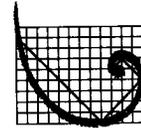
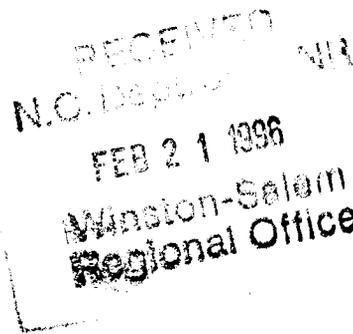


ERM-Southeast, Inc.

Suite 200
7300 Carmel Executive Park
Charlotte, NC 28226
(704) 541-8345
(704) 541-8416 (Fax)

February 20, 1996

Ms. Sherri V. Knight
Groundwater Supervisor
NCDEHNR
Division of Environmental Management
Groundwater Section
585 Waightown Street
Winston-Salem, NC 27107-2241



ERM

**Re: Comprehensive Site Assessment Report
Exxon Retail Location 4-3998
4701 W. Market Street
Greensboro, North Carolina
Incident #10001**

Dear Ms. Knight:

In accordance with T15A 2L .0106(c)(3) and T15A 2N .0706, and on behalf of Exxon Company, U.S.A., ERM-Southeast is submitting a Comprehensive Site Assessment Report for the above referenced site. A report that summarizes the results of the site comprehensive site assessment has been submitted to the Mayor of Greensboro and the Guilford County Health Director in accordance with T15A 2L .0114(a).

Exxon submitted a Corrective Action Plan (CAP) for the site in July 1994. The corrective action proposed in the site CAP, soil vapor extraction and air sparging ground water remediation, will be fully implemented in February 1996. Please indicate if it will be necessary to re-submit the site CAP.

Please call myself or Mr. Frank Medlin of Exxon (704-529-4263) if you have any questions.

Sincerely,
ERM-SOUTHEAST, INC.

A handwritten signature in cursive script, appearing to read "Jerry Prosser".

Jerry Prosser, P.G.
Project Manager

cc: F. Medlin - Exxon
M. Zappia - Guilford County Health Dept.

Offices of
ERM-Southeast Inc. in:

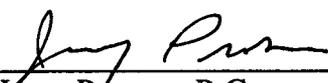
Brentwood, TN (Nashville)
Kennesaw, GA (Atlanta)
Charlotte, NC
Mobile, AL
Memphis, TN

**COMPREHENSIVE SITE ASSESSMENT
EXXON RETAIL LOCATION #4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA**

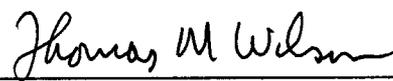
INCIDENT #10001

*Exxon Company U.S.A.
P.O. Box 30451
Charlotte, NC 28230*

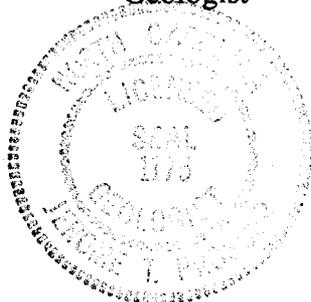
February 19, 1996



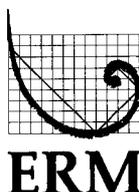
Jerry Prosser, P.G.
Geologist



Thomas M. Wilson, P.G.
Principal



ERM-Southeast
7300 Carmel Executive Park
Suite 200
Charlotte, NC 28226



EXECUTIVE SUMMARY

Exxon Retail Location 4-3998 is located at 4701 West Market Street in Greensboro, North Carolina. The site property has been owned by Exxon Company, U.S.A. since 1971 and is currently operating as a gasoline retail store and automobile service facility.

The potential release of petroleum hydrocarbons from the site was first discovered during the September 1991 closure of the former site gasoline underground storage tanks (USTs). Additional petroleum hydrocarbon affected soil was discovered at the site on June 25, 1995 during the replacement of existing pump islands. The North Carolina Department of Environment, Health, and Natural Resources - Division of Environmental Management (DEM) has assigned Ground Water Incident Number 10001 to the site due to the documented concentration of petroleum hydrocarbon constituents in ground water in excess of North Carolina ground water standards as stated in Title 15A of the North Carolina Administrative Code, Subchapter 2L, Section .0202.

Corrective actions implemented at the site to date include excavation and off-site treatment/disposal of TPH affected soils, and installation of a soil vapor extraction/air sparging (SVE/AS) soil and ground water remediation system. The site soil and ground water remediation system is expected to be operational in the first quarter of 1996.

A review of potential sensitive receptors in the vicinity of the site indicate that two active water supply wells and a small man-made pond are located within a 1,500-foot radius of the site. The water supply wells are located approximately 1,500 feet northwest and sidegradient of the site.

Approximately 1,100 cubic yards of TPH affected soil containing concentrations of low boiling point TPH above the North Carolina general action level of 10 milligrams/kilogram (mg/kg) remains in place at the site. The primary compounds of concern in ground water of the saprolite hosted water table aquifer are dissolved phase petroleum hydrocarbon compounds. Petroleum hydrocarbon compounds have not been detected in the bedrock aquifer at the site. The areal extent of the dissolved phase petroleum hydrocarbon plume at the site is estimated to be 50,000 square feet.

Soil vapor extraction and air sparging appear to be the most cost effective methods of soil and ground water remediation at the site respectively.

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1.0

SITE HISTORY AND SOURCE CHARACTERIZATION

Exxon Retail Location 4-3998 is located at 4701 West Market Street in Greensboro, North Carolina. Site location maps are provided in Figures 1 and 2. The site property is owned by Exxon Company, U.S.A. and is currently operating as a gasoline retail store and automobile service facility. A site plan is provided in Figure 3.

According to Exxon internal records and the North Carolina Department of Environment, Health, and Natural Resources Division of Environmental Management (DEM) UST database, the following USTs have been, or are currently, located at the site.

<u>Product</u>	<u>Volume (gallons)</u>	<u>Installation Date</u>	<u>Closure Date</u>
Gasoline	6,000	4/19/71	9/91
Gasoline	6,000	4/19/71	9/91
Gasoline	6,000	4/19/71	9/91
Used Oil	1,000	4/19/71	9/91
Fuel Oil	550	4/19/71	9/91
Gasoline	12,000	10/91	Active
Gasoline	12,000	10/91	Active
Gasoline	12,000	10/91	Active
Used Oil	1,000	10/91	Active

DEM has assigned Ground Water Incident Number 10001 to the site due to the documented concentration of petroleum hydrocarbon constituents in ground water in excess of North Carolina ground water standards as stated in Title 15A of the North Carolina Administrative Code, Subchapter 2L, Section .0202. A list of the compounds exceeding 15A NCAC 2L .0202 ground water standards is provided in Section 4.2 of this report. Ground water in the vicinity of the site has been classified as Class GA water, best used as a potable water source or a potential potable water source.

A thin film of free product petroleum hydrocarbons has been detected in monitor well MW-3 intermittently in 1995, ranging from 0.01 to 0.05 feet in thickness.

Although the former underground storage tanks (USTs) were potential on-site sources of the petroleum hydrocarbon compounds detected in ground water at the site, off-site sources are also present in the immediate vicinity of the site. According to the DEM Winston-Salem region Ground Water Incident Database (6/2/94), both the BP and Shell gasoline stores, located on the north side of

Market Street across from Exxon Retail Location 4-3998, have had documented releases of petroleum hydrocarbons. The release at the BP store has been assigned ground water incident number 5136. A ground water incident number has not been assigned to the release documented at the Shell site.

1.1 HISTORY OF PROPERTY OWNERSHIP

According to Guilford County Tax Department records, Exxon or its predecessor companies, has owned the site property since 1971. Based on UST database records, the site has been operated as a gasoline retail store and automobile service center since 1971.

1.2 SUMMARY OF RELEASE INCIDENTS AND ENVIRONMENTAL INVESTIGATIONS

Information on the site history and environmental investigations was obtained from the following reports and correspondence.

Summary of Investigation Report - Exxon Retail Location 4-3998, 9/12/95, Griffith Enterprises, Winston-Salem, NC.

Corrective Action Plan - Exxon Retail Location 4-3998, 7/25/94, ERM-Southeast, Inc., Charlotte, NC.

Comprehensive Site Assessment - Exxon Retail Location 4-3998, 10/6/93, Delta Environmental Consultants, Inc., Charlotte, NC.

Initial Subsurface Investigation Report - Exxon Retail Location 4-3998, 12/22/92, Delta Environmental Consultants, Inc., Charlotte, NC.

Tank Excavation Assessment Report - Exxon Retail Location 4-3998, 11/19/91, Griffith Enterprises, Winston-Salem, NC.

The potential release of petroleum hydrocarbons from the site was first discovered during the September 1991 closure of the former site gasoline USTs. Soils containing concentrations of total petroleum hydrocarbons (TPH) above North Carolina action levels were documented in the December 1991 tank excavation report prepared by Griffith Enterprises.

Additional petroleum hydrocarbon affected soil was discovered at the site on June 25, 1995 during the replacement of the existing pump islands located on the northern portion of the site. Soils containing concentrations of TPH above North Carolina action levels were documented in the Summary of Investigation Report (8/95) prepared by Griffith Enterprises.

A Comprehensive Site Assessment (CSA) was completed for the site in 1993 by Delta. Subsequently, a Corrective Action Plan (CAP) was prepared by ERM-Southeast which proposed soil vapor extraction/air sparging (SVE/AS) soil and ground water remediation for the site. In a letter dated June 20, 1995, DEM denied approval of the site CSA and CAP citing insufficient delineation of petroleum hydrocarbon affected soil and ground water at the site. In response to DEM's review of the existing CSA report, ERM-Southeast installed one additional monitor well (MW-9) and advanced and sampled 15 additional soil borings at the site. ERM-Southeast also conducted additional sensitive receptor survey activities. This revised CSA report incorporates the results of these additional site assessment activities into the existing site assessment data for the site.

1.3

SUMMARY OF CORRECTIVE ACTIONS

Corrective actions implemented at the site to date include excavation and off-site treatment of TPH affected soils, and installation of a soil vapor extraction/air sparging (SVE/AS) soil and ground water remediation system. The SVE/AS remediation system start-up is planned for the first quarter 1996.

Approximately 1,955.3 tons of soil was excavated from the site as part of the closure of the existing UST system and installation of new USTs in September 1991. All soils from both the former UST basin and the newly excavated UST basin were transported to the Cherokee Environmental Group treatment and disposal facility located in Gulf, North Carolina.

An additional 75.29 tons of petroleum hydrocarbon affected soil were excavated from beneath the northern pump islands in August 1995 as part of the pump island replacement activities being conducted at the site (Griffith, August 1995). The excavated soils were transported to the Cherokee Environmental Group treatment and disposal facility located in Gulf, North Carolina. Residual TPH affected soils left in place beneath the northern pump islands will be treated using soil vapor extraction when the site remediation system is started up. Soil disposal manifests for all soils removed from the site can be referenced in Appendix A.

2.0 POTENTIAL RECEPTORS AND MIGRATION PATHWAYS

Potential receptors are preferred contaminant migration pathways or points of contaminant exposure that could facilitate harm to human health or the environment. Potential receptors, as defined by DEM, include water supply wells, surface water intakes for municipal water supplies, surface water, underground utilities, and basements. A review of the potential sensitive receptors in the vicinity of the former Exxon site is provided in the subsequent sections of this chapter.

2.1 SURROUNDING LAND USAGE

The area surrounding the site is composed of a mix of light industry, commercial businesses, restaurants, small retail businesses (including other gasoline retail stores), and residential neighborhoods. Basements have been noted in some of the residential dwellings located north of the site. Land use in the vicinity of the site is depicted in Figure 4.

2.1.1 Adjacent Property Owners

Property owners adjacent to Exxon Retail Location 4-3998 are shown in Figure 5 and listed in Table 1.

2.2 WATER SUPPLY

Drinking water for the area surrounding the site is supplied by the city of Greensboro. The city of Greensboro obtains its water supply from three lakes, Lake Higgins, Lake Brandt, and Lake Townsend according to the Greensboro Utility Department. These surface water reservoirs are located approximately 5 miles north of the site. The site is not located within the Greensboro municipal watershed ordinance area for these reservoirs according to the Greensboro Zoning Map (August 1995).

One active water supply well has been identified within a 1,500-foot radius of the site based on a visual reconnaissance survey of the area and a review of the Greensboro Utility Department files. Two out-of-service water supply wells are also located within a 1,500-foot radius of the site. Several other irrigation, active water supply wells, and inactive water supply wells were also identified beyond the 1,500-foot search radius. Private water supply well locations are shown in Figure 4. The owners, addresses, and available construction details of the water supply wells located within 1,500 feet of the site are provided in Table 2.

There are several monitor wells located on properties adjacent to Exxon Retail Location 4-3998 that are not associated with the site monitor well network. Six

monitor wells are located on the BP gasoline retail store property located north of the site. The locations of these wells are shown in Figure 13. One monitor well is located on the property owned by VM-JDM-FIV Company to the south of the site. The location of this well is shown in Figure 3 (labelled MW-Moore).

2.3

UNDERGROUND UTILITIES

Underground utilities located adjacent to the site include electrical, water, natural gas, sanitary sewer, storm sewer, and telephone. The locations of these utilities are shown in Figure 6. The depth of burial of these utilities is unknown but is expected to be well above the depth to the water table, which occurs more than 20 feet below the ground surface. The public underground utilities located in the vicinity of the site do not appear to be in contact with petroleum hydrocarbons released from the site and are not expected to be adversely affected by the release.

2.4

SURFACE WATER BODIES

A review of the Greensboro Zoning Map (August 1995) indicates that there are no naturally occurring surface water bodies within a 1,500-foot radius of the site. A small man-made pond is shown on the map 1,400 feet west-southwest of the site (see Figure 4).

3.0 SOILS INVESTIGATION

Additional soil quality data that has been compiled at the site since the submittal of the 1993 site CSA report includes soil analytical data from borings SB-1 through SB-14, and HAS-1 and HAS-2. Additional soil sample analytical data were compiled during the replacement of the active site pump islands in June 1995 (soil samples D-1 through D-7, N-1). The additional soil quality data have been integrated into the existing site data to fully evaluate soil quality at the site and is presented in the following sections.

Standard operating procedures for environmental work conducted by ERM-Southeast and Griffith Enterprises at the site can be referenced in Appendix B.

3.1 REGIONAL GEOLOGY

Former Exxon Retail Location 4-3998 is located in the Piedmont physiographic province of North Carolina. The Piedmont province is a mature erosional peneplain characterized by low rolling hills and well developed drainage patterns. Saprolite, a zone of intensely weathered and variably decomposed rock/soil, commonly mantles bedrock in this region. Saprolite has the appearance of compact clayey to sandy soil with the original bedrock textures and features preserved. Saprolite is created through the chemical weathering of bedrock over a long period of time in areas of limited erosion.

Geologically, the site is located within the Carolina Slate belt which extends from the Savannah River in South Carolina to Virginia. Rocks of the Carolina Slate belt are of early Cambrian age (550 to 600 million years old) and are composed of metamorphosed igneous intrusives, volcanics and sediments. Regional metamorphic foliation is moderately to well developed in the Greensboro area and generally strikes to the northeast.

3.2 SITE GEOLOGY

According to the Geologic Map of North Carolina (1985), the city of Greensboro and the subject site are underlain by a regional scale metamorphosed granite batholith (large igneous intrusive body).

3.3 SITE SOILS

Based on hand auger and soil boring soil sampling data, soils at the site generally consist of red-orange clayey silt to silty clay saprolite. The depth to bedrock is 40 to 50 feet below the ground surface based on the DW-8 and SVE/AS-1 drilling logs/well construction details. The well construction records and available drilling logs for the site monitor wells can be referenced in Appendix C.

The evaluation of the extent and character of petroleum-affected soils presented in this report is based on the analytical results of soil samples collected during the course of the UST closure operations (Griffith Enterprises, 11/19/91), initial site assessment (Delta, 9/30/92), and subsequent site assessment activities (Griffith Enterprises, 8/95, ERM-Southeast, in-preparation). Soil TPH analytical results are shown in Figures 7, 8, and 9. A summary of soil field screening and analytical results is provided in Table 3. Soil analytical data sheets can be referenced in Appendix D for soil samples that have not been documented in previous reports.

Laboratory analysis of soil samples collected at the site indicate that soils containing concentrations of petroleum hydrocarbons in excess of DEM general action levels are present beneath the former UST field, and in the active and former pump island areas. Laboratory analysis of UST closure confirmation soil samples collected along the former product piping trench and the former west pump island (samples LINE 8, DISPENSER 5, and DISPENSER 6) indicated elevated concentrations of TPH. However, follow-up sampling in these areas indicated only trace concentrations of TPH under the former west pump island (SB-6, 18 milligrams/kilogram). It appears that TPH affected soils were excavated from these areas during the 1991 UST closure, although the areas of over excavation have not been documented.

A summary of the DEM TPH general action levels are given below for reference. A site sensitivity evaluation (SSE) was not completed for this site because the site assessment data indicate that petroleum hydrocarbon affected soil is in contact with the water table.

<u>Petroleum Hydrocarbon Range</u>	<u>Analytical Method</u>	<u>North Carolina General Action Level</u>
Low Boiling Point (Gasoline)	EPA Method 5030	10 mg/kg
High Boiling Point (Diesel, Fuel Oil)	EPA Method 3550	40 mg/kg
Oil and Grease (Motor Oil, Used Oil)	EPA Method 9071	250 mg/kg

NOTE: mg/kg = milligrams/kilogram

Approximately 1,100 cubic yards of TPH affected soil containing concentrations of low boiling point TPH above the North Carolina general action level of 10 milligrams/kilogram (mg/kg) remains in place at the site. The horizontal extent of soil exceeding the general TPH final clean-up levels is depicted in Figure 9. The vertical extent of TPH affected soil is shown in Figure 10.

4.0 **GROUND WATER INVESTIGATION**

The extent of petroleum hydrocarbon affected ground water in the upgradient direction (southwest) at the site was not evaluated in the 1993 CSA report. ERM-Southeast installed, sampled, and gauged monitor well MW-9 to address this deficiency of the 1993 CSA.

Standard operating procedures for environmental work conducted by ERM-Southeast and Griffith Enterprises at the site can be referenced in Appendix B.

4.1 **MONITOR WELL LOCATIONS AND CONSTRUCTION**

There are a total of eight shallow Type II monitor wells and one Type III bedrock monitor well (DW-8) currently in the site monitor well network. The site monitor well locations are depicted in Figure 3. The shallow site monitor wells are screened across the water table and into the upper portion of the saprolite aquifer in order to detect low density non-aqueous phase liquids (LNAPL) such as gasoline range petroleum hydrocarbons. The DW-8 monitor well is screened in bedrock in order to evaluate ground water quality in the bedrock aquifer, and evaluate the vertical extent of petroleum hydrocarbon affected ground water at the site. Monitor well construction records can be referenced in Appendix C.

4.2 **PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE GROUND WATER PLUME**

Ground water analytical data are summarized in Tables 4, 5, and 6. A summary of the current maximum concentrations for the compounds of concern identified at the site, and their respective North Carolina ground water standards, is given below.

<u>Compound</u>	<u>Monitor Well</u>	<u>Max. On-site Concentration (ug/l)</u>	<u>15A NCAC 2L .0202 Groundwater Standard (ug/l)</u>
Benzene	MW-3	19,800	1
Toluene	MW-3	94,500	1,000
Ethylbenzene	MW-3	6,300	29
Total Xylenes	MW-3	36,000	530
Methyl-tert-butyl-ether	MW-7	36	200
Isopropyl Ether	MW-3	7,650	NS
Lead	MW-3	147	15
1,2,-Dichloroethane	MW-3	400	0.38
1,1,2,2-Tetrachloroethane	MW-3	110	NS
Naphthalene	MW-2	369	21*
Bis (2-ethyl-hexyl) Phthalate	MW-2	56.8	NS

NOTES:

ug/l = micrograms/liter

* = Interim T15A NCAC 2L .0202 standard

NS = Standard not specified in T15A NCAC 2L .0202, the applicable standard is the laboratory method detection limit.

The areal extent of the dissolved phase petroleum hydrocarbon plume at the site is estimated to be 50,000 square feet.

The primary compounds of concern are petroleum hydrocarbon compounds characterized by specific gravities less than that of water. These compounds are expected to remain in the upper portion of the surficial aquifer in the absence of a significant vertical hydraulic gradient.

Benzene is the most widespread and concentrated compound of concern in ground water at the site, and as such, is used in this report to indicate the horizontal and vertical extent of petroleum hydrocarbon affected ground water. The inferred horizontal extent of benzene in ground water at the site is shown in Figure 11. The vertical extent of benzene in ground water at the site is shown in cross sections provided in Figure 12. Ground water laboratory data sheets for the September 18 and December 6, 1995 ground water sampling events can be referenced in Appendix E.

4.3

SITE HYDROGEOLOGIC CONDITIONS

The depth to ground water beneath the site ranges from 19 to 21 feet below the ground surface during seasonal high water table conditions, and 22 to 25 feet below the ground surface during seasonal low water table conditions. Based on the December 14, 1995 ground water elevation data, the gradient across the site is less than 0.01 feet/foot (MW-9 to MW-7). The vertical gradient, as inferred from the December 14, 1995 gauging data for the MW-3/DW-8 well pair, is approximately 0.02 feet/foot downward. Ground water elevation data are summarized in Table 7.

The water table aquifer is hosted within the saprolite zone which is characterized by a silty clay to clayey silt soil matrix. The saprolite zone soils appear to be relatively homogenous, both laterally and vertically.

The hydraulic conductivity of the saprolite aquifer was determined at the site using rising head slug tests of monitor wells MW-2 and MW-4 (Delta, 10/6/93). The results of these slug tests are provided below. Slug test data can be referenced in Appendix F.

<u>Well I.D.</u>	<u>Hydraulic Conductivity</u>		<u>Groundwater</u>
	<u>feet/year</u>	<u>centimeters/second</u>	<u>Velocity</u>
MW-2	310	3.0×10^{-4}	
MW-4	290	2.8×10^{-4}	
Geometric Mean: 300		2.9×10^{-4}	12 feet/year

Note: Hydraulic conductivity calculated using Bouwer and Rice (1976)

Using the geometric mean value of hydraulic conductivity calculated from monitor wells MW-2 and MW-4 and the December 14, 1994 calculated maximum hydraulic gradient from MW-9 to MW-7 (.01 feet/foot), and assuming an effective porosity of 25%, the ground water velocity across the site is estimated to be less than 12 feet/year in the saprolite aquifer. Ground water flow is to the north-northeast as shown in Figure 13.

5.0 RECOMMENDATIONS

5.1 SOILS

Previous corrective actions at the site, including excavation and removal of 2,030.59 tons of TPH affected soil, have significantly reduced the volume of TPH affected soils that remain at the site. Approximately 1,100 cubic yards of TPH affected soil containing concentrations of low boiling point TPH above the North Carolina general action level of 10 milligrams/kilogram (mg/kg) remains in place at the site.

A review of potentially applicable soil remediation methods is provided below.

Excavation: Excavation does not appear to be applicable to much of the TPH affected soils due to the proximity of the affected soils to developed and operational portions of the property. The depth to ground water at the site, 19 to 25 feet, is a technical difficulty for this remedial option and makes excavation and removal of the TPH affected soils cost prohibitive relative to in-situ remediation methods.

Soil Vapor Extraction: Soil vapor extraction (SVE) is potentially applicable at the site due to the low level of compaction and the silty texture of soils at the site. The applicability of SVE soil remediation at the site has been demonstrated by an on-site SVE/AS pilot test conducted by ERM-Southeast in April 1994 (reference the site Corrective Action Plan).

5.2 GROUND WATER

Petroleum hydrocarbon affected ground water is limited to the saprolite aquifer (total aquifer thickness is approximately 25 feet). A review of potentially applicable ground water remediation methods is provided below.

Ground Water Pump and Treat: Ground water pump and treat remediation of petroleum hydrocarbon affected ground water would provide hydraulic control of contaminant migration. However, pump and treat technology is unlikely to be effective in reducing the contaminant mass in the aquifer due to the ineffectiveness of this technology in removing adsorbed hydrocarbons from the aquifer matrix. Pump and treat systems, in general, are difficult to maintain and have potentially high costs associated with effluent treatment and disposal.

In addition to the general limitations of ground water pump and treat remediation technology, there are also site specific conditions that limit the applicability of this remedial technology. A pump and treat system, if implemented at the site, would likely require recovery wells in off-site locations

(NCDOT right-of-way) and would have the potential to draw petroleum affected ground water from adjacent sites (Shell, BP) toward the Exxon site.

Air Sparging: Air sparging has been shown in an April 1994 SVE/AS pilot test to be a viable ground water remediation option at the site. Air sparging should effectively control contaminant migration and reduce contaminant mass cost effectively. Air sparging is especially cost effective if soil vapor extraction is selected as the soil remediation technology best suited to the site contaminants and conditions. An advantage of air sparging over other applicable remediation technologies is that air sparging does not produce an effluent stream that requires treatment and disposal. Air emissions from an air sparging system may not require permitting or treatment, depending on local air emission regulations.

Dual Phase Extraction: Dual phase extraction (DPE), the removal of soil vapor and ground water from the subsurface through the application of a high vacuum in the vadose, capillary fringe, and saturated zones, appears to be applicable at the site. Use of DPE would have the added benefit of remediating TPH affected soils and ground water simultaneously. DPE is most effective when used to remediate volatile contaminants in low permeability soils. The high vacuum levels that can be achieved with a liquid ring blower also gives DPE a much broader radius of influence relative to traditional pump and treat ground water remediation methods.

The applicability of DPE ground water remediation at the site must be demonstrated by conducting an on-site pilot test. The pilot test data are also used to obtain remediation system design parameters. Dual phase extraction has potentially significant costs associated with effluent treatment and disposal.

Natural Attenuation: Natural attenuation of the compounds of concern in ground water at the site is only applicable if it can be shown that the compounds of concern have the capacity to naturally attenuate under the existing site conditions. Ground water quality data collected since 1992 (seven sampling events) indicate that petroleum hydrocarbon concentrations in monitor wells MW-1, 3, and 4 have not attenuated. However, significant reduction of petroleum hydrocarbon concentrations have been documented in MW-2 in the upgradient portion of the plume.

6.0 *REFERENCES*

6.1 *INTERVIEW SUMMARIES*

No interviews were conducted as part of this investigation.

6.2 *RESOURCE MATERIALS*

Summary of Investigation Report - Exxon Retail Location 4-3998, 9/12/95, Griffith Enterprises, Winston-Salem, NC.

Corrective Action Plan - Exxon Retail Location 4-3998, 7/25/94, ERM-Southeast, Inc., Charlotte, NC.

Comprehensive Site Assessment - Exxon Retail Location 4-3998, 10/6/93, Delta Environmental Consultants, Inc., Charlotte, NC.

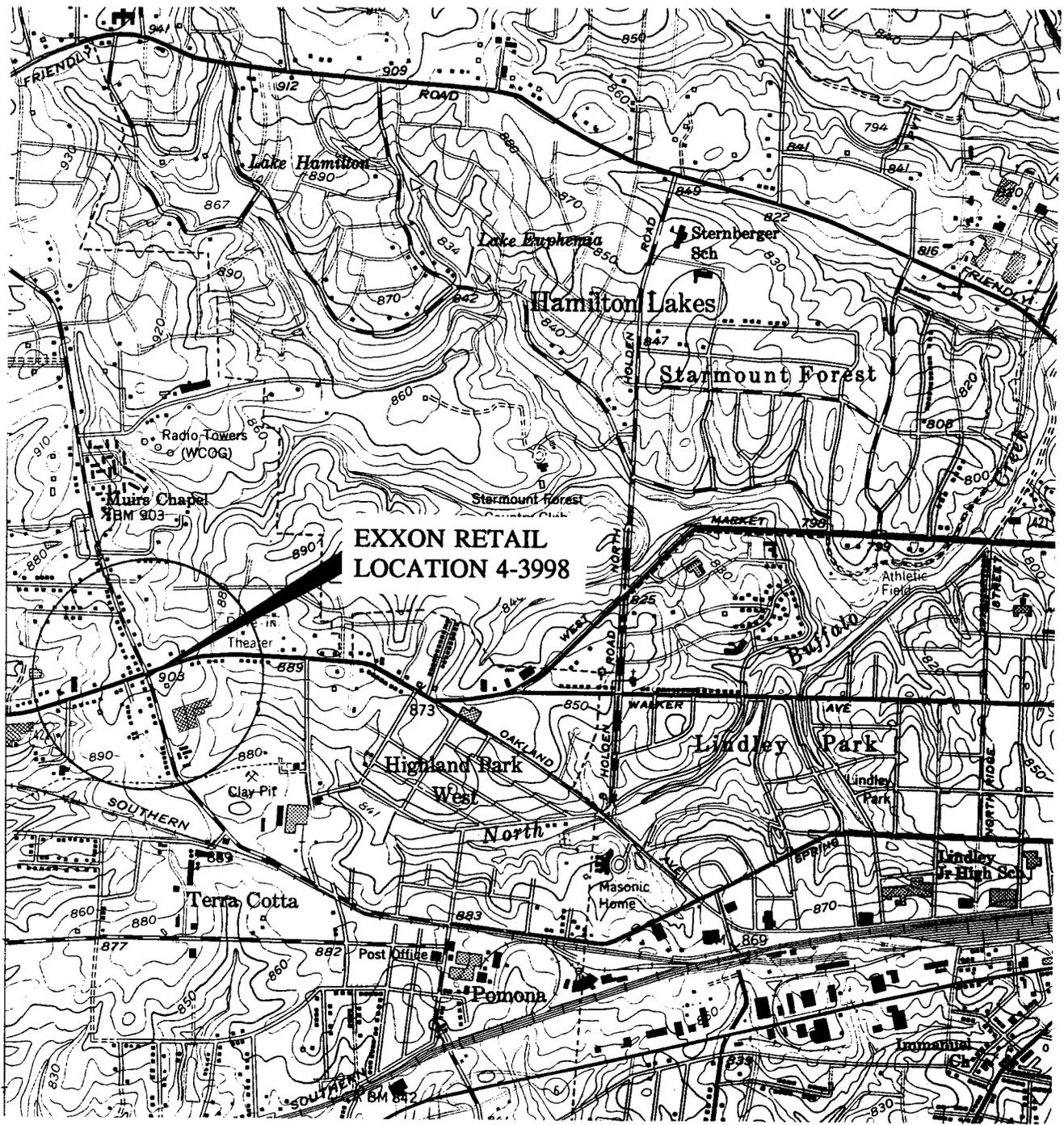
Initial Subsurface Investigation Report - Exxon Retail Location 4-3998, 12/22/92, Delta Environmental Consultants, Inc., Charlotte, NC.

Groundwater Investigation - Kitchen and Bath Menagerie, 11/27/92, Pyramid Environmental, Inc., Greensboro, NC.

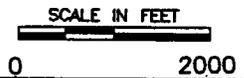
Tank Excavation Assessment Report - Exxon Retail Location 4-3998, 11/19/91, Griffith Enterprises, Winston-Salem, NC.

Bouwer, H. and Rice, R.C., 1976, *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells*, Water Resources Research, v. 12, pp. 423-428.

Brown, P.M., *Geologic Map of North Carolina*, North Carolina Department of Natural Resources and Community Development, Raleigh, North Carolina.



SOURCE: GREENSBORO, NC 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE, 1951 (PHOTOREVISED 1968)



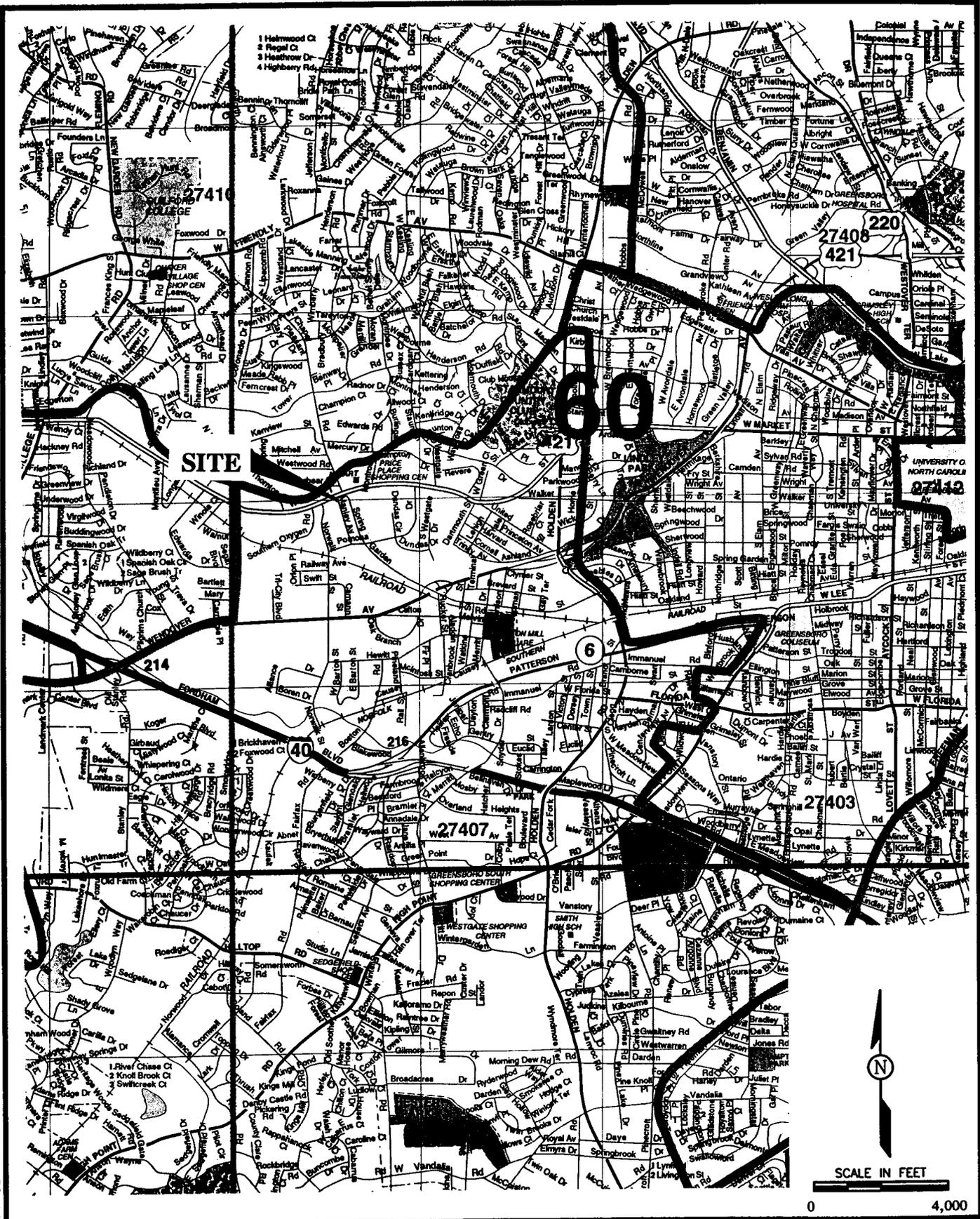
ERM-Southeast, Inc.
CHARLOTTE, NORTH CAROLINA

SITE LOCATION MAP
EXXON COMPANY, U.S.A.
RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

FIGURE

1

85X11VER.DWG MM-DD-YY AM 1=1 TIWK



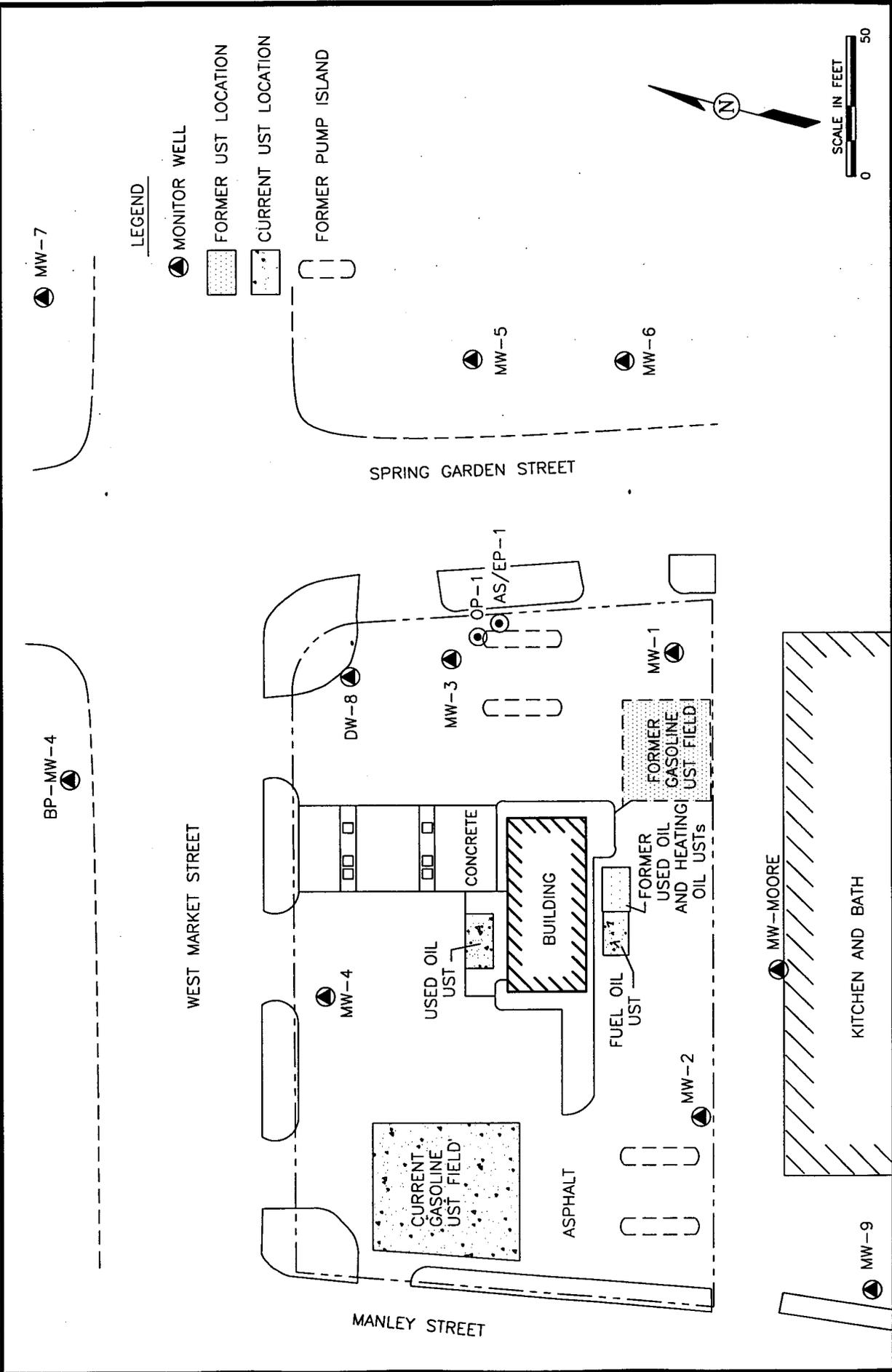
ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA

ERM

COUNTY ROAD MAP
 EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-3998
 GREENSBORO, NORTH CAROLINA

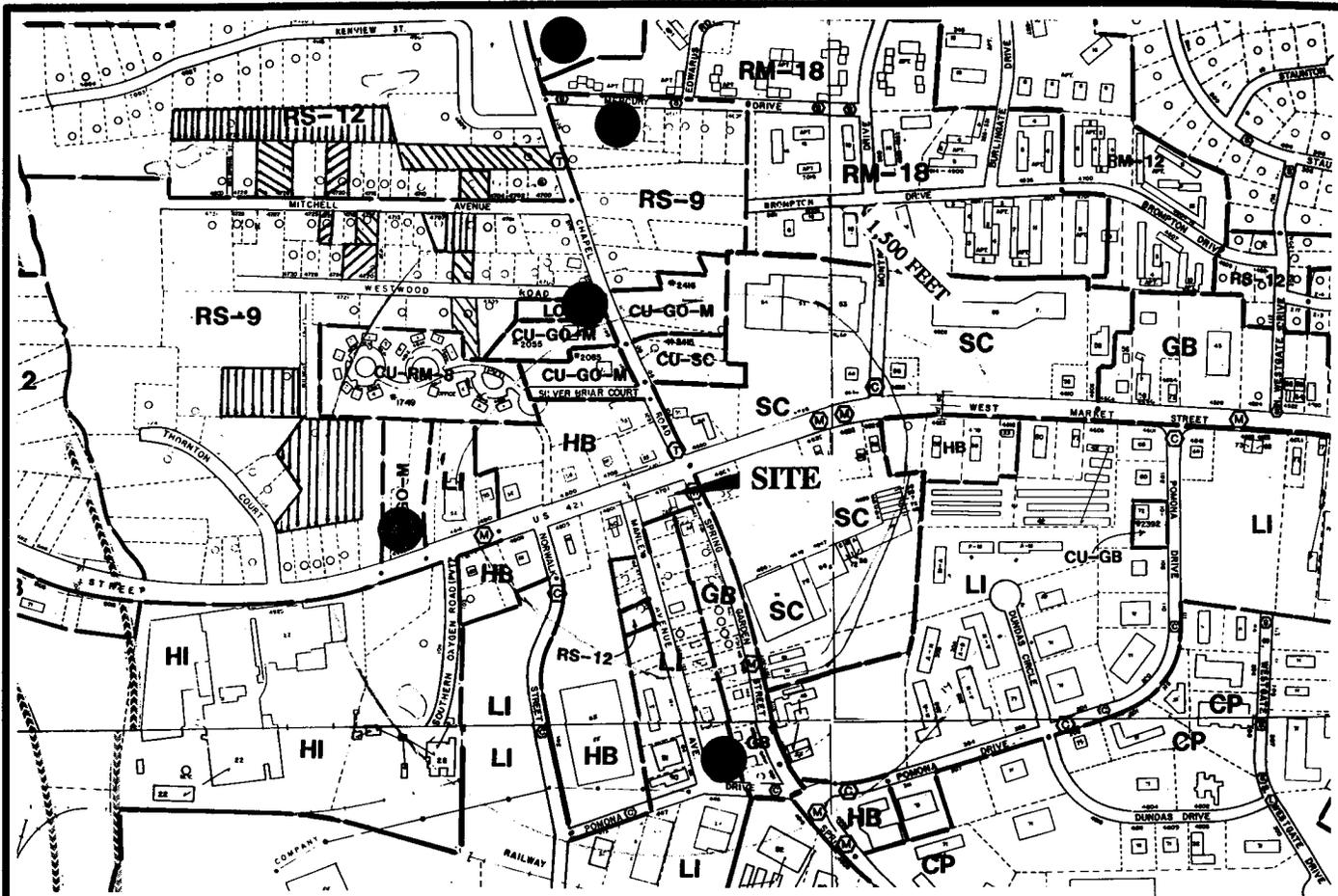
FIGURE

2



SITE PLAN
EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-3998
 4701 W. MARKET STREET
 GREENSBORO, NORTH CAROLINA

ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA
ERM



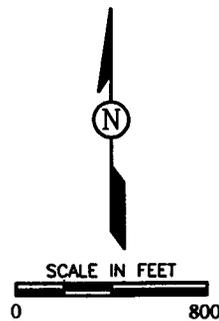
ZONING DESCRIPTIONS

- CU Corporate park district (office, warehouse, assembly, research and development uses)
- GB General business district (retail, service, office uses)
- GO Gerar Office district (M indicates moderate density)
- HB Highway business district (reatil, service, and distrubution purposes)
- HI Heavy industrial district
- LI Light industrial district
- LO Limited Office District
- RM Multifamily residential dwellings
- RS Single family detached residential dwellings
- SC Shopping center district

LEGEND

-  Residential water supply well
-  Residential irrigation well
-  Out-of-service water supply well
-  Child day care center, church, or school

SOURCE: GREENSBORO ZONING MAP, AUGUST 1995



85X11VER.DWG MM-DD-YY AM 1=1 TIWK



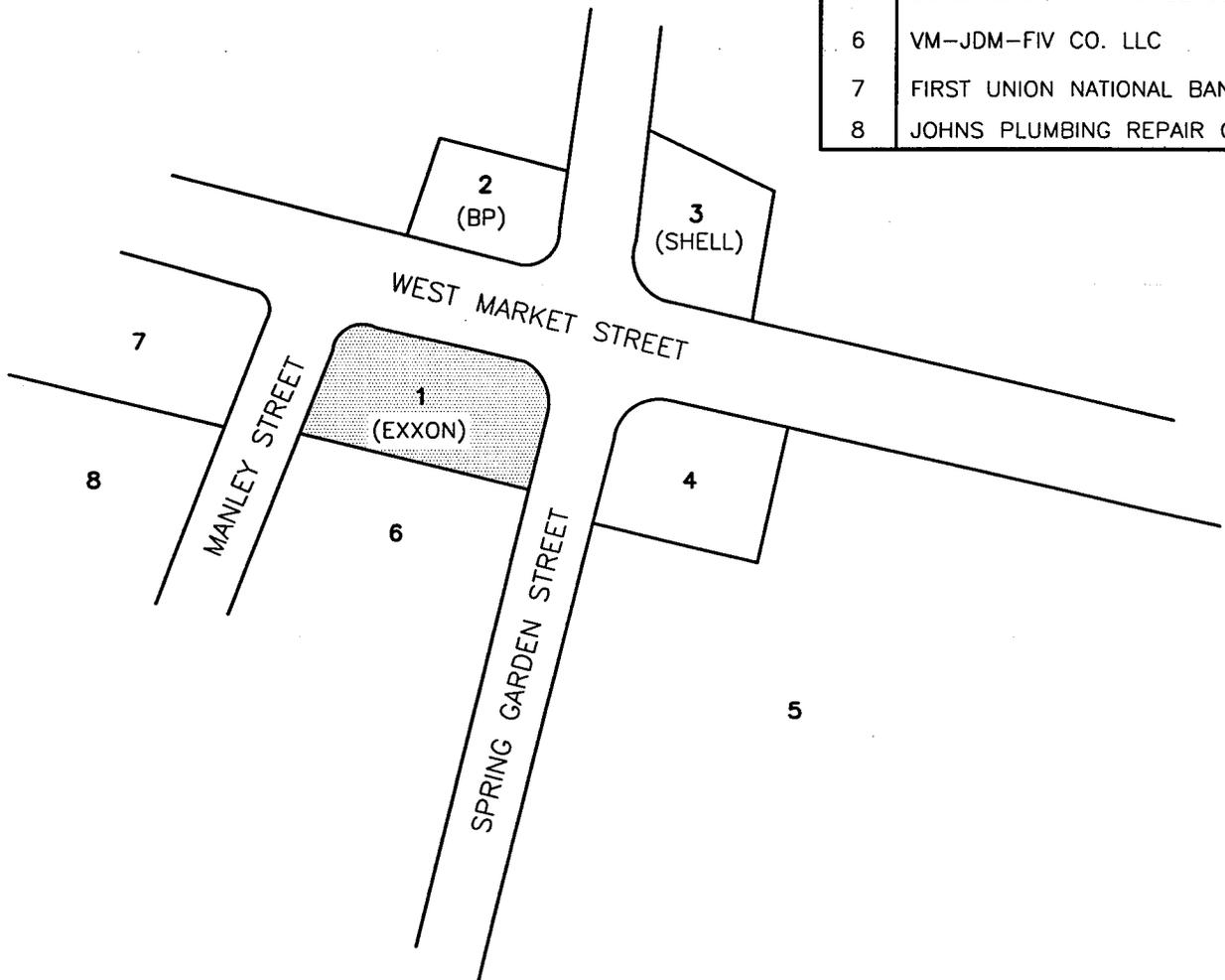
ERM-Southeast, Inc.
CHARLOTTE, NORTH CAROLINA

LAND USE AND WATER SUPPLY WELL LOCATION MAP
EXXON COMPANY, U.S.A.
RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

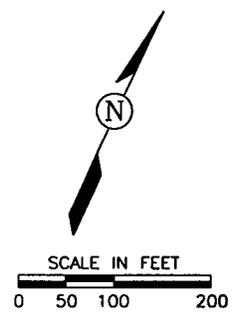
FIGURE

4

ID #	OWNER
1	EXXON COMPANY USA
2	SERVICE STATION REALTY
3	LUCY MAE EDWARDS QUALITY OIL CO.
4	SHONEY'S SOUTH INC
5	COASTAL EQUITIES GREENSBORO
6	VM-JDM-FIV CO. LLC
7	FIRST UNION NATIONAL BANK
8	JOHNS PLUMBING REPAIR CO.



SOURCE: GUILFORD COUNTY TAX DEPARTMENT

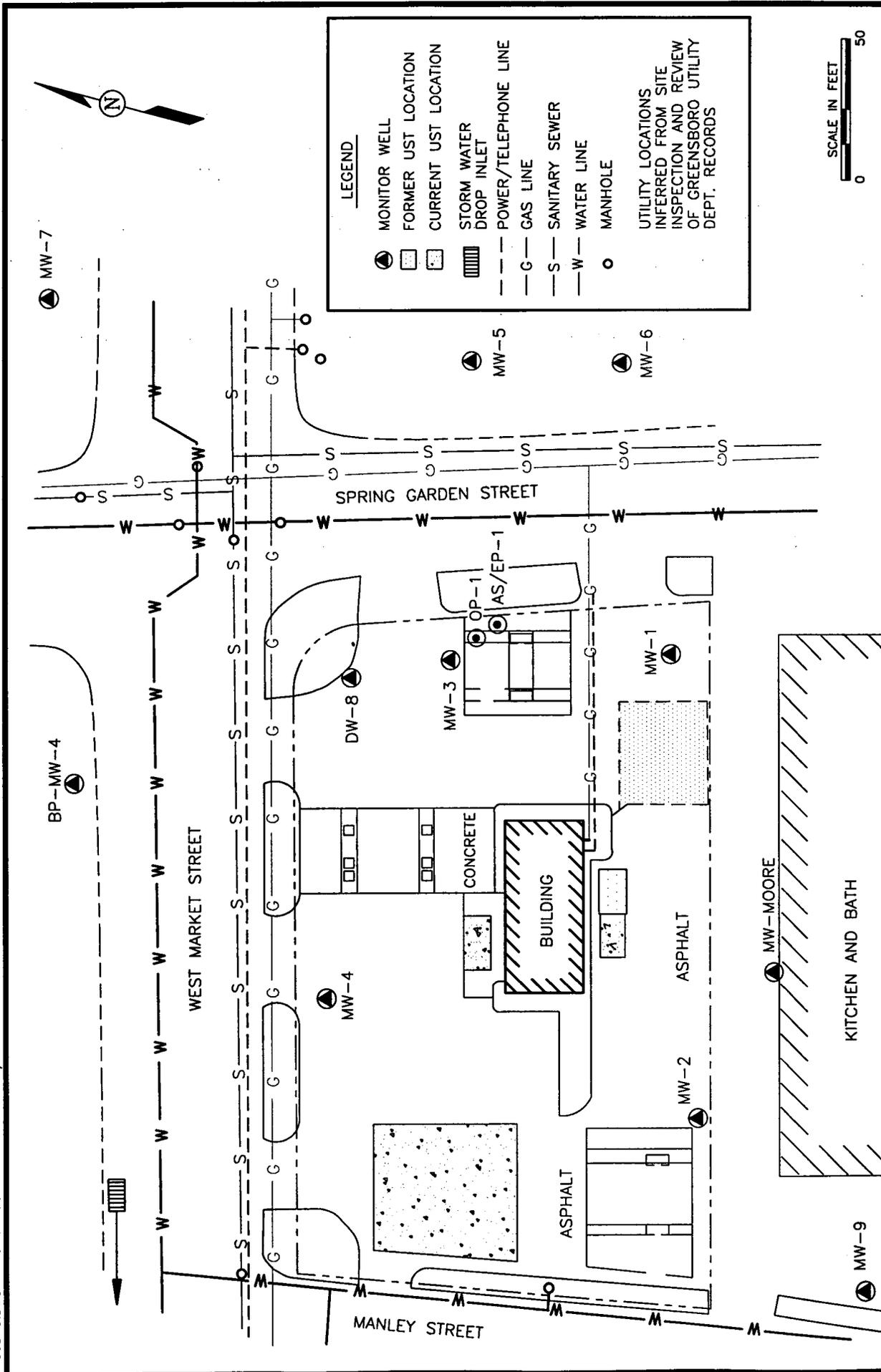


4106ADJ.DWG 10-18-95 1=1 RHR/JL

 **ERM-Southeast, Inc.**
CHARLOTTE, NORTH CAROLINA
ERM

ADJACENT PROPERTY OWNERS
EXXON COMPANY, U.S.A.
RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

FIGURE
5



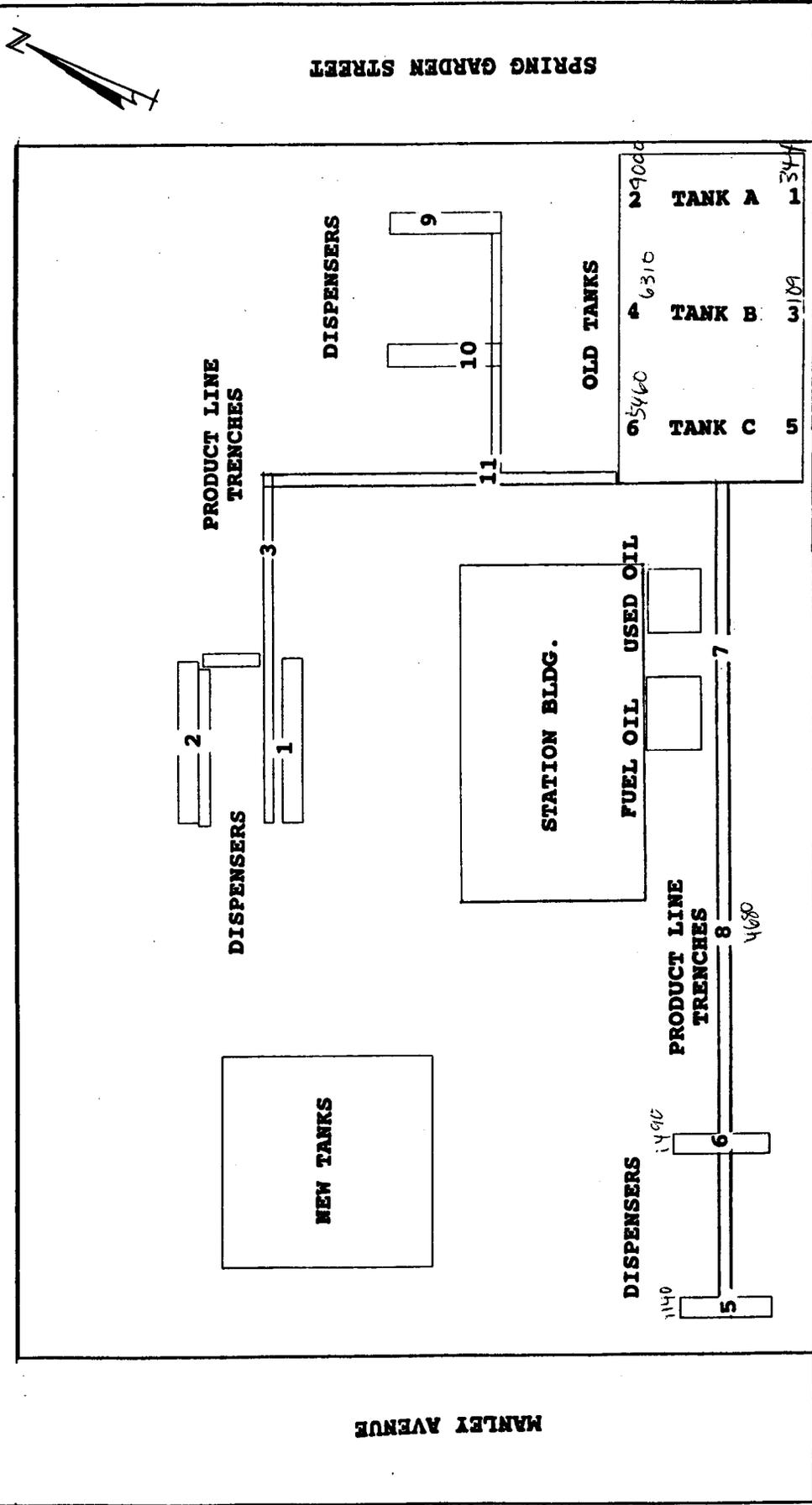
UNDERGROUND UTILITIES
EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-399B
 4701 W. MARKET STREET
GREENSBORO, NORTH CAROLINA

ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA



NOTE: THERE IS NO PRODUCT LINE OR DISPENSER SAMPLE #4

WEST MARKET STREET



SOURCE: TANK EXCAVATION ASSESSMENT REPORT - EXXON RETAIL LOCATION 4-3998, 11/19/91, GRIFFITH ENTERPRISES, WINSTON-SALEM, NC

MAP NOT TO SCALE

ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA

UST CLOSURE SOIL SAMPLE LOCATIONS
 EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-3998
 GREENSBORO, NORTH CAROLINA

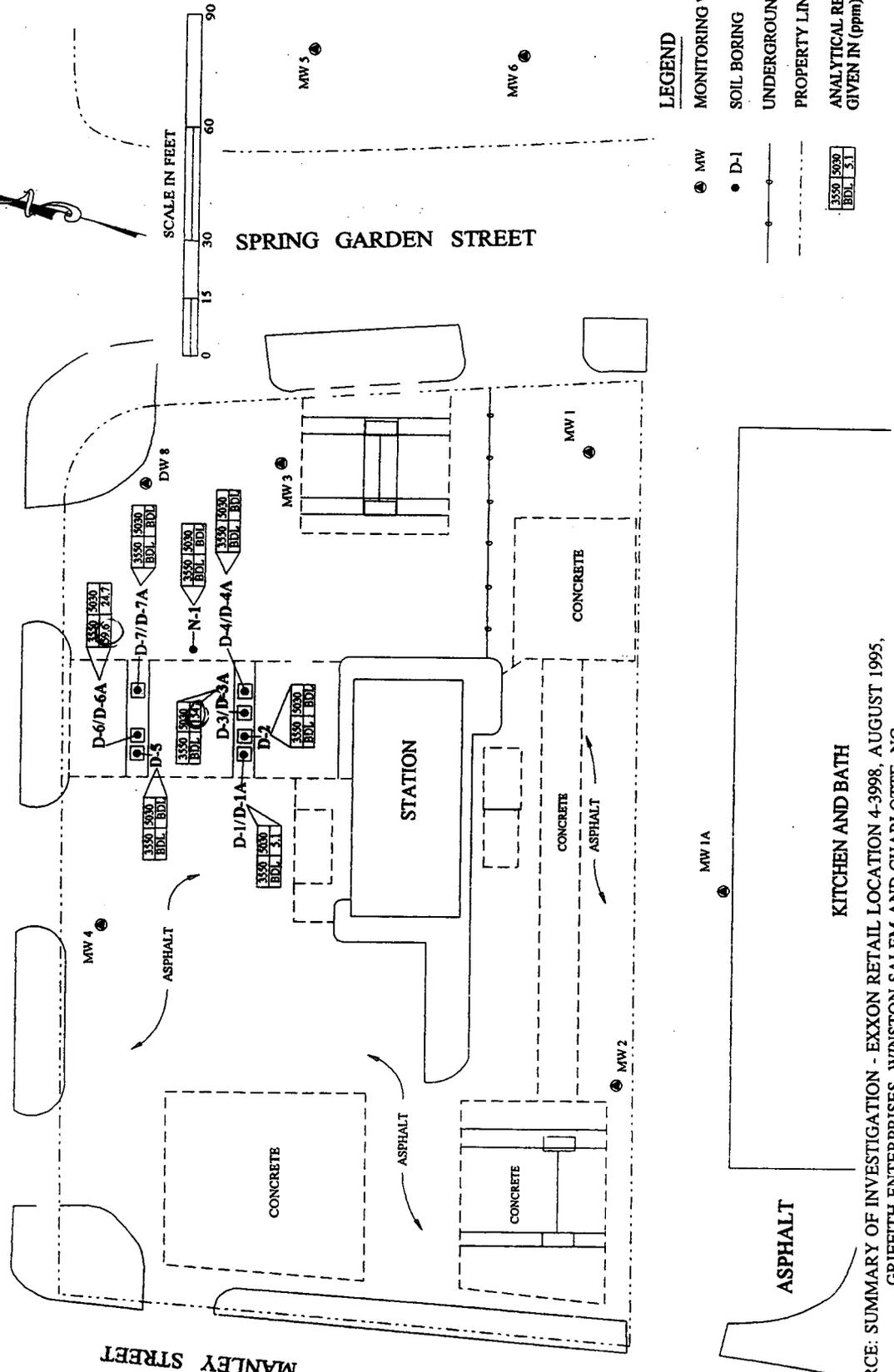
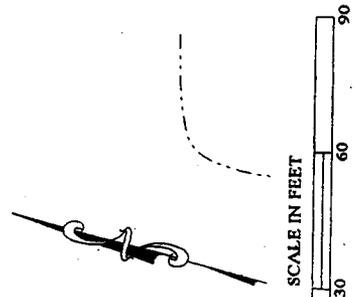
FIGURE

7

WEST MARKET STREET

MANLEY STREET

SPRING GARDEN STREET



LEGEND

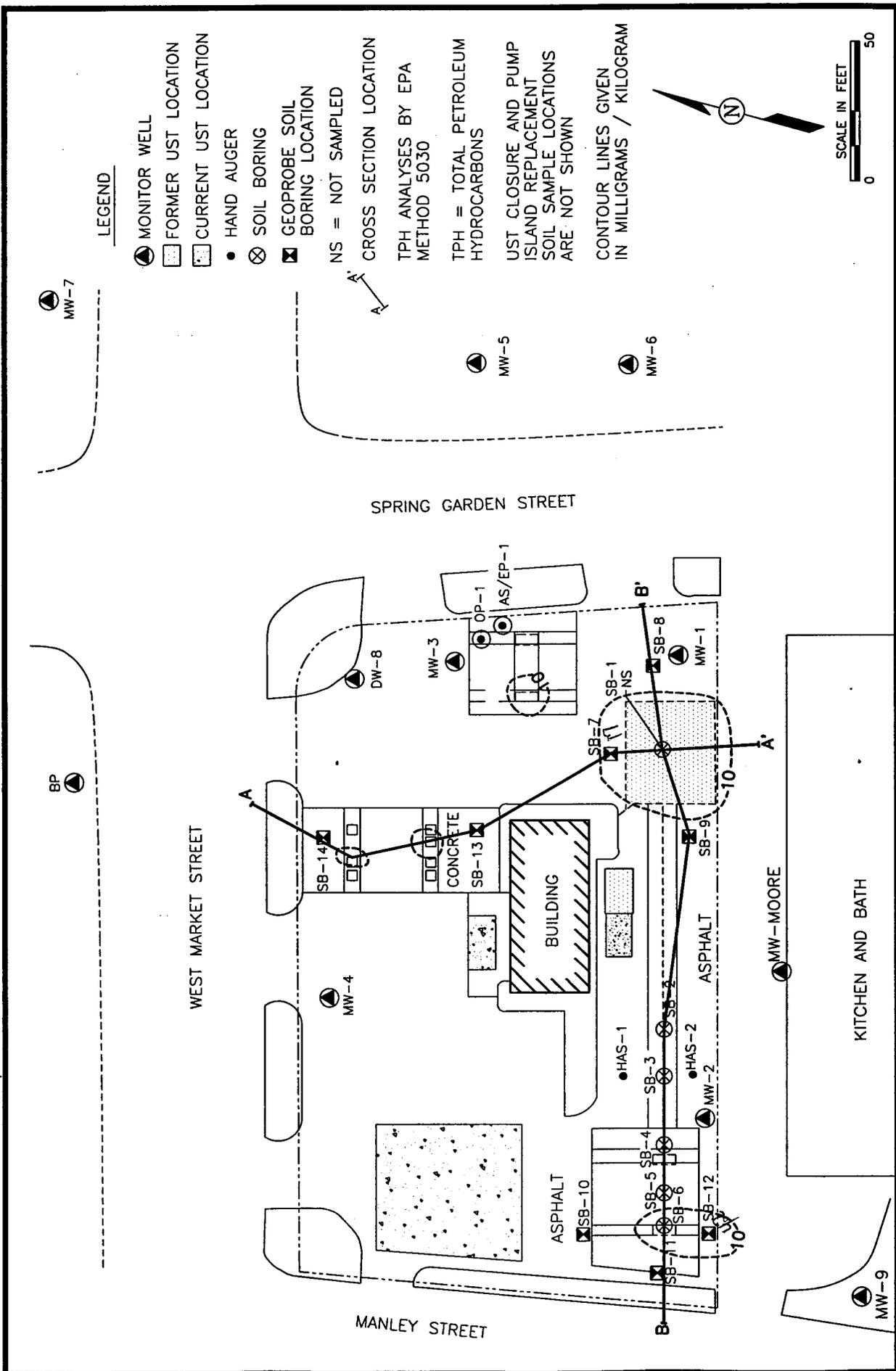
- MW MONITORING WELL
- D-1 SOIL BORING
- UNDERGROUND GAS LINE
- - - PROPERTY LINE
- | | |
|------|------|
| 3350 | 5000 |
| BDL | 31 |

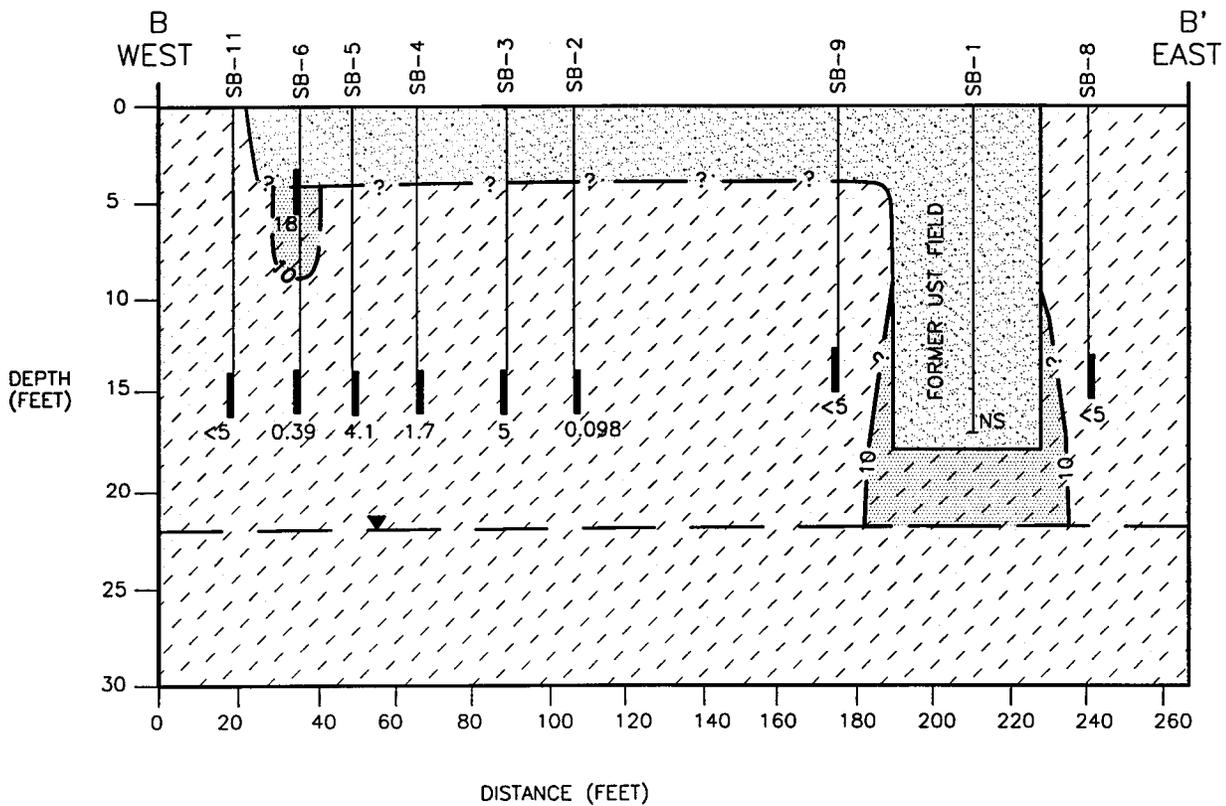
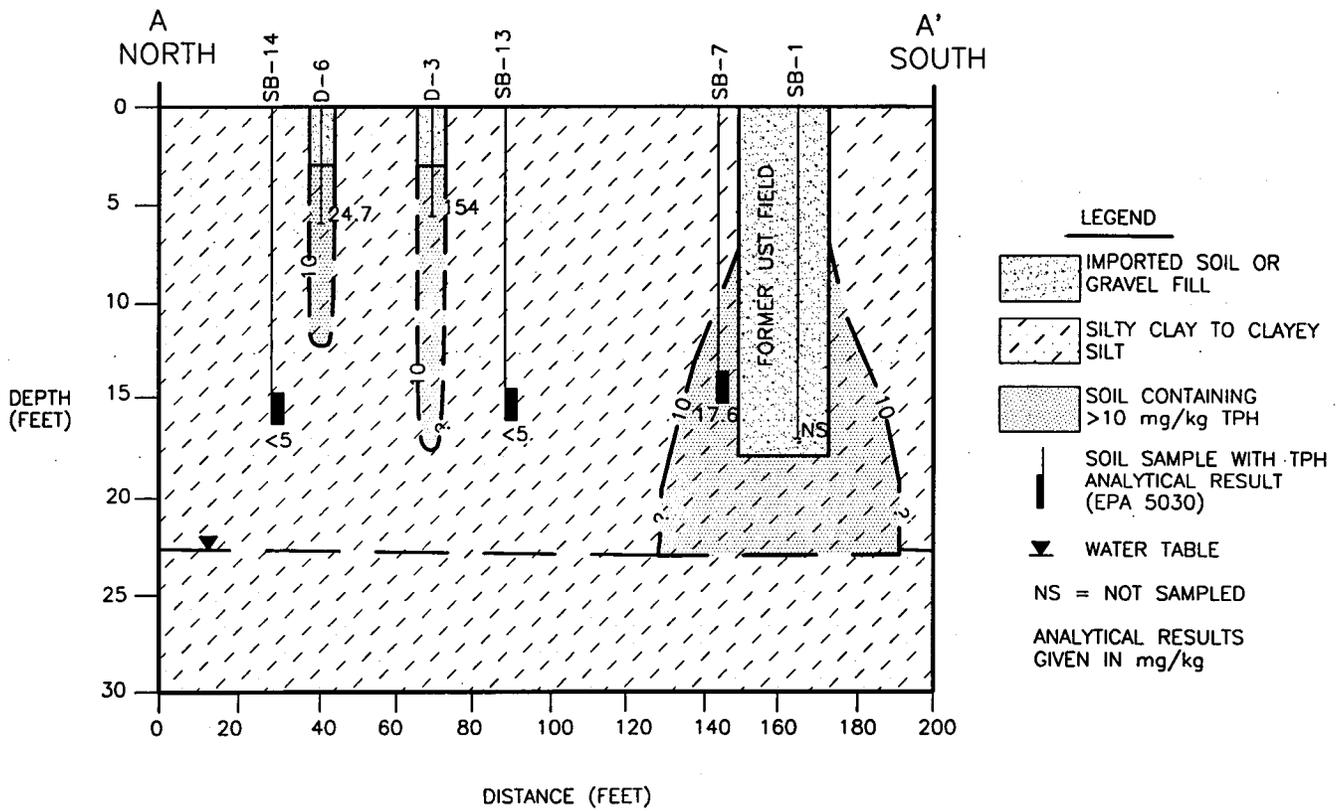
 ANALYTICAL RESULTS GIVEN IN (ppm)

SOURCE: SUMMARY OF INVESTIGATION - EXXON RETAIL LOCATION 4-3998, AUGUST 1995, GRIFFITH ENTERPRISES, WINSTON-SALEM AND CHARLOTTE, NC

ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA

PUMP ISLAND REPLACEMENT SOIL SAMPLE LOCATIONS
 EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-3998
 GREENSBORO, NORTH CAROLINA





4106CRS2.DWG 1-29-96 AM 1=1 KH/JP

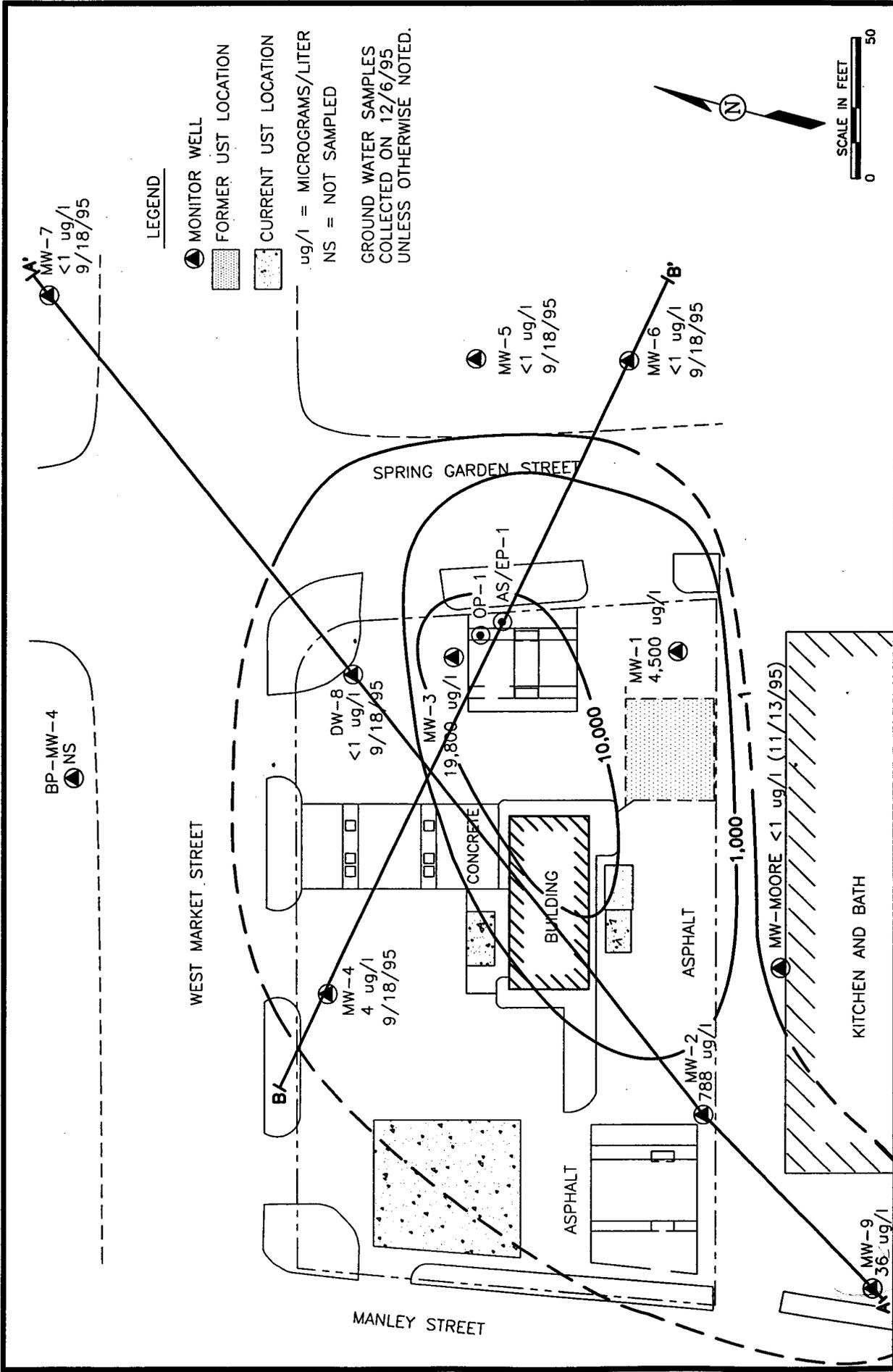


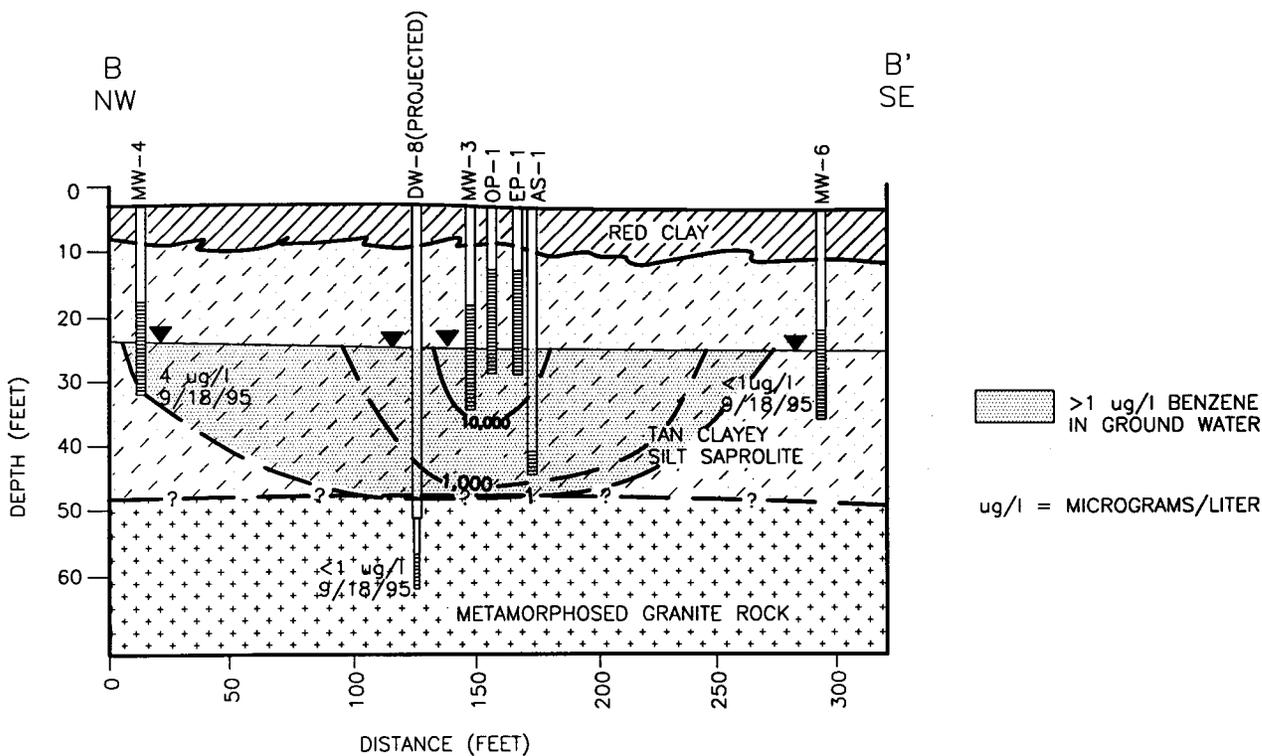
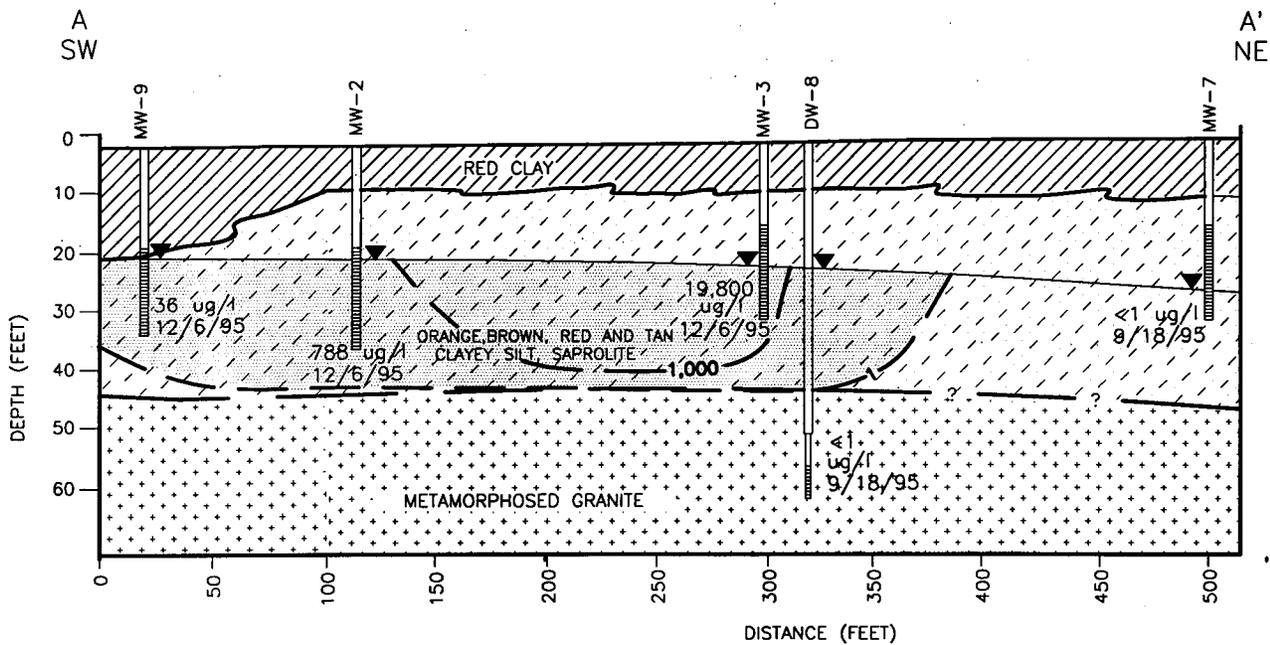
ERM-Southeast, Inc.
CHARLOTTE, NORTH CAROLINA

GEOLOGIC GROSS-SECTIONS WITH LOW BOILING POINT TPH ANALYTICAL RESULTS
EXXON RETAIL LOCATION NN 4-3998
GREENSBORO, NORTH CAROLINA

FIGURE

10





>1 ug/l BENZENE IN GROUND WATER

ug/l = MICROGRAMS/LITER

LEGEND

WATER TABLE

BENZENE ISOCONCENTRATION CONTOUR LINE (MICROGRAMS/LITER)

41061SOC.DWG 6-15-94 AM 1=1 KH/AN

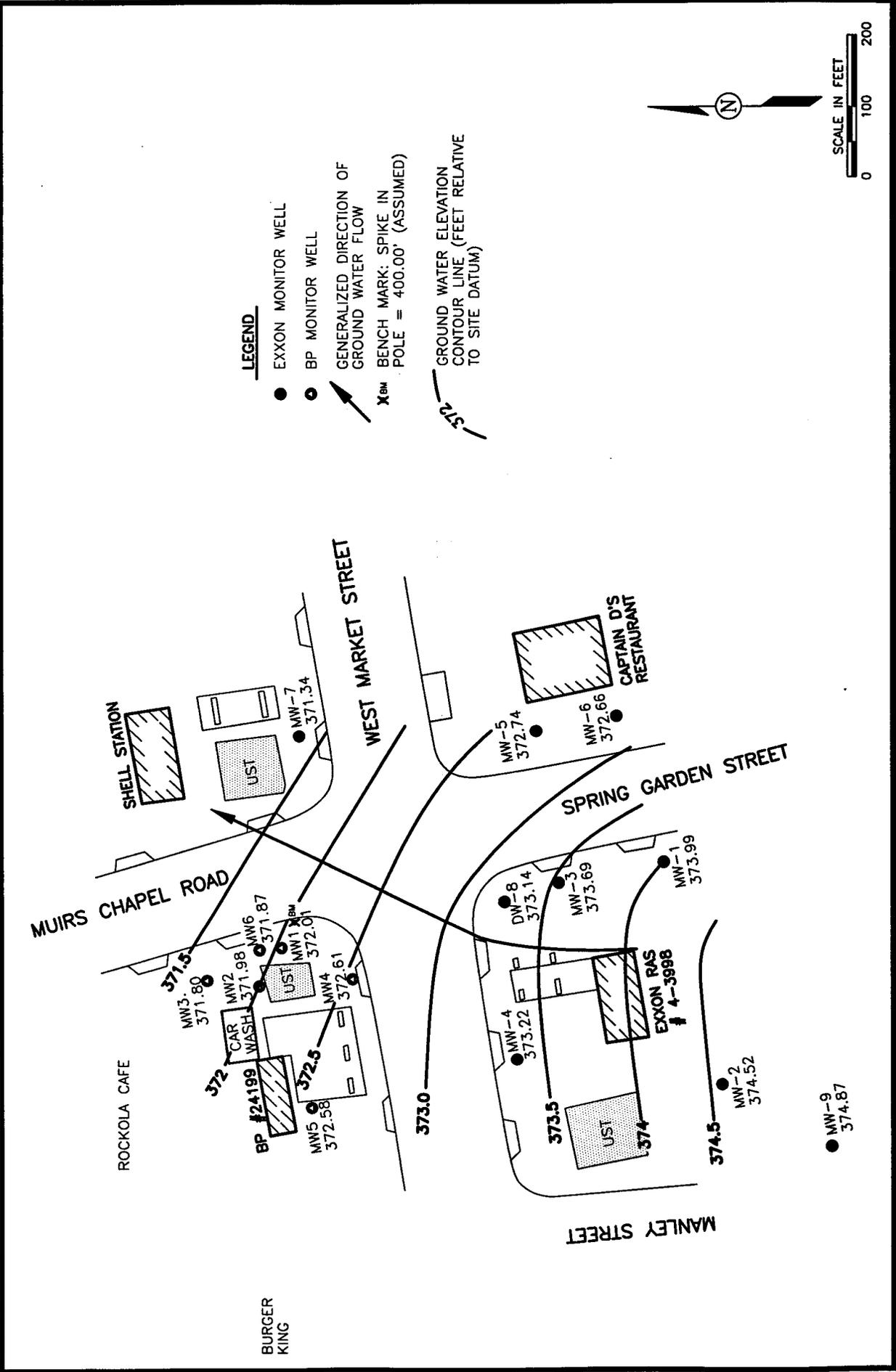


ERM-Southeast, Inc.
CHARLOTTE, NORTH CAROLINA

**GROUNDWATER BENZENE ISOCONCENTRATION
CONTOUR CROSS SECTIONS**
EXXON, U.S.A. LOCATION # 4-3998
GREENSBORO, NORTH CAROLINA

FIGURE

12



ERM-Southeast, Inc.
 CHARLOTTE, NORTH CAROLINA

ERM

GROUND WATER ELEVATION CONTOUR MAP
 BP SERVICE STATION NO. 24199 & EXXON RAS 4-3998
 GREENSBORO, NORTH CAROLINA

FIGURE 13

**TABLE 1
 ADJACENT PROPERTY OWNERS
 EXXON RETAIL LOCATION 4-3998
 4701 W. MARKET STREET
 GREENSBORO, NORTH CAROLINA**

REF. #	GUILFORD COUNTY TAX MAP I.D.	SITE ADDRESS	PROPERTY OWNER
1	384-1-0-1	4701 West Market Street	Exxon Company, U.S.A. P.O. Box 30451 Charlotte, NC 28230-0451
2	377-1-0-1	4700 West Market Street	Service Station Realty, Inc. P.O. Box 94563 Cleveland, OH 44114
3	375-1-0-36A	4650 West Market Street	Lucy M. Edwards, Trustee Quality Oil Company P.O. Box 2736 Winston-Salem, NC 27102-2736
	375-1-0-36B	4650 West Market Street	Quality Oil Co. Mt. Airy P.O. Box 2736 Winston-Salem, NC 27102-2736
4	376-2-0-4	4663 West Market Street	Shoneys South, Inc. No. 263 c/o RASH #817-33-263 P.O. Box 1600 Rowlett, TX 75088
5	376-2-0-3	4653 West Market Street	Coastal Equities 118 West 22nd Street New York, NY 10011
6	384-1-0-3	4141 Spring Garden Road	VM-JDM-FIV Company, LLP 2301 Stonehenge Drive Suite 101 Raleigh, NC 27615
7	384-2-0-1	4801 West Market Street	First Union National Bank Corporate Real Estate Building 579 1420 Two First Union Plaza Charlotte, NC 28282
8	384-2-0-2	106 Manley Street	John's Plumbing Repair Company P.O. Box 8496 Greensboro, NC 27419
NA	NA	Market Street right-of-way Spring Garden Road right-of-way Manley Street right-of-way	N.C. Dept of Transportation P.O. Box 14996 Greensboro, NC 27415-4996

Reference # refers to property I. D. numbers in Figure 5

NA = Not Available

TABLE 2
WATER SUPPLY WELL LOCATIONS WITHIN 1,500 FEET OF THE SITE
EXXON RETAIL LOCATION 4-3998
4106 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

OWNER	WELL LOCATION	WELL USAGE	CONSTRUCTION DETAILS
Howard W. Marshall (910) 299-1238	106 Thornton Court	Active water supply well	6-inch diameter 60 feet deep
Lane	4710 Westwood Road	Out of service	Unknown
David Wolf (910) 854-5624	4711 Westwood Road	Out of service	Unknown
Charles Ernest (910) 294-4984	4705 Mitchell Avenue	Active?	Unknown

TABLE 3
SOIL SAMPLE FIELD SCREENING AND ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

SAMPLE I.D.	DATE	DEPTH (feet BGL)	VOCs (ppm)	TPH BY 5030 (mg/kg)	TPH BY 3550 (mg/kg)	OIL AND GREASE BY 9071 (mg/kg)
UST CLOSURE SOIL SAMPLES						
Tank A1	9/13/91	Approx. 6	--	344	--	--
Tank A2	9/13/91	Approx. 9	--	9,000	--	--
Tank B3	9/13/91	Approx. 8	--	109	--	--
Tank B4	9/13/91	Approx. 13	--	6,310	--	--
Tank C5	9/13/91	Approx. 9	--	<20	--	--
Tank C6	9/13/91	Approx. 11	--	5,460	--	--
Disp. 1	NA	3	--	<20	--	--
Disp. 2	NA	3	--	12.8	--	--
Line 3	NA	3	--	<20	--	--
Disp. 5	9/19/91	3	--	1,140	--	--
Disp. 6	9/19/91	3	--	1,490	--	--
Line 7	9/19/91	3	--	<20	--	--
Line 8	9/19/91	3	--	4,680	--	--
Disp. 9	9/19/91	3	--	<20	--	--
Disp. 10	9/19/91	3	--	15.9	--	--
Disp. 11	9/19/91	3	--	<20	--	--
Fuel Oil	9/20/91	NA	--	--	22	--
Used Oil	9/20/91	NA	--	--	--	<20
SITE ASSESSMENT SOIL SAMPLES						
MW-1	8/13/92	15-17	8	0.22	<10	--
MW-2	8/13/92	20-22*	--	48	<10	--
MW-3	8/13/92	20-22*	100	44	<10	--
MW-4	8/13/92	20-22*	0.2	<.05	<10	--
MW-5	3/24/93	15-17	0	<.05	<10	--
MW-6	3/24/93	15-17	0	<.05	--	--
MW-7	3/24/93	15-17	25	0.59	--	--
DW-8	3/24/93	15-17	30	<.05	--	--
SB-2	3/9/94	4-6	0.6	--	--	--
		9-11	3	--	--	--
		14-16	4.2	0.095	--	--
SB-3	3/9/94	4-6	110	--	--	--
SB-3	3/9/94	9-11	112	--	--	--
SB-3	3/9/94	14-16	120	5	--	--
SB-4	3/10/94	4-6	120	--	--	--
SB-4	3/10/94	9-11	146	--	--	--
SB-4	3/10/94	14-16	162	1.7	--	--
SB-5	3/10/94	4-6	46	--	--	--
SB-5	3/10/94	9-11	76	--	--	--
SB-5	3/10/94	14-16	76	4.1	--	--
SB-6	3/10/94	4-6	106	18	--	--
SB-6	3/10/94	9-11	70	--	--	--
SB-6	3/10/94	14-16	54	0.39	--	--
HAS-1	3/9/94	2	0.8	--	--	--
HAS-1	3/9/94	4	5.6	--	--	--
HAS-1	3/9/94	6	8.2	0.14	--	--

TABLE 3
SOIL SAMPLE FIELD SCREENING AND ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

SAMPLE I.D.	DATE	DEPTH (feet BGL)	VOCs (ppm)	TPH BY 5030 (mg/kg)	TPH BY 3550 (mg/kg)	OIL AND GREASE BY 9071 (mg/kg)
HAS-2	3/10/94	2	8	--	--	--
HAS-2	3/10/94	4	8.2	--	--	--
HAS-2	3/10/94	6	16	0.12	--	--
PUMP ISLAND REPLACEMENT SOIL SAMPLES						
D-1	6/24/95	3.5	45	--	--	--
D-1A	6/24/95	5.5	50	5.1	<10	--
D-2	6/24/95	3.5	<1	<5	<10	--
D-3	6/24/95	3.5	500	--	--	--
D-3A	6/25/95	5.5	19	154	<10	--
D-4	6/24/95	3	60	--	--	--
D-4A	6/25/95	5.5	<1	<5	<10	--
D-5	6/24/95	3.5	60	<5	<10	--
D-6	6/24/95	4	600	--	--	--
D-6A	6/25/95	6	40	24.7	59.6	--
D-7	6/24/95	3.5	750	--	--	--
D-7A	6/25/95	6	40	<5	<10	--
N-1	6/25/95	3	20	<5	<10	--
ADDITIONAL SITE ASSESSMENT SOIL SAMPLES						
SB-7	8/31/95	13-15	298	17.6	--	--
SB-8	8/31/95	13-15	530	<5.0	--	--
SB-9	8/31/95	13-15	310	<5.0	--	--
SB-10	8/31/95	4-6	2	--	--	--
SB-10	8/31/95	9-11	32	--	--	--
SB-10	8/31/95	14-16	70	<5.0	--	--
SB-11	8/31/95	4-6	7.9	--	--	--
SB-11	8/31/95	9-11	65	--	--	--
SB-11	8/31/95	14-16	69	<5.0	--	--
SB-12	8/31/95	4-6	135	--	--	--
SB-12	8/31/95	9-11	390	--	--	--
SB-12	8/31/95	14-16	450	42.6	--	--
SB-13	8/31/95	4-6	79	--	--	--
SB-13	8/31/95	9-11	53	--	--	--
SB-13	8/31/95	14-16	121	<5.0	--	--
SB-14	8/31/95	4-6	16	--	--	--
SB-14	8/31/95	9-11	9	--	--	--
SB-14	8/31/95	14-16	73	<5.0	--	--

VOCs = Volatile organic compounds

VOCs field screened using a photoionization detector

TPH = Total petroleum hydrocarbons

* Indicates sample was collected below the water table

ppm = Parts per million

mg/kg = Milligrams/kilogram

"--" = Not analyzed

TPH analysis by EPA Method 3550 is for high boiling point petroleum hydrocarbons

TPH analysis by EPA Method 5030 is for low boiling point petroleum hydrocarbons

TPH analysis by EPA Method 9071 is for oil and grease petroleum hydrocarbons

TABLE 4
EPA METHOD 602 AND LEAD GROUND WATER ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

MONITOR WELL ID	DATE	EXPANDED EPA METHOD 602							METHOD 504.1	METHOD 3030C
		TOTAL BTEX	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	MTBE	IPE	EDB	LEAD
MW-1	8/20/92	65900	5000	35000	3900	22000	<500	--	--	--
	3/25/93	44600	3500	21000	3100	17000	<250	--	--	--
	6/22/93	44600	4200	18000	3400	19000	<500	--	--	--
	6/9/94	62450	6150	22500	5000	28800	96	900	<10	5
	6/14/95	<1	<1	<1	<1	<1	<10	465	--	--
	9/18/95	50,500	4,000	24,000	3,000	19,500	<5,000	<5,000	--	--
	12/6/95	47,700	4,500	18,000	3,600	21,600	<225	1,230	--	--
MW-2	8/20/92	13900	1400	4900	1600	6000	<250	--	--	--
	3/25/93	16400	2000	7300	1200	5900	<250	--	--	--
	6/22/93	76800	8100	40000	4700	24000	<2500	--	--	--
	6/9/94	70520	7160	33500	4560	25300	390	280	<10	3
	6/14/95	234,900	14,000	112,000	17,100	91,800	<225	1,710	--	--
	9/18/95	56,000	4,500	25,000	4,000	22,500	<1,000	1,600	--	--
	12/6/95	5,553	788	2,900	315	1,550	<225	292	--	--
MW-3	8/20/92	84800	11000	41000	4800	26000	<500	--	--	--
	3/25/93	67300	9700	35000	3600	19000	<1000	--	--	--
	6/22/93	88900	13000	50000	3900	22000	<2500	--	--	--
	6/9/94	114700	12600	65400	4500	32200	<1000	2580	<50	678
	6/14/95	308,200	25,200	157,000	18,000	108,000	<225	2,740	--	390
	9/18/95	125,000	15,000	73,000	6,000	31,000	<5,000	<5,000	--	372
	12/6/95	156,600	19,800	94,500	6,300	36,000	<4500	7,650	--	147
MW-4	8/20/92	4	<2.0	<2.0	<2.0	4	<10	--	--	--
	3/25/93	17.6	1.9	4.7	<1.0	11	<10	--	--	--
	6/22/93	17.5	1.5	<1.0	<1.0	16	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	4
	6/14/95	71	6	9	3	53	<10	<10	--	--
	9/18/95	33	4	<1.0	<1.0	29	<10	33	--	--
MW-5	3/25/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/22/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	13
	6/14/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	--
	9/18/95	2	<1.0	1	<1.0	1	<10	27	--	--
MW-6	3/25/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/22/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	13
	6/14/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	--
	9/18/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	14	--	--

TABLE 5
EPA METHOD 601 GROUND WATER ANALYTICAL RESULTS
FORMER EXXON LOCATION #4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

WELL	DATE	EPA METHOD 601			
		1,2-DICHLORO-ETHANE	1,1,2,2-TETRA-CHLOROETHANE	CHLOROFORM	ALL OTHER COMPOUNDS
MW-1	8/20/92	<150	<50	<50	BDL
	3/25/93	<1500	<300	<1.0	BDL
	6/22/93	<800	<800	<300	BDL
MW-2	8/20/92	<80	40	<30	BDL
	3/25/93	<300	<1.0	<1.0	BDL
	6/22/93	<800	<300	<300	BDL
MW-3	8/20/92	400	110	<30	BDL
	3/25/93	<1500	<1.0	<1.0	BDL
	6/22/93	<800	<300	<300	BDL
MW-4	8/20/92	<3	<1.0	<1.0	BDL
	3/25/93	<3	<1.0	<1.0	BDL
	6/22/93	<3	<1.0	<1.0	BDL
MW-5	3/25/93	<3.0	<1.0	<1.0	BDL
	6/22/93	<3.0	<1.0	<1.0	BDL
MW-6	3/25/93	<3.0	<1.0	<1.0	BDL
	6/22/93	<3.0	<1.0	<1.0	BDL
MW-7	3/25/93	<3.0	13	<1.0	BDL
	6/22/93	<3.0	<1.0	<1.0	BDL
DW-8	3/25/93	<3.0	<1.0	11	BDL
	6/22/93	<3.0	<1.0	<1.0	BDL

Notes:

EPA Method 601 analysis is for Purgeable Halocarbons

Results in micrograms per liter (ug/l).

BDL = Below Detection Limit

Samples dated prior to 1994 collected by Delta Environmental Consultants, Inc.

TABLE 6

EPA METHOD 625 GROUND WATER ANALYTICAL RESULTS
 FORMER EXON LOCATION #4-3998
 4701 WEST MARKET STREET
 GREENSBORO, NORTH CAROLINA

WELL	DATE	EPA METHOD 625										
		PHENOL	NAPHTHALENE	ANTHRACENE	BIS (2-ETHYL- HEXYL) PHTHALATE	BUTYL BENZYL PHTHALATE	FLUORENE	PHENANTHRENE	ALL OTHER EPA 625 COMPOUNDS			
MW-1	8/20/92	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/25/93	<8.0	320	<7.6	<10	<10	<7.6	<21.6	<10	<7.6	<21.6	BDL
	6/22/93	<1.5	216	<1.9	2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
MW-2	8/20/92	<1.5	189	<1.0	<2.5	<2.5	<1.0	<5.4	<2.5	<1.0	<5.4	BDL
	3/25/93	<3.0	370	<3.8	<5	<10	<7.0	<21.6	<10	<7.0	<21.6	BDL
	6/22/93	<1.5	369	<1.0	56.8	<2.5	<1.0	<5.4	<2.5	<1.0	<5.4	BDL
MW-3	8/20/92	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/25/93	<15	440	<1.9	<25	<25	<10	<54	<25	<10	<54	BDL
	6/22/93	<3.0	348	<3.8	17.2	<5.0	<3.8	<10.8	<5.0	<3.8	<10.8	BDL
MW-4	8/20/92	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/25/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
	6/22/93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	3/25/93	6.2	<1.6	3.2	8.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
	6/22/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
MW-6	3/25/93	21.3	5.4	<1.9	15.2	19.0	4.0	11.1	19.0	4.0	11.1	BDL
	6/22/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
MW-7	3/25/93	15.1	3.2	<1.9	<2.5	<2.5	2.5	7.8	<2.5	2.5	7.8	BDL
	6/22/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.0	<5.4	<2.5	<1.0	<5.4	BDL
DW-8	3/25/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL
	6/22/93	<1.5	<1.6	<1.9	<2.5	<2.5	<1.9	<5.4	<2.5	<1.9	<5.4	BDL

Notes:
 EPA Method 625 analysis is for Base/Neutral Extractables
 Results in micrograms per liter (ug/l).
 BDL = Below Detection Limit
 NA = Not Analyzed
 Samples collected by Delta Environmental Consultants, Inc.

TABLE 7
GROUND WATER ELEVATION DATA
EXXON RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

MONITOR WELL	TOP OF CASING ELEVATION (feet)	DATE GAUGED	DEPTH TO NAPL (ft. BTOC)	DEPTH TO WATER (ft. BTOC)	NAPL THICKNESS (feet)	GROUND WATER ELEVATION (feet)*
EXXON RETAIL LOCATION #4-3998						
MW-1	396.09	12/14/95		22.10		373.99
MW-2	396.14	12/14/95		21.62		374.52
MW-3	397.13	12/14/95	23.43	23.48	0.05	373.69
MW-4	397.44	12/14/95		24.22		373.22
MW-5	397.42	12/14/95		24.68		372.74
MW-6	396.32	12/14/95		23.66		372.66
MW-7	398.81	12/14/95		27.47		371.34
DW-8 (Type III well)	398.25	12/14/95		25.11		373.14
MW-9	394.06	12/14/95		19.19		374.87
BP SERVICE STATION #24199						
MW-1	397.97	12/14/95	25.84	26.43	0.59	371.98
MW-2	398.63	12/14/95		26.57		372.06
MW-3	398.71	12/14/95		26.91		371.80
MW-4	398.24	12/14/95		25.63		372.61
MW-5	398.65	12/14/95		26.07		372.58
MW-6 (Type III well)	398.03	12/14/95		26.16		371.87

Top of casing elevations are measured relative to a site datum with an assigned elevation of 400 feet

NAPL = Non-aqueous phase liquid

BTOC = Below top of casing

* - Ground water elevation in wells containing NAPL is corrected to account for the thickness of NAPL observed

APPENDIX A

SOIL DISPOSAL MANIFESTS



Cherokee Environmental Group

A Division of Cherokee Sanford Group, Inc.

**CERTIFICATION OF REMEDIATION AND RECYCLING
OF NON-HAZARDOUS HYDROCARBON
CONTAMINATED MATERIAL**

ORIGINATING AT: 4701 WEST MARKET STREET, GREENSBORO, NORTH CAROLINA

FROM THE "GENERATOR": EXXON CO. 4-3998

Cherokee Environmental Group ("CEG") received 75.29 tons of material from the Generator on 8/10/95 at its GULF facility. Receipt of this shipment of NON-HAZARDOUS hydrocarbon contaminated material is evidenced by CEG's manifests with control numbers 26486 thru 26489.

This NON-HAZARDOUS hydrocarbon contaminated material has been accepted by CEG, and this material will be remediated in one of CEG's fully permitted remediation/recycling processes. In the brick manufacturing process, the subject material is mixed with raw materials, crushed, ground, compacted, and extruded into brick. The brick are preheated and then fired in tunnel kilns at temperatures exceeding 1700 degrees Fahrenheit for a period of approximately 12 hours. This process drives off and/or consumes any organic constituents contained in the material, leaving the finished brick product free of any hydrocarbon contamination. Material that is more suitable for bio-remediation will be segregated, cleaned, remediated, and beneficially re-used in CEG's permitted bio-remediation operations. CEG guarantees complete remediation: should CEG's bio-remediation processes not reduce the Total Petroleum Hydrocarbons in the subject material to state defined "clean" soil levels, CEG will thermally remediate the material in one of its sixteen (16) brick kilns.

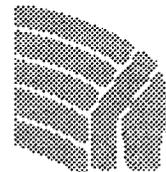
It must be stressed that these processes are permitted by the State of Maryland's Department of the Environment, the State of North Carolina's Department of Environment, Health, and Natural Resources, the State of South Carolina's Department of Health and Environmental Control, and the Commonwealth of Virginia's Department of Environmental Quality, only for the remediation and recycling of NON-HAZARDOUS material.

This certification does not change or modify the terms and conditions of any existing contract(s), agreement(s), or certification(s) between CEG and the Generator (or the Generator's authorized agent) relating to the referenced material.

This particular job is filed as WM# 12530.



CHEROKEE ENVIRONMENTAL GROUP



AUGUST 17, 1995

DATE



Cherokee Environmental Group

NON-HAZARDOUS MATERIAL MANIFEST

LOAD # 4 (number sequentially as trucks are dispatched)

CUSTOMER EXXON CO. USA
PO BOX 30451
CHARLOTTE NC 282300457

CONTACT: FRANK MEDLIN
PHONE: 704-529-4261

GENERATOR EXXON COMPANY USA
PO BOX 30451
CHARLOTTE NC 282300451

CONTACT: CRAIG SUMMEY
PHONE: 704-529-4261

TRANSPORTER N. P. SLOAN
1701 COLON ROAD
SANFORD NC 27330

CONTACT: JOE DAN SLOAN
PHONE: 919-774-4716

MATERIAL DESCRIPTION NON-HAZARDOUS - RECYCLED SOIL
CONTAMINANT(S): GASOLINE

MATERIAL TO BE PICKED UP AT EXXON COMPANY USA 43998

4701 WEST MARKET STREET
GREENSBORO NC

MATERIAL TO BE DELIVERED TO GULF PLANT
CLARENCE MCKEITHAN ROAD
GULF NC

CONTACT: Cherokee Environmental Group
PHONE: 919-775-2121
800-774-5330

TRUCK #: 1 GROSS WEIGHT: 54,200
TARE WEIGHT: 29,000 12.6 TONS.
NET WEIGHT: 25,200

GENERATOR'S CERTIFICATION: I certify the above material is not a "HAZARDOUS WASTE" under: 15A NCAC 13A .0006 or Title 40-Part 261 CFR or TSCA.

LERoy PRINTED / TYPED NAME & TITLE [Signature] SIGNATURE 2-10-95 DATE

TRUCK DRIVER'S SIGNATURE (acknowledgement of delivery of material): [Signature] DATE 8-10-95

NOTED DISCREPANCIES: _____
INSPECTED & ACCEPTED (except as noted above) BY: Cherokee Environmental Group
SIGNED BY: [Signature]
DATE: 8/10/95

TRUCKS MUST HAVE THIS MANIFEST AND A GROSS WEIGHT TICKET
(Scale available at Beltsville, Maryland facility only)
TRUCKERS MUST KNOW TARE WEIGHT AND ALL TRUCKS MUST BE COVERED

1600 Colon Road • Sanford, North Carolina 27330 • (919) 774-5330 • Fax (919) 774-5337
7100 Muirkirk Road • Beltsville, Maryland 20705 • (301) 210-6100 • Fax (301) 210-6104
5601 City Line Road • Newport News, Virginia 23607 • (804) 380-6337 • Fax (804) 380-6340



Cherokee Environmental Group

NON-HAZARDOUS MATERIAL MANIFEST

Sunny

LOAD # 3 (number sequentially as trucks are dispatched)

CUSTOMER EXXON CO. USA
PO BOX 30451
CHARLOTTE NC 282300457

CONTACT: FRANK MEDLIN
PHONE: 704-529-4261

GENERATOR EXXON COMPANY USA
PO BOX 30451
CHARLOTTE NC 82300451

CONTACT: CRAIG SUMMEY
PHONE: 704-529-4261

TRANSPORTER N. P. SLOAN
1701 COLON ROAD
SANFORD NC 27330

CONTACT: JOE DAN SLOAN
PHONE: 919-774-4716

MATERIAL DESCRIPTION NON-HAZARDOUS - RECYCLED SOIL
CONTAMINANT(S): GASOLINE

MATERIAL TO BE PICKED UP AT EXXON COMPANY USA 43998

4701 WEST MARKET STREET
GREENSBORO NC

MATERIAL TO BE DELIVERED TO GULF PLANT
CLARENCE MCKEITHAN ROAD
GULF NC

CONTACT: Cherokee Environmental Group
PHONE: 919-775-2121
800-774-5330

TRUCK #: 3 GROSS WEIGHT: 73360
TARE WEIGHT: 29000
NET WEIGHT: 44360

GENERATOR'S CERTIFICATION: I certify the above material is not a "HAZARDOUS WASTE" under: 15A NCAC 13A .0006 or Title 40-Part 261 CFR or TSCA.

LEWY

Sloan

PRINTED/TYPED NAME & TITLE

SIGNATURE

DATE

TRUCK DRIVER'S SIGNATURE
(acknowledgement of delivery of material):

Chad Thomas

DATE 8-10-95

NOTED DISCREPANCIES:

INSPECTED & ACCEPTED (except as noted above) BY: [Signature] Cherokee Environmental Group
SIGNED BY: [Signature]
DATE: 8/10/95

TRUCKS MUST HAVE THIS MANIFEST AND A GROSS WEIGHT TICKET

(Scale available at Beltsville, Maryland facility only)
TRUCKERS MUST KNOW TARE WEIGHT AND ALL TRUCKS MUST BE COVERED

1600 Colon Road • Sanford, North Carolina 27330 • (919) 774-5330 • Fax (919) 774-5337
7100 Muirkirk Road • Beltsville, Maryland 20705 • (301) 210-6100 • Fax (301) 210-6104
5601 City Line Road • Newport News, Virginia 23607 • (804) 380-6337 • Fax (804) 380-6340

GENERATOR

APPROVAL WM 1 - 12530
00001



CONTROL # 26487

Cherokee Environmental Group

NON-HAZARDOUS MATERIAL MANIFEST

Clouby

LOAD # 2 (number sequentially as trucks are dispatched)

CUSTOMER EXXON CO. USA
PO BOX 30451
CHARLOTTE NC 282300457

CONTACT: FRANK MEDLIN
PHONE: 704-529-4261

GENERATOR EXXON COMPANY USA
PO BOX 30451
CHARLOTTE NC 82300451

CONTACT: CRAIG SUMMEY
PHONE: 704-529-4261

TRANSPORTER N. P. SLOAN
1701 COLON ROAD
SANFORD NC 27330

CONTACT: JOE DAN SLOAN
PHONE: 919-774-4716

MATERIAL DESCRIPTION NON-HAZARDOUS - RECYCLED SOIL
CONTAMINANT(S): GASOLINE

MATERIAL TO BE PICKED UP AT EXXON COMPANY USA 43998

4701 WEST MARKET STREET
GREENSBORO NC

MATERIAL TO BE DELIVERED TO GULF PLANT
CLARENCE MCKEITHAN ROAD
GULF NC

CONTACT: Cherokee Environmental Group
PHONE: 919-775-2121
800-774-5330

TRUCK #: _____ GROSS WEIGHT: 65846
TARE WEIGHT: 29000
NET WEIGHT: 36840

GENERATOR'S CERTIFICATION: I certify the above material is **not** a "HAZARDOUS WASTE" under: 15A NCAC 13A .0006 or Title 40-Part 261 CFR or TSCA.

Tom Exxon Co USA
PRINTED / TYPED NAME & TITLE

[Signature]
SIGNATURE

8-10-95
DATE

TRUCK DRIVER'S SIGNATURE
(acknowledgement of delivery of material):

John D McNeil

DATE 8-10-95

NOTED DISCREPANCIES: _____

INSPECTED & ACCEPTED (except as noted above) BY: Cherokee Environmental Group

SIGNED BY: [Signature]

DATE: 8/10/95

TRUCKS MUST HAVE THIS MANIFEST AND A GROSS WEIGHT TICKET

(Scale available at Beltsville, Maryland facility only)

TRUCKERS MUST KNOW TARE WEIGHT AND ALL TRUCKS MUST BE COVERED

1600 Colon Road • Sanford, North Carolina 27330 • (919) 774-5330 • Fax (919) 774-5337
7100 Muirkirk Road • Beltsville, Maryland 20705 • (301) 210-6100 • Fax (301) 210-6104
5601 City Line Road • Newport News, Virginia 23607 • (804) 380-6337 • Fax (804) 380-6340

GENERATOR

APPROVAL WM 1 - 12530
00001



CONTROL # 26486

Cherokee Environmental Group

NON-HAZARDOUS MATERIAL MANIFEST

LEAD # 1 (number sequentially as trucks are dispatched)

CUSTOMER EXXON CO. USA
PO BOX 30451
CHARLOTTE NC 282300457

CONTACT: FRANK MEDLIN
PHONE: 704-529-4261

GENERATOR EXXON COMPANY USA
PO BOX 30451
CHARLOTTE NC 282300451

CONTACT: CRAIG SUMMEY
PHONE: 704-529-4261

TRANSPORTER N. F. SLOAN
1701 COLON ROAD
SANFORD NC 27330

CONTACT: JOE DAN SLOAN
PHONE: 919-774-4716

MATERIAL DESCRIPTION NON-HAZARDOUS - RECYCLED SOIL
CONTAMINANT(S): GASOLINE

MATERIAL TO BE PICKED UP AT EXXON COMPANY USA 43998

4701 WEST MARKET STREET
GREENSBORO NC

MATERIAL TO BE DELIVERED TO GULF PLANT
CLARENCE MCKEITHAN ROAD
GULF NC

CONTACT: Cherokee Environmental Group
PHONE: 919-775-2121
800-774-5330

TRUCK #: B GROSS WEIGHT: 73180
TARE WEIGHT: 29000
NET WEIGHT: 44180

GENERATOR'S CERTIFICATION: I certify the above material is not a "HAZARDOUS WASTE" under: 15A NCAC 13A .0006 or Title 40-Part 261 CFR or TSCA.

For Exxon Co USA
PRINTED / TYPED NAME & TITLE

[Signature]
SIGNATURE

8-10-95
DATE

TRUCK DRIVER'S SIGNATURE
(acknowledgement of delivery of material):

[Signature]

DATE 8-10-95

NOTED DISCREPANCIES: _____

INSPECTED & ACCEPTED (except as noted above) BY: Cherokee Environmental Group
SIGNED BY: Calvin Taylor
DATE: 8-10-95

TRUCKS MUST HAVE THIS MANIFEST AND A GROSS WEIGHT TICKET

(Scale available at Beltsville, Maryland facility only)
TRUCKERS MUST KNOW TARE WEIGHT AND ALL TRUCKS MUST BE COVERED

1600 Colon Road • Sanford, North Carolina 27330 • (919) 774-5330 • Fax (919) 774-5337
7100 Muirkirk Road • Beltsville, Maryland 20705 • (301) 210-6100 • Fax (301) 210-6104
5601 City Line Road • Newport News, Virginia 23607 • (804) 380-6337 • Fax (804) 380-6340

GENERATOR

RECEIVED
MAY 23 1994



MEMO

Cherokee Environmental Group

A Division of Cherokee Sanford Group, Inc.

1600 Colon Road • Sanford, North Carolina 27330 • (919) 774-5330 • 1-800-774-5330 • Fax (919) 774-5337
7100 Muirkirk Road • Beltsville, Maryland 20705 • (301) 210-6100 • Fax (301) 210-6104

DATE: 05-18-94

CC:

TO: Frank Medlin

FROM: Annette B. Thomas

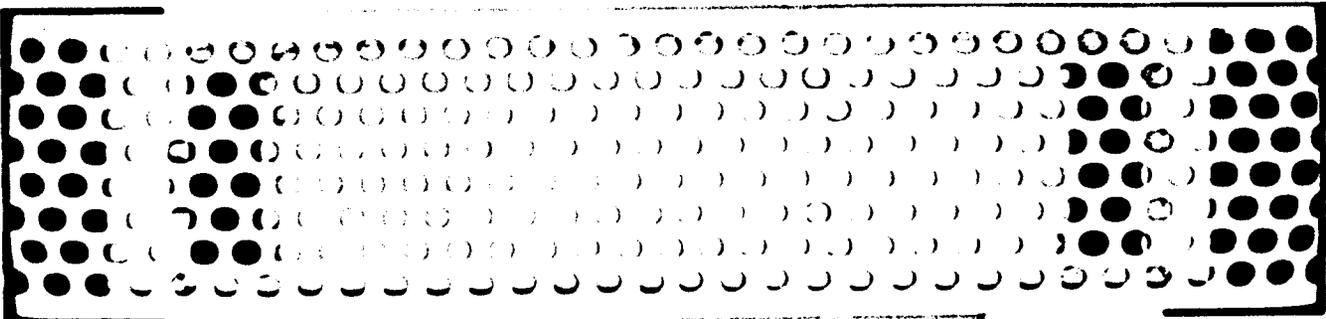
SUBJECT: Exxon SS# 4-3998

Dear Mr. Medlin,

Per Mr. Summey's request, I am sending you a copy of our truck log and remediation letter of the above mentioned.

If we can be of further assistance, please call.

Annette B. Thomas





Cherokee Environmental Group

A Division of Cherokee Sanford Group, Inc.

October 10, 1991

Exxon Company U.S.A.
PO Box 4386
Houston, TX 77210

RE: Remediation of NON-HAZARDOUS PETROLEUM CONTAMINATED SOIL
originating at Exxon Station #4-3998 4701 Market Street in
Greensboro, NC.

Dear Sir:

Cherokee Environmental Group ("CEG") received approximately 1955.30 tons of soil on September 4, 1991 through September 24, 1991. The Generator (or the Generator's agent) has certified that this soil is contaminated only with NON-HAZARDOUS PETROLEUM (Class I and Class II petroleum products). Receipt of this shipment of NON-HAZARDOUS PETROLEUM CONTAMINATED SOIL is evidenced by CEG's manifests with control numbers 6336 through 7316.

This NON-HAZARDOUS PETROLEUM CONTAMINATED SOIL has been accepted by CEG, and this soil will be remediated in CEG's brickmaking process. In this process, the subject contaminated soil is mixed with raw materials, crushed, ground, compacted, and extruded into green bricks. The green bricks are then preheated and fired in tunnel kilns at temperatures reaching 1950 degrees Fahrenheit. This process drives off and / or consumes any volatiles contained in the material, leaving the finished brick free of any petroleum products.

It must be stressed that this process is permitted by the State of North Carolina's Department of Environment, Health, and Natural Resources only for the remediation of NON-HAZARDOUS Class I and II Petroleum Contaminated Soil, and CEG has not contracted to remediate any other type of contaminated material.

This particular job is filed as WM # 549. If you have any questions on this job or if we can be of further service, please feel free to call me at (919) 774-5330.

Sincerely,

Melissa Dalrymple

Melissa Dalrymple
CHEROKEE ENVIRONMENTAL GROUP

ENVIRONMENTAL SERVICES
 1600 COLON ROAD
 SANFORD, N.C. 27330
 919-775-2121

Billing Date: 10/10/91

Page 3

Customer: EXXON CO. USA
 Address: P O BOX 4386
 HOUSTON, TX 77210

Cust #: 209400
 WM #: 549
 Price/Ton: 30.00

Waste Origin: EXXON COMPANY USA
 GREENSBORO, NC

Manifest Number	Date	Gross Weight	Tare Weight	Net Weight	Net Tons	Price Per Load
6868	9/11/91	80060	32100	47960	23.98	719.40
6869	9/11/91	62990	30000	32990	16.50	494.85
6870	9/11/91	67450	31000	36450	18.23	546.75
6871	9/17/91	68310	29300	39010	19.50	585.15
6872	9/17/91	71360	29620	41740	20.87	626.10
6873	9/17/91	60670	26000	34670	17.34	520.05
6874	9/17/91	61170	25280	35890	17.95	538.35
6875	9/17/91	73190	32000	41190	20.60	617.85
6876	9/17/91	67170	25000	42170	21.09	632.55
6877	9/17/91	68640	28560	40080	20.04	601.20
6878	9/17/91	58950	26000	32950	16.48	494.25
6879	9/17/91	68008	29300	38708	19.35	580.62
6880	9/17/91	73800	29620	44180	22.09	662.70
6881	9/17/91	72200	32000	40200	20.10	603.00
6882	9/17/91	59930	26120	33810	16.91	507.15
6883	9/17/91	70650	28560	42090	21.05	631.35
6884	9/17/91	61200	25280	35920	17.96	538.80
6885	9/17/91	54230	25000	29230	14.62	438.45
6886	9/17/91	60780	26000	34780	17.39	521.70
6887	9/18/91	48230	19680	28550	14.28	428.25
6888	9/18/91	64220	23000	41220	20.61	618.30
6889	9/18/91	67750	26200	41550	20.77	623.25
6890	9/18/91	68890	26000	42890	21.45	643.35
6891	9/18/91	47520	22000	25520	12.76	382.80
6892	9/18/91	58030	26000	32030	16.02	480.45
6893	9/19/10	51240	21000	30240	15.12	453.60
6894	9/19/91	47900	19680	28220	14.11	423.30
6971	9/24/91	60890	26000	34890	17.45	523.35
6972	9/24/91	63940	25280	38660	19.33	579.90
6973	9/24/91	65820	25000	40820	20.41	612.30
6974	9/24/91	69280	27000	42280	21.14	634.20
7314	9/19/91	48140	21000	27140	13.57	407.10
7315	9/18/91	54620	21500	33120	16.56	496.80
7316	9/18/91	49430	21500	27930	13.97	418.95

Invoice Subtotal =====> 1955.30 58,658.90

Surcharge =====>

Invoice Total =====>

CHEROKEE SHINFORD GROUP, INC.
 ENVIRONMENTAL SERVICES
 1600 COLON ROAD
 SANFORD, N.C. 27330
 919-775-2121

Billing Date: 10/10/91

Page 2

Customer: EXXON CO. USA
 Address: P O BOX 4386
 HOUSTON, TX 77210

Cust #: 209400
 WM #: 549
 Price/Ton: 30.00

Waste Origin: EXXON COMPANY USA
 GREENSBORO, NC

Manifest Number	Date	Gross Weight	Tare Weight	Net Weight	Net Tons	Price Per Load
6372	9/06/91	65320	18450	46870	23.44	703.05
6373	9/06/91	48770	18000	30770	15.39	461.55
6374	9/06/91	40270	18000	22270	11.14	334.05
6375	9/06/91	48670	21000	27670	13.84	415.05
6376	9/06/91	69980	30020	39960	19.98	599.40
6377	9/06/91	45100	15620	29480	14.74	442.20
6378	9/06/91	75180	30000	45180	22.59	677.70
6379	9/06/91	77710	28560	49150	24.58	737.25
6380	9/06/91	65310	29000	36310	18.16	544.65
6381	9/06/91	65000	30000	35000	17.50	525.00
6382	9/06/91	66150	31000	35150	17.57	527.25
6383	9/06/91	65150	29920	35230	17.61	528.45
6384	9/06/91	71820	32000	39820	19.91	597.30
6385	9/06/91	67240	29030	38210	19.11	573.15
6386	9/06/91	58700	25280	33420	16.71	501.30
6387	9/06/91	63830	24600	39230	19.61	588.45
6388	9/06/91	67690	25000	42690	21.35	640.35
6389	9/06/91	44540	14540	30000	15.00	450.00
6390	9/06/91	42110	17110	25000	12.50	375.00
6391	9/06/91	70120	27800	42320	21.16	634.80
6392	9/06/91	45660	18000	27660	13.83	414.90
6393	9/06/91	47740	21000	26740	13.37	401.10
6394	9/06/91	62025	21660	40365	20.18	605.48
6395	9/11/91	78000	29300	48700	24.35	730.50
6396	9/11/91	47510	19800	27710	13.86	415.65
6397	9/11/91	66180	24600	41580	20.79	623.70
6398	9/11/91	76180	29620	46560	23.28	698.40
6399	9/11/91	75710	30000	45710	22.86	685.65
6400	9/11/91	79300	30000	49300	24.65	739.50
6861	9/11/91	85070	31000	54070	27.04	811.05
6862	9/11/91	73760	32100	41660	20.83	624.90
6863	9/11/91	64300	24600	39700	19.85	595.50
6864	9/11/91	45730	19800	25930	12.97	388.95
6865	9/11/91	69150	29300	39850	19.93	597.75
6866	9/11/91	77470	30000	47470	23.74	712.05
6867	9/11/91	79390	29620	49770	24.89	746.55

Invoice Subtotal =====> 1335.76 40,072.73

Surcharge =====>

Invoice Total =====>

ENVIRONMENTAL SERVICES
 1600 COLON ROAD
 SANFORD, N.C. 27330
 919-775-2121

Billing Date: 10/10/91

Page 1

Customer: EXXON CO. USA
 Address: P O BOX 4386
 HOUSTON, TX 77210

Cust #: 209400
 WM #: 549
 Price/Ton: 30.00

Waste Origin: EXXON COMPANY USA
 GREENSBORO, NC

Manifest Number	Date	Gross Weight	Tare Weight	Net Weight	Net Tons	Price Per Load
0000	9/24/91	62100	23500	38600	19.30	579.00
6336	9/04/91	41810	19800	22010	11.01	330.15
6337	9/04/91	60220	23500	36720	18.36	550.80
6338	9/04/91	40680	20120	20560	10.28	308.40
6339	9/04/91	61590	25280	36310	18.16	544.65
6340	9/04/91	62980	27000	35980	17.99	539.70
6341	9/04/91	64700	25000	39700	19.85	595.50
6342	9/04/91	67150	25280	41870	20.94	628.05
6343	9/04/91	52480	25300	27180	13.59	407.70
6344	9/04/91	60390	27800	32590	16.30	488.85
6345	9/04/91	57890	24600	33290	16.64	499.35
6346	9/04/91	44260	23500	20760	10.38	311.40
6347	9/04/91	41230	19800	21430	10.72	321.45
6348	9/04/91	50820	20200	30620	15.31	459.30
6349	9/04/91	57990	25280	32710	16.36	490.65
6350	9/04/91	72430	28560	43870	21.94	658.05
6351	9/01/91	61890	24600	37290	18.64	559.35
6352	9/04/91	62940	27000	35940	17.97	539.10
6353	9/04/91	69520	25000	44520	22.26	667.80
6354	9/04/91	58300	25300	33000	16.50	495.00
6355	9/04/91	70010	27800	42210	21.11	633.15
6356	9/05/91	50030	20200	29830	14.92	447.45
6357	9/05/91	66730	25280	41450	20.73	621.75
6358	9/05/91	44100	19800	24300	12.15	364.50
6359	9/05/91	60250	23500	36750	18.38	551.25
6360	9/05/91	76180	28560	47620	23.81	714.30
6361	9/05/91	63060	24600	38460	19.23	576.90
6362	9/05/91	66870	27000	39870	19.93	598.05
6363	9/05/91	68120	25000	43120	21.56	646.80
6364	9/05/91	58330	15050	43280	21.64	649.20
6365	9/05/91	75620	27860	47760	23.88	716.40
6367	9/06/91	45640	19800	25840	12.92	387.60
6368	9/06/91	63730	25280	38450	19.23	576.75
6369	9/06/91	68740	25000	43740	21.87	656.10
6370	9/06/91	61000	14680	46320	23.16	694.80
6371	9/06/91	65660	24600	41060	20.53	615.90

Invoice Subtotal =====>	647.51	19,425.15
Surcharge =====>		
Invoice Total =====>		

APPENDIX B
STANDARD OPERATING PROCEDURES

INTRODUCTION

Soil and ground water sampling and analyses at the site have been conducted in accordance with North Carolina Department of Environment, Health, and Natural Resources - Division of Environmental Management Ground Water Section Guidelines (March 1993).

SOIL BORING AND SOIL SAMPLING METHODS

Soil borings completed during the soil and ground water investigations were advanced by the Geoprobe, hollow stem auger, or hand auger soil boring methods. Soil sample collection from Geoprobe and hollow stem auger borings was conducted using the split spoon sampling technique. The sampling equipment was cleaned prior to, and between each use by scrubbing with phosphate-free detergent, rinsing in tap water, and rinsing again with distilled water.

Soil samples were visually inspected and the physical characteristics logged prior to removing the sample from the split spoon. A representative portion of each soil sample was placed in a plastic bag and screened for volatile organic compounds using a flame ionization or photoionization detector (FID/PID). The remaining portion of each sample was placed in a clean glass jar and preserved on ice. Soil samples were selected for laboratory analysis based on the FID/PID screening results. Sample collection, handling, and preservation were conducted in accordance with accepted protocol, including chain-of-custody documentation.

MONITOR WELL CONSTRUCTION METHODS

The shallow monitor well boring, installed by ERM-Southeast, MW-9, was drilled using hollow stem auger drilling equipment with split spoon samples being collected at 5-foot intervals. The split spoon samples and augers were decontaminated by steam cleaning initially and prior to reuse. The split spoon samples and auger cuttings were visually inspected, scanned with a photoionization detector (FID/PID) for the presence of volatile organic compounds, and logged by an ERM-Southeast geologist in the field.

Each of the shallow ground water monitoring wells was constructed of 2-inch diameter Schedule 40, threaded flush joint PVC pipe. Each well was equipped with a section of 0.010-inch slot PVC well screen with a 0.5 to 2-foot PVC sediment trap. Blank PVC casing extends from the top of the well screen to approximately 0.5-feet below ground level. A clean silica sand pack was placed around the well screen to a depth of approximately two feet above the top of the screen. A two-foot thick bentonite seal was placed immediately above the sand pack with a cement-bentonite grout placed from the bentonite seal to the top of the blank PVC casing. Each well was completed flush with the ground surface inside a protective cast iron well access manhole to protect against surface water infiltration. Each flush mounted well is equipped with a lockable well cap.

The Type III deep monitor well boring was advanced by air rotary drilling. The upper portion of the well boring was advanced using air rotary drilling and a 8.25-inch diameter Schedule 40 PVC casing was installed and tremie grouted in place. The casing grout was allowed to cure for a period of approximately 24 hours prior to continuing the well boring. The lower portion of the well boring was also advanced using air rotary drilling. Upon reaching the total depth of the well, 2-inch diameter Schedule 40 PVC riser pipe and 0.010-inch mill slotted screen were installed in the boring. Sandpack was installed around the screening by pouring the sand through the annulus between the outer casing and the well casing. Approximately 2 feet of bentonite was placed above the well screen using the same method. The outer casing/well casing annulus was then tremie grouted. The well was completed with a flush mount well cover as for the shallow monitor wells.

Following monitor well installation, each well was properly developed by manually bailing an appropriate amount of water with a dedicated plastic bailer. The elevations of the tops of the PVC well casings were determined by a North Carolina registered Professional Surveyor.

MONITOR WELL SAMPLING AND GAUGING METHODS

A minimum of three well bore volumes of ground water are removed from each monitor well prior to collecting ground water samples. Well purging and sampling are conducted using disposable plastic bailers. Ground water samples are placed in laboratory supplied new glassware and immediately stored in an ice filled cooler following collection. Sample collection, handling, and preservation are conducted in accordance with accepted protocol, including chain-of-custody documentation.

SLUG TESTING

Slug tests were conducted by removing a slug of water from the monitor well and recording the recovery of the water level within the well with a pressure transducer data logger. Slug test data were analyzed using the method of Bouwer, H. and Rice, R.C., 1976.

APPENDIX C

***DRILLING LOGS AND MONITOR WELL
CONSTRUCTION RECORDS***

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: SB-1 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 17' Total Depth Well: NA Top of Casing Elevation: Boring/Casing Diameter: Water Level: Initial/24-hours: NA Screen Interval(s): NA Bentonite Interval(s): NA Grout Interval(s): NA
--	---

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type- Number	Sample Interval (feet)	Description/Soil Classification
0				Former UST field, gravel from 0 to 17 feet.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				TD = 17 feet
18				
19				
20				
21				
22				
23				

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: SB-2 Drilling Company: Southeastern Env. Services Date Drilled: 3-9-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 16' Total Depth Well: NA Top of Casing Elevation: Boring/Casing Diameter: Water Level: Initial/24-hours: NA Screen Interval(s): NA Bentonite Interval(s): NA Grout Interval(s): NA
---	---

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type- Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4				
5	4,3,3,4	SS	4-6	Medium brown silty CLAY. Moist. Recovery = 1.0 ft. PID = 0.6 ppm.
6				
7				
8				
9				
10	1,2,3,5	SS	9-11	Tan and orange silty clay to clayey silt. Saprolitic, moist. Recovery = 1.2 ft. PID = 3.0 ppm.
11				
12				
13				
14				
15	1,2,3,4	SS	14-16	Tan, orange and red clayey silt (30% clay). Saprolite. Moist. Recovery = 1.2 ft. PID = 4.2 ppm.
16				TD = 16 feet.
17				
18				
19				
20				
21				
22				

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998
 Location: Greensboro, NC
 Owner: Exxon Company U.S.A.
 Monitor Well: SB-3
 Drilling Company: Southeastern Env. Services
 Date Drilled: 3-9-94
 Driller: Steve Stratton
 Log By: Andy Nunnally
 MW Permit No.:

Drilling Method: Hollow Stem Auger
 Sampling Methods: SS = Split Spoon
 Total Depth Boring: 16'
 Total Depth Well: NA
 Top of Casing Elevation:
 Boring/Casing Diameter:
 Water Level: Initial/24-hours: NA
 Screen Interval(s): NA
 Bentonite Interval(s): NA
 Grout Interval(s): NA

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type- Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4				
5	3,4,5,6	SS	4-6	Medium brown silty CLAY. Moist, odor. Recovery = 0.4 ft. PID = 110 ppm.
6				
7				
8				
9				
10	2,3,4,7	SS	9-11	Tan and orange silty clay to clayey silt. Saprolitic, moist, odor. Recovery = 1.2 ft. PID = 112 ppm.
11				
12				
13				
14				
15	2,3,5,5	SS	14-16	Tan, orange and red clayey silt (30% clay). Saprolite. Moist, odor. Recovery = 1.5 ft. PID = 120 ppm.
16				TD = 16 feet.
17				
18				
19				
20				
21				
22				

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: SB-4 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 16' Total Depth Well: NA Top of Casing Elevation: Boring/Casing Diameter: Water Level: Initial/24-hours: NA Screen Interval(s): NA Bentonite Interval(s): NA Grout Interval(s): NA
--	---

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type-Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4				
5	1,1,2,5	SS	4-6	Red clay. Moist, odor. Recovery = 1.2 ft. PID = 120 ppm.
6				
7				
8				
9				
10	1,1,2,5	SS	9-11	Tan, orange, red clayey silt (30% clay). Saprolite, moist, odor. Recovery = 1.5 ft. PID = 146 ppm.
11				
12				
13				
14				
15	2,4,5,5	SS	14-16	Tan, orange and red clayey silt (30% clay). Saprolite, moist, strong odor. Recovery = 1.7 ft. PID = 162 ppm.
16				TD = 16 feet.
17				
18				
19				
20				
21				
22				

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: SB-5 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 16' Total Depth Well: NA Top of Casing Elevation: Boring/Casing Diameter: 8" Water Level: Initial/24-hours: NA Screen Interval(s): NA Bentonite Interval(s): NA Grout Interval(s): NA
--	--

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type- Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4				
5	3,5,8,16	SS	4-6	Red clay. Moist, odor. Recovery = 1.3 ft. PID = 46 ppm.
6				
7				
8				
9				
10	1,2,4,4	SS	9-11	Tan, orange, red clayey silt (30% clay). Saprolite, moist, odor. Recovery = 1.5 ft. PID = 76 ppm.
11				
12				
13				
14				
15	2,3,3,5	SS	14-16	Light brown clayey silt (30% clay). Saprolite, moist, odor. Recovery = 1.6 feet. PID = 76 ppm.
16				TD = 16 feet.
17				
18				
19				
20				
21				
22				

ERM-SOUTHEAST ENVIRONMENTAL RESOURCES MANAGEMENT

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: SB-6 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 16' Total Depth Well: NA Top of Casing Elevation: Boring/Casing Diameter: 8" Water Level: Initial/24-hours: NA Screen Interval(s): NA Bentonite Interval(s): NA Grout Interval(s): NA
---	--

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type- Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4				
5	2,3,9,8	SS	4-6	Red clay. Moist, odor. Recovery = 1.8 ft. PID = 106 ppm.
6				
7				
8				
9				
10	2,2,3,5	SS	9-11	Tan, orange, red clayey silt (30% clay). Saprolite, moist, slight odor. Recovery = 1.0 ft. PID = 54 ppm.
11				
12				
13				
14				
15				
16				TD = 16 feet.
17				
18				
19				
20				
21				
22				

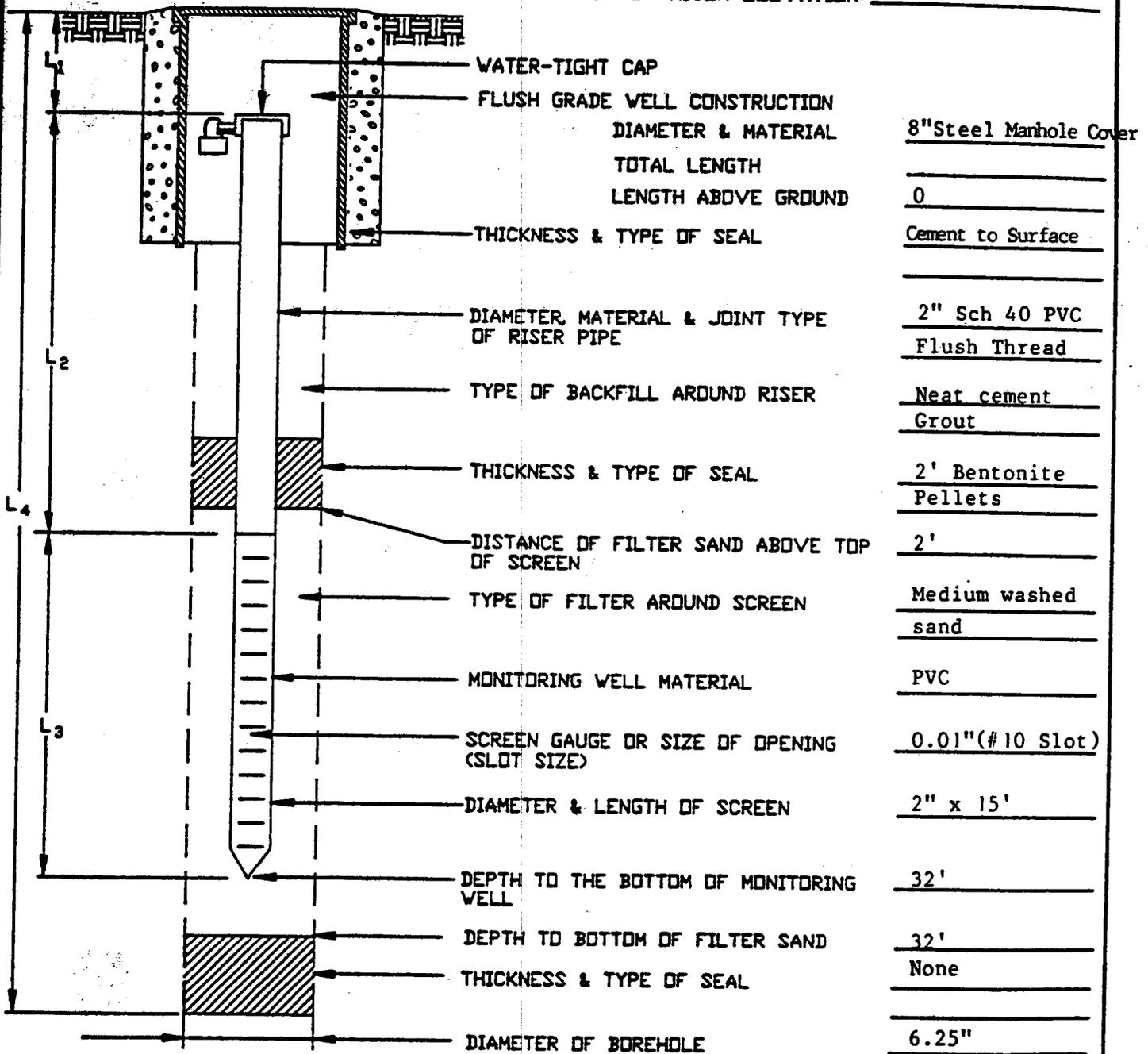
INSTALLATION OF FLUSH GRADE MONITORING WELL

PROJECT: Exxon U.S.A. Greensboro, NC

MONITORING WELL NO. MW-5

JOB NO. 50-92-037.01

TOP OF RISER ELEVATION: _____



8" Steel Manhole Cover

0

Cement to Surface

2" Sch 40 PVC

Flush Thread

Neat cement

Grout

2' Bentonite

Pellets

2'

Medium washed

sand

PVC

0.01" (#10 Slot)

2" x 15'

32'

32'

None

6.25"

L₁ = 0.5 FT
 L₂ = 17 FT
 L₃ = 15 FT
 L₄ = 32 FT

INSTALLATION COMPLETED:
 DATE: 3-29-93
 TIME: _____

MONITORING WELL WATER LEVEL MEASUREMENTS		
DATE	TIME	WATER LEVEL *

(*) DEPTH BELOW TOP OF RISER BOX _____



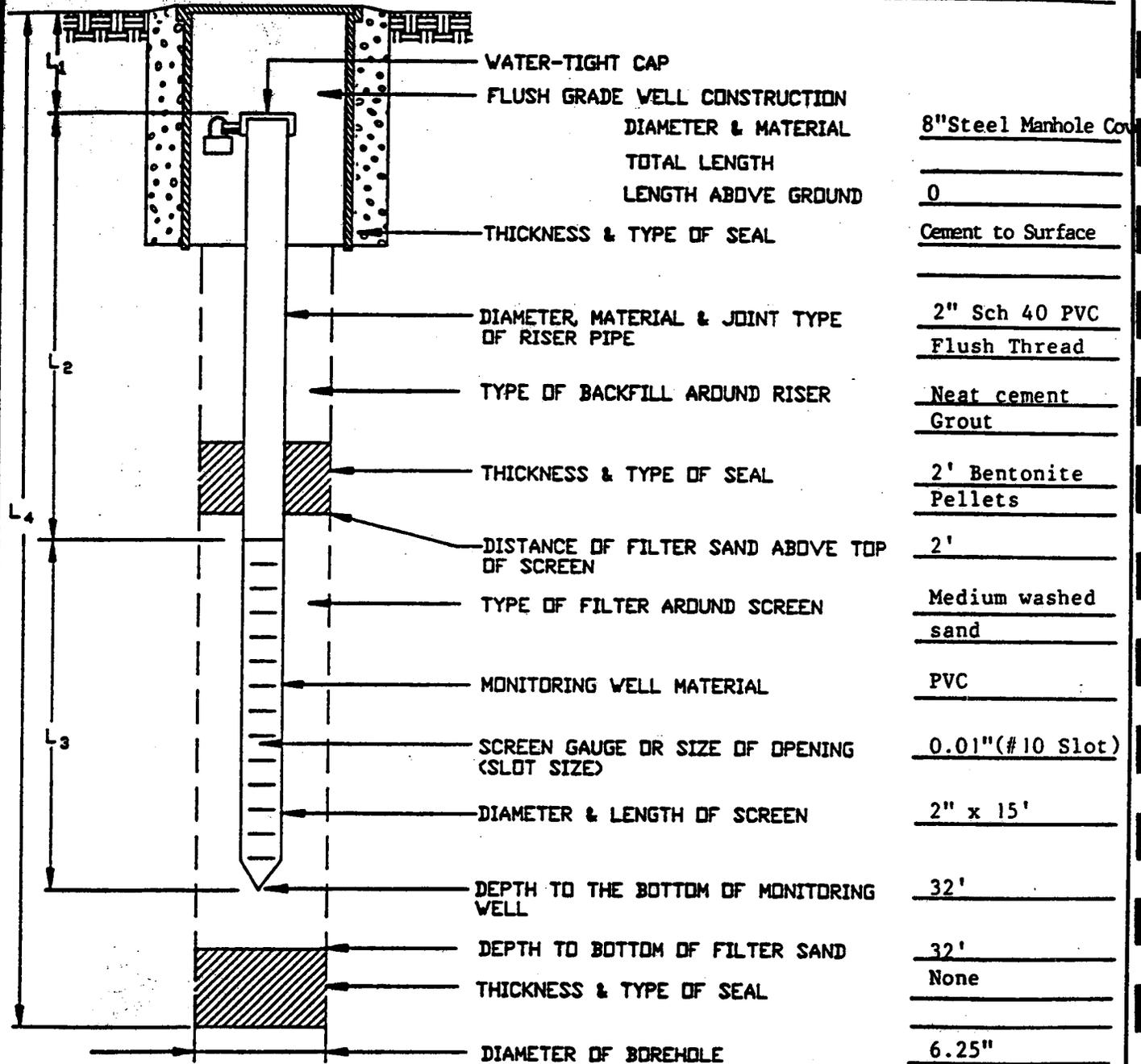
INSTALLATION OF FLUSH GRADE MONITORING WELL

PROJECT: Exxon U.S.A. Greensboro, NC

MONITORING WELL NO. MW-6

JOB NO. 50-92-037.01

TOP OF RISER ELEVATION: _____



L₁ = 0.5 FT
 L₂ = 17 FT
 L₃ = 15 FT
 L₄ = 32 FT

INSTALLATION COMPLETED:
 DATE: 3-29-93
 TIME: _____

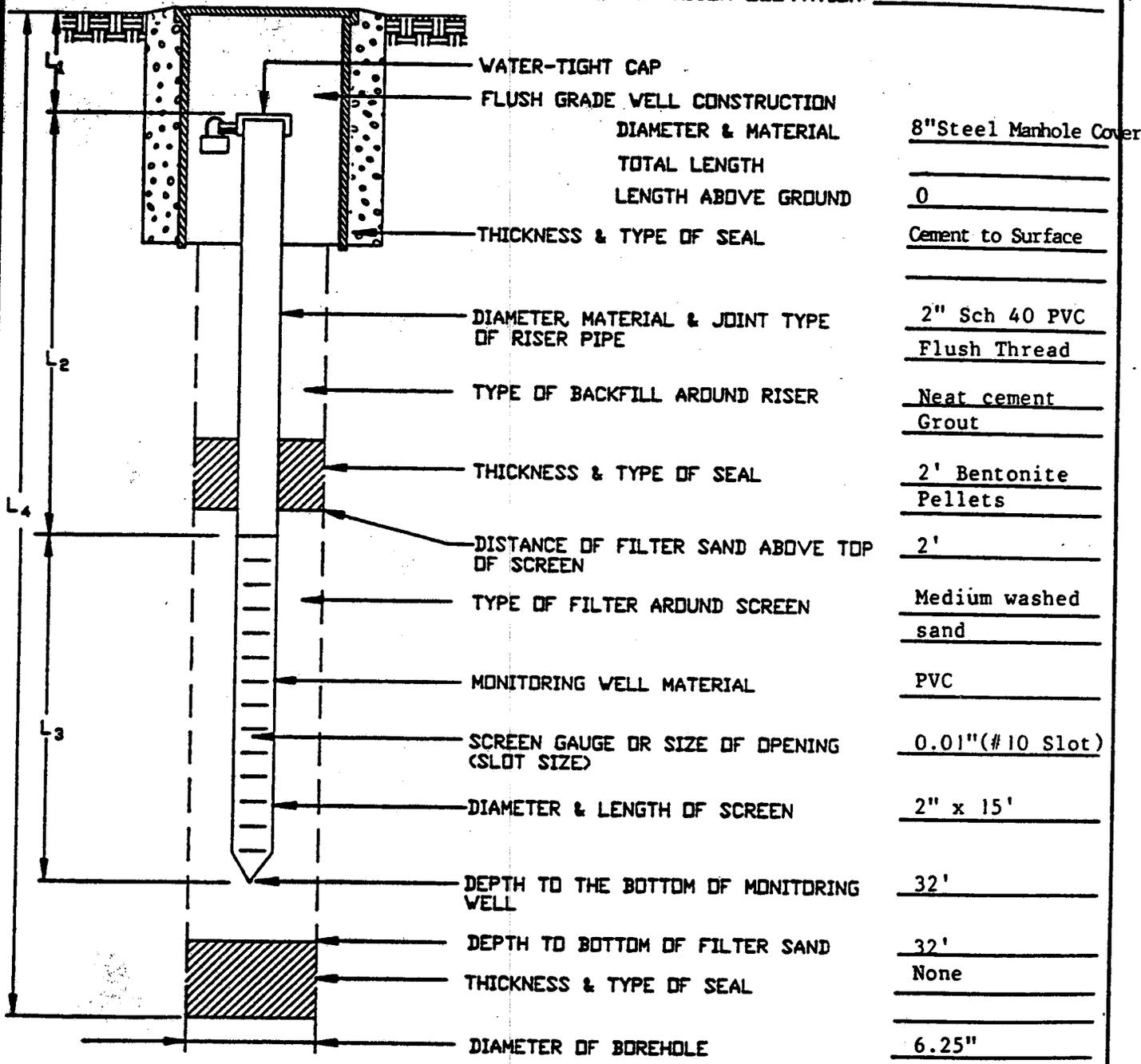
MONITORING WELL WATER LEVEL MEASUREMENTS		
DATE	TIME	WATER LEVEL #

(#) DEPTH BELOW TOP OF RISER BOX _____



INSTALLATION OF FLUSH GRADE MONITORING WELL

PROJECT: Exxon U.S.A. Greensboro, NC MONITORING WELL NO. MW-7
 JOB NO. 50-92-037.01 TOP OF RISER ELEVATION: _____



8" Steel Manhole Cover

 0

 Cement to Surface

 2" Sch 40 PVC
 Flush Thread

 Neat cement
 Grout

 2' Bentonite
 Pellets

 2'

 Medium washed
 sand

 PVC

 0.01" (#10 Slot)

 2" x 15'

 32'

 32'

 None

 6.25"

L₁ = 0.5 FT
 L₂ = 17 FT
 L₃ = 15 FT
 L₄ = 32 FT

INSTALLATION COMPLETED:
 DATE: 3-29-93
 TIME: _____

MONITORING WELL WATER LEVEL MEASUREMENTS		
DATE	TIME	WATER LEVEL #

(#) DEPTH BELOW TOP OF RISER BOX _____



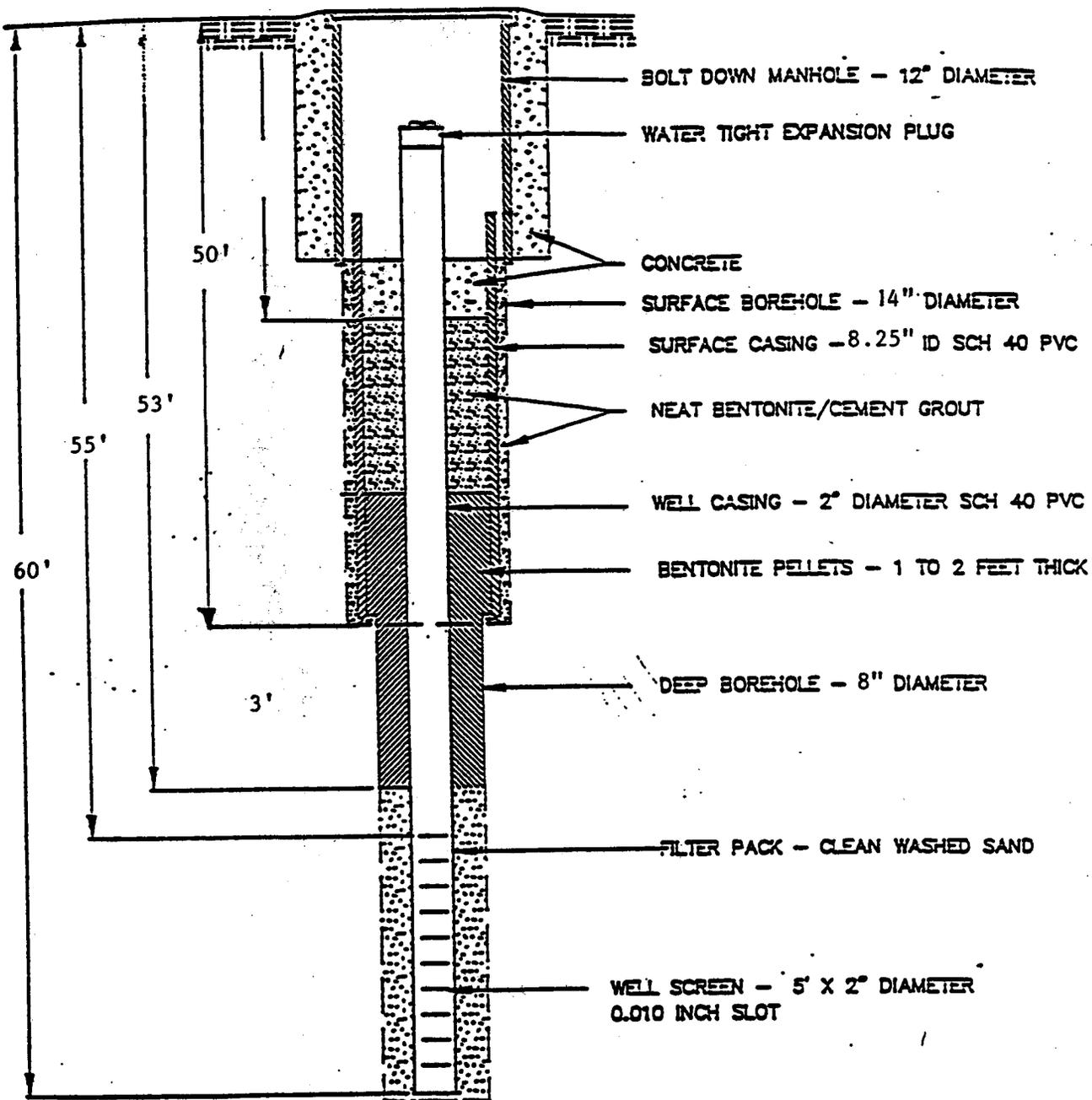


FIGURE
INSTALLED DETAIL MONITORING WELL

DW-8

NOTE: DRAWING NOT TO SCALE

PROJECT NO

DRAWN BY

C.S.G.

DATE

CAD NO.

REVIEW BY

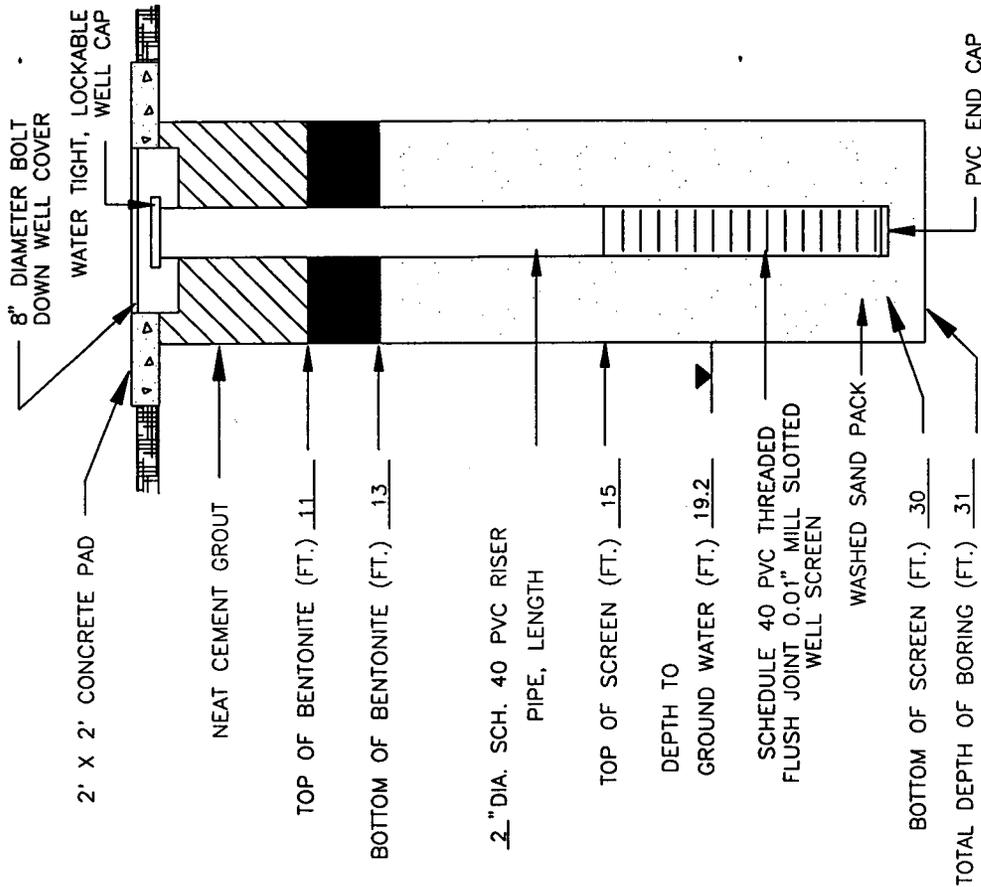
7-15-91

027-IDMW



Delta
Environmental
Consultants, Inc.

MW-9



Sample Interval (feet)	Sample type/number	Blow count per 6-inches	VOC (ppm)	Description
4-6	AS	--	0.98	Soft orange-red silty CLAY.
9-11	S	5-8-8-12	0.89	Soft orange-red silty CLAY saprolite with manganese oxide staining along relict structures.
14-16	S	7-6-8-11	1.52	As above.
19-21	S	4-6-6-14	6.1	Soft tan-red and purple clayey SILT saprolite.
24-26	S	3-4-6-6	18.4	As above.
29-31	S	4-6-10-12	18.9	As above.
31				Total depth = 31 feet BGL

Notes:

ppm = parts per million
 VOC = Volatile organic compound
 S = split spoon sample
 AS = auger sample
 BS = miscellaneous sample
 RC = rock core

DATE 12/6/95 DRILLING METHOD HOLLOW STEM AUGER
 DRILLING CO. GROUNDWATER PROTECTION TOP OF CASING ELEVATION (ft.) 394.06
 DRILLER J. SLACHCIAK LOG BY A. NUNNALLY

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

WELL CONSTRUCTION RECORD AS/EP-1

DRILLING CONTRACTOR Southeastern Environmental Services
DRILLER REGISTRATION NUMBER 1141

STATE WELL CONSTRUCTION PERMIT NUMBER: _____

WELL LOCATION: (Show sketch of the location below)

Nearest Town: Greensboro
4701 W. Market Street
(Road, Community, or Subdivision and Lot No.)

County: Guilford

2. OWNER Exxon Company USA
ADDRESS PO Box 30451
Charlotte NC 28230
City or Town State Zip Code

Depth		DRILLING LOG Formation Description
From	To	
0	8'	red clay - very firm
8'	40'	orange, brown, red to tan clayey silt, saprolite

DATE DRILLED 3-8-94 USE OF WELL Air Spurge Pilot Test

4. TOTAL DEPTH 40' CUTTINGS COLLECTED Yes No

DOES WELL REPLACE EXISTING WELL? Yes No

5. STATIC WATER LEVEL: _____ FT. above TOP OF CASING, below TOP OF CASING IS _____ FT. ABOVE LAND SURFACE.

YIELD (gpm): _____ METHOD OF TEST _____

3. WATER ZONES (depth): _____

CHLORINATION: Type _____ Amount _____

0. CASING:

AS	From	To	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
AS	0	38	Ft.	2"	SCH 40	PVC
EP	0	8	Ft.	2"	SCH 40	PVC

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)

1. GROUT:

From	To	Depth	Material	Method
		0	4	Ft. neat cement pour

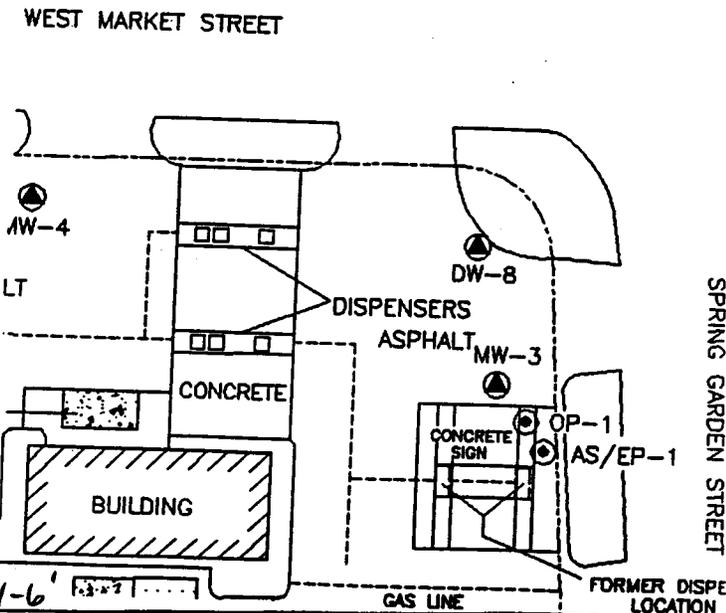
SCREEN:

AS	From	To	Depth	Diameter	Slot Size	Material
AS	38	40	Ft.	2"	in. .010 in.	PVC
EP	8	25	Ft.	2"	in. .010 in.	PVC

GRAVEL PACK:

AS	From	To	Depth	Size	Material
AS	35	40	Ft.		sand
EP	6	25	Ft.		sand

REMARKS: AS - bentonite seal 33-35; AS/EP bentonite seal 4-6'



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

SIGNATURE OF CONTRACTOR OR AGENT

**ERM-SOUTHEAST
ENVIRONMENTAL RESOURCES MANAGEMENT
PAGE 1 OF 2**

Drilling Log

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: AS/EP-1 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 40' Total Depth Well: 40'/25' Top of Casing Elevation: AS 96.38/EP-1 96.31 Boring/Casing Diameter: 8" Water Level: Initial/24-hours: 21.7'/21.43 Screen Interval(s): 38-40/8-25 Bentonite Interval(s): 33-35'/4-6 Grout Interval(s): 0-4
--	---

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type-Number	Sample Interval (feet)	Description/Soil Classification
0				
1				
2				
3				
4	pushed	SS	4-6	Red Clay. No odor or staining. Moist. Rec. = 1.5 ft., PID = 5.0 ppm.
5				
6	8,11,17,18	SS	6-8	Red Clay. No odor or staining. Moist. Rec. = 2.0 ft., PID = 6.0 ppm.
7				
8	1,2,3,3	SS	8-10	Orange-brown to dark red silty clay to clayey SILT. (30% clay). Saprolitic, moist, Recovery = 2.0 ft. PID = 14.6 ppm.
9				
10	1,3,4,4	SS	10-12	Orange-red to tan orange saprolitic clayey SILT (30% clay). Moist, Recovery = 2.0 ft. PID = 14.6 ppm.
11				
12	2,2,2,3	SS	12-14	Tan, orange and red clayey SILT (30% clay). Saprolite, moist. Recovery = 2.0 ft. PID = 22 ppm.
13				
14	2,2,3,4	SS	14-16	Tan, orange and red clayey SILT. (30% clay). Saprolite, slight odor, moist, Recovery = 2.0 ft., PID = 26 ppm.
15				
16	1,1,2,3	SS	16-18	Tan, orange and red clayey SILT (30% clay). Saprolite, slight odor, moist, Recovery = 2.0 ft. PID = 40 ppm.
17				
18	1,1,1,2	SS	18-20	Dark brown clayey silt (30% clay). Saprolite, moderate odor, very moist, Recovery = 2.0 ft. PID = 116 ppm.
19				
20	1,1,1,1	SS	20-22	Red and brown to tan and orange clayey SILT (30% clay). Saprolite, strong odor, wet. Recovery = 20 ft. PID = 132 ppm.
21				
22	1,1,1,1	SS	22-24	Brown and orange clayey silt (30%). Saprolite, wet, odor. Recovery = 2.0 ft. PID = 150 ppm.
23				

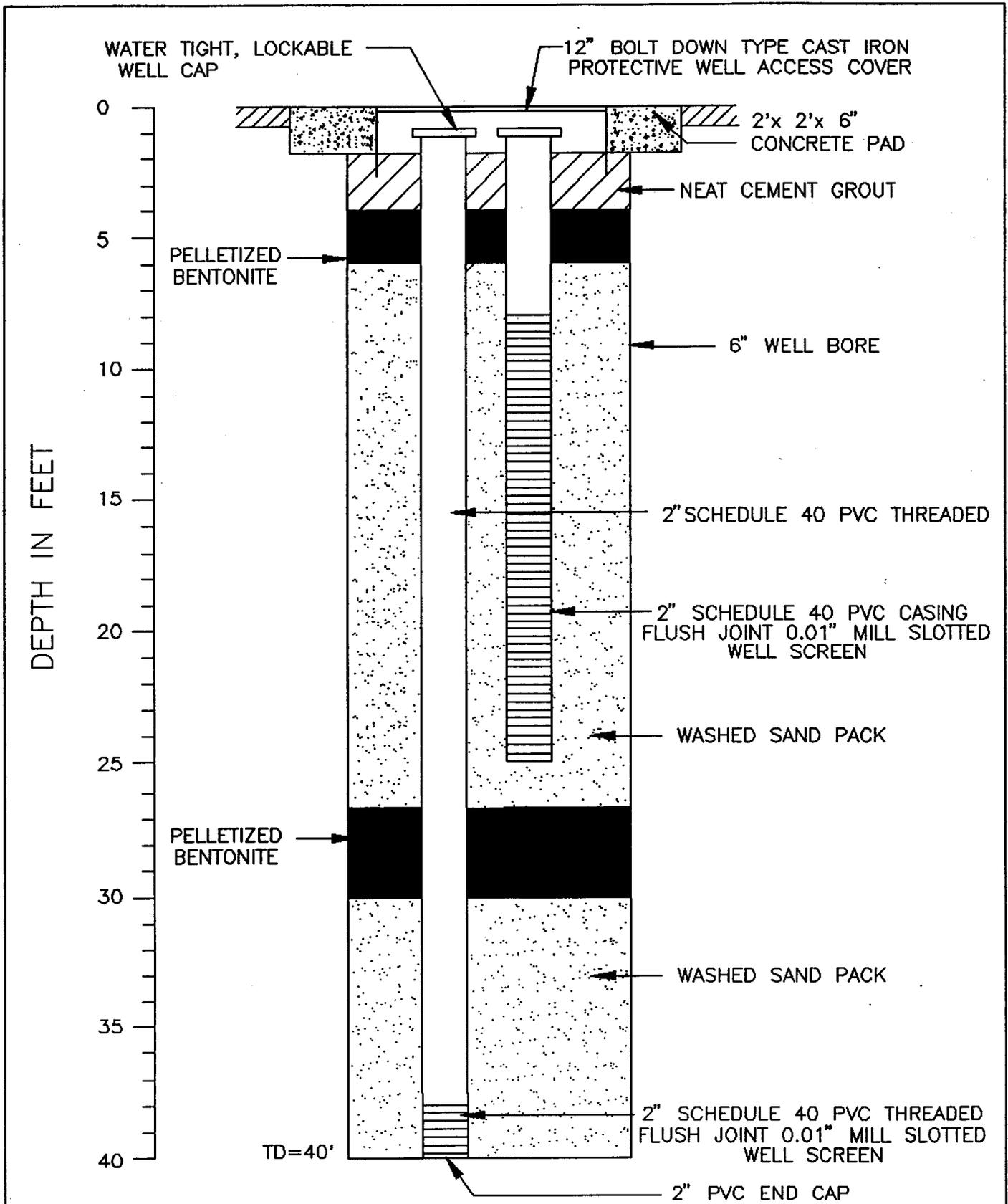
**ERM-SOUTHEAST
ENVIRONMENTAL RESOURCES MANAGEMENT**

Drilling Log

Page 2 of 2

Project: Exxon 4-3998 Location: Greensboro, NC Owner: Exxon Company U.S.A. Monitor Well: AS/EP-1 Drilling Company: Southeastern Env. Services Date Drilled: 3-10-94 Driller: Steve Stratton Log By: Andy Nunnally MW Permit No.:	Drilling Method: Hollow Stem Auger Sampling Methods: SS = Split Spoon Total Depth Boring: 40' Total Depth Well: 40'/25' Top of Casing Elevation: AS 96.38/EP-1 96.31 Boring/Casing Diameter: 8" Water Level: Initial/24-hours: 21.7'/21.43 Screen Interval(s): 38-40/8-25 Bentonite Interval(s): 33-35'/4-6 Grout Interval(s): 0-4
--	---

DEPTH (feet)	Blow Count (per 6 inches)	Sample Type-Number	Sample Interval (feet)	Description/Soil Classification
23	1,1,1,1	SS	22-24	Brown and orange clayey silt (30% clay). Saprolite, wet, odor, Recovery = 2.0 feet. PID = 150 ppm.
24				
25	1,1,1,1	SS	24-26	Brown and orange clayey silt (30% clay). Saprolite, wet, odor, Recovery = 2.0 ft. PID = 140 ppm.
26				
27	1,1,2,3	SS	26-28	Brown clayey silt (30% clay). Saprolite, wet, odor, Recovery = 2.0 ft. PID = 170 ppm.
28				
29	1,2,2,3	SS	28-30	Medium brown clayey silt (30% clay). Saprolite, wet, odor. Recovery = 2.0 ft. PID = 156 ppm.
30				
31	1,2,1,1	SS	30-32	Medium brown clayey silt (30% clay). Saprolite, wet, odor. Recovery = 2.0 ft. PID = 156 ppm.
32				
33	2,2,3,3	SS	32-34	Medium brown clayey silt (30% clay). Saprolite, wet, odor. Recovery = 1.5 ft. PID = 148 ppm.
34				
35	1,1,1,1	SS	34-36	Light brown, purplish red and tan clayey silt (30% clay). Saprolite, wet, odor. Recovery = 1.2 ft. PID = 100 ppm.
36				
37	4,4,7,9	SS	36-38	Red, tan and white clayey silt (30% clay). Saprolite, wet, odor. Recovery = 1.2 ft. PID = 50 ppm.
38				
39	2,3,4,7	SS	38-40	Red, brown and tan clayey silt (30% clay). Saprolite, wet, slight odor. Recovery = 2.0 ft. PID = 20 ppm.
40				
41				
42				
43				
44				
45				
46				



AS/EP-1 CONSTRUCTION DIAGRAM
 EXXON COMPANY, U.S.A.
 RETAIL LOCATION 4-3998
 GREENSBORO, NORTH CAROLINA



ERM-SOUTHEAST, INC

4106DWEL.DWG

FOR OFFICE USE ONLY

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

WELL CONSTRUCTION RECORD OP-1

DRIILLING CONTRACTOR Southeastern Environmental Services

DRILLER REGISTRATION NUMBER 1141

STATE WELL CONSTRUCTION PERMIT NUMBER: _____

WELL LOCATION: (Show sketch of the location below)

Nearest Town: Greensboro

County: Guilford

4701 West Market Street
 (Road, Community, or Subdivision and Lot No.)

OWNER Gxxon Company USA

ADDRESS PO BOX 30451
 (Street or Route No.)
Charlotte NC 28230
 City or Town State Zip Code

DATE DRILLED 3-9-94 USE OF WELL Observation

TOTAL DEPTH 25' CUTTINGS COLLECTED Yes No

DOES WELL REPLACE EXISTING WELL? Yes No

STATIC WATER LEVEL: 22 FT. above TOP OF CASING,
 below
 TOP OF CASING IS -0.5 FT. ABOVE LAND SURFACE.

YIELD (gpm): _____ METHOD OF TEST _____

WATER ZONES (depth): _____

CHLORINATION: Type _____ Amount _____

CASING:

From	Depth	To	Diameter	Wall Thickness or Weight/Ft.	Material
<u>0</u>	<u>8</u>	<u>8</u>	<u>2"</u>	<u>SCH 40</u>	<u>PVC</u>
From _____	To _____	Ft. _____	_____	_____	_____
From _____	To _____	Ft. _____	_____	_____	_____

GROUT:

From	Depth	To	Material	Method
<u>0</u>	<u>4</u>	<u>4</u>	<u>neat cement</u>	<u>pour</u>
From _____	To _____	Ft. _____	_____	_____

SCREEN:

From	Depth	To	Diameter	Slot Size	Material
<u>8</u>	<u>25</u>	<u>25</u>	<u>2"</u>	<u>in. 010 in.</u>	<u>PVC</u>
From _____	To _____	Ft. _____	_____	_____	_____
From _____	To _____	Ft. _____	_____	_____	_____

GRAVEL PACK:

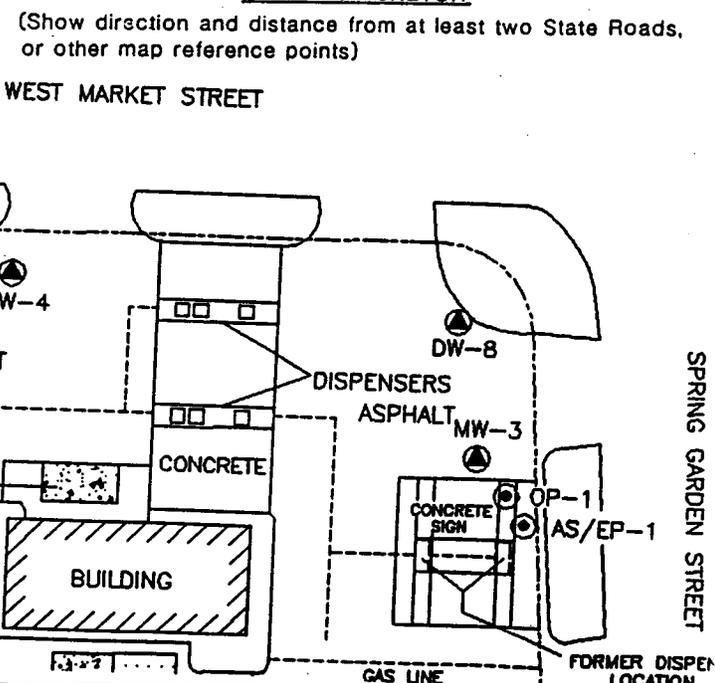
From	Depth	To	Size	Material
<u>6</u>	<u>25</u>	<u>25</u>	<u>_____</u>	<u>sand</u>
From _____	To _____	Ft. _____	_____	_____

REMARKS: Bentonite seal 4-6'

Depth		DRILLING LOG Formation Description
From	To	
<u>0</u>	<u>6'</u>	<u>Red clay - stiff</u>
<u>6</u>	<u>25'</u>	<u>Orange, brown, tan and red clayey silt saprolite</u>

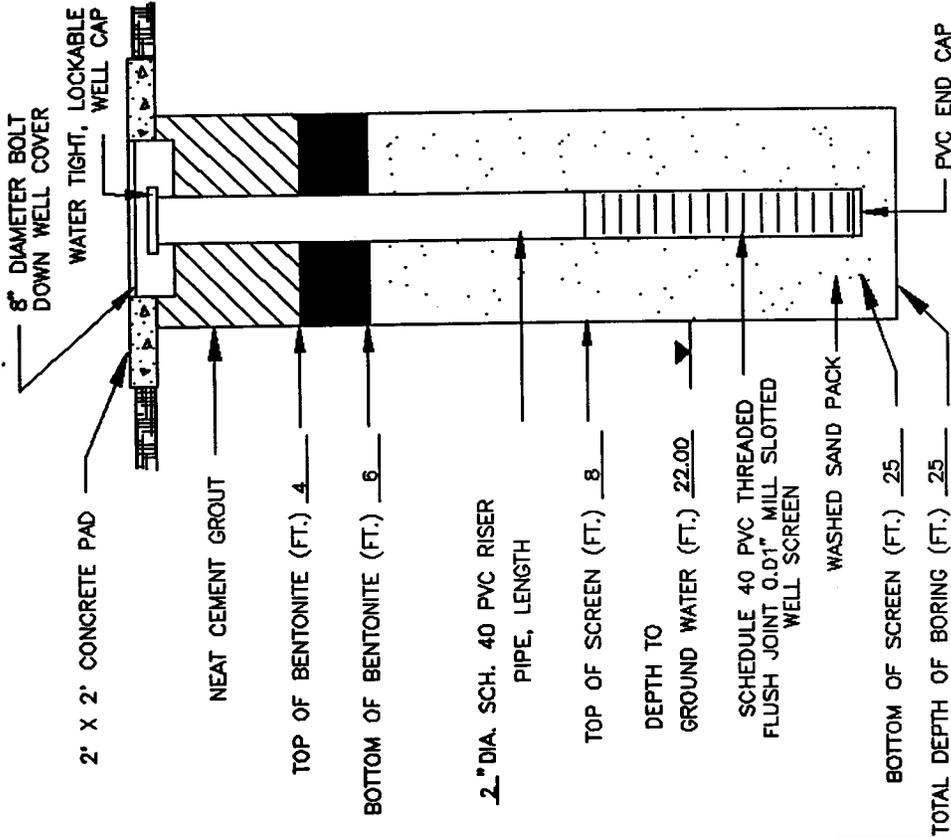
If additional space is needed use back of form.

LOCATION SKETCH



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

SIGNATURE OF CONTRACTOR OR LOGGERS



Sample Interval (ft.)	Sample Type/ Number	Blow Count per 6 inches	VOC (ppm)	Description
4-6	S	pushed	7.4	Red Clay. Stiff. Recovery 1.7 ft.
9-11	S	2,3,3,4	20	Orange, red and tan clayey Silt (30% clay). Saprolite, moist, slight odor. Recovery = 1.6 ft.
14-16	S	2,2,2,3	58	Medium brown, tan and orange clayey Silt (30% clay). Saprolite, moist, odor. Recovery = 1.8 ft.
19-21	S	3,2,2,3	148	Orange, brown and red clayey Silt, Saprolite very moist, strong odor. Recovery = 1.8 ft.
24-26	S	1,3,3,5	162	Red-tan and orange-brown clayey Silt (30% clay). Saprolite, wet, strong odor,

Notes:

- ppm = Parts per million
- VOC = Volatile organic compound
- S = Split spoon sample

- AS = Auger sample
- BS = Miscellaneous sample
- RC = Rock core

DATE 03/09/94

DRILLING METHOD HOLLOW STEM AUGER

DRILLING CO. SOUTHEASTERN ENVIRONMENTAL SERVICE TOP OF CASING ELEVATION (ft.) 96.79

DRILLER STEVE STRATTON

LOG BY ANDY NUNNALLY

410604.DWG
07/05/94/SBB/AN

OP-1



ERM-SOUTHEAST, INC
CHARLOTTE, NC
TYPELOC.DWG

EXXON COMPANY, U.S.A.
RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

DRILLING LOG AND MONITOR WELL
CONSTRUCTION DIAGRAM

BOREHOLE DIA. (IN.) 8

BOTTOM OF SCREEN (FT.) 25

TOTAL DEPTH OF BORING (FT.) 25

DEPTH TO GROUND WATER (FT.) 22.00

TOP OF SCREEN (FT.) 8

2" DIA. SCH. 40 PVC RISER PIPE, LENGTH

BOTTOM OF BENTONITE (FT.) 6

TOP OF BENTONITE (FT.) 4

NEAT CEMENT GROUT

8" DIAMETER BOLT DOWN WELL COVER

WATER TIGHT, LOCKABLE WELL CAP

PVC END CAP

WASHED SAND PACK

SCHEDULE 40 PVC THREADED FLUSH JOINT 0.01" MILL SLOTTED WELL SCREEN

Pyramid Environmental, Inc.

Boring Log

Project: Johns Plumbing

Date Started: 11/18/92

Elevation: 900'

Driller: Pyramid Environmental

Boring Number: 1 (MW-Moore)

Location: North of main building

GW Depth: 26'

Date Completed: 11/20/92

Sampling Method: Grab

Drilling Method: hand auger

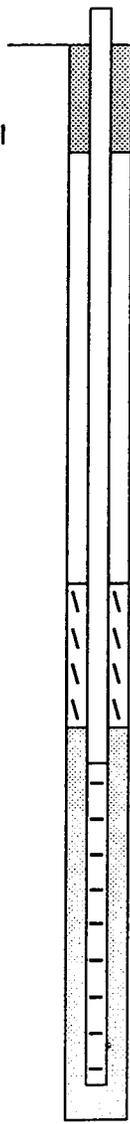
Sample ID	Depth (Feet)	Blows per 6"	Recover %	USCS Class	Material Description	Collection Time Date	Comments
	1-3'			CL	dark brown, black silty clay	11/18/92 2:00	
	4-20'			CL	reddish brown silty clay	11/18/92 2:15-4:00	
	20-27'			CL	reddish brown silty clay	11/20/92 2:30-3:00	
					TOTAL DEPTH 27'		

Source: Groundwater Investigation - Kitchen and Bath Menagerie, 11/27/92,
Pyramid Environmental, Inc., Greensbor, NC.

PYRAMID ENVIRONMENTAL, INC.
Environmental Consultants

MONITORING WELL CONSTRUCTION DIAGRAM

Location Johns Plumbing Date 20 November 1992
 Source/Well MW 1 (MW-MOORE) Installer Pyramid Environmental

Type of Surface Seal		Cuttings
Thickness of Surface Seal		13.5'
Type of Riser		PVC
Diameter of Riser		2"
Length of Riser		21'
Type of Backfill		Cuttings
Type of Seal		Bentonite
Thickness of Seal		5.5'
Type of Filter Sand		Natural/sorted sand pack
Thickness of Sand Fill		8'
Length of Screen		5'
Size of Screen Openings		0.010"
Total Depth of Well		27.42'
Diameter of Borehole	<->	4.5"

Source: Groundwater Investigation - Kitchen and Bath Menagerie, 11/27/92,
Pyramid Environmental, Inc.

APPENDIX D

***SOIL LABORATORY DATA REPORTS AND
CHAIN-OF-CUSTODY FORMS***



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

RECEIVED
MAR 31 1994

SUMMARY REPORT

CLIENT : ERM-Southeast
PROJECT : 4106 Exxon SS# 4-3998

JOB NUMBER : D94-2749
REPORT DATE : 21-MAR-1994

SAMPLE NO.	ID MARKS	MATRIX	DATE SAMPLED
1	HAS-1(6') Greensboro, NC	Soil	9-MAR-1994
2	SB-2(14-16) Greensboro, NC	Soil	9-MAR-1994
3	SB-3(14-16) Greensboro, NC	Soil	9-MAR-1994
4	SB-4(14-16) Greensboro, NC	Soil	10-MAR-1994

TPH BY GC (VOLATILE), EPA 5030/8015M	1	2	3	4
Total Petroleum Hydrocarbon $\mu\text{g/Kg}$	140	95	5000	1700

MISCELLANEOUS ANALYSES	1	2	3	4
Total Solids %	74.5	64.4	70.6	65.3

Martin Jeffus jm



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

SUMMARY REPORT

CLIENT : ERM-Southeast
PROJECT : 4106 Exxon SS# 4-3998

JOB NUMBER : D94-2749
REPORT DATE : 21-MAR-1994

SAMPLE NO.	ID MARKS	MATRIX	DATE SAMPLED
5	SB-5(14-16) Greensboro, NC	Soil	10-MAR-1994
6	SB-6(14-16) Greensboro, NC	Soil	10-MAR-1994
7	HAS-2(6') Greensboro, NC	Soil	10-MAR-1994
8	SB-6(4-6) Greensboro, NC	Soil	10-MAR-1994

TPH BY GC (VOLATILE), EPA 5030/8015M	5	6	7	8
Total Petroleum Hydrocarbon $\mu\text{g/Kg}$	4100	390	120	18000

MISCELLANEOUS ANALYSES	5	6	7	8
Total Solids %	67.8	64.9	75.6	72.6

Martin Jeffus jm



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-1
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : HAS-1(6')
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 17-MAR-1994
DILUTION FACTOR : 1
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	50 $\mu\text{g/Kg}$	140 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	94.0 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-1

REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : HAS-1(6')
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	74.5 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-2
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-2(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 17-MAR-1994
DILUTION FACTOR : 1
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	50 $\mu\text{g/Kg}$	95 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	89.0 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-2
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-2(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	64.4 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-3
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-3 (14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 18-MAR-1994
DILUTION FACTOR : 1
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	50 $\mu\text{g/Kg}$	5000 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	81.0 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-3

REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-3(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 9-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	70.6 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-4
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-4(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 18-MAR-1994
DILUTION FACTOR : 5
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	250 $\mu\text{g/Kg}$	1700 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	102 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-4

REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-4(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	65.3 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-5
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-5(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 18-MAR-1994
DILUTION FACTOR : 5
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	250 $\mu\text{g/Kg}$	4100 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	101 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

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Richardson, TX 75081
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Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-5
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-5(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	67.8 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-6

REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-6(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 17-MAR-1994
DILUTION FACTOR : 1
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	50 $\mu\text{g/Kg}$	390 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	77.0 %

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-6
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-6(14-16)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	64.9 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-7
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
 : Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : HAS-2 (6')
 : Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 17-MAR-1994
DILUTION FACTOR : 1
METHOD FACTOR : 1
QC BATCH NO : 26-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	50 $\mu\text{g/Kg}$	120 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	89.0 %

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-7
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : HAS-2(6')
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	75.6 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-8
REPORT DATE : 21-MAR-1994

SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-6(4-6)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994
ANALYSIS METHOD : EPA 5030/8015M /1
ANALYZED BY : MKS
ANALYZED ON : 18-MAR-1994
DILUTION FACTOR : 50
METHOD FACTOR : 1
QC BATCH NO : 28-031794A

TPH BY GC (VOLATILE)		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Petroleum Hydrocarbon	2500 $\mu\text{g/Kg}$	18000 $\mu\text{g/Kg}$

QUALITY CONTROL DATA		
SURROGATE COMPOUND	SPIKE LEVEL	SPIKE RECOVERED
Fluorobenzene	50.0 $\mu\text{g/Kg}$	96.0 %

Martin Jeffus jm
Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED : 11-MAR-1994

REPORT NUMBER : D94-2749-8
REPORT DATE : 21-MAR-1994

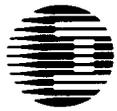
SAMPLE SUBMITTED BY : ERM-Southeast
ADDRESS : 7300 Carmel Executive Park #200
: Charlotte, NC 28226
ATTENTION : Mr. Jerry Prosser

SAMPLE MATRIX : Soil
ID MARKS : SB-6(4-6)
: Greensboro, NC
PROJECT : 4106 Exxon SS# 4-3998
DATE SAMPLED : 10-MAR-1994

MISCELLANEOUS ANALYSES		
TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids /1	0.01 %	72.6 %
Analyzed using EPA 160.3 on 18-MAR-1994 by JAM QC Batch No : 01135H		

Martin Jeffus jm

Martin Jeffus
General Manager



Inchcape Testing Services

NDRC Laboratories

1089 E. Collins Blvd.
Richardson, TX 75081
Tel. 214-238-5591
Fax. 214-238-5592

DATE RECEIVED: 11-MAR-1994

REPORT NUMBER: D94-2749

REPORT DATE: 21-MAR-1994

SUBMITTED BY: ERM-Southeast

LABORATORY QUALITY CONTROL REPORT

ANALYTE	Total Solids	TPH	TPH
BATCH No.	01135H	28-031794A	26-031794A
LCS LOT No.	----	091493A	091493A
PREP METHOD	----	EPA 5030	EPA 5030
PREP DATE	----	3/17/94	3/17/94
PREP CHEMIST	----	JH	JH
ANALYSIS METHOD	EPA 160.3	EPA 8015	EPA 8015
ANALYSIS DATE	3/18/94	3/17/94	3/17/94
ANALYST	JAM	MKS	MKS
METHOD BLANK	----	< 50.0 µg/Kg	< 50.0 µg/Kg
MS % RECOVERY	----	109	111
MSD % RECOVERY	----	104	106
LCS % RECOVERY	----	89.9	72.9
DUPLICATE RPD	0.13	----	----
MS/MSD RPD	----	4.69	4.63
SPIKE LEVEL	----	500 µg/Kg	500 µg/Kg
SPIKED SAMPLE ID No.	----	D94-2309-4	D94-2841-2
DUPLICATE SAMPLE ID No.	D94-2947-1	----	----

----: Not Applicable
NC: Not Calculable

MS: Matrix Spike
MSD: Matrix Spike Duplicate

LCS: Laboratory Control Sample
RPD: Relative Percent Difference

COMMENTS:

CHAIN OF CUSTODY RECORD

EXXON Company, USA
Regional Laboratory Program

Inchcape Testing Services

NDRC Laboratories

1089 East Collins Blvd, Richardson, Texas 75081 (214) 238-5591 (Voice), (214) 238-5592 (Fax)
Attn: Belinda Feuerbacher, Project Director

Consultant's Name: ERM-Southeast

Page 1 of 1

Address: Suite 200 7300 Carnel Executive Rte, Charlotte NC 28226

Project: Exxon - Market Street Consultant Proj #: 4106 Consultant Work Release #: 19430319

Project Contact: Tony Prusser Phone: 701-541-8344 Fax: 541-8416 Laboratory Work Release #: 19408629

Alternate Contact: Andy Nunnally Phone: 11 Fax: 11 Site Location: Greensboro NC

EXXON Contact: Frank Melvin (EE C&M (circle one)) Phone: 529-4263 Fax: 5294209 EXXON RAS #: 4-3598

Sampled by (print): Andy Nunnally Sampler's Signature: [Signature]

Shipment Method: Burlington Air Air Bill # 974 815 984

Shipment Date: 3-10-94

ANALYSIS REQUIRED Number of Containers: 24 DUE 3/18/94 WIC 1-250

Sample Condition as Received Temperature: 51A Cooler #: N/A Inbound Sealed: Yes Outbound Sealed: No

SAMPLE ID	DATE	TIME	MATRIX WATER/ SOIL	PRSV	SAMPLE LOCATION/ DESCRIPTION	ANALYSIS REQUIRED Number of Containers	DUE	WIC	Temperature as Received	COOLERS	INBOUND SEALED	OUTBOUND SEALED	COMMENTS
HAS-1(6)	3-9-94	1200	soil			24	250m						
SB-2(4-16)		1500				1							
SB-3(4-16)		1630				1							
SB-4(4-16)	3-16-94	1000				2							
SB-5(4-16)		1100				1							
SB-6(4-16)		1200				1							
HAS-2(6)		930				3							
SB-6(4-6)		1150				1							

LEVEL 100 SCREENED FOR RADIOACTIVITY

ORIGINAL

Turn around time 24 hr 48 hr 72 hr Standard Other _____ Total # of Containers: 11

(1) Relinquished by Signature: [Signature] Date: 3-10-94 Company: ERM Southeast

(2) Relinquished by Signature: _____ Date: _____ Company: _____

(1) Received by Signature: _____ Date: 3-10-94 Company: Burlington Air

(2) Received by Signature: [Signature] Date: 3-11-94 Company: ITS

(3) Received by Signature: _____ Date: _____ Company: _____

Distribut... White - Original Yellow - Exxon Pink - NDRC Laboratories Identrod - Consultant

3/23



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

RECEIVED
SEP 11 1995
BY: _____

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050332

Sample ID: SB-7 13-15

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Method
5030, Low Hydrocarbons	17.6	mg/kg	4.0	2	9/ 2/95	12:00	W. Klepper	8015
% Dry Weight	63.0	%			9/ 2/95	14:14	C. Bardwell	CLP

** QUALITY CONTROL DATA **

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
GRO Surrogate, soil	99.	50 - 150

Michael H. Dunne
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050333

Sample ID: SB-8 13-15

Date Collected: 8/31/95

Project: 1943019

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Method
5030, Low Hydrocarbons % Dry Weight	< 5.00 62.7	mg/kg %	4.0	1	9/ 2/95	12:00	W. Klepper	8015
					9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
GRO Surrogate, soil	98.	50 - 150

Michael H. Damm
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050334

Sample ID: SB-9 13-15

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Method
5030, Low Hydrocarbons % Dry Weight	< 5.00 63.7	mg/kg %	4.0	1	9/ 2/95	12:00	W. Klepper	8015
					9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
GRO Surrogate, soil	96.	50 - 150

Michael H. Dunbar
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050335

Sample ID: SB-10 14-16

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Meth
5030, Low Hydrocarbons % Dry Weight	< 5.00 62.3	mg/kg %	4.0	1	9/ 2/95	12:00	W. Klepper	B015
					9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
GRQ Surrogate, soil	95.	50 - 150

Michael H. Dorman
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab. Number: 95-A050336

Sample ID: SB-11 14-16

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Method
5030, Low Hydrocarbons % Dry Weight	< 5.00 62.7	mg/kg %	4.0	1	9/ 2/95	12:00	W. Klepper	8015
					9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
GRQ Surrogate, soil	101.	50 - 150

Michael A. Danner
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050337

Sample ID: SB-12 14-16

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Meth
5030, Low Hydrocarbons	42.6	mg/kg	4.0	1	9/ 2/95	12:00	W. Klepper	8015
% Dry Weight	75.4	%			9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
GRQ Surrogate, soil	118.	50 - 150

Metal H. Drenner
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050338

Sample ID: SB-13 14-16

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Method
5030, Low Hydrocarbons % Dry Weight	< 5.00 72.0	mg/kg %	4.0	1	9/ 2/95	12:00	W. Klepper	8015
					9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
GRQ Surrogate, soil	98.	50 - 150

Michael A. P... ..
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A050339

Sample ID: SB-14 14-16

Date Collected: 8/31/95

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/ 1/95

Sampler: JAY LANZY

Time Received: 9:00

State Certification: 387

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Quan Limit	Dil Factor	Date	Time	Analyst	Meth
5030, Low Hydrocarbons	< 5.00	mg/kg	4.0	1	9/ 2/95	12:00	W. Klepper	8015
% Dry Weight	67.9	%			9/ 2/95	14:14	C. Bardwell	CLP

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
GRO Surrogate, soil	100.	50 - 150

Michael H. Dunbar
Laboratory Supervisor



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery
Underground Storage Tank Parameters					
5030, Low Hydrocarbons	mg/kg	< 5.00	21.1	25.0	84.40
5030, Low Hydrocarbons	mg/kg	< 5.00	20.8	25.0	83.20

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD
Underground Storage Tank Parameters				
5030, Low Hydrocarbons	mg/kg	21.1	20.8	1.43

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery
---------	-------	------------	--------------	------------

Blank Data

Analyte	Blank Value	Units
Underground Storage Tank Parameters		
5030, Low Hydrocarbons	< 5.00	mg/kg



SPECIALIZED ASSAYS ENVIRONMENTAL
 300 12th Ave South
 Nashville, Tennessee 37203
 Phone: 704-541-0319
 Fax: 704-541-8416

EXXON COMPANY USA

**CHAIN-OF-CUSTODY RECORD
 AND ANALYSIS REQUESTED**

LWR #:

Name: **31/59**
 Phone: 5919
 Client Project #
 Name: **JAY C. LANZKY**
 Exxon Env. Work Release: **19430319**

Exxon Contact: **FRANK McDLIN** (circle one) **EE** or C&M Phone: **519-711-3**
 RAS #: **4-3998** Site Address: **Greensboro NC** State ID #:

Cooler Seal Consultant Receipt Laboratory Receipt
 Seal Intact yes no Initial yes no Initial

Air Bill # **5609352503** # of coolers **1** Sample Temperature **12** [*C] upon receipt
 Sampled by [please print] **JAY C. LANZKY** Sample Signature: *J. Lanzky*
 Ship Date: **8-31-95** **JAY C. LANZKY**

TAT REQUESTED 24hr 48hr 72hr other Exxon Std TAT day

FIELD SAMPLE ID	SAE LAB # [for lab use only]	# CONT	Matrix				Method Preserved			DATE	TIME			
			WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	HCL			HNO3	H2SO4	ICE
SB-7 13-15	50332	1	X										8-31	
SB-8 13-15	50333	1	X										8-31	
SB-9 13-15	50334	1	X										8-31	
SB-10 14-16	50335	1	X										8-31	
SB-11 14-16	50336	1	X										8-31	
SB-12 14-16	50337	1	X										8-31	
SB-13 14-16	50338	1	X										8-31	
SB-14 14-16	50339	1	X										8-31	

SPECIAL DETECTION LIMITS:
 REPORTING LIMITS:

Relinquished by Sampler: *J. Lanzky*
 Company / Affiliation: **ERM-SOUTH EAST**
 Relinquished by: _____
 Date: **8-31-95** Time: **3:50**

ANALYSIS REQUEST

<input type="checkbox"/> BTEX 602 <input type="checkbox"/> 8020	<input type="checkbox"/> MTBE <input type="checkbox"/> 504	<input type="checkbox"/> EDB <input type="checkbox"/> 504	<input type="checkbox"/> PETROLEUM HYDROCARBONS, GC, 8015 GAS <input checked="" type="checkbox"/> DIESEL <input type="checkbox"/> 413.2	<input type="checkbox"/> TRPH/OIL AND GREASE 418.1 <input type="checkbox"/> 9070 <input type="checkbox"/> 9071 <input type="checkbox"/> 413.1 <input type="checkbox"/> 413.2	<input type="checkbox"/> PURGEABLE HALOCARBONS 601 <input type="checkbox"/> 8010 <input type="checkbox"/> 8021	<input type="checkbox"/> PURGEABLE AROMATICS 602 <input type="checkbox"/> 8020 <input type="checkbox"/> 8021	<input type="checkbox"/> PCB'S	<input type="checkbox"/> VOLATILE ORGANICS 624 <input type="checkbox"/> 8240 TCL <input type="checkbox"/> 8260	<input type="checkbox"/> EXTRACTABLE ORGANICS 625 <input type="checkbox"/> 8270 TCL <input type="checkbox"/> 8270	<input type="checkbox"/> PAH'S 610 <input type="checkbox"/> 8310 <input type="checkbox"/> 8100 <input type="checkbox"/> 8270	<input type="checkbox"/> TCLP METALS <input type="checkbox"/> VOA'S <input type="checkbox"/> BNA'S <input type="checkbox"/> P/H <input type="checkbox"/> TOTAL	<input type="checkbox"/> METALS RCRA <input type="checkbox"/> PP <input type="checkbox"/> TAL	<input type="checkbox"/> LEAD 238.2 <input type="checkbox"/> 200.7 <input type="checkbox"/> 6010 <input type="checkbox"/> 7421	<input type="checkbox"/> CORROSIIVITY <input type="checkbox"/> REACTIVITY	<input type="checkbox"/> FP OPEN CUP <input type="checkbox"/> CLOSED CUP
---	--	---	---	--	--	--	--------------------------------	--	---	--	--	---	--	---	--

CLIENT REMARKS:

STORAGE LOCATION:
 Received by: *Ad W J*
 Date: **9/1/95** Time: **0900**

APPENDIX E

***GROUND WATER LABORATORY DATA REPORTS
AND CHAIN-OF-CUSTODY FORMS***



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

RECEIVED
OCT 10 1995
BY: _____

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053701

Sample ID: MW-3

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:00

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	15000	ug/l	1000	1.0	1000	9/21/95	21:00	E.SMITH	602
Toluene	73000	ug/l	1000	1.0	1000	9/21/95	21:00	E.SMITH	602
Ethylbenzene	6000	ug/l	1000	1.0	1000	9/21/95	21:00	E.SMITH	602
Xylenes, total	31000	ug/l	1000	1.0	1000	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	5000	10.0	500.	9/21/95	21:00	E.SMITH	602
Isopropyl ether	ND	ug/l	5000	10.0	500.	9/21/95	21:00	E.SMITH	602
Lead	0.372	ug/l	0.003	0.003	1.0	9/21/95	13:34	R.Street	3030c

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

* Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	102.	65 - 129

Report Approved By: _____

Michael H. Dumas

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053702

Sample ID: DW-1

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:25

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Isopropyl ether	ND	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	97.	65 - 129

Report Approved By:

Michael A. Dunbar

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053703

Sample ID: MW-1

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:30

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	4000	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Toluene	24000	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Ethylbenzene	3000	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Xylenes, total	19500	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	5000	10.0	500.	9/21/95	21:00	E.SMITH	602
Isopropyl ether	ND	ug/l	5000	10.0	500.	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/BRO Surrogate	97.	65 - 129

Report Approved By: Michael A. Omer

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053704

Sample ID: MW-4

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:40

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	4.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	29.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Isopropyl ether	33.0	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/BRO Surrogate	97.	65 - 129

Report Approved By:

Michael A. Dumas

Report Date: 10/ 4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053705

Sample ID: MW-2

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:45

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Duan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	4500	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Toluene	25000	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Ethylbenzene	4000	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Xylenes, total	22500	ug/l	500.	1.0	500.	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	1000	10.0	100.	9/21/95	21:00	E.SMITH	602
Isopropyl ether	1600	ug/l	1000	10.0	100.	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/BRD Surrogate	97.	65 - 129

Report Approved By:

Michael H. Damm

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053706

Sample ID: MW-6

Date Collected: 9/18/95

Project: 19430319

Time Collected: 16:15

Project Name: EXXON 4-399B

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-399B

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Isopropyl ether	14.0	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	97.	65 - 129

Report Approved By:

Michael H. Drenn

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053707

Sample ID: MW-5

Date Collected: 9/18/95

Project: 19430319

Time Collected: 16:05

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	1.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	1.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	ND	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Isopropyl ether	27.0	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	95.	65 - 129

Report Approved By:

Michael H. Danner

Report Date: 10/ 4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053708

Sample ID: MW-7

Date Collected: 9/18/95

Project: 19430319

Time Collected: 15:55

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	1.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	1.0	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Methyl-t-butylether	10.0	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Isopropyl ether	16.0	ug/l	10.0	10.0	1.0	9/21/95	21:00	E.SMITH	602
Lead	0.015	ug/l	0.003	0.003	1.0	9/21/95	13:34	R.Street	3030c

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	89.	65 - 129

Report Approved By: Michael A. Danner

Report Date: 10/ 4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A053709

Sample ID: TRIP BLANK

Date Collected:

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 9/19/95

Sampler: KIMBERLY HAGAN

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.: 4-3998

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Toluene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	9/21/95	21:00	E.SMITH	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	95.	65 - 129

Report Approved By: Michael G. Dumas

Report Date: 10/4/95



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery
Underground Storage Tank Parameters					
Benzene	mg/l	< 0.001	18.9	20.0	94.50
Benzene	mg/l	< 0.001	20.3	20.0	101.50
Toluene	mg/l	< 0.001	19.6	20.0	98.00
Toluene	mg/l	< 0.001	21.1	20.0	105.50
Ethylbenzene	mg/l	< 0.001	19.6	20.0	98.00
Ethylbenzene	mg/l	< 0.001	21.1	20.0	105.50
Xylenes, total	mg/l	< 0.001	41.1	40.0	102.75
Xylenes, total	mg/l	< 0.001	44.1	40.0	110.25

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD
Underground Storage Tank Parameters				
Benzene	mg/l	18.9	20.3	7.14
Toluene	mg/l	19.6	21.1	7.37
Ethylbenzene	mg/l	19.6	21.1	7.37
Xylenes, total	mg/l	41.1	44.1	7.04

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery
---------	-------	------------	--------------	------------

Blank Data

Analyte	Blank Value	Units
Underground Storage Tank Parameters		
Benzene	< 0.001	mg/l
Toluene	< 0.001	mg/l
Ethylbenzene	< 0.001	mg/l
Xylenes, total	< 0.001	mg/l



SPECIALIZED ASSAYS ENVIRONMENTAL
300 12th Ave South
Nashville, Tennessee 37203

1-800-765-0980
615-726-0177
Fax: 615-726-3404

Name: **JERRY PROSSE** Phone: 704-541-8416 Fax: 704-541-8416

Address: 7300 Carmel Executive Park NC 28226 Charlotte

Project Mgr: **JERRY PROSSE** Client Project #

Exxon Contact: **FRANK MEDLIN** [circle one] **EE** or C&M Phone: State ID #:

RAS #: **4-3998** MARKET ST. GREENSBORO N.C.

Cooler Seal Consultant Receipt Laboratory Receipt
Seal Intact yes no Initial yes no Initial

Air Bill # **5008352595** # of coolers **1** Sample Temperature **7** [*C] upon receipt

Sampled by [please print] **KIMBERLY C. HAYAN** Sampler Signature: *Kimberly C. Hayan*

Ship Date: **9/18/95** TAT REQUESTED 24hr 48hr 72hr other day Exxon Std TAT

FIELD SAMPLE ID	SAE LAB # (for lab use only)	# CONT	Matrix				Method Preserved				DATE	TIME		
			WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	HCL	HNO3			H2SO4	ICE
MW-3	53701	3	✓										9/18	1500
MW-1	53702	2	✓											1525
MW-1	53703	2	✓											1530
MW-4	53704	2	✓											1540
MW-2	53705	2	✓											1545
MW-6	53706	2	✓											1615
MW-5	53707	2	✓											1605
MW-7	53708	3	✓											1555
TRIP BLK.	53709	1	✓											

SPECIAL DETECTION LIMITS:

REPORTING LIMITS:

Relinquished by Sampler: *Kimberly C. Hayan*
Company / Affiliation: **ERM-SE**

Relinquished by: _____
Company / Affiliation: _____

DATE **9/18** TIME **1900**

DATE _____ TIME _____

EXXON COMPANY USA

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUESTED

LWR #:

ANALYSIS REQUEST

OTHER

EDB <input type="checkbox"/> 504	PETROLEUM HYDROCARBONS, GC, 8015 GAS <input type="checkbox"/> DIESEL	TPH/OIL AND GREASE 418.1 <input type="checkbox"/> 9070 <input type="checkbox"/> 413.1 <input type="checkbox"/> 413.2	PURGEABLE HALOCARBONS 601 <input type="checkbox"/> 8010 <input type="checkbox"/> 8021	PURGEABLE AROMATICS 602 <input type="checkbox"/> 8020 <input type="checkbox"/> 8021	PCB's <input type="checkbox"/>	VOLATILE ORGANICS 624 <input type="checkbox"/> 8240 TCL <input type="checkbox"/> 8260	EXTRACTABLE ORGANICS 625 <input type="checkbox"/> 8270 TCL	PAH's 610 <input type="checkbox"/> 8310 <input type="checkbox"/> 8100 <input type="checkbox"/> 8270	TCP METALS <input type="checkbox"/> VOA's <input type="checkbox"/> BNA's <input type="checkbox"/> P/H <input type="checkbox"/> TOTAL	METALS RCRA <input type="checkbox"/> PP <input type="checkbox"/> TAL	LEAD 338.2 <input checked="" type="checkbox"/> 200.7 <input type="checkbox"/> 6010 <input type="checkbox"/> 7421 <input type="checkbox"/> 3030G	CORROSION <input type="checkbox"/> REACTIVITY <input type="checkbox"/>	FP OPEN CUP <input type="checkbox"/> CLOSED CUP <input type="checkbox"/>
MTBE <input checked="" type="checkbox"/>													
BTEX 602 <input checked="" type="checkbox"/> 8020 <input type="checkbox"/>													

CLIENT REMARKS:

STORAGE LOCATION:

Received by: *Adel W. A.*

DATE **9/19/95** TIME **0930**

Received by: _____

DATE _____ TIME _____



SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
Nashville, Tennessee 37204

RECEIVED
NOV 21 1995
BY:

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A066070

Sample ID: MW-MOORE

Date Collected: 11/13/95

Project: 19430319

Time Collected: 10:00

Project Name: EXXON 4-3998

Date Received: 11/14/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Toluene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	85.	65 - 129

Report Approved By: Michael H. Duman

Report Date: 11/20/95



SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A066071

Sample ID: TRIP BLANK

Date Collected:

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 11/14/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Toluene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	11/18/95	15:33	S. Wani	602

ND = Not detected at the report limit.

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
BTEX/GRO Surrogate	85.	65 - 129

Report Approved By: Michael A. Dumas

Report Date: 11/20/95



SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
Nashville, Tennessee 37204

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery
Underground Storage Tank Parameters					
Benzene	mg/l	< 0.001	0.031	0.033	93.94
Benzene	mg/l	< 0.001	0.032	0.033	96.97
Toluene	mg/l	< 0.001	0.031	0.033	93.94
Toluene	mg/l	< 0.001	0.032	0.033	96.97
Ethylbenzene	mg/l	< 0.001	0.030	0.033	90.91
Ethylbenzene	mg/l	< 0.001	0.031	0.033	93.94
Xylenes, total	mg/l	< 0.001	0.060	0.066	90.91
Xylenes, total	mg/l	< 0.001	0.061	0.066	92.42

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD
Underground Storage Tank Parameters				
Benzene	mg/l	0.031	0.032	3.17
Toluene	mg/l	0.031	0.032	3.17
Ethylbenzene	mg/l	0.030	0.031	3.28
Xylenes, total	mg/l	0.060	0.061	1.65

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery
---------	-------	------------	--------------	------------

Blank Data

Analyte	Blank Value	Units
Underground Storage Tank Parameters		
Benzene	< 0.001	mg/l
Toluene	< 0.001	mg/l
Ethylbenzene	< 0.001	mg/l
Xylenes, total	< 0.001	mg/l



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070670

Sample ID: MW-1

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 12:00

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	4500	ug/l	900.	1.0	900.	12/11/95	16:27	S. Wani	602
Toluene	18000	ug/l	900.	1.0	900.	12/11/95	16:27	S. Wani	602
Ethylbenzene	3600	ug/l	900.	1.0	900.	12/11/95	16:27	S. Wani	602
Xylenes, total	21600	ug/l	900.	1.0	900.	12/11/95	16:27	S. Wani	602
Methyl-t-butylether	ND	ug/l	225.	10.0	22.5	12/11/95	16:27	S. Wani	602
Isopropyl ether	1230	ug/l	225.	10.0	22.5	12/11/95	16:27	S. Wani	602

ND = Not detected at the report limit.

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
BTEX/GRD Surrogate	88.	50 - 150



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070670

Sample ID: MW-1

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 12:00

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate

% Recovery

Target Range

Report Approved By:

Report Date: 12/12/95

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070671

Sample ID: MW-2

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 12:30

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	788.	ug/l	22.0	1.0	22.0	12/11/95	16:27	S. Wani	602
Toluene	2900	ug/l	22.0	1.0	22.0	12/11/95	16:27	S. Wani	602
Ethylbenzene	315.	ug/l	22.0	1.0	22.0	12/11/95	16:27	S. Wani	602
Xylenes, total	1550	ug/l	22.0	1.0	22.0	12/11/95	16:27	S. Wani	602
Methyl-t-butylether	ND	ug/l	225.	10.0	22.5	12/11/95	16:27	S. Wani	602
Isopropyl ether	292.	ug/l	225.	10.0	22.5	12/11/95	16:27	S. Wani	602

ND = Not detected at the report limit.

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
BTEX/GRD Surrogate	86.	50 - 150



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070671

Sample ID: MW-2

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 12:30

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

<u>Surrogate</u>	<u>% Recovery</u>	<u>Target Range</u>
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Report Approved By:

Theodore J. Duello

Report Date: 12/12/95

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070672

Sample ID: MW-3

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 13:00

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	19800	ug/l	450.	1.0	450.	12/11/95	16:27	S. Wani	602
Toluene	94500	ug/l	4500	1.0	4500	12/11/95	16:27	S. Wani	602
Ethylbenzene	6300	ug/l	450.	1.0	450.	12/11/95	16:27	S. Wani	602
Xylenes, total	36000	ug/l	450.	1.0	450.	12/11/95	16:27	S. Wani	602
Methyl-t-butylether	ND	ug/l	4500	10.0	450.	12/11/95	16:27	S. Wani	602
Isopropyl ether	7650	ug/l	4500	10.0	450.	12/11/95	16:27	S. Wani	602
Lead	1.47	ng/l	0.003	0.003	1.0	12/11/95	12:10	R.Street	3030c

ND = Not detected at the report limit.

**** QUALITY CONTROL DATA ****

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRD Surrogate	83.	50 - 150



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070672

Sample ID: MW-3

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 13:00

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate

% Recovery

Target Range

Report Approved By:

Theodore J. Duello

Report Date: 12/12/95

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070673

Sample ID: MW-9

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 13:30

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	36.0	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602
Toluene	7.0	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602
Ethylbenzene	110.	ug/l	10.0	1.0	10.0	12/11/95	8:46	Wasilewski	602
Xylenes, total	670.	ug/l	10.0	1.0	10.0	12/11/95	8:46	Wasilewski	602
Methyl-t-butylether	ND	ug/l	10.0	10.0	1.0	12/11/95	8:46	Wasilewski	602
Isopropyl ether	38.0	ug/l	10.0	10.0	1.0	12/11/95	8:46	Wasilewski	602

ND = Not detected at the report limit.

**** QUALITY CONTROL DATA ****

**** Surrogate Recoveries ****

Surrogate	% Recovery	Target Range
BTEX/GRD Surrogate	94.	50 - 150



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070673

Sample ID: MW-9

Date Collected: 12/ 6/95

Project: 19430319

Time Collected: 13:30

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

** QUALITY CONTROL DATA **

** Surrogate Recoveries **

Surrogate

% Recovery

Target Range

Report Approved By:

Theodore J. Duello

Report Date: 12/12/95

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

ANALYTICAL REPORT

ERM-SOUTHEAST INC. 5919
ATTN: JERRY PROSSER
7300 CARMEL EXEC. PARK STE 200
CHARLOTTE, NC 28226

Lab Number: 95-A070674

Sample ID: TRIP BLANK

Date Collected:

Project: 19430319

Time Collected:

Project Name: EXXON 4-3998

Date Received: 12/ 7/95

Sampler: ANDY NUNNALLY

Time Received: 9:30

State Certification: 387

Sample Type: Water

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Benzene	ND	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602
Toluene	ND	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602
Ethylbenzene	ND	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602
Xylenes, total	ND	ug/l	1.0	1.0	1.0	12/11/95	8:46	Wasilewski	602

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries **

Surrogate	% Recovery	Target Range
BTEX/GRD Surrogate	94.	50 - 150

Report Approved By:

Theodore J. Duello

Report Date: 12/12/95

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.



SPECIALIZED ASSAYS
ENVIRONMENTAL

2960 Foster Creighton Drive
Nashville, Tennessee 37204

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery
Underground Storage Tank Parameters					
Benzene	mg/l	< 0.001	0.034	0.033	103.03
Benzene	mg/l	< 0.001	0.034	0.033	103.03
Toluene	mg/l	< 0.001	0.034	0.033	103.03
Toluene	mg/l	< 0.001	0.033	0.033	100.00
Ethylbenzene	mg/l	< 0.001	0.033	0.033	100.00
Ethylbenzene	mg/l	< 0.001	0.033	0.033	100.00
Xylenes, total	mg/l	< 0.001	0.069	0.066	104.55
Xylenes, total	mg/l	< 0.001	0.068	0.066	103.03

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD
Underground Storage Tank Parameters				
Benzene	mg/l	0.034	0.034	0.00
Toluene	mg/l	0.034	0.033	2.99
Ethylbenzene	mg/l	0.033	0.033	0.00
Xylenes, total	mg/l	0.069	0.068	1.46

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery
Benzene	mg/l	0.033	0.033	100.00
Toluene	mg/l	0.033	0.033	100.00
Ethylbenzene	mg/l	0.033	0.033	100.00
Xylenes, total	mg/l	0.066	0.069	104.55

Blank Data

Analyte	Blank Value	Units
Underground Storage Tank Parameters		
Benzene	< 0.001	mg/l
Toluene	< 0.001	mg/l
Ethylbenzene	< 0.001	mg/l
Xylenes, total	< 0.001	mg/l

APPENDIX F
SLUG TEST DATA

DELTA ENVIRONMENTAL CONSULTANTS, INC.
 SLUG TEST DATA ANALYSIS - BOURER AND RICE METHOD
 For an Unconfined Aquifer with a Partially Penetrating Well

PROJECT DATA INPUT

Project: EXXON CO.,USA
 Site Name: EXXON CO.,USA
 Location: GREENSBORO,NC
 Delta No: 50-92-037

Wells Collected By: L.Gross Date: 03/24/93
 Wells Analyzed By: L.Gross Date: 06/28/93
 Analysis Reviewed By: D.Curlis Date: 07/02/93

TEST WELL DATA INPUT

Well No: MW-2, Slug Out
 Method: Pressure Transducer and Datalogger

Total Depth Of Well From Measuring Point: 35.000 ft
 Static Depth To Water From Measuring Point: 18.820 ft
 Depth To Top Of Screen From Measuring Point: 15.000 ft

Length of Screen: 20.000 ft
 Radius Of Hole: 0.333 ft
 Radius Of Casing: 0.083 ft
 Porosity Of Sandpack: 0.350 as a decimal

CALCULATED TEST WELL PARAMETERS

Le = 16.180 ft (effective screen length of well)
 Lw = 16.180 ft (saturated thickness penetrated by well)
 Rw = 0.333 ft (radius of borehole)
 Rc = 0.083 ft (radius of casing)
 Re = 0.208 ft (effective radial distance over which drawdown is dissipated)
 Le/Rw = 48.589 dimensionless
 A = 3.009 dimensionless
 B = 0.511 dimensionless
 (Re/Rw) = 2.560 dimensionless

AQUIFER (SATURATED ZONE) PARAMETERS INPUT

H = 41.28 ft (aquifer thickness - estimate to be 2 x Lw if unknown)

SLUG TEST DATA INPUT, DRAWDOWN, AND BEST FIT LINE FROM REGRESSION ANALYSIS

Time (min.)	Depth below NP(ft)	Drawdown (ft)	Log(y)	Drawdown (Best Fit Line)	Logger Field Data
0.0000	19.85	1.030	0.01284	0.144	7.19
0.0033	19.80	0.980	-0.00877	0.144	7.24
0.0066	19.80	0.980	-0.00877	0.144	7.24

0.0099	19.80	0.980	-0.00877	0.144	7.24
0.0133	19.80	0.980	-0.00877	0.144	7.24
0.0166	19.80	0.980	-0.00877	0.144	7.24
0.0200	19.77	0.950	-0.02228	0.144	7.27
0.0233	19.74	0.920	-0.03621	0.144	7.3
0.0266	19.71	0.890	-0.05061	0.144	7.33
0.0300	19.71	0.890	-0.05061	0.144	7.33
0.0333	19.71	0.890	-0.05061	0.144	7.33
0.0500	19.63	0.810	-0.09151	0.143	7.41
0.0666	19.58	0.760	-0.11919	0.143	7.46
0.0833	19.52	0.700	-0.15490	0.142	7.52
0.1000	19.47	0.650	-0.18709	0.142	7.57
0.1166	19.42	0.600	-0.22185	0.142	7.62
0.1333	19.37	0.550	-0.25964	0.141	7.67
0.1500	19.33	0.510	-0.29243	0.141	7.71
0.1666	19.30	0.480	-0.31876	0.140	7.74
0.1833	19.26	0.440	-0.35655	0.140	7.78
0.2000	19.23	0.410	-0.38722	0.140	7.81
0.2116	19.20	0.380	-0.42022	0.139	7.84
0.2333	19.17	0.350	-0.45593	0.139	7.87
0.2500	19.15	0.330	-0.48149	0.138	7.89
0.2666	19.14	0.320	-0.49485	0.138	7.9
0.2833	19.12	0.300	-0.52288	0.138	7.92
0.3000	19.11	0.290	-0.53760	0.137	7.93
0.3166	19.09	0.270	-0.56864	0.137	7.95
0.3333	19.07	0.250	-0.60206	0.136	7.97
0.4167	19.04	0.220	-0.65758	0.134	8
0.5000	19.01	0.190	-0.72125	0.132	8.03
0.5833	18.99	0.170	-0.76955	0.131	8.05
0.6667	18.98	0.160	-0.79588	0.129	8.06
0.7500	18.98	0.160	-0.79588	0.127	8.06
0.8333	18.96	0.140	-0.85387	0.125	8.08
0.9167	18.96	0.140	-0.85387	0.123	8.08
1.0000	18.95	0.130	-0.88606	0.121	8.09
1.0833	18.95	0.130	-0.88606	0.120	8.09
1.1667	18.95	0.130	-0.88606	0.118	8.09
1.2500	18.93	0.110	-0.95861	0.116	8.11
1.3333	18.93	0.110	-0.95861	0.115	8.11
1.4166	18.93	0.110	-0.95861	0.113	8.11
1.5000	18.93	0.110	-0.95861	0.111	8.11
1.5833	18.93	0.110	-0.95861	0.110	8.11
1.6667	18.93	0.110	-0.95861	0.108	8.11
1.7500	18.93	0.110	-0.95861	0.107	8.11
1.8333	18.93	0.110	-0.95861	0.105	8.11
1.9167	18.93	0.110	-0.95861	0.104	8.11
2.0000	18.92	0.100	-1.00000	0.102	8.12
2.5000	18.92	0.100	-1.00000	0.094	8.12
3.0000	18.90	0.080	-1.09691	0.086	8.14
3.5000	18.90	0.080	-1.09691	0.079	8.14
4.0000	18.90	0.080	-1.09691	0.072	8.14
4.5000	18.88	0.060	-1.22185	0.066	8.16
5.0000	18.88	0.060	-1.22185	0.061	8.16
5.5000	18.88	0.060	-1.22185	0.056	8.16
6.0000	18.88	0.060	-1.22185	0.051	8.16
6.5000	18.88	0.060	-1.22185	0.047	8.16

7.0000	18.87	0.050	-1.30103	0.043	8.17
7.5000	18.87	0.050	-1.30103	0.039	8.17
8.0000	18.87	0.050	-1.30103	0.036	8.17
8.5000	18.87	0.050	-1.30103	0.033	8.17
9.0000	18.87	0.050	-1.30103	0.030	8.17
9.5000	18.87	0.050	-1.30103	0.028	8.17
10.0000	18.87	0.050	-1.30103	0.026	8.17
12.0000	18.85	0.030	-1.52288	0.018	8.19
14.0000	18.85	0.030	-1.52288	0.013	8.19
16.0000	18.84	0.020	-1.69897	0.009	8.2
18.0000	18.84	0.020	-1.69897	0.006	8.2
20.0000	18.84	0.020	-1.69897	0.005	8.2
22.0000	18.82	0.000	ERR	0.003	8.22
24.0000	18.82	0.000	ERR	0.002	8.22
26.0000	18.82	0.000	ERR	0.002	8.22
28.0000	18.82	0.000	ERR	0.001	8.22

REGRESSION ANALYSIS INPUT

Time T1 = 1.2500 min (time that regression analysis starts)
Time T2 = 4.5000 min (time that regression analysis ends)

REGRESSION ANALYSIS OUTPUT

Regression Output:

Constant	-0.84035184808713
Std Err of Y Est	0.024912448836742
Squared	0.911827101128
So. of Observations	15
Degrees of Freedom	13
Coefficient(s)	-0.0751044
Std Err of Coef.	0.00647747

OUTPUT FROM BEST FIT LINE

Y(0) = 0.144 ft (= drawdown y @ t=0, derived from y intercept of best fit line on y/t plot)

INPUT FROM BEST FIT LINE

t = 1.5833 min (= time t, where t>0, at which Yt will be selected)
Y(t) = 0.110 ft (= drawdown y @ time t, derived from best fit line of y/t plot)

CALCULATED HYDRAULIC CONDUCTIVITY

K =	9.82E-06 ft/sec
K =	5.89E-04 ft/min
K =	8.49E-01 ft/day
K =	6.35E+00 gpd/ft^2
K =	3.00E-04 cm/sec
K =	3.00E-06 m/sec
K =	2.59E-01 m/day

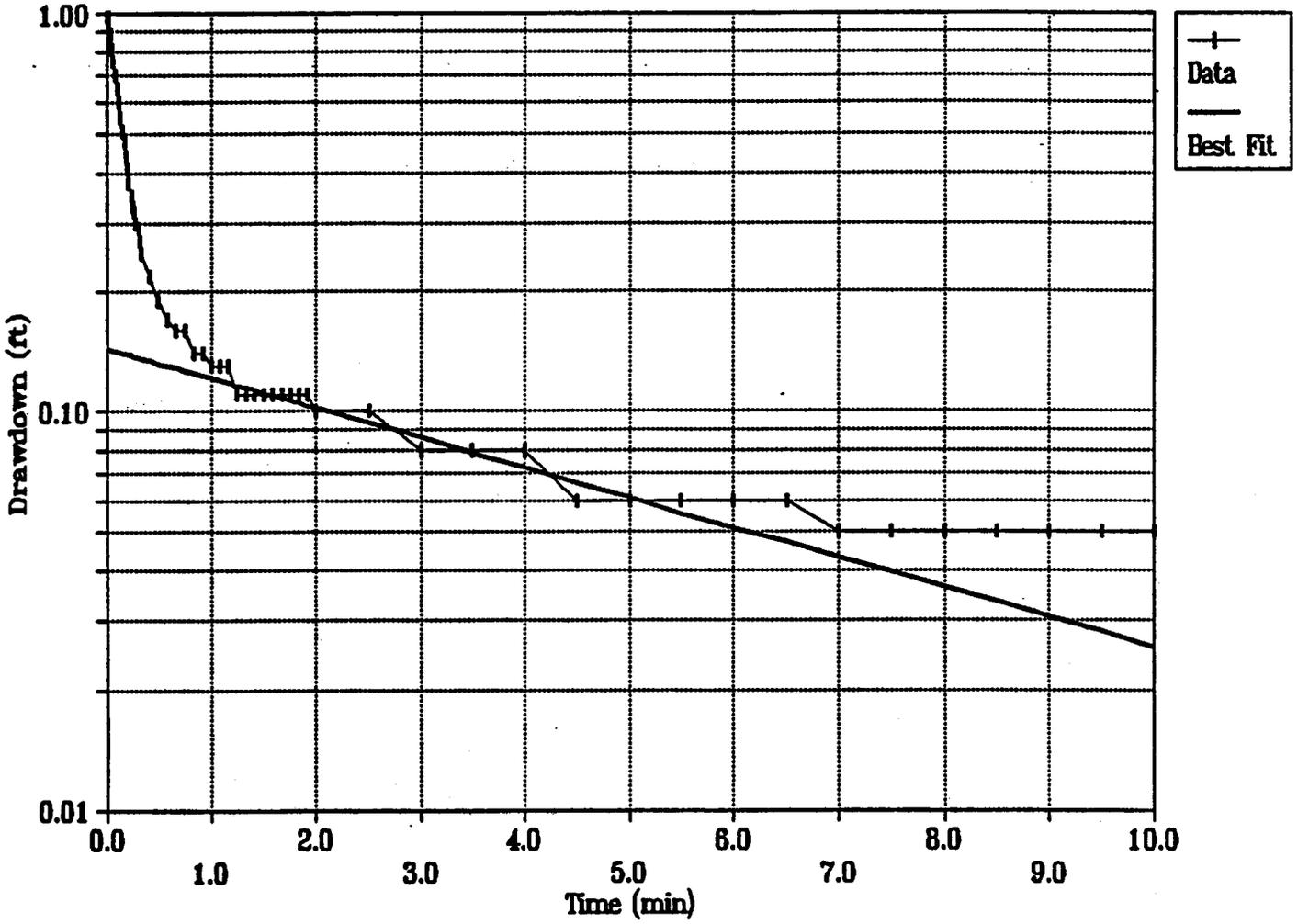
REFERENCES

Bower, N. and Rice, R. C., 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Fully Penetrating Wells, Water Resources Research, v. 12, pp. 423-428.

Bower, N., 1989, The Bower and Rice Slug Test - An Update, Groundwater, Vol. 27, No. 3, pp. 304-309.

Bower, N., 1989, DISCUSSION OF: The Bower and Rice Slug Test - An Update, Groundwater, Vol. 27, No. 5, p. 715.

SLUG TEST DATA (Drawdown vs Time)
Exxon Co., USA , MW-2 Slug Out



DELTA ENVIRONMENTAL CONSULTANTS, INC.
 SLUG TEST DATA ANALYSIS - BOUWER AND RICE METHOD
 For an Unconfined Aquifer with a Partially Penetrating Well

PROJECT DATA INPUT

Project: EXXON CO., USA
 Site Name: EXXON CO., USA
 Location: GREENSBORO, NC
 Well No: 50-92-037

Data Collected By: L.Gross Date: 03/24/93
 Data Analyzed By: L.Gross Date: 06/28/93
 Analysis Reviewed By: D.Curlis Date: 07/02/93

TEST WELL DATA INPUT

Well No: MW-4, Slug Out
 Method: Pressure Transducer and Datalogger

Total Depth Of Well From Measuring Point: 30.000 ft
 Static Depth To Water From Measuring Point: 22.590 ft
 Depth To Top Of Screen From Measuring Point: 15.000 ft

Length of Screen: 15.000 ft
 Radius Of Hole: 0.333 ft
 Radius Of Casing: 0.083 ft
 Porosity Of Sandpack: 0.350 as a decimal

CALCULATED TEST WELL PARAMETERS

Le = 7.410 ft (effective screen length of well)
 Lw = 7.410 ft (saturated thickness penetrated by well)
 Rw = 0.333 ft (radius of borehole)
 Rc = 0.083 ft (radius of casing)
 Re = 0.208 ft (effective radial distance over which drawdown is dissipated)
 Le/Rw = 22.252 dimensionless
 A = 2.272 dimensionless
 B = 0.362 dimensionless
 (Re/Rw) = 1.880 dimensionless

AQUIFER (SATURATED ZONE) PARAMETERS INPUT

H = 41.28 ft (aquifer thickness - estimate to be 2 x Lw if unknown)

SLUG TEST DATA INPUT, DRAWDOWN, AND BEST FIT LINE FROM REGRESSION ANALYSIS

Time (min.)	Depth below MP(ft)	Drawdown (ft)	Log(y)	Drawdown (Best Fit Line)	Logger Field Data
0.0000	22.86	0.270	-0.56864	0.116	0.42
0.0033	22.86	0.270	-0.56864	0.116	0.42
0.0066	22.85	0.260	-0.58503	0.116	0.41
0.0099	22.85	0.260	-0.58503	0.116	0.41
0.0133	22.83	0.240	-0.61979	0.116	0.39
0.0166	22.83	0.240	-0.61979	0.116	0.39
0.0200	22.81	0.220	-0.65758	0.116	0.37

0.0333	22.80	0.210	-0.67778	0.116	0.36
0.0500	22.78	0.190	-0.72125	0.116	0.34
0.0666	22.77	0.180	-0.74473	0.115	0.33
0.0833	22.75	0.160	-0.79588	0.115	0.31
0.1000	22.75	0.160	-0.79588	0.115	0.31
0.1166	22.75	0.160	-0.79588	0.115	0.31
0.1333	22.74	0.150	-0.82391	0.115	0.3
0.1500	22.74	0.150	-0.82391	0.115	0.3
0.1666	22.74	0.150	-0.82391	0.114	0.3
0.1833	22.74	0.150	-0.82391	0.114	0.3
0.2000	22.74	0.150	-0.82391	0.114	0.3
0.2116	22.72	0.130	-0.88606	0.114	0.28
0.2333	22.72	0.130	-0.88606	0.114	0.28
0.2500	22.72	0.130	-0.88606	0.113	0.28
0.2666	22.72	0.130	-0.88606	0.113	0.28
0.2833	22.72	0.130	-0.88606	0.113	0.28
0.3000	22.72	0.130	-0.88606	0.113	0.28
0.3166	22.72	0.130	-0.88606	0.113	0.28
0.3333	22.72	0.130	-0.88606	0.112	0.28
0.4167	22.70	0.110	-0.95861	0.111	0.26
0.5000	22.70	0.110	-0.95861	0.111	0.26
0.5833	22.70	0.110	-0.95861	0.110	0.26
0.6667	22.70	0.110	-0.95861	0.109	0.26
0.7500	22.70	0.110	-0.95861	0.108	0.26
0.8333	22.70	0.110	-0.95861	0.107	0.26
0.9167	22.69	0.100	-1.00000	0.106	0.25
1.0000	22.69	0.100	-1.00000	0.105	0.25
1.0833	22.69	0.100	-1.00000	0.104	0.25
1.1667	22.69	0.100	-1.00000	0.103	0.25
1.2500	22.69	0.100	-1.00000	0.102	0.25
1.3333	22.69	0.100	-1.00000	0.102	0.25
1.4166	22.69	0.100	-1.00000	0.101	0.25
1.5000	22.69	0.100	-1.00000	0.100	0.25
1.5833	22.69	0.100	-1.00000	0.099	0.25
1.6667	22.69	0.100	-1.00000	0.098	0.25
1.7500	22.69	0.100	-1.00000	0.097	0.25
1.8333	22.69	0.100	-1.00000	0.097	0.25
1.9167	22.69	0.100	-1.00000	0.096	0.25
2.0000	22.69	0.100	-1.00000	0.095	0.25
2.5000	22.69	0.100	-1.00000	0.090	0.25
3.0000	22.67	0.080	-1.09691	0.086	0.23
3.5000	22.67	0.080	-1.09691	0.082	0.23
4.0000	22.67	0.080	-1.09691	0.078	0.23
4.5000	22.66	0.070	-1.15490	0.074	0.22
5.0000	22.66	0.070	-1.15490	0.070	0.22
5.5000	22.66	0.070	-1.15490	0.067	0.22
6.0000	22.66	0.070	-1.15490	0.063	0.22
6.5000	22.66	0.070	-1.15490	0.060	0.22

7.0000	22.66	0.070	-1.15490	0.057	0.22
7.5000	22.66	0.070	-1.15490	0.055	0.22
8.0000	22.64	0.050	-1.30103	0.052	0.2
8.5000	22.64	0.050	-1.30103	0.049	0.2
9.0000	22.64	0.050	-1.30103	0.047	0.2
9.5000	22.64	0.050	-1.30103	0.045	0.2
10.0000	22.64	0.050	-1.30103	0.042	0.2
12.0000	22.64	0.050	-1.30103	0.035	0.2
14.0000	22.62	0.030	-1.52288	0.028	0.18
16.0000	22.62	0.030	-1.52288	0.023	0.18
18.0000	22.61	0.020	-1.69897	0.019	0.17
20.0000	22.61	0.020	-1.69897	0.015	0.17
22.0000	22.61	0.020	-1.69897	0.013	0.17
24.0000	22.59	0.000	ERR	0.010	0.15
26.0000	22.59	0.000	ERR	0.008	0.15
28.0000	22.59	0.000	ERR	0.007	0.15
30.0000	22.59	0.000	ERR	0.006	0.15

REGRESSION ANALYSIS INPUT

Time T1 = 1.0000 min (time that regression analysis starts)
Time T2 = 4.5000 min (time that regression analysis ends)

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REGRESSION ANALYSIS OUTPUT

Regression Output:

Constant -0.93460418165847
Standard Error of Y Est 0.019544019189948
Sum of Squares 0.85143406071821
No. of Observations 18
Degrees of Freedom 16
Coefficient(s) -0.0438584
Standard Error of Coef. 0.00458012

OUTPUT FROM BEST FIT LINE

Y(0) = 0.116 ft (= drawdown y @ t=0, derived from y intercept of best fit line on y/t plot)

INPUT FROM BEST FIT LINE

t = 1.5000 min (= time t, where t>0, at which Yt will be selected)
Y(t) = 0.100 ft (= drawdown y @ time t, derived from best fit line of y/t plot)

CALCULATED HYDRAULIC CONDUCTIVITY

K = 9.20E-06 ft/sec
K = 5.52E-04 ft/min
K = 7.95E-01 ft/day
K = 5.94E+00 gpd/ft^2
K = 2.80E-04 cm/sec
K = 2.80E-06 m/sec
K = 2.42E-01 m/day

REFERENCES

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Bower, N., 1989, The Bower and Rice Slug Test - An Update, Groundwater, Vol. 27, No. 3, pp. 304-309.

Bower, N., 1989, DISCUSSION OF: The Bower and Rice Slug Test - An Update, Groundwater, Vol. 27, No. 5, p. 715.

SLUG TEST DATA (Drawdown vs Time)
Exxon Co., USA , MW-4 Slug Out

