site structures are indicated on Figure 3, and a summary of MGP site development is provided in Appendix C. Historical aerial photographs of the CSX/Vaughn Landfill and Bramlette Road MGP sites are provided in Appendix D.

Gas plant ownership and operation transferred to Duke Power Company in 1935. The Piedmont Natural Gas Company purchased the site in 1951 and subsequently demolished the gas plant sometime in the late 1950s. Site ownership transferred to Piedmont and Northern Railway in 1963. Piedmont and Northern Railway became part of Seaboard Coast Line (CSX) in 1967. The site was used as a trucking facility in the 1970s and 1980s.

The site is currently vacant and access is restricted by perimeter fencing. Lockable gates are located at the southern corner of the site along Bramlette Road and at the northern corner of the site on West Washington Street. Texas Oil Company operated a petroleum bulking facility during the same timeframe as the gas plant operation on property immediately north and adjacent to the MGP site. This property is now owned by Suburban Propane and is currently used as a propane tank storage facility.

The CSX/Vaughn Landfill site is located within the eastern bank floodplain of the Reedy River. The site was developed as an unpermitted landfill by Mr. Robert Vaughn of Vaughn Construction and Demolition Company in Greenville. Mr. Vaughn attempted to purchase approximately 16 acres from CSXT in 1988 for the purpose of constructing a solid waste landfill. Following payment of a deposit, Mr. Vaughn began unpermitted landfilling activities on the property. The property transfer was never finalized, however, Mr Vaughn continued to operate the landfill. The South Carolina Department of Health and Environmental Control (SCDHEC) advised Mr. Vaughn in 1993 that his landfilling activities were improper. In February of 1994, the U.S. Army Corps of Engineers (ACE) notified CSXT that the property on which the landfill is located is considered a wetlands, and the landfilling operation was a violation of Section 301 of the Clean Water Act.

Following notification by the ACE, CSXT ordered Mr. Vaughn to cease landfilling activities and the site was closed.

3.0 History of Site Investigations

A Phase I investigation was conducted in early 1995 at the CSX/Vaughn Landfill site by Applied Engineering and Science (AES) of Atlanta, Georgia. This investigation included soil, sediment, surface water and groundwater sampling across and around the Landfill. The results of this investigation were documented in an AES report entitled "Site investigation; Soil, Sediment, and Groundwater Sampling; Vaughn Landfill, CSX Real Property; March 1995".

A Phase II investigation was conducted by AES in 1996. This investigation included the installation of 8 monitoring wells to assess groundwater quality at the MGP site and at the Landfill site; and soil sampling at the MGP site to assess the extent of coal tar. This investigation also included a biological survey conducted in the wetlands area surrounding the Landfill site, and included a site characterization and contaminant pathway/exposure evaluation. The results of this investigation were documented in an AES report entitled "Site Investigation Phase II, Vaughn Landfill/Duke Power Sites, CSXT Real Properties, Bramlette Road, Greenville, South Carolina, September 1996".

A wetlands delineation study was conducted by AES during February 1999. The results of this investigation were documented in an AES report entitled "Wetland Delineation Report, CSX Bramlette Road Property, Greenville, South Carolina, April 1999".

The extent and results of these investigations are summarized below:

3.1 AES Phase I Site Investigation - March 1995

SCDHEC and U.S. Army Corps of Engineers personnel performed inspections of the landfill site in April and May 1994. During these visits, petroleum sludge-type material was observed in the wetlands on the western side of the landfill. In August, 1994, the SCDHEC, in conjunction with the U.S. Army Corps of Engineers, requested that CSXT submit a work plan for an environmental assessment of the landfill site. CSXT retained Applied Engineering and Science, Inc. (AES) of Atlanta, Georgia to prepare and implement the subject work plan. AES submitted the work plan in November 1994, and SCDHEC approved the plan in December 1994. The work plan outlined a program of soil, sediment and surface water sampling to be conducted on the landfill and in the wetlands surrounding the landfill to assess the nature, extent and source of any contamination. AES began work plan implementation in February 1995.

Thirty-three soil samples were collected from sampling grid locations established across the landfill. Samples were collected from native soils below the fill material. The thickness of the fill material ranged from 8 feet in the northern area of the landfill near Bramlette Road to 14 feet in the south-central area of the landfill. Samples were primarily collected by direct-push methods (Strataprobe). A trackhoe was used to collect samples at locations inaccessible by the Strataprobe unit, or at locations where subsurface debris prevented direct-push sampling. At these locations, the trackhoe was

used to excavate through the fill material down to native soils. This technique allowed for inspection of the fill material which consisted of demolition debris comprised of wood, concrete, bricks, metal, roofing material, plastic and fiberglass insulation. Appliances and yard waste were also observed among the debris. The fill contained some soil that apparently had been used as cover material during the landfilling operation. No drums, tanks, cylinders or other containers containing potentially hazardous materials were observed. Groundwater samples were also collected from 7 of the soil sampling locations. These samples were collected from boreholes using a peristaltic pump, or were collected by stainless steel screen and tubing placed in groundwater that had entered open excavations.

Most soil samples were field screened for the presence of volatile organics using an Organic Vapor Analyzer (OVA). Several samples collected from native soil below the fill material exhibited strong hydrocarbon-like odors, and appeared oily and discolored. Some samples contained visible black, tarry material. Samples exhibiting the strongest odors and/or evidence of contamination were located in the northern and western area of the landfill. Samples collected from locations in the southern area of the landfill had little to no evidence of contamination. Some groundwater samples exhibited indications of petroleum odors.

Sediment samples were collected from 8 locations in the wetlands surrounding the landfill. Analytical results from 4 sediment sampling locations indicated petroleum contamination. Surface water samples were collected from 4 locations in the wetlands surrounding the landfill. No individual petroleum compounds were indicated in analytical results from surface water samples, however 3 surface water samples exhibited indications of total petroleum hydrocarbons.

Conclusions and recommendations from the Phase I Investigation are summarized as follows:

1. Tar-like substances and high lead concentrations are present in soils beneath the landfill at the fill/native soil interface and in floodplain soils surrounding the landfill. Volatile and semi-volatile organic compounds and lead are present in a band trending northeast to southwest beneath the landfill; and extends into the surrounding floodplain both northeast and southwest from the landfill.
2. Groundwater beneath the landfill has been impacted by volatile and semi-volatile organics.
3. No likely sources of tar, organic compounds and/or lead were discovered within the landfill materials observed.
4. The tar-like substances and organic compounds discovered beneath the landfill are consistent with the types of contaminants typically encountered at MGP sites.
5. The site for a former coal gasification facility lies across Bramlette Road immediately northeast and up-gradient from the landfill site. Wastewater containing coal tars apparently was discharged from the facility. This wastewater proceeded southwest from the MGP site in a ditch running parallel to Bramlette

Road before being routed into the wetlands/floodplain through a culvert beneath Bramlette Road.

6. Additional soil sampling is recommended to assess the extent and source of the organic contamination. Monitoring wells are recommended to assess the horizontal and vertical extent of groundwater contamination.

7. Grading should be conducted to cover exposed debris on the south end of the landfill.

Soil and sediment analytical results are discussed in Section 7.0, and groundwater analytical results are discussed in Section 8.0.

3.2 AES Phase II Site Investigation - September 1996

Following submittal of the March 1995 Report, SCDHEC requested by letter dated May 11, 1995 that CSXT submit a work plan outlining further assessment activities at the site. SCDHEC requested that CSXT determine the extent and source of the tar substance and the horizontal and vertical extent of groundwater contamination at the site. SCDHEC also requested that CSXT fully characterize the site, determine pathways of contaminant migration (to possible receptors), and further assess one landfill sampling location for the source of heavy metals present there. CSXT again retained Applied Engineering and Science, Inc. (AES) of Atlanta, Georgia to prepare and implement the subject work plan. AES submitted a general work plan in August 1995. This work plan described a program of soil sampling in the floodplain surrounding the landfill, along drainage pathways leading from the MGP site, and within the MGP site area. The work plan also proposed the installation of six monitoring wells (MW1 though MW6) south of Bramlette Road. SCDHEC approved the plan in November 1995 with the following adjuncts:

a. Groundwater sampling should be included with soil assessment at the MGP site.

b. A second shallow well should be installed adjacent to the proposed deep well (MW3D) within the landfill area.

c. A monitoring well proposed within the floodplain/wetland area east of the landfill (MW4) should be installed by hand auger to minimize impact to the wetland habitat.

d. Groundwater samples from wells within the landfill should be analyzed for sulfates in addition to organics.

e. A biological survey should be conducted to assess the impact of coal tar contamination on plant species within the floodplain.

f. The landfill should be reseeded following completion of grading activities.

AES began work plan implementation in March 1996.

For this investigation, soil sampling was conducted within 3 primary areas of the CSXT properties. Soil samples were collected from various locations within the former MGP site, from the area west of the MGP site and north of Bramlette Road, and from the Vaughn Landfill site. Soil sampling was conducted by direct-push methods

(Strataprobe) or by hand auger. Continuous samples were collected from each sampling location until the presence of coal tar was detected (visually or by odor), or until groundwater was reached. A limited number of soil samples were submitted for laboratory analyses.

Soil sampling was performed at 29 locations within the MGP site at depths varying from 3 to 14 feet. Coal tar residuals were indicated in a broad north-south band extending from the northern access gate on West Washington Street through the center of the site to the southernmost corner on Bramlette Road. Within this band, coal tar residuals or odors were indicated at various depths ranging from the surface down to 14 feet deep. Site reconnaissance and sampling efforts also revealed the presence of large quantities of surface and buried debris at the MGP site. The debris consists of bricks, concrete, metal, reinforcing bars, wood and other demolition materials that appear to be the remains of the coal gasification plant buildings demolished in the late 1950s. No coal tar residuals were indicated in soils in the eastern and western corners of the MGP site.

Soil sampling was performed at 9 locations in the area west of the MGP site and north of Bramlette Road. Sampling in this area was primarily limited to suspected surface drainage pathways of wastewater discharged from the former coal gasification plant. Sampling results indicated the presence of coal tars in a drainage ditch running southwest from the MGP site along the north side of Bramlette Road to a culvert that discharges surface runoff into the wetlands area south of Bramlette Road. The sampling results confirmed that coal tars and coal tar laden wastewaters were likely discharged into this ditch and eventually into the wetlands. The discharge point for this culvert lies on Greenville County School District property.

Four additional soil samples were collected in the seasonally flooded area of the floodplain west of the Vaughn Landfill. These samples confirmed the presence of coal tars in floodplain soils and in soils in the man-made drainage ditch running south through the floodplain. Samples were also obtained from one previous Landfill sampling location from the March 1995 investigation.

Eight monitoring wells (MW1 through MW7, and MW3D) were installed as part of this investigation. MW1, MW3, MW3D and MW6 were installed on the Vaughn Landfill. MW2 was installed near the CSXT office building west of the Landfill. MW4 was installed by hand auger in the wetlands east of the Landfill. MW5 was installed southwest of the Landfill adjacent to CSXT rail lines. MW7 was installed within the MGP site area.

Site geology, surface runoff patterns, and the results of a biological survey were also assessed during this investigation. Site geologic conditions are discussed in Section 5.0. Site topography and runoff patterns are discussed in Section 4.0. Site biological assessment results are discussed in Section 10.0.

Conclusions from the Phase II Investigation are summarized as follows:

1 Coal tar contaminated soils are widespread across the MGP site, and coal tar saturated soils were observed at 2 locations within the MGP site. Coal tars in soils at the Landfill site are either covered with landfill material or are underwater

within the floodplain/wetlands. Sampling results confirm that coal tars, and likely coal tar laden wastewaters, were discharged into a ditch leading from the MGP site and into the floodplain/wetlands south of Bramlette Road.

2 Groundwater at both the MGP site and the Landfill site is contaminated. The plume of contamination extends in a long, narrow band from the MGP site southwest through the Landfill site. The plume appears to be wholly within CSXT property. The plume may extend to the Reedy River, however, laboratory analytical results from Reedy River samples indicated no surface water contamination.

3 Contaminants in soil and groundwater within CSXT properties are the result of coal tar and coal tar laden wastewater from the former Duke Power coal gasification plant.

4 Much of the groundwater contamination at the Landfill site has likely occurred from coal tars from the MGP site that have settled in the floodplain/wetlands south of Bramlette Road.

5 Free product coal tar is present in deep monitoring well MW3D located within the Landfill. The free product appears to reside at a depth of 18 to 20 feet at the interface between overlying alluvial soils and underlying saprolite.

6 Coal tar saturated soils at the former MGP site represent a potentially continuing source of contamination.

7 No surface water contamination is indicated down-gradient from the Landfill site, no downstream users of Reedy River water were identified, and no drinking water supply wells were found within 0.5 miles of the CSXT properties. There are no earth disturbing activities on-going on the CSXT properties that could potentially result in exposure to, or transportation of, contaminated soils.

Soil analytical results are discussed in Section 7.0, and groundwater analytical results are discussed in Section 8.0.

3.3 AES Wetland Delineation Report - April 1999

In association with legal actions taken on the part of CSXT against Mr. Robert Vaughn for improper landfilling of the wetlands previously discussed; CSXT contracted with Applied Engineering and Science, Inc. (AES) of Atlanta, Georgia to perform a wetland delineation survey. This survey was performed to determine the valuation of the wetlands impacted by the landfill, and to submit an after-the-fact permit to the U.S. Army Corps of Engineers. This assessment was performed during February 1999.

4.0 Site Topography

The former MGP site occupies the highest elevations of the CSXT properties containing the MGP site, the Vaughn Landfill, and the floodplain areas of the Reedy River as indicated on Figures 3 through 6. Elevations within the MGP site vary from approximately 944 to 930 feet above mean sea level. The highest elevation occurs at the intersection of West Washington Street and Bramlette Road. The lowest elevation

occurs along the fenceline in the southern corner of the site. The site contains several shallow depressions that collect surface runoff. The western and southwestern areas of the site lie within the 100 year flood boundary of the Reedy River. The area west of the MGP site and north of Bramlette Road lies almost entirely within the 100 year flood boundary and varies in elevation from approximately 940 to 923 feet above mean sea level. Changes to the natural topography of this area and the MGP site have occurred as a result of grading and landfilling activities over time. Demolition debris was buried on the MGP site following dismantling of site facilities in the late 1950s. Over time, significant quantities of construction and demolition type debris has been placed within the floodplain area north of Bramlette Road from the western area of the MGP site to the rail lines east of the site. A test pit excavated in the western corner of the MGP site revealed approximately 7 feet of fill material placed over native clay soils. This fill consisted of a mixture of soil, brick, wood, broken concrete, coal dust and other inert materials. No MGP related contamination was indicated in this test pit.

Elevations of the floodplain area south of Bramlette Road vary little with the exception of that portion covered by the Vaughn Landfill. The floodplain area lies at an approximate elevation of 923 feet above mean sea level. The Vaughn Landfill varies in elevation from 923 to 937 feet. Borings taken across the top of the Landfill have indicated debris has been placed in thicknesses varying from 7 to 14 feet.

Stormwater runoff enters the northern corner of the MGP site from West Washington Street and to a lesser degree from the adjacent Suburban Propane property. This runoff tends to settle in depressions within the north-central area of the site. For the remainder of the site, surface runoff was generally toward the southern corner of the site with the majority of runoff exiting near the gate along Bramlette Road. Runoff from the extreme southwestern area of the site flows into a ditch (Ditch 1) running southwest along Bramlette Road. This ditch discharges into the floodplain/wetlands area south of Bramlette through a 24 inch diameter culvert beneath the road. The runoff spreads south and collects behind the Landfill that acts as a dam to the natural flow. Surface runoff from the school property and other properties along West Washington Street also discharges into this area. A 30 inch diameter culvert and narrow man-made channel (Ditch 4) was constructed through the Landfill to allow runoff to flow to the western side of the Landfill.

A 72 inch diameter culvert beneath Bramlette Road directs runoff from the area north of the road (Ditch 2) into the floodplain/wetlands area west of the Landfill. This runoff flows south in a ditch (Ditch 3) along the western side of the Landfill and joins runoff from the ditch that cuts through the Landfill (Ditch 4) from the east. The floodplain area west of the Landfill contains varying amounts of standing water throughout the year. During wet periods, considerable amounts of standing water are present in this area. This water is prevented from directly entering the Reedy River by an elevated CSXT rail line and rail yard embankment that lies between this area and the river.

Some amount of stormwater runoff from this rail line and rail yard area directly enters the wetlands from the west. During drier periods, water is primarily confined to a few pools and a man-made canal running through this area (Ditch 5). This canal directs floodplain waters south toward Willard Street and runs beneath a railroad trestle before

discharging into the Reedy River. This appears to be the only discharge point for surface runoff from CSXT properties located east of the Reedy River.

5.0 Site Geology

The CSX/Vaughn Landfill and Bramlette Road MGP sites lie within the Inner Piedmont belt, one of several northeast-trending geologic belts of the southern crystalline Appalachians. The Inner Piedmont belt lies between the Charlotte and Kings Mountain belts to the east and the Blue Ridge province to the west. The Inner Piedmont belt is a fault-bounded composite stack of thrust sheets containing a variety of gneisses, schists, amphibolites, sparse ultramafic bodies, and intrusive granitoids (Goldsmith and others, 1998). The general structure within the belt is characterized by irregular foliation of low dip and folds transverse to the northeast regional trend.

The stratified rocks of the belt consist of thinly layered mica schist and biotite gneiss that are interlayered with lesser amounts of amphibolite, calc-silicate rocks, hornblende gneiss, and quartzite. Protoliths of these rocks were largely sedimentary and in part volcanic. Large and small masses of granite and granodiorite are present throughout the belt and form concordant to semi-concordant bodies in the country rock. Some of these granitoid bodies are gneissic and are probably older than the poorly foliated to non-foliated facies. Small, ultramafic masses are present along the eastern and western edges of the belt. The rocks of the central core of the Inner Piedmont are in the sillimanite zone of amphibolite metamorphism. The flanks are primarily ion the staurolite-kyanite zone.

In the Piedmont region, crystalline bedrock is typically overlain by a variable thickness and degree of weathered rock. The degree of weathering typically decreases with depth with a thoroughly weathered and structureless material at the surface termed residuum. The residuum grades into a coarse-grained material that retains the structure of the parent bedrock and is termed saprolite. Beneath the saprolite, partially weathered bedrock occurs with depth until sound bedrock is encountered. Groundwater in this region generally occurs in a system composed of interconnected layers of saprolite overlying fractured metamorphic and igneous rocks.

Two borings advanced to refusal within the MGP site indicated refusal depths of 30.4 and 58.4 feet (elevations 903.14 and 878.12). Two borings advanced to refusal within the Landfill area indicated refusal depths of 18.0 and 25.5 feet (elevations 907.33 and 914.14). According to a report entitled *Groundwater Resources of Greenville County South Carolina*, seven former industrial wells located within 1/4 mile of the CSXT properties were installed with casings varying in length from 10 to 41 feet. Since production well casings typically extended from the ground surface into fractured rock, these casing lengths are another indicator of refusal depths in the vicinity of the subject property. These seven wells were reported as destroyed or abandoned. One of these wells was located at the MGP site. This well was installed to a total depth of 298 feet in fractured gneiss and was reported to have yielded 50 gpm. The exact location of this well is unknown.

The Piedmont region is characterized by rolling hills, uplands, and stream valleys that contain narrow floodplains. The general flow patterns of streams in this region is toward the southeast. Greenville County lies within the Santee River basin that includes several sub-basins such as the Reedy River basin. Alluvial soils found within river floodplains are typically the result of eroded and deposited residuum and saprolite. These soils vary in structure from fine to coarse depending on the depositional environment.

According to the Soil Conservation Service *Soil Survey of Greenville County*, soils found on the subject CSXT properties include the Cartecay, Chewacla and Cecil-Urban series types. Cartecay soils are described as alluvial sandy loams commonly found as deposits on floodplains. Chewacla soils are also described as alluvial deposits consisting of finer silty clay loams, and are considered hydric soils typical of those found in wetland environments. Cartecay and Chewacla soils are commonly intermixed within floodplain areas.

Borings for soil sampling and well installations conducted within the MGP site have indicated highly disturbed soils, intermixed with MGP debris (coal, coal tar, coal ash, coke, brick and other demolition materials), from the surface to generally between 2 and 6 feet deep. The greater depths of the debris layer tend to occur in the southern area of the site. A test pit dug in the western corner of the site indicated approximately 7 feet of landfill type debris mixed with soil overlying virgin clay. This landfill debris did not appear to contain demolition materials or contaminants related to the MGP facility, however some coal was present in the mixture. Virgin soil types underlying the debris at the MGP site tended to be silty clays and clayey sands extending to depths between 7 and 16 feet below the surface. Silty sands typically occurred below the clayey soils, eventually grading into saprolite with depth.

Borings for soil sampling and well installations conducted at the Vaughn Landfill site have indicated between 7 and 14 feet of demolition-type landfill debris and soil backfill. A 2 to 6 feet thick layer of clay or clayey soils was typically encountered below the Landfill debris. Sands and silty sands were present below the clay layer. The sandy soils typically graded into stiffer saprolite material at 17 to 19 feet below the Landfill surface. The lithologic units (clays, silty sands, and sands) across the Landfill site vary in thickness, location and in transition (gradual to abrupt) from one unit to another, indicative of alluvial deposits that might be found within a floodplain environment. Free coal tars were encountered at both the top of the clay layer immediately below the landfill debris, and near the sandy soil-saprolite interface.

Coal tar released from the MGP site had apparently settled into pools and depressions within the wetlands. Some of the coal tar remained pooled on the more impermeable clays. Over time, some of the coal tar migrated through narrow lenses of clay, or through gaps in the clay layer, and down through the underlying sand units. Split spoon samples retrieved from 2 borings drilled for the installation of monitoring wells (MW19 and MW20 discussed in Section 6.0) indicated coal tar in both the clayey soil beneath the debris, and at the sandy soil-saprolite interface.

6.0 Monitoring Wells and Site Hydrogeology

To-date, 25 permanent monitoring wells have been installed at the Landfill and MGP sites as indicated on Figures 7 through 9. Eight wells (MW1 through MW7) were installed in March 1996 as part of the AES September 1996 Phase II Investigation. The remaining wells (MW8 through MW25) were installed in the period from February through May, 1999, as part of this Duke Power Phase III Investigation. All 25 wells were installed using standard 2 inch diameter PVC casings and slotted well screens. All wells were installed using conventional drill rigs with the exception of MW4 which was installed by hand auger. A graded sand was used in all wells to fill the annular space between the screen and the borehole wall up to and over the screened section. Bentonite was used in all wells to seal the annular space above the sand pack. With the exception of MW4, cement grout was used in all wells to complete the seal up to the ground surface. MW4 was sealed with bentonite up to the ground surface. Wells MW3D, MW9 and MW20 were installed with double casings as discussed below. Well construction details are summarized in Table 1.

6.1 MGP Site Monitoring Wells

Eleven monitoring wells (MW7 through MW17) have been installed within the MGP site as indicated on Figure 7. Well MW7 was installed in March 1996 as part of the AES Phase II Site Investigation in an area of heavily stained soils south of the former retort house location. Wells MW8 through MW17 were installed in February-March, 1999 by Duke Power as part of the Phase III Assessment.

As outlined in the Phase III Workplan (Appendix B), the Duke wells were installed as nested wells consisting of shallow wells grouped with mid-depth wells. The Duke wells were generally installed in the 4 corners of the site and near existing well MW7 as indicated on Figure 7. The shallow wells (MW12, MW14 and MW16) were installed with 10 feet of PVC well screen placed to intersect the surficial aquifer. Shallow well depths were 12, 13 and 16 feet for MW12, MW14 and MW16, respectively. No split spoon samples were taken in these wells, however, samples were taken from adjacent wells MW11, MW13 and MW15 as discussed below.

The mid-depth wells (MW11 and MW13) were augered until stiffer saprolite material was encountered, and were fitted with 10 foot screens placed at the top of the saprolite layer. Well depths were 25.7 and 23.1 feet for MW11 and MW13, respectively. Split spoons from MW11 primarily contained silty sand type soils with no indications of debris or coal tar odors. Split spoons from MW13 contained silty sand type soil from the surface to 5.5 feet, sandy silty clay from 5.5 to 11 feet, clayey sandy silty from 11 to 14 feet, and silty sand from 14 to 23.1 feet. Very soft soil was encountered from 11 to 14 feet deep. There were no indications of debris or coal tar odors in MW13.

Three wells (MW8, MW10 and MW17) were installed as combined shallow/mid-depth wells with screen lengths of 13, 15 and 13.9 feet, respectively. Combined wells were stipulated for conditions in which the distance between the surficial water table and the saprolite layer was less than 13 feet. Combined well depths were 17, 19.5 and 16 feet for MW8, MW10 and MW17, respectively. Demolition-type debris was encountered from the surface to 2 feet in MW8. Silty sand with coal tar odors was indicated in split

spoons from 2 to 6 feet. Silty clay and silty sand with clay seams and coal tar odors were indicated in spoon samples from 6 to 9.5 feet; and silty sand with coal tar odors was indicated in the remaining spoons taken from 9.5 to 17 feet deep. There were no indications of debris or tar-like odors in split spoons retrieved from MW10. In MW17, black coal-like material and strong odors were present in split spoons from the surface to 2.5 feet deep. Rubber-like tar material with no soil was indicated in the subsequent spoon sample retrieved from 2.5 to 4 feet. Sandy silt and silty sand with coal tar odors were indicated in the remaining split spoons taken from 4 to 17.5 feet in MW17. The boring for MW17 was terminated at 16 feet.

Well MW9 was located adjacent to MW7 and MW8, and was constructed as a deep well. MW9 was drilled with a 10 inch auger to stiff, saprolite material previously encountered at 18 feet deep in adjacent well MW8. An 8 inch PVC casing was grouted into the hole and the boring was continued by augering with a standard 7.25 inch auger through the 8 inch casing. The auger was advanced to refusal at 30.4 feet and the well was fitted with 5 feet of screen placed at refusal. No tar-like odors were indicated in split spoons retrieved from below 18 feet in MW9.

Well MW15 was originally planned as a mid-depth well to be constructed adjacent to MW16. While augering for MW15, no noticeably stiffer saprolite layer was indicated until refusal was encountered at 58.4 feet. The well was fitted with 5 feet of screen placed at refusal. Landfill type debris (brick, wood and cloth) was indicated in split spoons taken from the surface to 8.5 feet deep in MW15. No coal tar odors were indicated in any split spoons from MW15.

Hydrogeologic cross-sections through monitoring well and soil sampling locations within the MGP site are shown on Figure 13, and on Figures 31 through 36.

6.2 CSX/Vaughn Landfill Monitoring Wells

Fifteen monitoring wells (MW1 through MW6, and MW18 through MW25) have been installed on and around the CSX/Vaughn Landfill site south of Bramlette Road as indicated on Figures 8 and 9. Wells MW1 through MW6 were installed in March 1996 as part of the AES Phase II Investigation. Wells MW18 through MW25 were installed in March-April, 1999 by Duke Power as part of the Phase III Assessment.

Wells MW1, MW3 and MW6 were installed as shallow wells at the Landfill site. These wells were augered through 8 to 10 feet of landfill debris and into underlying virgin sandy and silty clay soil. MW1 was augered to 15 feet and fitted with 10 feet of well screen. MW3 was augered to 14 feet and fitted with 5 feet of screen. MW6 was augered to 12 feet and fitted with 10 feet of screen. Coal tar and/or coal tar odors were encountered in the underlying clay soil in MW1, MW3 and MW6. MW2 was installed as a shallow well near the CSXT office building west of the Landfill. MW2 was augered to 15 feet and fitted with 10 feet of screen. MW5 was installed as a shallow well located southwest of the Landfill adjacent to CSXT rail lines. MW5 was augered to 14 feet and was also fitted with 10 feet of screen. MW4 was installed by hand auger in the wetlands east of the Landfill. MW4 was augered to 7 feet and fitted with 5 feet of screen. No coal tar or coal tar odors were indicated during the installation of MW2, MW4 and MW5.

MW3D was installed as a double-cased deep well. MW3D was drilled using a 14 inch auger that was advanced through the landfill debris and through the underlying virgin clay soil to the clay/sand interface at 14.5 feet deep. An 8 inch outer casing was set and grouted in the hole to seal off the overlying clay layer from the underlying sand unit. The boring was continued with a standard 7.25 inch auger through the outer casing until stiffer saprolite material was encountered at 20 feet below the Landfill surface. A 3 inch layer of coal tar was indicated in a split spoon sample that was retrieved from 16 to 18 feet below the Landfill surface. Coal tar was also indicated in the final split spoon retrieved from 18 to 20 feet deep. MW3D was fitted with 5 feet of screen located from 15 to 20 feet deep. Approximately 2.75 inches of free product coal tar was indicated in the bottom of MW3D during sampling conducted on March 13, 1996 as part of the Phase II investigation. The location of the coal tar appeared to correlate with the location of the interface between the overlying sandy silty residuum and the underlying saprolite. This observation suggested that free coal tar at this location is tending to pool at the interface with the more impermeable saprolite located 7 to 9 feet below the natural grade of the floodplain.

As outlined in the Phase III Workplan, certain Duke wells were proposed as mid-depth or deep wells nested with existing AES wells MW1, MW3, MW3D, MW5 and MW6. Nested shallow and mid-depth wells were also proposed for installation in the wetlands south of the Landfill, on the CSXT rail line embankment southwest of the Landfill, and on the Greenville School District property between the school facility and the Landfill.

MW19 was installed as a mid-depth well located adjacent to MW1. MW19 was augered through 7 feet of landfill debris to stiff material at 19 feet deep, and fitted with 10 feet of screen. Significant coal tar or coal tar odors were indicated in split spoon samples taken from 7 to 16 feet in MW19. Sandy clayey silt with coal tar was present in the split spoon sample retrieved from 7 to 8.5 feet. The spoon sample from 8.5 to 10 feet contained soft sandy clayey silt with a strong coal tar odor. Soft, sandy clayey silt was indicated in the spoon sample from 10 to 13 feet deep. The final spoon sample was taken from 13 to 16 feet and indicated fine to medium sand with coal tar. No split spoon samples were taken from 16 to 19 feet.

MW20 was installed as a double-cased deep well located adjacent to MW3 and MW3D. MW20 was drilled with a 10 inch auger to stiff saprolite material at 19 feet below the Landfill surface. Landfill debris was encountered from the surface to 11.5 feet deep, and virgin sandy silty clay with coal tar was indicated in split spoons retrieved from 11.5 to 13 feet. Wood particles were indicated in split spoons from 13 to 15 feet deep. Fine to medium sand with coal tar was indicated in split spoons from 15 to 19 feet. At 19 feet an 8 inch PVC casing was set and grouted in the hole, and the drilling was continued through the 8 inch casing using a conventional 7.25 inch auger. The auger was advanced to refusal at 25.5 feet where 5 feet of screen was set. No coal tar was indicated in split spoons retrieved from depths below 19 feet.

MW21 was originally proposed as a mid-depth well to be located adjacent to MW6. While augering for MW21, no noticeably stiffer saprolite layer was indicated until refusal was encountered at 18 feet. The well was fitted with a 13 feet of screen placed at refusal. Landfill debris was indicated from the surface to 12 feet deep where fine sandy silt was encountered. Moderate coal tar odors were indicated in split spoon samples

retrieved from 12 to 15 feet deep. A split spoon sample from 15 to 17 feet deep indicated silty fine to coarse sand grading into weathered rock. No coal tar odors were indicated below 15 feet.

MW22 was installed as a mid-depth well located adjacent to MW5 on the rail line embankment south of the Landfill. MW22 was augered through 8.5 feet of embankment soils and into underlying fine sandy silt alluvium. The fine sandy silt continued with depth until stiff fine to coarse weathered rock was encountered at 35 feet. The boring was terminated at 36.5 feet and the well was fitted with 10 feet of screen placed from 25 to 35 feet. No coal tar odors were indicated in split spoons taken from MW22.

MW18 was installed as a single combined well (shallow and mid-depth) located southwest of the Landfill on the CSXT rail line embankment. MW18 was augered through 8.5 feet of embankment soils and into underlying fine sandy silty clay. Sandy silt was indicated from 10 to 12 feet, and fine to coarse sand from 12 to 21 feet. Sandy silt was indicated from 21 feet to 26.5 feet where stiff weathered rock was encountered. The boring for MW18 was terminated at 25 feet and the well was fitted with 15 feet of screen placed from 9.5 to 24.5 feet. No coal tar odors were indicated in split spoons taken from MW18, however sewer-like odors were noticed in spoons from 5 to 17 feet.

Well MW23 and MW24 were installed near Ditch 5 in the wetlands south of the Landfill. The wells were located adjacent to Ditch 5 and in an overhead power line right-of-way clearing previously cut through the wetlands. The wells were installed using a track-mounted drill rig. MW24 was installed as a shallow well at a depth of 11 feet. MW24 was fitted with 10 feet of PVC well screen located from 0.4 to 10.4 feet below the surface. No split spoons samples were taken in MW24. MW23 was installed as a mid-depth well to a depth of 43 feet. Split spoons samples taken during the installation of MW23 indicated sandy clayey silt from the surface to 4 feet, sandy silt from 4 to 7 feet, silty sands from 7 to 31 feet, and sandy silts from 31 to 44.5 feet. No stiff saprolite layer was encountered in MW23, and the boring was terminated at 43 feet. No coal tar odors were indicated.

MW25 was installed as a single combined well (shallow and mid-depth) located on the Greenville School District property between the school facility and the Landfill. Permission was secured from the Greenville School District for installation of the well (Appendix A). Split spoons taken during the installation of MW25 indicated silty sand and sandy silt from the surface to 5 feet, clayey silt and silty clay from 5 to 8.5 feet, and silty sand from 8.5 to 15 feet. Very stiff weathered rock was encountered at 16 feet, and the boring was terminated at 16.7 feet. MW25 was fitted with 15 feet of screen from 1 to 16 feet below the surface. No coal tar odors were indicated during the installation of MW25.

Hydrogeologic cross-sections through Landfill site sampling locations and monitoring wells MW1, MW19, MW3, MW3D, MW20, MW6 and MW21 are shown on Figure 14, and on Figures 37 and 38.

6.3 Groundwater Elevations - June 1999

Groundwater elevations were recorded during a groundwater monitoring and sampling event conducted on June 15-17, 1999 as part of this Phase III Investigation. Field monitoring data and groundwater levels are summarized in Tables 2 and 3; and groundwater elevations and contours are shown on Figures 10 through 12. Groundwater elevations recorded during this period varied from approximately 936 to 919 feet above mean sea level.

Depths to groundwater within the MGP site varied from 2.74 to 8.01 feet below the ground surface. Depth to groundwater in the southern area of the site (wells MW7, MW8, MW9 and MW17) ranged from 2.74 to 3.19 feet below the surface. Depths to groundwater along West Washington Street (wells MW10 through MW14) ranged from 4.01 to 5.08 feet below the surface. The greatest depth to groundwater occurred in the western corner of the site (MW15 and MW16). Depths to groundwater in MW15 and MW16 were 7.99 and 8.01 feet, respectively. Groundwater contours within the MGP site varied from elevation 936 feet near the intersection of Bramlette and West Washington Roads (MW10) to elevation 928 feet near the western corner of the site (MW16).

Hydraulic gradients across the site were 1.5% to 2%. Groundwater in the northern area of the MGP site appears to flow in a west-southwesterly direction toward the Reedy River (Figure 10). Groundwater in the southern area of the site appears to flow in a slightly more southwesterly direction, and appears to turn more southerly toward the Landfill/wetlands area south of Bramlette Road. Groundwater contours in the area north of Bramlette Road and west of the MGP site varied from elevation 928 feet (MW16) to approximately 922 feet (MW2) near Ditch 2. Hydraulic gradients across this area appear to vary from 1% to 1.7% in a west-southwesterly direction toward the Reedy River.

Groundwater elevations south of Bramlette Road varied from elevation 926 east of the Landfill (MW25 and MW1) to 922 west of the Landfill (MW2, MW6 and MW18) as shown on Figure 11. Groundwater flow beneath the northern area of the Landfill appears to be west-southwesterly with a gradient of approximately 2%. Beneath the southern area of the Landfill, the groundwater appears to flow more south-southwesterly at flatter gradients varying from 0.7% to 1%. Depths from the Landfill surface to groundwater ranged from 5.29 feet (MW1) on the northern end of the Landfill; to 8.52 feet (MW3) near Ditch 4; to 8.24 feet (MW6) near the southern end of the Landfill.

The lowest groundwater elevations occurred in MW5 (919.40), MW18 (919.92) and MW22 (919.19) located along the CSXT rail lines west and southwest of the Landfill (Figures 11 and 12). Depths from the surface to groundwater in wells MW5, MW22 and MW18 were 8.09, 8.76 and 10.89 feet, respectively.

Groundwater occurs at or above the ground surface in the wetlands surrounding the Landfill as is evident in MW24 and MW25 . The depth to groundwater in mid-depth well MW23 installed near Ditch 5 in the wetlands south of the Landfill was 1.52 feet below the surface.

7.0 Soil and Sediment Assessment

Soil and sediment samples have been obtained from 105 separate sampling locations (including monitoring well locations) across the CSX/Vaughn Landfill and MGP sites beginning with the March 1995 Phase I Investigation. Soil and sediment sampling locations are indicated on Figures 13 and 14. Soil samples were collected from native soils at 33 sampling grid locations established across the Landfill, and sediment samples were collected from 8 locations in the wetlands surrounding the Landfill, for the Phase I Investigation.

For the Phase II Investigation, soil samples were collected from 29 probe locations and 1 well location within the MGP site, from 9 probe locations in the area north of Bramlette Road and west of the MGP site, and from 6 well locations in and around the Landfill area (Figure 13). Sediment samples were also collected from 4 locations in the wetlands surrounding the Landfill (Figure 14). In addition, sampling location LF024 from the Phase I Investigation was resampled.

For the Phase III Investigation, soil samples were obtained from 7 well locations within the MGP site, from 7 well locations in and around the Landfill site, and from one hand auger location (HA#1) in the wetlands off the southern edge of the Landfill (Figure 14).

Most soil samples collected were characterized in the field for soil type and presence of obvious contamination or odor. Samples obtained for the Phase I Investigation were field screened utilizing an organic vapor analyzer (OVA). A number of soil and sediment samples collected have been submitted for laboratory analyses as summarized in the following table:

Number of Soil and Sediment Samples Submitted For Laboratory Analyses				
Analysis	March 1995 Phase I Investigation	September 1996 Phase II Investigation	Duke Phase III Investigation	Total Laboratory Analyses
Volatiles (8260)	41	17	1	59
Semi-Volatiles (8270)	9	17	1	27
TPH (9071)	8	0	0	8
RCRA Metals	41	1	0	42
PCBs (8080)	41	0	0	41

Laboratory analytical results for all soil and sediment samples are summarized in Tables 4 through 19; and on Figures 15 through 18. All soil analytical data is provided in Appendix G.

Tables 5, 9, 12, 15 and 19 provide analytical result summaries on 16 polycyclic aromatic hydrocarbon compounds typically associated with MGP wastes. This group of compounds includes the following 9 non-carcinogenic PAHs and 7 carcinogenic PAHs:

Non-Carcinogenic PAHs	Carcinogenic PAHs
Naphthalene	Benzo(a)anthracene
Acenaphthylene	Chrysene
Acenaphthene	Benzo(b)fluoranthene
Fluorene	Benzo(k)fluoranthene
Phenanthrene	Benzo(a)pyrene
Anthracene	Indeno(1,2,3-c,d)pyrene
Fluoranthene	Dibenzo(a,h)anthracene
Pyrene	
Benzo(g,h,I)perylene	

Total PAH sums provided in the tables include non-detects at one-half the laboratory detection limit.

7.1 MGP Site - Soil Analytical Results

Soil samples collected within the former MGP site have indicated highly disturbed soils, intermixed with MGP debris (coal, coal tar, coal ash, coke, brick and other demolition materials), from the surface to generally between 2 and 6 feet deep as previously described in Sections 5.0 and 6.1. The site presently contains at least 3 masonry tar wells containing various quantities of free tar (Figure 3). Hydrogeologic cross-sections through soil sampling and monitoring well locations within the MGP site are provided on Figure 13, and on Figures 31 through 36. Soil types, depths of debris, presence and magnitude of obvious odors, and both soil and groundwater laboratory analytical results are also summarized on these figures.

As summarized in Section 3.2, coal tar residuals were indicated in a broad north-south band extending from the northern access gate on West Washington Street through the center of the site to the southernmost corner on Bramlette Road. Within this band, coal tar residuals or odors were indicated at various depths ranging from the surface down to 14 feet deep. No coal tar residuals were indicated in soils in the eastern and western corners of the MGP site. The coal tar contamination was also present west of the MGP site, primarily along stormwater drainage paths leading from the site and running parallel to Bramlette Road (Ditch 1) as previously discussed.

Soil samples from 10 sampling locations within the MGP site and 2 sampling locations north of Bramlette Road and west of the MGP site were submitted for laboratory analyses by EPA Methods 8260 and 8270 (Tables 8 and 9). The Phase II Investigation Report stated that, typically, only those samples exhibiting no detectable signs of contamination (i.e. visible coal tar or odor) were submitted for laboratory analyses. Certain obviously contaminated samples were submitted for analysis for classification of the various organic constituents present.

Method 8260 analytical results indicated detectable BTEX compounds in only 2 of the 10 samples analyzed from the MGP site, and none in the sample from location NB1 just

outside the western site boundary fence (Table 8 and Figure 15). Results from locations DP1A and DP28 indicated only m-p-xylene at 1.3 ppm and benzene at .007 ppm, respectively. The highest concentrations of BTEX were indicated along Ditch 1 at location NB8. The sampling depth at NB8 was not stated in the Phase II report, however, it is believed to have been taken within 3 feet of the surface. Total BTEX at NB8 was 66.5 ppm. Other compounds detected at this location included 1,2,4-trimethylbenzene at 16 ppm, 1,3,5-trimethylbenzene at 5.4 ppm and styrene at 4.1 ppm. Styrene was detected in near surface sample DP28 at .034 ppm, and TCE was detected in near surface sample DP26 at .094 ppm.

Method 8270 analytical results indicated detectable semi-volatile organics in 3 of the 10 samples analyzed from the MGP site. Semi-volatile organics were also detected in samples from locations NB1 and NB8 located west of the MGP site (Figure 17). Semi-volatiles were indicated at sampling locations DP1A (5 to 7 feet deep), DP9 and DP29 (surface to 12 inches deep). The sample depth taken at location DP9 was not recorded in the Phase II report. Total PAHs and total carcinogenic PAHs at DP1A were 281.9 and 66.4 ppm, respectively. Naphthalene at 48 ppm accounted for 17% of the total PAHs. Carcinogenic PAHs accounted for 23.5% of total PAHs in the DP1A sample. Total PAHs and total carcinogenic PAHs at DP9 were 187.7 and 95.4 ppm, respectively. Carcinogenic PAHs accounted for 51% of total PAHs in the DP9 sample. Naphthalene was not detected at DP9. Only carcinogenic PAHs chrysene (53 ppm), benzo(b)fluoranthene (62 ppm) and benzo(k)fluoranthene (72 ppm) were detected in the DP29 sample. Other PAHs were likely present in the DP29 sample, but were not detected due to the high method detection limit (33 ppm) established during the analysis.

Total PAHs and total carcinogenic PAHs at NB1 located just outside the western site boundary fence were 11.19 and 4.23 ppm, respectively. Carcinogenic PAHs accounted for 37.8% of total PAHs in the NB1 sample. Total PAHs and total carcinogenic PAHs at NB8 located along Ditch 1 west of the MGP site were 23,200 and 4,590 ppm, respectively. Naphthalene (5,800 ppm) accounted for 25% and carcinogenic PAHs accounted for 19.8% of total PAHs in the NB8 sample. These high concentrations at location NB8 in Ditch 1 appear to confirm that coal tars were discharged from the MGP site into Ditch 1 as previously discussed.

No soil samples taken from within the MGP site or from the area north of Bramlette Road and west of the MGP site were analyzed for RCRA metals, cyanide or PCBs.

7.2 CSX/Vaughn Landfill Site - Soil Analytical Results

Soil samples collected across the Landfill have indicated the presence of coal tar and coal tar constituents in soils beneath the landfilled debris as previously discussed in Sections 5.0 and 6.2. As discussed in Section 5.0, coal tars were encountered at both the top of the clay layer immediately below the landfill debris, and near the underlying sandy soil-saprolite interface. Hydrogeologic cross-sections through soil sampling and monitoring well locations across the Landfill are indicated on Figure 14, and on Figures 37 and 38. Soil types, depths of debris, presence and magnitude of obvious odors, and both soil and groundwater laboratory analytical results are also summarized on these figures.

All 33 soil samples collected from native soils below the landfilled debris during the March 1995 Phase I Investigation were submitted for analyses of volatile organics by Method 8260. Most of these samples were field screened for the presence of volatile organics using an Organic Vapor Analyzer (OVA). OVA readings ranged from zero to greater than 1000 ppm. Sample depths ranged from 6 to 17.5 feet below the top surface of the Landfill. OVA readings, sample depths, and Method 8260 analytical results on these samples are summarized in Table 4. BTEX compounds were detected in 13 of the 33 samples tested. The maximum total BTEX concentration was 69.3 ppm at LF004 located on the northeast edge of the Landfill near MW1 and MW19 (Figure 16). Total BTEX in the remaining 12 samples ranged from 0.006 to 2.48 ppm. BTEX compounds were detected at sampling locations extending across the Landfill from Bramlette Road to the Walnut Street right of way. No BTEX compounds were indicated at sampling locations in the southeastern area of the Landfill. Acetone, methylene chloride, chlorobenzene and styrene were detected in various samples across the Landfill. Chlorobenzene was detected at .013 ppm at LF028; and styrene was detected at 3.8, 0.42 and 0.091 ppm at LF004, LF014 and LF015, respectively. Acetone and methylene chloride were present in low concentrations in almost all samples analyzed. The absence of these 2 compounds in analytical results from subsequent investigations suggests that their presence may be attributable to contamination introduced during Phase I sampling or laboratory testing.

Phase I sampling location LF024 was resampled during the Phase II Investigation. Method 8260 results on LF024 indicated no detectable levels of volatile organics as summarized in Table 8.

One hand auger sample (HA#1) was collected in February 2000 for the Phase III Investigation. This sample was collected at 3 to 4 feet below the surface in the wetlands just off the edge of the Landfill near MW6 (Figure 16). Method 8260 results on HA#1 indicated benzene, toluene, ethylbenzene and total xylenes at 1.9, 6.3, 3 and 17.4 ppm, respectively as summarized in Table 11. Total BTEX was 28.6 ppm. Other volatile organics detected included styrene (2.2 ppm), 1,3,5-trimethylbenzene (3.7 ppm) and 1,2,4-trimethylbenzene (11 ppm).

Only 4 samples that were collected from across the Landfill were submitted for Method 8270 analyses (semi-volatile organics). Two samples (LF004 and LF027) were submitted as part of the March 1995 Investigation (Table 5). Samples from locations LF024 (resampled during the Phase II Investigation) and HA#1 were also submitted for Method 8270 analyses (Tables 8 and 12). Analytical results from LF004 indicated total PAHs at 2,669.5 ppm and total carcinogenic PAHs at 221.5 ppm. Phenanthrene was the most prevalent compound present in the sample at 1000 ppm. 2-Methylnaphthalene and dibenzofuran were also detected at 1,400 and 74 ppm, respectively. Results from LF027 indicated total PAHs at 1,230 ppm and total carcinogenic PAHs at 670 ppm. The most prevalent compound was the carcinogenic PAH benzo(b)fluoranthene at 230 ppm. Results from LF024 indicated total PAHs at 4.29 ppm. No carcinogenic PAHs were detected. Results from HA#1 indicated total PAHs at 3,381 ppm and total carcinogenic PAHs at 815 ppm. 2-Methylnaphthalene and dibenzofuran were also detected at 240 and 130 ppm, respectively. Total carcinogenic PAHs accounted for 8.3% of the total

PAHs at LF004, 54.5% of the total PAHs at LF027, and 24.1% of the total PAHs at HA#1.

All 33 soil samples collected during the March 1995 Phase I Investigation were submitted for RCRA Metals analyses as summarized in Table 6. Barium, chromium and lead were indicated in all 33 samples. The lowest concentrations of these 3 metals occurred in the sample from location LF007, while the highest concentrations of these 3 metals occurred in the sample from location LF024. Barium ranged from 19.4 to 557 ppm, chromium ranged from 6 to 79.9 ppm, and lead ranged from 13.9 to 1,538 ppm. Cadmium was detected at 40.4 and 0.58 ppm at LF024 and LF025, respectively. Silver was detected at 5.34 ppm at LF022. Arsenic, mercury and selenium were not detected in any of the samples. Samples were not analyzed for iron content. Sampling location LF024 was resampled during the Phase II Investigation for RCRA Metals analysis (Table 10). Barium was present in the sample at 190 ppm. Arsenic, chromium, lead and selenium were also present at 6, 42, 21 and 20 ppm, respectively.

Twenty-nine of the 33 samples collected during the March 1995 Investigation were analyzed for PCBs by Method 8080. As summarized in Table 7, no PCBs were detected.

7.3 CSX/Vaughn Landfill Site - Sediment Analytical Results

Sediment samples have been collected from 12 locations around the perimeter of the Landfill as indicated on Figure 14. Samples were collected from 8 locations during the Phase I Investigation and were analyzed for volatile and semi-volatile organics, TPH, RCRA Metals and PCBs. Analytical results for these 8 locations are summarized in Tables 13 through 17. Samples were collected from 4 locations during the Phase II Investigation and were analyzed for volatile and semi-volatile organics. Analytical results for these 4 locations are summarized in Tables 18 and 19.

Method 8260 analytical results indicated BTEX compounds in 4 of the 12 samples tested as summarized in Tables 13 and 18; and on Figure 16. BTEX compounds were indicated in sediments at DD001 taken from Ditch 4; at WE001 located east of the Landfill near LF004 and LF005; at WW001 located in the wetlands near the western edge of the Landfill; and at WW002 located southwest of the Landfill. The highest concentration of total BTEX was 58.6 ppm in sample WW002. No BTEX compounds were detected in sample DD002 taken from Ditch 3 running along the western edge of the Landfill. There were no indications of BTEX compounds in samples from WE002, WS001, or WS002; however, methylene chloride was detected at low concentrations in these 3 samples. Styrene was detected in samples from DD001 and WW002 at 0.81 and 8.3 ppm, respectively. There were no indications of any volatile organics in samples from WW10 through WW13.

Method 8270 analytical results indicated semi-volatile organics in sediment samples from WE001 (Phase I Investigation - Table 15), and from WW10, WW11 and WW13 (Phase II Investigation - Table 19). Analytical results from WE001 indicated total PAHs at 40.4 ppm. No carcinogenic PAHs were detected. Analytical results from WW10 indicated total PAHs at 28.51 ppm and total carcinogenic PAHs at 15.14 ppm. Analytical results from WW11 indicated total PAHs at 120 ppm and total carcinogenic

PAHs at 48 ppm. Analytical results from WW13 indicated total PAHs at 384.25 ppm and total carcinogenic PAHs at 177.5 ppm. Total carcinogenic PAHs accounted for between 40% to 53.1% of the total PAHs in samples from WW10, WW11 and WW13. Naphthalene was detected in the sample from WW10 at 0.13 ppm in the Method 8260 analysis, but was not detected in the Method 8270 analysis.

Sediment samples from the 8 locations sampled as part of the March 1995 Phase I Investigation were also submitted for analysis of Total Petroleum Hydrocarbons (TPH), RCRA Metals, and PCBs.

Samples were analyzed for TPH by Method 9071 (Table 14). TPH was detected at 120 ppm in the sample from Ditch 4 that cuts through the Landfill (location DD001).

Analyses of RCRA Metals indicated barium, chromium and lead at all 8 sampling locations (Table 16). The highest concentrations occurred in the sample from Ditch 3 that runs along the western edge of the Landfill (location DD002). Barium ranged from 65.4 ppm (DD001) to 221 ppm (DD002), chromium ranged from 13.3 ppm (DD001) to 38.4 ppm (DD002), and lead ranged from 46 ppm (WS002) to 177 ppm (DD002). Cadmium was also detected at 0.57 ppm and 5.74 ppm in ditch samples DD001 and DD002, respectively. Arsenic, mercury, selenium and silver were not detected in the 8 sediment samples. Samples were not analyzed for iron content.

Samples were analyzed for PCBs by Method 8080 as summarized in Table 17. No PCBs were detected.

8.0 Groundwater Assessment

Groundwater samples have been obtained from 7 temporary sampling locations and from 26 permanent monitoring wells at the MGP and CSX/Vaughn Landfill sites as shown on Figures 7 through 9, beginning with the AES March 1995 Phase I Investigation. Groundwater analytical results are summarized in Tables 20 through 30, and on Figures 19 through 42.

8.1 Phase I Investigation Sampling

Groundwater samples were obtained from 7 temporary sampling locations across the CSX/Vaughn Landfill site as part of the March 1995 Phase I Investigation (Figure 8). All 7 samples were submitted for laboratory analyses of volatile organics by EPA Method 8260. Two samples (LF023A and LF027A) were submitted for semi-volatile analyses by EPA Method 8270. All 7 samples were analyzed for RCRA Metals and PCBs (EPA Method 608). Two of these samples were taken from temporary boreholes (LF023A and LF025A) using a peristaltic pump. Five samples were collected from exploratory pits (LF001A, LF003A, LF027A, LF029A and LF031A) dug through fill material and into native soils below the Landfill.

Locations LF023A and LF025A are located in the northern area of the Landfill north of Ditch 4. Samples from these 2 locations indicated the highest levels of volatile organics

encountered in the 7 locations sampled as summarized in Table 20. Analytical results from LF023A indicated the presence of benzene, toluene, ethylbenzene, and total xylenes at 770, 460, 340 and 520 ppb, respectively. Total BTEX was 2,090 ppb. Styrene was also indicated at LF023A at 55 ppb. Analytical results from LF025A indicated the presence of BTEX compounds at 700, 45, 280 and 250 ppb, respectively. Total BTEX at LF025A was 1,275 ppb. Acetone was indicated at LF025A at 140 ppb. BTEX compounds were also indicated at LF027A at 84, 32, 20 and 58 ppb, respectively. Total BTEX at LF027A was 194 ppb. Minor concentrations of ethylbenzene (5 ppb) and total xylenes (18 ppb) were indicated at LF031A located at the southern end of the Landfill. No volatile organics were indicated at LF001A and LF003A located along the southwestern edge of the Landfill. No BTEX compounds were indicated at LF029A located between LF027A and LF031A. Trichlorofluoromethane was indicated at 17 ppb at location LF029A. Detected concentrations of benzene at LF023A, LF025A and LF027A exceeded the 5 ppb MCL.

Typical MGP related semi-volatile organics were detected in samples submitted from locations LF023A and LF027A. Location LF023A indicated the highest levels of semi-volatile organics with a total PAH concentration of 3,325 ppb (Table 21). Naphthalene comprised 66% of total PAHs at LF023A with a concentration of 2,200 ppb. Other PAH compounds detected at LF023A included acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene and benzo(a)pyrene. 2-methylnaphthalene, 4-methylphenol and dibenzofuran were also detected at LF023A at 1,400, 10 and 40 ppb, respectively. Location LF027A indicated naphthalene at 400 ppb and total PAHs at 500 ppb. Acenaphthene, fluorene and phenanthrene were also indicated at LF027A. 2-methylnaphthalene and 2,4-dimethylphenol were also detected at LF027A at 40 and 50 ppb, respectively.

Total PAHs summarized above and in Table 21 include non-detects at one-half the reported method detection limit. With the exception of benzo(a)pyrene detected at 10 ppb at LF023A, no carcinogenic PAH compounds were detected in either sample.

Phase I groundwater analytical results for RCRA Metals are summarized in Table 22. Barium was detected at all 7 sampling locations at concentrations from 120 to 350 ppb. Lead was detected at all sampling locations except LF025A at concentrations from 10 to 90 ppb. Five locations indicated lead concentrations above the 15 ppb MCL. Arsenic was detected at 110 ppb at location LF001A only, exceeding the 50 ppb MCL.

Phase I groundwater analytical results for PCBs are summarized in Table 23. No PCBs were detected at the 7 sampling locations.

8.2 Phase II Investigation Sampling

Groundwater samples were obtained from the 8 permanent monitoring wells (MW1 through MW7) installed at the CSX/Vaughn Landfill and MGP sites as part of the September 1996 Phase II Investigation (Figures 7 and 8). Samples from all 8 wells were submitted for laboratory analyses of volatile and semi-volatile organics by EPA Methods 8260 and 8270, respectively. Method 8260 and 8270 analytical results are summarized in Tables 24 and 25. Samples from MW1, MW3, MW3D and MW6 were also submitted for sulfate analyses as summarized in Table 26. All 8 wells were

sampled on March 13, 1996. Wells MW3, MW3D and MW6 exhibited strong coal tar odors at the time of sampling. Approximately 2.75 inches of free product coal tar was indicated in the bottom of MW3D located at a depth of 20 feet. The depth of the free product appeared to correlate with the location of the interface between the overlying sandy silty residuum and the underlying saprolite. This observation suggested that the free coal tar at this location is tending to pool at the interface with the more impermeable saprolite located 7 to 9 feet below the natural grade of the floodplain.

Method 8260 analytical results indicated BTEX compounds present in MW3, MW3D, MW6 installed at the Landfill site, and in MW7 installed at the MGP site. Total BTEX was indicated at a maximum detected concentration of 1,970 ppb in MW3D, with benzene comprising 56% of this total at 1,100 ppb. Benzene and total BTEX concentrations in adjacent shallower well MW3 were 160 and 548 ppb, respectively. Benzene was detected in MW7 at 680 ppb. Toluene and m-p-xylene were detected in MW6 at 7 and 10 ppb, respectively.

Method 8260 indicated high naphthalene concentrations in MW1, MW3, MW3D and MW7 at 3,800, 15,000, 9,300 and 2,400 ppb, respectively. Naphthalene was also indicated in MW5 and MW6 at 9 and 390 ppb, respectively. Other volatile organics indicated included isopropyl benzene (MW3D); 1,2,4-trimethylbenzene (MW3, MW3D and MW6); 1,3,5-trimethylbenzene (MW3 and MW3D); and styrene (MW3 and MW3D).

Elevated detection limits used in the 8260 analysis of MW1 and MW7 were necessary due to the high concentrations of naphthalene present in the samples. BTEX compounds were likely present in MW1; and toluene, ethylbenzene and xylenes were likely present in MW7. No volatile organics were indicated in MW2 installed near the CSXT office building west of the Landfill; nor in MW4 installed in the wetlands east of the Landfill.

Method 8270 analytical results indicated high naphthalene concentrations of 4,600, 3,000, 8,300, 1,800 and 1,900 ppb in MW1, MW3, MW3D, MW6 and MW7, respectively. Naphthalene was the only PAH compound detected in MW3D and MW7. The highest naphthalene concentration occurred in MW3D where free coal tar product was encountered. Naphthalene was also indicated in MW5 at 12 ppb. Total PAHs summarized in Table 25 include non-detects at one-half the reported method detection limit. Total PAH concentration sums were skewed due to high method detection limits in samples from MW1, MW3, MW3D, MW6 and MW7.

No carcinogenic PAHs were detected in the 8 wells sampled. 2-methylnaphthalene was also detected in MW1, MW3, MW3D, MW6 and MW7 at 1,800, 820, 1,800, 330 and 130 ppb, respectively. Dibenzofuran was detected in MW6 at 220 ppb.

Sulfate was indicated in MW3, MW3D and MW6 at 640, 35 and 160 ppm, respectively (Table 26). Sulfate was not detected in MW1.

8.3 Phase III Investigation Sampling

The original 8 AES wells (MW1 through MW7), and the18 new Duke Power wells (MW8 through MW25) were monitored and sampled on June 15-17, 1999, as part of the Phase

III Investigation. All sample collection, handling and chain-of custody procedures were performed in accordance with established USEPA protocols outlined in the "Standard Operating Procedures and Quality Assurance Manual", Engineering Support Branch, USEPA Region IV, 1986. Complete chain-of-custody records were maintained on all samples analyzed; and all laboratory analyses were performed by South Carolina state certified laboratories. Field monitoring reports and groundwater level summaries are provided in Tables 2 and 3. Laboratory analytical results are summarized in Tables 27 through 30, and on Figures 19 through 42. Actual laboratory results and chain-of-custody records are provided in Appendix G.

All 26 wells were monitored for depth to groundwater, presence of free product, pH, specific conductance and temperature. There were no indications of free product in any wells monitored. There was very little water present in MW4 at the time of field sampling and, as a result, no field monitoring data was recorded. Groundwater levels and site hydrogeologic conditions are discussed in Section 6.0.

Groundwater samples were collected from all 26 wells for volatile and semi-volatile analyses by EPA Methods 8260 and 8270, respectively (Tables 27 and 28); and for total cyanide analyses by EPA Method 335.3 (Table 29). Samples were collected from all wells except MW4 for analyses of RCRA Metals (Table 29), and for other miscellaneous parameters (Table 30) which included acidity, alkalinity, ammonia, calcium, chloride, copper, magnesium, manganese, nickel, oil & grease, potassium, sodium, sulfate, tin, total organic carbon (TOC), total phosphorus, total suspended solids (TSS) and zinc.

8.4 MGP Site - Groundwater Analytical Results

Volatile organic compounds were detected in 4 of the 11 wells installed within the MGP site as summarized in Table 27 and on Figures 19 and 22. The most highly contaminated wells were MW7, MW8 and MW17 located in the southern corner of the site in the vicinity of the former relief holder and tar wells (Figure 2). At the time of installation, soils within a 50' radius of MW7 were discolored and exhibited varying degrees of coal tar odors. Coal tar odors were also indicated in soil samples from depths up to 9 feet at nearby sampling location DP12. Well MW7 and adjacent well MW8 are similar in construction (depth, screen length, screen depth, etc.). Groundwater samples from MW7 and MW8 contained similar concentrations of volatile organics (Table 27). Benzene, ethyl benzene and xylenes were detected in both wells with total BTEX concentrations of 1,230 and 595 ppb in MW7 and MW8, respectively. 1,2,4-trimethylbenzene was also detected in both of these wells at 57 and 24 ppb, respectively. No volatile organics were indicated in adjacent deep well MW9 screened at a depth from 25 feet to auger refusal at 30 feet below the surface. As previously described, MW9 was installed with an outer casing set at 18 feet deep, or approximately 3 feet below the bottom of the screen in MW8. MW17 exhibited all BTEX compounds with a total BTEX concentration of 1,210 ppb. Benzene was indicated at concentrations above the 5 ppb MCL in MW7, MW8 and MW17.

No volatile organics were detected in samples from MW10, MW11 and MW12 located along West Washington Street as indicated on Figures 19 and 22. Minimal contamination (isopropyl ether at 29 ppb, benzene at 6 ppb) was indicated in deep well MW13 located adjacent to shallow well MW14. Groundwater samples from MW14

indicated cis-1,2-dichloroethene at 15 ppb, chloroform at 3 ppb, trichloroethene (TCE) at 100 ppb and tetrachloroethane (PCE) at 2.3 ppb. The trichloroethene concentration in MW14 exceeds the 5 ppb MCL. Cis-1,2-dichloroethene, TCE and PCE are solvents with solubilities ranging from 150 to 1,100 mg/l (at 25 deg C). The presence of these compounds in MW14 suggests an off-site source, most likely located somewhere on the western side of West Washington Street.

No volatile organics were indicated in MW15 and MW16 located in the western corner of the site. Naphthalene was indicated in MW15 at 5.9 ppb in the 8260 analysis but was not detected in the 8270 analysis.

The analytical results for semi-volatile organics are summarized in Table 28 and on Figures 25 and 28. Semi-volatile organics were indicated in wells MW7, MW8, MW9 and MW17. Naphthalene was indicated in MW7, MW8 and MW9 at 470, 1,900 and 54 ppb, respectively. Acenaphthene and phenanthrene were also indicated in MW7, MW8 and MW9. Other PAH compounds detected included acenaphthylene (MW7) and fluorene (MW7 and MW9). Method 8260 results indicated naphthalene at 6,400 ppb in MW17, however Method 8270 results indicated this compound at less than 1,000 ppb (not detected). At a concentration of 1,000 ppb, 2-methylnaphthalene was the only semi-volatile organic detected in MW17. No semi-volatile organics were indicated in MW10 through MW16. Bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was present in MW11 and MW12 at 14 and 16 ppb, respectively.

The analytical results for RCRA Metals and total cyanide are summarized in Table 29. Analytical results for RCRA Metals indicated iron and barium in all 11 wells at the MGP site. The maximum iron and barium concentrations occurred in MW7, MW8 and MW9. The maximum iron concentration was 49,403 ppb in MW17; and iron exceeded the 300 ppb MCL in 9 of the 11 wells. Elevated iron in these wells is likely a byproduct of biodegradation as discussed below. The maximum barium concentration was 458 ppb in MW8. Mercury was detected in 8 of the 11 wells but at no concentrations exceeding the 2 ppb MCL. Lead was detected only in MW8 at 130 ppb, exceeding the 15 ppb MCL. Chromium was also detected in MW8 at 47 ppb.

Total cyanide was indicated in all wells except MW10, MW13 and MW14. Total cyanide exceeded the 200 ppb MCL in only MW8 (220 ppb).

The analytical results for miscellaneous parameters are summarized in Table 30. Oil & grease was indicated in MW8 and MW17 at 1.3 and 1.8 ppm, respectively. Manganese exceeded the .05 ppm MCL in all 11 wells at the MGP site, with the maximum concentration occurring in MW9 at 5.92 ppm. No wells indicated concentrations exceeding applicable MCLs for chloride, copper, nickel, sulfate or zinc. The 500 ppm MCL for TSS was exceeded in MW8 (3074 ppm) and in MW17 (1920 ppm).

Sulfate concentrations were typically greater, and iron concentrations were typically lower, in wells with little to no indications of organic constituents as shown on Figure 40. Sulfate ranged from 6.2 to 151.3 ppm in wells MW10 through MW16, but was less than 1 ppm in MW7, MW8 and MW17. Sulfate was indicated at 20.4 ppm in deep well MW9. Relatively higher iron concentrations (16 to 49 ppm) were indicated in wells MW7, MW8 and MW17.

The absence of sulfate in highly contaminated wells MW7, MW8 and MW17, in conjunction with the high iron concentrations present, is a strong indication of naturally occurring biological degradation of the lower molecular weight organic compounds. Lower weight hydrocarbons in groundwater, such as BTEX compounds, are frequently attenuated to various degrees through natural biodegradation processes. These processes typically begin with the utilization of all dissolved oxygen in the aquifer, and then usually proceed through denitrification, iron reduction, sulfate reduction, and finally methanogenesis. No data has been obtained on dissolved oxygen or nitrate concentrations in the groundwater; however, an approximation can be made on the degree of biodegradation of BTEX from the mass ratios of the sulfate and iron metabolic byproducts present. The average sulfate and iron concentrations in relatively clean wells MW10 through MW16 are 50.4 and 2.4 ppm, respectively. The average sulfate and iron concentrations in contaminated wells MW7, MW8 and MW17 are 0.5 and 36.8 ppm, respectively. The mass of sulfate utilized to total BTEX degraded is typically 4.7 to 1. The mass of iron produced to total BTEX degraded is typically 21.8 to 1. The total assimilative capacity of sulfate and iron to degrade BTEX in the aquifer at the MGP site can be estimated as summarized in the following table:

Terminal Electron Accepting Process	Mass of Total BTEX Degraded per Unit Mass of Acceptor Used [mg]	Average Acceptor Background Concentration [mg/L]	Average Acceptor Concentration Within Plume [mg/L]	Expressed Assimilative Capacity of BTEX [mg/L]
Sulfate Reduction	0.21	50.4	0.5	10.5
Iron Reduction	0.05	2.4	36.8	1.7
Total Estimated BTEX Degraded by Sulfate and Iron Reduction:				12.2

As summarized in the table, sulfate and iron reduction processes alone have likely resulted in a 12,200 ppb reduction in total BTEX concentrations within the aquifer at the MGP site. Other naturally occurring attenuation processes likely occurring in the aquifer in addition to biological degradation include adsorption, dispersion and volatilization. However, given the present extent of coal tar constituents in MGP site soils (Figure 17), these natural attenuation processes are not sufficient to completely retain these organics wholly within the MGP site boundary.

Field monitoring data indicated relatively lower groundwater pH in wells MW10 through MW14 located along West Washington Street (Table 2). Groundwater pH ranged from 4.65 to 5.66 in these wells. Relatively higher pH was indicated in MW7, MW8, MW9 and MW17 located in the southern corner of the site. Groundwater pH in these wells ranged from 5.74 to 6.67.

8.5 CSX/Vaughn Landfill Site - Groundwater Analytical Results

The analytical results for volatile organics are summarized in Table 27 and shown on Figures 20, 21, 23 and 24. Volatile organic compounds were detected in 8 of the 15 wells (MW1, MW2, MW3, MW3D, MW6, MW19, MW20 and MW21) installed at and around the Landfill site. The most highly contaminated well was MW21 located at the

southern end of the Landfill adjacent to MW6. Benzene was detected above the 5 ppb MCL in MW1, MW2, MW3, MW3D, MW19, MW20 and MW21. The highest benzene concentrations occurred in MW3D, MW20 and MW21 at 990, 860 and 840 ppb, respectively. The highest total BTEX concentration occurred in MW21 at 2,010 ppb. 1,2,4-trimethylbenzene was detected in MW2, MW3 and MW21 at 3.2, 8.8 and 67 ppb, respectively.

No volatile organics were indicated in wells MW4, MW5, MW18, and MW22 through MW25. MW4 is located in the wetlands east of the Landfill. MW5, MW18 and MW22 are located southwest of the Landfill on the CSX rail line embankment. MW23 and MW24 are located near Ditch 5 in the wetlands south of the Landfill. MW25 is located on the Greenville School District property between the school facility and the Landfill.

The analytical results for semi-volatile organics are summarized in Table 28 and shown on Figures 26, 27, 29 and 30. Semi-volatile organics were indicated in Landfill wells MW1, MW3, MW3D, MW6, MW19, MW20 and MW21. The predominating compounds were naphthalene and 2-methylnaphthalene, with the highest concentrations of both compounds being detected in MW3D. Naphthalene and 2-methylnaphthalene were the only semi-volatile organics detected in MW1, MW3D and MW19. 2-methylnaphthalene (1,300 ppb) and 1,2,4-trichlorobenzene (5,600 ppb) were the only semi-volatiles detected in MW20. Other compounds detected in Landfill wells included acenaphthene (140 ppb in MW3), dibenzofuran (10 ppb in MW3), 2,4-dimethylphenol (65 ppb in MW6 and 1,100 ppb in MW21) and 4-methylphenol (550 ppb in MW21). Other semi-volatiles were likely present in samples from MW1, MW3D, MW19, MW20 and MW21; but were not detected due to elevated detection limits (500 to 1000 ppb).

Semi-volatiles were also detected in MW2 located west of the Landfill near the CSX office building. The groundwater sample from MW2 indicated naphthalene at 80 ppb, acenaphthene at 100 ppb, fluorene at 14 ppb, and 2-methylnaphthalene at 130 ppb. Indene was also indicated as a tentatively identified compound at 73 ppb in MW2. No semi-volatile compounds were detected in MW4, MW5, MW18 and MW22 through MW25. Bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was present in MW3 and MW24 at 160 and 32 ppb, respectively.

The analytical results for RCRA Metals and total cyanide are summarized in Table 29. Analytical results for RCRA Metals indicated iron and barium in all wells at the CSX/Vaughn Landfill site (MW4 was not sampled for RCRA Metals). The maximum iron concentrations occurred in MW1, MW19 and MW21 at 43,980, 42,737 and 44,730 ppb, respectively. Iron concentrations exceeded the 300 ppb MCL in all 14 wells sampled. Barium was not detected in any of the wells sampled at concentrations exceeding the 2000 ppb MCL. The maximum barium concentration was 445 ppb in MW21. Mercury was detected in 10 of the 14 wells sampled but at no concentrations exceeding the 2 ppb MCL. Lead, arsenic, chromium and selenium were not detected in any of the wells. Cadmium was not detected in any of the wells sampled, however the method detection limit of 30 ppb exceeded the 5 ppb MCL.

Total cyanide was indicated in MW1, MW2, MW3, MW3D, MW18, MW19, MW20 and MW21. No groundwater samples indicated total cyanide at concentrations exceeding the 200 ppb MCL. The maximum total cyanide concentration was 17 ppb in MW19.

The analytical results for miscellaneous parameters are summarized in Table 30. Oil & grease was indicated in MW1, MW3D, MW6, MW19, MW20, MW21 and MW23. The highest concentration of oil & grease was indicated in MW23 at 7.3 ppm. This result was not expected since no other volatile or semi-volatile organics were detected in MW23. Oil & grease was not detected in adjacent well MW24. Manganese exceeded the .05 ppm MCL in all wells at the Landfill site except MW24, with the maximum concentration occurring in MW6 at 2.11 ppm. No wells indicated concentrations exceeding applicable MCLs for chloride, copper, nickel, sulfate or zinc. The 500 ppm MCL for TSS was exceeded in MW21 (746 ppm).

Sulfate and iron concentrations are shown on Figures 41 and 42. As discussed in Section 8.4, the absence of sulfate (less than 1 ppm) and the presence of high iron levels (approximately 43,000 ppm) in highly contaminated wells MW1 and MW19 is a strong indication of naturally occurring biological degradation of lower molecular weight organic compounds. Low sulfate and high iron levels in MW6 and MW21 also suggests the presence of biological degradation. High sulfate (102.5 ppm) and relatively lower iron (10,672 ppm) was indicated in MW3, while lower sulfate (8 and 3.5 ppm) and higher iron (13.689 and 17,582 ppm) were indicated in adjacent deeper wells MW3D and MW20. These results suggests biologic degradation is occurring more with depth in the aquifer. Sulfate levels in clean wells MW5, MW22, MW23 and MW24 ranged from 4.7 to 25.2 ppm, while iron levels ranged from 378 to 8,707 ppm.

Field monitoring data indicated groundwater pH values ranging from 6.54 in MW3 to 5.19 in MW24 (Table 2).

8.6 Extent of Groundwater Contamination

The extent of benzene, total BTEX, naphthalene, and total PAHs in groundwater at the MGP and CSX/Vaughn Landfill sites is shown on Figures 19 through 30. These constituents appear to originate from the MGP site and proceed southwesterly with the general direction of groundwater movement indicated on Figures 10 and 11. Analytical results on groundwater samples taken from wells during the June 1999 sampling event and from temporary sampling locations for the March 1995 investigation indicate that groundwater contamination south of Bramlette Road extends the full length of the Landfill. Groundwater beneath the Landfill is likely contaminated from both upgradient sources within the MGP site and along Ditch 1 leading from the MGP site; and from coal tar deposits beneath the Landfill. Groundwater contamination may extend to some extent beyond the southern end of the Landfill, however no organic constituents were detected in MW5, MW22, MW23 and MW24 located approximately 600 feet south of the Landfill.

The extent of groundwater contamination extending west-southwest from the Landfill is unknown. While contaminants were detected in shallow well MW2, no contaminants were detected in mid-depth well MW18 located approximately 275 feet southwest and down-gradient of contaminated wells MW6 and MW21. No wells were installed along the rail line embankment between MW2 and MW18. As a result, it cannot be stated with certainty that organic compounds are, or are not, discharging to the Reedy River through this area.

Groundwater beneath the southeastern area of the Landfill and east of the Landfill appears to be uncontaminated. Analytical results on samples obtained from MW4 (June 1999 sampling event and September 1996 investigation) indicated no detectable organic compounds present. Analytical results on samples from temporary sampling locations LF001 and LF003 indicated no detectable volatile organics (samples were obtained for semi-volatile analyses). No organic compounds were indicated in samples from MW25 located on the Greenville School District property.

The plume of contaminated groundwater appears to be wholly contained within the CSX properties. Variations in groundwater sulfate and iron concentrations suggests that some degree of biodegradation is occurring, particularly with regard to degradation of the lower molecular weight organics. Other natural attenuation processes such as adsorption are likely occurring as well. Should future assessment work verify that no groundwater contaminants are discharging into the Reedy River, the groundwater plume is assumed to be stabilized.

8.7 Changes in Groundwater Contamination

Changes in naphthalene concentrations from September 1996 to June 1999 in wells MW1 through MW7 (Method 8260 results) are indicated graphically on Figure 39. Groundwater samples from MW7, located within the MGP site, decreased 41% in naphthalene concentration (from 2,400 to 1,400 ppb). Groundwater samples from MW1, located near Bramlette Road at the northeast corner of the Landfill, increased 50% in naphthalene concentration (from 3,800 to 5,700 ppb by Method 8260). Method 8270 results indicated no change in MW1 concentrations. The greatest changes in naphthalene concentrations occurred in samples from MW3 and MW3D. Samples from MW3 decreased 14,310 ppb (Method 8260) from 15,000 to 690 ppb (a decrease of 95%). Samples from MW3D decreased 3,700 ppb (Method 8260) from 9,300 to 5,600 ppb (a decrease of 40%). Method 8270 results indicated similar changes.

Groundwater samples from MW2, located near the CSXT office west of the Landfill, increased in naphthalene from non-detectable concentrations (<5 ppb) in 1996 to 150 ppb in 1999 (Method 8260 results). Method 8270 results indicated a similar change, from less than 10 ppb in 1996 to 80 ppb in 1999. Groundwater samples from MW5, located on the CSXT rail line embankment southwest of the Landfill, decreased in naphthalene from 9 ppb in 1996 to non-detectable concentrations (<3 ppb) in 1999 (Method 8260 results). Method 8270 results indicated a similar change, from 12 ppb in 1996 to less than 10 ppb in 1999. Groundwater samples from MW6, located at the southern end of the Landfill, increased in naphthalene from 390 in 1996 to 450 ppb in 1999 (Method 8260 results). Method 8270 results from MW6 indicated the opposite change, a decrease from 1,800 ppb in 1996 to1,300 ppb in 1999. Naphthalene was not detected in samples from MW4 in either 1996 or 1999.

9.0 Surface Water Assessment

Surface water samples have been obtained from 17 sampling locations around the CSX/Vaughn Landfill site beginning with the AES March 1995 Phase I Investigation.

Samples were obtained from 4 locations during the Phase I Investigation and were analyzed for volatile and semi-volatile organics (Methods 8260 and 8270), for TPH (Method 413.1), for RCRA Metals, and for PCBs (Method 608). Samples were obtained from 4 locations during the Phase II Investigation and were analyzed for volatile and semi-volatile organics (Methods 8260 and 8270) only.

Samples were obtained from 9 locations during the Phase III Investigation and were analyzed for volatile and semi-volatile organics (Methods 8260 and 8270), for RCRA Metals, and for total cyanide. Phase III samples were also analyzed for miscellaneous parameters which included acidity, alkalinity, ammonia, calcium, chloride, copper, magnesium, manganese, nickel, oil & grease, potassium, sodium, sulfate, tin, total organic carbon (TOC), total phosphorus, total suspended solids (TSS) and zinc.

9.1 Phase I Investigation - Surface Water Assessment

Surface water samples were obtained from 4 locations in the wetlands surrounding the Landfill during the Phase I Investigation (Figures 43 and 44). Two samples (SWE001 and SWE002) were collected in the wetlands east of the Landfill at locations corresponding with sediment sampling locations WE001 and WE002. Two samples (SWW001 and SWW002) were collected in the wetlands west of the Landfill at locations corresponding with sediment sampling locations WW001 and WW002.

Method 8260 results (Table 31) indicated no detectable volatile organics in the 4 surface water samples. Method 413.1 analytical results (Table 31) indicated TPH concentrations of 40, 11 and 4.5 ppm at SWE001, SWE002 and SWW001, respectively. No TPH was detected in the sample from location SWW002. Method 8270 results (Table 32) indicated no detectable semi-volatile organics in the 4 surface water samples.

Analytical results for RCRA Metals (Table 33) indicated barium at all 4 sampling locations. Barium concentrations ranged from 220 ppb (SWE001) to 1,940 ppb (SWW002). Lead was indicated at 50 ppb at location SWE001 and at 230 ppb at location SWW001. Selenium was indicated at 680 ppb at location SWE002 and at 120 ppb at location SWW001. Lead and selenium concentrations exceeded the applicable MCLs. Method detection limits were elevated in the sample from SWE002 due to high iron levels present in the sample. Method detection limits were elevated in the sample from SWW002 due to sample dilution. Method 608 analytical results (Table 34) indicated no detectable PCBs in the surface water samples.

9.2 Phase II Investigation - Surface Water Assessment

Surface water samples were obtained from 4 locations during the Phase II Investigation as shown on Figures 44 and 45. Two samples (REEDY1 and REEDY2) were collected from the Reedy River located west of the CSX/Vaughn Landfill site. Sample REEDY1 was obtained just north of Bramlette Road. Sample REEDY2 was obtained at the point near Willard Street where surface discharge from the MGP and Landfill sites enters the Reedy River. Sample FD1 was obtained from Ditch 5 just upstream of the confluence with another ditch running along Willard Street. Sample WD1 was obtained from the Willard Street ditch prior to it's confluence with Ditch 5. Method 8260 analytical results are summarized in Table 35 and indicated only naphthalene at 9 ppb at location FD1.

Method 8270 results (Table 36) indicated no typical MGP related contaminants in any of the samples. Method 8270 results did indicate low concentrations (20 to 38 ppb) of butylbenzylphthalate (BBP) in 3 samples (REEDY2, WD1 and FD1); and low concentrations (82 to 120 ppb) of di-n-butylphthalate (DBP) in all 4 samples. BBP is used to plasticize or flexibilize synthetic resins, primarily PVC. DBP is also used as a plasticizing agent in the manufacturing of plastic materials. Both compounds are commonly detected in surface water and sediment samples across the United States (Verschueren, Handbook of Environmental Data on Organic Chemicals). These 2 compounds are likely not associated with the MGP site. Furthermore, since these 2 compounds were not indicated in subsequent Phase III sampling results (discussed below), their presence may by attributable to laboratory contamination

9.3 Phase III Investigation - Surface Water Assessment

Ten surface water sampling locations were established for the Phase III Investigation as indicated on Figures 43 through 45 and described in the Phase III Workplan (Appendix B). Surface water field monitoring data recorded at the time of sampling is summarized in Table 37. Actual analytical data is provided in Appendix G.

Three samples (SW2, SW3 and SW4) were obtained from the Reedy River. Sample SW4 was obtained just north of Bramlette Road at the Phase II REEDY1 location. Sample SW2 was obtained near Willard Street approximately 150 feet downstream of where surface discharge from the MGP and Landfill sites (Ditch 5) enters the Reedy River. Sample SW3 was obtained west of monitoring well MW18 approximately 750 feet downstream of location SW4. This location was chosen as a likely discharge point for potentially contaminated groundwater migrating from the Landfill site.

Samples were obtained from drainage ditch locations north and south of the Landfill site. Sample SW5 was obtained from Ditch 2 just north of Bramlette Road. This location was chosen to provide an indication of surface water quality entering the wetlands west of the Landfill. Sampling was also planned for Ditch 1 (location SW6) near the inlet to the culvert beneath Bramlette Road. At the time of sampling no water was present in the ditch at location SW6, consequently no samples were obtained. Samples were collected from 3 locations along Ditch 5 south of the Landfill. Sample SW1 was collected from Ditch 5 just upstream of the confluence with a ditch draining the north side of Willard Street. Location SW1 corresponded with Phase II sampling location FD1. Samples SW9 and SW10 were collected from Ditch 5 near the proposed Phase III faunal study locations discussed in Section 10.2. SW9 was collected from a point within the right of way of Temple Street and near monitoring wells MW23 and MW24. SW10 was collected approximately 400 feet north of SW9.

Surface water samples were also obtained from one wetlands location east of the Landfill, and from one wetlands location west of the Landfill. Sample SW7 was obtained east of the Landfill near Phase I sampling location WE002. Sample SW8 was obtained west of the Landfill near Phase I sampling location WW002.

Method 8260 and 8270 analytical results indicated no detectable concentrations of volatile or semi-volatile organic compounds in any of the 9 surface water samples as

summarized in Tables 38 and 39. High detection limits (50 ppb) were established for the Method 8270 analysis on sample SW5 due to matrix interference.

Analytical results for RCRA Metals, iron and total cyanide are summarized in Table 40. The results indicated barium and iron in all 9 samples analyzed. The highest barium concentration was 208 ppb at location SW7 in the wetlands east of the Landfill. Barium concentrations in the Reedy River were 34 ppb at SW4, 32 ppb at SW3, and 33 ppb at SW2. Barium concentrations along Ditch 5 decreased with distance downstream of the Landfill. Barium was reported at 118 ppb (SW10), 98 ppb (SW9), and 70 ppb (SW1). Barium was reported at 107 ppb in sample SW5 from Ditch 2 north of Bramlette Road, and at 131 ppb in sample SW8. No barium concentrations exceeded the 2000 ppb MCL. Iron concentrations ranged from 636 to 6,828 ppb, exceeding the 300 ppb MCL at all 9 locations. Iron concentrations in the Reedy River samples were 2,838 ppb (SW4), 2,730 ppb (SW3), and 2,691 ppb (SW2). The maximum iron concentration was indicated at SW8, and the minimum indicated at SW1. Mercury was detected in low concentrations (0.10 to 0.13 ppb) at SW3, SW4, SW5, SW7, SW8 and SW9. No chromium was detected in the 9 samples analyzed. Arsenic, cadmium, lead and selenium were also undetected, however, method detection limits for these 4 metals exceeded the applicable MCLs.

As summarized in Table 40, total cyanide was indicated in samples SW5, SW7, SW8, SW9 and SW10. The maximum total cyanide detected was 11 ppb at location SW5 in Ditch 2 north of Bramlette Road. Total cyanide concentrations at SW7, SW8, SW9 and SW10 ranged from 3.3 to 4.3 ppb. All cyanide concentrations were well under the 200 ppb MCL.

Analytical results for various miscellaneous parameters are summarized in Table 41. The surface water sample from SW7 located in the wetlands east of the Landfill contained the highest concentrations of calcium, copper, magnesium, manganese, potassium, sulfate, total phosphorus, total suspended solids (TSS), and zinc. SW7 also indicated the highest degree of acidity, and the second highest degree of alkalinity and total organic carbon (TOC). SW7 indicated the lowest concentration of chloride. Samples SW2, SW3 and SW4 obtained from the Reedy River generally contained lower concentrations of most of the miscellaneous parameters than samples from other locations. The exceptions to this were copper, total phosphorus and TSS. The second highest copper concentration (0.014 ppm), and TSS concentration (24 ppm), was indicated at Reedy River sampling location SW4 located north of Bramlette Road. The highest sodium content was indicated at location SW5 in Ditch 2 north of Bramlette Road. Oil & grease, nickel and tin were not detected in any of the 9 samples analyzed.

Ditch 5 concentrations of certain parameters varied with distance downstream of the Landfill as presented on Figures 46 and 47. Analytical results indicated calcium, magnesium, potassium and manganese decreasing in concentration with distance downstream of the Landfill (locations SW10, SW9 and SW1). In comparison, sulfate, sodium and zinc were indicted as increasing in concentration with distance. Sulfate concentrations increased 125% from 17.9 to 40.2 mg/L. Iron levels in Ditch 5 were 1,521, 2,484, and 636 ppb at locations SW10, SW9 and SW1, respectively.

As discussed in Sections 8.4 and 8.5, sulfate levels were typically lower, and iron levels were typically higher, in groundwater samples from monitoring wells with high levels of organic contamination; suggesting naturally occurring biological degradation. The absence of organic compounds from Ditch 5 samples, along with the levels of sulfate and iron previously discussed, suggests that some degree of natural attenuation is occurring beneath the Landfill and in the wetlands surrounding the Landfill. These natural attenuation processes are likely a combination of biological degradation, adsorption, and volatilization. These attenuation processes appear to be occurring to such an extent as to prevent the transport of organics via surface water discharge from the site.

Changes in parameter concentrations in the Reedy River from Bramlette Road to Willard Street are presented graphically on Figures 48 and 49. Concentrations at location SW4 were assumed to be unaffected by any potential MGP related impacts and were set as baseline concentrations. Concentrations downstream at SW3 and SW2 are indicated as percent deviations (positive or negative) from the SW4 baseline concentration.

As indicated on Figure 49, barium, iron, magnesium, manganese and potassium decreased in concentration downstream of location SW4. Calcium decreased 5.8% at location SW3 but increased 2.2% at location SW2 relative to the SW4 baseline. As indicated on Figure 48, copper and zinc concentrations decreased significantly downstream of location SW4. Ammonia, chloride and sodium also decreased in concentration. Acidity increased 10.7% at SW3 but decreased 32.2% at SW2.

Sulfate increased 14.3 % at SW3 and 62.9% at SW2 relative to the SW4 baseline concentration. Iron levels increased with distance downstream (Table 40), from 2,838 ppb at SW4, to 2,730 ppb at SW3, and finally to 2,691 ppb at SW2. Low sulfate levels, in conjunction with higher relative iron levels, in groundwater are likely indications of biological degradation as has been previously discussed. The increasing sulfate levels along with the decreasing iron levels indicated in the stretch of the Reedy River from SW4 to SW2 could be an indication of contaminated groundwater discharge into the river from the Landfill site.

10.0 Biological Assessments

Two biological assessments have been performed for the CSX/Vaughn Landfill site beginning with the September 1996 Phase I Investigation. These assessments have been performed to establish the existence and magnitude of any impacts to plant and animal life resulting from coal tar constituents present in the wetlands environment.

10.1 Phase II Biological Assessment

The September 1996 Phase II Investigation report included the results of a biological survey conducted by Environmental Corporation of America (ECA). ECA presented their assessment results in a report dated May 31, 1996. The ECA assessment was performed to determine the existence, if any, of statistically significant correlations between the presence and concentrations of volatile and semi-volatile organic

compounds (primarily coal tar) in floodplain/wetland soils, and the prevalence of vascular plant species in the same floodplain/wetlands habitat.

The assessment included the evaluation of 5 sample plots equal in size to 450 square feet. Sample plots were selected to maintain similar environmental characteristics (plant community structure, water depth, water temperature and sunlight exposure) at each location. Two basic wetland habitats were observed at the site; floodplain habitat areas, and deeper drainage channel habitats areas. Both areas are primarily inundated year-round.

Assessment results indicated that, at a 95% confidence level, no statistically negative correlations existed between organic compounds in floodplain/wetland soils and the prevalence of plants. That is, there was no direct evidence indicating negative impacts to vascular plant species due to elevated levels of organics compounds in the soil. The assessment did indicate a positive relationship between organic compounds in soils and certain vascular plant species. That is, certain species were *more* prevalent in areas with elevated levels of organics.

10.2 Phase III Biological Assessment

The Phase III Investigation Workplan (Appendix B) outlined the rationale for further biological assessments requested by the SCDHEC previously discussed in Section 1.0. This additional work involved the sampling and inventory of aquatic fauna that come in direct contact with soil, sediments and water around the Landfill site. Inventory data was then used to determine if the presence and concentrations of volatile and semi-volatile organic compounds (primarily coal tar) in the soils, sediments and water have had any effects on the aquatic fauna. Fauna proposed for sampling included amphibians, macrobenthos, fish and zooplankton.

The faunal study was conducted by the Aquatic Ecology Group of Duke Power Company. The assessment report is included in Appendix E.

Two 100 feet by 100 feet sampling locations were established in the wetlands environment south of the Landfill as shown on Figures 50 and 51. Location PSA was established in an area within the plume of groundwater contamination (Phase II Investigation Report) immediately south of the Landfill between surface water sampling locations SW8 and SW10. Location NSA was located in an area along Ditch 5 near monitoring well MW5 and outside (south) of the groundwater plume. The wetland area is subject to varying water depths depending on the intensity and duration of rainfall during the year. During drier periods of the year certain areas within the wetland dry out leaving water in only a few pools and Ditch 5. Groundwater would contribute the greatest amount of standing and flowing water within the wetland during these drier periods. Consequently, organic contaminants in the groundwater would have the greatest effect on the fauna during these low water periods; and standing water would have the greatest potential to leach soluable organics from the surrounding soil. Conversely, groundwater contaminants would have the least impact to the fauna during wet periods when stormwater runoff dominates flow within the wetland; and any leaching of soluable organics from soils would be greatly diluted.

Aquatic invertebrates, amphibians, and zooplankton were sampled at the 2 locations on March 17, 1999. Fish were sampled at the 2 locations on March 18, 1999. At the time of sampling there were scattered pools of water in the wetland, and flow appeared to be confined to Ditch 5. It is assumed, therefore, that the sampling was conducted during a time of high potential for impact to the fauna by contaminated groundwater and soil.

Sampling results indicated that species dependent on water for completing all or part of their life cycle were present at both sampling locations. Differences in taxonomic composition and species abundance between the sampling areas were great in some instances. This was largely due to the extreme differences in habitat types between the 2 sampling locations. Location PSA was dominated by a beaver pond and the location NSA consisted almost entirely of the Ditch 5. Based on the results, aquatic and semi-aquatic species were found in both sampling locations indicating that the faunal populations were self-sustaining and likely unaffected by organic contaminants in the environment.

11.0 Risk Characterization

The characterization of risk from the exposure, or potential exposure, to MGP related contaminants involves an assessment of:

a. chemicals of concern

b. potential exposure pathways

c. exposure pathway analyses

11.1 Chemicals of Concern

Chemicals of concern associated with MGP related contamination include volatile and semi-volatile organic compounds and certain inorganics. Unless exposure concentrations are extremely high (typically unlikely); risks are usually controlled by exposure to certain organic compounds which have been shown to exhibit carcinogenic effects. Volatile organics of concern include primarily benzene (carcinogenic effects); and to a secondary degree toluene, ethyl benzene and xylenes (non-carcinogenic effects). Semi-volatile organic compounds of concern include the 7 carcinogenic PAHs documented in Section 7.0. Benzo(a)pyrene and dibenzo(ah) anthracene are the most potent and primary carcinogenic PAH compounds of concern. Non-carcinogenic PAH compounds are typically a distant secondary concern. Inorganic constituents of concern include arsenic, cadmium, chromium, lead, mercury and cyanide. Arsenic, cadmium, and the hexavalent form of chromium (+6) can exhibit carcinogenic effects.

11.2 Potential Exposure Pathways

The primary pathways for exposure to MGP related contamination are through inhalation of contaminants in air, ingestion of contaminants adsorbed onto soils, ingestion of contaminated water, and through direct dermal contact with contaminated materials (soil, water or free product).

Risk of exposure by inhalation involves the direct inhalation of volatilized organics and the inhalation of organics and inorganics adsorbed onto dust particles. Inhalation is a primary exposure pathway for carcinogenic volatile organics such as benzene; and for adsorbed carcinogenic inorganics such as cadmium and chromium (+6)

Ingestion of contaminants adsorbed onto soils involves the direct intake of contaminated soil into the gut. This pathway occurs primarily in children at play, through non-sanitary practices such as eating food without washing hands, and through swallowing of contaminated dust. Ingestion is a primary pathway for carcinogenic PAHs and arsenic.

Ingestion of contaminated water typically involves the drinking of groundwater obtained from private wells that have been impacted by dissolved contamination. Inhalation of organics that volatilize from contaminated groundwater during showering can also represent a significant exposure pathway. Ingestion (and inhalation) of contaminated water is a primary pathway for light weight volatile organics such as benzene that are readily dissolved. Heavier molecular weight hydrocarbons such as the carcinogenic PAHs tend to adsorb onto the soil matrix within the aquifer are not readily dissolved or transported in groundwater.

Direct dermal contact involves adsorption of contaminants through the pores of the skin. Adsorption can occur by direct contact with contaminated soils of with a pure product such as coal tar. The ability of coal tar constituents, particularly those held within a soil matrix, to penetrate skin pores is very low. As a result, dermal contact with these contaminants is rarely a significant or controlling exposure pathway.

11.3 Exposure Pathway Analysis

Inhalation of volatilized organics, PAHs adsorbed onto dust, or inorganics adsorbed onto dust does not present a current significant risk at the MGP and Landfill sites. Although coal tars are visible and coal tar odors are present within the MGP site; volatile organic concentrations were very low in soils (Table 8). Volatile organics such as benzene would not be expected to be present in near surface soils considering the age of the site. Tar-like odors present at the site fluctuate greatly in intensity with temperature and weather conditions. These odors are primarily produced from the volatilization of lighter weight (non-carcinogenic) PAHs and, while undesirable, do not represent an adverse risk. The surface of the MGP site is covered with a mixture of vegetation, debris, trees and concrete. No significant dust has been noticed at the MGP site. Volatile and semi-volaitle organics beneath the Landfill and in the wetlands surrounding the Landfill are not available to be considered an inhalation risk. Inhalation of volatilized organics, PAHs adsorbed onto dust, or inorganics adsorbed onto dust represents a potential *future* risk to any persons involved in excavation of contaminated soils. Individuals at greatest risk would be construction workers or site remediation personnel.

A current risk of ingestion of carcinogenic PAHs and inorganics implies ready access to contaminated surface soils at the MGP and Landfill sites. Access to the site is restricted by perimeter fencing and locked gates, and the surface of the site is covered with a mixture of vegetation, debris, trees and concrete. There is likely little current risk associated with the ingestion pathway at the MGP site. This pathway, however, can be assumed to be the highest potential risk for trespassers, particularly children, gaining

access to the site and ingesting site soils over an extended period. Furthermore, access to coal tars and coal tar contaminated soil along Ditch 1 is not restricted in any way. Exposure to contaminated soils at the Landfill site is highly improbable.

Although groundwater within the surficial aquifer at the MGP and Landfill sites is contaminated with various organic constituents, there is likely no risk associated with groundwater ingestion (drinking) or inhalation (while showering). The surrounding area is served by the local municipal water supply system; and there are no known drinking water wells in operation. Since the area is supplied by the local municipal system, there is little likelihood that any wells would be installed in the future.

Dermal contact with free tars or PAHs in soils implies ready access these materials. As previously stated, access to the site is restricted by perimeter fencing and locked gates and the surface of the site is covered with a mixture of vegetation, debris, trees and concrete. Furthermore, the bioavailability of these materials to penetrate the skin is low. Even considering potential future risk involving excavation of contaminated soils, the dermal contact pathway is insignificant in comparison to inhalation or ingestion.

12.0 Conclusions

Significant quantities of coal tar contaminated soils and some free tar are present within the MGP site, in Ditch 1 which drains the MGP site, and in native wetland soils below and around the Landfill. Free tars are present in as many as 3 masonry tar wells located on the MGP site. Contamination within the MGP site originated from day to day operations of the facility, and was made pervasive across the site when the facility was demolished. During operation, coal tar and coal tar laden wastewaters were discharged into Ditch 1 leading from the facility. These constituents settled into ditches, depressions and pools within the wetlands south of Bramlette Road. An unpermitted construction and demolition debris landfill has been placed on top of most of the coal tar contaminated soils in the wetlands. The Landfill covers approximately 7 acres of wetlands and ranges in depth from 7 to 14 feet.

Surficial groundwater at the MGP site and beneath the landfill has been impacted by volatile and semi-volatile organics originating from free tars and coal tar constituents in the soil at the MGP site, along Ditch 1, and in the wetlands south of Bramlette Road. The plume of contamination extends from the MGP site southwesterly into the Landfill site. No groundwater contamination was indicated in wells south and east of the Landfill. Contaminated groundwater may be discharging into the Reedy River west of the Landfill site, however, laboratory analytical results on surface water samples from the river indicated no detectable organics. Free coal tars and coal tar contaminated soils at the MGP site and along Ditch 1 represent a continuing up-gradient source of groundwater contamination migrating into the wetlands.

Some amount of free product coal tar is present at both the MGP site and in areas beneath the Landfill. Beneath the Landfill, coal tars reside at the debris-native soil interface and at the interface between overlying alluvial soils and underlying saprolite.

No organics were indicated in any surface water samples obtained from several locations in the wetlands surrounding the Landfill and in drainage pathways leading from the Landfill. No organics were indicated in samples from the Reedy River.

Variations in groundwater sulfate and iron concentrations suggests that some degree of biodegradation is occurring, particularly with regard to degradation of the lower molecular weight organics. Other natural attenuation processes such as adsorption are likely occurring as well. Should future assessment work verify that no groundwater contaminants are discharging into the Reedy River, the groundwater plume is assumed to be stabilized and contained wholly within CSX properties.

Biological assessments have indicated that the coal tar constituents in soils and sediments are not detrimental to plants and animals living in the wetlands environment surrounding the Landfill.

An evaluation of human health risks has shown that no significant risk currently exists in association with inhalation of organics or ingestion of contaminated groundwater. The greatest *current* risk involves site trespassers, particularly children, who might gain access to the site and ingest near-surface contaminated soils over an extended period of time. As previously stated, access to the MGP site is restricted by perimeter fencing and locked gates, however, there are no restrictions on access to coal tars and coal tar contaminated soil along Ditch 1. The greatest *future* risk associated with the MGP site involves ingestion of near-surface soils as previously stated; and ingestion of subsurface soils via excavation work at the site by construction or remediation personnel. There is no risk associated with contamination at the Landfill site.

13.0 Recommendations

The following recommendations are made to complete the investigation of the MGP and Landfill sites, to minimize or eliminate human health risks, and to reduce continuing environmental impacts:

1. Install 2 additional monitoring wells to be located along the CSX rail line embankment between MW2 and MW18. Samples from these wells should be analyzed for volatile and semi-volatile organics, iron and sulfate. Analytical results from these 2 wells should confirm whether or not organics in the groundwater are discharging into the Reedy River. Should no organics be detected in samples from these 2 wells, it can be assumed that contaminants in the groundwater are being attenuated and held within the CSX properties.

2. Minimize, or eliminate if feasible, the current potential risk of contaminated soil ingestion. This can be accomplished by excavating and removing free tars and contaminated near-surface soils within the MGP site and along Ditch 1 leading from the site. Excavating and removing these materials will also serve to reduce the source of continuing up-gradient groundwater contamination.

Attempts to excavate and remove coal tar and coal tar contaminated soil from the wetlands is not recommended. Beneath the Landfill, coal tars reside below the Landfill at the debris-native soil interface, and within the underlying soil structure down to saprolite. The degree and extent of excavation required to remove coal tars from the entire underlying soil stratum would likely result in severe damage, if not complete destruction, of the wetland environment. Since biological assessments have shown that the coal tar constituents are not significantly impacting plant and animal life in the wetlands, attempting to remove those constituents would be counter-productive.

14.0 References

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CSX/Vaughn Landfill and Bramlette Road MGP Sites
Monitoring Well Construction Details Summary

Well ID	Well Type	Installation Date	Surface Elevation [ft]	Top of Casing Elevation [ft]	Refusal Depth [ft]	Refusal Elevation [ft]	Well Screen Depth Interval [ft]	Screen Length [ft]	Well Screen Elevation Interval [ft]	Bottom of Well Depth [ft]	Bottom of Well Elevation [ft]
MGP Site Wells:											
MW7	Shallow	11-Mar-96	933.44	935.74	None	None	5.0 to 15.0	10.0	928.44 to 918.44	15.0	918.44
MW8	Combined	8-Mar-99	933.54	935.99	None	None	1.7 to 14.7	13.0	931.84 to 918.84	15.5	918.04
MW9	Deep	11-Mar-99	933.54	936.03	30.4	903.14	25.2 to 30.2	5.0	908.34 to 903.34	30.4	903.14
MW10	Combined	24-Feb-99	941.47	943.39	None	None	3.0 to 18.0	15.0	938.47 to 923.47	19.5	921.97
MW11	Mid-Depth	25-Feb-99	939.49	941.81	None	None	14.0 to 24.0	10.0	925.49 to 915.49	25.7	913.79
MW12	Shallow	25-Feb-99	939.19	941.89	None	None	1.5 to 11.5	10.0	937.69 to 927.69	12.0	927.19
MW13	Mid-Depth	18-Mar-99	938.08	940.48	None	None	11.5 to 21.5	10.0	926.58 to 916.58	23.1	914.98
MW14	Shallow	18-Mar-99	937.64	940.18	None	None	2.0 to 12.0	10.0	935.64 to 925.64	13.0	924.64
MW15	Deep	4-Mar-99	936.52	939.07	58.4	878.12	50.0 to 55.0	5.0	886.52 to 881.52	58.4	878.12
MW16	Shallow	8-Mar-99	936.84	938.75	None	None	5.0 to 15.0	10.0	931.84 to 921.84	16.0	920.84
MW17	Combined	17-Mar-99	933.29	935.22	None	None	1.6 to 15.5	13.9	931.69 to 917.79	16.0	917.29
Landfill and Wetland Area Wells:											
MW1	Shallow	11-Mar-96	931.35	933.97	None	None	5.0 to 15.0	10.0	926.35 to 916.35	15.0	916.35
MW2	Shallow	11-Mar-96	931.87	933.45	None	None	5.0 to 15.0	10.0	926.87 to 916.87	15.0	916.87
MW3	Shallow	11-Mar-96	932.66	935.23	None	None	9.0 to 14.0	5.0	923.66 to 918.66	14.0	918.66
MW3D	Deep	11-Mar-96	932.54	935.06	None	None	15.0 to 20.0	5.0	917.54 to 912.54	20.0	912.54
MW4	Shallow	11-Mar-96	928.79	931.34	None	None	2.0 to 7.0	5.0	926.79 to 921.79	7.0	921.79
MW5	Shallow	11-Mar-96	930.25	930.10	None	None	4.0 to 14.0	10.0	926.25 to 916.25	14.0	916.25
MW6	Shallow	11-Mar-96	930.67	933.24	None	None	2.0 to 12.0	10.0	928.67 to 918.67	12.0	918.67
MW18	Combined	23-Mar-99	930.82	932.94	None	None	9.5 to 24.5	15.0	921.32 to 906.32	25.0	905.82
MW19	Mid-Depth	25-Mar-99	931.37	934.04	None	None	9.0 to 19.0	10.0	922.37 to 912.37	19.0	912.37
MW20	Deep	1-Apr-99	932.83	935.36	25.5	907.33	20.0 to 25.0	5.0	912.83 to 907.83	25.5	907.33
MW21	Deep	29-Mar-99	932.14	934.42	18.0	914.14	5.0 to 18.0	13.0	927.14 to 914.14	18.0	914.14
MW22	Mid-Depth	7-Apr-99	930.26	930.08	None	None	25.0 to 35.0	10.0	905.26 to 895.26	36.5	893.76
MW23	Deep	3-May-99	922.15	924.23	None	None	32.5 to 42.5	10.0	889.65 to 879.65	43.0	879.15
MW24	Shallow	3-May-99	922.08	921.92	None	None	0.4 to 10.4	10.0	921.68 to 911.68	11.0	911.08
MW25	Combined	5-May-99	928.53	928.53	None	None	1.0 to 16.0	15.0	927.53 to 912.53	16.7	911.83

Table 1

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Field Monitoring Summary
June 15-17, 1999

DATE	Well ID	Well Depth [ft]	Depth To Water [ft]	Depth To Product [ft]	Product Thickness [ft]	Odor	Well Vol [gal]	Evac Vol [gal]	Comp Evac ?	pH	Specific Conductance [umho/cm]	Temperature [deg C]
6/16/99	MW-1	16.92	7.90	NA	NA	MINOR	1.5	4.5	NO	6.25, 6.24, 6.26	375, 376, 377	16.37, 16.15, 16.16
6/16/99	MW-2	18.20	12.34	NA	NA	MINOR	1.0	4.0	NO	5.95, 5.97, 5.95, 5.94	427, 420, 413, 409	16.77, 16.70, 16.71, 16.70
6/15/99	MW-3	16.68	11.13	NA	NA	STRONG	1.0	5.0	NO	6.51, 6.52, 6.54, 6.54	1263, 1293, 1301, 1307	17.12, 17.11, 17.08, 17.08
6/15/99	MW-3D	23.42	10.89	NA	NA	STRONG	2.0	8.0	NO	6.02, 6.04, 6.04, 6.05	309, 302, 297, 294	16.42, 16.17, 16.20, 16.16
6/17/99	MW-4*											
6/14/99	MW-5	15.92	10.70	NA	NA	NONE	1.0	4.0	NO	5.49, 5.50, 5.53, 5.55	294, 291, 290, 288	19.75, 17.66, 17.50, 17.33
6/16/99	MW-6	13.98	10.85	NA	NA	STRONG	0.5	2.0	NO	6.29, 6.28, 6.38, 6.41	744, 744, 743, 742	19.52, 19.54, 19.58, 19.56
6/15/99	MW-7	17.74	5.06	NA	NA	NONE	2.0	6.0	NO	6.44, 6.49, 6.49	593, 579, 577	17.58, 17.00, 16.95
6/15/99	MW-8	17.27	5.48	NA	NA	MINOR	2.0	5.0	YES	6.55, 6.61, 6.67	645, 654, 643	18.49, 17.75, 17.81
6/15/99	MW-9	33.21	5.36	NA	NA	NONE	4.5	13.5	NO	5.93, 6.01, 6.05	209, 220, 217	17.59, 17.97, 18.00
6/15/99	MW-10	20.31	7.37	NA	NA	NONE	2.0	4.0	YES	5.64, 5.66	140, 142	19.20, 19.31
6/15/99	MW-11	26.84	6.50	NA	NA	NONE	3.0	9.5	NO	4.71, 4.83, 4.80	84, 84, 84	17.58, 17.68, 17.67
6/15/99	MW-12	14.05	6.65	NA	NA	NONE	1.0	4.0	NO	4.51, 4.52, 4.61, 4.65	152, 152, 159, 154	18.18, 17.87, 17.66, 17.47
6/15/99	MW-13	24.33	6.38	NA	NA	NONE	3.0	6.0	YES	4.95, 5.16, 5.10	70, 72, 75	16.88, 17.45, 17.38
6/15/99	MW-14	14.72	6.30	NA	NA	NONE	1.0	3.0	NO	4.83, 4.80, 4.81	89, 89, 88	18.30, 17.84, 17.72
6/16/99	MW-15	57.51	10.28	NA	NA	NONE	8.0	8.0	YES	6.78	274	17.96
6/16/99	MW-16	17.92	10.30	NA	NA	NONE	1.5	4.5	NO	5.79, 5.96, 5.99	658, 655, 656	17.44, 16.81, 16.76
6/15/99	MW-17	17.75	5.03	NA	NA	STRONG	2.0	6.0	NO	5.80, 5.65, 5.74	146, 148, 153	18.68, 148, 153
6/16/99	MW-18	27.28	13.02	NA	NA	NONE	2.3	7.5	NO	5.45, 5.36, 5.43	268, 280, 280	15.40, 15.34, 15.31
6/16/99	MW-19	21.86	7.98	NA	NA	STRONG	2.3	6.5	NO	6.29, 6.27, 6.28	406, 407, 406	16.55, 16.13, 16.12
6/15/99	MW-20	28.04	11.15	NA	NA	MINOR	3.0	9.0	NO	6.11, 6.11, 6.10	334, 322, 316	16.18, 16.16, 16.18
6/16/99	MW-21	20.58	11.96	NA	NA	STRONG	1.4	3.0	YES	6.28, 6.40, 6.36	895, 781, 751	19.70, 19.71, 19.63
6/14/99	MW-22	35.36	10.89	NA	NA	NONE	4.0	16.0	NO	5.46, 5.55, 5.53, 5.61	194, 194, 195, 194	17.49, 18.22, 18.40, 17.47
6/14/99	MW-23	45.36	3.65	NA	NA	NONE	7.0	9.5	YES	5.77, 6.07	199, 206	19.34, 19.14
6/14/99	MW-24	10.30	1.90	NA	NA	NONE	1.5	6.0	NO	5.16, 5.18, 5.19	169, 169, 169	17.78, 17.69, 17.50
6/15/99	MW-25	15.90	1.87	NA	NA	NONE	2.3	7.5	NO	5.94, 5.88, 5.94	250, 248, 249	20.21, 18.69, 18.66

Water levels and well depths are referenced to top of PVC casing.

* Collected samples for 8260, 8270, Cyanide only.-very little water in well.

CSX/Vaughn Landfill and Bramlette Road MGP Sites

Groundwater Level Summary
June 15-17, 1999

Well ID	Top Casing Elev [ft]	Depth To Free Product [ft]	Depth to Groundwater From Top of Casing [ft]	Depth to Groundwater From Ground Surface [ft]	Adjusted Groundwater Elevation [ft]
MGP Site Wells:					
MW-7	935.74	NA	5.06	2.77	930.68
MW-8	935.99	NA	5.48	3.19	930.51
MW-9	936.03	NA	5.36	3.07	930.67
MW-10	943.39	NA	7.37	5.08	936.02
MW-11	941.81	NA	6.50	4.21	935.31
MW-12	941.89	NA	6.65	4.36	935.24
MW-13	940.48	NA	6.38	4.09	934.10
MW-14	940.18	NA	6.30	4.01	933.88
MW-15	939.07	NA	10.28	7.99	928.79
MW-16	938.75	NA	10.30	8.01	928.45
MW-17	935.22	NA	5.03	2.74	930.19
Landfill and Wetland Area Wells:					
MW-1	933.97	NA	7.90	5.29	926.07
MW-2	933.45	NA	12.34	9.73	921.11
MW-3	935.23	NA	11.13	8.52	924.10
MW-3D	935.06	NA	10.89	8.28	924.17
MW-4*	931.34				
MW-5	930.10	NA	10.70	8.09	919.40
MW-6	933.24	NA	10.85	8.24	922.39
MW-18	932.94	NA	13.02	10.89	919.92
MW-19	934.04	NA	7.98	5.85	926.06
MW-20	935.36	NA	11.15	9.02	924.21
MW-21	934.42	NA	11.96	9.83	922.46
MW-22	930.08	NA	10.89	8.76	919.19
MW-23	924.23	NA	3.65	1.52	920.58
MW-24	921.92	NA	1.90	-0.23	920.02
MW-25	928.53	NA	1.87	-0.26	926.66

Water levels and well depths are referenced to top of PVC casing.
* very little water in well.

Table 3

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
Volatile Organics by EPA Method 8260

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	LF 001	LF 002	LF 003	LF 004	LF 005	LF 006	LF 007	LF 008	LF 009	LF 010	LF 011	LF 012	LF 013	LF 014	LF 015	LF 016	LF 017
Sample Depth [ft]:	9.5	6.0	10.0	9.5	10.0	9.0	17.5	14.0	14.0	12.0	13.5	8.0	12.0	12.0	10.5	10.0	15.0
OVA Field Screen [ppm]:	NA	NA	>1000	300	300	28	7	70	400	400	760	17	0	NA	NA	NA	<5
MTBE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.0025	0.0025	0.0025	**8.30**	**0.046**	dm	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	**0.210**	**0.10**	0.0025	0.0025
Toluene	0.0025	0.0025	0.0025	**16.0**	**0.037**	dm	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	**0.006**	**0.570**	**0.390**	0.0025	0.0025
Ethylbenzene	0.0025	0.0025	0.0025	**17.0**	**0.053**	dm	0.0025	0.0025	**0.007**	0.0025	0.0025	0.0025	**0.020**	**0.130**	**0.083**	0.0025	0.0025
Total Xylenes	0.0025	0.0025	0.0025	**28.0**	**0.064**	dm	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	**0.110**	**1.10**	**0.590**	**0.015**	0.0025
Total BTEX (detected):	ND	ND	ND	**69.3**	**0.20**	ND	ND	ND	**0.007**	ND	ND	ND	**0.136**	**2.01**	**1.163**	**0.015**	ND
Other Compounds Detected:																	
Acetone	**0.370**	**0.228**	**0.570**	25.0	**0.10**	**2.40**	**1.0**	0.050	**0.570**	**1.50**	**0.210**	**0.230**	0.050	0.2500	0.250	**1.70**	**0.350**
Methylene Chloride	**0.570**	**0.190**	**0.480**	2.50	**0.062**	dm	**0.012**	**0.014**	**0.270**	**0.10**	**0.20**	**0.060**	**0.043**	0.0250	0.0250	**0.013**	**0.013**
Chlorobenzene	0.0025	**0.005**	0.0025	1.250	dm	dm	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0125	0.0125	0.0025	0.0025
Styrene	0.0025	0.0025	0.0025	**3.80**	dm	dm	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	**0.420**	**0.091**	0.0025	0.0025

NA = Not Analyzed ND = Not Detected dm = lab data sheets missing from Mar 1995 report; data shown is from report summary tables

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
Volatile Organics by EPA Method 8260

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	LF 018	LF 019	LF 020	LF 021	LF 022	LF 023	LF 024	LF 025	LF 026	LF 027	LF 028	LF 029	LF 030	LF 031	LF 032	LF 033
Sample Depth [ft]:	14.0	14.0	12.0	13.0	6.0	11.0	9.0	11.5	8.0	7.0	10.0	13.0	14.0	6.0	10.0	11.0
OVA Field Screen [ppm]:	30	>1000	40	22	90	400	32	610	>1000	>1000	250	140	610	0	590	120
MTBE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.0025	0.0025	0.0025	0.0025	0.0125	0.0025	0.0025	0.1250	0.0025	**0.010**	**0.040**	0.0025	0.0025	0.0025	dm	dm
Toluene	0.0025	0.0025	0.0025	0.0025	0.0125	**0.006**	0.0025	**0.630**	0.0025	0.0025	**0.083**	**0.094**	0.0025	0.0025	**0.056**	dm
Ethylbenzene	0.0025	0.0025	0.0025	0.0025	0.0125	0.0025	0.0025	**0.650**	0.0025	**0.006**	**0.120**	0.0025	0.0025	0.0025	**0.590**	dm
Total Xylenes	0.0025	0.0025	0.0025	0.0025	0.0125	0.0025	0.0025	**1.20**	0.0025	**0.024**	**0.230**	**0.010**	0.0025	0.0025	**0.650**	dm
Total BTEX (detected):	ND	ND	ND	ND	ND	**0.006**	ND	**2.48**	ND	**0.04**	**0.473**	**0.104**	ND	ND	**1.296**	ND
Other Compounds Detected:																
Acetone	**0.530**	**1.10**	**0.230**	**0.470**	0.250	**0.580**	**2.0**	**1.250**	**0.130**	**0.430**	**0.50**	**0.280**	**0.160**	**0.250**	**0.30**	**0.320**
Methylene Chloride	0.0050	**0.30**	**0.037**	**0.10**	**0.140**	0.0050	**0.125**	**0.80**	**0.061**	**0.180**	**0.090**	**0.067**	**0.150**	**0.074**	**0.098**	**0.120**
Chlorobenzene	0.0025	0.0025	0.0025	0.0025	0.0125	0.0025	0.0025	0.1250	0.0025	0.0025	**0.013**	0.0025	0.0025	0.0025	dm	dm
Styrene	0.0025	0.0025	0.0025	0.0025	0.0125	0.0025	0.0025	0.1250	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	dm	dm

NA = Not Analyzed ND = Not Detected dm = lab data sheets missing from Mar 1995 report; data shown is from report summary tables

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	LF 004	LF 027
	Sample Depth [ft]:	9.5	7.0
PAH Compounds:			
Non-Carcinogenic PAHs	Naphthalene	**44**	10
	Acenaphthylene	**570**	**30**
	Acenaphthene	**106**	10
	Fluorene	16.5	10
	Phenanthrene	**1,000**	**50**
	Anthracene	**219**	**30**
	Fluoranthene	**197**	**180**
	Pyrene	**279**	**170**
	Benzo(g,h,I)perylene	16.5	**70**
Carcinogenic PAHs	Benzo(a)anthracene	**55**	**80**
	Chrysene	16.5	**90**
	Benzo(b)fluoranthene	16.5	**230**
	Benzo(k)fluoranthene	**84**	**180**
	Benzo(a)pyrene	16.5	10
	Indeno(1,2,3-c,d)pyrene	16.5	**70**
	Dibenzo(a,h)anthracene	16.5	10
	Total Carcinogenic PAHs:	**221.5**	**670**
	Total PAHs:	**2,669.5**	**1,230**
Other Compounds Detected:			
	2-Methylnaphthalene	**1,400**	10
	Dibenzofuran	**74**	10

Table 5

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
RCRA Metals

Units in ppm

Sampling Location:	LF 001	LF 002	LF 003	LF 004	LF 005	LF 006	LF 007	LF 008	LF 009	LF 010	LF 011	LF 012	LF 013	LF 014	LF 015	LF 016	LF 017
Sample Depth [ft]:	9.5	6.0	10.0	9.5	10.0	9.0	17.5	14.0	14.0	12.0	13.5	8.0	12.0	12.0	10.5	10.0	15.0
Arsenic	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Barium	**132.0**	**105.0**	**91.3**	**67.4**	**165.0**	**164.0**	**19.4**	**128.0**	**118.0**	**104.0**	**145.0**	**87.5**	**226.0**	**209.0**	**132.0**	**86.4**	**237.0**
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**29.6**	**21.7**	**24.3**	**11.9**	**20.2**	**36.7**	**6.0**	**37.1**	**22.9**	**30.9**	**28.9**	**24.6**	**33.3**	**42.6**	**40.6**	**19.2**	**31.4**
Lead	**101.0**	**51.4**	**50.8**	**16.8**	**25.0**	**112.0**	**13.9**	**76.9**	**51.8**	**69.6**	**76.9**	**105.0**	**52.8**	**68.0**	**64.2**	**143.0**	**45.6**
Mercury	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Silver	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

NA = Not Analyzed

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
RCRA Metals

Units in ppm

Sampling Location:	LF 018	LF 019	LF 020	LF 021	LF 022	LF 023	LF 024	LF 025	LF 026	LF 027	LF 028	LF 029	LF 030	LF 031	LF 032	LF 033
Sample Depth [ft]:	14.0	14.0	12.0	13.0	6.0	11.0	9.0	11.5	8.0	7.0	10.0	13.0	14.0	6.0	10.0	11.0
Arsenic	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Barium	**118.0**	**33.3**	**178.0**	**63.1**	**53.7**	**149.0**	**557.0**	**202.0**	**138.0**	**154.0**	**191.0**	**224.0**	**126.0**	**127.0**	**177.0**	**122.0**
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**40.4**	**0.58**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**37.0**	**27.0**	**36.6**	**26.8**	**18.9**	**36.8**	**79.9**	**33.3**	**35.6**	**24.8**	**30.4**	**38.2**	**38.6**	**20.6**	**38.6**	**31.9**
Lead	**63.4**	**147.0**	**148.0**	**53.4**	**35.6**	**99.0**	**1,538.0**	**55.6**	**216.0**	**225.0**	**56.1**	**176.0**	**72.8**	**47.9**	**84.6**	**64.2**
Mercury	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Silver	<2.5	<2.5	<2.5	<2.5	**5.34**	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

NA = Not Analyzed

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - March 1995 Phase I Investigation
PCBs by EPA Method 8080

Units in ppm

Sampling Location:	LF 001	LF 002	LF 003	LF 004	LF 005	LF 006	LF 007	LF 008	LF 009	LF 010	LF 011	LF 012	LF 013	LF 014	LF 015	LF 016	LF 017
Sample Depth [ft]:	9.5	6.0	10.0	9.5	10.0	9.0	17.5	14.0	14.0	12.0	13.5	8.0	12.0	12.0	10.5	10.0	15.0
Aroclor 1016	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1221	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1232	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1242	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1248	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1254	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1
Aroclor 1260	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'	<1.0	<1.0	<1.0	<1.0	<18	<1.0	<1.0	<1.0	<1.0	<0.1

Sampling Location:	LF 018	LF 019	LF 020	LF 021	LF 022	LF 023	LF 024	LF 025	LF 026	LF 027	LF 028	LF 029	LF 030	LF 031	LF 032	LF 033
Sample Depth [ft]:	14.0	14.0	12.0	13.0	6.0	11.0	9.0	11.5	8.0	7.0	10.0	13.0	14.0	6.0	10.0	11.0
Aroclor 1016	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1221	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1232	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1242	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1248	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1254	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'
Aroclor 1260	<0.1	<1.0	<1.0	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA'	NA'

NA' = Not Analyzed or data missing from Mar 1995 report

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - September 1996 Phase II Investigation
Volatile Organics by EPA Method 8260

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	**DP1A**	**DP9**	**DP14**	**DP16**	**DP18**	**DP21**	**DP23**	**DP26**	**DP28**	**DP29**	**NB1**	**NB8**	**LF 024-2**
Sample Depth [ft]:	5-7	?	0-3	0-3	4-6	3-6	6	0-1	0-1	surface	9-12	?	9^
MTBE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.007**	0.0040	0.0030	**6.5**	0.0035
Toluene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**17**	0.0035
Ethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**11**	0.0035
m-p-Xylene	**1.3**	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**22**	0.0035
o-Xylene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**10**	0.0035
Total BTEX (detected):	**1.3**	ND	ND	ND	ND	ND	ND	ND	**0.007**	ND	ND	**66.5**	ND
Other Compounds Detected:													
Naphthalene	**79**	**0.069**	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.020**	**0.210**	0.0030	**990**	0.0035
1,2,4-Trimethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**16**	0.0035
1,3,5-Trimethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**5.4**	0.0035
Styrene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.034**	0.0040	0.0030	**4.1**	0.0035
Trichloroethene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	**0.094**	0.0035	0.0040	0.0030	1.0	0.0035

NA = Not Analyzed ? Sample depth not stated in Sep 1996 report

ND = Not Detected ^ Estimated depth

* Overall depth probe range at this location; actual sample depth not stated in Sep 1996 report

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - September 1996 Phase II Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	DP1A	DP9	DP14	DP16	DP18	DP21	DP23	DP26	DP28	DP29	NB1	NB8	LF 024-2
	Sample Depth [ft]:	5-7	?	0-3	0-3	4-6	3-6	6	0-1	0-1	surface	9-12	?	9^
	PAH Compounds:													
Non-Carcinogenic PAHs	Naphthalene	**48**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**5,800**	0.22
	Acenaphthylene	2.0	**7.9**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330	0.22
	Acenaphthene	**20**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**600**	0.22
	Fluorene	**17**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,700**	0.22
	Phenanthrene	**44**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.8**	**3,800**	**0.47**
	Anthracene	**15**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,400**	0.22
	Fluoranthene	**32**	**22**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**2**	**2,000**	**0.51**
	Pyrene	**30**	**19**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.7**	**2,600**	**0.45**
	Benzo(g,h,I)perylene	**7.5**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.49**	380	0.22
Carcinogenic PAHs	Benzo(a)anthracene	**14**	**12**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.78**	**1,000**	0.22
	Chrysene	**13**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**53**	**0.89**	**980**	0.22
	Benzo(b)fluoranthene	**9.1**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**62**	**0.67**	**460**	0.22
	Benzo(k)fluoranthene	**9.6**	**17**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**72**	**0.63**	**700**	0.22
	Benzo(a)pyrene	**12**	**20**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.60**	**780**	0.22
	Indeno(1,2,3-c,d)pyrene	**6.7**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.46**	**340**	0.22
	Dibenzo(a,h)anthracene	2.0	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330	0.22
	Total Carcinogenic PAHs:	**66.4**	**95.4**	1.54	1.44	1.40	1.58	1.16	1.16	1.16	**253.0**	**4.23**	**4,590**	1.54
	Total PAHs:	**281.9**	**187.7**	3.52	3.3	3.2	3.6	2.6	2.6	2.6	**401.5**	**11.19**	**23,200**	**4.29**
	Other Compounds Detected:													
	2-Methylnaphthalene	**13**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380	0.22
	Dibenzofuran	**15**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380	0.22

? Sample depth not stated in Sep 1996 report

* Overall depth probe range at this location; actual sample depth not stated in Sep 1996 report

^ Estimated depth

Table 9

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - September 1996 Phase II Investigation
RCRA Metals

Units in ppm

Sampling Location:	LF 024-2
Sample Depth [ft]:	9^
Arsenic	**6**
Barium	**190**
Cadmium	<0.5
Chromium	**42**
Lead	**21**
Mercury	<0.1
Selenium	**20**
Silver	<1.0

^ Estimated depth

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - Phase III Investigation
Volatile Organics by EPA Method 8260

Units in ppm
Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	**HA#1**
Sample Depth [ft]:	3-4
MTBE	0.275
Isopropyl Ether	0.275
Benzene	**1.9**
Toluene	**6.3**
Ethylbenzene	**3.0**
m-p-Xylene	**12.0**
o-Xylene	**5.4**
Total BTEX (detected):	**28.6**
Other Compounds Detected:	
Naphthalene	**240.0**
1,2,4-Trimethylbenzene	**11.0**
1,3,5-Trimethylbenzene	**3.7**
Styrene	**2.2**

CSX Vaughn Landfill and Bramlette Road MGP Sites
Soil Data Summary - Phase III Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	HA#1
	Sample Depth [ft]:	3-4
PAH Compounds:		
Non-Carcinogenic PAHs	Naphthalene	**660**
	Acenaphthylene	**140**
	Acenaphthene	65
	Fluorene	**190**
	Phenanthrene	**600**
	Anthracene	**190**
	Fluoranthene	**340**
	Pyrene	**340**
	Benzo(g,h,I)perylene	**41**
Carcinogenic PAHs	Benzo(a)anthracene	**140**
	Chrysene	**140**
	Benzo(b)fluoranthene	65
	Benzo(k)fluoranthene	**200**
	Benzo(a)pyrene	**130**
	Indeno(1,2,3-c,d)pyrene	**75**
	Dibenzo(a,h)anthracene	65
	Total Carcinogenic PAHs:	**815**
	Total PAHs:	**3,381**
Other Compounds Detected:		
	2-Methylnaphthalene	**240**
	Dibenzofuran	**130**

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - March 1995 Phase I Investigation
Volatile Organics by EPA Method 8260

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	DD 001	DD 002	WE 001	WE 002	WS 001	WS 002	WW 001	WW 002
Sample Depth [ft]:	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OVA Field Screen [ppm]:	10	NA	100	NA	NA	7	NA	NA
MTBE	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**1.10**	0.0025	**0.07**	0.0025	0.0025	0.0025	**0.0160**	**12.0**
Toluene	**1.70**	0.0025	**0.15**	0.0025	0.0025	0.0025	**0.0025**	**18.0**
Ethylbenzene	**0.470**	0.0025	**0.340**	0.0025	0.0025	0.0025	0.0025	**2.60**
Total Xylenes	**4.20**	0.0025	**0.36**	0.0025	0.0025	0.0025	0.0025	**26.0**
Total BTEX (detected):	**7.47**	ND	**0.915**	ND	ND	ND	**0.019**	**58.6**
Other Compounds Detected:								
Acetone	2.50	0.050	0.25	0.050	0.050	0.050	**0.120**	2.50
Methylene Chloride	0.2500	**0.014**	0.025	**0.024**	**0.025**	**0.088**	**0.077**	0.250
Styrene	**0.810**	0.0025	0.0125	0.0025	0.0025	0.0025	0.0025	**8.30**

NA = Not Analyzed ND = Not Detected

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - March 1995 Phase I Investigation
Total Petroleum Hdrocarbons by EPA Method 9071

Units in ppm

Sampling Location:	DD 001	DD 002	WE 001	WE 002	WS 001	WS 002	WW 001	WW 002
Sample Depth [ft]:	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OVA Field Screen [ppm]:	10	NA	100	NA	NA	7	NA	NA
TPH	**120**	ND	ND	ND	ND	ND*	ND	ND

NA = Not Analyzed ND = Not Detected

ND* = Sample analyzed by EPA Method 413.1

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - March 1995 Phase I Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	DD 001	DD 002	WE 001	WE 002	WS 001	WS 002	WW 001
	Sample Depth [ft]:	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PAH Compounds:								
Non-Carcinogenic PAHs	Naphthalene	100	1.65	**4.2**	1.65	0.165	0.165	1.65
	Acenaphthylene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Acenaphthene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Fluorene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Phenanthrene	100	1.65	**6.7**	1.65	0.165	0.165	1.65
	Anthracene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Fluoranthene	100	1.65	**3.4**	1.65	0.165	0.165	1.65
	Pyrene	100	1.65	**6.3**	1.65	0.165	0.165	1.65
	Benzo(g,h,I)perylene	100	1.65	1.65	1.65	0.165	0.165	1.65
Carcinogenic PAHs	Benzo(a)anthracene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Chrysene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Benzo(b)fluoranthene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Benzo(k)fluoranthene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Benzo(a)pyrene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Indeno(1,2,3-c,d)pyrene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Dibenzo(a,h)anthracene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Total Carcinogenic PAHs:	700	11.55	11.55	11.55	1.155	1.155	11.55
	Total PAHs:	1,600	26.40	**40.4**	26.40	2.640	2.640	26.40
Other Compounds Detected:								
	2-Methylnaphthalene	100	1.65	1.65	1.65	0.165	0.165	1.65
	Dibenzofuran	100	1.65	1.65	1.65	0.165	0.165	1.65

Table 15

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - March 1995 Phase I Investigation
RCRA Metals
Units in ppm

Sampling Location:	DD 001	DD 002	WE 001	WE 002	WS 001	WS 002	WW 001	WW 002
Sample Depth [ft]:	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Barium	**65.4**	**221.0**	**138.0**	**70.7**	**106.0**	**78.8**	**139.0**	**87.5**
Cadmium	**0.57**	**5.74**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**13.2**	**38.4**	**35.8**	**18.6**	**29.0**	**24.4**	**30.3**	**24.6**
Lead	**104.0**	**177.0**	**63.1**	**54.5**	**94.5**	**46.0**	**51.0**	**105.0**
Mercury	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Silver	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

NA = Not Analyzed

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - March 1995 Phase I Investigation
PCBs by EPA Method 8080

Units in ppm

Sampling Location:	DD 001	DD 002	WE 001	WE 002	WS 001	WS 002	WW 001	WW 002
Sample Depth [ft]:	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Aroclor 1016	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1221	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1232	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1242	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1248	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1254	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18
Aroclor 1260	<0.1	<0.1	<0.1	<0.1	<1.0	<0.1	<0.1	<18

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - September 1996 Phase II Investigation
Volatile Organics by EPA Method 8260

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	**WW 10**	**WW 11**	**WW 12**	**WW 13**
Sample Depth [ft]:	0-1	0-1	0-1	0-1
MTBE	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA
Benzene	0.0035	0.010	0.0045	0.0045
Toluene	0.0035	0.010	0.0045	0.0045
Ethylbenzene	0.0035	0.010	0.0045	0.0045
m-p-Xylene	0.0035	0.010	0.0045	0.0045
o-Xylene	0.0035	0.010	0.0045	0.0045
Total BTEX (detected):	ND	ND	ND	ND
Other Compounds Detected:				
Naphthalene	**0.13**	0.010	0.0045	0.0045

NA = Not Analyzed
ND = Not Detected

CSX Vaughn Landfill and Bramlette Road MGP Sites
Sediment Data Summary - September 1996 Phase II Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	WW 10	WW 11	WW 12	WW 13
	Sample Depth [ft]:	0-1	0-1	0-1	0-1
PAH Compounds:					
Non-Carcinogenic PAHs	Naphthalene	0.235	5	2.9	3.25
	Acenaphthylene	0.235	5	2.9	**13**
	Acenaphthene	0.235	5	2.9	3.25
	Fluorene	0.235	5	2.9	3.25
	Phenanthrene	**1.3**	5	2.9	**37**
	Anthracene	0.235	5	2.9	3.25
	Fluoranthene	**4.4**	**20**	2.9	**52**
	Pyrene	**4**	**17**	2.9	**73**
	Benzo(g,h,I)perylene	**2.5**	5	2.9	**19**
Carcinogenic PAHs	Benzo(a)anthracene	**2.7**	5	2.9	**33**
	Chrysene	**2.8**	**11**	2.9	**32**
	Benzo(b)fluoranthene	**3.1**	5	2.9	**24**
	Benzo(k)fluoranthene	**2.3**	5	2.9	**36**
	Benzo(a)pyrene	**1.9**	**12**	2.9	**32**
	Indeno(1,2,3-c,d)pyrene	**2.1**	5	2.9	**17**
	Dibenzo(a,h)anthracene	0.235	5	2.9	3.25
	Total Carcinogenic PAHs:	**15.14**	**48**	20.3	**177.25**
	Total PAHs:	**28.51**	**120**	46.4	**384.25**
Other Compounds Detected:					
	2-Methylnaphthalene	0.235	5	2.9	3.25
	Dibenzofuran	0.235	5	2.9	3.25

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - March 1995 Phase I Investigation
Volatile Organics by EPA Method 8260

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	*MCL*	LF 001(A)	LF 003(A)	LF 023(A)	LF 025(A)	LF 027(A)	LF 029(A)	LF 031(A)
MTBE		NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether		NA	NA	NA	NA	NA	NA	NA
Benzene	*5*	2.5	2.5	**770**	**700**	**84**	2.5	2.5
Toluene	*1,000*	2.5	2.5	**460**	**45**	**32**	2.5	2.5
Ethylbenzene	*700*	2.5	2.5	**340**	**280**	**20**	2.5	**5**
Total Xylenes	*10000**	2.5	2.5	**520**	**250**	**58**	2.5	**18**
Total BTEX (detected):		ND	ND	**2,090**	**1,275**	**194**	ND	**23**
Other Compounds Detected:								
Acetone					**140**			
Trichlorofluoromethane							**17**	
Styrene	*100*			**55**				

NA = Not Analyzed
ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - March 1995 Phase I Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Monitoring Wells:	*MCL*	LF 001(A)	LF 003(A)	LF 023(A)	LF 025(A)	LF 027(A)	LF 029(A)	LF 031(A)
PAH Compounds:									
Non-Carcinogenic PAHs	Naphthalene		NA	NA	**2,200**	NA	**400**	NA	NA
	Acenaphthylene		NA	NA	**500**	NA	5	NA	NA
	Acenaphthene		NA	NA	**60**	NA	**20**	NA	NA
	Fluorene		NA	NA	**170**	NA	**10**	NA	NA
	Phenanthrene		NA	NA	**200**	NA	**10**	NA	NA
	Anthracene		NA	NA	**50**	NA	5	NA	NA
	Fluoranthene		NA	NA	**40**	NA	5	NA	NA
	Pyrene		NA	NA	**60**	NA	5	NA	NA
	Benzo(g,h,I)perylene		NA	NA	5	NA	5	NA	NA
Carcinogenic PAHs	Benzo(a)anthracene		NA	NA	5	NA	5	NA	NA
	Chrysene		NA	NA	5	NA	5	NA	NA
	Benzo(b)fluoranthene		NA	NA	5	NA	5	NA	NA
	Benzo(k)fluoranthene		NA	NA	5	NA	5	NA	NA
	Benzo(a)pyrene	*0.2*	NA	NA	**10**	NA	5	NA	NA
	Indeno(1,2,3-c,d)pyrene		NA	NA	5	NA	5	NA	NA
	Dibenzo(a,h)anthracene		NA	NA	5	NA	5	NA	NA
	Total Carcinogenic PAHs:		NA	NA	**40**	NA	35	NA	NA
	Total PAHs:		NA	NA	**3,325**	NA	**500**	NA	NA
Other Compounds:									
	2-Methylnaphthalene				**1,400**		**40**		
	4-Methylphenol				**10**				
	2,4-Dimethylphenol						**50**		
	Dibenzofuran				**40**				

Table 21

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - March 1995 Phase I Investigation
RCRA Metals
Units in ppb

Sampling Location:	*MCL*	LF 001(A)	LF 003(A)	LF 023(A)	LF 025(A)	LF 027(A)	LF 029(A)	LF 031(A)
Arsenic	*50*	**110**	<50	<50	<50	<50	<50	<50
Barium	*2,000*	**120**	**180**	**200**	**140**	**350**	**210**	**130**
Cadmium	*5*	<5	<10	<10	<5	<5	<5	<5
Chromium	*100*	<50	<50	<50	<50	<50	<50	<50
Lead	*15**	**40**	**50**	**30**	<5	**10**	**90**	**40**
Mercury	*2*	<2	<2	<2	<2	<2	<2	<2
Selenium	*50*	<50	<50	<50	<50	<50	<50	<50
Silver	*100*	<50	<50	<50	<50	<50	<50	<50

NA = Not Analyzed * Lead MCL regulated by Treatment Technique (TT)

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - March 1995 Phase I Investigation
PCBs by EPA Method 608

Units in ppb

Sampling Location:	LF 001(A)	LF 003(A)	LF 023(A)	LF 025(A)	LF 027(A)	LF 029(A)	LF 031(A)
Aroclor 1016	<2	<2	<2	<2	<4	<2	<2
Aroclor 1221	<2	<2	<2	<2	<4	<2	<2
Aroclor 1232	<2	<2	<2	<2	<4	<2	<2
Aroclor 1242	<1	<1	<1	<1	<2	<1	<1
Aroclor 1248	<1	<1	<1	<1	<2	<1	<1
Aroclor 1254	<1	<1	<1	<1	<2	<1	<1
Aroclor 1260	<1	<1	<1	<1	<2	<1	<1

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - September 1996 Phase II Investigation
Volatile Organics by EPA Method 8260

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

Monitoring Wells:	*MCL*	**MW1**	**MW2**	**MW3**	**MW3D**	**MW4**	**MW5**	**MW6**	**MW7**
MTBE		NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether		NA	NA	NA	NA	NA	NA	NA	NA
Benzene	*5*	125	2.5	**160**	**1,100**	2.5	2.5	2.5	**680**
Toluene	*1,000*	125	2.5	**140**	**160**	2.5	2.5	**7**	250
Ethylbenzene	*700*	125	2.5	**100**	**380**	2.5	2.5	2.5	250
m-p-Xylene	*10000**	125	2.5	**100**	**210**	2.5	2.5	**10**	250
o-Xylene		125	2.5	**48**	**120**	2.5	2.5	2.5	250
Total BTEX (detected):		ND	ND	**548**	**1,970**	ND	ND	**17**	**680**
Other Compounds Detected:									
Naphthalene		**3,800**		**15,000**	**9,300**		**9**	**390**	**2,400**
Isopropyl Benzene					**9**				
1,2,4-Trimethylbenzene				**50**	**82**			**8**	
1,3,5-Trimethylbenzene				**17**	**24**				
Styrene	*100*			**50**	**14**				
1,2 Dichloroethane	*5*								

* Total Xylenes
NA = Not Analyzed
ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - September 1996 Phase II Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Monitoring Wells:	*MCL*	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7
PAH Compounds:										
Non-Carcinogenic PAHs	Naphthalene		**4,600**	5	**3,000**	**8,300**	5	**12**	**1,800**	**1,900**
	Acenaphthylene		100	5	**570**	200	5	5	**360**	50
	Acenaphthene		**700**	5	**120**	200	5	5	**150**	50
	Fluorene		**270**	5	**180**	200	5	5	**250**	50
	Phenanthrene		**240**	5	**230**	200	5	5	**360**	50
	Anthracene		100	5	50	200	5	5	**120**	50
	Fluoranthene		100	5	50	200	5	5	**130**	50
	Pyrene		100	5	50	200	5	5	**97**	50
	Benzo(g,h,I)perylene		100	5	50	200	5	5	20	50
Carcinogenic PAHs	Benzo(a)anthracene		100	5	50	200	5	5	20	50
	Chrysene		100	5	50	200	5	5	20	50
	Benzo(b)fluoranthene		100	5	50	200	5	5	20	50
	Benzo(k)fluoranthene		100	5	50	200	5	5	20	50
	Benzo(a)pyrene	*0.2*	100	5	50	200	5	5	20	50
	Indeno(1,2,3-c,d)pyrene		100	5	50	200	5	5	20	50
	Dibenzo(a,h)anthracene		100	5	50	200	5	5	20	50
	Total Carcinogenic PAHs:		700	35	350	1,400	35	35	140	350
	Total PAHs:		**7,010**	80	**4,650**	**11,300**	80	**87**	**3,427**	**2,650**
Other Compounds:										
	2-Methylnaphthalene		**1,800**		**820**	**1,800**			**330**	**130**
	Dibenzofuran								**220**	

Table 25

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - September 1996 Phase II Investigation
Sulfate

Units in ppm

Monitoring Wells:	*MCL*	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7
Sulfate	*250*	<10	NA	**640**	**35**	NA	NA	**160**	NA

NA = Not Analyzed

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
Volatile Organics by EPA Method 8260

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

Monitoring Wells:	MCL	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7	MW8	MW9	MW10	MW11	MW12	MW13
MTBE		150	1.5	3	150	1.5	1.5	7.5	15	15	7.5	1.5	1.5	1.5	1.5
Isopropyl Ether		150	1.5	3	150	1.5	1.5	7.5	15	15	7.5	1.5	1.5	1.5	**29**
Benzene	*5*	**200**	**89**	**49**	**990**	1.5	1.5	**21**	**570**	**340**	7.5	1.5	1.5	1.5	**6**
Toluene	*1,000*	**290**	1.5	**11**	150	1.5	1.5	**35**	15	15	7.5	1.5	1.5	1.5	1.5
Ethylbenzene	*700*	150	**15**	**28**	**430**	1.5	1.5	**15**	**350**	**140**	7.5	1.5	1.5	1.5	1.5
m-p-Xylene	*10000**	300	3	**9.4**	300	3	3	**19**	**170**	**75**	15	3	3	3	3
o-Xylene		150	**6.8**	**8.6**	150	1.5	1.5	**11**	**140**	**40**	7.5	1.5	1.5	1.5	1.5
Total BTEX (detected):		**490**	**111**	**106**	**1,420**	ND	ND	**101**	**1,230**	**595**	ND	ND	ND	ND	**6**
Other Compounds Detected:															
Naphthalene		**5,700**	**150**	**690**	**5,600**			**450**	**1,400**	**1,400**	**120**				
1,2,4-Trimethylbenzene			**3.2**	**8.8**					**57**	**24**					
Bromochloromethane		**260**													
1,2 Dichloroethane	*5*														**3.7**
TICs:															
indane			90						860	410					
indene				18					53						
methyl indane			7.5												
methyl naphthalene		740	73						51						
benzothiophene			14												
dimethyl naphthalene			12												

* Total Xylenes

ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
Volatile Organics by EPA Method 8260

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

Monitoring Wells:	*MCL*	MW14	MW15	MW16	MW17	MW18	MW19	MW20	MW21	MW22	MW23	MW24	MW25	Field Blank	Trip Blank
MTBE		1.5	1.5	1.5	75	1.5	75	75	37.5	1.5	1.5	1.5	1.5	1.5	1.5
Isopropyl Ether		1.5	1.5	1.5	75	1.5	75	75	37.5	1.5	1.5	1.5	1.5	1.5	1.5
Benzene	*5*	1.5	1.5	1.5	**120**	1.5	**140**	**860**	**840**	1.5	1.5	1.5	1.5	1.5	1.5
Toluene	*1,000*	1.5	1.5	1.5	**360**	1.5	**190**	**140**	**610**	1.5	1.5	1.5	1.5	1.5	1.5
Ethylbenzene	*700*	1.5	1.5	1.5	**150**	1.5	**120**	**290**	**150**	1.5	1.5	1.5	1.5	1.5	1.5
m-p-Xylene	*10000**	3	3	3	**400**	3	150	**170**	**280**	3	3	3	3	3	3
o-Xylene		1.5	1.5	1.5	**180**	1.5	75	75	**130**	1.5	1.5	1.5	1.5	1.5	1.5
Total BTEX (detected):		ND	ND	ND	**1,210**	ND	**450**	**1,460**	**2,010**	ND	ND	ND	ND	ND	ND
Other Compounds Detected:															
Naphthalene			**5.9**		**6,400**		**3,100**	**4,200**	**3,000**						
1,2,4-Trimethylbenzene									**67**						
cis-1,2-Dichloroethene	*70*	**15**													
Chloroform		**3**													
Trichloroethene	*5*	**100**													
Tetrachloroethene	*5*	**2.3**													
TICs:															
indene					920		380	480	720						
methyl indane															
methyl naphthalene							370								

* Total Xylenes

ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
Semi-Volatile Organics by EPA Method 8270

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Monitoring Wells:	MCL	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7	MW8	MW9	MW10	MW11	MW12	MW13
PAH Compounds:																
Non-Carcinogenic PAHs	Naphthalene		**4,600**	**80**	**750**	**6,400**	5	5	**1,300**	**470**	**1,900**	**54**	5	5	5	5
	Acenaphthylene		500	5	5	500	5	5	25	**20**	50	5	5	5	5	5
	Acenaphthene		500	**100**	**140**	500	5	5	25	**13**	**140**	**18**	5	5	5	5
	Fluorene		500	**14**	34	500	5	5	25	**15**	50	**14**	5	5	5	5
	Phenanthrene		500	5	29	500	5	5	25	**17**	**110**	**26**	5	5	5	5
	Anthracene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Fluoranthene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Pyrene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Benzo(g,h,I)perylene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
Carcinogenic PAHs	Benzo(a)anthracene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Chrysene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Benzo(b)fluoranthene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Benzo(k)fluoranthene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Benzo(a)pyrene	*0.2*	500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Indeno(1,2,3-c,d)pyrene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Dibenzo(a,h)anthracene		500	5	5	500	5	5	25	5	50	5	5	5	5	5
	Total Carcinogenic PAHs:		3,500	35	35	3,500	35	35	175	35	350	35	35	35	35	35
	Total PAHs:		**12,100**	**259**	**1,013**	**13,900**	80	80	**1,675**	**590**	**2,800**	**172**	80	80	80	80
Other Compounds:																
	2-Methylnaphthalene		**1,300**	**130**	**160**	**1,700**			**65**	**25**	**210**	**17**				
	Dibenzofuran				**10**					**11**		**14**				
	bis(2-ethylhexyl)phthalate				**160**						**310**			**14**	**16**	
	2,4-Dimethylphenol								**65**		**110**					
TICs:																
	substituted Indene			73												

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
Semi-Volatile Organics by EPA Method 8270

Units in ppb
Detects in bold text, Non-detects in plain text at one-half the detection limit

	Monitoring Wells:	MCL	MW14	MW15	MW16	MW17	MW18	MW19	MW20	MW21	MW22	MW23	MW24	MW25	Field Blank
PAH Compounds:															
Non-Carcinogenic PAHs	Naphthalene		5	5	5	500	5	**4,700**	500	**3,500**	5	5	5	5	5
	Acenaphthylene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Acenaphthene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Fluorene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Phenanthrene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Anthracene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Fluoranthene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Pyrene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Benzo(g,h,I)perylene		5	5	5	500	5	500	500	250	5	5	5	5	5
Carcinogenic PAHs	Benzo(a)anthracene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Chrysene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Benzo(b)fluoranthene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Benzo(k)fluoranthene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Benzo(a)pyrene	*0.2*	5	5	5	500	5	500	500	250	5	5	5	5	5
	Indeno(1,2,3-c,d)pyrene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Dibenzo(a,h)anthracene		5	5	5	500	5	500	500	250	5	5	5	5	5
	Total Carcinogenic PAHs:		35	35	35	3,500	35	3,500	3,500	1,750	35	35	35	35	35
	Total PAHs:		80	80	80	8,000	80	**12,200**	8,000	7,250	80	80	80	80	80
Other Compounds:															
2-Methylnaphthalene						**1,000**		**1,500**	**1,300**	**600**					
4-Methylphenol										**550**					
bis(2-ethylhexyl)phthalate													**32**		
1,2,4-Trichlorobenzene		*70*							**5,600**						
2,4-Dimethylphenol										**1,100**					
TICs:															
none identified															

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
RCRA Metals, Iron and Total Cyanide

Units in ppb

Monitoring Wells:	*MCL*	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7	MW8	MW9	MW10	MW11	MW12	MW13
Arsenic	*50*	<100	<100	<100	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100	<100
Barium	*2,000*	**117**	**193**	**372**	**111**	NA	**129**	**86**	**201**	**458**	**115**	**60**	**58**	**56**	**95**
Cadmium	*5*	<30	<30	<30	<30	NA	<30	<30	<30	<30	<30	<30	<30	<30	<30
Chromium	*100*	<40	<40	<40	<40	NA	<40	<40	<40	**47**	<40	<40	<40	<40	<40
Iron	*300*	**43,980**	**14,676**	**10,672**	**13,689**	NA	**8,707**	**18,286**	**18,003**	**42,957**	**419**	**1,562**	**211**	**4,612**	**710**
Lead	*15**	<90	<90	<90	<90	NA	<90	<90	<90	**130**	<90	<90	<90	<90	<90
Mercury	*2*	<0.10	**0.17**	<0.10	**0.10**	NA	**0.10**	**0.12**	**0.10**	**0.37**	<0.10	**0.12**	**0.10**	<0.10	**0.13**
Selenium	*50*	<125	<125	<125	<125	NA	<125	<125	<125	<125	<125	<125	<125	<125	<125
Silver	*100*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	*200*	**16**	**12**	**12**	**2.1**	<2	<2	<2	**12**	**220**	**5.1**	<2	**3.1**	**8.8**	<2

Monitoring Wells:		MW14	MW15	MW16	MW17	MW18	MW19	MW20	MW21	MW22	MW23	MW24	MW25	Field Blank
Arsenic	*50*	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Barium	*2,000*	**102**	**72**	**77**	**233**	**167**	**138**	**120**	**445**	**97**	**83**	**119**	**105**	<5
Cadmium	*5*	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Chromium	*100*	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Iron	*300*	**2,261**	**290**	**7,046**	**49,403**	**5,685**	**42,737**	**17,582**	**44,730**	**378**	**920**	**6,274**	**5,681**	**10**
Lead	*15**	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90
Mercury	*2*	**0.15**	<0.10	**0.12**	**0.94**	<0.10	**0.12**	**0.11**	**0.53**	**0.11**	**0.11**	<0.10	**0.55**	<0.10
Selenium	*50*	<125	<125	<125	<125	<125	<125	<125	<125	<125	<125	<125	<125	<125
Silver	*100*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	*200*	<2	**5.2**	**71**	**44**	**5.7**	**17**	**3.1**	**9.4**	<2	<2	<2	<2	<2

NA = Not Analyzed * Lead MCL regulated by Treatment Technique (TT)

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Groundwater Data Summary - June 15-17, 1999
Miscellaneous Parameters

Parameter:	Monitoring Wells: / Units:	*MCL*	MW1	MW2	MW3	MW3D	MW4	MW5	MW6	MW7	MW8	MW9	MW10	MW11	MW12	MW13
Acidity	mg-CaCO3/L		93.68	12.99	126.85	NA	NA	NA	NA	71.42	61.13	2.42	39.20	2.68	3.56	43.60
Alkalinity	meq/L		0.91	0.90	0.80	2.14	NA	0.52	0.86	5.76	0.85	0.88	0.49	0.13	0.12	0.27
Ammonia	mg-N/L		3.13	1.10	1.81	0.41	NA	0.23	43.41	0.79	59.21	1.20	<.02	0.05	0.13	<.02
Calcium	mg/L		18.472	29.175	209.370	12.797	NA	27.585	12.669	103.940	14.945	6.730	6.298	0.538	8.932	2.388
Chloride	mg/L	*250*	16.4	7.4	12.7	19.8	NA	11.0	15.1	26.2	14.7	12.2	9.6	7.7	4.8	8.8
Copper	mg/L	*1.3**	<.005	<.005	<.005	<.005	NA	<.005	<.005	<.005	0.028	<.005	<.005	<.005	<.005	<.005
Magnesium	mg/L		9.154	13.969	24.990	6.629	NA	5.983	4.810	12.739	7.390	3.272	3.539	0.508	2.391	1.272
Manganese	mg/L	*0.05*	0.930	1.257	0.914	0.201	NA	1.216	2.110	0.565	1.270	5.922	0.452	0.081	0.170	1.098
Nickel	mg/L	*0.10*	<.040	<.040	<.040	<.040	NA	<.040	<.040	<.040	0.046	<.040	<.040	<.040	<.040	<.040
Oil & Grease	mg/L		1.2	<1.0	<1.0	1.7	NA	<1.0	1.3	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0
Phenol	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	mg/L		6.45	2.86	14.36	2.84	NA	1.90	4.62	9.59	7.75	7.55	3.22	2.49	2.41	4.38
Sodium	mg/L		15.08	23.34	19.15	24.78	NA	9.57	12.02	16.68	11.67	16.06	12.49	12.39	9.42	6.60
Sulfate	mg/L	*250*	<1.0	1.3	102.5	8.0	NA	25.2	5.2	<1.0	1.0	20.4	83.9	6.2	81.2	10.8
Tin	mg/L		<.050	<.050	<.050	<.050	NA	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050
TOC	mg/L		3.89	4.39	17.85	NA	NA	4.56	4.86	6.64	6.46	0.79	1.16	0.44	2.02	0.90
Total Phosphorus	mg-P/L		<.005	0.006	0.021	0.021	NA	0.007	<.005	0.013	<.005	0.016	0.010	<.005	0.015	0.008
Total Suspended Soilds	mg/L	*500*	52	<4.0	22	6	NA	<4.0	10	6	3074	6	7	8	11	29
Zinc	mg/L	*5*	0.009	0.032	0.024	<.005	NA	0.011	<.005	0.007	0.168	<.005	0.005	<.005	0.037	0.007

NA = Not Analyzed

* Copper MCL regulated by Treatment Technique (TT)

CSX/Vaughn Landfill and Bramlette Road MGP Sites

Groundwater Data Summary - June 15-17, 1999

Miscellaneous Parameters

Parameter:	Monitoring Wells: Units:	*MCL*	MW14	MW15	MW16	MW17	MW18	MW19	MW20	MW21	MW22	MW23	MW24	MW25	Field Blank
Acidity	mg-CaCO3/L		1.45	12.81	NA	3.98	66.16	7.71	57.21	9.02	32.04	1.42	2.82	47.76	1.42
Alkalinity	meq/L		0.21	0.70	0.66	0.46	0.58	0.76	0.91	0.81	0.48	0.76	0.25	1.33	<.01
Ammonia	mg-N/L		<.02	0.65	0.56	1.44	0.27	3.10	0.23	2.93	0.04	0.09	<.02	1.20	<.02
Calcium	mg/L		5.374	18.909	99.021	6.404	20.004	17.698	12.119	96.192	12.765	8.327	4.833	11.456	0.068
Chloride	mg/L	*250*	5.1	4.8	7.0	11.9	11.8	16.7	20.5	30.0	28.5	22.0	21.3	23.6	<1.0
Copper	mg/L	*1.3**	<.005	<.005	0.006	0.053	<.005	<.005	<.005	0.023	<.005	0.017	<.005	<.005	<.005
Magnesium	mg/L		1.368	5.178	7.411	7.197	4.935	9.140	3.657	17.938	3.736	5.042	3.037	7.001	<.030
Manganese	mg/L	*0.05*	0.274	5.017	0.125	0.799	0.931	0.890	0.274	0.861	0.674	0.864	0.033	0.346	<.005
Nickel	mg/L	*0.10*	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040	<.040
Oil & Grease	mg/L		<1.0	<1.0	<1.0	1.8	<1.0	1.6	1.4	1.3	<1.0	7.3	<1.0	<1.0	<1.0
Phenol	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	mg/L		3.45	12.45	6.25	9.86	1.38	6.66	2.51	13.87	3.53	5.35	2.41	6.53	<.250
Sodium	mg/L		6.29	16.60	6.79	10.49	18.63	14.26	35.46	20.16	12.97	21.24	17.49	16.13	<1.500
Sulfate	mg/L	*250*	19.2	17.8	151.3	<1.0	7.5	<1.0	3.5	3.8	4.7	20.9	18.2	19.0	<1.0
Tin	mg/L		<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050	<.050
TOC	mg/L		0.87	0.73	4.70	3.24	3.29	4.03	5.08	23.00	0.32	4.54	0.41	1.95	0.11
Total Phosphorus	mg-P/L		<.005	0.021	<.005	<.005	0.019	0.009	<.005	0.013	0.006	0.011	<.005	0.022	<.005
Total Suspended Soilds	mg/L	*500*	141	8	306	1920	5	82	9	746	9	107	17	31	NA
Zinc	mg/L	*5*	0.008	0.014	0.288	0.113	<.005	0.015	<.005	0.217	<.005	0.017	<.005	0.005	<.005

NA = Not Analyzed

* Copper MCL regulated by Treatment Technique (TT)

Table 30

Sheet 2 of 2

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - March 1995 Phase I Investigation

Volatile Organics by EPA Method 8260

Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	*MCL*	SW E001	SW E002	SW W001	SW W002
MTBE		NA	NA	NA	NA
Isopropyl Ether		NA	NA	NA	NA
Benzene	*5*	2.5	2.5	2.5	NA
Toluene	*1,000*	2.5	2.5	2.5	NA
Ethylbenzene	*700*	2.5	2.5	2.5	NA
Total Xylenes	*10000**	2.5	2.5	2.5	NA
Total BTEX (detected):		ND	ND	ND	NA
Other Compounds Detected:					
None					

NA = Not Analyzed
ND = Not Detected

Total Petroleum Hydrocarbons by EPA Method 413.1

Units in ppm

Sampling Location:	SW E001	SW E002	SW W001	SW W002
TPH	**40**	**11**	**4.5**	ND

ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - March 1995 Phase I Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppb
Detects in bold text

	Sampling Location:	*MCL*	SW E001	SW E002	SW W001	SW W002
PAH Compounds:						
Non-Carcinogenic PAHs	Naphthalene		5	5	5	5
	Acenaphthylene		5	5	5	5
	Acenaphthene		5	5	5	5
	Fluorene		5	5	5	5
	Phenanthrene		5	5	5	5
	Anthracene		5	5	5	5
	Fluoranthene		5	5	5	5
	Pyrene		5	5	5	5
	Benzo(g,h,I)perylene		5	5	5	5
Carcinogenic PAHs	Benzo(a)anthracene		5	5	5	5
	Chrysene		5	5	5	5
	Benzo(b)fluoranthene		5	5	5	5
	Benzo(k)fluoranthene		5	5	5	5
	Benzo(a)pyrene	*0.2*	5	6	5	5
	Indeno(1,2,3-c,d)pyrene		5	5	5	5
	Dibenzo(a,h)anthracene		5	5	5	5
	Total Carcinogenic PAHs:		35	35	35	35
	Total PAHs:		80	80	80	80
Other Compounds:						
None						

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - March 1995 Phase I Investigation
RCRA Metals

Units in ppb

Sampling Location:	*MCL*	SW E001	SW E002	SW W001	SW W002
Arsenic	*50*	<50	<500^	<50	<500^^
Barium	*2,000*	**220**	**880**	**440**	**1,940**
Cadmium	*5*	<10	<100^	<10	<100^^
Chromium	*100*	<50	<500^	<50	<500^^
Lead	*15**	**50**	<500^	**230**	<500^^
Mercury	*2*	<2	<2	<2	**5**
Selenium	*50*	<50	**680**	**120**	<500^^
Silver	*100*	<50	<500^	<50	<500^^

NA = Not Analyzed

^ Detection limits elevated due to high level of iron present in sample
^^ Detection limits elevated due to sample dilution
* Lead MCL regulated by Treatment Technique (TT)

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - March 1995 Phase I Investigation
PCBs by EPA Method 608

Units in ppb

Sampling Location:	SW E001	SW E002	SW W001	SW W002
Aroclor 1016	<2	<2	<2	<2
Aroclor 1221	<2	<2	<2	<2
Aroclor 1232	<2	<2	<2	<2
Aroclor 1242	<1	<1	<1	<1
Aroclor 1248	<1	<1	<1	<1
Aroclor 1254	<1	<1	<1	<1
Aroclor 1260	<1	<1	<1	<1

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - September 1996 Phase II Investigation
Volatile Organics by EPA Method 8260

Units in ppb
Detects in bold text

Sampling Location:	*MCL*	REEDY 1	REEDY 2	WD 1	FD 1
MTBE		NA	NA	NA	NA
Isopropyl Ether		NA	NA	NA	NA
Benzene	*5*	<5	<5	<5	<5
Toluene	*1,000*	<5	<5	<5	<5
Ethylbenzene	*700*	<5	<5	<5	<5
m-p-Xylene	*10000**	<5	<5	<5	<5
o-Xylene		<5	<5	<5	<5
Total BTEX (detected):		ND	ND	ND	ND
Other Compounds Detected:					
Naphthalene					**9**

* Total Xylenes
NA = Not Analyzed
ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - September 1996 Phase II Investigation
Semi-Volatile Organics by EPA Method 8270

Units in ppb
Detects in bold text

	Sampling Location:	*MCL*	REEDY 1	REEDY 2	WD 1	FD 1
PAH Compounds:						
Non-Carcinogenic PAHs	Naphthalene		<10	<10	<10	<10
	Acenaphthylene		<10	<10	<10	<10
	Acenaphthene		<10	<10	<10	<10
	Fluorene		<10	<10	<10	<10
	Phenanthrene		<10	<10	<10	<10
	Anthracene		<10	<10	<10	<10
	Fluoranthene		<10	<10	<10	<10
	Pyrene		<10	<10	<10	<10
	Benzo(g,h,I)perylene		<10	<10	<10	<10
Carcinogenic PAHs	Benzo(a)anthracene		<10	<10	<10	<10
	Chrysene		<10	<10	<10	<10
	Benzo(b)fluoranthene		<10	<10	<10	<10
	Benzo(k)fluoranthene		<10	<10	<10	<10
	Benzo(a)pyrene	*0.2*	<10	<10	<10	<10
	Indeno(1,2,3-c,d)pyrene		<10	<10	<10	<10
	Dibenzo(a,h)anthracene		<10	<10	<10	<10
	Total Carcinogenic PAHs:		ND	ND	ND	ND
	Total PAHs:		ND	ND	ND	ND
Other Compounds:						
	Butylbenzylphthalate			**20**	**29**	**38**
	Di-n-Butylphthalate		**90**	**120**	**100**	**82**

ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Field Monitoring Summary
June 15-17, 1999

DATE	Sampling Location	pH	Specific Conductance [umho/cm]	Temperature [deg C]
6/17/99	SW-1	6.11	217	20.32
6/17/99	SW-2	6.37	50	20.25
6/17/99	SW-3	6.14	49	22.04
6/17/99	SW-4	6.26	52	21.82
6/17/99	SW-5	6.38	238	22.51
6/17/99	SW-6**			
6/17/99	SW-7	6.74	1387	22.49
6/17/99	SW-8	6.60	498	22.57
6/17/99	SW-9	6.65	348	20.67
6/17/99	SW-10	7.16	418	23.72

** Dry location

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - June 15-17, 1999
Volatile Organics by EPA Method 8260

Units in ppb
Detects in bold text

Sampling Location:	*MCL*	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
MTBE		<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
Isopropyl Ether		<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
Benzene	*5*	<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
Toluene	*1,000*	<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
Ethylbenzene	*700*	<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
m-p-Xylene	*10000**	<6	<6	<6	<6	<6	NS	<6	<6	<6	<6
o-Xylene		<3	<3	<3	<3	<3	NS	<3	<3	<3	<3
Total BTEX (detected):		ND	ND	ND	ND	ND	NS	ND	ND	ND	ND
Other Compounds Detected:											
None											
TICs:											
None											

* Total Xylenes
ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - June 15-17, 1999
Semi-Volatile Organics by EPA Method 8270

Units in ppb
Detects in bold text

	Sampling Location:	*MCL*	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
PAH Compounds:												
Non-Carcinogenic PAHs	Naphthalene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Acenaphthylene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Acenaphthene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Fluorene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Phenanthrene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Anthracene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Fluoranthene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Pyrene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Benzo(g,h,I)perylene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
Carcinogenic PAHs	Benzo(a)anthracene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Chrysene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Benzo(b)fluoranthene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Benzo(k)fluoranthene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Benzo(a)pyrene	*0.2*	<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Indeno(1,2,3-c,d)pyrene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Dibenzo(a,h)anthracene		<10	<10	<10	<10	<50	NS	<10	<10	<10	<10
	Total Carcinogenic PAHs:		ND	ND	ND	ND	ND	NS	ND	ND	ND	ND
	Total PAHs:		ND	ND	ND	ND	ND	NS	ND	ND	ND	ND
Other Compounds:												
None												
TICs:												
None												

ND = Not Detected

CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - June 15-17, 1999
RCRA Metals and Total Cyanide

Units in ppb

Sampling Location:	*MCL*	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Arsenic	*50*	<100	<100	<100	<100	<100	NS	<100	<100	<100	<100
Barium	*2,000*	**70**	**33**	**32**	**34**	**107**	NS	**208**	**131**	**98**	**118**
Cadmium	*5*	<30	<30	<30	<30	<30	NS	<30	<30	<30	<30
Chromium	*100*	<40	<40	<40	<40	<40	NS	<40	<40	<40	<40
Iron	*300*	**636**	**2,691**	**2,730**	**2,838**	**2,414**	NS	**2,671**	**6,828**	**2,484**	**1,521**
Lead	*15**	<90	<90	<90	<90	<90	NS	<90	<90	<90	<90
Mercury	*2*	<0.10	<0.10	**0.10**	**0.10**	**0.13**	NS	**0.13**	**0.12**	**0.12**	<0.10
Selenium	*50*	<125	<125	<125	<125	<125	NS	<125	<125	<125	<125
Silver	*100*	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
Total Cyanide	*200*	<2	<2	<2	<2	**11**	NS	**3.8**	**4.3**	**3.3**	**3.3**

NA = Not Analyzed
NS = No Sample

* Lead MCL regulated by Treatemnt Technique (TT)

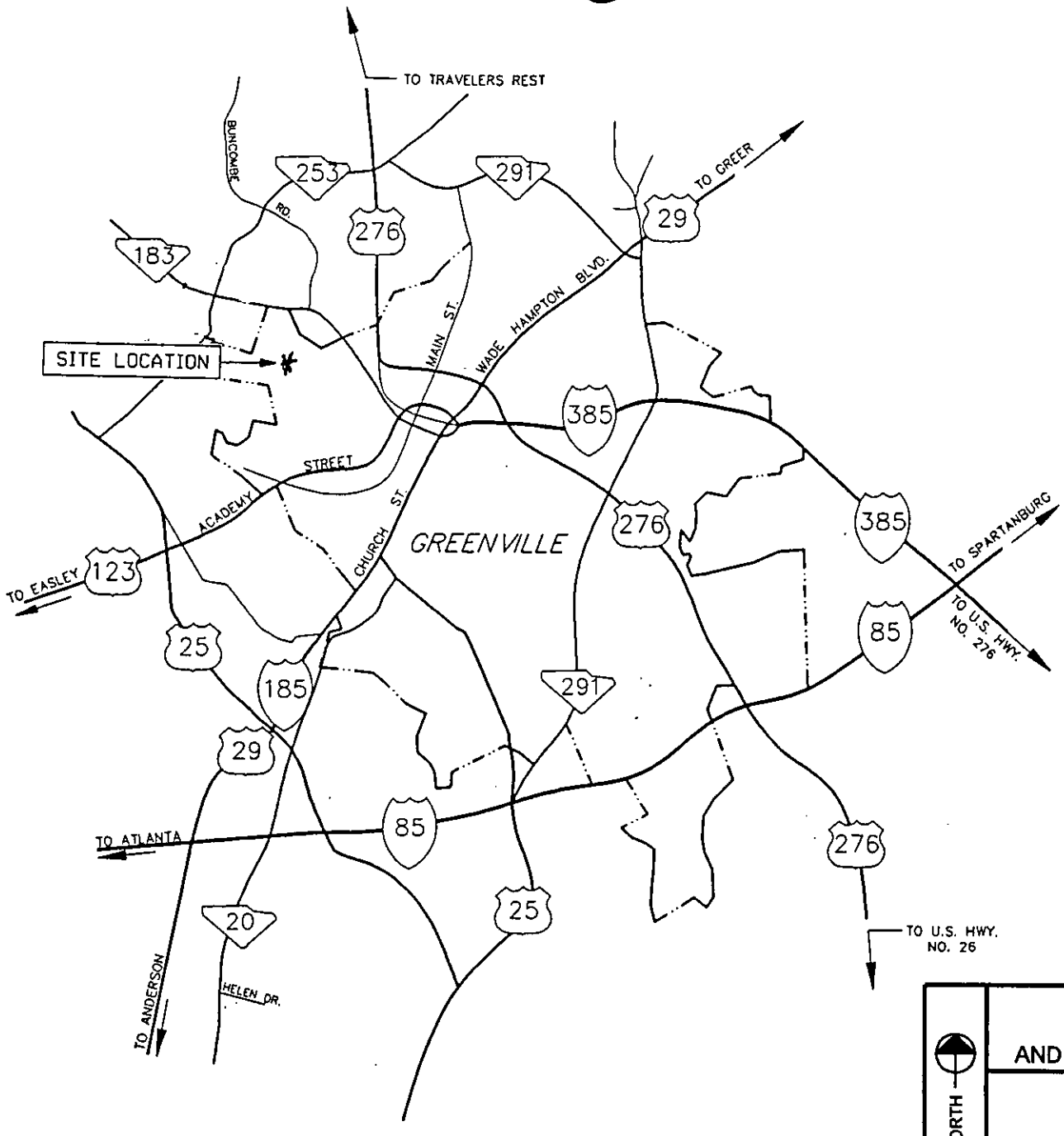
CSX/Vaughn Landfill and Bramlette Road MGP Sites
Surface Water Data Summary - June 15-17, 1999
Miscellaneous Parameters

units as indicated

Parameter: / Sampling Location:	Units:	*MCL*	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Acidity	mg-CaCO3/L		7.03	2.02	3.30	2.98	6.36	NS	20.36	2.76	9.30	5.92
Alkalinity	meq/L		0.97	0.25	0.25	0.24	0.51	NS	0.89	0.85	0.85	0.89
Ammonia	mg-N/L		<.02	0.07	0.07	0.08	0.25	NS	0.07	0.37	0.30	0.30
Calcium	mg/L		23.864	3.675	3.388	3.596	23.939	NS	276.764	69.629	45.511	60.075
Chloride	mg/L	*250*	9.5	3.6	3.6	4.8	13.6	NS	3.6	12.5	10.8	10.2
Copper	mg/L	*1.3**	0.005	0.006	<.005	0.014	0.007	NS	0.017	0.005	0.005	0.006
Magnesium	mg/L		3.509	1.077	1.069	1.089	3.333	NS	12.589	8.245	5.845	7.365
Manganese	mg/L	*0.05*	0.016	0.070	0.074	0.078	0.107	NS	0.955	0.353	0.190	0.213
Nickel	mg/L	*0.10*	<.040	<.040	<.040	<.040	<.040	NS	<.040	<.040	<.040	<.040
Oil & Grease	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0	NS	<1.0	<1.0	<1.0	<1.0
Phenol	mg/L		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
Potassium	mg/L		3.85	1.79	1.77	1.87	4.25	NS	9.80	6.82	5.12	5.72
Sodium	mg/L		8.10	3.18	2.67	3.47	12.79	NS	5.81	9.67	7.86	7.83
Sulfate	mg/L	*250*	40.2	5.7	4.0	3.5	9.0	NS	82.0	80.4	26.7	17.9
Tin	mg/L		<.050	<.050	<.050	<.050	<.050	NS	<.050	<.050	<.050	<.050
TOC	mg/L		5.81	2.98	2.96	3.97	3.21	NS	17.60	7.93	20.40	11.65
Total Phosphorus	mg-P/L		0.022	0.030	0.030	0.030	0.017	NS	0.028	0.019	0.021	NA
Total Suspended Soilds	mg/L	*500*	6	20	19	24	11	NS	71	23	12	10
Zinc	mg/L	*5*	0.032	0.012	0.014	0.032	0.019	NS	0.190	0.102	0.024	0.020

NA = Not Analyzed
NS = Not Sampled

* Copper MCL regulated by Treatemnt Technique (TT)



DUKE POWER

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

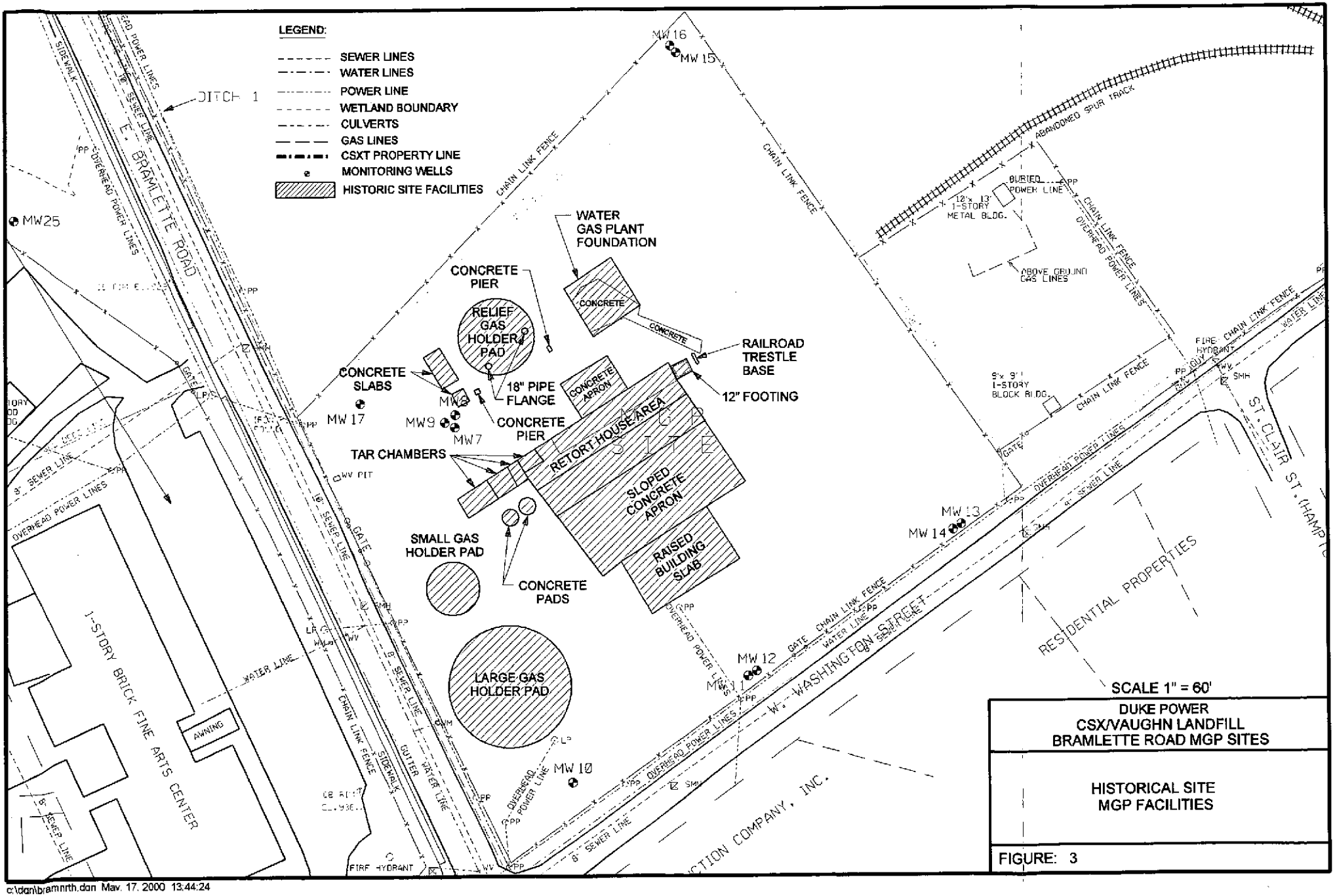
SITE LOCATION

FIGURE: 1

DUKE POWER
CSX/VAUGHN LANDFILL
AND BRAMLETTE ROAD MGP SITES

SITE LOCATION
USGS TOPO MAP
GREENVILLE, S.C.
1983

FIGURE: 2



SCALE 1" = 60'

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

HISTORICAL SITE
MGP FACILITIES

FIGURE: 3

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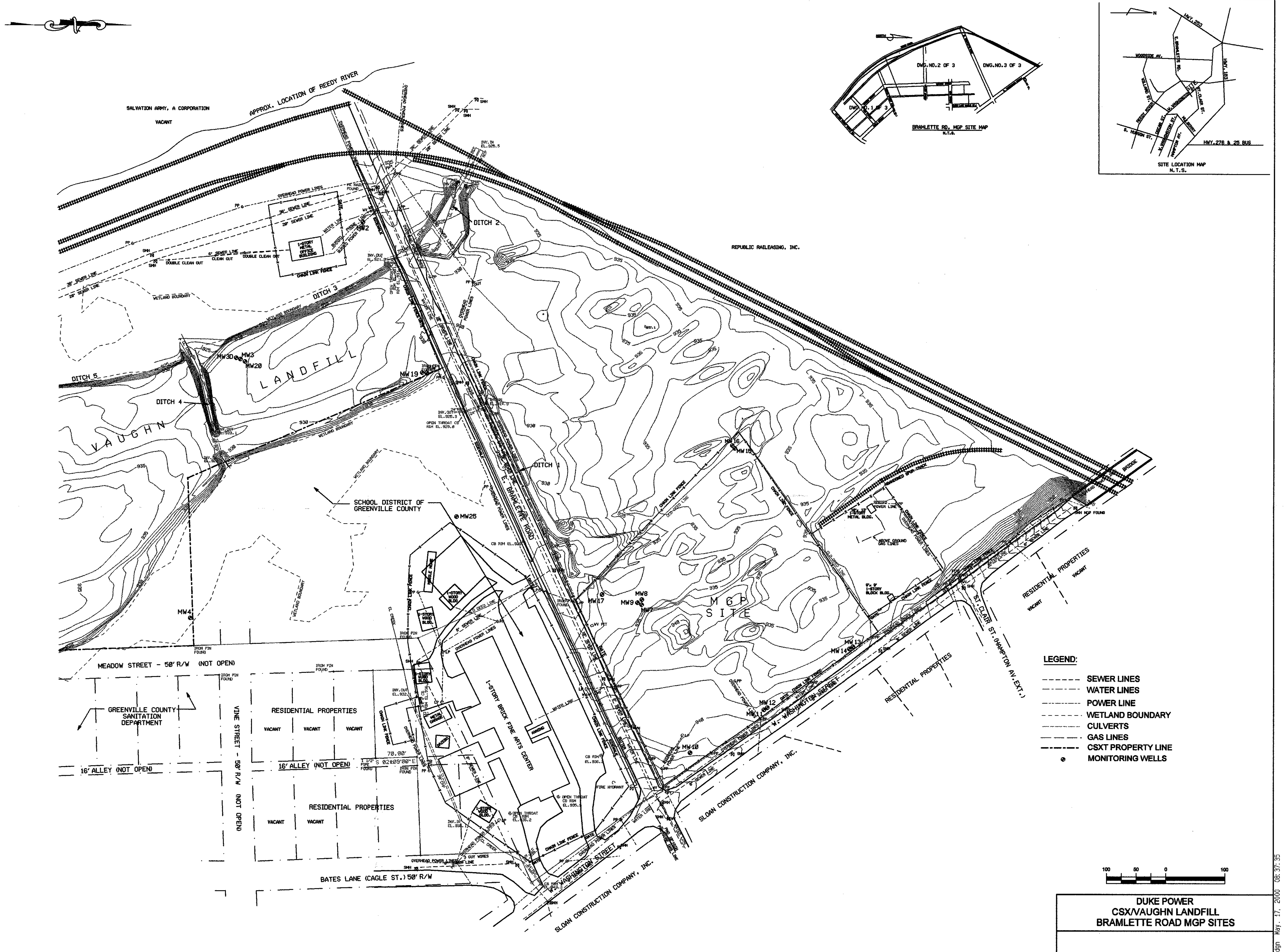

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

SITE PLANS

FIGURE: 4

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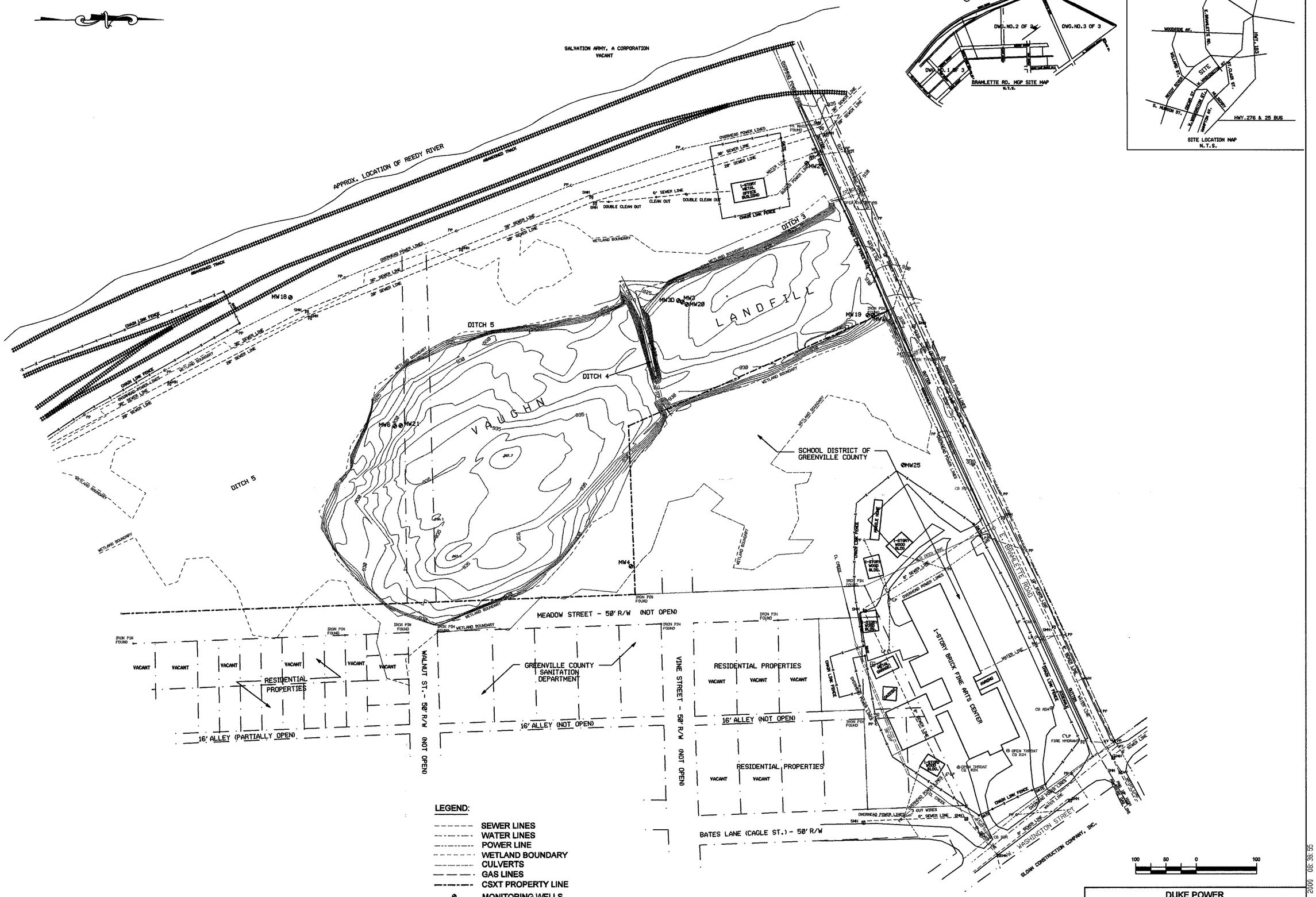
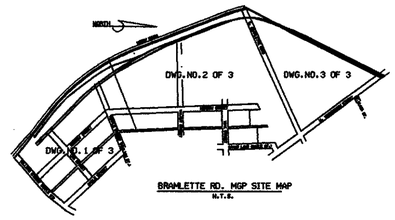


DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

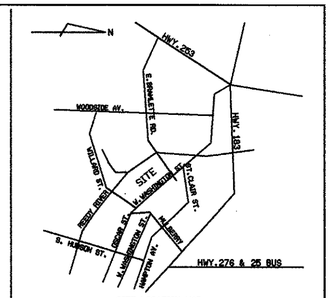
SITE PLANS

FIGURE: 5

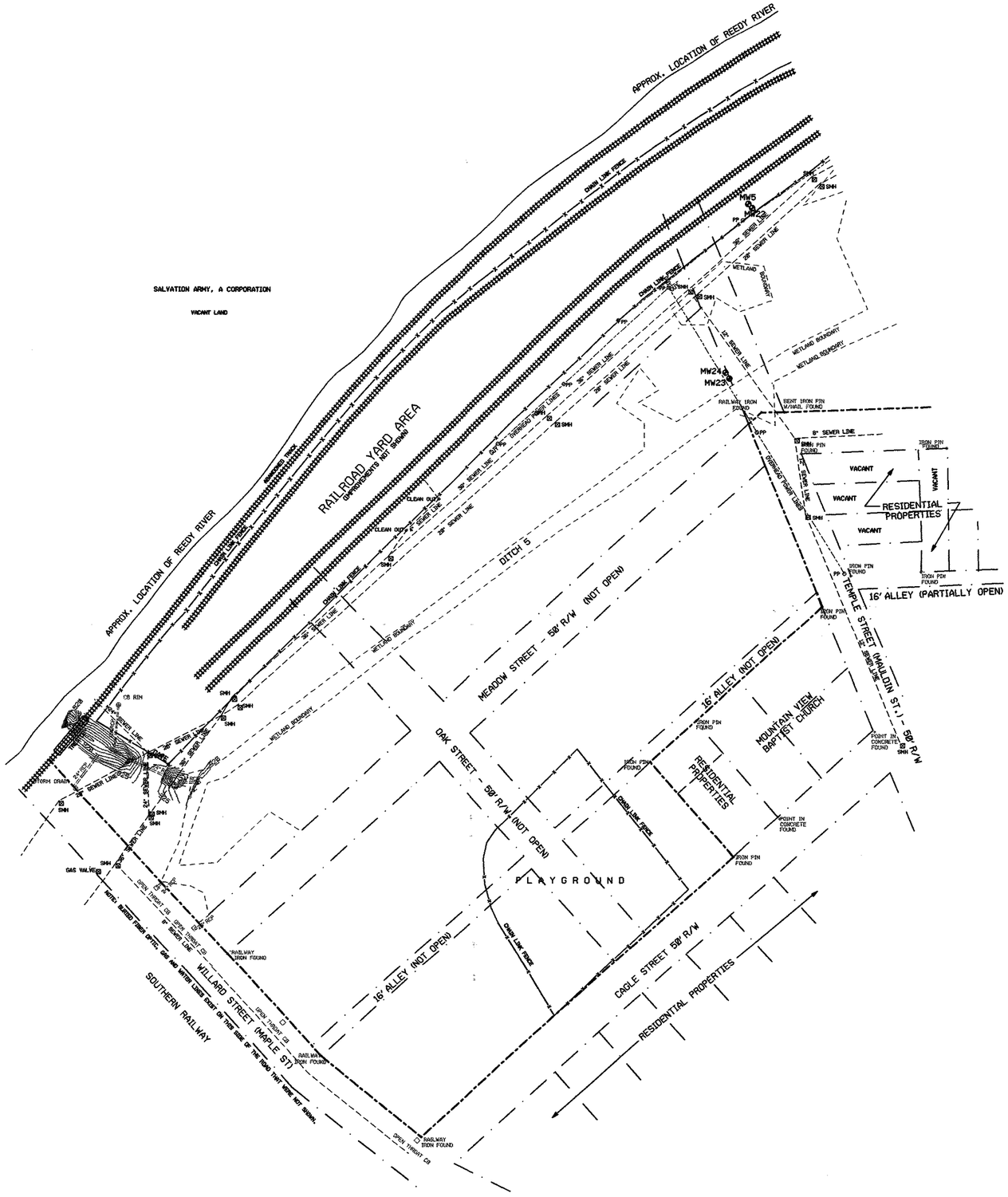
c:\dgn\brammdle.dgn May. 17, 2000 08:38:55



BRAMLETTE RD. MGP SITE MAP
N.T.S.



SITE LOCATION MAP
N.T.S.



LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- ⊗ MONITORING WELLS

100 50 0 100

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

SITE PLANS

FIGURE: 6

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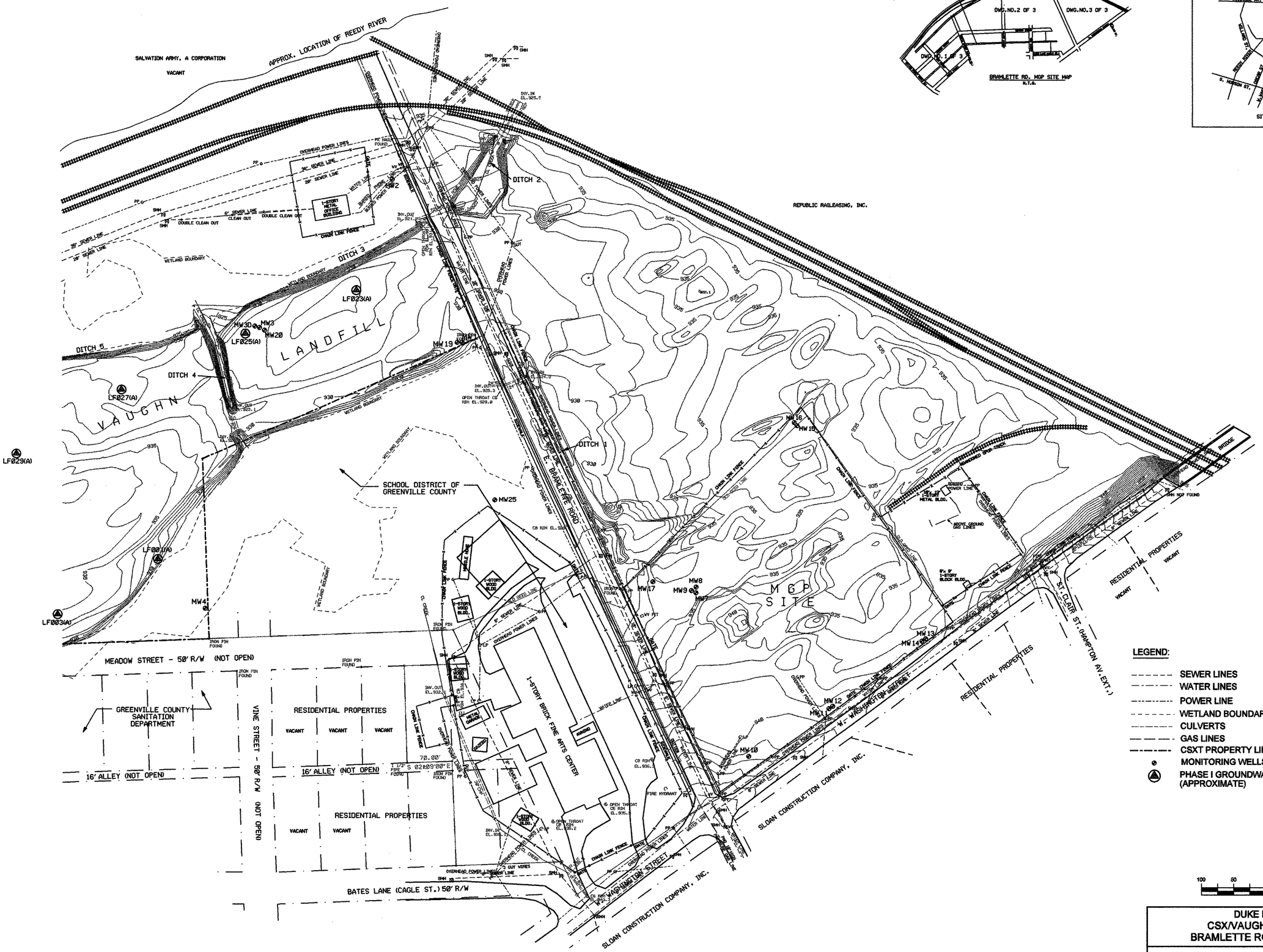

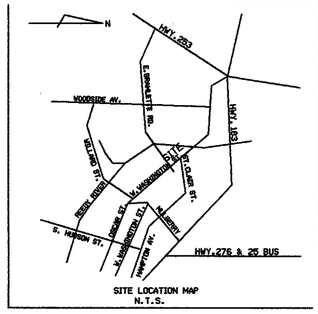

LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- PHASE I GROUNDWATER SAMPLE LOCATIONS (APPROXIMATE)

100 50 0 100

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

MONITORING WELL AND GROUNDWATER SAMPLING LOCATIONS

FIGURE: 7

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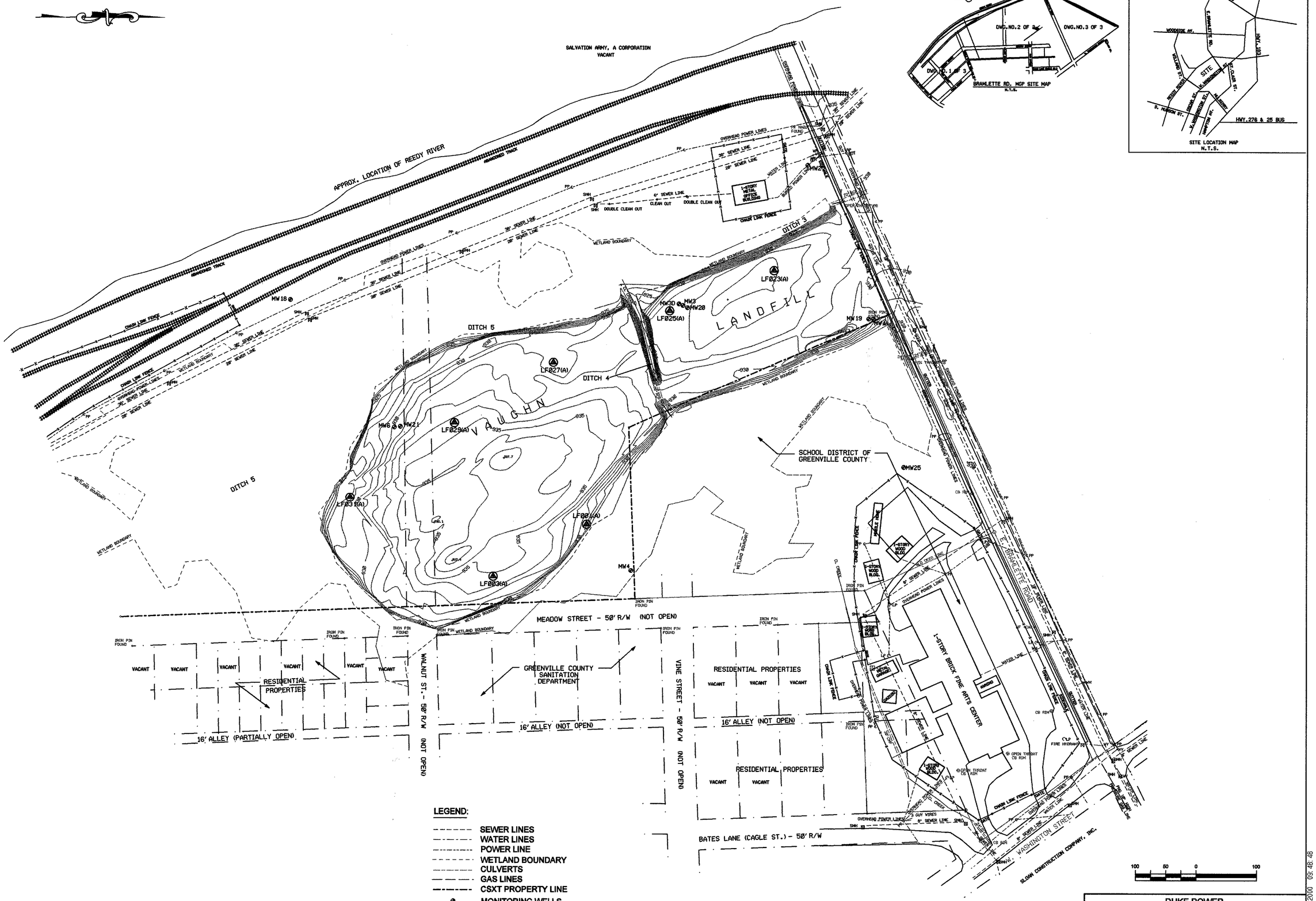
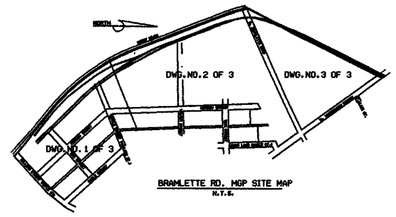


DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

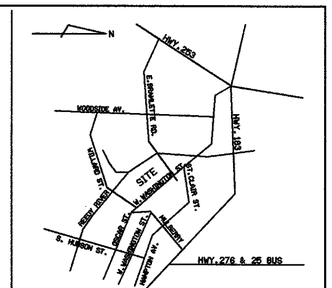
MONITORING WELL AND GROUNDWATER SAMPLING LOCATIONS

FIGURE: 8

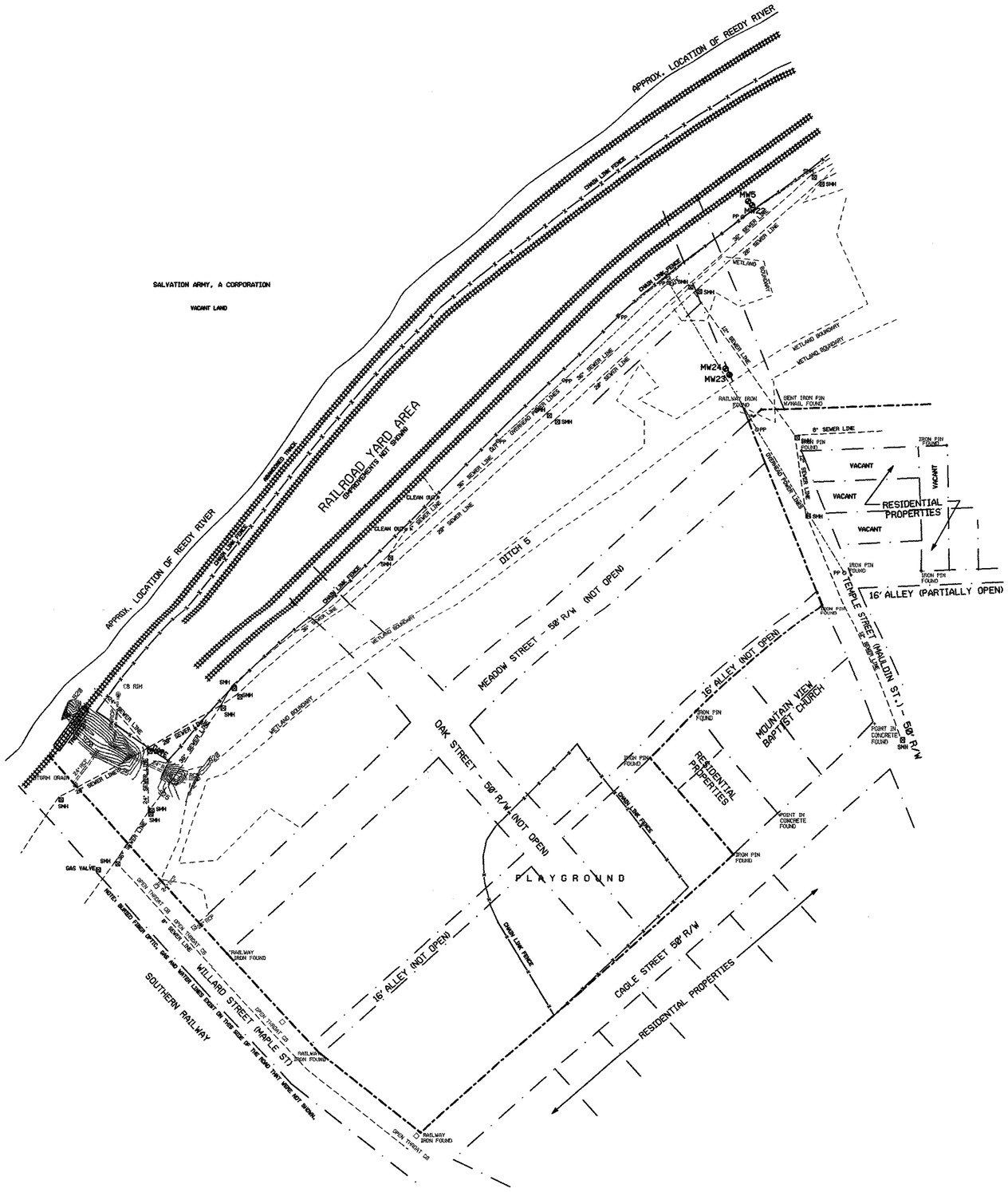
c:\dgn\bramrdmw.dgn May. 15, 2000 09:48:48



BRAMLETTE RD. MGP SITE MAP
N.T.S.



SITE LOCATION MAP
N.T.S.



LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- ⊗ MONITORING WELLS

100 50 0 100

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

MONITORING WELL AND GROUNDWATER SAMPLING LOCATIONS

FIGURE: 9

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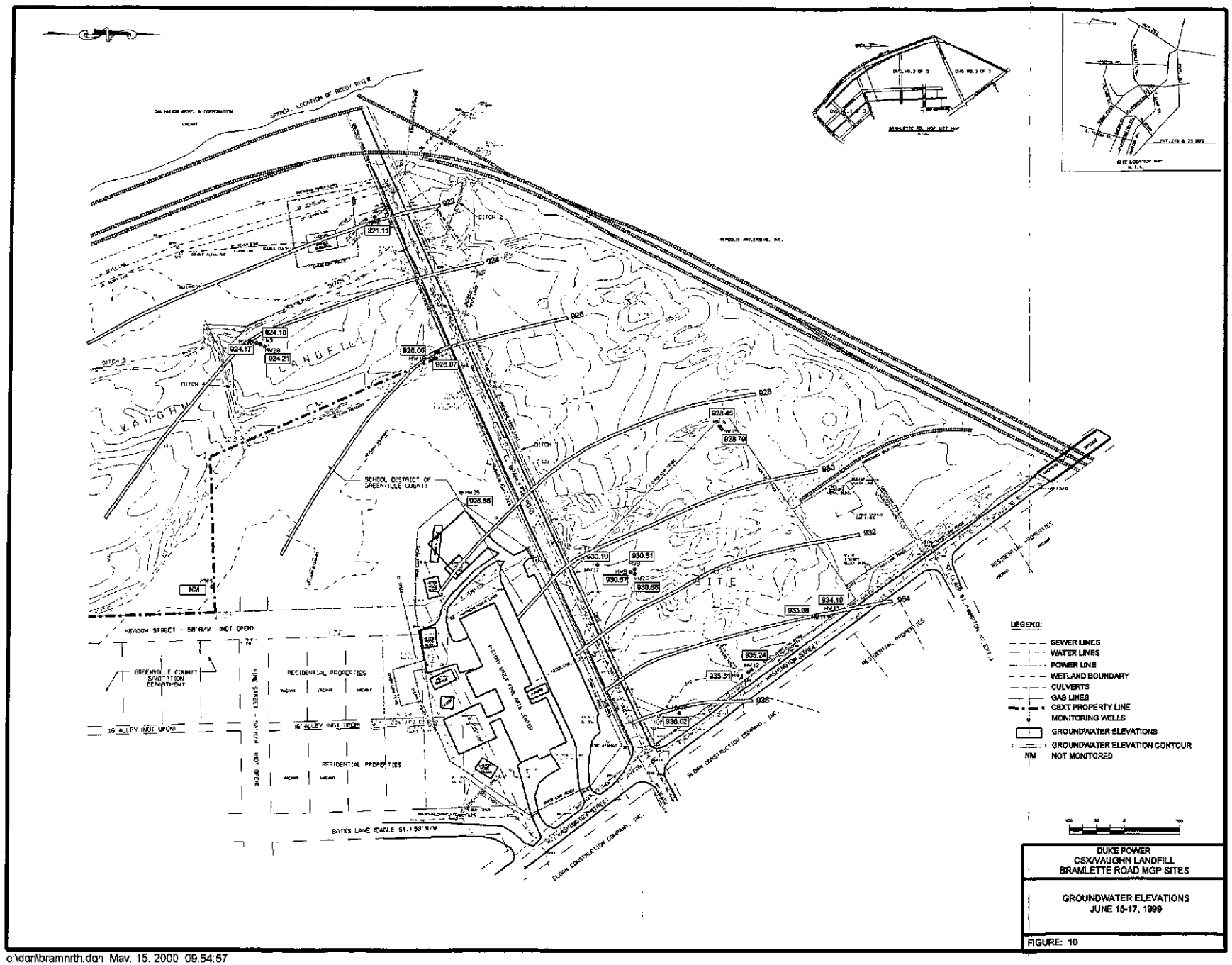

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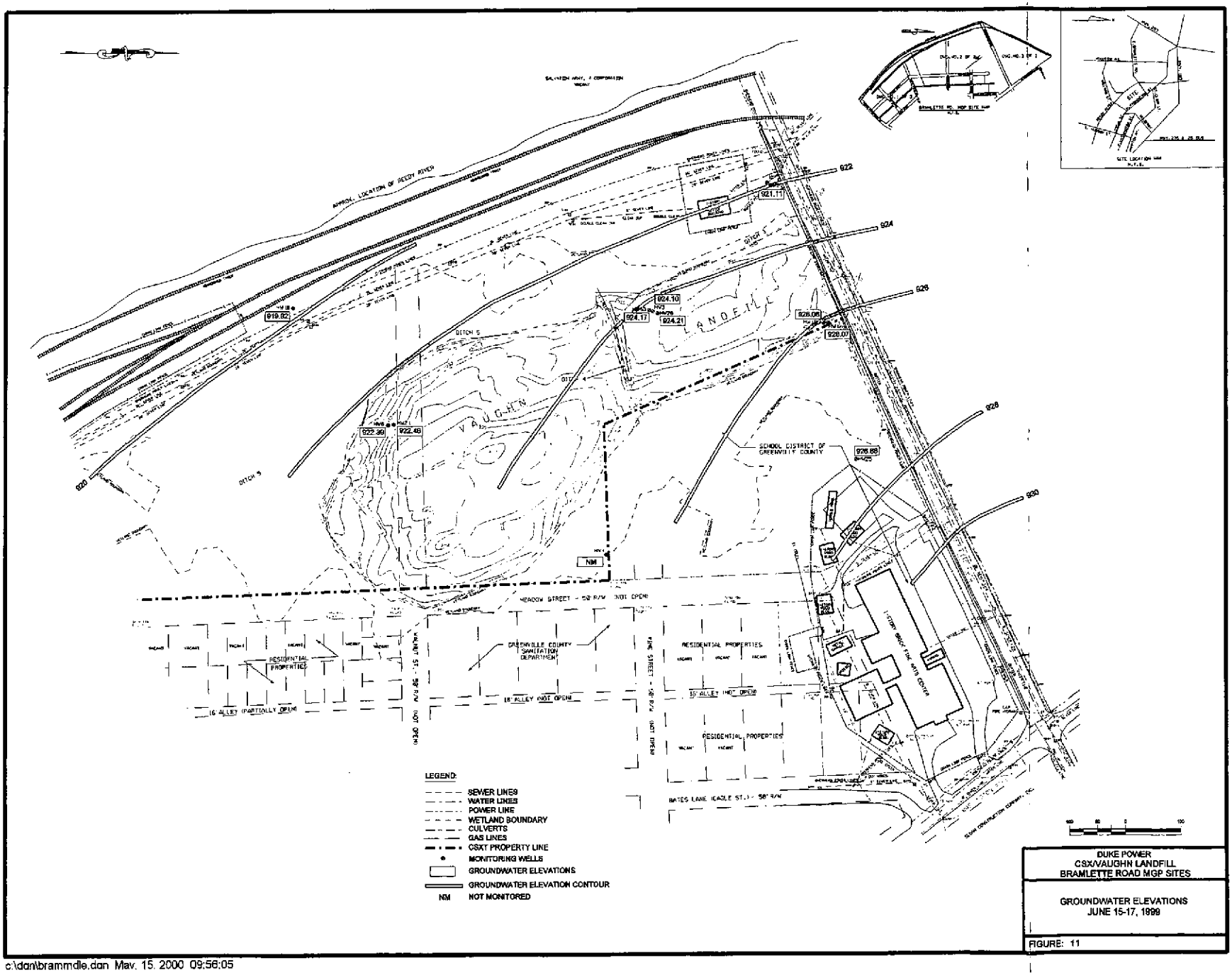

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

GROUNDWATER ELEVATIONS
JUNE 15-17, 1999

FIGURE: 11

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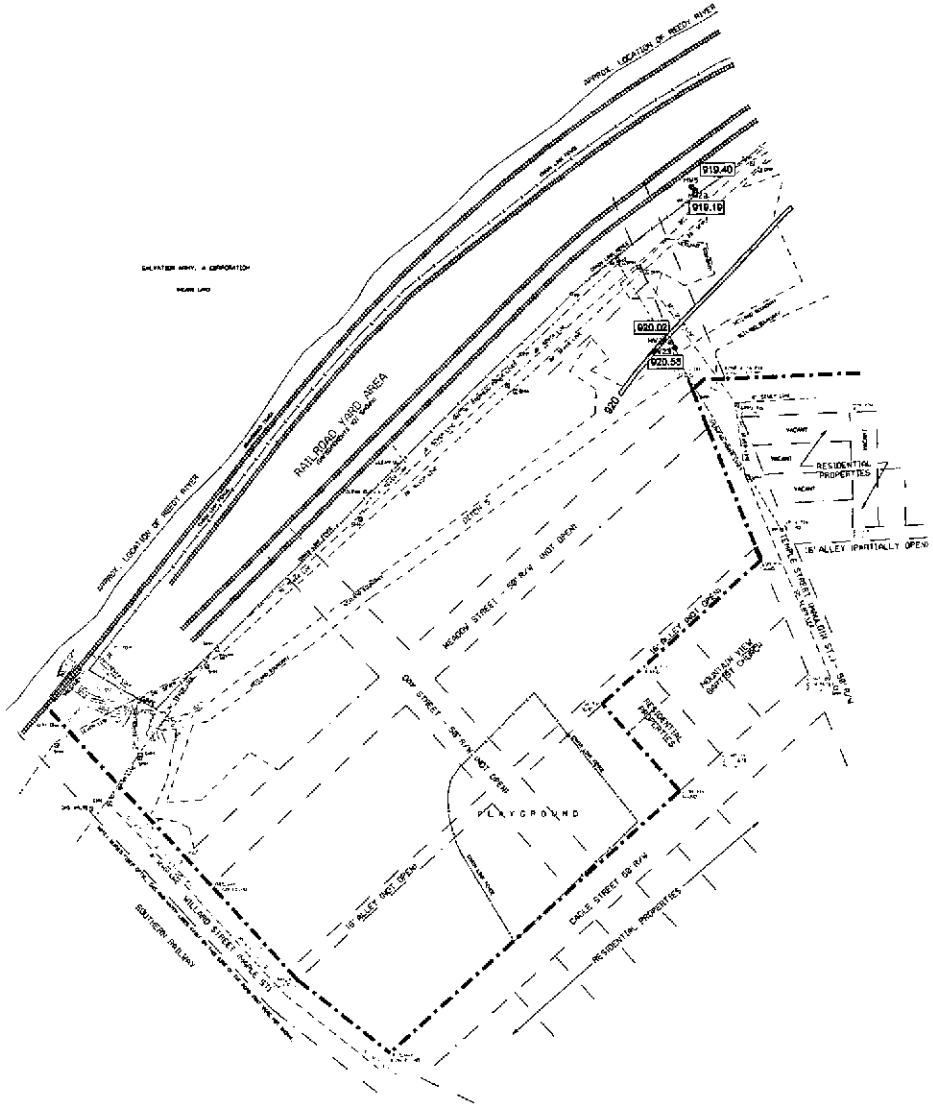

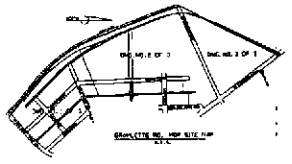

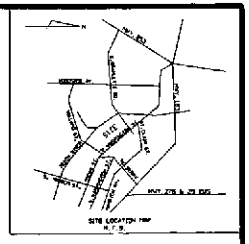

LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- GROUNDWATER ELEVATIONS
- GROUNDWATER ELEVATION CONTOUR

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

GROUNDWATER ELEVATIONS
JUNE 15-17, 1999

FIGURE: 12

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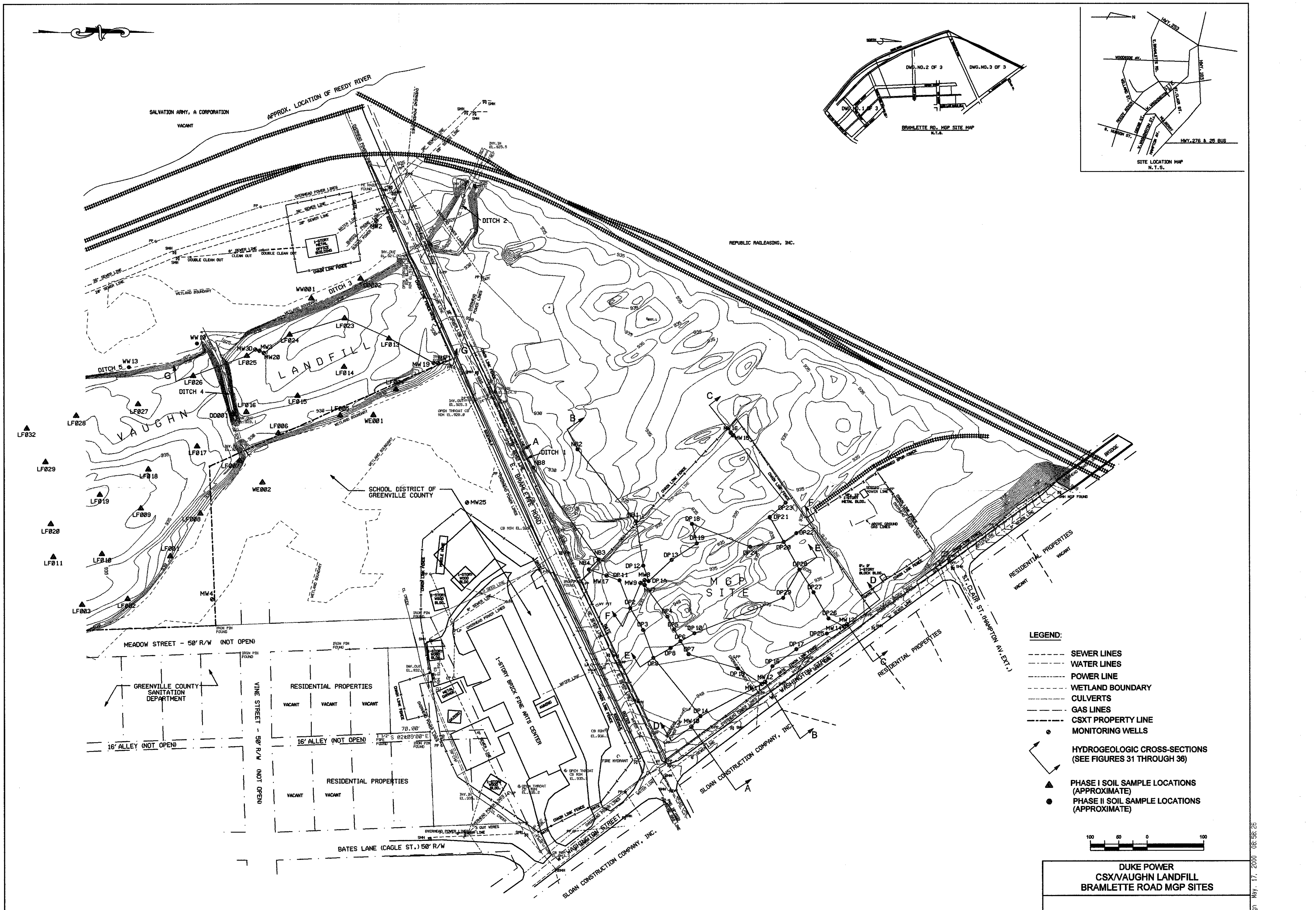
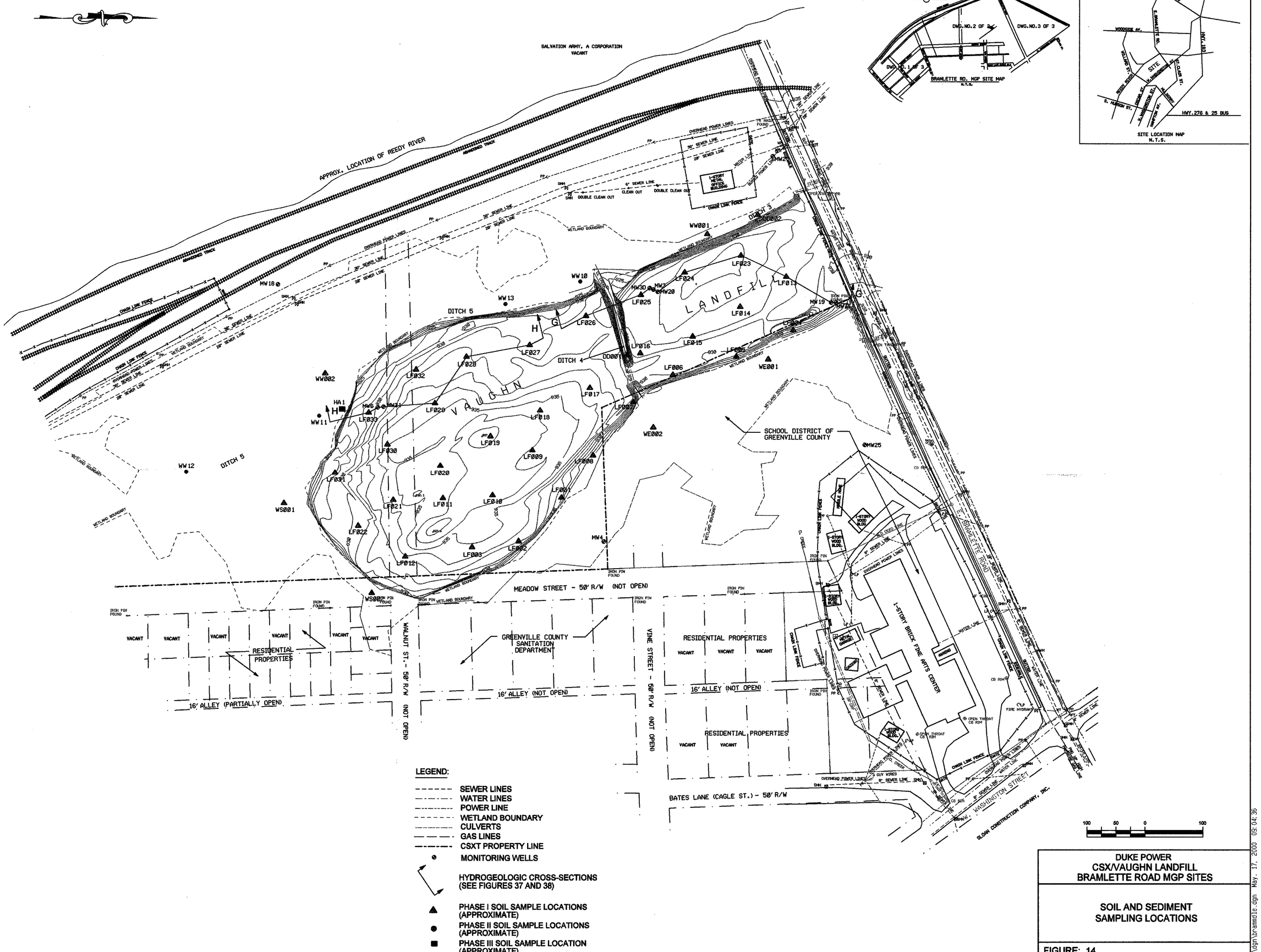


DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

SOIL AND SEDIMENT SAMPLING LOCATIONS

FIGURE: 13



LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- HYDROGEOLOGIC CROSS-SECTIONS (SEE FIGURES 37 AND 38)
- PHASE I SOIL SAMPLE LOCATIONS (APPROXIMATE)
- PHASE II SOIL SAMPLE LOCATIONS (APPROXIMATE)
- PHASE III SOIL SAMPLE LOCATION (APPROXIMATE)

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

SOIL AND SEDIMENT SAMPLING LOCATIONS

FIGURE: 14

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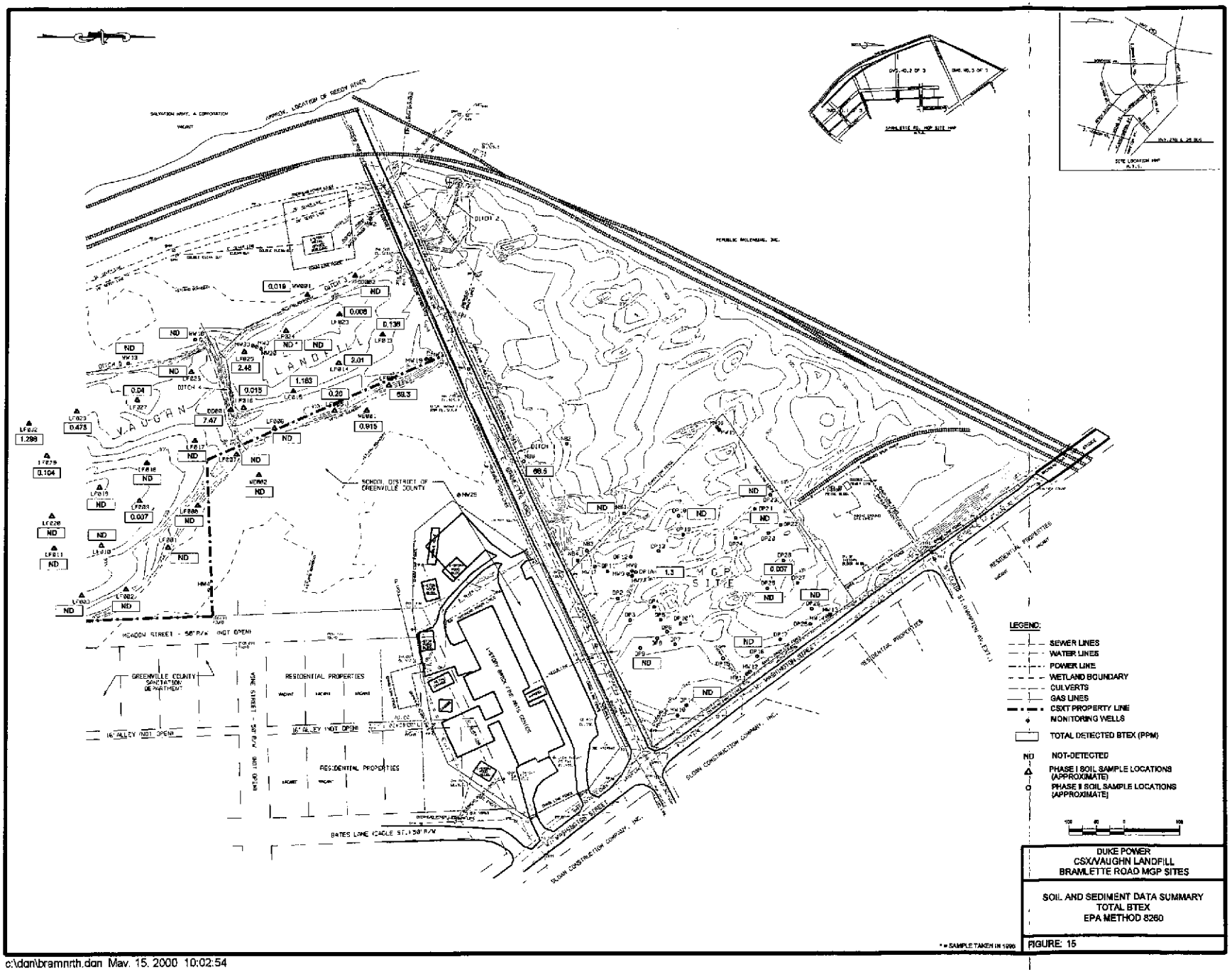

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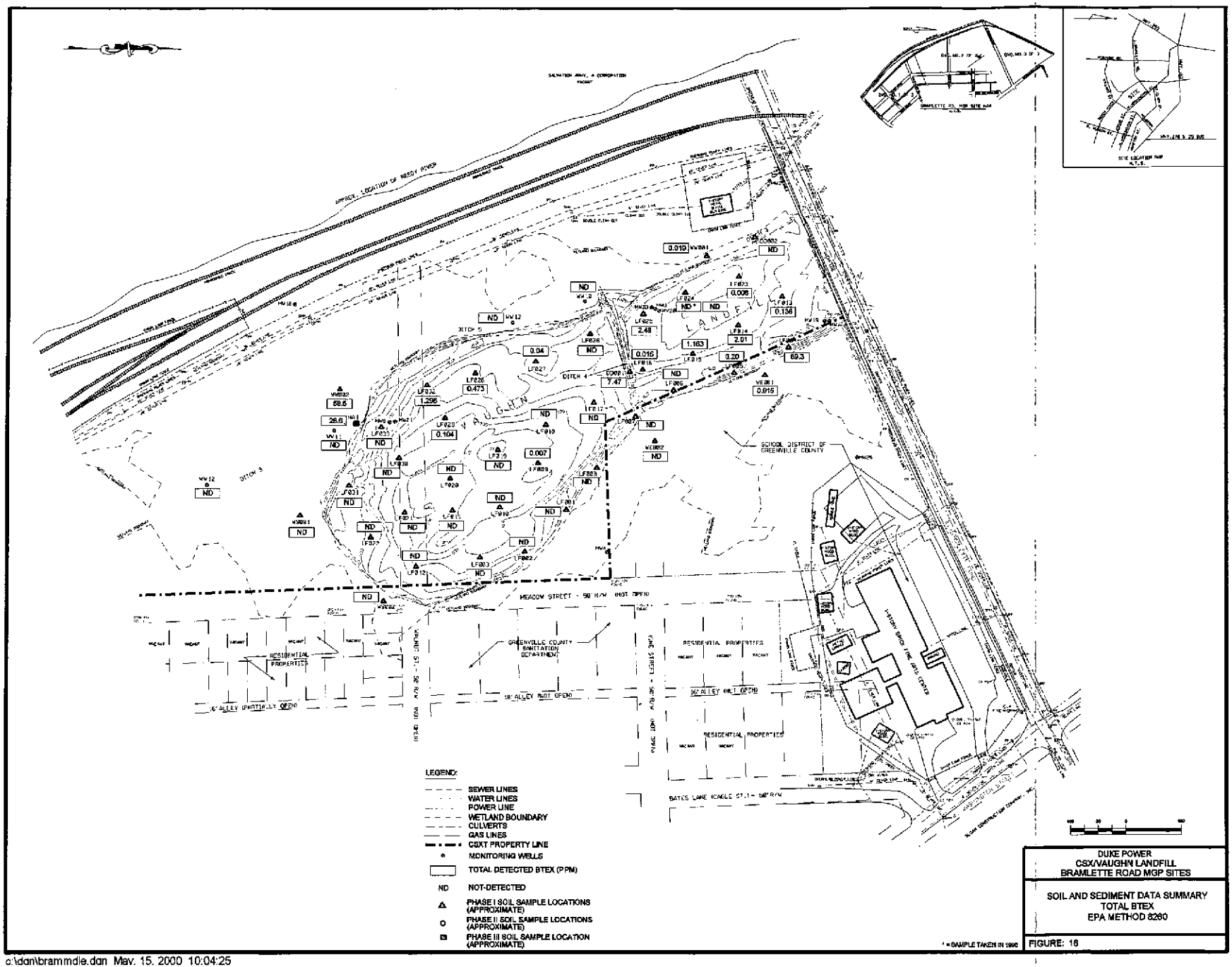

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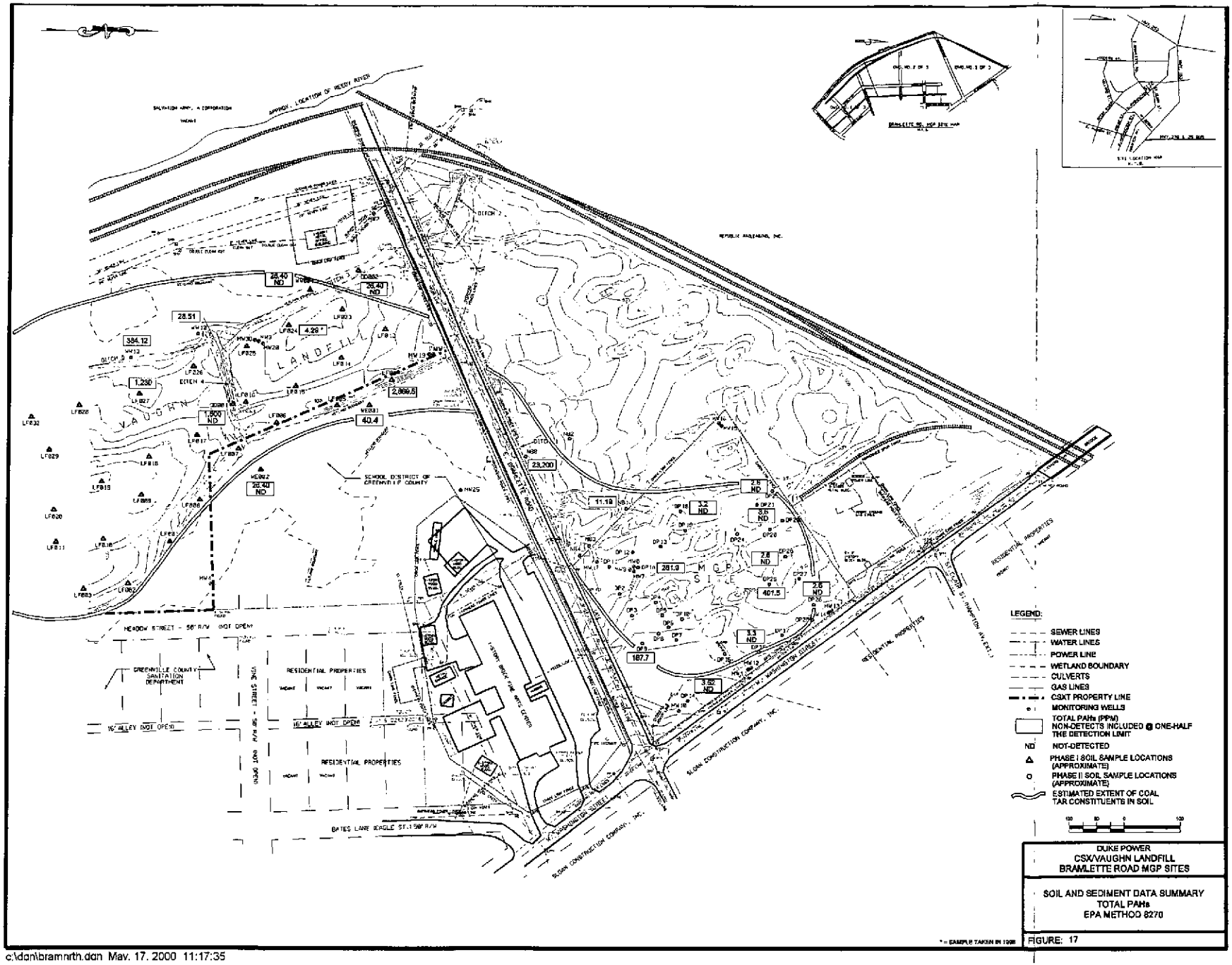

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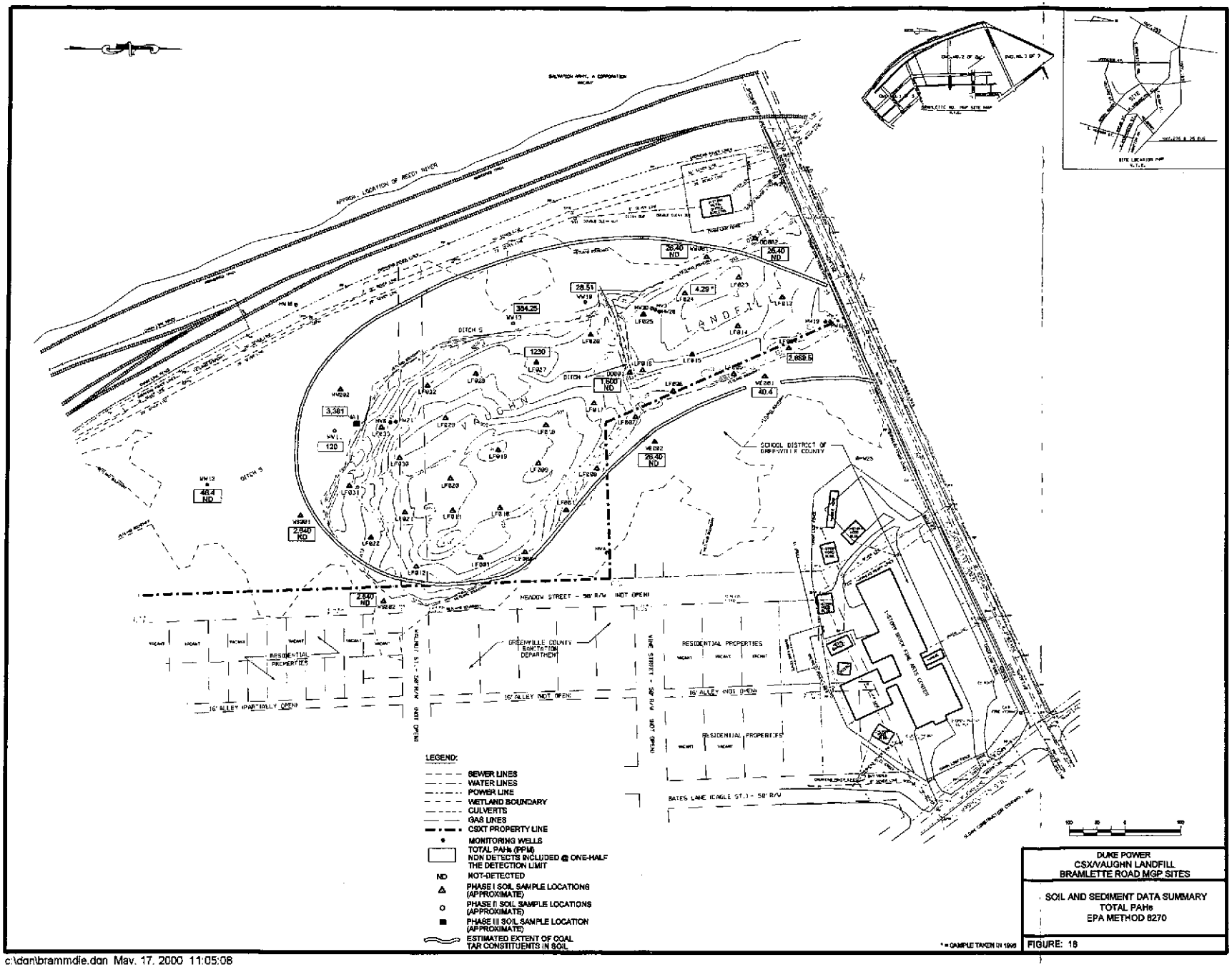

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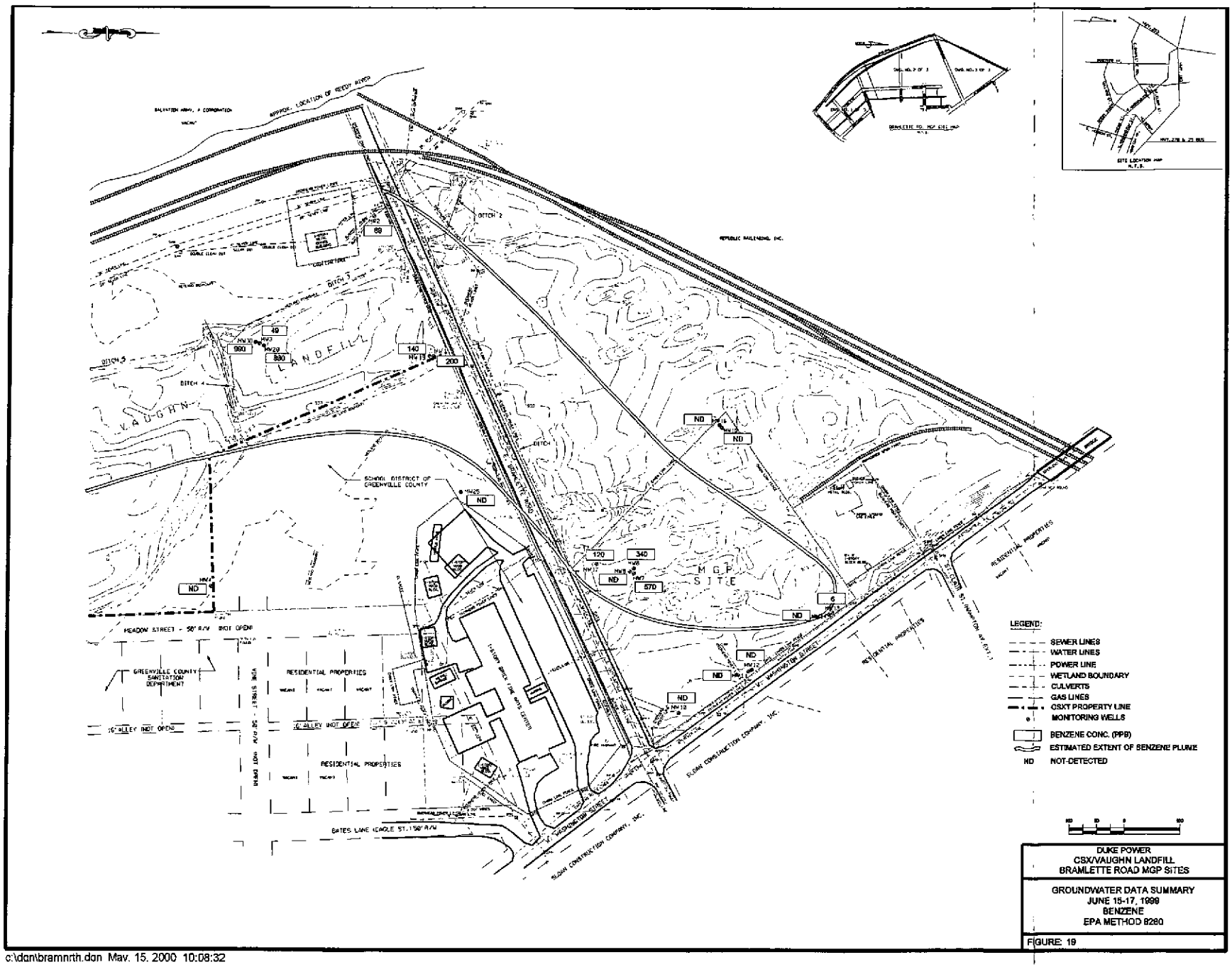

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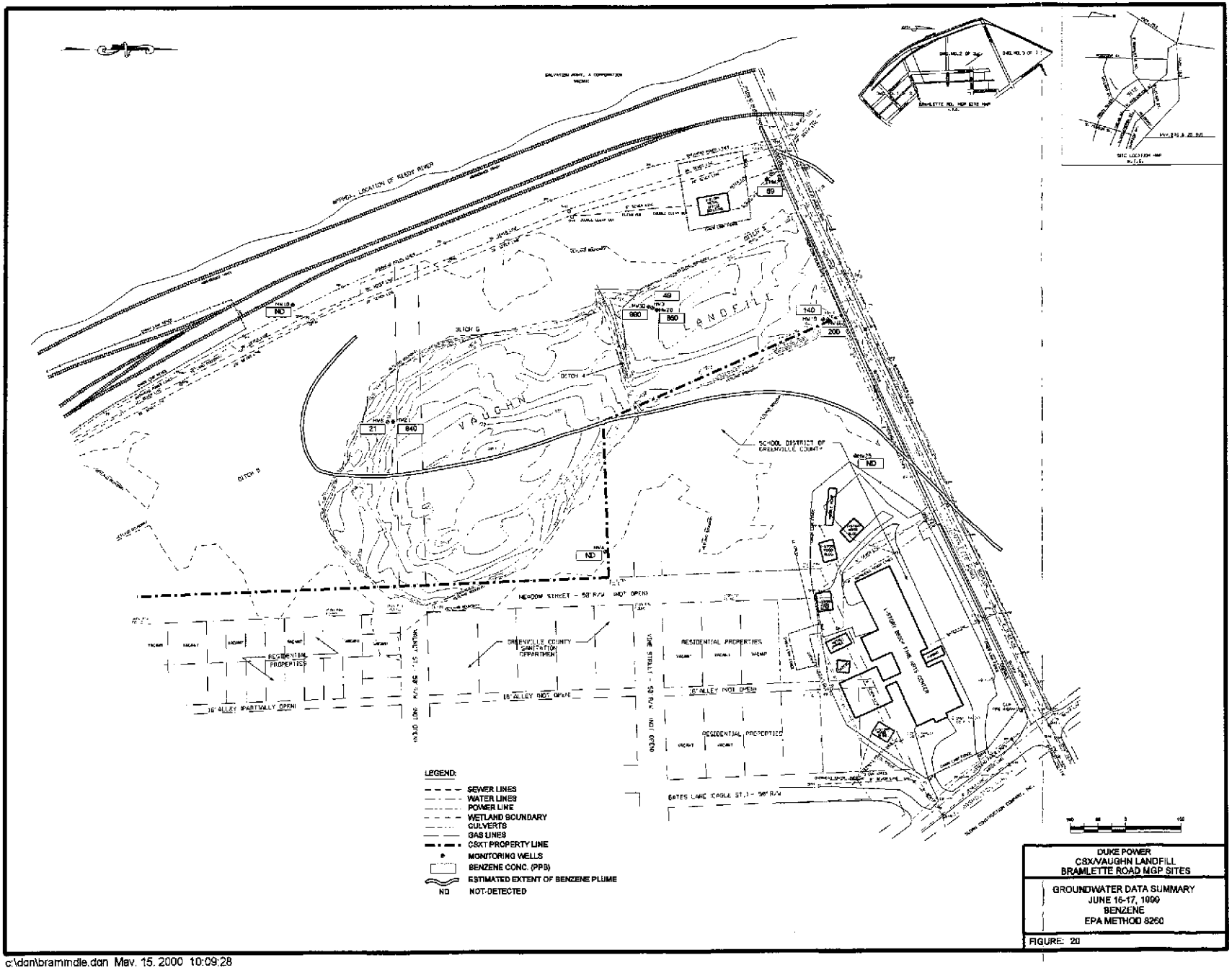
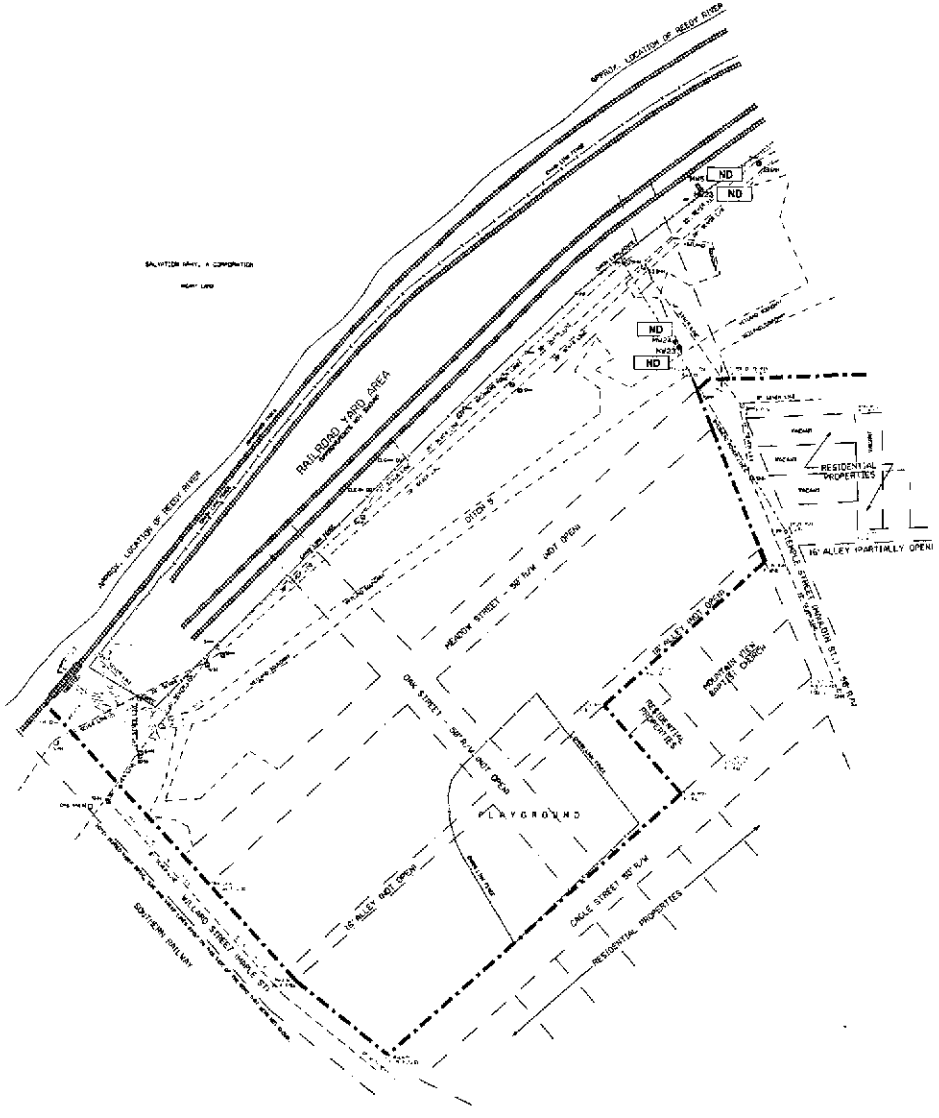
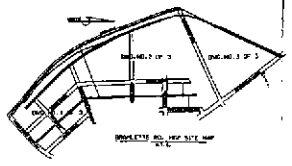
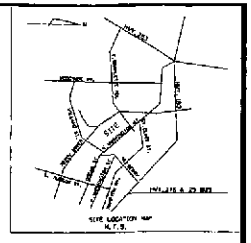


c:\dan\brammdle.dgn May. 15. 2000 10:09:28







LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- BENZENE CONC. (PPB)
- ND NOT-DETECTED

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

GROUNDWATER DATA SUMMARY
JUNE 15-17, 1999
BENZENE
EPA METHOD 8260

FIGURE: 21

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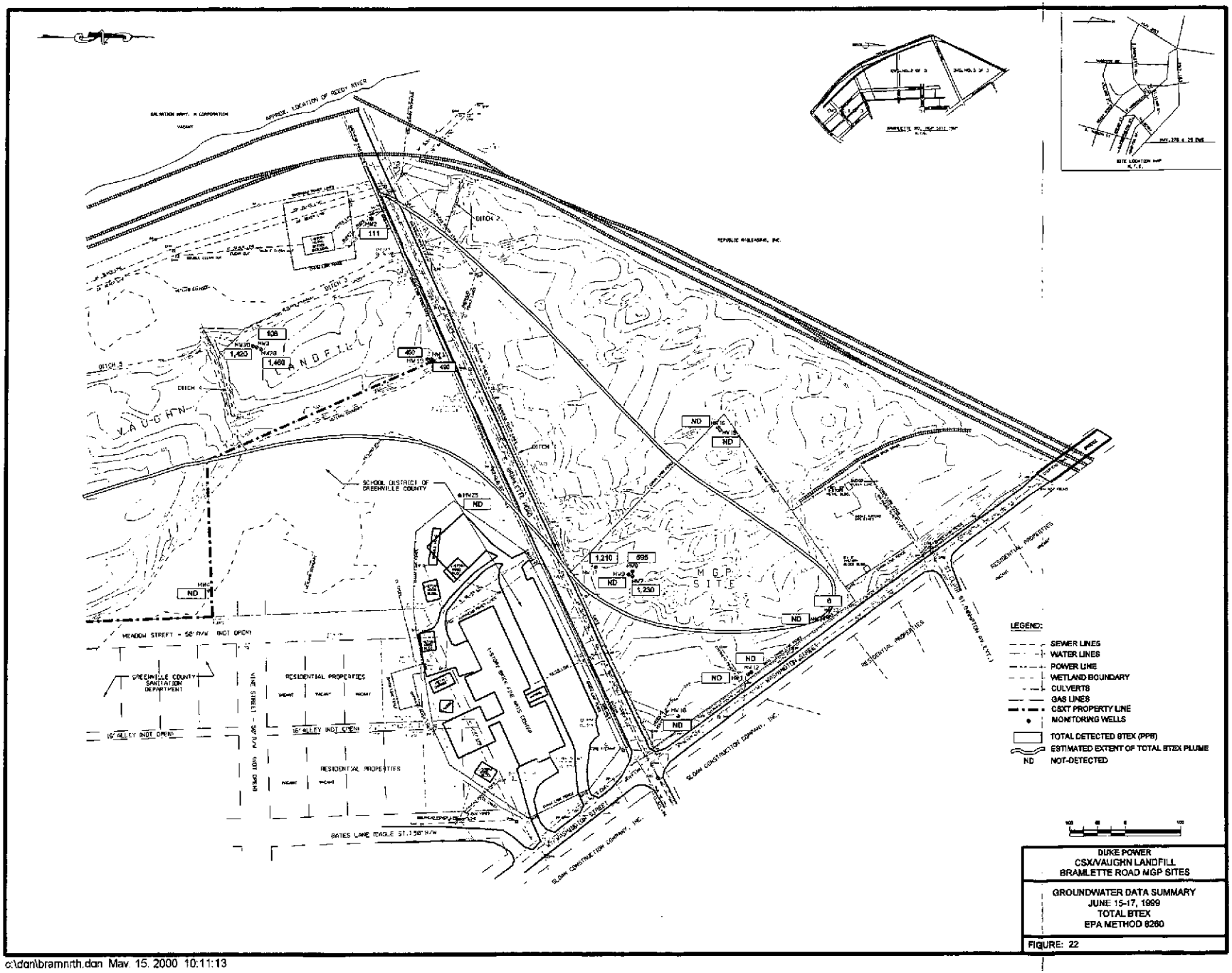

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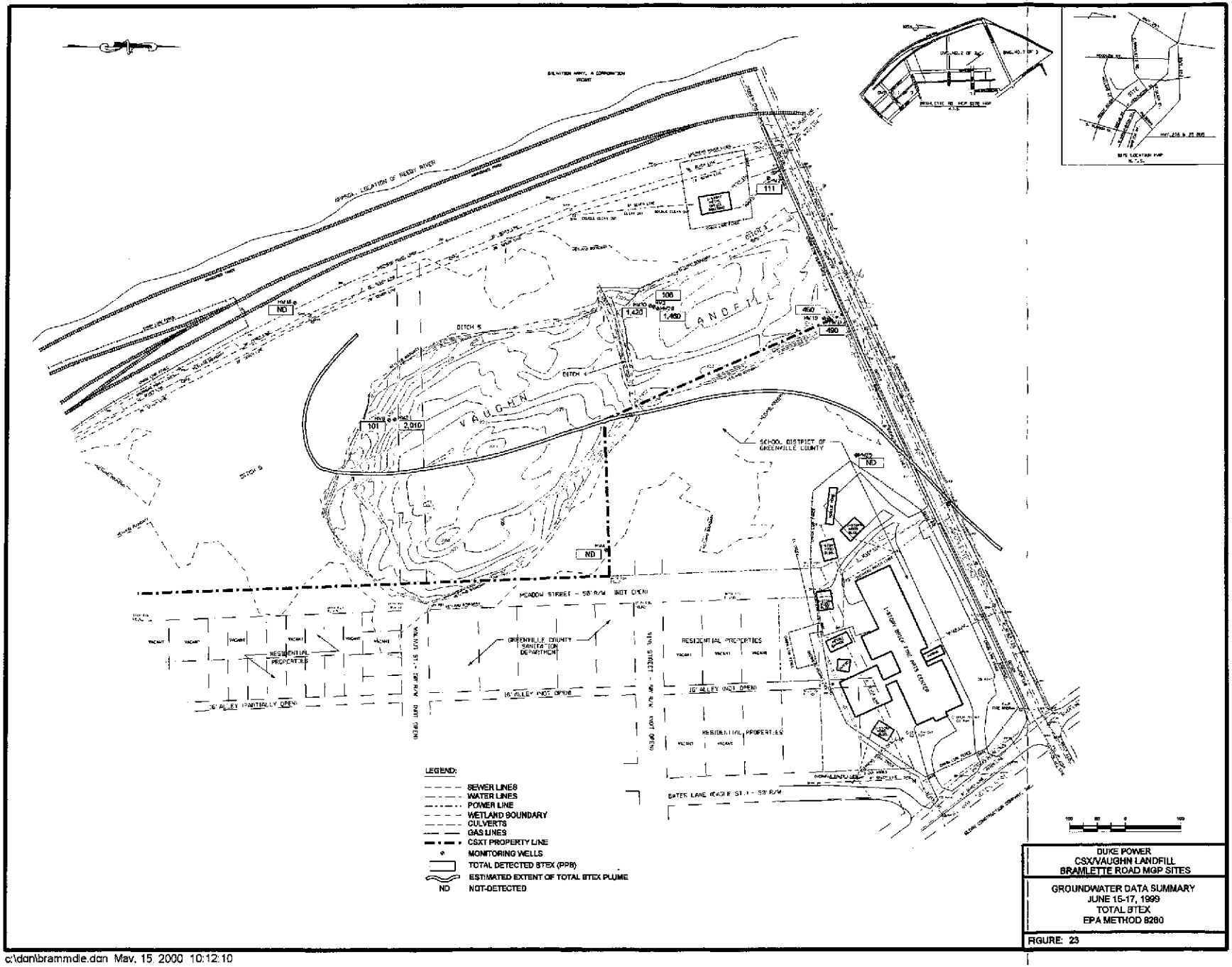

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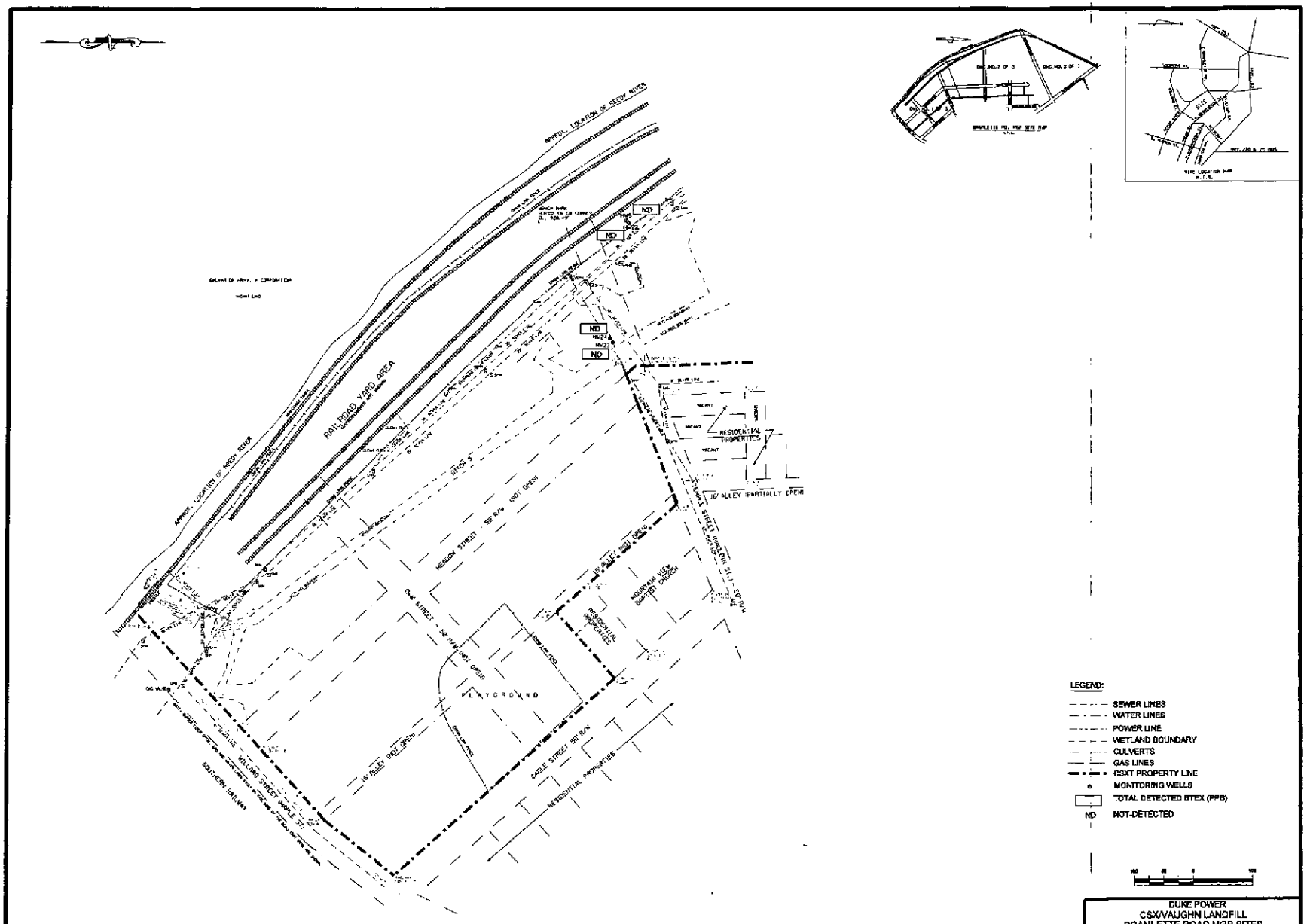

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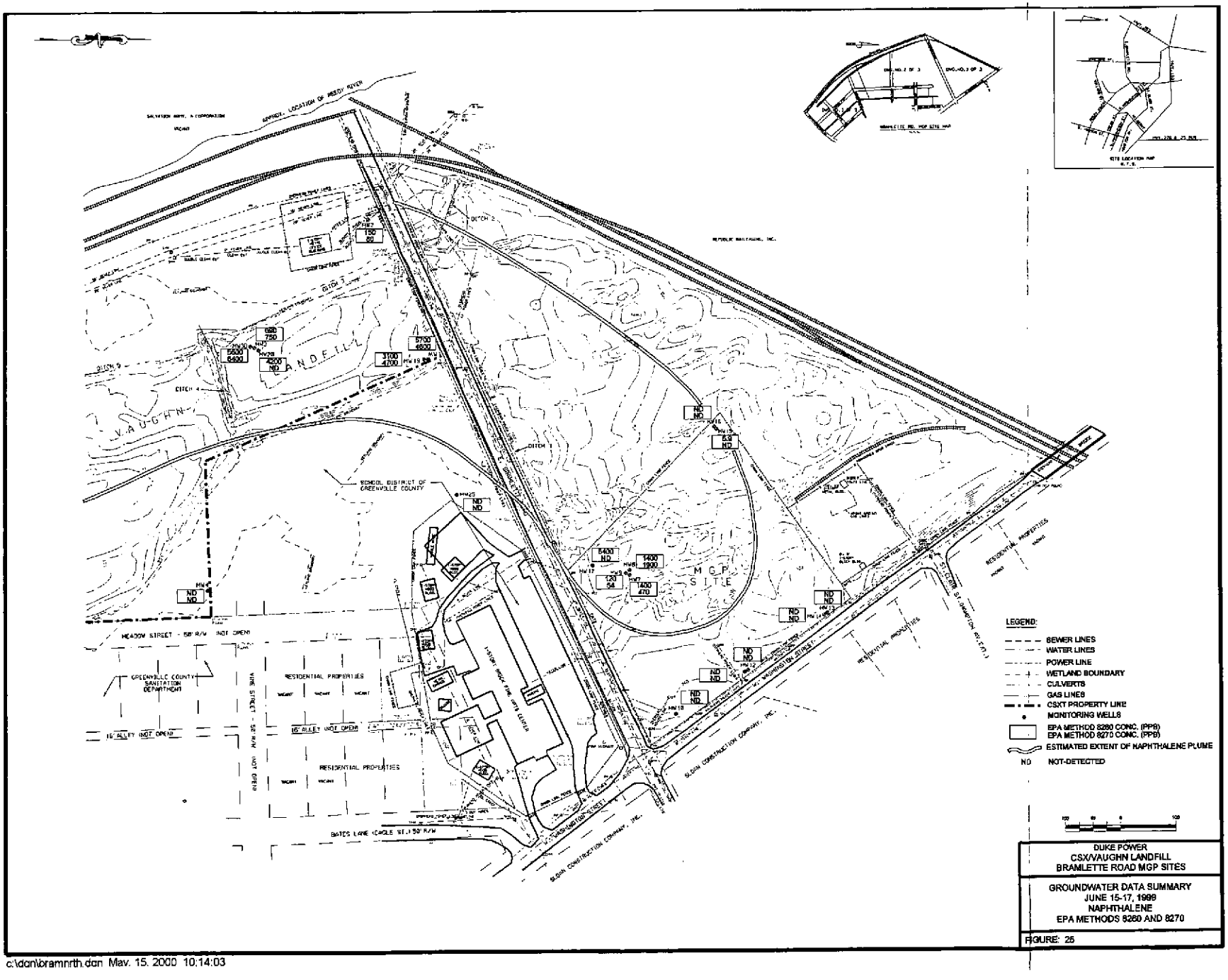

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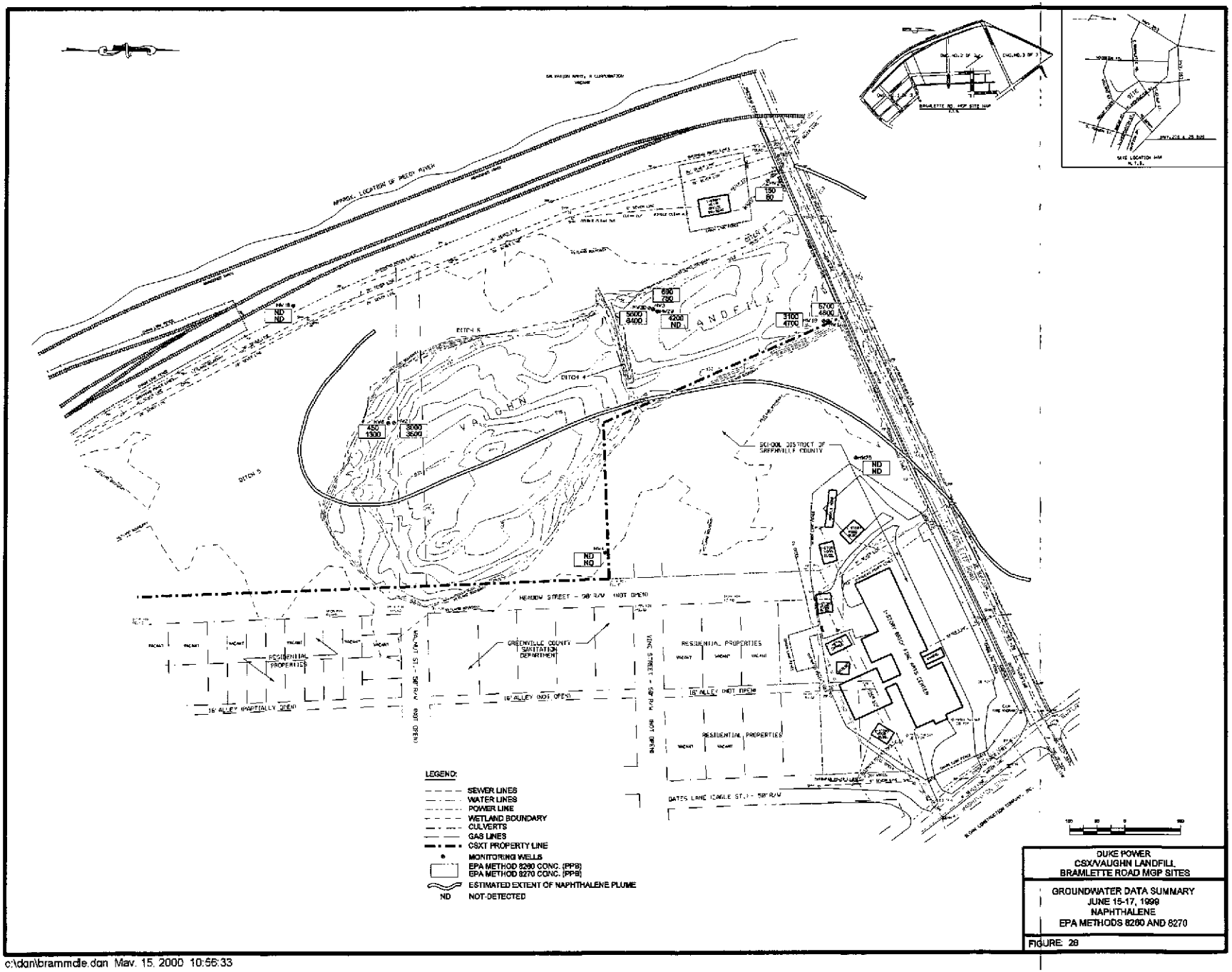

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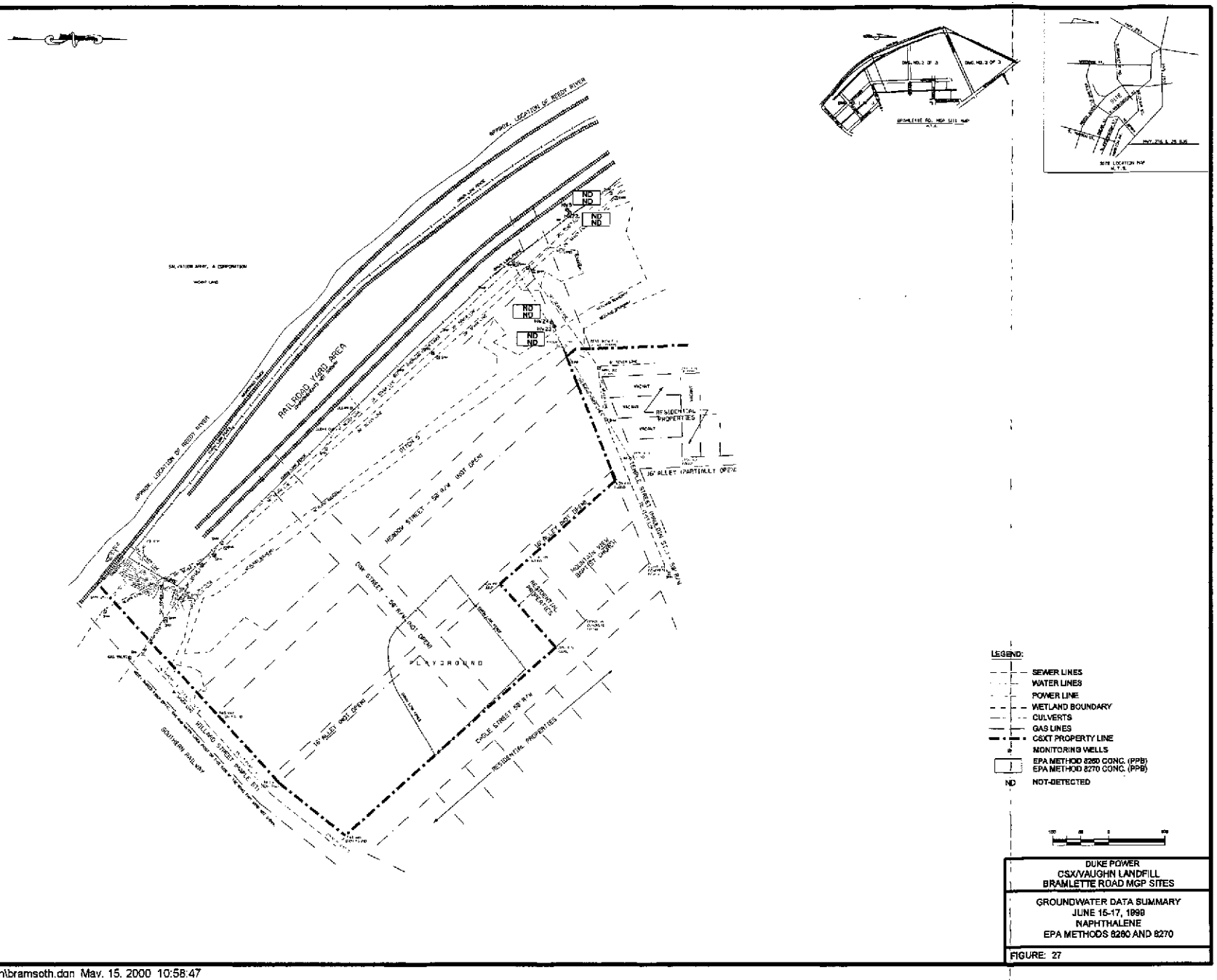

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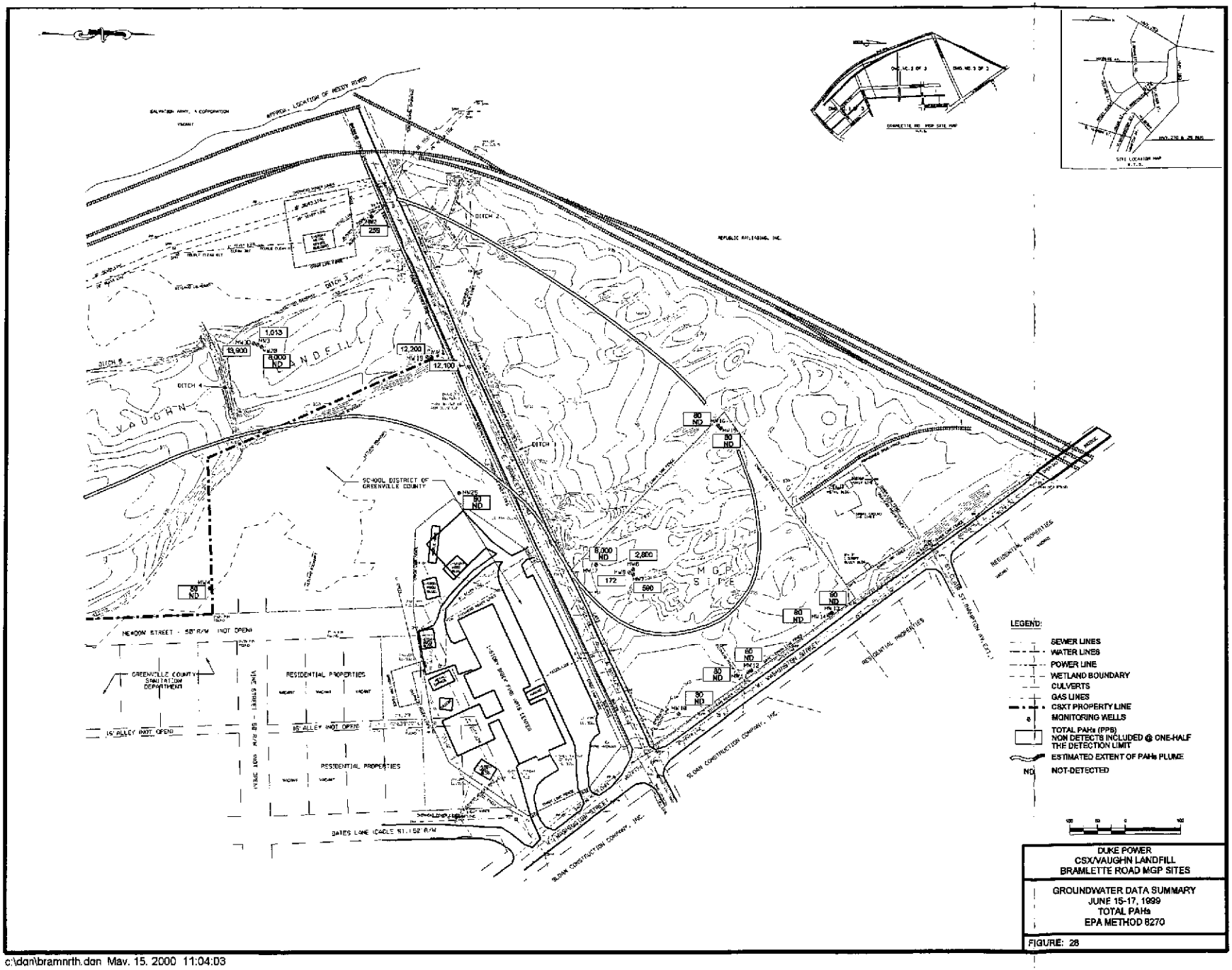

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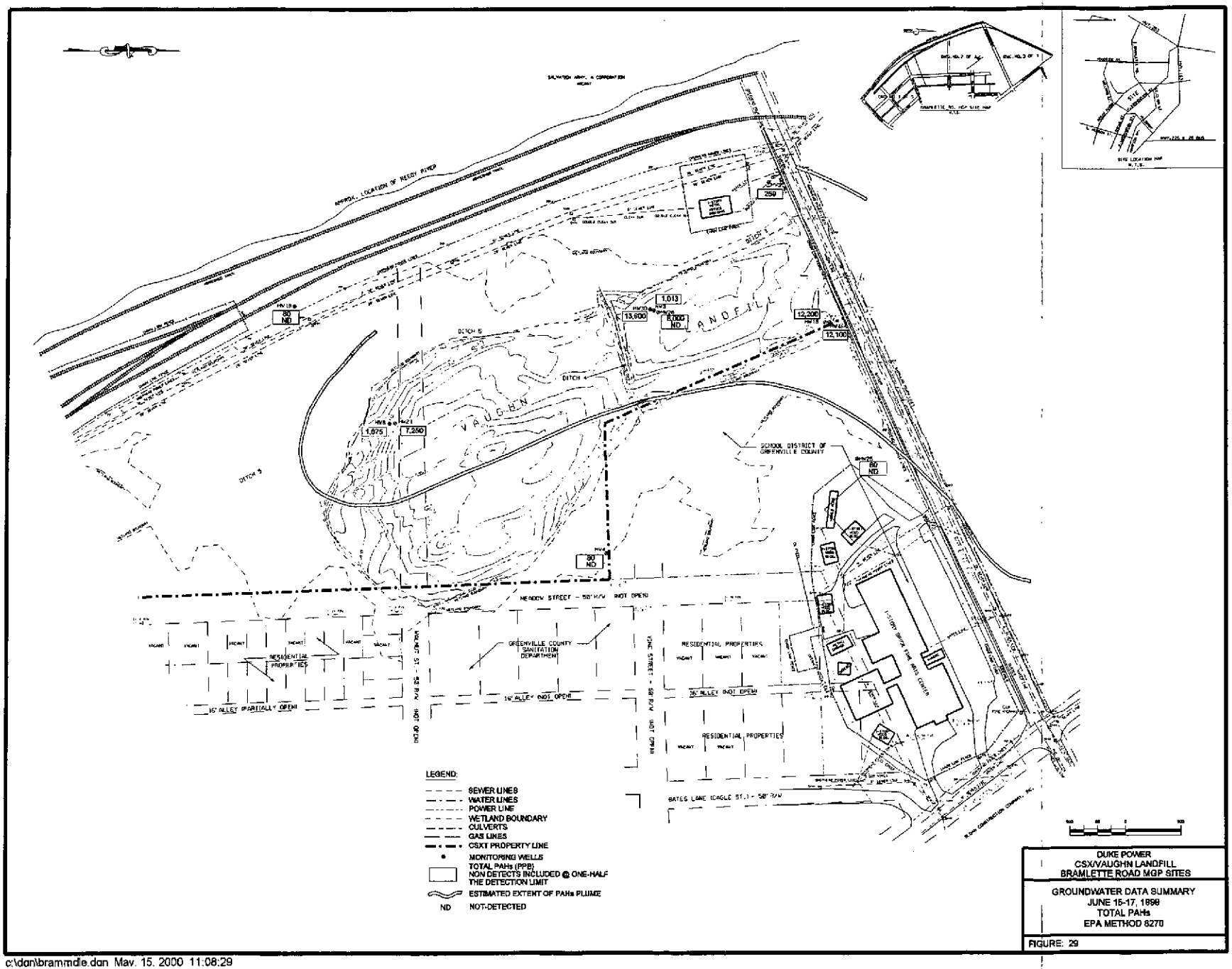
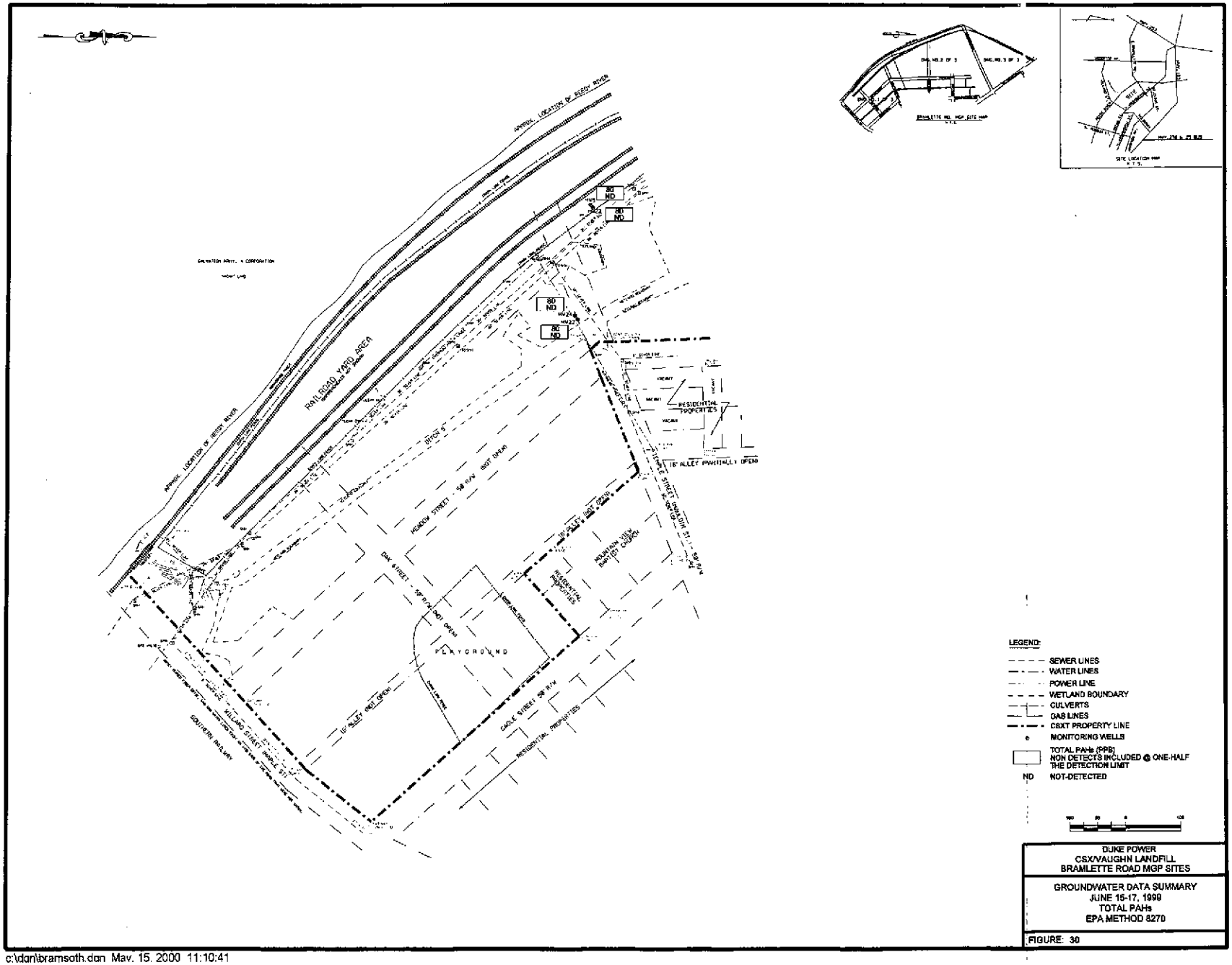


c:\dan\brammdle.dan May. 15. 2000 11:08:29



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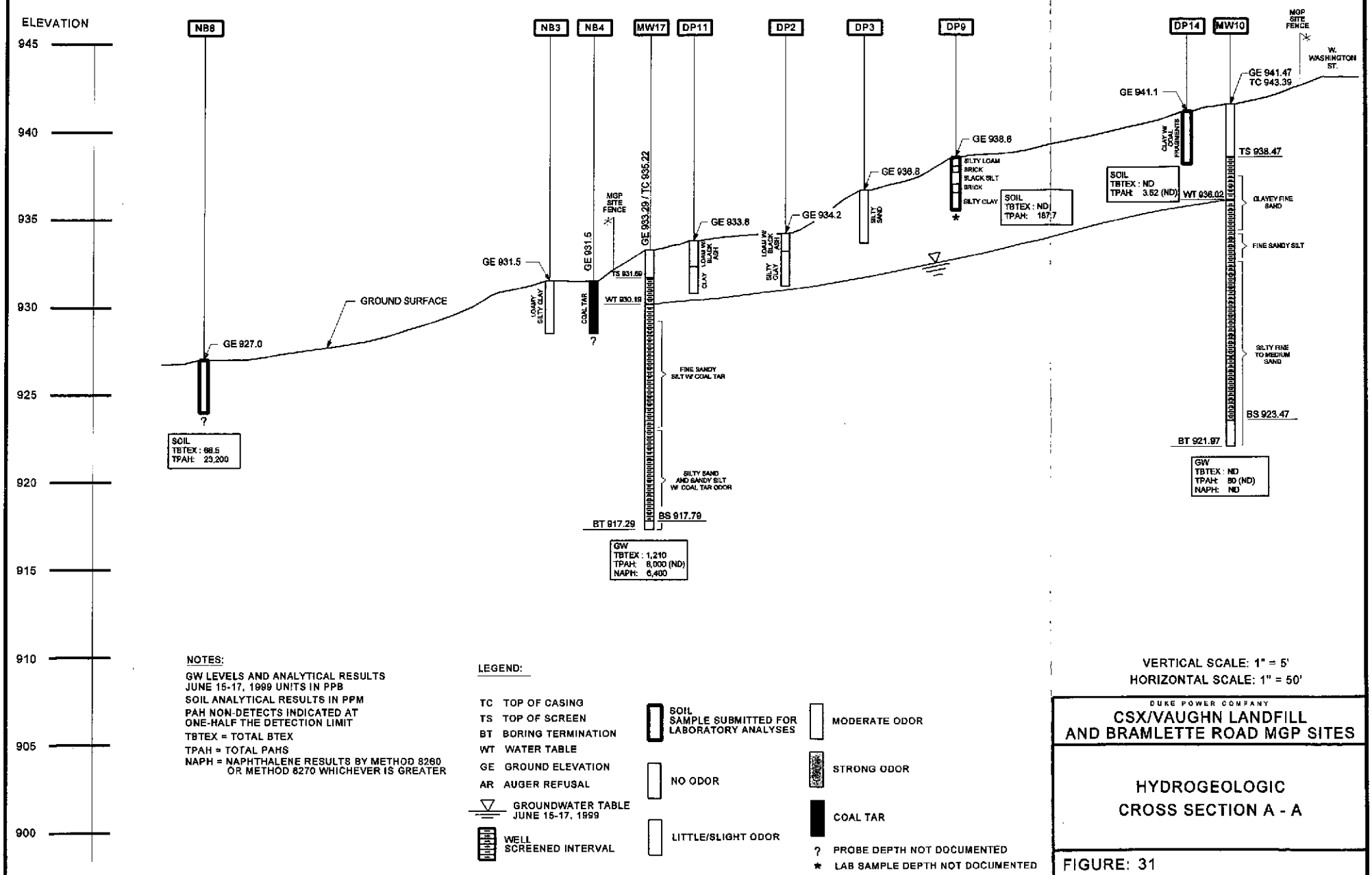

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

LEGEND:

- TC TOP OF CASING
- TS TOP OF SCREEN
- BT BORING TERMINATION
- WT WATER TABLE
- GE GROUND ELEVATION
- AR AUGER REFUSAL
- GROUNDWATER TABLE JUNE 15-17, 1999
- WELL SCREENED INTERVAL
- SOIL SAMPLE SUBMITTED FOR LABORATORY ANALYSES
- NO ODOR
- LITTLE/SLIGHT ODOR
- MODERATE ODOR
- STRONG ODOR
- COAL TAR
- ? PROBE DEPTH NOT DOCUMENTED
- * LAB SAMPLE DEPTH NOT DOCUMENTED

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION A - A

FIGURE: 31

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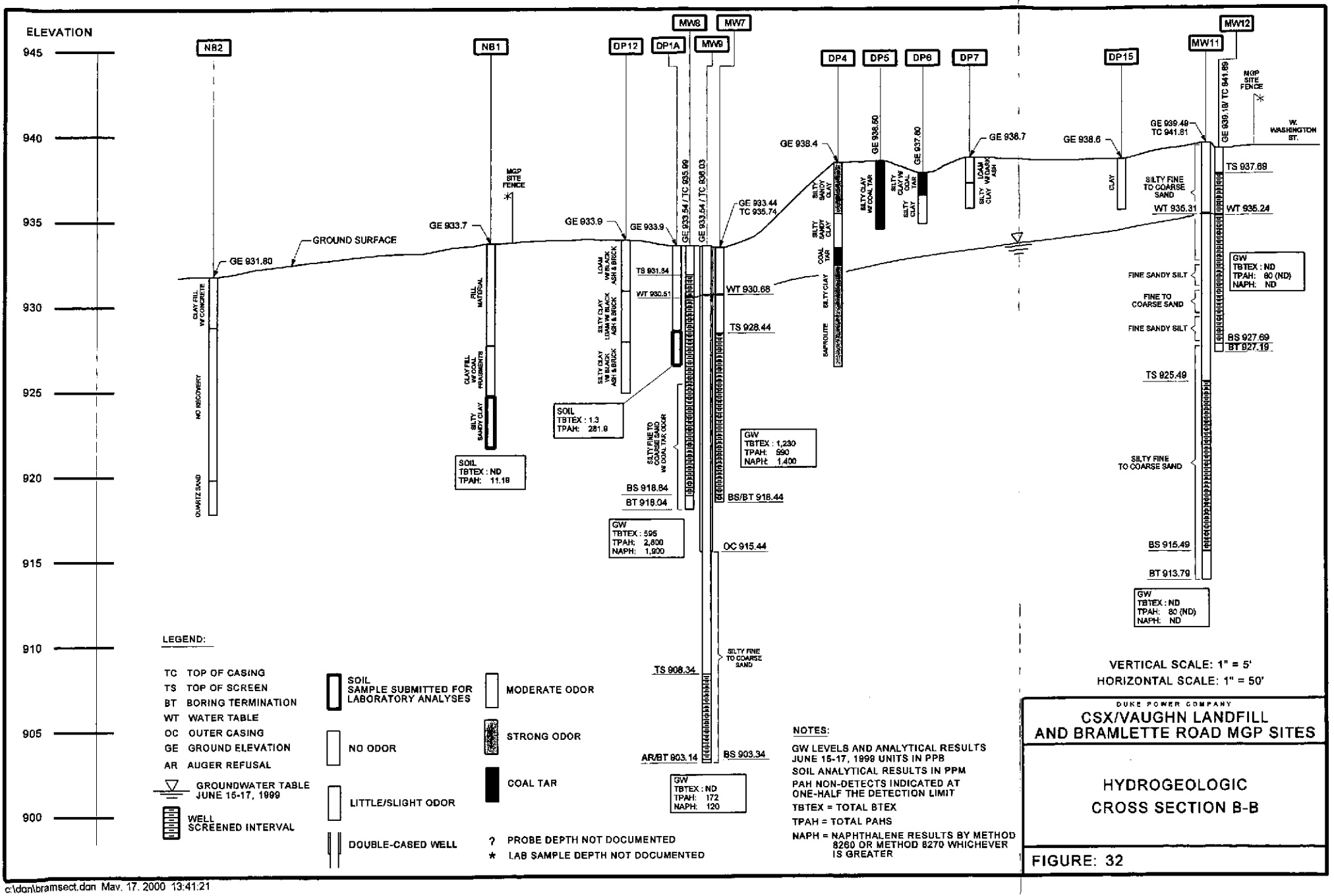


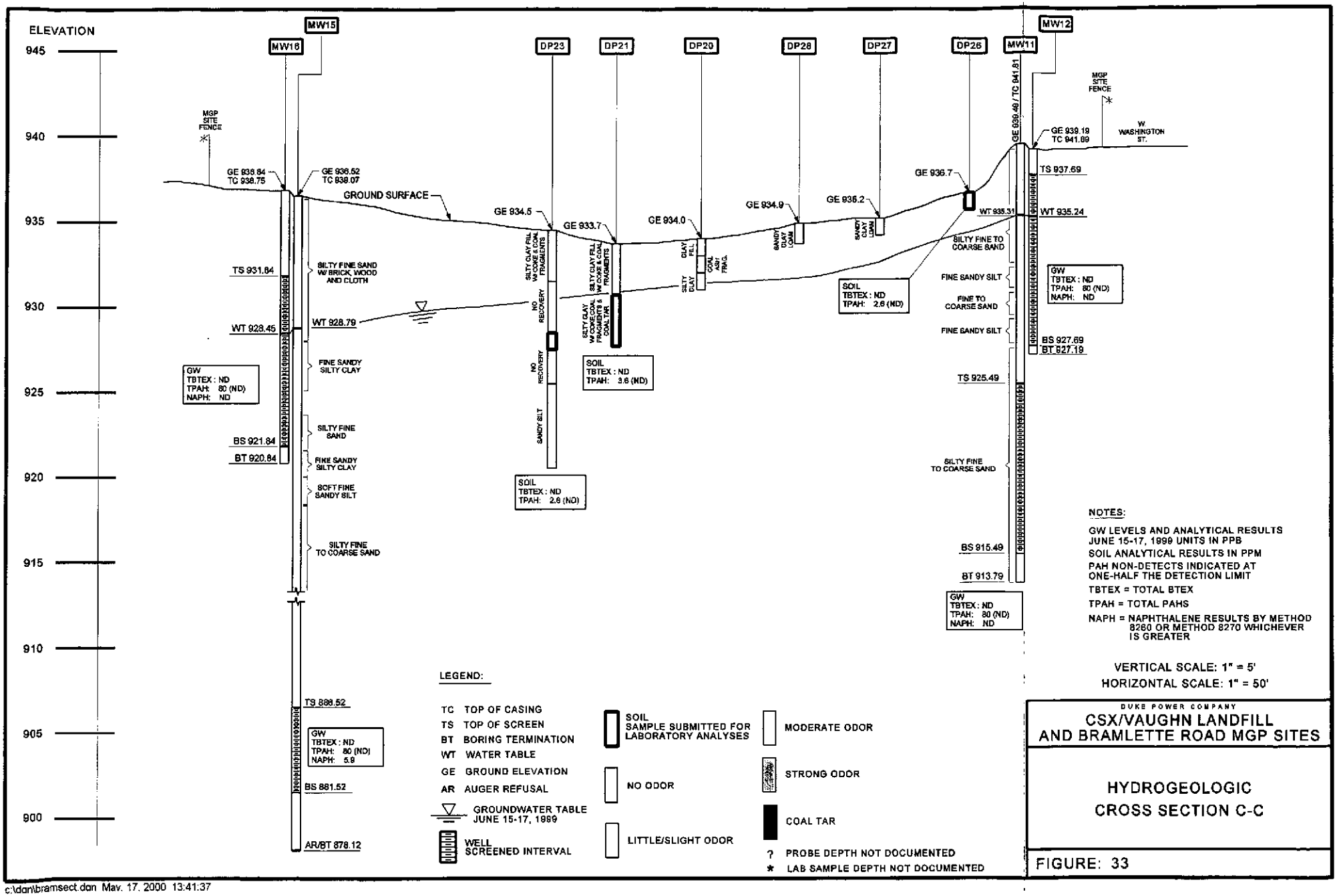
DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION B-B

FIGURE: 32

c:\dan\bramsect.dan Mav. 17. 2000 13:41:21



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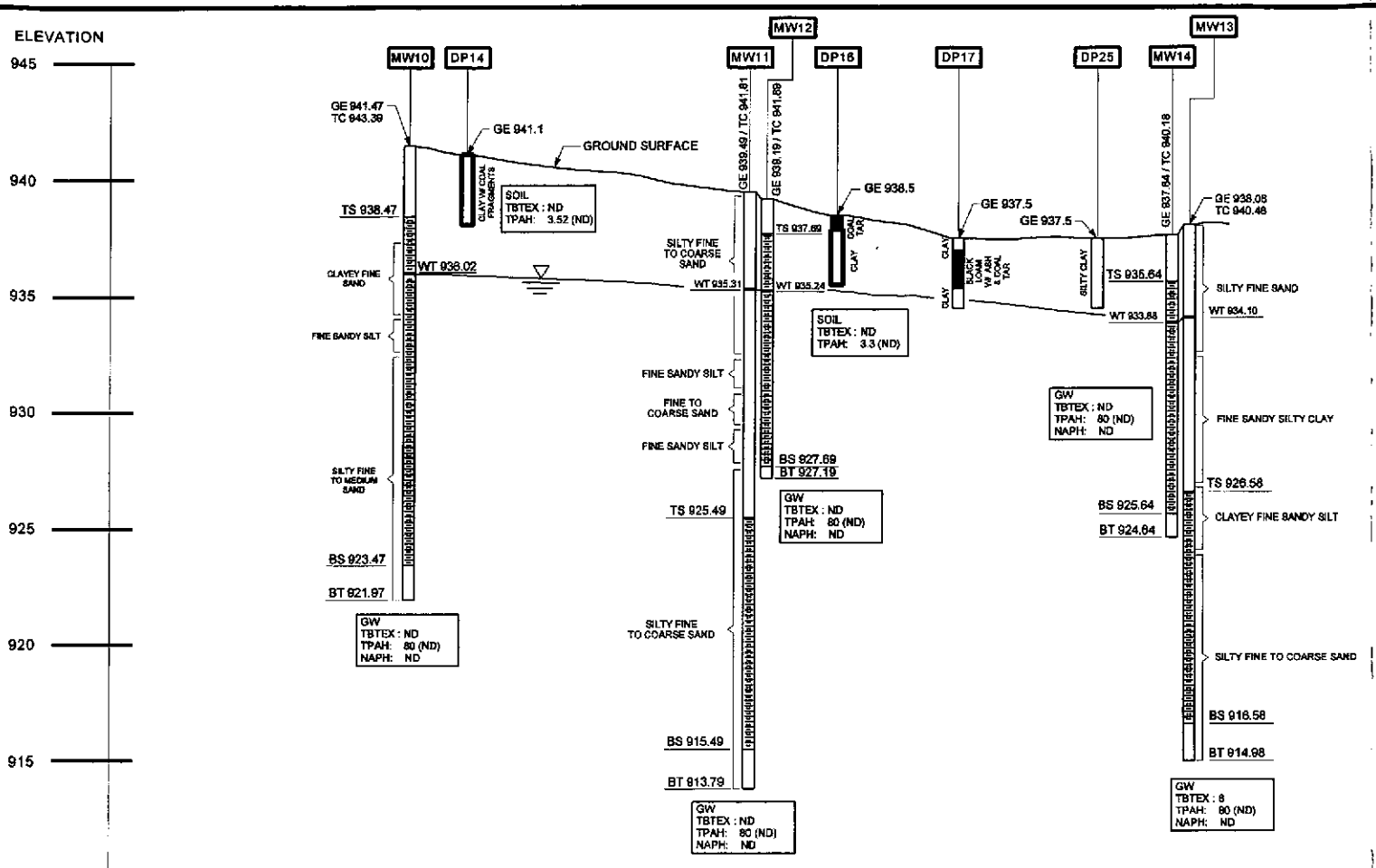

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION D-D

FIGURE: 34

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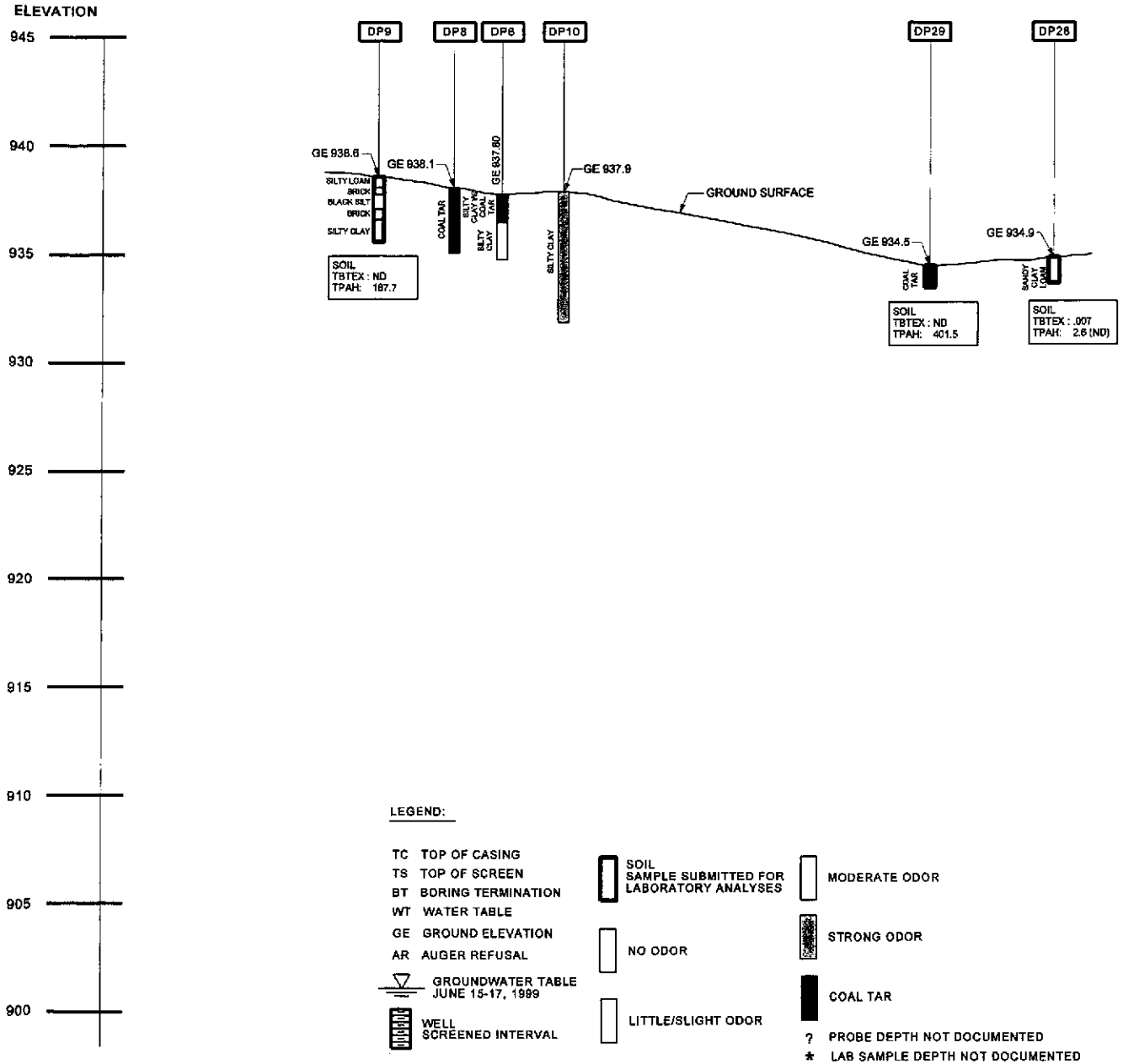

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION E-E

FIGURE: 35

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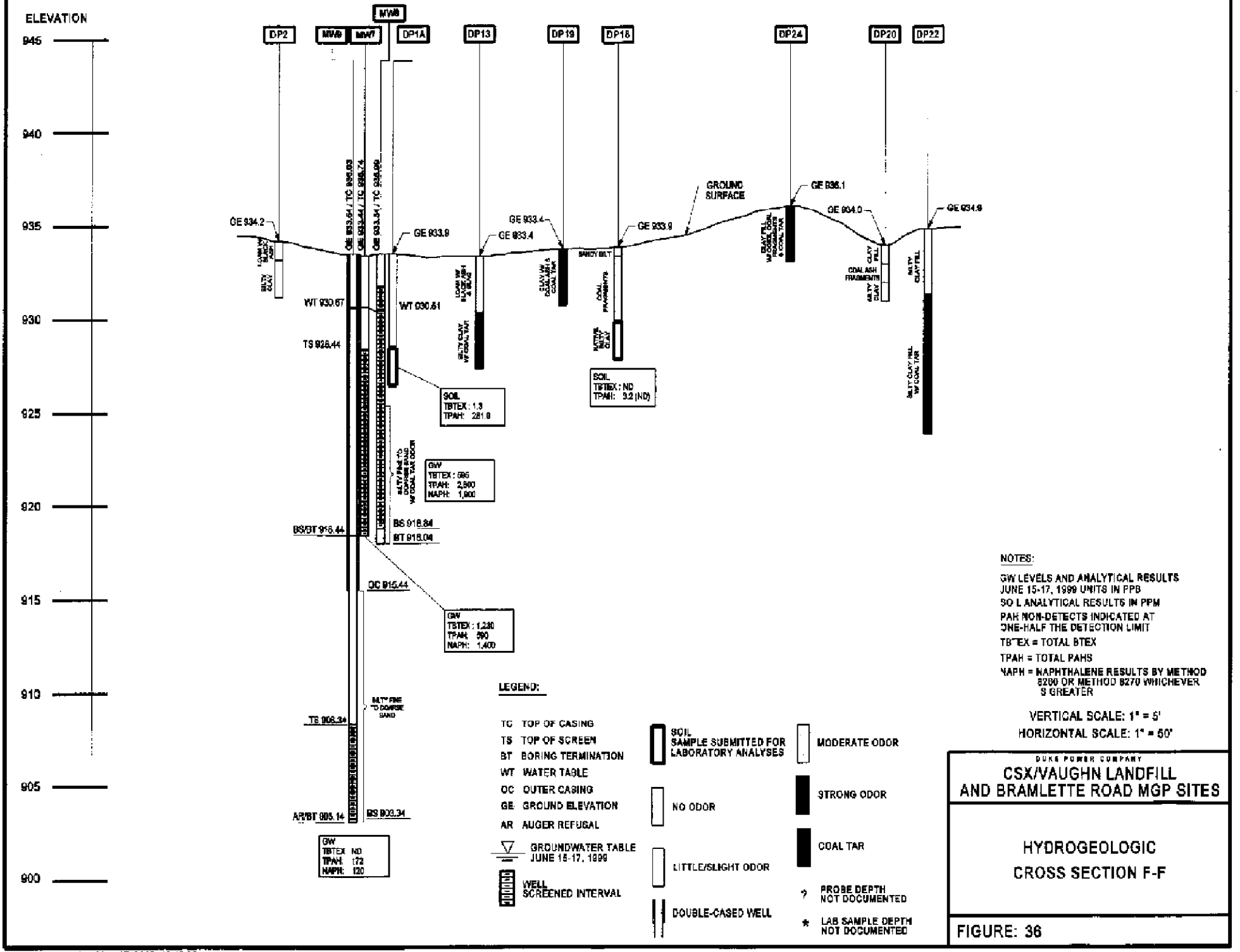

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION F-F

FIGURE: 36

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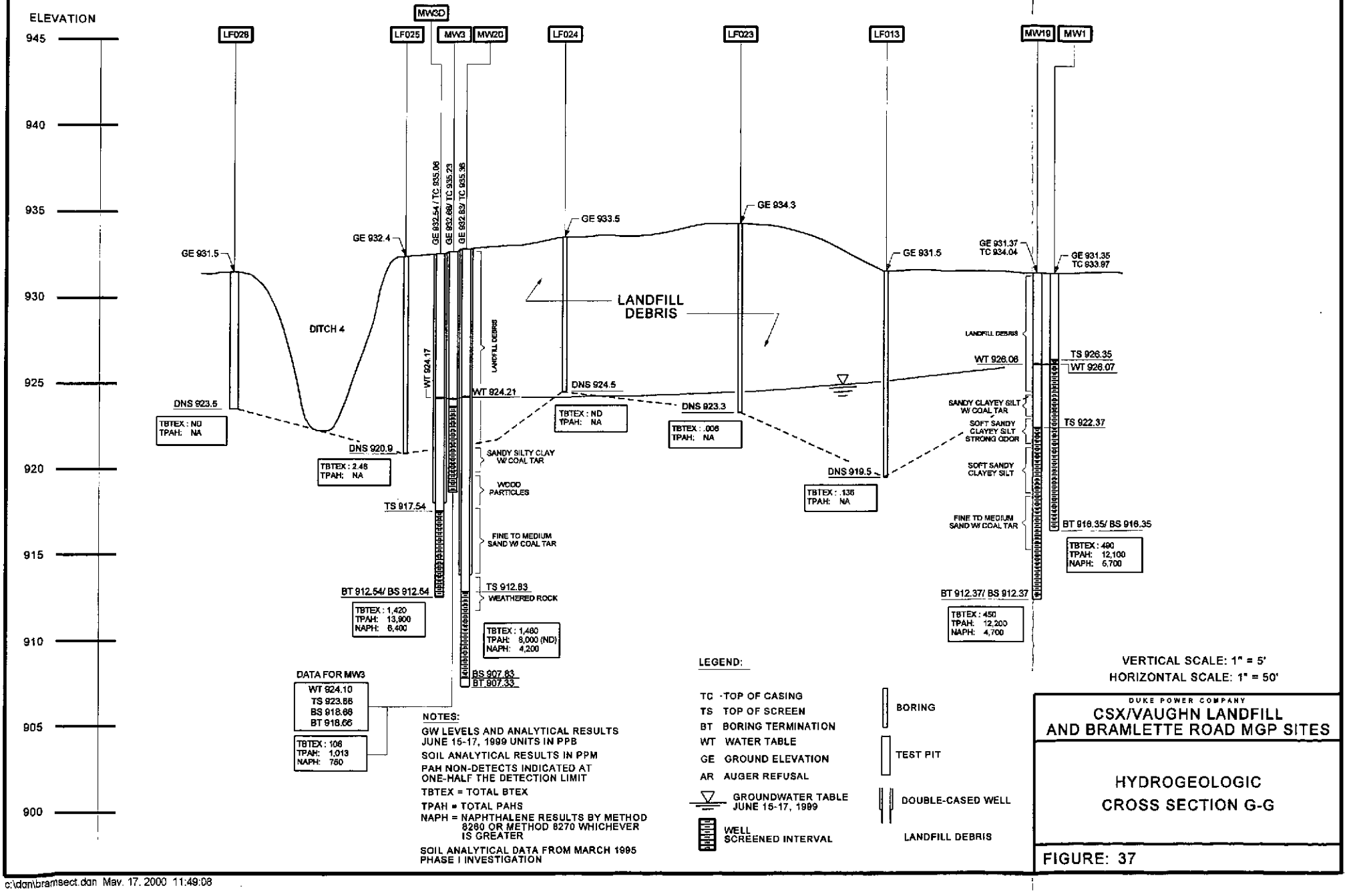
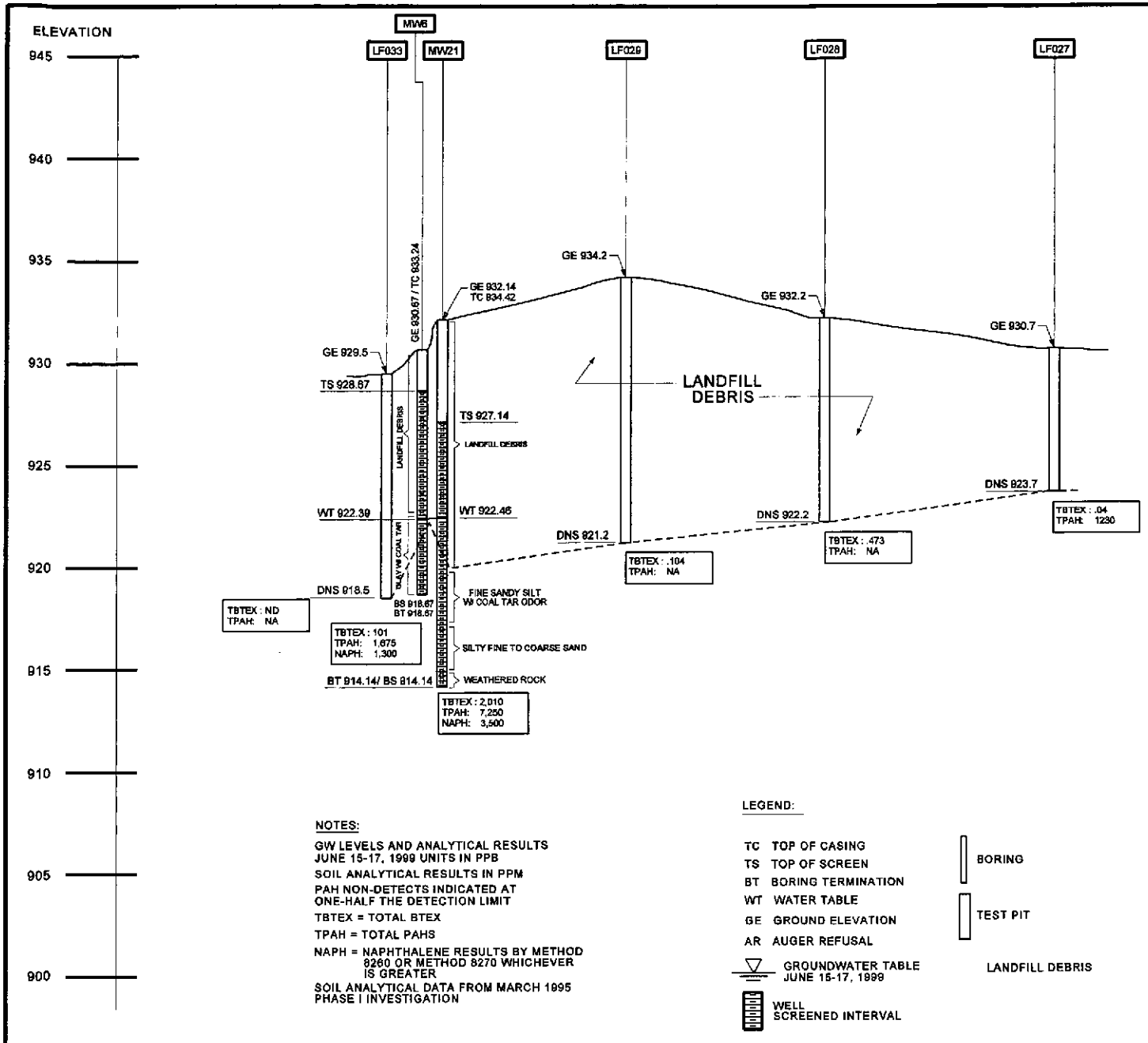


c:\dan\bramsect.dan May. 17. 2000 11:49:08



NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

SOIL ANALYTICAL DATA FROM MARCH 1995 PHASE I INVESTIGATION

LEGEND:

TC TOP OF CASING
TS TOP OF SCREEN
BT BORING TERMINATION
WT WATER TABLE
GE GROUND ELEVATION
AR AUGER REFUSAL

GROUNDWATER TABLE JUNE 15-17, 1999

WELL SCREENED INTERVAL

BORING

TEST PIT

LANDFILL DEBRIS

VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY
CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION H-H

FIGURE: 38

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CSX/Vaughn Landfill and Bramlette Road MGP Sites
Change in Groundwater Naphthalene Concentration: Sep. 1996 to Jun. 1999
Method 8260 Analytical Results

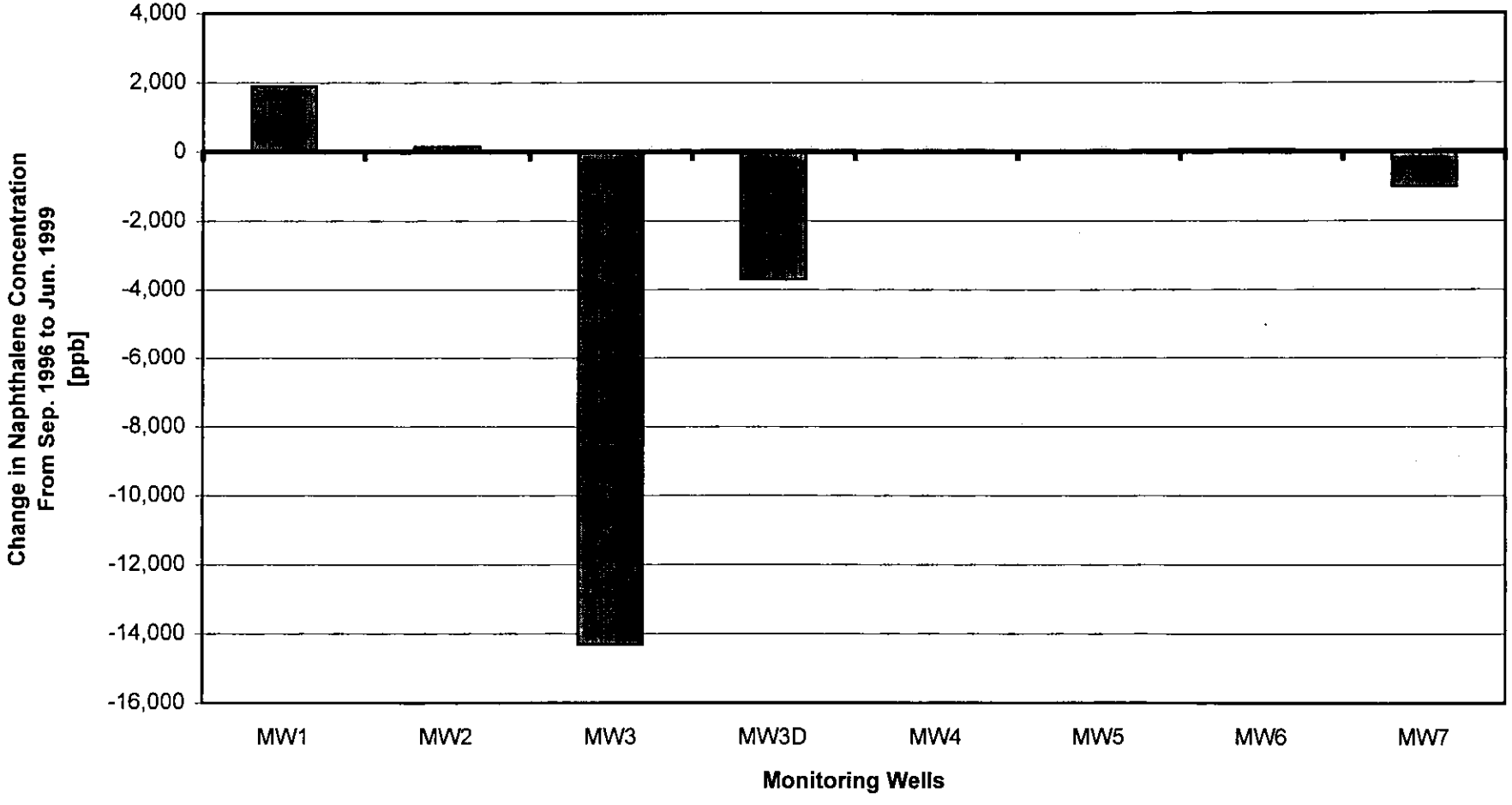
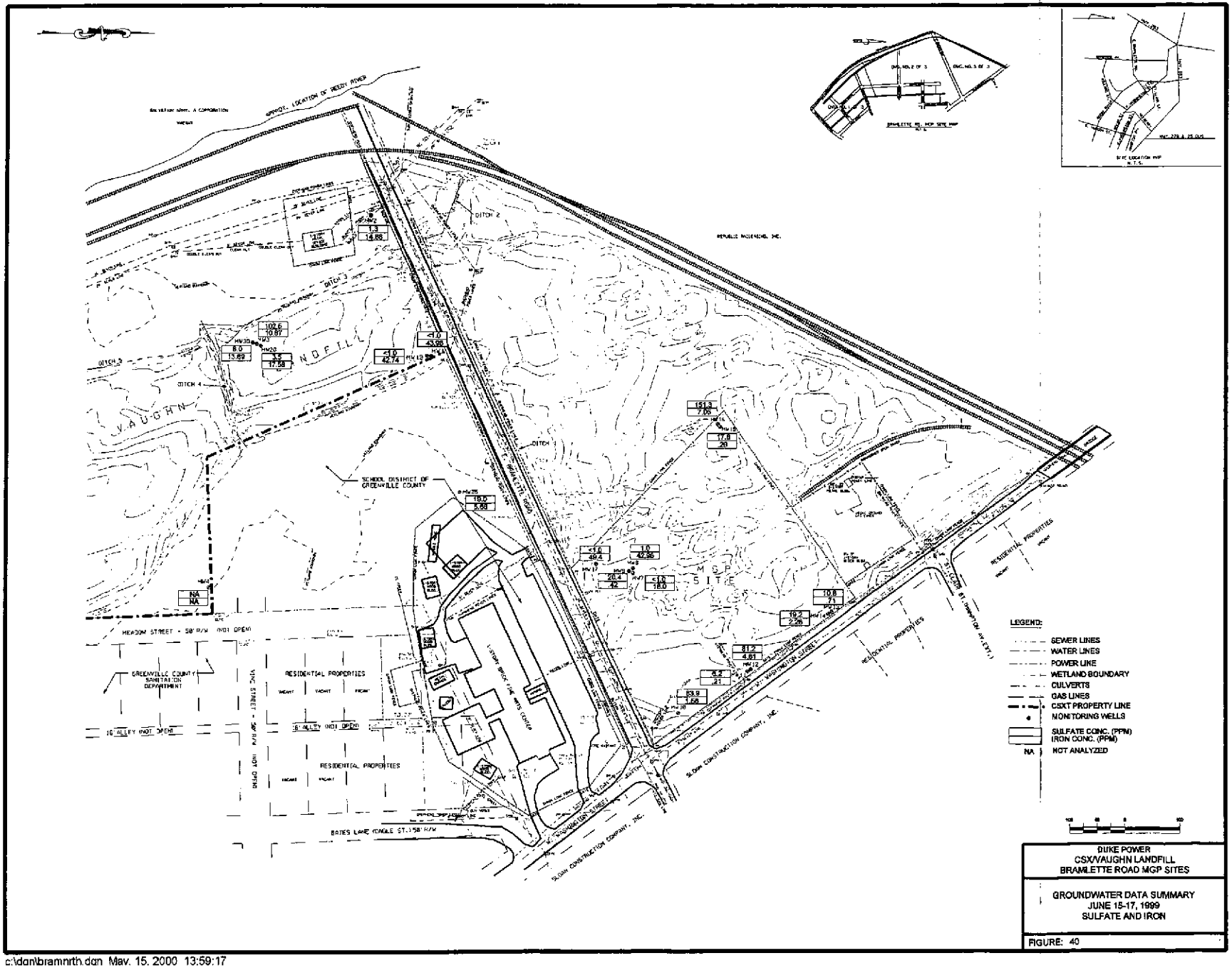


Figure 39



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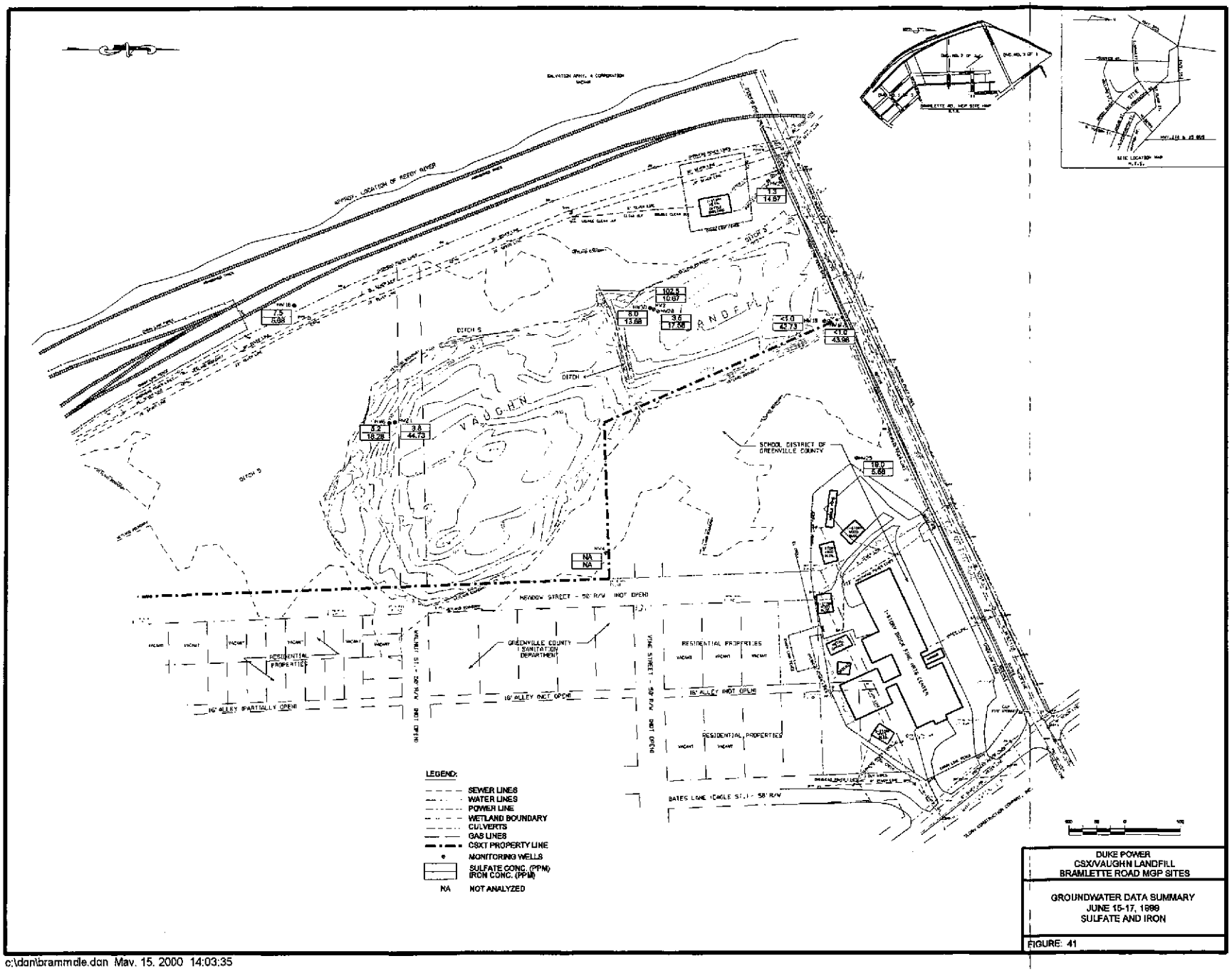

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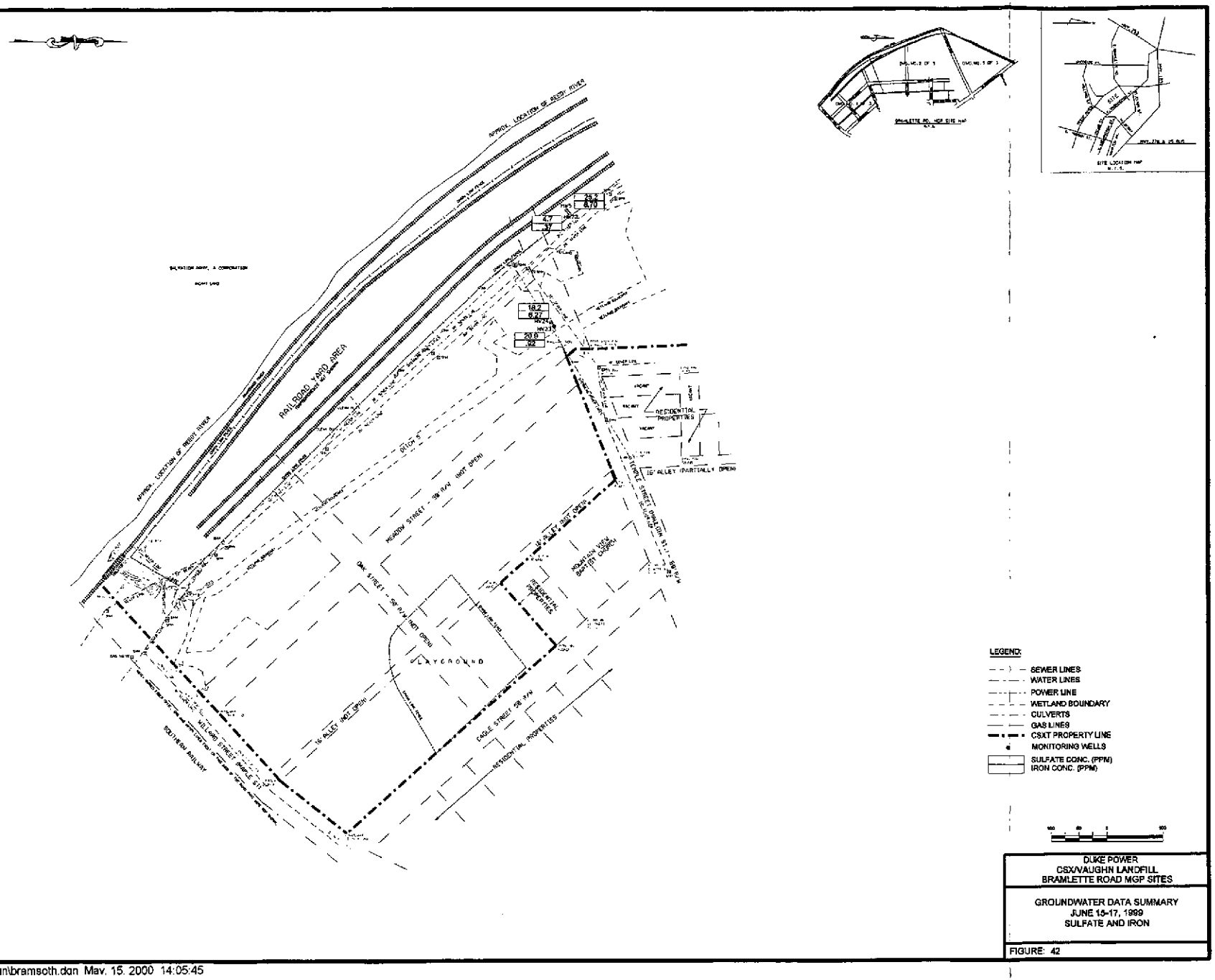

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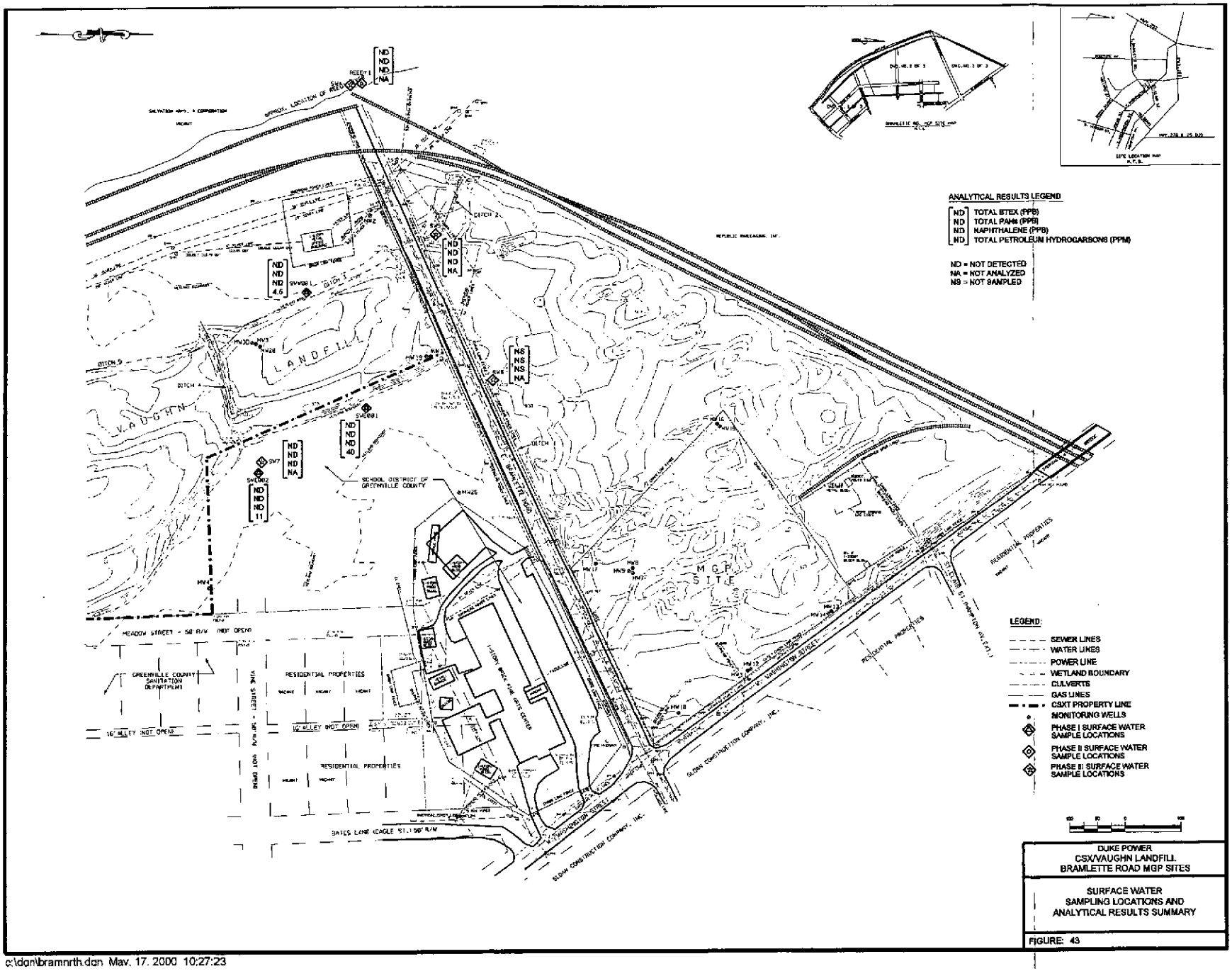

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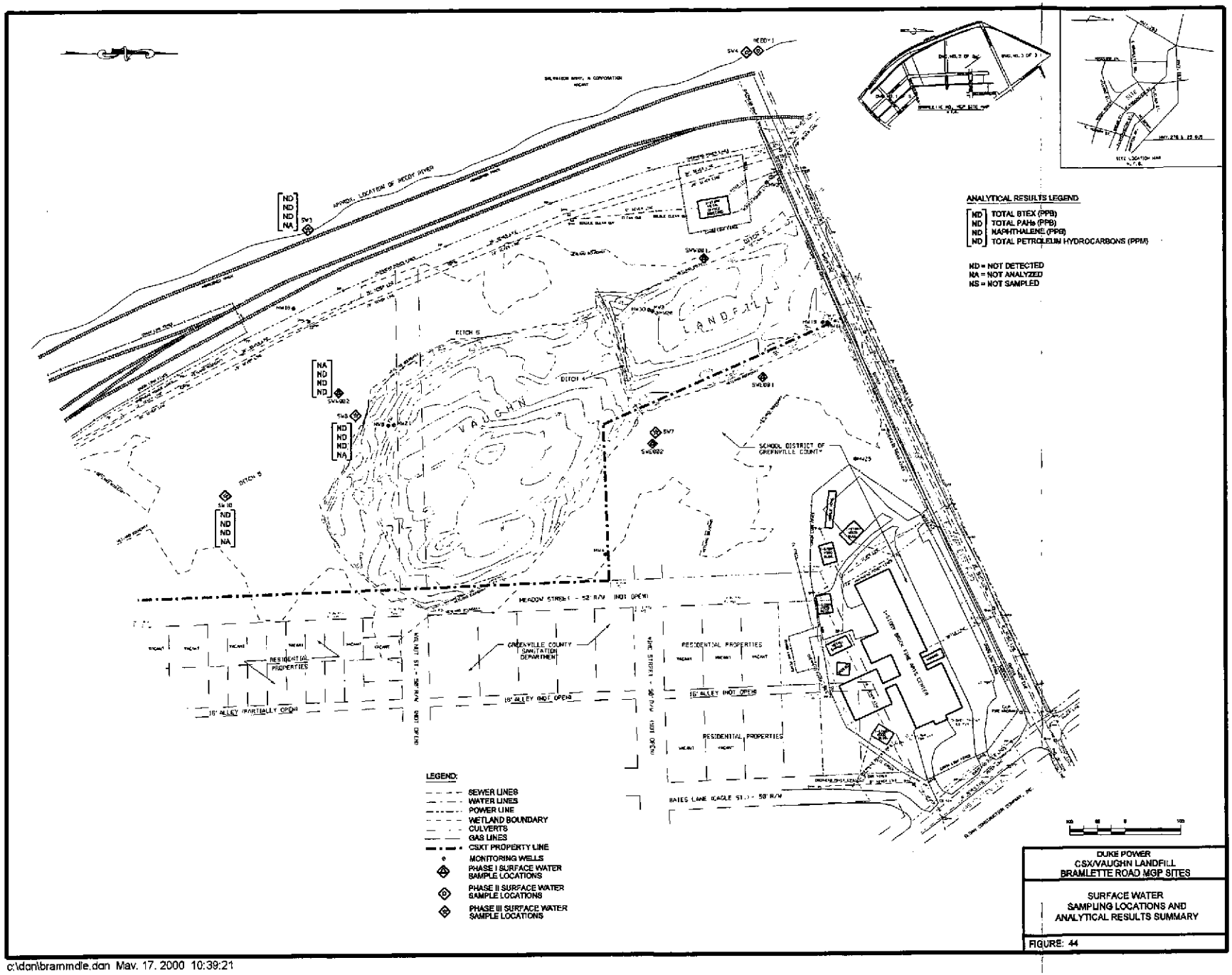
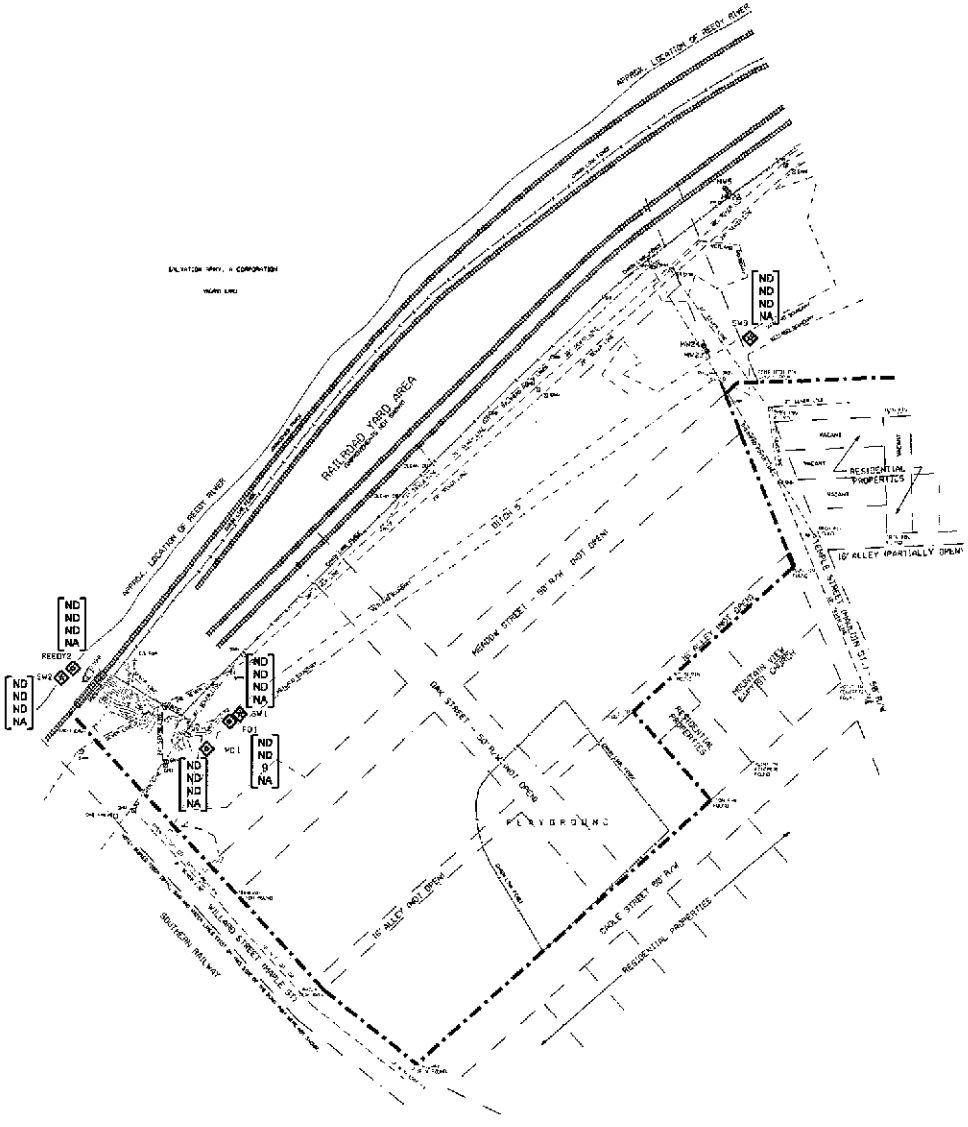
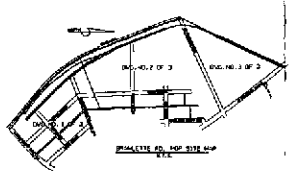
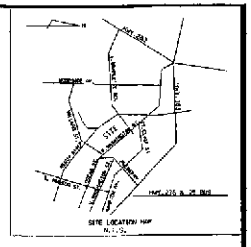


c:\don\bramndle.dgn May. 17. 2000 10:39:21







ANALYTICAL RESULTS LEGEND

ND	TOTAL BTEX (PPB)
ND	TOTAL PAHs (PPB)
ND	NAPHTHALENE (PPB)
ND	TOTAL PETROLEUM HYDROCARBONS (PPM)

ND = NOT DETECTED
NA = NOT ANALYZED
NS = NOT SAMPLED

LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- PHASE II SURFACE WATER SAMPLING LOCATIONS
- PHASE III SURFACE WATER SAMPLING LOCATIONS

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

SURFACE WATER
SAMPLING LOCATIONS AND
ANALYTICAL RESULTS SUMMARY

FIGURE: 45

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CSX/Vaughn and Bramlette Road MGP Sites
Ditch 5 Surface Water Samples
Miscellaneous Parameters

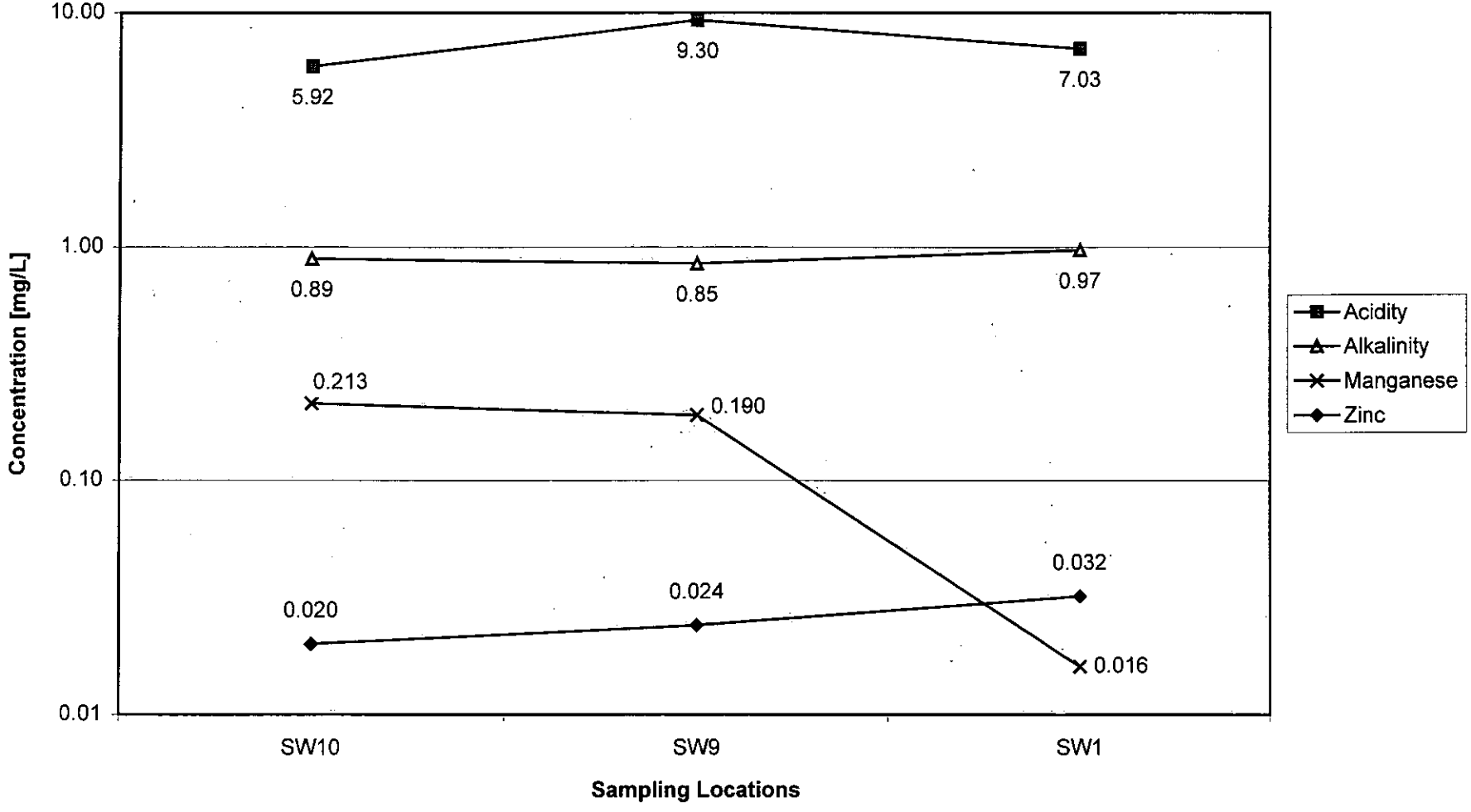


Figure 46

CSX/Vaughn and Bramlette Road MGP Sites
Ditch 5 Surface Water Samples
Miscellaneous Parameters

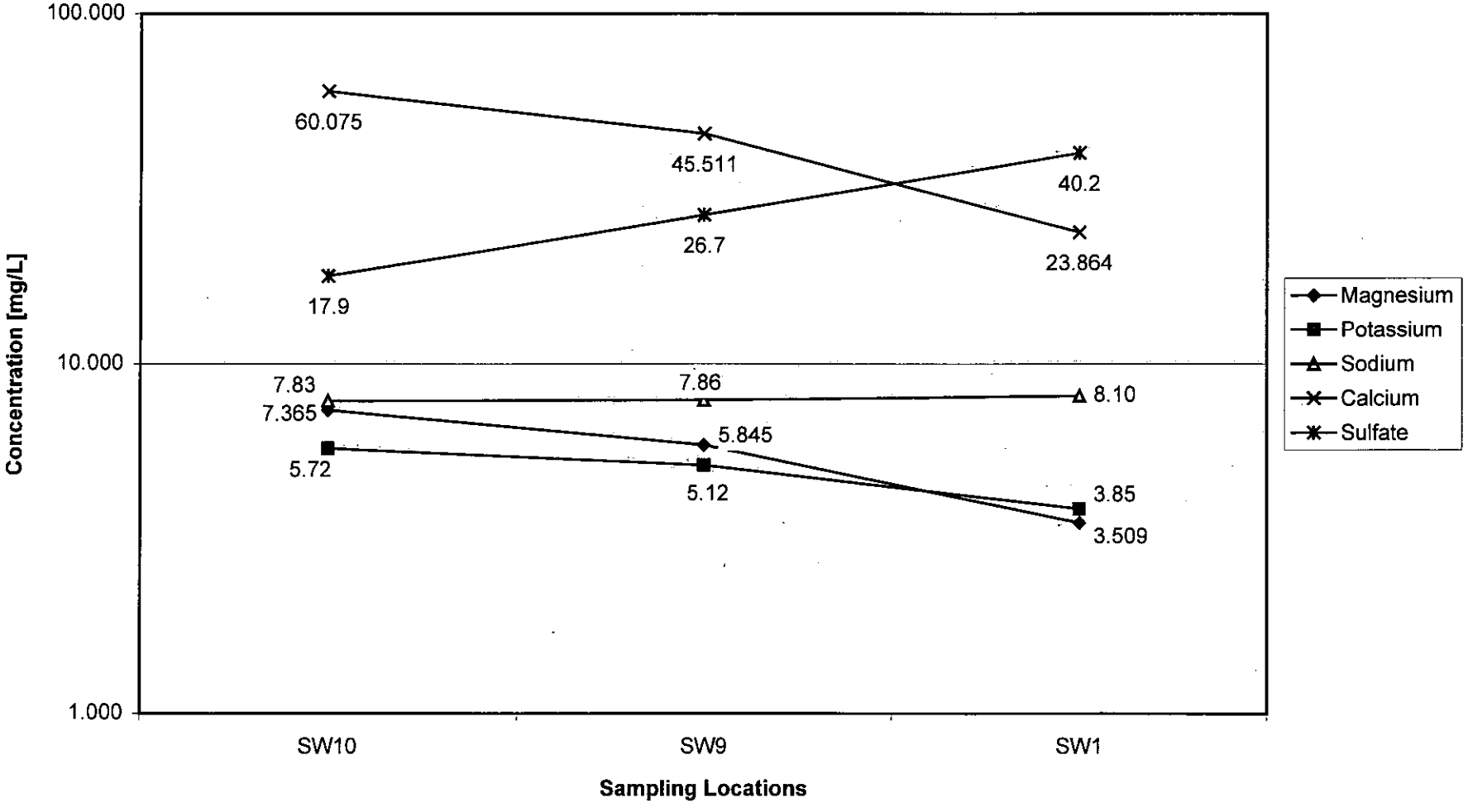


Figure 47

CSX/Vaughn and Bramlette Road MGP Sites
Reedy River Surface Water Samples
Miscellaneous Parameters

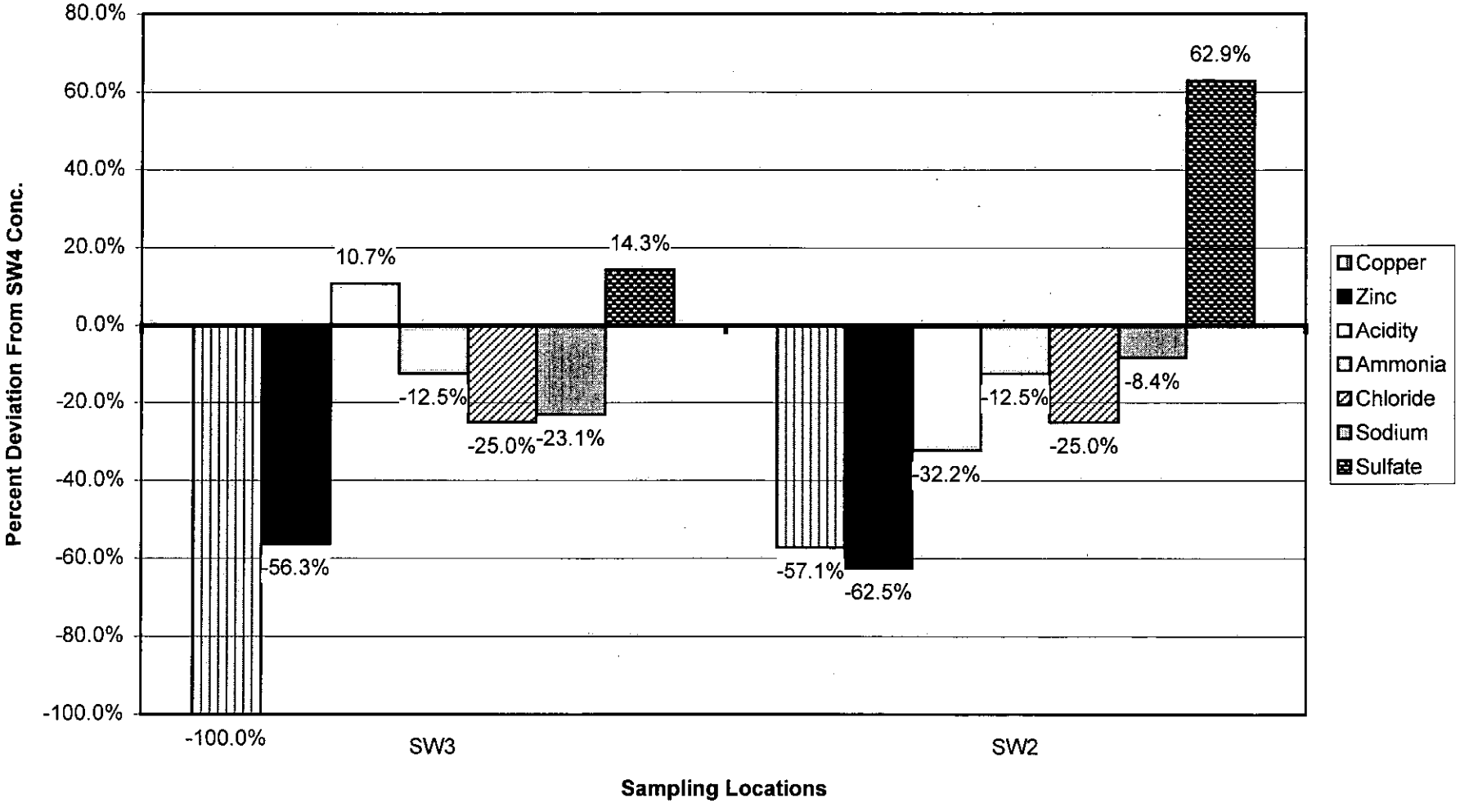


Figure 48

CSX/Vaughn and Bramlette Road MGP Sites
Reedy River Surface Water Samples
Miscellaneous Parameters

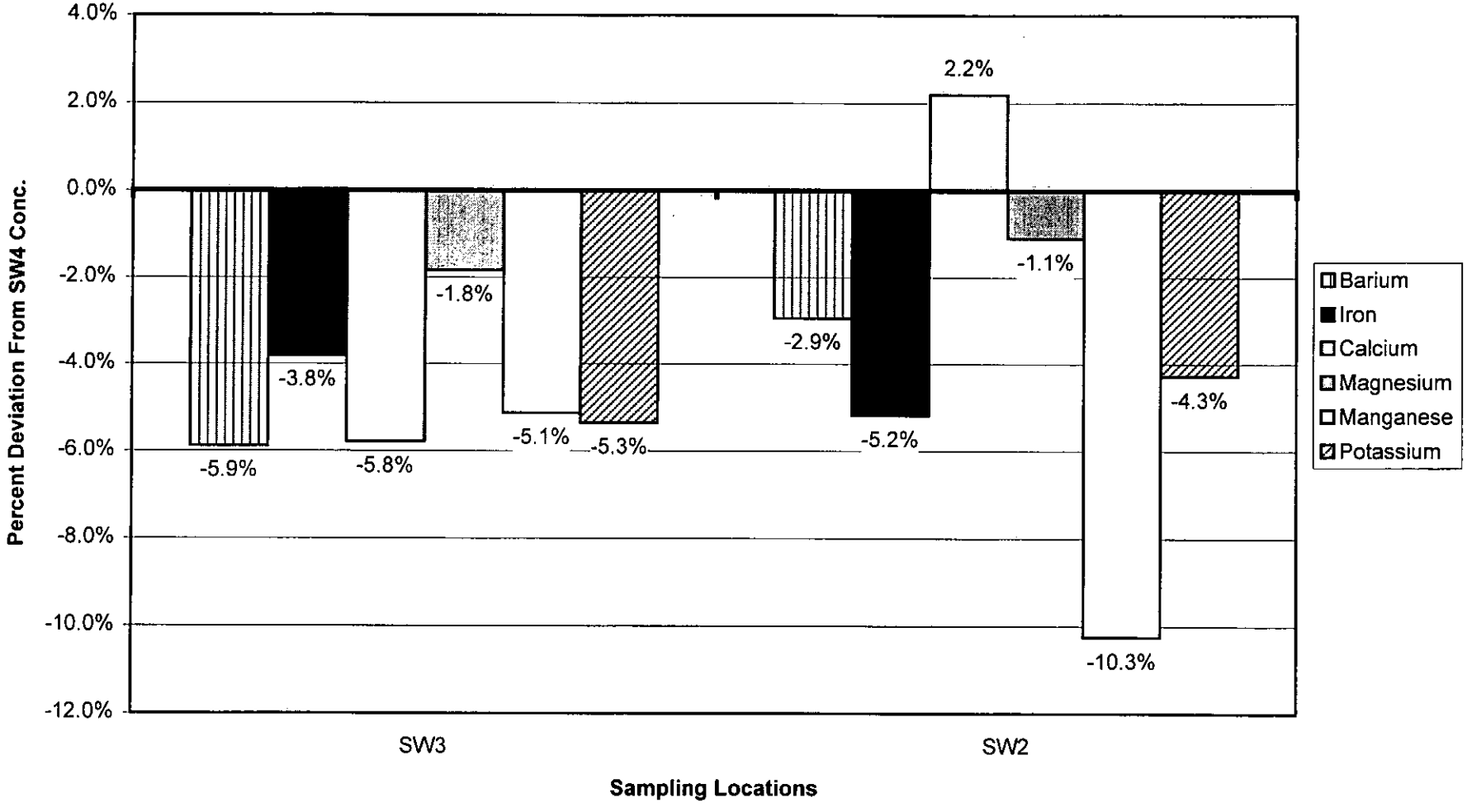
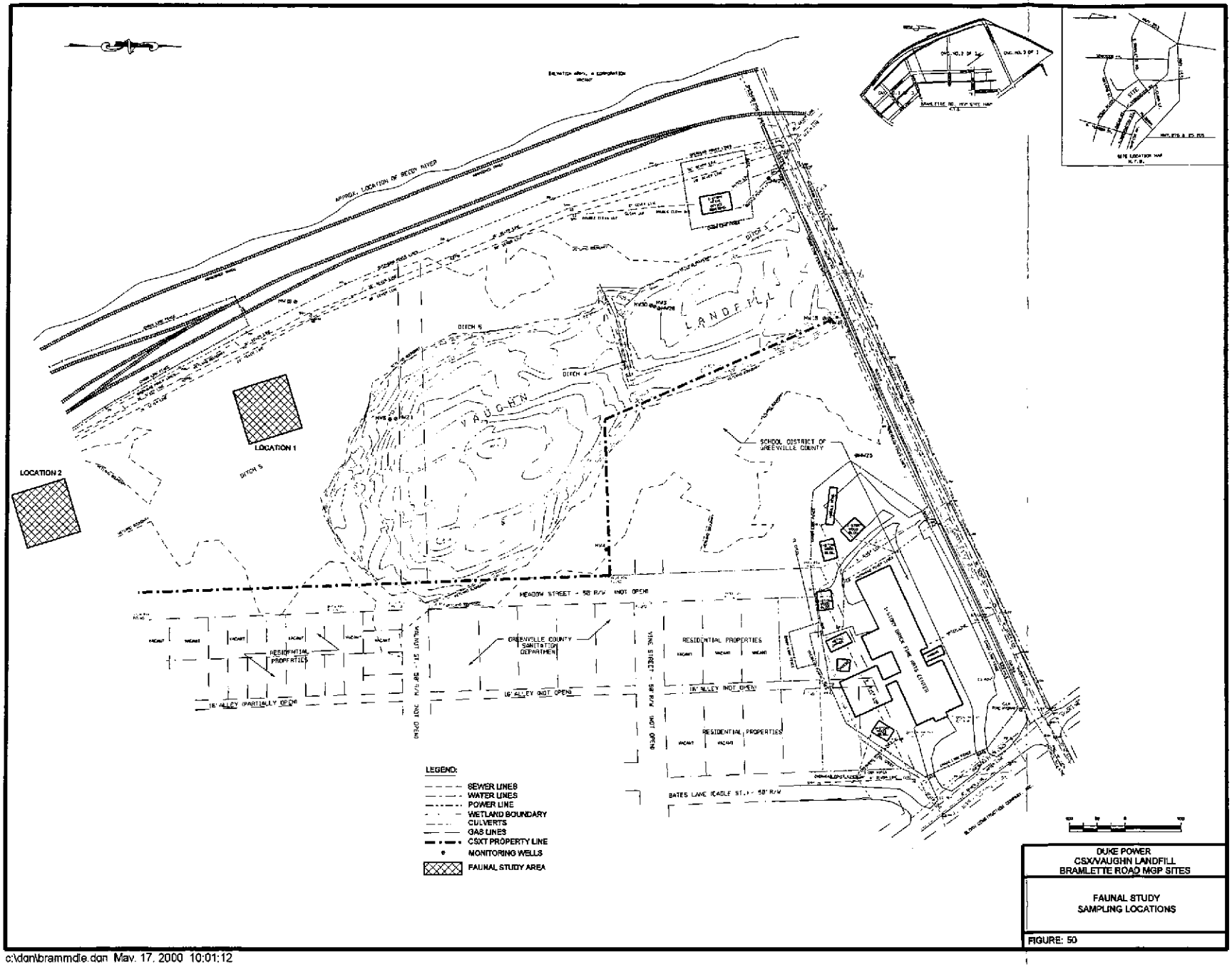


Figure 49



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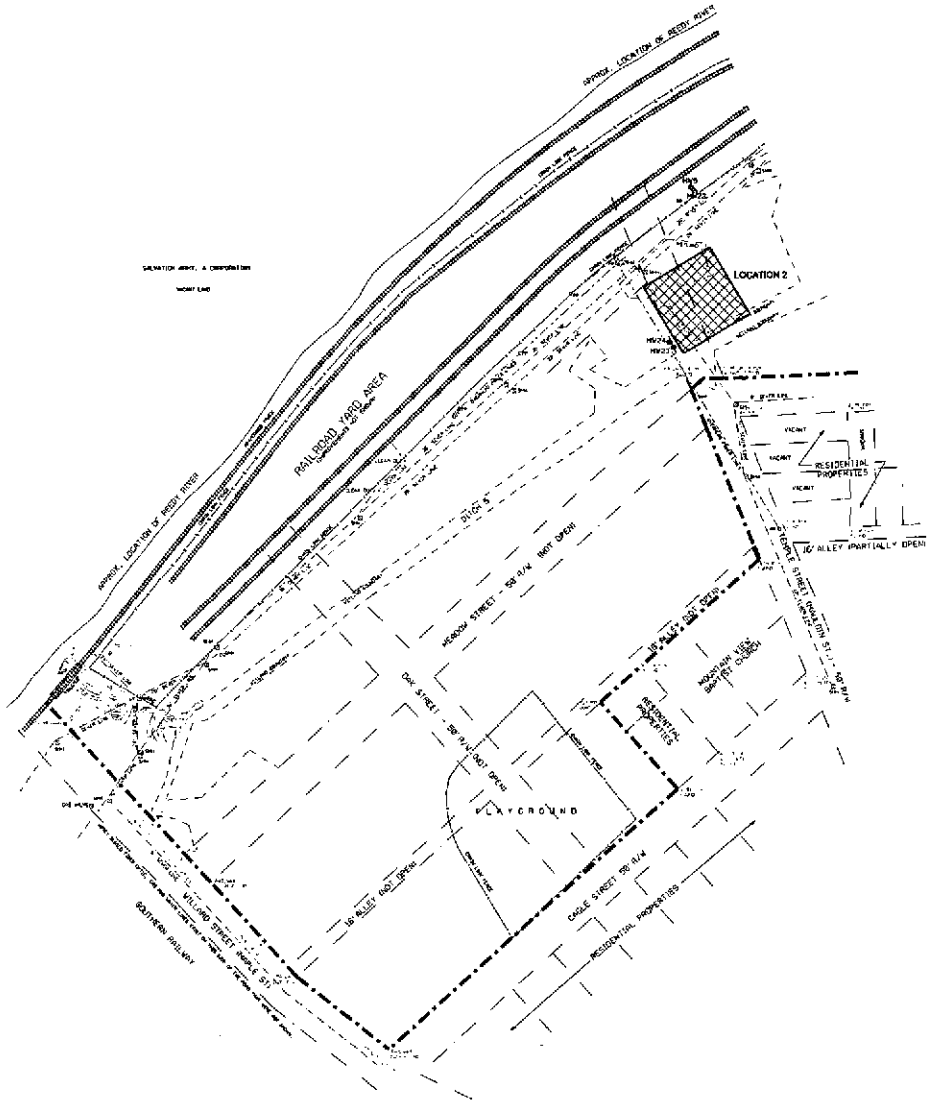

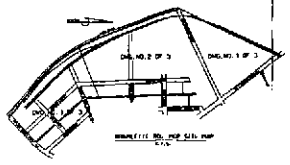

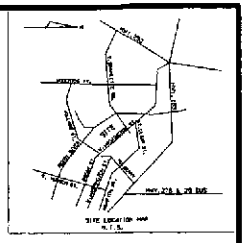

LEGEND:

- SEWER LINES
- WATER LINES
- POWER LINE
- WETLAND BOUNDARY
- CULVERTS
- GAS LINES
- CSXT PROPERTY LINE
- MONITORING WELLS
- FAUNAL SAMPLING LOCATIONS

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

FAUNAL STUDY
SAMPLING LOCATIONS

FIGURE: 51

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