HYDROGEOLOGIC RECONNAISSANCE OF THE SWOPE OIL SUPERFUND SITE AND VICINITY, CAMDEN AND BURLINGTON COUNTIES, NEW JERSEY

By Gary J. Barton and Martha Krebs

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CONVERSION FACTORS AND ABBREVIATIONS

Data presented in this report are in inch-pound units. To convert inch-pound units to metric (International System) units, use the following factors:

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter [(L/s)/m]

Temperature Conversion

Temperature in degrees Celsius (°C) is converted to degrees Fahrenheit (°F) by the equation: °F = (9/5)°C + 32.

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

HYDROGEOLOGIC RECONNAISSANCE OF THE SWOPE OIL SUPERFUND SITE AND VICINITY, CAMDEN AND BURLINGTON COUNTIES, NEW JERSEY

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ABSTRACT

From 1965-79, a chemical reclamation facility, now known as the Swope Oil Superfund site, sold and processed a variety of chemical compounds. Operation of the facility resulted in contamination of ground water beneath the 1.9-acre site. During 1984, the maximum concentrations of chromium and lead in ground water were 64 and 90 μg/L (micrograms per liter), respectively; the maximum concentration of total purgeable organic compounds (POCs) was 108 μg/L; and the maximum concentration of total base/neutral- and acid-extractable organic compounds was 116 μg/L. Although the off-site migration of these compounds has not been studied, a public-supply well 300 feet from the site is contaminated, and a public-supply well 1,400 feet from the site may be threatened.

The study area is adjacent to the tidally influenced Delaware River and is situated in the New Jersey part of the Atlantic Coastal Plain physiographic province. This province consists of a wedge of unconsolidated sediment which thickens and dips toward the Atlantic Ocean.

The study area is underlain by alluvial deposits, the Cretaceous Merchantville-Woodbury confining unit, and the Potomac-Raritan-Magothy aquifer system. These deposits, which are composed of gravel, sand, silt, and clay, crop out in the study area and are underlain by bedrock. These hydrogeologic units comprise the water-table aquifer, the confining units, and the confined aquifer found throughout the study area.

The Potomac-Raritan-Magothy aquifer system is incised by the Delaware River and is hydraulically connected to it. Regional estimates of hydraulic conductivities of aquifers and confining units in Cretaceous rocks are 130 to 350 ft/d (feet per day), and approximately 2.0×10^{-2} ft/d, respectively. The average yield of wells 6 inches or larger in the confined aquifer is approximately 1190 gallons per minute; specific capacity ranges from 17 to 80 gallons per minute per foot of drawdown.

The surface of the water table beneath the Swope Oil Superfund site is approximately 17 feet below sea level. Ground-water levels throughout the study area are believed to be below the stage of the Delaware River, causing induced recharge to the Potomac-Raritan-Magothy aquifer system from the river. Precipitation is the principal source of recharge to the water-table aquifer. Induced recharge into aquifers of the Potomac-Raritan-Magothy aquifer system from the Delaware River and downward leakage of water through confining units toward pumping centers in Camden County are the principal sources of recharge to the confined aquifer.

Five public-supply well fields are located in the study area, primarily adjacent to the Delaware River. During 1983 public-supply wells pumped approximately 25 million gallons per day of water, which accounts for

approximately 30 percent of all ground-water withdrawals by public-supply wells in Camden County. Four waste-disposal sites with observation-well networks are also located in the study area.

The water-table and confined aquifers are contaminated in several locations in the study area. The concentration of metals and purgeable organic compounds exceeds U.S. Environmental Protection Agency and New Jersey Department of Environmental Protection maximum contaminant level for drinking-water in more than 20 wells in the study area. Based on limited data, the maximum concentration of total POCs in water from public-supply wells is approximately 300 μg/L and at waste-disposal sites is 35,140 μg/L.

Construction details of 98 wells and 16 test borings are presented. Drillers', geologists', and geophysical logs made in 68 wells and 12 test borings are included. Ground-water levels measured during three water-level measurement programs from 1984-86, slug-test data, and ground-water withdrawals from 1956 to 1987 are listed. Results of more than 180 chemical analyses of ground-water samples collected during 1980-87 from 53 wells are given. Physical properties and chemical constituents including common ions, trace metals, purgeable organic compounds, and base/neutral- and acid-extractable organic compounds are reported.

INTRODUCTION

The study area includes the Swope Oil Superfund site[1] and adjacent areas in northern Camden and western Burlington Counties, New Jersey (fig. 1). From 1965 to 1979, a chemical reclamation facility was operated on a 1.9-acre site in Pennsauken Township, Camden County. This site is underlain by the Potomac-Raritan-Magothy aquifer system, the most heavily pumped source of water in the New Jersey Coastal Plain and the only source of drinking water in the area. Operations at the site contaminated the ground water with synthetic organic compounds and trace metals (NUS Corporation, 1985). Although off-site migration of these compounds has not been studied, a public-supply well 300 feet from the site is contaminated, and a public-supply well 1,400 feet from the site may be threatened.

The Region II Administrator of the U.S. Environmental Protection Agency (USEPA) signed a Record of Decision in 1985 recommending that a supplemental Remedial Investigation/Feasibility Study (RI/FS) be undertaken to evaluate the extent of ground-water contamination at this site (Geraghty and Miller, Inc., 1987). The USEPA subsequently requested that the U.S. Geological Survey provide technical assistance in evaluating the impact of the site, now called the Swope Oil Superfund site, on the local ground-water quality.

Purpose and Scope

This report provides a generalized description of the hydrogeologic framework, information on waste-disposal sites, and data on wells and test borings in the Swope Oil study area. These data were compiled from U.S. Geological Survey files and reports, New Jersey Department of Environmental

[1] The use of industry or firm names in this report is for location purposes only, does not impute responsibility for any present or potential effects on the natural resources.

Protection (NJDEP) files, and consultants' reports. Data collected prior to the initial 1985 RI/FS at the Swope Oil Superfund site are presented for historical perspective.

Also in this report are hydrogeologic sections and maps of the top of the bedrock surface and the potentiometric surface of the Potomac-Raritan-Magothy aquifer system. Locations of public-supply well fields, waste-disposal sites, and wells and test borings in the study area are shown on maps. Tables include well-construction details, specific capacities of wells, ground-water levels, slug-test data, ground-water withdrawals, and results of analyses for physical properties and common ions, trace metals, purgeable organic compounds, and base/neutral- and acid-extractable compounds in water from wells. Appendixes include copies of drillers', geologists', and geophysical logs for wells and test borings.

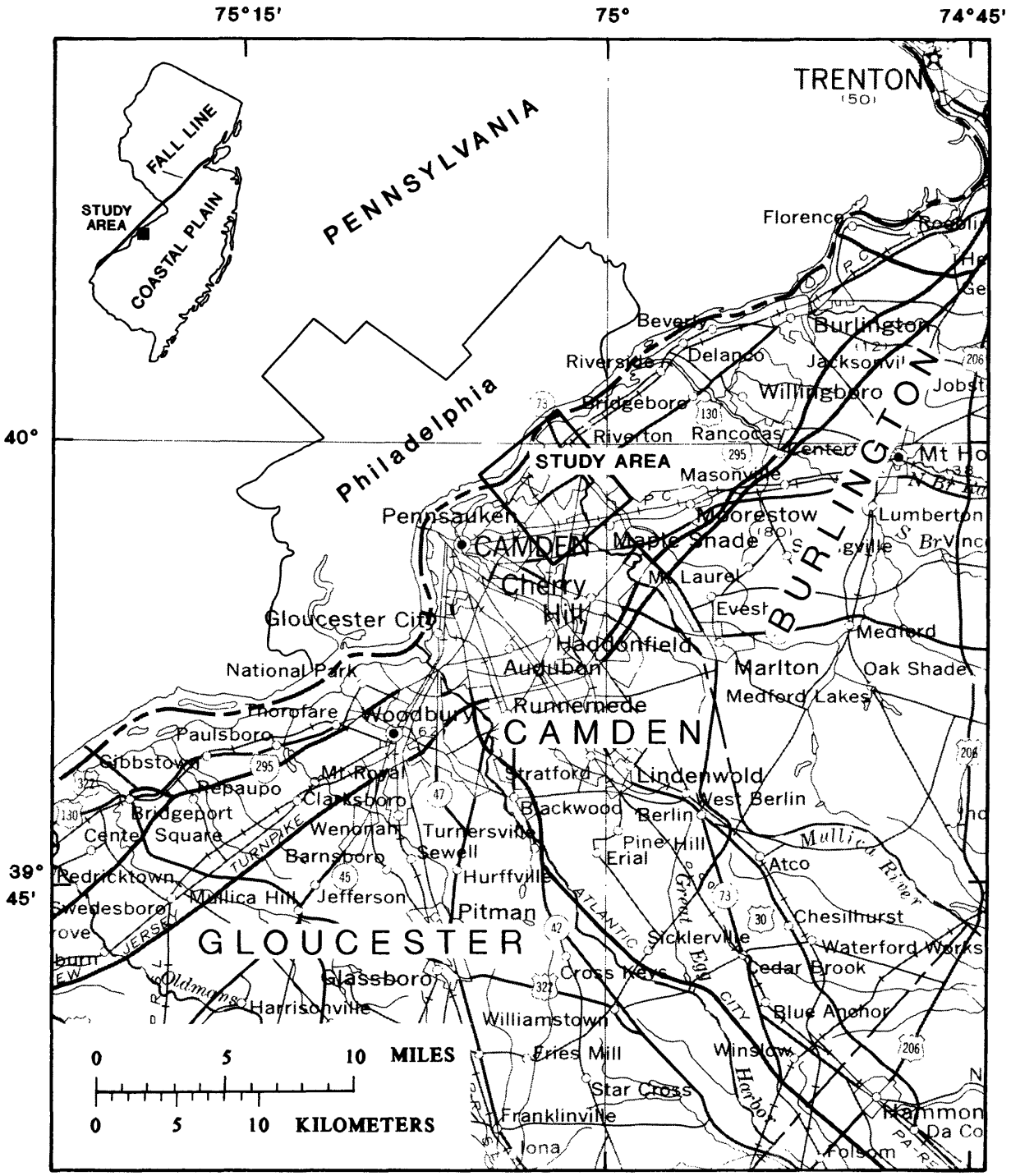
Previous and Ongoing Investigations

Previous and ongoing investigations adjacent to or including the Swope Oil study area focused on defining the regional hydrogeologic units, assessing regional ground-water resources, simulating regional ground-water flow in the Potomac-Raritan-Magothy aquifer system, and assessing waste disposal sites.

Gill and Farlekas (1976) developed geohydrologic maps of the Potomac-Raritan-Magothy aquifer system in the New Jersey Coastal Plain. Farlekas and others (1976) provided information on the ground-water hydrology of Camden County. They mapped the hydrogeologic units and addressed the availability and quality of ground water based chiefly on analysis and interpretation of ground-water levels, aquifer tests, water-use data, and water-quality data. Owens and Minard (1979) presented a detailed reconnaissance of upper Cenozoic sediments in the Delaware River Valley and the Northern Delmarva Peninsula, New Jersey, Pennsylvania, Delaware, and Maryland.

Vowinkel and Foster (1981) appraised and described the ground-water system, computed approximate hydrologic budgets, and summarized the effects of ground-water withdrawals on the natural hydrologic system of the Coastal Plain in New Jersey. Vowinkel (1984) presented aggregate ground-water withdrawal data for the New Jersey Coastal Plain. Zapecza (1984) presented the results of an intensive study of borehole geophysical logs of the New Jersey Coastal Plain and defined the occurrence and configuration of regional hydrogeologic units. Walker (1983) and Eckel and Walker (1986) documented and evaluated changes in water levels in the major artesian aquifers of the New Jersey Coastal Plain.

Navoy and others (U.S. Geological Survey, written commun., 1988) are studying the ground-water hydrology of Camden County and vicinity. The main purpose of their study is to examine the flow of ground water in the Potomac-Raritan-Magothy aquifer system. The study will define the geologic framework and hydraulic properties of the aquifer system and describe characteristics of flow, interaction of the aquifer system with the Delaware River estuary and overlying aquifers, and water use. The findings of the investigation will be used to develop a detailed three-dimensional model of



Base from U.S. Geological Survey
State base map, 1:500,000

Figure 1.--Location of study area.

ground-water flow in the Camden area. This study also will assess the need for and feasibility of modeling contaminant transport (Leahy and others, 1987).

Luzier (1980) developed a two-dimensional model of ground-water flow in the Potomac-Raritan-Magothy aquifer system to evaluate the effects of increasing water use. Using Luzier's model, Harbaugh and others (1980) tested various conjunctive-use strategies to determine the resulting potentiometric surface. A model prepared by Camp Dresser McKee, Inc. (1982) for the Delaware River Basin Commission was used to simulate flow in the Coastal Plain of New Jersey, Pennsylvania, and parts of Delaware. The New Jersey subregional Regional Aquifer System Analysis project includes a detailed investigation of the geohydrologic framework, geochemistry, and regional flow systems of major aquifers in the New Jersey Coastal Plain (Meisler, 1980; Martin, 1987).

Langmuir (1969), Farlekas and others (1976), Fusillo and Voronin (1981), and Fusillo and others (1985) conducted regional or county reconnaissance studies of ground-water quality that included the Swope Oil study area. Water samples, chiefly from the Potomac-Raritan-Magothy aquifer system, were collected for each study and were analyzed for various chemical constituents including purgeable organic compound and trace metals. Fusillo and others (1984) compiled ground-water quality data collected from 1923 to 1983 for part of the Potomac-Raritan-Magothy aquifer system in southwestern New Jersey.

The Swope Oil Superfund site has been studied since 1984. An analysis of aerial photographs of the Swope Oil Superfund site taken between 1965 and 1983 was prepared by the Bionetics Corporation (1984) for the USEPA. The NUS Corporation conducted a Remedial Investigation/ Feasibility study at the Swope Oil Superfund site during 1984-85. NUS Corporation installed five monitoring wells and eight test holes to obtain geologic and geophysical logs, cores of the lower confining unit, slug-test data, samples for water-quality and soil-chemistry analyses, and water levels (NUS Corporation, 1985). As part of an ongoing study, ERT, a contractor to the responsible parties, investigated the occurrence of polychlorinated biphenyls (PCBs) in shallow soils and conducted a terrain conductivity survey at this site during October 1987 (Phillip Guarraia, U.S. Environmental Protection Agency, Region II, oral commun., 1988).

Hydrogeologic investigations are currently being conducted at three additional waste-disposal sites in the study area--the Pennsauken Township Landfill, Aluminum Shapes, and Remanufactured Engines and Auto Parts. These investigations include installing wells and test holes, defining hydrogeologic units and hydrologic conditions, measuring water levels, and evaluating the quality of ground water (G. Haag, New Jersey Department of Environmental Protection, oral commun., 1987). Some of the data collected at these three sites have been obtained from the NJDEP and consulting firms and are included in this report.

Well-Numbering System

Two well-numbering systems are used in this report. The first, based on the well-numbering system used by the U.S. Geological Survey in New Jersey

since 1978, consists of a county code number (first two digits), followed by a sequence number of the well within the county (last four digits). County codes used are Burlington (5) and Camden (7). For example, well number 070372 represents the 372nd well inventoried in Camden County. Construction details for wells with this type of identifier are stored in the U.S. Geological Survey Ground Water Site Inventory (GWSI) data base.

The second well-numbering system consists of a three-digit well number used only in this report. This well-numbering system was developed for this report and is not used by either NJDEP or NUS Corporation. These well numbers are used to identify wells located in Camden County (for example, well number 021) that have not yet been entered into the GWSI data base.

Acknowledgments

The authors gratefully acknowledge the assistance of NJDEP in providing hydrogeologic data for ground-water contamination sites and results of chemical analyses of water from public-supply wells in the study area. James Anderson Associates and Woodward Clyde Consultants generously provided data on slug-tests conducted in the study area.

DESCRIPTION OF STUDY AREA

The Swope Oil study area includes approximately 10.5 square miles in Pennsauken Township, Camden County, and the Palmyra Borough and Cinnaminson Township, Burlington County, New Jersey (fig. 1 and pl. 1a). The Swope Oil Superfund site is a 1.9-acre triangular site situated between two railroad spurs and National Highway in an industrial park in the center of the study area (pl. 1a). Bordering the study area to the northeast are Palmyra Borough and Cinnaminson Township. The study area extends southeast to Maple Shade Township. The Delaware River borders the study area to the northwest. The study area has gently rolling hills and low-lying topography with altitudes that range from sea level to slightly more than 80 ft (feet) above sea level. Land use is primarily commercial, industrial, and residential.

The Swope Oil study area is situated within the Delaware River basin. The Delaware River is an estuary from Trenton, New Jersey to the Atlantic Ocean; the river and the lower reaches of its tributaries are tidally influenced in the study area. Delaware River tide elevations in the study area are measured at the U.S. Geological Survey tide-gaging station, Delaware River at Palmyra, New Jersey near the Tacony-Palmyra Bridge (pl. 1a). From October 1985 to September 1986, elevations ranged from a maximum high tide of 6.56 ft above sea level during May to a minimum low tide of 3.94 ft below sea level during January and March (Bauersfeld and others, 1987).

In the study area, the Delaware River Basin is divided into the Pennsauken, Baldwin Run, and Pomperston drainage basins (Vowinkel and Foster, 1981). Surface water in the study area drains into the Delaware River. The primary stream, Pennsauken Creek, is located in the northern part of the study area. North Branch and South Branch are streams in the

eastern part of the study area that meet to form Pennsauken Creek (pl. 1a). Pochack Creek is a smaller stream located in the southern part of the study area. Because these perennial streams are tidal throughout most of the study area, base flows have not been estimated.

Swope Oil Site Operations

A chemical reclamation facility operated from 1965 to 1979 (pl. 1b) at the Swope Oil Superfund site. Various chemical compounds were stored and/or processed at this facility. These chemical compounds include phosphate-ester hydraulic fluid, paints, varnishes, solvents, plasticizers, and printing inks. On-site features include a main building that served as an office and warehouse, a distilling house, a diked tank farm consisting of approximately 15 above-ground tanks, an unlined lagoon, and an area of buried sludge (NUS Corporation, 1985). The unlined lagoon has an irregular oval shape, and is approximately 120 ft long with a maximum width of 60 ft. The buried sludge area is approximately 160 ft by 100 ft. The depths of the lagoon and buried sludge area have not been reported.

In 1975, an inspector from the State Bureau of Air Pollution visited the site and recommended that the Bureau of Water Pollution Control inspect the site. During subsequent visits, officials observed discharges to drainage ditches on the site and probable migration toward Pennsauken Creek via storm sewers. Swope Oil Chemical Company was cited in 1975 for operating without proper permits and again in 1979 for failure to prepare, maintain, or fully implement a Spill Prevention, Containment and Countermeasure Plan. The company ceased operation in December 1979, and has declined to take any action at the site (NUS Corporation, 1985). To date, surface drums and approximately 3,000 tons of sludge from the on-site waste lagoon have been removed and a fence has been installed on the perimeter of the site (Geraghty and Miller, Inc., 1987), and approximately 75 percent of the above-ground tanks have been removed and building demolition has been initiated (T. Dunkelman, U.S. Environmental Protection Agency, oral commun., 1989).

Public-Supply Wells

Water used for public supply in the study area is derived from ground water. Of the five well fields in the study area, the Puchack, Delair, and Morris well fields are owned by the Camden City Water Department, and the Marion and Park Avenue fields are owned by the Merchantville-Pennsauken Water Commission (MPWC) (pl. 1c). In addition, National Highway well 1 and National Highway well 2 (well numbers 070372 and 070602) are owned by the MPWC, and the DVWC 28 (well number 050123) and the Stephen Drive well (well number 050124) are owned by the Delaware Valley Water Company (pl. 1a). Pumpage is concentrated primarily along the Delaware River. During 1983, public-supply wells in the study area pumped approximately 25 Mgal/d (million gallons per day) of water from the lower aquifer of the Potomac-Raritan-Magothy aquifer system within the Swope Oil study area. Approximately 30 percent of all ground-water withdrawals from public-supply wells in Camden County occur within a one-mile radius of the Swope Oil Superfund site. Withdrawals by public-supply purveyors in the study area are listed in the section "Data base."

Two public-supply wells, National Highway well 1 and National Highway well 2 (pl. 1a), are adjacent to the Swope Oil Superfund site. National Highway well 1, 250 ft southwest of the site, is contaminated with organic compounds and operates only during emergencies. During 1987, about 1.15 Mgal/d were withdrawn from National Highway well 2, approximately 1,400 ft northeast of the site.

Waste-Disposal Sites

The locations of four waste-disposal sites with observation-well networks in the study area are shown on plate 1c. The New Jersey Pollutant Discharge Elimination System (NJPDES) permit, observation-well, and select test-boring numbers for waste-disposal sites are listed in table 1. Observation-well and test-boring data from the four sites, drilled between 1979 and 1986, are listed in the section "Data Base".

HYDROGEOLOGIC FRAMEWORK

Regional Stratigraphy

The study area is in the New Jersey part of the Atlantic Coastal Plain physiographic province, a wedge of unconsolidated sediments that thickens and dips toward the Atlantic Ocean. This physiographic province is bounded on the northwest by the Fall Line (fig. 1).

The study area is located within the lowland subprovince of the Coastal Plain (Owens and Minard, 1979), an area characterized by stream valleys, tidal marshes, and swamp deposits at altitudes that are generally less than 20 ft above sea level. Areas at higher elevations are much sandier and have better drainage than the low-lying areas.

The study area is underlain by alluvial deposits; the Merchantville Formation of Cretaceous age that forms the Merchantville-Woodbury confining unit; and the Magothy Formation and the underlying Raritan Formation and the Potomac Group, all of Cretaceous age, that form the Potomac-Raritan-Magothy aquifer system. The Woodbury Clay crops out just east of the study area. These units lie unconformably on pre-Cretaceous bedrock that consists of metamorphic and igneous rocks (table 2).

Alluvial deposits of late Cenozoic age cover that part of the Delaware River Valley in which the study area is located. These deposits were described by Owens and Minard (1979). In the study area, the upper Cenozoic deposits range in age from Quaternary to Tertiary. These deposits consist of several geologic units--late Wisconsin and Holocene Delaware River alluvial deposits and fill; the Pleistocene Van Sciver Lake beds and Spring Lake beds; and possibly the upper Miocene Pensauken Formation.

Late Wisconsin and Holocene alluvial and fill deposits occur in the Delaware River channel and tidal wetlands. Tidal wetlands deposits consist of dark silt and clay mixed with organic matter and are sufficiently permeable to allow appreciable recharge and discharge to pass through them (Parker and others, 1964). The Pleistocene deposits are graywacke sands deposited in a broad valley bordering the present-day Delaware River channel. The Pensauken Formation occurs southwest of the Pleistocene

Table 1.--New Jersey pollutant discharge elimination system permit, observation-well, and selected test-boring numbers for waste-disposal sites in the Swope Oil study area

[--- indicates no data available. Source of information: New Jersey Department of Environmental Protection hazardous-waste files]

Waste-disposal site[1]	NJPDES permit number[2]	Test-boring number[3]	Observation-well number[4]
Swope Oil Superfund Site	---	006 007 008 009 010 011 012 013	001 002 003 004 005
Pennsauken Township Landfill	0054470	034 035 036 037	014 015 016 017 018 019 020 021 022 023 024 025 026 027 028 029
Aluminum Shapes	0034576	---	038 039 040 041
Remanufactured Engines and Auto Parts	0054046	---	042 043 044 045 046

[1] Waste-disposal site locations shown on plate 1b.
[2] New Jersey Pollutant Discharge Elimination system permit number.
[3] Three-digit test-boring numbers were assigned to test borings not in the U.S. Geological Survey Ground Water Site Inventory (GWSI) data base. Shallow soil-boring locations are shown on plates 1a and 1c.
[4] Three-digit well numbers were assigned to wells not in the U.S. Geological Survey GWSI data base. Well locations shown on plates 1a and 1c.

Table 2.--Geologic and hydrogeologic units in the Swope Oil study area and vicinity

System	Geologic unit	Hydrogeologic unit	
Quaternary	Alluvial deposits	Undifferentiated	
Tertiary	Pensauken Formation		
Upper Cretaceous	Woodbury Clay	Merchantville-Woodbury confining unit	
	Merchantville Formation		
	Magothy Formation	Potomac-Raritan-Magothy aquifer system	Upper aquifer
	Raritan Formation		Confining unit
			Middle aquifer
			Confining unit
Lower Cretaceous	Potomac Group		Lower aquifer
Pre-Cretaceous	Metamorphic and igneous rocks	Bedrock confining unit	

Modified from Zapecza (1989).

deposits on a low-elevation plain 50 to 80 ft above sea level, and forms a band of sediments approximately 5 miles wide that has been mapped from Salem to Trenton, New Jersey. These deposits are primarily glauconitic and feldspathic sand and gravel (Owens and Minard, 1979).

The Merchantville-Woodbury confining unit overlies the Potomac-Raritan-Magothy aquifer system, and is comprised of the Merchantville Formation in the study area and the Woodbury Clay just east of the study area. The Merchantville-Woodbury confining unit consists of thick glauconitic clay and sand and is one of the least permeable confining units in the New Jersey Coastal Plain (Zapecza, 1984).

The Magothy and Raritan Formations and Potomac Group, the oldest deposits in the New Jersey Coastal Plain, consist of deposits of gravel, sand, silt, and clay. The Potomac-Raritan-Magothy aquifer system crops out in a narrow three- to five-mile wide band adjacent to the Delaware River in southwestern New Jersey and in the study area. In southern New Jersey, the Potomac-Raritan-Magothy aquifer system is composed of three major aquifers--the upper, middle, and lower aquifers (Zapecza, 1984). These aquifers are lithologically similar to the overlying alluvial deposits and are hydraulically connected to them.

The Potomac-Raritan-Magothy aquifer system lies on top of bedrock. The altitude of the top of the bedrock surface is shown in figure 2. Because the bedrock consists of relatively impermeable metamorphic and igneous rocks, it is not hydraulically connected to the aquifer system and acts as a confining unit (Barksdale and others, 1958).

Study Area

Maps, cross sections, and well-log interpretations from previous investigations of the hydrogeologic units throughout New Jersey (Zapecza, 1989) and in the Camden region (A.S. Navoy, U.S. Geological Survey, written commun., 1985) were used to develop generalized sections of the study area. Refinement of the regional framework was accomplished primarily through interpretation of additional gamma-ray geophysical logs done as part of this study. The following preliminary discussion of the hydrogeologic framework of the study area is based on section A-A′ and B-B′ (pl. 1d and 1e) and on regional trends developed by Owens and Minard (1979) and Zapecza (1984).

Alluvial deposits form a thin veneer of permeable sediments over the Cretaceous deposits in the study area. Based on reconnaissance mapping conducted by Owens and Minard (1979) in the Delaware Valley, the thickness of alluvial deposits is variable and can be as much as 55 ft or more. Sand and clay layers in these deposits are discontinuous over short distances, as illustrated in section C-C′ (fig. 3). Alluvial sand and gravel deposits are hydraulically connected to the underlying aquifer where they overlie aquifers of the Potomac-Raritan-Magothy aquifer system. Together these deposits form the water-table aquifer in the study area.

The Merchantville-Woodbury confining unit crops out in the study area east of National Highway 2 well (pl. 1c) and dips to the southeast. None of the logs available for wells in the study area penetrates this unit.

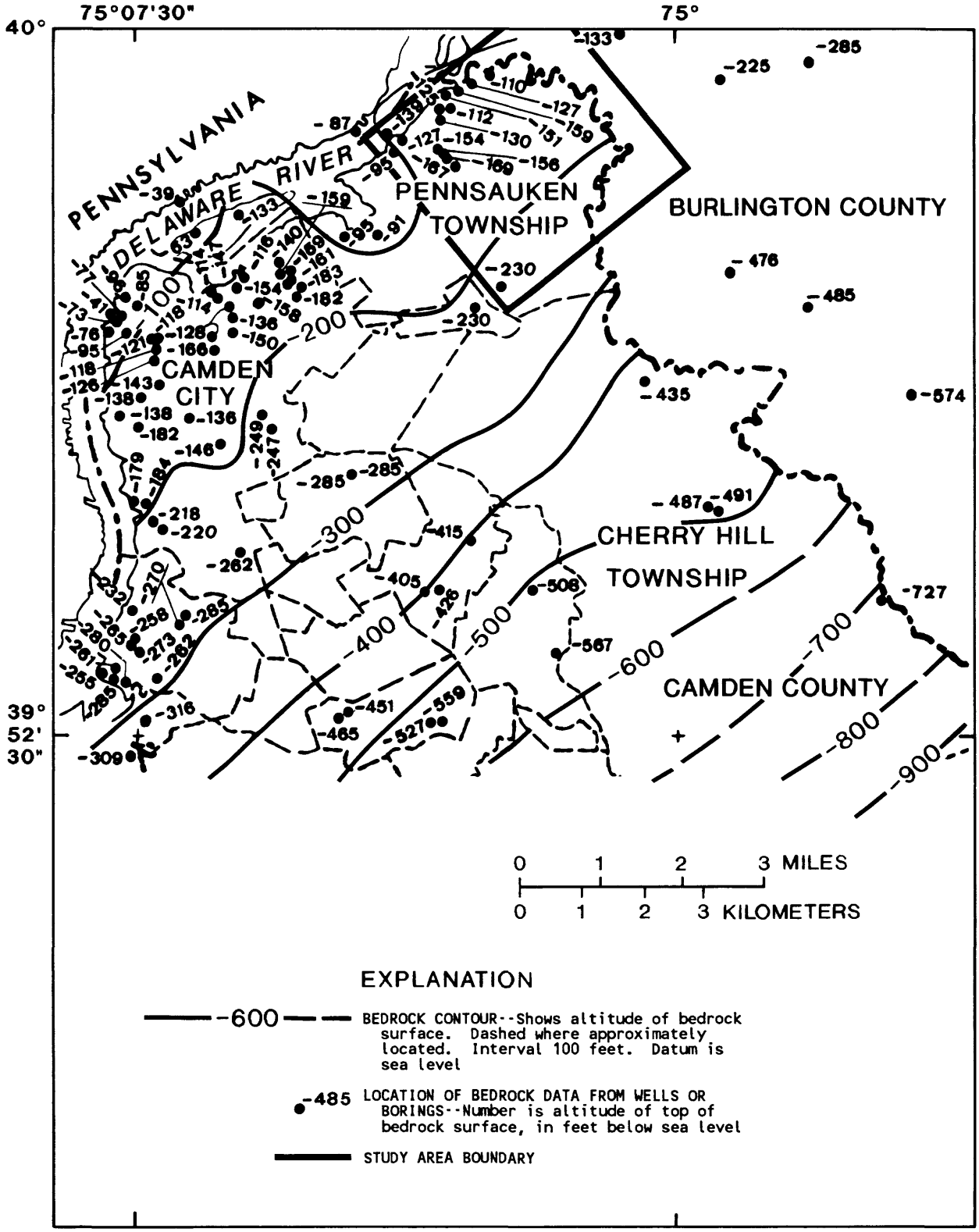


Figure 2.--Structure contours of the top of the bedrock surface beneath Coastal Plain sediments in Camden and Burlington Counties, New Jersey. (From Farlekas and others, 1976.)

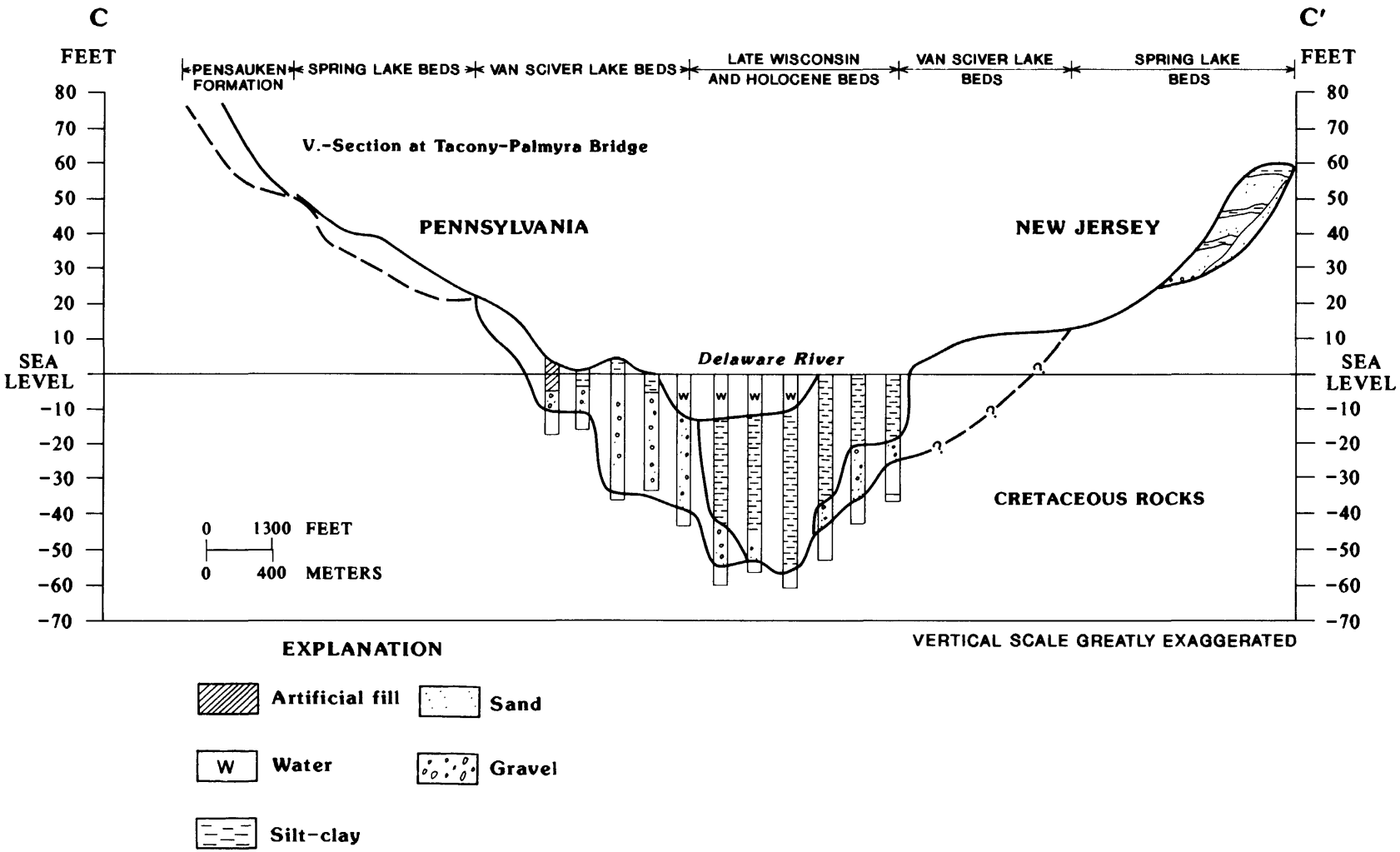


Figure 3.--Geologic section showing alluvial deposits in the Swope Oil study area and vicinity, New Jersey, and Pennsylvania. Line of section shown on plate 1a. (Modified from Owens and Minard, 1979, figure 29.)

The upper and middle aquifers of the Potomac-Raritan-Magothy aquifer system crop out where the discontinuous cover of alluvial deposits in the study area is absent. Both aquifers are incised by the Delaware River and are hydraulically connected to it. The upper and middle aquifers are differentiated in the southern part of the study area, where the upper aquifer is less than 20 ft thick and is considered to be a water-table aquifer, and the middle aquifer is confined and is approximately 20 ft thick.

In the rest of the study area, the upper and middle aquifers cannot be differentiated because the confining unit separating them is absent. This undifferentiated aquifer is a water-table aquifer that consists of numerous local silt and clay layers. The unsaturated and saturated parts of this unit together range from approximately 80 ft to greater than 100 ft thick. The confining unit that separates the middle, and the upper and middle undifferentiated aquifer, from the lower aquifer has a maximum thickness of 30 ft and appears to extend west to the Delaware River (A. S. Navoy, U.S. Geological Survey, oral commun., 1988).

The lower aquifer, which lies on top of bedrock, is approximately 45 to 110 ft thick and is hydraulically connected to the Delaware River throughout the study area. Altitude of bedrock east of the Delaware River in the study area ranges from approximately 75 to 250 ft below sea level.

Swope Oil Superfund Site

Only the water-table aquifer and the underlying confining unit at the Swope Oil Superfund site have been studied with test borings and wells. The unsaturated zone and the water-table aquifer are composed of alluvial deposits and the upper and middle undifferentiated aquifer of the Potomac-Raritan-Magothy aquifer system. From land surface to a depth of approximately 30 ft, the deposits consist primarily of interbedded sand, silt, and clay (NUS Corporation, 1985). Based on limited geologic framework analyses (fig. 3) conducted approximately 0.5 miles north of this site by Owens and Minard (1979), part or all of the upper 30 ft or so of sediments may be upper Cenozoic deposits. Below the surficial deposits to the top of the confining unit overlying the lower aquifer, sediments are coarse-grained and consist primarily of sand and some gravel with minor amounts of silt and clay. Several discontinuous clay lenses with thicknesses ranging from less than two to seven ft are present (NUS Corporation, 1985). The top surface of the confining unit separating the water-table and the confined aquifer is approximately 57 to 60 ft below sea level. The confined aquifer is the lower aquifer of the Potomac-Raritan-Magothy aquifer system.

Hydraulic Properties of Hydrogeologic Units

The vertical hydraulic conductivity of the Merchantville-Woodbury confining unit in the study area has not been evaluated. However, according to Martin (1987), the hydraulic conductivity of this unit may be as much as two orders of magnitude less than that reported for the confining units separating the aquifers of the Potomac-Raritan-Magothy aquifer system. The vertical hydraulic conductivity of the confining unit separating the upper and middle aquifers of the Potomac-Raritan-Magothy aquifer system in the study area has not been evaluated. A regional estimate for this unit based

on Martin's (1987) data is 2.0×10^{-2} ft/d. Two vertical hydraulic conductivity values, 1.47×10^{-4} ft/d and 1.28×10^{-3} ft/d, for the confining unit overlying the lower aquifer beneath the Swope Oil Superfund site has been reported by NUS Corporation (1985). A regional estimate of hydraulic conductivity for this unit based on Martin's (1987) data is 4×10^{-3} ft/d.

Aquifer-test analyses in Camden and Burlington Counties, summarized by Martin (1987), show that the horizontal hydraulic conductivity of the aquifers in the Potomac-Raritan-Magothy aquifer system, including alluvial deposits, ranges from 130 to 350 ft/d. Horizontal hydraulic conductivity of the upper and middle undifferentiated aquifer beneath the Swope Oil Superfund site was determined by NUS Corporation (1985) to range from 14 to 1,360 ft/d. In the study area, the average yield of wells (6-in. diameter or larger) screened in the lower aquifer is approximately 1190 gal/min (gallons per minute); specific capacity ranges from 6 to 80 gal/min/ft (gallons per minute per foot) of drawdown. Slug-test data and specific-capacity-test data are presented in Appendixes A and B, and table 3.

GROUND WATER

The most productive source of ground water in the Swope Oil study area is the Potomac-Raritan-Magothy aquifer system. Ground-water withdrawals in the study area are primarily from the lower aquifer in this system (Farlekas and others, 1976). The main source of recharge to the unconfined aquifer system is precipitation. Mean annual precipitation is about 44 in. (Vowinkel and Foster, 1981). Because the terrain is generally flat and covered with permeable, sandy soils, a significant percentage of the precipitation infiltrates into the ground-water reservoir. Induced recharge into the Potomac-Raritan-Magothy aquifer system from the Delaware River and downward leakage of water through confining units toward pumping centers in Camden County are the primary sources of recharge to the confined lower aquifer.

Flow

Prior to development, the natural ground-water flow regimen was influenced by topography. Recharge to the aquifer system was from precipitation on the topographically high areas of the outcrop northeast of Trenton, New Jersey. Ground-water flowed from these areas toward discharge areas that included the Delaware River and, to some extent, the topographic lows or stream valleys that cut across the outcrop (Farlekas and others, 1976).

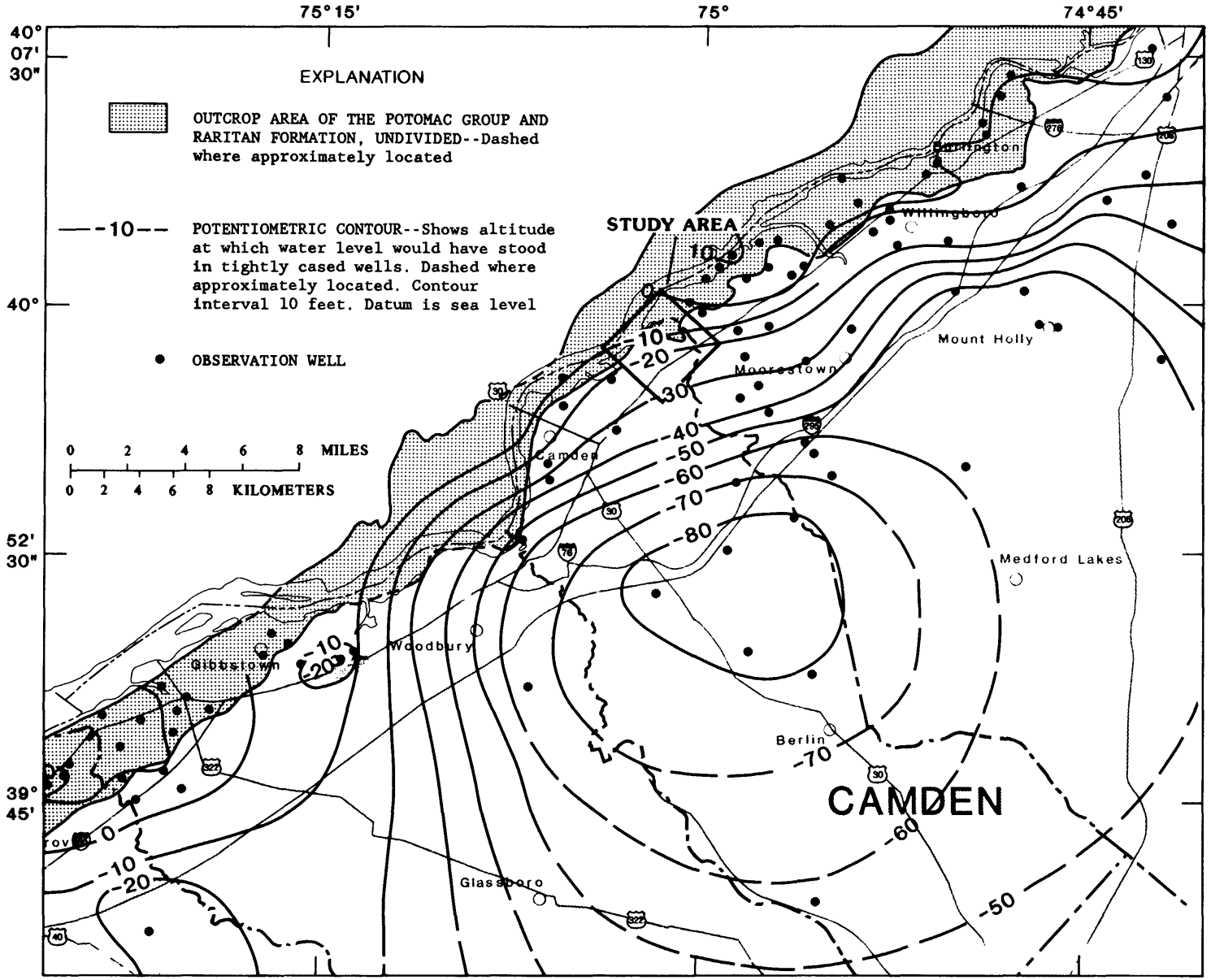
Ground-water diversion has increased steadily since the early 1900's (Farlekas and others, 1976, fig. 15). By 1965, ground-water levels were below sea-level. The large withdrawal of water from the Potomac-Raritan-Magothy aquifer system reversed natural direction of flow, so that ground water flowed toward major cones of depression rather than toward the Delaware River (figs. 4 and 5). Cones of depression are centered in north-central Camden County, where water levels in 1983 were as low as 96 ft below sea level (Eckel and Walker, 1986). Heads in the aquifer system are currently below the stage of the Delaware River.

Table 3.--Summary of selected specific-capacity-test data from the Swope Oil study area

[Data from U.S. Geological Survey Ground-Water Site Inventory; gpm, gallons per minute; --, data not available]

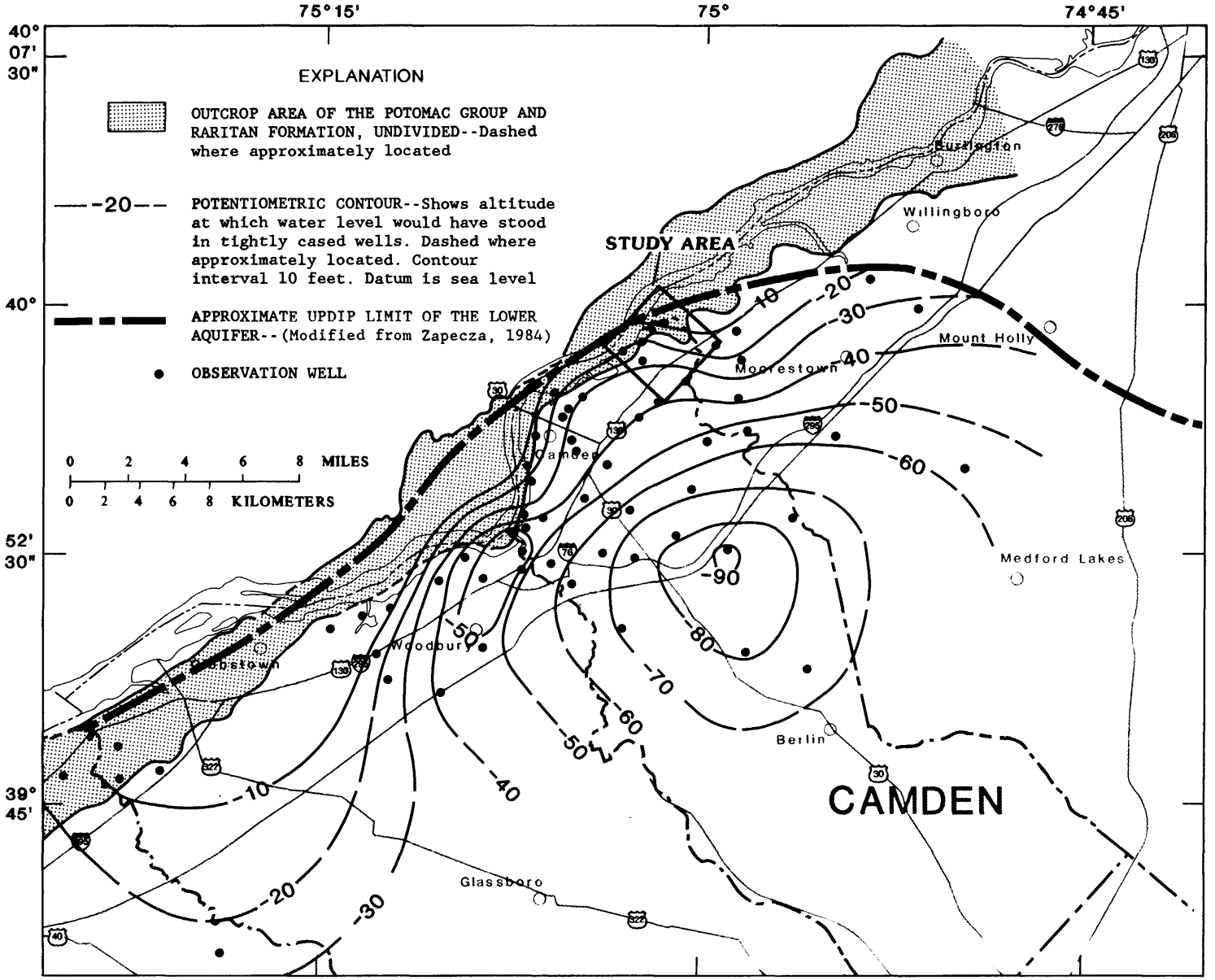
Well number[1]	Owner	Local number	Date of test	Duration (hours)[2]	Discharge (gpm)	Drawdown (feet)	Specific capacity (gpm/foot)
050123	DELA VALLEY WC	DVWC 28	02-24-69	1	1200	38	32
050124	DELA VALLEY WC	STEPHENS DR	02- -70	--	1002	17	59
070332	MCHVL-PNSK WMC	MARION 2	--	8	1005	43	23
070335	MCHVL-PNSK WMC	MARION 1	07-03-57	8	1020	39	26
070346	MCHVL-PNSK WMC	PARK AVE 3A	01-31-40	24	720	20	36
070349	MCHVL-PNSK WMC	PARK AVE 1	11-24-47	8	1005	20	50
070350	MCHVL-PNSK WMC	PARK AVE 2	10-13-43	--	1000	27	37
070359	CAMDEN CITY WD	PUCHACK 5	08-23-24	6	1000	49	20
070362	CAMDEN CITY WD	6-75	01-29-75	8	1287	23	56
070363	CAMDEN CITY WD	PUCHACK 2	--	6	1440	49	29
070364	CAMDEN CITY WD	TEST 1-70	05-01-70	8	542	21	26
070366	CAMDEN CITY WD	PUCHACK 1	10-16-24	6	1400	48	29
070367	CAMDEN CITY WD	PUCHACK 3	05-29-24	6	1175	67	18
070368	CAMDEN CITY WD	DELAIR 1	10-31-30	8	1680	21	80
070369	CAMDEN CITY WD	DELAIR 2	10-31-30	8	1330	75	18
070372	MCHVL-PNSK WCM	NATIONAL HWY 1	07-21-67	8	1000	29	34
070373	CAMDEN CITY WD	MORRIS 6	07-11-32	8	1700	46	59
070374	CAMDEN CITY WD	MORRIS 9	07-03-32	8	1900	28.5	68
070377	CAMDEN CITY WD	MORRIS 7	--	8	1680	32	53
070379	CAMDEN CITY WD	MORRIS 10	11-07-61	3	1450	35	41
070380	KINGSTON TRAP	TRAP RK IND 2	08-25-66	2	200	34.5	6
070381	KINGSTON TRAP	TRAP RK IND 1	09-14-55	2	125	8	17
070382	CAMDEN CITY WD	MORRIS 4A	--	8	1585	28	57
070386	CAMDEN CITY WD	MORRIS 3A	07-28-53	8	1000	34	29
070389	CAMDEN CITY WD	MORRIS 5NA	--	6	1450	46	32
070528	CAMDEN CITY WD	PUCHACK 7	01-29-75	8	1287	23	56
070530	MCHVL-PNSK WMC	4R-A	07-30-79	8	1515	34	45
070533	CADILLAC PET FOODS	1	08-14-82	4	300	10	30
070540	CAMDEN CITY WD	TW-7-79	02-07-79	6	608	12.3	49
070545	CAMDEN CITY WD	MORRIS 11	08-01-79	24	2030	46	44
070602	MCHVL-PNSK WC	NATIONAL HWY 2	09-01-82	8	1236	32	39

[1] Well locations shown on plate 1a.
[2] Estimated.



Base from U.S. Department of Agriculture, Soil Conservation Service, scale 1:250,000

Figure 4.--Potentiometric surface of the middle aquifer and undifferentiated parts of the Potomac-Raritan-Magothy aquifer system, southwestern New Jersey, 1983. (Modified from Eckel and Walker, 1986, plate 2.)



Base from U.S. Department of Agriculture, Soil Conservation Service, scale 1:250,000

Figure 5.--Potentiometric surface of the lower aquifer of the Potomac-Raritan-Magothy aquifer system, southwestern New Jersey, 1983. (Modified from Eckel and Walker, 1986, plate 1.)

The Swope Oil study area is located on the northwestern edge of the cone of depression centered in Camden County. Water levels in the water-table aquifer (upper Cenozoic deposits, the upper aquifer, and upper and middle undifferentiated aquifers of the Potomac-Raritan-Magothy aquifer system) in the study area range from near sea level to greater than 20 ft below sea level. During a water-level-measurement program, conducted by the U.S. Geological Survey in 1986, water levels in the lower aquifer of the Potomac-Raritan-Magothy aquifer system in the study area ranged from 5 to 44 ft below sea level. Water levels in the water-table aquifer beneath the Swope Oil Superfund site during June 1984 to April 1985 ranged from 15.8 to 17.9 ft below sea level (NUS Corporation, 1985). The water level in the lower aquifer at the National Highway 1 well, 300 ft southwest of the site, was reported to be approximately 51 ft below sea level during 1984 (NUS Corporation, 1985), which is significantly lower than that found during the U.S. Geological Survey's 1983 synoptic water-level-measurement program (Eckel and Walker, 1986). It is not reported whether this measurement was taken under static or pumping conditions. Leakage from the water-table aquifer to the lower aquifer is likely the result of large withdrawals from the lower aquifer. The direction and hydraulic gradients of ground-water flow at the Swope Oil Superfund site have not been adequately determined.

Water-Level Fluctuations

Water levels in wells in the study area adjacent to the Delaware River and Pennsauken Creek are believed to show a cyclic fluctuation in response to changes in river levels caused by the ocean tides. Tides produce water-level fluctuations in the water-table aquifers by generating a flux of water into and out of the aquifer. Tides produce water-level fluctuations in confined aquifers by pressure loading.

Rush (1968) reported maximum tidal fluctuations of approximately 3 ft in wells screened in the water-table aquifer adjacent to the Delaware River near the study area. Whether ground water at the Swope Oil Superfund site is influenced by tides is unknown. Water-level fluctuations at the site, if any, would be considerably less than those in wells closer to the Delaware River. Ground-water levels in the study area also fluctuate in response to changes in withdrawal rates of public-supply and industrial wells, to precipitation (only in the water-table aquifer), and to changes in barometric pressure.

Quality

Sample-Collection and Laboratory Analytical Methods

Water-quality data available from 53 selected wells in the study area were compiled from information collected by the U.S. Geological Survey, NUS Corporation, and NJDEP. Sampled wells and the type of analysis performed are listed in table 4. All water-quality data are presented in tables 5, 6, 7, and 8. These data were compiled from all sources without regard to sample-collection methods, laboratory analytical methods, or quality assurance/quality control. Data sources and methodology are referenced.

Methods of collection and analysis of U.S. Geological Survey data follow the accepted U.S. Geological Survey water-sample-collection and laboratory

Table 4.--Wells with water-quality data by type from 1980-87 in the Swope Oil study area

Well number[1]	Local name	Analysis type
CAMDEN CITY WATER DEPARTMENT		
070363	Puchack 2	I, M, P, B/N
070366	Puchack 1	I, M, P
070367	Puchack 3	I, M, P
070368	Delair 1	I, M, P
070369	Delair 2	I, M, P
070370	Delair 3	I, M, P
070373	Morris 6	I, M, P
070379	Morris 10	I, M, P
070386	Morris 3A	I, M, P
070545	Morris 11	I, M, P
070586	Morris 12	I, M, P
070587	Morris 13	I, M, P
070528	Puchack 7	I, M, P
070535	TW-1-79	I, M, P
DELAWARE VALLEY WATER COMPANY		
050123	DVWC 28	I, M, P
050124	Stephens Dr	I, P
MERCHANTVILLE-PENNSAUKEN WATER COMMISSION		
070335	Marion 1	I, M, P
070345	Park Ave 5	I, M, P, B/N
070350	Park Ave 2	I, M, P, B/N
070372	National Hwy 1	I, M, P, B/N
070602	National Hwy 2	I, M, P, B/N
USGS OBSERVATION WELLS		
050826	Tacony-Palm 1s	I
050827	Tacony-Palm 2	I
050829	Tacony-Palm 3s	I
RECREATIONAL WELL		
070559	SWIM 1	I, M, P
SWOPE OIL SUPERFUND SITE		
001	MW-1	I, M, P, B/N
003	MW-3	I, M, P, B/N
004	MW-4	I, M, P, B/N
005	MW-5	I, M, P, B/N
PENNSAUKEN TOWNSHIP LANDFILL		
014	MW-1	I, M, P, B/N
015	MW-2	I, M, P, B/N
016	MW-3	I, M, P, B/N
017	MW-3D	I, M, P, B/N
018	MW-4	I, M, P, B/N
019	MW-5	I, M, P, B/N
020	MW-5D	I, M, P, B/N
021	MW-6	I, M, P, B/N
022	MW-6D	I, M, P, B/N
023	MW-7	I, M, P, B/N
024	MW-8	I, M, P, B/N
025	MW-9	I, M, P, B/N
026	MW-10	I, M, P, B/N
027	MW-11	I, M, P, B/N
028	MW-11D	I, M, P, B/N
029	MW-12	I, M, P, B/N
ALUMINUM SHAPES INCORPORATED		
038	MW-1-55	I, M, P, B/N
039	MW-2-55	I, M, P, B/N
040	MW-3-65	I, M, P, B/N
041	MW-4-60	I, M, P, B/N
REMANUFACTURED ENGINES AND AUTO PARTS		
042	MW-1-55	I, M, P, B/N
043	MW-2-55	I, M, P, B/N
045	MW-3-65	I, M, P, B/N
046	MW-4-60	I, M, P, B/N

[1] Six-digit well numbers are U.S. Geological Survey unique well numbers; well-construction data are stored in the U.S. Geological Survey GWSI data base. Three-digit well numbers were assigned to wells not in the U.S. Geological Survey GWSI data base. Well locations shown on plates 1a and 1b.

I Physical properties and common ions

M Metals

P Purgeable organic compounds

B/N Base/neutral- and acid-extractable organic compounds

Table 8.--Results of analyses with detectable concentrations of base/neutral- and acid-extractable organic compounds in water from wells in the Swope Oil study area

[Dissolved constituents, in micrograms per liter; <, concentration of compound is less than the detection limit of 2 parts per billion; BD, compound not detected - detection limit not specified]

Well number[1]	Local name	Date	Source of data[2]	Naptha-lene	Bis (2-ethylhexl) Phthalate	Di-N Octyl Phthalate
			Swope Oil Superfund Site			
001	MW-1	07-12-84	NUS	BD	<2	<2
003	MW-3	07-12-84	NUS	BD	58	58
005	MW-5	07-12-84	NUS	BD	<8	BD
			Pennsauken Township Landfill			
014	MW-1	02-10-87	NJDEP	BD	30	BD
015	MW-2	02-10-87	NJDEP	BD	68	BD
019	MW-5	02-10-87	NJDEP	BD	16	BD
023	MW-7	02-10-87	NJDEP	BD	65	BD
025	MW-9	02-10-87	NJDEP	BD	38	BD
			Remanufactured Engines and Auto Parts			
042	MW-2	03-17-87	NJDEP	4	BD	BD
042	MW-2	06-11-87	NJDEP	3	BD	BD

[1] Three-digit well numbers were assigned to wells not in the U.S. Geological Survey GWSI data base.

[2] Source of data: NUS Corporation (NUS) and the New Jersey Department of Environmental Protection (NJDEP). Data presented were not verified or examined for quality assurance or quality control.

analytical techniques summarized by Fusillo and others (1984). The U.S. Geological Survey laboratory analytical methods for purgeable organic compounds in water is equivalent to USEPA method 624 (J. Gibs, U.S. Geological Survey, oral commun., 1988) and is described by Wershaw and others (1987). Friedman and Erdman (1982) documented the quality-control program currently used by U.S. Geological Survey laboratories.

NUS Corporation collected water-quality data at the Swope Oil Superfund site during 1985. Samples were analyzed by private laboratories for organic compounds on the USEPA hazardous substance list (table 9). Water-sample-collection methods are described in NUS Corporation (1985).

Water-quality data from areas surrounding the Swope Oil Superfund site were obtained from the NJDEP. Ground water from observation wells was sampled at three permitted waste-disposal sites--Pennsauken Township Landfill, Aluminum Shapes Incorporated, and Remanufactured Engines and Auto Parts Incorporated. Analyses of ground-water samples were performed by private laboratories. Water-sample collection and laboratory analytical methods are described in New Jersey Pollutant Discharge Elimination System (NJPDES) permits (G. Haag, New Jersey Department of Environmental Protection, oral commun., 1988), and NJDEP (1987). NJPDES permits specify gas chromatograph and mass spectroscopy analysis for organic compounds.

Contamination

Based on a review of ground-water-quality data available for the study area from 1980 to 1987, the water-table and confined aquifers are contaminated at several locations. Ground water with concentrations of metals and purgeable organic compounds (POCs) that exceed the USEPA MCL (maximum contaminant level) limits and NJDEP recommended drinking-water criteria is considered to be contaminated. Maximum concentrations and drinking-water limits for metals and POCs are summarized in table 10.

Water in three supply wells operated by the Camden City Water Department in the Puchack field and screened in the lower aquifer of the Potomac-Raritan-Magothy aquifer system contains concentrations of chromium (maximum concentration 390 μg/L) and POCs (maximum total POCs 64 μg/L) that exceed the USEPA MCL drinking-water regulation (U.S. Environmental Protection Agency, 1977a) and the NJDEP recommended drinking-water criteria (table 10). Water in two supply wells operated by the Merchantville-Pennsauken Water Commission and screened in the lower aquifer of the Potomac-Raritan-Magothy aquifer system contains concentrations of POCs that exceed NJDEP recommended drinking-water criteria--National Highway well 1 and the Park Avenue well 2 (table 7). During 1988, total POCs concentrations in water from National Highway well 1 are approximately 300 μg/L (R. Brown, Merchantville-Pennsauken Water Commission, oral commun., 1988).

Water in observation wells screened in the water-table aquifer at four waste-disposal sites--Swope Oil Superfund site, Pennsauken Township landfill, Aluminum Shapes Inc., and Remanufactured Engines and Auto Parts--contains concentrations of chromium, lead, cadmium, and mercury, and POCs that exceed the USEPA MCL and RMCL (recommended maximum contaminant level) and the NJDEP recommended drinking-water criteria (table 10). Water in observation well 11-D, well number 028 (pl. 1a) at the Pennsauken Township

Table 9.--U.S. Environmental Protection Agency hazardous substance list

[The following compounds comprise the U.S. Environmental Protection Agency Hazardous Substance List, from NUS Corporation (1986)]

ORGANICS

acenaphthene
acenaphthylene
acetone
aldrin
anthracene
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
benzene
benz(a)anthracene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzoic acid
benzo(ghi)perylene
benzo(a)pyrene
benzyl alcohol
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
bromodichloromethane
bromomethane
4-bromophenyl phenyl ether
butyl benzyl phthalate
carbon disulfide
carbon tetrachloride
chlordane
p-chloroaniline
chlorobenzene
chlorodibromomethane
chloroethane
2-chloroethyl vinyl ether
chloroform
chloromethane
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
ortho-cresol
para-cresol
4,4'DDD
4,4'DDE
4,4'DDT
dibenzo(a,h)anthracene
dibenzofuran
di-n-butyl phthalate
m-dichlorobenzene
o-dichlorobenzene
3,3'-dichlorobenzidine
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
dichloromethane
2,4-dichlorophenol
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dieldrin
diethyl phthalate
2,4-dimethylphenol
dimethyl phthalate
4,6-dinitro-o-cresol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-n-octyl phthalate
di-n-propylnitrosamine
endosulfan sulfate
endosulfan I (alpha)
endosulfan II (beta)
endrin
endrin ketone
ethyl benzene
fluoranthene
fluorene
heptachlor
heptachlor epoxide
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
2-hexanone
indeno(1,2,3-cd)pyrene
isophorone
methoxychlor
methyl ethyl ketone
2-methylnaphthalene
4-methyl-2-pentanone
2-methylphenol
4-methylphenol
napthalene
m-nitroaniline
o-nitroaniline
p-nitroaniline
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitrosodiphenylamine
pentachlorophenol
phenanthrene
phenol
pyrene
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
toxaphene
tribromomethane
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
2,4,5-trichlorophenol
2,4,6-trichlorophenol
vinyl acetate
vinyl chloride
total xylenes

METALS

aluminum
antimony
arsenic
barium
beryllium
cadmium
calcium
chromium
cobalt
copper
iron
lead
magnesium
manganese
mercury
nickel
potassium
selenium
silver
sodium
thallium
tin
vanadium
zinc

INORGANICS

cyanide

Table 10.--Maximum concentrations of metals and purgeable organic compounds in ground water in the Swope Oil study area, grouped by water purveyors and waste-disposal sites

[Drinking-water standards and maximum concentrations in micrograms per liter; --, water-quality data not available; BD, concentration of the constituent is less than the detection limit; (#), number of analyses that exceed drinking-water limits; SE, recommended drinking-water standards have not been established]

Metals and purgeable organic compounds detected in ground water	Drinking-water standards		Maximum concentrations and number of analyses that exceed drinking-water limits		
	USEPA maximum contaminant levels[1]	NJDEP[2]	Camden City Water Dept.	Delaware Valley Water Company	Merchantville-Pennsauken Water Commission
Aluminum	SE	SE	100	--	100
Arsenic	50	50	4	1	1
Barium	1,000	1,000	110	61	60
Berylium	SE	SE	3	BD	5
Cadmium	10	10	7	2	1
Chromium (Hexavalent)[3]	50	50	390(4)	1	BD
Cobalt	SE	SE	170	--	6
Copper[4]	1,000	SE	51	25	110
Lead	50	50	20	--	20
Mercury	2	2	0.48	--	1.9
Nickel	SE	SE	20	--	BD
Selenium	10	10	--	--	2
Silver	50	50	--	--	--
Thalium	SE	SE	BD	--	BD
Zinc[4]	5,000	SE	295	56	57
Benzene	SE	1	5(1)	BD	--
Bromoform	SE	SE	BD	BD	BD
Carbon Tetrachloride	SE	2	BD	BD	18(1)
Chlorobenzene	SE	4	10(1)	BD	BD
Chloroform	SE	SE	BD	BD	BD
Ethyl Benzene	SE	SE	BD	BD	BD
Methyl Chloride	SE	SE	BD	--	BD
Acrolein	SE	SE	--	--	--
1,3-Dichloropropene	SE	SE	BD	BD	BD
Methylene Chloride	SE	2	8(1)	BD	13(1)
Tetrachloroethylene	SE	1	5(2)	BD	5(1)
Toluene	SE	SE	6	BD	BD
Trichloroethylene	SE	1	64(6)	BD	150(8)
Vinyl Chloride	SE	5	4.6	BD	BD
1,1-Dichloroethylene	SE	2	6(2)	BD	BD
1,1-Dichloroethane	SE	SE	BD	BD	6
1,1,1-Trichloroethane	SE	26	BD	BD	14(1)
1,1,2,2-Tetrachloroethane	SE	SE	BD	BD	BD
1,2-Dichloroethane	SE	2	BD	BD	2
1,2-Dichloropropane	SE	SE	BD	BD	BD
Cis and Trans 1,2-Dichloroethylene	SE	10	25(2)	BD	53(2)
1,3-Dichlorobenzene	SE	600	BD	--	--
1,4-Dichlorobenzene	SE	6	BD	--	--
1,2-Dichlorobenzene	SE	600	BD	--	--
Total purgeable organic[5] compound--maximum concentration for a single well	SE	50	64(1)	BD	[6]162(6)

1 Taken from U.S. Environmental Protection Agency (1986).
2 Taken from U.S. Environmental Protection Agency (1977a), and proposed by the N.J. Department of Environmental Protection (Baker and Hamill, written commun., 1987).
3 NUS reported total dissolved chromium, refer to table 6.
4 U.S. Environmental Protection Agency recommended maximum contaminant level (U.S. Environmental Protection Agency, 1977b).
5 The number of purgeable organic compounds analyzed for in water samples is variable.
6 During 1988, total purgeable organic compounds in water from National Highway well 1 are approximately 300 micrograms per liter (Dick Brown, Merchantville-Pennsauken Water Commission, oral commun., 1988).

Table 10.--Maximum concentrations of metals and purgeable organic compounds in ground water in the Swope Oil study area, grouped by water purveyors and waste-disposal sites--Continued

[Drinking-water standards and maximum concentrations in micrograms per liter; --, water-quality data not available; BD, concentration of the constituent is less than the detection limit; (#), number of analyses that exceed drinking-water limits; SE, recommended drinking-water standards have not been established]

Metals and purgeable organic compounds detected in ground water	Maximum concentrations and number of analyses that exceed drinking-water standards				
	Recreational Well	Swope Oil Superfund site	Pennsauken Township Landfill	Aluminum Shapes Incorporated	Remanufactured Engines and Auto Parts
Aluminum	--	18,900	90	421	--
Arsenic	--	16	8	9	--
Barium	70	131	200	390	--
Berylium	BD	2	1	--	33
Cadmium	1	1.1	8	10	17.(3)
Chromium (Hexavalent)	--	64(2)	1100(2)	6	56.(1)
Cobalt	8	16	40	--	--
Copper[3]	33	40	55	--	163
Lead	--	90(3)	47	--	89.(4)
Mercury	--	0.71	4.5(1)	4	--
Nickel	--	25	--	104	128
Selenium	--	--	8.6	--	--
Silver	--	--	--	--	11
Thalium	--	BD	--	--	1500
Zinc[3]	77	152	200	86	147
Benzene--	--	--	190(11)	72(4)	300(1)
Bromoform	--	--	BD	5	--
Carbon Tetrachloride	BD	--	24(3)	--	--
Chlorobenzene	--	BD	72(10)	48(3)	BD
Chloroform	BDK	--	7,600	BD	BD
Ethyl Benzene	--	--	300	180	BD
Methyl Chloride	--	--	10	BD	10
Acrolein	--	--	BD	10	BD
1,3-Dichloropropene	--	--	47	BD	BD
Methylene Chloride	BD	--	15(7)	BD	20(1)
Tetrachloroethylene	BD	42(3)	59(8)	67(1)	BD
Toluene	BD	BD	38	BD	400
Trichloroethylene	BD	BD	50(5)	BD	3,000(6)
Vinyl Chloride	--	BD	37(5)	25(1)	BD
1,1-Dichloroethylene	--	13(3)	BD	BD	310(2)
1,1-Dichloroethane	BD	BD	83	BD	1,000
1,1,1-Trichloroethane	BD	53(3)	16	BD	4,900(3)
1,1,2,2-Tetrachloroethane	--	BD	35	BD	BD
1,2-Dichloroethane	BD	BD	BD	BD	BD
1,2-Dichloropropane	--	BD	BD	BD	300
Cis and Trans 1,2-Dichloroethylene	BD	8	170(10)	115(2)	3,300(3)
1,3-Dichlorobenzene	--	BD	8	BD	BD
1,4-Dichlorobenzene	--	BD	17(2)	17(1)	--
1,2-Dichlorobenzene	--	--	63	BD	52
Total purgeable organic compounds--maximum concentration for a single well	BD	108(3)	451(10)	145(4)	35,140(5)

landfill, which is screened in the lower aquifer of the Potomac-Raritan-Magothy aquifer system, contains concentrations of POCs that exceed NJDEP recommended drinking-water criteria. The maximum concentration of total POCs[1] in water from wells at each waste-disposal site ranges from 108 μg/L (micrograms per liter) at the Swope Oil Superfund site to 35,140 μg/L at Remanufactured Engines and Auto Parts. Water in observation wells screened in the water-table aquifer at the Swope Oil Superfund site, Pennsauken Township landfill, and Remanufactured Engines and Auto Parts also contains base/neutral- and acid-extractable organic compounds.

At the Swope Oil Superfund site, four observation wells are screened in the water-table aquifer (upper and middle undifferentiated aquifer of the Potomac-Raritan-Magothy aquifer system). During 1984, concentrations of chromium and lead exceeded the USEPA MCL in two observation wells. The maximum concentration of chromium and lead in water from these wells is 64 μg/L and 90 μg/L. Concentrations of POCs in three wells exceed NJDEP recommended drinking-water criteria. Total POCs in water from these three wells range from 66 μg/L to 108 μg/L. POCs detected are 1,1,1-trichloroethylene, tetrachloroethylene, trichloroethylene, and 1,1-dichloroethylene (table 7). In addition, base/neutral- and acid-extractable organic compounds were detected in well MW-3 (pl. 1a, well number 003).

DATA BASE

Well Inventory

Table 11 presents selected information on 98 wells and 16 test borings in the Swope Oil study area (pl. 1a). This table includes data on construction, drillers' and geologists' logs, geophysical logs, water levels, well yield and aquifer tapped. Data on 64 wells and test borings were obtained from the U.S. Geological Survey GWSI data base, 41 were obtained from NJDEP files, and five were obtained from NUS Corporation (1985). Copies of selected drillers' and geologists' logs and geophysical logs made in 68 wells and 12 test borings are shown in Appendixes C and D. Many geologists' logs are based on cored lithologic samples inspected by geologists. Gamma-ray, single-point resistance and spontaneous potential logs are included in Appendix D. Because the geophysical logs have been reduced in size, some details may be missing. Copies of the original logs are available for public inspection at the New Jersey District office of the U.S. Geological Survey.

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[1] The number of POCs analyzed in water samples is variable.

Ground-Water Levels

Ground-water levels measured in 14 wells in the study area by the U.S. Geological Survey during regional synoptic ground-water measurement programs in 1984 and 1986 are listed in table 12. Ground-water levels measured in five observation wells by NUS Corporation during 1984 and 1985 at the Swope Oil Superfund site are listed in table 13. Water levels were measured using the wetted-steel-tape method or electric tape.

Accuracy of ground-water levels in this report depends on the method used to determine land-surface elevation at a well, and on the method used to measure water levels. Land-surface elevation at wells in the U.S. Geological Survey water-level network in the study area was estimated by visual inspection of U.S. Geological Survey 7 1/2-minute quadrangle maps that have a 10-ft contour interval. Land-surface elevation for wells at the Swope Oil Superfund site and at the other waste disposal sites were measured to within 0.01 ft by land surveyors. The U.S. Geological Survey ground-water-level measurements are less accurate than measurements taken at the Swope Oil Superfund site due to the inherent limitations of estimating land-surface elevations from a map.

Specific-Capacity and Slug Tests

Specific-capacity-test results and specific capacities for 30 wells in the study area with diameters equal to or greater than 6 in. are listed in table 3. Data are available only for the lower aquifer of the Potomac-Raritan-Magothy aquifer system. Specific capacity depends on the hydraulic characteristics of an aquifer and on the construction of a well. Specific capacity may be used to estimate the hydraulic conductivity of an aquifer (Heath, 1987).

Data from 14 slug tests conducted in observation wells at the Swope Oil Superfund site and the Pennsauken Township Landfill are shown in Appendix A and are listed in Appendix B. Slug tests provide information on the horizontal hydraulic conductivity of an aquifer. Hydraulic conductivities derived from slug tests are most representative of the hydraulic properties of the material adjacent to the well screen. Because slug tests stress a relatively small volume of the aquifer, they are less likely to include the pathways that control the effective hydraulic conductivity of the system (B. P. Sargent, U.S. Geological Survey, written commun., 1987).

NUS Corporation conducted slug tests in four wells screened in the water-table aquifer (upper and middle undifferentiated aquifer of the Potomac-Raritan-Magothy aquifer system) at the Swope Oil Superfund site using the vacuum method. These wells are screened below the water table. The water levels in each observation well were raised by creating a vacuum in the well. The vacuum was maintained for a short time so that the water level could stabilize. When the vacuum was released, a pressure transducer recorded water-level changes (NUS Corporation, 1985).

Woodward-Clyde Consultants conducted rising-head and falling-head slug tests in 10 wells screened in the water table and confined aquifers of the Potomac-Raritan-Magothy aquifer system at the Pennsauken Landfill. The water levels in each well were raised or lowered by adding a slug of water

Table 12.--Water levels in wells in the Swope Oil study area measured by the U.S. Geological Survey, 1984 and 1986

[ft, feet; mo/day, month and day; --, data not available]

Well number[1]	Owner	Local number	Altitude of land surface (ft)	Method of measurement		Water level			
						1984		1986	
				Land surface[2]	Water levels[3]	Altitude (ft)	Date (mo/day)	Altitude (ft)	Date (mo/day)
050123	Dela Valley WC	DVWC 28	25	M	S	-7	11/14	-11	8/27
070348	Mchvl-Pnsk WC	Park Ave 3	25	M	T	-35	11/19	-39	8/26
070359	Camden City WD	Puchack 5	30	M	S	-25	11/28	-30	8/28
070377	Camden City WD	Morris 7	10	L	S	-12	11/26	--	--
070379	Camden City WD	Morris 10	16	M	S	-10	11/28	-13	8/28
070382	Camden City WD	Morris 4A	8	M	--	--	--	-9	8/28
070390	Camden City WD	Morris 1	9	M	T	-3	11/28	-5	8/28
070528	Camden City WD	Puchack 7	20	M	S	-29	11/28	-33	8/28
070533	Cadillac Pet Food	1	8	M	--	-14	1/30	--	--
070535	Camden City WD	TW-1-79	10	M	S	-24	11/28	-23	8/28
070537	Camden City WD	TW-4-79	10	M	--	--	--	-30	8/28
070538	Camden City WD	TW-5-79	10	M	S	-39	11/28	-35	8/28
070539	Camden City WD	TW-6-79	10	M	S	-47	11/28	-44	8/28
070540	Camden City WD	TW-7-79	10	M	T	-29	11/28	-29	8/28

1 Six-digit well numbers are USGS unique well numbers; well construction details are stored in the USGS GWSI data base. Well locations shown on plate 1a.

2 Method of altitude of land surface measurement: (M) taken from USGS 7-1/2-minute quadrangle map with a 10-foot contour interval; (L) leveled in with surveying equipment.

3 Method of water-level measurement(s): (S) wetted-steel-tape; (T), electric tape.

4 Feet below sea level.

Table 13.--Water levels in wells at the Swope Oil Superfund site, 1984 and 1985

[Data from NUS Corporation, 1985; ft, feet; mo/day, month and day; --, data not available]

Well number[1]	Owner	Local number	Altitude of land surface (ft)	Water level[2,3,4] 1984 Altitude (ft)	1984 Date (mo/day)	1985 Altitude (ft)	1985 Date (mo/day)
001	Swope Oil Co.	MW-1	63.28	-16.18	06/13	-16.74	01/31
001	Swope Oil Co.	MW-1	63.28	-16.27	06/19	-17.52	03/05
001	Swope Oil Co.	MW-1	63.28	-16.05	06/27	-17.86	04/01
001	Swope Oil Co.	MW-1	63.28	-16.49	06/28	--	--
001	Swope Oil Co.	MW-1	63.28	-16.17	07/01	--	--
001	Swope Oil Co.	MW-1	63.28	-16.07	07/04	--	--
001	Swope Oil Co.	MW-1	63.28	-15.97	07/11	--	--
001	Swope Oil Co.	MW-1	63.28	-15.94	10/27	--	--
002	Swope Oil Co.	MW-2	63.39	-15.94	07/11	-16.92	01/31
002	Swope Oil Co.	MW-2	63.39	-15.79	10/27	-17.54	03/05
002	Swope Oil Co.	MW-2	63.39	--	--	-17.81	04/01
003	Swope Oil Co.	MW-3	64.10	-16.27	06/27	-16.98	01/31
003	Swope Oil Co.	MW-3	64.10	-16.64	06/28	-17.68	03/05
003	Swope Oil Co.	MW-3	64.10	-16.35	07/01	-17.86	04/01
003	Swope Oil Co.	MW-3	64.10	-16.28	07/04	--	--
003	Swope Oil Co.	MW-3	64.10	-16.15	07/11	--	--
003	Swope Oil Co.	MW-3	64.10	-15.98	10/27	--	--
004	Swope Oil Co.	MW-4	59.77	-16.13	06/13	-16.78	01/31
004	Swope Oil Co.	MW-4	59.77	-16.18	06/19	-17.51	03/05
004	Swope Oil Co.	MW-4	59.77	-16.13	06/27	-17.90	04/01
004	Swope Oil Co.	MW-4	59.77	-16.53	06/28	--	--
004	Swope Oil Co.	MW-4	59.77	-16.15	07/01	--	--
004	Swope Oil Co.	MW-4	59.77	-16.10	07/04	--	--
004	Swope Oil Co.	MW-4	59.77	-15.96	07/11	--	--
004	Swope Oil Co.	MW-4	59.77	-15.80	10/27	--	--
005	Swope Oil Co.	MW-5	63.27	-16.01	07/01	-16.81	01/31
005	Swope Oil Co.	MW-5	63.27	-15.94	07/04	-17.40	03/05
005	Swope Oil Co.	MW-5	63.27	-15.81	07/11	-17.78	04/01
005	Swope Oil Co.	MW-5	63.27	-15.94	10/27	--	--

1 Three-digit well numbers were assigned to wells not in the USGS GWSI data base. Well locations shown on plate 1b.

2 Water levels were measured using the electric-tape method and/or the wetted-steel-tape method.

3 Feet below sea level.

4 Data presented were not verified or examined for quality assurance or quality control.

to or removing a slug of water from the well. A pressure transducer coupled to a data logger recorded water-level changes (Woodward-Clyde Consultants, 1988).

Ground-Water Withdrawals

Ground-water withdrawals in the study area during 1973-87 are presented in table 14. Monthly and annual withdrawals are listed for individual public-supply wells or well fields. In the study area, well fields rather than individual wells are generally metered for withdrawals. Withdrawals from industrial wells in the study area are currently unavailable (G. M. Farlekas, U.S. Geological Survey, oral commun., 1988). Withdrawal data prior to the 1985 RI/FS study conducted at the Swope Oil Superfund site are presented for historical perspective.

Chemical Analyses

Results of 183 chemical analyses of water from 49 wells in the Swope Oil Superfund study area are shown in tables 5 through 8. These analyses include 44 chemical analyses of water collected from 29 observation wells at four waste disposal sites and three public supply wells during 1984-87 by consultants for the USEPA and NJDEP; and 139 chemical analyses of water collected from 23 wells during 1980-87 by the U.S. Geological Survey. Data listed in these tables are physical properties and common ions (table 5); trace metals (table 6); purgeable organic compounds (table 7); and base/neutral- and acid-extractable organic compounds (table 8).

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Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area

[Dissolved constituents, in milligrams per liter except as noted; deg C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; --, data not available]

Well number[1]	Local name	Date	Source of data[2]	Remarks	Temperature water (deg C)	Specific conductance lab (µS/cm)	pH field (standard units)
			CAMDEN CITY WATER DEPARTMENT				
070363	PUCHACK 2	04-10-84	NUS	3	--	253	6.9
070363	PUCHACK 2	04-10-84	NUS	3,4	--	270	6.8
070363	PUCHACK 2	04-10-84	NUS	4	--	--	--
070363	PUCHACK 2	07-10-84	NUS		--	--	--
070363	PUCHACK 2	09-15-82	USGS		14.5	351	5.9
070366	PUCHACK 1	07-13-82	USGS		14.0	285	6.4
070367	PUCHACK 3	07-21-80	USGS		16.0	240	6.3
070367	PUCHACK 3	08-06-85	USGS		14.5	186	5.6
070368	DELAIR 1	07-22-80	USGS		15.5	278	6.2
070368	DELAIR 1	09-15-82	USGS		15.0	269	6.8
070368	DELAIR 1	01-03-83	USGS		15.0	249	6.9
070368	DELAIR 1	03-02-83	USGS		15.0	252	6.8
070368	DELAIR 1	05-09-83	USGS		15.0	255	6.9
070368	DELAIR 1	07-12-83	USGS		15.5	258	6.9
070369	DELAIR 2	09-15-82	USGS		15.0	267	6.9
070369	DELAIR 2	01-03-83	USGS		14.5	235	7.2
070369	DELAIR 2	03-02-83	USGS		15.0	231	7.0
070369	DELAIR 2	05-09-83	USGS		14.5	254	7.2
070369	DELAIR 2	07-12-83	USGS		15.5	245	7.0
070369	DELAIR 2	09-21-83	USGS		15.0	225	7.1
070369	DELAIR 2	11-29-83	USGS		13.0	212	6.8
070369	DELAIR 2	01-17-84	USGS		14.5	222	7.1
070369	DELAIR 2	03-14-84	USGS		15.0	221	7.2
070369	DELAIR 2	05-23-84	USGS		15.5	243	6.8
070369	DELAIR 2	07-25-84	USGS		17.0	236	6.9
070369	DELAIR 2	09-19-84	USGS		15.5	235	7.0
070369	DELAIR 2	11-28-84	USGS		14.5	214	6.9
070369	DELAIR 2	01-16-85	USGS		15.0	222	6.9
070369	DELAIR 2	03-28-85	USGS		16.0	238	7.0
070369	DELAIR 2	05-23-85	USGS		16.0	249	6.7
070369	DELAIR 2	09-11-85	USGS		15.0	262	7.2
070369	DELAIR 2	07-17-85	USGS		16.0	268	7.1
070370	DELAIR 3	09-15-82	USGS		15.0	200	6.9
070370	DELAIR 3	01-03-83	USGS		14.5	204	7.2
070370	DELAIR 3	03-02-83	USGS		15.0	213	7.1
070370	DELAIR 3	05-09-83	USGS		15.0	221	6.6
070370	DELAIR 3	07-12-83	USGS		16.0	208	7.0
070370	DELAIR 3	09-21-83	USGS		15.0	181	6.9
070370	DELAIR 3	11-29-83	USGS		14.0	201	6.9
070370	DELAIR 3	01-17-84	USGS		14.5	215	7.0
070370	DELAIR 3	03-14-84	USGS		15.5	224	7.3
070370	DELAIR 3	05-23-84	USGS		16.5	218	6.7
070370	DELAIR 3	07-25-84	USGS		17.0	201	7.0
070370	DELAIR 3	09-19-84	USGS		15.5	184	7.0
070370	DELAIR 3	11-28-84	USGS		14.0	174	6.8
070373	MORRIS 6	07-22-80	USGS		14.5	268	5.9
070379	MORRIS 10	07-21-80	USGS	5	14.5	456	6.6
070379	MORRIS 10	07-17-85	USGS		15.0	289	7.0
070386	MORRIS 3A	07-22-80	USGS		15.5	744	6.1
070386	MORRIS 3A	07-12-82	USGS		15.0	640	6.5
070386	MORRIS 3A	08-06-85	USGS		14.5	639	6.4
070545	MORRIS 11	07-12-82	USGS		14.5	251	6.7
070545	MORRIS 11	01-03-83	USGS		14.5	242	6.8
070545	MORRIS 11	03-02-83	USGS		14.0	252	6.5
070545	MORRIS 11	05-09-83	USGS		14.0	255	6.4
070545	MORRIS 11	07-12-83	USGS		14.5	260	6.7
070545	MORRIS 11	09-21-83	USGS		15.0	261	6.7
070545	MORRIS 11	11-29-83	USGS		13.0	253	6.6
070545	MORRIS 11	01-17-84	USGS		14.5	256	6.6
070545	MORRIS 11	03-14-84	USGS		14.0	253	6.6

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; μg/L, micrograms per liter; --, data not available]

Well number[1]	Sulfate	Sodium	Potassium	Calcium	Magnesium	Iron (μg/L)	Manganese (μg/L)	Chloride
				CAMDEN CITY WATER DEPARTMENT				
070363	36	25	4.4	19	10	--	1,100	40
070363	37	22.7	4.41	16.4	9.8	--	1,192	37
070363	40.6	24.2	4.6	18.8	10.9	137	284	37.5
070363	34	18.1	2.8	13.9	7.3	134	279	27.1
070363	34	18.3	2.9	14.2	7.5	137	284	26.5
070366	27	19	2.7	19	8.3	220	4,300	23
070367	28	15	3.1	13	6.4	49	1,500	23
070367	22	12	2.8	11	5.5	6	170	21
070368	26	15	2.5	18	6.7	7,400	3,600	21
070368	31	16	2.2	19	6.4	7,000	3,200	23
070368	28	16	2.2	18	6.3	6,700	3,300	19
070368	26	16	2.4	19	6.4	6,800	3,200	21
070368	31	16	2.4	19	6.5	6,900	3,300	22
070368	24	16	2.3	20	6.7	7,500	3,300	22
070369	16	18	2.8	16	5.2	12,000	1,800	30
070369	18	17	2.7	15	4.9	10,000	1,700	23
070369	23	17	2.8	16	5.0	10,000	1,800	24
070369	21	22	3.1	18	5.7	11,000	1,900	28
070369	31	17	3.0	17	5.2	11,000	2,000	36
070369	20	16	2.7	15	5.0	9,300	1,900	22
070369	21	15	2.5	14	4.6	9,100	1,700	20
070369	21	14	2.7	14	4.7	9,500	1,800	22
070369	24	15	2.7	15	5.0	9,900	1,800	23
070369	33	15	2.9	16	5.1	11,000	1,900	25
070369	29	14	2.7	16	5.2	10,000	2,000	26
070369	38	16	2.6	15	5.1	10,000	1,900	24
070369	20	15	2.6	15	5.0	9,400	1,800	22
070369	21	14	2.7	15	5.1	9,100	1,800	21
070369	39	15	2.4	17	5.4	9,400	1,800	26
070369	19	18	2.3	18	6.2	11,000	2,000	30
070369	28	17	2.9	18	6.0	10,000	2,000	32
070369	32	18	3.5	18	6.0	11,000	1,900	34
070370	26	14	1.8	14	4.9	6,900	1,000	18
070370	23	13	2.0	15	5.2	7,000	1,200	17
070370	27	14	2.3	16	5.4	6,800	1,200	20
070370	43	16	2.3	18	5.9	7,500	1,300	22
070370	26	14	2.2	16	5.2	7,200	1,200	20
070370	22	12	2.1	15	4.8	6,500	1,100	15
070370	24	13	2.0	16	5.2	--	1,000	17
070370	28	12	2.2	17	5.5	6,900	1,300	19
070370	34	14	2.3	18	5.7	6,800	1,300	21
070370	35	14	2.3	16	5.3	7,000	1,200	20
070370	34	12	2.1	15	5.0	6,600	1,100	20
070370	34	12	2.0	13	4.4	6,000	960	13
070370	22	11	2.3	14	4.6	5,800	980	15
070373	30	16	4.9	16	7.0	5,600	4,300	23
070379	5.3	27	19	20	7.9	25,000	5,700	51
070379	2.3	12	5.6	20	8.2	29,000	7,400	22
070386	38	--	9.2	--	--	--	--	43
070386	37	33	9.8	40	26	28,000	9,200	30
070386	80	25	12	42	25	49,000	6,100	35
070545	24	15	2.3	18	7.3	5,200	3,300	20
070545	22	14	2.8	17	7.1	4,800	3,300	20
070545	24	14	2.9	17	6.9	4,800	3,400	21
070545	24	15	2.9	20	7.7	5,300	3,800	21
070545	23	14	2.9	20	7.6	5,300	3,800	23
070545	23	14	2.8	20	7.9	6,000	3,800	21
070545	24	14	2.6	19	7.3	5,800	3,600	21
070545	25	13	2.6	19	7.4	5,900	3,800	19
070545	28	13	2.6	19	7.4	6,200	3,900	19

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; deg C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; --, data not available]

Well number[1]	Local name	Date	Source of data[2]	Remarks	Temperature water (deg C)	Specific conductance lab (µS/cm)	pH field (standard units)
			CAMDEN CITY WATER DEPARTMENT--Continued				
070545	MORRIS 11	05-23-84	USGS		15.0	268	6.5
070545	MORRIS 11	07-25-84	USGS		14.0	276	6.5
070545	MORRIS 11	09-19-84	USGS		14.0	270	6.5
070545	MORRIS 11	11-28-84	USGS		14.0	249	6.4
070545	MORRIS 11	08-06-85	USGS		14.5	256	6.6
070586	MORRIS 12	07-27-81	USGS		14.5	260	6.6
070586	MORRIS 12	07-13-82	USGS		15.5	202	7.2
070586	MORRIS 12	01-03-83	USGS		14.0	202	7.2
070586	MORRIS 12	03-02-83	USGS		14.0	216	6.9
070586	MORRIS 12	05-09-83	USGS		14.5	207	6.9
070586	MORRIS 12	07-12-83	USGS		15.5	191	7.1
070586	MORRIS 12	09-21-83	USGS		15.0	182	7.0
070586	MORRIS 12	11-29-83	USGS		13.0	203	7.0
070586	MORRIS 12	01-17-84	USGS		14.0	211	6.9
070586	MORRIS 12	03-14-84	USGS		15.5	210	7.0
070586	MORRIS 12	05-23-84	USGS		16.0	212	6.8
070586	MORRIS 12	07-25-84	USGS		15.5	198	7.0
070586	MORRIS 12	09-19-84	USGS		14.5	184	7.1
070586	MORRIS 12	11-28-84	USGS		13.5	186	6.9
070586	MORRIS 12	07-17-85	USGS		15.5	206	7.1
070587	MORRIS 13	07-27-81	USGS		15.5	--	--
070587	MORRIS 13	01-03-83	USGS		14.0	209	7.1
070587	MORRIS 13	03-02-83	USGS		15.0	218	6.9
070587	MORRIS 13	05-09-83	USGS		16.0	209	7.0
070587	MORRIS 13	07-12-83	USGS		16.0	190	7.2
070587	MORRIS 13	09-21-83	USGS		14.0	180	7.1
070587	MORRIS 13	11-29-83	USGS		13.0	210	7.0
070587	MORRIS 13	01-17-84	USGS		14.5	225	6.9
070587	MORRIS 13	03-14-84	USGS		15.5	214	7.0
070587	MORRIS 13	05-23-84	USGS		16.0	221	6.8
070587	MORRIS 13	07-25-84	USGS		14.5	202	7.0
070587	MORRIS 13	09-19-84	USGS		13.0	197	7.1
070587	MORRIS 13	11-28-84	USGS		14.0	205	6.9
070528	PUCHACK 7	07-13-82	USGS		13.0	168	5.4
070528	PUCHACK 7	08-06-85	USGS		13.5	82	5.1
070528	PUCHACK 7	08-06-85	USGS	4	13.5	80	5.1
070528	PUCHACK 7	08-06-85	USGS	4	13.5	83	5.1
070535	TW-1-79	07-28-80	USGS	5	17.0	212	6.7
070539	TW-6-79	01-05-83	USGS		14.5	220	7.2
070539	TW-6-79	03-04-83	USGS		14.5	248	6.8
070539	TW-6-79	05-10-83	USGS		14.5	260	6.8
070539	TW-6-79	07-12-83	USGS		15.5	385	6.6
070539	TW-6-79	09-21-83	USGS		15.5	376	6.8
070540	TW-7-79	01-05-83	USGS		14.5	212	7.2
070540	TW-7-79	03-04-83	USGS		14.5	222	7.0
070540	TW-7-79	05-10-83	USGS		14.5	221	7.0
070540	TW-7-79	07-12-83	USGS		15.0	221	6.6
070540	TW-7-79	09-21-83	USGS	3	15.0	218	6.7
070540	TW-7-79	01-26-84	USGS		14.5	214	6.7
070540	TW-7-79	03-14-84	USGS		15.0	204	7.0
070540	TW-7-79	05-23-84	USGS		15.5	209	6.6
070540	TW-7-79	07-25-84	USGS		15.0	227	6.8
070540	TW-7-79	09-20-84	USGS		14.5	233	6.6
070540	TW-7-79	11-29-84	USGS		14.5	237	6.7
			DELAWARE VALLEY WATER COMPANY				
070123	DVWC 28	08-06-80	USGS		14.0	80	5.4
070123	DVWC 28	12-02-82	USGS		13.5	77	4.7
070124	STEPHENS DR	08-02-85	USGS		14.0	95	4.9

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; µg/L, micrograms per liter; --, data not available]

Well number[1]	Sulfate	Sodium	Potassium	Calcium	Magnesium	Iron (µg/L)	Manganese (µg/L)	Chloride
			CAMDEN CITY WATER DEPARTMENT--Continued					
070545	24	13	2.7	19	7.6	6,800	4,000	20
070545	28	13	2.8	19	7.7	6,900	4,100	21
070545	37	14	2.7	20	7.9	6,800	4,100	19
070545	29	13	2.6	19	7.7	6,500	4,000	20
070545	35	12	2.9	19	7.6	7,100	3,800	19
070586	--	18	--	16	6.1	8,100	1,700	--
070586	26	14	1.7	15	5.2	6,200	1,000	16
070586	23	13	1.9	15	5.6	6,500	1,100	16
070586	26	13	2.1	16	5.4	6,700	1,200	20
070586	31	14	2.1	16	5.6	6,700	1,200	19
070586	32	12	2.0	15	5.1	6,600	1,100	18
070586	22	11	1.9	14	5.0	6,200	1,100	15
070586	24	12	1.9	16	5.5	6,600	1,200	18
070586	26	12	2.0	16	5.7	6,900	1,200	19
070586	30	12	2.0	16	5.4	6,600	1,200	19
070586	28	12	2.1	15	5.3	6,800	1,200	18
070586	32	11	2.0	14	4.9	6,300	1,200	18
070586	34	11	1.8	14	4.8	5,900	1,100	15
070586	21	11	1.8	15	5.3	6,300	1,200	16
070586	25	12	2.1	15	5.4	6,200	1,200	19
070587	--	18	--	18	6.3	5,800	1,200	--
070587	24	13	1.9	16	5.8	5,400	1,200	17
070587	26	14	2.2	18	6.0	5,700	1,200	20
070587	35	16	2.2	17	5.9	5,600	1,200	20
070587	29	12	2.0	15	5.1	5,100	1,200	21
070587	22	11	1.8	15	5.0	4,900	1,100	14
070587	24	12	1.9	17	5.7	5,500	1,200	18
070587	28	12	2.1	18	6.0	5,800	1,200	19
070587	30	13	2.0	17	5.6	5,600	1,200	19
070587	34	13	2.1	16	5.5	5,600	1,200	23
070587	25	11	1.8	16	5.4	5,600	1,300	17
070587	30	11	1.7	16	5.4	6,100	1,400	13
070587	21	11	1.9	18	6.2	7,300	1,600	16
070528	23	11	2.1	9.4	4.5	35	75	15
070528	7.7	4.1	1.6	5.1	2.2	10	26	7.4
070528	7.6	4.0	1.7	5.1	2.2	6	25	7.5
070528	7.7	3.8	1.7	4.9	2.1	10	25	7.7
070535	24	10	2.2	16	5.3	6,600	1,000	16
070539	22	12	1.8	18	6.6	6,500	2,700	16
070539	17	12	2.0	21	8.4	7,100	4,500	16
070539	19	13	2.2	22	9.0	8,200	4,500	17
070539	17	11	2.4	34	16	20,000	10,000	14
070539	14	9.9	2.5	33	16	20,000	9,900	14
070540	27	13	1.8	15	5.3	5,000	3,300	21
070540	26	15	2.0	16	5.7	4,900	3,200	21
070540	25	15	2.0	16	5.8	4,700	3,400	21
070540	28	14	2.0	16	5.4	5,200	3,200	22
070540	24	14	1.9	15	5.3	4,800	3,200	20
070540	25	14	1.9	14	5.2	4,600	3,000	19
070540	24	14	1.9	15	5.4	4,600	3,100	19
070540	25	13	2.0	14	5.1	5,000	3,000	19
070540	28	14	1.9	16	5.9	5,100	3,400	19
070540	29	14	2.1	16	5.9	5,300	3,200	16
070540	27	14	2.0	19	6.9	5,800	3,300	18
			DELAWARE VALLEY WATER COMPANY					
070123	0.1	5.4	1.7	4.4	2.0	4	10	7.2
070123	<1.0	5.7	1.6	5.0	2.1	6	2	7.1
070124	11	4.8	2.0	5.5	2.6	8	27	11

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; deg C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; --, data not available]

Well number[1]	Local name	Date	Source of data[2]	Remarks	Temperature water (deg C)	Specific conductance lab (µS/cm)	pH field (standard units)
			MERCHANTVILLE-PENNSAUKEN WATER COMMISSION				
070335	MARION 1	07-10-80	USGS	5	13.5	92	--
070335	MARION 1	12-21-82	USGS		13.0	96	5.5
070345	PARK AVE 5	07-31-85	USGS		16.0	104	5.4
070350	PARK AVE 2	07-10-80	USGS		13.5	158	5.3
070350	PARK AVE 2	10-27-82	USGS		13.5	109	5.3
070350	PARK AVE 2	04-10-84	NUS	3	--	129	6.5
070350	PARK AVE 2	07-10-84	NUS		--	--	--
070350	PARK AVE 2	07-31-85	USGS		15.0	110	5.0
070372	NATIONAL HWY 1	07-10-80	USGS	3	13.5	101	4.8
070372	NATIONAL HWY 1	12-21-82	USGS		13.5	106	4.5
070372	NATIONAL HWY 1	08-01-85	USGS		15.0	134	4.8
070372	NATIONAL HWY 1	04-10-84	NUS		--	82.3	5.8
070602	NATIONAL HWY 2	04-10-84	NUS		--	88.9	6.5
070602	NATIONAL HWY 2	08-01-85	USGS		15.0	124	5.0
			RECREATIONAL WELL				
070559	SWIM 1	07-01-80	USGS	3	13.0	100	4.7
			USGS OBSERVATION WELLS				
050826	TCNY-PALM 1S	07-31-84	USGS		14.5	243	6.2
050826	TCNY-PALM 1S	12-05-84	USGS		14.0	284	6.3
050827	TCNY-PALM 2	07-30-84	USGS		14.0	124	5.8
050827	TCNY-PALM 2	09-24-84	USGS		14.0	112	5.5
050827	TCNY-PALM 2	12-03-84	USGS		13.0	112	6.2
050829	TCNY-PALM 3S	12-06-84	USGS		15.0	220	6.4
			SWOPE OIL SUPERFUND SITE				
001	MW-1	07-12-84	NUS		--	--	--
003	MW-3	07-12-84	NUS		--	--	--
004	MW-4	07-12-84	NUS		--	--	--
004	MW-4	07-12-84	NUS	3	--	--	--
005	MW-5	07-12-84	NUS		--	--	--
			PENNSAUKEN TOWNSHIP LANDFILL				
070568	LANDFILL 1	10-29-80	USGS	5	15.0	442	5.6
070571	LANDFILL 4	10-29-80	USGS	5	16.0	169	4.7
070571	LANDFILL 4	01-07-83	USGS		15.0	193	4.8
070571	LANDFILL 4	03-04-83	USGS		15.5	185	4.8
070571	LANDFILL 4	05-10-83	USGS		15.5	184	4.8
070571	LANDFILL 4	07-12-83	USGS		15.5	182	4.6
070571	LANDFILL 4	09-20-83	USGS		15.5	189	4.7
070571	LANDFILL 4	12-01-83	USGS		14.0	201	5.0
070571	LANDFILL 4	01-26-84	USGS	5	15.0	189	3.7
070571	LANDFILL 4	03-14-84	USGS		16.0	181	4.8
070571	LANDFILL 4	05-23-84	USGS		16.5	179	4.6
070571	LANDFILL 4	07-25-84	USGS		16.0	171	4.6
070571	LANDFILL 4	09-20-84	USGS		15.5	178	4.5
070571	LANDFILL 4	11-26-84	USGS		16.0	178	4.5
070571	LANDFILL 4	10-10-85	USGS		16.0	154	4.8

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; µg/L, micrograms per liter; --, data not available]

Well number[1]	Sulfate	Sodium	Potassium	Calcium	Magnesium	Iron (µg/L)	Manganese (µg/L)	Chloride
MERCHANTVILLE-PENNSAUKEN WATER COMMISSION								
070335	7.5	4.6	1.9	4.9	2.5	25	28	9.2
070335	13	4.9	1.9	5.1	2.6	<3	28	9.0
073345	5.5	5.9	2.1	6.4	2.6	10	83	13
070350	11	9.2	1.79	6.17	2.6	8	89	18.7
070350	13	10.7	2.4	6.0	2.5	<50	85	20.5
070350	10	12	2.1	7.6	2.9	19	100	23
070350	13	12	1.9	6.4	2.7	24	91	21
070350	6.0	5.9	2.4	6.7	2.6	95	100	15
070372	11	6.2	1.7	4.8	2.4	17	39	10
070372	14	7.5	1.7	5.5	2.9	<3	47	10
070372	16	8.7	2.0	7.2	3.5	8	62	15
070372	17.4	7.3	1.73	4.8	2.6	<50	47	15
070602	6.8	15.5	2.0	4.1	2.6	--	18	11.5
070602	14	8.8	1.8	6.3	3.2	9	39	14
RECREATIONAL WELL								
070559	24	1.8	1.7	3.6	4.7	74	42	3.0
USGS OBSERVATION WELLS								
050826	24	6.4	3.5	15	6.1	85,000	590	6.6
050826	11	0.4	4.1	13	4.9	74,000	450	16
050827	9.8	6.1	2.2	7.1	2.7	220	160	13
050827	8.4	5.0	2.1	7.0	2.7	260	140	13
050827	7.2	3.9	2.1	6.9	2.7	300	130	13
050829	0.3	0.3	2.2	17	7.2	92,000	720	5.0
SWOPE OIL SUPERFUND SITE								
001	20	10.8	<0.2	--	--	0.798	<0.001	13.7
003	23	19.4	5.3	11.2	2.7	1.320	0.083	10.3
004	43	37.1	15.0	23.0	5.6	23.50	0.257	9.2
004	43	35.7	14.0	32.5	6.0	--	--	9.6
005	31	12.5	5.9	16.1	4.6	--	--	13.0
PENNSAUKEN TOWNSHIP LANDFILL								
070568	71	29	16	28	12	340	5,100	65
070571	42	7.5	3.9	8.8	7.1	65	470	16
070571	41	12	3.6	8.0	6.7	13	460	18
070571	39	12	4.1	7.8	6.4	20	530	18
070571	38	12	4.4	7.2	6.1	16	530	17
070571	41	11	4.3	6.9	5.7	18	540	18
070571	35	12	4.7	7.2	6.0	17	580	21
070571	37	14	5.3	7.4	6.2	42	630	23
070571	39	11	5.2	7.3	6.4	58	630	20
070571	42	11	5.4	7.3	6.1	60	640	19
070571	37	8.6	5.8	6.9	5.7	21	660	15
070571	37	7.9	5.1	7.6	5.9	20	590	14
070571	41	8.0	5.2	7.4	6.1	18	580	10
070571	40	8.6	4.9	8.3	6.8	15	590	16
070571	31	8.3	5.9	6.0	5.0	11	500	17

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; deg C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; --, data not available]

Well number[1]	Local name	Date	Source of data[2]	Remarks	Temperature water (deg C)	Specific conductance lab (µS/cm)	pH field (standard units)
			PENNSAUKEN TOWNSHIP LANDFILL--Continued				
014	MW-1	02-10-87	NJDEP	3	--	420	6.0
014	MW-1	04-23-87	NJDEP	3	--	430	5.?
015	MW-2	02-10-87	NJDEP	3	--	220	5.6
015	MW-2	04-27-87	NJDEP	3	--	190	5.3
016	MW-3	02-11-87	NJDEP	3	--	210	6.5
016	MW-3	04-27-87	NJDEP	3	--	2,100	6.2
017	MW-3D	05-12-87	NJDEP	3	--	350	6.4
018	MW-4	02-10-87	NJDEP	3	--	140	4.5
018	MW-4	04-23-87	NJDEP	3	--	140	5.0
019	MW-5	02-11-87	NJDEP	3	--	750	6.2
019	MW-5	04-27-87	NJDEP	3	--	1,200	6.5
020	MW-5D	05-12-87	NJDEP	3	--	940	7.1
021	MW-6	02-10-87	NJDEP	3	--	350	6.1
021	MW-6	04-23-87	NJDEP	3	--	330	6.6
022	MW-6D	05-12-87	NJDEP	3	--	740	7.3
023	MW-7	02-10-87	NJDEP	3	--	250	5.8
023	MW-7	04-27-87	NJDEP	3	--	150	5.2
024	MW-8	02-10-87	NJDEP	3	--	320	6.3
024	MW-8	04-27-87	NJDEP	3	--	290	5.8
025	MW-9	02-10-87	NJDEP	3	--	150	5.5
025	MW-9	04-24-87	NJDEP	3	--	170	4.3
026	MW-10	02-10-87	NJDEP	3	--	600	6.3
026	MW-10	04-23-87	NJDEP	3	--	440	6.0
027	MW-11	02-10-87	NJDEP	3	--	210	6.4
027	MW-11	04-23-87	NJDEP	3	--	240	5.9
028	MW-11D	04-30-87	NJDEP	3	--	540	6.7
029	MW-12	02-10-87	NJDEP	3	--	620	6.6
029	MW-12	04-23-87	NJDEP	3	--	750	--
			ALUMINUM SHAPES INCORPORATED				
038	MW-1-55	03-02-87	NJDEP	3	--	--	5.3
039	MW-2-55	03-02-87	NJDEP	3	--	--	5.6
040	MW-3-65	03-02-87	NJDEP		--	--	--
041	MW-4-60	03-02-87	NJDEP		--	--	--
			REMANUFACTURED ENGINES AND AUTO PARTS				
042	MW-1	06-11-87	NJDEP	3	--	--	6.5
042	MW-1	08-27-85	NJDEP	3	--	--	6.6
043	MW-2	06-11-87	NJDEP	3	--	--	6.2
043	MW-2	08-27-85	NJDEP	3	--	--	5.4
044	MW-3	08-27-85	NJDEP	3	--	--	6.4
045	MW-4	06-11-87	NJDEP	3	--	--	5.9
046	MW-5	06-11-87	NJDEP	3	--	--	5.9

1 Six-digit well numbers are USGS unique well numbers. Well-construction data are stored in the USGS GWSI data base. Three-digit well numbers were assigned to wells not in the USGS GWSI data base.

2 Source of data: NUS Corporation (NUS), U.S. Geological Survey (USGS), and the New Jersey Department of Environmental Protection (NJDEP). Data presented, but not collected by the USGS, were not verified or examined for quality assurance or quality control.

3 Laboratory measurement of pH.

4 Replicate sample.

5 Field measurement for specific conductance.

Table 5.--Results of analyses for physical properties and common ions in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in milligrams per liter except as noted; µg/L, micrograms per liter; --, data not available]

Well number[1]	Sulfate	Sodium	Potassium	Calcium	Magnesium	Iron (µg/L)	Manganese (µg/L)	Chloride
			PENNSAUKEN TOWNSHIP LANDFILL--Continued					
014	60	18	--	--	--	720	7,600	45
014	4.?	2.?	--	--	--	6,100	--	44
015	23	6.8	--	--	--	1,000	1,900	15
015	41	8.7	--	--	--	2,100	--	8
016	29	290	--	--	--	2,900	1,300	390
016	38	250	--	--	--	33,000	--	360
017	19	25	--	--	--	13,000	1,900	40
018	34	7.9	--	--	--	<10	510	16
018	22	17	--	--	--	30	--	14
019	8	96	--	--	--	1,900	1,300	140
019	21	140	--	--	--	2,900	--	170
020	48	143	--	--	--	7,100	1,400	0.1
021	27	19	--	--	--	<10	7,100	23
021	22	22	--	--	--	10	--	22
022	30	41	--	--	--	610	1,100	50
023	9	8.6	--	--	--	410	760	23
023	9	9	--	--	--	950	--	6
024	14	30	--	--	--	2,900	1,600	35
024	22	20	--	--	--	1,400	--	32
025	2	12	--	--	--	1,500	2,400	19
025	41	22	--	--	--	26,000	--	16
026	56	34	--	--	--	3,300	2,000	65
026	40	32	--	--	--	6,100	--	42
027	15	4.6	--	--	--	8,200	2,800	11
027	48	4.3	--	--	--	58,000	--	14
028	26	74	--	--	--	--	--	18?
029	34	14	--	--	--	3,600	400	25
029	?	?	--	--	--	36,000	--	16
			ALUMINUM SHAPES INCORPORATED					
038	25	--	--	--	4.76	--	150	--
039	41	--	--	--	4.03	--	1,390	--
040	10	--	--	--	8.96	--	--	--
041	--	--	--	--	4.76	--	1,170	--
			REMANUFACTURED ENGINES AND AUTO PARTS					
042	--	--	--	--	--	6,300	--	--
042	--	--	--	--	--	--	--	--
043	--	--	--	--	--	53,000	--	--
043	--	--	--	--	--	--	--	--
044	--	--	--	--	--	12,000	--	--
045	--	--	--	--	--	17,000	--	--
046	--	--	--	--	--	12,000	--	--

Table 6.--Results of analyses for trace metals in water from wells in the Swope Oil study area

[Dissolved constituents, in micrograms per liter; --, data not available; <DL, concentration is less than the detection limit; <10, concentration is less than the detection limit of 10 micrograms per liter]

Well number[1]	Local name	Date	Source of data[2]	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Chromium, hexavalent[3]
			Camden City Water Department						
070363	PUCHACK 2	09-15-82	USGS	100	1	--	--	--	3
070363	PUCHACK 2	04-10-84	NUS	<100	<10	<100	<5	<1	49
070363	PUCHACK 2	04-10-84	NUS	<100	<10	<100	<5	<1	69
070363	PUCHACK 2	04-10-84	NUS	<DL	<8	43	<1	<0.5	76
070363	PUCHACK 2	07-10-84	NUS	<DL	<8	<13	<1	<0.5	76
070366	PUCHACK 1	07-13-82	USGS	<100	1	--	--	--	<1
070367	PUCHACK 3	07-21-80	USGS	--	--	60	3	<1	--
070367	PUCHACK 3	07-27-81	USGS	--	--	--	--	--	<1
070367	PUCHACK 3	08-06-85	USGS	20	<1	49	<0.5	<1	390
070368	DELAIR 1	07-22-80	USGS	--	--	80	1	2	--
070368	DELAIR 1	09-15-82	USGS	100	1	--	--	--	<1
070369	DELAIR 2	09-15-82	USGS	100	2	--	--	--	<1
070369	DELAIR 2	07-17-85	USGS	<10	<1	89	0.5	2	1
070370	DELAIR 3	09-15-82	USGS	100	1	--	--	--	<1
070373	MORRIS 6	07-22-80	USGS	--	--	110	1	<1	--
070379	MORRIS 10	07-21-80	USGS	--	--	60	<1	7	--
070379	MORRIS 10	07-27-81	USGS	--	--	--	--	--	--
070379	MORRIS 10	07-17-85	USGS	<10	1	67	<0.5	2	<1
070386	MORRIS 3A	07-12-82	USGS	<100	2	--	--	--	<1
070545	MORRIS 11	07-12-82	USGS	<100	<1	--	--	--	<1
070545	MORRIS 11	08-06-85	USGS	10	<1	85	1	1	<1
070586	MORRIS 12	07-27-81	USGS	--	3	30	1	1	<1
070586	MORRIS 12	07-13-82	USGS	100	4	--	--	--	<1
070586	MORRIS 12	07-17-85	USGS	20	4	37	<0.5	<1	<1
070587	MORRIS 13	07-27-81	USGS	--	3	30	1	1	<1
070528	PUCHACK 7	07-13-82	USGS	<100	1	--	--	--	<1
070528	PUCHACK 7	08-06-85	USGS	40	<1	33	<0.5	<1	<1
070528	PUCHACK 7	08-06-85	USGS	40	<1	27	0.7	<1	<1
070528	PUCHACK 7	08-06-85	USGS	30	<1	27	0.5	<1	<1
070535	TW-1-79	07-28-80	USGS	--	--	30	<1	2	--
			Delaware Valley Water Company						
050123	DVWC 28	08-06-80	USGS	--	--	50	<1	2	--
050123	DVWC 28	12-02-82	USGS	<100	1	--	--	--	1
050124	STEPHENS DR	08-02-85	USGS	<10	<1	61	<0.5	<1	<1
			Merchantville-Pennsauken Water Commission						
050335	MARION 1	07-10-80	USGS	--	--	70	<1	2	--
070345	PARK AVE 5	07-31-85	USGS	30	<1	36	<0.5	<1	<1
070350	PARK AVE 2	07-10-84	NUS	<DL	<8	32	<1	<0.5	<4
070350	PARK AVE 2	04-10-84	NUS	<100	<10	<100	<5	<1	<10
070350	PARK AVE 2	07-10-80	USGS	--	--	40	<1	<1	--
070350	PARK AVE 2	10-27-82	USGS	<100	1	--	--	--	<1
070350	PARK AVE 2	07-31-85	USGS	20	<1	38	0.5	<1	<1
070372	NATIONAL HWY 1	07-10-80	USGS	--	--	50	<1	<1	--
070372	NATIONAL HWY 1	12-21-82	USGS	100	1	--	--	--	<1
070372	NATIONAL HWY 1	04-10-84	NUS	<100	<10	<100	5	<1	<10
070372	NATIONAL HWY 1	08-01-85	USGS	40	<1	60	0.8	<1	<1
070602	NATIONAL HWY 2	08-01-85	USGS	<10	<1	58	<0.5	1	<1
070602	NATIONAL HWY 2	04-10-84	NUS	<100	<10	<100	<5	<1	<10
			Recreational Well						
070559	SWIM 1	07-01-80	USGS	--	--	70	1	1	--

Table 6.--Results of analyses for trace metals in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; --, data not available; <DL, concentration is less than the detection limit; <10, concentration is less than the detection limit of 10 micrograms per liter]

Well number[1]	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
				Camden City Water Department					
070363	--	--	--	--	--	--	--	--	--
070363	<62	51	--	0.2	<40	<2	<10	<10	295
070363	71	<50	--	<0.2	<40	<2	<10	<20	218
070363	11	17	<2	0.48	20	<2	<3	<2	36
070363	<10	<12	<2	0.55	20	<2	<3	<2	39
070366	--	--	--	--	--	--	--	--	--
070367	60	20	<10	--	--	--	--	--	53
070367	--	--	--	--	--	--	--	--	--
070367	5	10	<10	--	--	--	--	--	41
070368	170	<10	<10	--	--	--	--	--	13
070368	--	--	--	--	--	--	--	--	--
070369	--	--	--	--	--	--	--	--	--
070369	80	<10	<10	--	--	--	--	--	4
070370	--	--	--	--	--	--	--	--	--
070373	170	<10	<10	--	--	--	--	--	14
070379	<3	<10	<10	--	--	--	--	--	12
070379	--	--	--	--	--	--	--	--	--
070379	30	<10	20	--	--	--	--	--	63
070386	--	--	--	--	--	--	--	--	--
070545	--	--	--	--	--	--	--	--	--
070545	130	<10	<10	0.2	--	--	--	--	28
070586	80	10	10	--	--	--	--	--	5
070586	--	--	--	--	--	--	--	--	--
070586	20	<10	<10	--	--	--	--	--	10
070587	60	10	14	--	--	--	--	--	10
070528	6	20	<10	--	--	--	--	--	23
070528	7	20	<10	--	--	--	--	--	26
070528	6	20	<10	0.1	--	--	--	--	27
070535	20	<10	<10	--	--	--	--	--	8
				Delaware Valley Water Company					
050123	<3	25	<10	--	--	--	--	--	56
050123	--	--	--	--	--	--	--	--	--
050124	<3	10	<10	--	--	--	--	--	27
				Merchantville-Pennsauken Water Commission					
050335	7	15	<10	--	--	--	--	--	28
070345	6	10	10	<0.1	--	--	--	--	20
070350	<10	32	<2	<0.2	<15	<2	<3	<2	24
070350	<50	55	--	<0.2	<40	<2	<10	<10	--
070350	<3	17	<10	--	--	--	--	--	19
070350	--	--	--	--	--	--	--	--	--
070350	6	110	20	<0.1	--	--	--	--	57
070372	<50	<50	<5	1.9	<40	<2	<10	<10	--
070372	<10	21	<2	1.5	<15	<2	<3	<2	26
070372	<3	33	<10	--	--	--	--	--	57
070372	--	--	--	--	--	--	--	--	--
070372	4	40	10	1.8	--	--	--	--	28
070602	<3	20	<10	1.7	--	--	--	--	37
070602	<50	<50	<5	0.7	<40	<2	<10	<10	--
				Recreational Well					
070559	8	33	<10	--	--	--	--	--	77

Table 6.--Results of analyses for trace metals in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; --, data not available; <DL, concentration is less than the detection limit; <10, concentration is less than the detection limit of 10 micrograms per liter]

Well number[1]	Local name	Date	Source of data[2]	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Chromium, hexavalent[3]
			Swope Oil Superfund Site						
001	MW-1	07-12-84	NUS	306	<8	<1	<1	0.73	<4
003	MW-3	07-12-84	NUS	819	<8	29	<1--	<0.5	6
004	MW-4	07-12-84	NUS	18,900	16	118	1	0.85	59
004	MW-4	07-12-84	NUS	--	14	131	2	1.1	64
005	MW-5	07-12-84	NUS	--	<8	87	--	1.1	29
			Pennsauken Township Landfill						
070568	LANDFILL 1	10-29-80	USGS	--	--	200	<1	3	--
070571	LANDFILL 4	10-29-80	USGS	--	--	70	1	8	--
070571	LANDFILL 4	10-10-85	USGS	90	<1	75	<0.5	<1	980
014	MW-1	04-23-87	NJDEP	--	--	--	--	--	--
014	MW-1	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
015	MW-2	04-27-87	NJDEP	--	--	--	--	--	--
015	MW-2	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
016	MW-3	04-27-87	NJDEP	--	--	--	--	--	--
016	MW-3	02-10-87	NJDEP	--	8	<1,000	--	<5	<50
017	MW-3D	05-12-87	NJDEP	--	<5	<1,000	--	<5	<50
018	MW-4	04-23-87	NJDEP	--	--	--	--	--	--
018	MW-4	02-11-87	NJDEP	--	<5	<1,000	--	<5	1,100
019	MW-5	04-27-87	NJDEP	--	--	--	--	--	--
019	MW-5	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
020	MW-5D	05-12-87	NJDEP	--	<5	<1,000	--	<5	<50
021	MW-6	04-23-87	NJDEP	--	--	--	--	--	--
021	MW-6	02-11-87	NJDEP	--	<5	<1,000	--	<5	<50
022	MW-6D	05-12-87	NJDEP	--	<5	<1,000	--	<5	<50
023	MW-7	04-27-87	NJDEP	--	--	--	--	--	--
023	MW-7	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
024	MW-8	04-27-87	NJDEP	--	--	--	--	--	--
024	MW-8	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
025	MW-9	04-24-87	NJDEP	--	--	--	--	--	--
025	MW-9	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
026	MW-10	04-23-87	NJDEP	--	--	--	--	--	--
026	MW-10	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
027	MW-11	04-23-87	NJDEP	--	--	--	--	--	--
027	MW-11	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
028	MW-11D	04-30-87	NJDEP	--	--	100	--	--	--
029	MW-12	04-23-87	NJDEP	--	--	--	--	--	--
029	MW-12	02-10-87	NJDEP	--	<5	<1,000	--	<5	<50
			Aluminum Shapes Incorporated						
038	MW-1-55	03-02-87	NJDEP	421	1.0	200	--	10	<1.0
039	MW-2-55	03-02-87	NJDEP	281	9.0	390	--	<10	1.0
040	MW-3-55	03-02-87	NJDEP	362	--	--	--	--	--
041	MW-4-55	03-02-87	NJDEP	421	4.0	170	--	<10	6.0
			Remanufactured Engines and Auto Parts						
042	MW-1	06-11-87	NJDEP	--	--	--	--	<5	<50
042	MW-1	08-27-85	NJDEP	--	<10	--	21	11	28
043	MW-2	06-11-87	NJDEP	--	--	--	--	<5	<50
043	MW-2	08-27-85	NJDEP	--	<10	--	33	11	56
044	MW-3	08-27-85	NJDEP	--	<10	--	9	17	14
045	MW-4	06-11-87	NJDEP	--	--	--	--	<5	<50
046	MW-5	06-11-87	NJDEP	--	--	--	--	<5	<50

1 Six-digit well numbers are USGS unique well numbers. Well-construction data are stored in the USGS Ground-Water Site Inventory data base. Three-digit well numbers were assigned to wells not in the USGS GWSI data base. Well locations are shown on plates 1a and 1b.

2 Source of data: NUS Corporation (NUS), U.S. Geological Survey (USGS), and the New Jersey Department of Environmental Protection (NJDEP). Data presented, but not collected by the USGS, were not verified or examined for quality assurance or quality control.

3 NUS reported total dissolved chromium.

Replicate analyses are shown for well 070363 on 04-10-84, for well 070528 on 08-06-85, and for well 004 on 07-12-84.

Table 6.--Results of analyses for trace metals in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; --, data not available; <DL, concentration is less than the detection limit; <10, concentration is less than the detection limit of 10 micrograms per liter]

Well number[1]	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
				Swope Oil Superfund Site					
001	<10	7	8.8	0.71	<15	<2	<3	<2	152
003	<10	18	7.7	<0.2	<15	<2	<3	<2	53
004	12	40	74	<0.2	<15	<2	<3	<2	109
004	16	--	90	--	22	<2	<3	<2	123
005	11	--	61	--	25	<2	<3	<2	121
				Pennsauken Township Landfill					
070568	40	13	15	--	--	--	--	--	200
070571	20	55	47	--	--	--	--	--	140
070571	30	10	<10	--	--	--	--	--	79
014	--	<50	<5	--	--	--	--	--	--
014	--	<50	<5	<1	--	<5	<50	--	120
015	--	<50	<5	--	--	--	--	--	--
015	--	<50	<5	<1	--	<5	<50	--	<100
016	--	<50	<5	--	--	--	--	--	--
016	--	<50	<5	<1	--	<5	<50	--	<100
017	--	<50	6	<1	--	--	--	--	--
018	--	<50	6	--	--	--	--	--	--
018	--	<50	<5	1.8	--	<10	<50	--	70
019	--	<50	<5	<1	--	--	--	--	--
019	--	<50	<5	<1	--	<5	<50	--	<50
020	--	<50	<5	<1	--	--	1.3	--	<0.05
021	--	<50	5	--	--	--	--	--	<50
021	--	<50	<5	4.5	--	<10	<50	--	<50
022	--	<50	6	<1	--	8.6	1.6	--	<50
023	--	<50	7	--	--	--	--	--	--
023	--	<50	<5	<1	--	<5	<50	--	<50
024	--	50	<5	--	--	--	--	--	--
024	--	<50	<5	<1	--	<5	<50	--	<100
025	--	<50	5	--	--	--	--	--	--
025	--	<50	<5	<1	--	<5	<50	--	<50
026	--	<50	<5	--	--	--	--	--	--
026	--	<50	<5	<1	--	<5	<50	--	<100
027	--	50	5	--	--	--	--	--	--
027	--	<50	<5	<1	--	<5	<50	--	<100
028	--	?	?	?	--	<5	2.4	--	70
029	--	50	5	--	--	--	--	--	--
029	--	<50	<5	<1	--	<5	<50	--	<100
				Aluminum Shapes Incorporated					
038	--	<20	<2.0	0.2	<100	--	--	--	86
039	--	<20	<2.0	0.4	104	--	--	--	48
040	--	--	--	--	--	--	--	--	55
041	--	<20	<2.0	0.3	--	--	--	--	86
				Remanufactured Engines and Auto Parts					
042	--	60	89	--	<20	--	--	--	50
042	--	113	37	<0.4	69	<2	11	180	68
043	--	60	89	<0.2	<20	--	--	--	30
043	--	15	50	<0.4	128	<2	11	1,500	63
044	--	163	12	<0.4	69	<2	11	200	147
045	--	40	76	<0.2	<20	--	--	--	50
046	--	70	74	<0.2	<20	--	--	--	50

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Local name	Date	Source of data[2]	Benzene	Bromo-form	Carbon-tetra-chlo-ride	Chloro-benzene	Chloro-di-bromo-methane	Chloro-ethane
			Camden City Water Department						
070363	PUCHACK 2	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070363	PUCHACK 2	04-10-84	NUS	BD	--	BD	<5	BD	BD
070366	PUCHACK 1	07-13-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070367	PUCHACK 3	07-21-80	USGS	<1.0	--	<1.0	--	<1.0	--
070367	PUCHACK 3	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070367	PUCHACK 3	08-06-85	USGS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
070368	DELAIR 1	07-22-80	USGS	<1.0	--	<1.0	--	<1.0	--
070368	DELAIR 1	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070368	DELAIR 1	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070369	DELAIR 2	09-15-82	USGS	<1.0	<1.0	<1.0	2.0	<1.0	<1.0
070370	DELAIR 3	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070373	MORRIS 6	07-22-80	USGS	<1.0	--	<1.0	--	<1.0	--
070373	MORRIS 6	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070379	MORRIS 10	07-21-80	USGS	5.0	--	<1.0	--	<1.0	--
070379	MORRIS 10	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070386	MORRIS 3A	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070386	MORRIS 3A	07-12-82	USGS	<1.0	<1.0	<1.0	10	<1.0	<1.0
070586	MORRIS 12	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070586	MORRIS 12	07-13-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070587	MORRIS 13	07-27-81	USGS	<1.0	--	<1.0	--	<1.0	--
070528	PUCHACK 7	07-13-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070535	TW-1-79	07-28-80	USGS	<1.0	--	<1.0	--	<1.0	--
070545	MORRIS 11	07-12-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
			Delaware Valley Water Company						
050123	DVWC 28	08-06-80	USGS	<1.0	--	<1.0	--	<1.0	--
050123	DVWC 28	12-02-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
050124	STEVENS DR	08-02-85	USGS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
			Merchantville-Pennsauken Water Commission						
050335	MARION 1	07-11-80	USGS	<1.0	--	<1.0	--	<1.0	--
070345	PARK AVE 5	07-31-85	USGS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
070350	PARK AVE 2	07-10-80	USGS	<1.0	--	<1.0	--	<1.0	--
070350	PARK AVE 2	07-30-80	USGS	<1.0	--	<1.0	--	<1.0	--
070350	PARK AVE 2	10-27-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070350	PARK AVE 2	04-10-84	NUS	BD	--	BD	BD	BD	BD
070350	PARK AVE 2	07-10-84	NUS	BD	--	BD	BD	BD	BD
070350	PARK AVE 2	07-31-85	USGS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
070372	NATIONAL HWY 1	07-10-80	USGS	<1.0	--	<1.0	--	<1.0	--
070372	NATIONAL HWY 1	04-10-84	NUS	BD	--	18	BD	BD	BD
070602	NATIONAL HWY 2	04-10-84	NUS	BD	--	BD	BD	BD	BD
			Recreational Well						
070559	SWIM 1	07-01-80	USGS	<1.0	--	<1.0	--	<1.0	--
			Swope Oil Superfund Site						
001	MW-1	07-12-84	NUS	BD	--	BD	BD	BD	BD
003	MW-3	07-12-84	NUS	BD	--	BD	BD	BD	BD
004	MW-4	07-12-84	NUS	BD	--	BD	BD	BD	BD
004	MW-4	07-12-84	NUS	BD	--	BD	BD	BD	BD
005[3]	MW-5	07-12-84	NUS	BD	--	BD	BD	BD	BD

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 µg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Chloroform	Dichlorobromomethane	Dichlorodifluoromethane	Ethylbenzene	Methylbromide	Methylene chloride	Acrylonitrile	Acrolein	1,3-dichloropropene	Methylchloride
					Camden City Water Department					
070363	<1.0	--	--	BD	BD	<5	--	--	BD	--
070363	BD	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070366	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070367	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070367	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070367	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	<3.0	<3.0
070368	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070368	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070368	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070369	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070370	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070373	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070373	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070379	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070379	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070386	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070386	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070586	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070586	<1.0	<1.0	<1.0	<1.0	<1.0	8.0	--	--	<1.0	--
070587	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070528	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070535	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070545	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
					Delaware Valley Water Company					
050123	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
050123	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
050124	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	<3.0	--
					Merchantville-Pennsauken Water Commission					
050335	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070345	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	<3.0	<3.0
070350	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070350	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070350	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	<1.0	--
070350	BD	--	--	BD	BD	BD	--	--	BD	--
070350	BD	--	--	BD	BD	13	--	--	BD	--
070350	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	<3.0	--
070372	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
070372	BD	--	--	BD	BD	BD	--	--	BD	--
070602	BD	--	--	BD	BD	<5	--	--	BD	--
					Recreational Well					
070559	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
					Swope Oil Superfund Site					
001	BD	--	--	BD	BD	BD	--	--	BD	--
003	BD	--	--	BD	BD	BD	--	--	BD	--
004	BD	--	--	BD	BD	BD	--	--	BD	--
004	BD	--	--	BD	BD	BD	--	--	BD	--
005	BD	--	--	BD	BD	BD	--	--	BD	--

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Local name	Date	Source of data[2]	Tetra-chloro-ethyl-ene	Toluene	Tri-chloro-ethyl-ene	Tri-chloro-flouro-methane	vinyl chlo-ride	1,1-di-chloro-ethyl-ene	1,1-di-chloro-ethane
				Camden City Water Department						
070363	PUCHACK 2	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0
070363	PUCHACK 2	04-10-84	NUS	<5	BD	<5	--	BD	BD	BD
070366	PUCHACK 1	07-13-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070367	PUCHACK 3	07-21-80	USGS	<1.0	<1.0	14.0	--	--	--	<1.0
070367	PUCHACK 3	07-27-81	USGS	5.0	<1.0	11.2	--	--	--	<1.0
070367	PUCHACK 3	08-06-85	USGS	<3.0	<3.0	9.6	<3.0	<3.0	<3.0	<3.0
070368	DELAIR 1	07-22-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070368	DELAIR 1	07-27-81	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070368	DELAIR 1	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070369	DELAIR 2	09-15-82	USGS	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070370	DELAIR 3	09-15-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0
070373	MORRIS 6	07-22-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070373	MORRIS 6	07-27-81	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070379	MORRIS 10	07-21-80	USGS	<1.0	6.0	<1.0	--	--	--	<1.0
070379	MORRIS 10	07-27-81	USGS	<1.0	<1.0	2.0	--	--	--	<1.0
070386	MORRIS 3A	07-27-81	USGS	<1.0	<1.0	3.2	--	--	--	<1.0
070386	MORRIS 3A	07-12-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070545	MORRIS 11	07-12-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070586	MORRIS 12	07-27-81	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070586	MORRIS 12	07-13-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
070587	MORRIS 13	07-27-81	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070528	PUCHACK 7	07-13-82	USGS	<1.0	<1.0	64.0	<1.0	<1.0	<1.0	<1.0
070535	TW-1-79	07-28-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
				Delaware Valley Water Company						
050123	DVWC 28	08-06-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
050123	DVWC 28	12-02-82	USGS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
050124	STEPHENS DR	08-02-85	USGS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
				Merchantville-Pennsauken Water Company						
050335	MARION 1	08-11-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070345	PARK AVE 5	07-31-85	USGS	<3.0	<3.0	15.0	<3.0	<3.0	<3.0	<3.0
070350	PARK AVE 2	07-10-80	USGS	<1.0	<1.0	119	--	--	--	<1.0
070350	PARK AVE 2	07-30-80	USGS	<1.0	<1.0	146	--	--	--	<1.0
070350	PARK AVE 2	10-27-82	USGS	<1.0	<1.0	150	<1.0	<1.0	<1.0	<1.0
070350	PARK AVE 2	04-10-84	NUS	--	--	107	--	BD	BD	BD
070350	PARK AVE 2	07-10-84	NUS	--	--	68	--	BD	BD	BD
070350	PARK AVE 2	07-31-85	USGS	<3.0	<3.0	3.1	<3.0	<3.0	<3.0	<3.0
070372	NATIONAL HWY 1	07-10-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
070372	NATIONAL HWY 1	04-10-84	NUS	5	--	9	--	BD	<4	6
070602	NATIONAL HWY 2	04-10-84	NUS	BD	BD	BD	--	BD	BD	BD
				Recreational Well						
070559	SWIM 1	07-01-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
				Swope Oil Superfund Site						
001	MW-1	07-12-84	NUS	<2	<2	BD	BD	BD	<2	<2
003	MW-3	07-12-84	NUS	42	<1	BD	BD	BD	13	<2
004	MW-4	07-12-84	NUS	28	BD	<4	BD	BD	9	BD
004	MW-4	07-12-84	NUS	30	BD	<4	BD	BD	10	BD
005	MW-5	07-12-84	NUS	<4	BD	<2	BD	BD	BD	<3

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1,2,2-tetrachloroethane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	1,2-transdichloroethylene	2-chloroethylvinylether	1,3-dichlorobenzene	1,4-dichlorobenzene	1,2-dichlorobenzene
					Camden City Water Department						
070363	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--
070363	BD	BD	BD	BD	BD	--	<5	BD	BD	BD	BD
070366	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--
070367	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070367	<1.0	--	--	<1.0	--	--	25	--	--	--	--
070367	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.4	<3.0	--	--	--
070368	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070368	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070368	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	--	--	--
070369	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--
070370	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--
070373	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070373	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070379	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070379	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070386	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070386	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--
070545	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--
070586	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070586	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--
070587	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070528	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	15	<1.0	--	<1.0	--
070535	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
					Delaware Valley Water Company						
050123	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
050123	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--
050124	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--
					Merchantville-Pennsauken Water Company						
050335	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070345	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--
070350	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070350	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070350	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	12	<1.0	--	--	--
070350	BD	BD	BD	BD	BD	--	BD	BD	BD	BD	BD
070350	BD	BD	BD	BD	BD	--	BD	BD	BD	BD	BD
070350	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--
070372	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070372	14	BD	BD	2	BD	--	53	BD	BD	BD	BD
070602	BD	BD	BD	BD	BD	--	BD	BD	BD	BD	BD
					Recreational Well						
070559	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
					Swope Oil Superfund Site						
001	<3	<3	BD	BD	BD	--	BD	BD	BD	BD	BD
003	53	BD	BD	BD	BD	--	<2	BD	BD	BD	BD
004	29	BD	BD	BD	BD	--	<3	BD	BD	BD	BD
004	32	BD	BD	BD	BD	--	<3	BD	BD	BD	BD
005	<3	BD	BD	BD	BD	--	8	BD	BD	BD	BD

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 µg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Local name	Date	Source of data[2]	Benzene	Bromoform	Carbon-tetra-chloride	Chloro-benzene	Chloro-di-bromo-methane	Chloro-ethane
			Pennsauken Township Landfill						
070586	LANDFILL 1	10-29-80	USGS	22	--	<1.0	--	<1.0	--
070571	LANDFILL 4	10-29-80	USGS	<1.0	--	<1.0	--	<1.0	--
014	MW-1	02-10-87	NJDEP	190	<5	<5	<5	<5	<5
014	MW-1	04-23-87	NJDEP	140	<5	<5	6	<5	<5
015	MW-2	02-10-87	NJDEP	<5	<5	<5	<5	<5	<5
015	MW-2	04-27-87	NJDEP	<5	<5	<5	<5	<5	<5
016	MW-3	02-10-87	NJDEP	63	<5	<5	61	<5	<5
016	MW-3	04-27-87	NJDEP	56	<5	<5	72	<5	<5
017	MW-3D	05-12-87	NJDEP	<5	<5	<5	<5	<5	<5
018	MW-4	02-11-87	NJDEP	<5	<5	<5	<5	<5	<5
018	MW-4	04-23-87	NJDEP	<5	<5	<5	<5	<5	<5
019	MW-5	02-10-87	NJDEP	12	<5	<5	21	<5	<5
019	MW-5	04-27-87	NJDEP	14	<5	24	<5	<5	<5
020	MW-5D	05-12-87	NJDEP	8.7	<5	<5	<5	<5	<5
021	MW-6	02-11-87	NJDEP	<5	<5	<5	5.2	<5	<5
021	MW-6	04-23-87	NJDEP	5.5	<5	<5	<5	<5	<5
022	MW-6D	05-12-87	NJDEP	<5	<5	<5	8.9	<5	<5
023	MW-7	02-10-87	NJDEP	<5	<5	<5	<5	<5	<5
023	MW-7	04-27-87	NJDEP	<5	<5	9.8	7.6	<5	<5
024	MW-8	02-10-87	NJDEP	<5	<5	<5	<5	<5	<5
024	MW-8	04-27-87	NJDEP	<5	<5	<5	<5	<5	<5
025	MW-9	02-10-87	NJDEP	12	<5	<5	20	<5	<5
025	MW-9	04-24-87	NJDEP	86	<5	<5	<5	<5	<5
026	MW-10	02-10-87	NJDEP	<5	<5	<5	<5	<5	<5
026	MW-10	04-23-87	NJDEP	<5	<5	<5	<5	<5	<5
027	MW-11	02-10-87	NJDEP	<5	<5	<5	<5	<5	<5
027	MW-11	04-23-87	NJDEP	<5	<5	8.4	9.5	<5	<5
028	MW-11D	04-30-87	NJDEP	<5	<5	<5	<5	<5	<5
029	MW-12	02-10-87	NJDEP	<5	<5	<5	11	<5	<5
029	MW-12	04-23-87	NJDEP	--	--	--	--	--	--
			Aluminum Shapes Incorporated						
038	MW-1-55	03-02-87	NJDEP	38	<5	<5	6	<5	<5
039	MW-2-55	03-02-87	NJDEP	72	<5	<5	48	<5	<5
040	MW-3-65	03-02-87	NJDEP	55	<5	<5	29	<5	<5
041	MW-4-60	03-02-87	NJDEP	<5	<5	<5	<5	<5	<5
042	MW-1	06-11-87	NJDEP	4	5	<3	<6	<3	<10
			Remanufactured Engines and Auto Parts						
042	MW-1	08-27-85	NJDEP	<10	<10	<10	<10	--	<10
043	MW-2	06-11-87	NJDEP	<220	<240	<140	<300	<160	<500
043	MW-2	08-27-85	NJDEP	300	<200	<200	<200	--	<200
044	MW-3	08-27-85	NJDEP	<10	<10	<10	<10	--	<10
045	MW-4	06-11-85	NJDEP	<11	<12	<7	<15	<8	<25
046	MW-5	08-27-85	NJDEP	<4	<5	<3	<6	<3	<10

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Chloroform	Dichlorobromomethane	Dichlorodifluoromethane	Ethylbenzene	Methylbromide	Methylene chloride	Acrylonitrile	Acrolein	1,3-dichloropropene	Methylchloride
				Pennsauken Township Landfill						
070568	<1.0	<1.0	--	--	--	4.6	--	--	--	--
070571	<1.0	<1.0	--	--	--	<1.0	--	--	--	--
014	<5	<5	--	<5	<5	<5	<50	<50	47	<5
014	<5	<5	--	6.9	<5	<5	<50	<50	<5	<5
015	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
015	<5	<5	--	<5	<5	<5	<50	<50	<5	9.7
016	<5	<5	--	300	<5	<5	<50	<50	7.7	<5
016	<5	<5	--	90	<5	<5	<50	<50	<5	<5
017	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
018	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
018	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
019	<5	<5	--	7	<5	5.9	<50	<50	<5	<5
019	<5	<5	--	6.6	<5	15	<50	<50	<5	<5
020	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
021	<5	<5	--	<5	<5	9.4	<50	<50	<5	<5
021	<5	<5	--	<5	<5	5.9	<50	<50	<5	<5
022	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
023	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
023	<5	<5	--	<5	<5	8.0	<50	<50	<5	8
024	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
024	<5	<5	--	<5	<5	<5	<50	<50	<5	10
025	<5	<5	--	8.2	<5	5.5	<50	<50	<5	<5
025	<5	<5	--	10	<5	<5	<50	<50	<5	<5
026	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
026	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
027	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
027	<5	<5	--	9.3	<5	<5	<50	<50	<5	<5
028	<5	<5	--	<5	<5	<5	<50	<50	<5	<5
029	7.6	<5	--	<5	<5	<5	<50	<50	<5	<5
029	--	<5	--	<5	<5	<5	<5	<5	<5	<5
				Aluminum Shapes Incorporated						
038	<5	<5	--	<5	<5	<5	<10	<10	<5	<5
039	<5	<5	--	8.1	<5	<5	<10	<10	<5	<5
040	<5	<5	--	18	<5	<5	<10	<10	<5	<5
041	<5	<5	--	<5	<5	<5	<10	<10	<5	<5
042	<2	<2	--	<7	<10	<3	--	10	<5	<10
				Remanufactured Engines and Auto Parts						
042	<10	<10	--	<10	--	<10	<100	<100	--	--
043	<80	<110	--	<360	<500	<140	--	--	<250	<500
043	<200	<200	--	<200	--	<200	<2000	<2000	--	--
044	<10	<10	--	<10	--	20	<100	<100	--	--
045	<4	<6	--	<18	<25	<7	--	--	<13	<25
046	<2	<2	--	<7	<10	<3	--	--	<5	10

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	Local name	Date	Source of data[2]	Tetra-chloro-ethyl-ene	Toluene	Tri-chloro-ethyl-ene	Tri-chloro-flouro-methane	vinyl chlo-ride	1,1-di-chloro-ethyl-ene	1,1-di-chloro-ethane
				Pennsauken Township Landfill						
070568	LANDFILL 1	10-29-80	USGS	13	3.5	17.0	--	--	--	83
070571	LANDFILL 4	10-29-80	USGS	<1.0	<1.0	<1.0	--	--	--	<1.0
014	MW-1	02-10-87	NJDEP	7.9	<5	<5	--	37	<5	<5
014	MW-1	04-23-87	NJDEP	6.6	11	<5	--	6.4	<5	<5
015	MW-2	02-10-87	NJDEP	<5	<5	<5	--	12	<5	<5
015	MW-2	04-27-87	NJDEP	<5	<5	<5	--	<5	<5	<5
016	MW-3	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
016	MW-3	04-27-87	NJDEP	<5	<5	<5	--	<5	<5	<5
017	MW-3D	05-12-87	NJDEP	5.9	<5	6.6	--	14	<5	<5
018	MW-4	02-11-87	NJDEP	<5	<5	<5	--	<5	<5	<5
018	MW-4	04-23-87	NJDEP	<5	<5	<5	--	<5	<5	<5
019	MW-5	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
019	MW-5	04-27-87	NJDEP	<5	5.2	<5	--	<5	<5	<5
020	MW-5D	05-12-87	NJDEP	<5	<5	<5	--	<5	<5	<5
021	MW-6	02-11-87	NJDEP	9.5	<5	<5	--	<5	<5	<5
021	MW-6	04-23-87	NJDEP	<5	<5	<5	--	<5	<5	<5
022	MW-6D	05-12-87	NJDEP	<5	<5	<5	--	<5	<5	<5
023	MW-7	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
023	MW-7	04-27-87	NJDEP	<5	<5	6.2	--	<5	<5	<5
024	MW-8	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
024	MW-8	04-27-87	NJDEP	9.1	<5	12	--	<5	<5	<5
025	MW-9	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
025	MW-9	04-24-87	NJDEP	30	38	18	--	19	<5	<5
026	MW-10	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
026	MW-10	04-23-87	NJDEP	<5	<5	<5	--	<5	<5	<5
027	MW-11	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
027	MW-11	04-23-87	NJDEP	<5	<5	<5	--	<5	<5	<5
028	MW-11D	04-30-87	NJDEP	59	<5	50	--	<5	<5	<5
029	MW-12	02-10-87	NJDEP	<5	<5	<5	--	<5	<5	<5
029	MW-12	04-23-87	NJDEP	<5	<5	<5	--	<5	<5	<5
				Aluminum Shapes Incorporated						
038	MW-1-55	03-02-87	NJDEP	<5	<5	<5	<5	25	<5	<5
039	MW-2-55	03-02-87	NJDEP	<5	<5	<5	<5	<5	<5	<5
040	MW-3-65	03-02-87	NJDEP	<5	<5	<5	<5	<5	<5	<5
041	MW-4-60	03-02-87	NJDEP	6.7	<5	<5	<5	<5	<5	<5
				Remanufactured Engines and Auto Parts						
042	MW-1	08-27-85	NJDEP	--	<10	20	--	<10	<10	<10
042	MW-1	06-11-87	NJDEP	<4	<6	37	--	<10	<3	<5
043	MW-2	08-27-85	NJDEP	--	400	<200	--	<200	<200	1000
043	MW-2	06-11-87	NJDEP	<210	<300	2200	--	<500	310	970
044	MW-3	08-27-85	NJDEP	--	<10	31000	--	<10	20	500
045	MW-4	06-11-87	NJDEP	<10	<15	160	--	<25	<7	<12
046	MW-5	06-11-87	NJDEP	<4	<6	120	--	<10	<3	<5

Table 7.--Results of analyses for purgeable organic compounds in water from wells in the Swope Oil study area--Continued

[Dissolved constituents, in micrograms per liter; <10, concentration of compound is less than the detection limit of 10 μg/L; BD, constituent not detected-detection limit is not specified; --, not analyzed. A complete list of compounds analyzed for during 1984 for the remedial investigation and feasibility study (RI/FS) conducted at the Swope Oil Superfund site is given in table 9. Compounds analyzed for during the RI/FS and not listed in this table were below the detection limit in all samples (NUS Corporation, 1985).]

Well number[1]	1,1,1-tri-chloro-ethane	1,1,2-tri-chloro-ethane	1,1,2,2-tetra-chloro-ethane	1,2-di-chloro-ethane	1,2-di-chloro-propane	1,3-di-chloro-propane	1,2-transdi chloro-ethyl-ene	2-chloro-ethyl-vinyl-ether	1,3-di-chloro-benzene	1,4-di-chloro-benzene	1,2-di-chloro-benzene
Pennsauken Township Landfill											
070568	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
070571	<1.0	--	--	<1.0	--	--	<1.0	--	--	--	--
014	<5	<5	<5	<5	<5	--	170	<5	<10	<10	<10
014	<5	<5	<5	<5	<5	--	72	<5	<5	<5	14
015	<5	<5	<5	<5	<5	--	40	<5	<10	<10	<10
015	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
016	<5	<5	<5	<5	<5	--	<5	<5	<10	11	<10
016	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	63
017	<5	<5	<5	<5	<5	--	17	<5	<5	<5	<5
018	<5	<5	<5	<5	<5	--	<5	<5	<10	<10	<10
018	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
019	<5	<5	<5	<5	<5	--	7.0	<5	<10	<10	<10
019	<5	<5	<5	<5	<5	--	50	<5	<5	<5	3
020	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
021	<5	<5	<5	<5	<5	--	17	<5	<10	<10	<10
021	<5	<5	<5	<5	<5	--	22	<5	<5	<5	<5
022	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
023	<5	<5	<5	<5	<5	--	7.4	<5	<10	<10	<10
023	16	<5	<5	<5	<5	--	29	<5	<5	<5	<5
024	<5	<5	<5	<5	<5	--	<5	<5	<10	<10	<10
024	<5	<5	<5	<5	<5	--	15	<5	<5	<5	<5
025	<5	<5	<5	<5	<5	--	7.9	<5	<10	<10	<10
025	<5	<5	<5	<5	<5	--	35	<5	<5	<5	25
026	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
026	<5	<5	<5	<5	<5	--	<5	<5	<10	<10	<10
027	<5	<5	<5	<5	<5	--	<5	<5	<10	<10	<10
027	8.5	<5	35	<5	<5	--	<5	<5	8.0	17	22
028	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
029	<5	<5	<5	<5	<5	--	<5	<5	<10	<10	<10
029	<5	<5	<5	<5	<5	--	<5	<5	<5	<5	<5
Aluminum Shapes Incorporated											
038	<5	<5	<5	<5	<5	--	76	<5	<10	<10	5
039	<5	<5	<5	<5	<5	--	8.2	<5	<10	17	5
040	<5	<5	<5	<5	<5	--	7.0	<5	<10	<10	5
041	<5	<5	<5	<5	<5	--	115	<5	<10	<10	10
Remanufactured Engines and Auto Parts											
042	<4	<5	<7	<3	<6	--	<5	<10	<5	<10	<10
042	<10	<10	<10	<10	<10	--	--	<10	--	--	--
043	6000	<250	<350	<140	300	--	3300	500	<250	<500	<500
043	4900	<200	<200	<200	<200	--	--	<200	--	--	--
044	4100	<10	<10	<10	<10	--	--	<10	--	--	--
045	<10	<13	<17	<7	<15	--	110	<25	<13	<25	<25
046	23	<5	<7	<3	<6	--	87	<10	<5	<10	<10

1 Six-digit well numbers are USGS unique well numbers. Well-construction data are stored in the USGS GWSI data base. Three-digit well numbers were assigned to wells not in the USGS GWSI data base.

2 Source of data: NUS Corporation (NUS), U.S. Geological Survey (USGS), and the New Jersey Department of Environmental Protection (NJDEP). Data presented, but not collected by the USGS, were not verified or examined for quality assurance or quality control.

3 Water from well 005 on 07-12-84 also contained: acetone, 41 μg/L; 2-butone, 5 μg/L; and total xylenes, 30 μg/L.

Table 11.--Records of selected wells and test borings in the Swope Oil study area

[Well locations are shown on plates 1a and 1c; --, data not available]

Well number[1]	Latitude (degrees)	Longitude (degrees)	Local name	Permit number[2]	Date constructed	Driller	Depth drilled (feet)	Total depth of well (feet)
			Camden City Water Department					
070359	395835	0750308	PUCHACK 5	--	08-23-24	LAYNE NY	--	186
070362	395840	0750309	6-75	--	01-29-75	LAYNE NY	--	180
070363	395842	0750312	PUCHACK 2	--	00-00-24	LAYNE NY	--	169
070364	395844	0750308	TEST 1-70	--	04-29-70	LAYNE NY	--	195
070366	395845	0750312	PUCHACK 1	--	10-16-24	LAYNE NY	--	140
070367	395840	0750307	PUCHACK 3	--	05-29-24	LAYNE NY	--	175
070368	395848	0750347	DELAIR 1	--	10-31-30	LAYNE NY	--	138
070369	395851	0750355	DELAIR 2	--	10-31-30	LAYNE NY	--	141
070370	395853	0750348	DELAIR 3	--	10-31-30	LAYNE NY	--	135
070373	395900	0750318	MORRIS 6	--	07-11-32	LAYNE NY	--	133
070374	395906	0750313	MORRIS 9	--	07-03-32	LAYNE NY	--	143
070375	395910	0750307	MORRIS 8	--	00-00-53	--	--	124
070377	395916	0750303	MORRIS 7	--	00-00-32	LAYNE NY	--	120
070378	395920	0750305	MORRIS OBS	--	00-00-60	--	--	103
070379	395923	0750300	MORRIS 10	--	10-29-60	LAYNE NY	--	115
070382	395929	0750253	MORRIS 4A	--	00-00-60	--	--	134
070383	395929	0750253	MORRIS 4	--	00-00-60	LAYNE NY	--	130
070386	395933	0750229	MORRIS 3A	--	07-28-53	LAYNE NY	--	107
070387	395938	0750222	MORRIS 2	--	00-00-32	LAYNE NY	--	115
070389	395940	0750230	MORRIS 5NA	--	00-00-60	LAYNE NY	--	114
070390	395944	0750211	MORRIS 1	--	00-00-61	LAYNE NY	--	107
070528	395835	0750302	PUCHACK 7	--	01-29-75	LAYNE NY	190	180
070535	395857	0750344	TW-1-79	--	00-00-79	--	--	132
070536	395905	0750333	TW-3-79	--	00-00-79	--	--	117
070537	395909	0750328	TW-4-79	--	00-00-79	--	--	128
070538	395914	0750324	TW-5-79	--	00-00-79	--	--	129
070539	395902	0750325	TW-6-79	--	00-00-79	--	--	144
070540	395858	0750325	TW-7-79	--	00-00-79	--	--	141
070545	395900	0750325	MORRIS 11	--	08-01-79	LAYNE NY	156	144
070586	395914	0750324	MORRIS 12	--	01-07-81	LAYNE NY	125	117
070587	395905	0750333	MORRIS 13	--	06-04-80	LAYNE NY	136	130
							--	--
			Delaware Valley Water Company					
050123	395904	0750009	DVWC 28	--	02-24-69	SCHULTES, AC	--	262
050124	395906	0750006	STEPHENS DR	--	02-01-70	SCHULTES, AC	--	270
			Merchantville-Pennsauken Water Commission					
070332	395711	0750220	MARION 2	--	10-01-62	LAYNE NY	258	258
070335	395720	0750225	MARION 1	--	07-03-57	LAYNE NY	278	278
070345	395758	0750120	PARK AVE 5	--	04-07-48	LAYNE NY	--	288
070346	395800	0750115	PARK AVE 3A	--	01-31-40	ARTESIAN	--	260
070348	395801	0750119	PARK AVE 3	--	00-00-58	LAYNE NY	--	275
070349	395802	0750117	PARK AVE 1	--	11-24-47	LAYNE NY	--	270
070350	395802	0750118	PARK AVE 2	--	10-13-43	LAYNE NY	--	257
070372	395902	0750153	NATIONAL HWY 1	--	07-21-67	LAYNE NY	--	231
070530	395755	0750127	4R-A	--	07-30-79	LAYNE NY	300	270
070602	395917	0750125	NATIONAL HWY 2	--	09-01-82	HYDRO GROUP	218	206
			Industrial Wells and Recreational Well 070559[4]					
070353	395811	0750233	VERCHIO, R	--	10-10-58	CLAIR, WR	--	106
070365	395844	0750352	PENN PR 1	--	12-11-51	LAYNE NY	--	122
070376	395915	0750245	MANEELY J CO 1	--	08-15-53	ROBBINS, HJ	--	135
070380	395925	0750230	KINGSTON TRAP 2	--	08-25-66	SCHULTES, AC	--	123
070381	395925	0750230	KINGSTON TRAP 1	--	09-14-55	MOLLITOR, C	--	65
070384	395931	0750226	WARD, RUSSEL 1	--	11-24-52	BUCLOW, WM	--	65
070533	395932	0750238	CADILLAC PET 1	--	08-14-82	MURTHA INC	117	117
070555	395850	0750230		--	09-14-68	--	80	80
070559	395815	0750150	MEADOW BROOK 1	--	07-12-63	MURTHA, JOHN	--	107

Table 11.--Records of selected wells and test borings in the Swope Oil study area--Continued

[Well locations are shown on plates 1a and 1c; --, data not available; gal/min, gallons per minute]

Well number[1]	Screened Interval (feet)	Diameter of casing (in.)	Altitude of land surface (feet)	Water level (feet)	Date water level measured	Discharge (gal/min)	Aquifer code[3]	Copies of logs in Appendix A and (or) B[4]	Remarks
				Camden City Water Department					
070359	136 - 181	26	30	38	08-23-24	1000	MRPAL	D	
070362	140 - 180	18	--	56	01-29-75	1287	MRPAL	D	
070363	126 - 165	26	14	20	04-01-24	1440	MRPAL	D, J	
070364	175 - 195	8	10	77	05-01-70	542	MRPA		
070366	108 - 140	26	10	20	10-16-24	1400	MRPAL	D	
070367	127 - 175	26	10	14	05-29-24	1175	MRPAL	D	
070368	103-138,106-136	18,26	10	20	10-31-30	1680	MRPAL	D	
070369	111 - 141	26	5	13	10-31-30	1330	MRPAL	D	
070370	87-127, 89-129	18,26	8	11	10-31-30	1850	MRPAL	D	
070373	98 - 133	26	14	14	07-11-32	1700	MRPAL	D	
070374	89-99, 118-143	26	10	12	07-03-32	1900	MRPAL	D	
070375	-- - --	--	10	--	--	1412	MRPAL		
070377	85 - 120	26	10	--	--	1680	MRPAL	D	
070378	-- - --	--	6	--	--	--	--		
070379	75 - 115	18	16	11	11-07-61	1450	MRPAL		
070382	95 - 134	18	8	13	10-01-60	1585	MRPAL	J	
070383	-- - --	--	8	--	--	--	MRPAL		
070386	73 - 103	18	10	12	07-28-53	1000	MRPAL	D	
070387	93 - 123	18	10	--	--	--	MRPAL		
070389	79 - 114	18	5	12	11-01-60	1450	MRPAL	D	
070390	-- - --	--	9	--	--	1180	MRPAL	D	
070528	140 - 180	18	20	56	01-29-75	1287	MRPAL	D	
070535	100 - 130	4	10	--	--	--	MRPAL	D, J, E	
070536	85 - 115	4	10	--	--	--	MRPAL	D, J	
070537	97 - 128	6	10	--	--	--	MRPAL	D, J	
070538	80 - 110	4	10	--	--	--	MRPAL	D, J	
070539	100-106, 116-142	4	10	--	--	106	MRPAL	D, J	
070540	98-108, 118-138	6	10	--	--	608	MRPAL	D, J	
070545	102 - 144	16	10	39	08-01-79	2030	MRPAL	D, J, E	
070586	86-95, 102-117	16	10	--	--	--	MRPAL	D	
070587	90-94,102-117,98-124,126-130	--	10	--	--	--	MRPAL	D, J, E	
				Delaware Valley Water Company					
050123	226 - 261	20	25	32	02-24-69	1200	MRPAL		
050124	221 - 267	12	30	36	02-01-70	1002	MRPAL	E	
				Merchantville Pennsauken Water Commission					
070332	223 - 258	12	65	90	10-01-62	1005	MRPA	D	6
070335	243 - 278	12	61	59	07-03-57	1020	MRPA	D	6
070345	248 - 288	12	20	22	04-07-48	1000	MRPAL	D	
070346	210 - 260	16	15	6	01-31-40	720	MRPAL		
070348	240 - 275	12	25	39	08-01-58	1034	MRPAL	D	
070349	240 - 270	12	19	15	11-24-47	1005	MRPA	D	6
070350	232 - 257	12	12	17	10-13-43	1000	MRPAL	D	
070372	195-200, 210-230	12	40	80	07-21-67	1000	MRPA	D, E	6
070530	240 - 270	18	30	78	05-30-79	1515	MRPAL		
070602	182 - 206	12	25	55	09-01-82	1236	MRPAL	D, J, E	
				Industrial Wells and Recreational Well 070559					
070353	100 - 106	4	40	35	10-10-58	30	MRPAM		
070365	102 - 122	6	30	58	12-18-51	--	MRPAL	D	
070376	115 - 135	8	45	25	08-15-53	100	MRPAL		
070380	115 - 123	8	35	26	08-25-66	200	MRPAL	D	
070381	55 - 65	6	35	12	09-14-55	125	MRPAM		
070384	53 - 65	6	3	23	11-26-52	150	MRPAL		
070533	92 - 117	8	8	--	--	300	MRPAL	D	
070555	75 - 80	4	50	60	09-13-68	18	MRPAU		
070559	97 - 107	6	50	31	08-06-63	200	MRPAU		

Table 11.--Records of selected wells and test borings in the Swope Oil study area--Continued

[Well locations are shown on plates 1a and 1c; --, data not available]

Well number[1]	Latitude (degrees)	Longitude (degrees)	Local name	Permit number[2]	Date constructed	Driller	Depth drilled (feet)	Total depth of well (feet)
				Domestic Wells[4]				
070336	395736	0750130	QUINT, A A	--	05-15-52	ROBBINS, E	95	95
070352	395810	0750223	SOROCHANIUK, D	--	--	CLAIR, WR	--	48
070356	395821	0750220	EROCKSON, M	--	07-10-58	MOLLITOR, C	--	115
070357	395827	0750246	LAYER, H W	--	04-10-51	ROBBINS, HJ	--	137
070360	395837	0750151	CHRISTIAN BR S	--	00-00-50	SCHULTES, AC	--	136
070371	395854	0750113	BASS, JOHN A	--	--	CLAIR	--	78
070385	395932	0750214	ATL BL DIAMOND	--	11-07-58	MOLLITOR, C	--	110
				USGS Observation Wells				
050826	400031	0750237	TACONY-PALM 1s	--	06-01-84	NJDEP	35	35
050827	400017	0750227	TACONY-PALM 2	--	05-24-84	NJDEP	95	95
050828	400017	0750227	TACONY-PALM 2s	--	06-01-84	NJDEP	45	45
050829	400024	0750231	TACONY-PALM 3s	--	06-01-84	NJDEP	35	35
050830	400031	0750237	TACONY-PALM 1	--	05-17-84	NJDEP	68	68
				Swope Oil Superfund Site				
001	--	--	MW-1	31-21538	06-01-84	HYDRO GROUP	133	130
002	--	--	MW-2	31-21539	07-05-84	HYDRO GROUP	106	102
003	--	--	MW-3	31-21540	06-25-84	HYDRO GROUP	136	134
004	--	--	MW-4	31-21541	06-11-84	HYDRO GROUP	136	136
005	--	--	MW-5	31-21542	06-30-84	HYDRO GROUP	134	134
006	--	--	TB-1	--	05-10-84	HYDRO GROUP	42	--
007	--	--	TB-2	--	05-10-84	HYDRO GROUP	41	--
008	--	--	TB-3	--	05-14-84	HYDRO GROUP	44	--
009	--	--	TB-4	--	05-14-84	HYDRO GROUP	11	--
010	--	--	TB-6	--	05-15-84	HYDRO GROUP	12	--
011	--	--	TB-7	--	05-15-84	HYDRO GROUP	10	--
012	--	--	TB-8	--	05-14-84	HYDRO GROUP	10	--
013	--	--	TB-9	--	05-16-84	HYDRO GROUP	10	--
				Pennsauken Township Landfill				
070568	395921	0750210	LANDFILL 1	--	10-01-79	--	--	60
070569	395910	0750201	LANDFILL 2	--	10-01-79	--	--	91
070570	395903	0750217	LANDFILL 3	--	10-01-79	--	--	90
070571	395912	0750248	LANDFILL 4	--	10-01-79	--	--	48
014	395922	750216	MW-1	51-00047-4	10-10-79	CRAIG	61	61
015	395913	750206	MW-2	31-17781	03-26-81	FRITTS, JE	101	101
016	395902	750220	MW-3	51-00048-2	10-10-79	CRAIG	91	91
017	395902	750219	MW-3D	31-26142-0		HAMPTON, WJ	181	181
018	395912	750247	MW-4	51-00049-1	10-10-79	CRAIG	49	49
019	395903	750227	MW-5	31-1818-3	07-14-81	FRITTS, JE	--	110
020	395903	750227	MW-5D	31-26143-4		HAMPTON, WJ	190	187
021	395907	750235	MW-6	31-19602	11-18-82	SCHULTES, AL	83	81
022	395907	750235	MW-6D	31-26141-8		HAMPTON, WJ	157	157
023	395900	750210	MW-7	31-19603	11-23-82	SCHULTES, AL	120	115
024	395901	750217	MW-8	31-19604	12-01-82	SCHULTES, AL	221	189
025	395927	750208	MW-9	31-24597-8	04-28-86	HAMPTON, WJ	61	61
026	395929	750218	MW-10	31-24600-1	05-27-86	HAMPTON, WJ	51	50
027	395937	750201	MW-11	31-24601-0	05-23-86	HAMPTON, WJ	51	30
028	395936	750201	MW-11D	31-26140-0	04-03-	HAMPTON, WJ	110	110
029	395935	750148	MW-12	31-26580	05-29-86	HAMPTON, WJ	39	33
030	--	--	OW-1	--	08-20-85	HAMPTON, WJ	43	43
031	--	--	OW-2	31-23481	08-23-85	HAMPTON, WJ	32	32
032	--	--	OW-3	31-23483	08-28-85	HAMPTON, WJ	41	41
033	--	--	OW-4	31-23482	09-03-85	HAMPTON, WJ	46	46
034	--	--	DB-1	--	08-09-85	HAMPTON, WJ	50	--
035	--	--	DB-2	--	08-11-85	HAMPTON, WJ	90	--
036	--	--	DB-3	--	08-01-85	HAMPTON, WJ	91	--
037	--	--	DB-4	--	09-13-85	HAMPTON, WJ	90	--
				Aluminum Shapes				
038	395926	750245	MW-1-55	31-25900-6	12-10-86	ENGINEERING	--	56
039	395923	750243	MW-2-55	31-25899-9	12-04-86	ENGINEERING	57	57
040	395922	750244	MW-3-65	31-25898-1	12-03-86	ENGINEERING	67	67
041	395920	750248	MW-4-60	31-25901-4	12-01-86	ENGINEERING	61	61

Table 11.--Records of selected wells and test borings in the Swope Oil study area--Continued

[Well locations are shown on plates 1a and 1c; --, data not available; gal/min, gallons per minute]

Well number[1]	Screened Interval (feet)	Diameter of casing (in.)	Altitude of land surface (feet)	Water level (feet)	Date water level measured	Discharge (gal/min)	Aquifer code[3]	Copies of logs in Appendix A and (or) B[4]	Remarks
				Domestic Wells					
070336	75 - 95	4	65	45	05-15-52	47	MRPAU		
070352	43 - 48	4	42	--	--	20	MRPAU		
070356	109 - 115	4	29	60	07-10-58	5	MRPAL		
070357	127 - 137	4	40	95	04-11-51	25	MRPAL		
070360	125 - 136	6	73	0	11-01-50	75	MRPAM	D	
070371	73 - 78	3	57	--	--	40	MRPAU		
070385	99 - 110	6	10	25	11-07-58	180	MRPAL	D	
				USGS Observation Wells					
050826	25 - 35	2	5	--	--	--	MRPA		
050827	75 - 95	4	10	--	--	--	MRPA	D	
050828	35 - 45	2	10	--	--	--	MRPA		
050829	25 - 35	2	10	--	--	--	MRPA	D	
050830	48 - 68	4	5	--	--	--	MRPA	D	
				Swope Oil Superfund Site					
001	110 - 130	4	63.28	81.19	07-06-84	--	--	D, J, E	5
002	77 - 102	4	63.39	81.44	07-10-84	--	--	D	5
003	109.8 - 129.8	4	64.10	82.55	07-06-84	--	--	D, J, E	5
004	109.8 - 129.8	4	59.77	77.8	06-11-84	--	--	D, J, E	5
005	108 - 128	4	63.27	80.92	07-06-84	--	--	D, J, E	5
006	-- - --	--	64	--	--	--	--	D	
007	-- - --	--	60	--	--	--	--	D	
008	-- - --	--	63	--	--	--	--	D	
009	-- - --	--	60	--	--	--	--	D	
010	-- - --	--	63	--	--	--	--	D	
011	-- - --	--	60	--	--	--	--	D	
012	-- - --	--	63	--	--	--	--	D	
013	-- - --	--	63	--	--	--	--	D	
				Pennsauken Township Landfill					
070568	59 - 60	4	26	--	--	--	MRPAM		
070569	-- - --	4	63	--	--	--	--		
070570	-- - --	4	61	--	--	--	--		
070571	47 - 48	4	21	--	--	--	MRPAM		
014	-- - --	4	28.6	43.84	10-10-79	12	--	D	5
015	90 - 100	4	71.75	86.82	03-26-81	--	--		5
016	-- - --	4	62.81	73.34	10-10-79	15	--	D	5
017	157 - 177	4	62.81	--	--	--	--	D, J, E	6
018	-- - --	4	22.95	36.3	10-10-79	8	--	D	5
019	90 - 110	4	72.27	--	--	--	--	D	5
020	168 - 187	4	74.33	--	--	--	--	D, J, E	6
021	62 - 81	4	40.37	60.0	11-18-82	20	--	D	5
022	128 - 148	4	--	--	--	--	--	D, J, E	6
023	95 - 113	4	70.82	93.71	11-23-82	--	--		5
024	169 - 188	4	65.10	88.68	12-01-82	--	--	D	5
025	38 - 53	4	28	45.0	04-28-86	--	--	D	5
026	27 - 47	4	20	34.0	05-27-86	--	--	D	5
027	10 - 30	4	20	16	05-23-86	--	--	D	5
028	85 - 105	4	20	--	--	--	--	D, J, E	
029	13 - 33	4	20	19	05-30-86	--	--	D	5
030	23 - 43	4	--	30	08-21-85	--	--	D	5
031	12 - 24	4	31	15	08-26-85	--	--	D	5
032	20 - 40	4	13.2	--	--	--	--	D	5
033	35 - 45.5	4	45	--	--	--	--	D	5
034	-- - --	--	51	--	--	--	--	D	
035	-- - --	--	90	--	--	--	--	D	
036	-- - --	--	15	--	--	--	--	D	
037	-- - --	--	91	--	--	--	--	D	
				Aluminum Shapes					
038	39 - 54	4	--	--	--	5	--	D	5
039	40 - 55	4	--	--	--	10	--	D	5
040	45 - 65	4	31.63	46.28	12-03-86	10	--	D	5
041	40 - 60	4	34.32	48.53	12-01-86	10	--	D	5

Table 11.--Records of selected wells and test borings in the Swope Oil study area--Continued

[Well locations are shown on plates 1a and 1c; --, data not available]

Well number[1]	Latitude (degrees)	Longitude (degrees)	Local name	Permit number[2]	Date constructed	Driller	Depth drilled (feet)	Total depth of well (feet)
				Remanufactured Engines and Auto Parts				
042	405635	750115	MW-1	31-23546	08-16-85	LIPPINCOTT	51	46
043	405635	750114	MW-2	31-23547	08-21-85	LIPPINCOTT	39.3	39.3
044	405636	750119	MW-3	31-23571	08-22-85	LIPPINCOTT	25	24.8
045	--	--	MW-4	--	--	--	--	--
046	--	--	MW-5	--	--	--	--	--

1 Wells with a three-digit well number are not in the USGS Ground-Water-Site-Inventory data base.
2 Permit numbers are listed for wells not in the USGS GWSI data base.
3 Aquifer code:
MRPA - Potomac-Raritan-Magothy aquifer system.
MRPAU - Potomac-Raritan-Magothy aquifer system - upper unit.
MRPAM - Potomac-Raritan-Magothy aquifer system - middle unit.
MRPAL - Potomac-Raritan-Magothy aquifer system - lower unit.
4 Logs: driller (D), gamma (J), electric log(s) (E).
5 Screened interval is above the confining unit above the lower aquifer in the Potomac-Raritan-Magothy aquifer system.
6 Screened interval is in the lower aquifer of the Potomac-Raritan-Magothy aquifer system.

Table 11.--Records of selected wells and test borings in the Swope Oil study area--Continued

[Well locations are shown on plates 1a and 1c; --, data not available; gal/min, gallons per minute]

Well number[1]	Screened Interval (feet)	Diameter of casing (in.)	Altitude of land surface (feet)	Water level (feet)	Date water level measured	Discharge (gal/min)	Aquifer code[3]	Copies of logs in Appendix A and (or) B[4]	Remarks
			Remanufactured Engines and Auto Parts						
042	34.6 - 44.6	4	33.03	36	08-16-85	1	--	D	5
043	23.2 - 38.2	4	27.41	32.8	08-21-85	5	--	D	5
044	14.3 - 24.3	4	24.29	--	--	--	--	D	5
045	-- - --	--	--	--	--	--	--		5
046	-- - --	--	--	--	--	--	--		5

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

Puchack well field: includes well numbers 070359, 070363, 070366, 070367, 070528
[Data not available for 1984 to 1987]

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1956	143.0	140.0	144.0	134.0	142.0	136.0	130.0	136.0	147.0	142.0	130.0	131.0	1655
1957	143	128	138	143	141	135	141	161	146	101	89.1	111	1577
1958	115	110	101	133	144	135	132	153	141	119	95.9	100	1479
1959	87.5	97.2	121	145	127	125	126	141	130	128	103	114	1445
1960	91.5	103	118	135	137	146	122	157	147	140	142	145	1584
1961	150	142	153	144	152	109	92.3	237	197	181	143	126	1826
1962	154	153	198	182	202	197	174	223	178	153	128	137	2079
1963	175	144	878	207	201	188	175	212	200	202	176	163	2130
1964	161	165	172	204	180	197	176	202	197	198	181	189	2222
1965	200	176	191	187	194	185	182	192	180	162	155	153	2157
1966	181	179	192	183	191	179	172	190	187	188	184	189	2215
1967	187	172	189	179	188	174	181	184	179	193	183	177	2186
1968	183	184	193	186	196	178	193	167	194	182	166	153	2175
1969	170	144	170	184	186	189	171	193	180	161	152	156	2056
1970	157	142	160	150	158	168	201	226	218	160	171	176	2087
1971	143	160	163	171	176	168	174	202	197	195	187	192	2128
1972	196	187	200	182	185	190	173	236	226	207	194	198	2374
1973	105	181	202	185	198	105	164	213	201	168	148	135	2005
1974	105	181	202	185	198	105	164	213	201	168	148	135	2005
1975	171	165	184	186	207	193	218	241	222	212	209	182	2390
1976	203	194	209	199	201	201	155	205	201	204	198	205	2375
1977	223	187	192	179	202	191	202	120	139	81.4	147	158	2021
1978	141	129	175	182	176	179	174	147	177	169	165	183	1869
1979	199	175	186	173	189	178	189	204	146	149	106	162	2056
1980	199	186	199	171	166	158	160	193	174	179	153	153	2091
1981	171	189	199	163	165	149	158	184	176	143	128	131	1956
1982	135	124	152	147	147	148	144	144	141	97	90.3	98.6	1567
1983	94.6	85.8	139	128	120	115	120	154	149	105	96	106	1412

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

Park Avenue well field: includes well numbers 070345, 070346, 070348, 070349, 070350

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1956	68.6	51.3	50.7	52.6	68.4	65.6	57.4	64.7	60.2	66.1	58.4	57.0	721
1957	56.2	49.1	59.8	63.2	84.7	82.7	93.5	67.4	50.5	56.6	49.9	52.7	766
1958	47.7	43.1	48.1	49.3	55.3	69.4	66.6	61	59.5	60.6	51.9	56.3	669
1959	56.6	50.5	56.2	57.6	88.5	81	74.7	67.6	67.6	75.5	63.2	35.3	774
1960	34.7	32.4	40.6	79	92.8	92.2	96	79.9	75.7	80.7	73.6	63.6	841
1961	58.6	53	76	67.7	89.6	86.8	81.4	68.8	76.3	71.5	67.7	59.5	857
1962	72.6	58.9	68.8	66.7	97.1	89.8	94.4	80.6	80.1	83.4	85.4	78.8	857
1963	76.8	69.3	87.3	90.9	95.6	86.5	95.8	92.8	76.7	81.7	62	69.5	985
1964	68.1	47.2	62.7	66.2	87.5	98.1	92.8	90.5	90.9	84.9	73.6	71.7	934
1965	68	65.6	73	72.4	95.4	92.8	98.3	89.2	80.2	77.7	74.4	68.4	955
1966	60.6	56.9	81.7	72	81.2	109	124	106	91.8	76.1	68	69.8	997
1967	76.1	68	69.8	66.2	73.6	92.1	73.5	68.4	71.5	67.1	56.2	59.4	842
1968	52.8	52.8	66.5	73.6	74.4	92.5	102	92.3	68.4	87.5	85.7	69.1	918
1969	67.4	55.4	73.5	63.3	80.9	81.5	72.9	76.5	79.4	66.8	52.5	57.9	828
1970	61.3	54.9	65.2	86	82.6	80.8	87.7	81.5	82.9	77.5	92.2	65.2	918
1971	63.1	76.7	73.9	77.9	78.7	88.9	105	89.5	79.6	79.7	76.3	73.2	963
1972	76.9	76.1	82	68.9	60.2	49.7	49.9	73.7	55.1	55.5	40.8	35.3	724
1973	36.7	32.1	34.3	36.9	42.9	55.7	61	66.5	49.3	38.1	35.5	36.5	526
1974	37	34.9	38.4	41.1	46.6	56.5	78.2	63.6	47.9	41.4	39.7	49.1	514
1975	39.5	31.7	32.5	39.5	31.7	32.5	51.6	54.2	36.4	37.5	34.3	32.9	454
1976	33.3	35	43.1	39.9	60	75.7	63.8	65.1	50.1	32	38.3	50.7	587
1977	50.8	35	54.5	54.1	65.7	61.6	78	53.7	44.8	39.9	38	43.7	620
1978	63.1	65	82.5	69.9	77.4	94.6	71.8	71.5	58.6	53	45	40.3	793
1979	50.8	43.1	54.9	58.5	69.5	63.7	73	77.9	68.6	63.8	64.6	81.8	770
1980	95.4	78	82.1	76.5	74.6	89.9	93.7	77.7	80.2	62.5	53.9	46.4	911
1981	50.5	43.3	42	38.1	42.9	58.2	66.3	77.6	67.7	65	54.4	55.3	661
1982	63.7	59	59.6	54.7	73.9	62.3	78.7	71.3	62.2	59.9	47.4	50.8	743
1983	48.9	48	59.6	53.6	48.7	51.9	76.5	83.6	79.7	104	95.4	62.1	812
1984	48.2	50.7	57.1	55.6	59.6	79.8	71.7	72.5	72.6	59.8	48.9	49.4	726
1985	56	52.5	57.6	62	62.9	57.8	66.4	69.6	69.9	85.9	73.7	68.7	783
1986	58.7	62.7	68.5	69.1	87.5	85.5	84.3	81.1	66.6	63.3	47.9	43.7	819
1987	36.3	37.5	83.4	85.1	60.4	76.8	64.8	73.7	50.4	51.3	40.3	35.8	696

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

Morris well field: includes well numbers 070373, 070375, 070377, 070379, 070382, 070383, 070386, 070389, 070390, 070545, 070586, 070587, 070374, 070378, 070387

Delair field: includes well numbers 070368, 070369, 070370
[Data not available for 1984 to 1987]

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1956	186.0	170.0	185.0	181.0	184.0	179.0	186.0	186.0	180.0	186.0	180.0	186.0	2189
1957	158	134	149	144	150	152	155	151	148	152	145	152	1790
1958	149	137	108	125	148	145	153	151	147	152	147	152	1714
1959	152	138	153	148	150	139	138	132	122	130	124	129	1655
1960	126	116	125	99.7	82.7	78.4	44.7	110	72.6	67.6	78.6	107	1108
1961	116	34.1	0	0	0	163	220	178	209	220	212	240	1592
1962	188	204	196	195	206	197	18.9	293	281	268	252	244	2543
1963	179	202	314	194	252	258	263	342	274	249	247	264	3038
1964	265	246	262	109	257	248	225	339	290	260	245	192	2938
1965	182	166	169	151	156	254	275	339	266	207	232	242	2639
1966	252	214	228	192	194	222	269	362	331	228	214	211	2917
1967	234	220	236	228	246	233	253	328	324	268	245	243	3058
1968	247	233	248	234	232	231	257	248	346	259	247	259	3041
1969	255	236	259	267	261	253	266	365	332	278	267	277	3316
1970	275	254	283	268	276	237	251	407	366	280	287	314	3498
1971	340	306	311	353	328	336	330	461	427	348	295	304	4139
1972	323	295	331	325	356	323	303	331	315	297	272	264	3735
1973	274	244	276	259	276	274	310	432	413	344	331	367	3800
1974	274	244	276	259	276	274	310	432	413	344	331	367	3800
1975	338	294	326	236	417	392	457	399	386	399	385	403	4432
1976	382	350	385	357	363	393	404	448	428	404	396	413	4723
1977	422	376	411	379	440	420	356	429	408	341	275	348	4605
1978	366	334	325	314	321	350	382	434	440	413	343	296	4318
1979	285	288	405	345	341	349	354	461	474	475	434	388	4599
1980	364	366	392	417	447	457	428	457	459	464	441	437	5129
1981	466	395	262	289	302	290	334	333	343	413	394	370	4191
1982	381	390	435	353	343	420	427	424	369	446	382	390	4760
1983	409	392	424	361	398	458	497	519	463	554	497	518	5421

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

New Jersey Water Company well: well number 050123

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	.21	.83	.88	0	0	0	0	1.66	3.90	2.32	3.25	2.46	15.6
1971	1.99	1.58	1.69	2.42	2.03	6.74	1.76	3.18	2.69	3.36	2.95	3.88	50.1
1972	1.56	1.43	3.49	2.79	4.10	1.97	1.56	3.13	1.52	2.73	1.72	2.71	25
1973	2.08	1.42	2	0	0	3.55	3.90	4.15	3.51	2.67	6.83	0	24
1974	0	0	0	3.49	6.53	6.52	1.46	9.87	8.10	6.66	9.82	9.34	74.9
1975	9.51	8.24	8.40	11.10	8.43	6.30	5.14	9.79	6.34	5.24	6.41	3.85	88.75
1976	5.73	6.28	8.77	1.13	8.82	15.20	7.58	8.69	10.40	10.90	7.49	7.27	98.26
1977	4.04	1.52	3.58	16.40	12	6.44	11.10	1.02	.76	2.08	1.36	1.74	62.04
1978	2.02	3.28	3.90	3.72	1.56	3.47	4.53	2.49	1.99	2.61	2.06	2.86	34.49
1979	2.66	1.37	.46	1.02	3.93	2.24	2.95	1.30	3.23	3.42	4.31	6.46	33.35
1980	7.27	8.65	11.90	4.75	3.15	9.09	8.42	2.78	2.63	2.86	3.39	5.89	70.78
1981	9.41	3.48	9.53	3.51	3.49	2.04	6.59	3.28	2.78	2.59	4.82	2.27	53.79
1982	3.20	2.66	2.57	2.26	2.65	1.76	5.74	3.33	6.23	3.52	1.93	2.96	38.81
1983	4.03	1.54	6.70	7.18	4.64	6.74	14.70	9.57	5.91	2.66	2.65	28.60	94.92
1984	3.88	1.45	7.14	5.10	22.70	26.70	17.90	30.80	19.20	2.63	4.52	13.23	155.25
1985	11.16	13.40	16.13	12.82	20.01	11.60	0	2.38	0	0	0	0	87.50
1986	0	0	7.6	21.8	33.9	36.5	22.7	14.5	8.5	4.2	6.2	12.4	168.3
1987	16.9	5.9	.83	0	2	9.8	3.4	7.6	2.8	4	1.1	1.3	55.6

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

New Jersey Water Company well: well number 050124

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.852	0.0	0.85
1971	0	0	0	.103	.89	.231	.617	1.01	1.02	.149	1.32	2.09	7.43
1972	1.80	1.01	1.40	1.91	2.12	.504	.468	1.91	.684	1.37	1.08	1.22	15.48
1973	1.22	1.20	.709	0	0	1.97	.713	1.54	1.27	2.51	.309	0	11.44
1974	0	0	0	0.226	.745	.853	4.66	2.82	1.32	.884	2.52	1.80	15.83
1975	1.43	1.33	1.47	2.06	.80	.78	1.27	2.21	.69	.70	.91	.86	14.54
1976	1.09	.80	.77	2.69	1.18	7.41	1.76	1.04	2.13	.96	.63	.59	21.06
1977	.45	.32	.57	3.59	5.87	2.09	3.73	.46	1.14	.47	.35	.44	19.50
1978	.50	.21	.27	.27	.24	.60	1.82	1.43	8.66	3.02	3.01	1.29	21.35
1979	.27	.51	.42	.16	1	1.03	1.63	1.09	.83	1.04	.08	0	8.09
1980	0	0	0	3.39	1.85	6.58	3.95	2.82	3.48	0	0	0	22.07
1981	0	0	0	0	0	0	3.53	1.63	2.13	0	0	0	7.29
1982	0	0	0	0	2.22	.83	2.21	1.45	3.51	.35	0	0	10.58
1983	0	0	0	15.40	29.20	9.71	19	22.90	18.40	12.90	24.50	35.40	187.41
1984	31.30	11.60	37	34.20	17.30	6.09	1.26	2.60	3.23	0	0	0	144.58
1985	0	--	--	--	--	--	24.09	20.04	27.36	25.65	31.43	39.18	167.75
1986	34.57	26.67	22.16	6.08	10.34	20.78	7.21	1.42	1.29	1.91	1.41	1.27	135.10
1987	15.22	1.70	2.28	1.70	1.55	3.21	3.35	7.55	2.84	1.70	.62	.58	42.30

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons													
National Highway well 1: well number 070372													
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	20.2	20.2	56.0
1968	20.3	19.6	20.6	24.9	22.5	32.1	30.3	33.3	29.3	30.7	21.3	29.9	314.8
1969	27.3	27.4	26.8	28.2	30.1	30.9	28.6	28.7	27.6	20.7	25.5	25.9	327.7
1970	25.8	24.4	23.5	24.3	26.6	28.8	27.8	27.1	28.4	25.4	20.7	25	307.8
1971	23.2	25.5	25.5	25.5	26.4	26.9	25.2	24.1	21.4	23	22.5	22	291.2
1972	18	17.2	20.3	22.6	23.7	25.7	26.2	28.1	24.5	23.7	25	29.6	284.6
1973	30	24.7	31.4	30	32	30.4	31.3	31	29.5	31	28.7	29.1	359.1
1974	29.2	25.5	29.5	30.7	30.5	29.3	29.2	25.8	29.3	31.3	30.3	30.9	351.5
1975	29.9	25.9	30.3	29.9	25.9	30.3	31.3	31	30.2	31	28.8	29	353.5
1976	30.4	28	31.2	30.1	31	30.2	31.2	31.3	30.2	27.8	24.2	25.2	350.8
1977	25.7	27.7	30.8	30.3	30.9	30.3	31.4	30.6	27	30.2	27.7	28.8	351.4
1978	30.7	23.5	23.7	21	19.1	27.8	28.8	27.6	28	30.8	29.3	29.6	319.9
1979	29.8	27.9	27.9	27.5	30.1	27.6	26.7	29.4	23.6	25.8	24	20.3	320.6
1980	17.3	22	25.5	27.4	26.2	27.8	26.5	29.7	29.6	34.3	28.9	31	326.2
1981	31.4	35.2	39.1	38.8	40.9	39	40.9	39.8	39.1	40.2	38.6	38.6	461.6
1982	32	22.9	39	37.4	39.6	36.8	38.8	38.9	38.1	33.3	36.8	39.3	432.9
1983	41.1	36.1	39.9	40.2	43.1	41.2	40.5	37.9	36.6	38.3	37.6	39.6	472.1
1984	39.3	37.1	39.3	11.2	9.6	1.9	0	0	0	0	0	0	138.3
1985	0	0	0	0	0	0	0	0	0	0	0	13	13.0
1986	0	11.6	0.9	0	1.4	12.1	8.6	0	0	0	0	0	34.6
1987	0	0	0	0	0	0	0	0	0	0	0	0	0.0
National Highway well 2: well number 070602													
1983	0.0	0.0	0.0	0.0	0.0	0.0	7.7	14.8	14.3	8.3	0.0	0.0	45.1
1984	0	0	0	27.7	33.7	42.1	40.9	40.6	39.4	39.4	30	30	323.8
1985	31	28	30.5	40.1	29.7	29	31	27.8	26.6	29.8	28.2	15.5	347.1
1986	25.1	13.2	25.9	25	29.4	28.9	29.7	30.6	29.5	30.6	28.1	31	327.8
1987	33.8	30.8	34.1	32.4	38	36.4	37.3	39.5	38.5	34.4	31.6	33.6	420.1

Table 14.--Ground-water withdrawals from public-supply well fields and wells in the Swope Oil study area--Continued

[Data from the U.S. Geological Survey State Water-Use Data System, and pumpage files; well locations shown on plate 1a and 1c; --, data not available]

Withdrawals, in millions of gallons

Marion well field: includes well numbers 070332, 070335

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual total
1957	0.0	0.0	0.0	0.0	0.0	0.0	18.0	30.3	24.8	17.4	14.7	18.1	123.3
1958	10.1	20.4	35.5	18	22.5	21.9	27.1	27.5	28.7	28.1	25.2	25.2	290.2
1959	23.4	21.6	23.1	27.2	33.2	29.6	29.6	32.1	29.9	20.7	29	33.8	333.2
1960	30.9	29.4	27	13.4	14	28.1	28.2	21.9	21.2	21.2	19	22.9	277.2
1961	27.5	26.1	16.5	21.4	10.1	22.1	23.2	26.2	25.6	26.3	22	26.8	273.8
1962	17.4	21.1	23.2	28.8	30.3	32.5	30.6	31.1	27.6	31.9	28.3	25.4	328.2
1963	27.7	21.4	22	27.1	31	33.8	28.8	27.7	24.8	32.4	37.1	31.4	345.2
1964	31	31.6	30.3	31.6	39.4	42.2	34.6	34.2	30.4	21.3	21.1	28.3	376
1965	31.3	25.8	27.7	31.2	41.8	47.4	44.4	32.9	33.2	29.6	17.5	22.7	385.5
1966	22.6	20.7	8.19	27.7	34.6	48.6	43.4	31.6	24.9	24	17.9	16.8	321
1967	24	17.9	16.8	24.6	31.2	46	28.9	26.1	20.4	18.3	19.5	19.9	293.6
1968	17.9	19.6	15.1	23.1	24.7	36.2	33.8	53.9	45.2	37.8	34.7	32.9	374.9
1969	25	24.3	37.4	34.9	44	41.3	32.9	33.1	33.1	31.8	30	29.8	397.6
1970	30	30	30.5	35	50.6	46.7	56.8	54.4	60	44.2	31.4	27.9	497.5
1971	36.3	26.8	28.2	37.9	41.8	53.4	54	33.7	32.5	33.9	27	29.8	435.3
1972	18	16.2	60	12.5	20.2	26.5	20.7	34.6	24	20.2	24.9	23.7	247.5
1973	26.5	21.9	25.7	24	29.5	26	37.2	37.2	32	29.8	24.5	25	339.3
1974	21.6	21.4	23.6	26.9	28.2	27.2	35.1	33.1	57.6	24.4	20.8	19.6	339.5
1975	20.6	18.2	20.2	20.6	18.2	20.2	25.1	29.2	28.8	28	25.8	25.9	280.8
1976	26.9	29	30.1	30.2	28.9	39.2	28.8	35.2	32.4	26	25.9	22.8	355.4
1977	35.7	28.8	29.8	52.3	78	74.5	43.5	20.3	16.6	14.3	21.4	32.1	447.3
1978	34.4	18	30.9	35	33.7	49.1	34.8	16.4	18.3	19	26.5	24.1	340.2
1979	21.8	23.2	33.3	25.7	35.8	32.4	35.2	31.4	28.1	29	27.7	27.2	350.8
1980	22.1	21	26.4	24.5	30.5	37.7	39.9	51.6	47.1	42.1	34.9	36.4	414.2
1981	40.3	39.6	36.1	32.4	35.4	38.8	39.1	34	39.9	36.4	29.7	38.6	440.3
1982	35.4	30.7	27.8	26.5	45.5	36.4	51.1	52.5	43.2	49.1	31.9	29.9	460
1983	33.3	34.4	38.9	37.2	36.8	35.2	.055	12.4	53.1	60.6	56.1	47.2	450.7
1984	41	32.2	37	33.1	40.7	49.3	44.2	52	33	25.1	24.3	26.2	438
1985	26.4	23.6	26.3	30	32.8	26	30.3	27	32.5	54.2	50	42.3	401.5
1986	34.3	29.9	35	36.7	51.4	60.6	49.8	49.6	28.8	18.6	16.4	21.4	432.7
1987	24.6	24	27	20.4	43.2	54.5	57.3	57.9	48.5	43.4	40.9	42.7	484.5

GLOSSARY

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Base/neutral- and acid-extractable organic compounds are a group of synthetic organic compounds that include chlorinated phenols, polynuclear aromatic hydrocarbons, certain chlorinated pesticides and PCB's.

Confined aquifer is an aquifer containing water under sufficient pressure so that when penetrated by a well, the water level stands at some height above the top of the aquifer but not necessarily above the land surface (Synonymous with artesian aquifer).

Confining unit is a body of relatively impermeable material stratigraphically adjacent to one or more aquifers.

Depth of Well:

Depth drilled or total depth of hole is the total depth in ft below land-surface datum to which the hole was drilled, regardless of the finished depth of the well.

Depth of well is the maximum depth in ft below land-surface datum at which the well was originally finished.

Dissolved as used in this report refers to that material in a representative water sample that passes through a 0.45-micrometer membrane filter.

Geophysical logs:

Single-point resistance log is a record of the electrical resistance of the earth material lying between an in-hole electrode and a surface electrode, versus depth. The single-point resistance log is used to correlate geologic units and to differentiate clay beds from sand beds.

Spontaneous potential log is a record of the natural electrical potentials developed between the borehole fluid and the surrounding earth material as a function of depth. The spontaneous potential log is used chiefly to correlate geologic units and to determine bed thickness.

Gamma-ray log is a record of the amount of natural gamma radiation that is emitted by the earth material surrounding a borehole, versus depth. The chief uses of natural gamma-ray logs are to identify lithology and to correlate stratigraphic units.

Land-surface datum is a datum plane that is approximately at the land surface at a site. Well and exploratory borehole depths, screen settings, and water levels listed in table 4 are referenced to the land-surface datum.

Micrograms per liter (μg/L) is a unit used to express the concentration of chemical constituents in a solution as weight (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter.

Milligrams per liter (mg/L) is a unit used to express the concentration of chemical constituents in a solution as weight (milligrams) per unit volume (liter) of water.

Minimum detection limit for a particular chemical constituent and analytical procedure is that concentration below which the presence of the constituent cannot be verified. In this report the minimum detection limits are listed in table 3, and can be identified as those entries in the water-quality tables that are preceded by a "less-than" (<) symbol.

Purgeable organic compounds are a group of synthetic organic substances that include several chlorinated hydrocarbon solvents. These compounds are less than 2 percent soluble in water, and have boiling points less than 150 degrees Celsius.

Responsible parties, individual(s) and private or public organizations identified by U.S. Environmental Protection Agency as being responsible for the restoration of the environment at a Superfund site.

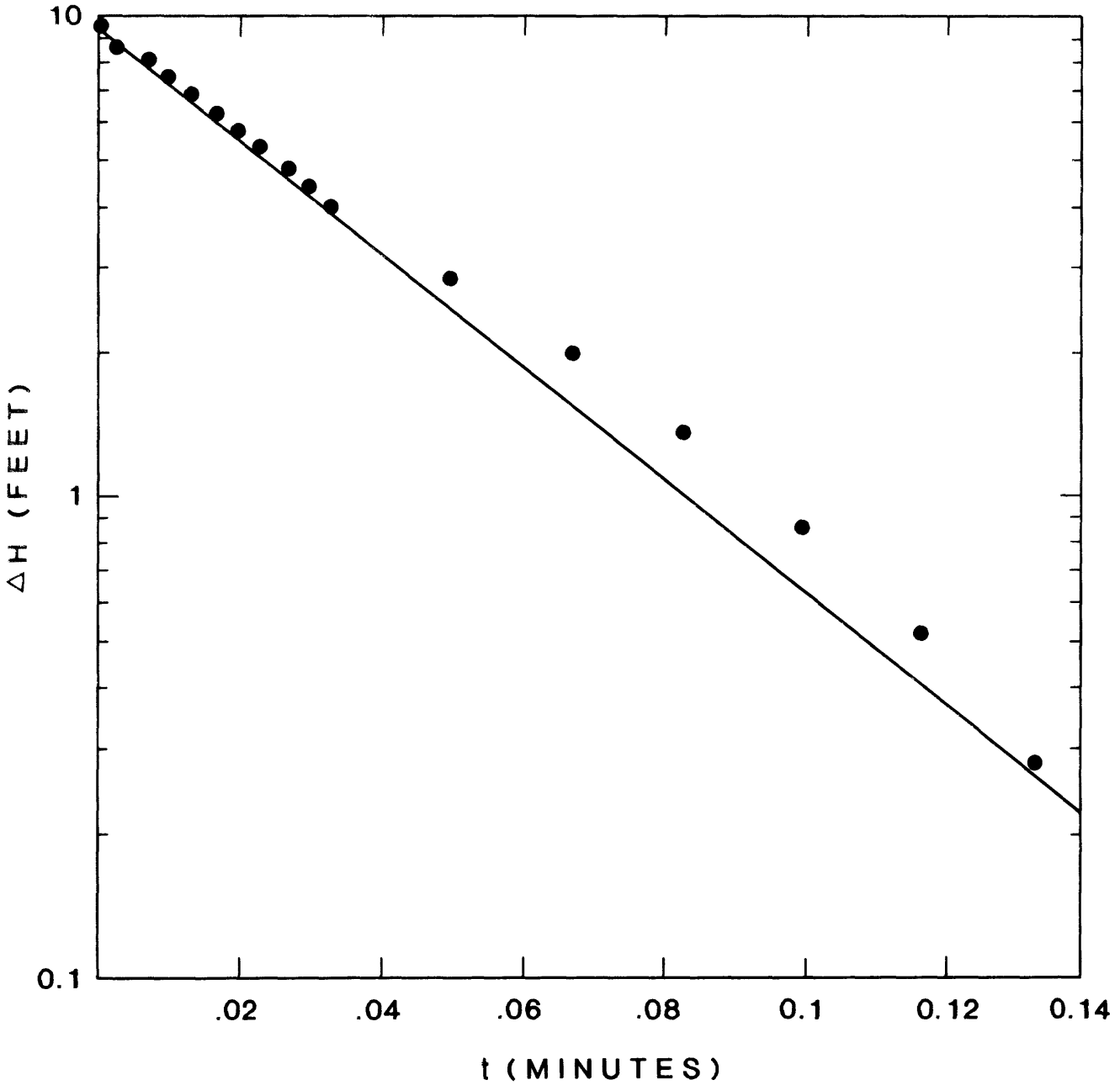
Specific capacity of a well is the rate of discharge (in gallons per minute) of water from the well divided by the drawdown (in feet) of the water level in the well. Specific capacity usually decreases slowly as the duration of pumping increases.

Specific conductance, a measure of the ability of water to conduct an electrical current, is expressed in microsiemens per centimeter at ± °C (degrees Celsius), written as μS/cm, formerly termed micromhos per centimeter at 25 °C (μmho/cm). Because the specific conductance is related to the particular types of chemical ions in solution and their concentrations, it can be used to approximate the dissolved-solids content of the water. The dissolved-solids concentration, in mg/L, is about 55 to 75 percent of the specific conductance in μS/cm at 25 °C (Hem, 1985). This relation is not constant, however, and may vary in water from the same source.

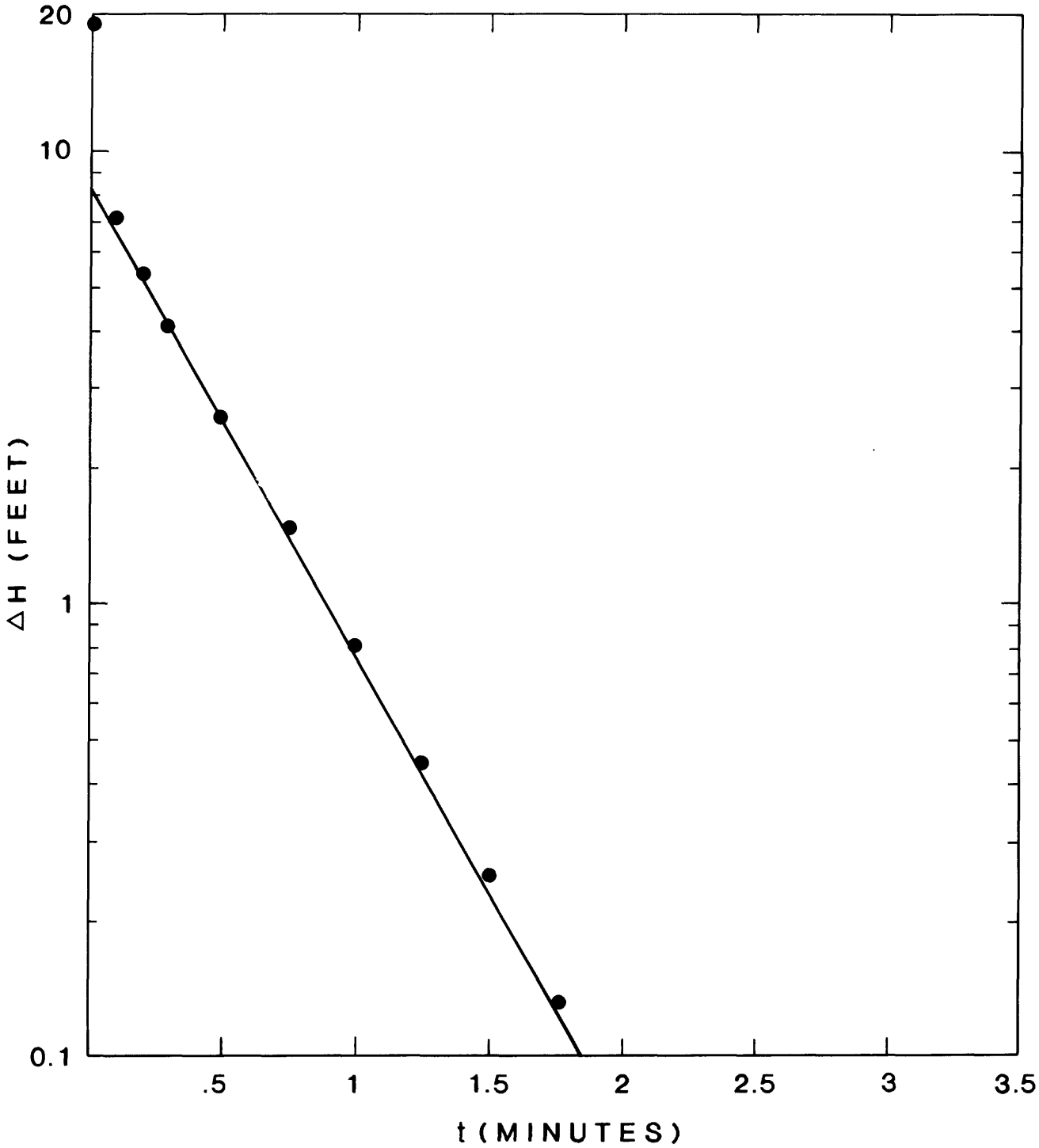
Appendix A.--Slug-test plots for observation wells at Swope Oil Superfund site, 1985.

[Data from NUS Corporation (1985).]

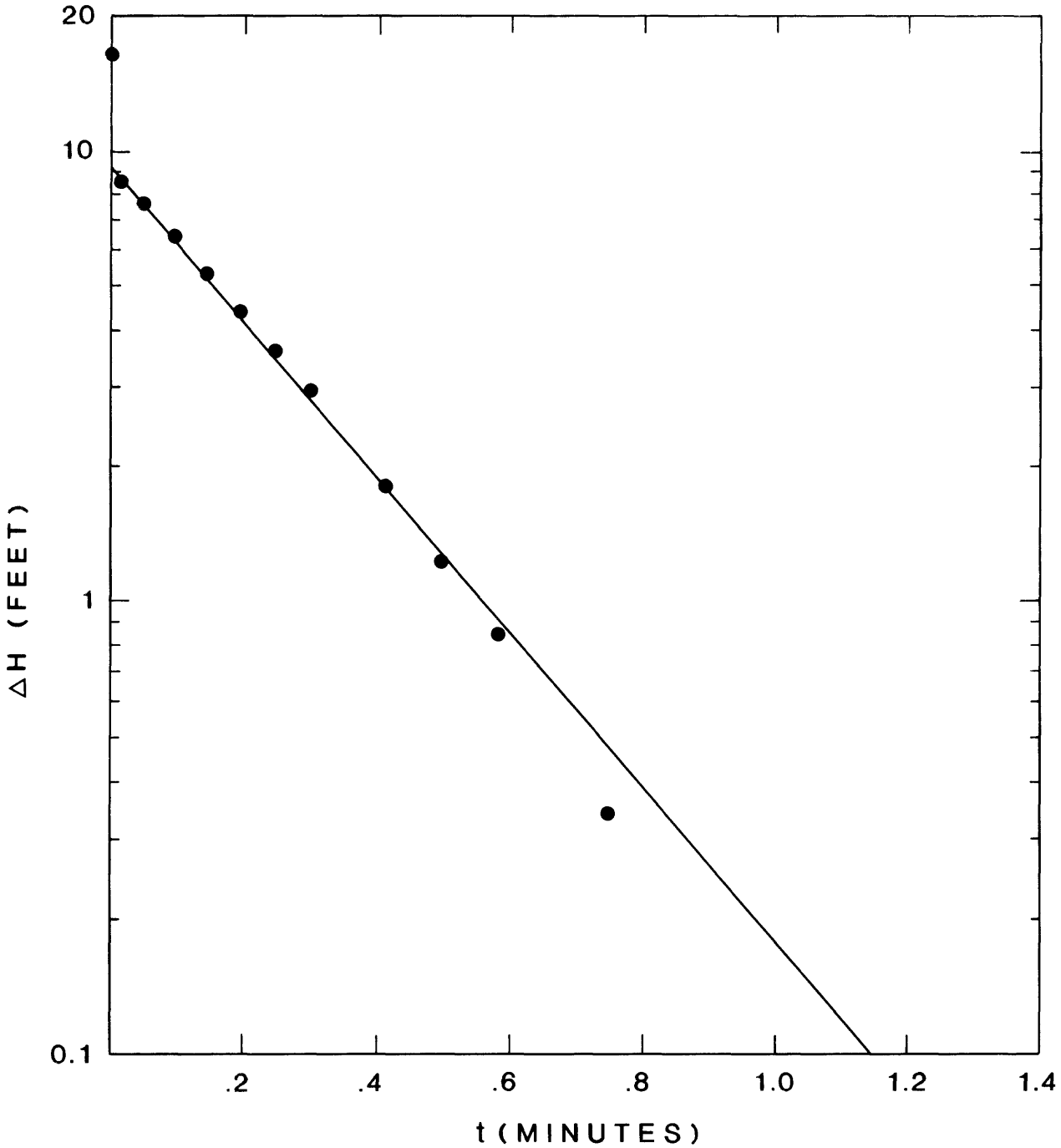
[Data presented were not verified or examined for quality control.]



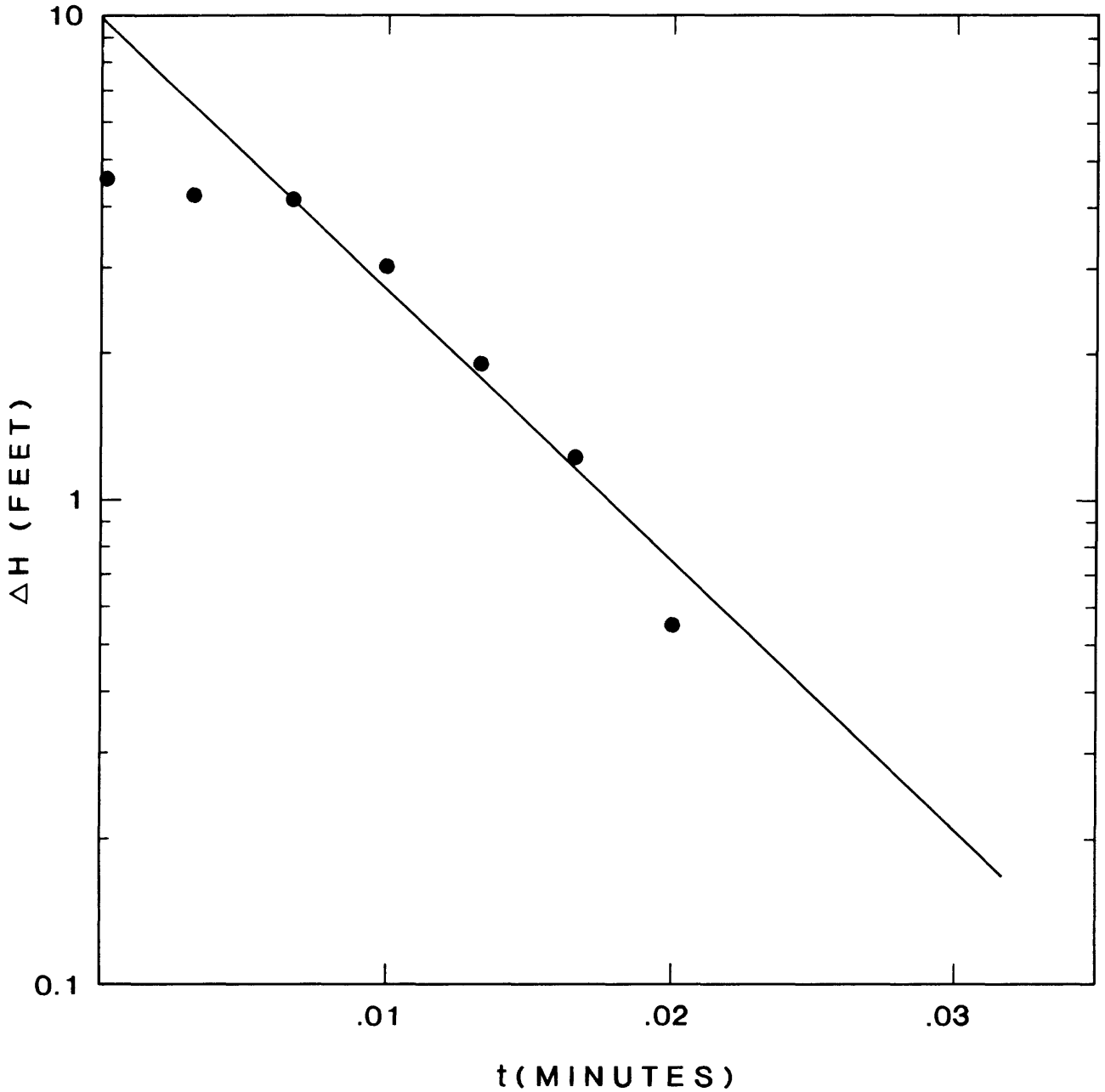
Semilogarithmic plot of change in head (ΔH) as a function of time (t) for slug test at Swope Oil Company site MW-1. (From NUS Corporation, 1985.)



Semilogarithmic plot of change in head (ΔH) as a function of time (t) for slug test at Swope Oil Company site MW-3. (From NUS Corporation, 1985.)



Semilogarithmic plot of change in head (Δ H) as a function of time (t) for slug test at Swope Oil Company site MW-4. (From NUS Corporation, 1985.)



Semilogarithmic plot of change in head (Δ H) as a function of time (t) for slug test at Swope Oil Company site MW-5. (From NUS Corporation, 1985.)

Appendix B.--Slug-test data for observation wells at the Pennsauken Landfill, 1987.

[Data from Woodward-Clyde Consultants (1988).]

[Data presented were not verified or examined for quality control.]

Rising head slug test
12/30/87

Well no. 014

TIME (SECONDS)	HEAD (FEET)
1.00	1.250
2.00	1.110
3.00	.980
4.00	.870
5.00	.760
6.00	.670
7.00	.600
8.00	.520
9.00	.460
10.00	.410
11.00	.360
12.00	.310
13.00	.270
14.00	.250
15.00	.220
16.00	.190
21.01	.100
26.00	.060
31.00	.030

Well no. 017

TIME (SECOND)	HEAD (FEET)
1.00	2.440
2.00	2.110
3.00	1.830
4.00	1.580
5.00	1.380
6.00	1.200
7.00	1.040
8.00	.910
9.00	.770
10.00	.680
11.00	.580
12.00	.500
13.00	.440
18.01	.210
23.00	.110
28.00	.050
33.01	.070
38.00	.040
43.00	.040
48.01	.030
53.00	.030
58.00	.030
63.01	.030
68.00	.030
73.00	.030
78.00	.030
83.00	.030
88.00	.020
93.01	.020
98.00	.020
103.00	.020
108.01	.020
113.00	.020
143.00	.020
173.00	.020
203.00	.020
233.00	.010
263.00	.010
293.00	.010
323.00	.010
353.00	.010
383.00	.010

Well no. 018

TIME (SECOND)	HEAD (FEET)
1.00	2.530
2.00	2.310
3.00	2.120
4.00	1.960
5.00	1.790
6.00	1.640
7.00	1.510
8.00	1.400
9.00	1.280
10.00	1.250
15.01	.790
20.00	.520
25.00	.350
30.01	.230
35.00	.160
40.00	.110
45.01	.080
50.00	.060
55.00	.040
60.01	.030
65.00	.020
70.00	.020
75.00	.010
80.00	.010
85.00	.010

Well no. 015

TIME (SECOND)	HEAD (FEET)
1.00	.940
2.00	.490
3.00	.780
4.00	.340
5.00	.240
6.00	.180
7.00	.130
8.00	.100
9.00	.080
10.00	.070
11.00	.060
12.00	.050
13.00	.040
14.00	.040
15.00	.040
16.00	.040
21.01	.010

From Woodward-Clyde Consultants (1988)

Rising head slug test
12/30/87

Well no. 20

TIME (SECOND)	HEAD (FEET)
5.00	2.400
10.00	2.300
15.00	2.210
20.00	2.130
25.00	2.060
30.00	1.980
35.00	1.910
40.00	1.840
45.00	1.770
50.00	1.710
55.00	1.640
60.00	1.580
65.00	1.530
70.00	1.470
75.00	1.410
80.00	1.370
85.00	1.310
115.00	1.050
145.00	.840
175.00	.670
205.00	.530
235.00	.430
265.00	.360
295.00	.290
325.00	.240
355.00	.200
385.00	.160
415.00	.130
445.00	.110
475.00	.090
505.00	.080
535.00	.070
565.00	.060
685.00	.040
805.00	.030

Well no. 22

TIME (SECOND)	HEAD (FEET)
1.00	2.500
2.00	2.280
3.00	2.060
4.00	1.890
5.00	1.710
6.00	1.570
7.00	1.430
8.00	1.290
9.00	1.170
10.00	1.060
11.00	.960
12.00	.880
13.00	.810
14.00	.720
19.00	.450
24.00	.280
29.00	.160
34.00	.090
39.00	.070
44.00	.050
49.00	.030
54.00	.010
59.00	.020
64.00	.020
69.00	.010
74.00	.020
79.00	.010
84.00	.010
89.00	.010
94.00	.010
99.00	.020
104.00	.010
109.00	.010
114.00	.010
144.00	.010
174.00	.010
204.00	.010
234.00	.010

Well no. 25

TIME (SECOND)	HEAD (FEET)
1.00	3.180
2.00	3.170
3.00	3.170
4.00	3.160
5.00	3.130
6.00	3.110
7.00	3.100
8.00	3.060
9.00	3.070
10.00	3.050
11.00	3.040
12.00	3.030
13.00	3.010
14.00	2.990
19.00	2.940
24.00	2.870
29.00	2.810
34.00	2.750
39.00	2.680
44.00	2.620
49.00	2.560
54.00	2.500
59.00	2.430
64.00	2.370
69.00	2.310
74.00	2.250
79.00	2.190
84.00	2.130
89.00	2.070
94.00	2.010
99.00	1.950
104.00	1.890
109.00	1.830
114.00	1.780
144.00	1.450
174.00	1.130
204.00	.850
234.00	.620
264.00	.440
294.00	.310
324.00	.220
354.00	.150
384.00	.100
414.00	.080
444.00	.050
474.00	.030
504.00	.020
534.00	.010
564.00	.010

From Woodward-Clyde Consultants (1988)

Rising head slug test
12/30/87

Well no. 26

TIME (SECOND)	HEAD (FEET)
1.00	1.770
2.00	1.550
3.00	1.380
4.00	1.260
5.00	1.160
6.00	1.060
7.00	.980
8.00	.910
9.00	.850
10.00	.810
11.00	.870
12.00	.740
13.00	.720
18.01	.570
23.00	.490
28.00	.420
33.01	.360
38.00	.320
43.00	.270
48.01	.250
53.00	.210
58.00	.190
63.01	.160
68.00	.140
73.00	.120
78.00	.110
83.00	.100
88.00	.090
93.01	.080
98.00	.080
103.00	.070
108.01	.060
113.00	.050
143.00	.030
173.00	.010
203.00	.010
233.00	.010

Well no. 27

TIME (SECOND)	HEAD (FEET)
1.00	2.900
2.00	2.860
3.00	2.870
4.00	2.830
5.00	2.800
6.00	2.800
7.00	2.770
8.00	2.740
9.00	2.730
10.00	2.720
11.00	2.700
12.00	2.700
13.00	2.680
14.00	2.680
19.00	2.620
24.00	2.580
29.00	2.540
34.00	2.500
39.00	2.460
44.00	2.430
49.00	2.390
54.00	2.360
59.00	2.330
64.00	2.300
69.00	2.280
74.00	2.250
79.00	2.230
84.00	2.200
89.00	2.180
94.00	2.160
99.00	2.140
104.00	2.120
109.00	2.100
114.00	2.070
144.00	1.960
174.00	1.860
204.00	1.770
234.00	1.690
264.00	1.610
294.00	1.540
324.00	1.480
354.00	1.420
384.00	1.360
414.00	1.310
444.00	1.260
474.00	1.220
504.00	1.180
534.00	1.130
564.00	1.110

Well no. 27 (Continued)

594.00	1.060
714.00	.940
834.00	.840
954.00	.750
1074.00	.700
1194.00	.650
1314.00	.600
1434.00	.580
1554.00	.550
1674.00	.530
1794.00	.510

Well no. 028

TIME (SECOND)	HEAD (FEET)
1.00	2.870
2.00	2.810
3.00	2.760
4.00	2.670
5.00	2.640
6.00	2.600
7.00	2.490
8.00	2.460
9.00	2.420
10.00	2.410
15.01	2.170
20.00	1.950
25.00	1.780
30.01	1.620
35.00	1.470
40.00	1.340
45.01	1.230
50.00	1.120
55.00	1.020
60.01	.930
65.00	.850
70.00	.770
75.00	.700
80.00	.640
85.00	.580
90.01	.530
95.00	.490
100.00	.440
105.01	.400
110.00	.370
140.00	.200
170.00	.110
200.00	.050
230.00	.020

From Woodward-Clyde Consultants (1988)

Rising head slug test
12/30/87

Well no. 029

TIME (SECOND)	HEAD (FEET)
1.00	1.960
2.00	1.860
3.00	1.840
4.00	1.810
5.00	1.770
6.00	1.730
7.00	1.670
8.00	1.670
9.00	1.630
10.00	1.590
11.00	1.580
12.00	1.530
17.00	1.400
22.00	1.310
27.00	1.230
32.00	1.150
37.00	1.080
42.00	1.020
47.00	.970
52.00	.920
57.00	.880
62.00	.840
67.00	.780
72.00	.730
77.00	.700
82.00	.670
87.00	.640
92.00	.610
97.00	.590
102.00	.570
107.00	.550
112.00	.530
142.00	.430
172.00	.370
202.00	.310

Well no. 029 (Continued)

232.00	.260
262.00	.230
292.00	.200
322.00	.180
352.00	.170
382.00	.150
412.00	.140
442.00	.120
472.00	.110
502.00	.110
532.00	.100
562.00	.090
592.00	.090
712.00	.050
832.00	.040
952.00	.030
1072.00	.030
1192.00	.020
1312.00	.020
1432.00	.020

Well no. 033

TIME (SECOND)	HEAD (FEET)
1.00	.530
2.00	.520
3.00	.500
4.00	.500
5.00	.470
6.00	.460
7.00	.460
8.00	.440
9.00	.440
10.00	.430
11.00	.420
12.00	.390
13.00	.370
14.00	.350
15.00	.360
20.00	.320
25.00	.250
30.00	.220
35.00	.200
40.00	.160
45.00	.140
50.00	.130
55.00	.110
60.00	.070
65.00	.070
70.00	.080
75.00	.050
80.00	.050
85.00	.050
90.00	.050
95.00	.050
100.00	.040
105.00	.050
110.00	.030
115.00	.020
145.00	.020
175.00	.010
205.00	.030

From Woodward-Clyde Consultants (1988)

Falling head slug test
12/30/87

Well no. 014

TIME (SECOND)	HEAD (FEET)
1.00	1.140
2.00	.890
3.00	.700
4.00	.550
5.00	.430
6.00	.350
7.00	.280
8.00	.230
9.00	.210
10.00	.170
11.00	.150
12.00	.130
13.00	.120
14.00	.110
15.00	.100
16.00	.090
21.01	.070
26.00	.060
31.00	.050
36.01	.040
41.00	.030
46.00	.030
51.01	.030
56.00	.020
61.00	.020
66.01	.020
71.00	.010

Well no. 015

TIME (SECOND)	HEAD (FEET)
1.00	1.270
2.00	.860
3.00	.560
4.00	.370
5.00	.270
6.00	.200
7.00	.160
8.00	.130
9.00	.110
10.00	.100
11.00	.090
12.00	.080
13.00	.080
14.00	.070
15.00	.070
20.00	.060
25.00	.050
30.00	.050
35.00	.050
40.00	.050
45.00	.040
50.00	.040
55.00	.030
60.00	.030
65.00	.030
70.00	.030
75.00	.030
80.00	.030
85.00	.030
90.00	.020
95.00	.020
100.00	.020
105.00	.020
110.00	.020
115.00	.020
145.00	.020
175.00	.030
205.00	.020
235.00	.010

Well no. 016

TIME (SECOND)	HEAD (FEET)
1.00	.850
2.00	.450
3.00	.190
4.00	.100
5.00	.070
6.00	.050
7.00	.040
8.00	.040
9.00	.040
10.00	.030
11.00	.030
12.00	.030
13.00	.030
14.00	.030
15.00	.030
16.00	.030
17.00	.030
18.00	.030
23.00	.020
28.00	.010
33.00	.010
38.00	.010

Well no. 017

TIME (SECOND)	HEAD (FEET)
1.00	2.360
2.00	1.500
3.00	1.210
4.00	1.100
5.00	.960
6.00	.830
7.00	.730
8.00	.900
9.00	.560
10.00	.360
11.00	.430
12.00	.370
13.00	.320
14.00	.280
15.00	.250
20.00	.130
25.00	.070
30.00	.050
35.00	.030
40.00	.020
45.00	.020

From Woodward-Clyde Consultants (1988)

Falling head slug test
12/30/87

Well no. 018

TIME (SECOND)	HEAD (FEET)
1.00	1.690
2.00	1.550
3.00	1.440
4.00	1.320
5.00	1.220
6.00	1.130
7.00	1.040
8.00	.960
9.00	.890
10.00	.820
11.00	.760
16.00	.510
21.00	.340
26.00	.230
31.00	.160
36.00	.100
41.00	.070
46.00	.050
51.00	.030
56.00	.030
61.00	.020
66.00	.010
71.00	.010
76.00	.010
81.00	.010

Well no. 020

TIME (SECOND)	HEAD (FEET)
1.00	2.000
2.00	1.980
3.00	1.970
4.00	1.950
5.00	1.930
6.00	1.920
7.00	1.900
8.00	1.880
9.00	1.870
10.00	1.850
11.00	1.840
12.00	1.820
13.00	1.800
14.00	1.790
19.00	1.720
24.00	1.640
29.00	1.580
34.00	1.510
39.00	1.450
44.00	1.390
49.00	1.330
54.00	1.270
59.00	1.220
64.00	1.170
69.00	1.120
74.00	1.080
79.00	1.030
84.00	.990
89.00	.950
94.00	.910
99.00	.870
104.00	.840
109.00	.800
114.00	.770
144.00	.590
174.00	.460
204.00	.350
234.00	.270
264.00	.210
294.00	.170
324.00	.130
354.00	.110
384.00	.080
414.00	.060
444.00	.050
474.00	.040
504.00	.030
534.00	.030
564.00	.020
594.00	.010
714.00	.010
834.00	.010
954.00	.010

Well no. 022

TIME (SECOND)	HEAD (FEET)
1.00	2.390
2.00	1.790
3.00	1.800
4.00	1.620
5.00	1.470
6.00	1.340
7.00	1.220
8.00	1.110
9.00	1.020
10.00	.940
11.00	.870
12.00	.760
13.00	.700
14.00	.640
15.00	.590
20.00	.360
25.00	.230
30.00	.150
35.00	.100
40.00	.070
45.00	.050
50.00	.030
55.00	.040
60.00	.030
65.00	.030
70.00	.020
75.00	.020
80.00	.010
85.00	.010
90.00	.010
95.00	.010
100.00	.010
105.00	.010
110.00	.010
115.00	.010
145.00	.010
175.00	.010

From Woodward-Clyde Consultants (198

Falling head slug test
12/30/87

Well no. 025

TIME (SECOND)	HEAD (FEET)
1.00	1.550
2.00	1.510
3.00	1.480
4.00	1.450
9.01	1.340
14.00	1.290
19.00	1.240
24.01	1.190
29.00	1.150
34.00	1.100
39.01	1.050
44.00	1.010
49.00	.970
54.01	.930
59.00	.890
64.00	.850
69.00	.820
74.00	.790
79.00	.760
84.01	.730
89.00	.700
94.00	.670
99.01	.640
104.00	.610
134.00	.480
164.00	.360
194.00	.280
224.00	.210
254.00	.160
284.00	.120
314.00	.090
344.00	.070
374.00	.050
404.00	.030
434.00	.020
464.00	.020
494.00	.010
524.00	.010
554.00	.010
584.00	.010
704.00	.010

Well no. 026

TIME (SECOND)	HEAD (FEET)
1.00	1.590
2.00	1.110
3.00	.780
4.00	.880
5.00	.820
6.00	.770
7.00	.730
8.00	.710
9.00	.680
10.00	.650
11.00	.630
12.00	.610
13.00	.590
14.00	.570
15.00	.550
16.00	.530
17.00	.520
18.00	.500
23.00	.450
28.00	.410
33.00	.360
38.00	.320
43.00	.280
48.00	.250
53.00	.220
58.00	.200
63.00	.180
68.00	.160
73.00	.150
78.00	.130
83.00	.120
88.00	.110
93.00	.100
98.00	.090
103.00	.080
108.00	.070
113.00	.070
118.00	.060
148.00	.030
178.00	.020
208.00	.010

Well no. 028

TIME (SECOND)	HEAD (FEET)
1.00	2.770
2.00	2.760
3.00	2.730
4.00	2.700
5.00	2.670
6.00	2.640
7.00	2.610
8.00	2.600
9.00	2.540
10.00	2.520
11.00	2.490
12.00	2.470
13.00	2.440
14.00	2.420
19.00	2.300
24.00	2.190
29.00	2.080
34.00	1.990
39.00	1.890
44.00	1.810
49.00	1.730
54.00	1.650
59.00	1.570
64.00	1.500
69.00	1.440
74.00	1.370
79.00	1.310
84.00	1.250
89.00	1.190
94.00	1.140
99.00	1.090
104.00	1.040
109.00	.990
114.00	.950
144.00	.710
174.00	.550
204.00	.410
234.00	.310
264.00	.230
294.00	.180
324.00	.130
354.00	.100
384.00	.070
414.00	.060
444.00	.040
474.00	.030
504.00	.020
534.00	.020
564.00	.010
594.00	.010

From Woodward-Clyde Consultants (1988)

Falling head slug test
12/30/87

Well no. 027

TIME (SECOND)	HEAD (FEET)
1.00	1.070
2.00	1.060
3.00	1.060
4.00	1.050
5.00	1.050
6.00	1.050
7.00	1.050
8.00	1.050
9.00	1.050
10.00	1.050
11.00	1.050
16.00	1.040
21.00	1.040
26.00	1.030
31.00	1.030
36.00	1.030
41.00	1.020
46.00	1.020
51.00	1.020
56.00	1.020
61.00	1.020
66.00	1.020
71.00	1.020
76.00	1.010
81.00	1.010
86.00	1.000
91.00	1.010
96.00	1.010
101.00	1.000
106.00	1.000
111.00	.990
141.00	.980
171.00	.980
201.00	.970
231.00	.970
261.00	.960
291.00	.960
321.00	.950
351.00	.950
381.00	.940
411.00	.940
441.00	.930
471.00	.930
501.00	.920
531.00	.920
561.00	.910

Well no. 027 continued

591.00	.900
711.00	.870
831.00	.840
951.00	.810
1071.00	.760
1191.00	.690
1311.00	.650
1431.00	.630
1551.00	.570
1671.00	.530
1791.00	.510
1911.00	.480
2031.00	.460
2151.00	.450

Well no. 033

TIME (SECOND)	HEAD (FEET)
1.00	.850
2.00	.780
3.00	.690
4.00	.640
5.00	.590
6.00	.550
7.00	.490
8.00	.470
9.00	.430
10.00	.400
11.00	.370
12.00	.340
13.00	.320
14.00	.280
19.00	.200
24.00	.140
29.00	.110
34.00	.080
39.00	.030
44.00	.040
49.00	.030
54.00	.030
59.00	.020
64.00	.010

Well no. 029

TIME (SECOND)	HEAD (FEET)
1.00	1.530
2.00	1.480
3.00	1.430
4.00	1.380
5.00	1.340
6.00	1.300
7.00	1.260
8.00	1.220
9.00	1.190
10.00	1.160
15.01	1.020
20.00	.920
25.00	.820
30.01	.740
35.00	.680
40.00	.630
45.01	.580
50.00	.540
55.00	.500
60.01	.470
65.00	.430
70.00	.410
75.00	.390
80.00	.370
85.00	.350
90.01	.330
95.00	.310
100.00	.290
105.01	.280
110.00	.260
140.00	.190
170.00	.160
200.00	.140
230.00	.110
260.00	.090
290.00	.090
320.00	.070
350.00	.060
380.00	.050
410.00	.050
440.00	.040
470.00	.040
500.00	.040
530.00	.030
560.00	.030
590.00	.030
710.00	.020
830.00	.010
950.00	.010
1070.00	.010
1190.00	.010

From Woodward-Clyde Consultants (1988)

Appendix C.--Drillers' and geologists' logs of wells and test borings in the study area.

[Drillers' and geologists' logs are presented in order of increasing well number.]

[Source: U.S. Geological Survey ground-water inventory system files; New Jersey Department of Environmental Protection hazardous-wastes files; and NUS Corporation, 1985.]

REPRODUCED FROM BEST AVAILABLE COPY

WELL No.

WELL LOG SHEET

001

WELL №. MW 1	PROJECT №. 0768.16.	PROJECT NAME SWOPE OIL	
LOCATION Pennsauken N.J.		GEOLOGIST L. Reitz	
DRILLING DATE 5/30/84	DRILLING CONTRACTOR Hydro Group, Inc		
DRILLING METHOD Mud rotary	DRILLER J Yost	INSTALLATION DATE 6/1/84	
WATER LEVEL BEFORE INSTALLATION ~60'		WATER LEVEL AFTER INSTALLATION 81.19 7-6	
DEVELOPMENT METHOD compressed air		GROUND ELEVATION 63.	

LITHOLOGY

DESCRIPTION

0-35' Alternating layers of grey green medium sand and brown clay, loose

35-45' white and light brown gravel, trace of clay, loose

45-55' light grey silty clay, some medium grained sand, stiff

55-65' v. light grey and yellow brown. fine grained silty sand, trace of white clay, med. dense

65-72' light grey fine to medium grained sand, med. dense

72-80' light brown fine to coarse sand, trace gravel loose

80-95' v. light brown fine to medium sand, some interbeds of light grey clay

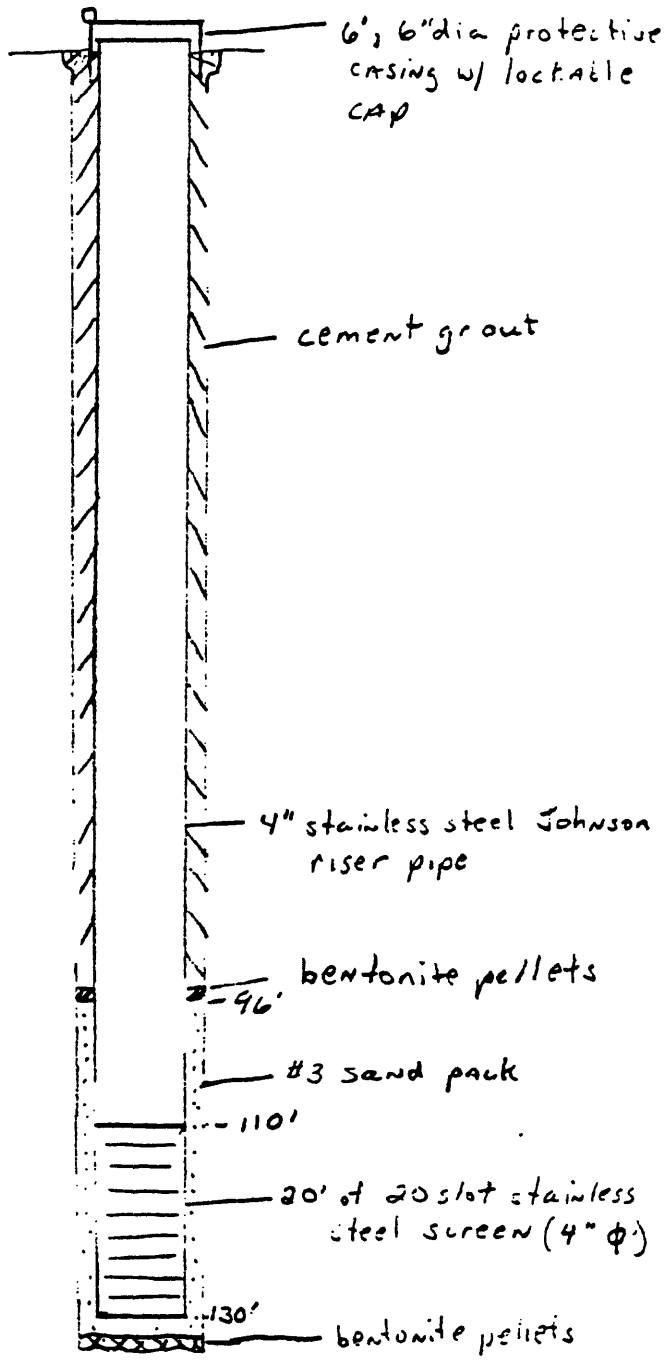
95-125' v. light brown gravel, some interbeds of coarse sand, v. loose

125-133' v. light brown grey sandy silt, trace clay, stiff

SYMBOL

CONSTRUCTION DETAILS

DESCRIPTION | DEPTH



JPO 8/1/84

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL No. 001
PROJECT NO. 0758.16 BORING MW-1
ELEVATION ~70' DATE 5/22/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR 20 SCA HNU READ
001A	51	1'		stiff / loose	gry grn brn / gry grn	SANDY CLAY, some lots / fine sand some silt	CH / SM	0
↓								
001B	31	1'6"		loose	grn gray	medium grained SAND	SP	0
↓				v stiff	gry grn / brn	interbedded clay and / medium grained SAND	CL	
001C	41	1'8"		loose	gray green	medium grained SAND, some clay	SM	0
↓				loose	red brn	medium grained, clayey SAND	SC	
001D	30	2'		loose / stiff	gry grn brn / brn	fine to medium grained SAND / with interbeds of clay	SM / CL	0
↓								

REMARKS Jars used instead of hammer to take samples, weight approximately 75 lbs

BORING MW-1

PAGE 1 OF 1

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL NO. 001
PROJECT NO. 0758.16 BORING MW-1
ELEVATION ~70' DATE 5/24/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA 20 SC HNu PE
25 001E	35	1'		loose / stiff	gray brn / gray	medium grained sand with interbeds of clay	SM / CL	0
↓						some limonite cemented sand zones		
30 *								
001F	9	7"		loose	white to lt brn	pebble size gravel, trace clay	GP	0
35 ↓						gravel subrounded & subangular, (mostly qtz, well sorted)		
40 001G		2'		v. loose	white to lt brn	pebble size gravel, trace sand/silt	GP	0
↓						gravel subrounded & subangular, (mostly qtz, moderate sorting)		
45 001H		8"		v. stiff	lt gray	silty clay, trace of sand and gravel	ML	0
↓						at top 2", gradational contact possible		
50								

REMARKS *SPOON broke off of jars, not retrieved after 3hrs of trying, NO SAMPLE taken until 34', drilled around spoon. BORING MW-1

PAGE 2 OF

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL No. 001
PROJECT NO. 0758.16 BORING MW-1
ELEVATION ~70' DATE 5/24/84
FIELD GEOLOGIST L. Reite

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
001 I	60	1'		stiff	lt gray	silty clay, some medium SAND at bottom of sample, contact? some limonite staining	ML	0
001-J	65	1'		dense	v. lt gray yel brn	fine grained, silty SAND, some thin beds of white clay	SM	0
001 K	35	6"		med dense	yel brn	fine grained SAND, trace silt limonite staining common	SP	0
001 L	30	6"		med dense	lt gray	silty fine to medium grained SAND some yel brn coarse SAND at bottom of sample, contact? grains are subround	SM	0
			72					
001 M	30	1'		loose	lt brn	v. fine to v. coarse SAND, trace gravel, limonite staining common grains are subround (poorly sorted)	SW	0

REMARKS sample recovery poor, gravel tears teeth out of plastic retainer rings

BORING MW-1

PAGE 3 OF

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL No. 001
PROJECT NO. 0258.16 BORING MW-1
ELEVATION ~70' DATE 5/25/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA 20 scr HNU Rea
001N	20	18"		loose	lt brn	fine to v. coarse sand, trace gravel	GP	0
↓						grains subrounded (poorly sorted)		
001O	40	1'		stiff	lt grey	silty clay, some v. thin interbeds of	ML	0
↓						lt gray coarse sand		
001P	100	1'2"		dense	lt brn	fine to medium sand, some thin		
↓						interbeds of stiff, lt gray silty	SC	0
						clay		
001Q	100	12"		dense	lt brn	medium to v. coarse sand, trace gravel	SW	0
↓						(grains subrounded, poorly sorted)		
001R	75	18"		dense	"	" " "	SW	0
↓								
001S	75	12"		dense / stiff	lt brn / lt gray	v. coarse sand to pebble gravel / silty clay	SW / ML	0
↓								
001T	50	24"		dense	lt brn	pebble gravel, trace interbeds of coarse to v. coarse sand	GP	0
↓						(grains subrounded, moderate sorting)		
001U	50	18"		"	"	" " " "	GP	0
↓								

insufficient type of grains, trace iron nodules.

REMARKS raining v. hard all day, occasional drop of oil falls on drillrod from drive chuck, can't stop it BORING MW-

PAGE 4 OF

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL No. 001
PROJECT NO. 075816 BORING MW-1
ELEVATION ~70' DATE 5/25/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA 20 SCA HNU REA
001V	30	6"		v loose	vlt brn	As before, trace lignite?	GP	0
↓								
001W	50	18"		v. loose	vlt brn	pebble gravel, trace coarse sand (grains subround, well sorted)	GP	0
↓								
001X	70	18"		v. loose	vlt brn	pebble gravel and to coarse v. coarse sand (grains subround, poor sorting)	GW	0
↓								
001Y	75	2'		v. loose	vlt brn	pebble gravel and interbeds of coarse to v coarse sand, (grains subround)	GP	0
↓								
001Z	75	2'		v. loose	vlt brn	" " " "	GP	0
↓						" " " "		
001AA	75	19"		v loose	"	" " " "	GP	0
↓								
001BB	"	2'		"	"	" " " "	GP	0
↓								
001CC	"	10"		"	"	" " " "	GP	0
↓								
00100	"			"	"	" " " "	GP	0
↓						(trace v. light gray silty clay)		
001EE	"			"	"	" " "	GP	0
↓								
001FF	"			"	"	" " " "	GP	0
↓								

Increase w/ depth

REMARKS could possibly be washing gravel from upper zone? 100-115'

BORING MW-1

PAGE 5 OF

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL WELL No. 001
PROJECT NO. 0258.16 BORING MW-1
ELEVATION ~70 DATE 5/30/86
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA 2.0 sc HNU PC
125 00166	75	.2'		v. loose	v lt brn	pebble gravel, some interbeds of coarse	GP	0
↓						sand, some lt gray sandy silt, trace mica		
						(grains subround, poor sorting)		
2.0 00111H	75	22"		stiff	v lt brn gray	sandy silt, trace clay, some	mH	0
↓						limonite staining, trace gravel		
								SHELBY
TD @ 133								
135								
140								
145								
150								

REMARKS

BORING MW-1

PAGE 6 OF

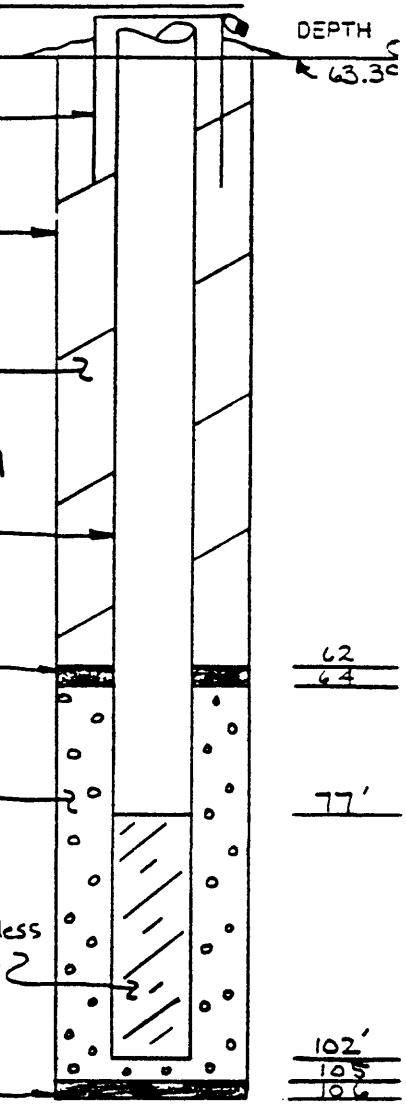
WELL No.

WELL LOG SHEET

002

WELL Nº. MW 2	PROJECT Nº. 0758.16	PROJECT NAME SWOPE OIL CO.	
LOCATION PENNSAUKEN, N.J.		GEOLOGIST SJ CONTI	
DRILLING DATE 7-2-84	DRILLING CONTRACTOR HYDRO GROUP		
DRILLING METHOD MUD ROTARY	DRILLER J. YOST	INSTALLATION DATE 7-5-84	
WATER LEVEL BEFORE INSTALLATION		WATER LEVEL AFTER INSTALLATION 81.44	7-10-84
DEVELOPMENT METHOD COMPRESSED AIR		GROUND ELEVATION 63.39	

LITHOLOGY DESCRIPTION	SYMBOL	CONSTRUCTION DETAILS DESCRIPTION	DEPTH
Interbedded Sands and Sandy clay, from 0 - 61. Becomes more sandy with depth. Clay lens from 75 To 80 with sand interbedded. Then medium to coarse sand to bottom, Trace clay.		6"Φ Protective locking cap	63.39
		10"Φ Hole	
		Cement grout	
See MW 1 log for more accurate description.		4"Φ Stainless Steel Riser pipe	
No Shovel samples taken on this hole.		Bentonite pellets	62 64
		# 3 well gravel	77'
		25' of 20 slot stainless Steel screen (4"Φ)	
	106'	Bentonite pellets	102' 105 106



Bottom of Hole @ 106'

JPO 5/1/84

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO WELL No. 002
PROJECT NO. 0758.16 BORING MW 2
ELEVATION DATE 7-2-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
0					M DENSE	GRAY	SAND AND SLAG (ROADBED)		OHNU
									ENTIRE
5					M DENSE	GREEN BROWN	INTERBEDDED CLAYS AND	SC/SP	
					TO	TO	SANDS		
					DENSE	BROWN			
10									
15									
20.0						RED BROWN			

REMARKS BORING ADVANCED WITH 10" Φ ROLLER BIT (MODIFIED) USING QUICK GEL AS DRILLING FLUID, DID NOT TAKE AND SHOVEL SAMPLES - TOOK SPLIT SPOON AT SELECTED INTERVALS.

BORING MW 2

NOTE: DESCRIPTIONS FROM DRILLERS LOG - NO SHOVEL SAMPLES WERE TAKEN.

PAGE 1 OF 1

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO WELL No. 002
PROJECT NO. 9758.16 BORING MW2
ELEVATION DATE 7-2-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
25.0					DENSE	YELL BRN	SANDY CLAY	SC	
30.0									
									DRILLED IN 30-33
									IRON STAIN SANDY FRA
35.0									
40.0									
									DRILLER NOT A BIT MORE ABOUT 41.0
44.0									TOOK SAMPL 44.0' (PER
	S-1 OOS A	100/2'	1.6/2.0		V. DENSE	V. LT GRAY	V. FINE TO FINE SANDY CLAY -	SC	MOIST SPLIT SPOON
6.0							TRACE GRAVEL TO		SAMPLE 1/2" Ø GRAV
							CLAYEY VERY FINE SAND -		SAND IS V. F TO FINE MI
							MICACEOUS.		MICACEOUS SOME PORT OF SAMPLE
									COULD ROLL
									1/8" Ø THREA ALMOST WH IN COLOR.

REMARKS MATERIAL DESCRIBED BETWEEN SAMPLES WAS LOGGED FROM CUTTINGS. BORING MW2

PAGE 2 OF 5

NUS CORPORATION
A Halliburton Company

WELL No. 002

PROJECT SWOPE OIL CO
PROJECT NO. 0758.16 BORING MW 2
ELEVATION DATE 7-3-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION* SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
50.0				DENSE	TAN BRN	MEDIUM SAND - SOME	SP	
						COARSE SAND - TRACE		
						GRAVEL		
55.0								
60.0								
						SANDY CLAY - INTERBEDDED	SC	
						W/ SAND		
65.0								
70.0								

REMARKS

BORING MW 2

PAGE 3 OF 3

NUS CORPORATION
A Halliburton Company

WELL No. 002

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW 2
ELEVATION DATE 7-3-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION* SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
				DENSE				
S-2 005 B	100/2'	1.6'		DENSE	BROWN	FINE TO MEDIUM SAND- TRACE	SP	O-HNU. WET
						FINE GRAVEL		V. SLIGHT TI OF CLAY, E
								NOTED SOM STREAKS OF
								AROUND 80 SUBANGUL
								GRAINS. MAX 3/8" d
								QUARTZ GI
						SANDY CLAY	SC	
						MEDIUM TO COARSE SAND		
						TR GRAVEL.		

REMARKS

BORING MW 2

PAGE 4 OF 9

NUS CORPORATION
A Halliburton Company

WELL No. 002

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW 2
ELEVATION DATE 7-4-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	MATERIAL DESCRIPTION: COLOR	MATERIAL DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAI
50.0									
55.0	S-3 005 C					TAN			
		100/2'	1.4'/2		DENSE	BRN GRAY	FINE TO COARSE SAND - SOME	SW	MOIST DHAN - M
57.0					TO V. DENSE		GRAVEL		SIZE 3/8" SUBANGU
									TO SUBROU SAND GRA
							BOTTOM OF DRILLED HOLE		V. SLIGHT SF CLAY.
							@105. SPLIT SPOON TO		
							107.		

REMARKS

BORING MW2

PAGE 5 OF 5

WELL No. 003

WELL LOG SHEET

WELL №. MW 3	PROJECT №. 0758.16	PROJECT NAME	SWOPE OIL CO.
LOCATION PENNSAUKEN, N.J.		GEOLOGIST	SJ CONTI
DRILLING DATE 6-21-84	DRILLING CONTRACTOR	HYDRO GROUP	
DRILLING METHOD MUD ROTARY	DRILLER JOE YOST	INSTALLATION DATE	6-25-84
WATER LEVEL BEFORE INSTALLATION		WATER LEVEL AFTER INSTALLATION	82.55 7-6-84
DEVELOPMENT METHOD COMPRESSED AIR		GROUND ELEVATION	64.10

LITHOLOGY DESCRIPTION

0-5 - Loose, Orange Brown Silty Sand, Some gravel - Trace Organic Matl.

5-35 - Medium Dense to Dense, Yellow Brown Gray, Alternating layers of sandy clay and clayey sand. Sand content increasing with depth.

35-54 - Loose to Medium Dense, Yellow Brown, Medium to Coarse Sand, trace clay lenses Subangular sand grains.

54-64 - Loose yellow brown, Clayey Sand Trace fine gravel. Subangular Sand grains

64-79 - Loose to Medium Dense, Yellow Brown, Fine to Medium Sand, Trace clay and Fine gravel. Subangular Sand grains.

79-83 - Dense, Light gray Brown, Medium to coarse sand, trace fines and gravel. (Subangular grains.)

83-84 - Stiff, v. light gray clay lens

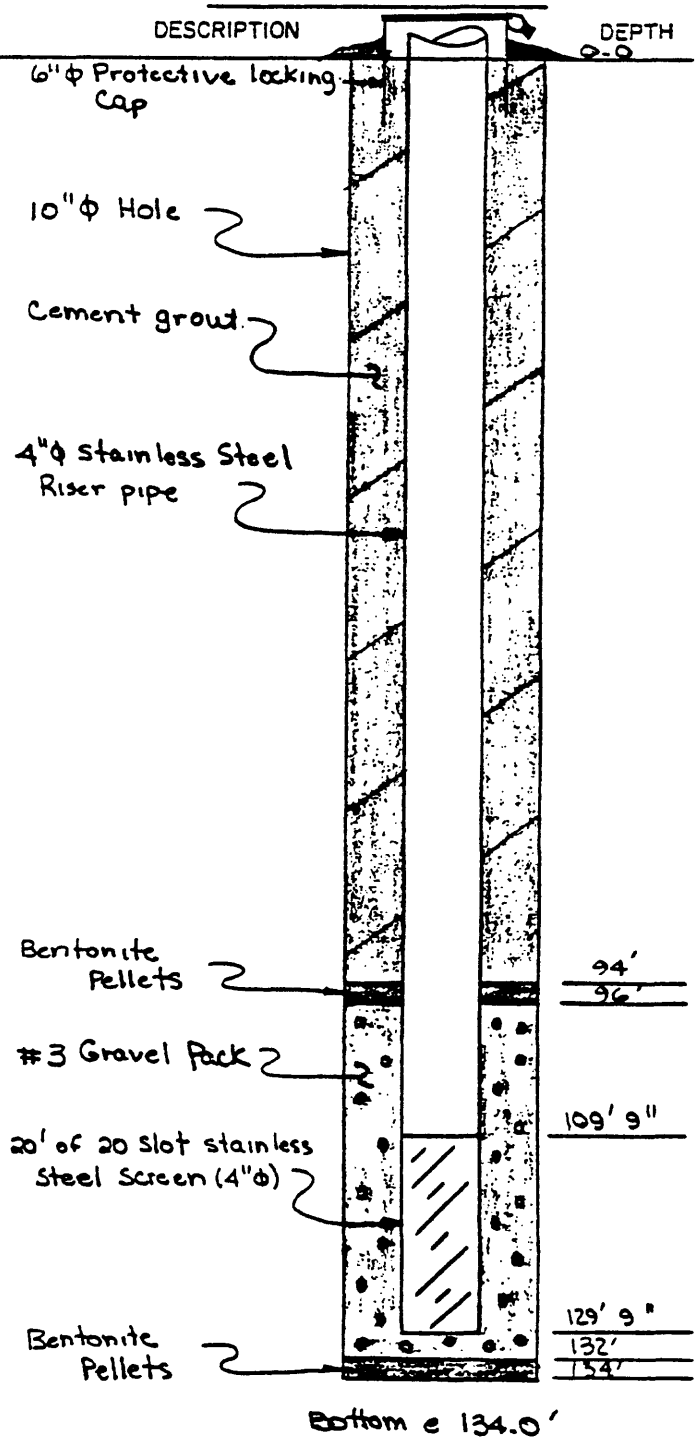
84-125 - Medium Dense to Dense Brown gray medium to coarse Sand - Trace fine gravel and trace clay. Sub-angular to Subrounded sand grains

125-132 - Dense Brown gray Sand and gravel, trace of clay lenses. Subangular to subrounded grains.

132-136 Very Stiff, Very light gray Silty clay - Trace fine sand.

SYMBOL

CONSTRUCTION DETAILS



JPO 8/1/84

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW 3
ELEVATION DATE 6-18-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
0	S-1 003 A				LOOSE	ORANGE BRN	SILTY SAND - SOME GRAVEL - TRACE	SM	SURFACE SAMP 1½" GRAVEL
							ORG. MATL.		WET FROM RI
						YELLOW			
0	S-2 003 B			5.0	LOOSE	BRN	SANDY CLAY - TRACE COARSE SAND	SC	SHOVEL SAMP
							AND ORGANICS		
									SOME CHATERI AT 9'.0".
0.0	S-3 003 C				M. DENSE	BROWN GRAY	CLAYEY SAND - TRACE GRAVEL AND	SC	SHOVEL SAM
							ORG. MATLS - TRACE	SP	MAX ¼" Φ GRA
							IRON STAINED SANDSTONE		AT 9' MOSTLY COARSE SAND
							FRAGS		W/CLAY LENS
						YELLOW			
50	S-4 003-D					BRN GRAY	SANDY CLAY - SOME SILT - TR ORG	SC	SHOVEL SAMPL
							MATL		CLAYEY SILT MIXTURE.
									TRACES OF LT. GRAY CLAY
									MORE FINES THAN S-3
						YELLOW			SIMILAR TO S-2
0.0	S-5 003-E					GRAY BROWN	SANDY/SILTY CLAY - TRACE ORG MAT'L	SC/CL	SHOVEL SAMPL
									DARKER THAT S- MORE COARSE
									SAND - BUT ONL TRACE.
									DRILLER ALSO NOTED MORE
									CLAY THAN IN MW 4 - SIMILA
									TO W1 AT THI DEPTH

REMARKS USED 10" ROLLER BIT (MODIFIED) TO ADVANCE BORING, USED QUICK GEL AS DRILLING FLUID. SOIL DENSITY WAS APPROXIMATED AS ONLY SHOVEL SAMPLES WERE TAKEN.

BORING MW 3

PAGE 1 OF 6

WELL No. 003

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW 3
ELEVATION DATE 6-18-84
FIELD GEOLOGIST SJ CONTI / J. FERGUSON

SAMPLE NO. TYPE & DEPTH(ft)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH(ft)	MATERIAL MOISTURE & WATER DEPTH(ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK WHOKENNESS	REMARKS
25.0 S-6 003 F				Loose	Yellow Brown	Silty/Sandy Clay	CL	SHOVEL SAMPLE
0.0 S-7 003 G				Loose	Yellow Brown	Silty Clay - Some Medium Grained Sand	CL/SC	increasing sand content
						Trace Gravel		SUBANGULAR GRAINS
			34.0					
5.0 S-8 003 H				Loose	Yellow Brown	Fine to Medium Sand Trace Clay	SP	SHOVEL SAMPLE
						and gravel		SUB ANGULAR
0.0 S-9 003 I				Med. Range		Med-Coarse Sand	SP	Less Clay 1mm - 2mm
								SUBANGULAR
5. S-10 003 J				Med Range		Med - Coarse Sand - TRACE CLAY	SP	SHOVEL SAMPLE
								SUBANGULAR

REMARKS

BORING MW 3

PAGE 2 OF 6

WELL No. 003

NUS CORPORATION
A Halliburton Company

PROJECT Swope Oil Co.
PROJECT NO. 0758-16 BORING MW 3
ELEVATION DATE 6-18-84
FIELD GEOLOGIST SJ Conti / J. Ferguson

	SAMPLE NO. TYPE & DEPTH(ft)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH(ft)	MATERIAL MOISTURE & WATER DEPTH(ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
50.0	S-11 003 K				Med Dense	Yellow Brown	Med. - Coarse Sand	SP	Less Fines
									SUBANGULAR
				54.0					
55.0	S-12 003 L				Loose	Yellow Brown	Clayey Sand	SC	Fine-grained Sand
									Lt. Grey Clay SUBANGULAR
60.0	S-13 003 M				Loose	Yellow Brown	Clayey Sand, Trace Fine - Med Grav	SC	Lt. Grey Clay LENSES
									SUBANGULAR GRAINS
				64.0					
65.0	S-14 003 N				Dense	Yellow Brown	Fine - Medium Sand Trace Silt	SM	SHOVEL SAMPLE
									SUBANGULAR
70.0	S-15 003 O				Dense	Yellow Brown	Silty, Fine Sand, TRACE CLAY	SM	SHOVEL SAMPLE
									SUBANGULAR GRAINS

REMARKS

BORING MW 3

PAGE 3 OF 6

WELL No. 003

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW 3
ELEVATION DATE 6-21-84
FIELD GEOLOGIST SJ CONTI / J. FERGUSON

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
75.0 S-16 003 P				Med Dense	Yellow Brown	Fine Sand, Some Silt Trace Gravel	SM	Clay-[illegible]
						Trace Clay		Gravel - subon
			79.0					
0 0 S-17 003 Q				DENSE	Light Grey	Medium - Coarse Sand, Some Clay	SP	noticeable color transition
								Subangular gra
			83.0					
			84.0			CLAY LENS		
5.0 S-18 003 R					Light Grey	Med - Coarse Sand Some fine Sand	SP	Clay ap 83' PER DRILLER
								Subangular
0 S-19 003 S					Light Grey	Med - Coarse Sand Some fines - Silt	SP	subangular
						Trace fine Gravel		
5.0 S-20 003 T					Light Grey	Med - Coarse Sand Some fines	SP	subangular
								quartzose
								micaceous

REMARKS

BORING MW 3

PAGE 4 OF 6

WELL NO.
003

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO.
PROJECT NO. 0758-16 BORING MW3
ELEVATION DATE 6-21-84
FIELD GEOLOGIST SJ CONTI / J. FERGUSON

SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
100.0 S-21 003 U				DENSE	LT GRAY TO BROWN GRAY	Medium - Coarse Sand Trace Clay	SP	Trace Silt
								Sub angular
								ALL SHOVEL SAMPLES
								↓
105.0 S-22 003 V						Med-Coarse Sand Clayey	SP	Subangular
110.0 S-23 003 W						Med-Coarse Sand, Trace Clay	SP	Subangular
								GOOD AQUIFER MATL.
115.0 S-24 003 X						Med-Coarse Sand Trace Clay	SP	Subangular
120.0 S-25 003 Y						Med-Coarse Sand, Trace Clay	SP	Subangular -
						Trace Gravel		Subrounded
								Grains
								Alternating layers of wh
				↓	↓	↓	↓	Clay -

REMARKS

BORING MW3

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WELL No. 003

NUS CORPORATION
A Halliburton Company

PROJECT Swowe Oil Co.
PROJECT NO. 0758.16 BORING MW3
ELEVATION DATE 6-21-84
FIELD GEOLOGIST SJ Conti / J Ferguson

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
			125.0					
5-26 003-2				Dense	Light Grey	Sandy Gravel Trace Clay	GP	Sandy cla
								balls
5-27 003-AA		SS #1		Dense	Light Grey	Sandy Gravel Trace - Silt Clay	GW	1st Split-spo
								Max Size
								1/2"
								subangular -
								subrounde
5-28 003-BB		SS #2		Dense	Light Grey	Silty Fine Sand Trace Gravel	SM	Split Spoon
			132.0			Trace Clay poor recovery		
	75/18"	SS #3	133.7	Very stiff	Light Grey	Silty Clay, Trace gravel, sand	CL/ML	Split Spoon
ST			ST			moist		18" recove
3" Φ			3" Φ	VERY STIFF	LT GRAY	SILTY CLAY - TRACE SAND	CL /ML	75 Blows
			135'11"					2'4" REC ON
								SHELBY TU
						BOTTOM @ 136.0'		TAKEN @ 11: AM
								PUSHED FRO
								133'7" TO 135'11".

REMARKS ST. = Shelby Tube 3" Φ

BORING MW 3

PAGE 6 OF 6

WELL No.

WELL LOG SHEET

004

WELL Nº. MW4	PROJECT Nº. 0758.16	PROJECT NAME	SWOPE OIL
LOCATION	PENNSAUKEN, N.J.	GEOLOGIST	SJ CONTI
DRILLING DATE	6-5 → 6-7-84	DRILLING CONTRACTOR	HYDRO GROUP, INC
DRILLING METHOD	MUD ROTARY	DRILLER	J. YOST
INSTALLATION DATE	6-11-84		
WATER LEVEL BEFORE INSTALLATION	≈ 60'	WATER LEVEL AFTER INSTALLATION	≈ 77.8' From top.
DEVELOPMENT METHOD	COMPRESSED AIR	GROUND ELEVATION	≈ El. 59.

LITHOLOGY

DESCRIPTION

0-20 - Alternating layers of silty and clayey sand - trace of gravel - some gravel @ 12'±.

Medium Dense

20-25 ^ Orange Brown Sandy clay to medium grained sand - trace gravel. More clay 20 to 23.

M. Dense to Dense

25-35 Yellow Brown Medium to coarse sand - some gravel - trace fines

Medium Dense

35-45 ^ Yellow Brown to light gray Sandy Clay and clayey sand - trace gravel.

Dense

45-55 Yellow gray brown clayey sand - trace gravel

Loose to Med Dense

55-70 ^ Light gray Sandy Clay - trace fine gravel - becomes dark gray at ± 69'. Then light again.

Medium Dense to Dense

70-85 ^ Light yellow brown Clayey sand to sandy clay - trace gravel Sand is fine to medium grained.

Dense to V. Dense

85-135 Tan Brown to yellow brown Coarse sand - trace fine gravel - Becomes coarser w/ depth. Traces of clay @ 105 and 115'.

Sand and Fine gravel @ 125 to 135.

135 V. light gray Sandy Clay, Stiff, More Clay content w/ depth.

SYMBOL

50

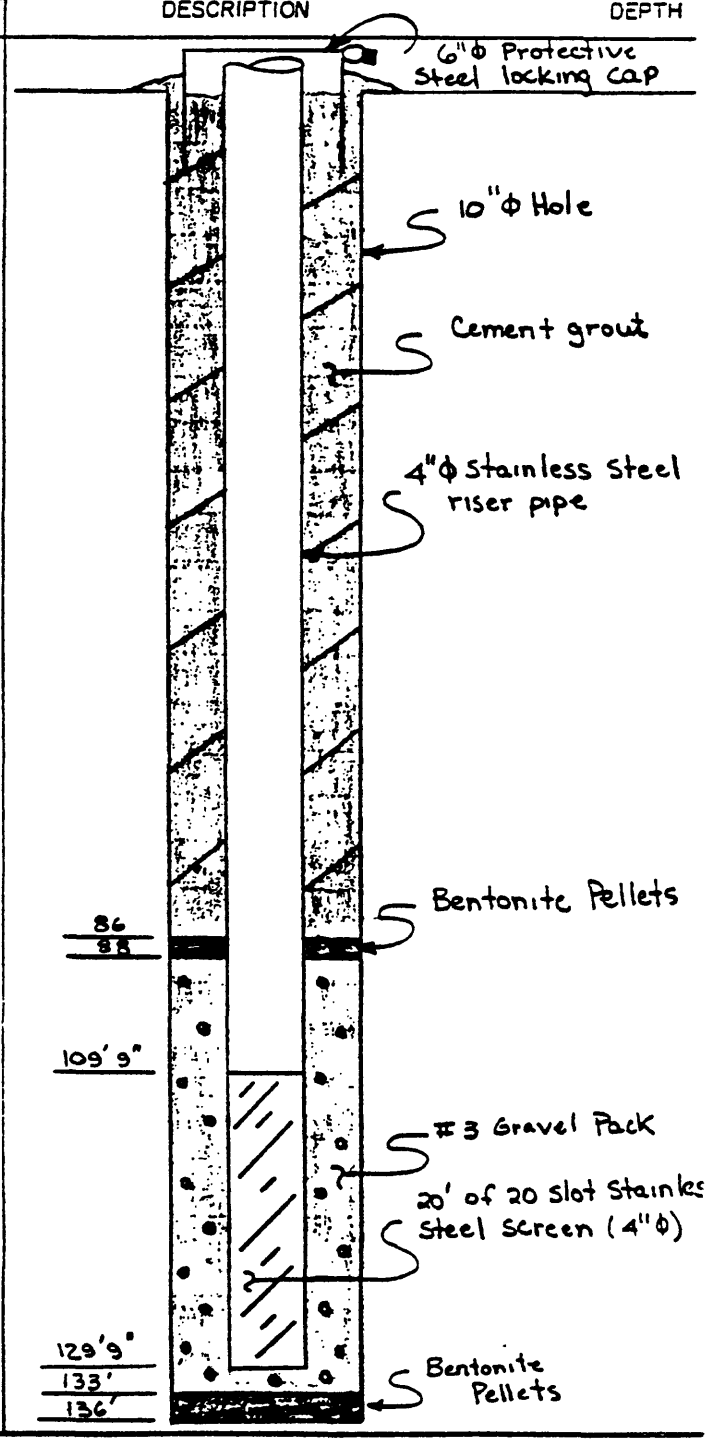
80

100

120

CONSTRUCTION DETAILS

DESCRIPTION | DEPTH



JPD 8/1/84

WELL No.
004

NUS CORPORATION
A Halliburton Company

PROJECT Swope Oil
PROJECT NO. 0758.16 BORING MW 4
ELEVATION DATE 6-5-84
FIELD GEOLOGIST S.J. Conti

SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
S-1 002 A				M DENSE	YELLOW BROWN	SILTY SAND - TRACE GRAVEL AND	SP	MOIST - SURF
						ORGANICS.		SAMPLE 0 HNU
					GRAY			
5' S-2 002 B				M. DENSE	YELLOW BROWN	CLAYEY SAND - TRACE FINE GRAVEL	SW	0-HNU - SHO
						AND ORGANICS TO		SAMPLE.
						MEDIUM GR SAND		
						SILTY SAND - TRACE FINE GRAVEL	SW	0-HNU - SHO
0' S-3 002C				DENSE		TO AND ORGANICS AND CLAY		SAMPLE
						MEDIUM GRAINED SAND		TOOLS CHATTERING
								AT 12' FIRST NOTICABLE
								HARD DRILLIN (GRAVEL)
5' S-4 002 D						SILTY SAND - TR CLAY AND GRAVEL	SW/SP	0-HNU -
								SHOVEL SAM
0 S-5 002 E				M DENSE		CLAYEY SAND - TRACE GRAVEL	SM	0 HNU
					ORANGE	SANDY CLAY		SHOVEL SAMP
					BROWN	TO		DRILLER NOTED EASIER DRILL
					TO			TOOLS CHATTE
					YELLOW BROWN			23-25.
						MED. GRAINED SAND - TR GR.		

REMARKS BORING ADVANCED BY MODIFIED 10" Φ ROLLER BIT.
USING QUICK GEL AS DRILLING FLUID.
SOIL DENSITY DESCRIPTION IS ESTIMATED

BORING MW 4

PAGE 1 OF 6

WELL No. 004

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758.16 BORING MW 4
ELEVATION DATE 6-6-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO. TYPE & DEPTH(ft)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH(ft)	MATERIAL MOISTURE & WATER DEPTH(ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
5 S-6 002F				M DENSE	ORANGE BROWN	SANDY CLAY TO MEDIUM GRAINED SAND - TRACE GRAVEL	SW	0-4NU -
				TO	TO YELLOW BROWN	TO COARSE SAND - SOME GRAVEL		TOOLS CHATTER 23-25 DRILL
				DENSE				CLAY 20-23 TOOLS QUIET
						QUARTZ		
30 S-7 002G				DENSE	YELLOW BROWN	MED TO COARSE SAND - SOME GRAVEL	SW	0-4NU - SHOVE
				TO V. DENSE		TRACE FINES (SILT)	TO GW	SAMPLE FIRST SIGN OF
						W/ LT GRAY CLAY LENS		GOOD AQUIFER MATERIAL
						TO		TOOLS STILL FAIR QUIET
					YELLOW			
35 S-8 002H				DENSE	BROWN W/ LT	MED TO COARSE SAND - TRACE LT	SP	0-4NU SHOVE
					GRAY	GRAY CLAY AND GRAVEL		SAMPLE
				M DENSE	LT GRAY	SANDY CLAY - TR FINE GRAVEL		LT GRAY CLAY LENS. TOOLS
						SAND LENS		35' STILL QUIET → 40 LIGHT
								CLAYEY W/ SAND.
40 S-9 002I					LT. GRAY	SANDY CLAY - TR FINE GRAVEL	SC	0 4NU TOOLS
								QUIET - SHOVE SAND OE
					YELLOW GRAY			
45 S-10 002J					BROWN	CLAYEY FINE TO MEDIUM SAND	SP	0HNU - SHOVE
								SAMPLE
50								

REMARKS

BORING MW 4

PAGE 2 OF 6

WELL NO. 004

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758.16 BORING MW4
ELEVATION DATE 6- 84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
50 S-11 002 K				M DENSE	YELLOW BROWN	MEDIUM TO COARSE SAND - TRACE	SP	OHNU SHOVE
				TO DENSE		FINE GRAVEL AND FINES		SAMPLE
								CUTTING LIKE CLAY ≈ 52
								55
55 S-12 002 L				M DENSE	LT GRAY	SANDY CLAY	SC	O HNU SHOV
								SAMPLE
60 S-13 002 M				LOOSE M DENSE	GRAY	SANDY CLAY - TRACE LIGNITE	SC	DARK GRAY
					LT GRAY	AND FINE GRAVEL		CLAY LIGNITE
								DISTINCT CHANGE IN
								COLOR TO A DARKER GRA
				M. DENSE				FROM 30'-60'
65 S-14 002 N				DENSE	LT GRAY	SANDY CLAY - TRACE FINE	SC	OHNU - BACK
						GRAVEL		INTO LT GRAY CLAYEY MAT
								COLOR CHANGE AT ABOUT 80'
70 S-15 002 O				DENSE	LT GRAY BROWN	CLAYEY FINE TO MEDIUM SAND	SM	O HNU
						TRACE GRAVEL		SHOVEL SAMPL
								SAND BECOM.
								COARSER
					LT YELLOW			
75					BROWN	CLAYEY MED TO COARSE SAND TR FINE GRAVEL	SP	OHNU SHOVEL SAMPLE

REMARKS

BORING MW4

PAGE 3 OF 6

WELL No. 004

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758.16 BORING MW 4
ELEVATION DATE 6-6&7-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
5 S-16 002 P				DENSE	LT YELLOW	CLAYEY MEDIUM TO COARSE SAND	SP	OHNU SLO
					BROWN	TR FINE GRAVEL		SAMPLE.
								GRADES INTO A CLAY LEAN
								≈ 78'±
0 S-17 002 Q				M DENSE	LT GRAY	SANDY CLAY - TRACE GRAVEL	SC	OHNU SLO
								SAMPLE. LAST SAMPLE
								6-6-84
								CUTTINGS AR
								FINE TO MED 80-85' DRILLIN
					TAN			SLOW.
5 S-18 002 R				DENSE	BROWN	FINE TO MEDIUM SAND	SP	OHNU - SHOVE FIRST SAMPLE
								6-7-84
								BECOMING COARSER W/
								DEPTH
						SOME		
0 S-19 002 S				DENSE		COARSE SAND - FINE GRAVEL	SW /SP	OHNU SLO
								QUARTZ SAND
								GOOD AQUIF MATERIAL
								STARTED ≈ 88' W/ COARSER
								MATERIAL.
5 S-20 002 T				V. DENSE		COARSE SAND - TRACE TO SOME	SW /SP	OHNU
						FINE GRAVEL		MAX SIZE 5/8
								DESCRIPTION FROM SIEVED
								SHOVEL SAMP

REMARKS

BORING MW 4

PAGE 4 OF 6

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758.16 BORING MW 4
ELEVATION DATE 6-7-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO. TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
00 S-21 002 U				V. DENSE.	TAN BROWN	COARSE SAND - TRACE FINE	SP	OHNU. SIEVE
						GRAVEL		SHOVEL SAMP
				DENSE				
05 S-22 002 V						COARSE SAND - SOME FINE GRAVEL	SP	OHNU - SIEVE
						TRACE CLAY LENS.		SHOVEL SAMP MAX SIZE 1/2"
10 S-23 002 W						SAME AS ABOVE	SP	OHNU - SIEVE
								SHOVEL SAMPL MAX SIZE 1/4"
								GRAVEL
15 S-24 002 X						COARSE SAND AND FINE	SP	OHNU - SIEVE
						GRAVEL - TRACE		SAMPLE APPEARS HAVE
						V. LT. GRAY CLAY		A BIT MORE CLAY THAN AB
								SAMPLE MAX SIZE 1/4" Φ
								GRAVEL
0 S-25 002 Y						FINE TO MEDIUM SAND - TR.	SP/SW	O-HNU - SIEV
						FINE GRAVEL		SAMPLE GETTING

REMARKS

BORING MW 4

PAGE 5 OF 6

WELL No. 004

NUS CORPORATION
A Halliburton Company

PROJECT Swope Oil
PROJECT NO. 0758.16 BORING MW4
ELEVATION DATE 6-7-84
FIELD GEOLOGIST SJ Conti

	SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
126	S-26 002 Z	100/24"	0.5		V. DENSE	TAN GRAY	SAND AND GRAVEL	GW	2" SPOON SA MOIST - MAX 3/8
128									NO SIGN OF A CLAY
	S-27 002 AA	100/24"	0.7			TAN GRAY	SAND AND GRAVEL	GW	2" SPOON SA
130									MOIST MAX 3/8" D
									NO SIGN OF CL
135	S-28	88/6"				VERY			
135.5	002 BB		0.5	136.0	STIFF	LT GRAY	SANDY CLAY	SC	2" SPLIT SPOO MOIST - OHN
									LAST 6" VERY CLAYEY SILT
							BOTTOM @ 136.0		BUT IS SAND COULD ROLL 1
									1/16" THREAD (L
									OF THE SAMPL UPPER 3" W
									CLAYEY, BUT MORE CLAY
									AT THE BOTT

REMARKS

BORING MW4

PAGE 6 OF 6

WELL No.

WELL LOG SHEET

005

WELL Nº. MW5	PROJECT Nº. 0758.16	PROJECT NAME SWOPE OIL CO.	
LOCATION PENNSAUKEN, N.J.		GEOLOGIST SJ CONTI	
DRILLING DATE 6-27-84	DRILLING CONTRACTOR HYDRO GROUP		
DRILLING METHOD MUD ROTARY	DRILLER JOE YOST	INSTALLATION DATE 6-30-84	
WATER LEVEL BEFORE INSTALLATION		WATER LEVEL AFTER INSTALLATION 80.92 7-6-8	
DEVELOPMENT METHOD COMPRESSED AIR		GROUND ELEVATION 63.2	

LITHOLOGY

DESCRIPTION

0-1.0 Gray Slag and Gravel (Roadbed)

1-5 - Medium dense brown Silty Sand trace gravel

5-20 - Loose to medium dense - gray brown sandy clay

20-35 - Loose to dense yellow brown to gray brown clayey sand / sandy clay - trace gravel and weathered sand fragments.

35-55 Dense gray brown to brown gray fine to medium sand - interbedded with clay lenses, trace fine gravel.

55-78 Dense Brown gray Fine to coarse sand - trace fine gravel, Trace fines - subangular grains

78-80 Stiff light gray clay lens

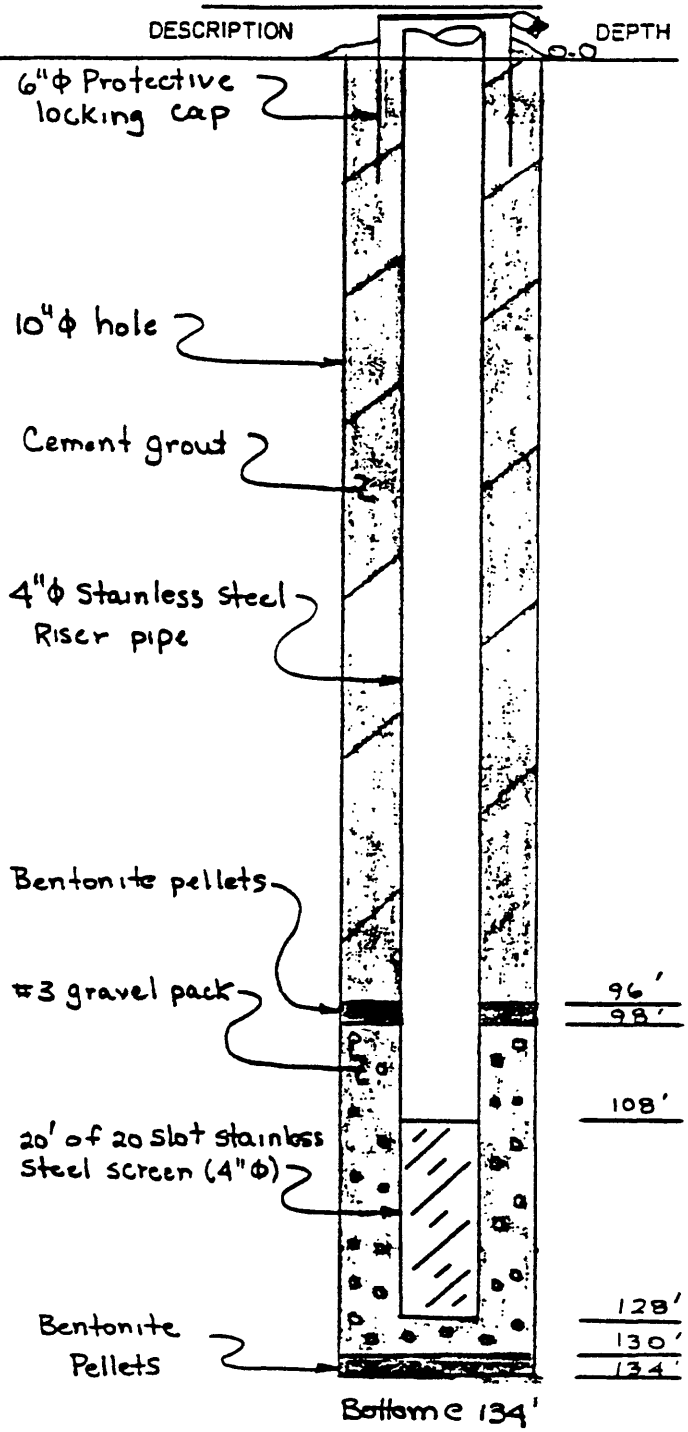
80-132 Dense medium to coarse sand, clayey to 100', trace to some fine gravel. Subangular to subrounded sand grains.

132-136 Stiff, Light gray Sandy Clay - trace fine gravel.

SYMBOL

CONSTRUCTION DETAILS

DESCRIPTION | DEPTH



JPO 8/1/84

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO. WELL No. 005
PROJECT NO. 0758.16 BORING MW5
ELEVATION DATE 6-27-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
0	S-1 004 A				DENSE	DARK GRAY	SLAG - (ROADBED) GRAVEL & FINES	GP	DRY - ROAD BEHIND SLA
									OIL CO BLDG NW OF LAGO
									0-HNU
.0	S-2 004-B			5	M. DENSE	BROWN	SANDY CLAY	SC	SHOVEL SAMPLE
									3:05 PM-SAM TAKEN.
									0-HNU
0.0	S-3 004-C						SANDY CLAY/ CLAYEY SAND	SC	SHOVEL SAM 3:20 PM
									APPEARS TO B LESS CLAY I
									S-3 - SAND VF GRAINED
									ODOR NOTIC
									GOING FROM 15' 0.8 PPM
5.0	S-4 004D				LOOSE/SOFT	GRAY BROWN	SILTY/SANDY CLAY	SC	H-NU. SHOVEL SAM
									MORE CLAY AGAIN TEXM
									15. CLAY IS C IN COLOR
.0	S-5 004 E			20			CLAYEY SAND/SANDY CLAY	SC	0-HNU
									SHOVEL SAMP SIMILAR TO
									MORE SAND THOUGH.

REMARKS USING MODIFIED 10" Φ ROTARY BIT TO ADVANCE BORING, USING QUICK GEL AS DRILLING FLUID. SOIL DENSITY IS APPROXIMATED, AS BLOW COUNTS ARE NOT TAKEN; SHOVEL SAMPLES ONLY

BORING MW5

PAGE 1 OF 6

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO. WELL No. 005
PROJECT NO. 0758.16 BORING MW 5
ELEVATION DATE 6-27-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
25.0	S-6 004F				LOOSE	YELLOW BROWN	CLAYEY SAND	SC	0 HNU - S
									SAMPLE SOME COA
									SUBANGUL SAND GRA
						ORANGE			
30.0	S-7 004G				DENSE	YELLOW BROWN	SANDY CLAY - TRACE GRAVEL AND	SC	0 HNU
							WEATHERED SANDY FRAGMENTS (LIMONITE)		SOME CHAT OF TOOLS
									TO 31 IRON STAIN
									FRAGMENT 1/4"Ø MAX
35.0	S-8 004H			35.0	DENSE	GRAY BROWN	FINE TO MEDIUM SAND - TRACE GRAVEL	SW	0 HNU - S
							AND CLAY		SAMPLE ±6:00 P
									MAX SIZE SUBANGU
									GRAINS. FIRST SIGN
									GOOD WA BRG. MAT
40.0	S-9 004I						SOME MEDIUM TO COARSE SAND - TRACE	SW/SP	SHOVEL SA AT 6:15 P
							FINE GRAVEL AND CLAY		0 HNU MAX SIZE
									SUBANGULA SUBROUND
									SAND GRA SOME ODOR
						YELLOW			NO-HNU R
45.0	S-10 004J					GRAY BROWN	MEDIUM SAND - TRACE CLAY	SP	0 HNU - SW
							AND GRAVEL		SAMPLE - SIZE 1/4"
							- MICACEOUS		SUBANGUL GRAINS

REMARKS

BORING MW 5

PAGE 2 OF

NUS CORPORATION
A Halliburton Company

WELL No. 005

PROJECT SWOPE OIL CO
PROJECT NO. 0758.16 BORING MW5
ELEVATION DATE 6-27-84 / 6-28-84
FIELD GEOLOGIST SJ CONTI

	SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
50.0	S-11 004 K				DENSE	BROWN GRAY	FINE TO MEDIUM SAND- TRACE	SP	O-HNU - SH
							LT GRAY CLAY LENS		SAMPLE @ 7 PM - SUBA
									GRAINS MORE CLAY
									S-10.
55.0	S-12 004 L			55.0	M. DENSE	BROWN GRAY	SANDY CLAY - TRACE FINE	SC	O-HNU - SH
							GRAVEL		SAMPLE LT GRAY IS
									INTERBEDD WITH SAN
									MORE CLAY THAN S-11.
						LT			MAX SIZE 1/4 GRAVEL.
60.0	S-13 004 M				M DENSE	GRAY BROWN	FINE TO MEDIUM SAND- SOME	SC/SP	0.8 HNU - W PROBE WAT
							CLAY LENSES		RIGHT ON SI OHNU AT FE
									HEIGHT - SA S-13 AT 8:3
									6-28-84 SUBANGULA
									SAND GRAIN
65.0	S-14 004 N				DENSE	BROWN GRAY	MEDIUM TO COARSE SAND- TRACE	SP	O-HNU - SHO SAMPLE.
							GRAY CLAY AND FINE		SUBANGULAR GRAINS - M
							GRAVEL		SIZE 1/4" ϕ GRAVEL
70.0	S-15 004 O				DENSE	TAN BRN	MEDIUM TO COARSE SAND -	SP	OHNU SHOVEL SAM
						GRAY	TRACE GRAVEL		@ 9:20 AM SUBANGULA
									SAND GRAIN V. LITTLE FIN
									GOOD WATE BEARING SA

REMARKS

BORING MW 5

PAGE 3 OF 6

NUS CORPORATION
A Halliburton Company

WELL No. 005

PROJECT SWOPE OIL CO.
PROJECT NO. 0758-16 BORING MW5
ELEVATION DATE 6-28-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
S-16 004P				DENSE	BROWN GRAY	MEDIUM TO COARSE SAND - TRACE	SP	O-HNU SHOVEL S
						FINE GRAVEL		TAKEN C SUBANGU
			78.0					GRAINS- AS S-15
				STIFF		CLAY	SC/CL	MAX SIZE GRAVEL.
S-17 004Q			80.0	DENSE	BROWN GRAY	MEDIUM SAND - SOME CLAY LENSES	SP/SC	OHNU-S
						INTERBEDDED - TRACE		SAMPLE DRILLER
						FINE GRAVEL		CLAY @ 78 80'
S-18 004R						MEDIUM SAND - TRACE CLAY AND	SP	O-HNU SUBANGU
						FINE GRAVEL		GRAINS SAMPLE F SHOVEL CL
S-19 004S								
								SAME AS
S-20 004T				V. DENSE		MEDIUM TO COARSE SAND - TRACE	SP	OHNU SHOVEL SI
						GRAVEL		SUBANGU GRAINS MAX 78" ¢

REMARKS

BORING MW5

PAGE 4 OF

NUS CORPORATION
A Halliburton Company

WELL No. D05

PROJECT SWOPE OIL CO.
PROJECT NO. 0758.16 BORING MW5
ELEVATION DATE 6-28-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
00.0 S-21 004 U				DENSE	TAN BRN GRAY	MEDIUM TO COARSE SAND - TRACE FINE GRAVEL	SP	O HNU SHOVEL S SUBANGU TO SUBRO GRAINS MAX Φ 3/
05.0 S-22 004 V				DENSE		MEDIUM TO COARSE SAND - TRACE INTERBEDDED CLAY AND TRACE FINE GRAVEL	SP	OHNU SHOVEL SA SUBANGULI SUBROUNDE MAX SIZE GRAVEL
10.0 S-23 004 W						MEDIUM TO COARSE SAND - TRACE TO SOME FINE GRAVEL	SP	OHNU SHOVEL SA SUBANGUL TO SUBROU GRAINS 3/8" Φ MAX
15.0 S-24 004 X						MEDIUM TO COARSE SAND - SOME FINE GRAVEL - TRACE CLAY	SP	OHNU SHOVEL SA SUBANGULA SUBROUND MAX 5/8" Φ
20.0 S-25 004 Y						SAME AS ABOVE	SP	OHNU SA AS S-24

REMARKS

BORING MW5

PAGE 5 OF

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL CO — WELL No. 005
PROJECT NO. 0758.16 — BORING MW 5
ELEVATION — DATE 6-28-84
FIELD GEOLOGIST SJ CONTI

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMA
S-26 004 Z			BOTTOM OF SCREEN @ 128.0	DENSE	BROWN GRAY	MEDIUM TO COARSE SAND-	SP	OHNU-SH SAMPLE-
						TRACE FINE GRAVEL		ANGULAR ROUNDED
						AND CLAY		
S-27 004 AA				DENSE		MEDIUM TO COARSE SAND-TRACE	SW	OHNU SHOVEL SA
						FINES AND GRAVEL		MAX SIZE GRAVEL
			132.0			TRACE CLAY		SUBANGUL SUBROUND
S-28 004 BB		SS #1		STIFF	LT GRAY	SANDY CLAY- TRACE FINE GRAVEL	SC/CL	SPLIT SPOO
								SAMPLE.
		ST Δ #1						
			136.0					
						BOTTOM @ 136.0'		
						LOGGED TO 136.0'		
						SET SCREEN AT 128' → 108'		
						PELLETS TO 130'		
						DRILLED TO 134 TOOK SHELBY		
						TO 136'.		

REMARKS

BORING MW5

PAGE 6 OF

NUS CORPORATION
A Halliburton Company

WELL No. 006

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-1
ELEVATION ~70' DATE 5/10/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
TB1A	15	100% / 1.5'	damp	med stiff	red brown	clayey sand, plant material common	SC	plastic pelle on surface
5'								
TB1B	12	100% / 1.5'	damp	loose	red brown	clayey silty sand, trace gravel clay content increases down	SC	
10'								
TB1C	10	100% / 1.5'	wet	loose	red brown	clayey silty sand	SC	
				loose	yellow brown	clayey silty sand	SC	
15'								
20'								
25'								

REMARKS split spoons for analysis only - taken with jar sampler

BORING TB-1

PAGE 1 OF 2

NUS CORPORATION
A Halliburton Company

WELL No. 006

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-1
ELEVATION DATE
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
30								
			dry	loose	yellow brown	sand, trace clay	SP	
35								
40			wet					
TB10 41.5'	9	100% / 1.5'		stiff	vi. light grey	clay, some interbeds of fine sand	CL	
								TD-42'

REMARKS hit clay @ 40', J. Peterson got OVA readings at 40', hole was grouted with cement

BORING TB-1

PAGE 2 OF 2

NUS CORPORATION
A Halliburton Company

WELL No. 007

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-2
ELEVATION ~70' DATE 5/10/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
TB2A	NA	100%/1'	damp	soft	red brown	clayey sand, some plant material	SC	black clay at
TB2B	NA	100%/1'	damp	soft	green grey	sand, some clay, black streaks	SC	
						trace yellow and grey sand		sludge?
5								
10			wet					
TB2C	12	10-7%/1.0'		soft	yellow brown & green	clayey silty sand, some streaks of clay	SC	intermittent black sludge streaks
15								
TB2D	16	100%/1.0'	wet	loose	green grey	silty sand		some black streak
20								
TB2E	7	100%/1'						
TB2F	8	100%/1'						
25				soft	yellow brown	sandy clayey silt	ML	OVA 75 ppm

REMARKS split spoons for analysis only, taken with jar sampler

BORING TB-2

PAGE 1 OF 2

WELL No. 007

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-4
ELEVATION ~70' DATE 5/14/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
TB4A			damp		red brown	clayey sand, some gravel some plant material		
					black	sandy sludge & clayey silty sand		HNU reading
								5 ppm
				loose	yellow grey	sand	SP	
5'				dense	red brown	clayey sand	SM	5 ppm
				loose	H yellow grey	fine sand	SP	5 ppm
TB4B				dense	red brown	clayey silty sand	SM/ML	
10								
TB4C								TDA 11'

REMARKS Sample TB4A is a composite sample of the sludge 0 to 6', Drilled at Level B

BORING TB-4

PAGE 1 OF 1

NUS CORPORATION
A Halliburton Company

WELL No. 010

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-6
ELEVATION ~70' DATE 5/15/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD(%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMAR
TB6A			dry	loose		road gravel & sand		
				loose	grey green	sand	SP	HNU >20
			damp					
				loose	red brown	silty sand & gravel	SP	
TB6B	15		damp	med dense	green yellow brown	silty sand & gravel	SP	HNU >20
				loose	yellow brown	sand, some gravel	SP	
				loose	lt yellow brown	sand, some gravel, trace grey clay	SP	HNU 160
				loose	olive green	sand	SP	
				loose	yellow brown	sand & brown silt, trace clay	SM	TD at 12'
TB6C				loose	lt brown	sand, some green silt & brown clay	SM	HNU 180

REMARKS hole was grouted with cement, drilled at Level B
last split spoon from 12 to 13', drilling stopped at 12'

BORING TB-6

PAGE 1 OF 1

NUS CORPORATION
A Halliburton Company

WELL NO. 011

PROJECT SWOPE O/L
PROJECT NO. 0758 BORING TB-7
ELEVATION ~70' DATE 5/15/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO. TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
TB7A	10	75%/.75'	damp	loose	yellow brown	clayey sand, some plant material	SC	
						some black clay streaks		
				loose	yellow brown	silty sand and gravel	SP	
5				loose	lt yellow brown	silty sand and gravel	SP	
TB7B	19	75%/.75'	damp					
TB7C		75%/1.10'	damp					
10								TD @ 10'

REMARKS when auger flights were retracted, high HNU readings were registered, vented then proceeded to pull flights, hole was grouted with cement

BORING TB-7

PAGE 1 OF 1

NUS CORPORATION
A Halliburton Company

WELL NO. 012

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-8
ELEVATION ~70 DATE 5/14/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARK
TBRA	10	100%/1.5'	damp	loose	red brown	sand and gravel, trace plant material and silt	GM	
			damp	loose	yellow brown	sand and gravel	SP	
TB 8B	15/10 10	80%/1.2'	damp	loose	red brown	sand, some silt	SM	
TB 8C	13	100%/1.5'	damp	loose	lt brown	silty sand	SM	TD @ 10'

REMARKS hole grouted with cement

BORING TB-8

PAGE 1 OF 1

WELL No. 013

NUS CORPORATION
A Halliburton Company

PROJECT SWOPE OIL
PROJECT NO. 0758 BORING TB-9
ELEVATION ~70' DATE 5/16/84
FIELD GEOLOGIST L. Reitz

SAMPLE NO., TYPE & DEPTH (ft.)	BLOWS/SIX INCHES OR RQD (%)	SAMPLE RECOVERY/ SAMPLE LENGTH (ft)	MATERIAL MOISTURE & WATER DEPTH (ft)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS
						road gravel		
TB9A		100%/1.5'	damp	loose	green brown	sand and gravel	SP	HNU 7/50 ppm
				loose	H brown	sand, some brown silt	SM	
				loose	yellow brown	sand	SP	
5								
TB9B	20	100%/1.0'	damp					HNU 0
TB9C 10		100%/1.0'	damp	loose	pale green	silty sand	SP	HNU - 7/000

REMARKS hole grouted with cement, hole drilled at Level B

BORING TB-9

PAGE 1 OF 1

WELL No. 014

CRAIG TESTING LABORATORIES, INC.

565 East A. ..ing Highway, Mays Landing, New Jersey 083. • (609) 625-1700
1800 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE 10/10/79

PROJECT Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well-#1 Sheet No. 1 of 2 Ground Surface Elev.

Ground Water Data			
Depth	Hour	Date	Hrs. After Completion

A – Method of Advancing Boring	Depth
Rotary Method	0 to 61'
	to
	to

Depth	A	Sample No.	Sample Depth	N	Soil Classification	Remarks
			0-6"		Topsoil	6"
5						
10			6"-10		Brown C/F Sand Some F/Gravel W/F/Clay Layers (5-10')	10'
			10-13.5'		Tan F/C Sand	13.5
15			13.5'-15		Tan Clayey F/Sand	15'
20			15-20		Tan M/F Sand	2
25						
30			20-31		Tan F/Sand	
			31-34		Very Dense Brown M/F Sand Some Clay and M/F Gravel	
35						
40						

...on Sample

Driller Jay Freck

WELL No. 014

CRAIG TESTING LABORATORIES, INC.

565 East Harding Highway, Mays Landing, New Jersey 08330 • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE 10/10/79

PROJECT Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well-[redacted] Sheet No. 2 of 2

Ground Surface Elev.

Ground Water Data			
Depth	Hour	Date	Hrs. After Completion

A - Method of Advancing Boring	Depth
Rotary Method	0 to 61'
	to
	to

Depth	A	Sample No.	Sample Depth	N	Soil Classification	Remarks
45 5						
50 10						
55 15			34-55		Med. Dense Wet White M/F Sandy Clay	55'
60 20			55-61		Very Dense Wet White F/Sand Trace Clay	61'
65 25					Test boring completed at 61 feet.	
30						
35						
40						

Water Encountered at----------37 feet
Boring Completed at----------61 feet
Well Point Set at----------60 feet
Pumping Rate----------12 Gal. Min.
Draw Down----------3 feet
Static Water Level----------45 feet

[1] S - 2" O. D. Split Spoon Sample
[■] U - Undisturbed Sample, 3" Diameter
[ ] -- Core Drilling
N -- Standard Penetration Resistance per 6" (140# hammer, 30" drop)

Driller Jay Freck

WELL No. 016

CRAIG TESTING LABORATORIES, INC.

565 East ... rding Highway, Mays Landing, New Jersey 08... • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT: Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE: 10/10/79

PROJECT: Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well-#3 Sheet No. 1 of 3

Ground Surface Elev.

Ground Water Data- Depth	Hour	Date	Hrs. After Completion

A – Method of Advancing Boring	Depth
Rotary Method	0 to 91'
	to
	to

Depth	A	Sample No.	Sample Depth	N	Soil Classification	Remarks
5			0-5		Orange M/F Sand Some C/F Gravel Trace Clay	5'
10			5-9.5		Orange Tan Sandy Clay	9.5'
			9.5-11		Tan Clayey Some F/Sand	11'
15						
20						
25						
30						
35			11-35		Orange Tan Red Clayey M/F Sand & Clay Layers	35'
40			35-40		Brown M/F Sand Trace Sm. Gravel With Clay Layers	40'

S – 2" O. D. Split Spoon Sample
U – Undisturbed Sample, 3" Diameter
— Core Drilling
N – Standard Penetration Resistance per 6" (140 – hammer, 30" drop)

Driller ~~Jay Frock~~

WELL No. 016

CRAIG TESTING LABORATORIES, INC.

565 East Harding Highway, Mays Landing, New Jersey 083__ • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT: Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE: 10/10/79

PROJECT: Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well #3 Sheet No. 2 of 3 Ground Surface Elev.

Ground Water Data				A – Method of Advancing Boring	Depth
Depth	Hour	Date	Hrs. After Completion	Rotary Method	0 to 91'
					to
					to

Depth	A	Sample No.	Sample Depth	N	Soil Classification	Remarks
45 5			40-46		Brown M/F Sand & M/F Gravel Trace Clay	46'
50 10			46-51		Brown C/F Sand & Lg. Gravel	51'
55 15						
60 20						
65 25						
70 30						
75 35						
80 40			51-80		White Plastic F/Sand Clay Trace Sm. Gravel - /Wet	80'

S – 2" O. D. Split Spoon Sample
U – Undisturbed Sample, 3" Diameter
— Core Drilling

Driller Jay Freck

WELL No: 016

CRAIG TESTING LABORATORIES, INC.

565 East Landing Highway, Mays Landing, New Jersey 083.. • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT: Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE: 10/10/79

PROJECT: Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well # 3 Sheet No. 3 of 3

Ground Surface Elev.

Ground Water Data			
Depth	Hour	Date	Hrs. After Completion

A – Method of Advancing Boring	Depth
Rotary Method	0 to 91
	to
	to

Depth	A	Sample No.	Sample Depth	Sample N	Soil Classification	Remarks
85 5						
90 10			80–91		Very Dense Wet C/F Sand & M/F Gravel Some Clay Layers	91'
95 15					Test boring completed at 91 feet.	
100 20			Water First Encountered at----------75 feet Boring Completed at----------91 feet Well Point Set at----------90 feet Pumping Rate----------15 gal. min. Draw Down----------5 feet Static Water Level----------76 feet			
25						
30						
35						
40						

S – 2" O. D. Split Spoon Sample
U – Undisturbed Sample, 3" Diameter
— Core Drilling
N – Standard Penetration Resistance per 6"

Driller. Jay Freck

WELL No. 017

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG

I.D. NO. MW-3D

PROJECT: NJPDES DEEP WELLS

CLIENT: PSWMA

Sheet 1 of 5

Job No. PN5029

Elevation ~60'

Date Started

Date Finished

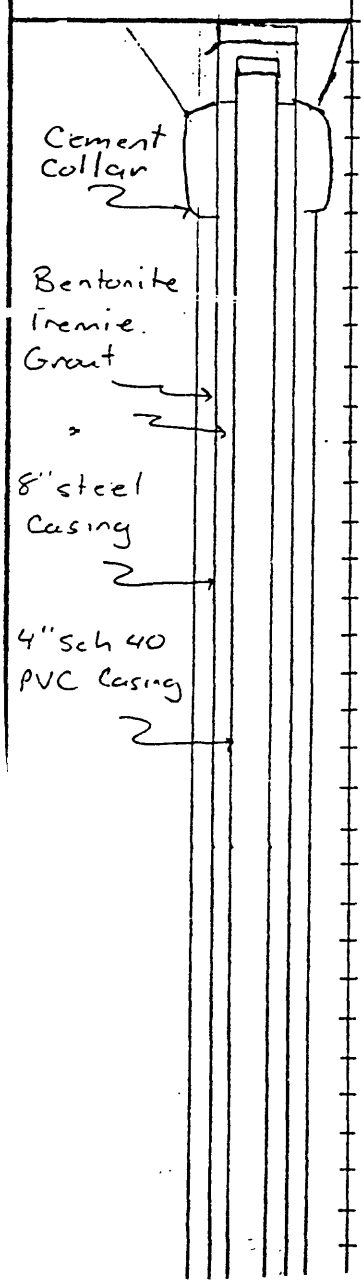
Driller R. GERRA

Inspector WHM

Well Permit No. 3126142-(

GROUNDWATER:			DRILLING METHOD	DEPTH
Date	Time	Depth	16" MUD ROTARY	0 to 189
			12" " "	0 to 141
			18" MUD ROTARY	0 to 181
				to
				to

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0						
5	1	5-6'			ORANGE-RED BRN F. SANDY SILTY CLAY	FILL
10	2	10-11'			ORANGE-RED BRN SILTY F. SAND	
15	3	15-16'			ORANGE-BRN SANDY SILT & CLAY	
20	4	20-21'			SAME	
25	5	25-26'			ORANGE BRN CLAY	
30	6	30-31'			ORANGE BRN SILTY F. SAND TR. MICACEOUS	

WELL No.- 017

ISD. NUMBER

SHEET 2 5

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35	7				RED-BRN - HEMATITE CEMENTED SAND & GRAVEL	TOUGH DRILLING
	40	8				ORANGE-BRN M/C SAND & MULTI COLORED SUB-ANGULAR TO ROUNDED. M. GRAVEL	
	45	9				ORANGE-BRN M/C SAND TR. SILT. SOME F. GRAVEL	
	50	10				MULTI COLORED QTZ & CHERT GRAVEL 1-2" DIA.	
	55	11				ORANGE-BRN SILTY C. SAND & F. GRAVEL	
	60	12				ORANGE-BRN M. SAND TR. F. GRAVEL TR. SILT	
	65	13				TAN M/C SAND TR. SILT	
	70	14				SAME	
	75	15				WHITE & PINK F. SANDY CLAY	

WELL No - 017

D. NUMBER

Sheet 3 - 5

ELL ONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	80	16				LT. GRAY F. SAND TR SILT	
	85	17				ORANGE-BRN M/C SAND & MULTICOLORED F. GRAVEL	
	90	18				ORANGE BRN SILTY GRAVEL	LITTLE RECOVERY
	95	19				LT. GRAY TO ORANGE-BRN SILTY C. SAND & MULTI-COLORED M/F GRAVEL	
	100	20				PINK-WHITE CLAY & F. SAND	
	105	21				ORANGE-BRN C. SAND TO F GRAVEL	
	110	22				SAME	
	115	23				LT. GRAY SILTY C. SAND TO F. GRAVEL	
	120	24				LT. GRAY F. SANDY CLAY & F. SAND	

WELL No. 017

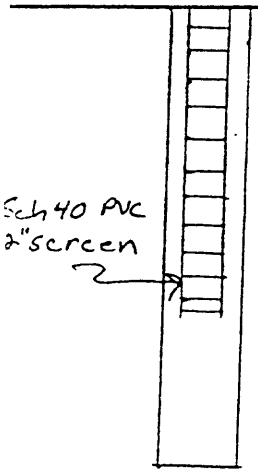
I. D. NUMBER

Sheet 4 of 5

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	125	26				TAN M.SAND TR.SILT	
	130	27				LT.GRAY M/C SAND AND CLAY	
Bentonite Tremie Grout	135	28				TAN TO BRN M/C SAND TO M/F GRAVEL	
2" Borehole	140	29				TAN M/F SAND TR.SILT TR. F. GRAVEL	INCREASED DRILLING RESISTANCE @ 141' POSS. CLAY
Bottom, 4" Steel Casing	145	30				LT GREY/WHITE CLAY TR SAND TR SILT	
4" Sch 40 PVC casing flush Joint		31				LT. GREY V.F. SANDY SILT	
	150	32				SAME	
Bentonite Pellet Seal		33				TAN M SAND	
Fine Silica #1 Gravel Pack	155					LT. GREY SILTY M/C SAND & F. GRAVEL	
	160	33				TAN C. SAND & F. GRAVEL	
	165	34				SAME	

WELL No.- 017

..D. NUMBER

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	170						
						SAME, ~ 2" LT. GREY CLAY IN MIDDLE OF SPOON	
	175						
	180						
	185						

CRAIG TESTING LABORATORIES, INC.

565 East Hi..ing Highway, Mays Landing, New Jersey 0833 • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:-

CLIENT: Township of Pennsauken c/o Rautter Anderson Schoor Associates
DATE: 10/10/79
PROJECT: Installation of Monitoring Wells Pennsauken Township - Sanitary Landfill
LAB. NO. 42649
Boring No. Well # 4 Sheet No. 1 of 2
Ground Surface Elev. — - — —

Ground Water Data			
Depth	Hour	Date	Hrs. After Completion

A – Method of Advancing Boring	Depth
Rotary Method	0 to 4
	to
	to

Depth	A	Sample No.	Sample Depth	Sample N	Soil Classification	Remarks
			0–2		Fill Orange M/F Sand & C/Gravel	2'
5			2–7		Orange M/F Sand C/F Gravel Trace Clay	7'
10			7–13		Tan F/Sand Some Clay Some Sm. Gravel	13'
15			13–16		Very Dense Orange Tan M/F Sand With White Clay Layer	16'
20			16–22		White Clay Trace F/Sand	22'
25			22–27		Very Dense White M/F Sand Some Clay & Sm. Gravel	27'
30						
35			27–37		White Tan Clay Trace F/Sand Layers	37'
40			37–40		Very Dense Wet Tan C/F Sand & C/F Gravel Some Clay Layers	40'

S – 2" O. D. Split Spoon Sample
U – Undisturbed Sample, 3" Diameter
—— Core Drilling
N – Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R – No Recovery

Driller ~~Jay Freck~~

WELL No 018

CRAIG TESTING LABORATORIES, INC.

565 East K ing Highway, Mays Landing, New Jersey 063 • (609) 625-1700
1600 Broadway, Westville, New Jersey 08093

Testing -:- Inspection -:- Asphalt -:- Chemical Analysis -:- Test Borings -:- Foundations -:- Soils -:- Water -:- Steel

CLIENT Township of Pennsauken
c/o Reutter Anderson Schoor Associates

DATE 10/10/79

PROJECT Installation of Monitoring Wells
Pennsauken Township - Sanitary Landfill

LAB. NO. 42649

Boring No. Well # 4 Sheet No. 2 of 2 Ground Surface Elev.

Ground Water Data - Depth	Hour	Date	Hrs. After Completion

A – Method of Advancing Boring	Depth
Rotary Method	0 to 48.5
	to
	to

Depth	A	Sample No.	Sample Depth	N	Soil Classification	Remarks
45 5			40-48.5'		Very Dense wet Tan C/F Sand & C/F Gravel Trace Clay Layers	48.5'
50 10					Test boring completed at 48.5'	
15			Water Encountered at----------38 feet.			
			Boring Completed at----------48.5 feet			
			Well Point Set at----------48 feet			
			Pumping Rate----------8 Gals. min.			
			Draw Down----------7 feet			
			Static Water Level----------37 feet			
20						
25						
30						
35						
40						

S – 2" O. D. Split Spoon Sample
U – Undisturbed Sample, 3" Diameter
— Core Drilling
N – Standard Penetration Resistance per 6"

Driller Jay Freck

WELL No. 019

J. E. FRITTS & ASSOC. INC.

7-14-81

Job No. 942

Address PENNSAKEN Landfill

Datum used is

Surface this boring is 2 1/2 SPLIT SPOON

DEPTH From	DEPTH To	CLASSIFICATION	Sample & Type No.	Sample Depth	No. of 30" blows on Spoon 1st 6"	2nd 6"	3rd 6"	Recovery in.	Lost W or Rema
		WELL #5							
Grd. Surface	100	STRAIGHT AUGER TO							
		100' CLEANED OUT HOLE W/ WATER ROTARY							
100'	102	GRAY M/C SAND W/ GRAVEL							
		WET	SS 1	100' 102'	No Blow Count				
			2	110' 112'					
		INSTALLED 4" WELL TO 110'							
		USED							
		20' SCREEN							
		90' SOLID PIPE							
		2 CAPS							
		10:00 AM TO 10:00 INSTALLATION TIME							
		7/31							
		110' - 20 Screen							
		90' PVC							
		SS-0	Bill	2					

Metal

Surface to _____ ft. used _____ casing,

level is _____ ft. below Ground surface at completion.

level is _____ ft. below Ground surface _____ hrs. after completion

Foreman [signature]

WILLIAM J. HAMILTON WELL No. 020

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG

I.D. NO: MW 5D

PROJECT: PENNSAUKEN NJPDES DEEP WELLS

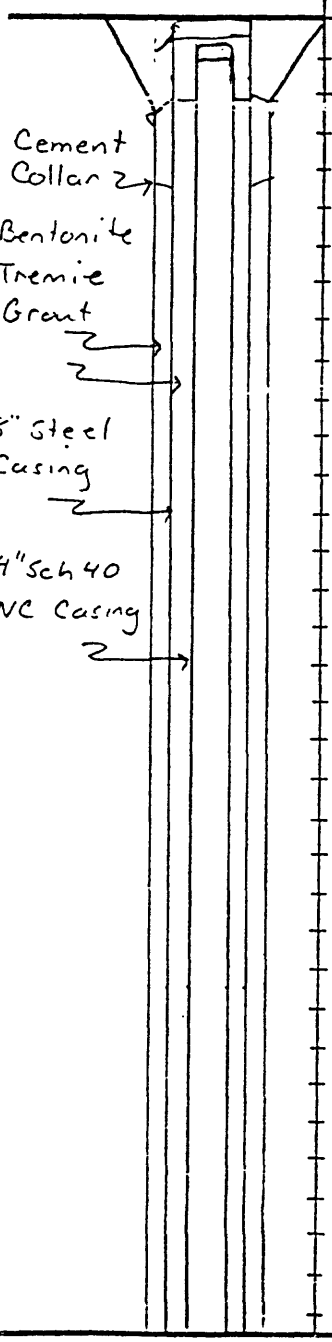
Sheet 1 of 5

CLIENT: PSWMA

Job No PNS029

GROUNDWATER:			DRILLING METHOD	DEPTH	
Date	Time	Depth	6" MUD ROTARY	0 to 185'	Elevation 70'
			12" MUD ROTARY	0 to 150'	Date Started 3/9
			8" MUD ROTARY	0 to 190'	Date Finished 3/20
			2" SPLIT SPOON/5'	0 to 185'	Driller R GERRA
				to	Inspector KOG/WHM
					Well Permit No. 3126143-4

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0					Red-brn silty sand	Fill
5	1	5			Dk. brn sandy clayey silt. tr. M/F sand	
10	2	10			Dk. brn sandy silty clay tr. F. sand	
15	3	15'			Sandy silty clay tr. M/C sand	
20	4	20'			Same as above	
25	5	25'			Brn M/C sand tr. gravel tr. F. sand	
30	6	30'			Red-brn clayey silt tr. F. sand	

■ – UNDISTURBED SAMPLE ▥ – SPLIT SPOON SAMPLE

WELL No.- 020

I. D. NUMBER MW-50

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
		–					
	30	6	30'			Red-brn/Orange mottled Clay. Tip of spoon - brn-orange M. sand tr. silt tr. opaques	
	35	7	35'			Red-orange F. sandy clay & silt tr. hematite staining	
	40	8	40'			Orange-tan mottled F. sandy clay to M/F sand tr. opaques	Sand wet perched ▽
	45	9	45'			Orange-red silty M/C sand tr. hematite cement	Hard drilling gravel in cutting
	50	10	50'			Lt. grey & red-brn C. sand & gravel	
	55	11	55'			Lt. grey silty C. sand & C. gravel	Hard drilling
	60	12	60'			Lt. grey M/C sand tr. opaques	
	65	13	65'			Lt. grey M/C sand & gravel over slightly cemented F. sand	
	70	14	70'			Lt. grey M/C sand & gravel, tr. silt, tr. opaques	

WELL No. 020

I. D. NUMBER MW-5D

WELL CONSTRUCTION	Depth Feet	SAMPLE No	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	75	15				Lt. grey M/F sand tr. silt, tr. opaques	Wet
	80	16				Same	Wet
	85	17.				Tan - Lt. grey C. sand & F gravel	Wet
	90	18				Tan - Lt. grey silty C. sand & F. gravel	
	95	19				F/M Qtz gravel	
	100	20				Lt. grey C. sand & M. gravel tr. opaques	
	105	21				Lt. grey clay stiff	
	110	22				Lt. grey V.F. sandy silt to silty sandy clay	
	115	23				Grey silty F. sand	

WELL No. 020

I. D. NUMBER MW-50 Sheet 4 of 5

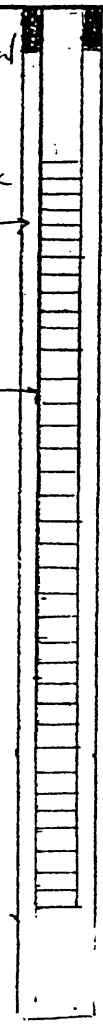
WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
							End 3/12
	120	24	120'			Lt. Grey-Tan M/F sand tr. opaques	
	125	25	125'			Lt. grey F. sandy silt and clay	
	130	26	130'			Lt. grey M. sandy clay M sand in bottom of spoon - some opaques	
	135	27	135'			Grey M/F sand & F opaques	
Bentonite Tremie Grout	140	28	140'			Grey - multi colored F/M sand & F/M gravel F. opaques	
	145	29	145'			Lt. grey silty c. sand over silty clay	Increased Drilling Resistance
Bottom 8" steel Casing	150	30	150			Lt. grey Silt & clay; st. ff	Increased Drilling Resistan
4" Sch 40 PVC Casing	155	31	155'			Lt. grey F. sandy clay To clayey sand	
	160	32	160'			Top - Lt. grey F. sandy silt Bottom. Lt. grey - tan F.	

WELL No. 020

I. D. NUMBER MW-5D

Sheet 5

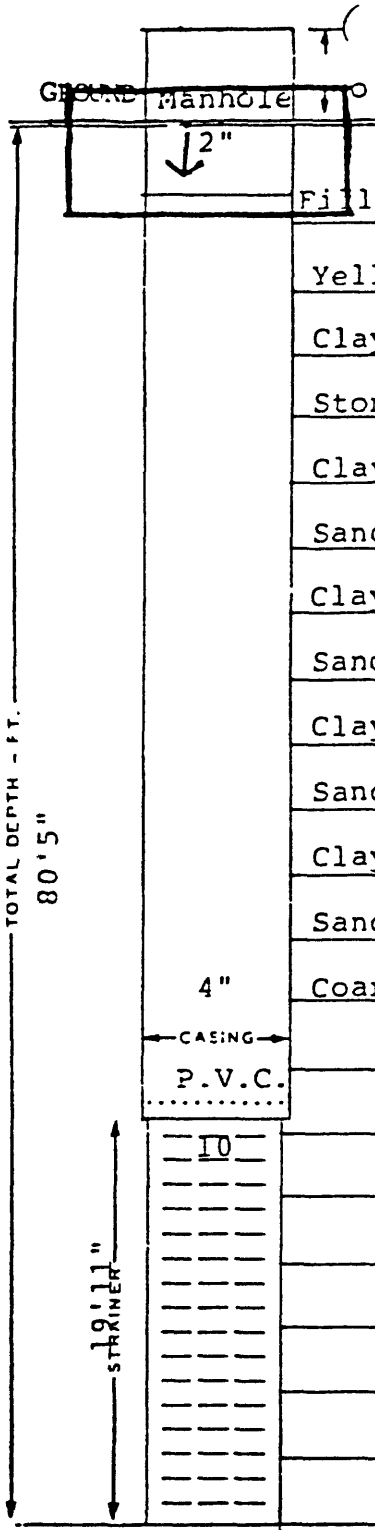
WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	RI
Bentonite Pellet Seal	165	33	165'			Lt. grey M/F sand	
Jessie Morie #1 Gravel Pack	170	34	170'			Tan M/F sand	
4" Sch 40 PVC 0.02" Screen	175	35	175'			Same, tr. opaques	
	180	36	180'			Lt. grey/tan silty C. sand & F. gravel	
	185	37	185'			Lt. grey-tan M/ sand tr. F. gra	
	190		190'			EOR	



WELL No.- 021

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE		NAME OF OWNER
Fill	0 TO	3'	Pennsauken Towns Landfill, River
Yellow sand & stones	3	12	Job # 19301
Clay	12	14	Desoto Property Location Pennsauken Lar
Stones	14	15	Well No. 6
Clay	15	21	Hrs. Pumped 2
Sand some streaks of clay	21	44	Capacity G.P.M. 20
Clay	44	46	Static Level 60'
Sand, clayish	46	48	Pumping Level
Clay	48	52	Specific Capacity
Sand	52	54	Diameter of Well 4" P.V
Clay hard & dry	54	62	Depth of Well (ground) 80'5
Sand	62	63	Length of Casing 60'4
Coarse gravel	63	83	Distance to Top of Packer (gr.)
			Type Screen Slotted P
			Size of Screen 4" P.S.
			Length of Screen 19'11"
			Top Screen Fitting M.T.
			Bottom Screen Fitting Plug
			Blank No
			Slot Size 20
			Drilling Machine No. 1250
			Driller A. Hammond
			Gravel Yes #1
			Bags of Cement 10
			Date Well Completed 11-18

Rotary Table approx. 3 above ground level

WELL No. 022

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG

I.D. NO. MW-6D

PROJECT: PENNSAUKEN NJPDES DEEP WELLS

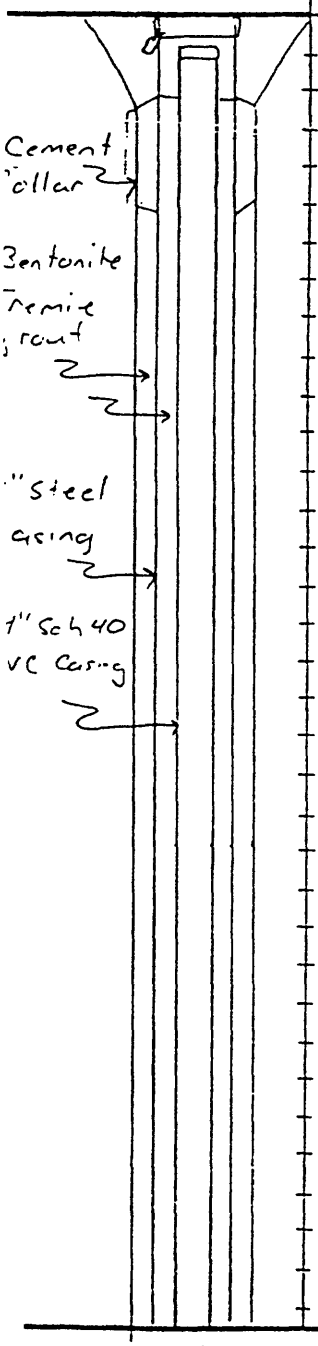
Sheet 1 of 4

CLIENT: PSWMA

Job No. PN5029

GROUNDWATER:			DRILLING METHOD	DEPTH	
Date	Time	Depth	6" MUD ROTARY	0 to 157'	Elevation ~ 20'
			12" MUD ROTARY	0 to 105'	Date Started
			8" MUD ROTARY	0 to 155'	Date Finished
			2" SPLIT SPOON/5'	0 to 150'	Driller R. Gerra
				to	Inspector KOG/WHM
					Well Permit No. 312641-8

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0					Red-Brn clayey silty c. sand tr. gravel & f. sand	
5	1	5'			Same	
10	2	10'			Red-brn sandy silt, tr. F/M/C sand & gravel	
15	3	15'			Same	
20	4	20'			1" qtz gravel & tr. F. sand	
25	5	25'			brn-grey clayey silt & F. sand tr M. sand	
30	6	30'			M/F white sand	

■ – UNDISTURBED SAMPLE ▯ – SPLIT SPOON SAMPLE

WELL No 022

I. D. NUMBER MW-6D

Sheet 2 of 4

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35	7	35			Yellow-brn c/M sand tr. mica & gravel	
	40	8	40			Same	
	45	9	45			Brn clayey silt & gravel tr. f. sand	
	50	10	50			Brn M/F sand tr. silt	
	55	11	55			Brn. to grey M/C sand & gravel tr. F sand & silt	
	60	12	60			Gray-white clayey silt very stiff	Tough drilling
	65	13	65			white silty clay	
	70	14	70			No recovery	
	75	15	75			Grey-brn F/M/C sand & gravel tr. blk. opaques	

WELL No 022

I. D. NUMBER MW-6D

Sheet 3 of 4

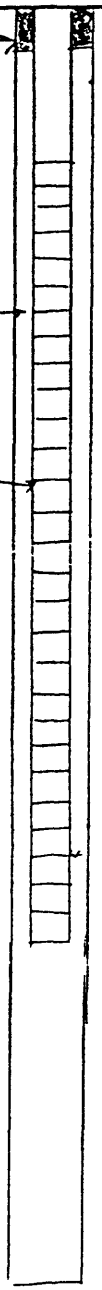
WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	80	16	80'			Brn-grey M/C sand & gravel	
	85	17	85'			Same	
	90	18	90'			Same	
	95	19	95'			Brn-grey C sand & gravel tr M/F sand	
Bentonite cement grout	100	20	100'			Tan M/C sand & gravel tr. F. sand & blk opaques	
Bottom 8" Steel Casing	105	21	105'			White silty clay tr. f sand	
	110	22	110'			White & red mottled silty clay	
	115	23	115'			White & red mottled sandy silty clay	
	120	24	120'			Gray silty sand tr blk opaques	

WELL No 022

I. D. NUMBER MW-6D

Sheet 4 of 4

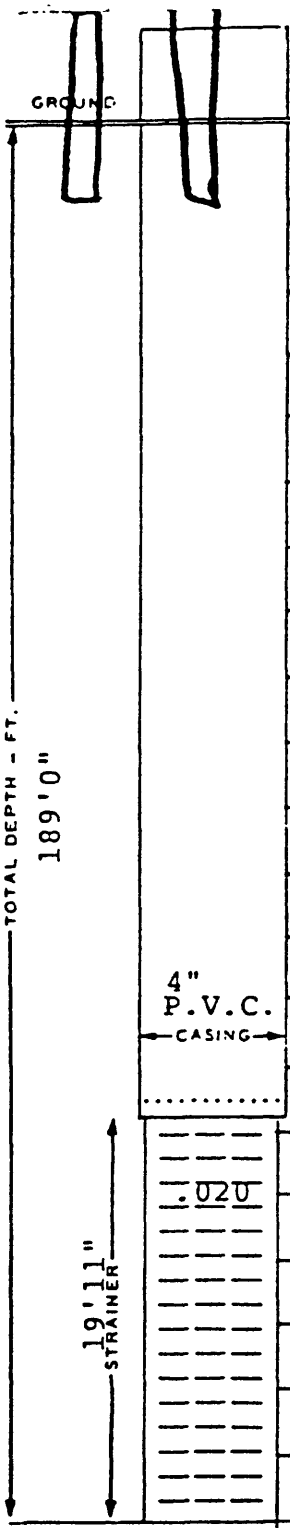
WELL CONSTRUCTION	Depth Feet	SAMPLE No.	SAMPLE Depth/Type	SAMPLE Blows per 6"	SAMPLE N.	CLASSIFICATION	REMARKS
entonite pellet seal	125	25				tan-M/F sand, tr silt, tr opaques	
Jessie Murie #1 Gravel Pack	130	26				brown-tan-white C/M/F sand, tr. gravel	
"Sch 40 VC 02" Screen	135	27				Same	
	140	28				Same	
	145	29				brown/tan white C. sand & gravel tr M/F sand	
	150	30				C. gravel	
	155					EOB	Refusal-entered Boulder field abo Wissahickon



WELL No. 024

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE 0 TO	
Fill		12
Sandish clay	12	30
Hard green clay	30	34
White clay	34	52
Stones very hard	52	55
Clay lamented	55	68
Stones, small, streaks of clay	68	70
Clay, white	70	85
Hard stones, no sand	85	98
Small gravel & fine white sand	98	103
White clay	103	134
Sandish clay, streaks of gravel	134	150
Fine to coarse sand	150	157
Handwhite clay	157	160
Hard red clay	160	183
Sand, fine to medium	183	184
Clay	184	188
Sand	188	190
Clay	190	191
Sand	191	201
Clay, thin layer of fine sand	201	203
Fine sand, clayish white	203	206
Weather zone	206	210
Rock	210	221

NAME OF OWNER	
	Pennsauken Towns Landfill, River Roa
Job	19301
Location	Pennsauken La
Well No.	8
Hrs. Pumped	
Capacity G.P.M.	
Static Level	91'
Pumping Level	
Specific Capacity	
Diameter of Well	4" P.V.
Depth of Well (ground)	189'0
Length of Casing	171'6"
Distance to Top of Packer (gr.)	
Type Screen	Slotted P.
Size of Screen	4" P.S.
Length of Screen	19'11"
Top Screen Fitting	M.T.
Bottom Screen Fitting	Plug
Blank	
Slot Size	20
Drilling Machine No.	12506
Driller	A. Hammond
Gravel	Yes #1
Bags of Cement	21
Date Well Completed	12-1-

Rotary Table approx. 3' above ground level

WELL No. 025

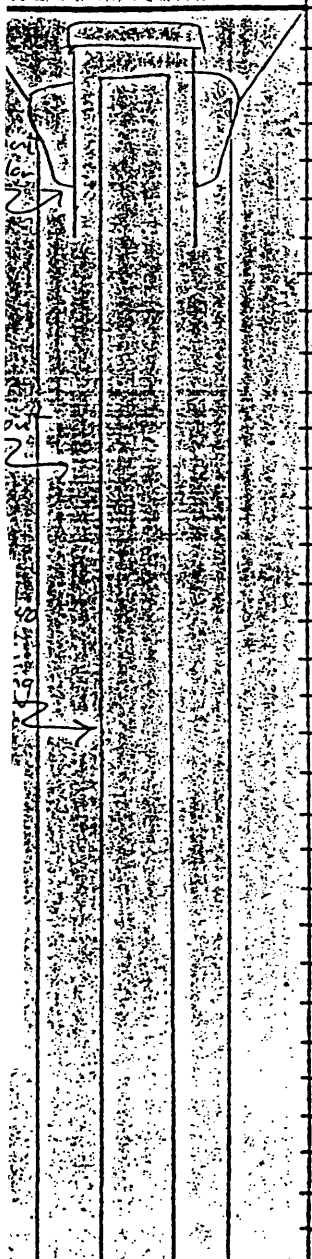
A. J. HAMPTON and ASSOCS., INC.
Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. MW-9

PROJECT: PENNSAUKEN NJPDES
Sheet 1 of 2
CLIENT: PSWMA
Job No. PN5035

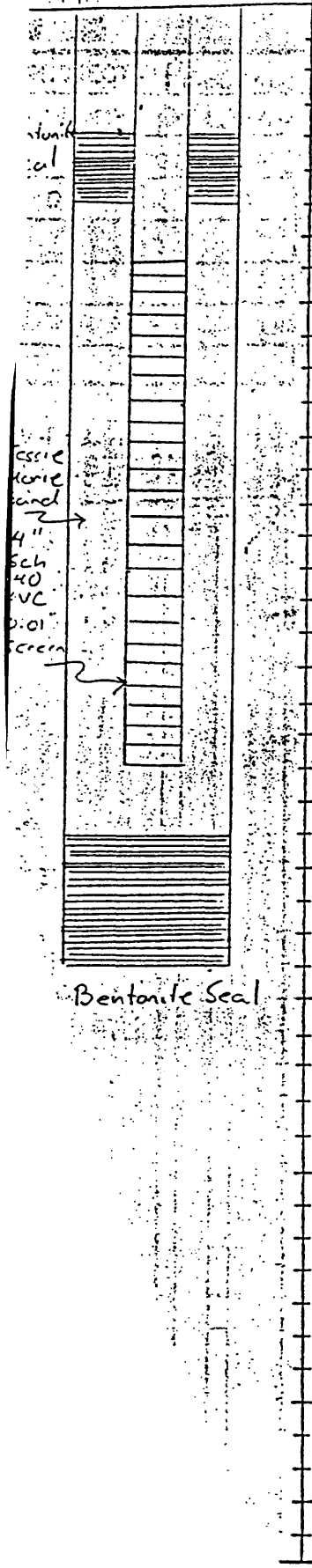
GROUNDWATER:			DRILLING METHOD	DEPTH	
Date	Time	Depth			Elevation ~28'
4/28/86	3:00PM	4.5'	6" HSA	0 to 59	Date Started 4/28/86
			2" OD SPLIT SPOON/5'	0 to 61	Date Finished 4/28/86
				to	Driller J. Duffy
				to	Inspector WHM
				to	Well Permit No.

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0	1	0-2	3-3 4-5		Orange-Brn silty M/C Sand 3" Layer of Brn Silt (Fill)	
5	2	4-6	3-3 4-7		T Orange Brn C. Sand Tr. Silt M Brn silty Clayey M/C Sand B White F. sandy clay	
10	3	9-11	6-15 18-18		T Orange M/F Sand M Orange/White M/F Sand B White C. Sand & F. Gravel	
15	4	14-16	7-11 34-52		T Orange-Brn M. Sand M White/Orange Laminated M/F Sand B Lt. Brn M/C Sand Tr M Gravel	
20	5	19-21	4-10 13-19		T Orange M/C Sand M Lt. Gray-Brn C. Sand F. Gravel B Lt. Gray Clayey M/F Gravel	
25	6	24-26	13-25 29-32		T Lt. Gray Clayey F. Gravel M Brn/White M/C Sand B Red/Brn C. Sand	
30	7	29-31	25-34 73-100/5		T Brn C/Sand F Gravel M Gray M/F Sand B Lt Brn Laminated M/F Sand	Damp

WELL CONSTRUCTION



WELL No. 025

Depth Feet	No.	Depth/Type	Blows per 6"	N.		
30						
35	8	34-36	53 100/5		Grey F. Sand to M. Gravel Damp	
40	9	39-41	32-56 80 100/2		Lt. Brn F/M/C Sand	
45	10	44-46	10-21 15-28		T. Gray C/Sand F/Gravel Tr. Silt M Orange Brn Sandy Clay B. Brn/Orange Stiff Clay	WET
50	11	49-51	10-12 23-31		T Gray C Sand & Gravel Tr. Silt B Red/Lt. Brn Stiff Clay	WET
55	12	54-56	13-25 48-100		T. Brn/Red Mottled Stiff Clay	
60	13	59-61	35-75 100/2		White F. Sand	WET

WELL No. 026

Suite 205 Tiffany Square · 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. MW-10

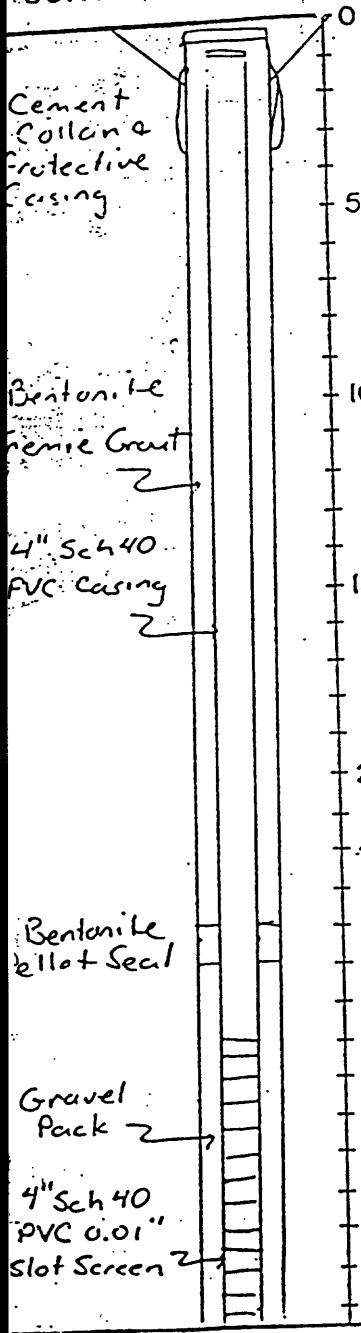
PROJECT: PENNSAUKEN NJPDES
Sheet 1 of 2
CLIENT: PSWMA
Job No. PNS035
GROUNDWATER: ~34'

Date	Time	Depth

DRILLING METHOD	DEPTH
8" HSA	0 to 49
2" OD SPLIT SPOON /5'	0 to 51
	to
	to
	to

Elevation ~20'
Date Started 5/27/86
Date Finished 5/27/86
Driller J URBAN
Inspector WHM
Well Permit No.

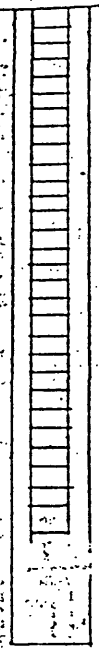
WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0	1	0-2	8-13 / 12-14		T: Brn silty loam B: Lt. Brn-orange C. sand Tr. F. Gravel, silt	
5	2	4-6	38-16 / 16-20			
10	3	9-11	11-15 / 43-36		T. Lt. gray/orange mottled sandy stiff clay M. Lt gray/orange mottled clayey silty M. sand B. orange/tan laminated M/C sand	
15	4	14-16	10-23 / 40-32		T. Lt gray clayey sand M Orange/Tan laminated B M. Sand Loose	
20	5	19-21	10-24 / 42-49		T: Tan M/F sand Tr. silt B: Orange M/C sand	
25	6	24-26	11-24 / 32-46		T. Orange/tan laminated M/F sand M Tan/Orange M. Sand B	
30	7	29-31	6-11 / 23-32		Orange/tan M. sand	

WELL CONSTRUCTION

WELL No. 026



Depth Feet	No.	Depth/Type	Blows per 6"	N.	Classification
35	8	34-36	6-11 15-21		T · Lt. Brn silty M. sand M = Lt Brn silty C. sand F. gravel B = Lt. Gray clayey sandy gravel
40	9	39-41	5-20 27-86		Lt. Gray/Orange V.F. Sand tr. silt
45	10	44-46	5-14 23-52		T. Lt. Brn/Gray silty M/C sand & F Gravel B. Orange/tan laminated V.F. sand Tr silt
50	11	49-51	5-15 28-45		T Tan stiff clay M B Tan silty V.F sand
			EOB		

WILLIAM J. HAMPTON and ASSOCS., INC.

WELL No. 027

Suite 205 Tiffany Square 2615 Rt. 38
Haines port, NJ 08060

DRILLERS LOG

I.D. NO. MW-11

PROJECT: PENNSAUKEN NJPES

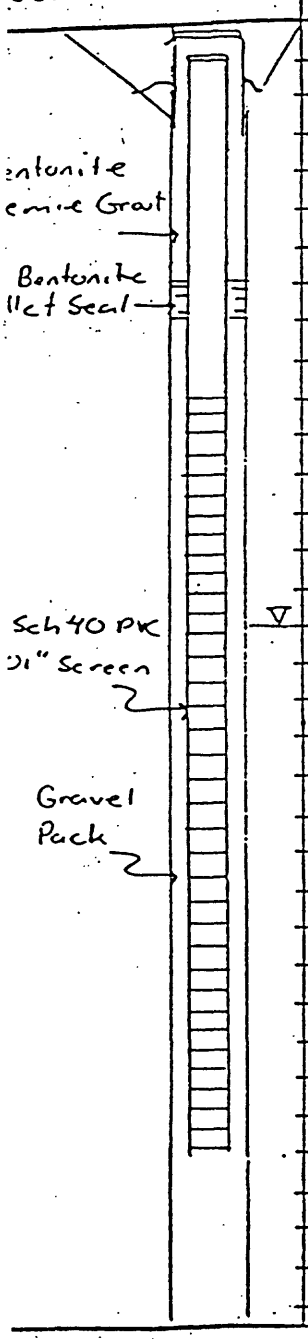
Sheet 1 of 2

CLIENT: PSWMA

Job No. PNS035

GROUNDWATER: ~16'			DRILLING METHOD	DEPTH	Elevation ~20'
Date	Time	Depth	8" HSA	0 to 39'	Date Started 5/23/86
			2" OD SPLIT SPOON/5'	0 to 41'	Date Finished 5/23/86
				to	Driller W J HAMPTON
				to	Inspector K. Gullon
				to	Well Permit No.

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0	1	0-2	3-8 7-8		Brn. silt tr. F. sand R=50%	
5	2	4-6	9-9 10-10		Brn silty clay Tr F. sand R=40%	
10	3	9-11	8-7 10 10		T Brn sandy silty clay B. Brn to grn M/F sand Tr silt R=40%	
15	4	14-16	3-2 3-2		Grn. brn sandy silty clay R=80%	
20	5	19-21	1-2 2-3		Black clayey silt R=80%	
25	6	24-26	1-2 2-4		Black clayey silt some organics R=100%	
30	7	29-31	1-1 2-3		Same R=100%	

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type		Blows per 6"	N.	CLASSIFICATION	REMARKS 2/2
WELL No. 027								
	35	8	34-36		3-2 3-1		Black silty clay	
							R = 90%	
	40	9	39-41		WOH-7 3-7		T Black clayey silt M	
							B · Black silty clay w/ M/F sand TR. Qtz gravel	
							EOB R = 90%	

WELL No. 028

Suite 205 Tiffany Square - 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG

I.D. NO MW-11D

PROJECT: NJPDES Deep Wells

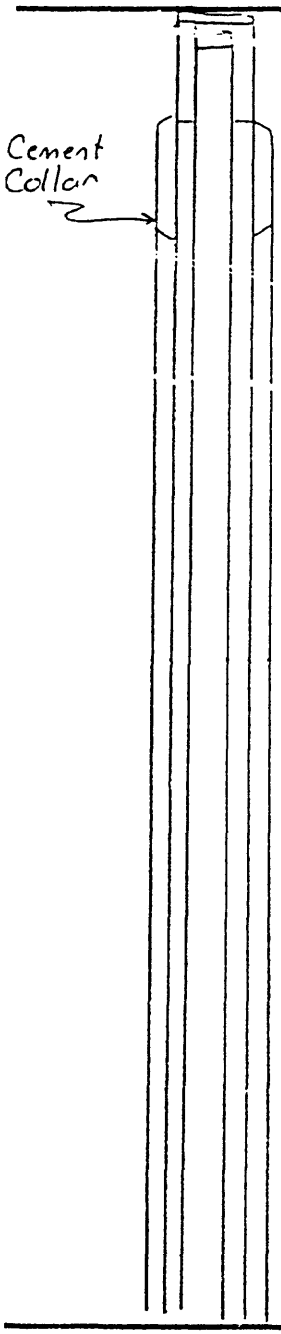
Sheet 1 of 3

CLIENT: PSWMA

Job No. PNS029

GROUNDWATER:			DRILLING METHOD	DEPTH	
Date	Time	Depth	6" Mud Rotary	0 to 110'	Elevation 20
			12" Mud Rotary	0 to 63'	Date Started 4/3
			8" Mud Rotary	0 to 110'	Date Finished
			2" Split Spoon/5'	0 to 110'	Driller- R Gerra
				to	Inspector WHM
					Well Permit No. 3126140-0

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0						
5	1	5'			Orange-Brn Sandy Clay	Berm Fill
10	2	10'			Same	Berm Fill
15	3	15'			Same	Berm Fill
20	4	20'			Dk Grey silty M sand & green. brn clay	
25	5	25'			Dk grey clay, tr organics	
30	6	30'			Dk grey-grn silty V.F. sandy clay, tr. organics	

■ — UNDISTURBED SAMPLE [I] — SPLIT SPOON SAMPLE

WELL No 028

I.D. NUMBER MW-11D

Sheet 2 of 3

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35	7	35'			Grey M. Sand over ~5" Dk. grey-grn clay	Twigs & wood chips in drilling fluid
	40	8	40'			Dk. grey grn clay, some organics, tr. M. sand	
	45	9	45'			0-recovery, spoon bouncing Cuttings - F. gravel & wood chips	Increased drilling resistance
	50	10	50'			Same, 0 recovery	- stump?
Bentonite Tremie Grout	55	11	55'			Orange - tan M/F sand tr. silt	
12" Borehole	60	12	60'			Tan - Lt. gray/Faint orange mottled stiff clay tr. F. sand	
"steel casing	65	13	65'			Lt. gray-white V.F. sand & silt	
"Sch 40 PVC casing	70	14	70'			Lt. gray-white silty clay tr. V.F. sand	
	75	15	75'			Lt. gray-white clayey F. sand to F. sandy clay & silt	

WELL No. 028

I. D. NUMBER

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
Bentonite Pellet Seal	80					Lt. grey-white silty F. sand	
	85					Tan-grey C. sand, tr. C. gravel	
	90					Lt. grey/orange M/C sand tr. silt tr. clay	
4" Sch 40 PVC 0.02" Screen	95					Lt. grey-tan M/F sand	
	100					Lt. grey/white silty C. sand & F gravel some clay	
Jessie Morie F. / Gravel Pack	105					Lt. Grey / Tan M. sand tr. silt	Hard drilling - lo of mica flakes in cuttings
	110					Tan / Orange Schistose Saprolite	EOB

WILLIAM J. HAMPTON and ASSOCS., INC.

WELL No. 029

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ .08060

DRILLERS LOG

I.D. NO. MW-12

PROJECT: PENNSAUKEN NJPDES

CLIENT: PSWMA

Sheet 1 of 2

Job No. PJS035

Elevation ~20'

Date Started 5/29/86

Date Finished 5/29/86

Driller W. J. HAMPTON

Inspector K.O.L.

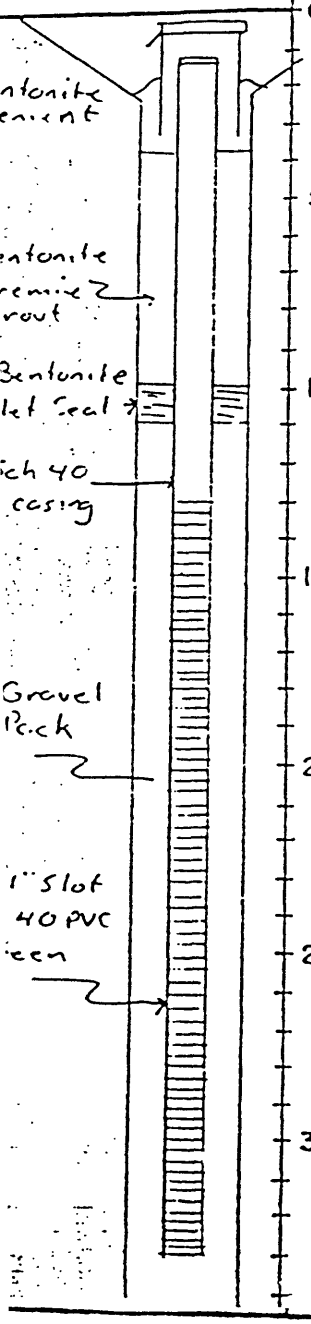
Well Permit No.

GROUNDWATER:

Date	Time	Depth
5/30/86	12:30	19'

DRILLING METHOD	DEPTH
12" HSA	0 to 34'
2" OD SPLIT SPOON/5'	0 to 36
	to
	to
	to

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0	1	0-2	2-4 8-8		Lt. brn. sandy clay Tr. silt R=40%	
5	2	4-6	2-4 9-6		Same R=40%	
10	3	9-11	3-4 6-7		Olive silty clay Tr F. sand R=40%	
15	4	14-16	2-2 4-5		Brn sandy silt Tr clay R=40%	
20	5	19 21	1-2 2-3		T - Lt Brn/Orange sandy silty clay B Lt. Brn sandy silty clay w/ Black M/F sand R=30%	
25	6	24-26	2-2 3-5		T. Yellow. brn silty sand M.B Black silty clay R=100%	
30	7	29-31	2-2 2-4		Black silty clay, some organics, trash R=80%	

WELL CONSTRUCTION	Depth Feet	No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	2/2
WELL No. 029							
	35	8	34-36	3-2 3-2		Black silty clay some trash	
						R = 80%	
	40					EOB	

WELL No 030

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LC

I.D. NO. OW-1

PROJECT: PENSAUKEN SWMA LANDFILL EXPANSION BORING PROGRAM

Sheet 1 of 2

CLIENT: PENSAUKEN LANDFILL, CAMDEN CO. N.J.

Job No. RF 108

GROUNDWATER:			DRILLING METHOD	DEPTH	
Date	Time	Depth	8" HSA ROTARY	0 to 42	Elevation
8/13/85	2 PM	32'6"	12" HSA ROTARY	0 to 42	Date Started 8/12/
8/19/85	9 AM	31'		to	Date Finished 8/20/
8/21/85	1 PM	30'		to	Driller T. SILAR, JV
				to	Inspector W. HAMPTO
				to	Well Permit No.

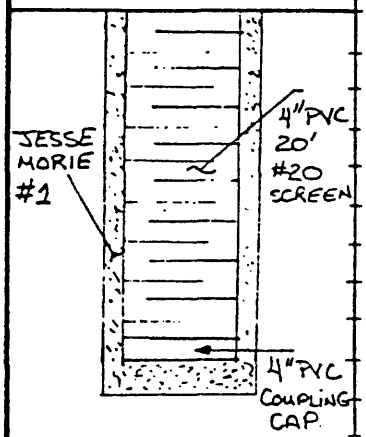
Date Started 8/12/
Date Finished 8/20/
Driller T. SILAR, JV
Inspector W. HAMPTO
Well Permit No.

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
CEMENT COLLAR.	0					Cobbles w/ gravel tr. brn. crs to fine sand	
4"Ø SOLID PVC	5						
MIXTURE OF QUICK GEL SAND MIX CONCRETE AND SANDY GRAVEL AND CLAYEY SAND	10	1	9'-11'	19-25 20-7	45		
		2	11'-13'	5-4 3-4	7		
		3	13'-15'	5-4 3-3	7	14'9"	
	15	4	15'-17'	4-5 8-10	13	lt. gry fine to crs sand w/ tr. gravel 17'0	
		5	17'-19'	5-6 4-7	10	Cobbles w/ gravel tr. brn. fine to med. sand, tr. lt. gry clay	
1' OF BENTONITE PELLET SEAL	20	6	19'-21'	8-7 7-8	15		
4" PVC 20'- #20 SCREEN		7	21'-23'	10-5 7-10	12		
		8	23'-25'	14-10 11-5	21	24'9"	
	25	9	25'-27'	7-7 18-18	25	lt. gry. lt. brn fine-med sand, tr. clay, tr. gravel	
JESSE MORIE #1		10	27'-29'	23-27 27-27	54	white-lt. gry crs to fine sand tr. gravel	
	30	11	29'-31'	40-80 78-93	158	white. lt. gry crs-fine	
		12	31'-33'	52 100/5"	—	Tan crs sand w/ some gravel	
		13	33'-35'	37-52	—	Multi colored gravel w/	

WELL No. 030

I. D. NUMBER

Sheet of

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35					MULTI-COLORED GRAVEL	
		14	35'-37'	27-42 53-80	95	36' LIGHT GREY CLAY WITH COARSE SAND TO GRAVEL	
		15	37'-39'	29-31 24-87	55	LIGHT GREY CLAY - FINE SAND WITH CLAY WITH TRACES OF GRAVELS	
	40	16	39'-41'	25-52 87-100/4"	139	LIGHT GREY-WHITE COARSE SAND WITH TRACES OF GRAVEL, AND TRACES OF WHITE CLAY	
		17	41'-43'	12-32 78-100/3	110		
	45					EOB	

WELL No. 031

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

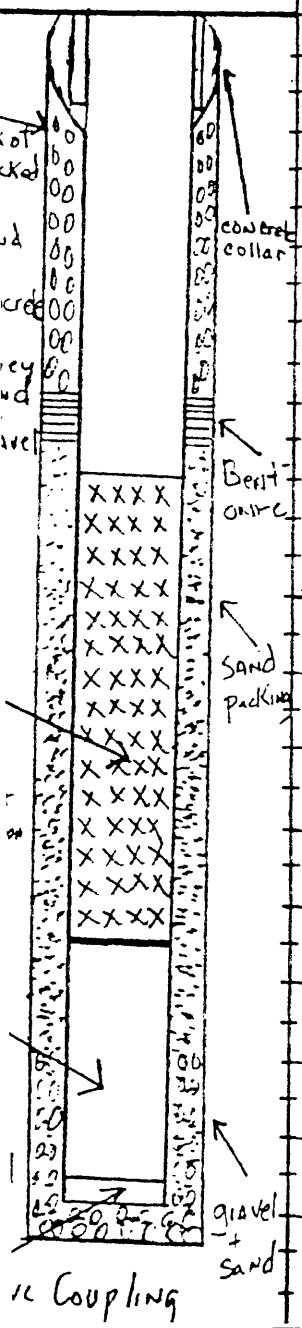
DRILLERS LOG
I.D. NO. OW-2

PROJECT: Pensauken SWMA Landfill Expansion Boring Program
CLIENT: Pensauken Landfill Camden County, New Jersey

Sheet 1 of 1
Job No. BF 1084
Elevation ~ 31'
Date Started 8/22/85
Date Finished 8/23/85
Driller J Walsh
Inspector W. Hampton
Well Permit No. 31-23981

GROUNDWATER: Date	Time	Depth	DRILLING METHOD	DEPTH
8/22/85	2:00 PM	17'-10"	8" Hollow Stem Auger	0' to 34'
8/23/85	8:30 AM	17'-0"	24" Split Spoon continuous	15' to 31'
8/23/85	4:00 PM	20'-0"	12" Hollow Stem Auger	0' to 32'
8/26/85	9:00 AM	15'-0"		to
				to

WELL CONSTRUCTION



Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0					0'-15' Brown-Dark Brown Clayey Med-Fine Sand with small-med sized gravel with some clay and silt	Auger Sample
5						
10						
15	S-1	15'-17'	4-8 17-26	25	15'-17' Brown Clayey Fine Sand with some clayey silt and white clay lamina	
	S-2	17'-19'	7-9 26-31	35	17'-21' Brown Grey Med-Fine Sand with some silt and clay	
20	S-3	19'-21'	3-4 5-3	9		
	S-4	21'-23'	3-5 4-5	9	21'-23' Olive Green - Brown Silt and clay with Fine-Med Sand	
	S-5	23'-25'	3-4 5-6	9	23'-29' Green-Grey Silty Clay with black grains and mica flakes	
25	S-6	25'-27'	4-5 5-5	10		
	S-7	27'-29'	4-7 14-16	21		
30	S-8	29'-31'	4-8 12-16	20	29'-31' Black-Grey Clay with an undetermined amount of mica flakes and organics	

WELL No. 032

WILLIAM J. HAMPTON and ASSOCS., INC.

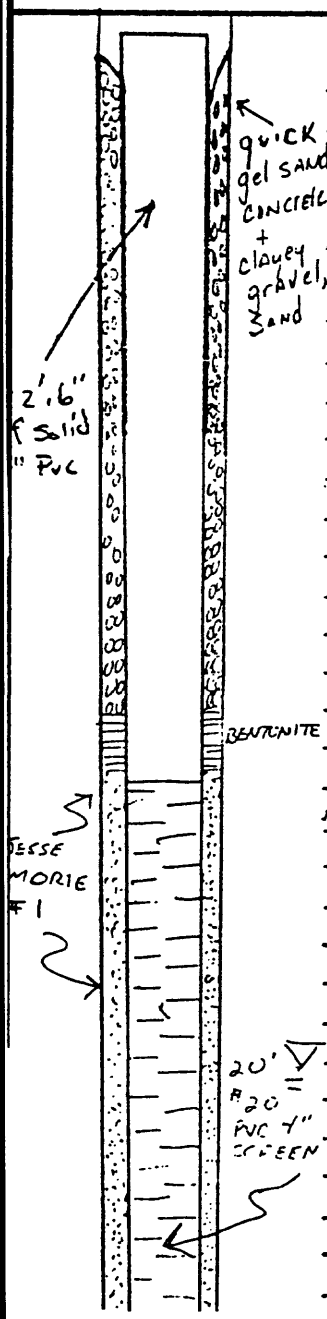
Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. OW-3

PROJECT: PENNSAUKEN SWMA LANDFILL EXPANSION BORING PROGRAM
CLIENT: PENNSAUKEN LANDFILL Camden County, New Jersey

Sheet 1 of 2
Job No. BF1084
Elevation ~13.2'
Date Started 8/27/85
Date Finished 8/28/85
Driller J. Walsh
Inspector W. Hampton
Well Permit No. 3123483

GROUNDWATER: Date	Time	Depth	DRILLING METHOD	DEPTH
			8" Hollow Stem Auger Rotary	0' to 41'
8/27/85	2:30 PM	26'	24" Split Spoon	0' to 2'
8/28/85	11:30 AM	25'-5"	24" Split Spoon continuous	4' to 40'
8/28/85	12:30 PM	25'	12" Hollow Stem Auger Rotary	0' to 41'
				to

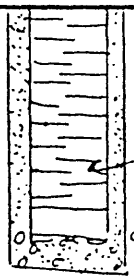


Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
0	S1A	0'-2'	4-6 8-11	14	0'-2' Light Brown-Grey Silty Med-Fine Sand with a Trace of clay and organics	
					2'-4' Light Rust Brown clayey Fine-Med Sand with mica Flakes	Auger Sample
5	S1	4'-6'	4-7 10-14	17	4'-6' Light Rust Brown Silty Coarse-Med Sand with a Trace of Fine Sand and gravel	
	S-2	6'-8'	3-8 14-16	22	6'-8' Olive Green-Rust Brown Clayey Med Fine Sand with a Trace of silt and gravel	
	S-3	8'-10'	6-10 18-20	18	8'-10' Light Brown Tan-Rust Tan Silty Fine-Coarse Sand with a Trace of Clay	
10	S-4	10'-12'	14-9 32-41	41	10'-18' White Fine-Coarse Sand with traces of mica	
	S-5	12'-14'	12-32 44-60	76		
15	S-6	14'-16'	14-74 100/4	—		
	S-7	16'-18'	13-52 99-81	151		
	S-8	18'-20'	12-40 51-90	91	18'-20' Light Rust Yellow Tan Fine-Med Sand with a Trace of Silt	
20	S-9	20'-22'	15-48 69-85	87	20'-22' Light Yellow Fine-Coarse Sand with a Trace of silt and gravel	
	S-10	22'-24'	13-70 100/4	—	22'-26' Rust Yellow Fine-Coarse Sand with a Trace of silt and mica	
25	S-11	24'-26'	17-75 100/4	—		WATER @ 26'
	S-12	26'-28'	29-71 74-100/4	155	26'-28' Yellow White Clay with a trace of White Fine-Coarse Sand and gravel	
	S-13	28'-30'	27-51 95-100	146	28'-34' Beige Clay with White Med-Coarse Sand and gravel	
30	S-14	30'-32'	11-48 79-100/4	127		
	S-15	32'-34'	10-60 [illegible] 100	141		

WELL No. 032

. D. NUMBER OW-3

Sheet 2 of 2

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
SSE RIE  4" PVC #20 SCREEN; 4" PVC COUPLING CAP	35	S-16	34'-36	13-57 91-100/5	148	34'-38' Yellow Clay with med-coarse Sand with a Trace of gravel	
		S-17	36'-38'	15-61 89-100/4	150		
	40	S-18	38'-40'	17-50 97-100/4	147	38'-40' White Clay with med-coarse SAND AND a trace of SILT And mica	

WELL No. 033..

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Haines port, NJ 08060

DRILLERS LOG
I.D. NO. OW-4

PROJECT: Pennsauken SWMA Landfill Expansion Boring Program
CLIENT: Pennsauken Landfill Camden County, New Jersey

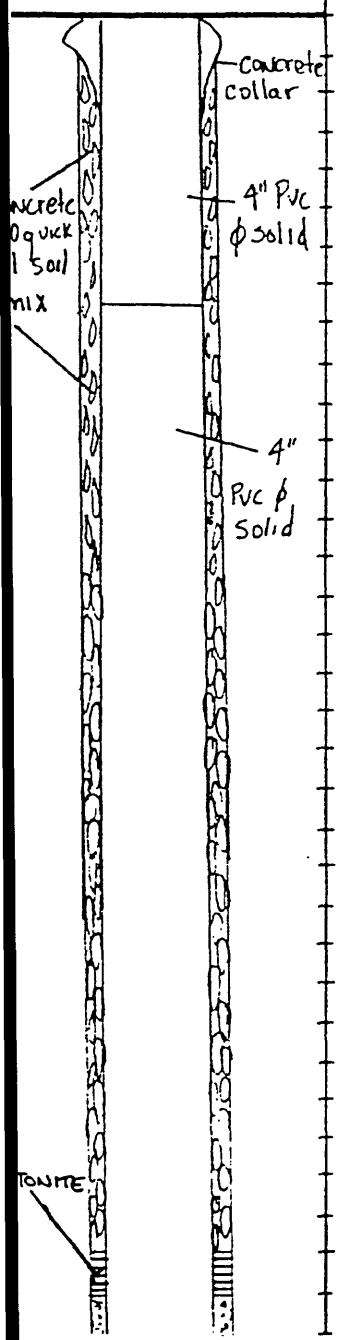
Sheet 1 of 2
Job No. BF1084
Elevation ~45'-0"
Date Started 9/3/85
Date Finished 9/3/85
Driller J. Walsh
Inspector W. Hampton
Well Permit No. 31-23482

GROUNDWATER:

Date	Time	Depth
9/3/85	15:30	34'
9/4/85	10:00	34'6"
9/4/85	16:30	34'2"

DRILLING METHOD	DEPTH
8" Hollow Stem Auger	0' to 45
	to
	to
	to
	to

WELL CONSTRUCTION

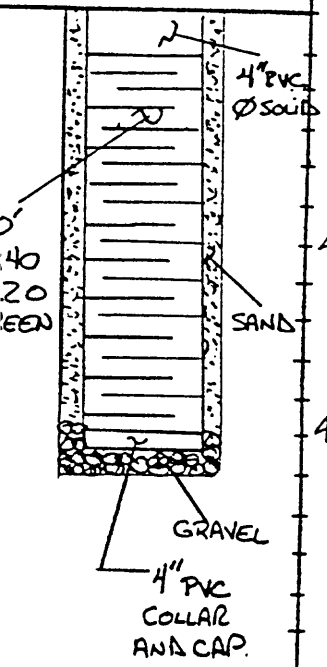


Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0					0'-10' Light Brown clayey silty sand and small gravel	
10					10'-15' Brown - Green Brown Clayey Med - Fine Sand	
15					15'-20' Golden Brown Fine - Med Sand	
20					20'-23' Yellow Golden gravelly Med - coarse Sand	
					23'-26' Olive green - green Silty Fine Sand	
25					26'-29' White Golden gravelly med - coarse Sand	
					29'-32' White Med - Fine Sand with a Trace of silt And clay	
30					32'-34' White gravelly Fine - Coarse Sand	

WELL NO. 033

I. D. NUMBER OW-4

Sheet 2 of 2

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	SAMPLE Depth/Type	SAMPLE Blows per 6"	SAMPLE N.	CLASSIFICATION	REMARKS
	35					34'-39'6" White Med-Fine Sand with White Sandy clay	
	40					39'-6"-41'6" White Med-Coarse Sand with small gravel	
						41'-6"-45' White clayey Fine Sand with a Trace of clay	
	45						

WELL No. 034

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. DB-1

PROJECT: Pennsauken SWMA Landfill Expansion Boring Program
CLIENT: Pennsauken Landfill Camden County, New Jersey

Sheet 1 of 2
Job No. BF1084
Elevation ~ 51'
Date Started 8/7/85
Date Finished 8/9/85
Driller J. Walsh
Inspector W. Hampton
Well Permit No.

GROUNDWATER:

Date	Time	Depth

DRILLING METHOD	DEPTH
6" Hollow Stem Augar Rotary	0' to 50'
2"ϕ 29" Split Spoon /5'	0' to 21'
24" Split Spoon continues	21' to 45'
24" Split Spoon /5'	49' to 51'
	to

WELL CONSTRUCTION

Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
0	S-1	0'-2'	19-29 24-17	53	0'-2' Very Fine - Fine Sand with small gravel and silty clay	
					2'-4' Brown muddy gravel with a trace of Fine Sand	Auger Sample
5	S-2	4'-6'	4-4 4-4	8	4'-6' Silty Coarse - Fine Sand with small gravel	
					6'-9' Brown Silty clay and Med-Fine Sand with small gravel	Auger Sample
10	S-3	9'-11'	4-6 6-9	12	9'-11' Yellow-White Med-Fine Sand and gravel	
					11'-14' Brown Med-Fine Sand with a trace of clayey silt	Auger Sample
15	S-4	14'-16'	4-6 9-11	15	14'-16' Light Brown Silty and clayey Med-Fine Sand and gravel	
					16'-19' Brown silty clay with coarse-med Sand and gravel	Auger Sample
20	S-5	19'-21'	6-8 9-8	17	19'-27' Pale Yellow Coarse-Fine Sand with gravel	
	S-6	21'-23'	6-9 9-7	18		
	S-7	23'-25'	4-4 4-8	8		
25	S-8	25'-27'	10-17 35-50/5	52		
	S-9	27'-29'	8-37 72-100/5		27'-29' Lt. Grey silty clay with mica and a trace of coarse sand	
30	S-10	29'-31'	18-85 100/4"		29'-39' White Coarse - Med. Sand and gravel	
	S-11	31'-33'	20-57 72-100/4.5			

WELL No. 034

I. D. NUMBER DB-1

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35						
		S-13	35'-37'	20-28 100/5.5"			
		S-14	37'-39'	6-14 46-100/3"			
	40	S-15	39'-41'	14-27 46-100/4.5"		39'-43' Yellow-White Coarse-Med Sand with a Trace of Silty clay	
		S-16	41'-43'	~~48~~-40 100/4"			
	45	S-17	43'-45'	10-12 53-100/4		43'-59' Pale Yellow Fine-Coarse Sand and gravel with silty clay	
	50	S-18	49'-51'			49'-51' White Med-Fine Sand with gravel and sandy clay	

WELL No 035

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. DB-2

PROJECT: Pennsauken Landfill	Sheet 1 of 3
CLIENT: Pennsauken TWN	Job No. BF1084
GROUNDWATER: 26'-0"	Elevation ~91'-0"
	Date Started 9/10/85
	Date Finished 9/11/85
	Driller J. Walsh
	Inspector
	Well Permit No.

Date	Time	Depth	DRILLING METHOD	DEPTH
			Rotary / Water	0' to 30'
9/10/85	15:30	26'-0"	Rotary / Mud	30' to 90'
				to
				to
				to

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
	0						
	5						
		S-1	8'-10'	3-4 3-3	7	8'-10' TAN Med-Fine Sand with a Trace of Silt and clay	
	10	S-2	10'-12'	4-12 100/5		10'-12' Brown Clay Sand with a Trace of clay and silt	
		S-3	12'-14'	4-7 7-12	14	12'-18' Brown Fine-Med Sand with a Trace of clay and silt	
	15	S-4	14'-16'	3-9 13-16	22		
		S-5	16'-18'	3-7 9-14	16		
		S-6	18'-20'	6-6 11-15	17	18'-20' Brown Med Sand and clay with a Trace of silt	
	20	S-7	20'-22'	4-7 7-12	14	20'-28' Green Brown Med-Fine Sand with a Trace of silt and clay	
		S-8	22'-24'	5-9 11-11	20		
	25	S-9	24'-26'	8-7 11-14	18		
		S-10	26'-28'	6-9 12-14	21		
		S-11	28'-30'	5-9 13-17	22	28'-32' Brown Fine-Med Sand with a Trace of silt and clay	
	30	S-12	30'-32'	3-7 6-11	13		
		S-13	32'-	4-6		32'-44' Dark Brown	

WELL No. 035

I. D. NUMBER DB-2

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type		Blows per 6"	N.	CLASSIFICATION	REMARKS
	35	S-14	34'-36'		5-6 9-13	15		
	40	S-15	39'-41'		5-3 7-9	10		
	45	S-16	44'-46'		2-2 2-2	4	44'-54' Silty Clay	
	50	S-17	49'-51'		weight of Hammer	-		
	55	S-18	54'-56'		7-8 10-12	18	54'-59' TAN Course - Med Sand with a trace of Clay AND silt	
	60	S-19	59'-61'		6-9 13-16	22	59'-69' Brown Course - Med Sand with a Trace of Clay AND Silt	
	65	S-20	64'-66'		6-6 9-12	15		
	70	S-21	69'-71'		7-5 10-12	15	69'-91' TAN Course - Med Sand with a Trace of silt	
	75	S-22	74'-76'		6-9 10-14	19		

WELL No. 035

I. D. NUMBER DB-2

Sheet 3 of 3

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	SAMPLE Depth/Type	SAMPLE Blows per 6"	SAMPLE N.	CLASSIFICATION	REMARKS
	85	S-24	84'-86'	8-11 13-11	24		
	90	S-25	89'-91'	8-10 11-17	21		

WELL No. 036

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG
I.D. NO. DB-3

PROJECT: PENSAUKEN SWMA LANDFILL EXPANSION BORING PROGRAM.
CLIENT: PENSAUKEN LANDFILL, CAMDEN COUNTY, N.J.

Sheet 1 of 3
Job No. BF1084
Elevation ~15'
Date Started 7/29/8
Date Finished 8/1/85
Driller J WALSH/JR URB
Inspector W HAMPTON
Well Permit No. —

GROUNDWATER:

Date	Time	Depth
7/29/85	3:30 P.M.	16'6" *
7/30/85	11:25 A.M.	25' *
7/31/85	9:00 A.M.	26' *
8/1/85	8:00 AM	18' *
8/2/85	4:00 PM.	12'
8/5/85		

* - INSIDE 6" AUGER

DRILLING METHOD	DEPTH
6" HSA - ROTARY.	0 to 89'
24" SPLIT SPOON	0 to 2'
24" SS - CONTINUOUS.	4' to 26'
24" SS / 5'	26' to 91'
	to

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type		Blows per 6"	N.	CLASSIFICATION	REMARKS
	0	1	0'-2'	SS	4-12 18-11	30	BROWN-TAN, CLAYEY M/F SAND WITH TRACES OF GRAVEL.	
				AS			BROWN, DAMP, MUDDY (SILT AND CLAY) M/F SAND WITH SM/MED GRAVEL	
	5	2	4'-6'		9-9 9-12	18	ALTERNATE LAYERS OF BROWN-LIGHT BROWN, CLAYEY, FINE SAND AND SANDY CLAY TO BROWN-RUST BROWN CLAYEY SILT WITH TRACES OF FINE SAND AND MICA	
		3	6'-8'		11-11 13-19	24	DARK GREY-WHITE, M/F SAND WITH TRACES OF SILT TO BROWN-RUST BROWN CLAYEY SILT WITH TRACES OF FINE SAND AND MICA	
		4	8'-10'		8-14 22-20	36	BROWN WITH GREEN SECTIONS, STIFF CLAYEY M/F SAND WITH SILT AND MICA TO LIGHT BROWN-BLACK-WHITE, F/M SAND	
	10	5	10'-12'		2-4 4-11	8	TAN-RUST BROWN-GREEN MIXTURE OF MUDDY FINE SAND, SO SILTY CLAY WITH MICA WITH TRACES OF FINE SAND AND VERY FINE SAND AND GRAVEL	
		6	12'-14'		10-18 24-30	42	SILTY-GREEN FINE SAND WITH TRACES OF CLAY AND GRAVEL TO MUDDY BROWN F/M SAND (WET)	
	15	7	14'-16'		10-18 14-11	32	LIGHT BROWN-TAN M/C SAND WITH TRACES OF SILT (WET - VERY WET)	
		8	16'-18'		3-6 14-11	20	BROWN-OLIVE BROWN, F/M SAND WITH CLAY AND TRACES OF SILT (WET)	
		9	18'-20'		3-8 12-16	20	BROWN, MEDIUM SAND WITH CLAY TO BLACK, SANDY FINE SILT WITH TRACES OF CLAY TO BROWN MUDDY C/M WITH TRACES OF SILT (WET)	
	20	10	20'-22'		3-4 4-11	8	BROWN-TAN MUDDY SILT AND CLAY C/M SAND (WET)	
		11	22'-24'		5-12 12-12	24	GREY-BLACK-LIGHT OLIVE BROWN SILTY, F/M, SAND WITH TRACES OF SMALL GRAVEL	
	25	12	24'-26'		10-15 16-14	31	GREY-WHITE MEDIUM SAND WITH TRACES OF SILT TO LIGHT BROWN, M/F, SAND WITH TRACES OF CLAY-SILT AND PEBBLES	END OF CONTINUOUS SAMPLING.
				AS			BROWN, F/M, SAND WITH TRACES OF CLAY (WET)	
	30	13	29'-31'		4-4 5-6	9	BROWN, F/M, SAND WITH TRACES OF SILT AND GRAVEL TO BLACK-OLIVE GREY SILTY CLAY WITH BROWN ORGANIC (WET)	
SHELBY TUBE ATTEMPT				STD				NO RECOVERY IN SHELBY TUBE
							OLIVE GREEN CLAYEY SILT AND FINE	

WELL No. 036

I. D. NUMBER DB-3

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type		Blows per 6"	N.	CLASSIFICATION	REMARKS
	35	14	34'-36'	SS	3-4 4-6	8	OLIVE GREY, SILTY CLAY WITH TRACES OF MICA AND ORGANICS	
				AS			OLIVE GREEN VISCOUS, CLAYEY-SILTY MUD	
	40	15	39'-41'		5-7 9-10	16	OLIVE-GREEN-GREY SILTY CLAY WITH BROWN ORGANICS AND MICA PARTIALLY LAMINATED.	
				AS			CLAYEY FINE SAND AND SILT (WET)	
	45	16	44'-46'		6-8 11-19	19	BROWN-BLACK ORGANIC SILTY CLAY WITH MICA AND ABUNDANT ORGANICS	
				AS			BROWN MUD CONSISTING OF SILT AND CLAY WITH TRACES OF FINE SAND AND MICA.	
	50	17	49'-51'		2-2 8-20	10	BLACK-OLIVE GREEN, SILTY CLAY WITH ORGANICS TO LIGHT GREY AND WHITE TO GOLDEN TAN GRAVELY C/M SAND WITH TRACES OF FINE SAND	
				AS			BROWN - VERY LIGHT BROWN, SILTY, C/M SAND (WET)	
	55	18	54'-56'		11-16 21-29	37	WHITE, F/C SAND WITH TRACES OF FINE SAND TO MULTI-COLORED M/C SAND GRAINS TO COARSE SAND - (WET)	
				AS			MUDDY WATER WITH M/F SAND	
	60	19	59'-61'		54-70 50-39	120	WHITE, F/C SAND WITH TRACES OF SILT TO MULTI COLORED M/C SAND GRAINS TO VERY ANGULAR/ANGULAR SMALL GRAVELS	(WET)
				AS			WATER UP FLIGHTS - OLIVE GREEN TO BROWN WITH SUSPENDED CLAY-SILTY AND FINE SAND TO WHITE F/M SAND TO WHITE MILKY CLAY SILT SUSPENDED IN WATER	
	65	20	64'-66'		26-28 37-46	65	WHITE-GREY WHITE SILTY M/F SAND WITH CLAY - TRACES OF COARSE SAND AND SMALL GRAVEL TO FEW COLORED SAND GRAINS TO FINE SAND WITH MICA	(WET)
				AS			WHITE CHANGING TO MUDDY GREEN WATER UP AUGER FLIGHT WHILE DRILLING (WET)	
	70	21	69'-71'		8-9 7-20	16	WHITE-GREY WHITE ALTERNATING CLAY AND CLAYEY SILT WITH MICA WITH TRACES OF SMALL GRAVEL TO SANDY FINE CLAY.	
				AS			MUDDY, OLIVE GREEN WATER WITH SUSPENDED CLAY SILT AND FINE SAND BROUGHT UP FLIGHTS	
	75	22	74'-76'		5-12 14-16	26	WHITE, M/F CLAYEY SAND WITH TRACES OF SILT AND COARSE SAND TO MINOR LAMINA OF CLAY-CLAYEY SAND-SANDY CLAY	(WET)
				AS			LITTLE COLOR TO WATER. COMING UP FLIGHT, VERY LIGHT MUDDY GREEN COLOR WITH FINE SAND	
					6-12		WHITE-OFF WHITE CLAYEY M/F SAND	

WELL No. 036

I. D. NUMBER DB-3

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type			Blows per 6"	N.	CLASSIFICATION	REMARKS
	81	23	79'-81'	S	S	6-13 11-10	24	WHITE-OFF WHITE, CLAYEY M/F SAND DETAIL ON PAGE 2	
				AS				WHILE DRILLING - OLIVE GREEN - BROWN MUDDY WATER WITH FINE SAND WITH TRACES OF MEDIUM SAND COMING UP AUGER FLIGHTS TO TOP OF BORE HOLE	
	85	24	84'-86'			5-9 11-16	20	WHITE-OFF WHITE, SANDY CLAY AND M/F SAND WITH TRACES OF SILT AND COARSE SAND AND SMALL ANGULAR GRAVEL (WET)	
				AS				WHITE-LIGHT FADED MAROON (MAUVE) CLAY WITH SMALL TO MEDIUM ANGULAR GRAVELS WHILE DRILLING-OLIVE-GREEN-BROWN MUDDY WATER WITH M/F SAND FLOWED FROM BORE HOLE	
	90	25	89'-91'			3-5 6-9	11	WHITE-GREYWHITE-MAUVE CLAY TO SILTY CLAY WITH MORE TRACES OF MICA AND FINE SAND TO LARGE ANGULAR TO VERY ANGULAR, SMALL TO MEDIUM GRAVEL	
						EOB.			

Well No. 051

WILLIAM J. HAMPTON and ASSOCS., INC.

Suite 205 Tiffany Square 2615 Rt. 38
Hainesport, NJ 08060

DRILLERS LOG

I.D. NO. DB4

JECT: PENNSAUKEN LANDFILL

Sheet 1 of 3

ENT: PENNSAUKEN TWN

Job No. BF1084

UNDWATER: 37'-0"			DRILLING METHOD	DEPTH	Elevation ~ 91'-0"
ate	Time	Depth	ROTARY-Mud	0' to 90'	Date Started 9/12/85
/85	11:00	37'-0"	Cont. SS sample	27' to 49'	Date Finished 9/13/85
			24" SS / 5'	49' to 90'	Driller J. Walsh
				to	Inspector
				to	Well Permit No.

LL NSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N	CLASSIFICATION	REMARKS
	0						
	5						
	10						
	15						
	20						
	25						
		S-1	27'-29'	7-10 14-14	24	27'-33' Red-Brown Course-Med SAND with a Trace of SILT AND small gravel	
	30	S-2	29'-31'	5-9 13-16	22		
		S-3	31'-33'	5-7 8-13	15		

WELL No. 037

I. D. NUMBER DB-4

Sheet 2 of 3

WELL CONSTRUCTION	Depth Feet	SAMPLE No.	Depth/Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	35						
		S-5	35'-37'	5-7 9-13	16	35'-41' RED Brown Course-Med Sand with a Trace of Silt	
		S-6	37'-39'	4-6 8-11	14		
	40	S-7	39'-41'	7-7 11-14	18		
		S-8	41'-43'	6-7 9-11	16	41'-54' TAN Med-FINE Sand with a Trace of Silt	
		S-9	43'-45'	8-7 9-9	16		
	45	S-10	45'-47'	8-10 10-14	20		
		S-11	47'-49'	7-12 10-16	22		
	50						
	55	S-12	54'-56	6-7 11-16	18	54'-59' TAN Course-Med Sand with a Trace of Silt	
	60	S-13	59'-61'	8-8 14-17	22	59'-91' TAN Med-FINE Sand with a Trace of silt	
	65	S-14	64'-66'	7-8 9-12	17		
	70	S-15	69'-71'	7-7 9-12	16		
	75	S-16	74'-76'	8-7 8-11	15		

WELL No. 037

D. NUMBER

Sheet of

ELL NSTRUCTION	Depth Feet	SAMPLE No.	Depth/ Type	Blows per 6"	N.	CLASSIFICATION	REMARKS
	85	S-18	84'-86'	5-8 10-13	18		
	90	S-19	89'-91'	8-10 11-17	21		

BCM WELL DRILLING LOG		WELL NO: MW-1-55
		SHEET 1 OF: 2
PROJECT: Aluminum Shapes Inc., Delair, N.J.		PROJECT NO.: 00-5007-04
WELL LOCATION:		DATE(S) DRILLED: 12/8/86, 12/10/86
DRILLING CONTRACTOR: Engineering Drilling Co.		DRILLING METHOD: Mud/Water Rotary
BORING DIAMETER: 8"	SAMPLING METHOD: 2½" Split Spoon, 140lb/36"	SAMPLE INTERVAL: 10' and 5'
LOGGED BY: Rob Sheneman		TOTAL DEPTH: 55'
SCREEN SIZE AND MATERIAL: 4" I.D. Factory Slotted PVC		SCREENED INTERVAL: 0.010-54'-44' 0.016-44'-39'
CASING SIZE AND MATERIAL: 4" I.D. Schedule 40 PVC		CASED INTERVAL: 39'-+2'
GRAVEL PACK SIZE: No. 2 Silica Sand		PACKED INTERVAL: 54'-36.5'
GROUT TYPE: Type I Portland Cement and Bentonite		GROUTED INTERVAL: 31'-0'
GROUTING METHOD: Tremie Pipe		BENTONITE SEAL: 36.5'-31'
DEVELOPMENT METHOD: Submersible Pump	TIME: 1.75 hrs.	ESTIMATED YIELD: 3-5 gpm
STATIC WATER DEPTH: 40.31'	DATE: 12-22-86	REFERENCE: Top of PVC

REMARKS:

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY	CLASSIFICATION OF MATERIALS
0'-±7'	cuttings			Brown m/c sandy loam with small amounts of medium round gravel and concrete chips
±7'-±17'	10'-12'	33,30,50, 100/5	18"	Tan to brown loamy m/c sand with small amounts of fine round gravel and occasional light gray clay seams.
±17'-45'	20'-20.75'	90,100/3	8"	Tan to brown m/c sand with small amounts of fine round gravel.
	30'-30.5'	120,50/1	6"	Damp tan m/c sand with small amounts of fine to medium round gravel.
	40'-41'	86,105	12"	Damp tan m/c sand with small amounts of fine to medium round gravel and a light gray clay layer (3") at bottom.

WELL No. 038

WELL NO. MW-1-55 SHEET 2 OF: 2

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in)	CLASSIFICATION
45'-55'	45'-47'	75,95,75,100	22"	Wet light gray to tan m/c sandy clay loam
				with fine clay loam layers and frequent fine
				black crossbeds.
	50'-51.5'	27,25,33	18"	Wet friable medium to dark brown m/f sandy
				clay loam.
55'-56.5'	55-56.5	26,43,63	18"	Dry very hard medium brown clay.
55				WELL COMPLETED

WELL No. 039

BCM WELL DRILLING LOG			WELL NO: MW-2-55
			SHEET 1 OF: 2
PROJECT: Aluminum Shapes Inc., Delair, N.J.			PROJECT NO.: 00-5007-04
WELL LOCATION: In area of former percolation field			DATE(S) DRILLED: 12-4-86
DRILLING CONTRACTOR: Engineering Drilling Co.			DRILLING METHOD: Mud/Water Rotary
BORING DIAMETER: 8"	SAMPLING METHOD: 2½" Split Spoon, 140lb/36"		SAMPLE INTERVAL: 10' and 5'
LOGGED BY: Rob Sheneman			TOTAL DEPTH: 57'
SCREEN SIZE AND MATERIAL: 4" I.D. Factory Slotted PVC			SCREENED INTERVAL: 0.020-45'-40' 0.010-55'-45'
CASING SIZE AND MATERIAL: 4" I.D. Schedule 40 PVC			CASED INTERVAL: 40'-+2'
GRAVEL PACK SIZE: No. 2 Silica Sand			PACKED INTERVAL: 55'-37.5'
GROUT TYPE: Type I Portland Cement and Bentonite			GROUTED INTERVAL: 34'-0'
GROUTING METHOD: Tremie Pipe			BENTONITE SEAL: 37.5'-34'
DEVELOPMENT METHOD: Submersible Pump	TIME:		ESTIMATED YIELD: 8-10gpm
STATIC WATER DEPTH: 45.31'	DATE: 12-22-86	REFERENCE: Top of PVC	

REMARKS:

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY	CLASSIFICATION OF MATERIALS
0'-±17'	cuttings			Medium brown m/c sandy loam with small amounts of m/f round gravel
	10'-12'	11,13,14,13	1½"	Medium brown silty clay loam with trace amounts of fine round gravel.
±17'-±49'	20'-20.5'	89, 60/2	6"	White to tan loamy m/c sand.
	30-30.5	118	4"	Moist, tan loamy subangular m/c sand
	40-40.5	125/5	2"	Moist, tan loamy subangular m/c sand with small amounts of medium round gravel.
	45-46.5	42,83,65/3	14"	Moist, tan loamy subangular m/c sand with small amounts of m/c round gravel.

WELL No. 039

WELL NO. MW-2-55

SHEET 2 OF: 2

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY in	CLASSIFICATION
±49'-57'	50-51.5	37,62,60	12"	Dry, hard light gray, silty clay with 3" dark gray moist sandy loam layer at ±51'.
	55-57	25,27,48,50	20"	Very hard, dry light gray to tan clay.

WELL No.
040

BCM WELL DRILLING LOG			WELL NO: MW-3-65
			SHEET 1 OF: 2
PROJECT: Aluminum Shapes Inc., Delair, N.J.			PROJECT NO.: 00-5007-04
WELL LOCATION: Next to fence in rear metal storage area.			DATE(S) DRILLED: 12-3-86
DRILLING CONTRACTOR: Engineering Drilling Co.			DRILLING METHOD: Mud/Water Rotary
BORING DIAMETER: 8"	SAMPLING METHOD: 2½" Split Spoon, 140lb/36"		SAMPLE INTERVAL: 10' and 5'
LOGGED BY: Rob Sheneman			TOTAL DEPTH: 65'
SCREEN SIZE AND MATERIAL: 4" I.D. Factory Slotted PVC (0.016")			SCREENED INTERVAL: 65'-45'
CASING SIZE AND MATERIAL: 4" I.D. Schedule 40 PVC			CASED INTERVAL: 45'-±2'
GRAVEL PACK SIZE: No. 2 Silica Sand			PACKED INTERVAL: 65'-42.5'
GROUT TYPE: Type I Portland Cement and Bentonite			GROUTED INTERVAL: 27'-0'
GROUTING METHOD: Tremie Pipe			BENTONITE SEAL: 42.5'-27'
DEVELOPMENT METHOD: Submersible Pump	TIME: 2 hrs.		ESTIMATED YIELD: 8-10gpm
STATIC WATER DEPTH: 48.34'	DATE: 12-22-86	REFERENCE: Top of PVC	

REMARKS:

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY	CLASSIFICATION OF MATERIALS
0'-0.5'	cuttings			Concrete pad.
0.5'-10'	0.5-2.5	6,10,7,6	14"	Stiff, dry, gray to brown m/f sandy loam with trace amounts of fine round gravel, glass and wood.
10'-21'	10'-12'	15,35,53,67	20"	Stiff, dry light gray m/f sand with fine black crossbedding.
	20'-22'	17,30,45,40	18"	Stiff, dry medium gray m/f sandy loam with fine tan crossbedding (15").
21'-31'				Loose, gray m/c sand with fine brown cross-bedding (3").
	30'-32'	15,30,34,34	16"	Slightly stiff gray m/c sand with some fine round gravel (10")
31'-33'				Hard, dry, light gray silty clay (6")

WELL No.
040

WELL NO. MW-3-65

SHEET 2 OF: 2

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in)	CLASSIFICATION
±33'-±49'	40-40.5'	125/6	6"	Slightly stiff, damp, tan m/c subangular sand with trace amounts of m/c round gravel.
±49'-±52'	50'-51'	55,83,80/1	12"	Stiff, dry light gray clay with fine orange veins.
±52'-65	55'-55.3'	125/4	3"	Wet, tan to white medium sand.
	60'-61'	52,100	12"	Wet, tan m/c sand with small amounts of fine round gravel.
	65-67	35,56,40, 100/4	20"	Dry, very hard, light gray clay.
65'				WELL COMPLETED

WELL No. 041

BCM	WELL DRILLING LOG	WELL NO: MW-4-60
		SHEET 1 OF: 2

ROJECT: Aluminum Shapes Inc., Delair, N.J.		PROJECT NO.: 00-5007-04
ELL LOCATION: NE side of building 12K		DATE(S) DRILLED: 12-1-86
RILLING CONTRACTOR: Engineering Drilling Co.		DRILLING METHOD: Mud/Water Rotary
ORING AMETER: 8"	SAMPLING METHOD: 2½ Split Spoon, 140lb/36"	SAMPLE INTERVAL: 10' and 5'
OGGED BY: Rob Sheneman		TOTAL DEPTH: 60.75'
CREEN SIZE ND MATERIAL: 4" I.D. Factory Slotted PVC (0.016")		SCREENED INTERVAL: 60'-40'
ASING SIZE ND MATERIAL: 4" I.D. Schedule 40 PVC		CASED INTERVAL: 40'-+2'
RAVEL ACK SIZE: No. 2 Silica Sand		PACKED INTERVAL: 60'-38'
ROUT TYPE: Type I Portland Cement and Bentonite		GROUTED INTERVAL: 35'-0'
ROUTING ETHOD: Tremie Pipe		BENTONITE SEAL: 38'-35'
EVELOPMENT ETHOD: Submersible Pump	TIME: 2 hrs.	ESTIMATED YIELD: 10gpm
ATIC ATER DEPTH: 50. 63'	DATE: 12-22-86	REFERENCE: Top of PVC

MARKS: Hnu readings not above background.

THOLOGIC NTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOV-ERY	CLASSIFICATION OF MATERIALS
-4"	cuttings			Concrete paving.
5'-±30'	0.5'-2.5'	13,15,10.9	3"	Dry, light brown to orange loamy medium sand with small amounts of m/c round gravel.
	10'-11.5'	24,50,75	8"	Dry, light brown to orange coarse subangular sand.
	20'-20.75	36,100/3	6"	Damp, light brown to orange coarse subangular sand with small amounts of m/c round gravel.
'-±42'	30'-31.75	51,82,93	10"	Dry, light gray loamy m/f sand (5") Dry, tan to white m/f sand with trace amounts of m/f round gravel (5")
	35'-36'	45,145	6"	Damp, tan to white loamy m/f sand with small amounts of fine round gravel.

WELL No. 041

WELL NO. MW-4-60

SHEET 2 OF: 2

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in)	CLASSIFICATION
	40'-42'	32,46,56,47	16"	Damp, light gray m/f sandy loam with trace amounts of fine round gravel.
±42'-±59'	45'-45.75'	70,100/3	6"	Wet, tan m/c subangular sand with some m/f round gravel.
	50'-50.5'	130	6"	Wet, tan m/c subangular sand with small amounts of m/f round gravel.
	56-59	cuttings		Light gray m/c sand.
±59'-60.75'	60-60.75	70,100/3	6"	Dry, light gray clay.
60'				WELL COMPLETED

WELL No. 042

LIPPINCOTT ENGINEERING ASSOCIATES

501 BURLINGTON AVENUE DELANCO, N.J. 08075

ROJECT NO. 4068.1 SHEET 1 OF 4

ATE 8/15/85 SURFACE ELEV

ROJECT MONITORING WELLS CLIENT RMP

OCATION PENNSAUKEN, NJ LOG OF BORING NO. MW-1

JJT:mk PERMIT NO 31-23546

DEPTH	SAMPLE NUMBER	TYPE*	SAMPLE DEPTH	NUMBER OF BLOWS PER 6"	CLASSIFICATION OF MATERIALS BASED ON SAMPLES RECOVERED PLUS OBSERVATION OF MATERIAL RETURNED BETWEEN SAMPLES	MOISTURE CONTENT
	S-1	A	0/ 2	8-9-9-11	2" ASPHALT - 3" QUARRY BLEND Light brown fine-medium SAND.	
5	S-2	A	4/ 6	7-20-21	Orange-brown fine-medium SAND with iron deposits.	
10	S-3	A	9/ 11	12-18-26	Light brown-orange brown fine-coarse SAND.	
15	S-4	A	14/ 16	18-19-13	Orange-light brown-off white fine-medium SAND, trace silt.	
20	S-4	A	19/ 21	19-43-36	Light brown-white fine-medium SAND, densely packed	
25	S-6	A	24/ 26	57-61-75	White fine SAND, very densely packed.	
30	S-7	A	29/ 31	75/4"	Same.	
35	S-8	A	34/ 36	54-67	Same.	
	S-9	A	39/ 41	69-50/3"	White fine-medium SAND.	

GROUND WATER DATA

DEPTH	HOUR	DATE
'-0"	EOB	8/15/85
'-0"	9 am	8/16/85

* A. STANDARD PENETRATION TEST (ASTM-D 1586)
B. STANDARD THIN-WALLED 3" TUBE (ASTM-D 1587)
C. CORE DRILLING

R-106 Rev.2/7

WELL No. 042

LIPPINCOTT ENGINEERING ASSOCIATES

501 BURLINGTON AVENUE DELANCO, N.J. 08075

OJECT NO. 4068.1 SHEET 2 OF 4

TE 8/15/85 SURFACE ELEV

OJECT MONITORING WELLS CLIENT RMP

CATION PENNSAUKEN, NJ LOG OF BORING NO. MW-1

JJT:mk

SAMPLE NUMBER	TYPE*	SAMPLE DEPTH	NUMBER OF BLOWS PER 6"	CLASSIFICATION OF MATERIALS BASED ON SAMPLES RECOVERED PLUS OBSERVATION OF MATERIAL RETURNED BETWEEN SAMPLES	MOISTURE CONTENT
S-10	A	44/ 46	39-67	White fine-coarse SAND.	
S-11	A	49/ 51	6-7-16-30	Grey SANDY CLAY, lenses of peat.	
				EOB 51'-0"	

GROUND WATER DATA

DEPTH	HOUR	DATE

R-106 Rev.2/

* A. STANDARD PENETRATION TEST (ASTM-D 1586)

B. STANDARD THIN-WALLED 3" TUBE (ASTM-D 1587)

C. CORE DRILLING

DRILLER B. WOODINGTON HELPER E. DORON

WELL No. 043

LIPPINCOTT ENGINEERING ASSOCIATES

501 BURLINGTON AVENUE DELANCO, N.J. 08075

ROJECT NO. 4068.1 SHEET 3 OF 4

ATE 8/21/85 SURFACE ELEV

ROJECT MONITORING WELLS CLIENT RMP

OCATION PENNSAUKEN, NJ LOG OF BORING NO. MW-2

WS:mk PERMIT 31-23547

DEPTH	SAMPLE NUMBER	TYPE*	SAMPLE DEPTH	NUMBER OF BLOWS PER 6"	CLASSIFICATION OF MATERIALS BASED ON SAMPLES RECOVERED PLUS OBSERVATION OF MATERIAL RETURNED BETWEEN SAMPLES	MOISTURE CONTENT
0	S-1	A	0/ 2	3-3-2-3	Dark brown fine SAND, trace silt.	
	S-2	A	2/ 4	3-1-2-2	Same.	
5	S-3	A	4/ 6	5-5-6-11	Same.	
	S-4	A	6/ 8	7-11-13-16	Light brown fine SAND, trace silt.	
	S-5	A	8/ 10	8-19-24-32	Light brown-white mottled fine SAND, trace silt.	
10	S-6	A	10/ 12	9-24-42-50/5"	Same.	
	S-7	A	12/ 14	32-46-50/4"	Same.	
15	S-8	A	14/ 16	14-25-36	Brown-white layered fine-medium SAND, trace silt.	
	S-9	A	18/ 20	23-33-50/4"	Dark brown fine-medium SAND, trace silt.	
	S-10	A	23/ 25	16-15-16-14	Light white fine SAND, trace silt. Light brown fine-coarse SAND, trace fine gravel, trace silt.	
25	S-11	A	28/ 30	29-33-54	Light brown fine-medium SAND, trace silt.	
	S-12	A	33/ 35	26-32-52	Light grey fine-coarse SAND, trace fine gravel, trace silt.	
35	S-13	A	38/ 39'3"	28-62-58/3"	Same.	

GROUND WATER DATA

DEPTH	HOUR	DATE
32'-8"		8/21/85

EOB 39'-3"

R-106 Rev. 2/7

* A. STANDARD PENETRATION TEST (ASTM-D 1586)

B. STANDARD THIN-WALLED 3" TUBE (ASTM-D 1587)

C. CORE DRILLING

WELL No. 044

LIPPINCOTT ENGINEERING ASSOCIATES

501 BURLINGTON AVENUE DELANCO, N.J. 08075

ROJECT NO. 4068.1 SHEET 4 OF 4

ATE 8/22/85 SURFACE ELEV

ROJECT MONITORING WELLS CLIENT RMP

OCATION PENNSAUKEN, NJ LOG OF BORING NO. MW-3

WS:mk Permit No. 31-23571

DEPTH	SAMPLE NUMBER	TYPE*	SAMPLE DEPTH	NUMBER OF BLOWS PER 6"	CLASSIFICATION OF MATERIALS BASED ON SAMPLES RECOVERED PLUS OBSERVATION OF MATERIAL RETURNED BETWEEN SAMPLES	MOISTURE CONTENT
0	S-1	A	0/	1-3-9-8	6" TOPSOIL - GRASS	
			2		Layers brown fine SAND, trace silt and	
	S-2	A	2/	5-11-8-4	asphalt.	
			4		Same.	
	S-3	A	4/	1-2-8-15	Brown fine SAND, trace silt.	
5			6			
	S-4	A	6/	11-27-35-44	Same.	
			8			
	S-5	A	8/	8-25-37-24	Same.	
10			10			
	S-6	A	10/	18-33-36-41	Same.	
			12			
	S-7	A	12/	11-12-23-23	Light brown fine SAND, trace silt.	
			14			
	S-8	A	14/	18-26-32-32	Same.	
15			16			
	S-9	A	18/	5-6-8-8	Same.	
			20			
20						
	S-10	A	23/	4-12-15-21	Same.	
			25		Grey CLAY.	
25						
					EOB 25'-0"	

GROUND WATER DATA

DEPTH	HOUR	DATE
NONE ENCOUNTERED		8/22/85

R-106 Rev.2/

* A. STANDARD PENETRATION TEST (ASTM-D 1586)

B. STANDARD THIN-WALLED 3" TUBE (ASTM-D 1587)

C. CORE DRILLING

05082+

ELL TP2 ~ 1000 INLAND FROM DEL. RIVER.

	Remarks
Well Log 4" well	
30 ft - 33 Fine - coarse ~~Sand~~ light grey - brown in color of wood splinters	running rough - grinding cobbles
3 ft - 36 ft fine to coarse grained ~~sand~~ lite brown Return of mica flakes @ 36 ft	running pretty smooth at 36 ft hooked up mini-desander
6 - 38 ½ ft. Gravel bed	drilled rough for over an hour. Pulled bit & checked rollers.
8 ½ - 49 ft. medium - coarse ~~Sand~~ yellowish white in color	
9 ft - 67 ft - fine - medium sand, yellowish white in color	water bearing layer Pan losing water @ 50 ft
7 ft - 71 ft fine to coarse ~~sand~~ but mostly coarse sand mica present	water bearing
1 ft - 73 ft fine to med ~~sand~~ (yellowish white in color, wood & traces of mica flakes and tr. bits of white clay	
- 78 ft - Very fine - fine ~~sand~~ with mica flakes & fine clay particles	Taking in water @ 76 ft
- 80 ft - coarse grained ~~sand~~ & gravel with Large mica flakes (weathered) & bits of white clay larger than before	

050227

0ft - 95ft coarse sand and gravel, mica flakes, some clay particles. Rock chips.

Tan clay in bit & stabilizer when drill pat up from 95 ft

WELL No 050829

Well ITP35
Well drilled by CME (Roger Isler & Chuck ?)
demonstration of CME-55 using auger bit
<u>Screen</u> 2" PVC from 25 FT TO 35 FT

Partial Drillers Log

0-5' Brown dredge fill, m-c sand with gravel and pebb
5'-10' Dredge fill. M-C sand, brown
10'-15' Gray m-c sand
@ 13' F-SAND W/ MICA 6" thick
@ 11' F. SAND 6" THICK
SAMPLER CLOGGING. NO ACCURATE DEPTH INFO.
NO ACCURATE LOG AVAILABLE AFTER 15'

Notes: Well TP2 screened from 75' to 95' w/ 4" PVC

050830

Lithologic Log of TP-1 hole

0-25' FINE SAND, WOOD, LIGNITE?
25-35' COARSE SAND
35-50' FINE SAND & SILT, COMPACT, W/ GLAUCONITE
50-63' COARSE SAND
63-67' WEATHERED SCHIST
67-71' TD SCHIST (WISSAHICON)

DRILLING by NJDEP-NJGS CREW, MAY '83

WELL No.

070 332

0'-4'	FILL
4'-8'	BROWN & YELLOW SANDY CLAY
8'-51'	GREENISH GRAY CLAY
51'-85'	COARSE MED SAND & GRAVEL WITH STRS OF IRON ORE
85'-96'	LIGHT GRAY & WHITE CLAY, SEAMS OF FINE SAND
96'-118'	COARSE MED. LIGHT BROWN SAND
118'-139'	WHITE & GRAY SANDY CLAY, SEAMS OF FINE SAND & GRAVEL
139'-160'	FINE MED. GRAVEL & SAND
160'-163'	SOFT GRAY & WHITE CLAY
163'-180'	FINE MED. GRAVEL & SAND
180'-220'	GRAY WHITE FINE SANDY CLAY STRKS HEAVY GRAVEL
220'-230'	FINE TO MED. SAND & GRAVEL
230'-240'	WHITE RED CLAY
240'-260'	FINE TO MED. GRAVEL & SAND.

WELL No.

070335

0'-10'	top ~~at~~ soil and sandy clay
10'-33'	coarse yellow sand and gravel
33'-61'	sandy white clay and gravel
61'-88'	sandy white clay and gravel
88'-120'	coarse brown sand streaks white clay
120'-130'	soft white and blue clay
130'-157'	coarse sand and gravel streaks white clay
157'-161'	sandy white clay
161'-213'	coarse brown sand and gravel streaks of white clay
213'-215'	tough clay
215'-222'	coarse sand and gravel
222'-232'	tough clay
232'-283'	coarse brown sand gravel and boulders.

RECEIVED
AS 1958
Department of Conservation
& Economic Development
Geologic & Top. Survey

Received
1-10-58

WELL No. - 070345

LOG OF WELL

Each Stratum	Depth of Strata	Formation Found Each Stratum
12	12	Top Soil Yellow Sand
7	19	Gray Sandy Clay
38	57	Gray Sand St. Clay
10	67	White Clay
22	89	Gray Sand & Clay Streaks
23	112	Gray Sand St. Blue Clay
12	124	Coarse Gray Sand
5	129	Brown Clay
22	151	Gray Sand Streaks Clay
34	185	Coarse Gray Sand
3	188	Clay
7	195	Coarse Sand
7	202	Clay
3	205	Sand
33	238	Tough Clay
52	290	Coarse Gray Sand & Gravel
2	292	Clay

WATER POLICY & SUPPLY DIVISION OF

WELL No. - 070348

FEET		
0	7	Top soil and sandy lume
7	27	Coarse gray sand
27	45	Sand and streaks of brown clay
45	70	Soft sandy clay streaks of sand
70	96	Clay with streak of sand
96	118	Gray sand some streaks of clay
118	140	Gray sand
140	163	Gray sand, streak of clay
163	185	Brown sand a little clay mixed
185	208	brown sand
208	218	Brown sand
218	228	Clay
228	252	Coarse sand with soft streaks
252	273	Coarse sand fine gravel
273	278	Clay

RECEIVED

JAN 12, 1959

RECEIVED
JAN 15 1959
DEPT. CONS. & ECON. DEV.
DIVISION OF
WATER POLICY AND SUPPLY

WELL No.- 070349

LOG OF WELL

Each Stratum	Depth of Strata	Formation Found each Stratum	Each Stratum	Depth Stratum	Formation Found each Stratum
5'	5'	Fill	23'	255'	Coarse Sa & Gravel
16.8"	21.8"	River Mud			Very Coar Sand
10'	31'.8"	Brown & Gray Sand	23'	278'	Heavy Gravel
11-4"	43'-	Sandy Clay			
10'	53'	Brown & Gray Sand			
10'	63'	Fine Gray Sand			
23'	86'	Coarse Brown Gray Sand			
21'	107'	Brown & Gray Sand & Streaks Clay			
15'	122'	Brown & White Sand Streaks Clay			
10'	132'	Coarse Brown Sand			
12'	144'	Soft White Clay			
22'	166'	Yellow Sand Streaks of Clay			
22'	188'	White & Yellow Sand Streaks Clay			
12'	200'	Clay			
4'	204'	Sand			
10'	214'	Clay			
4'	218'	Sand			
14'	232'	Tough Clay			

DEPT. OF CONSERVATION RECEIVED MAY 1 3 1985 DIVISION OF WATER POLICY & SUPPLY

WELL No.

070350

Gray Sand	21
White & Gray Sand	40
W. Clay & Sand	67
White Clay	5[illegible]
White Sandy Clay	[illegible]
White Sand	85
White Clay	91
Coarse Red Sand	106
Red Sand	115
Sandy Clay Brown	125
Coarse Red Sand	137
Tough Clay	146
Coarse Brown & Gray Sand	168
Sand & [illegible] of Clay	190
Gray Sand Some Clay	202
Coarse Gray Sand	223
Clay	225
Coarse Sand & Gravel	258
Coarse Gray Sand & Clay	286

WELL No.

070359

[illegible]	[illegible]
Sandy Silt & Gravel	[illegible]
Sandy Clay	[illegible]
White Sand	[illegible]
Sandy Clay	[illegible]
Sand	[illegible]
Sandy Clay	[illegible]
Tough Clay	[illegible]
Soft Sandy Clay	[illegible]
Coarse Sand	[illegible]
Clay	[illegible]
Soft Sandy Clay	[illegible]
Tough Clay	[illegible]
Sandy Clay	[illegible]
Sand & Gravel	[illegible]
Sandy Clay	[illegible]
Sand & Gravel	[illegible]
Sandy Gravel & Boulders	[illegible]

WELL No. 070360

0	-	8'	Top Soil & Loam
8	-	15	Yellow Clay
15	-	22	Sand & Gravel
22	-	27	Yellow Clay
27	-	30	Sand
30	-	42	Sand & Gravel
42	-	47	Gravel
47	-	55	Sand & Stones
55	-	70	White Sand
70	-	81	Yellow Sand
81	-	86	Sandy Clay
86	-	87	Sand
87	-	89	Clay
89	-	101	White Clay
101	-	104	White Sand
104	-	105	Yellow Sand
105	-	106	White Clay
106	-	120	Sand & Clay
120	-	126	Yellow Sand
126	-	131	Sand & Gravel
131	-	137	Gravel

DEPT. OF CONSERVATION
RECEIVED
DEC 14 1950
WATER POLICY & SUPPLY
DIVISION OF

WELL No.

070362

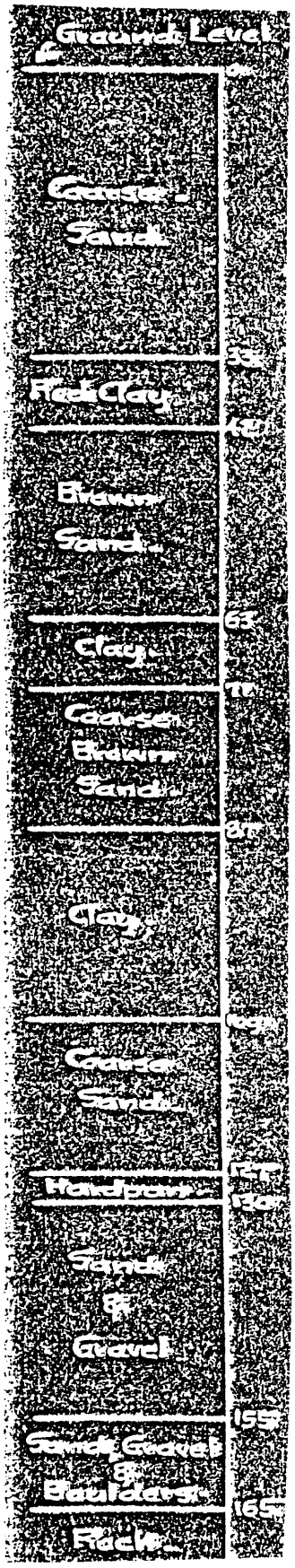
LOG OF WELL

0'-1' SAND. GRAVEL. w/ CLAY
1'-24' CLAY w/ GRAVEL AND BOULDERS
24'-34' CLAY w/ SOME SAND AND GRAVEL STRKS.
34'-56' SAND w/ CLAY AND GRAVEL STRKS.
56'-64' SAND AND CLAY STRKS w/ WOOD
64'-84' SANDY CLAY
84'-99' MEDIUM TO COARSE SAND SOME CLAY
99'-116' CLAY. SMALL STRKS. OF SAND
116'-139' SAND w/ SOME CLAY STRKS.
139'-143' CLAY, SAND, w/ GRAVEL
143'-148' SAND AND GRAVEL
148'-190' SAND GRAVEL BOULDERS, SOME WHITE CLAY STRKS.

RECEIVED
AUG 5 1975
U.S. GEOLOGICAL SURVEY

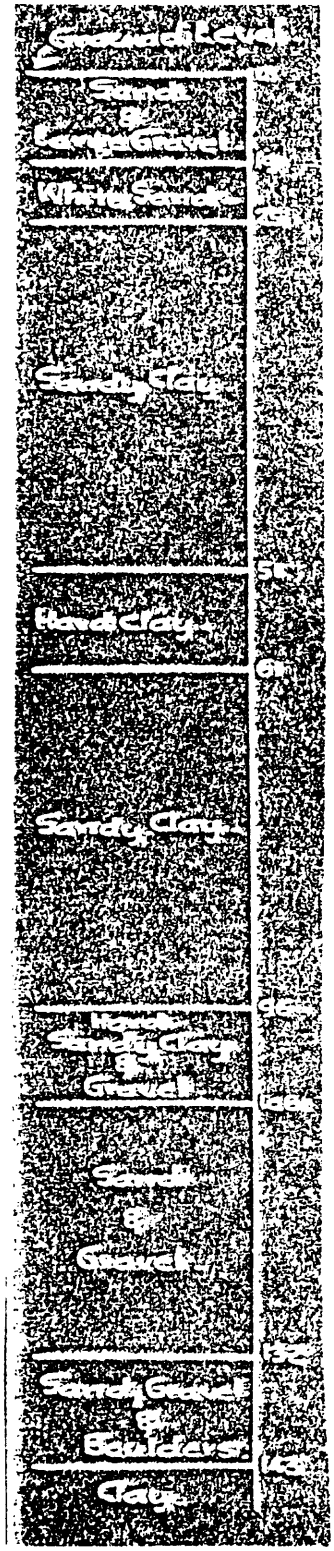
WELL No.

070363



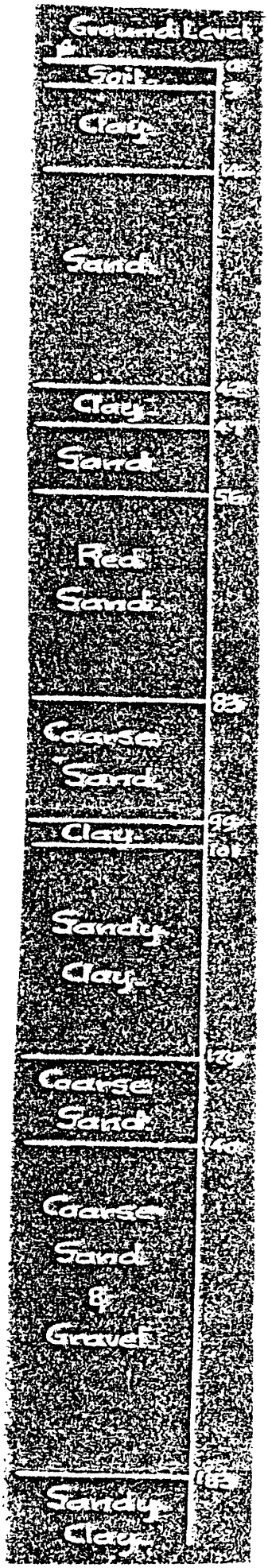
WELL No.

070366



WELL No.

070367



WELL No.- 070365

Camden Co.
31.2.4.3.1
Sample #163
1-7-52

PENNA. R.R. WELL ON RIVER ROAD, CAMDEN, N. J. , DRILLED BY LAYNE-NEW YORK CO.

0' - 10' Sand, very pale grayish orange) Rock chart - between 10YR 8/2 and 10YR 7/4.
Grain size ranges from .062 mm. to 1.0+mm. with finer fraction predominate - medium sorted. All minerals are rounded to sub-rounded with clear colorless quartz predominant. Feldspar, black mineral - iron type, garnet(?), and glauconite noted. Limonitic stained grains are very common.

10' - 20' Sand, very pale grayish orange. Rock chart - between 10YR 8/2 and 10YR 7/4.
Grain size ranges from .062 mm. to 2.0 mm. with coarser fraction dominant - medium well sorted. Clasts are subangular to sub-rounded with much limonitic staining -- dirty sand. Quartz grains dominate with feldspar, altered Biotite (green), and black mineral (non-magnetic). Sample shows medium sorting.

20' - 40' Sand, dark yellowish grayish orange - between 10 YR 7/4 and 10YR 6/6 on rock chart.
Grain size ranges from 1/4 mm. to 2 mm. with coarse grains dominant. The clasts are subangular to subrounded and much less dirty than previous samples. Quartz grains are predominant with feldspar, mice altered to chlorite, garnet, black mineral-rounded, and small amount of magntite(?). Sample shows medium sorting.

40' - 50' Sand, dark yellowish grayish orange - between 10YR 7/4 and 10 YR 6/6 on rock chart.
Grain size ranges from .125 mm. to 10 mm. - poorly sorted and limonitic stained like previous sample. Quartz grains are dominant with muscovite, feldspar and black mineral - quartzite(?). Clasts are angular to subangular.

50' - 75' Sand, white and gravel, clean with white clay-poorly sorted. Grain size of clasts ranges from clay size to 20 mm. - granule size dominating in sample. Grains are angular to subanguler and clean. Quartz (some vein) grains predominate with muscovite, black quartzite, black iron mineral, feldspar, and altered hornblende. Clay - white with scattered sand grains. Some of the quarts grains showing etching.

75' - 80' Clay, white and sand and gravel - very pale orange - 10YR 8/2 on rock chart.
Clay is white, gritly, and contains angular to subangular quartz up to 3 mm. - would be impervious to water percolation. Gravel and sand - grain size ranges from 1/4 mm. to 10 mm. - poorly sorted, pretty clean. Clasts are angular to subangular. Quartz grains dominate with feldspar, muscovite, black mineral-allanite(?), and gray quartzites.

(continued)

WELL No. 070365

Camden Co.
31.2.4.3.1
Sample #163
1-7-52

PENNA. R.R. WELL ON RIVER ROAD, CAMDEN, N. J., DRILLED BY LAYNE-NEW YORK CO.

80' - 100' Clay, white and sand and gravel - very pale orange 10YR 8/2 on rock chart.
Clay, white - gritly and quartz grained up to 1 mm. scattered in matrix - subangular. Sand and gravel - poorly sorted. Grain size ranges from clay size to 10 mm. - pretty clean. Clasts are angular to subangular with quartz dominant - muscovite, feldspar, and black mineral-iron type.

100' - 125' Sand and gravel - very clean. Clasts are angular to subangular with quartz (dominant), muscovite, quartzite, black mineral, small grains, some white clay, feldspar, and black mica schist. Grain size ranges from 1/4 mm. to 15 mm. - large proportion coarser than 2 mm. - poorly sorted.

125' - 140' Sand and gravel - very pale orange 10YR 8/2 - rock chart. Grain size ranges from 1/4 mm. to 10 mm. with coarse and fine fractions about equal - poorly sorted. Clasts are angular to subangular with abundant quartz and muscovite. Biotite, quartzites, and black mineral - iron type noted.

140' - 150' Sand, very light to medium gray (N-8 - N-5) rock chart. Grain size ranges from .25 mm. to 9 mm. with 1/2 mm. to 2 mm. fraction predominant - more uniform than previous samples. Represents in all respects weathered Pre-E. Clasts are angular to subangular with all sizes of mica flakes. Minerals recognized are quartz (clear opaque), biotite, muscovite, talc(?), feldspar and garnet(?).

(Log prepared from samples, by George S. Hilton, U. S. Geological Survey.)

WELL No.

070368

LOG

20	0-20	Soil and sand.
25	20-45	White sand.
5	45-50	Clay
5	50-55	Coarse sand.
6	55-61	Clay
23	61-84	Coarse sand and clay.
7	84-91	Coarse sand.
5	91-96	Soft clay
20	96-116	Sand and gravel.
25	116-141	Gravel, sand and boulders.
	141-	Clay

WELL No.

070369

LOG

0-15	Fill
15-20	Boulders and sand.
20-36	Brown sand.
36-63	do and gravel.
63-79	Hard Brown clay.
79-99	Coarse white sand and gravel.
99-109	Sand and gravel, streaks of clay.
109-146	Coarse sand and gravel.
146-	Clay

WELL No.
070370

LOG

0-5	Black soil
5-20	Boulders and sand
20-45	Sand, Boulders and gravel.
45-75	Coarse sand and some boulders.
75-80	Clay and sand.
80-100	Coarse sand and gravel.
100-102	Clay.
102-135	Coarse sand and boulders.
135-	Rock

WELL No. - 070372

0-18	YELLOW CLAY & GRAVEL
18-38	CLAY & GRAVEL
38-50	HEAVY GRAVEL
50-68	WHITE SANDY CLAY
68-111	FINE TO COARSE SAND & GRAVEL STKS OF WHITE CLAY
111-113	WHITE CLAY
113-142	SAND & GRAVEL STKS OF CLAY
142-157	SAND & GRAVEL
157-162	COARSE SAND
162-180	SOFT SANDY CLAY
180-202	SAND & GRAVEL STKS OF WHITE CLAY
202-247	COARSE SAND & GRAVEL STKS OF CLAY

WELL No.
070373 -

0-7'	Yellow sand, gravel and clay.
7-20'	Clay and Boulders.
20-26'	Yellow sand and gravel.
26-31'	Clay.
31-38'	Yellow sand and gravel.
38-48'	Clay.
48-56'	Sand and gravel.
56-80'	Streaks of hard and soft clay.
80-109'	White sand and gravel.
109-135'	Packed sand, gravel and boulders.
135-148'	Clay and mica.

WELL No. 070374

0-7'	Sandy clay.
7-9'	Sand and boulders.
9-26'	Sand, gravel and boulders.
26-28'	Clay and boulders.
28-55'	Sand and gravel.
55-64'	Clay.
64-66'	Sandy clay.
66-80'	Hard clay.
80-99'	Sand and gravel.
99-103'	Clay.
103-113'	Sand and gravel.
113-140'	Sand, gravel and boulders.
140-159'	Mica Rock.

WELL No. 070377

30. (Driller's log) C. D. Chandler

to depth	lithology	to depth	lithology
5	Clay, sdy	129	Clay & boulders
10	Sd, hard; boulders	135	Gravel, packed & boulders
26	Sd & gavel	146	Rock, mica
32	Clay		
47	Sd & gravel		
60	Sd, crs, gravel, stks of clay		
68	Clay, red		
79	Sd & gravel, w/ clay balls		
105	Sd, crs, white & grav		
121	Sd crs, grav. & boulders		
125	Clay		

31. -Notes-
e-1932
Open for cleaning-Feb 10, 1960

WELL No. 070386

30. (Driller's log)

to depth	lithology	to depth	lithology
15'	Sd.		
25'	Sd, gravel & clay		
59'	Clay, sdy		
66'	Clay, tough		
72'	Clay, sdy		
103'	Sd., crs.		
119'	Sd, gravel & clay stks		
134'	Clay		
136'	Rock, mica		

31. -Notes-

WELL No. - 070380

Cement	0 - 3'
Sand & fill	3 - 23'
Clay (yellow)	23 - 35'
Stones	35 - 37'
Sandish Clay (white)	37 - 43
Sand & gravel	43 - 59'
Rocks	59 - 61'
Sand	61 - 63'
Rocks	63 - 65'
Sand	65 - 67'
Very hard packed cemented sands	67 - 73'
Very thin layers of clay	73 - 82'
Sand & gravel	82 - 97'
Clay	97 - 100'
Sand	100 - 118'
Rocks	118 - 120'
Weather Zone	120 - 123'
Rock	XXX 123' - 127'

RECEIVED
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GEOLOGY
&
TOPOGRAPHY

WELL No.

070385

Well Log.

0	-	16'	Sand
16'	-	29'	Sand and Gravel
29'	-	39'	Sand and Clay
39'	-	61'	White Clay
61'	-	64'	Sand and Gravel
64&	-	73'	White Clay
73'	8	77'	Sand and Gravel
77'	-	86'	Yellow Clay
86'	-	98'	Red Clay
98'	-	110'	Sand and Gravel

WELL No. 070387

30. (Driller's log) C.D. Chandler

to depth	lithology	to depth	lithology
[illegible]	Power Mud		
41	F Gry Sd		
51	Crs Gry Sd.		
71	Soft White Clay		
101	Crs Gry Sd		
136	Crs. Gry Sd & boulder		
145	Mica rock		

31. -Notes-

Pump test

5-12-41

Sl. [illegible] 12' B.P.

P.L. 39' B.P

Yield 1555 gpm

RP 46"

WELL No. 070528

LOG OF WELL

0'-1' SAND. GRAVEL. w/ CLAY
1'-24' CLAY w/ GRAVEL AND BOULDERS
24'-34' CLAY w/ SOME SAND AND GRAVEL STRKS.
34'-56' SAND w/ CLAY AND GRAVEL STRKS.
56'-64' SAND AND CLAY STRKS w/ WOOD
64'-84' SANDY CLAY
84'-99' MEDIUM TO COARSE SAND SOME CLAY
99'-115' CLAY. SMALL STRKS. OF SAND
115'-137' SAND w/ SOME CLAY STRKS.
137'-143' CLAY, SAND, w/ GRAVEL
143'-148' SAND AND GRAVEL
[illegible]'-190' SAND GRAVEL BOULDERS, SOME WHITE CLAY STRKS.

WELL No.
070533

LOG OF WELL:

0 - 11 ft. Sand
11 - 16 ft. Coarse sand & shale
16 - 25 ft. White & yellow Sandy Clay with Pea Gravel & Rocks
25 - 30 ft. White Clay
30 - 55 ft. Coarse white sand & some white clay
55 - 60 ft. Coarse white sand
60 - 63 ft. Yellow & white clay
63 - 77 ft. Red Clay
77 - 83 ft. Yellow clay
83 -117 ft. Coarse white sand & stones - some mica

WELL No. - 070535

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. Test Well #1 Job No. 2040-03 Test No.

Log of Well for (Owner) City of Camden - Delair

Address

Representative, if any

Well Located at Morris Station Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started 2-7-79 Date Test Hole Completed

Total depth to bottom of Well 132' Diameter Test Hole 11-7/8 Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from Ground Level

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0'-2'	Fine Sand						
2'-6'	Sand and gravel						
6'-35'	Sand and heavy gravel streaks of brown clay and black muddy sand						
35'-41'	Heavy gravel sandy white clay						
41'-51'	Sandy white clay with streaks of gravel						
51'-61'	White clay, streaks of sand and medium gravel						
61'-71'	Fine to medium sand						
71'-81'	Fine to medium sand, with soft white clay						
81'-92'	Medium sand and gravel and white clay (mud loss 4")						
92'-102'	Fine to coarse sand and gravel streaks of white clay (mud loss 2-3")						
102'-122'	Heavy gravel and clay (mud loss 5")						
112'-122'	Heavy gravel (mud loss)						
122'-132'	Heavy gravel (mud loss)						
132'-142'	Sand and gravel some white clay (mud loss 4")						
142'-150'	White and yellow clay						
150'-153'	Decomposed rock						

Remarks and opinion of Test

CHECK TYPE OF RIG USED: Reverse Rotary, Cable Tool, Wash

213

J. Drebes

WELL No - 070536

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. Test Well #3 Job No. 2040-03 Test No.

Log of Well for (Owner) City of Camden

Address Delair

Representative, if any

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started 4-10-79 Date Test Hole Completed 4-17-79

Total depth to bottom of Well 116' 6" Diameter Test Hole 11-7/8 Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping 26' feet 7" inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0 - 1'			Fine sand				
1'- 14'			Brown and black silty clay with streaks of coarse gravel				
14'- 21'			Coarse gravel and clay				
21'- 31'			Brown clay and coarse gravel and coal				
31'- 41'			Fine to medium sand and gravel hard packed, white and yellow clay				
41'- 51'			Fine to medium orange sand white and yellow clay mud loss 6"				
51'- 62'			Fine to medium white sand and gravel with streaks of white clay				
62'- 72'			Fine to medium white sand and gravel white clay mixed mud loss 8"				
72'- 82'			Fine to medium white sand and gravel with white clay mud loss 3"				
82'- 92'			Fine to medium white sand and gravel white clay mud loss 3"				
92'- 97'			Fine to medium sand and white clay soft mud loss 2"				
97'- 102'			Fine to medium sand and soft white clay				
102'- 107'			Medium to coarse sand and gravel mud loss 3"				
107'- 112'			Medium to coarse sand and gravel mud loss 3"				
112'- 117'			Fine to coarse sand and gravel soft white clay mud loss 2"				
117'- 122'			Coarse gravel and white clay mud loss 3"				
122'- 127'			Medium to coarse sand and gravel some clay mud loss 2"				
128'- 139'			Yellow clay decomposed mica schist				

Remarks and opinion of Test

(Reverse

Joseph Drobes

WELL No - 070537

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. ..... Job No. 2040-03 ..... Test No. 4 .....

Log of Well for (Owner) City of Camden

Address Zimmerman Avenue, Delair

Representative, if any .....

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location ..... Date Drilling started ..... Date Test Hole Completed .....

Total depth to bottom of Well 124' 4" Diameter Test Hole 15½ Elevation at Ground Level, if available .....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping 28.65 feet ..... inches from the surface of the ground

All Measurements taken from Top of 3/4" pipe

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0 - 13'			Fine sand brown and black clay.				
13' - 31'			Hard pan mixed with clay.				
31' - 46'			Sand and gravel clay mixed				
46' - 61'			Fine to medium sand mixed with clay.				
61' - 71'			Fine to medium white sand (mud loss 6")				
71' - 91'			Fine to coarse sand and gravel with streaks of white clay. Mud los				
91' - 106'			Fine to coarse sand and gravel and white clay.				
106'-111'	(Mud Loss 6")		Coarse gravel and clay.				
111'-121'	" "	"	Coarse gravel and clay				
121'-130'	(Mud Loss 5")		Coarse gravel and clay (tough drilling)				
130'-132'			Yellow clay				
132'-146'			Decomposed mica schist.				

Remarks and opinion of Test

WELL No - 070538

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. Test Well #5 Job No. 2040-03 Test No.

Log of Well for (Owner) City of Camden

Address Delair

Representative, if any

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started 3-6-79 Date Test Hole Completed 3-8-79

Total depth to bottom of Well 125' Diameter Test Hole 11-7/8 Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0-4'			Fine sand				
4-15'			Sand and gravel with brown clay				
15-32'			Orange sand and gravel tough drilling				
32-40'			Sand with white and yellow clay				
40-51'			Sand and gravel, streaks of clay				
51-61'			Multi colored clay				
61-71'			Clay withorange sand streaks				
71-81'			Soft white clay and streaks of sand, gravel				
81-91'			Fine to medium sand, gravel with soft white clay mud loss				
91-101'			Fine to coard sand gravel with soft white clay mud loss				
101-112'			Medium to coarse sand gravel with soft white clay streaks mud loss				
112-117'			Medium to coarse sand, gravel with clay mud loss				
117-119'			Yellow clay				
119-132'			Gray decomposed mica schist				

Remarks and opinion of Test

CHECK TYPE OF { Reverse Rotary

J. Drebes and J. Thompson

WELL No. 070539

LOG OF WELL

0'-5' - BLACK SANDY CLAY
5'-10' - FINE TO MEDIUM SAND, STKS OF SOFT CLAY, SOME FINE GRAVEL
10'-15' - FINE TO MED. WHITE SAND AND GRAVEL, STREAKS OF SOFT BROWN CLAY
15'-21' - FINE TO MED. WHITE SAND AND GRAVEL
21'-26' - HARD STK'S, LARGE GRAVEL, TOUGH DRILLING
26'-31' - SAND, GRAVEL + RUBBER, CLAY 29-31'
31'-41' - WHITE + YELLOW CLAY
41'-51' - WHITE SANDY CLAY WITH STREAKS OF WHITE SAND AND GRAVEL
51'-61' - MEDIUM WHITE SAND WITH STREAKS OF WHITE CLAY (MUD LOSS)
61'-72' - WHITE CLAY WITH SAND STREAKS
72'-77' - SANDY CLAY
77'-81' - WHITE CLAY
81'-92' - WHITE CLAY WITH SAND STREAKS (MUD LOSS)
92'-102' - WHITE CLAY WITH SAND AND GRAVEL STREAKS (MUD LOSS)
102'-113' - FINE TO MEDIUM SAND AND GRAVEL, SMALL STREAKS OF WHITE CLAY
113'-118' - FINE TO MEDIUM SAND AND GRAVEL, STREAKS OF WHITE AND YELLOW CLAY (MUD LOSS)
118'-123' - FINE TO MEDIUM SAND AND GRAVEL, LIGHT STKS OF WHITE C
123'-128' - FINE TO COAR. SAND AND GRAVEL, STK'S OF WHITE CLAY
128'-133' - FINE TO COAR. SAND AND GRAVEL, STRKS OF WHITE CLAY
133'-144' - COARSE GRAVEL, SMALL STREAKS OF WHITE CLAY
144'-149' - COARSE GRAVEL STREAK'S OF CLAY
149'-154' - WHITE CLAY
154'-164' - WHITE AND YELLOW CLAY
164'-165' - WHITE CLAY AND WEATHERED ROCK
165'-166½' - HARD DRILLING ROCK .5 OFT. PER 20 MINUTES

LOG OF WELL - TEST # 7

WELL No. 070540

0'- 6' - TRASH AND FILL, DRY CLAY
6'-17'- COARSE GRAVEL
17'-27'- YELLOW, ORANGE SAND + GRAVEL, STREAKS OF SOFT CLAY
27'-35'- WHITE CLAY
35'-37'- WHITE CLAY AND BOULDERS
37'-42'- WHITE AND BROWN CLAY MIXED
42'-47'- BROWN CLAY
47'-52'- WHITE CLAY
52'-68'- COARSE SAND WITH WHITE CLAY MIXED IN
68'-92'- FINE TO MEDIUM SAND WITH LOTS OF CLAY MIXED IN
92'-96'- WHITE CLAY
110'-115'- GRAVEL WITH WHITE CLAY MIXED IN
115'-117'- HARDPAN OR BOULDERS AND CLAY
117'-120'- GRAVEL, DRILLED HARD W/ MORE WHITE CLAY MIXED IN
120'-126'- COARSE GRAVEL LOTS OF WHITE CLAY MIXED IN
126'-128'- WHITE CLAY HARD DRILLING
128'-139'- BOULDERS, SOME COARSE GRAVEL IMBEDDED IN CLAY
139'-141'- FINE SAND AND CLAY MIXED IN - DRILLED EASY
141'-142'- HARD DRILLING, BOULDERS + GRAVEL IMBEDDED IN CLAY
142'-149'- BOULDERS + GRAVEL IMBEDDED IN CLAY - HARD DRILLING
149'-152'- HARD DRILLING LIKE ROCK TRACES OF RED CLAY
152'-162'- BOULDERS AND GRAVEL IMBEDDED IN WHITE CLAY
162'-167'- LARGE GRAVEL AND BOULDERS WITH WHITE CLAY
167'-172'- MEDIUM TO COARSE GRAVEL AND WHITE CLAY
172'-177'- MEDIUM TO COARSE GRAVEL
177'-182'- WHITE AND YELLOW CLAY - TRACES OF ROCK
182'-185'- WHITE AND YELLOW CLAY AND GRAVEL
185'-187'- ROCK - GREEN SCHIST.

WELL No. - 070545

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. 11 Job No. 2150-03 Test No.

Log of Well for (Owner) City of Camden

Address Delrousse Avenue

Representative, if any

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started 5/11/79 Date Test Hole Completed

Total depth to bottom of Well 149' Diameter Test Hole 17 Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0-5'			Black sandy clay				
5-10'			Fine to medium sand, streaks of soft clay, some fine gravel				
10-15'			Fine to medium white sand and gravel, streaks of soft brown clay				
15-21'			Fine to medium white sand and gravel				
21-26'			Large gravel and boulders				
26-31'			Sand and gravel large rocks				
31-41'			Sand and gravel with shite and yellow sand				
41-52'			White clay with fine to medium white sand				
52-62'			Fine to coarse white sand				
62-72'			Fine to medium white sand				
72-78'							
78-82'6"			White and yellow clay with coarse sand				
82-90'			Soft sandy clay				
90-92'6"			Fine packed sand traces of clay				
92-95'			Fine to medium packed sand				
95-96'			Fine to medium sand				
96-99'			Fine to medium sand				
99-100'6"			Clay				

Remarks and opinion of Test

CHECK TYPE OF RIG USED { (Reverse) Rotary, Cable Tool, Wash

219

Drebes, Burke
Driller

WELL No. 070545

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. 11 Job No. 2150-03 Test No.

Log of Well for (Owner) Camden

Address

Representative, if any

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started Date Test Hole Completed

Total depth to bottom of Well Diameter Test Hole Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
100'6"-108'6"			Fine to coarse sand				
108'6"-109'6"			Sand and gravel traces of clay				
109'6"-119'			Fine to coarse sand with gravel				
119-126'6"			Sand, gravel and boulders				
126'6"-128'			Sand, gravel and boulders				
129'			Streaks of white clay				
132'6"			Sand , gravel and boulders				
142'6"			Sand and gravel, boulders mixed with some white clay				
145'6"			Sand and gravel, boulders mixed with some white clay				
147'			Fine sand				
148'6"			Sand with large boulders				
152'6"			White and yellow clay				

Remarks and opinion of Test

CHECK TYPE OF RIG USED { Reverse Rotary / Cable Tool

220

Driller

WELL No. 070586

LOG OF WELL - CAMDEN, N.J. WELL #12

0'- 7' — FINE SILTY GREY SAND
7'- 18' - GREY CLAY, COARSE GRAVEL
18'- 33'- FINE TO MEDIUM COARSE GRAVEL, LARGE ROCKS
33'- 34'- WHITE SANDY CLAY
34'- 42'- FINE TO MEDIUM SAND AND GRAVEL, LARGE ROCKS AND BOULDERS, WHITE CLAY
42'- 47' WHITE SANDY CLAY WITH FINE SAND MIXED
47'- 50' STREAKS OF SAND AND WHITE CLAY
50'- 52'- GRAVEL AND YELLOW CLAY
52'- 60'- YELLOW AND WHITE CLAY
60'- 66'- WHITE CLAY
66'- 68'- CLAY AND SAND STREAKS
68'- 71'- SAND WITH GRAVEL
71'- 74'- CLAY WITH SAND
74'- 77'- SAND, GRAVEL AND CLA
77'- 78'- CLAY STREAKS WITH S
78'- 80'- SAND GRAVEL, CLAY
80'- 81'- CLAY AND SAND
81'- 82'- SAND WITH
82'- 84'- SAND A
84'- 85'- WHITE
85'- 95'- SAND AND GRAVEL
95'- 97'- GRAVEL AND CLAY
97'- 100'-6" WHITE CLAY
100'-6"- 105'- SAND, GRAVEL, TRACES OF CLAY
105'- 119'- SAND AND LARGE GRAVEL
119'- 120'- BROWN SANDY CLAY AND GRAVEL
120'- 121'-6"- YELLOW CLAY
121'6"- 125'- GREY CLAY
125' — DECOMPOSED ROCK

WELL No. 070587

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. 13 Job No. 2408-03 Test No.

Log of Well for (Owner) City of Camden

Address Delair

Representative, if any

Well Located at Morris Well Field in Camden County, State of New Jersey

Furnish sketch of location Date Drilling started 6/6/80 Date Test Hole Completed 6/14/80

Total depth to bottom of Well 135' Diameter Test Hole 17" Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping 33 feet 7 inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0	11'		Fine sand, grey silty clay and gravel.				
	13'		Med. gravel, river muck.				
	19'		Coarse gravel mixed with clay.				
	31'		Boulders, brown clay.				
	32'		White clay.				
	34'		Coarse sand and gravel.				
	39'		Boulders, gravel, white and yellow clay				
	41'		Yellow clay.				
	48'		Sand with some gravel streaks.				
	51' 6"		White clay.				
	55'		White sandy clay.				
	62'		Fine white sand with med. gravel.				
	64'		Fine white sand.				
	65'		White clay.				
	66'		Gravel.				
	68'		Tough white sandy clay.				
	70'		Fine to medium gravel mixed with clay.				
	72' 6"		Fine White sand.				

Remarks and opinion of Test

CHECK TYPE OF RIG USED { Reverse Rotary / Cable Tool

222

Joe Drebes
Driller

WELL No. 070587

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. 13 Job No. 2408-03 Test No.

Log of Well for (Owner) City of Camden

Address

Representative, if any

Well Located at in County, State of

Furnish sketch of location Date Drilling started Date Test Hole Completed

Total depth to bottom of Well Diameter Test Hole Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
	76'		Fine to medium white sand.				
	77'		Medium to coarse gravel and mica.				
	78'		Coarse gravel with white clay.				
	80'		Fine sand, coarse gravel streaks of dry white clay.				
	82' 6"		Medium to coarse gravel with fine sand.				
	85' 6"		Medium to coarse gravel fine sand.				
	87' 6"		Sandy white clay.				
	90'		Dry white sandy clay tough.				
	94'		Sand and gravel.				
	98'		White sandy clay.				
	100'		Sand and gravel.				
	107'		Sand and gravel, traces of clay.				
	111'		Sand and gravel with some clay.				
	117'		Sand and gravel with clay balls.				
	123'		Sand and gravel, some white clay.				
	126'		Heavy gravel.				
	127'		Clay.				
	130'		Heavy gravel.				

Remarks and opinion of Test

CHECK TYPE OF RIG USED { Reverse Rotary / Cable Tool

223

WELL No.- 070587

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. 13 Job No. 2408-03 Test No. .....

Log of Well for (Owner) City of Camden

Address .....

Representative, if any .....

Well Located at ..... in ..... County, State of .....

Furnish sketch of location ..... Date Drilling started ..... Date Test Hole Completed .....

Total depth to bottom of Well ..... Diameter Test Hole ..... Elevation at Ground Level, if available .....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping ..... feet ..... inches from the surface of the ground

All Measurements taken from .....

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
	131'		White ant yellow clay.				
	134'		Sandy orange clay (decomposed rock)				
	136'		Green and silver mica shist (decomposed).				

Remarks and opinion of Test

.....

.....

CHECK TYPE OF RIG USED { Reverse Rotary, Cable Tool, Wash

224

.....

WELL No.- 070602

LOG OF WELL # 2 NATIONAL HWY
MERCHANTVILLE - PENNSAUKEN WATER

0'- 14' - TOP SOIL COARSE SAND + GRAVEL
14'- 21' - SAND, GRAVEL + CLAY
21'- 28' - FINE TO MED. SAND, STREAKS OF CLAY
28'- 39' - WHITE CLAY
39'- 45' - SAND, GRAVEL CLAY STREAKS
45'- 49' - FINE WHITE SAND
49'- 54' - FINE WHITE AND YELLOW SAND
54'- 58' - FINE TO MEDIUM WHITE SAND
58'- 67' - FINE TO COARSE SAND AND GRAVEL
67'- 72' - COARSE SAND AND GRAVEL
72'- 99' - COARSE SAND AND GRAVEL WITH CLAY
99'- 108' - COARSE SAND HEAVY GRAVEL STREAKS OF WHITE CLAY
108'- 111' - COARSE SAND AND GRAVEL
111'- 118' - WHITE CLAY
118'- 125' - MEDIUM COARSE. SAND AND GRAVEL
125'- 131' - FINE SAND STREAKS OF GRAVEL AND CLAY
131'- 139' - FINE TO MEDIUM SAND + GRAVEL WHITE CLAY
139'- 155' - FINE TO MEDIUM SAND + GRAVEL, STK'S OF WHITE CLAY
155'- 158' - RED AND WHITE CLAY
158'- 161' - SAND, GRAVEL, CLAY STREAKS
161'- 171' - COARSE SAND AND GRAVEL
171'- 180' - FINE TO COARSE SAND AND GRAVEL, STREAKS OF CLAY
180'- 191' - MEDIUM TO COARSE SAND AND GRAVEL, WITH LARGE GRAVEL
191'- 198' - COARSE SAND, LARGE ROCKS
198'- 202' - SAND, GRAVEL CLAY STREAKS
202'- 210' - LARGE ROCKS, GRAVEL, CLAY AND COARSE SAND
210'- 218' - FINE SAND, WHITE CLAY AND GRAVEL

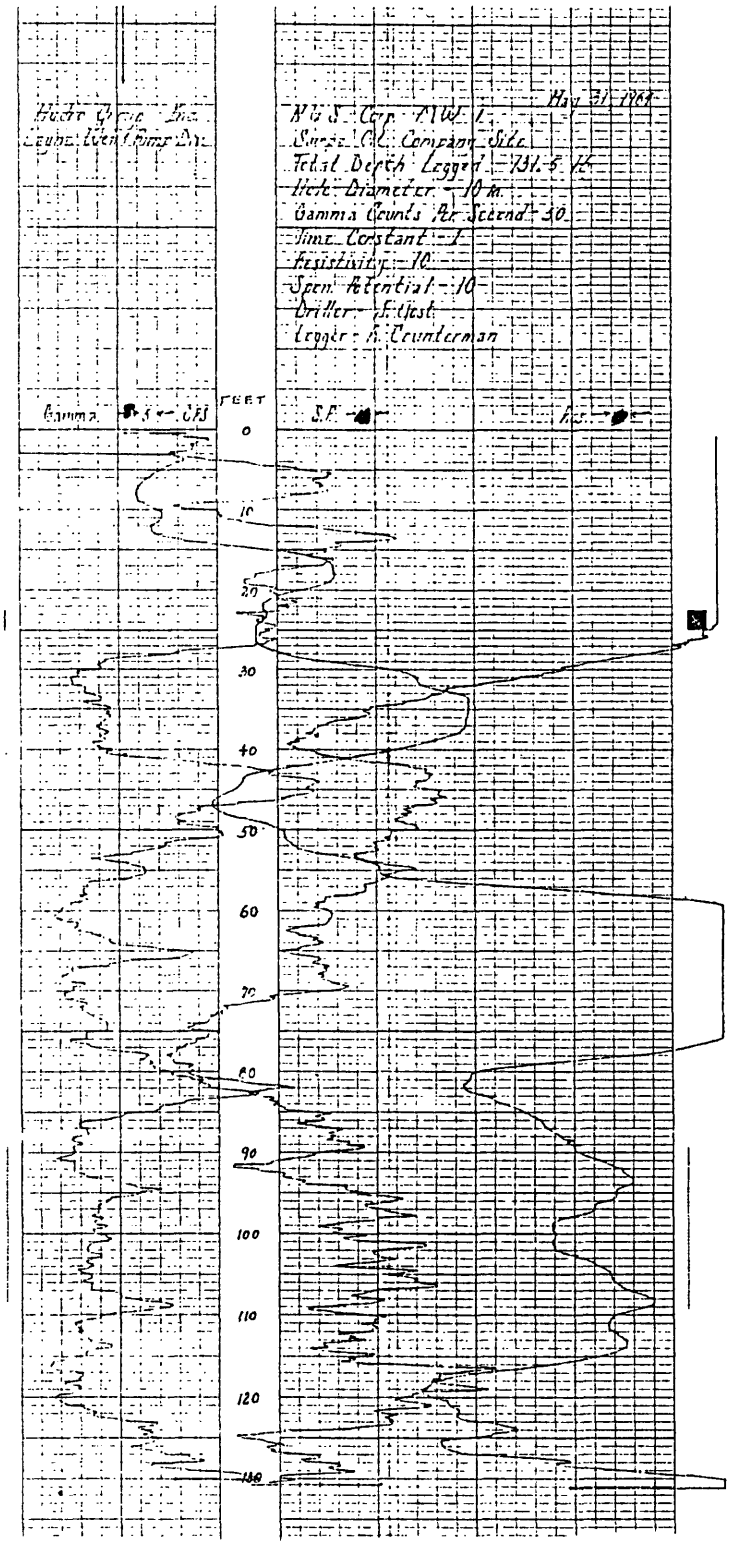
Appendix D.--Geophysical logs of wells and test borings in the study area.

[Geophysical logs are in order of increasing well number.]

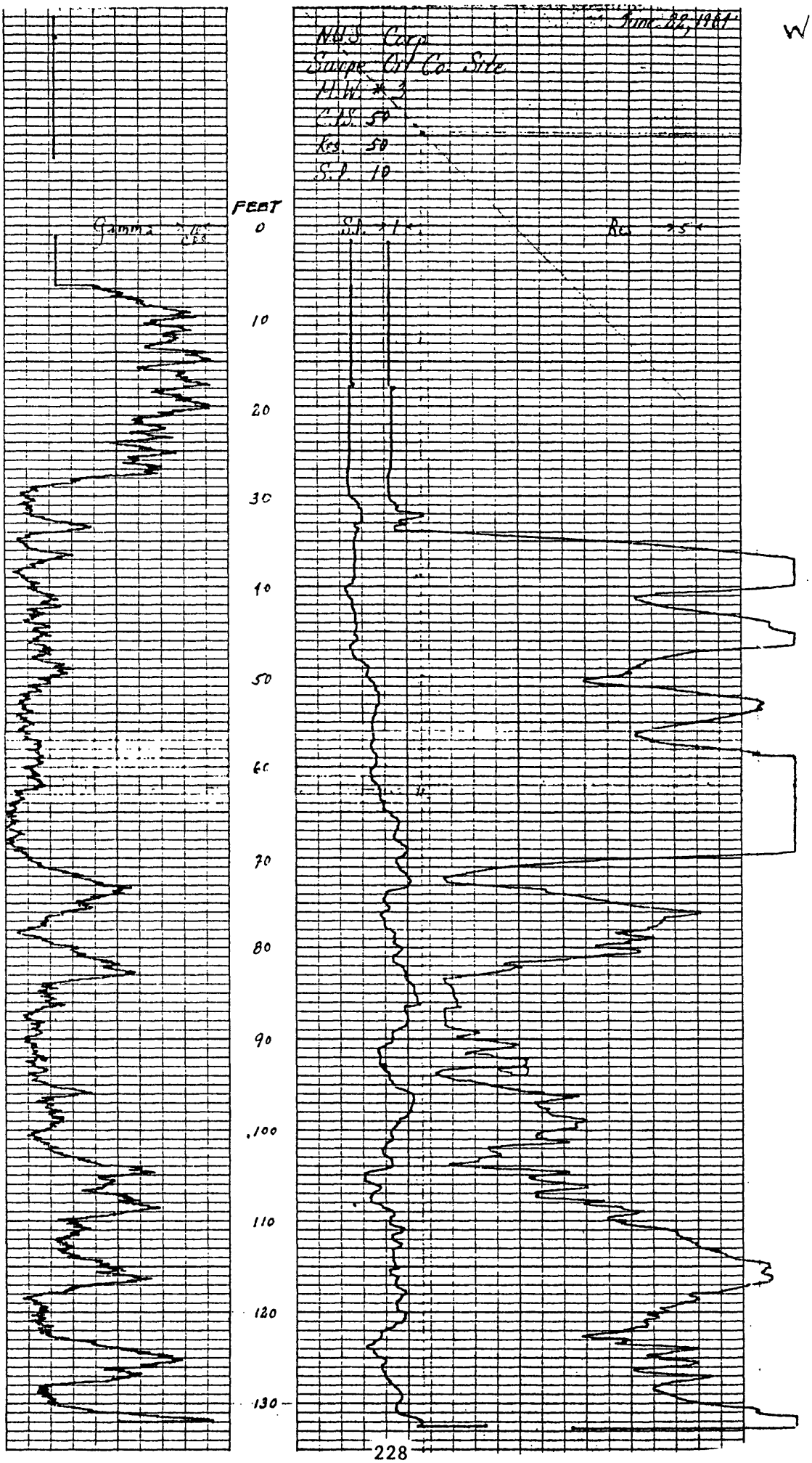
[Source: U.S. Geological Survey geophysical log files; New Jersey Department of Environmental Protection hazardous-wastes files; and NUS Corporation, 1985.]

WELL No

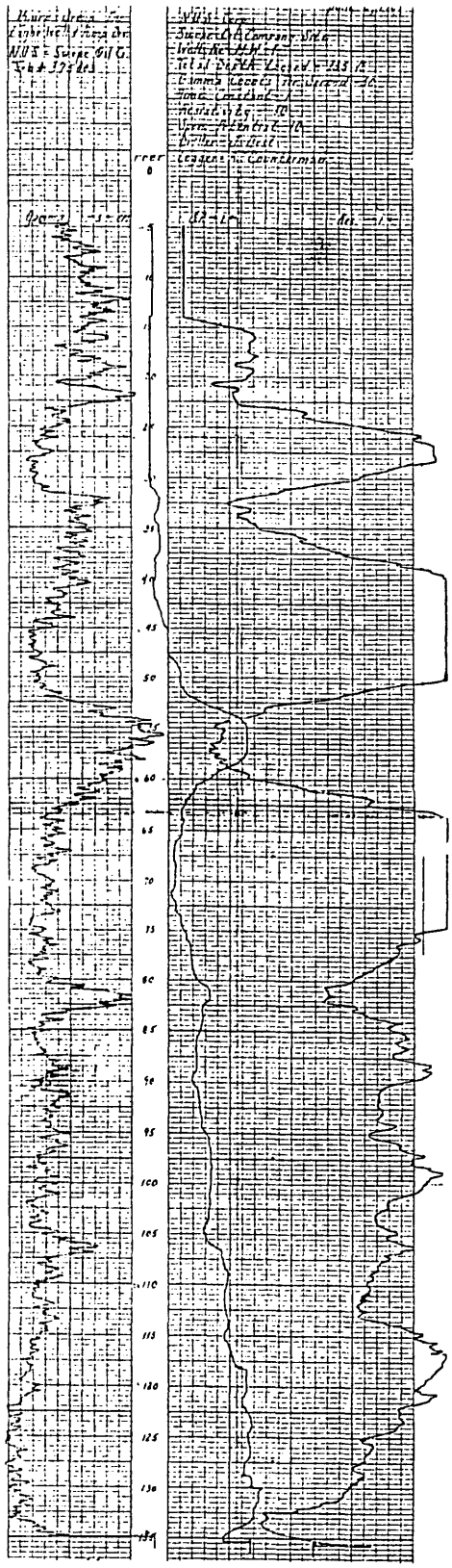
001


Total Depth Logged
Hole Diameter
Gamma Counts Per Second
Time Constant
Resistivity
Spon. Potential
Driller
Logger
Gamma
S.P.
FEET
0
10
20
30
40
50
60
70
80
90
100
110
120
130

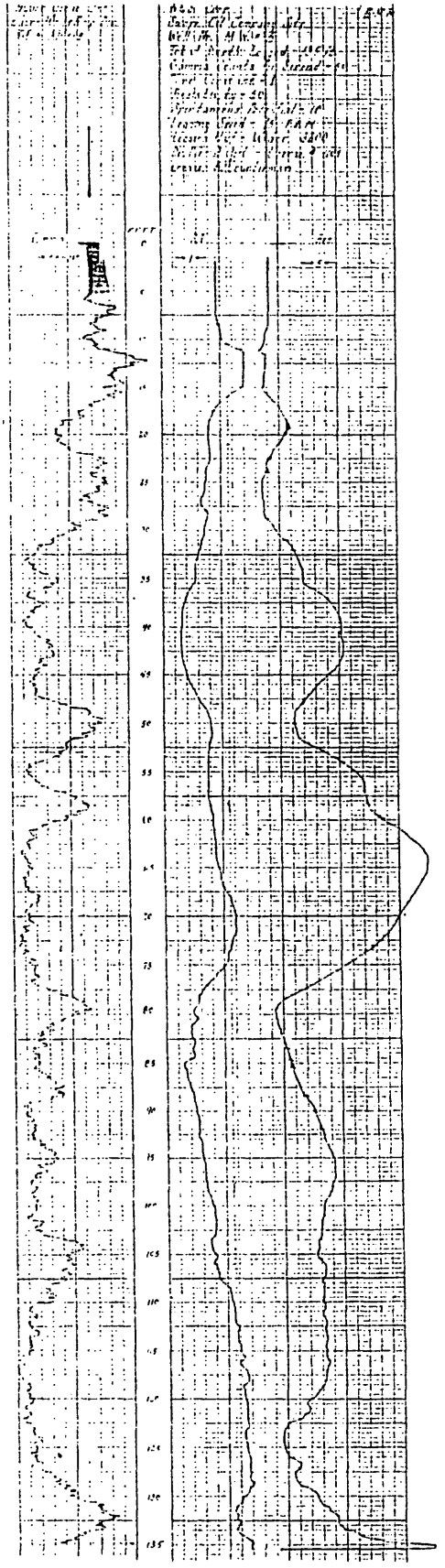
WELL No
003

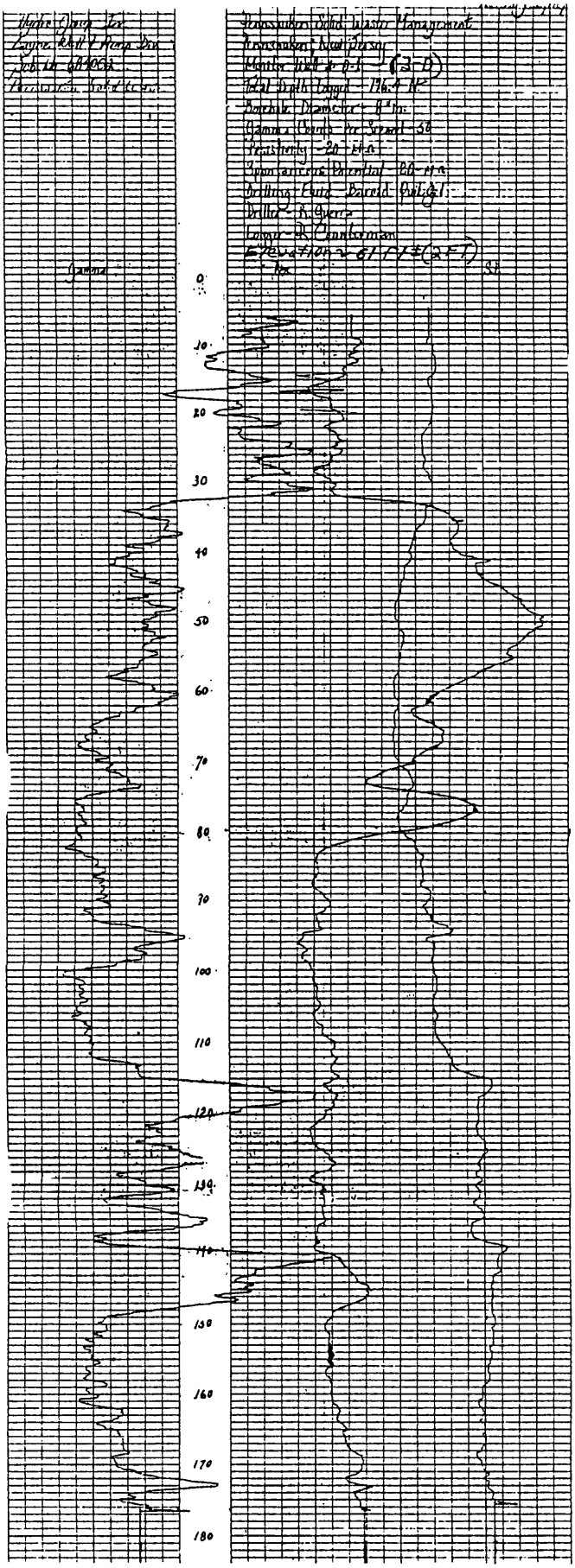

June 22, 1961
N.W.S. Corp
Swope Oil Co. Site
H.W. #3
C.S. 50
Res. 50
S.P. 10
FEET
Gamma
S.P.
Res.
0
10
20
30
40
50
60
70
80
90
100
110
120
130

WELL No
004



WELL No.
005





WELL No.

017

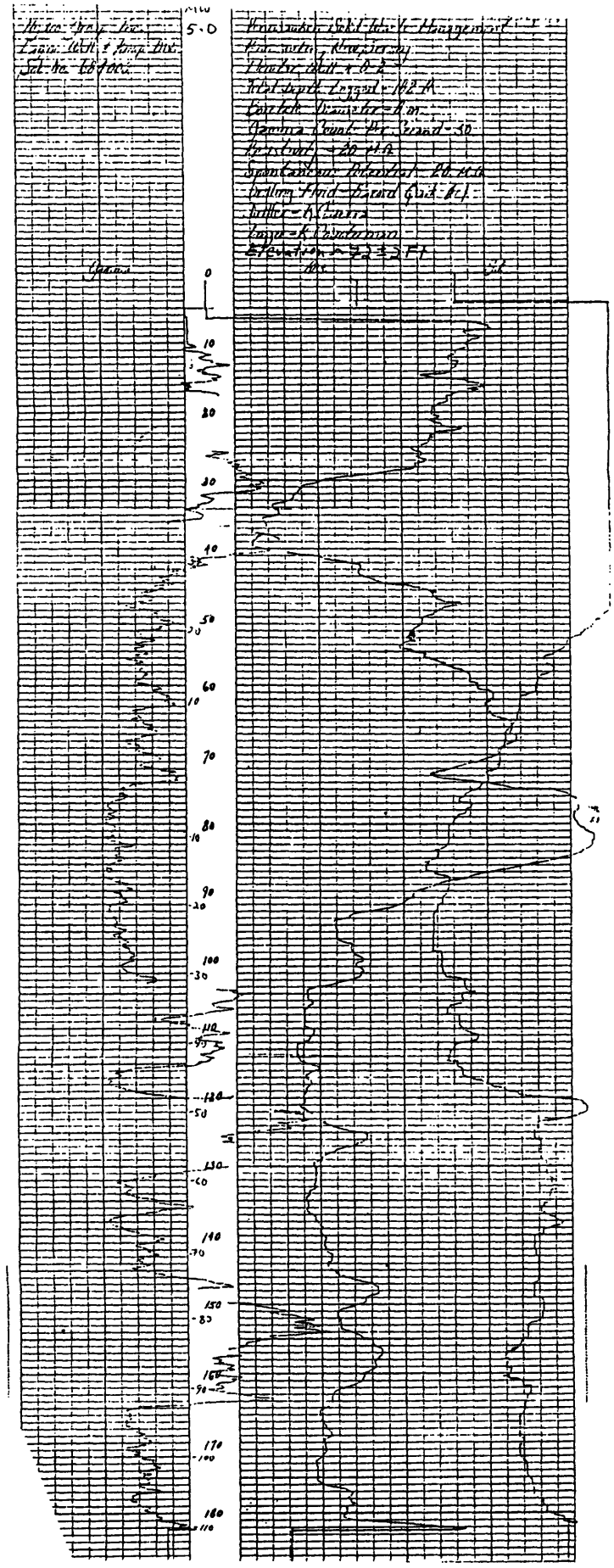
Pennsauken Solid Waste Management.

Total depth logged - 176.4 ft.

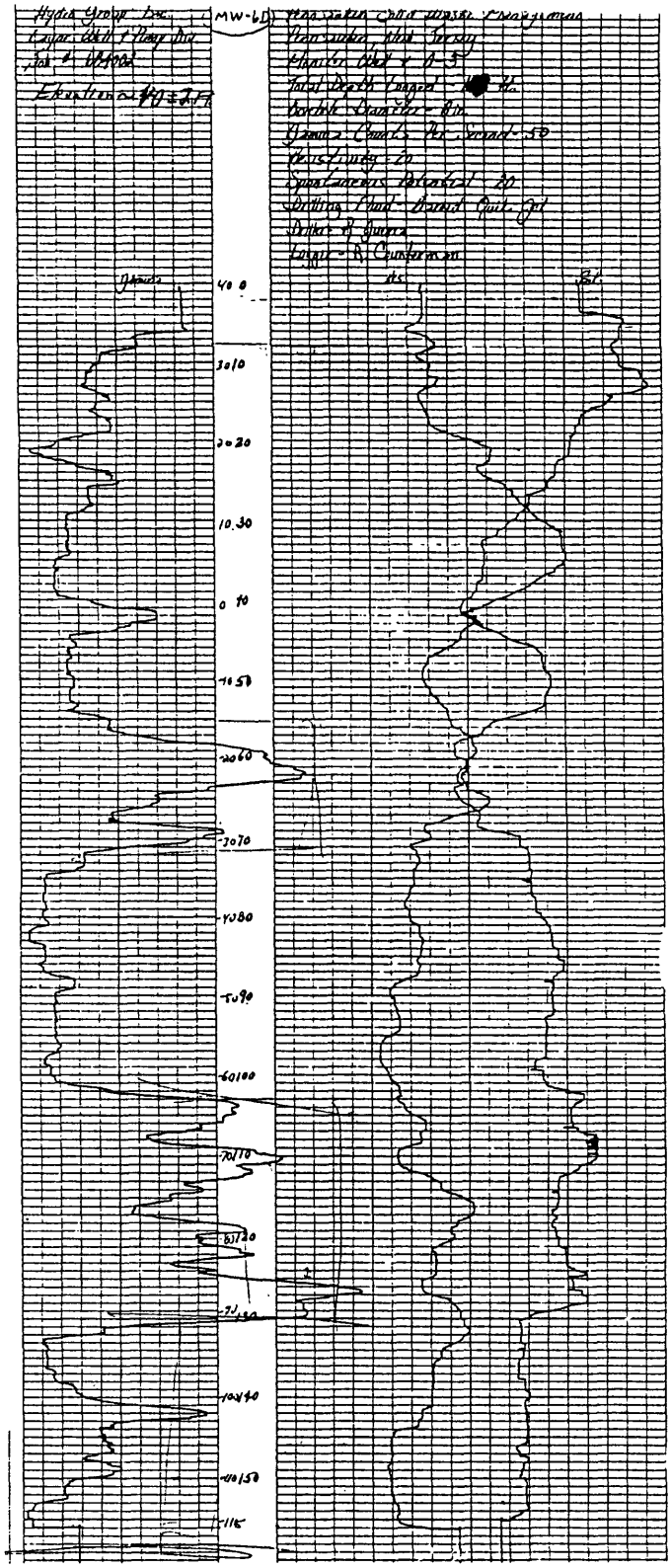
Hydro Group Inc.

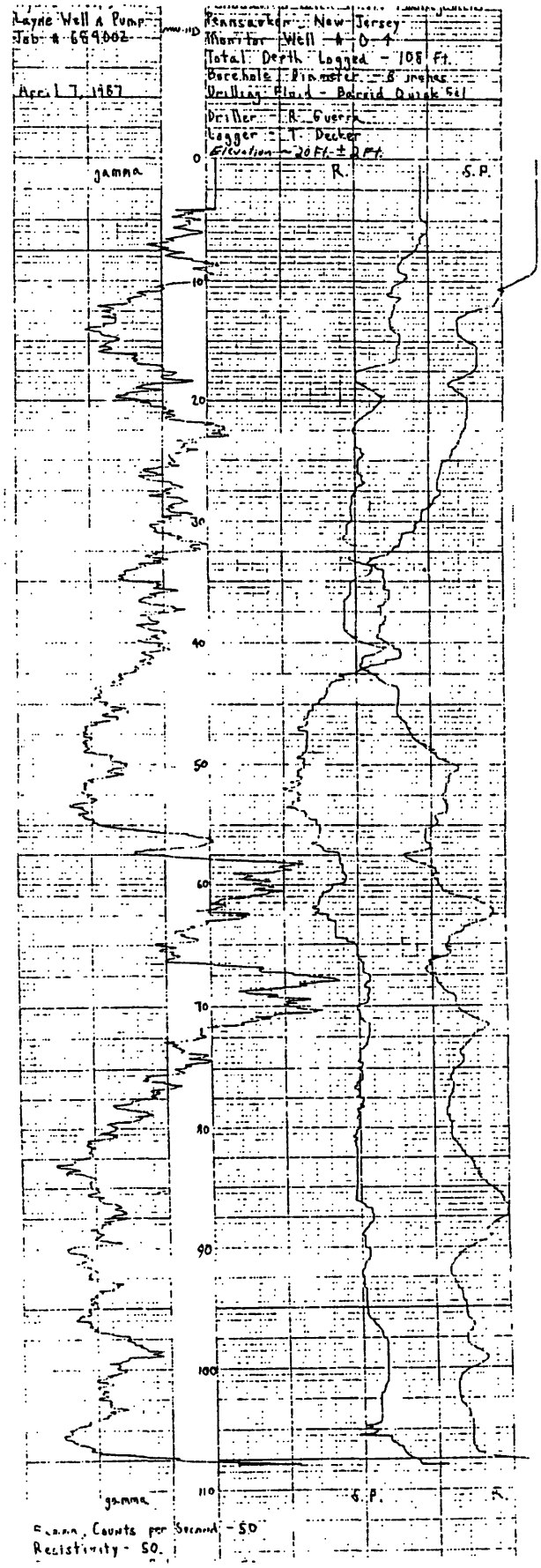
WELL NO

020



WELL No
022


MW-6D
Total Depth Logged
Resistivity - 20
Spontaneous Potential - 20
Drilling Fluid - Hazard Quit. Gel
Logger - R. Cunterman
40.0
30.10
20.20
10.30
0.40
-10.50
-20.60
-30.70
-40.80
-50.90
-60.100
-70.110
-80.120
-90.130
-100.140
-110.150
-115



WELL No.

028

Pennsauken Solid Waste Management

Total depth logged - 108

Hydro Group Inc.

WELL No
050124

ORIGINAL

[39° 59' 06" N.] [075° 00' 06" W.]

ELECTRIC

A. C. SCHULTES & SONS INC.

Water Well Contractors

Woodbury, New Jersey

COMPANY Delaware Valley Water Co.

WELL NO. 31

COUNTY Burlington

STATE New Jersey

GINAMINSON TWP

Electric

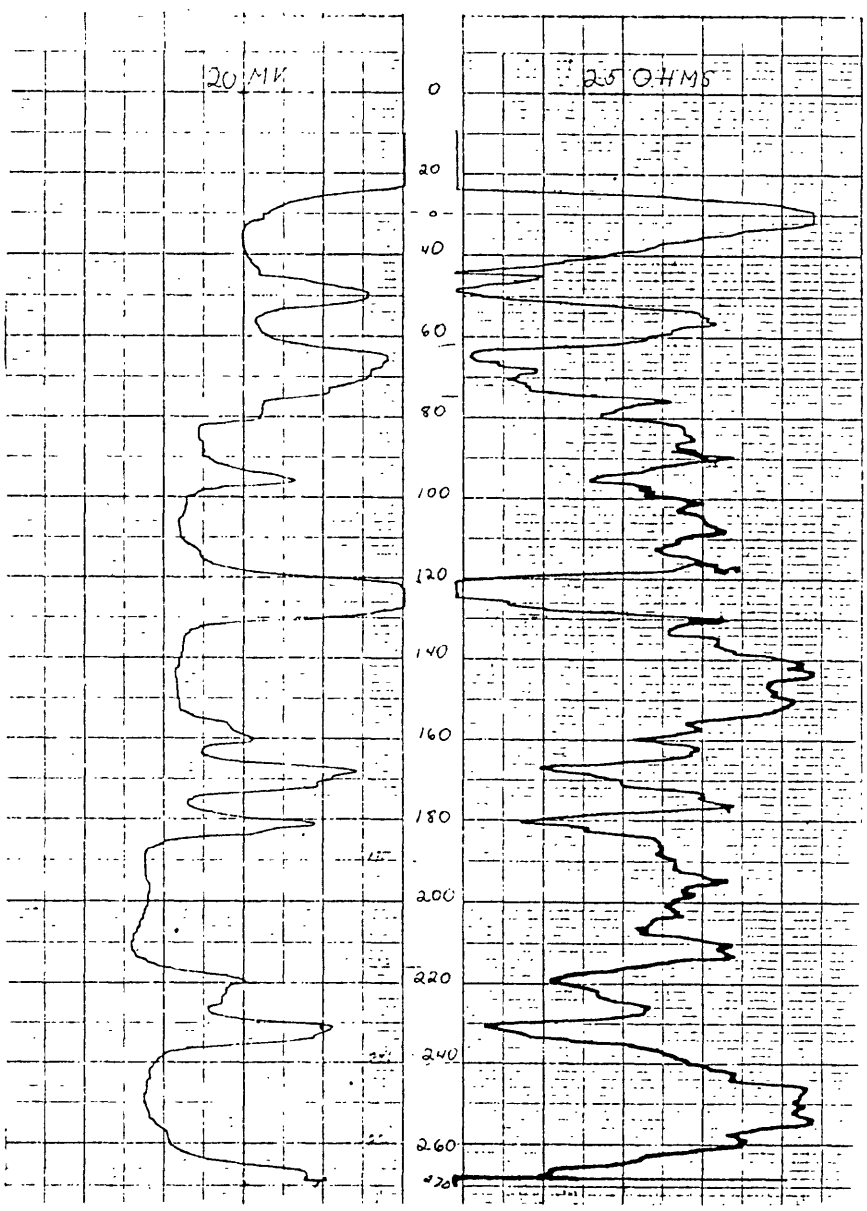
1-28-70

270'

270'

18"

2/70



Widco WELL LOG

WELL No 070363

COMPANY CAMDEN CITY WATER DEPT.

AREA 500' southeast of Puchack Station, Delair, N.J.

WELL PUCHACK NO. 2

COUNTY Camden STATE New Jersey

COORDINATES: N.J. GRID
S

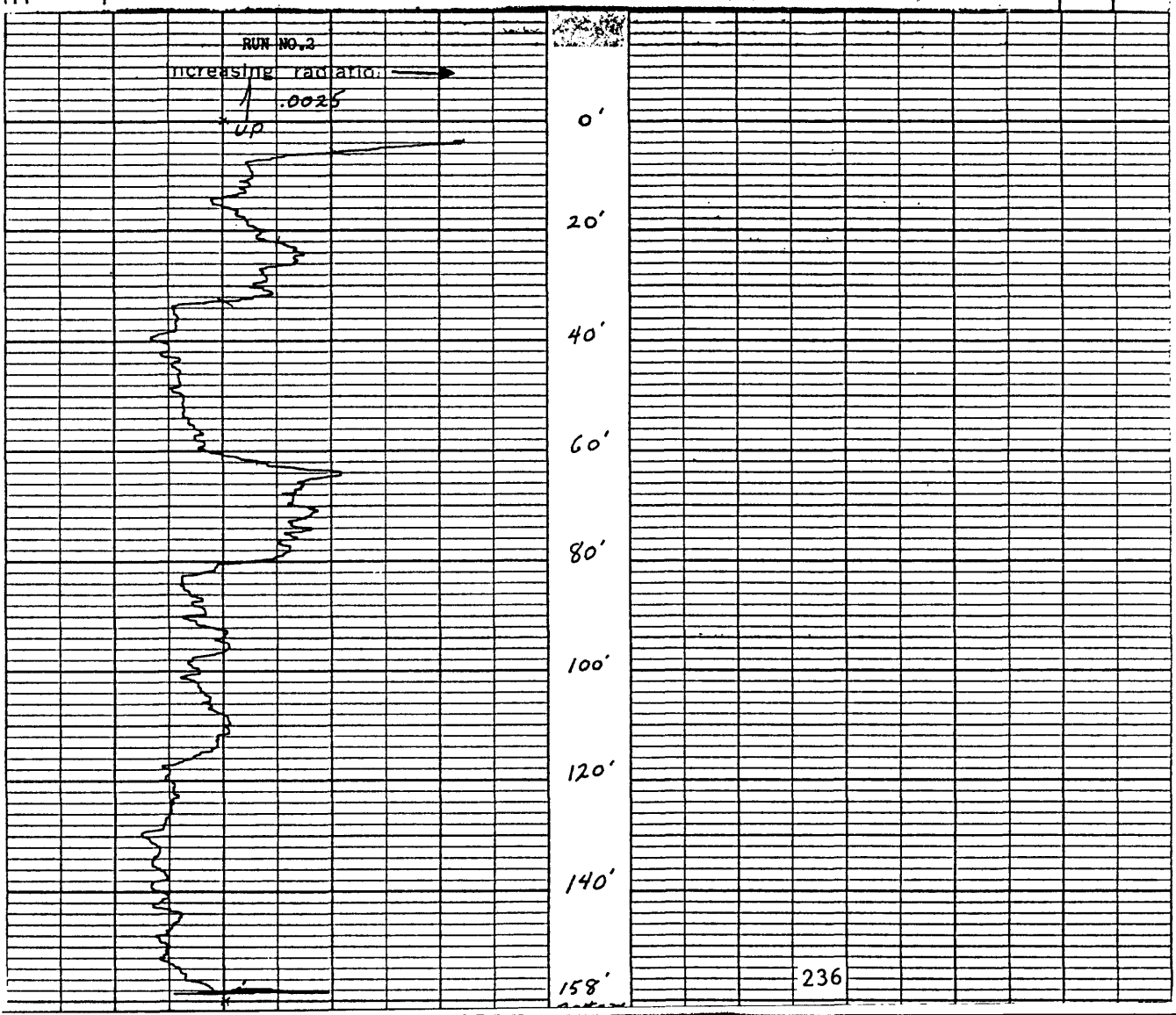
ELEVATION: D.F.
K.B.
G.L. 4.15' msl

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	7-25-61	7-25-61	Nature		
First Reading	004	158	Density		
Last Reading	158	004	Viscosity	@ °F	@ °F
Footage Logged	154	154	Resistivity	@ °F	@ °F
Bottom (Driller)	—	—	Res. @ BHT	@ °F	@ °F
Casing (From Log)	—	—	pH		
Casing (Driller)			Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size:					
Bit Size:					
Scale	.005	.0025			
time constant	10 /sec.	10 /sec.	Logged by	G.CLARK	
logging speed	18'/min.	20'/min.	Witnessed by	E.DONSKY	

REMARKS Well logged after cleaning, acidizing, swabbing and bailing. Run No. 1 poor, run No. 2 good.
E.D.

Reg. U.S. Pat. Off.

FO-139

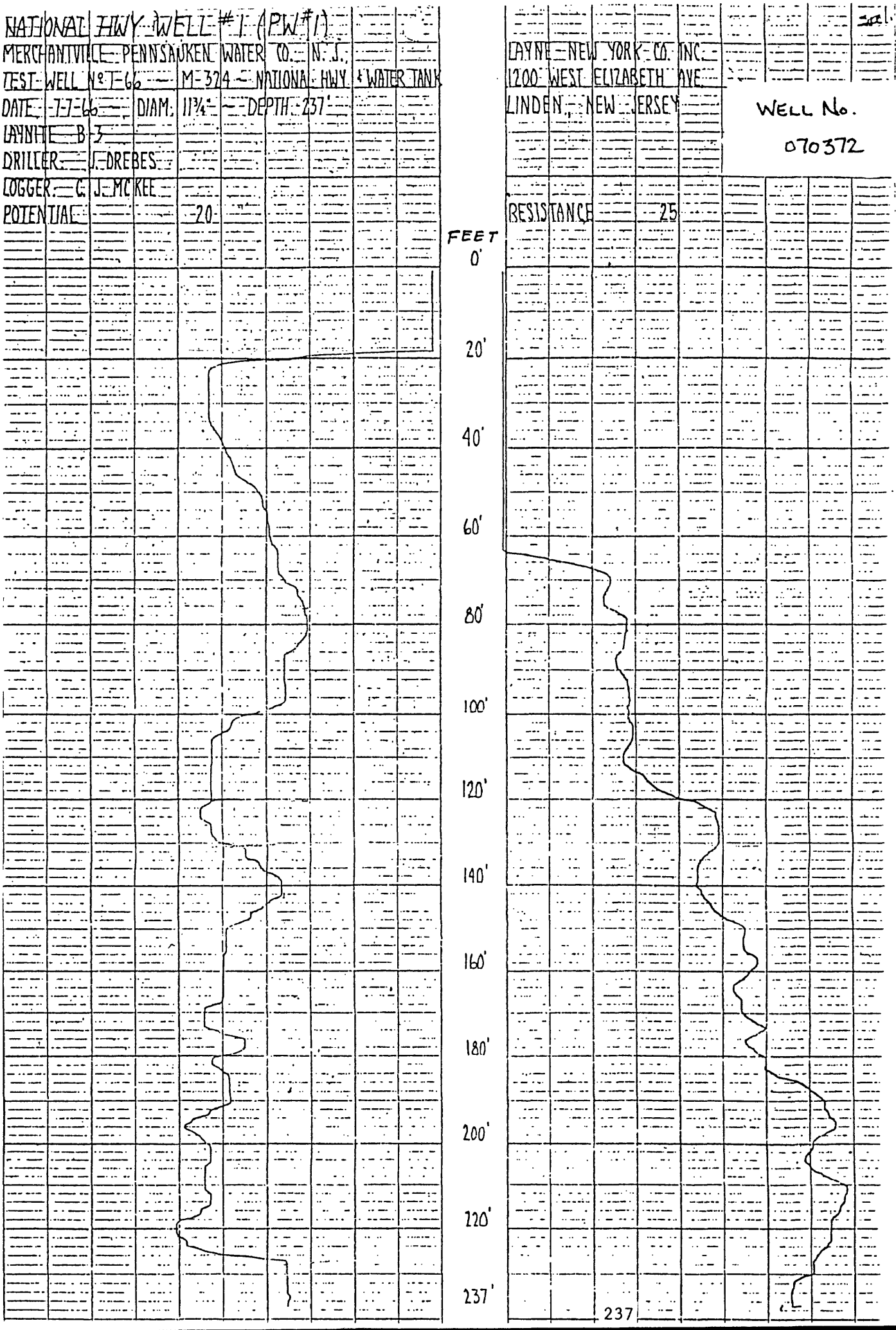


NATIONAL HWY WELL #1 (PW#1)
MERCHANTVILLE PENNSAUKEN WATER CO. N.J.
TEST WELL Nº T-66 M-324 NATIONAL HWY & WATER TANK
DATE 7-7-66 DIAM. 11¾" DEPTH 237'
LAYNE B-3
DRILLER J. DREBES
LOGGER G. J. MCKEE
POTENTIAL -20-

LAYNE NEW YORK CO. INC.
1200 WEST ELIZABETH AVE
LINDEN, NEW JERSEY

WELL No.
070372

RESISTANCE 25



GAMMA RAY

WELL No. 070382

Widco* WELL LOG

COMPANY City of Camden, N.J. Water Dept.

AREA

WELL Morris Station #4A

COUNTY Camden STATE New Jersey

COORDINATES:
N 39 59 29
S 075 02 53.1

ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL Morris Station #4

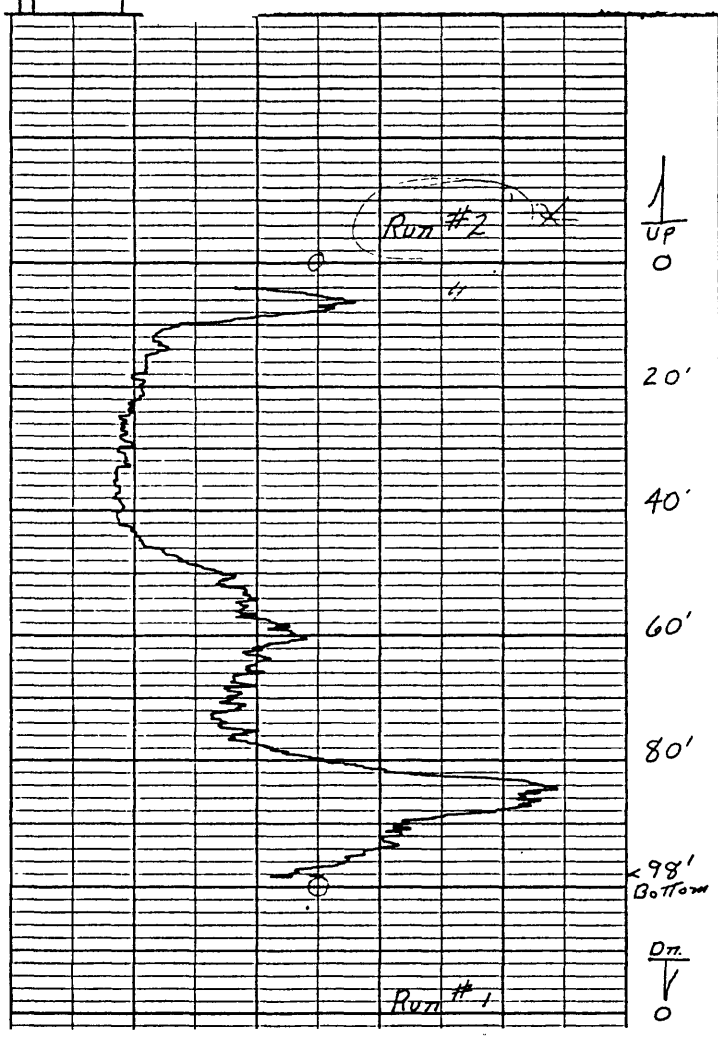
COMPANY City of Camden Water Dept.

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	5/25/60	5/25/60	Nature		
First Reading			Density		
Last Reading			Viscosity	@ °F	@ °F
Footage Logged	98'	98'	Resistivity	@ °F	@ °F
Bottom (Driller)			Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)			Circ. Temp.		
Casing Size	26"	26"	B.H. Temp.		
Bit Size:					
Bit Size:					
Scale	.005	.025			
Time Constant	16/sec.	16/sec.	Logged by	G. Clark	
Logging Speed	12'/min.	12'/min.	Witnessed by	E. Donsky	

REMARKS Log started 4' below L.S.D.

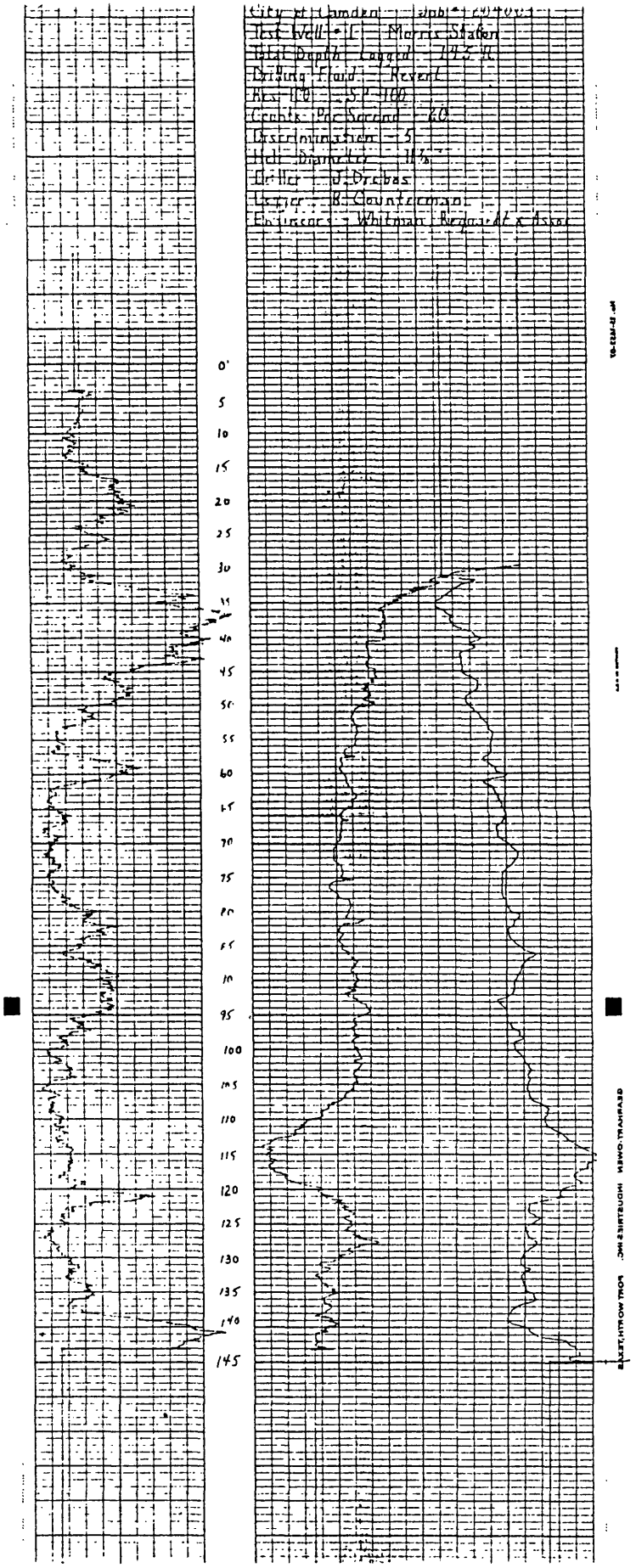
* Reg. U.S. Pat. Off.

FO-139



WELL No.

070535



U.S. Geological Survey
water resources division

WELL LOG

COMPANY ____
WELL ____
LOCATION ____

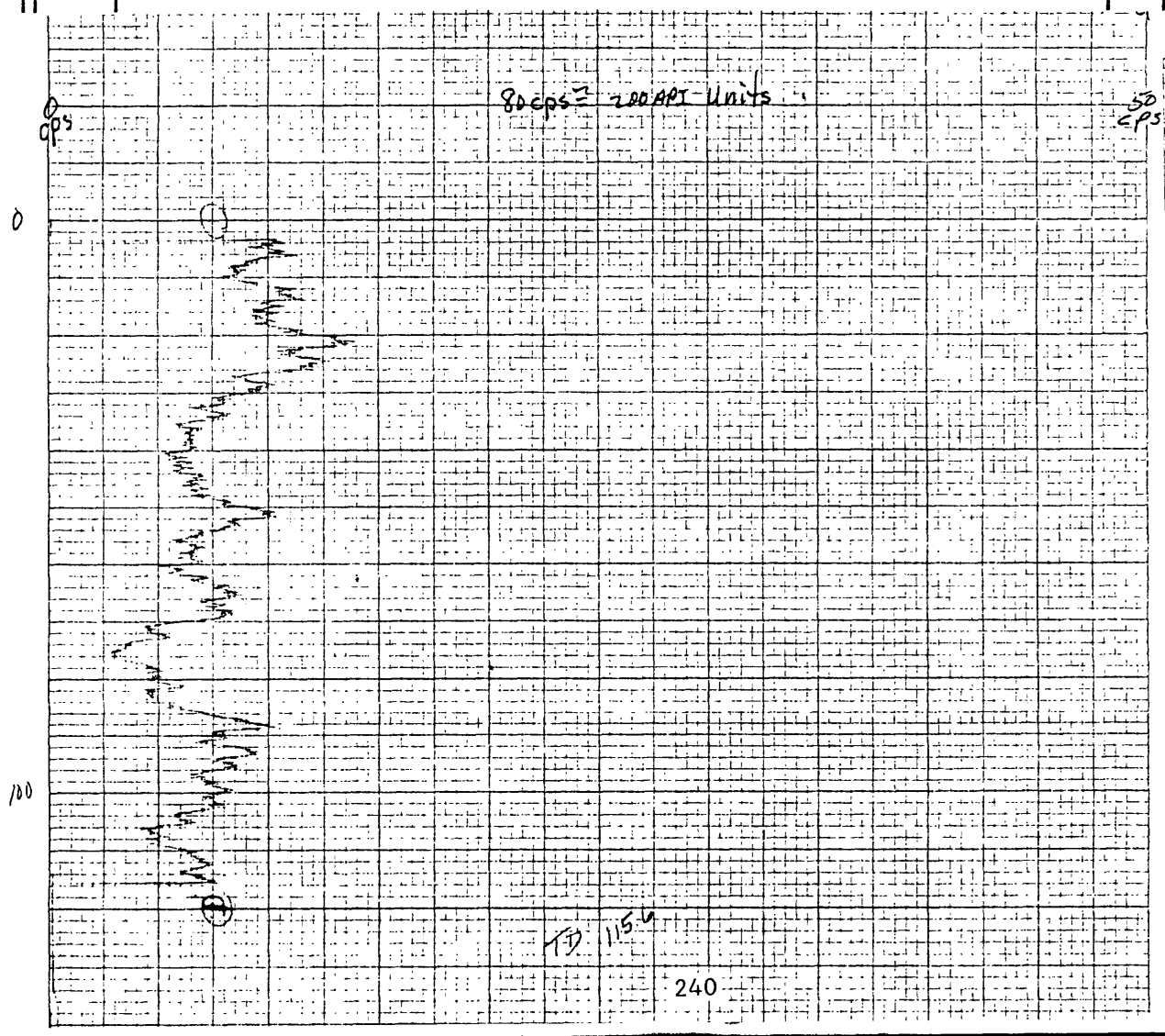
WELL No 070536

COMPANY Camden City WD
AREA Pennsauken Twp.
WELL Camden City TW 3-79
COUNTY Camden STATE New Jersey

COORDINATES:
N 395905
S 075 0333
ELEVATION:
D.F.
K.B.
G.L. 10

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	12-21-81		Nature		
First Reading	115.6		Density		
Last Reading	4		Viscosity	@ °F	@ °F
Footage Logged	112		Resistivity	@ °F	@ °F
Bottom (Driller)	117		Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)			Circ. Temp.		
Casing Size	12" & 4"		B.H. Temp.		
Scale	0-50 cps				
Time Constant	4				
Sensitivity	Sen 10.0				
Logging speed	25'/min		Logged by	R Walker	
			Witnessed by	GP Lenman	

REMARKS 12" casing cemented around 4"
Casing 12" 0 - 10.8'
0 4" 0 87.5 ft
Screen 4" 85'-115'
WL 35.5 TOC
LSDC 2.0
WLBLS 33.5
Well 12 on
Well 13 off
Digitized



CHARTS CHAPHIC CONTROLS CORPORATION BUFFALO NEW YORK

Well no. 070537

Gamma Ray Log

Camden

U.S. Geological Survey
water resources division

WELL LOG

COMPANY: Camden City WD
AREA: Pennsauken Twp.
WELL: TW #4-79
COUNTY: Camden STATE: New Jersey

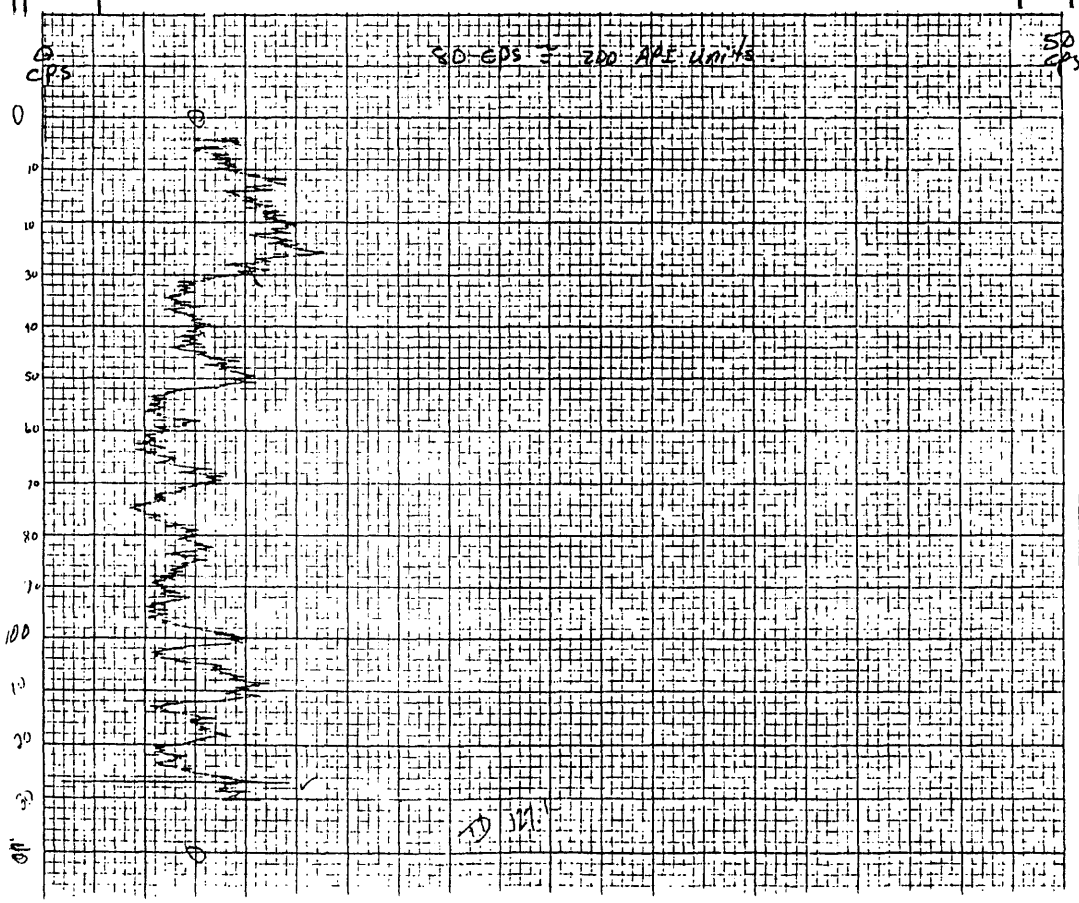
COORDINATES:
N 39 59 09
S 075 63 28
ELEVATION:
D.F.
K.B.
G.L. 10

LOCATION
WELL
COMPANY

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	12-21-81		Nature		
First Reading	127		Density		
Last Reading	4		Viscosity	@ °F	@ °F
Footage Logged	123		Resistivity	@ °F	@ °F
Bottom (Driller)	128		Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)			Circ. Temp.		
Casing Size	6" x 8"		B.H. Temp.		
Scale	0-50 cps				
Time Constant	4				
Sensitivity	10.0				
Logging speed	25'/min		Logged by	P. Lubitker	
			Witnessed by	G P Lennon	

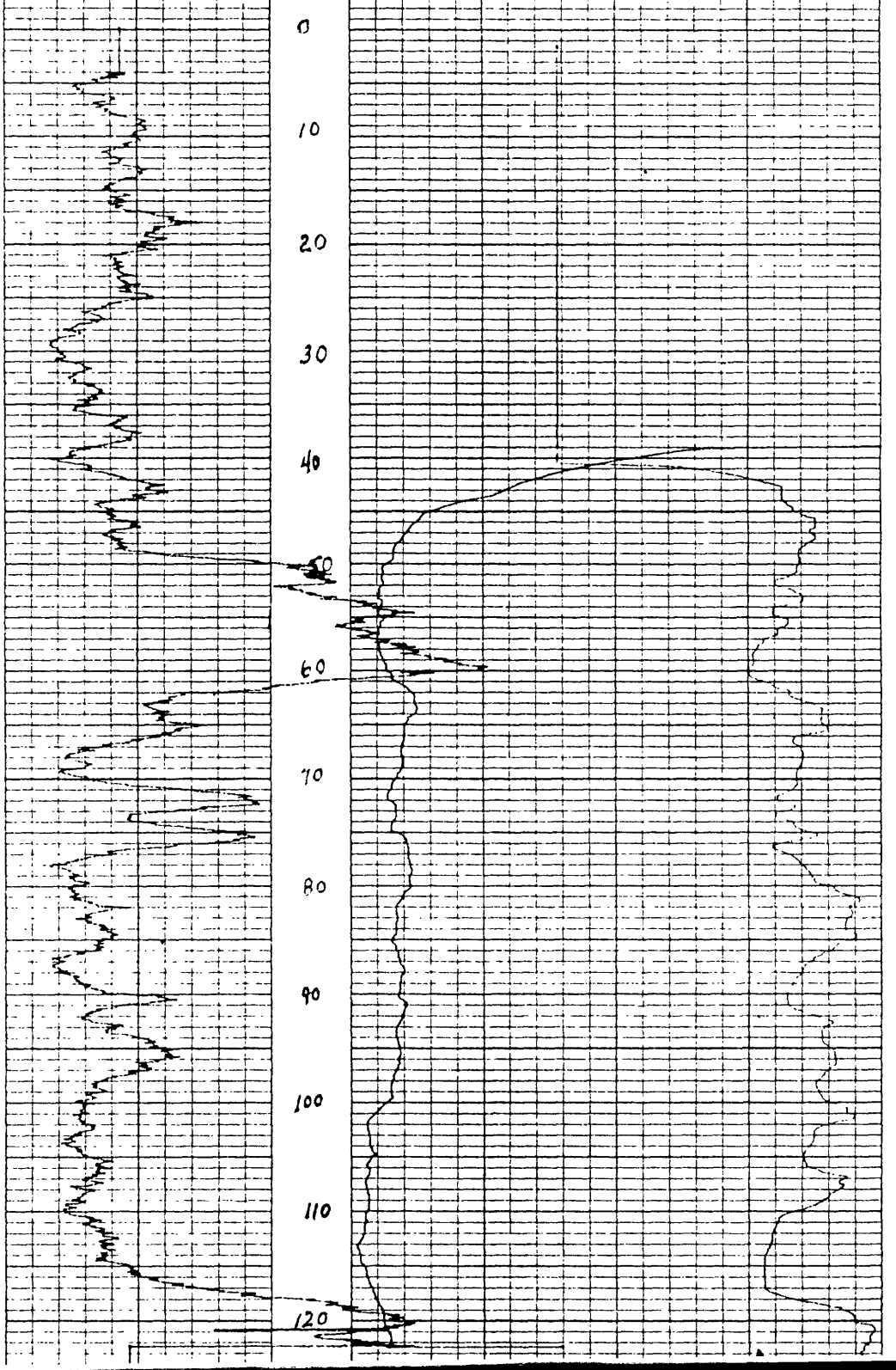
REMARKS: Casing 8" 0-98' Green-Yellow oily substance
Screen 6" 97-127 on the water surface

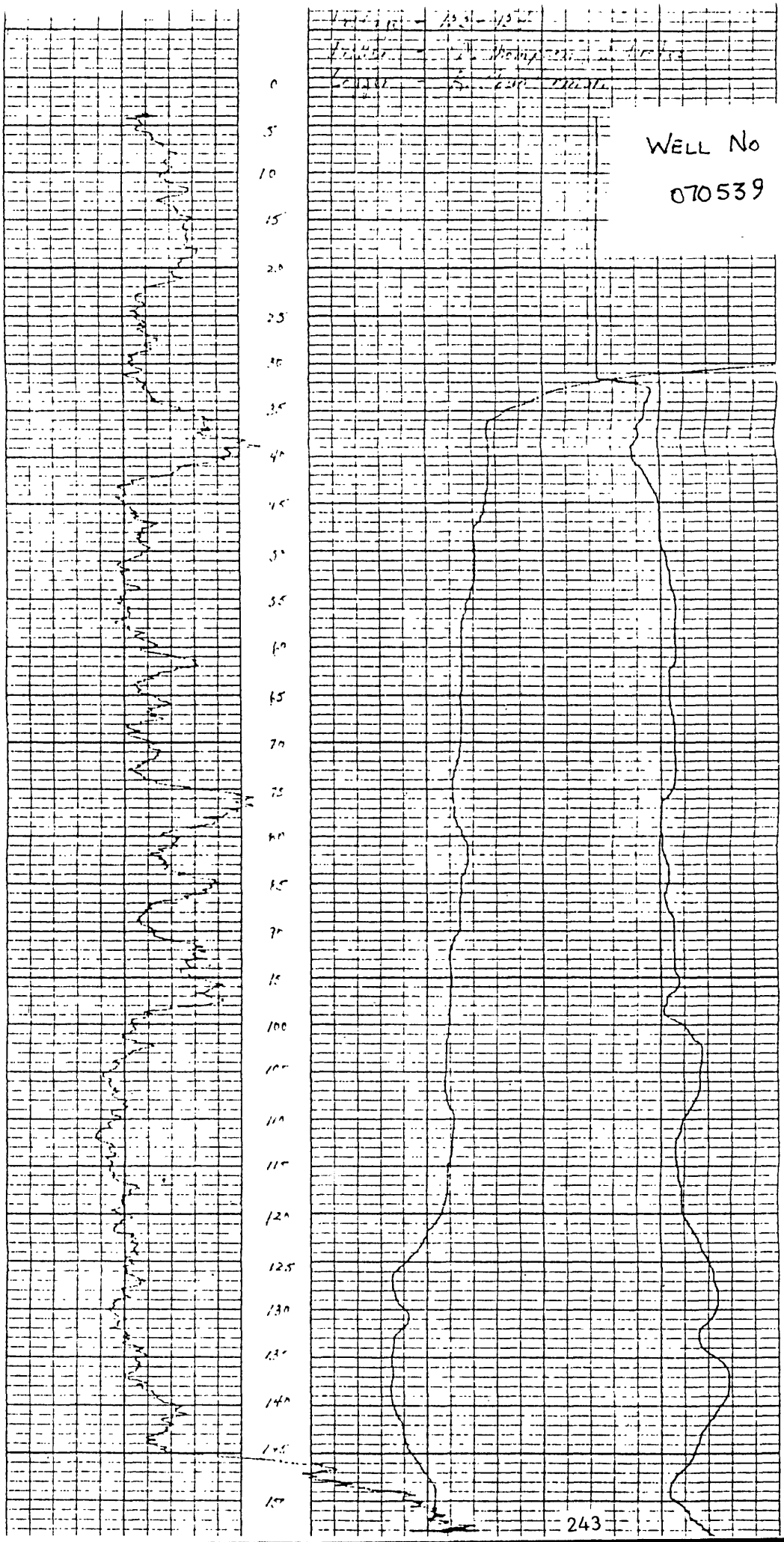
WL 37.1 bls
LSDC 1.7
WL BLS 35.4 Well 12 is pumping 13 gpm



City of Camden Job # 204003
Test Well #5 Morris Station
Total Depth Logged - 124 ft
Drilling Fluid - Revert
Time Constant - 1
Res: 50 SP 100
Counts Per Second - 30
Discrimination - 5
Hole Diameter - 11 7/8"
Driller - J. Drebes, J. Thompson
Logger - R. Counterman
Equipment Whitman Leonard & Assoc.

WELL No
070538




WELL No
070539
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150

Well No. 070540

U.S. Geological Survey water resources division — WELL LOG

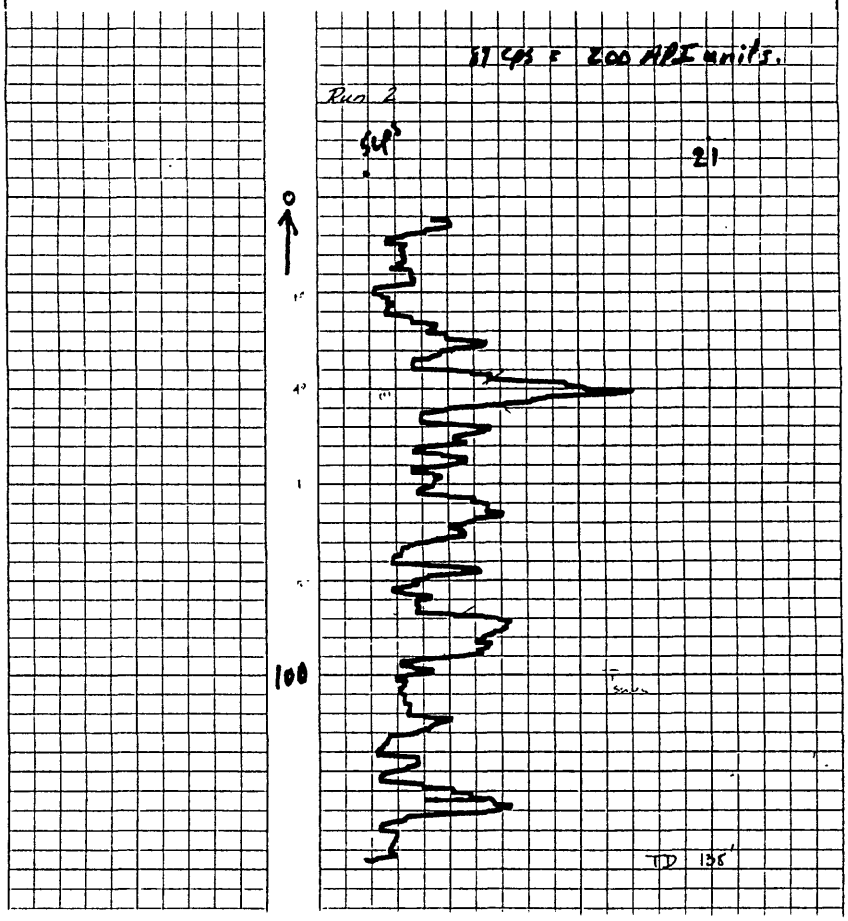
COMPANY: Camden City W.D.
AREA: Pennsauken Twp.
WELL: TW 7-79 Unique # 070540
COUNTY: Camden STATE: New Jersey

COORDINATES: N 39 58 58 S 075 03 25.01
ELEVATION: D.F. K.B. G.L.

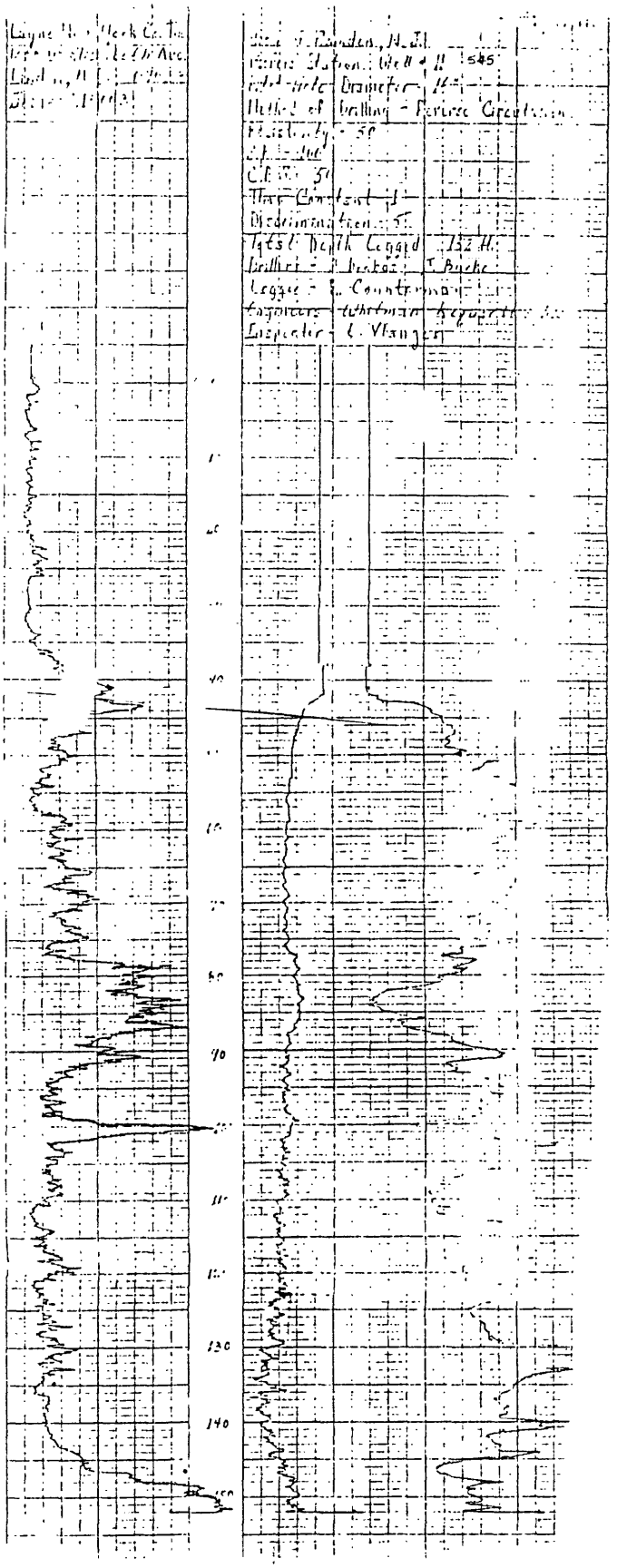
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	11-30-79	11-30-79	Nature		
First Reading	4	138	Density		
Last Reading	138	4	Viscosity	@ °F	@ °F
Footage Logged	134	134	Resistivity	@ °F	@ °F
Bottom (Driller)			Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)			Circ. Temp.		
Casing Size			B.H. Temp.		
Scale	10	10			
Time Constant	4	4			
Sensitivity	6.06	6.06			
Logging speed	30'/min	30'/min	Logged by	R. L. Walker	
			Witnessed by	T. V. Fusillo	

REMARKS: Multicased 16" 0-29.5 ft Casing Annulus
10" 0-86 ft Cemented.
WL 35.2 ft. 6" 0-98 ft
6" Screen 98 To 108
6" Pvc 108 To 118
Screen 118 to 138
TD 141'

Digitized 6/16/80



WELL No.
070545



Company

Dept. New York C. Inc.

Date - 1-4-2003

July 11, 1980

Town of Cameron, N.Y.

Well - Stone Well #13

Bore Hole Diameter - 15" +

Total Depth Logged - 135 ft.

Resistivity - 20

Potential - 10

Gamma Count Per Second - 50

Time Constant - 1

Method: Reverse Circulation

Driller - D. Dorbe, D. Dorbe

Logger - N. Cornforman

WELL No.

070587

Gamma

Potential

Resistivity

0

10

20

30

40

50

60

70

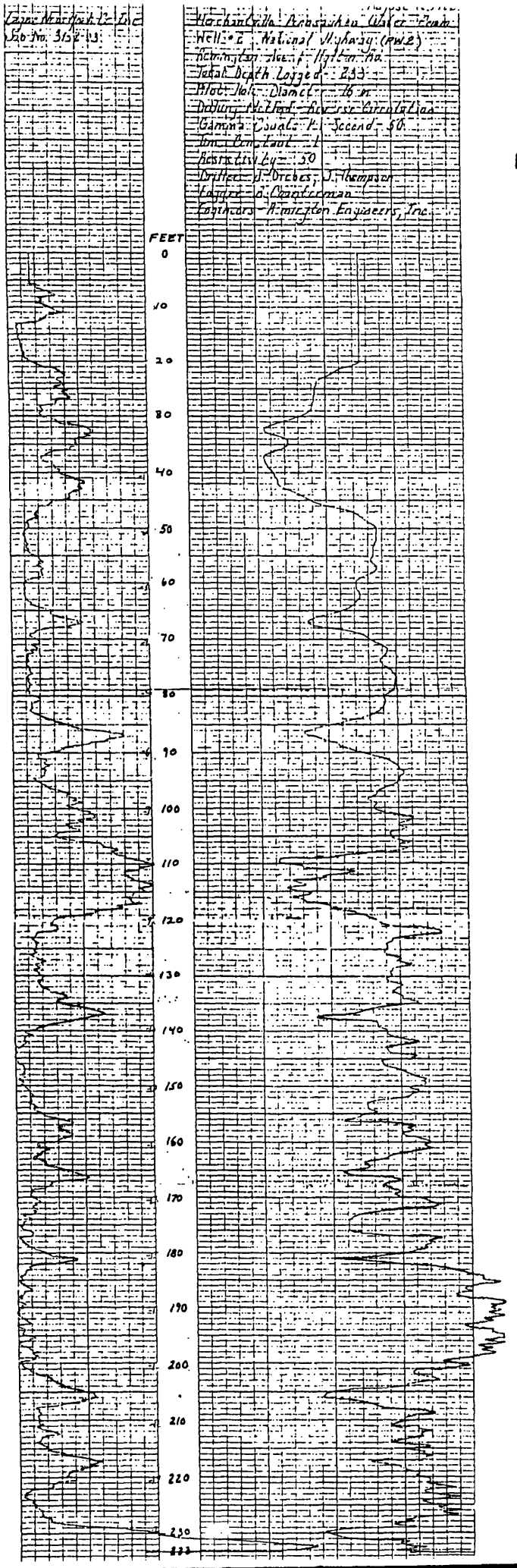
80

90

100

110

120



WELL No
070602

Merchantville - Pennsauken
Water Commission

Total depth logged - 233 f.

Layne - New York Co Inc