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Solid Waste
Section

Waste Management of Carolinas, Inc.

Carmen Johnson
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DIN

Water Quality Monitoring Plan for the Unconstructed Portion of the Piedmont Landfill And Recycling Center

Kernersville, North Carolina

May 1994

RUST ENVIRONMENT & INFRASTRUCTURE

Piedmont Landfill
and Recycling Center
9900 Freeman Road
Kernersville, North Carolina 27284
919/595-6677
FAX: 919/ 595-9735

A Waste Management Company

MAY 1994
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Solid Waste
Section

May 16, 1994

Mr. Robert Lutfy
North Carolina Dept of Environment, Health, and Natural Resources
Department of Solid Waste Management
401 Oberlin Road
Raleigh, NC 27611

Re: Water Quality Monitoring Plan (WQMP) for the Unconstructed Portion of the Piedmont Landfill & Recycling Center (PLFRC); Kernersville, NC; Solid Waste Permit 34-06

Dear Mr. Lutfy:

Enclosed please find three (3) copies of the above referenced document for your review and approval. As you can see, this WQMP is for the unconstructed portion of the PLFRC.

Mr. Lutfy, we would appreciate your expedient response in this matter in order that the new wells can be installed and background water quality can be established prior to October 9, 1994. As always, should you have any questions or need further information please do not hesitate to call either Bill Lewis or myself at (910) 595-6677.

Sincerely,

Edward L. Gibson, P.E.
Environmental Engineer

cc: William R. Lewis

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SOLID WASTE SECTION
JUN 24 1994

RESPONSE TO DEHNR COMMENTS
DATED JUNE 15, 1994
(WATER QUALITY MONITORING PLAN)

1. **Site maps and plans should be supplied at a size and scale that will permit meaningful interpretation of information. (Figure 2-a, Seasonal High Potentiometric Map)**

   A full size version of Figure 2-A is included in Attachment J.

2. **It is stated that "Leachate samples will be obtained from the leachate collection system periodically and submitted for analysis of the Appendix I parameters". How frequently are leachate samples to be taken? At a minimum, leachate samples should be taken semi-annually, at the time of the water quality monitoring events. (Page 3-4)**

   Leachate samples will be obtained semi-annually.

3. **Detection monitoring wells should generally be located no more than 100 to 150 feet from the waste boundary. Generally monitoring wells screened at the water table should be constructed with 15 foot screens set so that the top of the screen is just above the seasonal high water table. (Page 3-5)**

   Existing wells MW-1 and MW-6 are background wells for the site and therefore are located more than 150 feet from the waste boundary. Existing well location MW-4 and proposed well location MW-11 are located approximately 200 feet from the waste boundary due to the presence of Freeman Road. The remaining existing and proposed well locations are located no more than 100 to 150 feet from the waste boundary.

4. **On the Monitoring Well Construction Summary Table, the Top of Screen Elevations and the Bottom of Screen Elevations do not appear to be correct, based upon a review of the Well Construction Records. How were the vertical gradients determined? Were the existing monitoring well borings taken to auger refusal? (Table 3-1)**

   A revised Table 3-1 is provided in Attachment K with the correct top and bottom of screen elevations.

   The "gradient" column in Table 3-1 only shows whether the monitoring wells are located upgradient or downgradient of the landfill and is not associated with vertical gradients.

The monitoring well construction records in Appendix C indicate that the well borings were not specifically taken to auger refusal.

5. **Site maps and plans should be supplied at a size and scale that will permit meaningful interpretation of information. Also there should be enough of off-site topography to enable interpretation of topographic trends that would assist in interpretation of ground-water flow. (Figure 3-1)**

   A full size version of Figure 3-1 is included in Attachment J. Off-site topographic trends may be interpreted from Figure 3-2.

6. **The reporting date for the results of the baseline sampling of the Phase 3 area should be based upon the date the Permit to Operate is issued. (Page 4-1)**

   We have been informed by Mr. Lutfy that a new rule is going to be implemented which makes the reporting date 6 months from the date of the Permit to Operate.

7. **Purging of monitoring wells should be done until field parameters have stabilized, but at least three to five well volumes should be evacuated. (Page 4-4)**

   Purging will be performed until field parameters have stabilized, but at least three to five well volumes will be evacuated.

8. **Lab certification, sample analytical methodologies, and detection limits should be consistent with the rules and policies of the Solid Waste Section. The Section is in the process of preparing a revised policy statement on these issues. (Page 4-7, and Table 4-1)**

   EML Inc. has been accepted by the State of North Carolina as a certified laboratory to perform the required analyses. The analyses will be performed in accordance with the methodologies listed in Table 4-1 using the currently accepted detection limits.

9. **The office for the Solid Waste Section has a different zip code from our Post Office Box. The zip code for our street address is 27605. The zip code for our P.O. Box address is 27611. Mail should be addressed to the Solid Waste Section.**

   Noted.

10. **A copy of the Temporary Registration letter of N.C. Professional Geologist certification should accompany the Water Quality Monitoring Plan. (Page 5-1)**

    A copy of the letter granting temporary Professional Geologist registration in North Carolina is included in Attachment A.

11. The Typical Monitoring Well Schematic varies from specifications required by North Carolina rules and policies. (Appendix C)

Please note that the schematic contained in Appendix C applies to existing monitoring wells at the site. As discussed on page 3-2, the deviations from the North Carolina rules and policies do not adversely affect the quality of the samples obtained from these wells and may actually enhance the integrity of the wells. As stated on Page 3-5, the proposed monitoring wells will be designed in general accordance with the requirements of the N.C. Well Construction Standards, 15A NCAC 2C .0108.

JUL 1994
Received
Solid Waste
Section

WATER QUALITY MONITORING PLAN
FOR THE UNCONSTRUCTED PORTION OF THE
PIEDMONT LANDFILL AND RECYCLING CENTER
KERNERSVILLE, NORTH CAROLINA

JULY 1994

RUST ENVIRONMENT & INFRASTRUCTURE
GREENVILLE, SOUTH CAROLINA

REVISION No. 1
JULY, 1994

State of North Carolina
North Carolina Board for Licensing of Geologists
P.O. Box 27402 • Raleigh, North Carolina 27611
(919) 850-9669 • Fax (919) ~~872-1598~~

February 24, 1994

Peter J. Walls
RUST Environment & Infrastructure
15 Brendan Way
Greenville, SC 29615

Dear Mr.Walls:

Your request for a temporary permit for geological work in North Carolina has been received.

The material seems to be in order and you are granted a temporary registration not to exceed 90 days of work within a calendar year.

Sincerely,

Robert M. Upton
Administrator

cc: Arthur Mouberry
Dept. Environment, Health
& Natural Resources

SOLID WASTE SECTION
JUN 24 1994

WATER QUALITY MONITORING PLAN FOR THE UNCONSTRUCTED PORTION OF THE PIEDMONT LANDFILL AND RECYCLING CENTER

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Section 1

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present the Water Quality Monitoring Plan for the unconstructed portion of the Piedmont Landfill and Recycling Center (PLRC). The goal of this plan is to provide a means of detecting potential releases from the Phase 3 redesign to the ground waters and surface waters in the vicinity. This plan is not intended to address water quality monitoring associated with the existing landfill cells located west of this area. A separate Transition Water Quality Monitoring Plan was submitted to the N.C. Division of Solid Waste Management (Division) in March of 1994 [RUST E&I, 1994A] to address the monitoring requirements of these existing landfill cells.

This plan has been developed to meet the new North Carolina solid waste management rules (codified as T15A: 13B.1600-.1680) which became effective on October 9, 1993, and the NCDEHNR Division of Solid Waste Management policy memo dated June 24, 1994, as well as Waste Management, Inc. (WMI) policies, and to address the monitoring needs of the unconstructed portion of the PLRC. Appendix A contains ~~a~~ letters written by the N.C. Division of Solid Waste Management (Division) to WMI describing the implementation of the new ground water monitoring requirements. Periodic revisions to this document may be necessitated by changing regulations and/or permit conditions and policies.

The site location, operation history, and monitoring plan status are discussed in the remaining portions of this section. Section 2.0 of this document summarizes the physical setting (i.e., topographic, geologic, and, hydrologic) of the facility as determined during the Design Hydrogeologic Investigation for the Phase 3 redesign area [RUST E&I, 1994B]. The Monitoring System Plan is discussed in Section 3.0 while the Sampling and Analysis Plan is presented in Section 4.0. Section 5.0 contains professional certification and Section 6.0 contains references.

1.2 Location

The PLRC is located approximately ten miles north of Kernersville, North Carolina, in the northeast corner of Forsyth County. Access to the site is by Goodwill Church (Guilford Co.)-Freeman (Forsyth Co.) Road. A vicinity map illustrating the regional location of the site is included as Figure 1-1. A larger scale map showing the location of the facility is included as Figure 1-2.

1.3 Operational History

Waste Management of Carolinas, Inc. (WMCI) acquired the PLRC property from Beulah C. Barrow in 1988. The site was formerly agricultural land with five residences located within its boundaries. The residences have since been abandoned. The landfill accepts both domestic and commercial non-hazardous waste.

The current permitted landfill occupies a footprint of approximately 68 acres. Phase 1 of the landfill began operation in June 1990 while Phase 2 of the landfill began operation early in 1993. Both Phase 1 and Phase 2 are currently accepting waste. Phase 3 of the landfill encompasses the additional unconstructed landfill cells located east of the existing phases. A design upgrade for Phase 3 of the landfill has been submitted under an application in December 1993 and is currently in the process of being reviewed.

The first two modules of the landfill (Phase 1, Modules 1 and 2) were constructed with a composite liner consisting of a 60 mil high density polyethylene (HDPE) geomembrane underlain by 18 inches of clay with a specified maximum hydraulic conductivity of $1x10^{-7}$ cm/sec. Modules 3, 5 and 6 of Phase 1 and Modules 1, and 2 of Phase 2 were constructed with a double geomembrane liner (60 mil HDPE) with a geosynthetic clay liner (GCL) situated between the two geomembranes.

The PLRC currently operates under the State of North Carolina Solid Waste Permit Number 34-06. A copy of the current permit is included as Appendix B.

1.4 Surrounding Land Use

The surrounding land use is primarily residential and agricultural. The area is currently zoned A-6, suburban residential, but is sparsely settled. Eleven residences lie within 3,000 feet of the site of which 6 are located in the Hiram Hill subdivision which is about 1/2 mile southeast of the site [Waste Management, Inc., 1993]. Additional houses are concentrated along Grove Road in Forsyth Co. and Haw River Road in Guilford Co. The closed Kernersville Municipal Landfill lies along the eastern half of the site's southern border.

Belews Lake, operated by Duke Power, lies to the north of the site, with the lake shore being about 3,000 feet from the site. Duke Power is currently working to reestablish sport fishing in the lake to increase recreational use. No state parks, scenic areas, recreational facilities, state nature, or state historical preserves have been identified near the site.

Two unnamed tributaries flow on either side of the site before flowing into Belews Lake. One traverses the southwest corner of the site while the other lies immediately north of the site. The southwestern corner along with a small area on the northern boundary of the site have been designated as wetlands by the U.S. Army Corps of Engineers.

1.5 Status of Monitoring Program

1.5.1 Ground Water Monitoring

Between 1989 and 1993, the PLRC monitored wells MW-1 through MW-5 in accordance with the Solid Waste Permit. The parameters required by the permit were specified in the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities which was produced by the Solid & Hazardous Waste Management Branch of the Department of Human Resources in 1987. These

parameters were substantially different from the parameters presently required under the new NC Solid Waste Regulations (i.e. Appendix I constituents). In the summer of 1993, a new background well, MW-6, was added. The six existing ground water wells are presently being monitored to establish background data for the Appendix I constituents. Two of these background samples will be taken during the months of February and August or September. When new wells are constructed, four background samples will be taken. The first will be taken after the permit to construct is issued. The remaining three will be taken within six months of the date that the permit to operate is issued.

All data established by this background sampling will be submitted to the DSWM within six months of the date that the permit to operate is issued. This data will include analytical data, calculations of groundwater flow directions and rates, statistical analysis, and information on hydraulic conductivity, porosity, effective porosity, construction on newly constructed wells.

1.5.2 Surface Water Monitoring

Since 1989, the PLRC has monitored five surface water sampling points in accordance with the Solid Waste Permit. The parameters required by the permit were those specified in the guidance document which are also substantially different from the parameters specified under the new regulations. In accordance with the new regulations, only one sample from each surface water sampling point is required to establish baseline conditions. See also Transition Water Quality Plan.

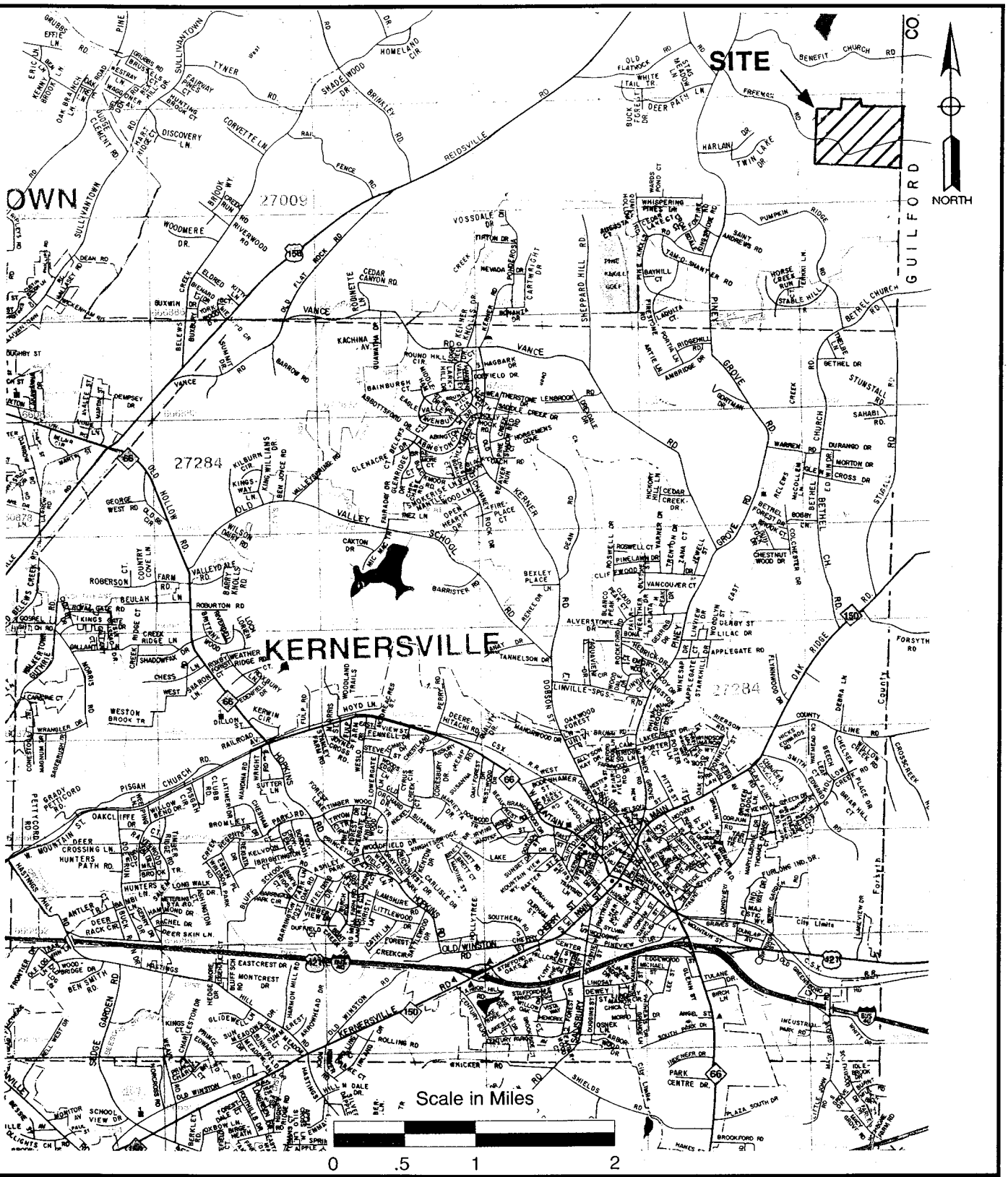
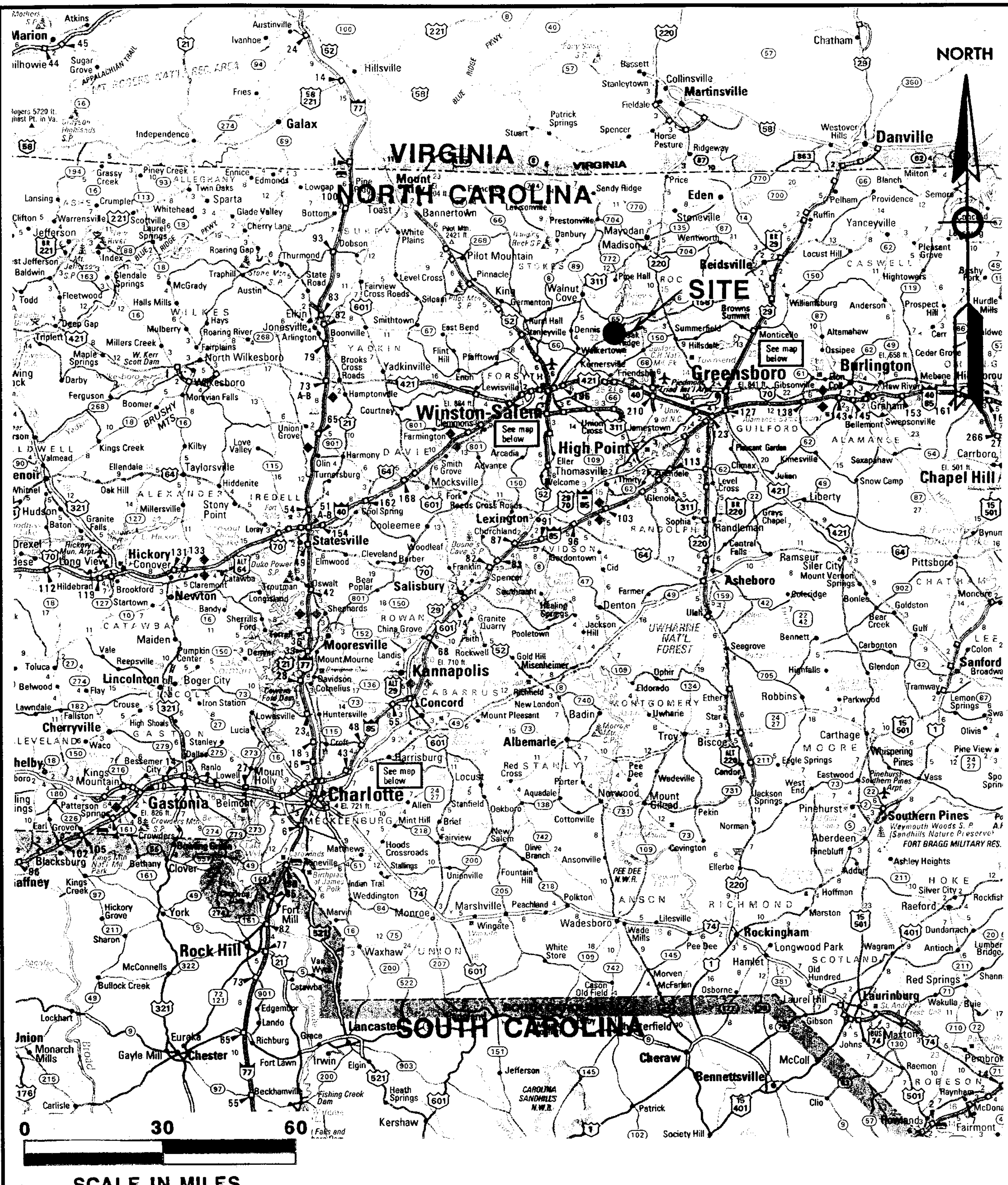


FIGURE 1-1
SITE VICINITY MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

RUST ENVIRONMENT & INFRASTRUCTURE



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 1-2
SITE LOCATION MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

Section 2

2.0 PHYSICAL SETTING

2.1 Topography

2.1.1 Regional Topography

The PLRC is located in the Piedmont physiographic province. This province is characterized by gently rolling to hilly terrain with a dendritic surface water drainage network, moderately steep stream valleys, and broad ridge crests. Total relief is not usually great, but slopes can often be steep. Elevations range from approximately 800 to 1000 feet msl [Golder, 1988].

The regional mountain system formed during the late Paleozoic period was still active during the Triassic period and was eroded to near sea level during the Triassic period. The flat surface was then uplifted. The resulting plateau was again eroded, producing the topography of relatively dense drainage networks, steep valleys, and near equal ridge crest elevations which characterize the Piedmont province today.

2.1.2 Site Topography

The pre-landfill development topography of the PLRC site is illustrated in Figure 2-1. The topography was determined from an aerial photograph of the site dated March 21, 1987. Relatively recent landfill topography is illustrated in Figure 2-2 which was based on an aerial survey dated July 1, 1993. It should be noted, however, that landfilling has been continuing within the existing landfill area. Although the development area has had significant material stockpiled, earth moving operations have been taking place for daily cover since the date of the aerial survey. The present topography of the site varies from what is shown in Figure 2-2.

The anticipated site topography upon closure of the existing landfill area and the Phase 3 development area is illustrated in Figure 2-3. The figure shows that upon closure, the facility will reach an ultimate height of approximately 900 feet MSL and the final cover will be placed on a 3:1 (horizontal:vertical) sideslope. Figure 2-3 also shows that the existing landfill area and the Phase 3 development area will be tied together as a contiguous unit upon closure.

2.2 Geology

2.2.1 Regional Geology

The PLRC site is located primarily within what has been previously mapped as the Charlotte Belt, close to the boundary of the Charlotte and Milton belts. Some authors consider the Milton Belt to be a continuation of the Charlotte Belt.

The Milton Belt is characterized by strongly foliated, metamorphic rocks. Mineralogy indicates that most of the Milton Belt has been subjected to moderate to high temperature/high pressure regional metamorphism. Some evidence suggests that rocks of the Milton belt are mainly Precambrian in age and were metamorphosed and deformed during the early to middle Paleozoic. The Charlotte Belt is defined as dominantly plutonic with intrusive igneous rock bodies.

In the Milton Belt, the rock types typically include strongly foliated gneiss and schist, commonly with compositional layering and felsic composition (Figure 2-4). In the region close to the PLRC site, the boundary between the Milton and Charlotte belts is indicated where gneiss and schist units of the Milton are found adjacent to the dominantly non-layered mafic and felsic intrusives of the Charlotte Belt.

The Charlotte Belt is composed of igneous and metamorphic rock (Figure 2-4). The oldest rocks are mafic igneous rocks, which are generally characterized as dense, dark colored rocks high in magnesium and iron content. These were later intruded by silicious granitic igneous rock. At approximately the same geologic time, the rocks were metamorphosed. The mafic igneous rocks were metamorphosed into amphibolite and the granitic rocks into gneiss. Blocks of amphibolite may be found within the gneiss, indicating that it is older than the gneiss. Veins of pegmatite, composed of primarily coarse-grained quartz and feldspar, cross cut both the amphibolite and gneiss. The pegmatite veins were formed during the late stages of igneous intrusion and metamorphism [Golder, 1988].

Except for alluvial soils associated with surface drainage features, soils in the Piedmont are formed primarily by chemical weathering of the bedrock. The extent of the weathering is heavily dependent upon the original rock type, its chemical composition and its susceptibility to weathering. The depth of weathering is quite variable within this belt. Soil depths up to 140 feet have been recorded [Bloxham et al., 1970].

The major soil types present near the PLRC site are classified as the Wilkes-Enon association, which represent the residuum. In this landscape, the Enon soils typically occur on the ridges, the Wilkes soils are on the steep side slopes, and the Congaree and Chewacla soils are in the drainage ways [USDA, 1976].

The surface layer of Enon and Wilkes soils is a well-drained loam, sandy loam, or fine sandy loam. The Congaree soil series consists of well-drained soils located on stream flood plains. These soils are formed in recent alluvium and are classified as a loam or fine sandy loam. Chewacla soils consist of nearly level, somewhat poorly drained soils of stream flood plains. They are also formed in recent alluvium. Chewacla soils are classified as a loam or clay loam [USDA, 1976].

2.2.2 Site Geology

The exploration program conducted for the PLRC landfill development area as part of the Design Hydrogeologic Investigation [RUST E&I, 1994B] confirmed that the site lithology consists primarily of micaceous silts, poorly graded micaceous sands, lean sandy clays, saprolite and highly weathered rock. These soil strata were underlain by bedrock which was first encountered from 32 feet to 130 feet below existing ground surface. The locations of the exploratory borings/piezometers performed during the Design Hydrogeologic Investigation and geologic cross sections of the site are illustrated in Figures 2-5 and 2-5A through 2-5D, respectively.

Soils at the site consist of both fill soils and soils formed by in-place weathering of the underlying rock. The latter soils can be divided into two types, residual soil and saprolite. The fill soils are mainly disturbed variations of these. The fill soils are soils which were excavated from the active landfill area and placed in the development area in the past. The distinguishing factor between residual soils and saprolite is that saprolite retains the original fabric and structure of the parent bedrock. Residual soils, however, are the product of more intense weathering which causes the soil to lose whatever fabric or structure it may have had. Residual soils generally overly the saprolite. The residual soil thickness encountered in the borings drilled at the site generally ranged from approximately 0 feet to 14 feet. Saprolite thickness ranged up to 48 feet at the site, and partially weathered rock thickness varied up to 73 feet.

The fill soils observed south of MW-2 were placed on the original north slope of the ridge. This fill is a result of earth moving activities associated with the existing landfill's construction. The thickness of this fill stratum is illustrated on Figures 2-5A and 2-5D. Additional fill soils are observed between boring locations P-7, P-8, and P-11 which is an active stockpile area for daily cover for the existing landfill. This area is shown on Figures 2-5B and 2-5C. It is noted that the ground surface on these sections depicts a previous condition on July 1, 1993. A major earth moving project for daily cover is on-going at the site. The existing ridge is being lowered for this development. The fill material encountered in the drilling program was light brown, yellowish brown, yellowish orange, yellowish green and black silty sand containing some wood fragments.

The residual soil encountered at the site was generally comprised of light brown, yellowish orange, greenish gray and black, dry to moist, micaceous silt with varying degrees of fine to coarse sand and clay. At RUST piezometer location P-6D, a greenish gray, lean sandy clay was encountered from 4 feet to 6 feet. Standard penetration tests resulted in N-values which ranged from 5 to 38 but averaged around 10 within the residual soil.

The observed saprolite stratum was composed primarily of light brown, yellowish brown, yellowish orange, light red, greenish gray, or black and white; moist to wet,

foliated, micaceous, silt or sand with varying degrees of clay, silt and fine to medium sand. Standard penetration tests resulted in N-values which ranged from 5 to 100 but averaged around 20 within the saprolite.

The partially weathered rock encountered in the borings was predominantly orange pink, yellowish orange, yellowish brown, grayish orange, light brown, or white; moist to wet, either poorly graded sand or a foliated, micaceous, silty sand with varying degrees of fine to coarse particles. This soil unit exhibits standard penetration test N-values that exceed 100.

A more detailed discussion of the geotechnical engineering properties of the on site soils is presented by RUST E&I [1994B].

Granite gneiss was the predominant rock type encountered in the nine core holes drilled on the site. Biotite, feldspar quartz and hornblende are the major constituents. Other primary rock types encountered were granite schist, hornblende schist, biotite schist, quartz schist and chlorite schist. The top of bedrock map is shown in Figure 2-6. The foliated inter-banding of these rock units observed in the core samples have dips ranging from 0° to 50°. Actual joint fractures vary in frequency and spacing. No dikes were encountered during this investigation.

Of the 26 rock core runs made during the Design Hydrogeologic Investigation, 12 had recoveries at 90-100 percent. Corresponding rock quality designation (RQD) values were between 58% to 100% for these high recovery runs. As indicated in the discussion above, all of the poorer recoveries and low RQDs were in the upper two runs of the core holes. This trend is due to the fact that fractures within the rocks tend to become less frequent and tighter (less open) with depth, because of overburden/confining pressures.

Soil and rock borehole logs as well as more detailed descriptions of site geology and structure are presented by RUST E&I [1994B].

2.3 Hydrogeology

2.3.1 Climate

The climate at the PLRC and the Kernersville area is warm and humid with a mean annual temperature of 59.5° F and an average annual rainfall of approximately 42.4 inches. Figure 2-7 illustrates the 30-year average precipitation levels from 1951 through 1980 for the Greensboro, North Carolina area. As shown by the figure, rainfall is rather evenly distributed throughout the year. However, there are slightly higher levels of precipitation during June through September. The monthly averages range from a high of 4.27 inches in July to a low of 2.59 inches in November.

Figure 2-8 compares the 30-year average rainfall amounts to monthly totals recorded during 1988 through 1993. A comparison of the 30-year average annual precipitation and the total annual precipitation for each year is also shown below each graph. As illustrated by the figure, the Greensboro, North Carolina area received 35.2 inches of precipitation in 1988 which is seven inches below the average annual precipitation. Substantially lower than normal rainfall was received during the winter and spring months. The total annual precipitation received in 1989 was 50.6 inches. This was 8 inches greater than the 30-year average. Higher amounts were recorded during the early spring, early summer, and early fall months. Total precipitation recorded for the subsequent years of 1990, 1991, 1992, and 1993 was approximately average with up to 1.5 inches above the annual average. Above average amounts were usually recorded during the spring and/or fall months.

Mean monthly temperatures from the 30-year average range from 37°F in January to 77°F in July. Snow cover, which averages 2 inches in depth, is present approximately nine days of the year. Winds average 8 mph and are primarily out of the northeast during the fall months and from the southwest during the remainder of the year.

2.3.2 Regional Hydrogeology

Ground water in the Piedmont province is obtained from either soils composed of residual and/or saprolitic materials or from the underlying crystalline or metamorphic rocks. The ground water yield of soils is dependent on the thickness of the saturated zone, degree and depth of weathering, topographic setting, vegetative cover, and the permeability of the soil. Ground water within the crystalline and metamorphic rocks occurs in joints, fractures, fault zones, and other secondary porosity features. The amount of ground water yield is influenced by the degree of interconnection between these features [Golder, 1988].

The aquifers in the Piedmont province are recharged by infiltration of precipitation. Water infiltrates through the residual material into the saturated soil zone. Ground water may eventually flow into crystalline or metamorphic rock via fractures or by flowing directly into openings in exposed rock. Upon reaching the saturated zone, ground water generally flows laterally and downgradient to discharge areas in topographic lows.

Flow of ground water within the shallow water table is usually controlled by the trend of the surface topography. Ground water within surficial aquifers generally flows downgradient to discharge into streams or rivers.

Water levels within surficial aquifers in residual soils fluctuate as a function of precipitation and evapotranspiration. Water levels will rise during wet periods and decline during dry periods.

Ground water levels within deeper crystalline aquifers are affected primarily by

seasonal precipitation and less by evapotranspiration. Ground water levels are usually highest in the spring and lowest in the autumn months [Golder, 1988].

2.3.3 Site Hydrogeology

Site specific hydrogeology is interpreted from data obtained by Golder Associates during a previous hydrogeologic investigation performed in 1987 as well as from data obtained during the recent hydrogeologic investigation performed at the site during the months of January, February, and March of 1994.

The subsurface investigations and hydrologic data suggest that the zone of saturation predominantly occurs within residual soils and extends down into the upper bedrock. Occasionally, the saturated zone is found in bedrock highs. Upon review of soil logs and hydrogeologic information, the uppermost aquifer on site is considered to be unconfined. Residual materials and saprolite that comprise the uppermost aquifer at the site predominantly consist of micaceous sands, although saturated silty soils and some sandy silts are also present. The vertical hydraulic conductivities of these soils as obtained from laboratory testing of undisturbed samples ranged from 3×10^{-4} to 4×10^{-6} cm/sec. The saprolite grades into a partially weathered rock as the degree of weathering reduces.

Hydrogeologic cross-sections (Figures 2-5) illustrate the distribution of the zone of saturation into the various geologic units. These figures show that the zone of saturation is primarily associated with the saprolite (geologic unit 4, Golder Associates) which consists of micaceous sands derived from highly to partially weathered rock. The cross-sections also depict where the water table intersects competent rock near the hilltops at piezometer locations GP-1 and P-9. The ground water flows from the top of the ridge down towards the creeks. Ground water generally exhibits a downward gradient on the ridge tops and on the slopes. The ground water exhibits an upward gradient at the creeks.

In-situ permeability tests were performed at every piezometer that was installed as part of the Design Hydrogeologic Investigation and each existing monitoring well location. The results indicate hydraulic conductivities at the site range from 10^{-3} to 10^{-5} cm/sec in saprolite, 10^{-5} cm/sec in partially weathered rock, and 10^{-5} to 10^{-7} cm/sec in rock. Hydraulic conductivities generally decrease with depth within the rock.

Using the observed average hydraulic conductivities and average hydraulic gradients for the saprolite and bedrock piezometers and monitoring wells and using the Darcy equation:

$$\bar{v} = \frac{Ki}{\emptyset}$$

where:

$\bar{v}$	=	average ground water flow velocity
K	=	average hydraulic conductivity
i	=	average hydraulic gradient
$\varnothing$	=	effective porosity ($\approx$0.25 saprolite) ($\approx$0.15 P.W.R.) ($\approx$0.05 Rock)

The estimated average ground water flow velocity is 0.03 ft/day (10 ft/year) in saprolite, 0.005 ft/day (2 ft/year) in partially weathered rock, and ranges from 0.01 ft/day (5 ft/year) to 0.0001 ft/day (0.05 ft/year) in bedrock.

The interpretation of the ground water flow, as shown on Figures 2-5, depicts an upward gradient beneath the site potentiometric high which is located near the abandoned Golder piezometer GP-2. It is not certain whether this is a long term vertical gradient or whether it reverses like the observed gradients at piezometer locations P-4 and P-14. The likely explanation for this gradient is that it may be the result of a regional recharge area for water flowing from the ridge to the east of the site. The ground water then tends to flow radially from the southeast corner with an approximate horizontal gradient of 0.040 and vertical gradient of 0.020.

The ground water flowing radially from the southeast corner of the site eventually changes direction to flow on either side of the hydrologic divide that crosses the site. The ground water in this area exhibits a smaller horizontal gradient of 0.015 and a vertical gradient range of 0.002 to 0.009 downward. Due to lower hydraulic conductivities in rock, there are some minor vertical gradient reversals at piezometer locations P-4 and P-14 as the flow is balanced out between the two conductivity zones. The ground water flows onward until it reaches the creek where there is an approximate upward gradient of 0.020.

Figure 2-9 contains a graph showing the fluctuation in water levels that has been observed during the semi-annual monitoring of the existing monitoring wells. The water level data is also shown in Table 2-1. The potentiometric surface for the site as measured on March 18, 1994 is shown on Figure 2-10. This figure is a reasonable representation of the water table at the time of the Design Hydrogeologic Investigation for the landfill development area. A seasonal high potentiometric surface for the site is shown on Figure 2-10A. The contours represent the seasonal high water levels determined from the semi-annual monitoring of the monitoring wells. The maximum observed water levels, which occurred during 1989-90, correspond with above average monthly precipitation which in 1989 was eight inches above the annual average. Monthly precipitation had been consistently high prior to and during these readings. RUST E&I recommends that these levels be

considered the seasonal high levels for the site and that the contours drawn on Figure 2-10A be considered the seasonal high potentiometric surface. These contours were drawn based on these high levels and following the general orientation of the potentiometric contours determined during the Design Hydrogeologic Investigation.

2.3.4 Surface Water Hydrology

The site is separated into two watersheds with the dividing line running from the northwest corner of the site to the southeast corner of the site which can be seen in Figure 2-10. The northern watershed drains the north and east slopes. The southern watershed drains the south and west slopes.

These two watersheds are drained by two tributaries of East Belews Creek which empty into Belews Lake and subsequently into the Dan River [Golder, 1987]. These tributaries are located at the southwest corner of the site and immediately north of the site.

The spring shown by Golder [1987] to be located below piezometer location P-10 was not specifically identified during the Design Hydrogeologic Investigation. There was water in the swale but it appeared to be fed more from surface runoff and road drainage structures than from ground water sources. There is, however, probably a ground water component that is helping to fill the swale with water.

2.3.5 Local Water Use

Ground water was formerly withdrawn from the Piedmont province largely by means of wells advanced into the saturated zone or by wells set into near-surface fractured rock. Currently, most domestic water supply wells in the region are drilled into the Piedmont bedrock. The quantity of water that can be withdrawn from these wells depends upon the extent to which the bedrock openings are interconnected.

A visual well inventory was conducted by Golder [1988] to identify supply wells located within approximately 2,000 feet of the PLRC site. Five of these wells were within the property boundary. WMI [1993] indicated that four of the five onsite wells have been abandoned and that only one well remains to be abandoned. This latter well is upgradient to the existing landfill area and will be properly abandoned prior to landfill construction in the specific area.

An updating well inventory was conducted as part of the Design Hydrogeologic Investigation. The inventory included a review of state and county records in order to identify private and public supply wells located within approximately one mile of the PLRC property boundaries. Private and public supply records were reviewed for both Forsyth and Guilford Counties.

Figure 2-11 illustrates the approximate locations of the wells identified during both

the recent inventory and the inventory conducted by Golder [1988]. Table 2-2 contains specific information about the wells identified on Figure 2-11.

Figure 2-11 shows that each of the identified offsite wells are located either upgradient from the site or are situated across a hydrogeologic divide. It is therefore improbable that activities within the PLRC could affect water quality or quantity at the identified locations.

Table 2-1

Ground Water Elevations
Piedmont Landfill and Recycling Center

Date Measured	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Oct. 1989	784.23	753.56	748.38	748.12	739.57	n/a
May 1990	787.59	754.21	751.41	746.97	737.86	n/a
Nov. 1990	785.40	753.36	748.39	746.17	737.37	n/a
May 1991	786.51	752.48	747.20	747.23	739.21	n/a
Nov. 1991	784.26	751.06	745.83	744.85	736.95	n/a
Feb. 1992	783.06	750.99	745.31	745.23	737.41	n/a
Aug. 1992	783.28	751.06	745.34	745.60	737.17	n/a
Feb. 1993	783.85	751.60	744.75	746.32	737.85	n/a
Jul. 1993	786.11	751.08	746.61	744.44	737.07	n/a
2/19/94	782.51	752.28	744.76	745.57	736.95	781.20
3/5/94	782.77	751.49	745.03	746.07	737.3	781.58
3/12/94	782.92	751.41	745.03	746.02	737.17	781.77
Seasonal High Reading	787.59	754.21	751.41	748.12	739.57	n/a

Table 2-2

Well Inventory

PRIVATE WELLS

Map* Location	Permit No. or Owner	Diameter (inches)	Total Depth (feet)	Casing Depth (feet)	Static Water Level (feet)	Yield (gpm)
1	803235	6.25	505	21	60	0.5-0.75
2	NA	6	445	160	40	2
3	802209	NA	NA	NA	31	NA
4	803837	18	48	48	36	NA
5	802656	6.25	165	36	NA	35
6	800340	6.25	205	67	8	15
7	NA	6.25	240	NA	20	15
8	800760	6.25	285	37	NA	5
9	800713	NA	245	63	NA	75
10	801279	NA	145	36	NA	20
11	802563	6.25	185	125	NA	NA
12	Clyde Lowe	24	NA	NA	24.8	NA
13	NA	24	NA	NA	16	NA
14	WMI	24	NA	NA	NA	NA
15	Tom Beeson	24	42	NA	38.5	NA
16	Unidentified Residence	NA	NA	NA	NA	NA
17	Hiram Hills	NA	NA	NA	NA	NA
31	George Custer	NA	NA	NA	NA	NA
32	Tony Clayton	NA	295	55	30	50
32	Mack Peoples	NA	NA	NA	NA	NA
30	Sidney Owens	NA	100	25	15	30
35	Autumn Williams	2	505	43	38	1
27	Barbara Melton	12	120	22	30	8
28	M.J. Developers	12	120	41	10	6
25	Keith Zazzaro	NA	345	49	20	5
26	Cynthia Maple	NA	NA	NA	NA	NA
25	NA	NA	NA	NA	NA	NA
29	Julie Stowe	NA	NA	NA	NA	NA
25	James Lehman	NA	NA	NA	NA	NA
25	Lisa Blackmon	NA	NA	NA	NA	NA
24	E.C. Morris	NA	NA	NA	NA	NA
33	Larry Valentine	NA	NA	NA	NA	NA
34	Fred Mounce	1.5	175	69	31	7
21	Ryan Haywood	NA	NA	NA	NA	NA
21	Wade Welch	NA	NA	NA	NA	NA
21	Steven Randolph	NA	NA	NA	NA	NA
21	Kurt Barlow	NA	NA	NA	NA	NA
26	Joe Bigham	2	265	48	22	5

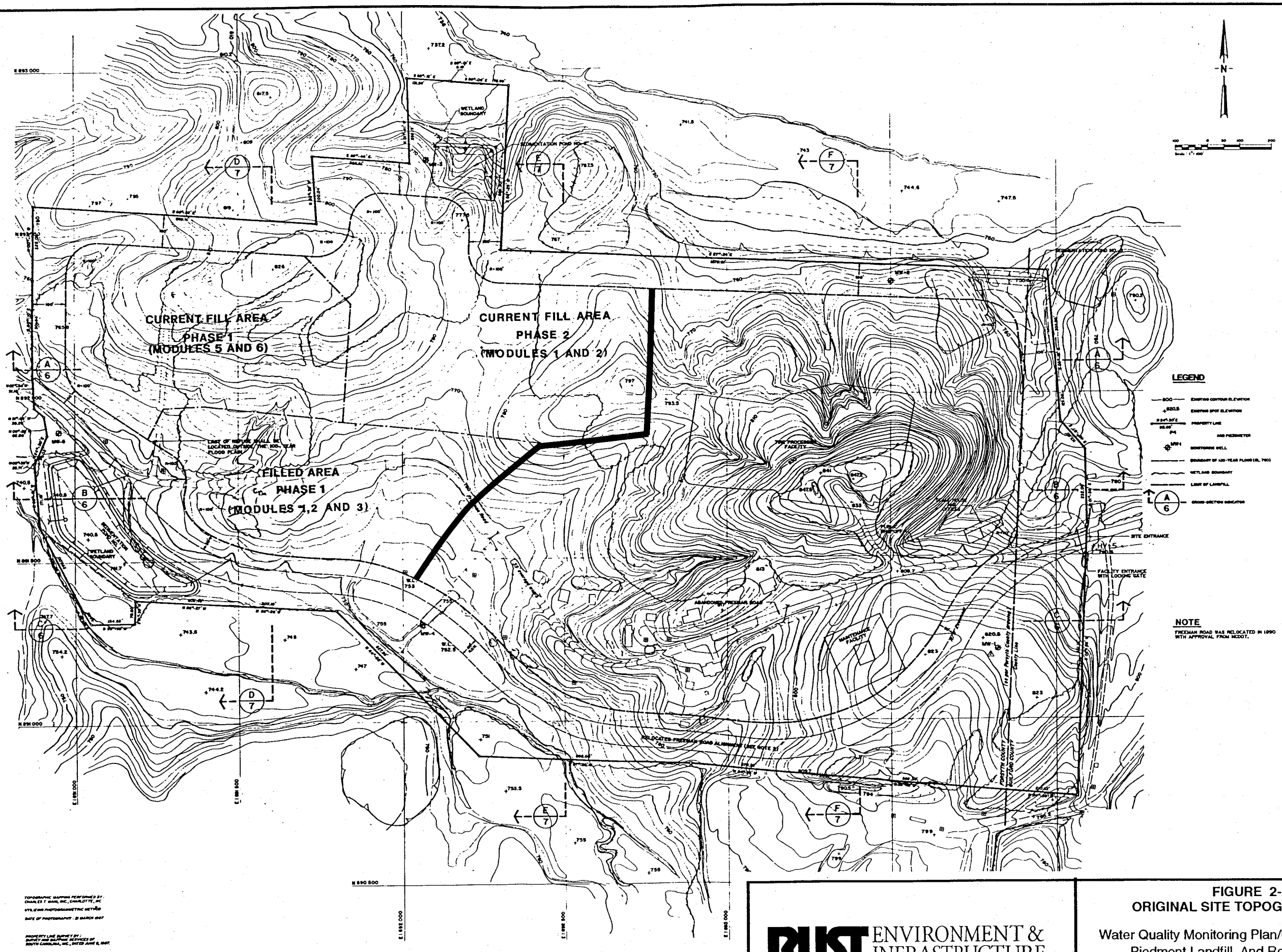
Table 2-2
(CONTINUED)

Map* Location	Permit No. or Owner	Diameter (inches)	Total Depth (feet)	Casing Depth (feet)	Static Water Level (feet)	Yield (gpm)
26	Alicia Flowers	NA	NA	NA	NA	NA
25	Bonnie Frostle	NA	NA	NA	NA	NA
22	Don Galloway	NA	NA	NA	NA	NA
22	Triad Properties	3	225	45	40	30
23	Larry Pachena	NA	NA	NA	NA	NA
23	Jeffery Davis	NA	NA	NA	NA	NA
20	Lamb & Peeples	NA	365	128	40	15
20	Lamb & Peeples	NA	365	91	40	8
20	Melvin Osborne	NA	NA	NA	NA	NA
18	Eunice Peancan	NA	NA	NA	NA	NA
18	Steve Feanrian	NA	NA	NA	NA	NA
18	Steve Feanrian	NA	NA	NA	NA	NA
19	Dewey Carlile	NA	NA	NA	NA	NA
19	Beth Simone	NA	NA	NA	NA	NA
19	Piedmont Triad Builders	NA	125	49	40	20

PUBLIC WELLS

Map Location	Permit No. or Owner	Diameter (inches)	Total Depth (feet)	Casing Depth (feet)	Static Water Level (feet)	Yield (gpm)
A1	Mikkola Downs Subdivision	8	300	40	NA	NA
A2		8	300	40	NA	NA
B1	Deerpath Subdivision	6.25	300	29	NA	NA
B2		6.25	300	29	NA	NA
C	Smoke View Subdivision	NA	NA	NA	NA	NA

NA = information not available
*see Figure 2-11 for approximate well locations

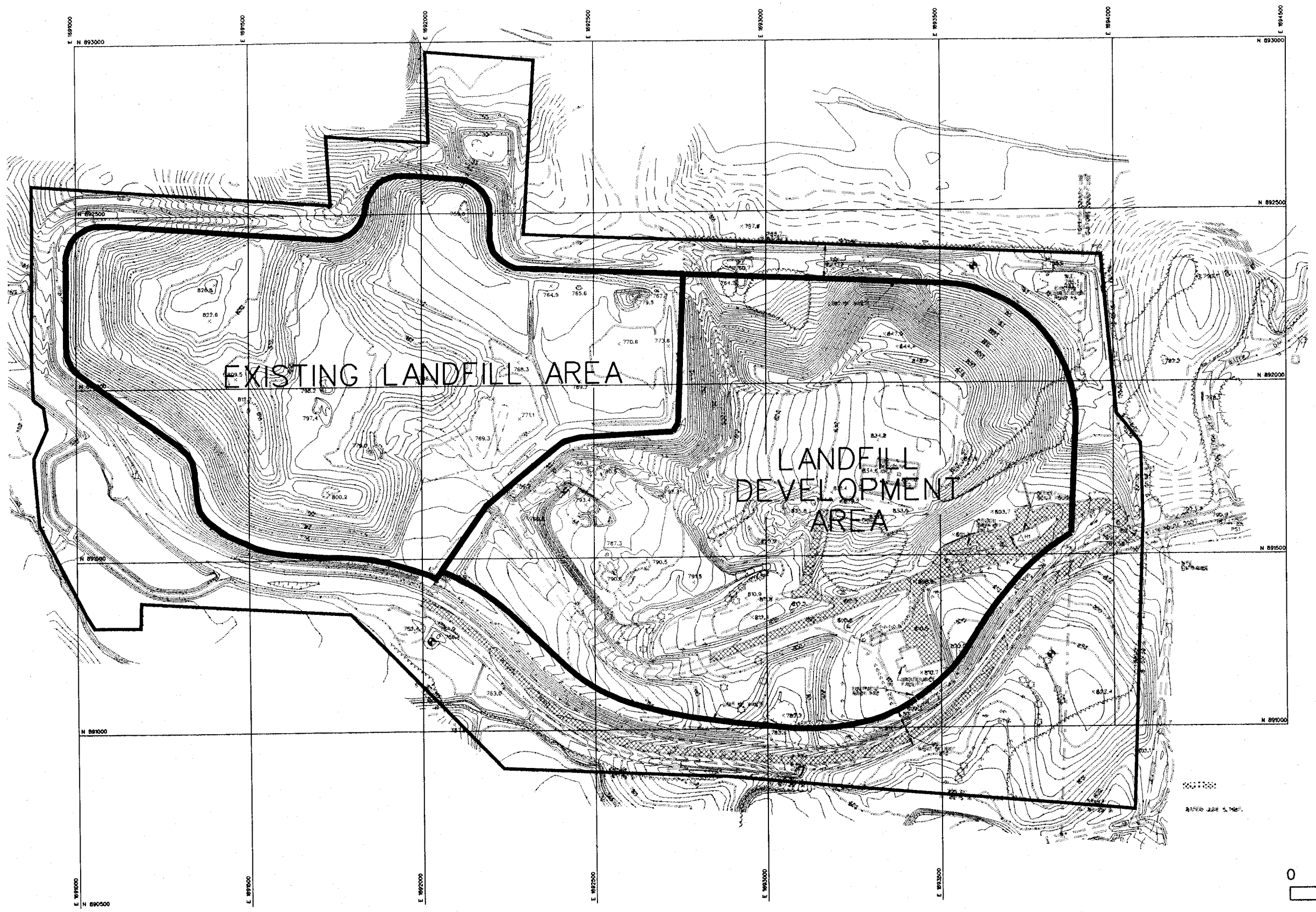


RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-1
ORIGINAL SITE TOPOGRAPHIC MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800



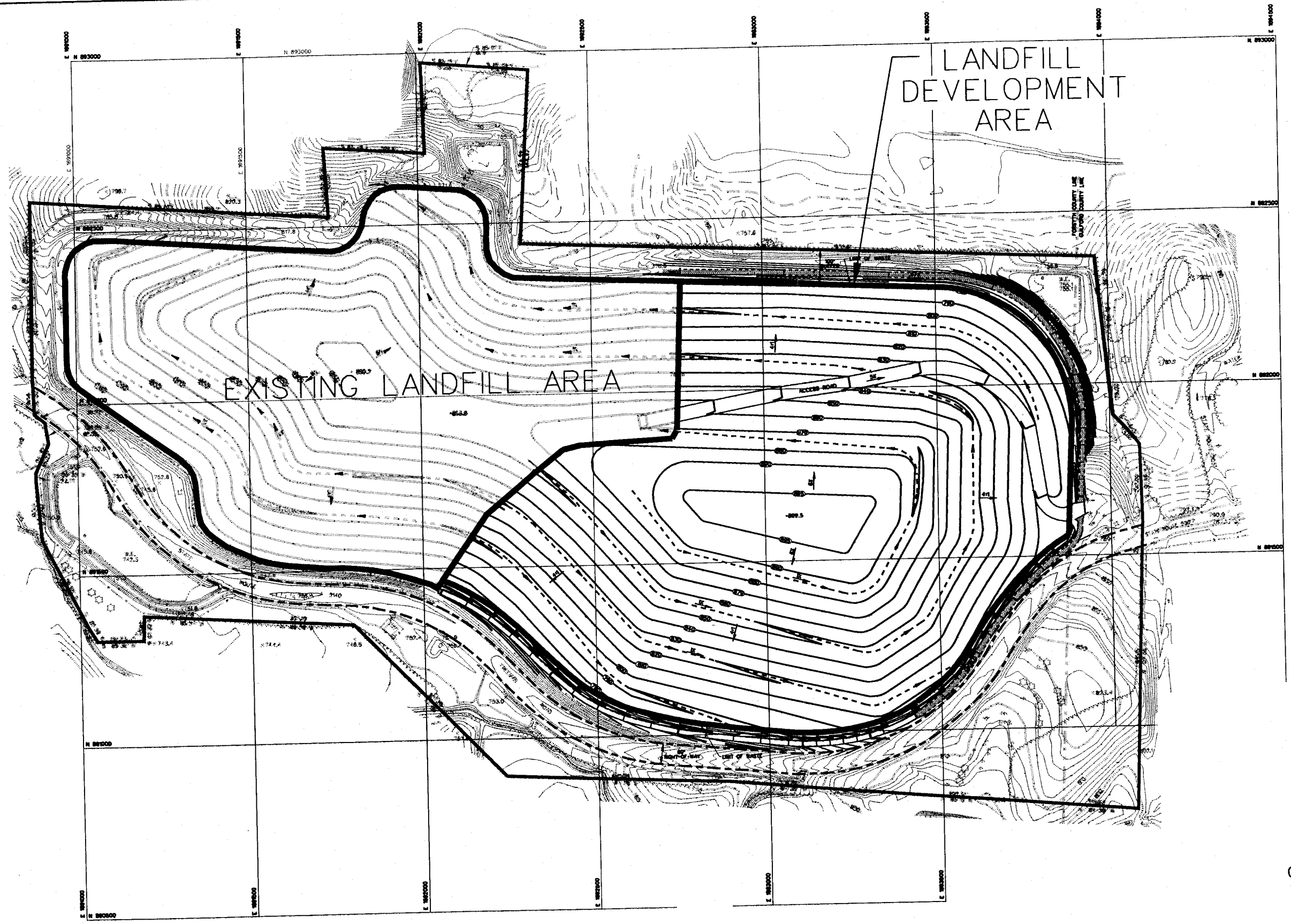
RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-2
PRESENT SITE TOPOGRAPHIC MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221EXTP.DGN



LEGEND:

- FINAL CONTOUR ELEVATION (10-FOOT INTERVAL)
- DRAINAGE FLOW DIRECTION

NOTES:
1. THE PROPERTY SHOWN WAS ESTABLISHED FROM SURVEY PERFORMED BY SURVEY MAPPING SERVICES OF SOUTH CAROLINA DATED JUNE 5, 1987.
2. TOPOGRAPHIC SURVEY AND GRID SYSTEM PREPARED BY AIR SURVEY CORP. OF STERLING, VA. DATED 7-1-93.
3. GRID BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM.
4. CONTOUR ELEVATIONS SHOWN REPRESENT TOP OF FINAL COVER
5. LANDFILL BENCHES SLOPE TOWARD THE LANDFILL AT A MINIMUM OF 10 PERCENT.

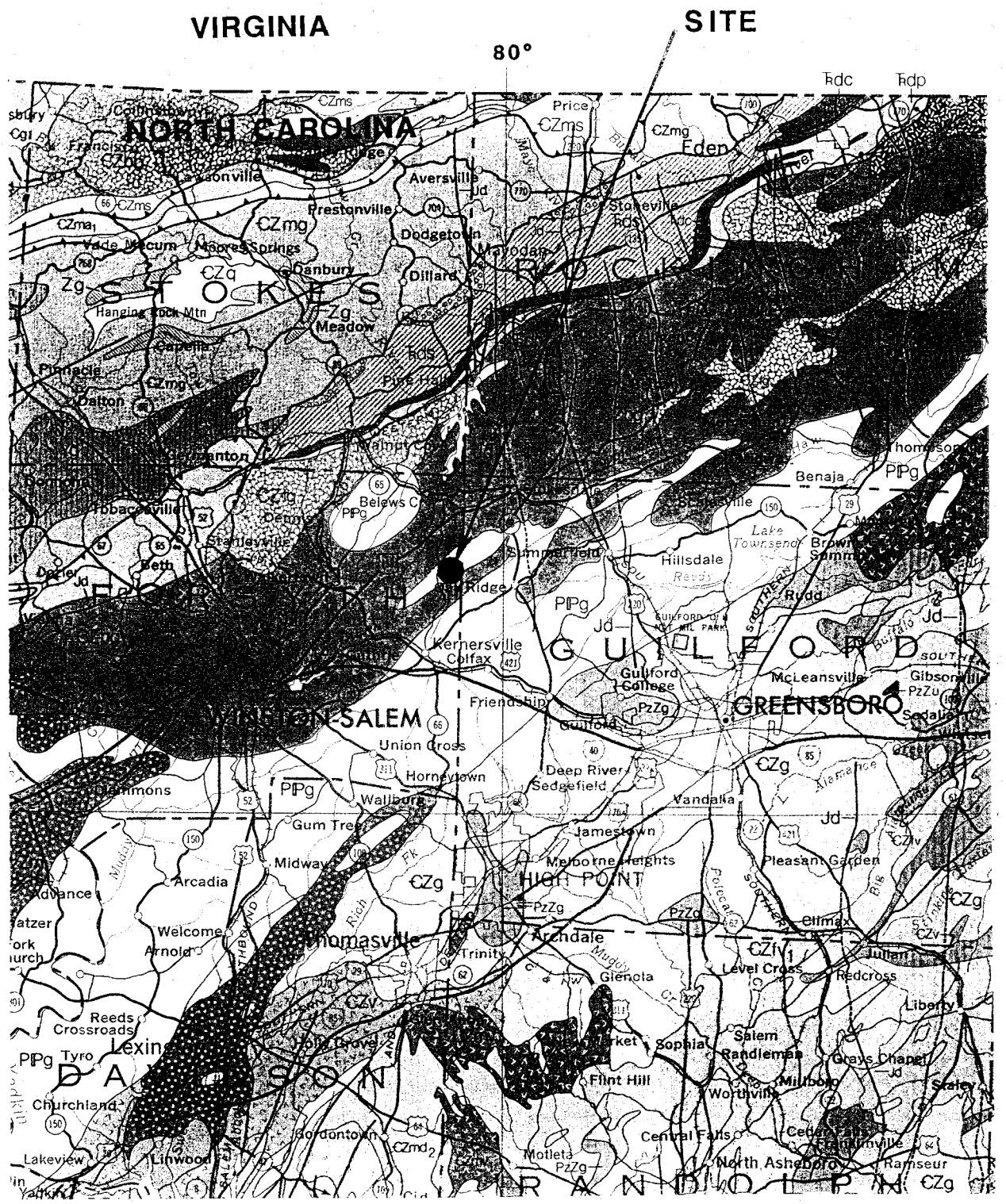
0 300 600 900
SCALE IN FEET

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-3
FINAL CONTOUR PLAN

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800
N:/87221/7221HWT3.DGN



Scale 1:500,000
1 inch equals approximately 8 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometres

CHARLOTTE AND MILTON BELTS

METAMORPHIC ROCKS

- €Zbf — FINE-GRAINED BIOTITE GNEISS — Massive to strongly foliated; minor layers of amphibolite and muscovite schist
- €Zfg — FELSIC MICA GNEISS — Interlayered with biotite and hornblende gneiss and schist
- €Zbg — BIOTITE GNEISS AND SCHIST — Inequigranular and megacrystic; abundant potassic feldspar and garnet; interlayered and gradational with calc-silicate rock, sillimanite-mica schist, mica schist, and amphibolite. Contains small masses of granitic rock
- €Zv — METAVOLCANIC ROCK — Interbedded felsic to mafic tuffs and flowrock
- €Zmv — MAFIC METAVOLCANIC ROCK — Metamorphosed basaltic to andesitic tuffs and flows, grayish green to black. Locally includes hypabyssal intrusives and minor felsic metavolcanic rock
- €Zfv — FELSIC METAVOLCANIC ROCK — Metamorphosed dacitic to rhyolitic flows and tuffs, light gray to greenish gray; minor mafic and intermediate metavolcanic rock
- €Zq — QUARTZITE — Massive to well foliated; contains andalusite, kyanite, or sillimanite, chloritoid, and pyrite
- €Zph — PHYLLITE AND SCHIST — Minor biotite, pyrite, and sillimanite; includes minor quartzite

INTRUSIVE ROCKS

- Jd — DIABASE — Dikes, gray to black
- PlPg — GRANITIC ROCK (Pennsylvanian to Permian, 265-325 my; 11,9) — Megacrystic to equigranular. Churchland Plutonic Suite (Western group) - Churchland, Landis, and Mooresville intrusives
- DSg — GRANITE OF SALISBURY PLUTONIC SUITE (Devonian to Silurian, 385-415 my; 5) — Pink, massive to weakly foliated. Gold Hill, Kannapolis, Salisbury, Southmont, and Yadkin intrusives
- DSs — SYENITE OF CONCORD PLUTONIC SUITE (Silurian, 404 my; 9) — Includes the Concord ring dike
- DOgb — GABBRO OF CONCORD PLUTONIC SUITE (Devonian to Ordovician, 399-479 my; 24) — Barber, Concord, Farmington, Mecklenburg, and Weddington intrusives
- DOg — GRANITIC ROCK — Locally pinkish gray, massive to weakly foliated; contains hornblende
- SHELTON GRANITE GNEISS (Silurian, 429 my; 21) — Poorly foliated, lineated granitic to quartz monzonitic gneiss
- PzZg — METAMORPHOSED QUARTZ DIORITE — Foliated to massive
- PzZg — METAMORPHOSED GABBRO AND DIORITE — Foliated to massive
- METAMORPHOSED MAFIC ROCK — Metagabbro, metadiorite, and mafic plutonic-volcanic complexes
- META-ULTRAMAFIC ROCK — Metamorphosed dunite and peridotite; serpentinite, soapstone, and other altered ultramafic rock. Only larger bodies shown
- €Zg — METAMORPHOSED GRANITIC ROCK — Megacrystic, well foliated; locally contains hornblende

SYMBOLS

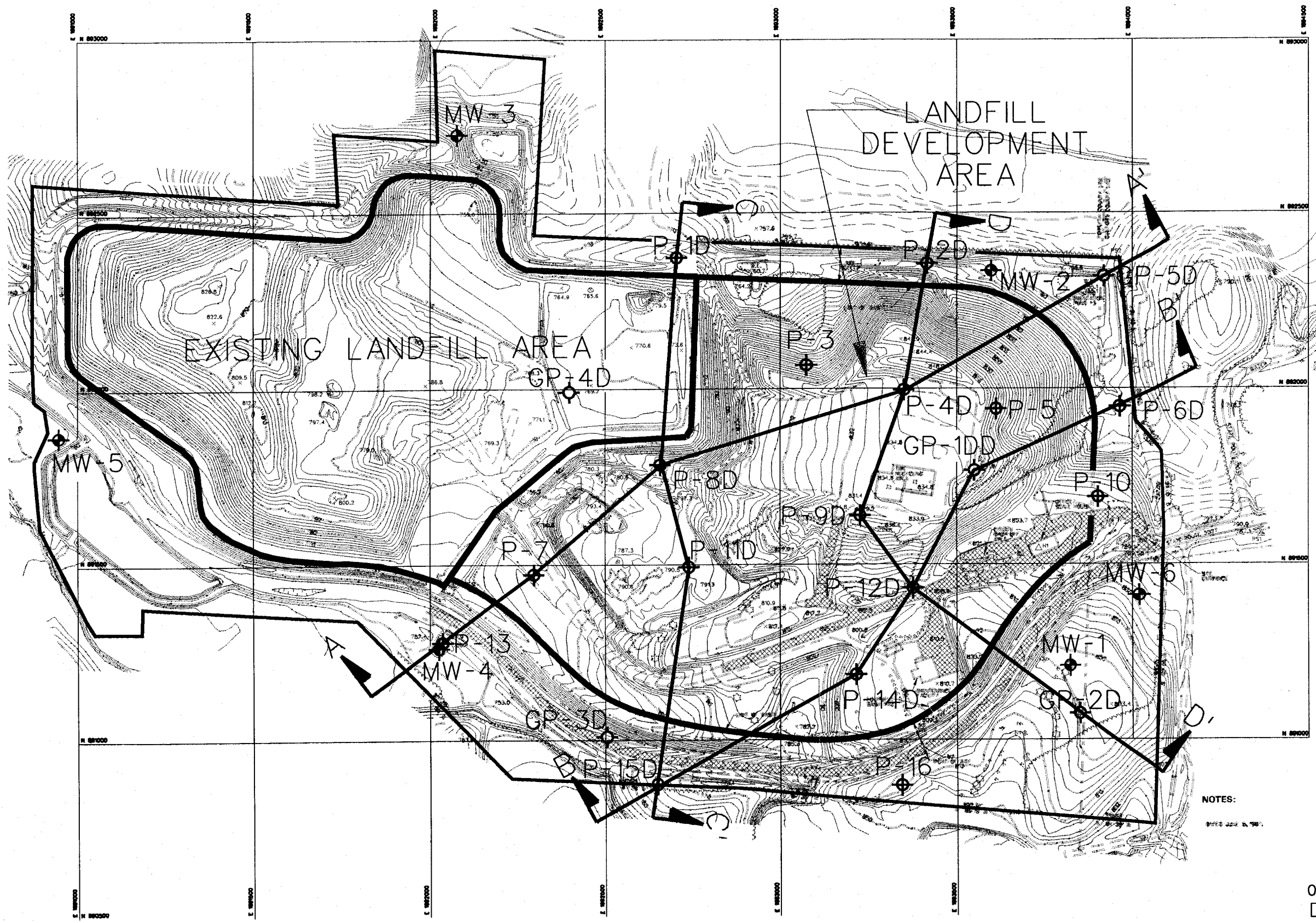
- Contact
- Fault
- Fault — Showing relative horizontal movement
- Normal fault — Bar and ball on downthrown side
- Overturned normal fault
- Thrust fault — Sawteeth on upper plate
- Overturned thrust fault
- Anticline — Showing direction of plunge
- Overturned anticline — Showing direction of dip of limbs
- Syncline — Showing direction of plunge
- Dike — Dashed where inferred from aeromagnetic data
- Scarp — Hachured on downslope side
- Zone of mylonitization

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-4
REGIONAL GEOLOGIC MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800



LEGEND:

- GOLDER PIEZOMETER LOCATION
- EXISTING GROUND WATER MONITORING WELL
- DESIGN HYDROGEOLOGIC INVESTIGATION PIEZOMETER LOCATIONS
- GEOLOGIC SECTION

NOTES:

0 300 600 900

SCALE IN FEET

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-5
HYDROGEOLOGIC SECTIONS

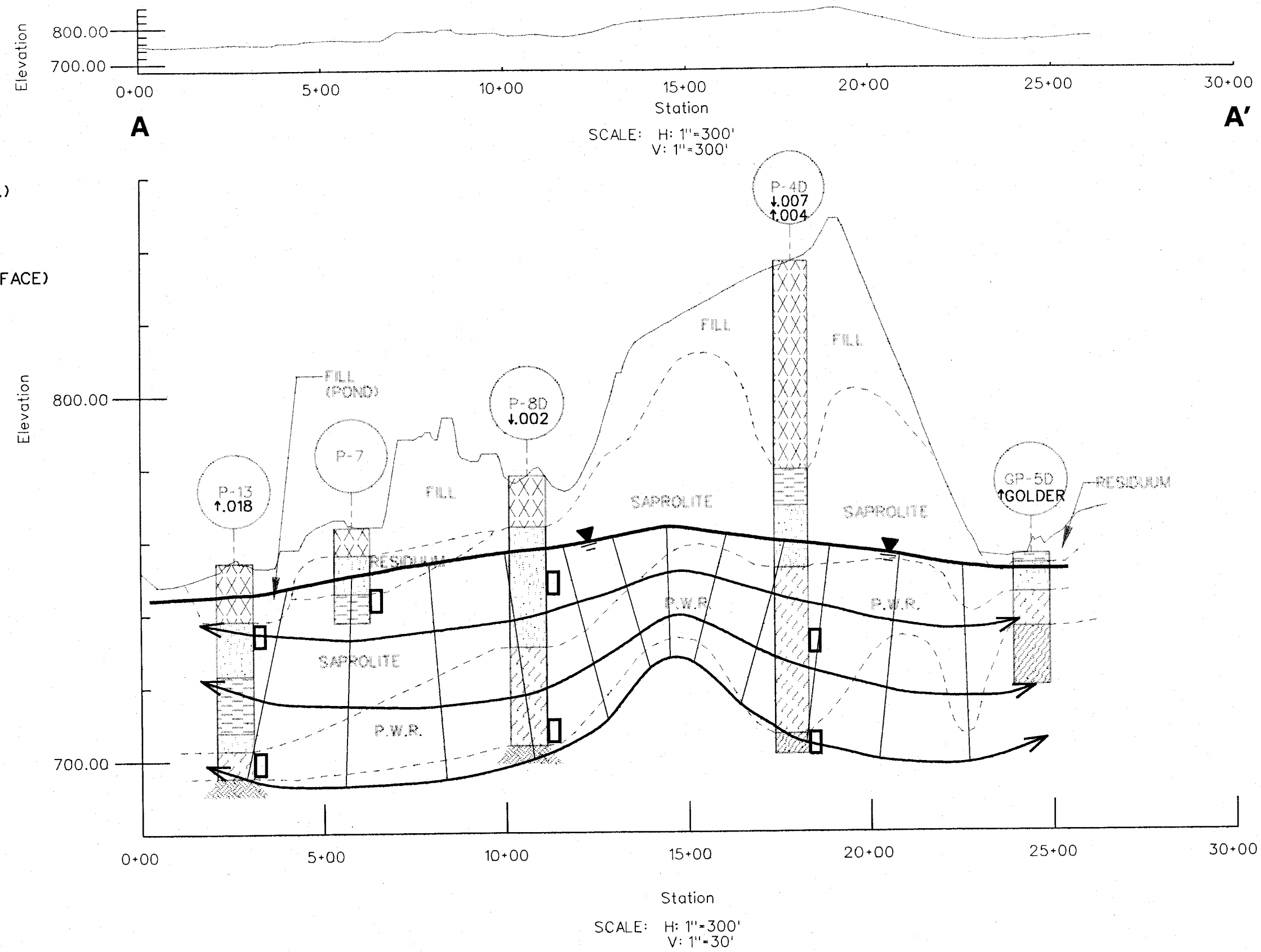
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

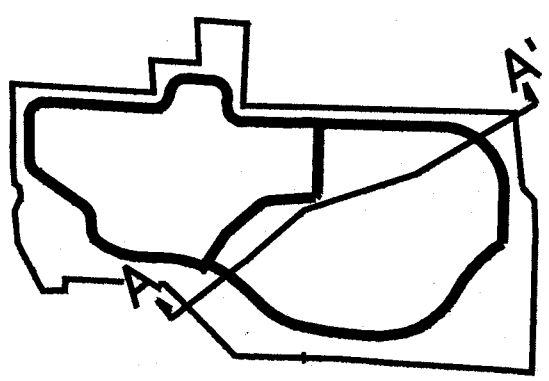
Project No. 87221.800

N:/87221/7221SEC3.DGN

LEGEND

- FILL
- PREDOMINANTLY SANDY RESIDUAL SOILS OR SAPROLITE
- PREDOMINANTLY SILTY RESIDUAL SOILS OR SAPROLITE
- PARTIALLY WEATHERED ROCK (P.W.R.)
- COMPETENT BEDROCK
- WATER TABLE (POTENTIOMETRIC SURFACE)
- FLOW LINES
- EQUIPOTENTIAL LINES
- SCREEN LOCATIONS
- ↑.018 VERTICAL GRADIENT





RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-5A
HYDROGEOLOGIC SECTION A-A'

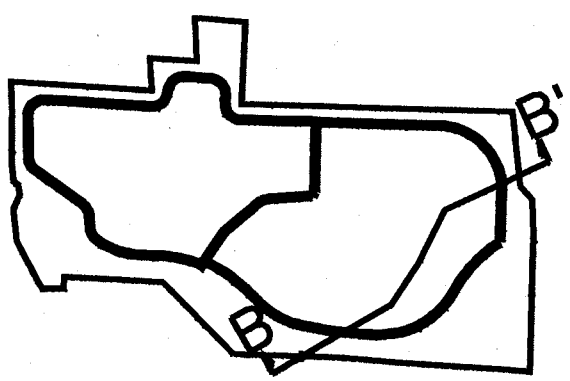
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

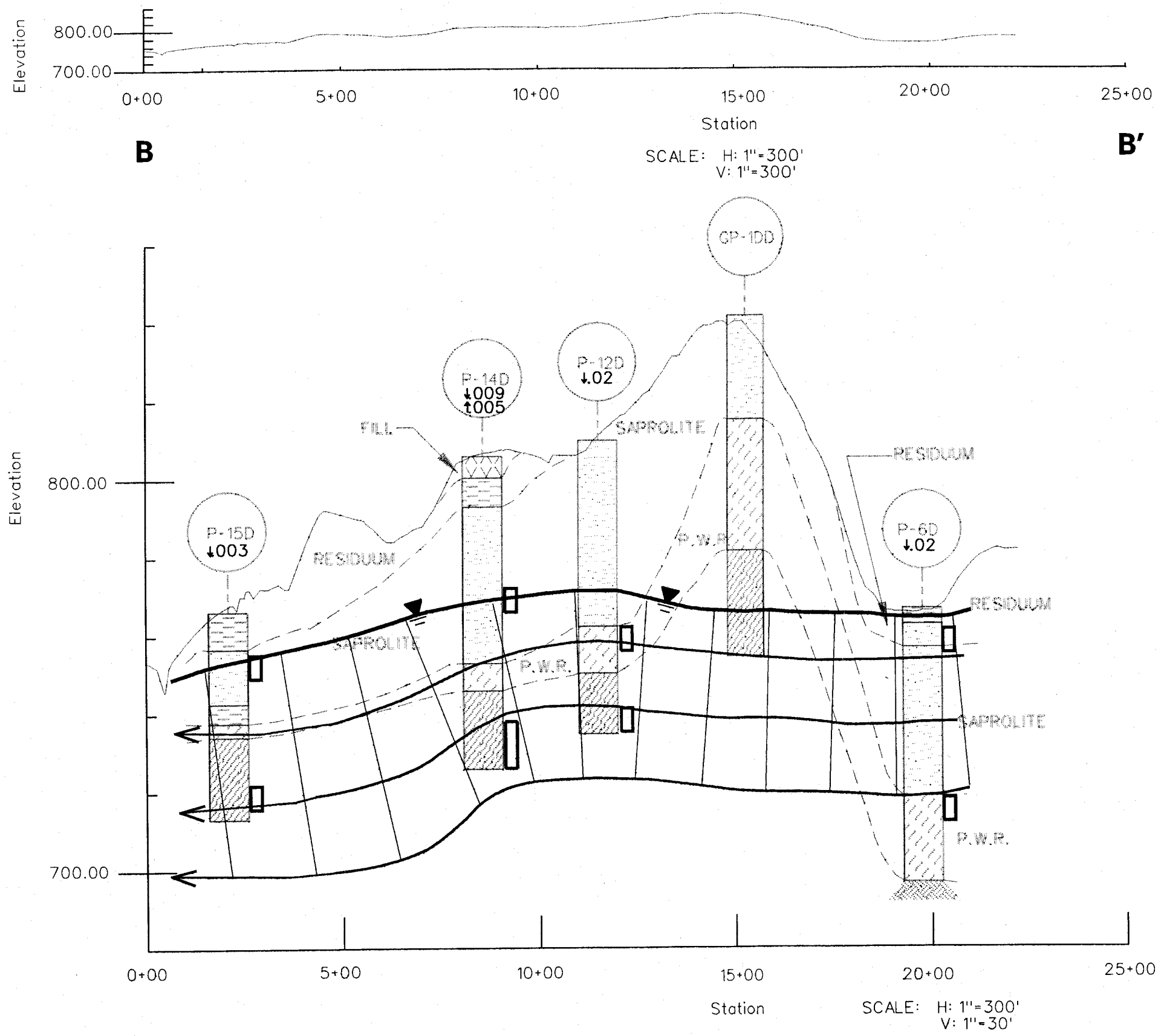
Project No. 87221.800

N:/87221/7221ND1A.DGN

LEGEND

- FILL
- PREDOMINANTLY SANDY RESIDUAL SOILS OR SAPROLITE
- PREDOMINANTLY SILTY RESIDUAL SOILS OR SAPROLITE
- PARTIALLY WEATHERED ROCK (P.W.R.)
- COMPETENT BEDROCK
- WATER TABLE (POTENTIOMETRIC SURFACE)
- FLOW LINES
- EQUIPOTENTIAL LINES
- SCREEN LOCATIONS
- ↑.018 VERTICAL GRADIENT





RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-5B
HYDROGEOLOGIC SECTION B-B'

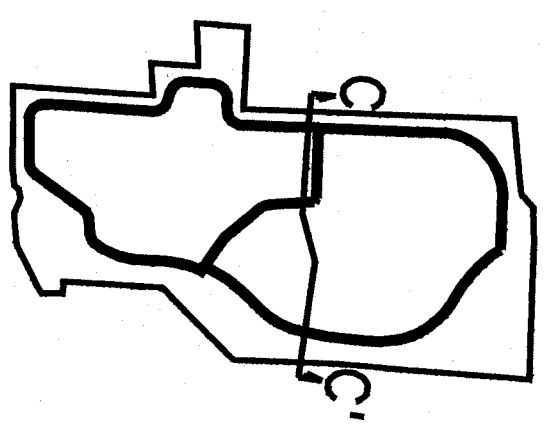
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

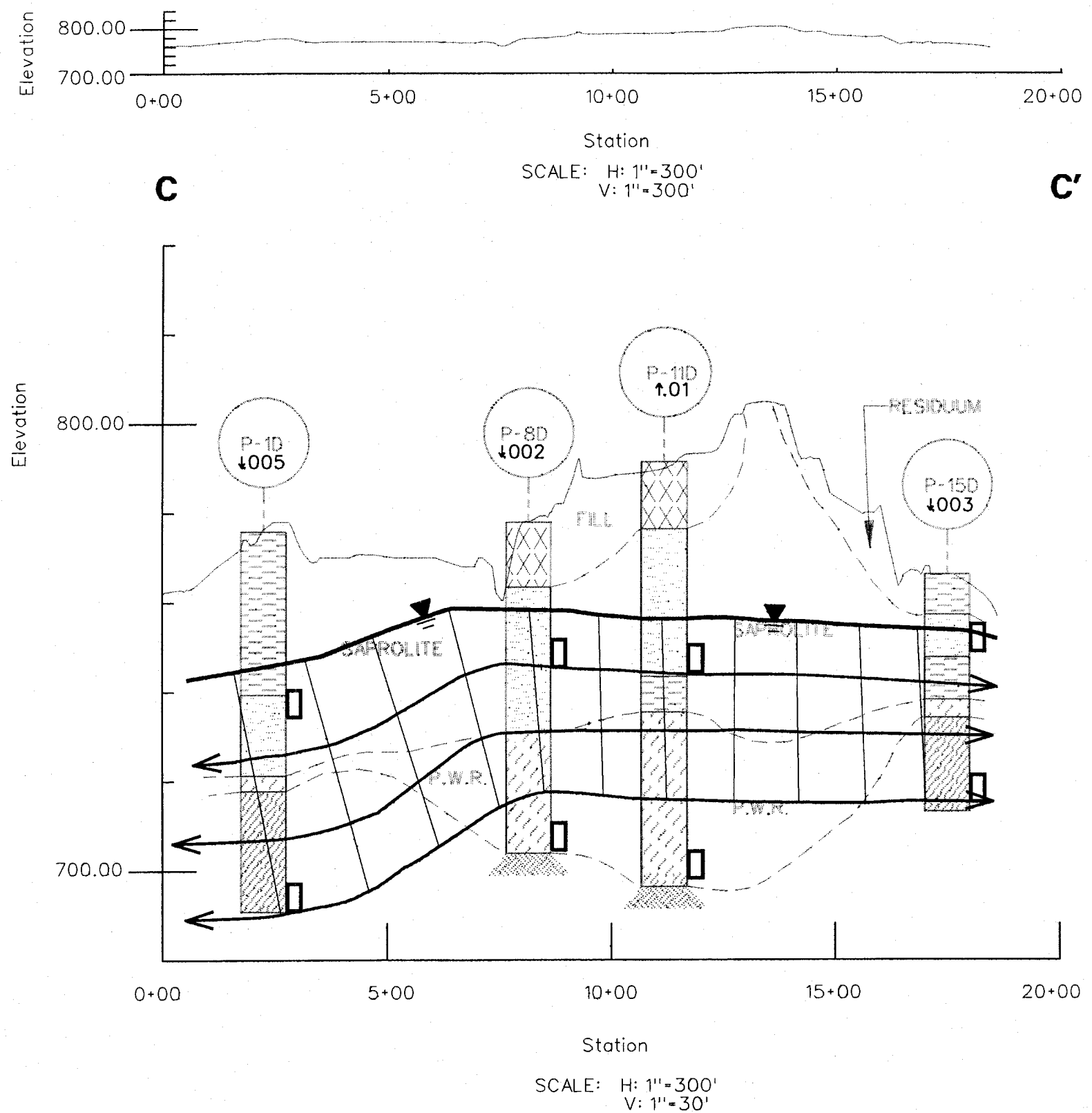
Project No. 87221.800

N:/87221/7221ND2A.DGN

LEGEND

- FILL
- PREDOMINANTLY SANDY RESIDUAL SOILS OR SAPROLITE
- PREDOMINANTLY SILTY RESIDUAL SOILS OR SAPROLITE
- PARTIALLY WEATHERED ROCK (P.W.R.)
- COMPETENT BEDROCK
- WATER TABLE (POTENTIOMETRIC SURFACE)
- FLOW LINES
- EQUIPOTENTIAL LINES
- SCREEN LOCATIONS
- ↑.018 VERTICAL GRADIENT





RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-5C
HYDROGEOLOGIC SECTION C-C'

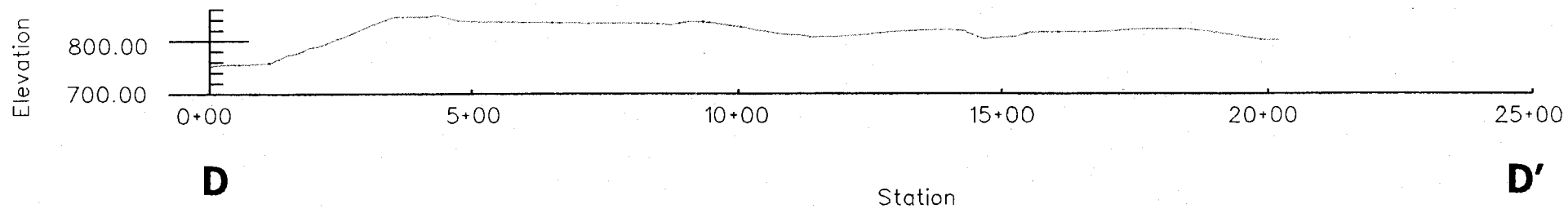
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

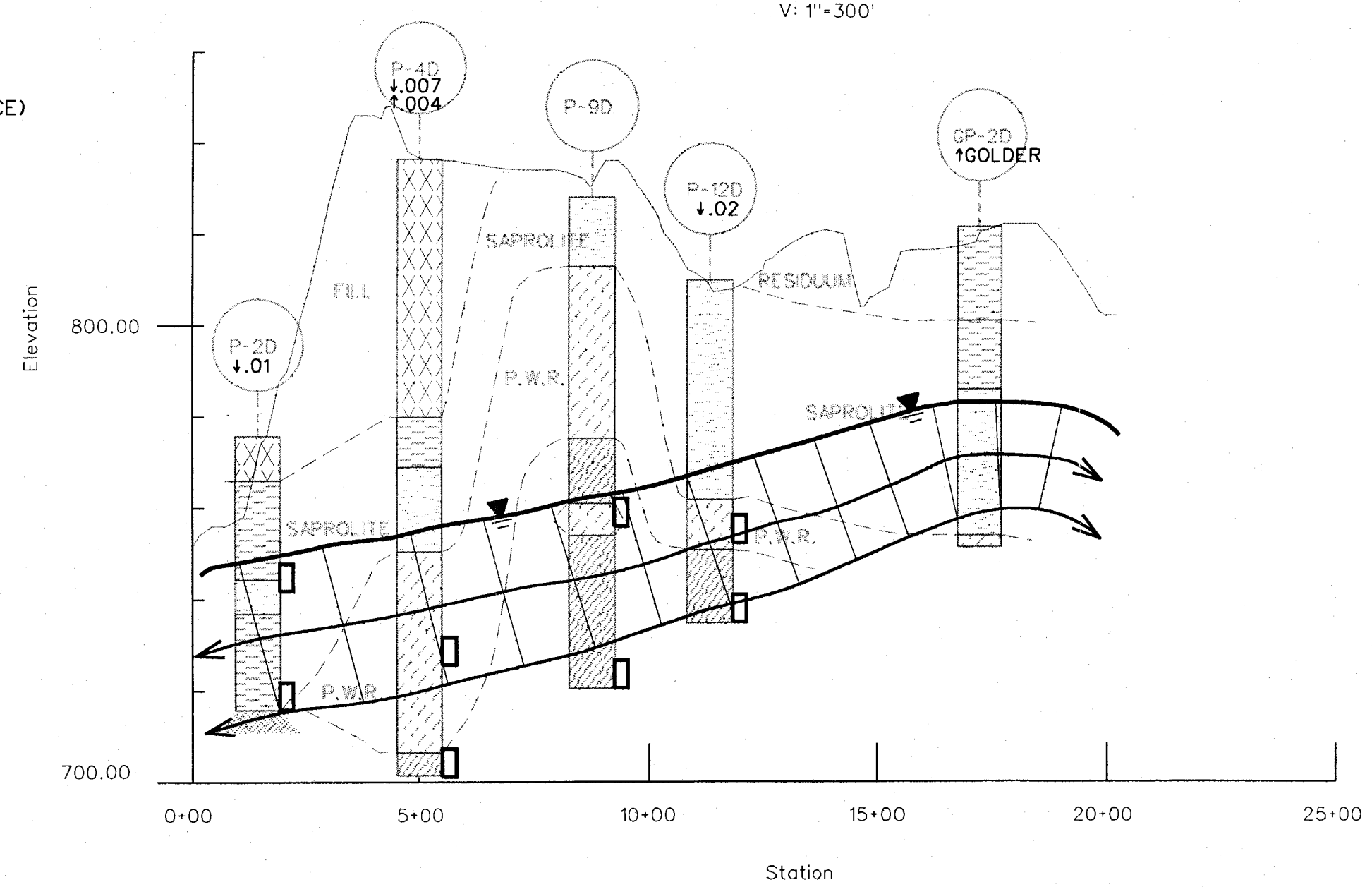
N:/87221/7221ND3A.DGN

LEGEND

- FILL
- PREDOMINANTLY SANDY RESIDUAL SOILS OR SAPROLITE
- PREDOMINANTLY SILTY RESIDUAL SOILS OR SAPROLITE
- PARTIALLY WEATHERED ROCK (P.W.R.)
- COMPETENT BEDROCK
- WATER TABLE (POTENTIOMETRIC SURFACE)
- FLOW LINES
- EQUIPOTENTIAL LINES
- SCREEN LOCATIONS
- ↑.018 VERTICAL GRADIENT



SCALE: H: 1"=300'
V: 1"=300'



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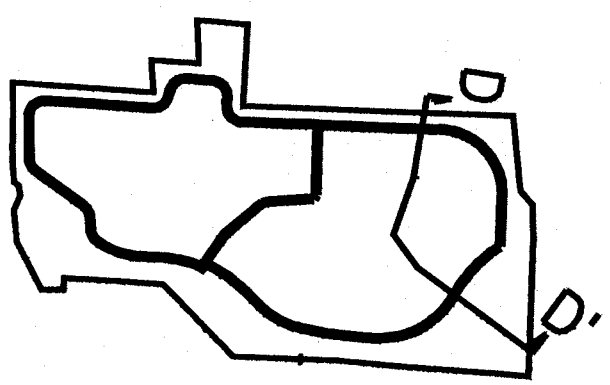


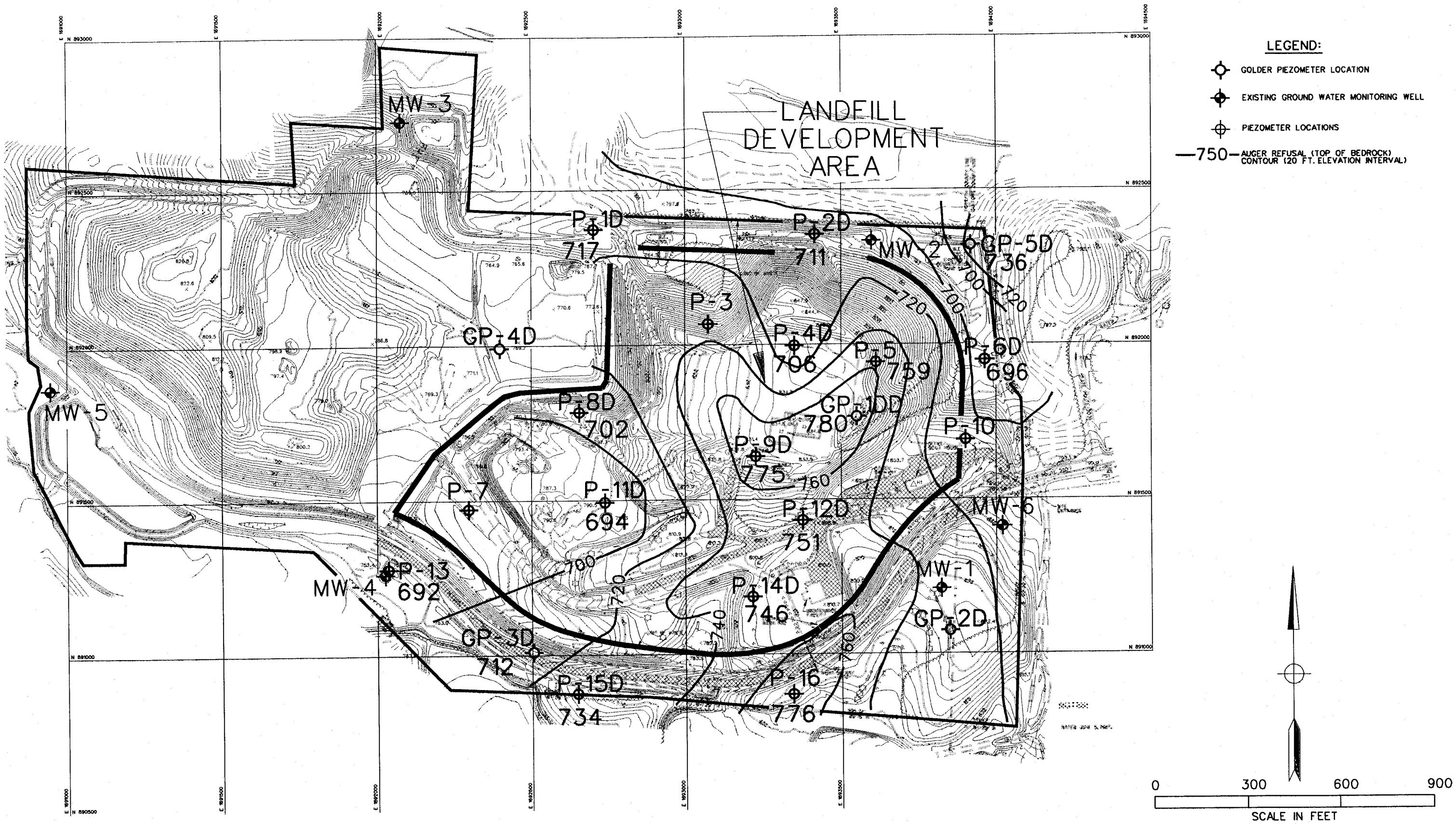
RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-5D
HYDROGEOLOGIC SECTION D-D'

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221ND4A.DGN



RUST ENVIRONMENT & INFRASTRUCTURE

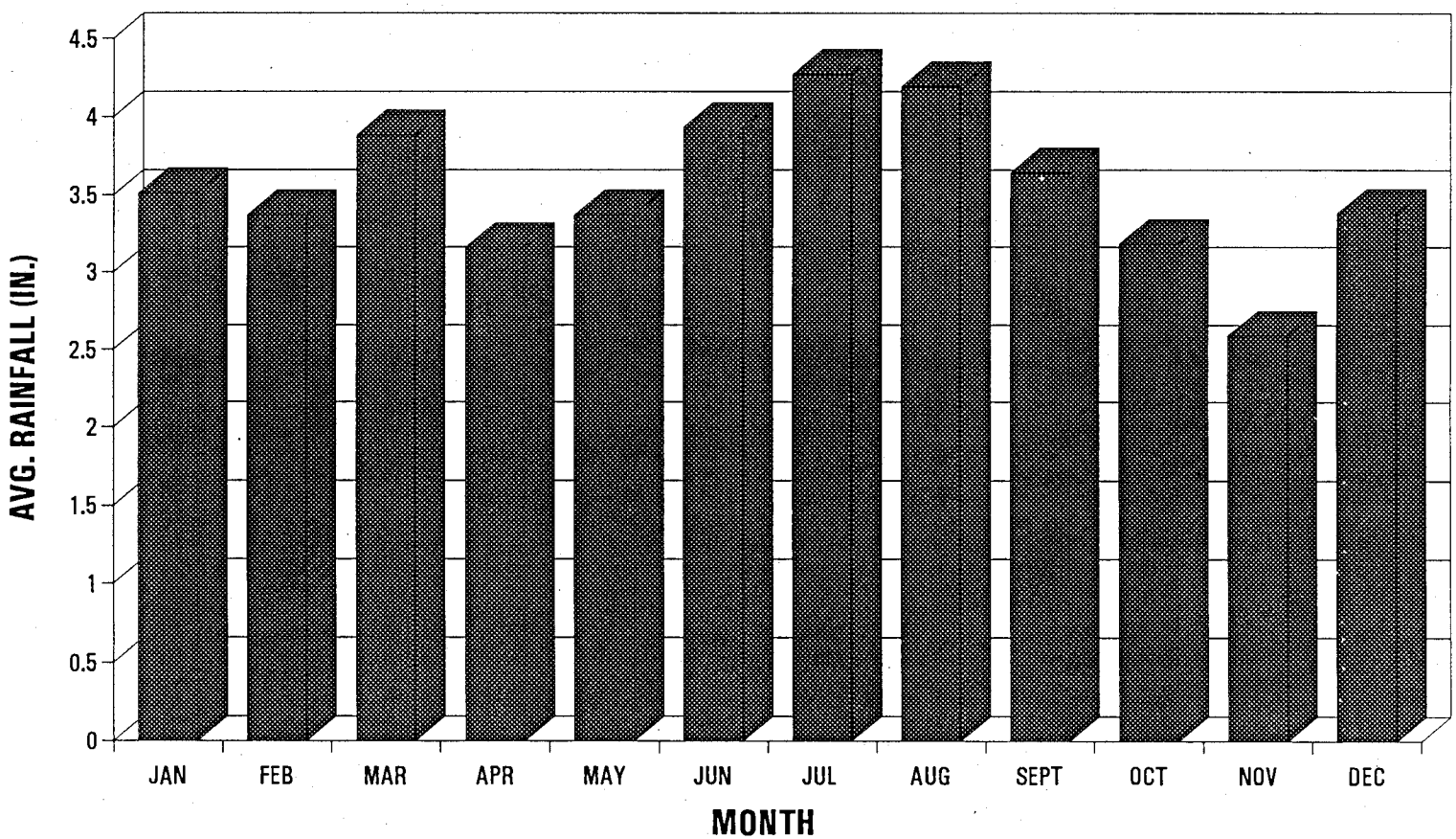
FIGURE 2-6
TOP OF BEDROCK

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221ROCK.DGN

30 YEAR AVERAGE MONTHLY RAINFALL
GREENSBORO, NC AIRPORT



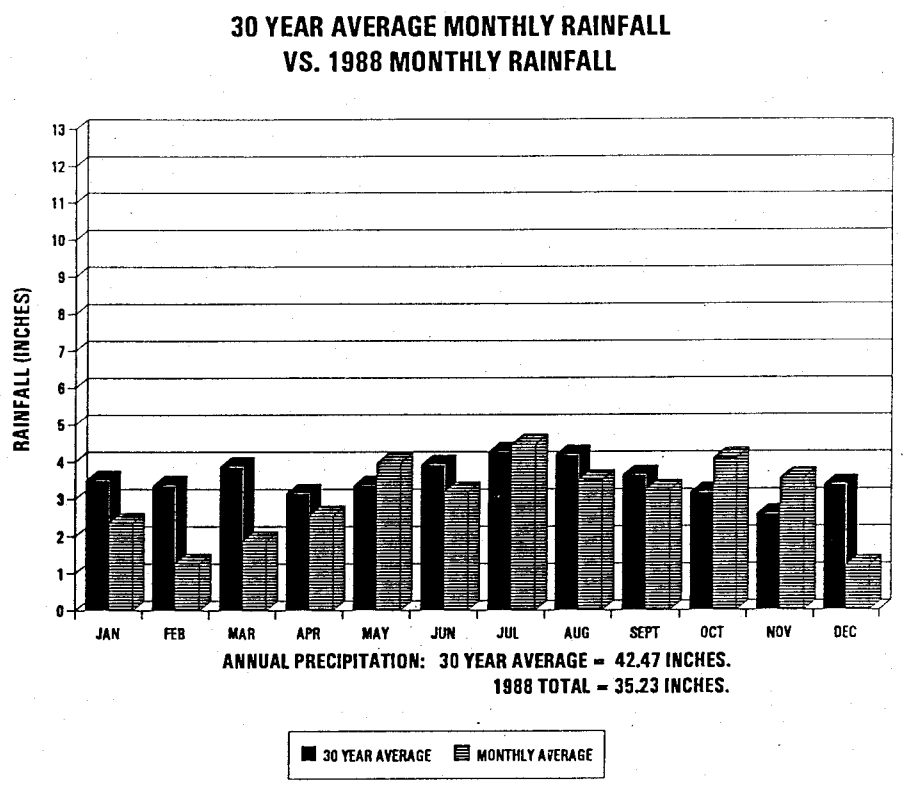
PLOTTED DATA REPRESENTS A 30 YEAR AVERAGE FROM 1951 THROUGH 1980.
30 YEAR AVERAGE = 42.47 INCHES.

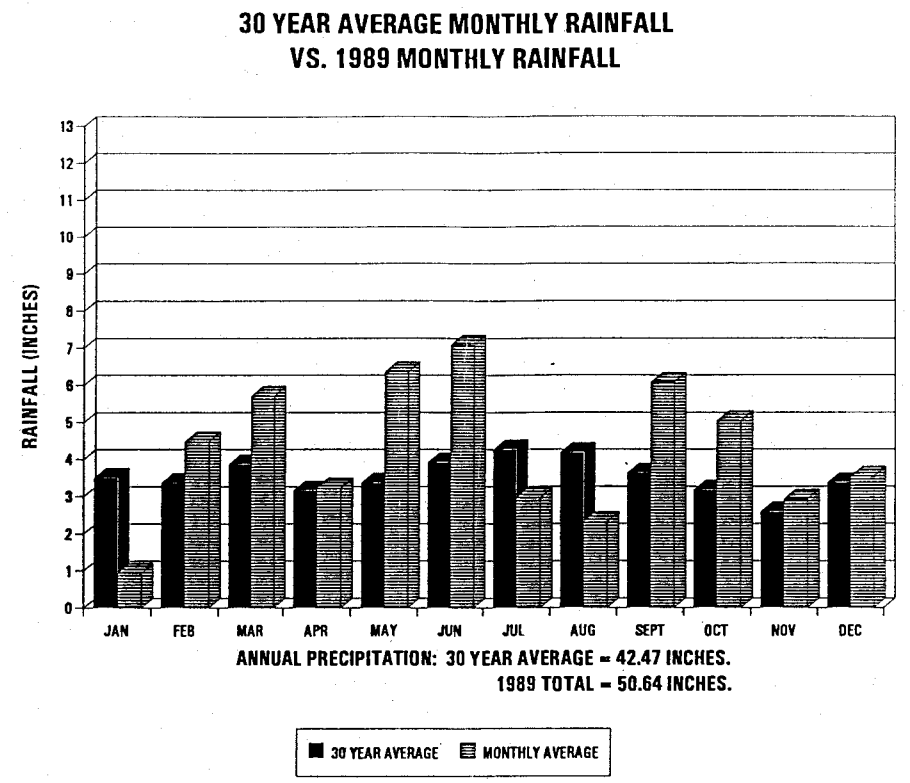
RUST ENVIRONMENT & INFRASTRUCTURE

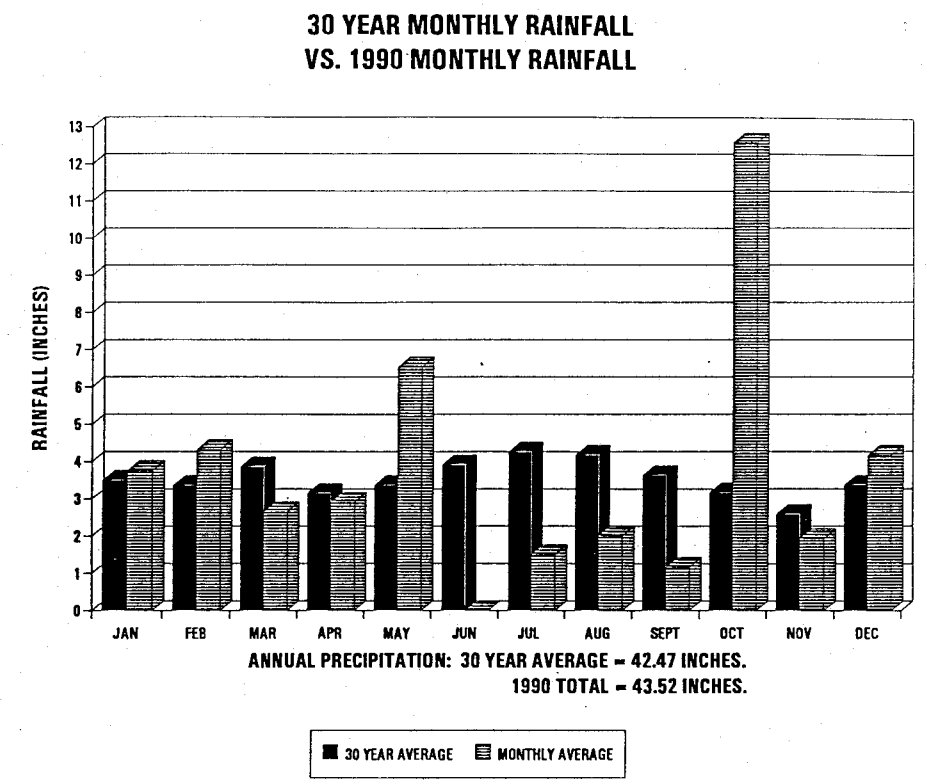
FIGURE 2-7
30-YEAR AVERAGE MONTHLY RAINFALL

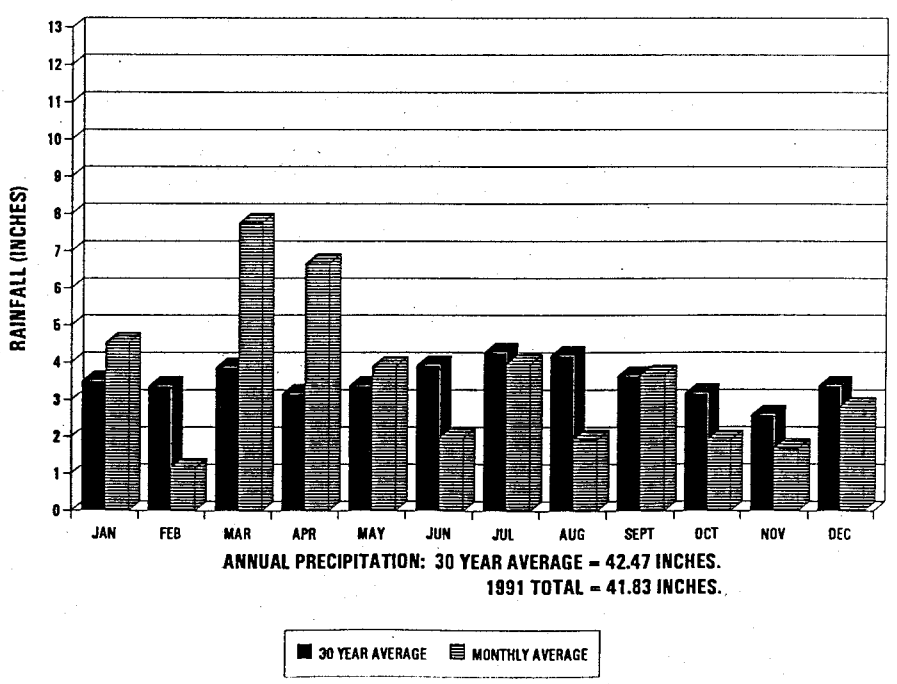
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

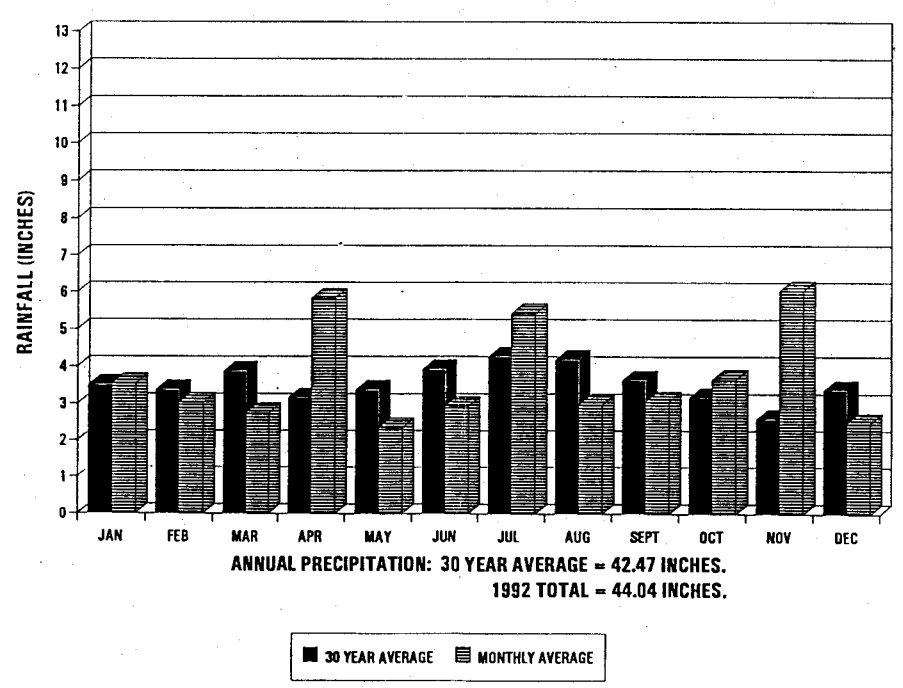
Project No. 87221.800

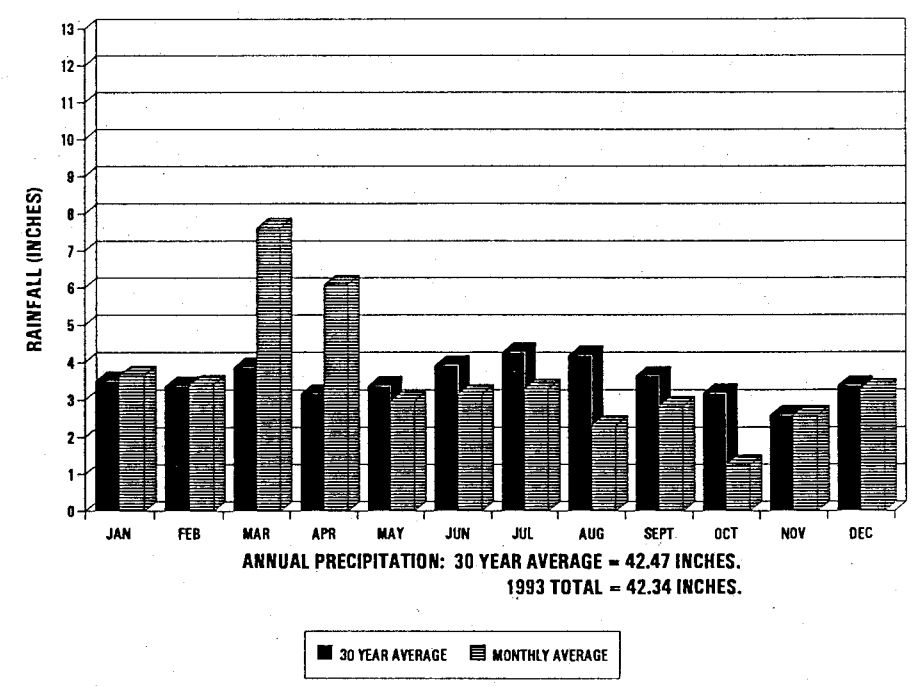










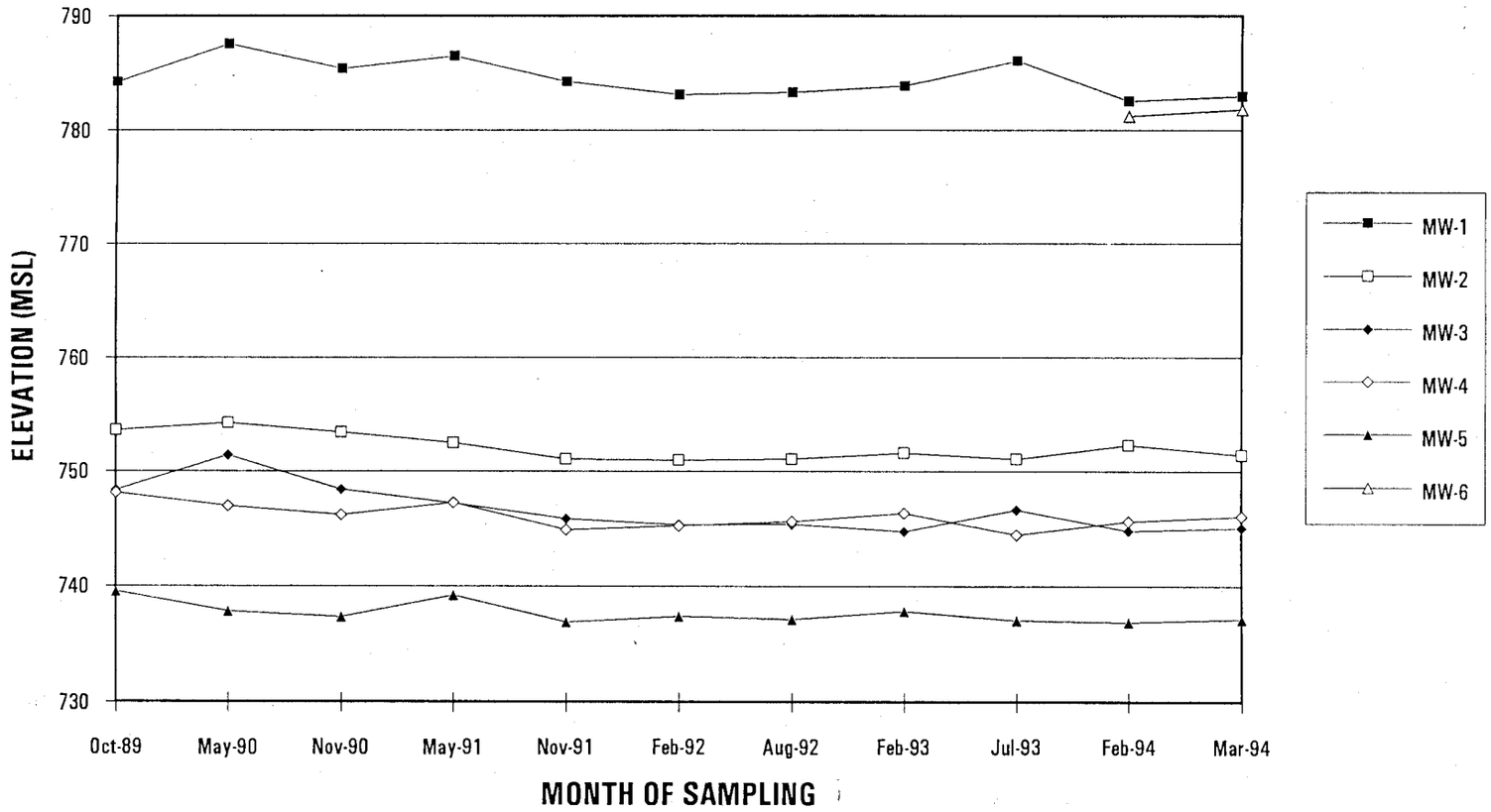


RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-8
ANNUAL PRECIPITATION FOR 1988 THROUGH 1993 VERSUS 30-YEAR AVERAGE
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

PIEDMONT LANDFILL AND RECYCLING CENTER
MONITORING WELL WATER LEVELS



YEARLY PRECIPITATION SUMMARY

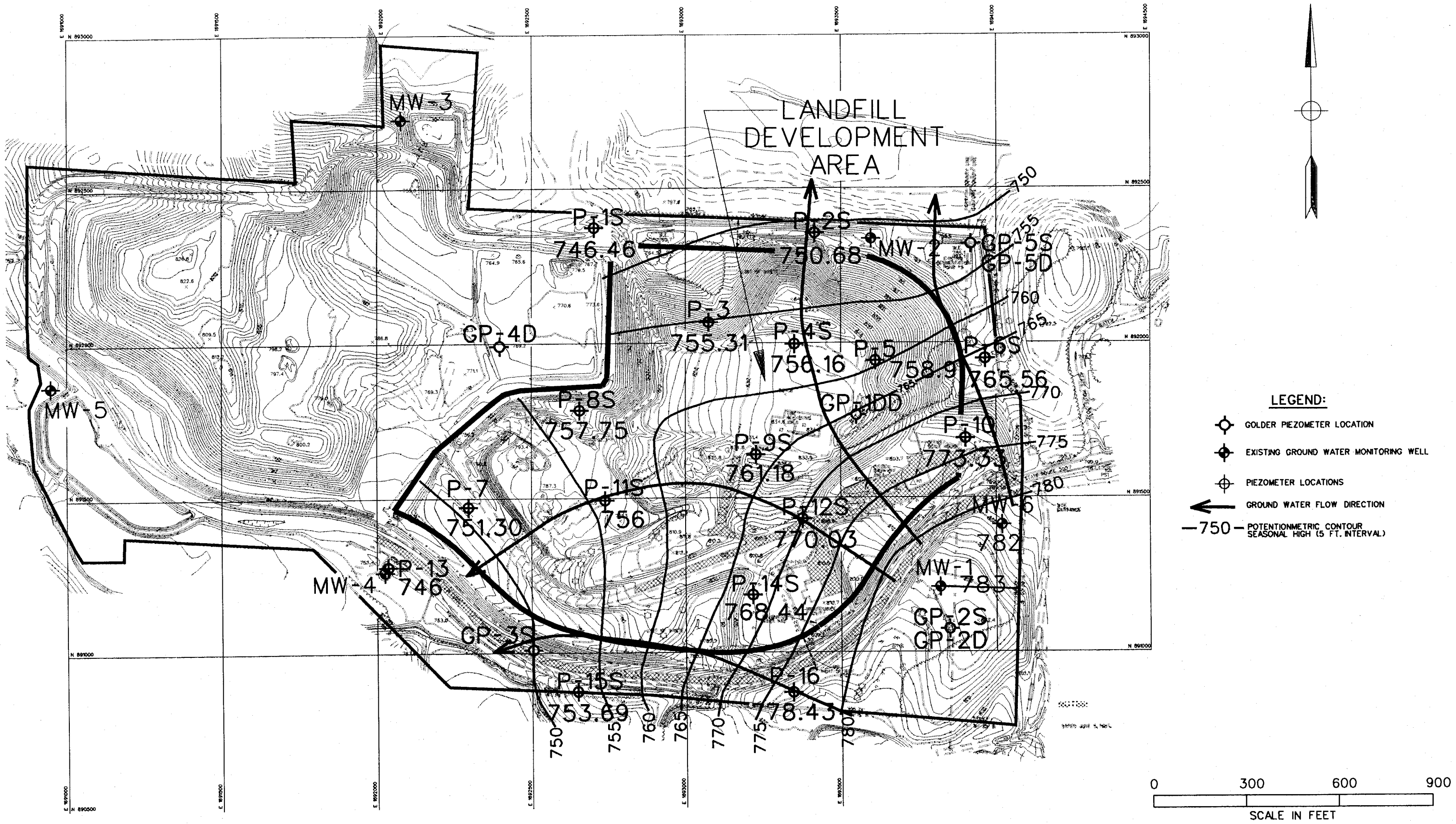
YEAR	YEARLY PRECIPITATION (IN)	DEPARTURE FROM AVERAGE (IN)
1989	50.64	8.17
1990	43.52	1.05
1991	41.83	-0.64
1992	44.04	1.57
1993	42.34	-0.13

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-9
MONITORING WELL WATER LEVELS

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-10
POTENTIOMETRIC MAP
(MARCH 18, 1994)
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

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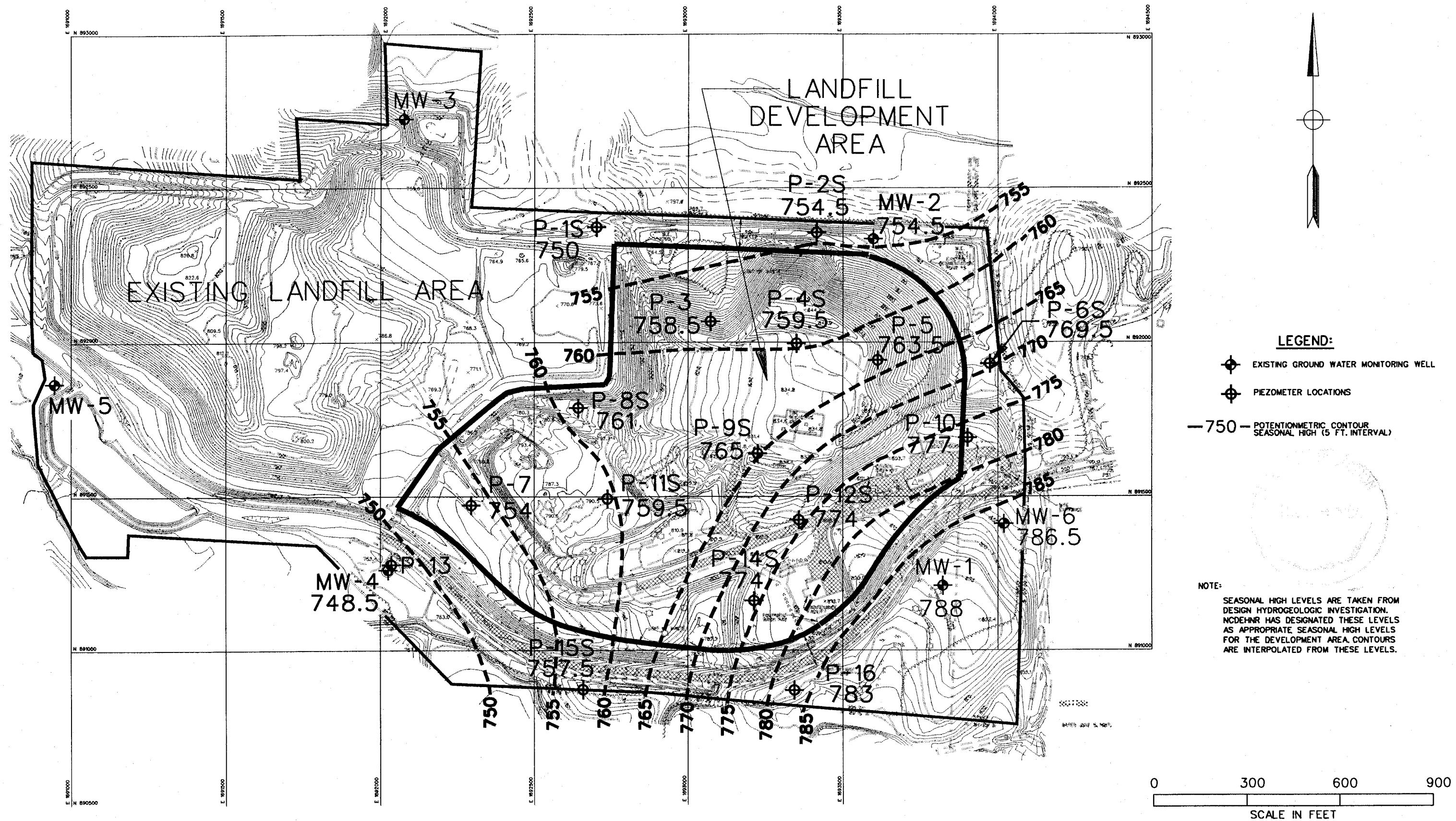
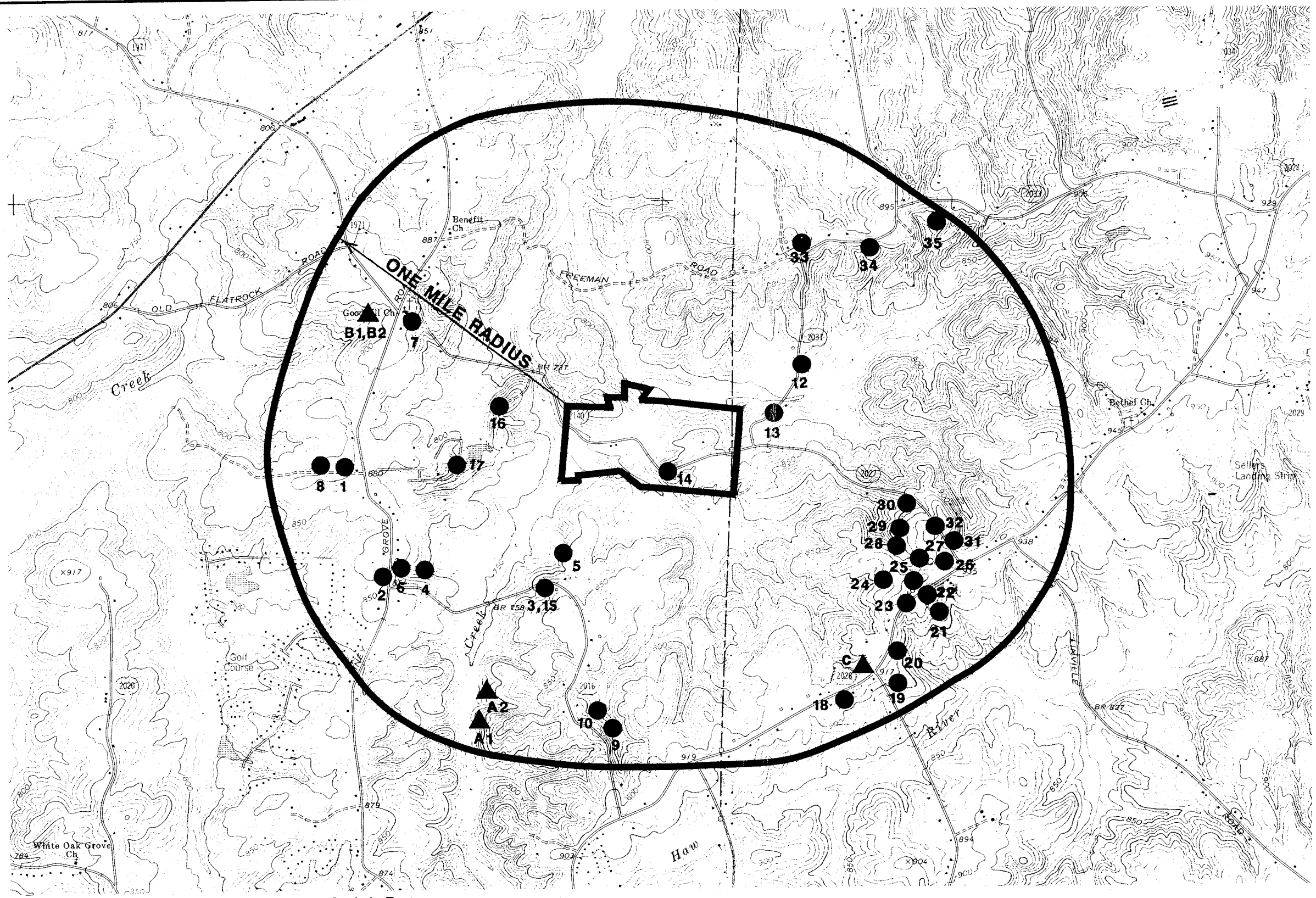


RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-10A
SEASONAL HIGH
POTENTIOMETRIC MAP
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221HWT5.DGN



Note:
Well locations were determined through search of private and public water supply records of Forsyth County and Guilford County. Figure includes well locations identified by Golder [1988].

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-11
WELL INVENTORY

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

Section 3

3.0 MONITORING SYSTEM PLAN

3.1 Evaluation of Existing Monitoring System

3.1.1 Number and Location of Monitoring Wells

Ground water monitoring is currently being performed at six monitoring wells (MW-1 through MW-6) in order to evaluate ground water chemistry and flow within the uppermost aquifer. The locations of these monitoring wells are illustrated in Figure 3-1. Monitoring wells MW-1 and MW-6 provide the upgradient background data while the others serve as downgradient locations. At present, monitoring wells MW-3, MW-4, and MW-5 monitor the transition area while wells MW-2 and MW-4 monitor the landfill development area. The depth of the individual wells was designed to intercept the uppermost water bearing zone as determined during the previous site hydrogeological studies [Golder, 1987, 1988].

In accordance with Rule .1631(a)(2)(A), each of the existing monitoring wells at the site are located no more than 250 feet from a proposed waste boundary. All wells are at least 50 feet inside the facility property boundary, except for monitoring wells MW-2 and MW-5, which are 47 feet and 38 feet inside the property boundary, respectively.

3.1.2 Design of Wells

Well construction techniques that were used for the existing monitoring wells, and will be used for the proposed wells, were designed to maintain the integrity of the borehole, minimize the introduction of extraneous materials, provide representative ground water samples from the monitored aquifer, minimize maintenance, and prevent entry of surface water into the well. The materials used for well construction have been selected on the basis of strength, resistance to corrosion, low interference with the parameters of interest, cost, and compatibility with the drilling method employed. Existing monitoring wells were designed and constructed in general accordance with the applicable North Carolina Well Construction Standards as codified in 15A NCAC 2C .0108 and the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities. These wells were approved by the N.C. Department of Solid Waste Management as part of the Solid Waste Permit.

The existing ground water monitoring wells were installed in accordance with the following procedures: all monitoring wells consisted of two-inch ID, schedule 40 PVC pipe with threaded connections; the screen consisted of a five-foot section of PVC pipe with 0.010-inch wide slots; the screen was centered in the borehole, and a filter pack consisting of 20/40 clean sand was placed around the screen up to a minimum of two feet above the screen for MW-1 through MW-5 and up to 1.2 feet for MW-6 with an additional 0.8 feet of fine sand above this sand; a seal consisting of one quarter inch bentonite pellets was installed with at least a minimum thickness of 2

feet immediately above the filter pack; an approximately 0.5 to 1.0 foot thick layer of fine sand was then placed above the seal and; a cement/bentonite grout mixture was tremied into place above this latter sand. Similar materials and construction techniques will be used for the construction of the three proposed monitoring wells. Existing monitoring well construction details are included in Appendix C. Table 3-1 is a construction summary for existing monitoring wells MW-1 through MW-6.

The design and construction of the existing monitoring wells at the site deviate slightly from the State recommendations. These deviations are as follows:

- MW-6 contains a 0.8-foot layer of 80/100 fine sand above the filter pack sand and below the bentonite seal to reduce the likelihood of bentonite migration into the filter pack;

- the filter pack extends between 2.5 and 3.5 feet above the slotted screen in wells MW-1 through MW-5 which is greater than the specified maximum of 2 feet;

- a layer of sand 0.4 to 1.0-foot in thickness was placed above the seal and below the grout in each of the wells to reduce the likelihood of grout migration into the seal and filter pack;

- screened intervals are 5 feet which is less than the specified 10-foot interval; and,

- the wells do not bracket the water table.

These deviations will not adversely affect the quality of the samples obtained from these wells and in some cases may actually enhance the integrity of the wells. It is therefore concluded that these wells have been designed and constructed in a fashion that allows them to be included within this WQMP.

Monitoring wells MW-1 through MW-5 were installed during July and August 1989 while MW-6 was installed in August, 1993. Development of the wells occurred soon after installation. The wells were developed primarily with a manually operated 1-1/4-inch diameter positive displacement pump. A manual bailer was used for part of the development of MW-1 and MW-6..

Each existing monitoring well installed at the PLRC has been accurately surveyed by a North Carolina Registered Land Surveyor. The horizontal location of each well has been determined to the nearest 0.1 foot. The vertical control for the ground surface near each well and the measuring reference point on the top of the inner well casing has been determined to the nearest 0.01 foot. All new wells will be similarly surveyed.

3.1.3 Maintenance of Wells

Periodic reviews of monitoring well maintenance are conducted at the PLRC. The following items are specifically evaluated during the reviews:

- that surface water is diverted away from the well head;
- the concrete pad is intact and free of cracks;
- surface water does not undercut the concrete pad;
- the outer protective casing is secure and locked;
- the well identification tag is present and legible;
- the inner well casing is firmly grouted in place;
- the inner and outer well casings are upright and unobstructed;
- a weep hole is bored in the outer casing to eliminate water collecting within the outer casing;
- monitoring wells are accessible to four-wheel drive vehicles;
- the inner well casings have vented caps; and
- monitoring wells are visible to, and adequately protected from, moving equipment.

If any of the above listed items are shown to be lacking during the review, it is brought to the attention of the landfill manager and repairs or corrections are promptly made. The existing monitoring wells onsite have thus far been adequately maintained and are suitable for inclusion in this WQMP.

3.1.4 Surface Water Monitoring

Samples are currently analyzed from five offsite surface water monitoring locations to assess surface water conditions in the vicinity of the PLRC as required by the solid waste permit. The surface water monitoring locations, which cover both upgradient and downgradient monitoring points on both the north and south unnamed tributaries of East Belews Creek, are illustrated on Figure 3-2. Since these two tributaries are the only discharge features for the site, it is assessed that the current surface water monitoring locations are adequate and should be retained for this WQMP without modification.

3.1.5 Leachate Monitoring

A leachate collection system has been installed within the existing landfill phases to remove leachate. The leachate is pumped from the collection sumps to above ground storage tanks where it is periodically removed for treatment and disposal at a permitted offsite facility.

Leachate samples will be obtained from the leachate collection system periodically and submitted for analysis of the Appendix I parameters.

3.2 Proposal for Upgraded Monitoring System

The proposed ground water monitoring system for this WQMP includes both existing wells as well as additional proposed wells. The locations of these wells are shown in Figure 3-1.

Existing wells MW-1 and MW-6 serve as background wells for the Transition WQMP [RUST E&I, 1994]. Since these wells are also located upgradient from the landfill development area as shown on Figure 3-1, they will also serve as background wells for this WQMP.

Existing downgradient wells MW-3, MW-4, and MW-5 were specifically designated as monitoring wells for the existing landfill area within the Transition WQMP. In addition, the Transition WQMP proposed three additional monitoring wells (MW-7, MW-8, and MW-9) in order to comply with recent changes to the monitoring requirements as stipulated by the new regulations. Although the existing and proposed downgradient monitoring wells listed above are considered part of the Transition WQMP, it is evident from the potentiometric surface shown in Figure 3-1 that existing well MW-4 and proposed well MW-7 will also monitor ground water flow travelling beneath the future development area. MW-4 monitors a southwestward component of flow from the development area while MW-7 will monitor a small northwest component of ground water flow. Therefore adequate monitoring coverage of ground water flowing from the transition area is provided by the Transition WQMP.

In order to increase monitoring coverage of the landfill development area to satisfy the requirements of the current regulations, three additional monitoring locations are proposed to complement existing well locations. The proposed locations (MW-10, MW-11, and MW-12) are shown in Figure 3-1. Each of the three proposed locations will include wells to monitor the upper aquifer that will be screened across the water table.

One existing well location (MW-4) and two proposed well locations (MW-11 and MW-12) are recommended to include a well located deep within the saprolite since the site exhibits a consistent downward flow gradient. These wells will be able to detect potential contaminants that may be pulled down into the aquifer. Since in-situ permeability values appear to be less within the competent bedrock than in the saprolite/partially weathered rock, it is recommended that the deep wells be set just above the saprolite/partially

weathered rock contact with competent bedrock. This is the lowest extent that potential contamination is anticipated to be drawn. This would require installing two additional deep wells (MW-11D and MW-12D) and redesignating existing piezometer P-13, which was installed during the Design Hydrogeologic Investigation, as MW-4D. Piezometer P-13 was installed in accordance with the N.C. Well Construction Standards, 15A NCAC 2C .0108.

The locations of these proposed wells have been selected to provide lateral and vertical coverage of the uppermost aquifer in order to detect potential releases from the Phase 3 expansion. The proposed monitoring wells (MW-10, MW-11, MW-11D, MW-12, and MW-12D) will be installed following approval of this WQMP by the Division of Solid Waste Management (Division). The wells associated with the existing landfill area are described in detail within the Transition WQMP and will be installed following Division approval.

The locations of the proposed wells shown on Figure 3-1 are approximate and are subject to favorable well installation conditions. Each of the wells will be within 250 feet of the final waste boundary and approximately 50 feet within the facility property boundary, thus satisfying the criteria established under 15A NCAC 13B .1631.

The upgraded monitoring system will provide downgradient wells spaced at adequate intervals to detect a possible release of leachate from the landfill. These locations are based on assessing aquifer thickness, ground water flow rate, ground water flow direction including seasonal and temporal fluctuations in ground water flow, and properties of the unsaturated and saturated geologic units.

Proposed monitoring wells MW-10, MW-11, and MW-12 will be screened across the water table. Each of these wells will possess a 15-foot slotted screen that will be installed so that the water table always falls within the screen. The top of the slotted well screen will be installed just above the level of the estimated seasonal high water table. The two proposed deep wells (MW-11D and MW-12D) will be constructed with a 10-foot slotted screen installed just above auger refusal. Existing deep well MW-4D has been constructed similarly. The proposed wells will be designed in general accordance with the requirements of the N.C. Well Construction Standards, 15A NCAC 2C .0108.

Each of the monitoring wells will be surveyed by a North Carolina Registered Land Surveyor. Survey data will be tied to the onsite benchmark. Horizontal control will be at least to the nearest 0.1 foot. Vertical control will be at least to the nearest 0.01 foot. A vertical control shall be established for a measuring reference point on the top of the inner well casing of each well. The location of each well will be identified in NCSP coordinates, consistent with Rule .1624(b)(6). Monitoring wells will be identified in the field with an ID number which is consistent with the well completion records or the monitoring system plan. The wells will also be located and properly identified on the facility map.

Once the new monitoring wells are installed and developed, baseline sampling of the new wells will commence. Baseline sampling is discussed in Sections 1.5 and 4.1.

Table 3-1R

Monitoring Well Construction Summary

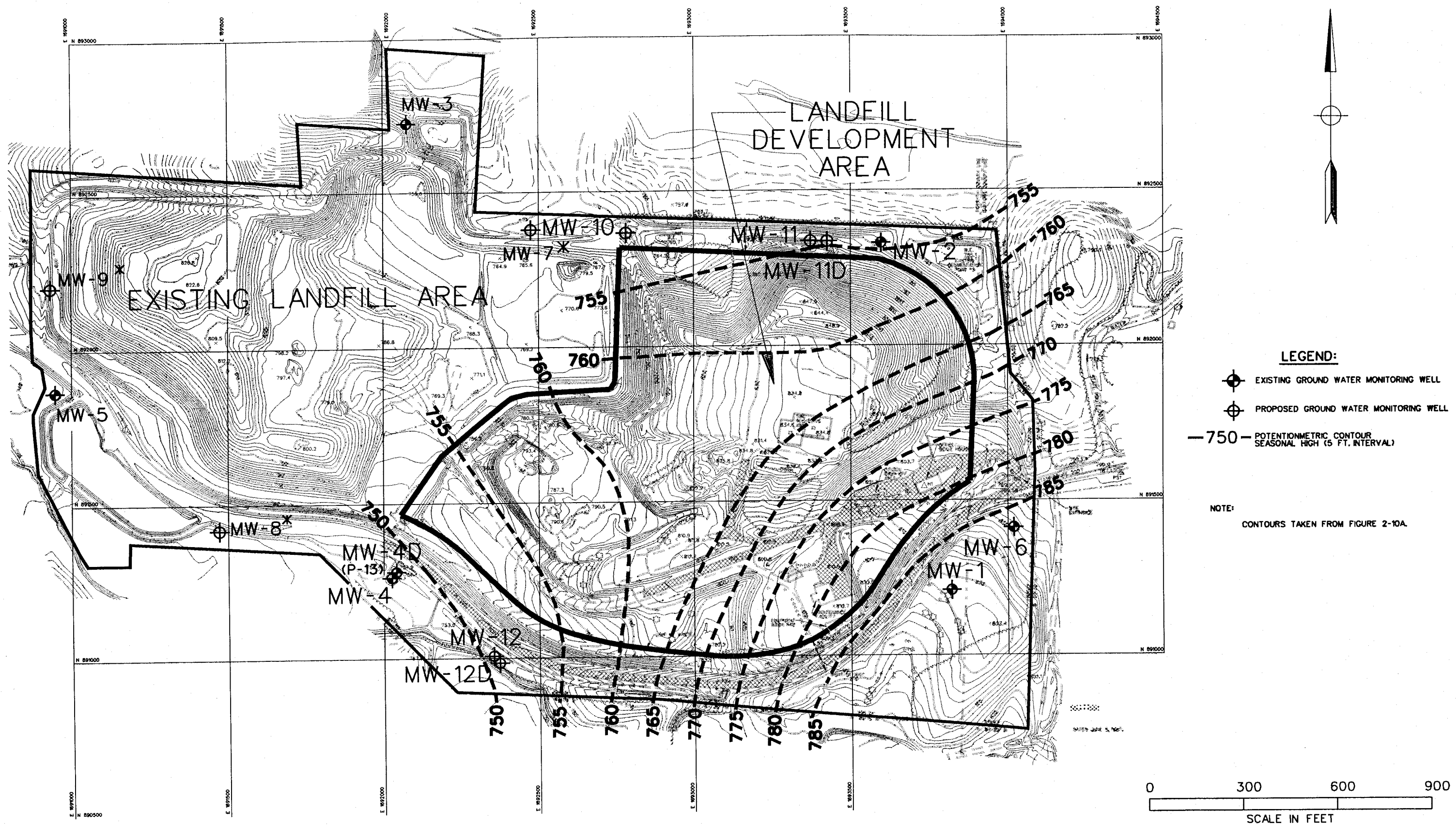
WMI Well ID No.	Coordinates	Ground Elevation (ft. msl)	Internal Casing Material	Internal Casing Dia. (in.)	Top of Internal Casing (ft. msl)	Internal Casing Length (ft.)	Internal Casing Stick-up (ft.)	Top of Screen Elevation (ft. msl)
MW-1	N891210.07 E1693821.85	821.4	PVC	2	823.93	46.6	2.6	777.33
MW-2	N892336.89 E1693597.61	767.34	PVC	2	770.16	23.2	.82	746.96
MW-3	N892723.56 E1692075.85	767.3	PVC	2	770.08	35.5	2.78	734.58
MW-4	N891261.29 E1693597.61	754.46	PVC	2	756.92	23.0	2.46	733.92
MW-5	N891866.18 E1690947.65	740.37	PVC	2	743.17	17.45	2.8	725.72
MW-6	N891410.86 E1694018.30	798	PVC	2	800.82	23.9	2.82	776.92

WMI Well ID No.	Bottom of Screen Elevation (ft. msl)	Screen Length (ft.)	Screen Material	Gradient	Well Depth (ft.)	Completion Date	Drilling Firm	Drilling Method
MW-1	772.33	5	PVC	UP	49	8/5/89	GOLDER	HSA/AR**
MW-2	741.96	5	PVC	DOWN	25.5	8/7/89	GOLDER	HSA
MW-3	729.58	5	PVC	DOWN	38	8/8/89	GOLDER	HSA
MW-4	728.92	5	PVC	DOWN	27	8/3/89	GOLDER	HSA
MW-5	720.72	5	PVC	DOWN	20.5	8/6/89	GOLDER	HSA
MW-6	771.92	5	PVC	UP	26.8	8/4/93	ECS*	HSA

Notes: * Environmental Construction Services, Inc.
** HSA = Hollow Stem Auger, AR = Air Rotary

WMI Well ID No.	Development Method	Sand Length (ft.)	Length of Filter Sand Above Packing (ft.)	Length of Bentonite Seal (ft.)	Length of Filter Sand Above Seal (ft.)	Type of Grout	Grout Length (ft.)
MW-1	B/HP*	8.5	NA**	2.8	0.7	BC***	34
MW-2	B/HP	8.0	NA	3	0.5	BC	11
MW-3	B/HP	8.4	NA	2.6	1	BC	23.6
MW-4	B/HP	8.3	NA	2.7	0.4	BC	10
MW-5	B/HP	8.5	NA	2.2	0.8	BC	7
MW-6	B/HP	7.1	0.8	3.3	0.6	BC	12.6

Notes: * B = Bailer, HP = Hand Pump
** NA = Not Applicable
*** BC = Bentonite/Cement Grout



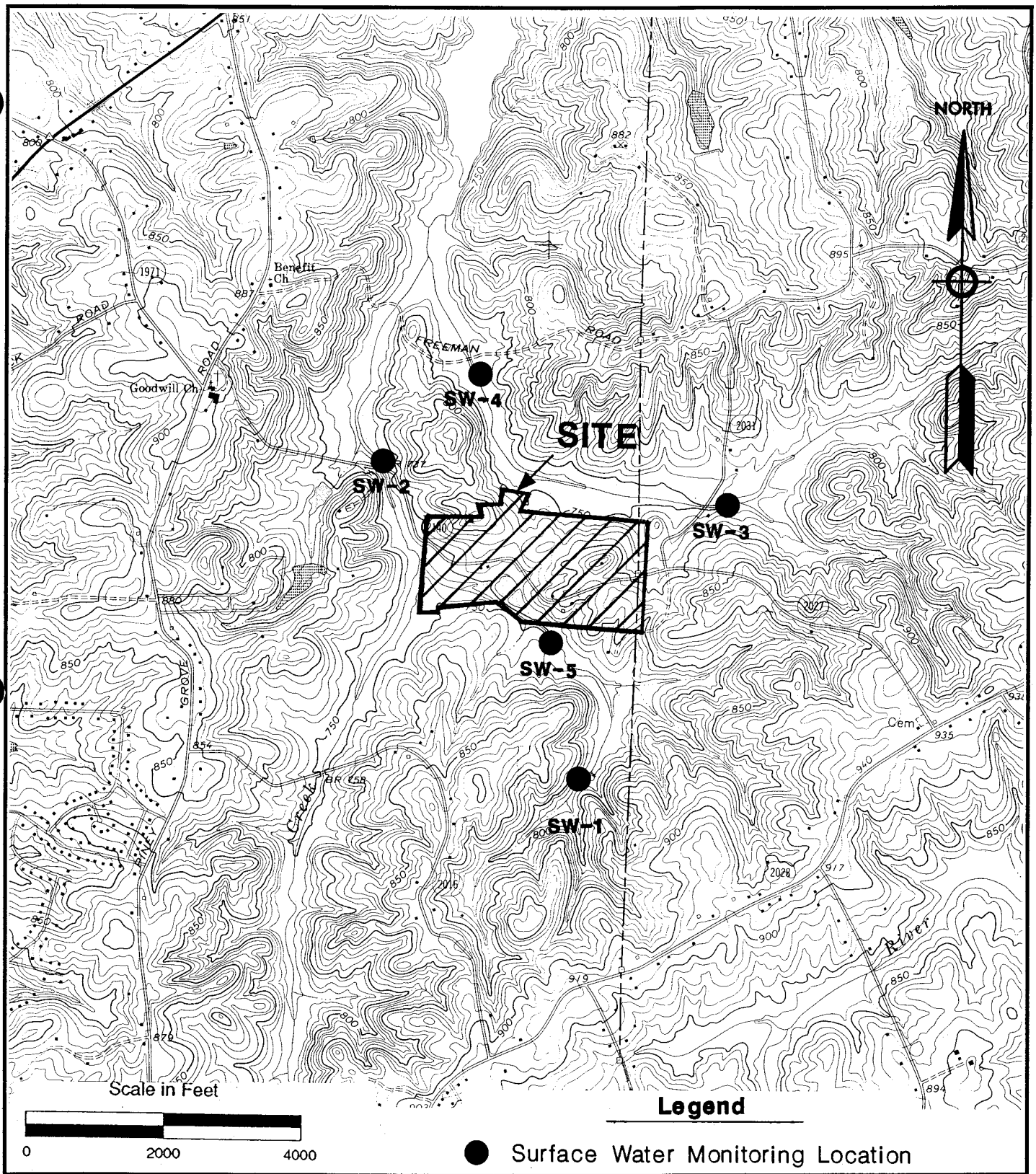
* THESE MONITORING WELLS HAVE BEEN PROPOSED IN THE TRANSITION WATER QUALITY MONITORING PLAN TO MONITOR THE EXISTING LANDFILL AREA.

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-1
EXISTING AND PROPOSED
MONITORING WELL LOCATIONS
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221HWT6.DGN



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-2
SURFACE WATER MONITORING LOCATION MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill And Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

Section 4

4.0 SAMPLING AND ANALYSIS PLAN

The Sampling and Analysis Plan for the unconstructed portion of the PLRC is designed to adhere to applicable regulatory requirements. The goals of the plan are to provide representative environmental samples from the site; to maintain the integrity of the samples during collection, shipping, and laboratory analysis; and to report and evaluate the results of the analyses in a meaningful and timely manner.

Sampling and analysis at the PLRC will be coordinated by the Environmental Monitoring Coordinator for the landfill:

Edward Gibson
Piedmont Landfill and Recycling Center
9900 Freeman Road
Kernersville, NC 27284
(919) 595-6677

4.1 Monitoring Requirements

Following approval of the upgraded monitoring system for the site and installation of the new monitoring wells, baseline sampling will be initiated. The baseline sampling will consist of four independent sampling events consisting of four separate sampling episodes. See Section 1.5 above specific schedule months. The baseline sampling program shall include, in addition to field parameters, monitoring for the constituents listed in Appendix I of 40 CFR Part 258 - "Appendix I Constituents for Detection Monitoring". The Appendix I constituents are included in Appendix D of this WQMP. Field parameters will include pH, temperature, and specific conductivity. Once baseline sampling of the wells is complete, sampling will be conducted semiannually. A report on the baseline sampling that includes the results of the chemical analysis, well information, groundwater calculations and the statistical analysis will be submitted to the Division within six months of the date that the permit to operate is issued.

Water quality samples obtained at the PLRC site will be analyzed in accordance with the North Carolina Subtitle D Rules (15A NCAC 13B .1633). Detection monitoring will be performed for all of the ground water monitoring wells that are included in the PLRC monitoring system. In addition, the five surface water sampling points will be monitored. These latter sampling points are the same as those that have been proposed under the Transition WQMP. A single surface water sampling event will therefore satisfy the requirements of both this WQMP and the Transition WQMP. The detection monitoring program shall include both the field parameters noted above for baseline sampling and the Appendix I parameters. Detection monitoring sampling shall be conducted semiannually during the life of the facility, including the closure and post-closure care period. At least one sample from each monitoring well and surface water monitoring station shall be collected and analyzed during each semiannual sampling event.

The rate and direction of ground water flow will be determined each time the ground water

is sampled. The hydraulic conductivity of formation materials for the screened interval of each monitoring well will be determined by slug tests if such information is not currently available. Effective porosities of the formation materials will be estimated based on drilling information and geotechnical testing results. The top of the inner well casing of each new well will be accurately surveyed in accordance with Rule .1632(d)(1) in order to determine ground water flow gradients and flow directions. This information will be provided in the report of the baseline sampling due by October 9, 1995.

Whenever a statistically significant increase over background concentrations has been detected for one or more of the constituents listed in Appendix I of 40 CFR Part 258, or whenever one or more of the Appendix I constituents is in violation of the North Carolina ground water quality standards (15A NCAC 2L, 0202), the following actions will be taken:

(1) The Division will be notified within 14 days of the finding and a notice will be placed in the operating record indicating which constituents have shown statistically significant changes from background levels.

(2) An assessment monitoring program meeting the requirements of 15A NCAC 13B.1634 will be established within 90 days except as provided for in 15A NCAC 13B .1633(c)(3).

Within 90 days of triggering an assessment monitoring program, and annually thereafter, the ground water will be sampled and analyzed for all the constituents identified in Appendix II of 40 CFR Part 258 - "Appendix II List of Hazardous Inorganic and Organic Constituents". The Appendix II constituents are included in Appendix E of this Water Quality Monitoring Plan. A minimum of one sample from each downgradient well will be collected and analyzed during each assessment sampling event.

Within 90 days of finding that any of the constituents listed in Appendix II of 40 CFR Part 258 have been detected at a statistically significant level exceeding the ground water protection standards, an assessment of corrective action measures will be initiated. Such an assessment will be completed within a reasonable period of time. The assessment will be conducted in accordance with 15A NCAC 13B .1635.

Based on the results of the corrective measures assessment, a remedy shall be selected that, at a minimum, meets the standards listed in 15A NCAC 13B .1636(b). Within 14 days of selecting a remedy, an application to modify the permit describing the selected remedy to the Division of Solid Waste Management for evaluation and approval. The selection of a remedy will be conducted in accordance with 15A NCAC 13B .1636.

Implementation of any corrective action program will be based on the approved schedule for initiation and completion of remedial activities. Implementation will proceed in accordance with 15A NCAC 13B .1637.

4.2 Sampling and Analysis Procedures

Sampling at the PLRC is performed by a sampling team under contract to the PLRC. The team has been trained to comply with the required protocol as outlined by this plan.

4.2.1 Sampling Equipment and Containers

The PLRC sampling system dedicates all purging and sampling equipment to the well, thus preventing any potential cross contamination between wells that may otherwise occur using conventional water sampling practices. Dedicated pumps such as Well Wizard™ pumps are used to purge the wells and to obtain the samples. Division approval is requested to install dedicated sampling equipment within the new monitoring wells that are proposed for the landfill development area. If the dedicated sampling equipment becomes inoperable, then stainless steel or Teflon bailers will be used for sampling.

Since multiple analyses will be required, different types of sample containers and preservatives will be necessary. In these situations, multiple pre-labeled containers will be supplied by the laboratory for each sampling point. The appropriate preservatives will be attached to the bottle in small vials or will have been added to each container (as required) during sample bottle preparation by the analytical laboratory. The acid requirements, containers, preservatives, and holding times will be in accordance with the procedures specified in the current US-EPA, Environmental Services Division, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM). Relevant portions of the EPA document are included in Appendix F.

Immediately after collection, bottles will be placed in insulated shuttles or coolers with ice packs and sealed for shipment to the laboratory. At the present time, the DSWM requires that the laboratory used shall be certified in groundwater analysis (15A NCAC 2H .0800). The PLRC currently uses Environmental Laboratory, Inc. (EML), Geneva, IL in providing the required analysis. EML, Inc. is certified in other States for groundwater analysis and at the present time is seeking North Carolina certification by way of reciprocity. Since all of the past groundwater and surface water analysis has been performed by Environmental Laboratory, Inc., the PLRC will continue to use this laboratory provided it becomes certified in the above mentioned program by April 9, 1995. If EML is not certified by this date, an appropriately certified lab will be used.

Samples will arrive within 48 hours of collection. Signed Chain-of-Custody and Field Parameter forms will be placed inside the sample shipping containers. Examples of these field forms are included in Appendix G.

4.2.2 Equipment Cleaning Procedures

Since dedicated sampling equipment is requested for each of the monitoring wells included in this WQMP, equipment cleaning will be kept at a minimum. Should equipment cleaning be required, however, only laboratory cleaning will be allowed. Field cleaning of bailers will not be permitted. The following procedure will be followed for undedicated stainless steel items:

- wash with phosphate-free soap and tap water;
- rinse with tap water;
- rinse with deionized or distilled water;
- rinse with isopropyl alcohol;
- rinse again with deionized or distilled water;
- let air dry; and
- securely wrap to prevent contamination before use.

Procedures to be followed for undedicated Teflon equipment are as follows:

- wash with phosphate-free soap and tap water;
- rinse with tap water;
- rinse with 10% nitric acid or 10% hydrochloric acid;
- rinse with deionized or distilled water;
- rinse with isopropyl alcohol;
- rinse again with deionized or distilled water;
- let air dry; and
- securely wrap to prevent contamination before use.

Bailer line, if required, will consist of either Teflon coated wire, single strand stainless steel wire, other monofilament line, or nylon rope. New segments of bailer line will be used at each well location.

4.2.3 Purging Procedures

The equivalent of three to five standing water volumes, measured from the water surface to the base of the well, are evacuated from the well prior to sampling to assure that samples are representative of the water within the aquifer and are not comprised of stagnant water left in the well between sampling events. If the well is purged dry, then a sample may be obtained upon recharge. If a monitoring well does not recharge within a reasonable time after purging (24 hours), the well is considered dry for the sampling event.

The standing water volume within a well may be calculated from the following equation:

$$V = (\pi D^2/4)(L)(1ft^2/144in^2)(7.48gal/1ft^3)$$

where; V = standing water volume (gallons);
D = inside diameter of well (inches); and,
L = length of water column in well (feet).

4.2.4 Sample Collection Procedures

General procedures that are to be followed prior to sample collection at each monitoring well are as follows. Upon arrival at the well location, observe and record the condition of the well and its surrounding area on the Monitoring Well Integrity Field Survey Form. A sample of this form is included in Appendix G. Information to be noted includes:

- the condition of the well's identification sign;
- condition of the locking cap and lock;
- well integrity, including condition of well's concrete pad and protective casing. In addition, note physical surroundings, obstructions or kinks in well casing, water in annular space, grease around the top of the well or on the threaded cap, etc.;
- evidence of contamination; and,
- the condition of any guard posts, if installed;

Prior to ground water purging and sample withdrawal, an accurate water level measurement device, such as a portable electric tape or a conventional fiberglass tape, shall be used to measure the water level in each well. The water level measurement is recorded on the Field Parameter Form.

Specific conductance, pH, and ground water temperature measurements are taken subsequent to well purging. Procedures provided with the measuring instruments will be used for calibration and testing. All results will be recorded on the Field Parameter Form.

If the values of the field parameters are not within the normal range, the Environmental Monitoring Coordinator or landfill manager will be notified immediately as it may be necessary to resample. The initial sample will not be discarded. Additional samples may be requested by the Environmental Monitoring Coordinator to ascertain the cause of abnormal readings.

All water quality samples obtained as part of the PLRC water quality monitoring program will not be field filtered in accordance with State guidelines. The PLRC may obtain filtered samples for its own use.

4.2.5 Field QA/QC Procedures

Blanks will be obtained during each sampling event in order to assess the integrity of the collected samples. One trip blank per sampling event will be collected. If non-dedicated equipment is used for ground water sampling, then one equipment blank will also be collected for each day that ground water monitoring wells are sampled. Trip blanks will be analyzed for the Appendix I volatile organic contaminants only. Equipment blanks, if required, will be analyzed for all of the constituents that are being analyzed in the ground and surface water quality samples.

All sampling procedures, measurements, and observations will be recorded on the Field Forms (Field Parameter and Chain-of-Custody). The following information will be documented on the Field Forms:

- facility site name, sample point identification number, and other pertinent identifiers;
- depth to ground water;
- information regarding purging the well prior to sampling;.
- date and elapsed time from the start of sampling to the finish (if elapsed hours are greater than one);
- sampling method -- Well Wizard™, bailer, or other method;
- field test results, including pH, temperature, and specific conductance;
- type of sample and necessary treatment (e.g., filtering, if necessary);

- field observations (e.g., well condition);
- appearance of sample (i.e., color, turbidity, sediment, or oil on surface); and,
- Sampler's identity and signature.

As part of the Chain-of-Custody procedure, each sample container will be labeled with the sample number and the parameter(s) to be sampled. At the time each sample is taken, a Chain-of-Custody Form will be completed and placed in the sample chest. A sample Chain-of-Custody Form is included in Appendix G. Upon transfer of sample possession to subsequent custodians, the Chain-of-Custody form will be signed by a person taking custody of the sample container. Upon receipt of the sample at the laboratory, the date and time of arrival will be noted on the Chain-of-Custody forms. The shipping container seal will then be broken and the condition of samples, including temperature, will be recorded by the receiver. The Chain-of-Custody records will be included in the analytical report prepared by the laboratory, and will be considered an integral part of that report.

Records of all ground water and surface water monitoring information required by this document will be maintained in the site Operating Record. Records of monitoring information will include:

- the date, exact place, and time of sampling or measurements;
- the individual(s) who performed the sampling or measurements;
- the date(s) analyses were performed;
- the individual(s) who performed the analyses;
- the analytical techniques or methods used (including equipment used); and,
- the results of such analyses.

This WQMP, as well as the analytical results for each sampling event, are kept onsite.

4.2.6 Laboratory QA/QC Procedures

All water quality analyses will be performed by a certified laboratory under strict adherence to a Quality Assurance Program Plan (QAPP). The laboratories will be certified to perform analyses for the Appendix I constituents.

The laboratory will maintain a record of laboratory sample receipt, storage, and analysis procedures for each sample received. A summary of this record will be part of the Laboratory Analysis Report..

The analytical detection limits of constituents that will be monitored within the ground water and the surface water at the PLRC are those specified in Table 4-1R. Detection limits utilized for each parameter are identified on the analytical reports provided by the laboratory.

Methodologies for the organic analysis will be SW-846 GC/MS (8240 or 8260).

The EML presently coordinates the analyses of the samples taken at the PLRC. The present EML contact is:

Kyle Dardis
2100 Clearwater Drive
Geneva, Illinois 60134-4100
(708) 208-3126

4.3 Data Evaluation

The method of statistical analysis and the selection of parameters to routinely statistically analyze at PLRC is currently being evaluated to ensure that potential contamination can be identified and that natural background concentrations do not produce false indications of contamination. The Division was notified in an April 15, 1994 letter that the PLRC intends to use prediction limits for its statistical analysis.

Statistically significant increases over background levels or exceedences of surface or ground water standards will be reported to the following State address:

Mr. Robert Lutfy
NC Dept. of Environment, Health, & Natural Resources
Solid Waste Section
401 Oberlin Road
Raleigh, NC 27605

Table 4-1R

ANALYTICAL PQLs

Parameter	PQL, in ppb
Antimony	30
Arsenic	10
Barium	500
Beryllium	2
Cadmium	1
Chromium	10
Cobalt	10
Copper	200
Lead	10
Nickel	50
Selenium	20
Silver	10
Thallium	10
Vanadium	40
Zinc	50

APPENDIX I ORGANIC CONSTITUENTS

ORGANIC CONSTITUENT	PQL (UG/L)	ORGANIC CONSTITUENT	PQL (UG/L)
(16) ACETONE	100	(40) T-1,3-DICHLOROPROPENE	10
(17) ACRYLONITRILE	200	(41) ETHYLBENZENE	5
(18) BENZENE	5	(42) METHYL BUTYL KETONE	50
(19) BROMOCHLOROMETHANE	5	(43) METHYL BROMIDE	10
(20) BROMODICHLOROMETHANE	5	(44) METHYL CHLORIDE	10
(21) BROMOFORM	5	(45) METHYLENE BROMIDE	10
(22) CARBON DISULFIDE	100	(46) METHYLENE CHLORIDE	10
(23) CARBON TETRACHLORIDE	10	(47) MEK: 2-BUTANONE	100
(24) CHLOROBENZENE	5	(48) METHYL IODIDE	10
(25) CHLOROETHANE	10	(49) METHYL ISOBUTYL KETONE	100
(26) CHLOROFORM	5	(50) STYRENE	10
(27) CHLORODIBROMOMETHANE	5	(51) 1,1,1,2-TETRACHLOROETHANE	5
(28) DBCP	25	(52) 1,1,2,2-TETRACHLOROETHANE	5
(29) ETHYLENE DIBROMIDE	5	(53) TETRACHLOROETHYLENE	5
(30) O-DICHLOROBENZENE	5	(54) TOLUENE	5
(31) P-DICHLOROBENZENE	5	(55) 1,1,1,-TRICHLOROETHANE	5
(32) T-1,4-DICHLORO-2-BUTENE	100	(56) 1,1,2-TRICHLOROETHANE	5
(33) 1,1-DICHLOROETHANE	5	(57) TRICHLOROETHYLENE	5
(34) ETHYLENE DICHLORIDE	5	(58) CFC-11	5
(35) VINYLIDENE CHLORIDE	5	(59) 1,2,3-TRICHLOROPROPANE	15
(36) CIS-1,2-DICHLOROETHENE	5	(60) VINYL ACETATE	50
(37) T-1,2-DICHLOROETHENE	5	(61) VINYL CHLORIDE	10
(38) PROPYLENE DICHLORIDE	5	(62) XYLENES	5
(39) CIS-1,3-DICHLOROPROPENE	10		

ALSO KNOWN AS: (21)-TRIBROMOMETHANE, (25)-ETHYL CHLORIDE, (26)-TRICHLOROMETHANE, (27)-DIBROMOCHLOROMETHANE, (28)-1,2-DIBROMO-3-CHLOROPROPANE, (29)-1,2-DIBROMOETHANE, (30)-1,2-DICHLOROBENZENE, (31)-1,4-DICHLOROBENZENE, (33)-ETHYLIDENE CHLORIDE, (34)-1,2-DICHLOROETHANE, (35)-1,1-DICHLOROETHENE (ETHYLENE), (36)-CIS-1,2-DICHLOROETHYLENE, (37)-TRANS-1,2-DICHLOROETHYLENE, (38)-1,2-DICHLOROPROPANE, (42)-2-HEXANONE, (43)-BROMOMETHANE, (44)-CHLOROMETHANE, (45)-DIBROMOMETHANE, (46)-DICHLOROMETHANE, (47)-METHYL ETHYL KETONE, (48)-IODOMETHANE, (49)-4-METHYL-2-PENTANONE, (53)-TETRACHLOROETHENE, PERCHLOROETHYLENE, (55)-METHYLCHLOROFORM, (57)-TRICHLOROETHENE (58)-TRICHLOROFLUOROMETHANE

Section 5

5.0 CERTIFICATION

This Water Quality Monitoring Plan for the unconstructed portion of the PLRC is certified to provide an effective early detection of a release of hazardous constituents from the landfill to the uppermost aquifer, so as to be protective of public health and the environment.

Peter J. Walls
N.C. Professional Geologist
Temporary Registration - Letter dated 2/24/94

State of North Carolina
North Carolina Board for Licensing of Geologists
P.O. Box 27402 • Raleigh, North Carolina 27611
(919) 850-9669 • Fax (919) ~~872-1598~~

February 24, 1994

Peter J. Walls
RUST Environment & Infrastructure
15 Brendan Way
Greenville, SC 29615

Dear Mr.Walls:

Your request for a temporary permit for geological work in North Carolina has been received.

The material seems to be in order and you are granted a temporary registration not to exceed 90 days of work within a calendar year.

Sincerely,

Robert M. Upton
Administrator

cc: Arthur Mouberry
Dept. Environment, Health
& Natural Resources

Section 6

6.0 REFERENCES

Bouwer, H., "*The Bouwer and Rice Slug Test - An Update*", Ground Water Journal #3, pp. 304-309, 1988.

Bouwer, H., and Rice, R., "*A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells*", Water Resource Research, Vol. 12, No. 3, pp. 423-428, 1976.

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Price, L.K., "*Some Preliminary Results of Reconnaissance Geologic Mapping in the Inner Piedmont of Spartanburg County, South Carolina*", South Carolina Geological Survey Open File Report, 1989.

RUST Environment & Infrastructure, Inc., "*Transition Water Quality Monitoring Plan, Piedmont Landfill and Recycling Center, Kernersville, North Carolina*", March 1994A.

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US Dept. of Agriculture, "*Soil Survey of Forsyth County, North Carolina*", May 1976.

US EPA, Environmental Services Division, "*Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*", February 1991.

US EPA, "*Solid Waste Disposal Facility Criteria*", 40 CFR Parts 257 and 258, Federal Register, Vol. 56, No. 196, October 9, 1991.

Waste Management of Carolinas, Inc., "*Site-Specific Groundwater Monitoring Plan for Piedmont Landfill & Recycling Center*", January 1993.

Waste Management of Carolinas, Inc., "*Site-Specific Groundwater Monitoring Plan for Piedmont Landfill & Recycling Center*", January 1993.

Appendix A

APPENDIX A: LETTER FROM THE DIVISION OF SOLID WASTE MANAGEMENT

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

James B. Hunt, Jr., Governor

Division of Solid Waste Management
Telephone (919)733-0692

Jonathan B. Howes, Secretary

August 17, 1993

Mr. William R. Lewis
Piedmont Sanitary Landfill
9900 Freeman Road
Kernersville, N.C. 27284

Re: Implementation Of Subtitle 'D' Ground-water Monitoring Program

Dear Mr. Lewis,

The purpose of this correspondence is to provide information and clarification on the changes in ground-water monitoring requirements for MSWLF facilities that remain in operation after October 9, 1993. The proposed North Carolina Solid Waste Management Rules reflect significant changes for ground-water monitoring based on requirements of the E.P.A. Subtitle D Rules.

Attachment A to this letter provides a summary of important dates and significant activities that must be accomplished in order to be in compliance with the new rules. Attachment B contrasts existing and proposed ground-water monitoring and assessment requirements based on changes in the rules. Increases in costs will be incurred in order to operate a MSWLF under the new Subtitle D Rules, including financial assurance and increased costs for ground-water monitoring and assessment.

When the new rules take effect, MSWLF facilities that have violations of the North Carolina Groundwater Quality Standards or facilities that show a significant statistical increase in the level of any Appendix I constituent will be required to implement assessment monitoring for all Appendix II constituents. Since the Groundwater Quality Standards are also used in establishing the ground-water protection standards, MSWLF facilities with violations may also move into assessment of corrective action alternatives based on a full-scale ground-water investigation to determine the nature and extent of contamination at the site.

P.O. Box 27687, Raleigh, North Carolina 27611-7687 Telephone 919-733-4984 Fax # 919-733-0513

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If W.M.I. chooses to continue to operate their MSWLF facility after October 9, 1993, then you need to begin planning and budgeting immediately for the activities outlined in Attachment A. A revised Water Quality Monitoring Plan must be submitted as part of the Transition Plan on or before April 9, 1994. All background sampling and related activities for the upgraded monitoring system must be completed and reported to the Division in order to demonstrate compliance with the new water quality monitoring requirements on or before October 9, 1994.

I hope this letter has been helpful in providing you more insight into the actions that will be required by W.M.I. to maintain compliance with the water quality monitoring requirements of the Solid Waste Management Rules as we make the transition to the new rules growing out of the E.P.A. Subtitle D Regulations. If you have any questions or comments regarding this letter, please contact the Solid Waste Section at (919) 733-0692.

Sincerely,

Bobby Lutfy

Bobby Lutfy, Hydrogeologist

Solid Waste Section

cc: Brent Rockett

(34-06)
Attachments

ATTACHMENT A

Important dates and significant activities that must be accomplished in order to be in compliance with the new rules on ground-water monitoring at MSWLF facilities:

April 9, 1994: A Water Quality Monitoring Plan that fulfills the requirements of the new Solid Waste Management Rules must be submitted to the Division as part of the Transition Plan on or before April 9, 1994.

October 9, 1994: Compliance with the new ground-water monitoring requirements must be demonstrated to the Division on or before October 9, 1994. In order to demonstrate compliance, the MSWLF owner or operator must perform the following activities and provide documentation to the Division.

1. Upgrade the ground-water monitoring system so that it meets the criteria of the new rules for monitoring systems. Rule .1631

   (a) Monitoring wells shall be installed at the relevant point of compliance based upon the waste boundaries established on October 9, 1993. - Rule .1631(a)(2)

   (b) Monitoring wells shall be designed and constructed in accordance with the applicable North Carolina Well Construction Standards as codified in 15A NCAC 2C. - Rule .1631(b)

2. In order to accurately determine ground-water elevations for each monitoring well, the wells shall have been accurately surveyed by a North Carolina Registered Land Surveyor. - Rule .1632(d)(1)

3. In order to determine the rate of ground-water flow, the owner or operator shall provide data for hydraulic conductivity and porosity for the formation materials at each of the well locations. - Rule .1632(d)(2)

4. A minimum of four independent samples from each well (background and downgradient) shall be collected and analyzed for the Appendix I constituents during the first semiannual sampling event. - Rule .1633(b)

5. The owner or operator shall determine whether or not there is a statistically significant increase over background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the MSWLF unit. - .1632(i)

ATTACHMENT B

Contrasts between the existing and the new ground-water monitoring and assessment requirements based on changes in the Solid Waste Management Rules. All MSWLF units that are in operation on or after October 9, 1993, will be subject to the new rules.

EXISTING RULES	NEW RULES
Detection monitoring:	
Monitoring frequency: Semiannual monitoring	Monitoring frequency: Semiannual monitoring
Monitoring parameters: 23 landfill constituents	Monitoring parameters: Appendix I constituents
Data evaluation based on: N.C. Groundwater Quality Standards	Data evaluation based on: N.C. Groundwater Quality Standards and statistical increase over background levels
st Closure Monitoring:	
Length of time: 5 years and reevaluate need for further monitoring	Length of time: 30 years and reevaluate need for further monitoring
Monitoring parameters: 23 landfill constituents & occasional VOCs	Monitoring parameters: Appendix I constituents
Data evaluation based on: N.C. Groundwater Quality Standards	Data evaluation based on: N.C. Groundwater Quality Standards and statistical increase over background levels
Assessment monitoring and ground-water investigations:	
Monitoring parameters: 23 landfill constituents, VOCs, semi-VOCs	Monitoring parameters: Appendix II constituents (213 constituents)
Data evaluation based on: N.C. Groundwater Quality Standards	Data evaluation based on: N.C. Groundwater Quality Standards and statistical increase over background levels
Greater flexibility	Flexibility more limited

ADDENDUM TO APPENDIX A

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

JUN 29 1994

June 24, 1994

TO: MSWLF Owners And Operators

FROM: Solid Waste Section

RE: Baseline Water Quality Sampling At Municipal Solid Waste Landfill Facilities

The Solid Waste Section is revising the schedule on baseline water quality sampling and analysis at MSWLF units. Only one of the four independent sampling events required as part of the baseline sampling event will be required prior to October 9, 1994. There is also a revision in the Laboratory Certification requirements. Additional clarifications on sampling analytical methods and reporting limits and statistical analysis are also provided in this memorandum.

BASELINE SAMPLING:

The Solid Waste Management Rules, 15A NCAC 13B .1630(b)(3), require that "For existing MSWLF units, compliance with the ground-water monitoring requirements shall be demonstrated to the Division on or before October 9, 1994." Past directives, as indicated in the letters sent this past summer (1993) to all MSWLF owner/operators regarding "Implementation of Subtitle D Ground-water Monitoring Program," indicated that the baseline sampling of four independent sampling events must be completed and reported to the Division by October 9, 1994. **This directive is being revised in that only the initial sampling of the four independent sampling events that make up the baseline sampling will be required prior to October 9, 1994.** The initial sampling event done to demonstrate compliance should include:

- information on monitoring well construction of newly installed wells,
- information on hydraulic conductivity, porosity, and effective porosity for each monitoring well,
- calculations of ground-water flow directions and rates for each well, and
- results of the initial sampling analysis.

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The complete baseline sampling results including sampling analysis results for the four independent sampling events shall be completed and reported to the Division on or before April 9, 1995. The four independent sampling events shall be scheduled so that seasonal ground-water variability will be represented by initial samples taken during the seasonal low water table conditions in August or September and the forth set of samples taken during the seasonal high water table conditions in February or March. Ground-water flow direction and rate information shall be provided for each of the four sampling events.

LAB CERTIFICATION REQUIREMENTS:

In the past the Solid Waste Section has required sample analysis at "a State Certified Drinking Water Laboratory". Recently the Division of Environmental Management has established a laboratory certification program for groundwater analysis (15A NCAC 2H .0800). The Solid Waste Section will require future water quality sample analysis to be done by laboratories certified under the Division of Environmental Management (DEM) Certification program.

SAMPLING ANALYTICAL METHODS AND REPORTING LIMITS:

Each parameter on the Appendix I constituent list shall be certified at the following level and an appropriately certified method used for the sample analysis. The data shall be reported at the specified Practical Quantitation Limit (PQL).

Parameter	Certification by DEM	PQL in ppb
Antimony	Metals, Group II - low level	30
Arsenic	Metals, Group I - low level	10
Barium	Barium (20)	500
Beryllium	Metals, Group I - low level	2
Cadmium	Metals, Group I - low level	1
Chromium	Metals, Group I - low level	10
Cobalt	Metals, Group I - low level	10
Copper	Metals, Group I - regular level	200
Lead	Metals, Group I - low level	10
Nickel	Metals, Group I - regular level	50
Selenium	Metals, Group I - low level	20
Silver	Metals, Group II - low level	10
Thallium	Metals, Group II - low level	10
Vanadium	Metals, Group I - low level	40
Zinc	Metals, Group I - regular level	50

For the parameters and PQLs required for volatile organic analysis of Appendix I constituents, refer to the attachment at the end of this memorandum. For Appendix I organic analysis the laboratory shall be certified for an SW-846 GC/MS Method (8240 or 8260). The recommended method of analysis is EPA Method 8260.

SAMPLING AND ANALYSIS:

In addition to sampling for the Appendix I constituents, all sampling should also include field testing of pH, temperature, and specific conductivity. EPA requires analysis for total metals. No filtering of samples is allowed. The 3030C preparation method for metals analysis is not allowed.

STATISTICAL ANALYSIS:

INORGANIC CONSTITUENTS - Since many of the inorganic constituents are naturally occurring, it is critical that sufficient spacial and seasonal variability be considered in the determination of the background values for these constituents. This is one of the reasons the Division is extending the period of time to complete the four independent samples. The rules require analysis for total metals concentrations. Therefore it will be very important that sampling and analysis be done correctly and the data be properly analyzed statistically.

ORGANIC CONSTITUENTS - Since organic constituents are man-made chemical compounds, there should not be any of these compounds present in the ground water in the background monitoring wells (unless there is some other source of organic contamination in the vicinity). Therefore if four independent samples are analyzed, all of the data should be reported at levels below the detection limits. When statistical analysis is done, any detected amount for any organic constituent would constitute a statistical increase. Therefore, if the MSWLF unit owner/operator is willing to accept any detected amount for any organic constituent as a statistical increase (unless it can be demonstrated to be sampling or analysis error), then there is no need to sample four times to establish background values for the organic constituents. Only one sampling for the organic constituents is sufficient to establish background values (unless anything is detected). This method of comparing organic data to the detection limit is a simple form of statistical analysis that is protective of human health and the environment.

TRANSITION PLANS:

Baseline sampling should not begin until the Solid Waste Section takes action on the Transition Plan by approving the Monitoring System Plan or by issuing some interim authorization to proceed with the upgrade of the monitoring system and the baseline sampling of the monitoring wells. Each MSWLF owner/operator should receive a letter within the next few weeks that addresses these issues. If you have any questions regarding this memorandum, please contact Bobby Lutfy, Solid Waste Section, at (919) 733-0692.

Appendix B

APPENDIX B: SOLID WASTE PERMIT

AMENDMENT TO PERMIT NO. 34-06
DATE ISSUED 06-17-92

STATE OF NORTH CAROLINA

DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

DIVISION OF SOLID WASTE MANAGEMENT

P.O. BOX 27687 RALEIGH, NC 27687

S O L I D W A S T E P E R M I T

Waste Management of Carolinas, Incorporated

is hereby issued a permit to construct and operate a

SANITARY LANDFILL

located

on Freeman Road, Kernersville, N.C.

in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. This facility is described by the legal description incorporated in the original permit issued February 23, 1989.

James C Coffey

James C. Coffey, Supervisor
Permitting Branch
Solid Waste Section
Division of Solid Waste Management

AMENDMENT TO PERMIT NO. 34-06
DATE ISSUED 06-17-92

SOLID WASTE PERMIT

(PERMIT TO CONSTRUCT & OPERATE)

CONDITIONS OF PERMIT:

GENERAL

✓ 1. This amendment to permit shall not be effective unless the certified copy is filed in the Register of Deeds Office, in the grantor index under the name of the owner of the land in the county or counties in which the land is located. After recordation, the certified copy shall be returned to the Solid Waste Section and shall have indicated on it the page and book number, date of recordation, and Register's seal.

N/A ✓ 2. When this property is sold, leased, conveyed or transferred, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument a statement that the property has been used as a sanitary landfill.

N/A 3. The original permit issued 23 Feb 89 describes the approved plan and conditions for construction of Phase I, Modules 1 & 2. The amendment to permit issued 10 Dec 90 describes the approved plan and conditions for construction of Phase I, Modules 5 & 6.

This amendment to permit describes the approved plan and conditions for: (a) construction and operation of Phase II, Modules 1, 2, & 3 and subsequent modules; (b) operation and closure of the landfill and on-site support facilities, including the constructed modules (Phase I, Modules 1, 2, 5, & 6). The approved plan is described by Attachment 1, "List of Documents for the Approved Plan". Where discrepancies may exist, the Conditions of this Permit shall govern. Some components of the approved plan are reiterated in the Conditions of Permit.

N/A 4. Prior to receiving waste in a newly constructed module(s), the pre-operative requirements described in Construction Condition 3.g. shall be met.

N/A 5. Construction of Phase II, Modules 1, 2, & 3 are explicitly approved for construction; development of subsequent modules/areas will require the permittee to notify the Division of Solid Waste Management (DSWM) 180 days prior to the scheduled date of construction. DSWM will provide a written response to the notification within 30 days of receipt. The pre-construction notification shall include:

a. modules to be constructed;
b. anticipated schedule for construction and operation; and
c. proposed modifications for stormwater segregation, leachate management, and construction quality assurance.

6. This permit will be subject to review every five years as per 15A NCAC 13B .0201(c), according to the issuance date of the original permit (23 Feb 89). Upcoming amendents to the N.C. Solid Waste Management Rules, in accordance with the new 40 CFR Part 258 requirements, may necessitate modifications to this facility prior to the review date.

7. This permit is not transferable.

CONSTRUCTION

1. Construction of the landfill and stormwater, leachate, and gas management facilities shall be in accordance with the approved plan and as specified herein. Construction of the landfill systems shall be in accordance with the following conditions:

   a. The components of the engineered systems shall be constructed to meet the performance requirements established by the facility design.

   b. Relative to the established performance requirements and design standards, design revisions shall be reviewed by the DSWM and accepted or rejected in writing. Minor modifications to construction specifications (not affecting design standards) may be verbally approved by the DSWM, with subsequent documentation on record drawings.

   c. The granular drainage layer shall extend up the side slopes as previously approved in Phase I. CQA for the progressive placement of this material shall be performed according to Document # X in the approved plan.

   d. The selected leachate collection and removal system (LCRS) components (to construct "base grade") will be specified to (1) function without clogging, (2) exhibit chemical compatibility with the anticipated leachate characteristics, and (3) meet the designed performance requirements under the pressures exerted by overlaying fill and equipment, through the scheduled closure of the facility.

      All information pertinent to material selection shall be submitted to the DSWM for review to verify media compatibility and establish parameters for LCRS construction quality assurance.

   e. As described in the approved plan, Construction Quality Assurance (CQA) activities for each phase/area of development shall be documented and summarized in a CQA report and illustrated with as-built drawings. The CQA Report and Document Drawings shall bear an imprint of the registration seal of the engineer licensed to practice in the State of North Carolina.

   f. The CQA report will summarize the following:

      (1) Construction of the geosynthetic system components as presented in the Waste Management, Inc. document "Quality Assurance Manual for the Installation of Geosynthetic Lining Systems", June 1990.
      (2) Material screening / construction of the leachate collection system (LCRS) implementing adequate sampling strategies which define: data

type (attribute or measurement); representative sampling units; acceptance/rejection criteria; treatment of outliers; and corrective measures. Results will correlate material parameters and constructed properties to satisfy the performance requirements as specified herein.

g. Construction and subsequent abandonment of the stormwater segregation system for Phase II, Modules 1, 2, & 3 and subsequent modules shall be documented with record drawings. CQA documentation and record drawings shall be submitted to DSWM. The system shall be abandoned prior to receiving waste in the segregated area.

h. Construction of leachate collection line/storage/off-loading facilities shall meet the following conditions: (1) pipes installed in the permitted disposal area shall be removed prior to construction of the module and the subgrade prepared according to specifications; (2) proposed additions to these facilities shall be included in the required pre-construction notification; (3) piping shall be constructed to be watertight, and; (4) construction shall be documented in record drawings and submitted to DSWM.

i. Option # 3 described in the cap design is not an approved option. Please reference 40 CFR 258 for the cap performance requirements for this landfill unit. Options # 1 & 2 are approved under current 15A NCAC 13B requirements.

2. All sedimentation/erosion control activities will be conducted in accordance with the Sedimentation Control Act codified at 15 NCAC 4.

3. The following pre-operative requirements shall be met prior to receiving approval from DSWM to operate any module:

   a. Site preparation shall be in accordance with the approved plan and the conditions specified herein.
   b. Upon completion of construction, the permittee will submit the CQA report and document drawings to DSWM; within 30 days upon receipt, the agency will review the submittal, inspect the site, and issue its concurrence that the facility was constructed as specified herein.

OPERATION

1. This solid waste disposal facility is permitted to receive solid waste generated within the territorial boundaries of North Carolina and as defined in 15A NCAC 13B, .0101(36), except that hazardous waste, lead acid batteries, used oil and liquid waste are prohibited from disposal at this site.

   a. Acceptance of specific wastes subject to the Division's "Procedure and Criteria for Waste Determination" shall be in accordance with 15A NCAC 13B .0103 (d).
   b. Acceptance of asbestos shall be in accordance with the approved plan and as specified in Condition # 3.g. of this section.
   c. Acceptance of processed scrap tires shall be in accordance with 15A NCAC 13B .1108 (c).

2. Acceptance of Out-Of-State waste shall be in accordance with 15A NCAC 13B .0103 (d) and .0108.

3. This facility shall conform to all operating procedures described in the approved plan, in accordance with Section .0505 of 15A NCAC 13B, and as specified herein.

   a. All pertinent landfill operating personnel will receive training and supervision necessary to properly operate this landfill. Specifically, training must be provided in operational procedures that will prevent damage to the liner and leachate collection and removal systems.

   b. Leachate management, including the monitoring, sampling, storage, transportation and ultimate disposal will be conducted in accordance with the approved plan, the conditions specified herein, and all pertinent Federal and State rules and regulations. Additional sampling and monitoring of leachate required by the DSWM will be conducted upon request.

   c. Leachate levels measured in each sump (primary leachate collection and removal system, PLCRS, and secondary leachate collection and removal system, SLCRS) shall be recorded as elevations; the elevations of the sump bases being the established datum, level 0.0 feet.

   d. WMC shall remove leachate from the PLCRS sump when monitored levels are at or below 3.5 feet. WMC shall remove leachate from the SLCRS when monitored levels are at or below 4.5 feet, or every 30 days, whichever occurs first. When leachate is removed, the volume pumped and the ending level shall be recorded. If leachate levels exceed 3.5/4.5 feet respectively, then WMC shall adjust monitoring frequency and pumping schedules acccordingly.

   e. In an active Phase, the "trigger level" for the rate of leachate accumulating in the SLCRS shall be 20 gallons/acre/day. On a monthly basis, the SLCRS rate shall be calculated and recorded for each sump/drainage area. In any sump, if the SLCRS rate calculated for a one month period exceeds the "trigger level" then WMC shall notify DSWM immediately and remove leachate in the SLCRS sump at the necessary frequency to maintain a level in the SLCRS sump at or below 3.5 feet. SLCRS rates continuously exceeding the trigger level may require further action.

   f. The Leachate Collection Line/Storage/Off-loading Facilities shall be operated in a manner which prevents leachate releases to the environment.

   g. WMC is permitted to dispose of friable asbestos waste in an active landfill cell in accordance with the following conditions:
      (1) Disposal shall be in an area seperate from the active working face;
      (2) The waste shall be covered with a minimum of six (6) inches of soil, and the waste shall not be compacted;
      (3) Asbestos disposal shall be in accordance with 40 CFR Part 61;
      (4) Disposal locations shall be recorded on a log and topographic map, using a grid system. The limits of disposal shall be identified by horizontal and vertical coordinates to prevent future disturbance of the waste; and

(5) In any Module, the extent of the asbestos disposal area shall be identified by the horizontal coordinates delineating the largest lateral area at any given elevation (i.e. the largest area in a specific lift). The active disposal area shall be identified by a sign.

h. WMC is permitted to use an alternative daily cover in accordance with the approved plan. Use of this material shall be limited to those areas of the active working face which shall receive waste on the following operational day.

4. Ground water quality at this facility is subject to the classification and remedial action provisions referenced in Section .0503 (2)(d) of 15A NCAC 13B.

5. A closure and post-closure plan must be submitted for approval at least 90 days prior to closure or partial closure of the landfill. The plan must include all steps and measures necessary to close and maintain the facility in accordance with all rules in effect at that time. The cap system option selected will be evaluated by DSWM based on performance and upgraded if necessary.

6. Construction and operation of the Scrap Tire Collection and Processing Facility (Permit No. 34-06-TP) shall not interfere with active landfill operations. Relocation of the facility shall require an amendment to this permit.

MONITORING AND REPORTING REQUIREMENTS

1. Ground water and surface water monitoring requirements:

   a. Five wells shall be located as shown on the approved plan.
   b. Surface water sampling shall be performed at the five locations illustrated on Figure 20 of the Golder hydrogeologic report. The sampling frequency shall be concurrent with ground water sampling.
   c. WMC shall sample monitoring wells and surface waters semi-annually, or as directed by the SWS Hydrogeologist.
   d. Sampling equipment, parameters, and procedures shall conform to the specifications outlined in the N.C. Water Quality Monitoring Guidance Document for Solid Waste Facilities, or the current guidelines established by DSWM at the time of sampling.
   e. A readily accessible unobstructed path shall be initially cleared and maintained so that four-wheel drive vehicles may access the monitoring wells at all times.

2. WMC shall obtain a representative sample of the leachate collected in each primary LCRS sump and analyze the sample for the water quality monitoring parameters referenced in Condition 1.d. Protocol for obtaining this sample shall be documented and submitted with the analytical results. With approval by DSWM, this sampling event may be satisfied by leachate monitoring performed for compliance with any pertinent leachate management permits and/or requirements.

3. The permittee shall maintain a record of all required monitoring events and analytical data. Reports of the analytical data for each required sampling event are to be submitted to DSWM in a timely manner.

4. Removal of all temporary stormwater segregation structures in a module shall be documented and a record maintained on-site.

5. Leachate monitoring records shall be maintained on-site through the active life of the facility and made available to the DSWM upon request. On or before 01 Aug 92, and each year thereafter, the permittee shall submit a leachate management report including the following information for leachate removed from the landfill, according to the PLCRS and SLCRS:

   a. the reporting period shall be for the previous year, beginning 01 July and ending on 30 June;
   b. the volume (gallons) of leachate removed, compiled on a monthly basis;
   c. the approximate area (square feet), i.e. footprint, subject to leachate collection, noting date(s) and new total area when expanded (areas with active stormwater segregation are not included); and
   d. the sampling report required by Condition 2 of this section.

6. The permittee shall maintain a record of the amount of solid waste received at the facility, compiled on a monthly basis. The landfill scales shall be used to determine the amount of waste received.

   a. The data shall be collected and categorized according to a geographic area; where the geographic area is defined by the local government solid waste management plans approved in accordance with N.C.G.S. 130A-309.04 (e) or (f).

7. On or before 01 Aug 92, and each year thereafter, the permittee shall report the amount of waste received (in tons) at this facility and disposed of in the landfill to the Solid Waste Section, on forms prescribed by the Section. This report shall include the following information:

   a. The reporting period shall be for the previous year, beginning 01 July and ending on 30 June;
   b. The amount of waste received and landfilled in tons, compiled on a monthly basis, according to Condition 6 described above; and
   c. Notification that a copy of the report has been forwarded to those units of local government referenced in Condition 6.a. (sent to City/County Manager).

8. All records shall be maintained on-site and made available to DSWM upon request.

ATTACHMENT 1
List of Documents for the Approved Plan

The following documents are incorporated as the approved plan for Permit 34-06, as amended 17 June 92.

1. Revised Site Development Plan for Piedmont Landfill and Recycling Center, Oct 1991, prepared by WMNA, Oak Brook, IL.

2. Revised Operations Manual for Piedmont Landfill and Recycling Center, Oct 1991, prepared by WMC.

3. CQA for Liner Side Slopes at PLF&RC, 08 Aug 91, WMC.

4. Portable Synthetic Daily Cover for PLFRC, 13 Jan 92, WMC.

5. Amended Final Cover Design for the PLFRC, 28 Jan 92, WMC.

6. Proposed Stormwater Segregation Flap/Berm Plan for Phase II, Modules 1, 2, 3 (partial), 24 Feb 92, WMC.

7. PLFRC Amended Design Application, 06 Apr 92, WMC.

PRESENTED FOR
REGISTRATION
AND RECORDED

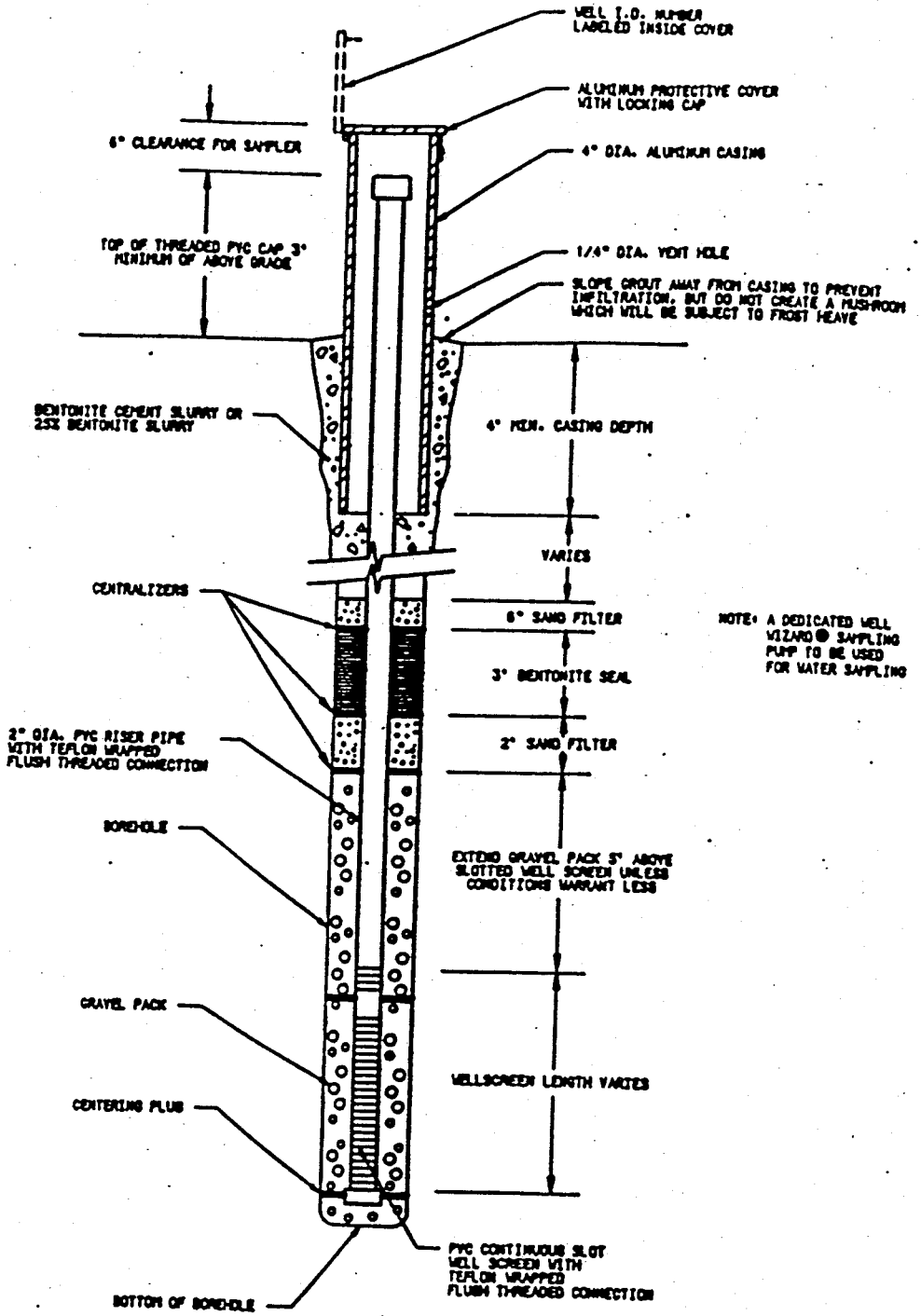
'92 JUL 15 A10:08

L.E. SPEAS
REGISTER OF DEEDS
FORSYTH CO. N.C.

$21.00pd DK

Appendix C

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS



6/11 TYPICAL MONITORING WELL DETAIL

NTS

NORTH CAROLINA DEPARTMENT OF NATURAL R RCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEM. . - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)733-3221

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

WELL CONSTRUCTION RECORD MW-1

DRILLING CONTRACTOR Law Engineering
DRILLER REGISTRATION NUMBER 332

Sanitary Landfill
~~STATE WELL CONSTRUCTION~~
PERMIT NUMBER: 34-06

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Kernersville, N. C. County: Forsyth
(Road, Community, or Subdivision and Lot No.)

2. OWNER Waste Management of Carolinas, Inc.
ADDRESS 110 Berry Shoals Road (Street or Route No.)
Duncan (City or Town) S.C. (State) 29334 (Zip Code)

3. DATE DRILLED 7/13/89 USE OF WELL Monitoring
4. TOTAL DEPTH 49 ft. CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: _____ FT. ☐ above ☐ below TOP OF CASING.
TOP OF CASING IS 2.6 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): -- METHOD OF TEST --
8. WATER ZONES (depth): --
9. CHLORINATION: Type -- Amount --

10. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 44.0	To -2.6	Ft.	2 in.	Sch. 40	PVC
From	To	Ft.			
From	To	Ft.			

11. GROUT:

	Depth		Material	Method
From 37.0	To 3.0	Ft.	Cement/bentonite	Tremie
From	To	Ft.		

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From 49.0	To 44.0	Ft.	2 in.	0.010 in.	PVC
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

13. GRAVEL PACK:

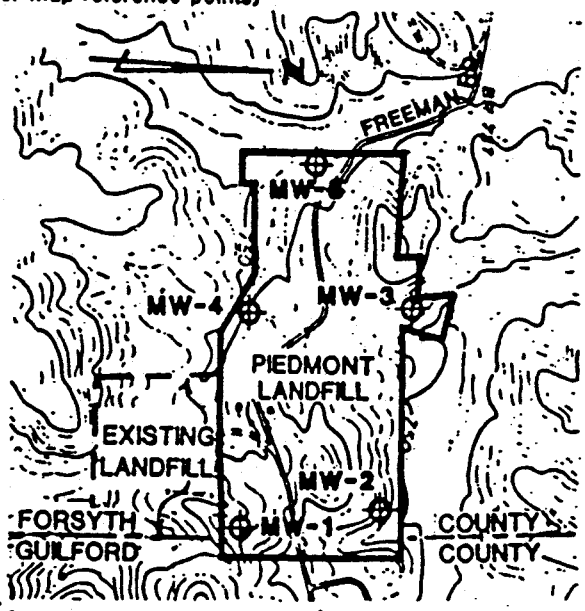
	Depth		Size	Material
From 49.0	To 40.5	Ft.	20/40	sand
From	To	Ft.		

REMARKS: Bentonite pellet seal from 40.5 ft. to 37.7 ft.

Depth (ft) From	To	DRILLING LOG Formation Description
0	20	Red silty clay trace sand
20	47	Red brown sand some silt
47	49	Weathered gneiss bedrock

If additional space is needed use back of form.

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



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

GOLDER ASSOCIATES INC. [signature] October 2, 1989
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 6/88

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

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)733-3221

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

WELL CONSTRUCTION RECORD MW-2

DRILLING CONTRACTOR Law Engineering
DRILLER REGISTRATION NUMBER 332

Sanitary Landfill
~~STATE WELL CONSTRUCTION~~
PERMIT NUMBER: 34-06

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Kernersville, N. C. County: Forsyth
(Road, Community, or Subdivision and Lot No.)

2. OWNER Waste Management of Carolinas, Inc.
ADDRESS 110 Berry Shoals Road (Street or Route No.)
Duncan (City or Town) S.C. (State) 29334 (Zip Code)

3. DATE DRILLED 8/5/89 USE OF WELL Monitoring
4. TOTAL DEPTH 25.5 ft CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: _____ FT. ☐ above ☐ below TOP OF CASING.
TOP OF CASING IS 3.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): -- METHOD OF TEST --
8. WATER ZONES (depth): --
9. CHLORINATION: Type -- Amount --
10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	20.2	-3.0	2 in.	Sch. 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	14.0	3.0	Cement/bentonite	Tremie

12. SCREEN:

	Depth From	Depth To	Diameter	Slot Size	Material
	25.2	20.2	2 in.	0.010 in.	PVC
			in.	in.	
			in.	in.	

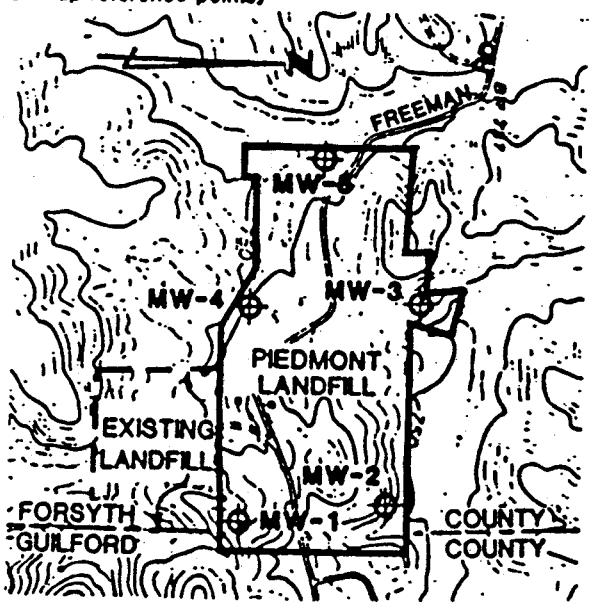
13. GRAVEL PACK:

	Depth From	Depth To	Size	Material
	25.2	17.5	20/40	sand

Depth (ft) From	To	DRILLING LOG Formation Description
0	5	Tan clayey silt some sand
5	25.5	Brown sand, some silt

If additional space is needed use back of form.

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



REMARKS: Bentonite pellet seal from 17.5 ft. to 14.5 ft.

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

GOLDER ASSOCIATES INC. _____ October 2, 1989
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 6/88

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

NORTH CAROLINA DEPARTMENT OF NATURAL RE' 'RCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEM - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)733-3221

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

WELL CONSTRUCTION RECORD MW-3

DRILLING CONTRACTOR Law Engineering
DRILLER REGISTRATION NUMBER 332

Sanitary Landfill
~~STATE WELL CONSTRUCTION~~
PERMIT NUMBER: 34-06

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Kernersville, N. C. County: Forsyth
(Road, Community, or Subdivision and Lot No.)

2. OWNER Waste Management of Carolinas, Inc.
ADDRESS 110 Berry Shoals Road (Street or Route No.)
Duncan (City or Town) S.C. (State) 29334 (Zip Code)

3. DATE DRILLED 8/6/89 USE OF WELL Monitoring
4. TOTAL DEPTH 38.0 CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: _____ FT. ☐ above ☐ below TOP OF CASING,
TOP OF CASING IS 3.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): -- METHOD OF TEST --
8. WATER ZONES (depth): --
9. CHLORINATION: Type -- Amount --
10. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 32.5	To -13.0	Ft.	2 in.	Sch. 40	PVC
From	To	Ft.			
From	To	Ft.			

11. GROUT:

	Depth		Material	Method
From 26.6	To 3.0	Ft.	Cement/bentonite	Tremie
From	To	Ft.		

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From 37.5	To 32.5	Ft.	2 in.	0.010 in.	PVC
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

13. GRAVEL PACK:

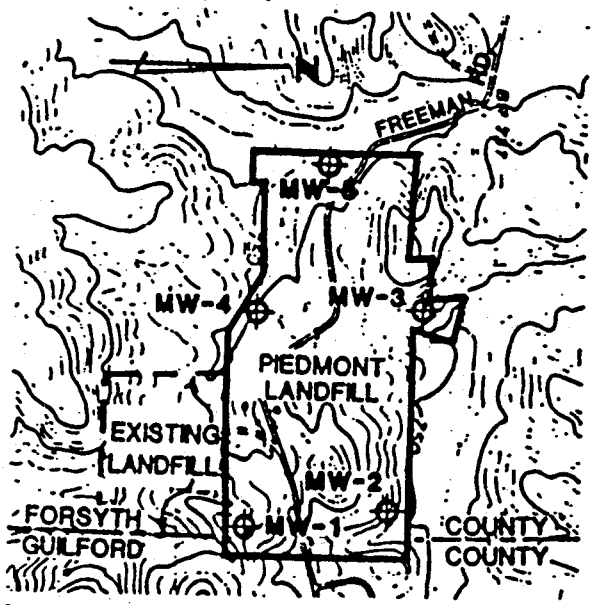
	Depth		Size	Material
From 37.5	To 29.6	Ft.	20/40	sand
From	To	Ft.		

REMARKS: Bentonite pellet seal from 29.6 ft. to 27.0 ft.

Depth (ft) From	To	DRILLING LOG Formation Description
0	5	Tan clayey silt some sand
5	38	Brown sand some silt

If additional space is needed use back of form.

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



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

GOLDER ASSOCIATES INC. [signature] October 2, 1989
SIGNATURE OF CONTRACTOR OR AGENT DATE

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

GW-1 Revised 6/88

NORTH CAROLINA DEPARTMENT OF NATURAL RE' 'CES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMA - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)733-3221

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

WELL CONSTRUCTION RECORD MW-4

DRILLING CONTRACTOR Law Engineering
DRILLER REGISTRATION NUMBER 332

Sanitary Landfill
~~STATE WELL CONSTRUCTION~~
PERMIT NUMBER: 34-06

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Kernersville, N. C. County: Forsyth
(Road, Community, or Subdivision and Lot No.)

2. OWNER Waste Management of Carolinas, Inc.
ADDRESS 110 Berry Shoals Road (Street or Route No.)
Duncan (City or Town) S.C. (State) 29334 (Zip Code)

3. DATE DRILLED 7/14/89 USE OF WELL Monitoring
4. TOTAL DEPTH 27 ft. CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: _____ FT. ☐ above ☐ below TOP OF CASING,
TOP OF CASING IS 3.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): -- METHOD OF TEST --
8. WATER ZONES (depth): --
9. CHLORINATION: Type -- Amount --

Depth (ft) From	To	DRILLING LOG Formation Description
0	10	Tan clayey silt some sand
10	27	Brown sand some silt

If additional space is needed use back of form.

10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	20.0	-3.0	2 in.	Sch. 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	13.0	3.0	Cement/bentonite	Tremie

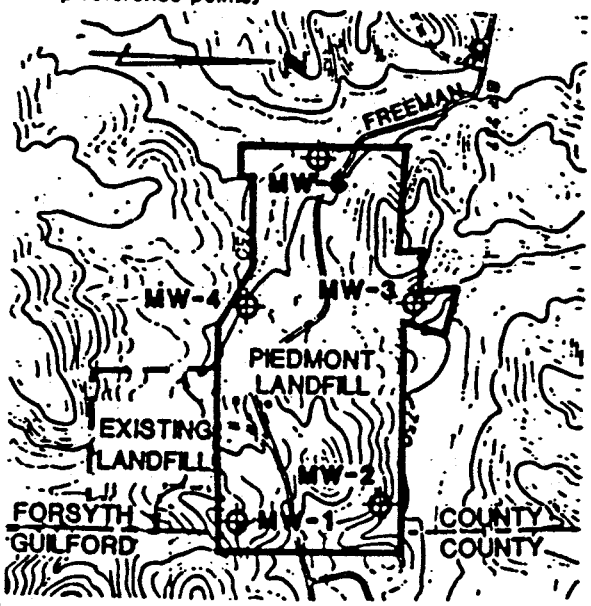
12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	25.0	20.0	2 in.	0.010 in.	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	25.0	16.7	20/40	sand

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



REMARKS: Bentonite pellet seal from 16.7 ft. to 14.0 ft.

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

GOLDER ASSOCIATES INC. [signature] October 2, 1989
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 6/88

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

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)733-3221

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

WELL CONSTRUCTION RECORD MW-5

DRILLING CONTRACTOR Law Engineering
DRILLER REGISTRATION NUMBER 332

Sanitary Landfill
~~STATE WELL CONSTRUCTION~~
PERMIT NUMBER: 34-06

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Kernersville, N. C. County: Forsyth
(Road, Community, or Subdivision and Lot No.)

2. OWNER Waste Management of Carolinas, Inc.
ADDRESS 110 Berry Shoals Road (Street or Route No.)
Duncan (City or Town) S.C. (State) 29334 (Zip Code)

3. DATE DRILLED 8/2/89 USE OF WELL Monitoring
4. TOTAL DEPTH 20.5 ft. CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: _____ FT. ☐ above ☐ below TOP OF CASING,
TOP OF CASING IS 3.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): -- METHOD OF TEST --
8. WATER ZONES (depth): --
9. CHLORINATION: Type -- Amount --

Depth (ft) From	To	DRILLING LOG Formation Description
0	10	Tan clayey silt some sand
10	20.5	Brown sand some silt

If additional space is needed use back of form.

10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	14.45	-3.0	2 in.	Sdh 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	9.0	3.05	Cement/bentonite	Tremie

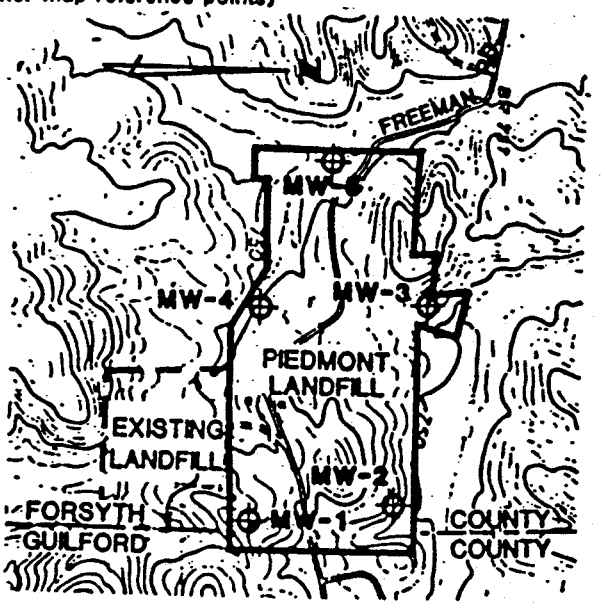
12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	19.45	14.45	2 in.	0.010 in.	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	19.45	12.0	20/40	sand

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



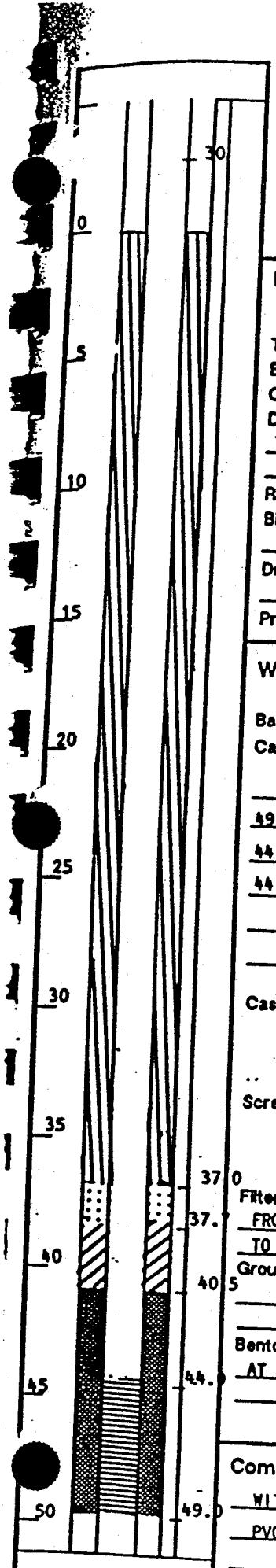
REMARKS: Bentonite pellet seal from 12.0 ft. to 9.8 ft.

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

GOLDER ASSOCIATES INC. October 2, 1989
SIGNATURE OF CONTRACTOR OR AGENT DATE

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

GW-1 Revised 6/88



Well No. MW-1

Boring No. X-Ref:

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N: 891210.07
E: 1693821.85

Elevation Ground Level 821.4

Top of Casing 823.93

Drilling Summary:

Total Depth 49.0 FT.
Borehole Diameter 10 INCH TO 6 INCH
Casing Stick-up Height: 3.0 FT.
Driller JOHN STONE

Rig MOBILE B-53
Bit(s) 10 INCH HOLLOW STEM AUGER AND 6 INCH ROLLER CONE
Drilling Fluid NONE

Protective Casing DEPTH 2.6 TO 3.0 FT.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	7/13/89	10:15	7/13/89	16:30
Geophys.Logging:				
Casing:	7/13/89	16:30	7/13/89	16:35
Filter Placement:	7/13/89	16:35	7/13/89	17:15
Cementing:	7/13/89	17:35	7/13/89	19:15
Development:	7/21/89	9:30	8/05/89	16:00

Well Design & Specifications

Basis: Geologic Log ____ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
49.0 - 44.0	S1	-
44.0 - + 3.0	C1	-
44.0 -	S2	-
-		-
-		-

Casing: C1 2.0 INCH PVC RISER PIPE FLUSH THREADED
C2

Screen: S1 2.0 INCH PVC MACHINE SLOTTED (0.010) PIPE
S2 CENTRALIZER

Filter Pack: 20/40 BAGGED SAND AT A DEPTH FROM 49.0 FT. TO 40.5 FT. AND 37.7 FT. TO 37.0 FT.

Grout Seal: SEE COMMENTS

Bentonite Seal: 0.25 INCH BENTONITE PELLETS AT A DEPTH FROM 40.5 FT. TO 37.7 FT.

Well Development:

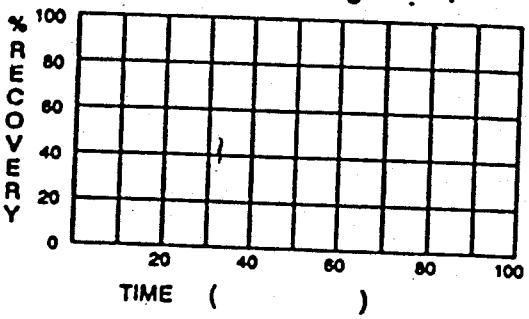
SEE WELL DEVELOPMENT FORM-TABLE 1

Stabilization Test Data:

Time	p H	Spec. Cond.	Temp (C)
SEE pH DEVELOPMENT SHEET TABLE 1			

Recovery Data:

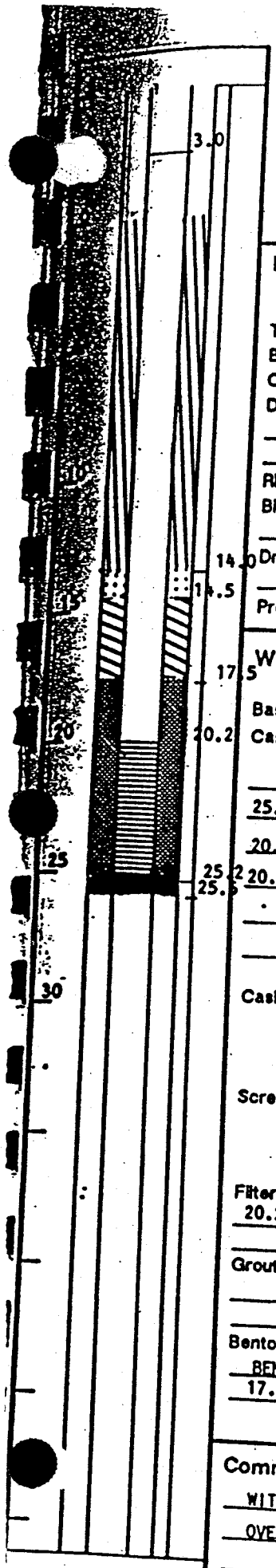
Q= S_o=



Comments: BOREHOLE BACKFILLED WITH A CEMENT/BENTONITE GROUT FROM 37.0 FT. TO WITHIN 3.0 FT. OF GROUND SURFACE. A METAL PROTECTIVE COVER CEMENTED IN PLACE OVER PVC RISER PIPE.

SITE NAME PIEDMONT LANDFILL

SUPERVISED BY FERRELL BRUNET-GOLDER ASSOCIATES/863-3407



Well No. MW-2

Boring No. X-Ref:

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N: 892336.89
E: 1693597.61

Elevation Ground Level 767.3

Top of Casing 770.16

Drilling Summary:

Total Depth 25.5 FT.
Borehole Diameter 10 INCH
Casing Stick-up Height: 3.0 FT.
Driller JOHN STONE

Rig MOBILE B-53
Bit(s) 10 INCH HOLLOW STEM AUGER

Drilling Fluid NONE

Protective Casing DEPTH 3.5 TO -3.0 FT.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/05/89	15:00	8/05/89	15:35
Geophys.Logging:				
Casing:	8/05/89	15:45	8/05/89	15:47
Filter Placement:	8/05/89	15:47	8/05/89	17:10
Cementing:	8/05/89	17:55	8/05/89	18:40
Development:	8/07/89	7:40	8/07/89	14:45

Well Design & Specifications

Basis: Geologic Log ____ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
25.2 - 20.2	S1	-
20.2 - + 3.0	C1	-
20.2 -	S2	-
-		-
-		-

Casing: C1 2.0 INCH PVC RISER PIPE FLUSH THREADED
C2

Screen: S1 2.0 INCH PVC MACHINE SLOTTED (0.010) PIPE
S2 CENTRALIZER

Filter Pack: 20/40 BAGGED SAND FROM 25.2 TO 20.2 AND FROM 14.5 TO 14.0

Grout Seal: SEE COMMENTS

Bentonite Seal: 0.25 INCH AND 0.50 INCH BENTONITE PELLETS AT A DEPTH FROM 17.5 FT. TO 14.5 FT.

Well Development:

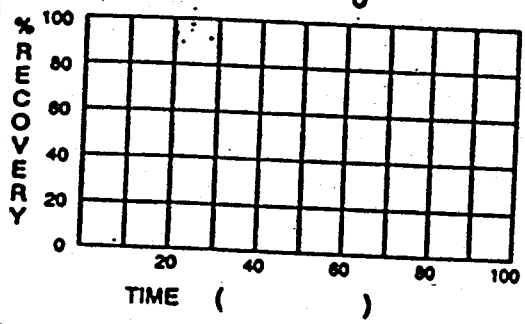
SEE WELL DEVELOPMENT FORM - TABLE 1

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
SEE pH DEVELOPMENT SHEET - TABLE 1			

Recovery Data:

Q= S_o=



Comments: BOREHOLE BACKFILLED WITH A CEMENT/BENTONITE GROUT FROM 14.0 FT. TO WITHIN 3.0 FT. OF GROUND SURFACE. A METAL PROTECTIVE COVER CEMENTED IN PLACE OVER PVC RISER PIPE.

ADDITIONAL BAGGED SAND PLACED 14.5 FT TO 14.0 FT. BELOW GROUND SURFACE.

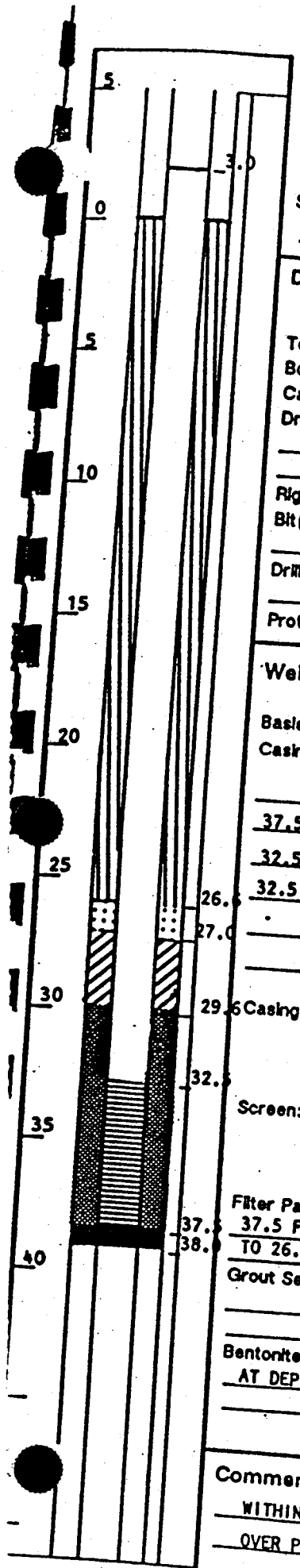
SITE NAME PIEDMONT LANDFILL

LOCATION

WC 7525

SUPERVISED BY FERRELL BRUNET-COLDER ASSOCIATES/863-3407

DATE 8/05/89



Well No. HW-3

Boring No. X-Ref:

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N: 892723.56
E: 1692075.85

Elevation Ground Level 767.30

Top of Casing 770.08

Drilling Summary:

Total Depth 38.0 FT.
Borehole Diameter 10 INCH
Casing Stick-up Height: 3.0 FT.
Driller JOHN STONE

Rig MOBILE B-53
Bit(s) 10 INCH HOLLOW STEM AUGER

Drilling Fluid NONE

Protective Casing DEPTH 3.5 TO -3.0 FT.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/06/89	11:15	8/06/89	13:15
Geophys. Logging:				
Casing:	8/06/89	13:30	8/06/89	13:40
Filter Placement:	8/06/89	13:40	8/06/89	15:50
Cementing:	8/06/89	17:10	8/06/89	18:00
Development:	8/08/89	7:30	8/08/89	11:10

Well Design & Specifications

Basis: Geologic Log ____ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
37.5 - 32.5	S1	-
32.5 - + 3.0	C1	-
32.5 -	S2	-
-		-
-		-

Casing: C1 2.0 INCH PVC RISER PIPE FLUSH THREADED
C2

Screen: S1 2.0 INCH PVC MACHINE SLOTTED (0.010) PIPE
S2 CENTRALIZER

Filter Pack: 20/40 SAND AT A DEPTH FROM 37.5 FT. TO 29.6 FT. AND FROM 27.0 TO 26.0

Grout Seal: SEE COMMENTS

Bentonite Seal: 0.5 INCH BENTONITE PELLETS AT DEPTH FROM 29.6 FT. TO 27.0 FT.

Well Development:

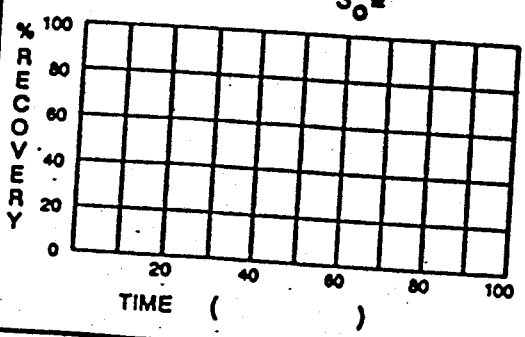
SEE WELL DEVELOPMENT FORM - TABLE 1

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
SEE pH DEVELOPMENT SHEET - TABLE 1			

Recovery Data:

Q= S_o=



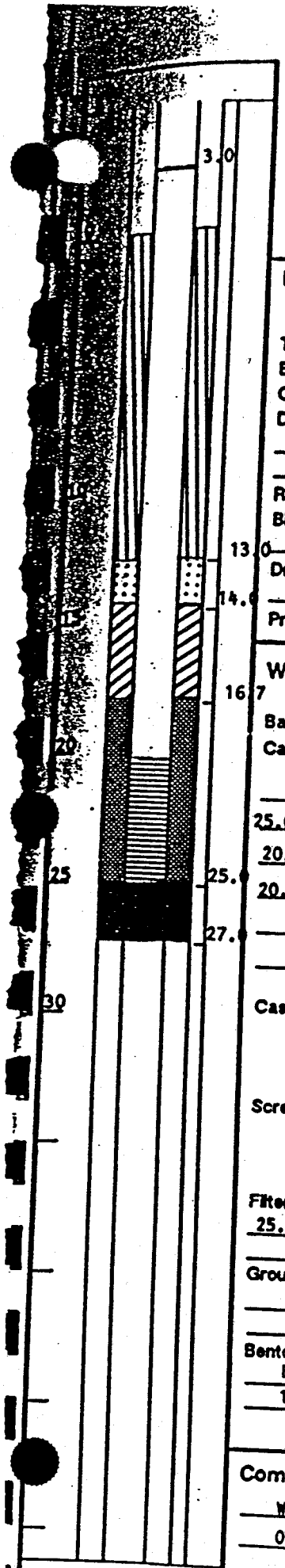
Comments: BOREHOLE BACKFILLED WITH A CEMENT/BENTONITE GROUT FROM 26.6 FT. TO WITHIN 3.0 FT. OF GROUND SURFACE. A METAL PROTECTIVE COVER CEMENTED IN PLACE OVER PVC RISER PIPE.
ADDITIONAL LAYER OF SAND AT 27.0 FT. TO 26.6 FT. BELOW GROUND SURFACE.

SITE NAME PIEDMONT LANDFILL

SUPERVISED BY FERRELL BRUNET-COLDER ASSOCIATES/863-3407

DATE 8/06/89

WC 7507



Well No. MW-4

Boring No. X-Ref:

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N: 891261.29
E: 1692025.37

Elevation Ground Level 754.5

Top of Casing 756.92

Drilling Summary:

Total Depth 27.0 FT.
Borehole Diameter 10 INCH
Casing Stick-up Height: 3.0 FT.
Driller JOHN STONE

Rig MOBILE B-53
Bit(s) 10 INCH HOLLOW STEM AUGER

Drilling Fluid NONE

Protective Casing DEPTH 3.5 TO -3.0 FT.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	7/14/89	11:05	7/14/89	12:30
Geophys.Logging:				
Casing:	7/14/89	12:31	7/14/89	12:35
Filter Placement:	7/14/89	12:35	7/14/89	13:35
Cementing:	7/14/89	14:10	7/14/89	14:50
Development:	8/03/89	14:21	8/03/89	16:55

Well Design & Specifications

Basic: Geologic Log ____ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
25.0 - 20.0	S1	-
20.0 - + 3.0	C1	-
20.0 -	S2	-
-		-
-		-

Casing: C1 2.0 INCH PVC RISER PIPE FLUSH THREADED
C2

Screen: S1 2.0 INCH PVC MACHINE SLOTTED (0.010) PIPE
S2 CENTRALIZER

Filter Pack: 20/40 BACGED SAND FROM 25.0 TO 16.7 AND FROM 14.0 TO 13.0

Grout Seal: SEE COMMENTS

Bentonite Seal: 0.25 INCH AND 0.50 INCH BENTONITE PELLETS AT A DEPTH FROM 16.7 FT. TO 14.0 FT.

Well Development:

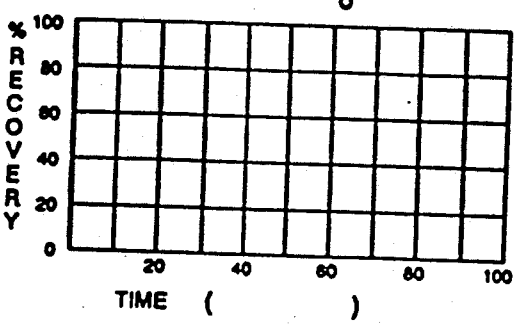
SEE WELL DEVELOPMENT FORM - TABLE 1

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
SEE pH DEVELOPMENT SHEET - TABLE 1			

Recovery Data:

Q= S_o=

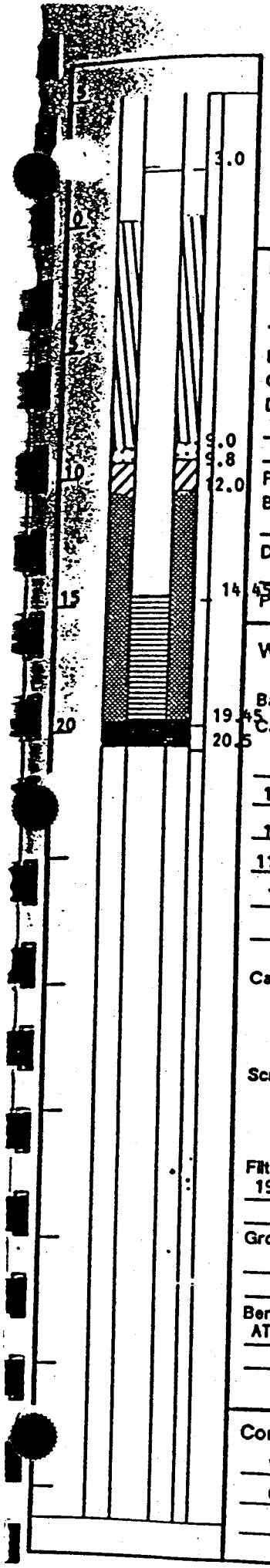


Comments: BOREHOLE BACKFILLED WITH A CEMENT/BENTONITE GROUT FROM 13.0 FT. TO WITHIN 3.0 FT. OF GROUND SURFACE. A METAL PROTECTIVE COVER CEMENTED IN PLACE OVER PVC RISER PIPE

SITE NAME PIEDMONT LANDFILL

SUPERVISED BY FERRELL BRUNET-COLDER ASSOCIATES/863-3407

DATE 7/14/89



Well No. MW-5

Boring No. X-Ref:

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N: 891866.18 E: 1690947.65

Elevation Ground Level 740.4

Top of Casing 743.17

Drilling Summary:

Total Depth 20.5 FT.

Borehole Diameter 10 INCH

Casing Stick-up Height:

Driller JOHN STONE

Rig MOBILE B-53

Bit(s) 10 INCH HOLLOW STEM AUGER

Drilling Fluid NONE

Protective Casing DEPTH 3.5 TO -3.0 FT.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/02/89	17:10	8/02/89	18:05
Geophys.Logging:				
Casing: PVC	8/03/89	9:15	8/03/89	9:25
Filter Placement:	8/03/89	9:25	8/03/89	10:37
Cementing:	8/03/89	11:10	8/03/89	11:50
Development:	8/05/89	7:35	8/06/89	9:50

Well Design & Specifications

Basis: Geologic Log ____ Geophysical Log ____

Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
19.45 - 14.45	S1	-
14.45 - + 3.0	C1	-
11.45 -	S2	-
-		-
-		-

Casing: C1 2.0 INCH PVC RISER PIPE FLUSH THREADED

C2

Screen: S1 2.0 INCH PVC MACHINE SLOTTED (0.010) PIPE

S2 CENTRALIZER

Filter Pack: 20/40 BAGGED SAND FROM 19.45 TO 12.0 AND FROM 9.8 TO 9.0

Grout Seal: SEE COMMENTS

Bentonite Seal: 0.25 INCH BENTONITE PELLETS AT A DEPTH FROM 12.0 FT. TO 9.8 FT.

Well Development:

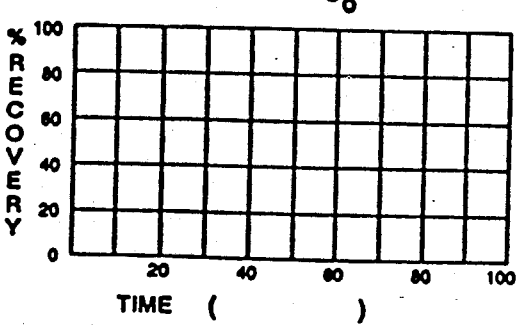
SEE WELL DEVELOPMENT FORM - TABLE 1

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
SEE pH DEVELOPMENT SHEET - TABLE 1			

Recovery Data:

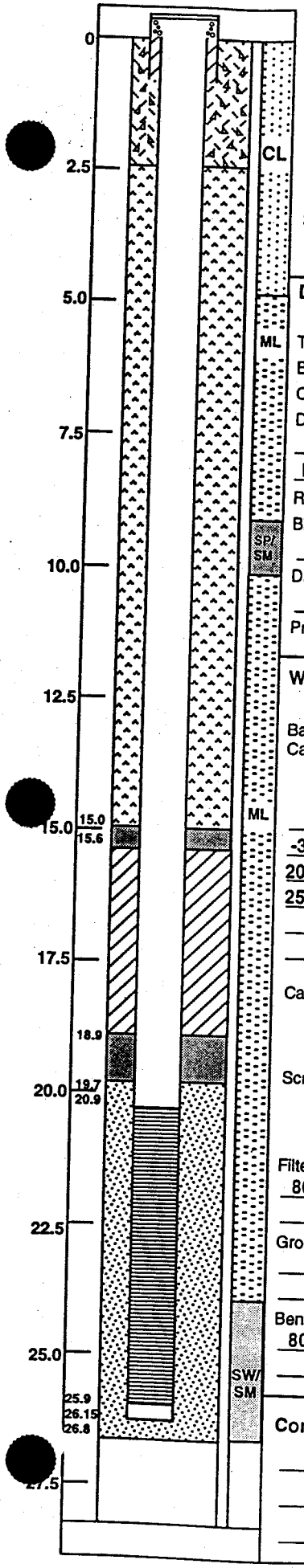
Q= S_o=



Comments: BOREHOLE BACKFILLED WITH A CEMENT/BENTONITE GROUT FROM 9.0 FT. TO WITHIN 2.0 FT. OF GROUND SURFACE. A METAL PROTECTIVE COVER CEMENTED IN PLACE OVER PVC RISER PIPE.

SITE NAME PIEDMONT LANDFILL

SUPERVISED BY FERRELL BRUNET-COLDER ASSOCIATES/863-3407



Well No.: MW-6

Boring No. X-Ref: MW-6

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N891410.856
E1694018.295

Elevation Ground Level: 798

Top of Casing: 800.82

Drilling Summary:

Total Depth: 26.8 ft.
Borehole Diameter: 8.0 inch
Casing Stick-up Height: 3.0 ft.
Driller: Mike Trinkle
Helper: Jim Foster
Envir. Const. Services Inc., Charlotte, NC
Rig: CME-75
Bit(s): HSA 4 1/4" Carbide Teeth

Drilling Fluid: N/A

Protective Casing: Aluminum 4"x4"x5'

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/3/93	12:00	8/3/93	13:00
Geophys. Logging:				
Casing:	8/3/93	14:30	8/3/93	14:40
Filter Placement:	8/3/93	14:45	8/3/93	15:15
Bentonite Seal:	8/3/93	15:20	8/3/93	16:00
Development:	8/4/93	09:30	8/4/93	12:30

Well Design & Specifications

Basis: Geologic Log: x Geophysical Log: ____
Casing String (s): C = Casing S = Screen P=Plug

Depth	String(s)	Elevation
-3.0 - 20.90	C	800.82 - 776.92
20.90 - 25.90	S	776.92 - 771.92
25.90 - 26.15	P	771.92 - 771.67

Casing: C1 2.0" Sch. 40 PVC Flush Threaded
C2

Screen: S1 2.0" Sch. 40 PVC Flush Threaded 0.010 inch slots

Filter Pack: 20/60 Filter Sand 26.8-19.7ft.; 80/100 Fine Sand 19.7 to 18.9 ft.

Grout Seal: Cement/Bentonite, 15.0-2.4 ft.

Bentonite Seal: Bentonite Chips 18.9-15.6 ft.; 80/100 Fine Sand from 15.6-15.0 ft.

Well Development:

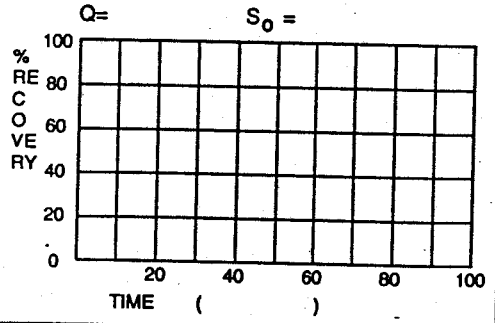
See Attched Log

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_0 =



Comments: A 2 ft. x 2 ft. concrete pad was built on 8/3/93 & 4 3-inch ID protective abutment posts were set in concrete around the well. Bentonite chips filled up to weep hole and then 3/8 inch single size topped up inside protective casing.

SITE NAME Piedmont Landfill & Recycling Center

LOCATION Kernersville, NC

WC 11427

SUPERVISED BY: Philip E. Lish

DATE: 8/3/93

Appendix D

APPENDIX D: 40 CFR PART 258, APPENDIX I CONSTITUENTS

responsible for the paying out of funds to the owner or operator or other person authorized to conduct closure or post-closure care, up to an amount equal to the face amount of the policy.

(3) The insurance policy must be issued for a face amount at least equal to the current cost estimate for closure or post-closure care, whichever is applicable, except as provided in § 258.74(a). The term *face amount* means the total amount the insurer is obligated to pay under the policy. Actual payments by the insurer will not change the face amount, although the insurer's future liability will be lowered by the amount of the payments.

(4) An owner or operator, or any other person authorized to conduct closure or post-closure care, may receive reimbursements for closure or post-closure expenditures, whichever is applicable. Requests for reimbursement will be granted by the insurer only if the remaining value of the policy is sufficient to cover the remaining costs of closure or post-closure care, and if justification and documentation of the cost is placed in the operating record. The owner or operator must notify the State Director that the documentation of the justification for reimbursement has been placed in the operating record and that reimbursement has been received.

(5) Each policy must contain a provision allowing assignment of the policy to a successor owner or operator. Such assignment may be conditional upon consent of the insurer, provided that such consent is not unreasonably refused.

(6) The insurance policy must provide that the insurer may not cancel, terminate or fail to renew the policy except for failure to pay the premium. The automatic renewal of the policy must, at a minimum, provide the insured with the option of renewal at the face amount of the expiring policy. If there is a failure to pay the premium, the insurer may cancel the policy by sending notice of cancellation by certified mail to the owner and operator and to the State Director 120 days in advance of cancellation. If the insurer cancels the policy, the owner or operator must obtain alternate financial assurance as specified in this section.

(7) For insurance policies providing coverage for post-closure care, commencing on the date that liability to make payments pursuant to the policy accrues, the insurer will thereafter annually increase the face amount of the policy. Such increase must be equivalent to the face amount of the policy, less any payments made, multiplied by an amount equivalent to 85 percent of the most recent investment rate or of the equivalent coupon-issue yield announced by the U.S. Treasury for 26-week Treasury securities.

(8) The owner or operator may cancel the insurance policy only if alternate financial assurance is substituted as specified in this section or if the owner or operator, is no longer required to demonstrate financial responsibility in accordance with the requirements of § 258.71(b), 258.72(b) or 258.73(b).

(e) *Corporate Financial Test.* [Reserved]

(f) *Local Government Financial Test.* [Reserved]

(g) *Corporate Guarantee.* [Reserved]

(h) *Local Government Guarantee.* [Reserved]

(i) *State-Approved Mechanism.* An owner or operator may satisfy the requirements of this section by obtaining any other mechanism that meets the criteria specified in § 258.74(1), and that is approved by the Director of an approved State.

(j) *State Assumption of Responsibility.* If the State Director either assumes legal responsibility for an owner or operator's compliance with the closure, post-closure care and/or corrective action requirements of this part, or assures that the funds will be available from State sources to cover the requirements, the owner or operator will be in compliance with the requirements of this section. Any State assumption of responsibility must meet the criteria specified in § 258.74(l).

(k) *Use of Multiple Financial Mechanisms.* An owner or operator may satisfy the requirements of this section by establishing more than one financial mechanism per facility. The mechanisms must be as specified in paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), and (j) of this section, except that it is the combination of mechanisms, rather than the single mechanism, which must provide financial assurance for an amount at least equal to the current cost estimate for closure, post-closure care or corrective action, whichever is applicable. The financial test and a guarantee provided by a corporate parent, sibling, or grandparent may not be combined if the financial statements of the two firms are consolidated.

(l) The language of the mechanisms listed in paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), and (j) of this section must ensure that the instruments satisfy the following criteria:

(1) The financial assurance mechanisms must ensure that the amount of funds assured is sufficient to cover the costs of closure, post-closure care, and corrective action for known releases when needed;

(2) The financial assurance mechanisms must ensure that funds will be available in a timely fashion when needed;

(3) The financial assurance mechanisms must be obtained by the owner or operator by the effective date of these requirements or prior to the initial receipt of solid waste, whichever is later, in the case of closure and post-closure care, and no later that 120 days after the corrective action remedy has been selected in accordance with the requirements of § 258.58, until the owner or operator is released from the financial assurance requirements under §§ 258.71, 258.72 and 258.73.

(4) The financial assurance mechanisms must be legally valid, binding, and enforceable under State and Federal law.

Appendix I to this Part 258—Constituents for Detection Monitoring [1]

Common name [2]	CAS RN [3]
Inorganic Constituents:	
(1) Antimony	(Total)
(2) Arsenic	(Total)
(3) Barium	(Total)
(4) Beryllium	(Total)
(5) Cadmium	(Total)
(6) Chromium	(Total)
(7) Cobalt	(Total)
(8) Copper	(Total)
(9) Lead	(Total)
(10) Nickel	(Total)
(11) Selenium	(Total)
(12) Silver	(Total)
(13) Thallium	(Total)
(14) Vanadium	(Total)
(15) Zinc	(Total)
Organic Constituents:	
(16) Acetone	67-64-1
(17) Acrylonitrile	107-13-1
(18) Benzene	71-43-2
(19) Bromochloromethane	74-97-5
(20) Bromodichloromethane	75-27-4
(21) Bromoform; Tribromomethane	75-25-2
(22) Carbon disulfide	75-15-0
(23) Carbon tetrachloride	56-23-5
(24) Chlorobenzene	108-90-7
(25) Chloroethane; Ethyl chloride	75-00-3
(26) Chloroform; Trichloromethane	67-66-3
(27) Dibromochloromethane; Chlorodibromomethane	124-48-1
(28) 1,2-Dibromo-3-chloropropane; DBCP	96-12-8
(29) 1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4
(30) o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1
(31) p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7
(32) trans-1,4-Dichloro-2-butene	110-57-6
(33) 1,1-Dichloroethane; Ethylidene chloride	75-34-3
(34) 1,2-Dichloroethane; Ethylene dichloride	107-06-2
(35) 1,1-Dichloroethylene; 1,1-Dichloroethene; Vinylidene chloride	75-35-4
(36) cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2

Common name [2]	CAS RN [3]
(37) trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	156-60-5
(38) 1,2-Dichloropropane; Propylene dichloride	78-87-5
(39) cis-1,3-Dichloropropene	10061-01-5
(40) trans-1,3-Dichloropropene	10061-02-6
(41) Ethylbenzene	100-41-4
(42) 2-Hexanone; Methyl butyl ketone	591-78-6
(43) Methyl bromide; Bromomethane	74-83-9
(44) Methyl chloride; Chloromethane	74-87-3
(45) Methylene bromide; Dibromomethane	74-95-3
(46) Methylene chloride; Dichloromethane	75-09-2
(47) Methyl ethyl ketone; MEK; 2-Butanone	78-93-3
(48) Methyl iodide; Iodomethane	74-88-4
(49) 4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
(50) Styrene	100-42-5
(51) 1,1,1,2-Tetrachloroethane	630-20-6
(52) 1,1,2,2-Tetrachloroethane	79-34-5
(53) Tetrachloroethylene; Tetrachloroethene; Perchloroethylene	127-18-4
(54) Toluene	108-88-3
(55) 1,1,1-Trichloroethane; Methylchloroform	71-55-6
(56) 1,1,2-Trichloroethane	79-00-5
(57) Trichloroethylene; Trichloroethene	79-01-6
(58) Trichlorofluoromethane; CFC-11	75-69-4
(59) 1,2,3-Trichloropropane	96-18-4
(60) Vinyl acetate	108-05-4
(61) Vinyl chloride	75-01-4
(62) Xylenes	1330-20-7

[1] This list contains 47 volatile organics for which possible analytical procedures provided in EPA Report SW-846 "Test Methods for Evaluating Solid Waste," third edition, November 1986, as revised December 1987, includes Method 8260; and 15 metals for which SW-846 provides either Method 6010 or a method from the 7000 series of methods.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

Appendix E

APPENDIX E: 40 CFR PART 258, APPENDIX II CONSTITUENTS

Appendix II to this Part 258—List of Hazardous Inorganic and Organic Constituents [1]

Common Name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	POL (µg/L) [6]
Acenaphthene	83-32-9	Acenaphthylene, 1,2-dihydro-	8100	200
			8270	10
Acenaphthylene	208-96-8	Acenaphthylene	8100	200
			8270	10
Acetone	67-64-1	2-Propanone	8260	100
Acetonitrile; Methyl cyanide	75-05-8	Acetonitrile	8015	100
Acetophenone	98-86-2	Ethanone, 1-phenyl-	8270	10
2-Acetylaminofluorene; 2-AAF	53-96-3	Acetamide, N-9H-fluoren-2-yl-	8270	20
Acrolein	107-02-8	2-Propenal	8030	5
			8260	100
Acrylonitrile	107-13-1	2-Propenenitrile	8030	5
			8260	200
Aldrin	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro- (1α,4α,4aβ,5α,8α,8aβ)-	8080	0.05
			8270	10
Allyl chloride	107-05-1	1-Propene, 3-chloro-	8010	5
			8260	10
4-Aminobiphenyl	92-67-1	[1,1'-Biphenyl]-4-amine	8270	20
Anthracene	120-12-7	Anthracene	8100	200
			8270	10
Antimony	(Total)	Antimony	6010	300
			7040	2000
			7041	30
Arsenic	(Total)	Arsenic	6010	500
			7060	10
			7061	20
Barium	(Total)	Barium	6010	20
			7080	1000
Benzene	71-43-2	Benzene	8020	2
			8021	0.1
			8260	5
Benzo[a]anthracene; Benzanthracene	56-55-3	Benz[a]anthracene	8100	200
			8270	10
Benzo[b]fluoranthene	205-99-2	Benz[e]acephenanthrylene	8100	200
			8270	10
Benzo[k]fluoranthene	207-08-9	Benzo[k]fluoranthene	8100	200
			8270	10
Benzo[ghi]perylene	191-24-2	Benzo[ghi]perylene	8100	200
			8270	10
Benzo[a]pyrene	50-32-8	Benzo[a]pyrene	8100	200
			8270	10
Benzyl alcohol	100-51-6	Benzenemethanol	8270	20
Beryllium	(Total)	Beryllium	6010	3
			7090	50
			7091	2
alpha-BHC	319-84-6	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1α,2α,3β,4α,5β,6β)-	8080	0.05
			8270	10
beta-BHC	319-85-7	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1α,2β,3α,4β,5α,6β)-	8080	0.05
			8270	20
delta-BHC	319-86-8	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1α,2α,3α,4β,5α,6β)-	8080	0.1
			8270	20

Common Name [3]	CAS RN [5]	Chemical abstracts service index name [4]	Suggested methods [6]	POL (µg/L) [6]
gamma-BHC; Lindane	58-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1α,2α,3β,4α,5α,6β)-	8080	0.05
Bis(2-chloroethoxy)methane	111-91-1	Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-	8270	20
Bis(2-chloroethyl) ether; Dichloroethyl ether	111-44-4	Ethane, 1,1'-oxybis[2-chloro-	8110	5
Bis-(2-chloro-1-methylethyl) ether; 2,2'-Dichlorodiisopropyl ether; DCIP, See note 7	108-60-1	Propane, 2,2'-oxybis[1-chloro-	8270	10
Bis(2-ethylhexyl) phthalate	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	8110	3
Bromochloromethane; Chlorobromomethane	74-97-5	Methane, bromochloro-	8270	10
Bromodichloromethane; Dibromochloromethane	75-27-4	Methane, bromodichloro-	8110	10
Bromoform; Tribromomethane	75-25-2	Methane, tribromo-	8270	10
4-Bromophenyl phenyl ether	101-55-3	Benzene, 1-bromo-4-phenoxy-	8060	20
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester	8060	10
Cadmium	(Total)	Cadmium	8270	10
Carbon disulfide	75-15-0	Carbon disulfide	6010	40
Carbon tetrachloride	56-23-5	Methane, tetrachloro-	7130	50
Chlordane	See Note 8	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-.	7131	1
p-Chloroaniline	106-47-8	Benzenamine, 4-chloro-	8260	100
Chlorobenzene	108-90-7	Benzene, chloro-	8010	1
Chlorobenzilate	510-15-6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester.	8021	0.1
p-Chloro-m-cresol; 4-Chloro-3-methylphenol	59-50-7	Phenol, 4-chloro-3-methyl-	8080	0.1
Chloroethane; Ethyl chloride	75-00-3	Ethane, chloro-	8270	50
Chloroform; Trichloromethane	67-66-3	Methane, trichloro-	8270	20
2-Chloronaphthalene	91-58-7	Naphthalene, 2-chloro-	8010	2
2-Chlorophenol	95-57-8	Phenol, 2-chloro-	8020	2
4-Chlorophenyl phenyl ether	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8021	0.1
Chloroprene	126-99-8	1,3-Butadiene, 2-chloro-	8260	5
Chromium	(Total)	Chromium	8270	10
Chrysene	218-01-9	Chrysene	8040	5
Cobalt	(Total)	Cobalt	8270	20
Copper	(Total)	Copper	8010	5
m-Cresol; 3-methylphenol	108-39-4	Phenol, 3-methyl-	8021	1
o-Cresol; 2-methylphenol	95-48-7	Phenol, 2-methyl-	8260	10
p-Cresol; 4-methylphenol	106-44-5	Phenol, 4-methyl-	8010	0.5
Cyanide	57-12-5	Cyanide	8021	0.2
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8260	5
4,4'-DDD	72-54-8	Benzene 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	8120	10
4,4'-DDE	72-55-9	Benzene, 1,1'-(dichloroethyenylidene)bis[4-chloro-	8270	10
4,4'-DDT	50-29-3	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	8040	5
Diallate	2303-16-4	Carbamothioic acid, bis(1-methylethyl)-,S-(2,3-dichloro-2-propenyl) ester.	8270	20
			8010	5
			8021	1
			8260	10
			8010	0.5
			8021	0.2
			8260	5
			8120	10
			8270	10
			8040	5
			8270	10
			8110	40
			8270	10
			8010	50
			8260	20
			6010	70
			7190	500
			7191	10
			8100	200
			8270	10
			6010	70
			7200	500
			7201	10
			6010	60
			7210	200
			7211	10
			8270	10
			8270	10
			8270	10
			9010	200
			8150	10
			8080	0.1
			8270	10
			8080	0.05
			8270	10
			8080	0.1
			8270	10
			8270	10

Common Name [a]	CAS RN [b]	Chemical abstracts service index name [c]	Suggested methods [d]	POL (µg/L) [e]
Dibenz[a,h]anthracene	53-70-3	Dibenz[a,h]anthracene	8100	200
Dibenzofuran	132-64-9	Dibenzofuran	8270	10
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-	8270	10
			8010	1
			8021	0.3
1,2-Dibromo-3-chloropropane; DBCP	96-12-8	Propane, 1,2-dibromo-3-chloro-	8260	5
			8011	0.1
			8021	30
1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4	Ethane, 1,2-dibromo-	8260	25
			8011	0.1
			8021	10
Di-n-butyl phthalate	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8260	5
			8060	5
o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1	Benzene, 1,2-dichloro-	8270	10
			8010	2
			8020	5
			8021	0.5
			8120	10
			8260	5
m-Dichlorobenzene; 1,3-Dichlorobenzene	541-73-1	Benzene, 1,3-Dichloro-	8270	10
			8010	5
			8020	5
			8021	0.2
			8120	10
			8260	5
p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7	Benzene, 1,4-dichloro-	8270	10
			8010	2
			8020	5
			8021	0.1
			8120	15
			8260	5
3,3'-Dichlorobenzidine	91-94-1	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	8270	10
trans-1,4-Dichloro-2-butene	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8270	20
Dichlorodifluoromethane; CFC 12	75-71-8	Methane, dichlorodifluoro-	8260	100
			8021	0.5
1,1-Dichloroethane; Ethylidene chloride	75-34-3	Ethane, 1,1-dichloro-	8260	5
			8010	1
			8021	0.5
1,2-Dichloroethane; Ethylene dichloride	107-06-2	Ethane, 1,1-dichloro-	8260	5
			8010	0.5
			8021	0.3
1,1-Dichloroethylene; 1,1-Dichloroethene; Vinylidene chloride	75-35-4	Ethene, 1,1-dichloro-	8260	5
			8010	1
			8021	0.5
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2	Ethene, 1,2-dichloro-, (Z)-	8260	5
			8021	0.2
trans-1,2-Dichloroethylene trans-1,2-Dichloroethene	156-60-5	Ethene, 1,2-dichloro-, (E)-	8260	5
			8010	1
			8021	0.5
2,4-Dichlorophenol	120-83-2	Phenol, 2,4-dichloro-	8260	5
			8040	5
2,6-Dichlorophenol	87-65-0	Phenol, 2,6-dichloro-	8270	10
1,2-Dichloropropane; Propylene dichloride	78-87-5	Propane, 1,2-dichloro-	8270	10
			8010	0.5
			8021	0.05
1,3-Dichloropropane; Trimethylene dichloride	142-28-9	Propane, 1,3-dichloro-	8260	5
			8021	0.3
2,2-Dichloropropane; Isopropylidene chloride	594-20-7	Propane, 2,2-dichloro-	8260	5
			8021	0.5
1,1-Dichloropropene	563-58-6	1-Propene, 1,1-dichloro-	8260	15
			8021	0.2
cis-1,3-Dichloropropene	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	8260	5
			8010	20
trans-1,3-Dichloropropene	10061-02-6	1-Propene, 1,3-dichloro-, (E)-	8260	10
			8010	5
Dieldrin	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexa, chloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aα,3β,6β,6aα,7β,7aα)-.	8080	0.05
			8270	10
Diethyl phthalate	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8060	5
			8270	10
0,0-Diethyl 0-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, 0,0-diethyl 0-pyrazinyl ester	8141	5
			8270	20
Dimethoate	60-51-5	Phosphorodithioic acid, 0,0-dimethyl S-[2-(methylamino)-2-oxoethyl] ester.	8141	3
			8270	20
p-(Dimethylamino)azobenzene	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270	10
7,12-Dimethylbenz[a]anthracene	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270	10

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Common Name [a]	CAS RN [b]	Chemical abstracts service index name [c]	Suggested methods [d]	POL (µg/L) [e]
3,3'-Dimethylbenzidine	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270	10
2,4-Dimethylphenol; m-Xylenol	105-67-9	Phenol, 2,4-dimethyl-	8040	5
			8270	10
Dimethyl phthalate	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060	5
			8270	10
m-Dinitrobenzene	99-65-0	Benzene, 1,3-dinitro-	8270	20
4,6-Dinitro-o-cresol 4,6-Dinitro-2-methylphenol	534-52-1	Phenol, 2-methyl-4,6-dinitro	8040	150
			8270	50
2,4-Dinitrophenol;	51-28-5	Phenol, 2,4-dinitro-	8040	150
			8270	50
2,4-Dinitrotoluene	121-14-2	Benzene, 1-methyl-2,4-dinitro-	8090	0.2
			8270	10
2,6-Dinitrotoluene	606-20-2	Benzene, 2-methyl-1,3-dinitro-	8090	0.1
			8270	10
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	8150	1
			8270	20
Di-n-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060	30
			8270	10
Diphenylamine	122-39-4	Benzenamine, N-phenyl-	8270	10
Disulfoton	298-04-4	Phosphorodithioic acid, 0,0-diethyl S-[2-(ethylthio)ethyl] ester	8140	2
			8141	0.5
			8270	10
Endosulfan I	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide,	8060	0.1
			8270	20
Endosulfan II	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3 oxide, (3α,5aα,6β,9β,9aα)-.	8060	0.05
			8270	20
Endosulfan sulfate	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-,3-3-dioxide.	8080	0.5
			8270	10
Endrin	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα, 2β,2aβ,3α,6α, 6aβ,7β,7aα)-.	8080	0.1
			8270	20
Endrin aldehyde	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β,2aβ,4β, 4aβ,5β,6aβ,6bβ,7R*)-.	8080	0.2
			8270	10
Ethylbenzene	100-41-4	Benzene, ethyl-	8020	2
			8221	0.05
			8260	5
Ethyl methacrylate	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015	5
			8260	10
			8270	10
Ethyl methanesulfonate	62-50-0	Methanesulfonic acid, ethyl ester	8270	20
Famphur	52-85-7	Phosphorothioic acid, 0-[4-[(dimethylamino)sulfonyl]phenyl] 0,0-dimethyl ester.	8270	20
Fluoranthene	206-44-0	Fluoranthene	8100	200
			8270	10
Fluorene	86-73-7	9H-Fluorene	8100	200
			8270	10
Heptachlor	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-.	8080	0.05
			8270	10
Heptachlor epoxide	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a-hexahydro-, (1aα, 1bβ, 2α, 5α, 5aβ, 6β, 6aα).	8080	1
			8270	10
Hexachlorobenzene	118-74-1	Benzene, hexachloro-	8120	0.5
			8270	10
Hexachlorobutadiene	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8021	0.5
			8120	5
			8260	10
			8270	10
Hexachlorocyclopentadiene	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120	5
			8270	10
Hexachloroethane	67-72-1	Ethane, hexachloro-	8120	0.5
			8260	10
			8270	10
Hexachloropropene	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-	8270	10
2-Hexanone; Methyl butyl ketone	591-78-6	2-Hexanone	8260	50
Indeno(1,2,3-cd)pyrene	193-39-5	Indeno(1,2,3-cd)pyrene	6100	200
			8270	10
Isobutyl alcohol	78-83-1	1-Propanol, 2-methyl-	8015	50
			8240	100
Isodrin	465-73-6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10- hexachloro-1,4,4a,5,8,8a hexahydro- (1α,4α,4aβ,5β,8β,8aβ)-.	8270	20
			8260	10
Isophorone	78-59-1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090	60
			8270	10
Isosafrole	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	8270	10
Kepone	143-50-0	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-.	8270	20

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Common Name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	POL (µg/L) [6]
Lead	(Total)	Lead	6010	400
			7420	1000
Mercury	(Total)	Mercury	7421	10
Methacrylonitrile	126-98-7	2-Propenenitrile, 2-methyl-	7470	2
			8015	5
Methapyrilene	91-80-5	1,2-Ethanediamine, N,N-dimethyl-N[1]-2-pyridinyl-N1/2-thienylmethyl)-.	8260	100
			8270	100
Methoxychlor	72-43-5	Benzene,1,1[1]-(2,2,2,trichloroethylidene)bis[4-methoxy-	8080	2
			8270	10
Methyl bromide; Bromomethane	74-83-9	Methane, bromo-	8010	20
			8021	10
Methyl chloride; Chloromethane	74-87-3	Methane, chloro-	8010	1
			8021	0.3
3-Methylcholanthrene	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270	10
Methyl ethyl ketone; MEK; 2-Butanone	78-93-3	2-Butanone	8015	10
			8260	100
Methyl iodide; Iodomethane	74-88-4	Methane, iodo-	8010	40
			8260	10
Methyl methacrylate	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester	8015	2
			8260	30
Methyl methanesulfonate	66-27-3	Methanesulfonic acid, methyl ester	8270	10
2-Methylnaphthalene	91-57-6	Naphthalene, 2-methyl-	8270	10
Methyl parathion; Parathion methyl	298-00-0	Phosphorothioic acid, 0,0-dimethyl 0-(4-nitrophenyl) ester	8140	0.5
			8141	1
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1	2-Pentanone, 4-methyl-	8270	10
			8015	5
Methylene bromide; Dibromomethane	74-95-3	Methane, dibromo-	8260	100
			8010	15
Methylene chloride; Dichloromethane	75-09-2	Methane, dichloro-	8021	20
			8260	10
			8010	5
			8021	0.2
Naphthalene	91-20-3	Naphthalene	8260	10
			8021	0.5
			8100	200
			8260	5
1,4-Naphthoquinone	130-15-4	1,4-Naphthalenedione	8270	10
1-Naphthylamine	134-32-7	1-Naphthalenamine	8270	10
2-Naphthylamine	91-59-8	2-Naphthalenamine	8270	10
Nickel	(Total)	Nickel	8270	10
			6010	150
			7520	400
o-Nitroaniline; 2-Nitroaniline	88-74-4	Benzenamine, 2-nitro-	8270	50
m-Nitroaniline; 3-Nitroaniline	99-09-2	Benzenamine, 3-nitro-	8270	50
p-Nitroaniline; 4-Nitroaniline	100-01-6	Benzenamine, 4-nitro	8270	20
Nitrobenzene	98-95-3	Benzene, nitro-	8090	40
			8270	10
o-Nitrophenol; 2-Nitrophenol	88-75-5	Phenol, 2-nitro-	8040	5
			8270	10
p-Nitrophenol; 4-Nitrophenol	100-02-7	Phenol, 4-nitro-	8040	10
			8270	50
N-Nitrosodi-n-butylamine	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270	10
N-Nitrosodiethylamine	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270	20
N-Nitrosodimethylamine	62-75-9	Methanamine, N-methyl-N-nitroso-	8070	2
N-Nitrosodiphenylamine	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8070	5
N-Nitrosodipropylamine; N-Nitroso-N-dipropylamine; Di-n-propylnitrosamine.	621-64-7	1-Propanamine, N-nitroso-N-propyl-	8070	10
N-Nitrosomethylethalamine	10595-95-6	Ethanamine, N-methyl-N-nitroso-		
N-Nitrosopiperidine	100-75-4	Piperidine, 1-nitroso-	8270	10
N-Nitrosopyrrolidine	930-55-2	Pyrrolidine, 1-nitroso-	8270	20
5-Nitro-o-toluidine	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270	40
Parathion	56-38-2	Phosphorothioic acid, 0,0-diethyl 0-(4-nitrophenyl) ester	8270	10
			8141	0.5
Pentachlorobenzene	608-93-5	Benzene, pentachloro-	8270	10
Pentachloronitrobenzene	82-68-8	Benzene, pentachloronitro-	8270	10
Pentachlorophenol	87-86-5	Phenol, pentachloro-	8270	20
			8040	5
Phenacetin	62-44-2	Acetamide, N-(4-ethoxyphenl)	8270	50
Phenanthrene	85-01-8	Phenanthrene	8270	20
			8100	200
Phenol	108-95-2	Phenol	8270	10
p-Phenylenediamine	106-50-3	1,4-Benzenediamine	8040	1
Phorate	298-02-2	Phosphorodithioic acid, 0,0-diethyl S-[(ethylthio)methyl] ester	8270	10
			8140	2
			8141	0.5
			8270	10

—Continued

Common Name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Polychlorinated biphenyls; PCBs; Aroclors	See Note 9	1,1'-Biphenyl, chloro derivatives	8080	50
			8270	200
Pronamide	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270	10
Propionitrile; Ethyl cyanide	107-12-0	Propanenitrile	8015	60
			8260	150
Pyrene	129-00-0	Pyrene	8100	200
			8270	10
Safrole	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-	8270	10
Selenium	(Total)	Selenium	6010	750
			7740	20
			7741	20
Silver	(Total)	Silver	6010	70
			7760	100
			7761	10
Silvex; 2,4,5-TP	93-72-1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150	2
Styrene	100-42-5	Benzene, ethenyl-	8020	1
			8021	0.1
			8260	10
Sulfide	18496-25-8	Sulfide	9030	4000
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5	Acetic acid, (2,4,5-trichlorophenoxy)-	8150	2
1,2,4,5-Tetrachlorobenzene	95-94-3	Benzene, 1,2,4,5-tetrachloro-	8270	10
1,1,1,2-Tetrachloroethane	630-20-6	Ethane, 1,1,1,2-tetrachloro-	8010	5
			8021	0.05
			8260	5
1,1,2,2-Tetrachloroethane	79-34-5	Ethane, 1,1,2,2-tetrachloro-	8010	0.5
			8021	0.1
			8260	5
Tetrachloroethylene; Tetrachloroethene; Perchloroethylene	127-18-4	Ethene, tetrachloro-	8010	0.5
			8021	0.5
			8260	5
2,3,4,6-Tetrachlorophenol	58-90-2	Phenol, 2,3,4,6-tetrachloro-	8270	10
Thallium	(Total)	Thallium	6010	400
			7840	1000
			7841	10
Tin	(Total)	Tin	6010	40
Toluene	108-88-3	Benzene, methyl-	8020	2
			8021	0.1
			8260	5
o-Toluidine	95-53-4	Benzenamine, 2-methyl-	8270	10
Toxaphene	See Note 10	Toxaphene	8080	2
1,2,4-Trichlorobenzene	120-82-1	Benzene, 1,2,4-trichloro-	8021	0.3
			8120	0.5
			8260	10
			8270	10
1,1,1-Trichloroethane; Methylchloroform	71-55-6	Ethane, 1,1,1-trichloro-	8010	0.3
			8021	0.3
			8260	5
1,1,2-Trichloroethane	79-00-5	Ethane, 1,1,2-trichloro-	8010	0.2
			8260	5
Trichloroethylene; Trichloroethene	79-01-6	Ethene, trichloro-	8010	1
			8021	0.2
			8260	5
Trichlorofluoromethane; CFC-11	75-69-4	Methane, trichlorofluoro-	8010	10
			8021	0.3
			8260	5
2,4,5-Trichlorophenol	95-95-4	Phenol, 2,4,5-trichloro-	8270	10
2,4,6-Trichlorophenol	88-06-2	Phenol, 2,4,6-trichloro-	8040	5
			8270	10
1,2,3-Trichloropropane	96-18-4	Propane, 1,2,3-trichloro-	8010	10
			8021	5
			8260	15
0,0,0-Triethyl phosphorothioate	126-68-1	Phosphorothioic acid, 0,0,0-triethylester	8270	10
sym-Trinitrobenzene	99-35-4	Benzene, 1,3,5-trinitro-	8270	10
Vanadium	(Total)	Vanadium	6010	80
			7910	2000
			7911	40
Vinyl acetate	108-05-4	Acetic acid, ethenyl ester	8260	50
Vinyl chloride; Chloroethene	75-01-4	Ethene, chloro-	8010	2
			8021	0.4
			8260	10
Xylene (total)	See Note 11	Benzene, dimethyl-	8020	5
			8021	0.2
			8260	5
Zinc	(Total)	Zinc	6010	20
			7950	50
			7951	0.5

Notes

[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and POL) are given for informational purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

[4] CAS index are those used in the 9th Collective Index.

[5] Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", third edition, November 1986, as revised, December 1987. Analytical details can be found in SW-846 and in documentation on file at the agency. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable method(s) for monitoring an analyte under the regulations.

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally stated to one significant figure. PQLs are based on 5 mL samples for volatile organics and 1 L samples for semivolatile organics. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a determination for individual compounds; PQLs are not a part of the regulation.

[7] This substance is often called Bis(2-chloroisopropyl) ether, the name Chemical Abstracts Service applies to its noncommercial isomer, Propane, 2,2'-oxybis[2-chloro- (CAS RN 39638-32-9).

[8] Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6). POL shown is for technical chlordane. POLs of specific isomers are about 20 µg/L by method 8270.

[9] Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor 1016 (CAS RN 12674-11-2), Aroclor 1221 (CAS RN 11104-28-2), Aroclor 1232 (CAS RN 11141-16-5), Aroclor 1242 (CAS RN 53469-21-9), Aroclor 1248 (CAS RN 12672-29-6), Aroclor 1254 (CAS RN 11097-69-1), and Aroclor 1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

[10] Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), i.e., chlorinated camphene.

[11] Xylene (total): This entry includes o-xylene (CAS RN 95-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7). POLs for method 8021 are 0.2 for o-xylene and 0.1 for m- or p-xylene. The POL for m-xylene is 2.0 µg/L by method 8020 or 8260.

Appendices to the Preamble

Appendix A—[Reserved]

Appendix B—Supplemental Information for Subpart A—General

Subpart A discusses the purpose, scope, and applicability of part 258 (§ 258.1). It provides definitions necessary for the proper interpretation of the rule (§ 258.2), and indicates that there are other Federal laws and rules with which owners and operators of MSWLFs must comply.

1. Section 258.1 Purpose, Scope, and Applicability

Part 258 sets forth minimum national Criteria for the location, design, operation, cleanup, and closure of municipal solid waste landfills. An MSWLF that does not meet these Criteria will be considered to be engaged in the practice of "open dumping" in violation of section 4005 of RCRA. Moreover, MSWLFs failing to satisfy these Criteria will be deemed to be in violation of sections 309 and 405(e) of the Clean Water Act if they are receiving sewage sludge. The purpose of part 258 is to establish minimum national Criteria for municipal solid waste landfills, including MSWLFs used for sludge disposal. The Criteria do not apply to owners and operators of MSWLFs that have stopped receiving waste as of October 9, 1991 (see § 258.1(c)). Owners and operators of MSWLFs that stop receiving waste between October 9, 1991 and October 9, 1993 are exempt from all of the requirements of part 258 except the final cover requirements cited in § 258.1(d). Finally, MSWLFs that receive waste on or after October 9, 1991 must comply with all of part 258 unless otherwise specifically exempted, e.g., the small communities exemption contained in § 285.1(f).

The effective date of part 258 is October 9, 1993, except for two provisions: (1) The ground-water monitoring provisions of §§ 258.51–258.55, which are phased in for existing MSWLFs and lateral expansions over a five-year period beginning on October 9, 1991, in accordance with § 258.50, and (2) the financial responsibility provisions of subpart G, which are effective April 4, 1994.

The proposed § 258.1 was the subject of extensive and substantive comments. These comments, and EPA's response to the comments, are addressed below.

a. Closed Facilities

The proposal excluded "closed units," from the revised Criteria. "Closed units" were defined as "* * * any solid waste disposal unit that no longer receives solid waste as of the effective date of this part and has received a final layer of cover material." The Agency proposed this approach for several reasons. First, as discussed in the preamble to the proposal, identification of "closed units" would be difficult, time consuming, and complicated by such issues as changes in ownership. Second, the inclusion of inactive facilities would dilute the already scarce technical and financial resources available to the States. Moreover, other authorities and resources are available to address inactive facilities that are creating environmental hazards. For example, abandoned MSWLFs releasing hazardous substances that pose a threat to human health and the environment can be addressed using authorities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Several commenters argued that EPA should distinguish between those facilities that have closed as of promulgation of the revised Criteria and those that continue to receive waste after today's date, but stop doing so prior to the date the rules take effect. These commenters were concerned that some MSWLF owners or operators would take advantage of this window, perpetuating problems that could compromise human health and the environment. Specifically, several commenters urged that liquid restrictions, ground-water monitoring, and final cover requirements should be applicable to facilities that cease receiving waste in the window between the date of promulgation and the effective date. Commenters argued that this approach was more protective of human health and the environment than allowing MSWLFs that close during the window to be exempt from all the revised Criteria.

To address these concerns, EPA is today distinguishing between (1) those facilities that stopped receiving waste prior to the date that the rule is published in the Federal Register, and (2) those MSWLFs that stop receiving waste in the window between the date of publication and the rule's effective date. MSWLFs in the first category will remain outside the scope of the revised Criteria. However, EPA is today requiring the second category of MSWLFs to install a final cover as specified under § 258.60(a). The cover must be completely installed within six months of the last receipt of wastes. Owners and operators of MSWLFs that stop receiving waste during the window but that fail to finish cover installation within six months of the last receipt of waste will be subject to all of the requirements of part 258. EPA also eliminated the proposed definition of "closed unit" from the final rule, because the definition was unnecessary given the revised rule language added to respond to comments described. The

Appendix F

APPENDIX F: EPA REGION IV STANDARD OPERATING PROCEDURES: APPENDIX A

APPENDIX A
RECOMMENDED SAMPLE CONTAINERS, SAMPLE PRESERVATION, SAMPLE HOLDING TIMES, AND PERMISSIBLE SAMPLE TYPE

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Concentrated Waste Samples					
Organic Compounds - Extractable and Pesticide/PCBs	8-oz. widemouth glass with Teflon® liner	None	14 days	G or C	A
Organic Compounds - Purgeable (VOA)	2-oz. (60-ml) VOA container with Teflon® lined septum sealed caps	None	14 days	G or C	A
Metals and Other Inorganic Compounds	8-oz. widemouth glass with Teflon® liner	None	Not Specified	G or C	A
EP Toxicity	8-oz. widemouth glass with Teflon® liner	None	Not Specified	G or C	B
TCLP Purgeable Organics (VOA)	2-oz. (60-ml) VOA container with Teflon® lined Septum sealed caps[1]	None	28 days[2]	G or C	A
TCLP Extractable Organics, Herbicides, and Pesticide/PCBs	8-oz. widemouth glass with Teflon® liner[1]	None	54 days[2]	G or C	A
TCLP Metals except Mercury	8-oz. widemouth glass with Teflon® liner[1]	None	360 days[2]	G or C	A
TCLP Mercury	Samples will be taken from TCLP Metals container[1]	None	56 days[2]	G or C	A
Flash Point and/or Heat Content	8-oz. widemouth glass with Teflon® liner	None	Not Specified	G	B

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Fish Samples					
Organic Compounds	Wrap in aluminum foil (shiny side out)	Freeze	Not Specified	G or C	
Metals and Other Inorganic Compounds	Place in plastic Zip-Loc® bag	Freeze	Not Specified	G or C	
Water - Low to Medium Concentration Samples					
Alkalinity	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	14 days	G or C	C
Acidity	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	14 days	G or C	C
Bacteriological	250-ml. glass with glass closure or plastic capable of being autoclaved	Cool, 4°C	6 hours	G	C
Static Bioassay	1-gal. amber glass (not solvent rinsed)	Cool, 4°C	48 hours	G or C	D
Biochemical Oxygen Demand (BOD)	1/2-gal. polyethylene[3] with polyethylene closure	Cool, 4°C	48 hours	G or C	C
Chlorine	500-ml or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	None	28 days	G or C	C
Chlorine Residual	In-situ, beaker or bucket	None	Analyze Immediately	G	C

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Water - Low to Medium Concentration Samples					
Conductivity	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	28 days (determine on site if possible)	G or C	C
Chromium, Hexavalent	1-liter polyethylene with Polyethylene closure	Cool, 4°C	24 hours	G	C
Cyanide	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Ascorbic acid[4,5] Sodium Hydroxide, Ph >12, Cool, 4°C	14 days	G	C
Dissolved Oxygen (Probe)	In-situ, beaker or bucked	None	Determine on site	G	C
Dissolved Oxygen (Winkler)	300-ml glass BOD bottle (store in dark if possible)	Fix on site	8 hours (determine on site	G	C
EP Toxicity	1-gal. glass (amber) with Teflon® liner	Cool, 4°C	Not Specified	G or C	B
TCLP Extractable Organics (VOA)	3 40-ml VOA containers with Teflon® lined Septum sealed caps	None	28 days[2]	G	-
TCLP Extractable Organics, Herbicides, and Pesticide/PCBs	1-gal amber glass with Teflon® liner	None	54 days[2]	G or C	-
TCLP Metals except Mercury	1-gal amber glass with Teflon® liner	None	360 days[2]	G or C	-
TCLP Mercury	Samples will be taken from TCLP Metals container	None	56 days[2]	G or C	-

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Water - Low to Medium Concentration Samples (Continued)					
Fluoride	1-liter polyethylene[3] or 1/2-gal. polyethylene with polyethylene or polyethylene lined closure	None	28 days	G or C	C
Hardness	500-ml. or 1-liter polyethylene with polyethylene or polyethylene lined closure	50% Nitric Acid[4], pH <2	6 months	G or C	C
LAS	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	48 hours	G or C	C
Metals	1-liter polyethylene with polyethylene lined closure	50% Nitric Acid[4], pH <2	6 months	G or C	C
Metals, Dissolved	1-liter polyethylene with polyethylene lined closure	Filter on site[4] 50% Nitric Acid, pH <2	6 months	G	C
Nutrients[6]	1-liter polyethylene or 1/2-gal. polyethylene with polyethylene or polyethylene lined closure	50% Sulfuric Acid[4], pH <2, Cool, 4°C	28 days	G or C	C
Oil and Grease	1-liter widemouth glass with Teflon® lined cap	50% Sulfuric Acid[4], pH <2, Cool, 4°C	28 days	G	C

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Water - Low to Medium Concentration Samples (Continued)					
Organic Compounds - Extractable and Pesticide Scan					
No Residual Chlorine Present	1-gal. amber glass or 2.5-gal. amber glass with Teflon® lined cap	Cool, 4°C	47 days[7]	G or C	A or C
Residual Chlorine Present	1-gal. amber glass or 2.5-gal. amber glass with Teflon® lined cap	Add 3 mls. 10% Sodium Thiosulfate per gallon, cool, 4°C	47 days[7]	G or C	A or C
Organic Compounds - Purgeable (VOA)					
No Residual chlorine Present	3 40-ml vials with Teflon® lined septum sealed caps	4 drops 1+1 HCl Cool, 4°C	14 days	G	A or C
No Residual Chlorine Present	3 40-ml vials with Teflon® lined septum sealed caps	Cool, 4°C	7 days	G	A or C
Residual Chlorine Present	3 40-ml vials with Teflon® lined septum sealed caps	Footnote 8	14 days	G	A or C
Organic Compounds - Specified and Pesticides (Non-Priority Pollutants such as Herbicides	1-gal. glass (amber) or 2.5-gal. glass (amber) with Teflon® lined closure	Footnote 9	47 days[7]	G or C	A or C
Organic Halides - Total (TOX)	250-ml amber glass with Teflon® lined septum closure	Cool, 4°C H_2SO_4 to pH <2	28 days	G	A or E

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Water - Low to Medium Concentration Samples (Continued)					
pH	In-situ, beaker or bucket	None	Analyze Immediately	G	C
Phenols	1-liter amber glass with Teflon®lined closure	50% H_2SO_4, ph <2, Cool, 4°C	28 days	G	C
Phosphate - Ortho	500-ml. or 1-liter polyethylene with polyethylene or polyethylene lined closure	Filter on site, Cool, 4°C	48 hours	G	C
Phosphorus, Total Dissolved	500-ml. or 1-liter polyethylene with polyethylene or polyethylene lined closure	Filter on site, 50% H_2SO_4, pH <2, Cool, 4°C	28 days	G	C
Solids, Settleable	1/2-gal. polyethylene with polyethylene closure	Cool, 4°C	48 hours	G or C	C
Solids (Total and Suspended, etc.)	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	7 days	G or C	C
Sulfates	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	28 days	G or C	C
Sulfides	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	2-ml. Zinc Acetate[4], Conc NaOH to pH >9, Cool, 4°C	7 days	G	C
Temperature	In-situ, beaker or bucket	None	Determine on site	G	C

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Water - Low to Medium Concentration Samples (Continued)					
Turbidity	500-ml. or 1-liter polyethylene[3] with polyethylene or polyethylene lined closure	Cool, 4°C	48 hours	G or C	C
Soil, Sediment or Sludge Samples - Low to Medium Concentrations					
EP Toxicity	8-oz. widemouth glass with Teflon® lined closure	Cool, 4°C	Not Specified	G or C	B
TCLP Purgeable Organics (VOA)	2 2-oz. (60-ml.) VOA containers with Teflon® lined septum sealed caps[1]	None	28 days[2]	G or C	A
TCLP Extractable Organics, Herbicides, and Pesticide/PCBs	8-oz. widemouth with Teflon® liner	None	54 days[2]	G or C	A
TCLP Metals Except Mercury	8-oz. widemouth with Teflon® liner	360 days[2]	360 days[2]	G or C	A
TCLP Mercury	Sample will be taken from TCLP Metals container	None	56 days[2]	G or C	A
Metals	8-oz. widemouth glass with Teflon® lined closure	Cool, 4°C	6 months	G or C	A
Nutrients Including: Nitrogen, Phosphorus, Chemical Oxygen Demand	500-ml. polyethylene with polyethylene closure or 8-oz. widemouth glass with Teflon® lined closure	Cool, 4°C	Not Specified	G or C	A
Organics - Extractable	8-oz. widemouth glass with Teflon® lined septum seal	Cool, 4°C	14 days	G or C	A

Parameter	Container	Preservative	Holding Time	Permissible Sample Type	Ref.
Soil, Sediment or Sludge Samples - Low to Medium Concentration (Continued)					
Organics - Purgeable (VOA)	2-oz. (60-ml.) VOA vial with Teflon® lined septum seal	Cool, 4°C	14 days	G or C	A
Other Inorganic compounds Including Cyanide	500-ml. polyethylene with polyethylene closure or 8-oz. widemouth glass with Teflon® lined closure	Cool, 4°C	Not Specified	G or C	A
Municipal Sludge - Low to Medium Concentrations					
Organics - Extractable & Pesticide/PCBs	0 - 30% Solids 1-gal. amber glass or 4-qt. widemouth bottle (depending on consistency) with Teflon® lined cap	Cool, 4°C	47 days[7]	G or C	F
	> 30% Solids 8-oz. widemouth glass jar with Teflon® lined cap	Cool, 4°C	47 days[7]	G or C	F
Organics - Purgeable (VOA)	0 - 1% Solids 3 40-ml. VOA vials with Teflon® lined septum sealed cap	4 drops 1+1 HCl, Cool, 4°C	14 days	G or C	F
	> 1% Solids 2 2-oz. (60-ml.) VOA vials with Teflon® septum sealed cap	Cool, 4°C	14 days	G or C	F

Abbreviations:
G = Grab
C = Composite
ASAP = As Soon As Possible
NS = Not Specified

NOTE: The Analytical Support Branch should be consulted prior to making any changes to any of the above sampling protocols.

Footnotes:

1. The TCLP method requires the leaching of 25 gms of solid for volatile organics and 100 gm of solids for all other parameters. If the sample is low in solids, additional sample containers may be required to provide sufficient sample for the TCLP leach extraction.

2. These are total holding times for TCLP that cover sampling through analysis. The holding times are broken down as follows: TCLP volatile organics - 14 days from collection to TCLP extraction plus 14 days from leach extraction to analysis; extractable organics, pesticides & herbicides - 7 days from collection to TCLP extraction plus 7 days to solvent extraction of leachate plus 40 days to analysis of extract; mercury - 28 days from collection to TCLP extraction plus 28 days to analysis; metals except mercury - 180 days from collection to TCLP extraction plus 180 days to analysis.

3. Use indicated container for single parameter requests or 1/2-gallon polyethylene container for multiple parameter requests except those including BOD. Use a 1-gallon polyethylene container for multiple parameter requests which include BOD.

4. Must be preserved in the field at time of collection.

5. Use ascorbic acid only if the sample contains residual chlorine. Test a drop of sample with potassium iodide-starch test paper; a blue color indicates need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6 g of ascorbic acid for each liter of sample volume.

6. May include nitrogen series (ammonia, total Kjeldahl nitrogen, nitrate-nitrite), total phosphorus, chemical oxygen demand and total organic carbon.

7. Samples must be extracted within seven days and extract must be analyzed within 40 days.

8. Collect the sample in a 4-oz. soil VOA container which has been pre-preserved with four drops of 25 percent ascorbic acid solution. Gently mix the sample and transfer to a 40-ml VOA vial that has been prepreserved with four drops 1+1 HCl, cool to $4^{o}C$.

9. See Organic Compounds - Extractable (page 4). The Analytical Support Branch should be consulted for any special organic compounds analyses in order to check on special preservation requirements and/or extra sample volume.

References

A. US-EPA, Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, Office of Solid Waste and Emergency Response, Washington,DC, Nov. 1986.

B. US-EPA, Test Methods for Evaluating Solid Waste, SW-846, Office of Solid Wastes, Washington, DC, 1982.

C. 40 CFR Part 136, Federal Register, Vol. 49, No. 209, October 26, 1984.

D. US-EPA, Region IV, Environmental Services Division, "Ecological Support Branch, Standard Operating Procedures Manual," latest version.

E. EPA Interim Method 450.1, "Total Organic Halide," US-EPA, ORD, EMSL, Physical and Chemical Methods Branch, Cincinnati, Ohio, November 1980.

F. US-EPA, Analytical Methods for the National Sewage Sludge Survey, Office of Water Regulations and Standards, Washington, DC, Aug. 1989.

Appendix G

APPENDIX G: FIELD FORMS

Waste Management, Inc.

MONITORING WELL INTEGRITY FIELD SURVEY

WMNA Well I.D._____

Permit Well I.D._____

Facility Name:_____

Evaluator:_____ Evaluation Date:_____

LOCATION	Y	N	NA	CARS
1. Is the well location appropriately shown on a facility permit and/or design drawing?	☐	☐	☐	☐
2. Are the wells in hard to find areas adequately flagged?	☐	☐	☐	☐
3. Is the well elevation information correct?	☐	☐	☐	☐
WELL CHARACTERISTICS & INTEGRITY				
4. Is the well ☐ Aboveground? ☐ Flush with the surface?				
5. No physical damage to wells?	☐	☐	☐	☐
6. Is the well labeled on the inside?	☐	☐	☐	☐
7. Is the well labeled outside?	☐	☐	☐	☐
8. Does the well have protective posts?	☐	☐	☐	☐
a. How many?_____				
b. Are posts painted or flagged?	☐	☐	☐	☐
9. Are the wells in or near a low point?	☐	☐	☐	☐
a. No evidence of ponded water around the well?	☐	☐	☐	☐
10. Do aboveground wells have weep holes at the base of the protective casing?	☐	☐	☐	☐
11. Does the area around the well appear clean (i.e., no mounds of waste; no dead animals)?	☐	☐	☐	☐
12. Is the casing secure (attempt to move along two perpendicular axes)?	☐	☐	☐	☐
13. Is the surface seal void of differential erosion around and under the base?	☐	☐	☐	☐
14. Is the surface seal free of cracks?	☐	☐	☐	☐
15. Is the surface seal sloped to prevent ponding in the immediate vicinity of the surface seal?	☐	☐	☐	☐
16. Is the monitoring well locked to prevent unauthorized access?	☐	☐	☐	☐
17. Is the cap void of large gaps which would breach security?	☐	☐	☐	☐
18. Is the locking cap free of rust?	☐	☐	☐	☐

Comments:_____

NOTE:

Response box legend:

Y=YES

N=NO [A negative response must be identified as an "A" unless a comment is made that demonstrates compliance]

NA=Not Applicable

CARS=Compliance Action REproting System issue.

WMX Environmental Monitoring Laboratories, Inc.

Site # ____

Bottle Set: ____

Sample Point: ____ (Source Code)

FIELD INFORMATION FORM

PURGING INFORMATION

PURGE DATE (YY MM DD)	START PURGE (2400 Hr Clock)	ELAPSED HRS	WATER VOL. IN CASING (Gallons)	ACTUAL VOLUME PURGED (Gallons)

PURGING AND SAMPLING EQUIPMENT

Purging Equipment ..... Dedicated | Y | | N | (circle one)

Sampling Equipment ..... Dedicated | Y | | N | (circle one)

Purging Device	____	A-Submersible Pump	D-Gas Lift Pump	G-Bailer	X-____ PURGING OTHER (SPECIFY)
Sampling Device	____	B-Peristaltic Pump	E-Venturi Pump	H-Scoop/Shovel	X-____ SAMPLING OTHER (SPECIFY)
		C-Bladder Pump	F-Dipper/Bottle	I-Piston Pump	
Purging Material	____	A-Teflon	C-Polypropylene	E-Polyethylene	X-____ PURGING OTHER (SPECIFY)
Sampling Material	____	B-Stainless Steel	D-PVC		X-____ SAMPLING OTHER (SPECIFY)
Tubing-Purging	____	A-Teflon	D-Polypropylene	F-Silicon	X-____ PURGING OTHER (SPECIFY)
Tubing-Sampling	____	B-Tygon	E-Polyethylene	G-Combination teflon/ Polypropylene	X-____ SAMPLING OTHER (SPECIFY)
		C-Rope X-____ (SPECIFY)			
Filtering Devices 0.45 μ:	____	A-In-line Disposable	B-Pressure	C-Vacuum	

FIELD MEASUREMENTS

Well Elevation	____ (ft/msl)	Land Surface Elevation	____ (ft/msl)
Depth to water From top of well casing	____ (ft)	Depth to water From land surface	____ (ft)
Groundwater Elevation	____ (ft/msl)	Groundwater Elevation	____ (ft/msl)
Well Depth	____ (ft)	Stickup	____ (ft)

	ph		spec. cond.		
1st	____ (STD)	1st	____ μm/cm at 25° C	Sample Temp.	____ (° C)
2nd	____ (STD)	2nd	____ μm/cm at 25° C	(other parameter) ____	value ____ units ____
3rd	____ (STD)	3rd	____ μm/cm at 25° C	(other parameter) ____	value ____ units ____
4th	____ (STD)	4th	____ μm/cm at 25° C	(other parameter) ____	value ____ units ____

FIELD COMMENTS

Sample Appearance: ____ (if applicable) Odor: ____ Color: ____ Turbidity: ____

Weather Conditions: Wind Speed ____ Direction ____ Precipitation Y/N Outlook ____

Specific Comments: ____

I certify that sampling procedures were in accordance with applicable EPA, State and WMI protocols.

____ / ____ / ____ (Date) ____ (Signature) Employer: ____

Subcontract To: _____

WMX Environmental Monitoring Laboratories, Inc.

FIELD CHAIN-OF-CUSTODY RECORD

AquaPak™ PREP
AquaPak™ # _____
Date Sealed _____ YY / MM / DD
Seal # _____
By: _____

SITE/FACILITY # _____ SITE NAME: _____

Sample Point: _____ (Source Code)

A R C O D E

SAMPLE DATE: _____ (YY / MM / DD)

SAMPLE TIME: _____ (2400 HR.)

MATRIX CODE: _____

Water ..... (W) Leachate ..... (C)
Soil ..... (S) Other ..... (X)

Source Codes:

Well ..... (W) Leachate System .. (C) Pretreatment Facility ... (P) River/Stream/Brook .. (R) Soil ..... (S) Generation Pt. .... (G)
Dewatering/Pressure Relief .... (D) Gas Condensate ... (M) Influent ..... (U) Lake or Ocean .... (L) Bottom Sediment ... (B) Other ..... (X)
Surface Water Impoundment ... (I) Air ..... (A) Effluent ..... (T) Outfall ..... (O) Noise ..... (N) Specify _____

ENS #

AquaPak™ CONTENT

SAMPLE I.D.	# OF BOTTLES	BOTTLE TYPE	PRESERVATIVE TYPE	ANALYTES/LAB GROUPS	FILTER Y — N	FIELD COMMENTS	E.M.L. COMMENTS
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		
					Y N		

CHAIN OF CUSTODY CHRONICLE

1. AquaPak™ Opened By: (print) _____ Date: ___/___/___ Time: ___:___ 2400 HR.
   Signature: _____ Seal #: _____ Intact: _____

I have received these materials in good condition from the above person.

2. Name: _____ Signature: _____
   Date: ___/___/___ Time: ___:___ 2400 HR. Remarks: _____

I have received these materials in good condition from the above person.

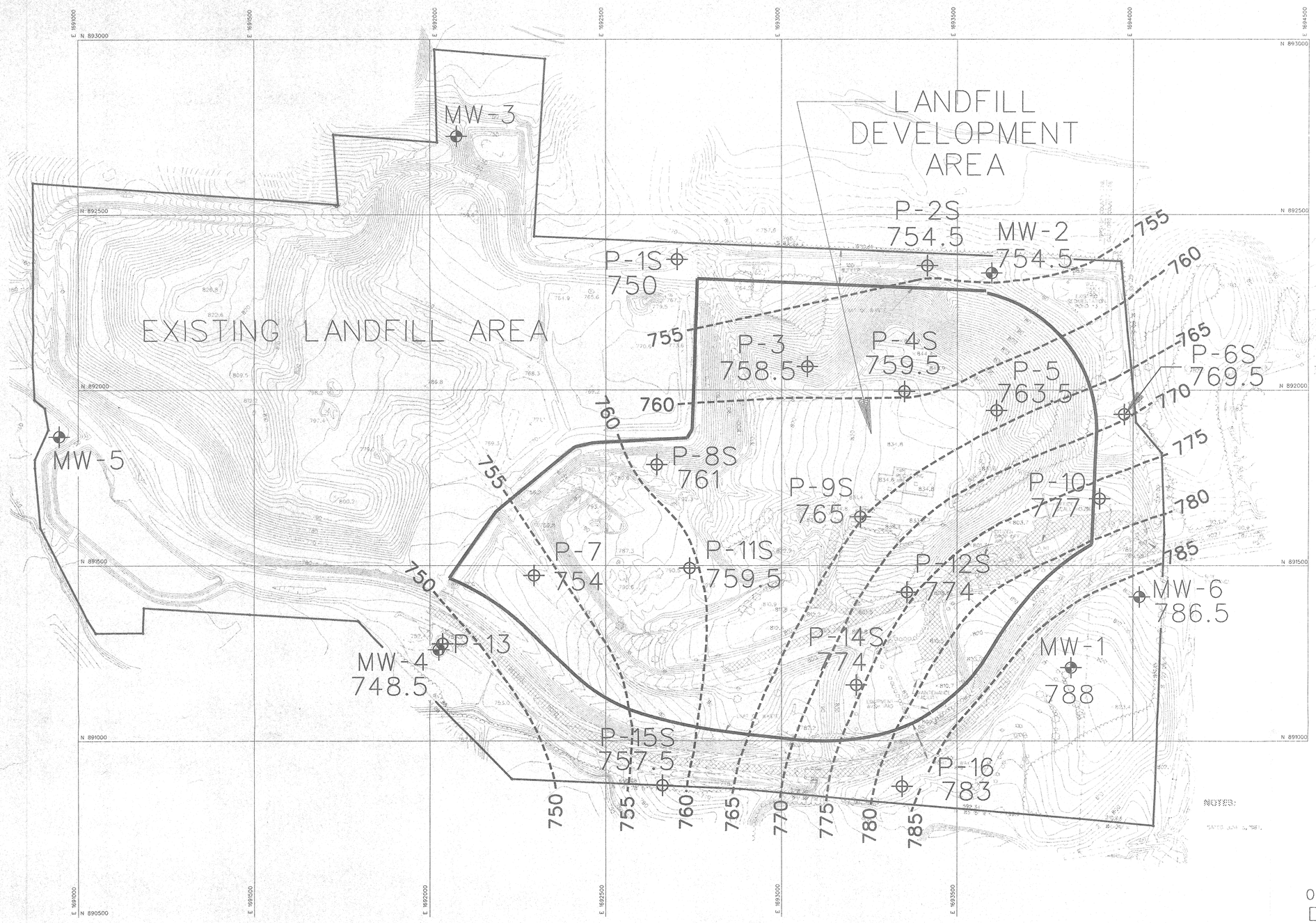
3. Name: _____ Signature: _____
   Date: ___/___/___ Time: ___:___ 2400 HR. Remarks: _____

4. AquaPak™/Sub Contr. # _____ Sealed By: _____ (Print) Date: ___/___/___ Time: ___:___ 2400 HR.
   Signature: _____ Seal #: _____ Intact: _____

LAB USE ONLY
Opened By: (Signature) _____ Date: ___/___/___ Time: ___:___ 2400 HR.
AquaPak™/Sub. Contr. # _____ Temp. °C _____ Seal # _____ Intact. _____

ORIGINAL LAB

EML FF-1



LEGEND:

EXISTING GROUND WATER MONITORING WELL

PIEZOMETER LOCATIONS

—750— POTENTIONMETRIC CONTOUR SEASONAL HIGH (5 FT. INTERVAL)

NOTE:

SEASONAL HIGH LEVELS ARE TAKEN FROM DESIGN HYDROGEOLOGIC INVESTIGATION. NCDEHNR HAS DESIGNATED THESE LEVELS AS APPROPRIATE SEASONAL HIGH LEVELS FOR THE DEVELOPMENT AREA. CONTOURS ARE INTERPOLATED FROM THESE LEVELS.

SOLID WASTE SECTION
JUN 24 1994

0 300 600 900

SCALE IN FEET

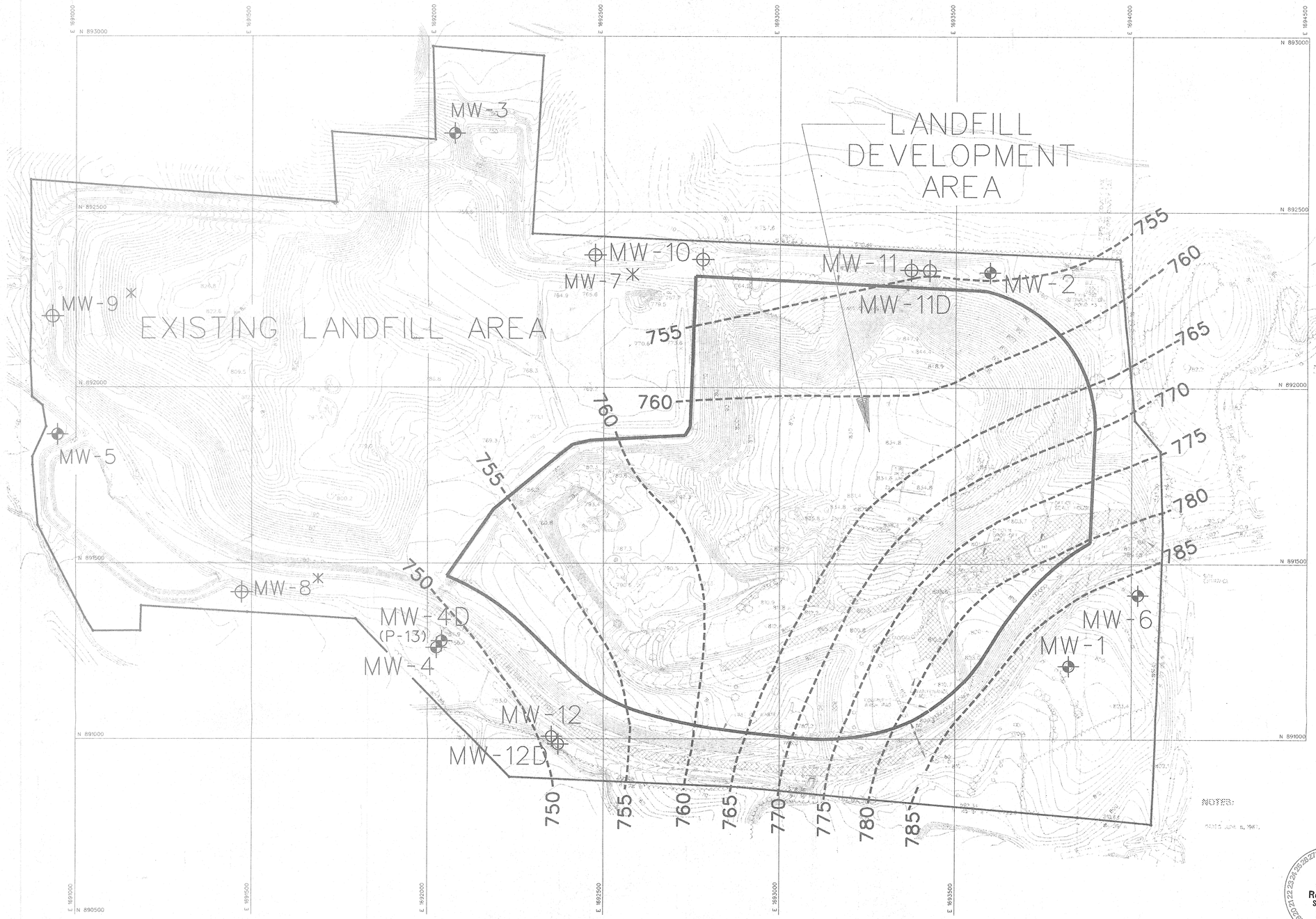
RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-10A
SEASONAL HIGH
POTENTIOMETRIC MAP

Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221HWT5.DGN



LEGEND:

EXISTING GROUND WATER MONITORING WELL

PROPOSED GROUND WATER MONITORING WELL

—750— POTENTIONMETRIC CONTOUR SEASONAL HIGH (5 FT. INTERVAL)

NOTE:

CONTOURS TAKEN FROM FIGURE 2-10A.

JUL 1994
Received
Solid Waste
Section

0 150 300 450
SCALE IN FEET

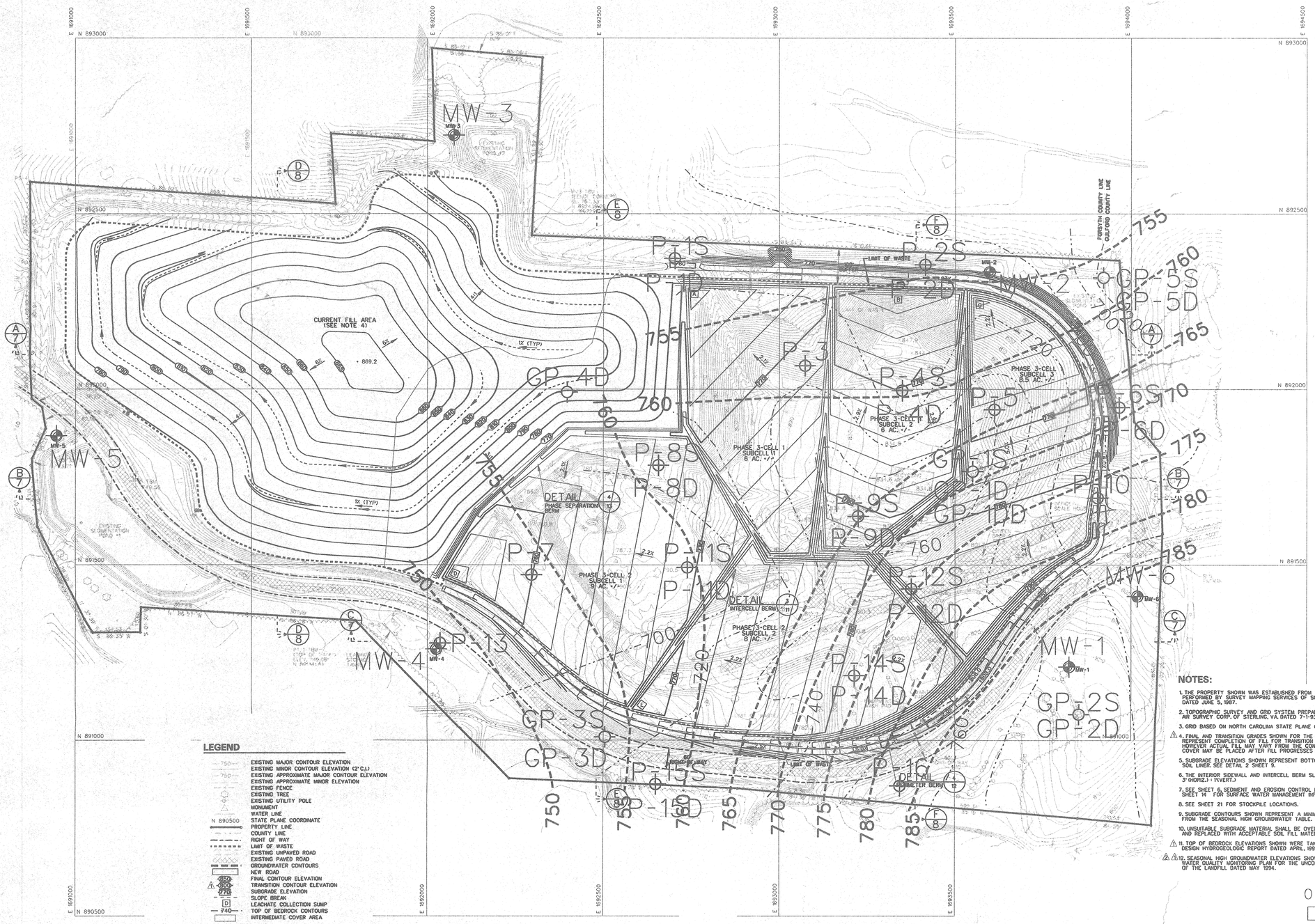
✳ THESE MONITORING WELLS HAVE BEEN PROPOSED IN THE TRANSITION WATER QUALITY MONITORING PLAN TO MONITOR THE EXISTING LANDFILL AREA.

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-1
EXISTING AND PROPOSED
MONITORING WELL LOCATIONS
Water Quality Monitoring Plan/Unconstructed Portion
Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221HWT6.DGN



LEGEND:

GP — GOLDER PIEZOMETER LOCATION

MW — EXISTING GROUND WATER MONITORING WELL

P — PIEZOMETER LOCATIONS

LEGEND

- 750 — EXISTING MAJOR CONTOUR ELEVATION
- 750 — EXISTING MINOR CONTOUR ELEVATION (2' C.I.)
- 750 — EXISTING APPROXIMATE MAJOR CONTOUR ELEVATION
- EXISTING APPROXIMATE MINOR ELEVATION
- EXISTING FENCE
- EXISTING TREE
- EXISTING UTILITY POLE
- MONUMENT
- WATER LINE
- N 890500 — STATE PLANE COORDINATE
- PROPERTY LINE
- COUNTY LINE
- RIGHT OF WAY
- LIMIT OF WASTE
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- GROUNDWATER CONTOURS
- NEW ROAD
- 850 — FINAL CONTOUR ELEVATION
- 800 — TRANSITION CONTOUR ELEVATION
- 770 — SUBGRADE ELEVATION
- SLOPE BREAK
- D — LEACHATE COLLECTION SUMP
- 740 — TOP OF BEDROCK CONTOURS
- INTERMEDIATE COVER AREA
- MW-5 — EXISTING GROUNDWATER MONITORING WELL
- A/7 — CROSS SECTION

NOTES:

1. THE PROPERTY SHOWN WAS ESTABLISHED FROM SURVEY PERFORMED BY SURVEY MAPPING SERVICES OF SOUTH CAROLINA DATED JUNE 5, 1987.
2. TOPOGRAPHIC SURVEY AND GRID SYSTEM PREPARED BY AIR SURVEY CORP. OF STERLING, VA DATED 7-1-93.
3. GRID BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM.
4. FINAL AND TRANSITION GRADES SHOWN FOR THE EXISTING LANDFILL REPRESENT COMPLETION OF FILL FOR TRANSITION APPLICATION. HOWEVER ACTUAL FILL MAY VARY FROM THE CONTOURS SHOWN. FINAL COVER MAY BE PLACED AFTER FILL PROGRESSES INTO PHASE 3.
5. SUBGRADE ELEVATIONS SHOWN REPRESENT BOTTOM OF COMPACTED SOIL LINER. SEE DETAIL 2 SHEET 9.
6. THE INTERIOR SIDEWALL AND INTERCELL BERM SLOPES ARE 3' (HORIZ.) : 1'(VERT.)
7. SEE SHEET 6, SEDIMENT AND EROSION CONTROL PLAN AND DETAIL SHEET 14 FOR SURFACE WATER MANAGEMENT INFORMATION.
8. SEE SHEET 21 FOR STOCKPILE LOCATIONS.
9. SUBGRADE CONTOURS SHOWN REPRESENT A MINIMUM 4FT. SEPARATION FROM THE SEASONAL HIGH GROUNDWATER TABLE.
10. UNSUITABLE SUBGRADE MATERIAL SHALL BE OVEREXCAVATED AND REMOVED AND REPLACED WITH ACCEPTABLE SOIL FILL MATERIAL.
11. TOP OF BEDROCK ELEVATIONS SHOWN WERE TAKEN FROM RUST'S DESIGN HYDROGEOLOGIC REPORT DATED APRIL, 1994.
12. SEASONAL HIGH GROUNDWATER ELEVATIONS SHOWN WERE TAKEN FROM WATER QUALITY MONITORING PLAN FOR THE UNCONSTRUCTED PORTION OF THE LANDFILL DATED MAY 1994.

SOLID WASTE SECTION
JUN 24 1994

0 300 600 900
SCALE IN FEET

RUST ENVIRONMENT & INFRASTRUCTURE

SUBGRADE FIGURE

Piedmont Landfill and Recycling Center
Forsyth County, North Carolina

Project No. 87221.800

N:/87221/7221SBFG.DGN