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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

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Defense Distribution Depot Memphis

FINAL

Groundwater Characterization Data Report

August 1997

Prepared for

U.S. Army Corps of Engineers
Huntsville Division

Prepared by

CH2MHILL
151 Lafayette Drive, Suite 110
Oak Ridge, Tennessee 37830

Contents

Contents (Continued)

Tables

Figures

Contents (Continued)

Figures (continued)

Acronyms

ASTM	American Society for Testing and Materials
BEHP	bis(2-ethylhexyl)phthalate
CCl_4	carbon tetrachloride
CEC	cation exchange capacity table
CEHND	Corps of Engineers, Huntsville Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
cm/sec	centimeters per second
CRDL	Contract-Required Detection Limit
CRQL	Contract-Required Quantitation Limit
DCE	dichloroethene
DDT	dichlorodiphenyltrichloroethane
DDMT	Defense Distribution Depot Memphis Tennessee
DNBP	di-n-butylphthalate
DO	dissolved oxygen
DR	Data Report
DRMO	Defense Reutilization and Marketing Office
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science & Engineering, Inc.
FSP	Filed Sampling Plan
FR	*Federal Register*
HRS	Hazard Ranking System
I.D.	inside diameter
IDL	Instrument Detection Limit
LCS	laboratory control standard
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
MDL	Method Detection Limit
MEK	methylethyl ketone, 2-butanone
mgd	million gallons per day
MLGW	Memphis Light, Gas, and Water
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
MW	monitoring well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O.D.	outside diameter
OU	operable unit
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCA	tetrachloroethane
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene

Acronyms (continued)

ppm	parts per million
PRGs	preliminary remediation goals
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RPD	relative percent difference
SOP	Standard Operating Procedure
STB	soil test boring
SVOC	semivolatile organic compound
TCA	trichloroethane
TCL	Target Compound List
TCE	trichloroethene
TDEC	Tennessee Department of Environmental Conservation
USAEHA	U.S. Army Environmental Hygiene Agency
USGS	U.S. Geological Survey
VOC	volatile organic compound

Executive Summary

This Data Report (DR) is an interim submittal of subsurface physical and groundwater chemical data collected during the first quarter of 1996. Additional evaluation and interpretation of the groundwater data including risk assessment, subsurface geological modeling, and fate and transport analysis will be presented in a subsequent Remedial Investigation Report. The objective of this groundwater investigation was to achieve a better understanding of the aquifer characteristics including direction and velocity of groundwater flow on a facility-wide basis and the horizontal and vertical extent of groundwater contamination. Specific objectives are as follows:

- Evaluate the groundwater quality and flow directions west of Dunn Field.
- Determine the quality of groundwater flowing onto the Defense Distribution Depot Memphis Tennessee (DDMT) main installation and Dunn Field.
- Evaluate the suspected area of vertical hydraulic interconnection between the uppermost and the underlying confined aquifer.
- Provide geologic, groundwater flow, and groundwater chemistry data to support the design of a groundwater extraction system proposed at Dunn Field.

To achieve these objectives, 16 new groundwater wells and 2 new geologic test borings were installed to provide hydrogeologic and geotechnical data. In addition, 54 new and existing wells were sampled and analyzed for organic and inorganic groundwater constituents.

Test boring and well installation west of Dunn Field have provided a general configuration of the dense clay that composes the base of the unconfined upper aquifer at DDMT. Across most of Dunn Field and the northern portion of the main installation, groundwater flow is largely controlled by the slope of the clay surface which is dominated by a depressed surface in the clay. It has not been determined if this depressed surface is an erosional feature or a gap in the deposition of the clay.

Volatile organic compounds (VOCs) detected above preliminary remediation goals (PRGs) for groundwater include trichloroethene; tetrachloroethene; 1,1,1-trichloroethane; 1,1-dichloroethene; carbon tetrachloride; and 1,1,2,2-tetrachloroethylene. Inorganic constituents exceeding groundwater PRGs include beryllium, chromium, copper, lead, and nickel.

The configuration of the organic and inorganic contaminant plumes within Dunn Field and the main installation are similar to that previously reported by Law (1990) and ESE (1993). Data collected to the west of Dunn Field indicate that for most constituents the plumes are bounded by wells MW-40, -42, -43, and -41 (See Figure 1-2). Low concentrations of organic compounds in an offsite well at the northeast corner of Dunn Field indicate that the plume is not completely bounded there.

Inorganic constituents are elevated at Dunn Field and the northwest portion of the main installation. Overall, the inorganic constituents are lower in the 1996 sampling than during previous sampling efforts.

Groundwater quality data, regional stratigraphy, and water level data do not indicate that there is a hydraulic connection between the uppermost aquifer and underlying confined sand aquifers. Additional investigation will be performed to determine if the upper aquifer belongs to the regional aquifer, the Confined Sand (Memphis Sand), or other water producing sands.

Section 1

Introduction

1.0 Introduction

Defense Distribution Depot Memphis Tennessee (DDMT) has been placed on the National Priorities List (NPL) and must fulfill requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The remedial process under CERCLA and the NCP requires the preparation of a Remedial Investigation/Feasibility Study (RI/FS) to determine the nature and extent of contamination, to evaluate public health risks, and to screen potential remedial actions.

Previous well installation and groundwater sampling activities (see Section 1.2) through 1993 indicated the presence of organic and inorganic constituents exceeding levels of concern in groundwater primarily at Dunn Field, but also at other locations within the main DDMT facility area. In January and February of 1996, DDMT expanded the groundwater monitoring network with additional wells to evaluate the extent of contamination west of Dunn Field and to provide additional upgradient groundwater quality data. The objective of this groundwater investigation was to achieve a better understanding of the aquifer characteristics including direction and velocity of groundwater flow on a facility-wide basis, the horizontal extent of groundwater contamination in the surficial aquifer, and the potential vertical extent of contamination into the underlying confined aquifer. Specific objectives are as follows:

- Evaluate groundwater quality and flow directions west of Dunn Field (*Operable Unit 4 Field Sampling Plan* [OU-4 FSP], Section 4).
- Determine the quality of groundwater flowing onto the DDMT main installation and Dunn Field and develop background constituent concentrations for groundwater.
- Evaluate the suspected area of vertical hydraulic interconnection between the uppermost and the underlying confined aquifers.
- Provide geologic, groundwater flow, and groundwater chemistry data to support the design of a groundwater extraction system proposed at Dunn Field (CEHND, August 1995).

To achieve these objectives, an investigation was completed that included installing new monitoring wells, collecting and analyzing groundwater and soil samples, and collecting data on groundwater flow directions and on the hydraulic properties of the aquifers. Details of the investigation are provided in Sections 2 and 3.

The groundwater field characterization reported in this Data Report (DR) was performed in accordance with the requirements of the *OU-4 FSP* (DDMT, 1995). OU-4 consists of the former and current hazardous materials storage buildings—Buildings 319, 629, and 835—and the Defense Reutilization and Marketing Office (DRMO) buildings and stockyards. The geographical coverage of OU-4 includes an area of suspected interaction between the Fluvial Aquifer and the Confined Sand Aquifer (Memphis Sand Aquifer); therefore, the scope of OU-4 was expanded to include sitewide groundwater flow and contaminant transport.

This DR is an interim submittal of subsurface physical and groundwater chemical data collected during the 1996 groundwater characterization field effort. Additional evaluation and interpretation of the groundwater data including risk assessment, subsurface geological modeling, and fate and transport analysis will be presented in a subsequent RI Report. Source-term characterization at Dunn Field and other potential sources of groundwater contamination will also be presented in the RI Report.

1.1 Facility Background

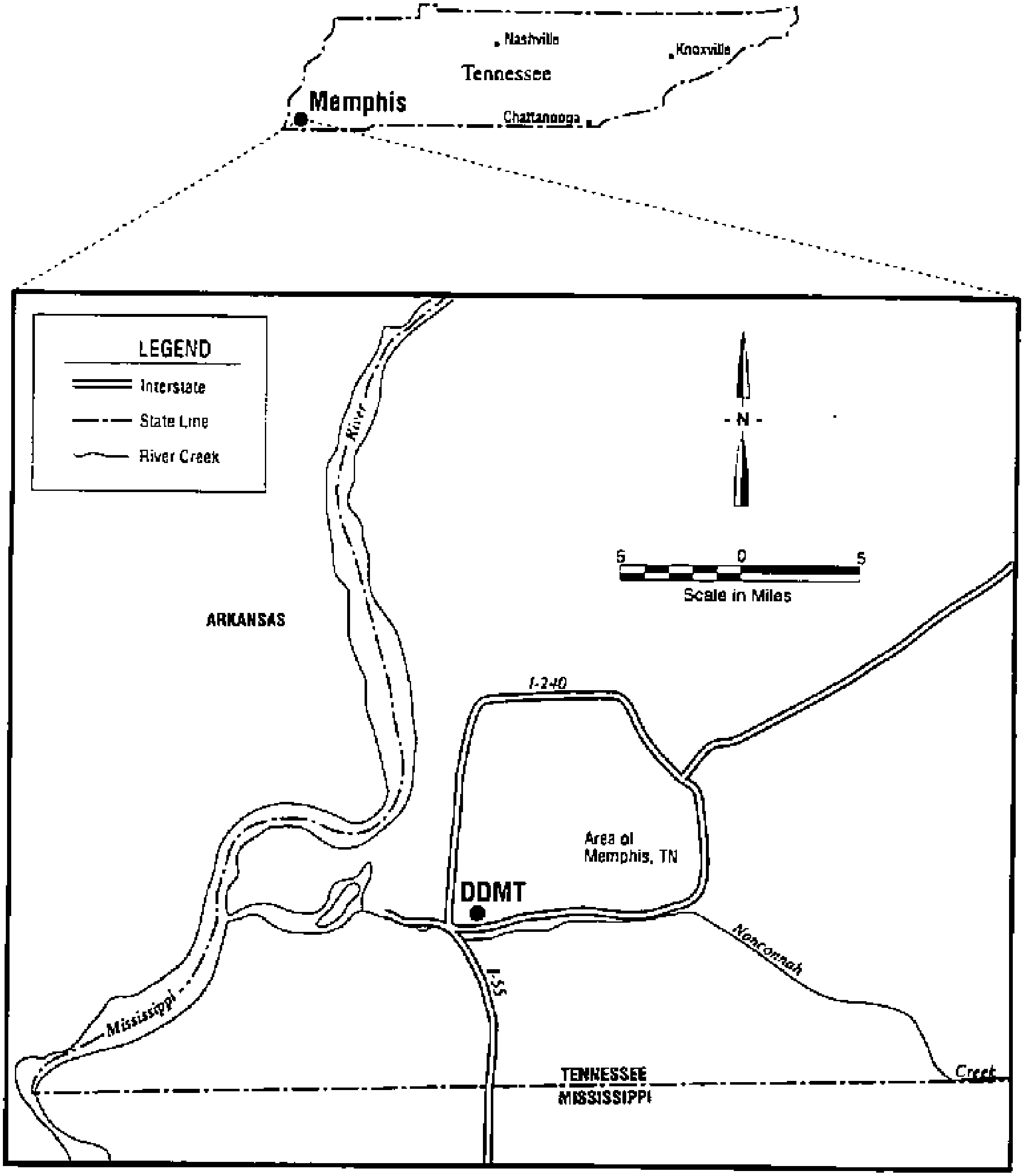
DDMT covers 642 acres of land in Shelby County, Memphis, Tennessee, in the extreme southwestern portion of the state (see Figure 1-1). Approximately 5 miles east of the Mississippi River and just northeast of the Interstate 240–Interstate 55 junction, DDMT is in the south-central section of Memphis, approximately 4 miles southeast of the Central Business District and 1 mile northwest of Memphis International Airport. Airways Boulevard borders DDMT on the east and provides primary access to the installation. Dunn Avenue, Ball Road, and Perry Road serve as the northern, southern, and western boundaries to the main installation, respectively. Dunn Field, the only known waste disposal area at DDMT, is located just north of the main installation. Person Avenue, Kyle Street, and Hays Street serve as the northern, western, and eastern boundaries to Dunn Field, respectively.

The installation consists of approximately 110 buildings, 26 miles of railroad track, and 28 miles of paved streets. The facility has approximately 5.5 million square feet of covered storage space and approximately 6 million square feet of open space.

Past activities at DDMT include a wide range of storage, distribution, and maintenance practices. Dunn Field has been used as a landfill area (northwest quadrant), storage area for mineral stockpiles (southwest and southeast quadrants), and pistol range (northeast quadrant). Activities within the southern portion of the main installation have included hazardous material storage and recoupment (Building 873), sandblasting/painting activities (Buildings 1086 through 1089), and maintenance (Building 770). Other activities documented to have occurred in this area of the installation include polychlorinated biphenyl (PCB) transformer storage (near Building 274), pesticide/herbicide storage and use, and fire truck pump testing (Lake Danielson). The northern portion of the main installation has a history of hazardous materials storage, treatment of wood products with pentachlorophenol (Building 737), and storage of items awaiting disposal. Specific building and facility locations are provided in Drawings 1 and 2 of the *Final Generic Remedial Investigation/Feasibility Study Work Plan* (CEHND, 1995).

DDMT was issued a Resource Conservation and Recovery Act (RCRA) Part B permit (No. TN4 210 020 570) by the U.S. Environmental Protection Agency (EPA), Region IV, and the Tennessee Department of Environmental Conservation (TDEC) on September 28, 1990. Subsequently, in accordance with Section 120 (d)(2) of CERCLA, 42 U.S.C. 9620(d)(2), EPA prepared a final Hazard Ranking System (HRS) Scoring Package for DDMT. On the basis of the final HRS score of 58.06, EPA added DDMT to the NPL by publication in the *Federal Register* (FR), 57 FR 47180 No. 199, on October 14, 1992.

As a result of DDMT's status as an NPL site, it was agreed that the investigation of all applicable sites would proceed under the CERCLA process for remediation (remedial



SOURCE: Engineering-Science, 1993.

Figure 1-1
DDMT Location in
Memphis Metropolitan Area
Defense Distribution Depot - Memphis, Tennessee

investigation, feasibility study, proposed plan, record of decision, remedial design, and remedial action).

1.2 Groundwater Characterization Scope

1.2.1 Summary of Previous Investigations

Initial groundwater investigations took place in 1986 by the U.S. Army Environmental Hygiene Agency (USAEHA). Groundwater samples were obtained from monitoring wells (MW)-3, -4, -5, -6, and -7 (see Figure 1-2) in Dunn Field. Additional installation of soil test borings (STBs) and wells, groundwater sampling and analysis, and subsurface geologic characterization were performed by Law Environmental through a contract with the Corps of Engineers, Huntsville Division (CEHND) in two phases during 1989 and 1990. This study indicated that the surficial aquifer under Dunn Field was contaminated and that additional investigation was needed to fully identify contaminant source areas and to delineate the organic contaminant plume. In 1993, Environmental Science & Engineering, Inc. (ESE) performed a groundwater monitoring study using existing monitoring wells at DDMT. The study was conducted to assess changes in groundwater quality since the completion of the RI/FS in 1990. Additional information on previous groundwater investigations is provided in Section 2.0 of the *Final Generic Remedial Investigation/Feasibility Study Work Plan* (CEHND, 1995).

1.2.2 Overview of the Scope

During the 1996 groundwater investigation described in this DR, 16 new monitoring wells were installed within the boundaries of DDMT and around the perimeter of the facility (MW-40 through MW-55). Eight of the 16 monitoring wells were installed to the west and northwest of Dunn Field to assess the lateral extent of the contamination plume emanating from Dunn Field (MW-40, -41, -42, -43, -44, -51, -54, and -55). Three monitoring wells were located east of Dunn Field to evaluate upgradient conditions (MW-45, -46, and -49), while the remaining five wells were placed around the perimeter of the main installation of DDMT (MW-47, -48, -50, -52, and -53).

Two additional test borings were installed (STB-12 and STB-13) to assess subsurface geological conditions and confirm the depth to the base of the surficial aquifer. Subsurface soil samples were collected for chemical analysis to evaluate the potential for groundwater contaminant sources in offsite locations. Samples were collected from the surficial aquifer and the confining unit clay to evaluate geotechnical conditions and other transport parameters.

1.3 DDMT Hydrogeology

1.3.1 Hydrogeologic Setting

Section 2.4 of the *Final Generic Remedial Investigation/Feasibility Study Work Plan* (CEHND, 1995) provides a thorough discussion of the regional geologic and hydrologic features applicable to DDMT. Recent work by Kingsbury and Parks (1993) and Parks and Carmichael (1988) also provides insight into the hydrogeologic setting. In particular the

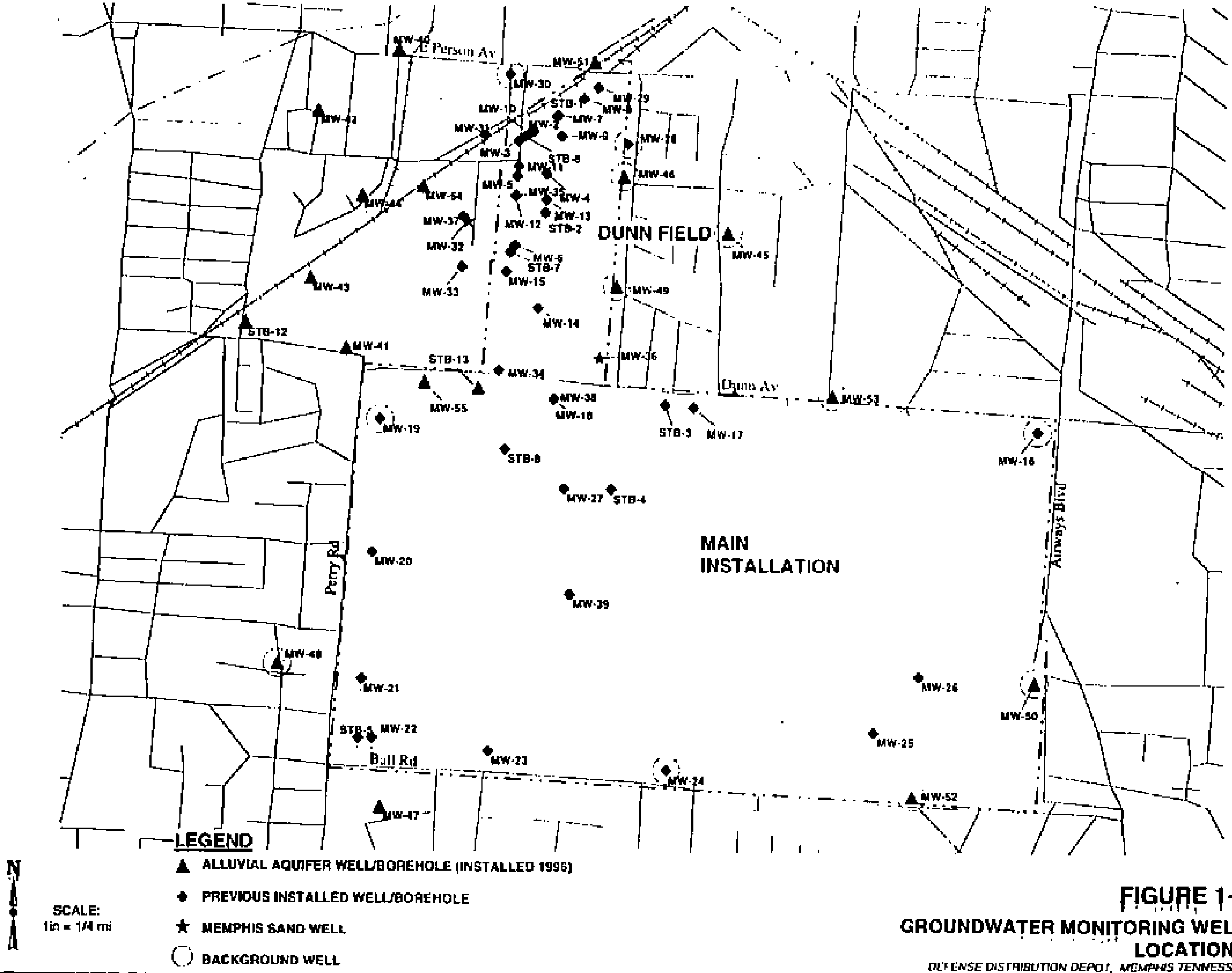


FIGURE 1-2
GROUNDWATER MONITORING WELL LOCATIONS
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

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unit called Jackson Formation/Upper Claiborne Group in Parks' earlier publications has been further defined. The Cockfield Formation is now recognized as a member of the Claiborne Group in western Tennessee. Figure 1-3 presents a general cross section of the Memphis Area extending southwest to northeast across Shelby County. Of the geologic units shown, the following are applicable to groundwater flow and contaminant transport conditions at DDMT:

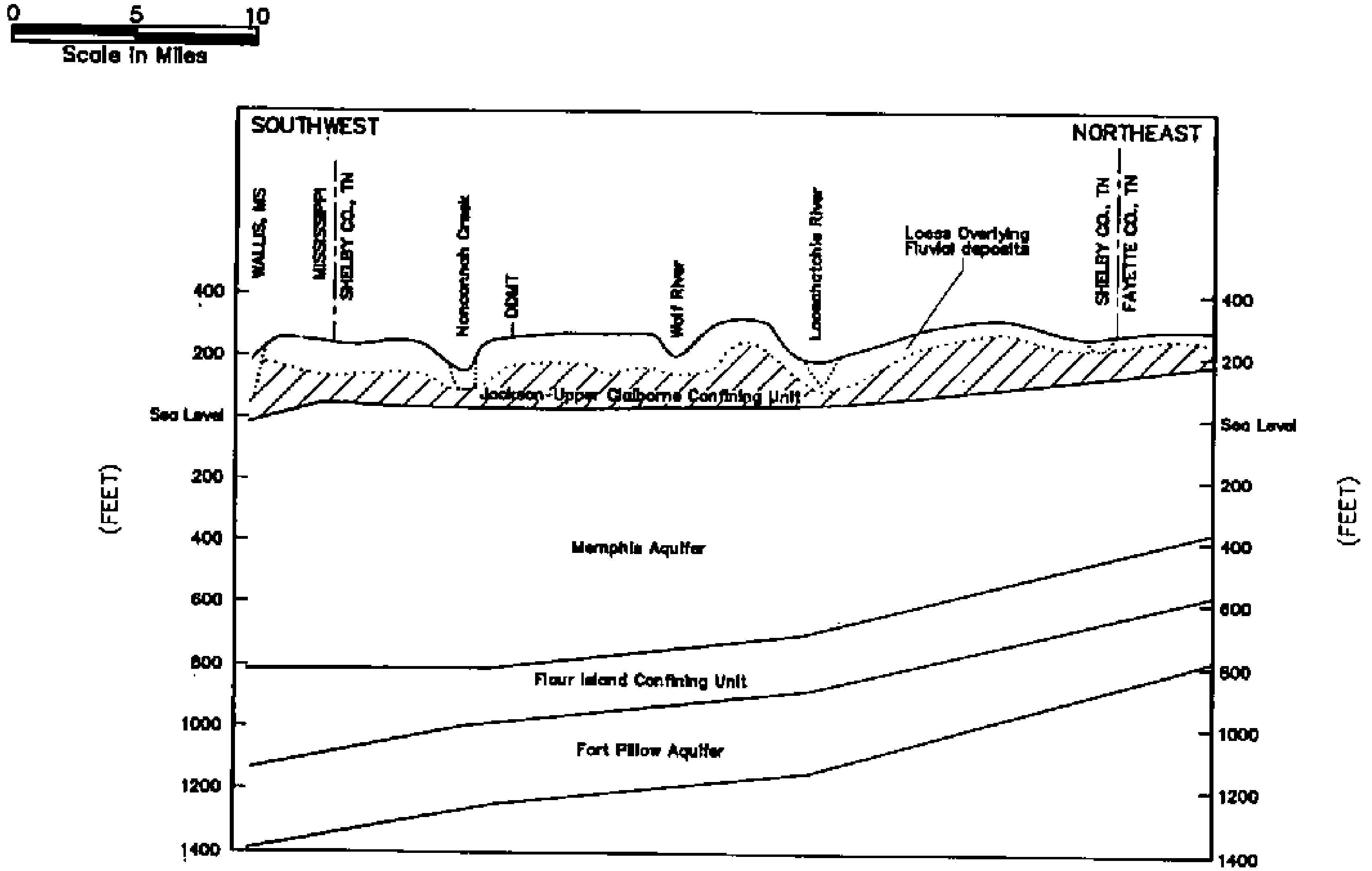
Loess. Loess is a semi-cohesive eolian deposit composed of silt, silty clay, silty fine sand, or mixtures thereof. It mantles the ground surface over wide areas of the central United States. It typically occurs above the alluvial (terrace) deposits and is thickest along the bluffs overlooking the Mississippi Alluvial Plain. Its maximum thickness is reported to be about 65 feet; it thins considerably toward the east. Locally, it may contain thin, discontinuous, fine sandy layers enclosed within silts and silty clays.

Fluvial (Terrace) Deposits. Quaternary and possibly Pliocene age fluvial deposits occur beneath the uplands and valley slopes of the Gulf Coastal Plain and are the remnants of ancient alluvial deposits of either present streams or an ancient drainage system. The fluvial deposits consist primarily of sand and gravel with minor lenses of clay and thin layers of iron-oxide cemented sandstone or conglomerate. These fluvial deposits range from zero to 100 feet in thickness and underlay the loess. The thickness is highly variable because of erosional surfaces at both top and base. Locally, in the Memphis area, the fluvial deposits may be absent (Graham and Parks, 1986). This deposit represents the upper aquifer at DDMT, herein termed the Fluvial Aquifer.

Jackson, Cockfield, and Cook Mountain Formations. The Late Eocene Jackson Formation and upper part of the Claiborne Group lie beneath the fluvial (terrace) deposits. The upper Claiborne consists of the Jackson, Cockfield, and the Cook Mountain Formations. Because of lithologic similarities, the Jackson Formation and the Cockfield Formation cannot be reliably subdivided in the subsurface of the Memphis area. The Jackson/Cockfield Formations consist of sand, silt, clay, and lignite beds. The preserved sequence is predominantly Cockfield, but in the northwestern part of the Memphis area the Cockfield is overlain by the Jackson Formation (Kingsbury and Parks, 1993). The Cockfield Formation is typically composed of clay and silt in the upper part and sand in the lower part, although locally this may be reversed (Parks and Carmichael, 1988). Lignite beds, up to 10 feet in thickness, occur in the clays, silts and sands. The base of the Cockfield Formation is faulted, and dips to the west at a rate of 10 to 40 feet per mile.

The thickness of the Jackson Formation is reported differently in the literature. Kingsbury and Parks (1993) report a range of zero to 50 feet, while Parks and Carmichael (1988) report a thickness ranging from zero to 150 feet. Where the Jackson Formation is present, the Cockfield may be from 235 to 270 feet in thickness. In other places extensive erosion caused the thickness to be highly variable. The Cockfield is generally an unconfined water-table aquifer (Parks and Carmichael, 1988), and provides water for some public and industrial uses.

The Cook Mountain Formation is the lower confining unit to the Cockfield and generally consists of clay, silt, and sand. Kingsbury and Parks (1993) report a range of zero to 50 feet in the Memphis area, while Parks and Carmichael (1988) report a thickness ranging from zero to 150 feet over the West Tennessee area.



Source: Parks, 1990

FIGURE 1-3
GENERAL GEOLOGIC CROSS SECTION OF THE MEMPHIS AREA
Defense Distribution Depot Memphis, Tennessee

Memphis Sand ("500-foot sand"). The widespread terrace deposits of the Memphis Sand were deposited during the Middle Eocene when streams carried extensive quantities of sand and gravel into the Mississippi embayment area. The Memphis Sand unit is composed primarily of thick bedded, white to brown or gray, very fine-grained to gravelly, partly argillaceous, and micaceous sand. Lignitic clay beds constitute only a small percentage of total thickness. The Memphis Sand ranges from 500 to 890 feet in thickness, and the depth to the top of the Memphis Sand Aquifer in the area ranges from approximately 120 feet to 300 feet below ground surface. It is thinnest in the northeastern part of the Memphis area in northwestern Fayette County, Tennessee, and thickest near the Mississippi River in southwestern Shelby County, Tennessee. The City of Memphis obtains its drinking water form this aquifer. The base of the Memphis Sand dips to the west at a rate of 20 to 50 feet per mile.

Graham and Parks (1986) present several lines of evidence to suggest that the Jackson Formation/Upper Claiborne Group is not laterally continuous throughout the Memphis area. In some areas, the Memphis Sand is directly overlain by the alluvial or fluvial deposits, permitting the downward vertical leakage from shallow water-bearing zones into the regional aquifer.

Cross-sections presented in Kingsbury and Parks (1993) provide useful information about the regional geology in the Memphis area. Well Sh:J-104 is less than 2 miles due west of DDMT (see Figure 1-4). It shows an approximate 75-foot thickness of Loess and Fluvial deposits, underlain by a 40-foot thickness of the Cockfield Formation. The Cook Mountain Formation is approximately 75 feet thick at this site, and is underlain by the Memphis Sand at elevation 46 feet mean sea level (msl). The Memphis Sand is several hundred feet thick in this well.

Well Sh:J-167, which is about two miles to the southwest of the southwest corner of the main installation (see Figure 1-4), is on the upthrown side of the fault described below. It is also north of Nonconnah Creek. It shows an approximate 100-foot thickness of Loess and Fluvial deposits, and no Cockfield Formation. However, approximately 70 feet of the confining Cook Mountain Formation are encountered before the top of the Memphis Sand at elevation 85 feet msl.

A northwest-southeast trending fault is also shown passing through the Allen Wellfield (Kingsbury and Parks, 1993) The downthrown side is to the northeast. Where the formations have been offset along a fault plane, the Cockfield aquifer and Memphis Sand aquifer could be in direct hydraulic connection, if the offset was greater than the thickness of the Cook Mountain Formation. In the vicinity of Allen Wellfield it appears that the Memphis Sand has been offset by about 30 to 40 feet, and the thickness of the Cook Mountain Formation is 70 to 75 feet.

1.3.2 DDMT Site-Specific Hydrogeology

DDMT is underlain by a layer of loess about 20- to 30-feet thick. The lower saturated portion of the underlying terrace deposits is locally referred to as the Fluvial Deposits Aquifer (herein referred to as the Fluvial Aquifer), which is the uppermost aquifer beneath DDMT. Perched groundwater also exists in the terrace deposits above small clay lenses at elevations above the Fluvial Aquifer. However, these perched water zones are temporal and

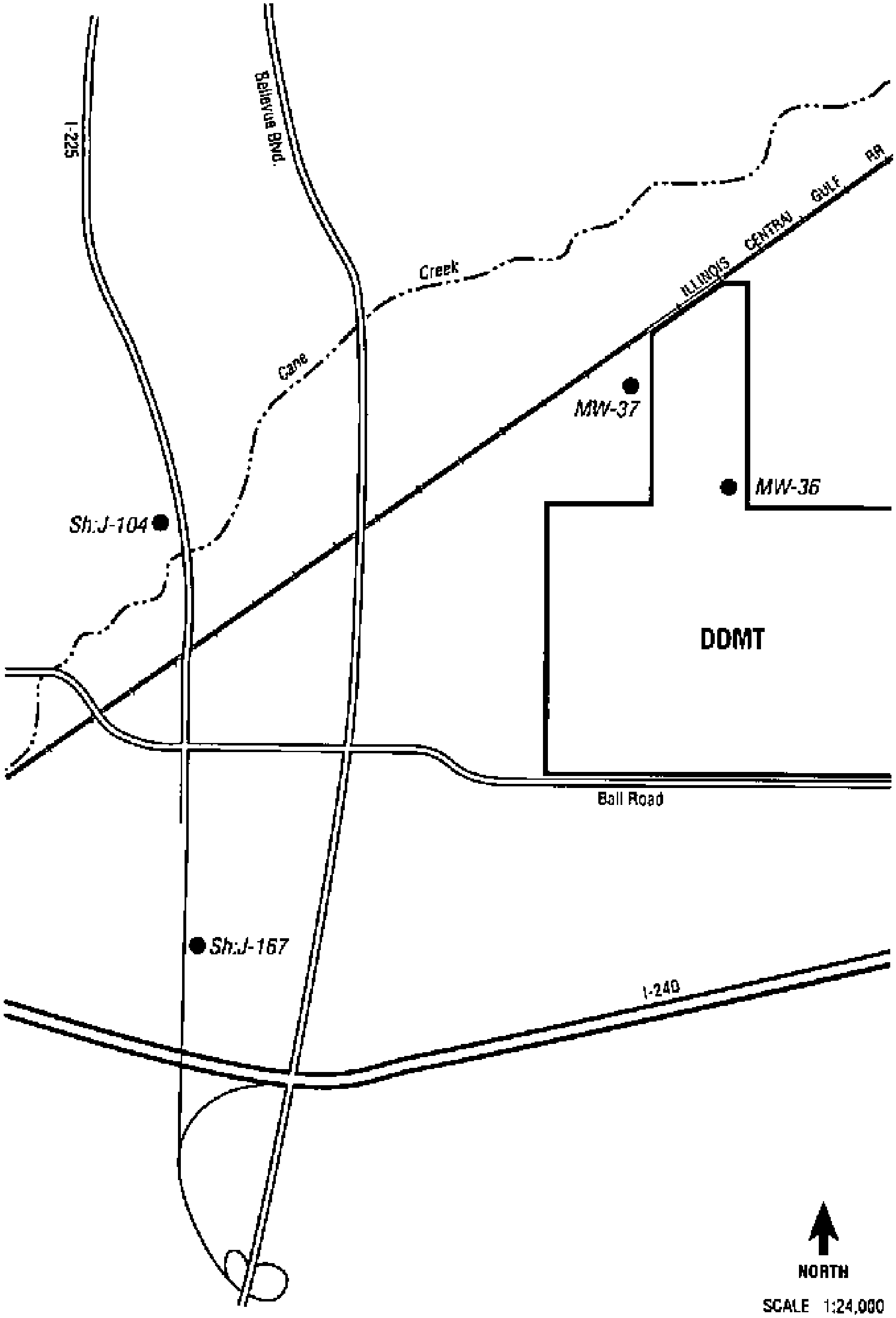


Figure 1-4
Confined Sand Aquifer Well Locations
Defense Distribution Depot • Memphis, Tennessee

are not considered part of the Fluvial Aquifer. The Fluvial Aquifer is not used as a drinking water source within the City of Memphis.

The upper portion of the Jackson Formation/Upper Claiborne Group, which serves as the base of the Fluvial Aquifer, generally consists of a high-plasticity clay of variable thickness. The depth to the top of the confining unit at OU-4 ranges from about 70 feet below land surface to about 160 feet bls in the northwest portion of Dunn Field, where a depression in the top of the clay exists. The maximum thickness of this unit is 85 feet in the northwest portion of Dunn Field (STB-6, Drawing 1 of the *OU-4 FSP*). The clay thins in the northwest portion of the main facility (STB-8, Drawing 2 of the *O-U4 FSP*) to 5 feet of sandy, silty clay and 9 feet of interbedded silty clay and fine grained sand.

The base of the Cockfield Formation has been mapped at an approximate elevation of 122 feet msl in well Sh:J-104. Extrapolation to wells MW-36 and MW-37 show that the base of the Cockfield should occur at elevation 145 feet msl for both wells. Review of the lithologic logs for these wells shows a change in formation at elevation 143 feet msl for MW- 36 and elevation 145 feet msl for MW-37, from a dense silty clay to a sandy clay; possibly signifying the gradation from the Cockfield to the Cook Mountain Formations.

The altitude of the top of the Memphis Sand was also mapped by Kingsbury and Parks (1993). At well Sh: J-104, the top is at elevation 46 feet msl. Extrapolation to MW-36 and MW-37 shows an approximate elevation of 82 feet and 93 feet, respectively, for the top of the Memphis Sand. Wells MW-36 and MW-37 encountered sands at elevations 128 and 125 feet msl which is approximately 46 and 32 feet above the projected top of the Memphis Sand, respectively. Thus based on regional stratigraphic information, the lower sand units at DDMT could belong to the Cook Mountain Formation rather than the Memphis Sand. Because it is uncertain whether the confined sand aquifer underlying the Fluvial Aquifer is the Memphis Sand (as has been assumed in previous DDMT documents), the underlying sands will be referred to in this report as the Confined Sand Aquifer.

Groundwater flow in the Fluvial Aquifer is controlled primarily by the orientation of erosional paleosurface of the upper clay in the Jackson Formation/Upper Claiborne Group. As discussed in Section 3.3, groundwater flow generally follows the slope of this clay unit. A prominent feature of the Fluvial Aquifer flow system is a generally northwest-southeast trending depression in the clay surface (see Figure 3-3) located in the northwest portion of the main facility. The depressed clay surface may result from either an erosional surface in the clay surface or a sand lens within the clay that comprises the Cockfield Formation of the Upper Claiborne Group. The groundwater flow direction across the main installation and southernmost portion of Dunn field is controlled by this feature.

The general orientation of the faults mapped in the Memphis area (Kingsbury and Parks, 1993) is to the northwest/southeast. It is likely that the orientation of the depressed feature is fault controlled. It has not been determined if the depressed clay surface results from paleoerosion or absence of the clay.

Section 2

Summary of Field Methods

2.0 Summary of Field Methods

2.1 Well Installation

All monitoring wells were drilled and installed using the Rotasonic drilling technique. The process combines vibrational and rotational forces to advance the drill pipe into the borehole. The boreholes were drilled by advancing two lines of drill pipe (see Figure 2-1). A studded drill bit was attached to the base of the core barrel, which has a 4-inch inside diameter (I.D.) and a 4.5-inch outside diameter (O.D.). The 10-foot core barrel was connected to the 4.5-inch O.D. inner drill pipe and was advanced to the desired depth using high-frequency vibration and rotation, forcing a relatively undisturbed, continuous core into the core barrel. When the core barrel reaches the desired depth, a larger outer drill pipe (6.25-inch O.D.) was advanced along the outside of the core barrel to the same depth. The larger pipe is left in place to hold open the borehole while the inner drill pipe, core barrel, and sample are retrieved. The core sample is extruded from the core barrel using vibration or hydraulic pressure, with the core barrel always driven ahead of the outer drill pipe to ensure representative sampling. At wells MW-40, -41, -42, -49, -54, and -55, thin-walled Shelby tubes were inserted into the base of the Fluvial Aquifer for analysis of geotechnical parameters. Water was added during the advancement of the outer drill pipe, when needed, to flush out cuttings in the annular space between the inner and outer drill pipes or to flush out cuttings at the bottom of the borehole after the sample is retrieved.

Boreholes were drilled to the base of the Fluvial Aquifer (uppermost clay in the Jackson Formation/Upper Claiborne Group) with minimal drilling into the confining unit clay. The only exception was well MW-43, which encountered a well-cemented ferruginous sandstone at a depth of 104 feet below ground surface at an elevation of 181 feet msl. The boring core indicated that the unconsolidated fluvial sand above the ferruginous sandstone was moist, suggesting that the ferruginous sandstone was the base of the Fluvial Aquifer. However, MW-43 never produced any water after the well was completed.

2.1.1 Well Construction

Monitoring wells were constructed using 2-inch I.D. Schedule 40 polyvinyl chloride (PVC) casings and 0.010-inch well screens. Monitoring wells were installed as follows.

Once the borehole was completed to the top of the confining unit clay, the inner core barrel was removed leaving the outer drill pipe to hold open the borehole. Any penetration into the confining unit clay was filled with chipped bentonite vibrated in place with the core barrel. A small amount of sand (usually 1 foot) was poured down the borehole to provide a firm base for installing the monitoring well. The well casing and screen were then installed through the outer drill pipe. A sand pack (20/40 silica sand) was then poured around the well screen to 2 feet above the top of the well screen. The inner core barrel was vibrated during sand pack installation to avoid bridging of sand grains. The borehole was then grouted using a high-solids bentonite clay to within 2 feet of the ground surface using side discharge tremie pipe. The outer drill pipe was then removed and the site restored to its original conditions. Appendix A contains copies of the boring logs.

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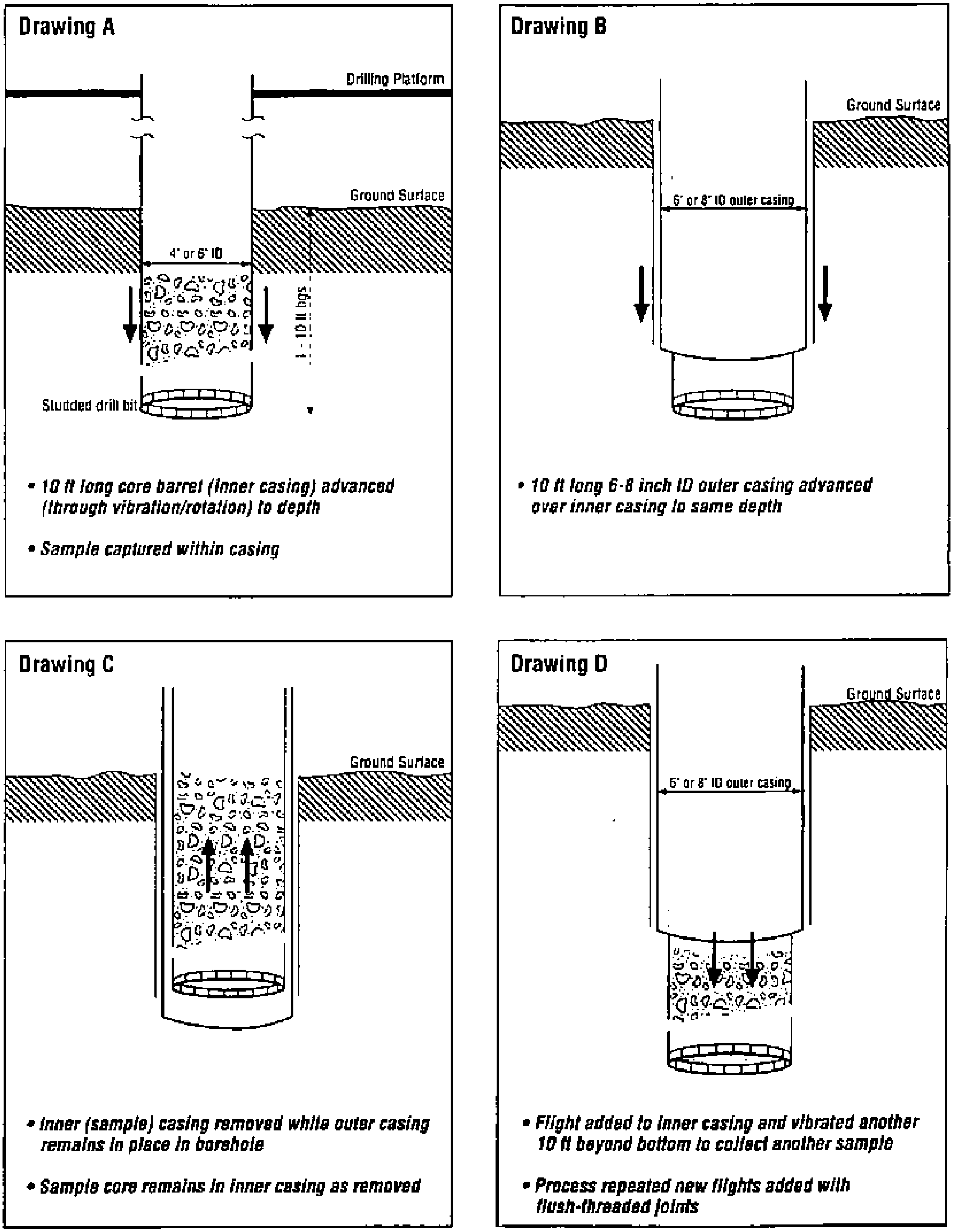


Drawing A

- *10 ft long core barrel (inner casing) advanced (through vibration/rotation) to depth*
- *Sample captured within casing*

Drawing B

- *10 ft long 6-8 inch ID outer casing advanced over inner casing to same depth*

Drawing C

- *Inner (sample) casing removed while outer casing remains in place in borehole*
- *Sample core remains in inner casing as removed*

Drawing D

- *Flight added to inner casing and vibrated another 10 ft beyond bottom to collect another sample*
- *Process repeated new flights added with flush-threaded joints*

Source: Roy F. Weston, Inc. Paper presented at American Defense Preparedness Association Environmental Symposium, San Antonio, TX. March 14-17 1994.

NOT TO SCALE

Figure 2-1
Rotasonic Drilling Method
Defense Distribution Depot • Memphis, Tennessee

2.1.2 Well Completion

The grout in the borehole was allowed to cure for a minimum of 24 hours before the concrete surface pad was installed. The well pad used for all wells was 3 feet by 3 feet by 6 inches deep. The finished pad was sloped so that drainage flows away from the protective casing. A steel tamper- and traffic-resistant flush mount protective vault was installed over the well casing. A vented lockable well cap was installed on all wells. The wells were locked with weather-resistant padlocks that were all keyed alike. Appendix B contains copies of all well completion logs.

2.1.3 Well Development

Monitoring wells with sufficient saturated thickness were developed using a decontaminated GrundFos Rediflo submersible pump. Wells were developed by overpumping with submersible pumps until the water was clear and free of suspended solids. Wells MW-41 and -46 had low saturated thickness and were developed using decontaminated Teflon bailers. MW-43 was not developed because it was dry. Table 2-1 presents a summary of the well construction including pertinent lithologic details. Appendix C contains copies of all well and sampling development logs.

2.1.4 Slug Testing

Slug tests (using the pneumatic method) were performed on 12 of 16 newly installed monitoring wells. A pneumatic slug testing method was chosen because of expected high values of hydraulic conductivity to be encountered within the Fluvial Aquifer (10^{-2} to 10^{-3} centimeters per second [cm/sec]). With manual slug insertion methods, high values of hydraulic conductivity result in rapid recovery of water levels that can lead to significant "noise" in the early time data and erroneous interpretation of the well recovery curve (see Appendix D). The pneumatic method essentially uses compressed air as the slugging agent. The well is sealed at the surface, and the air is injected into the well. The increased pressure head of air on the water column forces the water downward by a distance equivalent to the air pressure supplied. As the water level is forced downward, it escapes from the well via the screen and filter pack and enters the aquifer. After the water level has equilibrated in the well, the seal is released and the level of recovery is recorded using a pressure transducer. Figure 2-2 presents the configuration of the pneumatic slug testing device.

Four wells (MW-41, -42, -43, and -55) could not be tested because of water levels below the top of the screen. The pneumatic method requires that the water level be above the top of the screen so that compressed gases do not escape into the formation. In addition, the wetted length of the screen in these wells ranged between 3 and 5 feet. This thickness was not adequate to accommodate the pressure transducer and a standard solid slug required to perform the test.

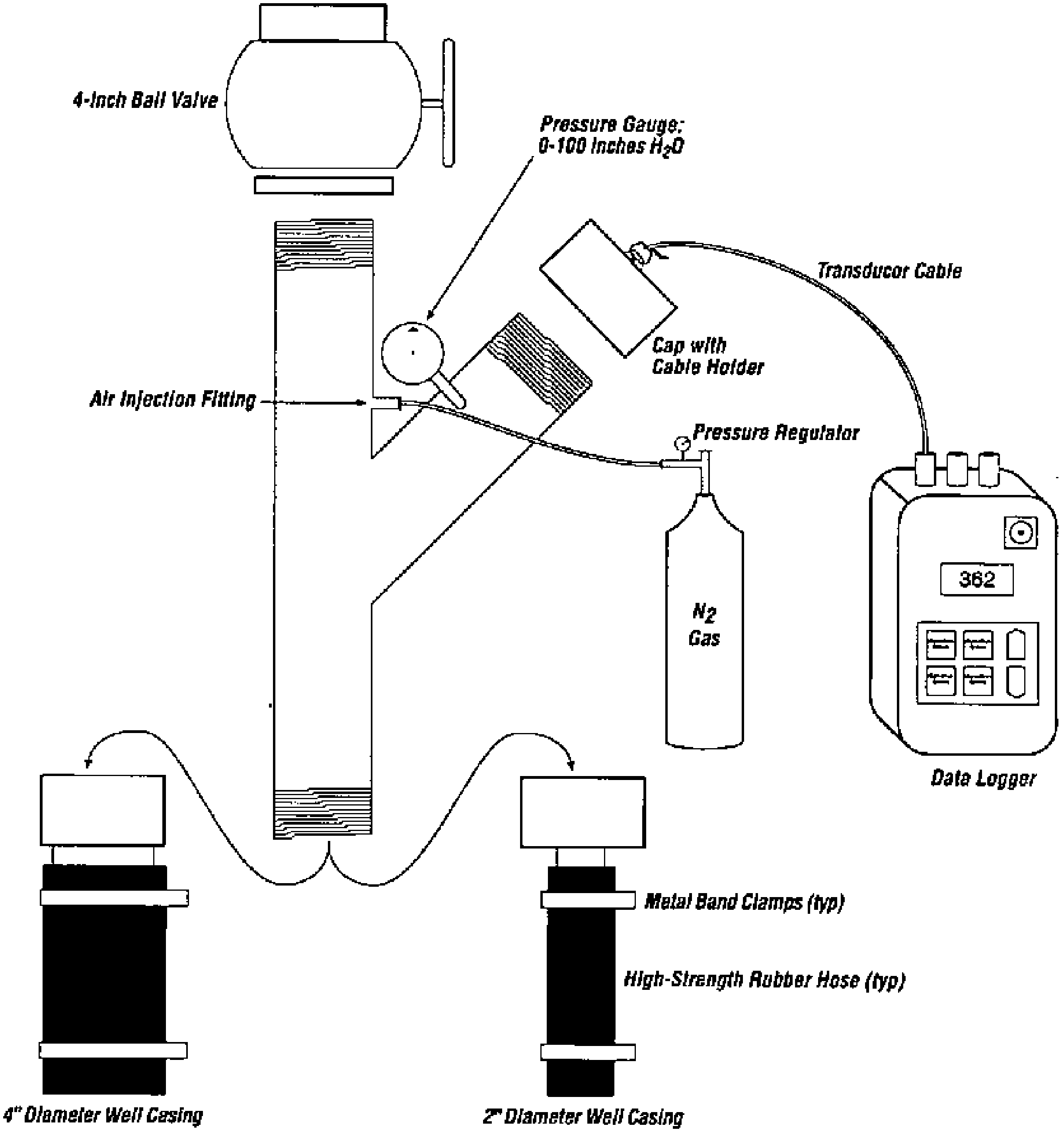
2.2 Soil Chemical Analysis

Soil samples were collected from the well boreholes in the northwest investigation area where surface soil contamination from potential non-DDMT offsite sources could be a factor in the extent of the groundwater plume. Soil samples from the northwest

Table 2-1
Well Construction Summary
DDMT Groundwater Characterization

Well No.	Drilling TD (ft bgs)	Well TD (ft bgs)	Depth to Clay (ft bgs)	Screened Interval (ft bgs)	Filter Pack Interval (ft bgs)
8	69	69	NA	65.5-66.5	55-69
9	85.5	82.5	NA	70-80	69-82.5
10	71	71	NA	59-69	55.5-71
11	85	85	NA	68-83	66-86
12	87	87	NA	69-84	67-87
13	83	83	NA	66-81	64-83
14	80	80	79.5	65-80	63-80
15	81	81	NA	63-78	58-81
16	75	75	75	58-83	48-75
17	95	95	94	78-92	71-95
18	140	140	NA	123-138	85-140
19	96	96	90	83-93	79-96
20	100.5	100.5	NA	83-98	80.5-100.5
21	109.5	109.5	NA	92-107	86-109.5
22	108	108	NA	95-105	93-107
23	114	114	NA	101-111	99-114
24	115	115	114.7	97-112	93.5-115
25	81	81	80.7	69-79	33-81
26	110	110	110	98-108	95.6-110
27	94	94	96	76-91	74-94
28	69	69	80	54-69	47-69
29	54	54	NA	34-54	22-54
30	59	59	66	39-59	30-59
31	79	79	76.3	64-79	51-79
32	68	68	66.5	53-68	44-68
33	60	60	60	45-60	39-60
34	157	157	158.3	137-157	81-157
35	90	90	90.5	70-90	57-90
36	209	209	90	192-207	94-29
37	183	183	70	166-181	91.5-183
38	155	155	98.5	140-155	89.5-155
39	116	116	NA	95.5-115.5	75-116
40	98.5	95	95	85-95	82-96
41	75	67	67	57-67	54-68
42	67.5	59	59	49-59	46-60
43	104	99	NA	89-99	85-100
44	85	74	78	64-74	61-75
45	75	68	70	58-68	54-69
46	77.5	72	73	62-72	59-73
47	125	120	120	110-120	107-121
48	105	94	94.5	84-94	81-95
49	92.5	90	90	80-90	77-91
50	136	124	125	114-124	111-125
51	70	65	64.5	55-65	52-66
52	105	104	104	94-104	90.5-105
53	85	82.5	83	72.5-82.5	68.5-82.5
54	101	94.5	95	84.5-94.5	81-95
55	85.5	74	75	64-74	61-75

Notes:
TD =
ft bgs = feet below ground surface
ft toc = feet below top of casing
NA = Not Applicable



NOT TO SCALE

Figure 2-2
Pneumatic Slug-Testing Wellhead Assembly
Defense Distribution Depot • Memphis, Tennessee

investigation area were taken near the base of the loess to evaluate whether potential surficial contaminant sources had leached at depth.

Soil samples were collected using a 10-foot core barrel during Rotasonic drilling. Soil samples were also taken in response to volatile organic compound (VOC) field-screening of the continuous Rotasonic core. Samples were collected by advancing the 4-inch I.D. core barrel ahead of the outer drill pipe to the desired depth. The soil core was extracted from the core barrel into a plastic sleeve. The soil sample was extracted directly from the core barrel using a decontaminated stainless-steel spoon. VOC samples were collected first and placed directly into the appropriate sampling containers. The remainder of the soil core sample was placed into decontaminated stainless-steel bowls and thoroughly mixed. Samples for semivolatile organic compounds (SVOCs), pesticides/PCBs, herbicides, and metals were collected from the homogenized soil and placed in the appropriate sampling jars.

2.3 Geotechnical Analysis

Soil samples were collected from groundwater well boreholes for geotechnical parameters (grain size, moisture, Atterberg limits, and triaxial permeability). Samples were collected for grain size and moisture content from the saturated zone of the Fluvial Aquifer. These samples were collected directly from the Rotasonic barrel using decontaminated stainless-steel spoons and placed in ziplock-type bags. The samples were then shipped to Christian, Carmichael and Associates, Inc., Montgomery, Alabama, for geotechnical analysis. In addition, geotechnical samples were collected from the Jackson/Claiborne confining units using Shelby tubes and analyzed for Atterberg limits, grain size, moisture, and triaxial permeability.

Once the desired drilling depth was reached, a decontaminated Shelby tube was placed on the inside of the core barrel. The Shelby tube was then lowered to the bottom of the borehole. Using the drilling rig, the Shelby tube was pushed into the undisturbed soil to its full length or to refusal. The tube was removed from the borehole and sealed at both ends with end caps and wax. Table 2-2 presents a summary of sample locations, intervals, and geotechnical analyses performed. Appendix E presents the laboratory data for the geotechnical analyses.

2.4 Surveying

Sixteen wells and two boreholes were surveyed by a CH2M HILL staff licensed professional surveyor. Control disk, top of casing, and ground surface elevations were based on North American Vertical Datum and tied to a National Geodetic Survey benchmark A-308 (1995). The horizontal coordinates of the control disk and well casing are based on the Tennessee State Plane System, North American Datum 83/93 and are tied to the Corps of Engineers monuments T1-1E (1975), T1-1G (1975), and T1-1H (1975), all located within the DDMT boundary. A drawing showing new well locations and survey coordinates along with copies of field notes and survey calculations are included in Appendix F, Figure F-1.

Table 2-2
Geotechnical Samples
DDMT Groundwater Characterization

Well No.	Old No.[a]	Time	Depth	Analysis	HNu (ppm)
MW41	K	1530	65 - 67	grain size, Atterberg, moisture content	0
MW42	N	1520	57 - 59	grain size, moisture content	2 & 4
MW43	L	1635	100 - 102	grain size, moisture content	4 to 7
MW44	M	1425	77	grain size, moisture content	0
MW45	C	1255	68 - 70	grain size, moisture content	0
MW46	B	1515	71 - 73	Alkalinity	1
MW47	H	1505	117.5 - 118.5	grain size, moisture content	0
MW48	I	1610	93.5 - 94.5	grain size, moisture content	0
MW49	D	1605	88 - 90	Alkalinity	0
MW50	F	1830	120 - 125	grain size, moisture content	0
MW51	A	1600	55 - 60	grain size, moisture content	0
MW52	G	1530	102 - 104	grain size, moisture content	0
MW53	E	1005	82 - 83	grain size, moisture content	0
MW54	J	1545	93 - 95	grain size, moisture content	0
MW55	U	1315	73 - 74	grain size, moisture content	0

[a] Old Well ID refers to the original well identification proposed in the OU-4 FSP.

Notes:

All samples were collected from the well screen interval within the saturated zone of the Fluvial Aquifer.

ppm = parts per million

2.5 Groundwater Sampling

Groundwater samples were collected in accordance with EPA Region IV Standard Operating Procedures (SOPs) and *DDMT Project Instructions* (CH2M HILL, 1995).

In general, wells were purged using a decontaminated GrundFos submersible pump or a decontaminated disposable Teflon bailer for 3 to 5 well volumes or until the field parameters (i.e., pH, temperature, conductivity) stabilized. If a submersible pump was used to purge the well, samples for parameters other than VOCs were first collected directly through the pump discharge tubing. The pump was then shut off and removed from the well. The well was allowed to recover for a minimum of 5 minutes, then a decontaminated disposable Teflon bailer was lowered into the well to collect a sample for VOCs.

For wells purged using disposable Teflon bailers, samples for VOCs were first collected after purging followed by other well-specific parameters. Appendix C contains copies of all the monitoring well purge and sampling logs.

Fifty monitoring wells were sampled for various parameters during the groundwater investigation. Table 2-3 presents a summary of wells sampled, parameters analyzed, and field parameters and purge information. Field parameters were taken during well purging using a Horiba U-10 for the following parameters: pH, temperature, conductivity, dissolved oxygen (DO), turbidity, and salinity.

Thirty-seven of the 50 monitoring wells were purged and sampled (for parameters other than VOCs) using GrundFos submersible pumps. All VOCs were collected using decontaminated disposable Teflon bailers. Thirteen monitoring wells (MW-2, -4, -5, -9, -12, -14, -15, -19, -32, -41, -42, -45, and -55) were purged and sampled using decontaminated disposable Teflon bailers because of low-well volume or mechanical pump problems. Two wells (MW-12 and -35) were sampled in Level C protocol. Prior to sampling, wellhead readings using an HNu were taken on adjacent wells MW-12 and MW-35. Wellhead readings were 350 parts per million (ppm) and 410 ppm, respectively, with 3 ppm within the breathing zone. The HNus were recalibrated to check for equipment error; similar readings were obtained at the wellhead. After discussion with project managers from CH2M HILL and CEHND, the decision was made to sample wells MW-12 and MW-35 in Level C using full-face respirators and volatile organic air purifying cartridges. An exclusion zone was set up around the wells, and two members of the sampling team conducted the sampling in Level C protocol under the direct guidance of the Site Safety Coordinator.

Table 2-3
Groundwater Sample Summary
DDMT Groundwater Characterization

Page 1 of 2

Well No.	Old No.	Date	Sample No.	Analysis	QA/QC Samples	Well Volume (gal)	Dev Volume (gal)	No. of Well Volumes Dev	Purged Volume (gal)	No. of Well Volumes Purged	pH	Conductivity (ms-cm)	Temp (c)	DO (mg/L)	Turbidity NTU	Hydraulic Conductivity (cm/sec)	Comments
40	O	15-Jan	MW40011596	VOC, PPM	Dup, MS/MSD	2.1	14	6.67	6.3	3.00	6.17	0.726	19.8	8.71	6	5.4 E -4	COE and TDEC split
41	K	17-Jan	MW41011796	VOC		0.15	0.25	1.67	0.25	1.67						NA	VOCs only: slow producer; not enough water for parameters
42	N	19-Jan	MW42011996	VOC, PPM		0.7	4.25	6.07	0.6	0.86	6.65	0.303	17.1	10.17	>scale	NA	Purged dry
43	L															NA	Dry - no sample available
44	M	19-Jan	MW44011996	VOC, PPM		3.41	100	29.33	18	5.28	6.42	0.346	15.8	7.66	117	4.9 E -3	
45	C	8-Feb	MW451	VOC, SVOC, TAL, Pest/PCB, Herb		2.01	50	24.88	8	3.98	6.14	0.378	18.00	9.67	138	2.2 E -2	
46	B	9-Feb	MW461	VOC, SVOC, TAL, Pest/PCB, Herb		2.8	72.4	25.86	10	3.57	6.05	0.266	17.5	8.35	10	3.8 E -3	
47	H	9-Feb	MW471	VOC, SVOC, TAL, Pest/PCB, Herb	MS/MSD	3.1	102	32.90	15	4.84	6.38	0.344	20.4	9.58	10	7.7 E -3	
48	I	8-Feb	MW481	VOC, SVOC, TAL, Pest/PCB, Herb		2.3	15	6.52	12	5.22	6.32	0.257	19.2	8.26	10	2.3 E -2	
49	D	9-Feb	MW491	VOC, SVOC, TAL, Pest/PCB, Herb		3.1	106	34.19	14	4.52	5.90	0.222	18.9	8.92	10	5.3 E -3	
50	F	11-Feb	MW501	VOC, SVOC, TAL, Pest/PCB, Herb		6.2	123	19.84	21	3.39	6.01	0.796	18.4	NA	10	1.6 E -3	DO meter down
51	A	8-Feb	MW511	VOC, SVOC, TAL, Pest/PCB, Herb	Duplicate	4.3	55.06	12.80	18	4.19	6.05	0.287	17.7	8.63	10	5.3 E -3	
52	G	11-Feb	MW521	VOC, SVOC, TAL, Pest/PCB, Herb		3.7	100	27.03	15	4.05	6.16	0.795	17.3	NA	10	5.9 E -3	DO meter down
53	E	13-Feb	MW531	VOC, SVOC, TAL, Pest/PCB, Herb	MS/MSD	1.5	100	66.67	7.5	5.00	5.81	0.364	18.1	8.75	33	1.0 E -2	
54	J	13-Feb	MW541	VOC, SVOC, TAL, Pest/PCB, Herb	Duplicate	3	100	33.33	15	5.00	6.12	0.225	17.3	10.38	9	3.0 E -3	
55	U	14-Feb	MW551	VOC, PPM		0.5	43	86.00	1.5	3.00	5.54	0.226	17.00	10.91	>100	NA	TDEC split
2	NA	12-Feb	MW021	VOC, PPM, AI		0.49	NA	NA	1.5	3.06	5.91	0.288	12.6	NA	>scale		DO meter down
3	NA	13-Feb	MW31	VOC, PPM, FS, AI		1.66	NA	NA	13.5	8.13	6.09	0.342	17.8	8.10	10		
4	NA	12-Feb	MW041	VOC, PPM, AI		1.08	NA	NA	3	2.78	6.07	0.188	14.5	NA	>scale		TDEC split; DO meter down
5	NA	12-Feb	MW051	VOC, SVOC, TAL, Pest/PCB, Herb, Iodine, pH		0.37	NA	NA	1.5	4.05	6.80	0.411	14.8	NA	>scale		COE split (excluding iodine & pH); DO meter down
6	NA	12-Feb	MW61	VOC, SVOC, PPM, FS, AI		1.61	NA	NA	10	6.21	5.69	0.886	17.6	7.95	148		
7	NA	12-Feb	MW71	VOC, SVOC, TAL, Pest/PCB, Herb		1.3	NA	NA	9.5	7.31	6.12	0.282	16.5	7.17	101		TDEC split
8	NA	13-Feb	MW081	VOC, PPM, FS, AI		1.04	NA	NA	7	6.73	5.94	0.286	17.1	NA	251	4.5 E -3	DO meter down
9	NA	11-Feb	MW91	VOC, PPM, AI		0.94	NA	NA	4	4.26	6.12	0.274	16.00	9.05	>scale	1.0 E -2	
10	NA	13-Feb	MW101	VOC, SVOC, Pest/PCB, Herb, TAL		1.32	NA	NA	12	9.09	6.08	0.333	16.9	8.84	10	1.5 E -2	
11	NA	12-Feb	MW111	VOC, PPM, AI, pH, Iodine		1.5	NA	NA	7.5	5.00	5.63	0.204	16.2	7.11	80	1.5 E -2	COE split
12	NA	13-Feb	MW121	VOC, PPM, AI		1.7	NA	NA	8	4.71	6.06	0.188	16.1	8.11	>scale	4.4 E -5	Level C sampling
13	NA	12-Feb	MW131	VOC, SVOC, PPM, FS, AI		1.62	NA	NA	9	5.56	6.02	0.213	16.5	7.32	143	5.5 E -3	
14	NA	11-Feb	MW141	VOC, SVOC, Pest/PCB, Herb, TAL, FS		0.86	NA	NA	4	4.65	6.03	0.221	16.2	7.86	>scale	7.9 E -3	
15	NA	7-Feb	MW151	VOC, TAL, AI		2.3	NA	NA	6.8	2.96	6.23	0.166	15.8	8.62	>scale	1.0 E -2	
16	NA	13-Feb	MW161	VOC, SVOC, TAL, Pest/PCB, Herb		2.55	NA	NA	9	3.53	6.58	0.630	17.4	NA	757	6.4 E -5	DO meter down
17	NA															3.2 E -3	Dry - no sample available
18	NA																Dry - no sample available
19	NA	7-Feb	MW191	VOC, SVOC, Pest/PCB, Herb, TAL		1.1	NA	NA	3.1	2.82	5.92	0.201	15.8	7.86	>scale	6.7 E -5	2 events
20	NA	7-Feb	MW201	VOC, SVOC, Pest/PCB, Herb, TAL		2.2	NA	NA	6.6	3.00	6.24	0.322	15.6	7.89	9	5.7 E -3	2 events

Table 2-3
Groundwater Sample Summary
DDMT Groundwater Characterization

Page 2 of 2

Well No.	Old No.	Date	Sample No.	Analysis	QA/QC Samples	Well Volume (gal)	Dev Volume (gal)	No. of Well Volumes Dev	Purged Volume (gal)	No. of Well Volumes Purged	pH	Conductivity (ms-cm)	Temp (c)	DO (mg/L)	Turbidity NTU	Hydraulic Conductivity (cm/sec)	Comments
21	NA	10-Feb	MW211	VOC, SVOC, Pest/PCB, Herb, TAL		2.12	NA	NA	13	6.13	6.00	0.188	19.00	NA	0	1.7 E -2	DO meter down
22	NA	10-Feb	MW221	VOC, SVOC, Pest/PCB, Herb, TAL		1.75	NA	NA	11	6.29	6.36	0.436	18.7	8.59	107	9.4 E -3	
23	NA	10-Feb	MW231	VOC, SVOC, Pest/PCB, Herb, TAL		2.15	NA	NA	21	9.77	6.70	0.296	19.6	NA	122	2.2 E -2	DO meter down
24	NA	10-Feb	MW241	VOC, SVOC, Pest/PCB, Herb, TAL	duplicate	1.15	NA	NA	22	19.13	6.26	0.181	19.9	NA	131	2.5 E -2	DO meter down
25	NA	9-Feb	MW251	VOC, SVOC, Pest/PCB, Herb, TAL		1.12	NA	NA	11	9.82	5.70	0.245	19.5	8.78	83	2.9 E -3	
25A	NA																Plugged; no sample available
26	NA	8-Feb	MW261	VOC, SVOC, Pest/PCB, Herb, TAL		1.7	NA	NA	10.2	6.00	5.59	0.358	19.2	8.14	>100	2.7 E -3	
28	NA	7-Feb	MW281	VOC, SVOC, Pest/PCB, Herb, TAL		1.5	NA	NA	7.5	5.00	5.87	0.184	16.00	8.04	>scale	1.0 E -2	2 events
29	NA	12-Feb	MW291	VOC, PPM, Al		2.3	NA	NA	13	5.65	6.18	0.400	17.3	8.97	40	1.1 E -3	TDEC split
30	NA	7-Feb	MW321	VOC, SVOC, Pest/PCB, Herb, TAL		2.4	NA	NA	27	11.25	6.65	0.276	17.5	8.03	35	2.8 E -4	2 events
31	NA	12-Feb	MW311	VOC, SVOC, PPM, Al	duplicate	2.6	NA	NA	13	5.00	5.62	0.279	15.1	6.12	>100	8.5 E -5	
32	NA	6-Feb	MW321	VOC, PPM, Al, FS, WQ		1.25	NA	NA	4	3.20	5.47	0.560	14.7	8.43	94	4.3 E -3	
33	NA	8-Feb	MW331	VOC, PPM, Al		1.59	NA	NA	30	18.87	5.62	0.180	18.7	11.57	36	1.5 E -3	VOCs pulled on 3/8/96
34	NA	9-Feb	MW341	VOC, SVOC, Pest/PCB, Herb, TAL FS		3.38	NA	NA	10.5	3.11	5.48	0.110	19.1	10.13	79	1.3 E -3	
35	NA	13-Feb	MW351	VOC, SVOC, Pest/PCB, Herb, TAL		2.6	NA	NA	12	4.62	6.06	0.204	17.6	NA	126	4.6 E -3	Level C; DO meter down
36	NA	9-Feb	MW361	PPM, FS, Al		7.77	NA	NA	24	3.09	6.70	0.316	23.2	NA	48	1.4 E -4	DO meter down
37	NA	9-Feb	MW371	PPM, Al, WQ		7.54	NA	NA	24	3.18	6.84	0.353	20.4	NA	251	7.1 E -5	DO meter down
38	NA	11-Feb	MW381	VOC, SVOC, Pest/PCB, Herb, TAL FS		3.1	NA	NA	14	4.52	6.45	0.263	21.8	NA	10	7.0 E -5	DO meter down
39	NA	10-Feb	MW391	VOC, SVOC, Pest/PCB, Herb, TAL		2.2	NA	NA	3.3	1.50	5.90	0.265	17.8	8.53	>100	9.4 E -5	Purged well dry twice

Notes:
Blank cells indicate no data available.
Dev = Development
QA/QC = Quality Assurance/Quality Control
gal = gallon
ms-cm = milliSiemens per centimeter
cm/sec = centimeter/second
VOC = volatile organic compound
PPM = parts per million
COE = U.S. Army Corps of Engineers
TDEC = Tennessee Department of Environmental Conservation
SVOC = semivolatile organic compound
TAL = Toxic Analyte List
Pest/PCB = Pesticides/PCBs
Herb = herbicides
MS/MSD = matrix spike/matrix spike duplicate
DO = dissolved oxygen
FS = TOC, Sulfate, Nitrate/Nitrite, Chloride (Cl), NH_4 and Iron (Fe)
Al = aluminum
WQ = HCO_3, SO_4, Chloride (Cl), Floride (Fl), NO_3, TDS, Hardness, and Tritium (H_3)

Section 3

Sampling Results

256 32

3.0 Sampling Results

3.1 Hydraulic Conductivity

Hydraulic conductivities were calculated from the slug test data using the Bouwer-Rice solution encoded in the AQTESOLV aquifer test software (Duffield, 1995). The Bower-Rice solution is applicable to unconfined aquifers with full or partially penetrating well screens (Kruseman and de Ridder, 1990). Hydraulic conductivity values measured from wells installed in February 1996 ranged from a high of 2.3×10^{-2} cm/sec (MW-48) to a low of 5.4×10^{-4} cm/sec (MW-40) with a mean value of 7.8×10^{-3} cm/sec for all 12 wells tested. Water levels within the slug tested wells recovered in less than 1 minute for most of the wells tested with the exception of MW-40 and -50, which recovered within 5 minutes each. Overall, there is order-of-magnitude agreement between hydraulic conductivities estimated by the grain size distribution (see Table 3-1) and those measured by slug testing. An exception is at MW-50 which has 44 percent gravel in the Fluvial Aquifer and one of the lowest hydraulic conductivities. Values from existing wells MW-25 and MW-26, west of MW-50, are also low.

Fluvial Aquifer hydraulic conductivities from previous investigations (Law, 1990) together with those measured in February 1996, are shown in tabular and graphical formats in Figure 3-1. The combined data show two areas of relatively elevated hydraulic conductivity: (1) Dunn Field and adjoining eastern area and (2) the southwest portion of the main installation. Both areas correspond to gently dipping surfaces in the confining unit clay discussed in Section 3.4.

3.2 Geotechnical Analysis

Results from the geotechnical analysis for the Upper Claiborne/Jackson Confining Unit indicate that the formation is a very tight clay with vertical hydraulic conductivities ranging from 2.5×10^{-7} cm/sec to 2.4×10^{-8} cm/sec. U.S. Geological Survey (USGS) classification indicates that the confining unit is a "CL," a low-plasticity clay unit with porosities ranging from 39.8 to 44.2 percent. The results also indicate that the clay confining unit is composed mostly of silts and clays (68.9 to 97.4 percent) and a lesser amount of fine sands (2.6 to 31.1 percent).

On the basis of these geotechnical results, the Fluvial Aquifer is composed mostly of medium-grained sand-sized particles with some silt and gravels. Percent total sand varies from 52.4 to 97.4 percent. Slug test results conducted on all Fluvial Aquifer wells yielded values ranging from a high of 1.0×10^{-2} cm/sec to a low of 7.7×10^{-3} cm/sec. These results are consistent with published values for clean to silty sands (Freeze and Cherry, 1979; p. 29). Table 3-1 summarizes the geotechnical analyses performed.

Table 3-1
Geotechnical Sample Summary
DDMT Groundwater Characterization

Grain Size and Moisture Content Samples:

Well	Sample Interval (ft bgs)	Water Content (%)	D_{10}	Cu	Cc	Media Classification	% Gravel	Total % Sands	% Coarse Grained Sands	% Medium Grained Sands	% Fine Grained Sands	% Silts and Clays	Estimated K (cm/sec)*	Slug Test K (cm/sec)	Description of Materials
MW41	65 - 67	18.8	0.26	1.9	0.93	Uniform	7	91.3	7	70	14.3	1.7	6.4×10^{-2}	na	Tan Med. Sand w/ Gravel
MW42	57 - 59	14.4	na	na	na	na	12	71.6	9	38	24.6	16.4	na	na	Tan Silty Sand w/ Gravel
MW43	100 - 102	9.3	na	na	na	na	1	83.6	3	52	28.6	15.4	na	na	Tan Silty Sand
MW44	76 - 77	16.6	0.21	2.5	1.3	Uniform	10	84.9	3	71	10.9	5.1	4.1×10^{2}	4.8×10^{-3}	Tan Med. Sand w/ Gravel
MW45	68 - 70	18	0.2	2.8	1.05	Uniform	17	78.9	7	55	16.9	4.1	3.7×10^{-2}	2.2×10^{2}	Tan Med. Sand w/ Gravel
MW46	71 - 73	18.8	0.18	2.9	1.5	Uniform	3	89.2	4	76	9.2	7.8	3.0×10^{-2}	3.8×10^{-3}	Tan Med. Sand w/ Silt
MW47	117.5 - 118.5	19.9	0.18	2	1.11	Uniform	0	92.6	0	60	32.6	7.4	3.0×10^{2}	7.7×10^{-3}	Tan Med. Sand w/ Silt
MW48	93.5 - 94.5	13	0.26	2.5	1.12	Uniform	13	83.2	10	65	8.2	3.8	6.3×10^{-2}	2.3×10^{-2}	Tan Silty Sand w/ Gravel
MW49	88 - 90	14.1	0.15	2.7	1.42	Uniform	4	89.9	2	63	24.9	6.1	2.1×10^{-2}	5.3×10^{-3}	Tan Med. Sand w/ Silt
MW50	120 - 125	8.3	0.33	16.5	1.99	Well Graded	44	52.4	33	14	5.4	3.6	1.0×10^{-1}	1.6×10^{-3}	Tan Med. Sand and Gravel
MW51	55 - 60	13.8	0.07	9.2	2.63	Well Graded	15	74	9	50	15	11	4.6×10^{-3}	5.3×10^{-3}	Tan Med. Sand w/ Silt & Gravel
MW52	102 - 104	20.4	0.19	2.4	1.3	Uniform	0	97.4	0	81	16.4	2.6	3.4×10^{-2}	5.9×10^{-3}	Tan Med. Sand
MW53	82 - 83	14.3	0.42	6.3	0.74	Well Graded	26	69.9	34	33	2.9	4.1	1.6×10^{-1}	1.0×10^{-2}	Tan Med. Sand w/ Gravel
MW54	93 - 95	18.6	0.19	2.1	1.15	Uniform	0	96.8	1	69	26.8	3.2	3.4×10^{2}	3.0×10^{-3}	Tan Med. Sand
MW55	73 - 74	9.8	0.15	15.7	0.3	Well Graded	31	63.2	12	31	20.2	5.8	2.1×10^{-2}	na	Tan Med. Sand and Gravel

Shelby Tubes and Atterberg Limits:

Well	Sample Interval (ft bgs)	Water Content (%)	Wet Unit Wt. (pcf)	Dry Unit Wt. (pcf)	Void Ratio	Triax. Perm. Test K Value (cm/sec)	Porosity	% Silts and Clays	% Fine Grained Sands	% Med. Grained Sands	LL	PL	PI	USCS	Description of Materials
MW40	98 - 99.5	20.8	120.4	99.7	0.68	2.4×10^{-8}	0.398	78.6	21.4	0	35	19	16	CL	Gray Clay with Sand
MW41	65 - 67	18.8	na	na	na	na	na	1.7	14.3	70	14	16	na	SW	Tan Med. Sand w/ Gravel
MW42	65 - 67.5	28.7	117.4	92.8	0.793	2.0×10^{-4}	0.442	94.6	5.4	0	47	27	20	CL/ML	Gray Clay
MW49	90 - 92.5	20.4	124.6	103.5	0.652	1.2×10^{-8}	0.395	82.4	17.6	0	41	25	16	CL	Gray Clay with Sand
MW54	100 - 101	27.7	123.8	97	0.79	1.6×10^{-8}	0.441	97.4	2.6	0	46	25	21	CL	Gray Clay
MW55	83 - 85.5	22.8	117.5	95.7	0.716	2.5×10^{-7}	0.417	68.9	31.1	0	na	na	na	na	Tan and Gray Sandy Clay

* K values estimated from grain size curves: $K = 2(100 \times D_{10})^2$ in gpd/ft^2

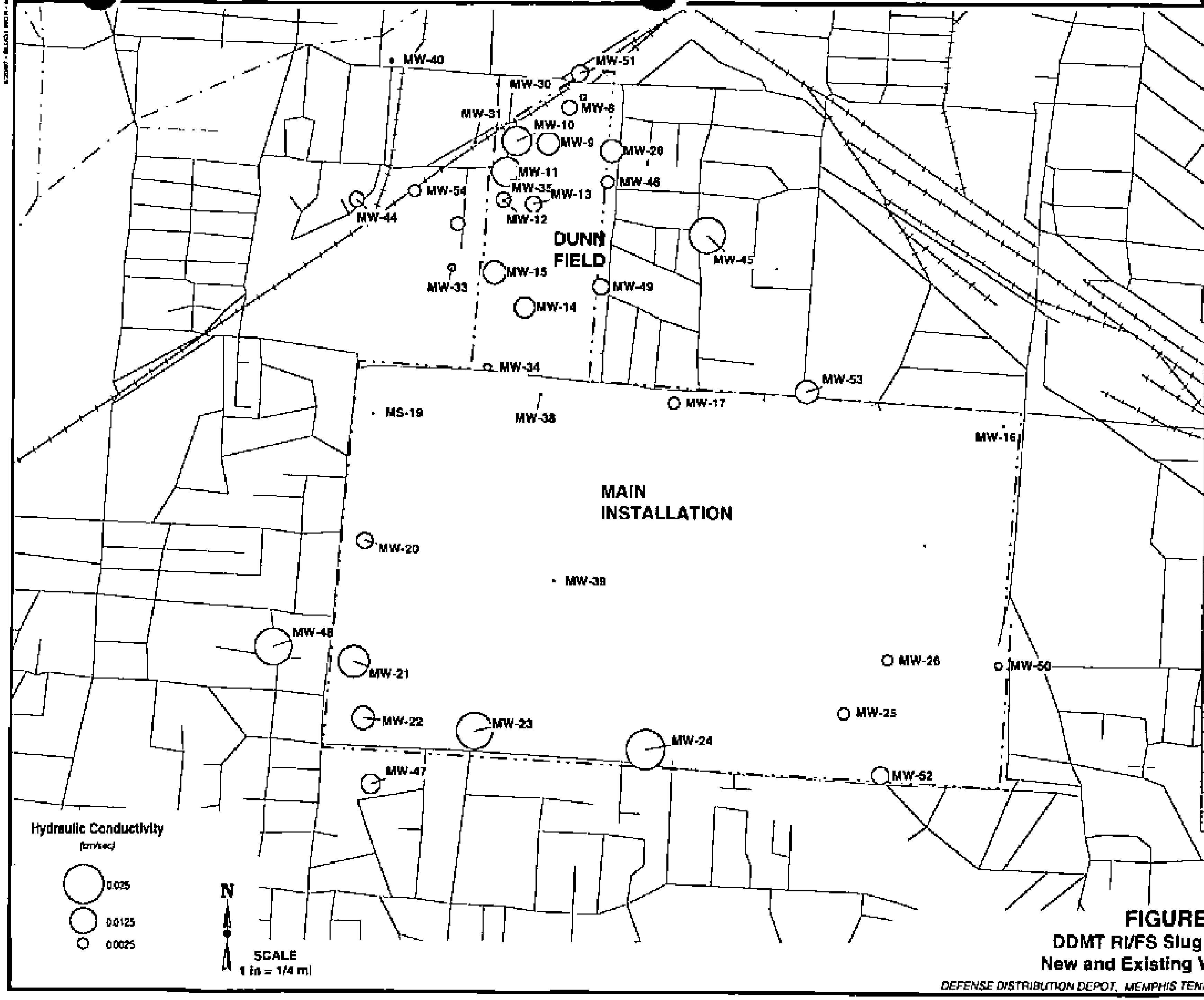
Notes:

The sample from MW41 was a bag sample of material collected at the contact of the Fluvial Aquifer and the confining layer.

The Shelby Tube collected at MW46 (well B) contained only 1 in. of clay material; therefore, the sample was not analyzed for geotechnical parameters.

D_{10} = Effective Particle Size from Grain Size Distribution
Cu = Uniformity Coefficient
Cc = Coefficient of Curvature
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
USCS = Unified Soil Classification System

Gravel = particles > 4.75 mm
Coarse Grained Sand = particles < 4.75 mm and > 2.0 mm
Medium Grained Sand = particles < 2.0 mm and > 0.425 mm
Fine Grained Sand = particles < 0.425 mm and > 0.075 mm
Silts and Clays = particles < 0.075 mm
PI >4 = clay, <4 = silt
LL <20 are considered cohesionless materials



Well ID	K-cm/sec
MW-8	4.5 E-3
MW-9	1.0 E-2
MW-10	1.5 E-2
MW-11	1.5 E-2
MW-12	4.4 E-3
MW-13	5.5 E-3
MW-14	7.9 E-3
MW-15	1.0 E-3
MW-16	6.4 E-5
MW-17	3.2 E-3
MS-19	6.7 E-5
MW-20	5.7 E-3
MW-21	1.7 E-2
MW-22	9.4 E-3
MW-23	2.2 E-2
MW-24	2.5 E-2
MW-25	2.9 E-3
MW-26	2.7 E-3
MW-28	1.0 E-2
MW-29	1.1 E-3
MW-30	2.8 E-4
MW-31	8.5 E-5
MW-32	4.3 E-3
MW-33	1.5 E-3
MW-34	1.3 E-3
MW-35	4.6 E-3
MW-38	7.0 E-5
MW-39	9.4 E-5
MW-40	5.4 E-4
MW-44	4.9 E-3
MW-45	3.3 E-2
MW-46	3.8 E-3
MW-47	7.7 E-3
MW-48	2.3 E-2
MW-49	5.3 E-3
MW-50	1.6 E-3
MW-51	5.3 E-3
MW-52	5.9 E-3
MW-53	1.0 E-2
MW-54	3.0 E-3

FIGURE 3-1
DDMT RI/FS Slug Test
New and Existing Wells
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

CH2MHILL

3.3 Soil Results

Table 3-2 summarizes the boreholes sampled, sample intervals, HNu detections, and analyses performed. Soil contaminant detections are presented in Table 3-3. The 74- to 75-foot below ground surface soil interval from test boring STB-12 had detections of fluoranthene, pyrene, and dieldrin; however, a groundwater sample was not obtained from this boring. The soil sample from the 29- to 30-foot below ground surface interval at well boring MW-43 contained an estimated 4,4'-dichlorodiphenyltrichloroethane (4,4'- DDT) detection of 4.2 micrograms per kilogram (µg/kg). 4,4'-DDT was not detected in the groundwater sample from well MW-43. Detection of these compounds at this depth is anomalous, since they are relatively immobile and were not detected in the underlying groundwater. The 4,4-DDT at MW-43 was associated with a 7 ppm HNu detection, but no volatile compounds were detected in soil.

3.4 Fluvial Aquifer Configuration

As discussed in Section 1.3, the unconfined Fluvial Aquifer is bounded below by the high-plasticity clay of the Jackson Formation/Upper Claiborne Group and above by the water table. Top of clay measurements were made on newly installed wells MW-40 through MW-55 and test boring STB-12, in accordance with the lithologic characterization of the continuous Rotasonic cores. Groundwater levels from all DDMT wells were measured on February 14, 1996. Top of clay and groundwater table elevations for all wells are summarized in Table 3-4.

Figure 3-2 shows a contour map of the top of the Jackson Formation/Upper Claiborne Group (base of the Fluvial Aquifer) based on top of clay elevations obtained from all DDMT wells. The highly variable nature of the clay surface is interpreted to be due to post-Eocene erosion and is not atypical relative to that observed at the Allen Wellfield, approximately 2 miles west of Dunn Field (*DDMT Generic RI/FS Work Plan*, Figure 2-17). The clay generally slopes to the south and northwest from an elevated level east of Dunn Field (about 235 feet msl); however, the surface is complicated west of Dunn Field by a prominent depression that begins near well MW-38 and extends to the northwest. The lowest portion of this feature was observed at MW-34 at an elevation of 142 feet msl. The break in slope demarcating the rim of this channel begins at an elevation of approximately 200 feet msl. STB-13 was continuously cored and logged to a depth of 120 feet (171.75 feet msl) without encountering the base of the Fluvial Aquifer, thus confirming that it is depressed at MW-34.

The specific orientation of the feature has not been established because there is only partial well control at MW-43. As discussed in Section 2.1, MW-43 was not drilled to the top of clay, but nonetheless the clay was not encountered above an elevation of 180 feet msl, indicating that it is depressed here. The clay surface is also low at MW-54 (199 feet msl) and at MW-44 (190 feet msl), indicating the presence of a northeast-southwest trending depression in the clay, although not as deep as the one intersecting MW-34 and MW-38.

Another high in the clay surface occurs between MW-55 and MW-41. The clay slopes steeply to the north toward the channel and at a more gradual gradient to the south. Although there is not much well control in the center of the main installation, well data from the main installation perimeter indicate that the clay slopes to the south and

Table 3-2
Soil Sampling Summary
DDMT Groundwater Characterization

Sample No.	Date	Location ID	Old No.	Depth (ft bgs)	HNu (ppm)	Analysis	QA/QC
SBSTB1202	9-Jan	STB-12	NA	0 - 2	0	VOC, SVOC, Pest/PCB, Herb, Metals	Dup, Split, RS001
SBSTB1275	9-Jan	STB-12	NA	74 - 75	0	VOC, SVOC, Pest/PCB, Herb, Metals	MS/MSD, Level 3
SBMW4223	13-Jan	MW42	N	23 - 24	0	VOC, SVOC, Pest/PCB, Herb, Metals	
SBMW4329	14-Jan	MW43	L	29 -30	7	VOC, SVOC, Pest/PCB, Herb, Metals	
SBMW4419	15-Jan	MW44	M	18 - 20	2	VOC, SVOC, Pest/PCB, Herb, Metals	
SBMW5119	28-Jan	MW51	A	19 - 20	0	VOC, SVOC, Pest/PCB, Herb, Metals	RS004
SBMW5477	9-Feb	MW54	J	76 - 77	0	VOC, SVOC, Pest/PCB, Herb, Metals	
SBMW5533	10-Feb	MW55	U	32 - 34	0	VOC, SVOC, Pest/PCB, Herb, Metals	

Notes:

NA = not applicable

Dup = duplicate sample

Split = Army Corp of Engineers split sample

RS = equipment rinseate sample

ORO113630.12.20/006.XLS

Table 3-3
SVOC Pesticide Results in Soil
DDMT Groundwater Characterization

Well No.	Sample No.	Depth (ft - bgs)	Parameter	Concentration (ug/kg)
STB12	SBSTB1202	74-75	Fluoranthene	54 J
STB12	SBSTB1202	74-75	Pyrene	53 J
STB12	SBSTB1202	74-75	Dieldrin	8
43	SBMW4329	29-30	4,4'-DDT	4.2 J

Note:

ft - bgs = feet below ground surface

ORO113630.12.20/008.XLS

Table 3-4
Water Level and Top of Confining Unit Elevations
DDMT Groundwater Characterization

Well / Boring No.	Old No.	DTW (ft below TOC)	Estimated Depth to Top of Confining Layer (ft)	Ground Surface Elevation	TOC Elevation	GW Elevation	Top of Confining Layer Elevation	Comments
2	NA	Dry	NA	NA	NA	NA	NA	
3	NA	64.59	NA	NA	NA	NA	NA	
4	NA	72.23	NA	NA	NA	NA	NA	
5	NA	76.71	NA	NA	NA	NA	NA	
6	NA	60.10	NA	NA	NA	NA	NA	
7	NA	68.01	NA	NA	NA	NA	NA	
8	NA	60.94	NA	292.74	NA	231.80	NA	
9	NA	73.98	NA	304.66	NA	230.68	NA	Replaced cap
10	NA	60.21	NA	288.96	NA	228.75	NA	
11	NA	71.60	NA	299.59	NA	227.99	NA	
12	NA	73.14	NA	301.40	NA	228.26	NA	Replaced cap
13	NA	70.25	NA	299.95	NA	229.70	NA	
14	NA	72.98	79.50	302.44	NA	229.46	222.94	Replaced cap
15	NA	65.88	NA	295.23	NA	229.25	NA	
16	NA	58.08	75.00	300.19	NA	242.11	225.19	
17	NA	dry	94.00	316.18	NA	NA	222.18	Dry well
18	NA	135.32	NA	308.25	NA	172.93	NA	Replaced cap, needs new TOC
19	NA	87.22	90.00	290.86	NA	203.64	200.86	
20	NA	84.12	NA	285.19	NA	201.07	NA	
21	NA	93.09	NA	295.11	NA	202.02	NA	
22	NA	95.82	NA	298.06	NA	202.14	NA	
23	NA	98.29	NA	299.04	NA	200.75	NA	
24	NA	106.34	114.70	299.57	NA	193.23	184.87	
25	NA	72.34	80.70	270.31	NA	197.97	189.61	
26	NA	99.99	110.00	303.68	NA	203.69	193.68	
27	NA	Dry	96.00	304.19	NA	NA	208.19	
28	NA	59.29	80.00	294.89	NA	235.60	214.89	Replaced cap
29	NA	39.28	NA	273.35	NA	234.09	NA	Replaced cap
30	NA	45.57	66.00	273.93	NA	228.36	207.93	
31	NA	66.03	76.30	287.38	NA	221.35	211.08	
32	NA	60.20	66.50	285.42	NA	225.22	218.92	
33	NA	48.98	60.00	277.52	NA	228.54	217.52	
34	NA	140.58	158.30	300.78	NA	160.20	142.48	
35	NA	72.32	90.50	301.65	NA	229.33	211.15	
36	NA	158.10	90.00	311.15	NA	153.05	221.15	
37	NA	132.61	70.00	285.45	NA	152.84	215.45	
38	NA	134.08	155.00	308.36	NA	174.28	153.38	
39	NA	101.65	NA	296.42	NA	194.77	NA	
40	O	81.47	95.00	262.40	262.25	180.78	167.40	
41	K	65.64	67.00	283.80	283.81	218.17	216.90	
42	N	56.02	59.00	275.10	274.87	218.85	216.10	
43	L	Dry	NA	285.50	285.23	NA	NA	Probe tip was wet
44	M	51.03	78.00	269.40	269.07	218.04	191.40	
45	C	55.31	70.00	293.10	292.81	237.50	223.10	
46	B	53.36	73.00	287.90	287.58	234.20	214.90	
47	H	101.75	120.00	306.70	306.39	204.64	186.70	
48	I	78.82	94.50	284.70	284.49	205.67	190.20	
49	D	78.10	90.00	310.70	310.49	232.39	220.70	
50	F	85.53	125.00	299.30	298.78	213.25	174.30	
51	A	40.63	64.50	275.50	275.24	234.61	211.00	
52	G	80.12	104.00	279.50	278.19	198.07	175.50	
53	E	73.14	83.00	306.70	306.38	233.24	223.70	
54	J	76.11	95.00	295.50	295.36	219.25	200.50	
55	U	70.32	75.00	292.40	292.05	221.73	217.40	
PW1	NA	54.43	NA	NA	NA	NA	NA	4" well
PW2	NA	54.60	NA	NA	NA	NA	NA	1" well
PW3	NA	68.00	NA	NA	NA	NA	NA	1" well
STB-6	NA	NA	75.00	287.32	NA	NA	212.32	
STB-7	NA	NA	70.00	287.81	NA	NA	217.81	
STB-8	NA	NA	95.00	298.51	NA	NA	203.51	
STB-12	NA	NA	104.00	NA	NA	NA	NA	

Notes:

All measurements collected from top of inner casing.

Water levels collected on February 14, 1996.
NA = not applicable

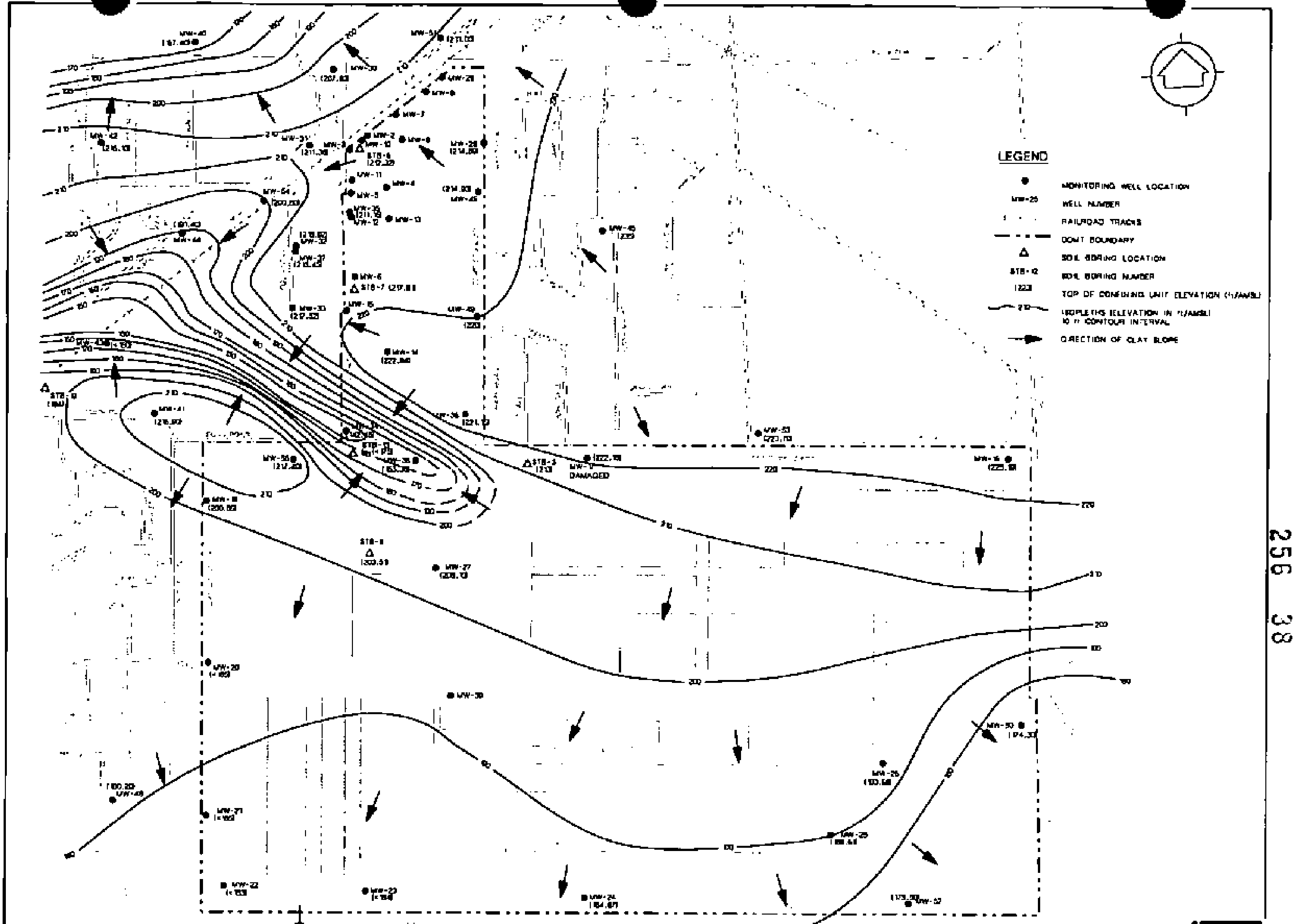


FIGURE 3-2
TOP OF THE JACKSON/CLAIBORNE GROUP CONTOUR MAP
Defense Distribution Depot-Memphis, Tennessee

southwest. West of Dunn Field, there appears to be an east-west trending divide in the clay slope between wells MW-31 and MW-42. This trending divide separates the north trending slope toward the low clay elevation at MW-40 from the southern slope toward the northeast-southwest trending channel.

Figure 3-3 shows the potentiometric surface map in accordance with groundwater elevations collected on February 14, 1996. Groundwater flow across the main installation and southernmost portion of Dunn Field is governed by the presence of the northwest-southeast trending feature that transports groundwater away from the main installation area and results in flow that is predominantly onto the main installation around its perimeter. This feature consists of a sand-filled depression in the clay feature that likely results from either an errosional depression in the clay that was subsequently filled with fluvial sands or from a distinct sand lens within the Cockfield Formation. Flow is generally westward across Dunn Field except for the southern portion, which flows toward the channel. Groundwater flow west of Dunn Field is influenced by the east-west trending divide in the clay slope between wells MW-31 and MW-42, separating flow northward toward well MW-40 from southward flow.

In the northern portion of the main installation and the area surrounding Dunn Field, groundwater flow gradients generally conform to the gradient of the Jackson Formation/Upper Claiborne Group confining unit clay surface indicating that flow is governed by the configuration of the clay. A comparison of the potentiometric surface (Figure 3-3) and confining unit clay (Figure 3-2) gradients in the southwest portion of the main installation indicate that groundwater is flowing against the gradient of the clay. It is likely that groundwater flow gradients are being controlled by drainage into the northwest-southwest trending feature rather than gravity flow along the surface of the clay.

3.5 Background Groundwater Characterization

A total of 12 groundwater wells installed in areas outside of known surface contamination and primarily upgradient of the main installation and Dunn Field were considered as potential background sampling locations. The presence of VOCs, SVOCs, or pesticides/PCBs was used to eliminate wells for further consideration as background wells. On the basis of these criteria, the following existing wells were selected for use as background wells: MW-16, MW-19, MW-24, MW-28, and MW-30 (*DDMT Generic RI/FS Work Plan*, Section 5.3.2.4). MW-23 was originally identified as a background well, but was dropped because of the presence of methylethyl ketone (MEK, or 2-butanone) and tetrachloroethylene (PCE), suggesting that MW-23 may be impacted by an organic groundwater plume located in the southwest portion of DDMT (see Section 3.6.1). Additional groundwater quality and water level data will be collected to determine whether DDMT is the source of the groundwater contamination.

The potentiometric gradient (see Figure 3-3) indicates that groundwater flows onto the main installation from the northeast, east, south, and southwest. Groundwater generally flows across Dunn Field from east to west. On the basis of these flow directions, monitoring wells MW-45, -46, -48, -49, -50, -52, and -53, installed in 1996, were selected as background wells. Wells MW-47 and MW-51 were not selected because they are associated with organic groundwater contamination that may originate onsite.

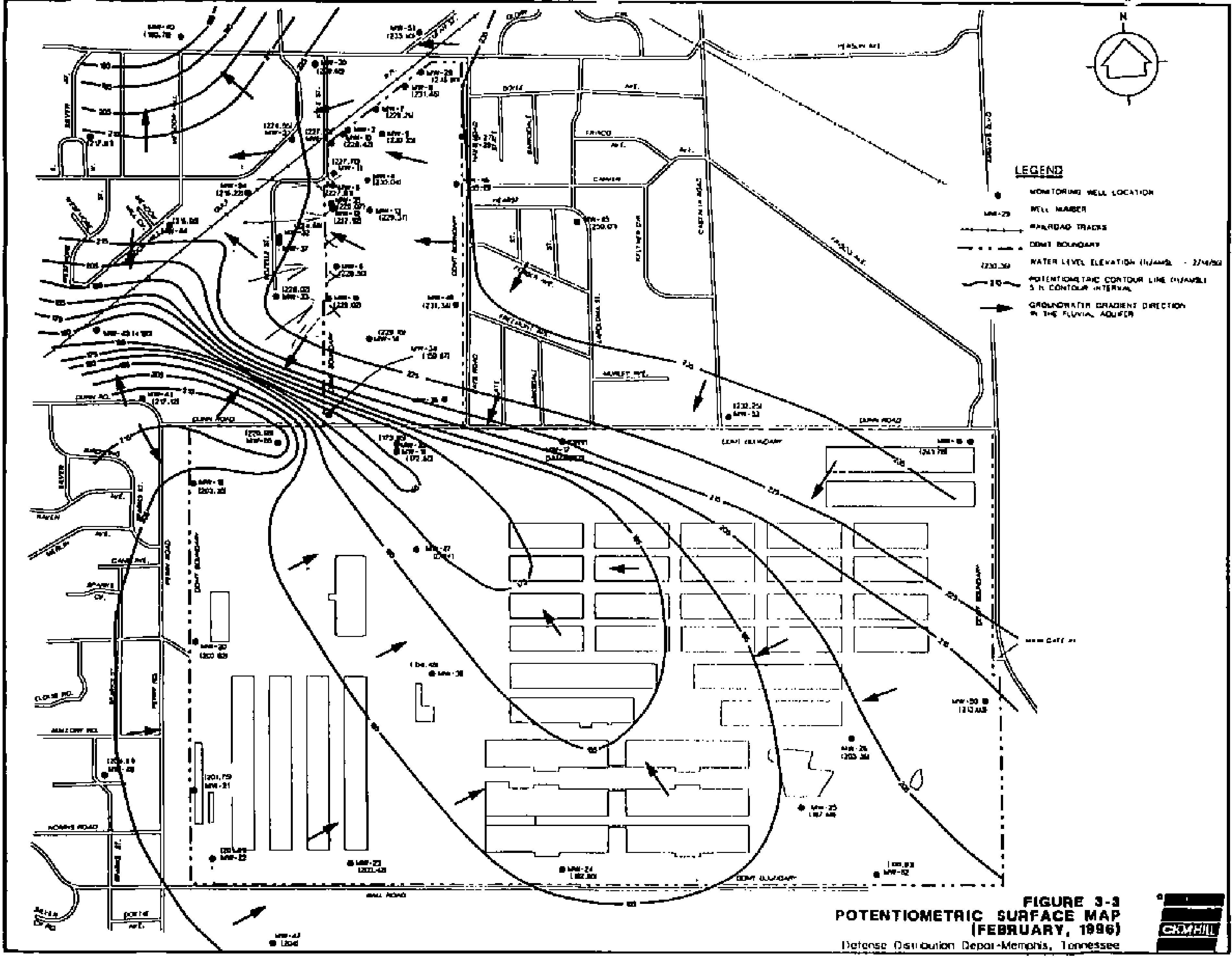


FIGURE 3-3
POTENTIOMETRIC SURFACE MAP
(FEBRUARY, 1996)
Defense Distribution Depot-Memphis, Tennessee

The groundwater background data are reported and further discussed in the *Draft Background Sampling Program Technical Memorandum* (CH2M HILL, September 1996).

3.6 Groundwater Chemical Results

Numerous VOCs and metals were detected within the Fluvial Aquifer. Some of the most common potentially man-made constituents detected were 1,1,1-trichloroethane(1,1,1-TCA); 1,2-dichloroethene (1,2-DCE); 1,1,2,2-PCA; carbon tetrachloride (CCl_4); trichloroethene (TCE); and PCE. Summary statistics for groundwater constituents are presented in Table 3-5. Well-specific groundwater analytical data are presented in Appendix H.

Table 3-6 lists all parameter detections in groundwater and compares the detected values to background values and to preliminary remediation goals (PRGs). Groundwater PRGs are discussed in Section 3.5 of the *Final Generic Remedial Investigation/Feasibility Study Work Plan* (CEHND, 1995). Groundwater constituents exceeding both PRGs and background at one or more wells are aluminum, barium, beryllium, total chromium, copper, iron, lead, manganese, nickel, PCE, TCE, and vanadium.

Review of the analytical data for laboratory blanks, field blanks, and field samples indicated that several compounds were most likely introduced during the sampling and analysis process and are not indicative of environmental contamination at the site. These compounds include acetone, methylene chloride, and all phthalates bis(2-ethylhexyl) phthalate, di-n-butylphthalate, di-n-octylphthalate, butylbenzylphthalate, and diethylphthalate. The results of the data validation process are discussed in Appendix G.

3.6.1 Distribution of Organic Constituents

Figures 3-4 through 3-8 show the distributions and concentrations of VOCs at DDMT. The VOCs depicted in Figures 3-4 through 3-8 were selected in accordance with frequency of detection. Table 3-5 summarizes the VOCs detected within the groundwater.

Concentrations of VOCs varied across the site from a low of 1 microgram per liter (µg/L) to a high of 1,900 µg/L (TCE at MW-35). In general, the highest concentrations of VOCs were located within the northwest corner of Dunn Field. Monitoring wells MW-36 and MW-37 are deep wells that are not screened in the Fluvial Aquifer system. VOCs were not collected from these two wells.

1,1-Dichloroethene (1,1-DCE). 1,1-DCE was detected in nine wells during the 1996 sampling event, three of which were offsite wells (see Figure 3-4). It was not detected anywhere on the main installation and was found onsite only in the northwest corner of Dunn Field (see Figure 3-5). Values of 1,1-DCE range from none detected to a high of 54 µg/L at well MW-7. The background value for 1,1-DCE is zero; thus, all detections exceeded background. No PRGs are available for this VOC.

A plume of 1,1-DCE exists in the northwest corner of Dunn Field and extends offsite to the north and the west. There is an anomalously elevated concentration at well MW-40 (51 µg/L) with poor well control between this well and the next elevated concentration at upgradient well MW-31 (30 µg/L); however, the 1,1-DCE value at MW-31 was rejected during the data quality evaluation (see Appendix G), so the concentration at MW-31 is uncertain. There is good well control on the position of the non-detect line along the

Table 3-5
Fluvial Aquifer Summary Statistics
DDMT Groundwater Characterization

Analyte	No. of Analyses	No. of Detections^a	Min	Max	Average	Standard Deviation
Inorganics						
Aluminum	49	28	210.0	22600.0	3394.0	5979.4
Antimony	51	2	15.0	17.2	16.1	1.6
Arsenic	51	4	0.8	9.2	3.0	4.1
Barium	35	34	42.9	362.0	119.6	77.7
Beryllium	51	10	0.2	3.7	1.5	1.3
Calcium	38	35	8910.0	57400.0	24716.0	12900.5
Chromium	51	20	2.6	278.0	46.4	72.7
Cobalt	35	17	1.6	61.9	15.5	18.4
Copper	51	17	2.0	315.0	57.0	84.5
Iron	42	28	598.0	96100.0	8716.4	18269.7
Lead	51	21	1.5	99.8	13.6	21.4
Magnesium	38	35	4750.0	27600.0	11145.1	5512.4
Manganese	35	28	11.4	1720.0	346.0	437.6
Mercury	51	3	0.2	0.8	0.4	0.4
Nickel	51	18	7.5	212.0	37.1	56.7
Potassium	51	26	849.0	12700.0	2294.8	2447.6
Selenium	51	1	2.9	2.9	2.9	ND
Silver	51	2	2.4	2.8	2.6	0.3
Sodium	38	15	16200.0	74600.0	35553.3	18806.0
Thallium	51	1	0.9	0.9	0.9	ND
Vanadium	35	12	1.7	101.0	17.6	27.7
Zinc	51	7	45.6	255.0	122.4	65.1
VOCs						
1,1,1-Trichloroethane	50	6	1.0	4.0	2.5	1.0
1,1,2,2-Tetrachloroethane	50	9	1.0	420.0	110.4	138.6
1,1,2-Trichloroethane	50	3	4.0	11.0	7.3	3.5
1,1-Dichloroethane	50	4	2.0	2.0	2.0	0.0
1,1-Dichloroethene	50	9	1.0	54.0	19.9	19.8
1,2-Dichloroethane	50	1	1.0	1.0	1.0	ND
1,2-Dichloroethene (total)	50	12	1.0	760.0	119.2	212.6
Carbon tetrachloride	50	10	1.0	27.0	7.4	9.3
Chlorobenzene	50	1	1.0	1.0	1.0	ND
Chloroform	50	13	1.0	35.0	9.9	9.8
Methylene chloride	50	1	2.0	2.0	2.0	ND
Tetrachloroethene	50	24	1.0	100.0	24.6	28.6
Trichloroethene	50	23	1.0	1900.0	128.6	408.9
SVOCs						
Butylbenzylphthalate	33	1	2.0	2.0	2.0	ND
Di-n-octylphthalate	33	6	2.0	7.0	3.7	2.1

[a] Qualifiers J, =, and TR

Note:

ND = Standard Deviation not defined (must have at least two values)

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
1,1,1-Trichloroethane	MW07	2	µg/L	J	164.3	C	1	MAX_DET	BCKG
	MW08	2	µg/L	J	164.3	C	1	MAX_DET	BCKG
	MW10	3	µg/L	J	164.3	C	1	MAX_DET	BCKG
	MW29	4	µg/L	J	164.3	C	1	MAX_DET	BCKG
	MW44	3	µg/L	J	164.3	C	1	MAX_DET	BCKG
	MW45	1	µg/L	J	164.3	C	1	MAX_DET	NEITHER
1,1,2,2-Tetrachloroethane	MW03	1	µg/L	J	0.213	S	NBD	ND	BOTH
	MW06	160	µg/L	=	0.213	S	NBD	ND	BOTH
	MW10	12	µg/L	=	0.213	S	NBD	ND	BOTH
	MW11	4	µg/L	J	0.213	S	NBD	ND	BOTH
	MW12	130	µg/L	=	0.213	S	NBD	ND	BOTH
	MW13	1	µg/L	J	0.213	S	NBD	ND	BOTH
	MW31	420	µg/L	=	0.213	S	NBD	ND	BOTH
	MW32	66	µg/L	=	0.213	S	NBD	ND	BOTH
	MW35	200	µg/L	=	0.213	S	NBD	ND	BOTH
1,1,2-Trichloroethane	MW06	7	µg/L	J	0.6	TN	NBD	ND	BOTH
	MW31	11	µg/L	J	0.6	TN	NBD	ND	BOTH
	MW32	4	µg/L	J	0.6	TN	NBD	ND	BOTH
1,1-Dichloroethane	MW29	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW41	12	µg/L	R	NA	NA	NBD	ND	NA
	MW08	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW10	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW10	20	µg/L	R	NA	NA	NBD	ND	NA
	MW31	80	µg/L	R	NA	NA	NBD	ND	NA
	MW07	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
1,1-Dichloroethene	MW45	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW51	4	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW51	4	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW47	49	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW47	48	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW09	1	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW40	49	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW40	51	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW41	12	µg/L	R	NA	NA	NBD	ND	NA
	MW08	26	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW10	48	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW10	53	µg/L	R	NA	NA	NBD	ND	NA
	MW03	14	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW53	51	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW53	51	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW02	7	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW31	23	µg/L	J	NA	NA	NBD	ND	BCKG ONLY

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
1,1-Dichloroethene (continued)	MW31	30	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW31	24	µg/L	R	NA	NA	NBD	ND	NA
	MW07	54	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW41	12	µg/L	R	NA	NA	NBD	ND	NA
	MW10	1	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
1,2-Dichloroethane	MW10	20	µg/L	R	NA	NA	NBD	ND	NA
	MW31	80	µg/L	R	NA	NA	NBD	ND	NA
	MW02	103	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW03	101	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
Total 1,2-Dichloroethene	MW32	87	µg/L	=	NA	NA	NA	NA	NA
	MW47	2	µg/L	J	NA	NA	NA	NA	NA
	MW11	41	µg/L	=	NA	NA	NA	NA	NA
	MW31	760	µg/L	=	NA	NA	NA	NA	NA
	MW06	200	µg/L	=	NA	NA	NA	NA	NA
	MW02	10	µg/L	=	NA	NA	NA	NA	NA
	MW05	2	µg/L	J	NA	NA	NA	NA	NA
	MW54	1	µg/L	J	NA	NA	NA	NA	NA
	MW12	55	µg/L	=	NA	NA	NA	NA	NA
	MW35	160	µg/L	J	NA	NA	NA	NA	NA
	MW10	110	µg/L	=	NA	NA	NA	NA	NA
	MW03	2	µg/L	J	NA	NA	NA	NA	NA
Aluminum	MW08	3610	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW09	5210	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW12	20500	µg/L	=	NA	NA	1798	2XMEAN	BCKG ONLY
	MW14	22600	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW16	2670	µg/L	=	NA	NA	1798	2XMEAN	BCKG ONLY
	MW35	3850	µg/L	=	NA	NA	1798	2XMEAN	BCKG ONLY
	MW39	15900	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW42	2670	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW44	4720	µg/L	J	NA	NA	1798	2XMEAN	BCKG ONLY
	MW02	601	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW03	718	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW04	252	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW06	1120	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW07	679	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW10	730	µg/L	=	NA	NA	1798	2XMEAN	< BCKG
	MW13	1270	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW15	210	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW19	235	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW20	635	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW21	393	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW22	1580	µg/L	J	NA	NA	1798	2XMEAN	< BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Aluminum (continued)	MW23	545	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW24	718	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW28	287	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW29	768	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW36[a]	406	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW37[a]	478	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW38	1610	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW45	586	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
	MW47	365	µg/L	J	NA	NA	1798	2XMEAN	< BCKG
Antimony	MW44	15	µg/L	J	1.46	S	34.4	2XMEAN	PRG
	MW45	17.2	µg/L	J	1.46	S	34.4	2XMEAN	PRG
Arsenic	MW07	1.2	µg/L	J	0.049	C	NBD	ND	BOTH
	MW14	0.9	µg/L	J	0.049	C	NBD	ND	BOTH
	MW31	0.81	µg/L	J	0.049	C	NBD	ND	BOTH
	MW39	9.2	µg/L	J	0.049	C	NBD	ND	BOTH
Barium	MW14	312	µg/L	=	255.5	S	223.8	2XMEAN	BOTH
	MW40	362	µg/L	=	255.5	S	223.8	2XMEAN	BOTH
	MW50	307	µg/L	=	255.5	S	223.8	2XMEAN	BOTH
	MW05	71.7	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW07	67.3	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW10	89.3	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW15	70.5	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW16	66.7	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW19	42.9	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW20	54.2	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW21	50.3	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW22	108	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW23	56.6	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW24	49.5	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW25	102	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW26	179	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW28	47.6	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW30	116	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW33	53.3	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW34	117	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW35	124	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW38	79.8	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW39	201	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW42	168	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW44	166	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW45	127	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW46	99.3	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Barium (continued)	MW47	99.6	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW48	91.1	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW49	96.4	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW51	86.4	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW52	177	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW53	122	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
	MW54	106	µg/L	J	255.5	S	223.8	2XMEAN	NEITHER
Benzyl Butyl Phthalate	MW24	2	µg/L	J		NA	2000	MAX_DET	< BCKG
Beryllium	MW02	3.7	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW12	2.9	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW14	2.9	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW20	1.1	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW39	1.6	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW55	2	µg/L	J	0.004	TN	0.6	2XMEAN	BOTH
	MW15	0.53	µg/L	J	0.004	TN	0.6	2XMEAN	PRG
	MW22	0.18	µg/L	J	0.004	TN	0.6	2XMEAN	PRG
	MW28	0.21	µg/L	J	0.004	TN	0.6	2XMEAN	PRG
	MW45	0.35	µg/L	J	0.004	TN	0.6	2XMEAN	PRG
Bicarbonate	MW32	47	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37[a]	168	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Calcium	MW05	19400	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW07	16900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW10	20100	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW14	16900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW15	14300	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW16	44900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW19	17800	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW20	28600	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW21	13600	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW22	27300	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW23	39700	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW24	9950	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW25	18500	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW26	21000	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW28	14000	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW30	22900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW32	57400	µg/L	=	NA	NA	52875	2XMEAN	BCKG ONLY
	MW33	8910	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW34	11300	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW35	13100	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW36[a]	39900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW37[a]	40500	µg/L	=	NA	NA	52875	2XMEAN	< BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Calcium (continued)	MW38	14100	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW39	41400	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW40	49800	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW42	20100	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW44	35200	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW45	34700	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW46	17400	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW47	23700	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW48	16500	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW49	16500	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW50	49200	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW51	21600	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW52	43700	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW53	29700	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
	MW54	14900	µg/L	=	NA	NA	52875	2XMEAN	< BCKG
Carbon Tetrachloride	MW03	1	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW06	27	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW09	2	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW10	3	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW11	1	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW15	7	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW26	4	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW31	6	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
	MW32	22	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW34	1	µg/L	J	NA	NA	NBD	ND	BCKG ONLY
Chloride (as Cl)	MW03	16.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW06	224	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW08	18.3	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW13	11.7	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW14	10.1	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW32	127	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW34	9.8	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW36[a]	3.4	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37[a]	4.5	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW38	11.3	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Chlorobenzene	MW40	1	µg/L	J	36.5	S	NBD	ND	BCKG
Chloroform	MW02	8	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW03	7	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW05	5	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW06	10	µg/L	=	0.19	TN	NBD	ND	BOTH
	MW07	8	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW09	2	µg/L	J	0.19	TN	NBD	ND	BOTH

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Chloroform (continued)	MW10	14	µg/L	=	0.19	TN	NBD	ND	BOTH
	MW11	2	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW15	25	µg/L	=	0.19	TN	NBD	ND	BOTH
	MW26	1	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW31	35	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW32	7	µg/L	J	0.19	TN	NBD	ND	BOTH
	MW34	5	µg/L	J	0.19	TN	NBD	ND	BOTH
Chromium, Total	MW12	63	µg/L	=	18.25	S	54.4	2XMEAN	BOTH
	MW38	278	µg/L	=	18.25	S	54.4	2XMEAN	BOTH
	MW39	215	µg/L	=	18.25	S	54.4	2XMEAN	BOTH
	MW55	96.7	µg/L	=	18.25	S	54.4	2XMEAN	BOTH
Chromium, Total (continued)	MW06	21.9	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW08	26.4	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW14	42.6	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW16	34	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW21	25	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW22	21.6	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW24	20.3	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW35	23.4	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW37°	24	µg/L	=	18.25	S	54.4	2XMEAN	PRG
	MW03	9.9	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
	MW10	10.8	µg/L	=	18.25	S	54.4	2XMEAN	NEITHER
	MW23	12.5	µg/L	=	18.25	S	54.4	2XMEAN	NEITHER
	MW25	2.6	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
	MW40	5.2	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
	MW42	4.4	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
	MW44	9.7	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
	MW47	5.6	µg/L	J	18.25	S	54.4	2XMEAN	NEITHER
Cobalt	MW14	61.9	µg/L	=	NA	NA	24.8	2XMEAN	BCKG ONLY
	MW16	12.3	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW21	1.6	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW23	1.8	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW24	2.2	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW25	1.8	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW35	11.7	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW38	37.8	µg/L	J	NA	NA	24.8	2XMEAN	BCKG ONLY
	MW39	52.5	µg/L	=	NA	NA	24.8	2XMEAN	BCKG ONLY
	MW40	5.3	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW42	4.4	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW44	16.4	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW45	9.5	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW47	1.9	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Cobalt (continued)	MW52	18.2	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW53	19.6	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
	MW54	3.9	µg/L	J	NA	NA	24.8	2XMEAN	< BCKG
Copper	MW19	315	µg/L	=	135.1	S	162.6	2XMEAN	BOTH
	MW20	207	µg/L	=	135.1	S	162.6	2XMEAN	BOTH
	MW02	32.5	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW04	2.8	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW09	33.9	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW12	105	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW14	36	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW15	75	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW26	3	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW28	4.4	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW36[a]	2.4	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW37[a]	2	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW38	29.8	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW39	73.1	µg/L	=	135.1	S	162.6	2XMEAN	NEITHER
	MW42	12.3	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW44	3.7	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW45	3.8	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW48	2	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
	MW55	29.2	µg/L	J	135.1	S	162.6	2XMEAN	NEITHER
Di-n-Octylphthalate	MW05	2	µg/L	J	73	S	NBD	ND	BCKG
	MW10	2	µg/L	J	73	S	NBD	ND	BCKG
	MW13	7	µg/L	J	73	S	NBD	ND	BCKG
	MW20	4	µg/L	J	73	S	NBD	ND	BCKG
	MW31	2	µg/L	J	73	S	NBD	ND	BCKG
	MW54	5	µg/L	J	73	S	NBD	ND	BCKG
Hardness (as CaC03)	MW32	212	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37[a]	170	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Iron	MW08	12600	µg/L	J	NA	NA	6728	2XMEAN	BCKG ONLY
	MW14	96100	µg/L	J	NA	NA	6728	2XMEAN	BCKG ONLY
	MW22	8870	µg/L	=	NA	NA	6728	2XMEAN	BCKG ONLY
	MW35	16200	µg/L	=	NA	NA	6728	2XMEAN	BCKG ONLY
	MW39	30400	µg/L	=	NA	NA	6728	2XMEAN	BCKG ONLY
	MW44	14000	µg/L	J	NA	NA	6728	2XMEAN	BCKG ONLY
	MW52	7960	µg/L	=	NA	NA	6728	2XMEAN	BCKG ONLY
	MW03	3810	µg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW06	4250	µg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW07	3270	µg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW10	1450	µg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW13	5370	µg/L	=	NA	NA	6728	2XMEAN	< BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (μg/L)	PRG Basis	Back-ground (μg/L)	Back-ground Basis	Exceeds?
Iron (continued)	MW16	3970	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW21	891	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW23	758	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW24	5190	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW25	805	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW28	598	μg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW36[a]	5090	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW37[a]	5260	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW38	4550	μg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW40	1060	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW42	3560	μg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW45	2280	μg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW46	648	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW47	1180	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW48	1120	μg/L	J	NA	NA	6728	2XMEAN	< BCKG
	MW50	4900	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW53	3610	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
	MW54	4660	μg/L	=	NA	NA	6728	2XMEAN	< BCKG
Lead	MW09	18.4	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW12	24.4	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW14	19.3	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW38	30.2	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW39	99.8	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW55	20.4	μg/L	=	15	MCL	9.4	2XMEAN	BOTH
	MW02	9.9	μg/L	=	15	MCL	9.4	2XMEAN	BCKG
	MW03	1.8	μg/L	J	15	MCL	9.4	2XMEAN	NEITHER
	MW06	5.2	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW08	6.7	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW10	3.5	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW13	2.3	μg/L	J	15	MCL	9.4	2XMEAN	NEITHER
	MW15	2.6	μg/L	J	15	MCL	9.4	2XMEAN	NEITHER
	MW16	7.6	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW19	3.9	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW20	5.2	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW26	3.4	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW32	1.5	μg/L	J	15	MCL	9.4	2XMEAN	NEITHER
	MW35	8.4	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW36[a]	3.3	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW37[a]	4.2	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER
	MW49	2.6	μg/L	J	15	MCL	9.4	2XMEAN	NEITHER
	MW04	9.4	μg/L	=	15	MCL	9.4	2XMEAN	NEITHER

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (μg/L)	PRG Basis	Back-ground (μg/L)	Back-ground Basis	Exceeds?
Magnesium	MW40	27600	μg/L	=	NA	NA	26045	2XMEAN	BCKG ONLY
	MW50	24000	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW52	22500	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW45	19500	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW16	19100	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW53	15800	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW37[a]	15500	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW22	15100	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW32	13300	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW47	12600	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MR30	12000	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW20	11800	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW26	10900	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW51	10500	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW05	10400	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW23	10400	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW10	10300	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW36[a]	10300	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW44	10200	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW25	10000	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW39	9760	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW14	8920	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW42	8740	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW48	8690	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW46	8660	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW07	8300	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW49	8140	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW21	7610	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW54	7440	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW35	6700	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW38	6640	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW28	6470	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW15	6280	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW19	6160	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW34	5570	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW24	5250	μg/L	=	NA	NA	26045	2XMEAN	< BCKG
	MW33	4750	μg/L	J	NA	NA	26045	2XMEAN	< BCKG
Manganese	MW14	1400	μg/L	=	18.25	S	560	2XMEAN	BOTH
	MW39	1720	μg/L	=	18.25	S	560	2XMEAN	BOTH
	MW40	1010	μg/L	=	18.25	S	560	2XMEAN	BOTH
	MW44	755	μg/L	=	18.25	S	560	2XMEAN	BOTH
	MW53	917	μg/L	=	18.25	S	560	2XMEAN	BOTH

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Manganese (continued)	MW07	23.2	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW10	20.5	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW15	52.2	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW16	143	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW19	296	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW20	247	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW25	42.4	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW28	75.6	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW35	142	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW38	134	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW42	383	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW45	326	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW46	228	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW47	99.1	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW48	112	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW49	57.6	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW50	441	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW51	112	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW52	467	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW54	445	µg/L	=	18.25	S	560	2XMEAN	PRG
	MW22	11.4	µg/L	J	18.25	S	560	2XMEAN	NEITHER
	MW23	12	µg/L	J	18.25	S	560	2XMEAN	NEITHER
	MW24	17.2	µg/L	=	18.25	S	560	2XMEAN	NEITHER
Mercury	MW02	0.84	µg/L	=	1.095	S	NBD	ND	BCKG
	MW12	0.17	µg/L	J	1.095	S	NBD	ND	BCKG
	MW55	0.16	µg/L	J	1.095	S	NBD	ND	BCKG
Methylene Chloride	MW40	2	µg/L	J	5	MCL	NBD	ND	BCKG
Nickel	MW12	46	µg/L	=	13.4	TN	31.4	2XMEAN	BOTH
	MW38	212	µg/L	=	13.4	TN	31.4	2XMEAN	BOTH
	MW39	164	µg/L	=	13.4	TN	31.4	2XMEAN	BOTH
	MW55	45.9	µg/L	=	13.4	TN	31.4	2XMEAN	BOTH
	MW06	25.3	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW08	16	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW14	25.3	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW16	25.6	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW21	18.1	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW37[a]	20.7	µg/L	J	13.4	TN	31.4	2XMEAN	PRG
	MW03	10.4	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW10	8.7	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW19	12.1	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW22	11.6	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW23	8.4	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Nickel (continued)	MW24	9.4	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW32	8.6	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW35	13	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW36[a]	11	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
	MW44	7.5	µg/L	J	13.4	TN	31.4	2XMEAN	NEITHER
Nitrogen, Ammonia (as N)	MW14	0.4	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Nitrogen, Nitrate (as N)	MW32	3.97	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Nitrogen, Nitrate-Nitrite	MW03	3.07	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW06	4.01	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW08	2.25	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW14	4.69	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW32	3.97	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Nitrogen, Initrate-Nitrite	MW34	3.85	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW38	4.08	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Potassium	MW05	1110	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW14	2470	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW15	1900	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW16	1330	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW19	4040	µg/L	J	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW20	12700	µg/L	=	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW22	1050	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW23	1120	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW24	962	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW26	2000	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW32	1280	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW34	849	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW35	1170	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW36[a]	5960	µg/L	=	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW37[a]	6340	µg/L	=	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW38	920	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW39	2790	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW40	4670	µg/L	J	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW42	5320	µg/L	=	NA	NA	3495.4	2XMEAN	BCKG ONLY
	MW44	2010	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW45	849	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW46	858	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW47	1630	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW48	1350	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW49	1260	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW50	3330	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW51	946	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG
	MW52	1750	µg/L	J	NA	NA	3495.4	2XMEAN	< BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Selenium	MW53	2.9	µg/L	J	10	TN	5.8	2XMEAN	NEITHER
Silicon	MW32	19500	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW36[a]	15400	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37[a]	9120	µg/L	=	NA	NA	NBD	ND	BCKG ONLY
Silver	MW39	2.8	µg/L	J	18.25	S	NBD	ND	BCKG
	MW44	2.4	µg/L	J	18.25	S	NBD	ND	BCKG
Sodium	MW05	48300	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW07	21700	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW10	25600	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW14	16200	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW16	45200	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW32	19900	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW35	17800	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW38	29800	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW40	63300	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW42	36800	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW44	22200	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW50	61200	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW52	74600	µg/L	=	NA	NA	106650	2XMEAN	< BCKG
	MW53	32300	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
	MW54	18400	µg/L	J	NA	NA	106650	2XMEAN	< BCKG
Sulfate (as SO4)	MW03	45.9	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW06	11.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW08	44	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW13	21.6	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW14	23.7	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW32	17.4	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW34	6.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW36[a]	4.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37[a]	4.9	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW38	15.3	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Tetrachloroethylene (PCE)	MW02	22	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW03	24	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW04	12	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW05	96	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW07	51	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW08	26	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW10	100	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW11	16	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW12	12	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW13	5	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW15	2	µg/L	J	0.835	C	1	MAX_DET	BOTH

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Tetrachloroethylene (PCE) (continued)	MW21	52	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW22	2	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW25	4	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW26	14	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW29	32	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW31	64	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW35	26	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW39	3	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW47	23	µg/L	=	0.835	C	1	MAX_DET	BOTH
	MW51	2	µg/L	J	0.835	C	1	MAX_DET	BOTH
	MW23	1	µg/L	J	0.835	C	1	MAX_DET	PRG
	MW32	1	µg/L	J	0.835	C	1	MAX_DET	PRG
	MW34	1	µg/L	J	0.835	C	1	MAX_DET	PRG
Thallium	MW06	0.86	µg/L	J	0.5	MCLG	NBD	ND	BOTH
Total Dissolved Solids (Residue, Filterable)	MW32	482	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW37^a	191	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Total Organic Carbon	MW03	48.7	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW06	30.7	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW08	36.4	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW13	26.3	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW14	27.8	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW32	24.6	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW34	28.1	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW36^a	33.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
	MW38	26.2	mg/L	=	NA	NA	NBD	ND	BCKG ONLY
Trichloroethylene (TCE)	MW02	26	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW03	13	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW05	14	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW06	130	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW07	26	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW08	14	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW11	46	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW12	650	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW15	11	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW21	9	µg/L	J	3.871	C	1	MAX_DET	BOTH
	MW29	13	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW32	68	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW35	1900	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW51	5	µg/L	J	3.871	C	1	MAX_DET	BOTH
	MW54	17	µg/L	=	3.871	C	1	MAX_DET	BOTH
	MW09	2	µg/L	J	3.871	C	1	MAX_DET	BCKG
	MW13	2	µg/L	J	3.871	C	1	MAX_DET	BCKG

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?
Trichloroethylene (TCE) (continued)	MW22	2	µg/L	J	3.871	C	1	MAX_DET	BCKG
	MW26	2	µg/L	J	3.871	C	1	MAX_DET	BCKG
	MW39	3	µg/L	J	3.871	C	1	MAX_DET	BCKG
	MW47	2	µg/L	J	3.871	C	1	MAX_DET	BCKG
	MW34	1	µg/L	J	3.871	C	1	MAX_DET	NEITHER
	MW53	1	µg/L	J	3.871	C	1	MAX_DET	NEITHER
Tritium (Hydrogen-3)	MW32	-620	pCi/L	=	NA	NA	NBD	ND	NA
	MW37[a]	-570	pCi/L	=	NA	NA	NBD	ND	NA
Vanadium	MW14	101	µg/L	=	25.55	S	6	2XMEAN	BOTH
	MW39	31.5	µg/L	J	25.55	S	6	2XMEAN	BOTH
	MW15	8.2	µg/L	J	25.55	S	6	2XMEAN	BCKG
Vanadium (continued)	MW16	6.5	µg/L	J	25.55	S	6	2XMEAN	BCKG
	MW20	19.9	µg/L	J	25.55	S	6	2XMEAN	BCKG
	MW35	12	µg/L	J	25.55	S	6	2XMEAN	BCKG
	MW45	14.8	µg/L	J	25.55	S	6	2XMEAN	BCKG
	MW07	2.9	µg/L	J	25.55	S	6	2XMEAN	NEITHER
	MW10	1.7	µg/L	J	25.55	S	6	2XMEAN	NEITHER
	MW19	2.6	µg/L	J	25.55	S	6	2XMEAN	NEITHER
	MW28	5.1	µg/L	J	25.55	S	6	2XMEAN	NEITHER
	MW38	4.9	µg/L	J	25.55	S	6	2XMEAN	NEITHER
Zinc	MW12	132	µg/L	=	1095	S	0	ND	BCKG
	MW14	100	µg/L	=	1095	S	0	ND	BCKG
	MW20	94.4	µg/L	=	1095	S	0	ND	BCKG
	MW38	99.5	µg/L	=	1095	S	0	ND	BCKG
	MW39	255	µg/L	=	1095	S	0	ND	BCKG
	MW42	45.6	µg/L	=	1095	S	0	ND	BCKG
	MW55	130	µg/L	=	1095	S	0	ND	BCKG

[a]Wells completed in Confined Sand Aquifer.

Notes:

Q = validated data qualifier
PRG = Preliminary Remediation Goal
BCKG = exceeds background; no PRG available
<BCKG = Less than background
NEITHER = exceeds neither background nor PRG
BOTH = exceeds PRG and background (both available)
µg/L = micrograms per liter
mg/L = milligrams per liter
pCi/L = picoCuries per liter
MAX_DET = maximum detected
2XMEAN = 2 times mean value
J = estimated below detection limit

NA = not applicable
NBD = no background data
ND = not detected
C = calculated in accordance with carcinogenic effects
S = calculated in accordance with systemic effects
TN = Tennessee Guidance Level (TDEC, 1987)
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal

Table 3-6
Groundwater Data Evaluation Against Applicable Criteria
DDMT Groundwater Characterization

Parameter	Well	Value	Units	Q	PRG (µg/L)	PRG Basis	Back-ground (µg/L)	Back-ground Basis	Exceeds?

= = detected above detection limit
R = rejected data

Residential Scenario

A. Carcinogens: groundwater concentration in milligrams per liter (mg/L) =

$$\frac{TR * BW * AT * 365days / year}{SFo * IRw * EF * ED}$$

B. Systemic toxicants

$$\frac{THQ * AT * BW * 365days / year}{1 / RfDo * IRw * EF * ED}$$

Notes for equations:
THQ = Target hazard quotient
IR_w = Ingestion rate water
Sf_o = Cancer slope factor oral
TR = Target risk/hazard (unitless)
BW = Body weight (Kg)
AT = Averaging time (days)
EF = Exposure frequency (days/yr)
IR_{oral} = Daily water ingestion rate
ED = Exposure duration (yr)
ET = Exposure time (hr/day)
FI = Fraction ingested (unitless)

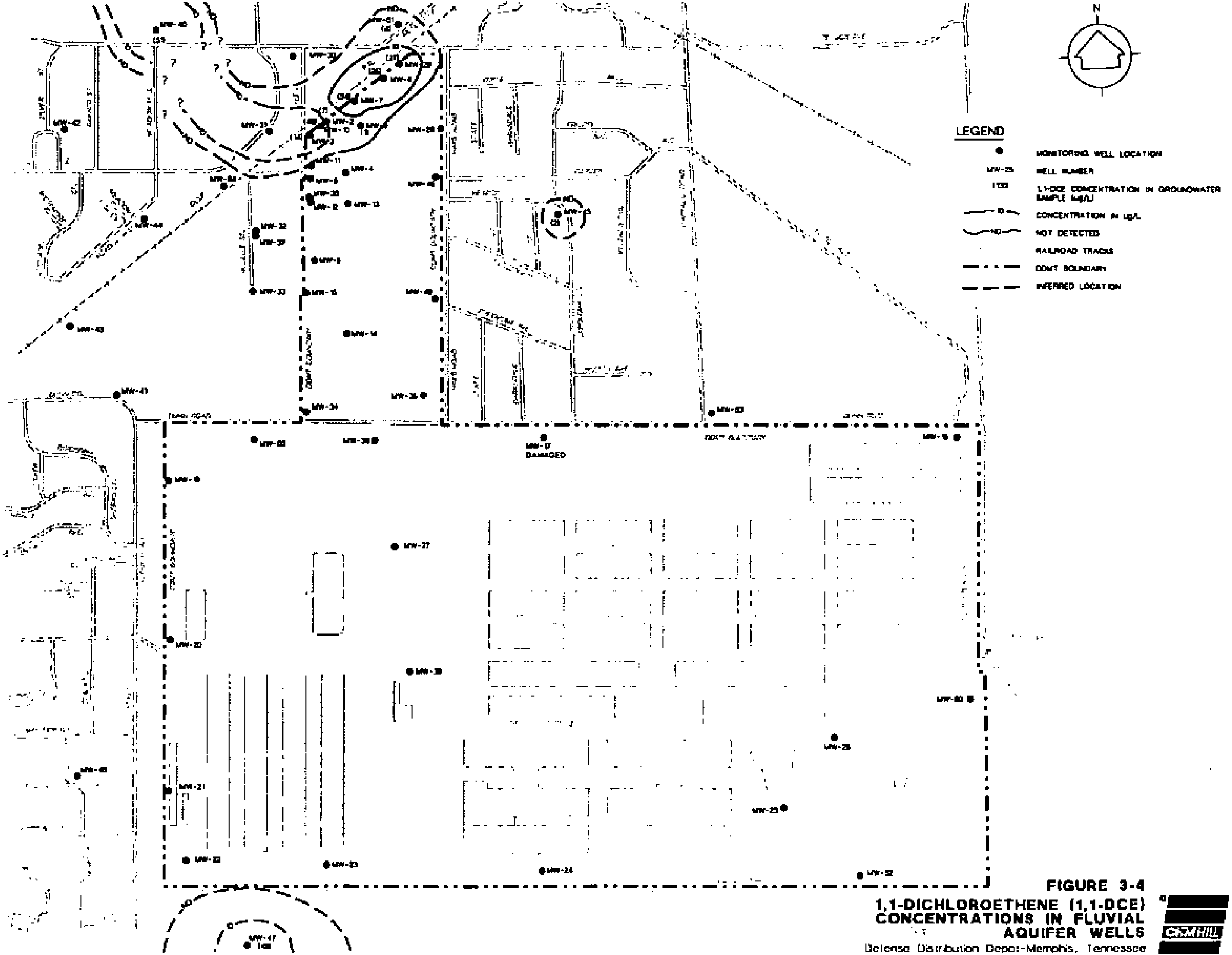


FIGURE 3-4

1,1-DICHLOROETHENE (1,1-DCE) CONCENTRATIONS IN FLUVIAL AQUIFER WELLS

Defense Distribution Depot-Memphis, Tennessee

CH2M HILL

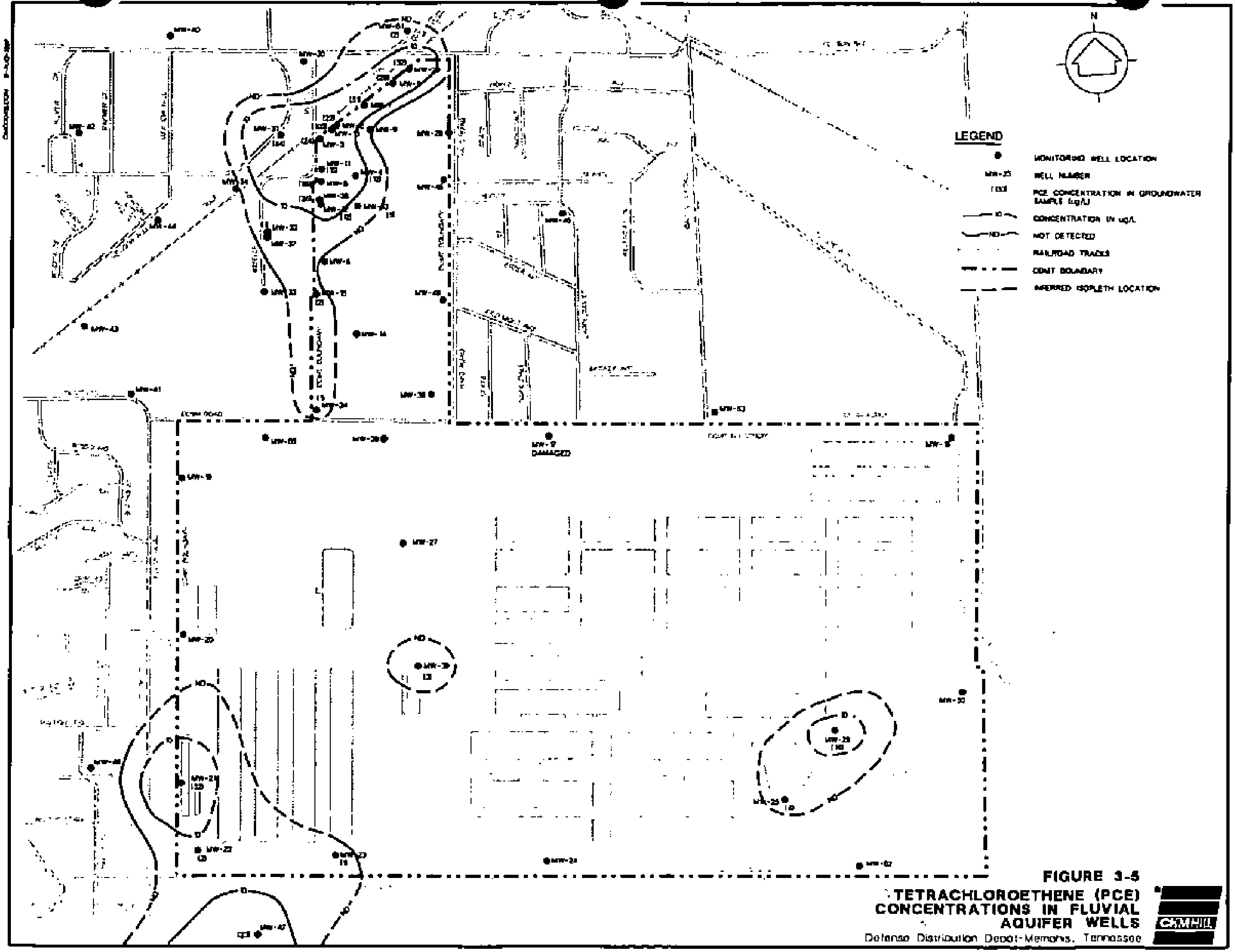


FIGURE 3-5

TETRACHLOROETHENE (PCE) CONCENTRATIONS IN FLUVIAL AQUIFER WELLS

Defense Distribution Depot-Memphis, Tennessee

CH2MHILL

256 60

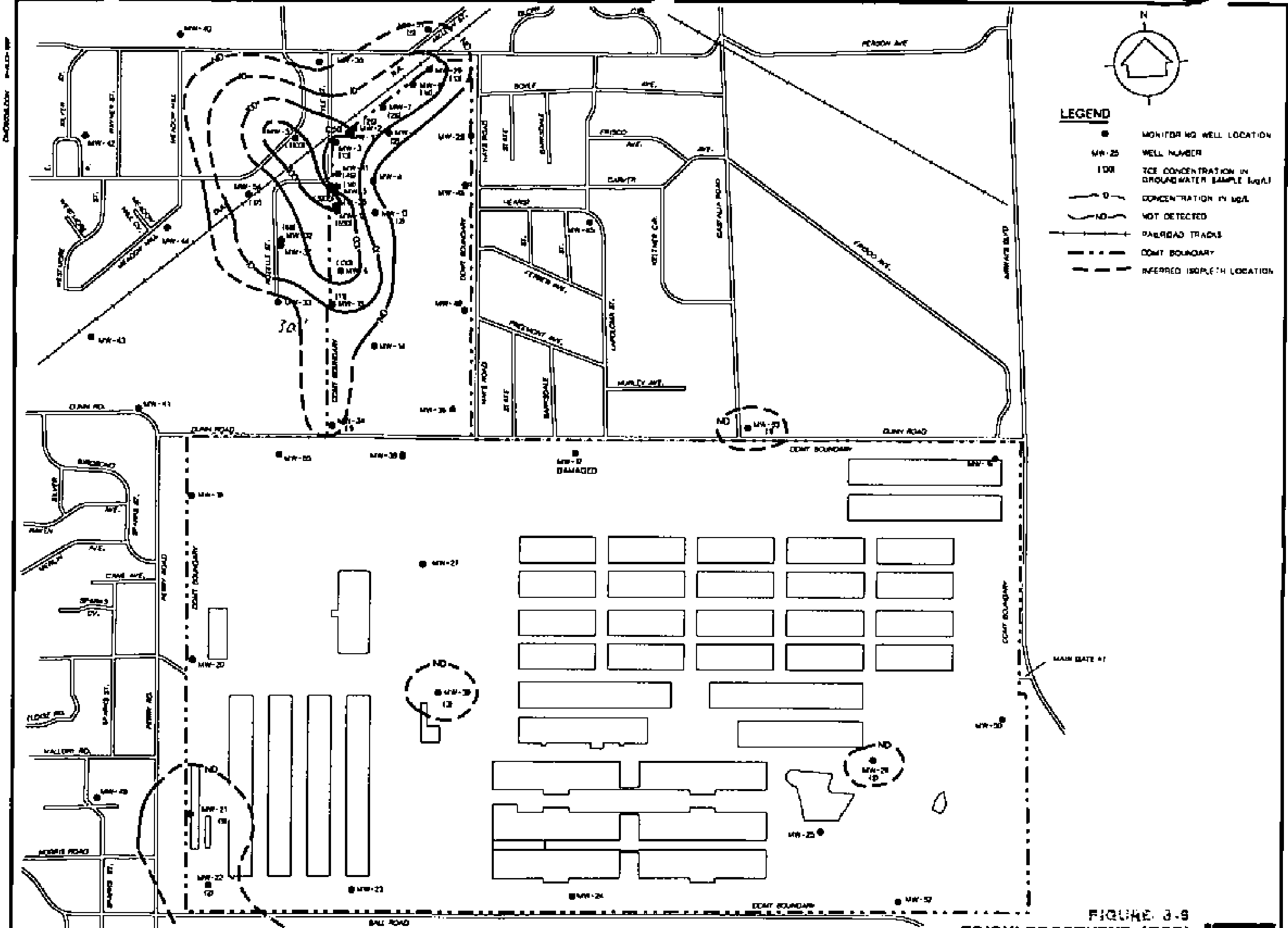


FIGURE 3-9
TRICHLOROETHENE (TCE) CONCENTRATIONS IN FLUVIAL AQUIFER WELLS
Defense Distribution Depot-Memphis, Tennessee

CH2M HILL

256 G1

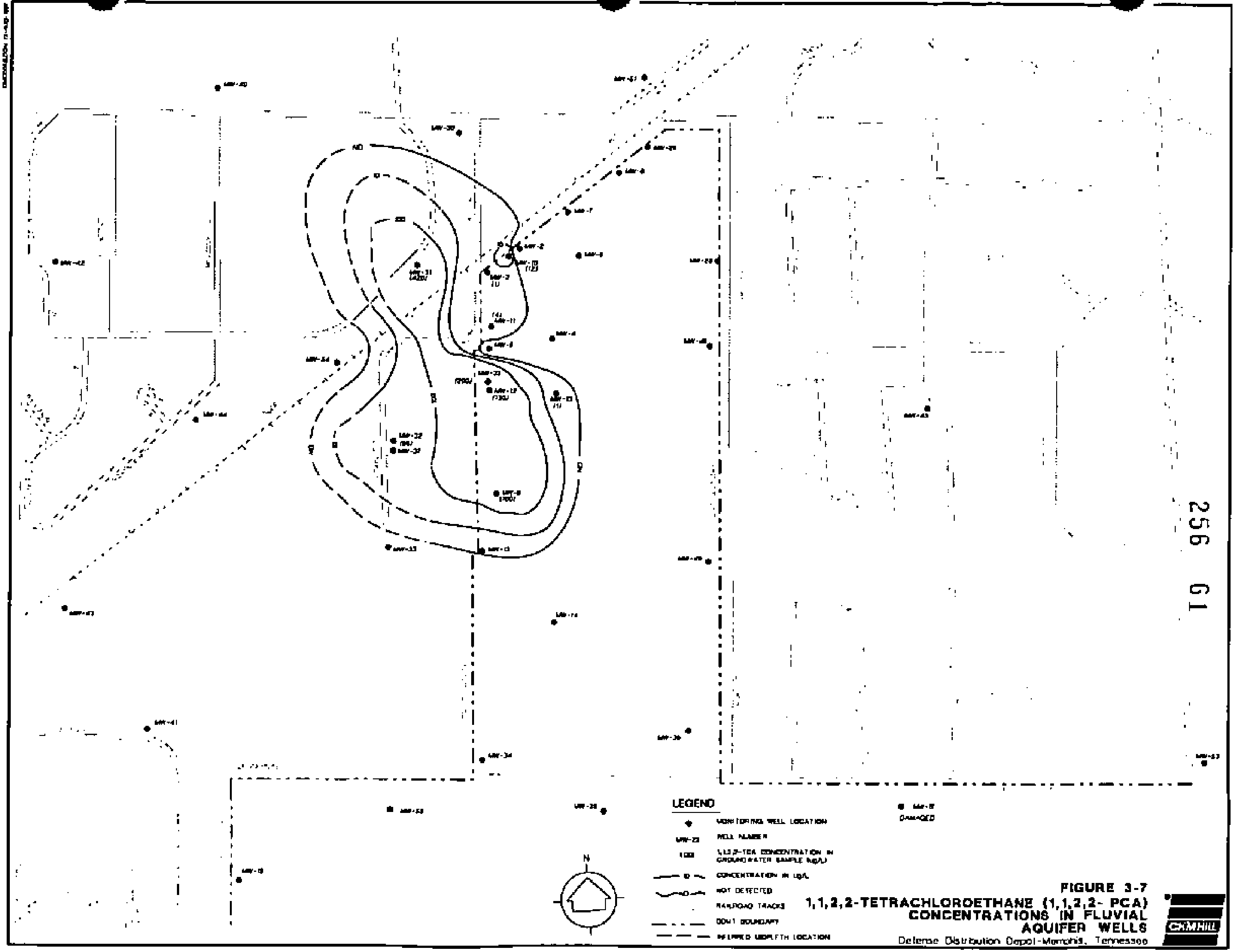


FIGURE 3-7
1,1,2,2-TETRACHLOROETHANE (1,1,2,2- PCA) CONCENTRATIONS IN FLUVIAL AQUIFER WELLS
Defense Distribution Depot-Memphis, Tennessee

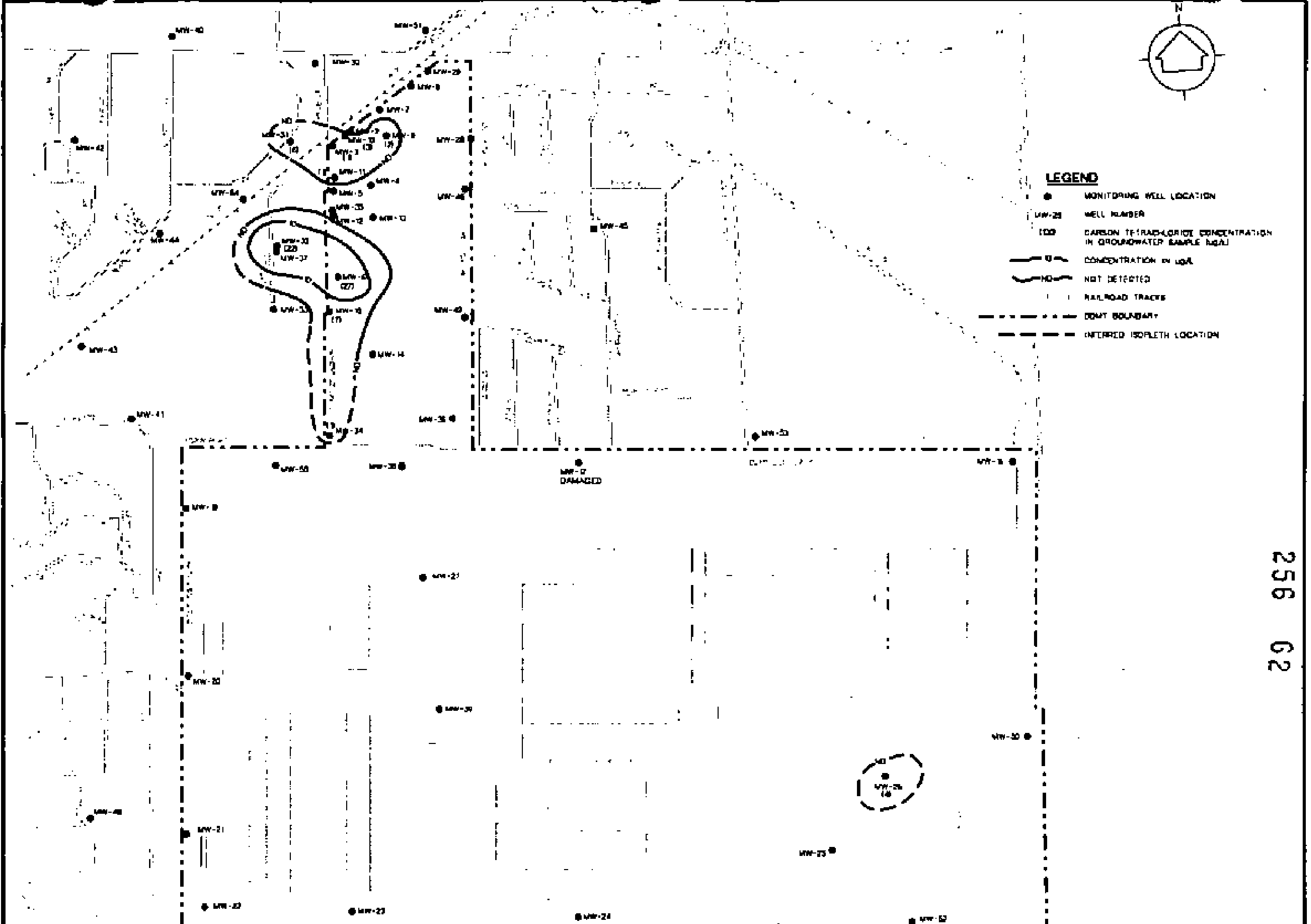


FIGURE 3-8

CARBON TETRACHLORIDE CONCENTRATIONS IN FLUVIAL AQUIFER WELLS

Defense Distribution Depot-Memphis, Tennessee

CH2M HILL

southeast portion of the 1,1-DCE plume, but the plume is also not bounded north of MW-51 (4 µg/L). 1,1-DCE was also detected in well MW-45 to the east of Dunn Field at a low concentration (2 µg/L). Another isolated 1,1-DCE detection was observed at MW-47; however, the compound was not detected in other downgradient wells on the DDMT main installation.

Tetrachloroethylene (PCE). The occurrence of PCE was relatively widespread in 1996, as it occurs in 24 wells both onsite and offsite. Concentrations of PCE range from none detected to 100 µg/L in well MW-10. For 21 of these wells, both the background values and PRGs are exceeded. For the remaining three wells, MW-23, MW-32, and MW-34, background is not exceeded but the PRGs are.

PCE is detected at four locations on DDMT, as shown in Figure 3-5. One of the two larger plumes is centered over the western and northwestern boundary of Dunn Field and extends offsite to the west and northwest. The plume is bounded everywhere but the area north of MW-51; although the position of the isopleths is inferred, particularly to the northwest. A low-level (1 µg/L) concentration of PCE was detected at MW-34. The extension of the non-detect isopleth to well MW-34 is speculative because organic constituents have not been previously detected at MW-34. Values as high as 100 µg/L are found within this plume (MW-10).

The second large plume is in the southwest corner of the main installation, extending south of the DDMT boundary. However, offsite well MW-47 is hydrologically upgradient of the other onsite wells in this area that are impacted by PCE, thus suggesting that the plume potentially has an offsite source. During periods of low groundwater recharge, it is possible that the water table drops such that continuity of flow draining toward the paleochannel ceases. If unconfined groundwater does not drain toward the paleochannel, the flow in the southwest area of the site would be governed by the slope of the clay thus potentially reversing the flow direction. Additional groundwater level data will be taken on a quarterly basis throughout 1997 to evaluate this potential. The highest value in this plume is 52 µg/L (MW-21). A smaller plume is found in the southeast corner of the main installation, centered around MW-25 and MW-26. It is bounded to the east (MW-50) and south (MW-52) and does not go beyond the eastern and southern borders of DDMT. An isolated occurrence of PCE was detected at 3 µg/L at MW-39. There is insufficient well control to determine whether the detection at MW-39 is part of a contiguous plume at wells MW-21 though MW-23.

Trichloroethene (TCE). TCE is found in five separate locations at DDMT and was detected in 23 wells during the 1996 sampling event. TCE occurs on Dunn Field, the main installation, and offsite at three locations (see Figure 3-6). Values range from none detected to a maximum of 1,900 µg/L at well MW-35. Most of the concentrations exceeded both background concentrations and PRGs, or at least background concentrations. Only two wells (MW-34 and MW-53) had values that neither exceeded background nor PRGs.

The largest TCE plume encompasses the west and northwest boundaries of Dunn Field and extends offsite to the northwest of Dunn Field. The plume is bounded everywhere but north of MW-51; although the position of the isopleths is inferred, particularly to the northwest. The highest value in this plume, and for the entire site, is 1,900 µg/L at well MW-35. A low level (1 µg/L) concentration of TCE was detected at MW-34. The extension of the non-detect isopleth to well MW-34 is speculative.

A second plume existing in the southwest corner of DDMT encompasses onsite wells MW-21 and MW-22 and offsite well MW-47. Well MW-47 is hydraulically upgradient of wells MW-21 and MW22; however, the base of the Fluvial Aquifer slopes from MW-21 and MW-22 toward MW-47. Additional groundwater elevations will be taken from these wells to confirm that the groundwater gradient is consistently from offsite toward onsite. An isolated occurrence of PCE was detected at 3 µg/L at MW-39. There is insufficient well control to determine whether the detection at MW-39 is part of a contiguous plume at wells MW-21 though MW-23. The configuration of the TCE detections on the southwest portion of the main installation is similar to that for PCE, thus suggesting an offsite, upgradient source.

TCE is also found in two other separate locations in single wells at low concentrations. MW-26 and MW-53 had 2 µg/L and 1 µg/L, respectively, of TCE.

1,1,2,2-Tetrachloroethane (1,1,2,2-PCA). This VOC was detected in nine onsite and offsite wells during the 1996 sampling event, but only occurs on the western side of Dunn Field and in the offsite wells to the west of Dunn Field (see Figure 3.7). Values of 1,1,2,2-PCA range from none detected to a maximum of 420 µg/L in well MW-31. All values exceeded both background and PRGs concentrations.

The groundwater plume occurs along the west central boundary of Dunn Field (see Figure 3-5) and extends to the west of the field. The plume is bounded on all sides. The highest value for this plume, and the entire site, is found at offsite well MW-31.

Carbon Tetrachloride. Three areas of carbon tetrachloride occur at Dunn Field (see Figure 3-8). The higher concentrations are at onsite well MW-6 (27 µg/L) and offsite well MW-32 (22 µg/L). A low-level (1 µg/L) concentration of carbon tetrachloride was detected at MW-34. The extension of the non-detect isopleth to well MW-34 is speculative. There is good well control identifying the eastern and northern bounds of this plume; however, the location of the western non-detect boundary is inferred because there is poor well control.

Low levels of carbon tetrachloride (1 to 6 µg/L) are detected in the northwest corner of Dunn Field. The location of the plume is well defined on all sides except northwest of MW-31. An isolated occurrence of carbon tetrachloride occurs at well MW-26. Carbon tetrachloride is not detected in upgradient wells MW-50 or MW-52.

3.6.2 Distribution of Inorganic Constituents

Groundwater samples were collected and analyzed for total (unfiltered) metals. Figures 3-9 through 3-13 show the concentration and distribution of five indicator metals (lead, nickel, beryllium, copper, and total chromium). These figures also show that the concentrations of metals are variable within the Fluvial Aquifer, with the highest values tending to be centered in the northwest quadrant of the main installation. Tables 3-5 and 3-6 summarize the concentrations of detected metals within the Fluvial Aquifer.

Table 3-7 and Figure 3-14 present the effect of groundwater sample turbidity on total indicator metal concentrations. Elevated concentrations of chromium, nickel, and copper are associated with lower ranges of turbidity (<20 nephelometric turbidity units [NTU]).

Table 3-7
Inorganic Data Used for Turbidity Correlation
DDMT Groundwater Characterization

Page 1 of 2

Well	Turbidity (NTU)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium, Total	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silicon	Silver	Sodium	Thallium	Vanadium	Zinc
MW-40	6	66.7	13.9	1.6	362	0.28	2.2	49800	5.2	5.3	1.9	1060	1	27600	1010	0.13	7.3	4670	2.3		2.3	63300	2.4	2	34.4
MW-20	9	635	10.9	1.7	54.2	1.1	1.8	28600	2.2	3.1	207	341	5.2	11800	247	0.28	7.7	12700	2.3		2.2	20100	0.86	19.9	94.4
MW-54	9	173	10.9	1	106	0.15	1.8	14900	2.2	3.9	2.7	4660	1.4	7440	445	0.07	7.7	767	2.3		2.2	18400	0.86	1.6	7
MW-03	10	718	10.9	0.68		0.19	1.8		9.9		2	3810	1.8			0.07	10.4		2.3		2.2		0.86		18
MW-10	10	730	10.9	0.81	89.3	0.15	1.8	20100	10.8	1.5	14.2	1450	3.5	10300	20.5	0.07	8.7	767	2.3		2.2	25600	0.86	1.7	23.4
MW-38	10	1610	10.9	0.68	79.8	0.28	1.8	14100	278	37.8	29.8	4550	30.2	6640	134	0.08	212	920	2.3		2.2	29800	0.86	4.9	99.5
MW-46	10	103	10.9	0.68	99.3	0.15	3.6	17400	4.6	8.5	2	648	2.3	8660	228	0.07	7.7	858	2.3		2.2	27400	0.86	1.6	54.9
MW-47	10	365	10.9	0.68	99.6	0.15	1.8	23700	5.6	1.9	2	1180	2.3	12600	99.1	0.07	7.7	1630	2.3		2.2	27600	0.86	1.6	12.7
MW-48	10	192	10.9	0.68	91.1	0.15	1.8	16500	2.6	4.6	2	1120	2.3	8690	112	0.07	7.7	1350	2.3		2.2	23100	0.86	1.6	11.3
MW-49	10	86.2	10.9	0.68	96.4	0.15	1.8	16500	3	1.5	2	328	2.6	8140	57.6	0.07	7.7	1260	2.3		2.2	14600	0.86	1.6	15
MW-50	10	174	10.9	0.68	307	0.15	1.8	49200	4.8	10.6	2	4900	2.3	24000	441	0.07	7.7	3330	2.9		2.2	61200	0.86	1.6	13.2
MW-51	10	153	10.9	0.68	86.4	0.15	1.8	21600	2.2	6.9	2	322	2.3	10500	112	0.07	7.7	946	2.3		2.2	19100	0.86	1.6	15.2
MW-52	10	111	10.9	0.68	177	0.15	1.8	43700	3.3	18.2	2	7960	2.3	22500	467	0.07	8.4	1750	2.3		2.2	74600	0.86	1.6	7.2
MW-53	33	203	10.9	0.68	122	0.15	1.8	29700	2.2	19.6	2	3610	1.4	15800	917	0.07	7.7	767	2.9		2.2	32300	0.86	1.6	10.4
MW-30	35	166	11.8	0.68	116	0.15	1.8	22900	2.2	1.8	2	340	1.4	12000	3.2	0.07	7.7	767	2.3		2.2	17000	0.86	1.6	12.9
MW-33	36	73.4	10.9	0.68	53.3	0.15	1.8	8910	2.2	1.7	2	147	2.3	4750	5.2	0.07	7.7	767	6.9		2.2	24100	0.86	1.6	9.8
MW-29	40	768	10.9	0.68		0.15	1.8		4		2		1.4			0.07	7.7		2.3		2.2		0.86		13.5
MW-36	48	406	10.9	2		0.15	2.2	39900	14.4		2.4	5090	3.3	10300		0.07	11	5960	6.9	15400	2.2	9560	0.86		11.6
MW-34	79	140	10.9	0.68	117	0.15	1.8	11300	4.8	2.4	2	340	2.3	5570	5	0.07	7.7	849	2.3		2.2	10300	0.86	1.6	15.2
MW-11	80	115	10.9	0.68		0.15	1.8		2.2		2		1.4			0.07	7.7		2.3		2.2		0.86		5.6
MW-25	83	110	10.9	0.68	102	0.15	1.8	18500	2.6	1.8	2	805	2.3	10000	42.4	0.07	7.7	767	2.3		2.2	19100	0.86	1.9	17.8
MW-32	94	213	16.1	0.68		0.15	1.8	57400	2.2		3	329	1.5	13300		0.55	8.6	1280	2.3	19500	2.2	19900	0.86		13.5
MW-07	101	679	10.9	1.2	67.3	0.15	1.8	16900	7.4	1.6	2.2	3270	1.4	8300	23.2	0.07	10.3	767	2.3		2.2	21700	0.86	2.9	18.1
MW-22	107	1580	10.9	0.68	108	0.18	2.4	27300	21.6	1.5	2.6	8870	2.3	15100	11.4	0.1	11.6	1050	2.3		2.2	39500	0.86	5.4	24.5
MW-44	117	4720	15	4.4	166	0.38	2.2	35200	9.7	16.4	3.7	14000	1.7	10200	755	0.15	7.5	2010	2.3		2.4	22200	2.4	10.5	19.6
MW-23	122	545	11.6	0.68	56.6	0.15	3	39700	12.5	1.8	2.2	758	3.7	10400	12	0.14	8.4	1120	2.3		2.2	13100	0.86	2.6	15.6
MW-35	126	3850	10.9	0.68	124	0.4	1.8	13100	23.4	11.7	5.8	16200	8.4	6700	142	0.07	13	1170	2.3		2.2	17800	0.86	12	29.6
MW-24	131	718	10.9	0.68	49.5	0.15	1.8	9950	20.3	2.2	4	5190	5.5	5250	17.2	0.08	9.4	962	2.3		2.2	21300	0.86	2.8	10.8
MW-45	138	586	17.2	1	127	0.35	1.8	34700	4.9	9.5	3.8	2280	2.3	19500	326	0.19	7.7	849	2.3		2.2	20300	0.86	14.8	12.2
MW-13	143	1270	10.9	0.68		0.18	1.8		12.5		3.2	5370	2.3			0.07	12.6		2.3		2.2		0.86		19.8
MW-06	148	1120	10.9	0.68		0.25	1.8		21.9		2	4250	5.2			0.33	25.3		2.3		2.2		0.86		21.6
MW-08	251	3610	10.9	0.68		0.39	1.8		26.4		2	12600	6.7			0.07	16		2.3		2.2		0.86		19.3
MW-37	251	478	12.7	0.88		0.15	2.6	40500	24		2	5260	4.2	15500		0.07	20.7	6340	2.3	9120	2.2	7390	0.84		12.3

Table 3-7
Inorganic Data Used for Turbidity Correlation
DDMT Groundwater Characterization

Page 2 of 2

Well	Turbidity (NTU)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium, Total	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silicon	Silver	Sodium	Thallium	Vanadium	Zinc
MW-16	757	2670	10.9	1.5	66.7	0.15	1.8	44900	34	12.3	12.3	3970	7.6	19100	143	0.07	25.6	1330	2.3		2.2	45200	0.86	6.5	38.9
MW-02	999	601	10.9	0.68		3.7	1.8		2.2		32.5		9.9			0.84	7.7		2.3		2.2		0.86		53.1
MW-04	999	252	10.9	0.68		1.1	1.8		2.2		2.8		9.4			0.07	7.7		2.3		2.2		0.86		10.8
MW-05	999	127	10.9	0.68	71.7	0.15	1.8	19400	2.2	1.8	2	160	1.4	10400	6.3	0.12	7.7	1110	2.3		2.2	48300	0.86	2	4.3
MW-09	999	5210	10.9	0.68		0.96	1.8		12.4		33.9		18.4			0.09	7.7		2.3		2.2		0.86		38.8
MW-12	999	20500	10.9	1.4		2.9	1.8		63		105		24.4			0.17	46		6.9		2.2		0.86		132
MW-14	999	22600	10.9	0.9	312	2.9	1.8	16900	42.6	61.9	36	96100	19.3	8920	1400	0.46	25.3	2470	2.3		2.2	16200	0.86	101	100
MW-15	999	210	10.9	0.68	70.5	0.53	1.8	14300	2.2	4	75	271	2.6	6280	52.2	0.37	7.7	1900	2.3		2.2	11600	0.86	8.2	23.2
MW-19	999	235	16.9	1.3	42.9	0.15	1.8	17800	2.2	6	315	155	3.9	6160	296	0.1	12.1	4040	2.3		2.2	13200	0.86	2.6	62.4
MW-28	999	287	19.7	0.68	47.6	0.21	1.8	14000	2.2	6.1	4.4	598	1.4	6470	75.6	0.14	7.7	767	4.6		2.2	15000	0.86	5.1	17.8
MW-42	999	2670	13.9	1.4	168	0.28	2.2	20100	4.4	4.4	12.3	3560	5.8	8740	383	0.13	7.3	5320	2.3		2.3	36800	2.4	4.5	45.6
Correlation Coefficient:		0.47	0.06	0.14	-0.21	-0.04	0.00	0.28	0.04	0.07	-0.08	0.24	0.13	0.18	-0.12	0.01	0.00	-0.04	-0.11	-0.81	-0.02	0.04	-0.05	0.21	0.01

Notes:

All analyses were conducted on unfiltered groundwater samples.

Concentration units = µg/L

Data from MW-21, MW-26, and MW-39 are not presented because the turbidity values recorded in the field notes were considered suspect based on range of values previously obtained at these locations.

Blank cells indicate data not available

Undetected data are reported at the detection limit.

Turbidity of 999 indicates offscale measurement.

NTU = Nephelometric Turbidity Unit

256 66

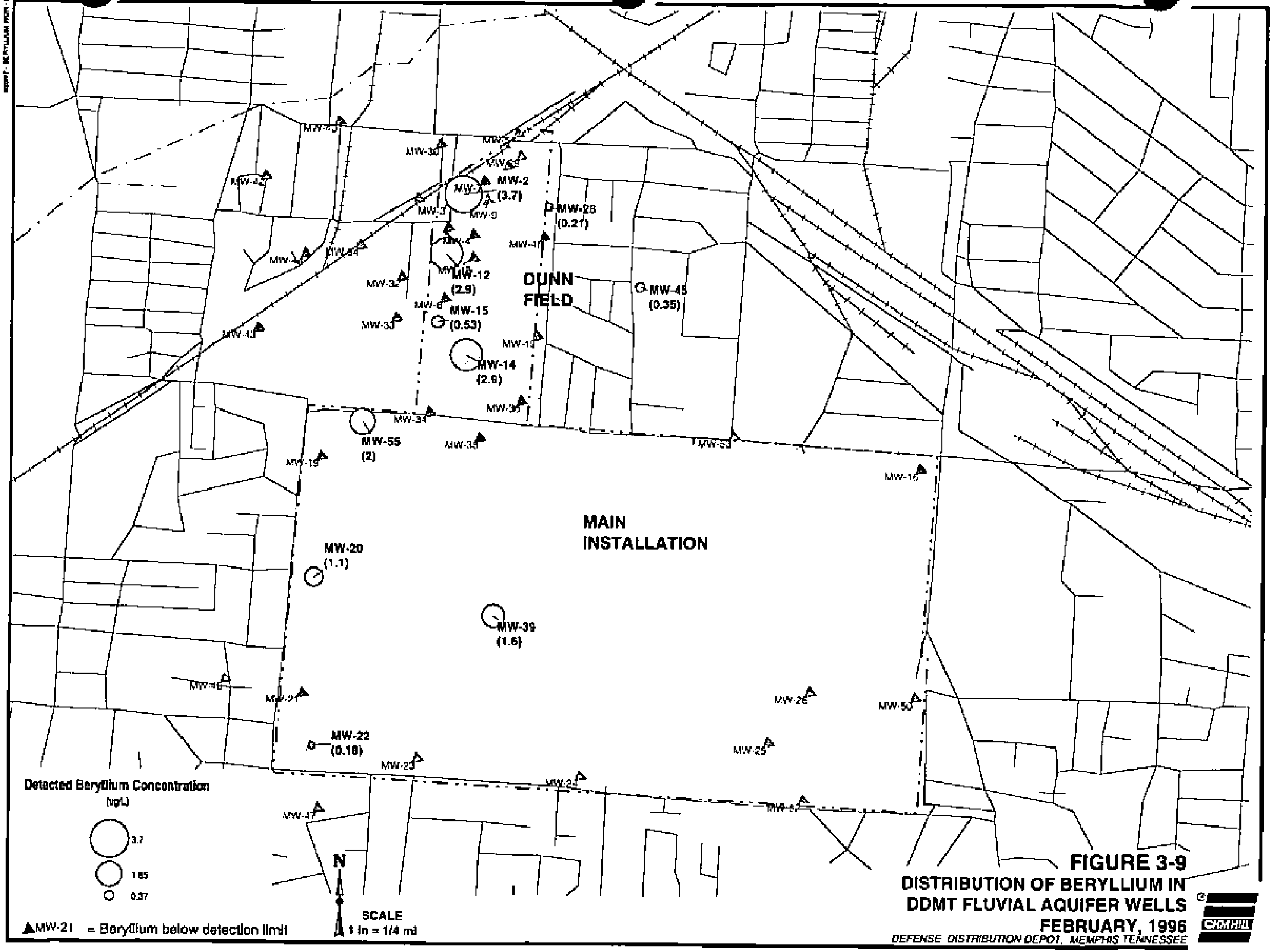


FIGURE 3-9
DISTRIBUTION OF BERYLLIUM IN
DDMT FLUVIAL AQUIFER WELLS
FEBRUARY, 1996
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

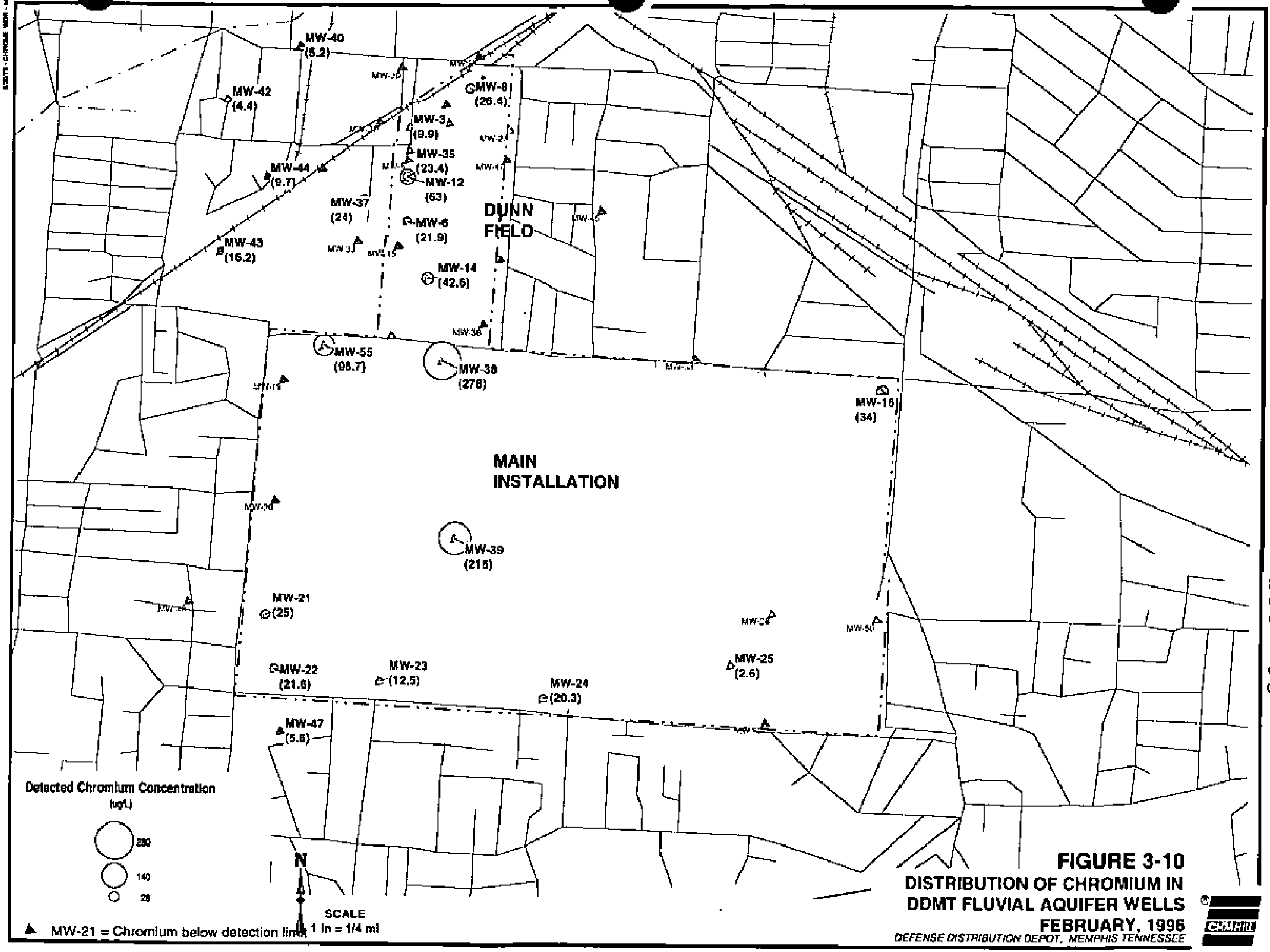


FIGURE 3-10
DISTRIBUTION OF CHROMIUM IN
DDMT FLUVIAL AQUIFER WELLS
FEBRUARY, 1996
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

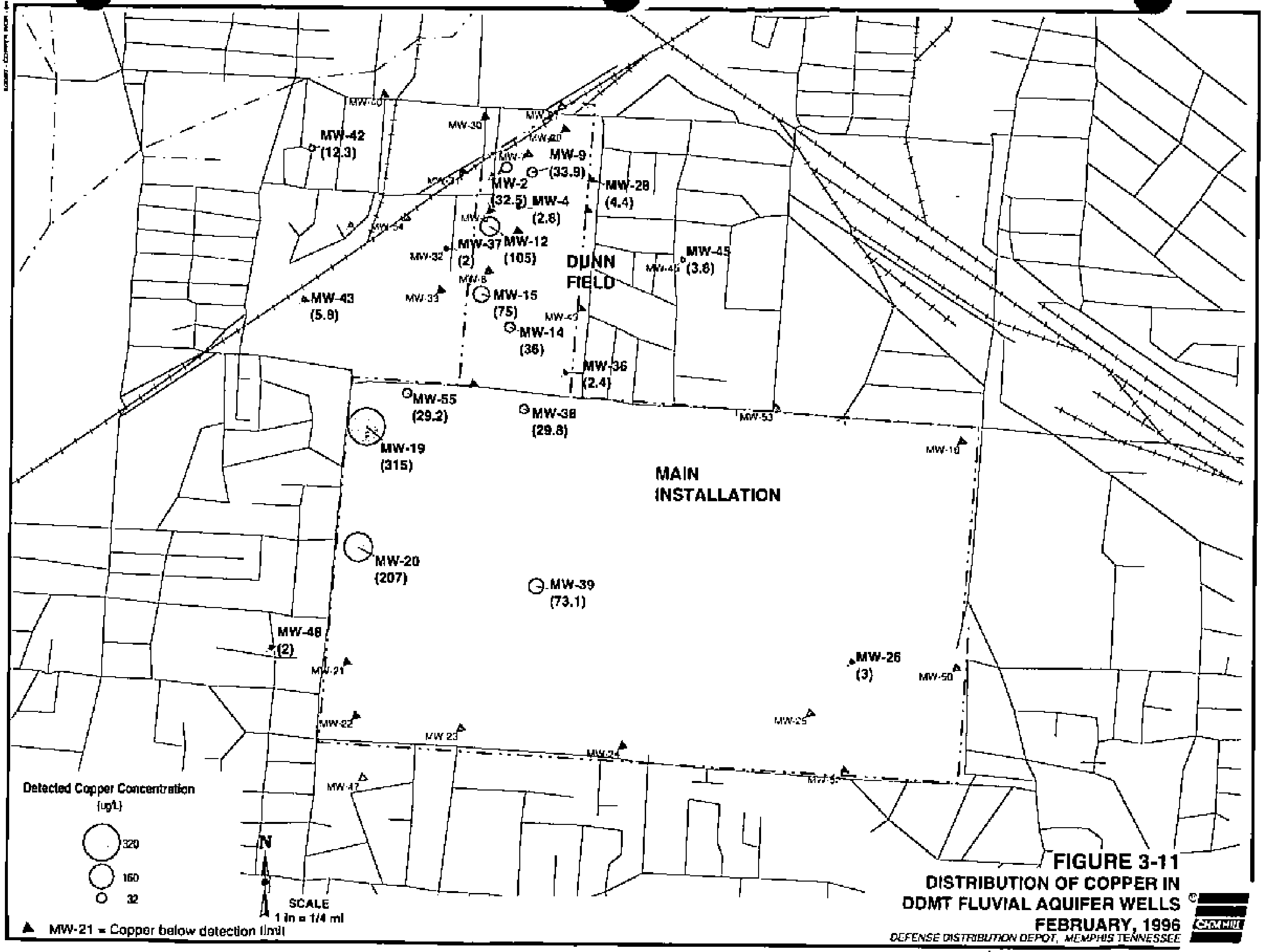


FIGURE 3-11
DISTRIBUTION OF COPPER IN
DDMT FLUVIAL AQUIFER WELLS
FEBRUARY, 1996
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

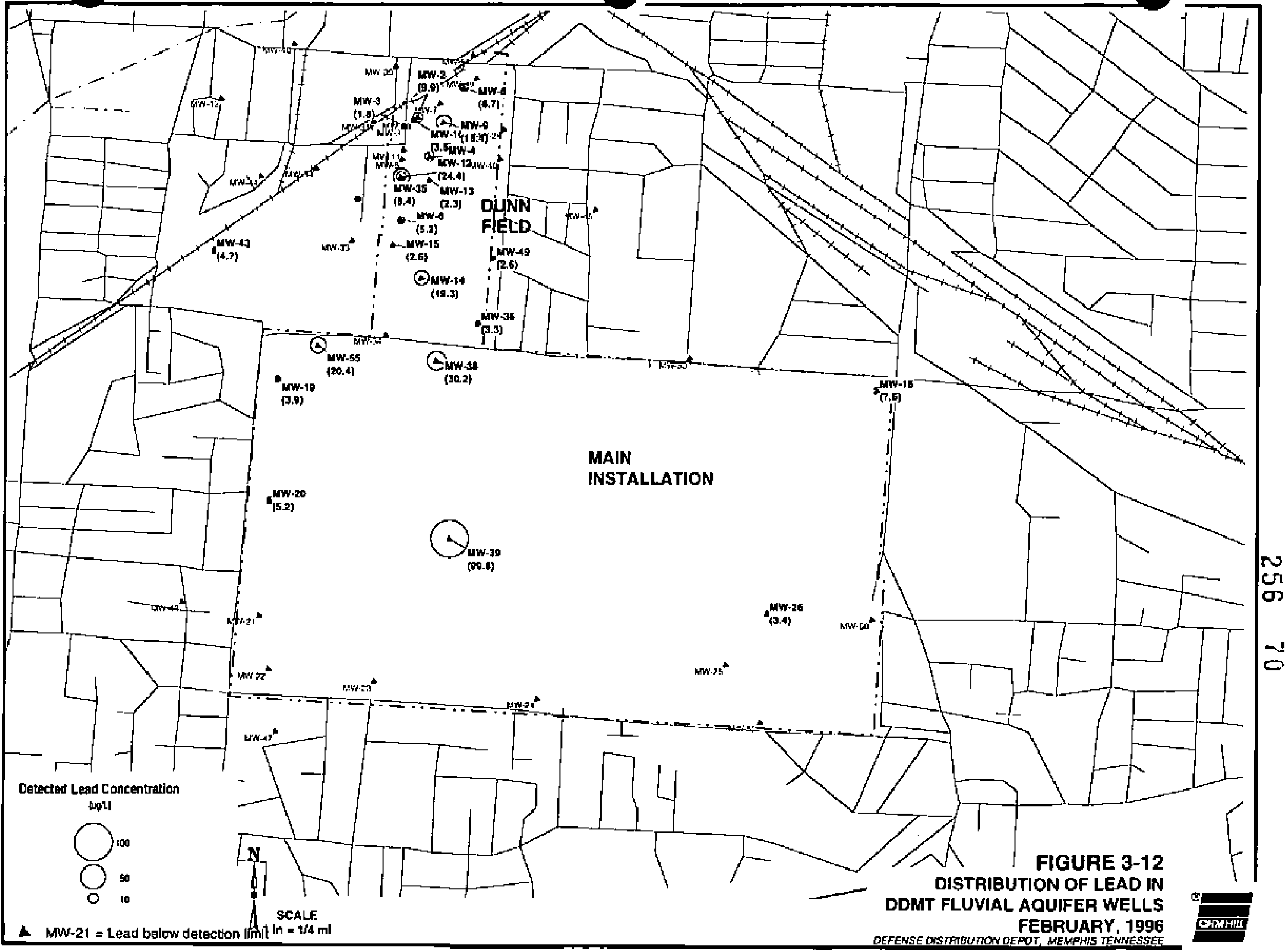


FIGURE 3-12
DISTRIBUTION OF LEAD IN DDMT FLUVIAL AQUIFER WELLS
FEBRUARY, 1996

DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

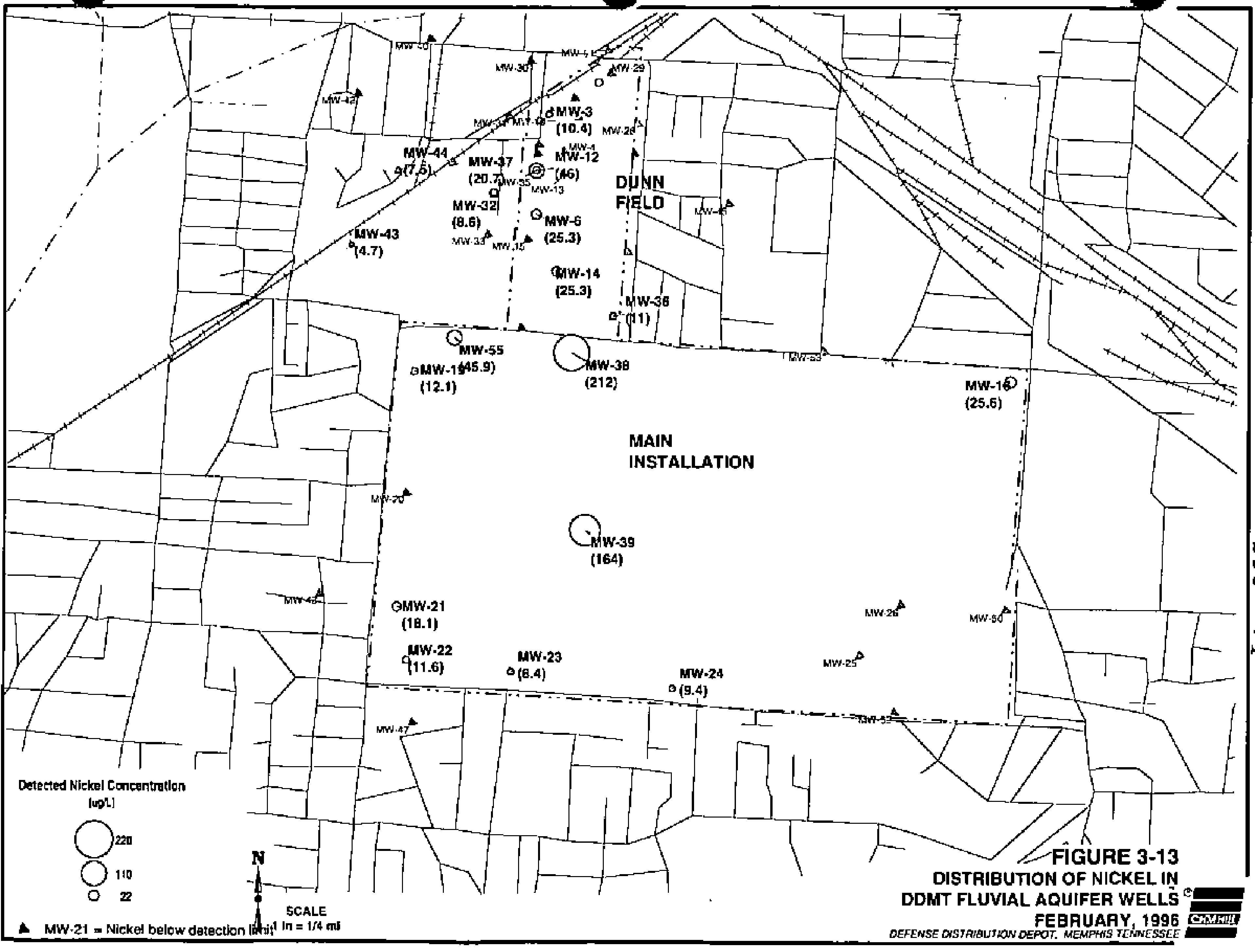


FIGURE 3-13
DISTRIBUTION OF NICKEL IN DDMT FLUVIAL AQUIFER WELLS
FEBRUARY, 1996
DEFENSE DISTRIBUTION DEPOT, MEMPHIS TENNESSEE

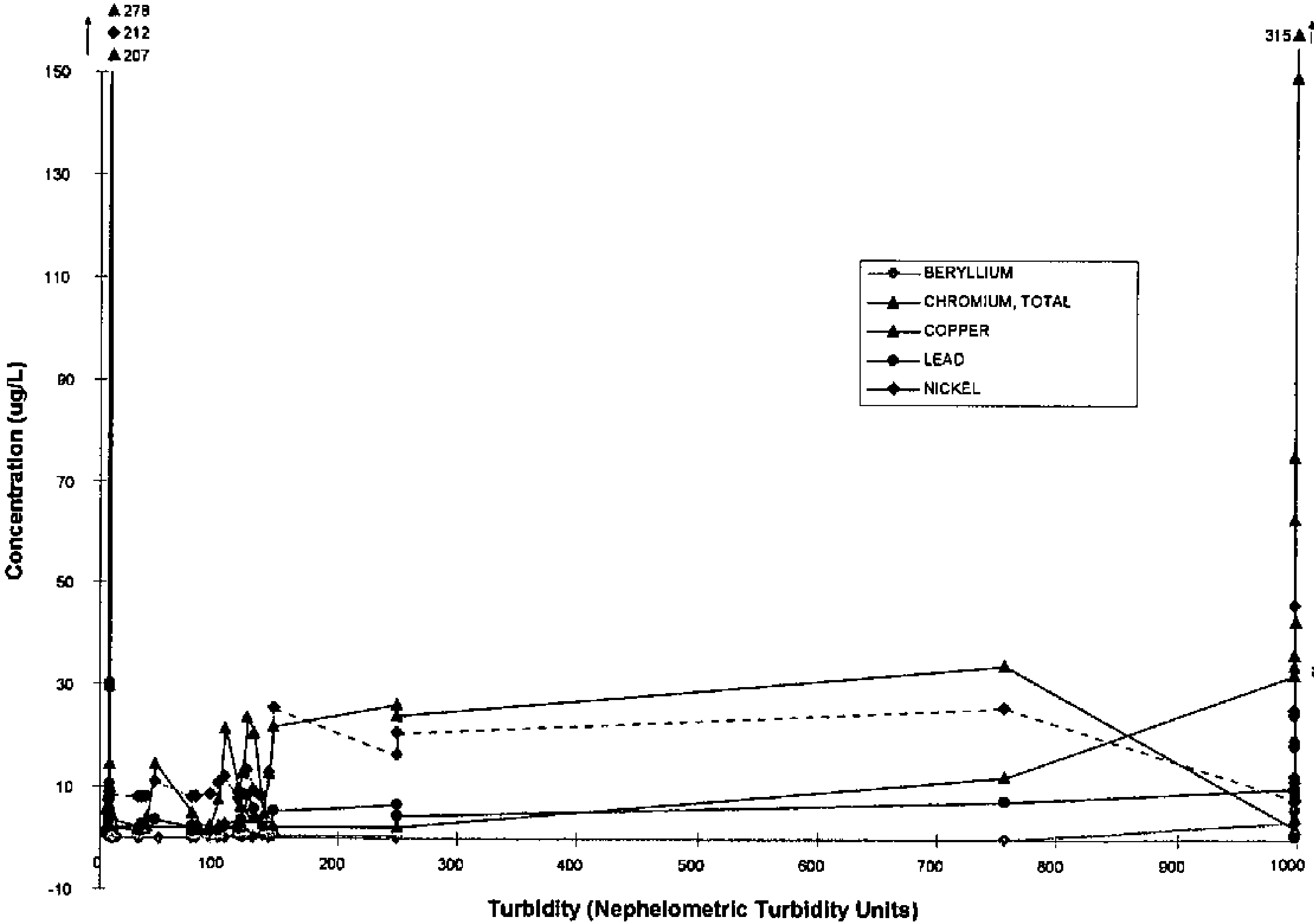


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Figure 3-14
Groundwater Sample Turbidity Versus Metal Concentration
Defense Distribution Depot - Memphis, Tennessee

Elevated copper and total chromium are also associated with elevated (off the instrument scale) turbidity. Metal concentrations generally do not show an increasing trend across the range of turbidity measured in the field. The linear correlation between turbidity and concentration is evaluated in Table 3-7 by calculating a linear correlation coefficient between individual total metal concentrations and turbidity. A correlation coefficient value of zero indicates that the magnitude of the metal concentration is not at all linearly dependent on the magnitude of turbidity. Values of positive or negative one indicates a perfect direct and inverse linear relationship between concentration and turbidity, respectively. Intermediate values indicate less-than-perfect correlations. Inspection of Table 3-7 indicates that the metal concentration to turbidity correlation coefficients are generally low (less than 0.1) with moderate to weak correlations for aluminum (0.47) and iron (0.25). Both constituents are naturally occurring in clay minerals.

Beryllium. Beryllium, found in 10 wells, was detected in Dunn Field and the western half of the main installation in the February 1996 sampling program (see Figure 3-9). The highest value of 3.7 μg/L, which exceeds the background value for beryllium, was found in MW-2. Higher values occur in Dunn Field than in the main installation. In all wells where beryllium was detected, the values were above background concentrations but not above PRGs.

Two offsite wells to the east of Dunn Field also had beryllium detected at 0.21 μg/L (MW-28) and 0.35 μg/L (MW-45). However, unlike the other metals, beryllium was not detected in the monitoring wells west of Dunn Field.

Chromium. Chromium was detected in Dunn Field, the main installation, and offsite to the west of Dunn Field, for a total of 21 wells (see Figure 3-10). Chromium (at 5.6 μg/L) was also detected in one offsite well (MW-47) to the southwest of the main installation. The highest values are found in the main installation, at MW-38 (278 μg/L), and at MW-39 (215 μg/L). Chromium values in Dunn Field range from 9.9 μg/L (MW-3) to 63 μg/L (MW-12); while values in the offsite wells to the west range from 4.4 μg/L (MW-42) to 34 μg/L (MW-34).

Chromium was detected in four wells (MW-12, MW-38, MW-39, and MW-55) at values above the PRG of 18 μg/L and background values. The remaining wells had either values above PRGs or values that did not exceed PRGs or background concentrations.

Copper. Copper was detected in Dunn Field, the main installation, offsite to the west of Dunn Field and the main installation, and east of Dunn Field (see Figure 3-11). The highest values of copper occur along the northwest edge of the main installation at wells MW-19 (315 μg/L) and MW-20 (207 μg/L). Both of these values exceed the risk-based PRG of 135 μg/L for copper and background values. The remaining wells, both onsite and offsite, had copper values that did not exceed PRGs or background concentrations. Copper values onsite were greater than offsite values. Copper was detected in 19 wells in the 1996 sampling program.

Lead. Lead was detected throughout Dunn Field and the main installation (where there was well control), for a total of 23 wells (see Figure 3-12). Lead was detected in well MW-43 (4.7 μg/L) to the west of Dunn Field. Three wells on the main installation have lead values that exceed PRGs and background concentrations: MW-55 (20.4 μg/L), MW-38 (30.2 μg/L), and MW-39 (99.8 μg/L). MW-39 had the highest value of all wells sampled. Offsite wells had either no lead detected or values below PRGs and background.

Nickel. With the exception of well MW-16, nickel was detected in the western half of the main installation, in Dunn Field, and offsite to the west of Dunn Field in a total of 20 wells (see Figure 3-13). Two wells with values exceeding PRGs and background concentrations are found on the main installation: MW-38 (212 µg/L) and MW-39 (164 µg/L). Offsite wells that are west of Dunn Field are below background concentrations.

3.6.3 Groundwater Constituent Trends

3.6.3.1 Well to Well Comparison of VOCs

Concentrations of detected volatile organics from the 1996 sampling event were evaluated as a group to assess how their concentrations and distributions varied from well to well. VOCs selected for discussion were based on frequency of occurrence. Occurrences within the main installation, Dunn Field, and offsite are discussed.

Main Installation. Concentrations and frequency of occurrence were lower on the main installation than on Dunn Field. In fact, only two of the five VOCs (TCE and PCE) occur on the main installation. These constituents occur in the same wells, which may indicate that they are from the same sources. The TCE and PCE plumes in the southwest corner of the main installation are of similar size and shape, which may indicate a similar source.

Dunn Field. All five VOCs occur in Dunn Field, in the western and northwestern portions of the field; and all five plumes have migrated offsite to the west. None of the VOCs were detected in any of the wells that parallel the eastern boundary of the field. Highest values detected from the 1996 sampling event were found in or adjacent to Dunn Field.

The TCE and PCE plumes in Dunn Field are nearly identical in shape and extent, indicating that they may both derive from a similar source area. The carbon tetrachloride and 1,1,2,2-PCA plumes are also very similar in extent. Only the 1,1-DCE plume has a unique configuration, suggesting either an alternative source area associated with the northeast trending border of Dunn Field or a degradation plume from PCE/TCE.

Offsite. VOCs were detected offsite west of Dunn Field, southwest of the main installation (MW-47), and at upgradient wells east of Dunn Field (MW-45 and MW-53). The highest values for 1,2-DCE and 1,1,2,2-PCA both occur offsite in MW-31. Organic constituents found offsite west of Dunn Field originated from the Dunn Field groundwater plume. Additional water level data will be collected to determine if offsite organic contamination southwest of the main facility results from sources on or off DDMT property. Isolated VOC detections upgradient from both Dunn Field and the main installation result from undetermined offsite sources.

3.6.3.2 Well to Well Comparison of Metals

Concentrations of beryllium, chromium, copper, lead, and nickel from the 1996 sampling event were evaluated as a group to assess how they varied from well to well. These metals were selected in accordance with the frequency of detection and exceedances of groundwater PRGs. Occurrences within the main installation, Dunn Field, and offsite are discussed.

Main Installation. With the exception of beryllium, higher concentrations of metals were found on the main installation than on Dunn Field. The highest concentrations and frequency of occurrence were in the northwest quadrant of the main installation.

In particular, wells MW-19, MW-20, MW-38, MW-39, and MW-55 showed the highest concentrations of metals. In the southeast quadrants, metals either were not detected or occurred at very low concentrations. Nickel, chromium, and beryllium occurred in wells in the southwest quadrant. One well (MW-16) in the northeast quadrant, where there is poor well control, showed concentrations of nickel, chromium, and lead.

Dunn Field. All five metals were detected in the wells in Dunn Field. Wells MW-12 and MW-14 were the only individual wells in which all five metals were detected. No pattern of metals distribution is apparent, which can be attributed to either variations in the turbidity of the unfiltered metal samples or spatial variation in the groundwater source terms for metals.

Offsite. All five metals were detected in at least one offsite well. Concentrations in these wells were lower than concentrations found in Dunn Field or the main installation. In no well were all five metals detected, and MW-43 was the only offsite well in which four metals were detected.

3.6.3.3 Temporal Trends in VOCs

Groundwater data were available for 18 wells for four separate monitoring events. Data reported for 1989 and 1990 were from the RI/FS characterization reported by Law (1990). Data reported in 1993 were taken from ESE (1994). These results were compared with the February 1996 water quality results, and the concentrations of TCE; PCE; 1,1,2,2-PCA; and carbon tetrachloride were plotted over time (see Figures 3-15 through 3-18) to identify trends in concentrations that might signify natural attenuation or continued input of organic contamination into the Fluvial Aquifer. Only those wells were plotted for which data were available for at least three of four possible consecutive time periods (1989, 1990, 1993, and 1996).

PCE. The PCE trend plots shown in Figure 3-15 display a variety of concentration trends over time. Wells with a predominately decreasing trend are MW-10, -04, -12, and -32. MW-03 shows a general increasing trend followed by a marked decrease between 1993 and 1996. With the exception of offsite well MW-32, all the decreasing trend wells are in the northwest portion of the Dunn Field plume. Wells with an increasing trend in PCE concentration are MW-35, -39, and -21 associated with the Dunn Field plume, the northwest portion of the main installation, and the southwest plume, respectively. Within Dunn Field, increases in PCE concentration are associated with the southern portion of the PCE plume while decreases are northward near the northwest corner.

TCE. The TCE trend plot shown in Figure 3-16 also shows a variety of concentration trends. Wells MW-11, and to a lesser extent MW-29 and MW-51 exhibit a continuously decreasing concentration over time. Wells MW-10 and MW-15 had an increasing concentration trend between 1989 and 1993, followed by a decrease in concentration between 1993 and 1996. Increasing concentrations were observed at MW-21, located in the southwest plume, and MW-35. MW-35 identifies the upgradient position of the 1,000 μg/L isopleth (see Figure 3-6); therefore, the consistently increasing concentration suggests a continual input of TCE into the Fluvial Aquifer. TCE concentrations in MW-31, the other significantly contaminated well downgradient from MW-35, show a generally uniform or slightly decreasing concentration over time. Wells MW-31, -11, and -29 all show a moderate decrease in concentration since 1990. Wells MW-10, -09 and -15, located in the north and

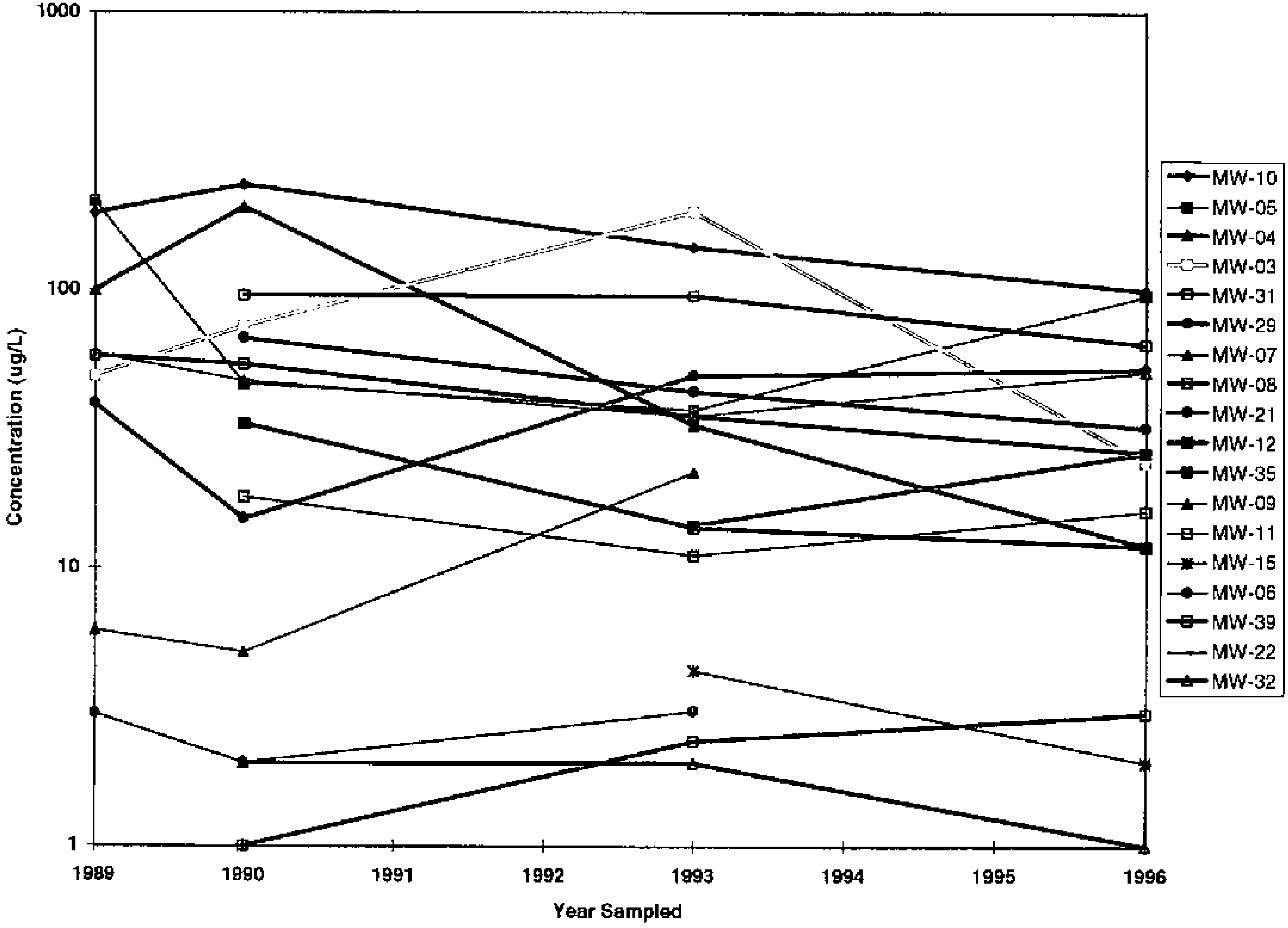


Figure 3-15. Tetrachloroethylene (PCE) Concentration Trends

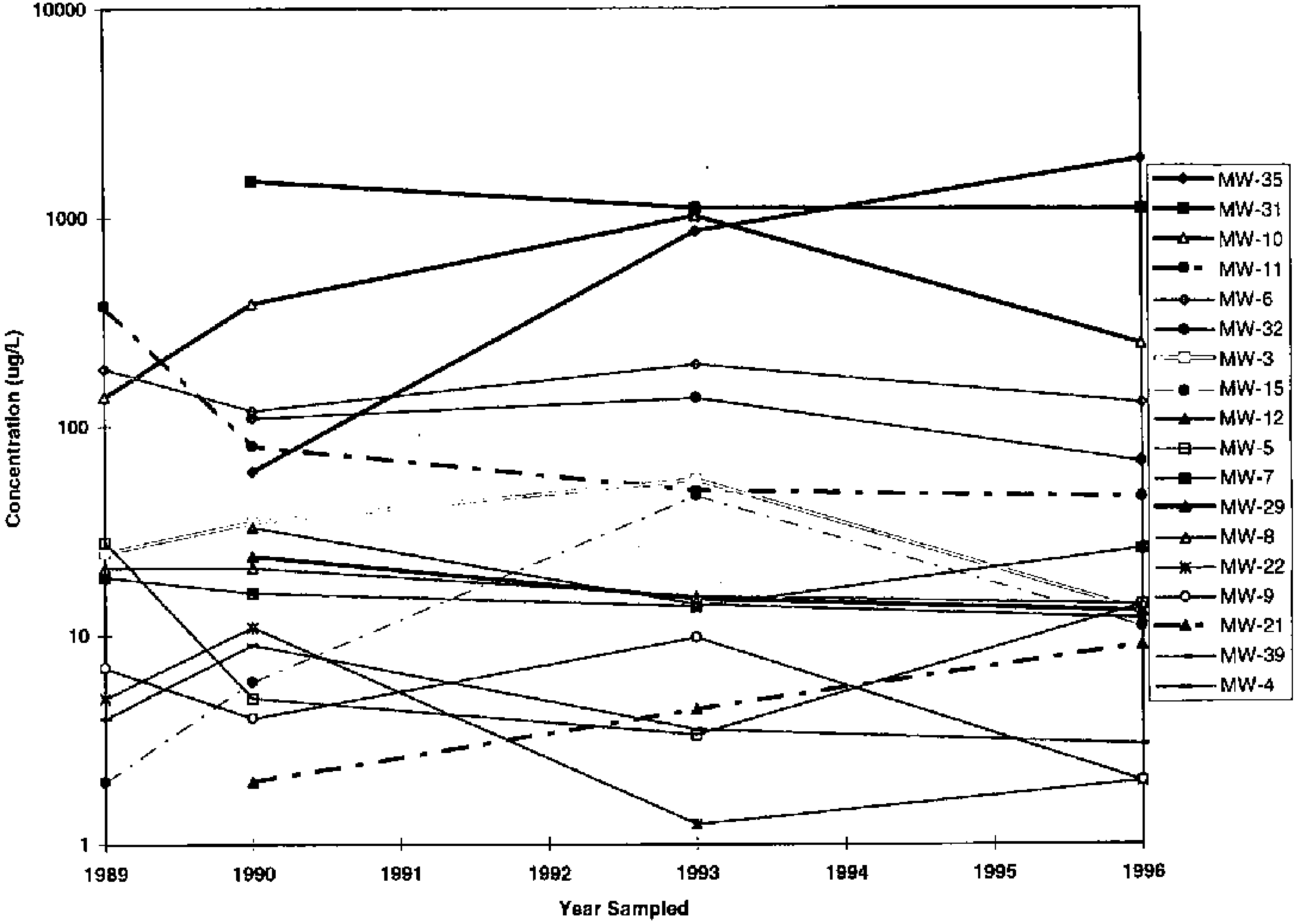


Figure 3-16. Trichloroethylene (TCE) Concentration Trends

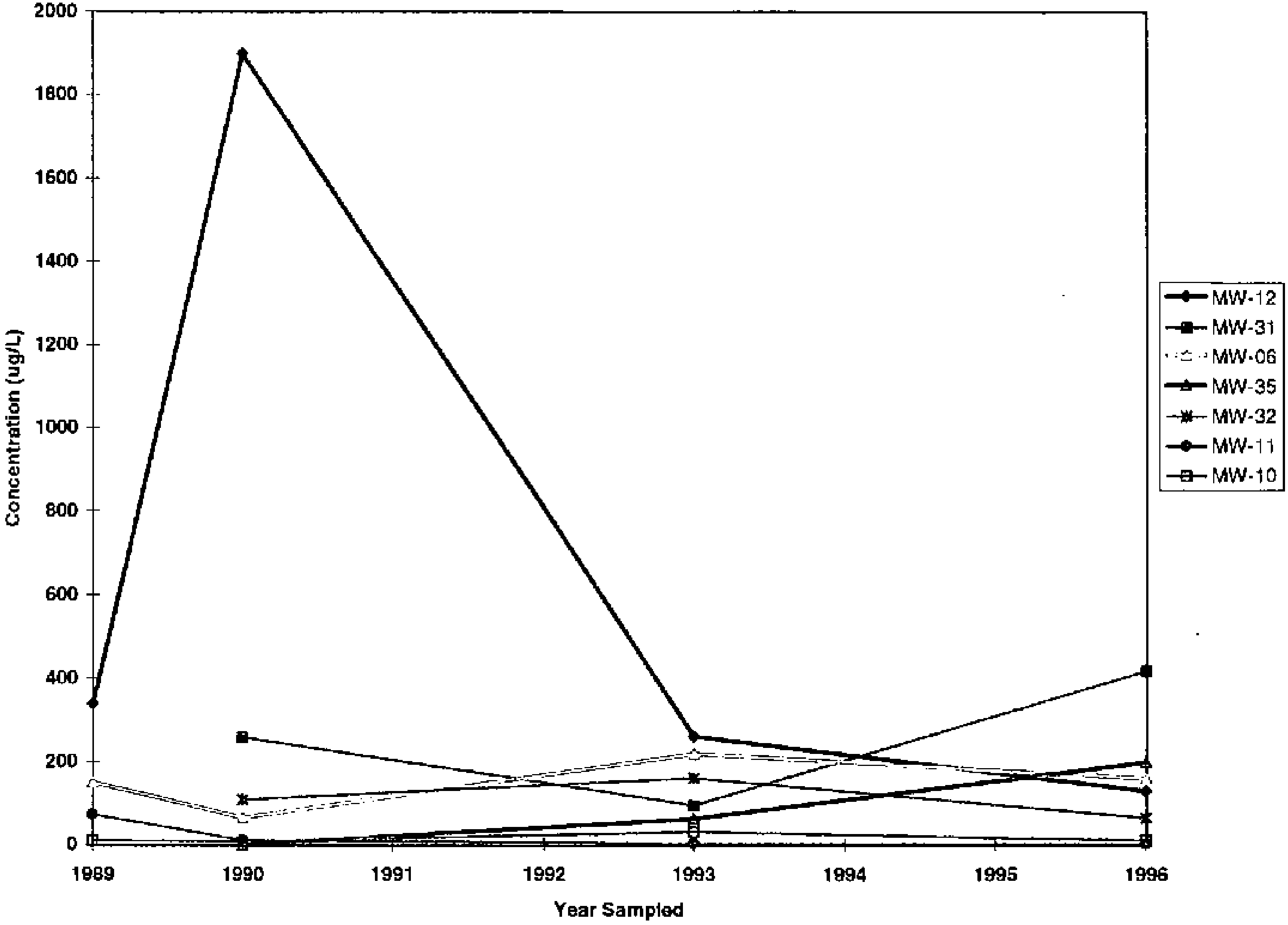


Figure 3-17. 1,1,2,2-Tetrachloroethane (1,1,2,2-PCA) Concentration Trends

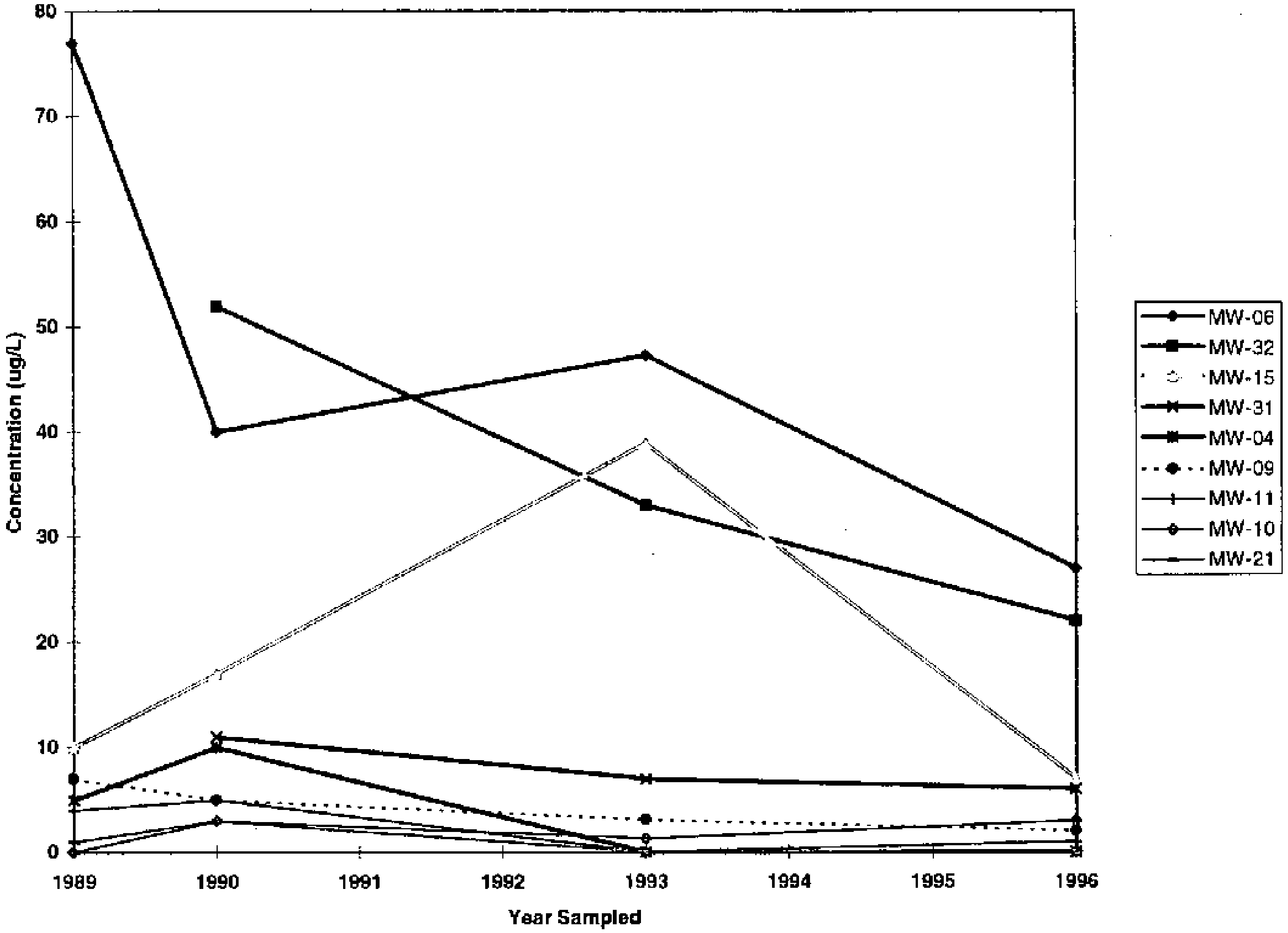


Figure 3-18. Carbon Tetrachloride Concentration Trends

south portion of the Dunn Field plume, show an increasing trend in TCE concentration marked by a decrease after 1993. Other wells again show varying fluctuations over time.

1,1,2,2-PCA. Well-specific fluctuations of 1,1,2,2-PCA are generally nonuniform (see Figure 3-17). The only uniform increase with time is observed at well MW-35, again suggesting a continual source of organic groundwater contamination in this vicinity. An anomalously large 1,1,2,2-PCA concentration was observed at well MW-12 in 1990; this concentration has not been observed since.

Carbon Tetrachloride. Decreasing trends in carbon tetrachloride concentration are observed at wells MW-6 and MW-32 (see Figure 3-18). MW-15 shows a drop in concentration between 1993 and 1996, after a continual increase. These three wells are located near the center of the southern Dunn Field carbon tetrachloride plume. Other wells with low (<10 µg/L) concentrations of carbon tetrachloride show a decreasing trend in concentration.

Comparison of VOC Trends. Increasing concentrations of both PCE and TCE are noted at well MW-35 and well MW-21. Both compounds are increasing, not just the TCE degradation product of PCE, which indicates the possibility of continual source term input in the center of the Dunn Field plume and (to a much lesser extent based on relative concentration) in the southwest plume. Decreases in both PCE and TCE are noted in the northern portion of the plume indicating reduced flux of contaminant input.

3.6.3.4 Temporal Trends in Metals

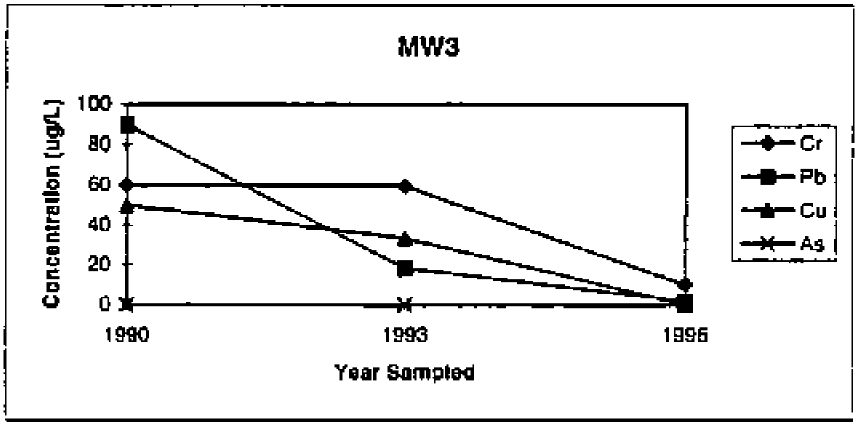
Data were available for 20 wells for three separate monitoring events. The *Remedial Investigation at DDMT* (Law, 1990) and the *Groundwater Monitoring Results for DDMT* (ESE, 1994) included results from a round of well sampling. These results were compared with the February 1996 water quality results, and the concentrations of chromium, copper, lead, and arsenic were plotted over time (see Figure 3-19). Only those wells were plotted for which data were available for the three time periods (1990, 1993, and 1996).

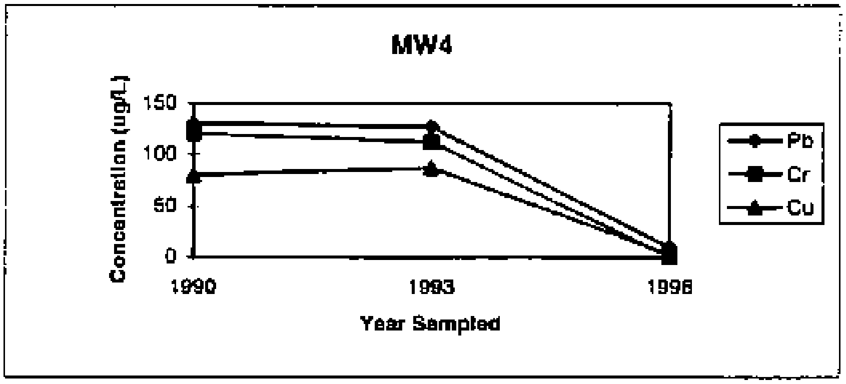
In general, of the four metals plotted, chromium typically had the highest values, followed by copper, lead, and arsenic. Metal values generally decreased between 1990 and 1996, with the notable exception of well MW-12. As a group, the metals concentrations were higher in the 1993 sampling event than in either the 1990 or 1996 event. The metals analyses for all three sampling events were performed on unfiltered samples. Therefore, it is likely that some of the differences in values may be attributed to turbidity in the samples.

Chromium. The chromium plots over time indicate that chromium occurred in the greatest concentrations relative to the other metals and that an overall decline in concentrations occurred between the 1990 and 1996 values. A comparison of the three sampling events showed that the general trend was that the highest chromium values occurred in 1993, intermediate values occurred in 1990, and the lowest values occurred in 1996.

Copper. Lower values of copper (as compared with chromium) were detected in all wells except MW-10, MW-12, and MW-13. The 1990 and 1993 values were generally equal, or the 1993 values were slightly higher than the 1990 values. An overall decline in the copper concentrations, with the exception of MW-12, occurred in the 1996 values.

256 - 81





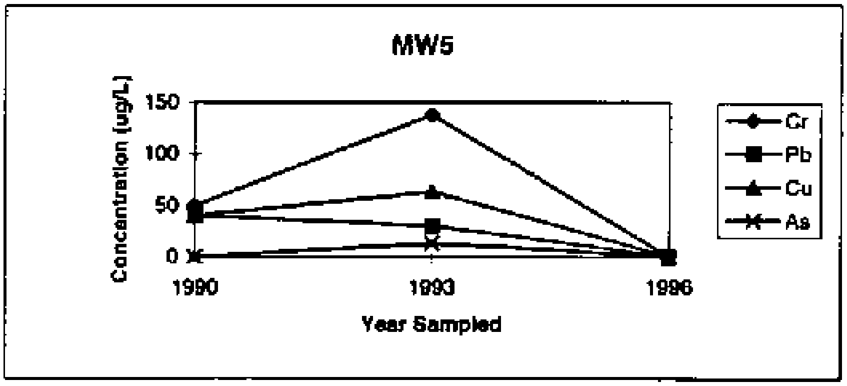


Figure 3.19 Temporal Trends in Metals Concentrations

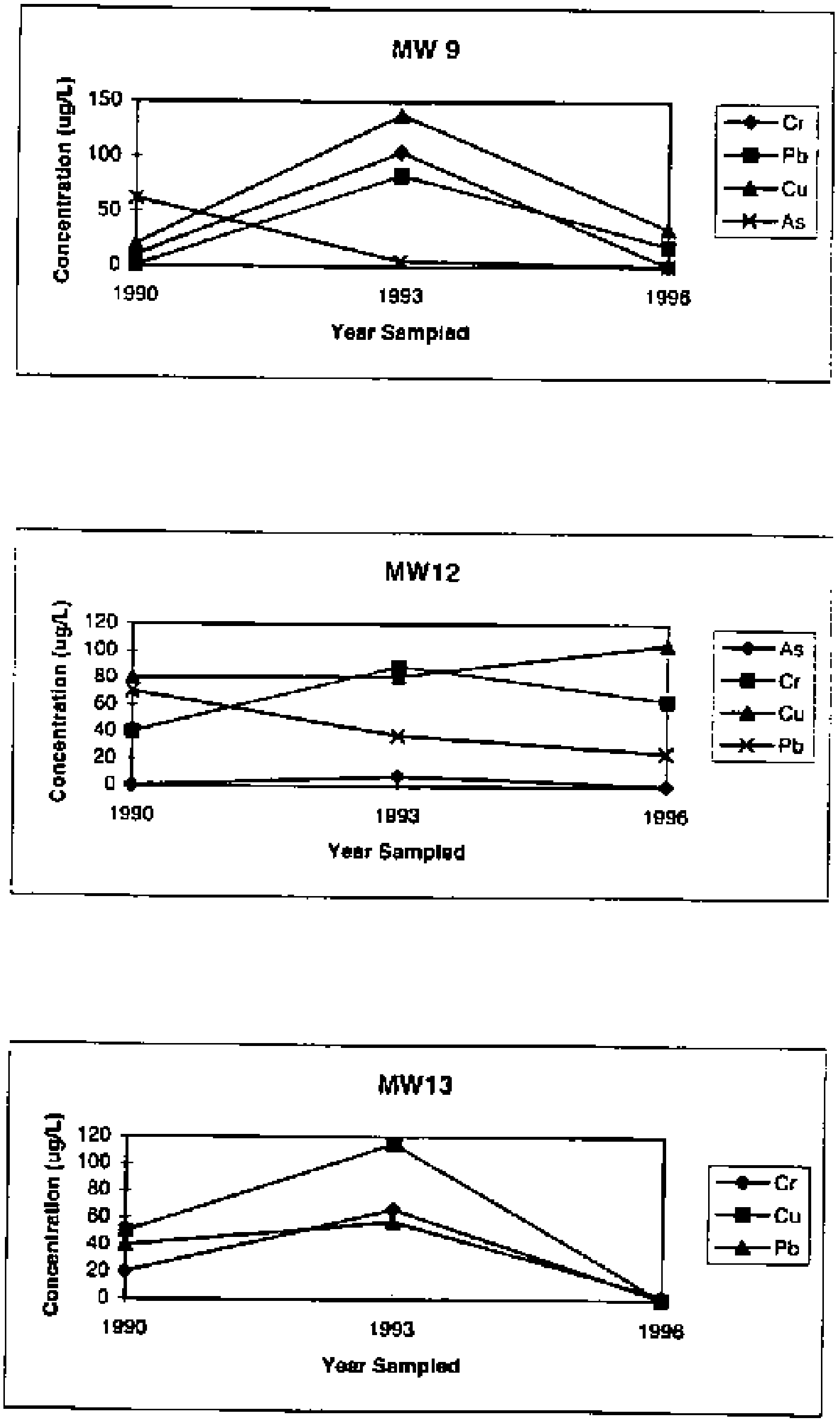
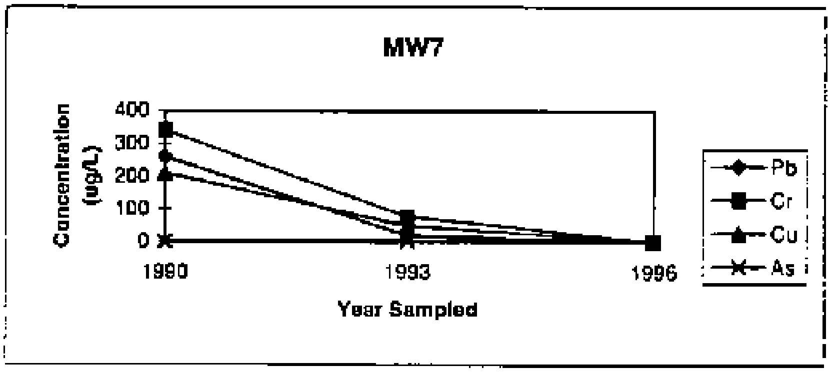
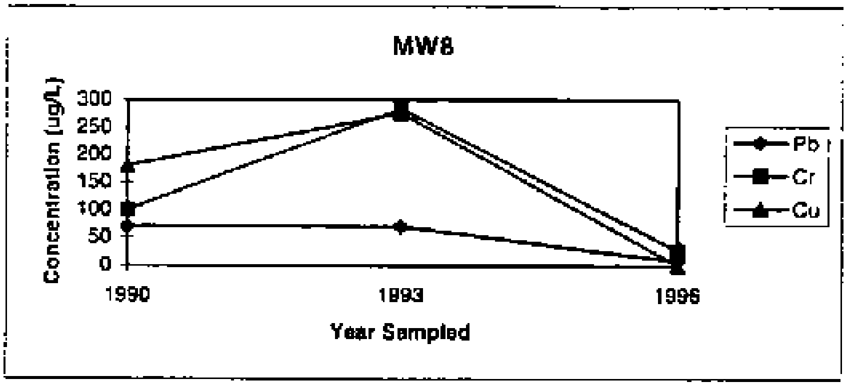


Figure 3.19 Temporal Trends in Metals Concentrations (Continued)





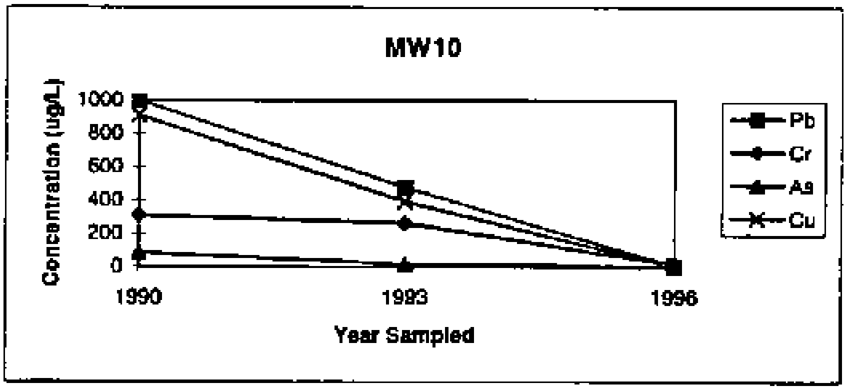
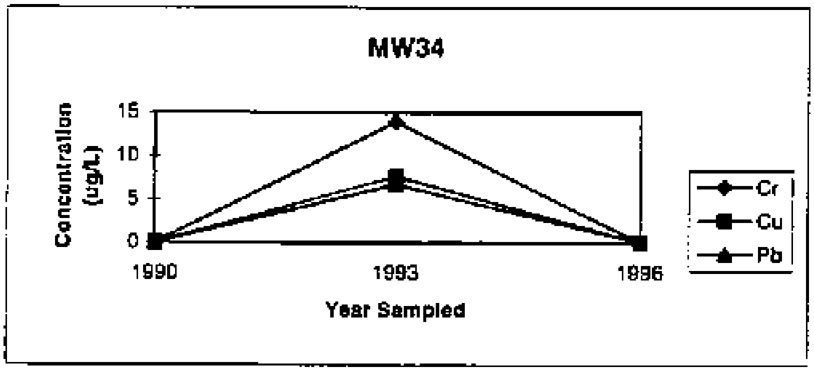
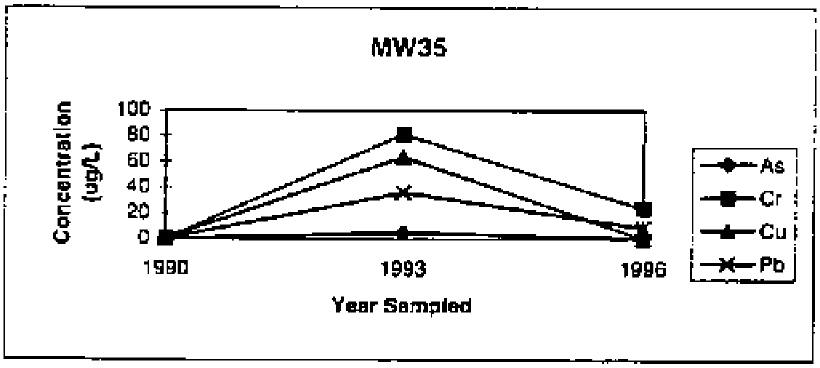


Figure 3.19 Temporal Trends in Metals Concentrations (Continued)





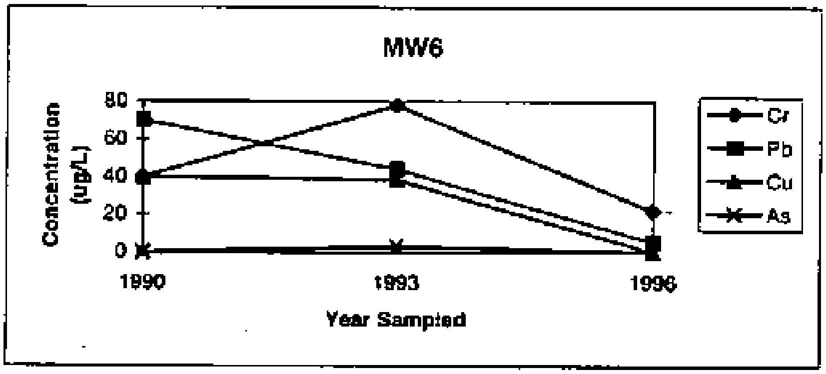
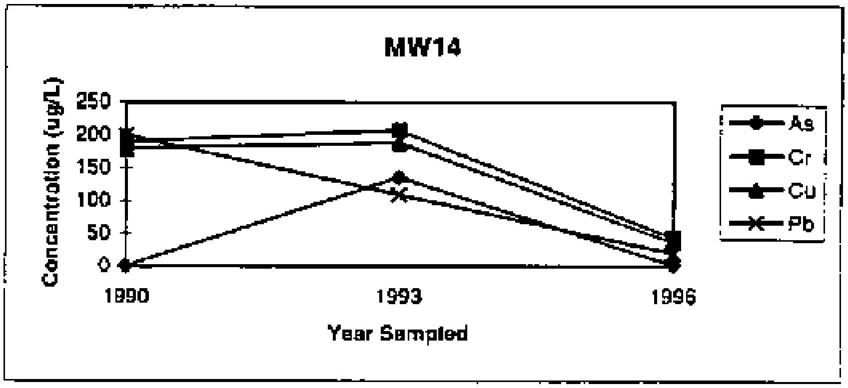
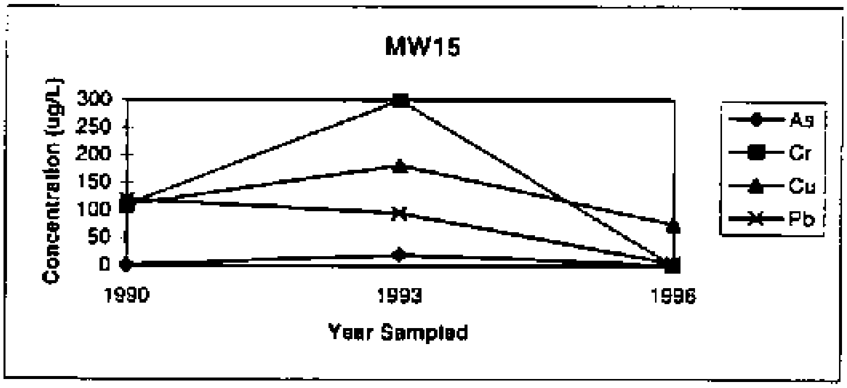


Figure 3.19 Temporal Trends In Metals Concentrations (Continued)





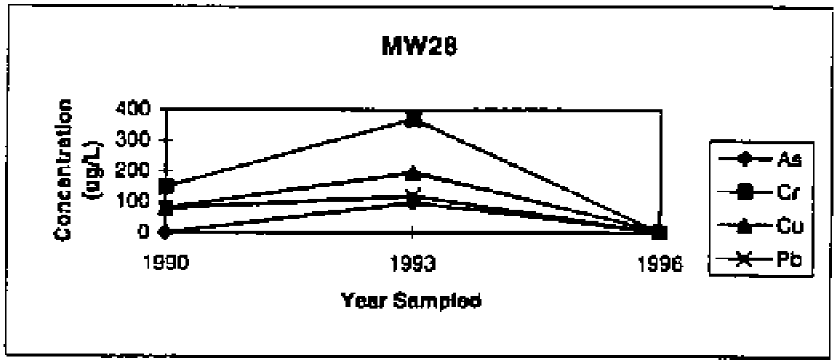
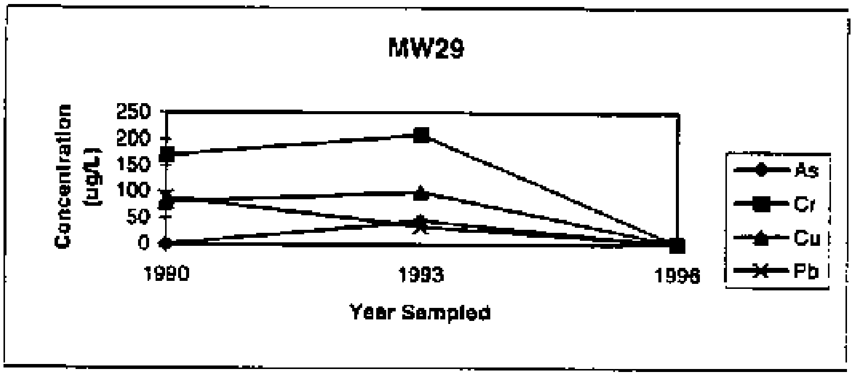
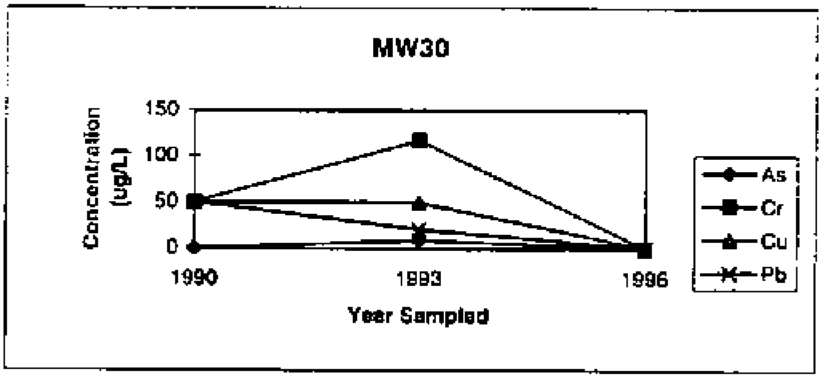


Figure 3.19 Temporal Trends in Metals Concentrations (Continued)





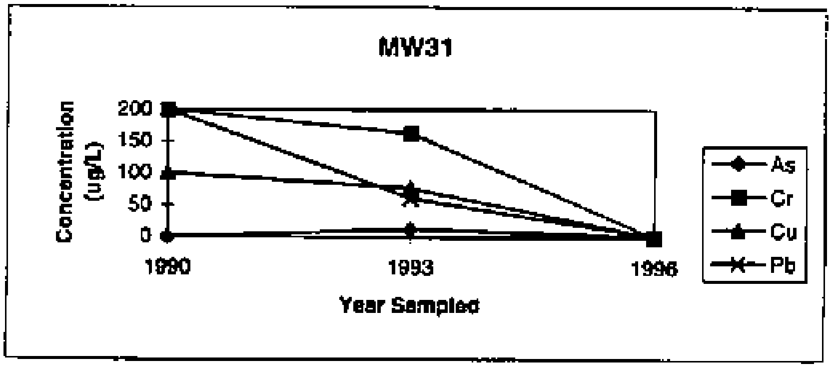
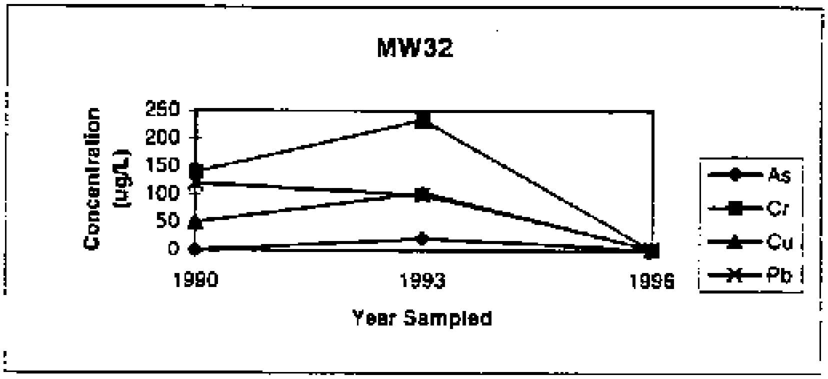


Figure 3.19 Temporal Trends in Metals Concentrations (Continued)



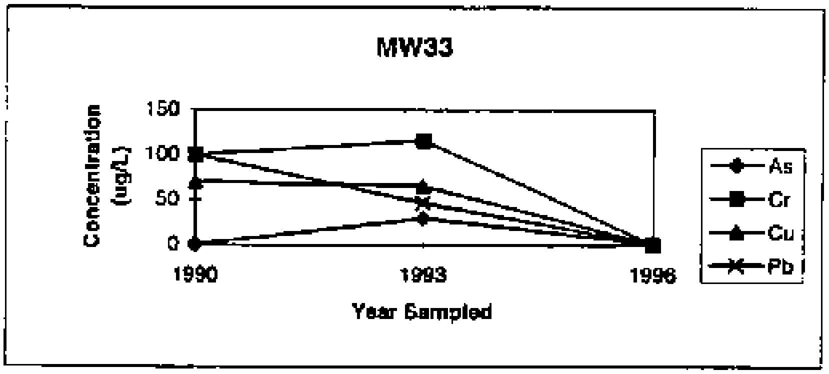


Figure 3.19 Temporal Trends in Metals Concentrations (Continued)

Lead. Lead values over time are less than chromium and copper. In two instances (MW-4 and MW-10), lead concentrations are higher than chromium and copper.

Lead concentrations exhibit a general downward trend: 1990 has the highest values, 1993 has intermediate values, and 1996 has the lowest concentrations.

Arsenic. Arsenic consistently had the lowest concentrations relative to the other metals and over time. In four cases (MW-4, MW-8, MW-13, and MW-34), arsenic was not even detected. Arsenic concentrations remained the same or slightly decreased over time.

3.6.4 Evaluation of Fluvial/Confined Sand Aquifer Connectivity

The hypothesis that the Fluvial Aquifer and the Confined Sand Aquifer are in direct hydraulic connection has been raised during the course of investigations at the DDMT. Evidence for these so-called "windows" has been cited at other locations in the Memphis area (Graham and Parks, 1986). Data are available from several sources that strongly suggest that the Fluvial Aquifer and Confined Sand Aquifer are separated by confining material beneath DDMT, and that a "windows" scenario does not exist beneath DDMT. These data include lithologic logs, thickness maps, structure contour maps, and water quality data from the two aquifers.

Lithologic Logs. Two wells in the vicinity of DDMT, MW-36 and MW-37, were drilled through the confining layer of the Fluvial Aquifer into a lower unconsolidated sand. This lower sand at DDMT was tentatively identified as the Memphis Sand by Law (1990); however, as discussed in Section 1.3.2, regional stratigraphic data indicates that the lower DDMT sand could be a member of the Cook Mountain Formation. The Cook Mountain Formation contains clay that can act as the confining unit to the Memphis Sand. Below the Fluvial Aquifer, MW-37 has at least 70 feet of a very stiff silty clay that grades to another 20 feet of sandy clay before encountering the lower sand. MW-36 has 78 feet of a silty lignitic clay that grades into another 14 feet of sandy clay above the lower sand. The silty clay sequence is attributed to the Cockfield Formation (Parks and Carmichael, 1988). Thus an adequate thickness of confining materials has been identified in logs from wells that are either onsite or very near DDMT.

Downhole sonic, gamma-gamma density, natural gamma, and caliper logs were run on MW-37 and MW-36 to evaluate the annular cement integrity, and thereby determine that interconnection between the aquifers was not provided by the well borehole. The logging results were reported in CH2M HILL (1996) and indicated that while there are sections of the grout seal where the integrity of the grout seal is less than adequate, these sections are isolated by intervals that do not exhibit any loss of grout seal integrity such that overall there is no evidence to suggest that the integrity of the annular seal as a whole is compromised throughout the confining unit interval (see Appendix I).

Thickness Maps. In their study of the urban area of Memphis, Graham and Parks (1986) show maps of the thickness of the Jackson-upper Claiborne confining bed and the aggregate thickness of clay beds thicker that 10 feet in the Jackson-upper Claiborne confining bed. In the vicinity of DDMT, the thickness is shown to be greater than 100 feet and less than 200 feet. The aggregate thickness is shown to be somewhat greater than 100 feet. Well control is reasonably good between the Allen and Sheahan wellfields.

Graham and Parks (1986) also show areas of depression on these thickness maps. These areas of depression are shown with inward hachures that imply a thinning of the beds in the direction of the hachures. It is significant that no depressions are shown for the DDMT area, or anywhere reasonably close to DDMT.

Structure Contour Maps. Well Sh:J-104 is approximately 2 miles west of DDMT in the Allen well field, and is referenced in many USGS publications. The altitude of the base of the Cockfield Formation in this well is shown on Plate 1 of Parks and Carmichael (1988) to be approximately 125 feet msl. For this same well, the elevation of the top of the Memphis Sand is at 46 feet msl (Kingsbury and Parks, 1993). Therefore, in addition to the thickness of the Cockfield Formation (approximately 40 feet), and any Jackson Formation if it exists at this site, there is also 79 feet of Cook Mountain Formation separating the Confined Sand from the Fluvial Aquifer. The Cook Mountain Formation serves as an upper confining unit to the Confined Sand (Kingsbury and Parks, 1993).

Water Levels. Water levels obtained at the time of construction were also compared between the two wells. The water level in MW-32 was 59 feet bgs, while it was 142 feet bgs in MW-37. Water levels were also taken during the February, 1996 sampling event, and, as shown in Table 3-4, are 60.2 feet bgs for MW-32 and 132.61 feet bgs for MW-37. These water levels support the lithologic evidence that the two aquifers are separated at this location.

Water Quality Data. Water quality data were obtained for wells MW-32, MW-36 and MW-37 and reviewed for similarities and differences. MW-32 is a Fluvial Aquifer well, while MW-36 and MW-37 are believed to be completed in the upper sands of the Confined Sand Aquifer. Allen Wellfield data are also available, as are the mean, minimum and maximum values for the DDMT Fluvial Aquifer wells.

Comparisons of the parameters shown in Tables 3-8 and 3-9 indicate that the water quality is indeed different between the Fluvial Aquifer and the Confined Sand wells, but is very similar between the two Confined Sand wells. The latter similarity indicates that there is not a change in Confined Sand groundwater chemistry across Dunn Field.

Comparing the groundwater chemistry between the Fluvial and Confined Sand Aquifers shows that chloride is higher in MW-32 (127 mg/L) and the DDMT mean (43.1 mg/l) than in MW-37 (4.5 mg/L). Nitrogen as nitrate is found in MW-32 at 3.97 mg/L but is undetected in MW-37. Sulfate is higher in MW-32 (17.4 mg/L) and the DDMT Fluvial mean (24.0 mg/L) than in MW-37 (4.9 mg/L). MW-32 has a lower value of bicarbonate (47 mg/L) than MW-37 (168 mg/L). Additionally, total dissolved solids are greater in the Fluvial Aquifer (482 mg/L in MW-32) than in the upper Confined Sand (191 mg/L in MW-37). Water chemistry at MW-36 and MW-37 was compared to that of the Confined Sand since data was not available from the Cook Mountain or Cockfield Formations.

The next comparison in groundwater chemistry is between wells MW-36/-37 and the DDMT Fluvial mean values. In wells MW-37 and MW-36, iron is found at 5.3 and 5.1 mg/L, while the mean for the DDMT Fluvial aquifer is 8.3 mg/L. Potassium is found at 6.3 and 6.0 mg/L in MW-37 and MW-36, but is only 2.1 mg/L in the DDMT Fluvial Aquifer mean. The DDMT Fluvial Aquifer mean for chloride is 43.1 mg/L, but chloride is found at 4.5 and 3.4 mg/L in MW-37 and MW-36. Nitrogen as nitrate is not detected in the Confined Sand wells, but is found at 3.97 mg/L in MW-32. In MW-37 and MW-36, sulfate is 4.9 and

Table 3-8
Comparison of MW-32 and MW-37 Water Chemistry
DDMT Groundwater Characterization

Parameter	Units	Fluvial Aquifer WELL MW-32		Memphis Sand WELL MW-37	
		Value	Q	Value	Q
Aluminum	µg/L	213	UJ	478	J
Antimony	µg/L	16.1	U	12.7	U
Arsenic	µg/L	0.68	U	0.88	U
Beryllium	µg/L	0.15	U	0.15	U
Bicarbonate	µg/L	47	=	168	=
Cadmium	µg/L	1.8	U	2.6	U
Calcium	µg/L	57400	=	40500	=
Chloride (as Cl)	µg/L	127	=	4.5	=
Chromium, Total	µg/L	2.2	U	24	=
Copper	µg/L	3	U	2	J
Fluoride	mg/L	0.1	U	0.1	U
Hardness (as CaCO3)	mg/L	212	=	170	=
Iron	µg/L	329	UJ	5260	=
Lead	µg/L	1.5	J	4.2	=
Magnesium	µg/L	13300	=	15500	=
Mercury	µg/L	0.55	U	0.07	UJ
Nickel	µg/L	8.6	J	20.7	J
Nitrogen, Ammonia (as N)	mg/L	0.2	U		
Nitrogen, Nitrate (as N)	mg/L	3.97	=	0.05	U
Nitrogen, Nitrate-Nitrite	mg/L	3.97	=	0.05	U
Potassium	µg/L	1280	J	6340	=
Selenium	µg/L	2.3	UJ	2.3	UJ
Silicon	µg/L	19500	=	9120	=
Silver	µg/L	2.2	UJ	2.2	UJ
Sodium	µg/L	19900	J	7390	U
Sulfate (as SO4)	mg/L	17.4	=	4.9	=
Thallium	µg/L	0.86	UJ	0.86	U
Total Dissolved Solids (Residue, filterable)	µg/L	482	=	191	=
Tritium (Hyrdrogen-3)	µg/L	-620	=	-570	=
Zinc	µg/L	13.5	U	12.3	U

Notes:
Q = validated qualifier
µg/L = microgram per liter
U = undetected
J = estimated value
UJ = undetected, estimated detection limit
mg/L = microgram per liter
pCi/L = pico Curie per liter

Table 3-9
Evaluation of Fluvial Aquifer and Confined Sand Well Major Ion Chemistry
DDMT Groundwater Characterization

Parameter	MW32 (Fluvial)		MW37 (Memphis)		MW36 (Memphis)		DDMT Fluvial Mean	DDMT Fluvial Min	DDMT Fluvial Max	Allen Well Field Memphis Sand Median	Allen Well Field Memphis Sand Min	Allen Well Field Memphis Sand Max	Allen Well Field Fluvial Median	Allen Well Field Fluvial Min	Allen Well Field Fluvial Max	Units
Aluminum	213	UJ	478	J	406	J	2,777	48	22,600	NA	NA	NA	NA	NA	NA	µg/L
Calcium	57,400	=	40,500	=	39,900	J	22,291	8,910	49,800	11,000	2,000	65,000	65,000	30,000	112,000	µg/L
Iron	329	UJ	5,260	=	5,090	=	8,291	147	96,100	5,400	0	16,000	5,200	2,000	24,000	µg/L
Potassium	1,280	J	6,340	=	5,960	=	2,148	767	12,700	1,000	0	5,000	3,000	1,000	8,000	µg/L
Silicon	19,500	=	9,120	=	15,400	=	NA	NA	NA	13,000	1,000	31,000	26,000	12,000	37,000	µg/L
Sodium	19,900	J	7,390	U	9,560	U	29,091	16,200	63,300	8,000	3,000	22,000	11,000	6,000	13,000	µg/L
Bicarbonate	47	=	168	=	NA		NA	NA	NA	57	14	317	292	99	572	mg/L
Chloride (as CL)	127	=	5	=	3	=	43	10	224	4	1	26	8	3	12	mg/L
Fluoride	0	U	0	U	NA		NA	NA	NA	0	0	1	0	0	1	mg/L
Hardness (as CaCO3)	212	=	170	=	NA		NA	NA	NA	46	9	306	285	120	408	mg/L
Nitrogen, Nitrate (as N)	4	=	0	U	0	U	NA	NA	NA	0	0	0	0	0	0	mg/L
Sulfate (as SO4)	17	=	5	=	4	=	24	6	46	3	0	30	23	7	33	mg/L
Total Dissolved Solids (residue, filterable)	482	=	191	=	NA		NA	NA	NA	83	32	383	314	197	652	mg/L
Tritium (Hydrogen-3)	-620		-570													pCi/L

Notes:

U = undetected

UJ = undetected, estimated detection limit

J = estimated value

µg/L = microgram per liter

mg/L = milligram per liter

pCi/L = pico Curie per liter

NA = not available

4.2 mg/L, but the DDMT Fluvial Aquifer mean is 24.0 mg/L. These differences support the hypothesis that the aquifers are not hydraulically connected.

Comparison of MW-36 and MW-37 groundwater chemistry to Confined Sand water chemistry from the Allen Well Field indicate a similarity between iron, silicon, sodium, chloride, and sulfate concentrations. However, calcium values at MW-36/-37 are significantly above the median Confined Sand value (40 versus 11 mg/L) at the Allen Well Field. As discussed in Section 1.3.2, the lower DDMT sand could belong to the Cook Mountain Formation rather than the Confined Sand thus accounting for the differences in water chemistry.

3.6.5 Groundwater Flow

Paleoerosional features strongly influence the direction of groundwater flow, as previously discussed in Section 3.4. These features also help govern the spread or containment of contaminants in the groundwater.

Figure 3-3, the potentiometric map of the Fluvial Aquifer, shows a flat gradient across the central and northern parts of Dunn Field. A stagnation plateau is found to the west of Dunn Field in the vicinity of MW-44 and MW-54. Flow moving slowly across Dunn Field bifurcates to the northwest or southwest upon encountering the stagnation plateau. Most of the contamination is originating in the northwestern quadrant of Dunn Field, so that it will flow west to the plateau and then to the northwest upon encountering the plateau, thus avoiding the depressed clay to the southwest. However, the configuration of the base of the Fluvial Aquifer (see Figure 3-2) suggests that another channel may extend to the northeast trending along wells MW-44 and MW-54 that could intercept offsite plumes to the northeast.

Groundwater flow in the southwest portion of the main installation is essentially onsite from the west and southwest. Both the PCE and TCE plumes in this area show elevated concentrations at offsite well MW-47, located south of Ball Road, which suggests that an offsite groundwater contamination source south of the main installation may be responsible.

The PCE and TCE plumes (see Figures 3-5 and 3-6) that emanate from Dunn Field are centered far enough north to avoid getting pulled into the clay depression. The plume shapes, particularly for TCE, have a northwestern lobe that mimics the direction of groundwater flow. The low levels of organic contaminants found in MW-6, MW-15, and MW-32 will migrate to the west and then possibly flow to the southwest to enter the clay depression. Because the gradient within the Fluvial Aquifer is flat at MW-15 and because contamination has not been detected at MW-33, it is evident that potential transport beyond MW-33 and into the clay depression will occur slowly.

The bulk of the VOC plume mass (see Figures 3-5 and 3-6) at Dunn Field is located in the northern portion of Dunn Field such that its transport is controlled by the component of the flow field that is flowing west and northwest of the clay depression toward MW-31 and MW-40. This is further evident in the southeast to northwest trending axis of the 1,000 µg/L TCE isopleth (Figure 3-6) indicating northwestern trending organic transport. Low levels or the absence of organic contaminants found in MW-6, MW15, MW-32, and MW-33 indicate that a much smaller fraction of the VOC plume mass is being transported to the west/southwest and potentially toward the clay depression.

Section 4

Conclusions

4.0 Conclusions

In accordance with new groundwater data collected during 1996, the following conclusions can be made regarding groundwater flow and groundwater contaminant transport.

- Test boring and well installation west of Dunn Field have provided a general configuration of the base of the Fluvial Aquifer showing the trend of the previously identified depression in the clay surface (Law, 1990). Groundwater flow in the Fluvial Aquifer west of Dunn Field is controlled by the configuration of the basal clay unit.
- The configuration of the organic and inorganic contaminant plumes within the area of pre-1996 well control is similar to that reported in Law (1990) and ESE (1994). A notable exception occurs at MW-34 where levels of PCE, TCE, and carbon tetrachloride were estimated at levels below the detection limit for the first time in the 1996 sampling. MW-34 is completed in the base of the depressed clay; therefore, contaminant levels here indicate transport to the channel from upgradient sources. Southward transport from the Dunn Field plumes has been assumed; however, the possibility exists that the organic contaminants may have entered the channel from sources within the main installation.
- With the exception of the detection of 1,1-DCE at offsite well MW-40, organic and inorganic plumes at Dunn Field are bounded on the west by wells MW-40, -42, -43, and -41. Significant uncertainty exists in the estimated location of the non-detect isopleths due to the lack of well control in the area bounded by Meadow Hill Street and Person Avenue. (The area is not easily accessible due to the location of the Memphis Light, Gas, and Water [MLGW] substation.) Low-level organic detections occur at MW-51 at the northeastern position of the Dunn Field organic plume, indicating that the plume is not completely bounded there. Based on February 1996 water level data, the water level at MW-51 (233.60 feet msl) is nearly sidegradient to that at MW-29 (233.80 feet msl).
- Inorganic constituents of concern (beryllium, lead, chromium, copper, and nickel) are elevated at Dunn Field and the northwest portion of the main installation. Offsite concentrations are below detection or significantly reduced. Overall, the inorganic concentrations are lower in the 1996 sampling than during previous sampling efforts. All metal samples reported herein were unfiltered and therefore sensitive to sampling techniques that influenced the amount of sediment in the sample. Use of low-flow down-hole pumps may have resulted in lower sediment concentrations than those of previously collected samples. Additional turbidity analysis and correlation will be performed during quarterly groundwater monitoring and reported in the RI Report.
- PCE and TCE groundwater contamination is observed offsite in the southwest portion of the main installation. On the basis of February 1996 water levels, the offsite contamination is hydrologically upgradient; however, whether the gradient reverses itself during periods of low flow has not been determined.
- Groundwater quality data, regional stratigraphy, and water level data do not indicate that there is a hydraulic connection between the Fluvial Aquifer and the underlying

sand at Wells MW-36 and MW-37. However, correlation with lithologic logs at the Allen Wellfield indicate that the sand encountered at these wells may be part of the Cook Mountain or Cockfield formations.

Section 5

References

5.0 References

CH2M HILL. *Downhole Geophysical Characterization of Monitoring Wells at the Defense Distribution Depot Memphis, Tennessee*. Technical Memorandum. November 1996.

CH2M HILL. *Generic Quality Assurance Project Plan*. Prepared for the Defense Distribution Depot Memphis, Tennessee. 1995.

Corps of Engineers, Huntsville Division (CEHND). *Record of Decision for Interim Remedial Action of the Groundwater at Dunn Field (OU-1)at the Defense Distribution Depot Memphis, Tennessee*. August 1995.

Duffield, G.M. *AQTESOLV Aquifer Test Solver, Version 2.01*. Geraghty & Miller, Inc. 1995.

Environmental Science and Engineering. *Groundwater Monitoring Results at DDMT*. February 1994.

Freeze, R.A., and J. A. Cherry. *Groundwater*. Prentice-Hall, Inc. 1979.

Graham, D.D., and W.S. Parks. *Potential for Leakage Among Principle Aquifers in the Memphis Area, Tennessee*. U. S. Geological Survey Water Resource Investigation Report 85-4295. 1986.

Kingsbury, J.A., and W. S. Parks. *Hydrogeology of the Principal Aquifers and Relation of Faults to Interaquifer Leakage in the Memphis Area, Tennessee*. U.S. Geological Survey Water-Resources Investigations Report 93-4075. 1993.

Kruseman, G.P., and N.A. de Ridder. *Analysis and Evaluation of Pumping Test Data*. Second Edition. International Institute for Land Reclamation and Improvement. 1990.

Law Environmental. *Remedial Investigation at DDMT*. Final Report. August 1990.

Nyman, D.J. *Predicted Hydrologic Effects of Pumping from the Lichterman Well Field in the Memphis Area, Tennessee*. U. S. Geological Survey Water Supply Paper 1819-B. 1985.

Parks, W.S., and J. K. Carmichael. *Geology and Ground-water Resources of the Cockfield Formation in Western Tennessee*. U.S. Geological Survey Water-Resources Investigations Report 88-4181. 1988.

Tennessee Department of Environmental Conservation (TDEC). *Hazardous Substances Guidelines*. Division of Superfund. Draft. December 14, 1987.

U.S. Environmental Protection Agency (EPA) . *U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. EPA540/R-94/-012. February 1994(a).

U.S. EPA. *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. EPA540/R-94/-13. February 1994(b).

Appendix A

Soil Boring Logs

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113830.01.ZZ	STB-12 SHEET 1 OF 4

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ——— DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 102 ft. (est.) START 1345, 1/8/98 FINISH 1850, 1/8/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0		5		3-inches Asphalt 3-inches Base coarse, reddish brown gravelly sand SILTY CLAY (CL), light brown, moist, with gray mottling from 3 ft. depth to 5 ft. depth, dark brown from 5 ft. depth to 10 ft. depth	Start drilling at 1345 SBSTB1202 collected at 1350, 0 ft. to 2 ft., DUP, SPLIT Modified loess
5.0	5		5			
10.0	10		5		CLAYEY SILT (ML), light brown with gray mottling, moist	
15.0	15		5		SILTY CLAY (CL), light brown with gray mottling, moist, trace iron concretions	
20.0	20		5			
25.0	25		10		Light brown below 25 feet	

PROJECT NUMBER	BORING NUMBER	
113830.0LZZ	STB-12	SHEET 2 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 102 ft. (est.) START 1345, 1/9/98 FINISH 1850, 1/9/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
					CLAYEY SAND (SC), orange with brown and gray mottling, moist, fine-grained, quartz, with mica flakes	Gradational contact from approximately 30 feet to 31 feet Fluvial Deposits
35.0	35					
			7		38-38.3', CLAY (CH), light gray, moist	
					WELL-GRADED SAND (SW), brown, dry to moist, medium to coarse grained, quartz, with some subangular to subrounded chert gravel	Gradational contact from approximately 38 feet to 38.5 feet
40.0						
	42					
			3		POORLY-GRADED SAND (SP), buff, moist, fine-grained, quartz, orange from 43.5 feet to 44.25 feet	Gradational contact from approximately 43 feet to 43.3 feet
45.0	45					
					WELL-GRADED SAND (SW), orange, moist, medium to coarse grained, quartz, with some subangular to subrounded chert gravel	
					POORLY-GRADED SAND (SP), buff colored, moist, medium grained, rounded quartz	
50.0			10			
					Orange below 52 feet	
					WELL-GRADED SAND (SW), brown, moist to wet, medium to coarse grained, quartz, with some subrounded to subangular chert gravel	Free water present from 54 feet to 57 feet
55.0	55					
			8		POORLY-GRADED SAND (SP), brown to orange, moist, medium grained quartz	
	60					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	STB-12 SHEET 3 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ____ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 102 ft. (est.) START 1345, 1/9/98 FINISH 1850, 1/8/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
					With trace subangular chert gravel below 61 feet	
					POORLY-GRADED SAND (SP), buff colored, moist, medium grained, with some subrounded to subangular chert gravel, orange colored from 64.5 feet to 65 feet	Coarse, subrounded chert gravel present at contact between buff and orange sands
65.0	65				WELL-GRADED SAND (SW), brown, moist to wet, medium to coarse grained, trace to some subrounded to subangular chert gravel	
70.0			8.5			
75.0	75				POORLY-GRADED SAND (SP), brown, moist, medium grained, quartz, trace subangular chert gravel	
80.0			10			
85.0	85				Orange and fine-grained below 85 feet	

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	STB-12

SHEET 4 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation
LOCATION Memphis, TN
ELEVATION
DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD AND EQUIPMENT Rotasonic
WATER LEVELS 102 ft. (est.)
START 1345, 1/8/98
FINISH 1850, 1/9/98
LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	90					
					Orange to brown below 94 feet	
95.0						
			13			
100.0						
					Wet below 102 feet	
	103					
					CLAY (CH), dark gray, moist, hard, lignitic	Jackson Formation/Upper Claiborne Group
105.0						
			5			
	108					Stop drilling at 1850
					Boring terminated at 108 ft.	Grouted borehole with pure gold high solids bentonite grout on 1/8/98.
110.0						
115.0						

256 103

PROJECT NUMBER	BORING NUMBER	
113630.01.ZZ	MW-40 (0)	SHEET 1 OF 4

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ______ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 80.80 ft. BTOC 1/14/98 **START** 1025, 1/10/98 **FINISH** 1805, 1/10/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0		5		1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, with quartz sand and chert gravel (FILL) Black, moist, with broken glass shards, metal pieces, and organics	Start drilling at 1025 Strong organic decay odor in FILL
5.0	5		5			HNU = 2 to 5 ppm at 5 ft. to 10 ft.
10.0	10		5		CLAYEY SILT (ML), greenish-gray, moist, soft, low plasticity with brown mottling below 11 ft. Light brown and gray below 14 ft.	Modified loess
15.0	15		5		SILTY CLAY (CL), light brown, moist, medium stiff, low to medium plasticity, with quartz sand and chert gravel CLAYEY SAND (SC), brownish orange, moist, medium dense, trace subrounded, fine to medium chert, occasional layer of lightly cemented sand	Fluvial Deposits
20.0	20		2.5			
	22.5		6		POORLY-GRADED SAND (SP), browish-orange, moist, loose to medium dense, medium, quartz, trace fine, chert gravel	
25.0						
	28.5					

256 104

PROJECT NUMBER 113830.01.ZZ

BORING NUMBER MW-40 (D)

SHEET 2 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ______ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 80.80 ft. BTOC 1/14/98 **START** 1025, 1/10/98 **FINISH** 1805, 1/10/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30		6.5		WELL-GRADED GRAVELLY SAND (SW), brownish-orange, moist, loose, fine to coarse, quartz, with subrounded to rounded fine to medium, chert gravel	Gradational contact
35.0	35		5		36.5 ft.: 3-inch layer of CLAY (CH), light gray and lavendar, moist, soft, medium to high plasticity 37.5 ft.: 3-inch layer of CLAY (CH), as above at 36.5 ft. POORLY-GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz	Gradational contact
40.0 45.0	40		7			
50.0	47.5		4			
55.0	52 60		8		52.5 ft.: 3-inch layer of SILTY SAND (SM), greenish-gray, moist, loose, fine, quartz	Slight organic odor in silty sand layer HNU = 0.0 ppm

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-40 (0) SHEET 3 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION

DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 80.80 ft. BTOC 1/14/96 START 1025, 1/10/96 FINISH 1805, 1/10/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	60					
			5		SILTY SAND (SM), light gray, moist, loose to medium dense, fine, quartz	Gradational contact with chert gravel and cobbles at 62 feet with free water
65.0	65					
70.0			7			
					Light brown to brownish-orange below 73 ft.	
75.0	75					
					Light gray and occasional clay below 78 ft.	
80.0			9			
85.0	85				Light brown below 85 ft.	
			10			

CH2M HILL

PROJECT NUMBER 113830.0LZZ

BORING NUMBER MW-40 (0)

SHEET 4 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ___ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 80.80 ft. BTOC 1/14/98 **START** 1025, 1/10/98 **FINISH** 1805, 1/10/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	95				Light gray below 92 ft. 93.5 ft.: 3-inch layer of CLAY (CH), light gray, moist, soft	
95.0	96		1		SILT (ML), light gray, moist, soft	
	98.5		2.5		SILTY CLAY (CL), light gray, moist, soft, low to medium plasticity	Jackson Formation/Upper Claiborne Group 1530 Installing MW-40
					Boring terminated at 98.5 ft.	1805 MW-40 installed (see attached construcion log)
100.0						
105.0						
110.0						
115.0						

CH2M HILL

PROJECT NUMBER 113830.01.ZZ

BORING NUMBER MW-41 (K) SHEET 1 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ____ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 65.82 ft. BTOC 1/14/98 **START** 0915, 1/12/98 **FINISH** 1710, 1/12/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0				1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, soft, trace organics	Start drilling: 0915 Modified loess
			5			
					Light gray mottling below 3 ft.	
5.0	5				Medium stiff below 5 ft.	
10.0			10			
15.0	15				Stiff with black and gray mottling below 15 ft.	
					With some coarse, quartz sand and fine, chert gravel below 18 ft.	
			8			
20.0						
					CLAYEY SAND (SC), orange to brown, moist, medium dense, fine to medium, quartz with fine to coarse subrounded, chert gravel	
	23					Fluvial Deposits
			2			
25.0	25					
			4		SILTY FINE SAND (SM), orangish-brown, moist, medium dense, fine, quartz with fine to coarse, subangular to subrounded chert gravel	23 ft. to 24 ft. HNU = 5 to 20 ppm Off core sample
	30					

PROJECT NUMBER	BORING NUMBER
113630.04.ZZ	MW-41 (K)

SHEET 2 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 65.82 ft. BTOC 1/14/96 START 0915, 1/12/96 FINISH 1710, 1/12/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	30				POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace to some subrounded to rounded, fine to coarse, chert gravel	30 ft. to 31 ft. HNU = 4 to 14 ppm Off core sample
			4			
	34					
35.0						Sample is very hot due to drilling friction
			3		Dry from 38 ft. to 37 ft.	
	38					
						1130
40.0						
			8		SILTY SAND (SM), orangish-brown, moist, loose, fine, quartz, with trace fine, subangular, chert gravel	
	44					1151
	45		1		44.5 ft. to 44.75 ft.: SILT (ML), light gray, dry	
45.0						1235 1300 - lunch break 1315 - drilling again
50.0			5			
	55					
55.0					WELL-GRADED GRAVELLY SAND (SW), brown, moist, loose, medium to coarse, quartz, with fine to medium, subangular to subrounded, chert gravel	1345
			3.5			
	60					1451

256 109

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113830.01.ZZ	MW-41 (K) SHEET 3 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 65.82 ft. BTOC 1/14/98 START 0915, 1/12/98 FINISH 1710, 1/12/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	60		5			
65.0	65					1510 Geotechnical Sample collected at 65 ft. to 67 ft.
					SILTY CLAY (CL), yellowish orange, moist, medium stiff	
			7			
70.0						Jackson Formation/Upper Claiborne Group
	72				Light gray below 72 ft.	
			3			
75.0	75				Boring terminated at 75 ft.	1544 Installing MW-41 1710 MW-41 Installed (see attached construction log)
80.0						
85.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113830.01ZZ	MW-42 (N) SHEET 1 OF 3

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 54.45 ft. BTOC 1/15/98 START 0935, 1/13/98 FINISH 1720, 1/13/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0				1-inch Asphalt SILTY CLAY (CL), light brown, moist, stiff to very stiff, trace organics	Start Drilling: 0935 Modified loess Driller had too much pressure in core barrel and lost most of run when extracting
			.5			
5.0	5					
					CLAYEY SILT (ML), light brown and light gray intermixed, moist, soft to medium stiff, trace organic	0945
			5			
10.0	10					0955
			5			
15.0	15					0959
			5			
					SILTY CLAY (CL), light brown, moist, medium stiff	
20.0	20					1007
					CLAYEY SILT (ML), light brown, moist, medium stiff	
			5			
					SILTY CLAY (CL), light brown, moist, medium stiff, with some coarse, quartz sand and fine , subrounded, chert gravel	Collected SBMW4223
25.0	25					1018
			2			
					CLAYEY SAND (SC), brick red, moist, medium dense, medium, quartz, with some fine subrounded to rounded, chert gravel and orange and gray, medium, quartz sand intermixed seams	
	27					
			2			1030, Fluvial Deposits
	29					1045

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-42 (N) SHEET 2 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN
ELEVATION DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD AND EQUIPMENT Rotasonic
WATER LEVELS 54.45 ft. BTOC 1/15/98 START 0935, 1/13/98 FINISH 1720, 1/13/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	30 32		3		SANDSTONE, orange to brown, dry, lightly cemented, fine to medium, quartz, with fine to coarse, rounded to subrounded, chert gravel and trace subrounded, chert cobbles	1100, sandstone crumbles with moderate finger pressure
35.0	35		2		WELL-GRADED GRAVELLY SAND (SW), orange, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel	
40.0	41		4.5		CLAY (CH), light brown and lavendar marbled, moist, stiff POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace fine to coarse, subrounded to rounded, chert gravel	1115, driller having trouble tripping out drill pipe/core barrel 1200, hole collapsed: re-core
45.0	45		4			1230
50.0	53		8			1245 1305, lunch break 1328, drilling again
55.0	55		2			1353
	57		2			1405, free water present on gravels
					SILT (ML), light gray, moist, soft	1428, geotechnical sample collected 57 ft. to 59 ft. Sand is lightly cemented at contact with silt

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
113630.01.ZZ	MW-42 (N)	SHEET 3 OF 3

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 54.45 ft. BTOC 1/15/98 START 0935, 1/13/98 FINISH 1720, 1/13/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6" -6" -6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE ORILLING FLUID LOSS TESTS AND INSTRUMENTATION
	65		8		SILTY CLAY (CL), light gray, moist, stiff 61.5 ft. to 61.75 ft.: SILT (ML), light gray, moist, soft 64.25 ft. to 64.5 ft.: SILT (ML), light gray, moist, soft	Jackson Formational Upper Claiborne Group
65.0	67.5		2.5			1445 S-1 Pocket Penetrometer: 3.0, 2.5, 2.5 tsf
					Boring terminated at 67.5 ft.	1550, Installing MW-42 1720, MW-42 installed (see attached construction log)
70.0						
75.0						
80.0						
85.0						

CH2M HILL

PROJECT NUMBER 113630.01.ZZ

BORING NUMBER MW-43

SHEET 1 OF 4

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ______ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/16/98 **START** 0915, 1/14/98 **FINISH** 1810, 1/14/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	0				1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, stiff, trace organics	Start Drilling: 0915 Modified loess
			5			
5.0	5					5 ft. to 10 ft. HNU = 2 ppm Off core sample
			3			
10.0	10					
			4			
15.0	15					0930
20.0			10			
					With black and orange mottling below 23 ft.	24 ft. to 25 ft. HNU = 1 ppm Off core sample
25.0	25					0952
					CLAYEY SAND (SC), brick red, moist, dense, medium, quartz, with trace fine to coarse, subrounded to rounded, chert gravel	Fluvial Deposits
			8		29 ft. to 31 ft.: with brown and gray sand seams/laminations	29 ft. to 30 ft. HNU = 7 ppm, off core sample

256 114

PROJECT NUMBER	BORING NUMBER	
113830.01.ZZ	MW-43	SHEET 2 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/18/98 START 0915, 1/14/98 FINISH 1810, 1/14/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	33				Orange below 32 feet	
	35		2		POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace fine, subrounded, chert gravel	1007
35.0	40		5		WELL-GRADED GRAVELLY SAND (SW), orange, moist, loose, fine to coarse, quartz and fine to coarse, subangular to rounded, chert gravel	1015
40.0	45		5		POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace fine subrounded, chert gravel	1023 44 ft. to 45 ft. HNU = 7 to 12 ppm Off core sample
45.0	50		5			1031
50.0	55		5		Trace coarse, subrounded, chert gravel 54 ft. to 54.5 ft.	1058
55.0			10		SILTY FINE SAND (SM), orange, loose, moist, quartz	1110 55 ft. to 65 ft. HNU = 4 ppm, off core

256 115

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SHEET 3 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/18/96 START 0815, 1/14/98 FINISH 1810, 1/14/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
					Yellowish-orange below 62 ft.	Free water present on gravels below 62 ft.
65.0	65				Moist to wet below 65 ft.	1133, 65 ft. to 68 ft. HNU = 6 to 12 ppm Off core sample
			3			
	68					1158, 68 ft. to 71 ft. HNU = 5 ppm Off core sample
70.0			7		Moist below 72 ft.	
75.0	75				WELL-GRADED SAND (SW), yellowish-orange, wet, loose, fine to coarse, quartz, trace fine, subrounded, chert gravel	1218 75 ft. to 80 ft. HNU = 12 ppm Off core sample
			5			
80.0	80					1255
			5			
85.0	85					1315 1320, lunch break 1340, drilling again 85 ft. to 87 ft. HNU = 2 to 8 ppm Off core sample
			7			

256 116

PROJECT NUMBER	BORING NUMBER
113830.01.ZZ	MW-43

SHEET 4 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/18/96 START 0915, 1/14/96 FINISH 1810, 1/14/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	92					
			3			1418, 92 ft. to 95 ft. HNU = 7 ppm Off core sample
95.0	95					
			3.5		POORLY-GRADED SAND (SP), yellowish-orange, moist, quartz, trace fine, subrounded, chert gravel	95 ft. to 100 ft. HNU = 1 to 4 ppm Off core sample
100.0	100					
			4		Olive green and brown below 101 ft.	1537, 100 ft. to 104 ft. HNU = 2 to 7 ppm Off core sample Geotech sample 100' to 102'
	104					
	104.5		0.5		SANDSTONE, dark red to dark brown, hard, well-cemented, medium, quartz, ferruginous	1810, Installing MW-43
105.0					Auger refusal at 104.5 ft.	1810, MW-43 Installed (see attached construction log)
110.0						
115.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113830.01.ZZ	MW-44 (M) SHEET 1 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION ______ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 51.87 ft. BTOC 1/16/98 START 0945, 1/15/98 FINISH 1715, 1/15/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	0				3-inches CONCRETE SILTY CLAY (CL), light brown, moist, medium stiff,	Start Drilling: 0845 Modified loess
			3			
	3					0849
			2			
5.0	5					1000
			5			
10.0	10				With black and orange mottling below 10 ft.	1006
			5			
					Trace coarse quartz sand and fine to coarse, subrounded, chert gravel below 14 ft.	
15.0	15					1013
					SANDY CLAY (CL), light brown with brick red mottling, moist, stiff	Fluvial Deposits
			5			
					CLAYEY SAND (SC), brick red with brown and gray intermixing, moist, medium dense, fine to medium, quartz, trace fine, subrounded chert gravel	18 ft. to 20 ft. HNU = 2 ppm Headspace in ziplock bag
20.0	20					1023
					WELL-GRADED GRAVELLY SAND (SW), orange, wet, loose to medium dense, fine to coarse, quartz with fine to coarse, subanuglar to subrounded, chert gravel	
			5			
25.0	25					1049
			6			
						28 ft. to 30 ft. HNU = 2 ppm

PROJECT NUMBER
113830.01.ZZ

BORING NUMBER
MW-44 (M)

SHEET 2 OF 3

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ____ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 51.87 ft. BTOC 1/18/98 **START** 0945, 1/15/98 **FINISH** 1715, 1/15/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	31					
					POORLY-GRADED SAND (SP), orange, wet, loose, medium, quartz, with trace fine, subrounded chert gravel	1100
			4			
35.0	35					1112
			8			
40.0						
	43					1137
			2			
45.0	45					1148
50.0			10			
55.0	55				WELL-GRADED SAND (SW), orange, wet (saturated), loose, fine to coarse, quartz, with trace fine, subrounded chert gravel	1209, Fluvial Aquifer 1210, drillers take break 1230, drilling again
			5			
	60					

256 119

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-44 (M) SHEET 3 OF 3

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 51.87 ft. BTOC 1/18/98 START 0945, 1/15/98 FINISH 1715, 1/15/98 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	60				Yellowish-orange below 60 ft.	1305, lunch break 1330, drilling again
			5			
65.0	65					1340
70.0			10			
75.0	75					1400
						Geotechnical Sample collected at 77 ft.
					<u>SILTY CLAY</u> (CL), light gray, with dark gray to black mottling, moist, medium stiff	Medium to coarse gravel-sized, ferruglous sandstone fragments at contact between SW and CL at 78 ft., dark brown to dark red, well cemented Pocket Penetrometer: 1.5, 1.75, 1.75 tsf Jackson Formation/Upper Claiborne Group
80.0			10			
85.0	85					1425
			0			
	87.5					1540, Installing MW-44
					Boring terminated at 87.5 ft.	1715, MW-44 installed (see attached construction log)

256 120

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113830.01.ZZ	MW-45 (C)

SHEET 1 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS **START** 0915, 1/16/96 **FINISH** 1450, 1/16/96 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RAT DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0		5		1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, soft, with trace organics	Start Drilling: 0915 Modified loess
5.0	5					0925
			5		Drier, but still moist, below 8 ft.; stiff	
10.0	10		2.5			0933 10 ft. to 15 ft. HNU = 2 ppm Headspace in ziplock bag
	12.5		2.5		With orange mottling below 13 ft.	
15.0	15				With orange and black mottling below 15 ft.	0945
			8			
20.0						
					SANDY CLAY (CL), light brown, moist, medium stiff, fine quartz sand	Fluvial Deposits
	23		2		CLAYEY SAND (SC), orange with light brown laminations, moist, medium dense, fine, quartz	0958
25.0	25		10		POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, trace rounded, fine, chert gravel	1005 1010, rig shut down, drilling making a telephone call 1020, drilling again

256 121

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
113630.01.ZZ	MW-45 (C)	SHEET 2 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS **START** 0915, 1/18/98 **FINISH** 1450, 1/18/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
35.0	35					1045
					WELL-GRADED GRAVELLY SAND (SW), orange, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded to rounded, chert gravel	
40.0			8.5			
					POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz	2-inch thick clay seam at contact between SW and SP at 43 ft., light gray, moist, soft
45.0	45					45 ft. to 50 ft. HNU = 4 ppm Headspace in ziplock bag
			4		Tan and fine to medium below 48 ft.	
50.0	50				WELL-GRADED GRAVELLY SAND (SW), yellowish-orange, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel and minor clay laminations	1130
			4		POORLY-GRADED SAND (SP), orange, moist, loose, fine to medium, quartz	
55.0	55				WELL-GRADED SANDY GRAVEL (GW), orange, wet (saturated), loose, fine to coarse, subangular to subrounded, chert, with coarse, quartz sand	1141, Fluvial Aquifer
			10		POORLY-GRADED SAND (SP), orange wet (saturated), loose, medium, quartz	

256 122

CHM HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-45 (C) SHEET 3 OF 3

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS **START** 0915, 1/18/96 **FINISH** 1450, 1/18/96 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
65.0	65				WELL-GRADED GRAVELLY SAND (SW), orange, wet (saturated), loose, fine to coarse, quartz, with fine to medium, subangular to subrounded, chert gravel and trace subrounded, chert cobbles	1153 1158, drillers take break 1205, drilling again
			5			Geotechnical Sample collected at 68 ft. to 70 ft.
70.0	70				CLAY (CH), lavendar and light gray marbled, moist, soft	1224 Jackson Formation/Upper Claiborne Group
			5		SILTY CLAY (CL), light gray with orange mottling, moist, stiff 73 ft. to 73.5 ft.: CLAYEY SILT (ML), orange and light gray, moist, soft SANDY SILT (ML), light gray with orange mottling, moist, soft, fine sand	
75.0	75				Boring terminated at 75 ft.	1242 1450, MW-45 installed (see attached construction log)
80.0						
85.0						

256 123

PROJECT NUMBER 113830.01.ZZ

BORING NUMBER MW-48 (B)

SHEET 1 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation

LOCATION Memphis, TN

ELEVATION

DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 54.01 ft. bgs. 1/27/98

START 1048, 1/22/98

FINISH 1840, 1/22/98

LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0				1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, soft to medium stiff, black and orange mottling	Start Drilling at 1048 Modified loess
			3.5			
					CLAYEY SILT (ML), light brown with light gray mottling, moist, medium stiff, trace organics, low plasticity, blocky structure	Abrupt contact
5.0	5					
			3			
	9					
					SILTY CLAY (CL), light brown with black mottling, moist, medium stiff, medium plasticity	Gradational contact
10.0						
			4			
					With orange mottling and trace iron nodules (<1/8") below 13 ft.	
	14					
15.0					SILTY CLAY (CL), reddish brown with black and light brown mottling, moist, medium stiff, trace fine to coarse, quartz sand and fine, subrounded chert gravel, medium plasticity	Abrupt contact
			10			
20.0						
					SANDY CLAY (CL), reddish brown, moist, medium stiff, fine to medium, quartz, sand, trace fine, subrounded, chert gravel	Gradational contact Fluvial Deposits
	24					
25.0						
			4		CLAYEY SAND (SC), reddish brown, moist, medium dense, medium quartz, trace fine, subrounded, chert gravel	Gradational contact
	28					
					SANDY CLAY (CL), reddish brown, moist, medium stiff, medium quartz sand	Gradational contact

PROJECT NUMBER 113830.01.ZZ

BORING NUMBER MW-46 (B)

SHEET 2 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ______ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 54.01 ft. bgs. 1/27/98 **START** 1048, 1/22/98 **FINISH** 1840, 1/22/98 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	30 34		3.5		WELL-GRADED GRAVELLY SAND (SW), brownish-orange, moist, loose, fine to coarse, quartz with fine to medium, subangular to subrounded, chert gravel SILTY FINE SAND (SM), brownish-orange, loose, fine	Gradational contact Gradational contact
35.0	38		3			
40.0	42		3.5			
45.0	47		3.5		WELL-GRADED SAND (SW), orangish-brown, moist, loose, fine to coarse, quartz, trace fine to coarse, subrounded chert gravel POORLY-GRADED SAND (SP), tan to orangish-brown, moist, loose, fine, quartz, some silt	Gradational contact Gradational contact
50.0	54		7		WELL-GRADED GRAVELLY SAND (SW), tan, moist, loose, fine to coarse, quartz, with fine to coarse subrounded, chert gravel SILTY FINE SAND (SM), light brown, moist, loose WELL-GRADED GRAVELLY SAND (SW), tan, moist, loose, fine to medium, quartz, with fine to coarse subrounded, chert gravel	Gradational contact Abrupt color change at 50 ft. to orangish brown Wet from 51 ft. to 42 ft. Gradational contact
55.0	57		3		54 ft.: 6-inch layer of SANDY CLAY (CL), light brown, moist, soft	Gradational contact
	60		3		SILTY FINE SAND (SM), tan moist to wet, loose, quartz POORLY-GRADED SAND (SP-SM), orangish-tan, moist to wet, loose, medium, quartz, silty, trace medium, subrounded, chert gravel	Gradational contact

CHM HILL

PROJECT NUMBER 113830.01.ZZ

BORING NUMBER MW-46 (B)

SHEET 3 OF 3

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation **LOCATION** Memphis, TN

ELEVATION ______ **DRILLING CONTRACTOR** Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS 54.01 ft. bgs. 1/27/96 **START** 1048, 1/22/96 **FINISH** 1840, 1/22/96 **LOGGER** S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	60				With olive gray silt laminations from 60 ft. to 62 ft.	Wet below 60 ft. Fluvial Aquifer
					POORYL-GRADED SAND (SP), brownish-orange, wet, loose, medium, quartz, trace medium, subrounded, chert gravel	Gradational contact
			8			
65.0						
	68				WELL-GRADED SAND (SW), orangish-brown, wet, loose, fine to coarse, quartz, trace fine to medium, subrounded, chert gravel	Gradational contact with iron staining
					69 ft.: 3-inch layer of clay, light gray and lavender	
70.0						
			7		71 ft.: 5-inch layer of clay, light gray and lavendar	
						Geotechnical Sample collected at 72 ft.
					SILTY CLAY (CL), light brown and light gray, moist, medium stiff to stiff, medium plasticity	Erosional contact
75.0	75					
						S-1: Pocket Penetrometer = 1.5, 1.5, 1.5 tsf
			2.5			
	77.5					Stopped Drilling at 1525
					Boring terminated at 77.5 ft.	MW-46 Installed at 1840 (see attached construction log)
80.0						
85.0						

256 126

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample: Interval	Sample: Number and Type	Sample: Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-47(H)**
Start: 0855 / 23 JAN 96					Finish: 1725 / 23 JAN 96	Water Level: 102.78 ft bgs
						Sheet 1 of 4
	0		5		1 inch TOPSOIL **SILTY CLAY** (CL), light brown with black and light gray mottling, moist, soft, trace organics	Start Drilling at 0855 modified loess
5	5					
10			10		- light gray with orange and light brown mottling with iron nodules (<1/8 inch diame+H42ter) below 10 ft	- gradational color change
15	15				- light brown with orange and light gray mottling below 15 ft	- gradational color change
20			10			
25	25				**SANDY CLAY** (CL), light brown with black staining and light gray streaking, moist, medium stiff, fine, quartz sand, with occasional iron nodules (<1/8 inch diameter)	- gradational contact Fluvial Deposits
30			10		- brownish-red with light brown and light gray intermixing below 28 ft	- gradational color change
35	35				**CLAYEY SAND** (SC), orange to orangish-brown, moist, medium dense, fine, quartz	- abrupt color change at 33 ft

NOTES:

- groundwater level measurement made on 27 JAN 96

FN: krg/a:MW47H.XLS [MW-47 (H)]

Printed: 2/7/96

256 127

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample: Interval	Sample: Number and Type	Sample: Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-47(H)**
Start: 0855 / 23 JAN 96					Finish: 1725 / 23 JAN 96	Water Level: 102.78 ft bgs
						Sheet 2 of 4
40 45	35 45		7		34 ft: POORLY GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz, trace fine, subrounded, chert gravel SANDY CLAY (CL), brownish-red with light brown and light gray streaking, moist, medium stiff, medium, quartz sand POORLY GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz	34 ft: gradational contact - gradational contact - gradational contact
50 55	55		7		SILTY FINE SAND (SM-SP), tan, moist, loose, quartz POORLY GRADED SAND (SP), orangish-brown, moist, loose, fine to medium, quartz, trace fine, subrounded, chert gravel - tan below 50 ft - tan and brownish-orange below 53 ft	- gradational contact
60 65	65		10		WELL GRADED GRAVELLY SAND (SW), tan and brownish-orange, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel, trace subrounded, chert cobbles SILTY FINE SAND (SM-SP), brownish-orange, moist, loose, quartz - tan below 63 ft	- gradational contact; clayey - gradational contact
70					- brownish-orange below 66 ft WELL GRADED GRAVELLY SAND (SW), tan to orangish-brown, fine to coarse,	- gradational contact

NOTES:

- groundwater level measurement made on 27 JAN 96

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-47(H)**
Start: 0855 / 23 JAN 96					Finish: 1725 / 23 JAN 96	Water Level: 102.78 ft bgs
						Sheet 3 of 4
			9		quartz, with fine to coarse, subrounded, chert, gravel	
	74				70 ft - 71 ft: SILTY FINE SAND (SM-SP), tan, moist, loose, quartz	
75	75		1		WELL GRADED GRAVELLY SAND (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded to rounded, chert gravel	- gradational contact
						- gradational contact; clayey
80			9		POORLY GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz, trace coarse sand and fine, subrounded, chert gravel	- gradational contact
	84				WELL GRADED SAND (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to medium, subrounded, chert gravel	
85	85		1			
					- well graded to gap graded below 84 ft	
90			10		- trace fine to medium, subrounded, chert gravel below 89 ft - tan below 90 ft	
95	95				- brownish-orange below 94 ft	
					- tan below 97 ft	
100			10		- with fine to coarse, subrounded to rounded, chert gravel below 100 ft	
105	105					

NOTES:

- groundwater level measurement made on 27 JAN 96

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, TN
Boring No. MW-47(H)
Start: 0855 / 23 JAN 96
Finish: 1725 / 23 JAN 96
Water Level: 102.78 ft bgs
Sheet 4 of 4

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	105					
110			10		**WELL GRADED GRAVEL** (GW), brownish orange, moist to wet, loose, fine to coarse, subrounded to rounded, chert with medium to coarse, quartz sand - wet below 112 ft	- gradational contact - Fluvial Aquifer at 112 ft (?)
115	115					
					SILTY CLAY (CL), light gray, lavender, an yellowish-orange (marbled), moist, stiff, medium plasticity	- erosional contact Jackson Fm\Upper Claiborne
120			10		**SILTY SAND** (SM-SP), light gray, wet, loose, fine to medium, quartz, minor clay - 2 inch clay seam at 118 ft	- black silt lamination on bottom of clay seam at 118 ft
					SILTY CLAY (CL), light gray, lavender, an yellowish-orange (marbled), moist, stiff to very stiff - light gray below 124 ft	
125	125					Stopped Drilling at 1503
					Boring Terminated at 125 feet	1725 - MW-47 installed; see attached construction diagram
130						
135						
140						

NOTES:

- groundwater level measurement made on 27 JAN 96

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Elevation:
Location: Memphis, TN
Boring No. MW-48(I)
Start: 0855 1/24/96
Finish: 1730 1/24/96
Water Level: 79.98 ft bgs
Sheet 1 of 3

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	0				1 inch TOPSOIL **SILTY CLAY** (CL), light brown with light gray mottling, moist, soft, low plasticity, trace organics, trace iron nodules (<1/8-inch diameter)	Start Drilling at 0855
			5			modified loess
5	5					
10			10			
15	15				- stiff with light brown with black mottling below 14 ft - with light gray, orange, and black mottling below 15 ft	- 1 inch SILT (ML), light gray, at 18 ft Fluvial Deposits
20			10		**SANDY CLAY** (CL), light brown, moist, medium stiff, medium plasticity, fine to coarse, quartz sand, trace fine to medium, subangular to rounded, chert gravel	- gradational contact
25	25				**CLAYEY SAND** (SC), brownish-red, moist, medium dense, medium to coarse, quartz, trace fine to medium, subrounded to rounded, chert gravel	- gradational contact at 26 ft
			5		**SILTY FINE SAND** (SM), brownish-orange, moist, loose, quartz	- abrupt contact with black iron staining and coarse, chert gravel at 27 ft
30	30				**POORLY GRADED SAND** (SP), orangish-brown, moist, loose, medium, quartz, trace fine, subrounded, chert gravel	- gradational contact at 29 ft - gradational contact at 31 ft
			5		**SILTY FINE SAND** (SM), tan, moist, loose, quartz	
35	35				**POORLY GRADED SAND** (SP), tan to orangish-brown, moist, loose, quartz,	

NOTES:

- groundwater level measurement made 1/27/96

256 131

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation

Drilling Contractor: Boart Longyear

Drilling Method & Equipment: Rotasonic

Logger: S. Bruer/MGM

Elevation:

Location: Memphis, TN

Boring No. MW-48(I)

Start: 0955 1/24/96

Finish: 1730 1/24/96

Water Level: 79.98 ft bgs

Sheet 2 of 3

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	35				trace fine, subrounded, chert gravel	
40			10		- light brown to orangish-brown below 39 ft	- free water present on gravels below 39 ft
					SILTY FINE SAND (SM), tan, moist, loose, quartz	- gradational contact
45	45					
50			10		**POORLY GRADED SAND** (SP), tan, moist loose, fine to medium, quartz	- gradational contact, clayey
					- orangish-brown below 52 ft	
55	55					
					WELL GRADED GRAVELLY SAND (SW), orangish-brown, moist to wet, loose, fine to coarse, quartz, with fine to coarse, subangular to rounded, chert gravel	- free water present on gravels below 55 ft
60			10			
					POORLY GRADED SAND (SP), tan, moist, loose, fine to medium, quartz - clay laminations at 62 ft - orangish-brown to brownish-orange below 62 ft	- gradational contact - abrupt color change at 62 ft
65	65					
					- clay laminations at 68 ft - tan below 68 ft	- abrupt color change at 68 ft
70						

NOTES:

- groundwater level measurement made 1/27/96

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Elevation:
Location: Memphis, TN
Boring No. MW-48(I)
Start: 0955 1/24/96
Finish: 1730 1/24/96
Water Level: 79.98 ft bgs
Sheet 3 of 3

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
			10		<u>WELL GRADED GRAVELLY SAND</u> (SW), brownish-orange, moist, loose, fine to coarse, quartz, with fine to coarse, sub-angular to rounded, chert and quartz gravel - tan and white below 72 ft	- gradational contact
75	75					
80			10			
85	85					
90			10		- orangish-brown below 88 ft; increase in gravel content to 91 ft, SW-GW	
95	95					- geotechnical sample collected from 93.5 ft to 94.5 ft
					<u>SILTY CLAY</u> (CL), light brown with black mottling, moist, medium stiff to stiff, low to medium plasticity - light brown and gray below 98 ft	- erosional contact at 94.5 ft <u>Jackson Fm/Upper Claiborne</u>
100			10		- light gray with black mottling and very stiff to hard below 99 ft - light gray SILT laminations at 102 ft	
105	105				Boring Terminated at 105 Feet	Stopped Drilling at 1610

NOTES:

- groundwater level measurement made 1/27/96

1730 - MW-48 installed, see attached construction log

256 133

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Elevation:
Location: Memphis, TN
Boring No. MW-49(D)
Start: 1010 1/25/96
Finish: 1803 1/25/96
Water Level: 78.92 ft bgs
Sheet 1 of 3

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	0				1 inch TOPSOIL	Start Drilling at 1010
			5		**SILTY CLAY** (CL), light brown, moist, soft to medium stiff, low plasticity, trace organics	
5	5				- with black and orange mottling below 3 ft	
			5		- with light gray mottling below 4 ft - soft below 6 ft	
10	10					- gradational contact
			5		**CLAYEY SILT** (ML), light brown with light gray mottling, moist to wet, very soft, low plasticity	
15	15					- gradational contact
					SILTY CLAY (CL), light brown, moist, soft, low plasticity	
20			10		- medium stiff and low to medium plasticity below 20 ft	
25	25				- with black, orange, and light gray mottling below 24 ft	
30			10		- reddish-brown with black mottling, soft, trace fine, quartz sand below 28 ft	- gradational color change
35	35					

NOTES:

(1) - water level measurement made on 1/27/96

FN: lurg/a:\MW49D.XLS (MW-49 (D))

Printed: 2/9/96

256 134

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results 6"-6"-6" (N)	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)		Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-49(D)**
Start: 1010 1/25/96					Finish: 1803 1/25/96	Water Level: 78.92 ft bgs
						Sheet 2 of 3
	35					- gradational contact
40			10		**CLAYEY SAND** (SC), reddish-brown, moist, medium dense, fine to medium, quartz, medium plasticity clay	Fluvial Deposits
						- gradational contact
					SILTY FINE SAND (SM), reddish- to orangish-brown, moist, loose, quartz	- gradational contact
45	45				**POORLY GRADED SAND** (SP), yellowish-brown, moist, loose, fine to medium, quartz - orangish-brown below 47 ft - orangish-yellow below 48.5 ft	
50			9			- gradational contact
55	55				**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist to wet, loose, fine to coarse, quartz, with fine to coarse, subrounded to rounded, chert gravel	
60	60		5		**POORLY GRADED SAND** (SP), yellowish-brown to yellowish-orange, moist, loose, fine to medium, quartz, trace coarse, quartz sand	
65	65		5		- brownish-orange below 62 ft	62 ft - 2 inch black, light gray, and light brown CLAY seam
70					**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel	68 ft - 2 inch light gray CLAY seam; abrupt contact

NOTES:

- water level measurement made on 1/27/96

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-49(D)**
Start: 1010 1/25/96					Finish: 1803 1/27/96	Water Level: 78.92 ft bgs
						Sheet 3 of 3
			10		(68 ft): **POORLY GRADED SAND** (SP), brownish-orange, moist, loose, medium, quartz, trace coarse sand - trace fine, subrounded, chert gravel below 74 ft	
75	75					
						- gradational contact
80			10		**WELL GRADED SANDY GRAVEL** (GW), orangish-brown, wet, loose, fine to coarse, subrounded to rounded, chert with medium to coarse, quartz sand, trace subrounded, chert cobbles	
						- gradational contact
85	85				**POORLY GRADED SAND** (SP), brownish-orange, moist, loose, fine to medium, quartz - 1 inch CLAY seam at 87 ft	
			5		**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, wet, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel	- Geotechnical Sample collected from 88 ft to 90 ft
90	90					
	92.5	S-1	2.5		**POORLY GRADED SAND** (SP), tan, wet, loose, medium, quartz, trace fine, subrounded, chert gravel	Jackson Fm\Upper Claiborne Stopped Drilling at 1710
95					**SILTY CLAY** (CL), light gray with black mottling, moist, very stiff, medium plasticity, lignitic Boring Terminated at 92.5 Feet	1803 - MW-49 installed; see attached construction diagram
100						
105						

NOTES:

- water level measurement made on 1/27/96

Pocket Penetrometer Measurements on S-1: 3.75, >4.5, >4.5 tsf

256 136

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-50(F)**
Start: 1045 1/26/96					Finish: 2018 1/26/96	Water Level: 82.72 ft bgs
						Sheet 1 of 4
	0				3 inches ASPHALT 6 inches BASE COURSE	Start Drilling at 1045
			5		SILTY CLAY , light gray and light brown, moist, medium stiff, with sub-rounded, medium, chert gravel (FILL)	fill
5	5					
					CLAYEY SILT (ML), light brown with light gray and black mottling, moist, very soft, low plasticity	modified loess
10			10		- medium stiff below 10 ft	
					SILTY CLAY (CL), light brown with light gray mottling, moist, medium stiff, medium plasticity	- gradational contact
15	15					
20			10		- with orange and black mottling and stiff below 18 ft - with black mottling and medium stiff below 20 ft	
25	25					
					SANDY CLAY (CL), orangish-brown, moist, medium stiff, medium plasticity, with trace fine to medium, quartz sand and fine, chert gravel	- gradational contact Fluvial Deposits
30			10			
					SILTY FINE SAND (SM), brownish-orange, moist, loose, quartz	- gradational contact
35	35				- tan below 33 ft	

NOTES:

- groundwater level measurement made 1/27/96

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, TN
Boring No. MW-50(F)
Start: 1045 1/26/96
Finish: 2018 1/26/96
Water Level: 82.72 ft bgs

Sheet 2 of 4

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	35				**WELL GRADED GRAVELLY SAND** (SW), tan, moist, loose, fine to coarse, quartz, with fine to medium, subrounded, chert gravel	- gradational contact
40			10			
					43.5 ft to 44 ft: CLAYEY SILT (ML), light gray, moist, soft	
45	45				**POORLY GRADED SAND** (SP), brownish-orange, moist, loose, fine to medium, quartz	- abrupt contact
			4		**WELL GRADED GRAVELLY SAND** (SW), tan, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded to rounded, chert gravel	- gradational contact
50	50				- orangish-brown below 49 ft	
			5			
55	55					
60			9		**POORLY GRADED SAND** (SP), brownish-orange, moist, loose, fine to medium, quartz, trace fine, subrounded, chert gravel	- gradational contact - gradational contact
	64				**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist, loose, fine to coarse, quartz with fine to coarse, subrounded, chert gravel	
65						
			6		**POORLY GRADED SAND** (SP), tan, moist loose, fine to medium, quartz	- gradational contact - 67 ft to 67.5 ft: Clayey, silty, sand and gravel
70	70				**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist, loose, fine to	

NOTES:

- groundwater level measurement made 1/27/96

256 138

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, Tn
Boring No. MW-50(F)
Start: 1045 1/26/96
Finish: 2018 1/26/96
Water Level: 82.72 ft bgs

Sheet 3 of 4

Depth Below Surface (FT)	Sample: Interval	Sample: Number and Type	Sample: Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	70		5		coarse, quartz, with fine to coarse, subrounded, chert gravel - brownish-orange below 72 ft - tan below 73.5 ft	
75	75					- gradational contact
			7		**SILTY FINE SAND** (SM), light gray, moist, loose, quartz	- gradational contact
80					**CLAYEY SILT** (ML), yellowish-brown, moist, soft, with fine sand and light gray silt laminations, and olive green intermixing	
	82				**SILTY FINE SAND** (SM), brownish-orange, moist, loose, quartz	- light gray below 80 ft - tan below 81 ft
			3		**POORLY GRADED SAND** (SP), tan, moist, loose, fine to medium, quartz, trace fine to medium, subangular to subrounded, chert gravel	- gradational contact
85	85					- gradational contact
90			10		**WELL GRADED GRAVELLY SAND** (SW), brownish-orange, moist, loose, fine to coarse, quartz, with fine to medium, subangular to subrounded, chert gravel - wet below 87 ft - yellowish-brown GW-SW below 90 ft	- iron-stained, cemented, sandstone fragments at 93 ft
95	95					
					WELL GRADED SANDY GRAVEL (GW), orangish-brown, wet, loose, fine to coarse, subrounded to rounded, chert, with fine to coarse, quartz sand	- gradational contact
100			6			
105	105					

NOTES:

- groundwater level measurement made 1/27/96

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	 Number and Type	 Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-50(F)**
Start: 1045 1/26/96					Finish: 2018 1/26/96	Water Level: 82.72 ft bgs
						Sheet 4 of 4
	105					
110			10		- 109 ft to 110 ft: dark brown SW-GW - 110.5 ft to 114 ft: clayey	
115	115					
120			10			
						- geotechnical sample collected from 120 ft to 125 ft
125	125				**SILTY FINE SAND** (SM), yellowish-brown, moist, loose, quartz	- gradational contact
					SILTY CLAY (CL), light gray with black mottling, moist, very stiff to hard, low to medium plasticity	- erosional contact Jackson Fm\Upper Claiborne
130			11			
135						
	136					1830 Stopped Drilling
					Boring Terminated at 136 Feet	2018 MW-50 installed; see attached construction diagram
140						

NOTES:

- groundwater level measurement made 1/27/96

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation Drilling Contractor: Boart Longyear\Minnesota

Drilling Method & Equipment: Rotasonic Logger: S. Bruer\MGM

Elevation:

Location: Memphis, TN

Boring No. MW-51(A)

Start: 0842 1/28/96

Finish: 1725 1/30/96

Water Level:

Sheet 1 of 2

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	0				4 inches CONCRETE SILTY CLAY (CL), light brown with light gray and black mottling, moist, medium stiff, low plasticity	Start Drilling at 0842 (1/28/96) modified loess
			5			
5	5				CLAYEY SILT (ML), light brown with light gray mottling, moist, medium stiff, trace organics	- gradational contact
			5			
10	10					
					- no organics below 10 ft	
			5			
15	15					
			5		SANDY CLAY (CL), reddish-brown, moist, stiff, medium plasticity, fine to medium, quartz sand, trace fine, subrounded, chert gravel	- gradational contact Fluvial Deposits
20	20					- collected sample: SBMW5119
			3			
	23					
	24		1			
25	25		1			
			6			
30						
	32					
			3			
35	35					

NOTES:

- 1/28/96 at 1045: threads stripped on rotary head tip where drill rods connect;
- 1/30/96 at 1145: drilling again; hole open to approximately 35 ft bgs

256 141

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruen\MGM

Elevation:
Location: Memphis, TN
Boring No. MW-51(A)
Start: 0842 1/28/96
Finish: 1725 1/30/96
Water Level:

Sheet 2 of 2

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	35		4		<u>POORLY GRADED SAND</u> (SP), brownish-orange, moist, loose, fine to medium, quartz, trace fine, subrounded, chert gravel	- first run 1145 1/30/96 - gradational contact
	39					
40			6			
45	45				<u>WELL GRADED GRAVELLY SAND</u> (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel	
50			0			- no recovery 45 ft to 55 ft
55	55				- wet below 55 ft	- geotechnical sample collected from 55 ft to 60 ft
60			10		- 5 inch clayey layer at 60 ft - brownish-orange, medium SP from 61 ft to 62 ft	
65	65					- erosional contact
			5		<u>SILTY CLAY</u> (CL), light brown and light gray, moist, stiff to very stiff, medium plasticity - light gray below 69 ft	<u>Jackson Fm/Upper Claiborne</u>
70	70				Boring Terminated at 70 Feet	Stopped Drilling 1600 (1/30/96)

NOTES:

- 1/28/96 at 1045: threads stripped on rotary head tip where drill rods connect;
- 1/30/96 at 1145: drilling again; hole open to approximately 35 ft bgs

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic Logger: S. Bruer/MGM

Elevation:
Location: Memphis, TN
Boring No. MW-52(G)
Start: 1015 / 06 FEB 96
Finish: 1730 / 06 FEB 96
Water Level:
Sheet 1 of 4

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
5	0 5		2.5		1 Inch TOPSOIL SILTY CLAY (CL), light brown with black and light gray mottling, moist, medium stiff, low to medium plasticity, trace organics	Start Drilling at 1015 modified loess
10	10		5		CLAYEY SILT (ML), light brown with black mottling, moist, soft, low plasticity - with black and light gray mottling below 8 ft	- gradational contact
15	15		5			
20 25	25		10		SILTY CLAY (CL), light brown with black and orange mottling, moist, stiff, medium plasticity, with iron nodules CLAYEY SAND (SC), light brown and light gray, moist, medium dense, fine to medium, quartz - brownish-red with black mottling below 23 ft	- gradational contact - with some fine to medium quartz sand below 20 ft - gradational contact Fluvial Deposits
30 35	35		10		- light gray and light brown below 25 ft - trace fine to medium, subrounded, chert gravel below 27 ft POORLY GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz, trace fine to medium, chert gravel	- gradational contact

NOTES:

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Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation

Elevation:	Location: Memphis, TN	**Boring No. MW-52(G)**
Start: 1015 / 06 FEB 96	Finish: 1730 / 06 FEB 96	Water Level:

Sheet 2 of 4

Depth Below Surface (FT)	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil Description	Comments
40	42		7		34.5 ft: **WELL GRADED SAND** (SW), orangish-brown to brownish-orange, moist, loose, fine to coarse, quartz with fine to medium, subrounded to rounded, chert gravel	- gradational contact
45 50	50		8		**SANDY CLAY** (CL), dark brown to black, moist, soft, fine to medium, quartz, trace fine to medium, subrounded, chert gravel **WELL GRADED SAND** (SW), brownish-orange, moist, loose, fine to coarse, quartz, with some fine to medium, subrounded, chert gravel - tand with fine to coarse, subrounded, chert gravel below 48 ft	- probably hole collapse - gradational contact
55	55		5		**POORLY GRADED SAND** (SP), brownish-orange, moist, loose, fine to medium, quartz	
	58		3		- tan and brownish-orange below 53 ft	
60 65	65		7		- fine to coarse, subrounded, chert gravel from 63 ft to 63.5 ft - brownish-orange with medium to coarse, subrouonded, chert gravel 64.5 ft to 65 ft	
70					**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, wet, loose, fine to coarse	- gradational contact

NOTES:

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation

Elevation:
Location: Memphis, TN
Boring No. MW-52(G)
Start: 1015 / 06 FEB 96
Finish: 1730 / 06 FEB 96
Water Level:

Sheet 3 of 4

			9		quartz, with fine to coarse, subrounded to rounded, chert gravel - tan below 73 ft	
75	75					
80			10		- tan and orangish-brown below 79 ft	
85	85					
					SILTY SAND (SM), light gray and orangish-brown, wet, loose, fine to medium, quartz with black biotite(?) flakes	- gradational contact
90					- light gray below 92 ft	
			15			
95						- 1 inch CLAY seam at 96 ft
100	100				- orangish-brown below 100 ft	- Geotechnical Sample collected from 102 ft to 104 ft
			5		- light gray below 103 ft	- erosional contact
105					**SILTY CLAY (CL)**, light brown with gray	Jackson Fm/Upper Claiborne

NOTES:

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear/Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer/MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-52(G)**
Start: 1015 / 06 FEB 96					Finish: 1730 / 06 FEB 96	Water Level:
						Sheet 4 of 4
					and black streaking, moist, stiff, medium plasticity Boring Terminated at 105 feet	1730 - MW-52 installed; see attached construction diagram
110						
115						
120						
125						
130						
135						
140						

NOTES:

CH2MHILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-53(E)**
Start: 0955 / 07 FEB 96					Finish: 1245 / 08 FEB 96	Water Level: 78 ft bgs
						Sheet 1 of 3
5	0 5		5		2 Inches CONCRETE 1 inch BASE COURSE - chert gravel SILTY CLAY (CL), light brown with light gray and black mottling, moist, medium stiff, low to medium plasticity	Start Drilling at 0955 (2/7/96)
10	10		5		CLAYEY SILT (ML), light brown, moist, soft, low plasticity	- gradational contact
15	15		5		SILTY CLAY (CL), light brown, moist, soft, low to medium plasticity	- gradational contact
20 25	25		10		- with black and orange iron nodules maximum 1/8-inch diameter below 17 ft - stiff with orange and light gray mottling below 19 ft - stiff with black and light gray mottling below 21 ft	
30 35	35		10		SANDY CLAY (CL), light brown, moist, stiff, medium plasticity, fine to medium, quartz sand, silty - with light gray and brownish-red intermixing below 32 ft	- gradational contact - increasing sand content with depth Fluvial Deposits
					CLAYEY SAND (SC), brownish-orange,	- gradational contact

NOTES:

- groundwater level estimated during drilling

256 147

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-53(E)**
Start: 0955 / 07 FEB 96					Finish: 1245 / 08 FEB 96	Water Level: 78 ft bgs
						Sheet 2 of 3
	35				moist, medium dense, fine to medium, quartz, silty	
40			9		POORLY GRADED SAND (SP), brownish-orange, moist, medium dense, fine to medium, quartz	- gradational contact
	44					
45						
					- yellowish-brown with trace fine, subrounded, chert gravel, silty 46 ft to 47 ft	
50			11			
					WELL GRADED SAND (SW), orangish-brown, moist, loose, fine to coarse, quartz, with some fine to medium, subrounded to rounded, chert gravel	- gradational contact - gradational contact
55	55				POORLY GRADED SAND (SP), yellowish-brown, moist, loose, fine to medium, quartz, trace fine to coarse, subrounded, chert gravel	
			5			
60	60					
			3		- brownish-orange below 61 ft	
	63					
65			5		- yellowish-brown below 66 ft	
	68					
70					WELL GRADED GRAVELLY SAND (SW), yellowish-brown to orangish-brown, moist,	- gradational contact

NOTES:

- groundwater level estimated during drilling

FN: lrg/a.MW53E.XLS (Soil Boring Log)

Printed: 2/6/96

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-53(E)**
Start: 0955 / 07 FEB 96					Finish: 1245 / 08 FEB 96	Water Level: 78 ft bgs
						Sheet 3 of 3
			3		loose, fine to coarse, quartz, with fine to coarse, subrounded, chert gravel	
75	75				- orangish-brown below 74 ft	
			5		- clayey from 76 ft to 76.5 ft - trace subrounded, chert cobbles below 77 ft	
80	80				- wet below 78 ft	<u>Fluvial Aquifer</u>
			5			- erosional contact at 83 ft
85	85				<u>SILTY CLAY</u> (CL), light brown and light gray (marbled), moist, stiff, medium plasticity	<u>Jackson Fm/Upper Claiborne</u> 2/8/96 - 1010: stopped drilling
					Boring Terminated at 85 Feet	2/8/96 - : MW-53 installed see attached construction log
90						
95						
100						
105						

NOTES:

- groundwater level estimated during drilling

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation

Elevation:
Location: Memphis, TN
Boring No. MW-54(J)
Start: 0840 2/9/96
Finish: 1950 2/9/96
Water Level:

Sheet 1 of 3

Depth Below Surface (FT)	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil Description	Comments
	0		5		1 inch TOPSOIL **CLAYEY SILT** (ML), light brown with light gray and black mottling, moist, soft, low plasticity, trace organics	Start Drilling at 0840 - using 6" core barrel modified loess
5	5		8			
10					- light brown, low to medium plasticity, no organics below 10 ft	
15	15		5		**SILTY CLAY** (CL), light brown with black mottling, moist, medium stiff, low to medium plasticity, trace iron nodules (< 1/8 inch diameter)	- gradational contact
20	20		5		- with black, orange, and light gray mottling below 21 ft	
25	25		8		- trace fine to coarse, quartz sand below 25 ft	- increasing sand content with depth below 25 ft Fluvial Deposits
					SANDY CLAY (CL), light brown with black, light gray, and orange mottling, moist, stiff, medium plasticity, fine to medium, quartz sand	- gradational contact - orangish-brown below 29 ft
30						- with brownish-red mottling below 31 ft
	33				**CLAYEY SAND** (SC), reddish-brown with light gray and light brown intermixing, moist, dense, fine to medium, quartz	- with fine to coarse, sub-rounded to rounded, chert gravel below 33 ft
35						

NOTES:

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, TN
Boring No. MW-54(J)
Start: 0840 2/9/96
Finish: 1950 2/9/96
Water Level:
Sheet 2 of 3

Depth Below Surface (FT)	Sample			Standard Penetration Test Results 6"-6"-6" (N)	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)		Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
			7			
40	40				SILTY SAND (SM-SP), brownish-orange, moist, loose, fine to medium, quartz, with some fine to coarse, subrounded to rounded, chert gravel, micaceous 42 ft - 43 ft: POORLY GRADED SAND (SP), tan, moist, medium, quartz	- gradational contact
			4			
	44					
45						
			6		- tan, medium to coarse below 46 ft - orangish-brown, with fine to coarse, subrounded to rounded, chert gravel below 48 ft	
50	50					
			5		- orangish-brown, fine to medium, no gravel below 49 ft WELL GRADED GRAVELLY SAND (SW), yellowish-brown, moist, loose, fine to coarse, with fine to coarse, subrounded, chert gravel	- gradational contact - tan to yellowish-brown below 52 ft - free water present on gravels below 52 ft
55	55					
60			6			
65	65				POORLY GRADED SAND (SP), yellowish-brown, moist, loose, fine to medium, quartz, trace coarse, quartz sand	- gradational contact - brownish-orange 63 ft to 63.5 ft
			4		- trace fine to coarse, subrounded, chert gravel below 66 ft	
	69				WELL GRADED GRAVELLY SAND (SW), yellowish-brown, moist to wet, loose, fine to coarse, quartz with fine to coarse,	- gradational contact
70						

NOTES:

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-54(J)**
Start: 0840 2/9/96					Finish: 1950 2/9/96	Water Level:
						Sheet 3 of 3
	72		0		subangular to rounded, chert gravel	- no recovery 69 ft to 72 ft - changing to 4" core barrel
75	75		3		**POORLY GRADED SAND** (SP), yellowish-brown, moist, loose, fine to medium, quartz, trace coarse quartz/chert sand, micaceous	- gradational contact
80	81		4		- orangish-brown below 77 ft - yellowish-brown with trace fine, subrounded, chert gravel below 79 ft - wet below 81 ft	- 75 ft to 81 ft: hnu = 3 ppm (headspace in ziplock bag) - collected SBMW5477
85	89		8			
90 95	95		6		- trace coarse, quartz sand and fine to medium, subrounded, chert gravel below 91 ft	- collected Geotechnical Sample from 93 ft to 95 ft
100	100		5		**SILTY CLAY** (CL), light brown and light gray, moist, very stiff, medium plasticity - light gray and lignitic below 100 ft	- erosional contact Jackson Fm/Upper Claiborne
	101	S-1	1			Stopped Drilling at 1625
105					Boring Terminated at 101 Feet	MW-54 Installed at 1950 - see attached construction diagram

NOTES:

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, TN
Boring No. MW-55(U)
Start: 1030 2/10/96
Finish: 1755 2/10/96
Water Level:

Sheet 1 of 3

Depth Below Surface (FT)	Sample			Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
	Interval	Number and Type	Recovery (FT)			
	0		5		6 inches CRUSHED STONE CLAYEY SILT (ML), light brown with light gray and black mottling, moist, medium stiff, low plasticity	Start Drilling at 1030 - using 6" core barrel modified loess
5	5					
10			10		- with black mottling below 5 ft	
15	15					
20			10		SILTY CLAY (CL), light brown with black and orange mottling, moist, medium stiff, medium plasticity - stiff with light gray, black, and orange mottling below 20 ft	- gradational contact
25	25					
			5		SANDY CLAY (CL), light brown with black mottling, moist, soft to medium stiff, medium plasticity, fine to medium, quartz/chert sand, trace fine, subrounded, chert gravel, silty	- gradational contact Fluvial Deposits
30	30					
			5		CLAYEY SAND (SC), orangish-brown, moist, loose to medium dense, fine to coarse, quartz/chert with trace to some, fine to medium, subrounded, chert gravel	- gradational contact
35	35					

NOTES:

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation

Drilling Contractor: Boart Longyear\Minnesota

Drilling Method & Equipment: Rotasonic

Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-55(U)**
Start: 1030 2/10/96					Finish: 1755 2/10/96	Water Level:
						Sheet 2 of 3
40	35 43		8		<u>WELL GRADED GRAVELLY SAND</u> (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subangular to rounded, chert gravel, micaceous <u>WELL GRADED GRAVELLY SAND to WELL GRADED SANDY GRAVEL</u> (SW-GW), orangish-brown, moist, loose, fine to coarse, quartz sand and fine to coarse, subangular to rounded, chert gravel, trace subangular chert cobbles	- gradational contact <u>38 ft to 40 ft</u>: <u>SILTY SAND</u> (SM orangish- to yellowish-brown with black/gray intermixing, fine to medium, quartz, trace fine to medium, subrounded, chert gravel
45 50	50		7		<u>WELL GRADED GRAVELLY SAND</u> (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subangular to rounded, chert gravel	- decreasing gravel content with depth below 45 ft - gradational contact
	54		4		<u>POORLY GRADED SAND</u> (SP), orangish-brown, moist, loose, fine to medium, quartz, trace subangular to subrounded, chert gravel - increasing gravel content below 53 ft	
55 60	60		6		<u>WELL GRADED GRAVELLY SAND to WELL GRADED SANDY GRAVEL</u> (SW-GW), orangish- to yellowish-brown, moist t wet, loose, fine to coarse, quartz sand and fine to coarse, subangular to rounded, chert gravel	- 5 inches <u>SILTY CLAY</u> (CL), dark brown, sandy, gravelly at 55 ft
65	65		5			
70						- switching to 4" core barrel

NOTES:

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. MW-55(U)**
Start: 1030 2/10/98					Finish: 1755 2/10/98	Water Level:
						Sheet 3 of 3
	73		8			- 6 inches **SILTY SAND** (SM), light gray and lavender, wet, loose, fine, quartz at 72 ft
75					**POORLY GRADED SAND** (SP), tan to white, wet, loose, fine to medium, quartz, trace fine, subrounded, chert gravel	- erosional contact with ferruginous, well-cemented, sandstone fragments at 74 ft
			10		**SILTY CLAY** (CL), light gray with black mottling, moist, stiff, medium plasticity	Jackson Fm/Upper Claiborne
80						
	83					
85	85.5	S-1	2.5			PP = 2.75, 2.5, 2.5 tsf 1505 Stopped Drilling
					Boring Termintaed at 85.5 Feet	MW-55 Installed 1755 see attached contruction log
90						
95						
100						
105						

NOTES:

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description: Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments: Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. STB-13**
Start: 0900 2/11/96					Finish: 1735 2/11/96	Water Level:
						Sheet 1 of 4
0	0		5		1 inch TOPSOIL **SILTY CLAY** (CL), light brown with black and light gray mottling, moist, medium stiff, medium plasticity, trace organics	Start Drilling at 0900 - using 6" core barrel
5	5					modified loess
					CLAYEY SILT (ML), light brown, moist, soft, low plasticity, trace organics	- gradational contact
10			10			
15	15					
					SILTY CLAY (CL), light brown with black mottling, moist, medium stiff, medium plasticity	- gradational contact
20			10		- stiff with black and orange mottling and iron nodules (<1/8 inch diameter) below 21 ft	
					- with black, orange, and light gray mottling below 23 ft	
25	25				- reddish-brown with trace to some, fine to meidum, quarz sand below 25 ft	
			9			
30						
					SANDY CLAY (CL), reddish- to orangish-brown, moist, stiff to very stiff, medium plasticity, fine to medium, quartz sand, trace fine to medium, subrounded, chert gravel	- gradational contact Fluvial Deposits
	34					
35						

NOTES:

CH2MHILL

Proj. No.: 113630.01.ZZ
SOIL BORING LOG

Project: DDMT GW Investigation	Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic	Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample			Standard Penetration Test Results	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)	6"-6"-6" (N)	Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. STB-13**
Start: 0900 2/11/96					Finish: 1735 2/11/96	Water Level:
						Sheet 2 of 4
			6		**SILTY SAND** (SM), orangish-brown, moist, medium dense, fine to medium, quartz	- gradational contact
					POORLY GRADED SAND (SP), brownish-orange, moist, loose, fine to medium, quartz	- gradational contact
40	40				- tan and micaceous below 39 ft	
			5		- orangish- to yellowish-brown and micaceous below 40 ft	
45	45				**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist, loose, fine to coarse, quartz, with fine to coarse, subrounded to rounded, chert gravel	- abrupt contact
			5		- tan below 48 ft	- 1 inch **SILTY CLAY** (CL), light gray, moist, soft at 47 ft
50	50				- orangish-brown with coarsening sand below 49 ft	
			5		**POORLY GRADED SAND** (SP), brownish-orange, moist, loose, fine to medium, quartz, micaceous	- minor clay at 53 ft - some coarse sand and fine to coarse, subrounded, chert gravel 53.5 ft to 54 ft
55	55				- trace fine, subrounded, chert gravel below 55 ft	- gradational contact
			5			
60	60					
			5		- yellowish-brown with trace coarse, quartz sand below 60 ft	
65	65				**WELL GRADED GRAVELLY SAND** (SW), orangish-brown, moist, loose, fine to coarse, quartz with fine to coarse, subrounded to rounded, chert gravel	- gradational contact
			5			
70	70					

NOTES:

CH2M HILL

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation

Drilling Contractor: Boart Longyear\Minnesota

Drilling Method & Equipment: Rotasonic

Logger: S. Bruer\MGM

Depth Below Surface (FT)	Sample Interval	Sample Number and Type	Sample Recovery (FT)	Standard Penetration Test Results 6"-6"-6" (N)	Soil Description Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Comments Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
Elevation:					Location: Memphis, TN	**Boring No. STB-13**
Start: 0900 2/11/96					Finish: 1735 2/11/96	Water Level:
						Sheet 3 of 4
70 75	70 75		3		- dark brown iron staining below 73 ft	- switching to 4" core barrel
80	80		5		**WELL GRADED GRAVELLY SAND** (SW), dark brown iron stained, moist, loose, fine to coarse, quartz with fine to coarse, subrounded to rounded, chert gravel	74.5 ft to 75.5 ft: **SANDSTONE/CONGLOMERATE**, dark reddish-brown iron stained, fine to coarse sand and fine to medium, chert gravel, well-cemented
85	85		5		- white to tan below 78 feet - yellowish-brown, with very coarse, chert sand and fine gravel below 80 ft - clayey and lignitic below 83 ft	- 2 inches **SILTY CLAY**, light gray, moist, soft at 79.5 ft - abrupt contact
90	90		5		**POORLY GRADED SAND** (SP), tan, moist loose, medium, quartz and chert, trace coarse sand and fine, subrounded, chert gravel	- gradational contact - **WELL GRADED SAND** (SW) dark brown, moist, loose,
95	95		5		**SILTY FINE SAND** (SM), light gray, moist, loose, quartz, micaceous	fine to coarse, quartz, some fine to coarse, chert gravel and ferrigunous sandstone fragments from 88 ft to 89 ft - abrupt contact, clayey at 91 ft
100	100		5			
105	105		5			

NOTES:

Proj. No.: 113630.01.ZZ

SOIL BORING LOG

Project: DDMT GW Investigation
Drilling Contractor: Boart Longyear\Minnesota
Drilling Method & Equipment: Rotasonic
Logger: S. Bruer\MGM

Elevation:
Location: Memphis, TN
Boring No. STB-13
Start: 0900 2/11/98
Finish: 1735 2/11/98
Water Level:
Sheet 4 of 4

Depth Below Surface (FT)	Sample			Standard Penetration Test Results 6"-6"-6" (N)	Soil Description	Comments
	Interval	Number and Type	Recovery (FT)		Soil name, uscs group symbol, color, moisture content, relative density or consistency, soil structure, mineralogy	Depth of casing, drilling rate, drilling fluid loss, tests and instrumentation
105	105				(see previous page)	
110			10			
115	115					
			5			
120	120					Stopped Drilling at 1548
					Boring Terminated at 120 Feet	1735: Borehole grouted with high solids bentonite clay - PureGold Grout - 17 sacks
125						
130						
135						
140						

NOTES:

Appendix B

Monitoring Well Construction Logs

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 160

Installation DOMT

Site NW of Dunn Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

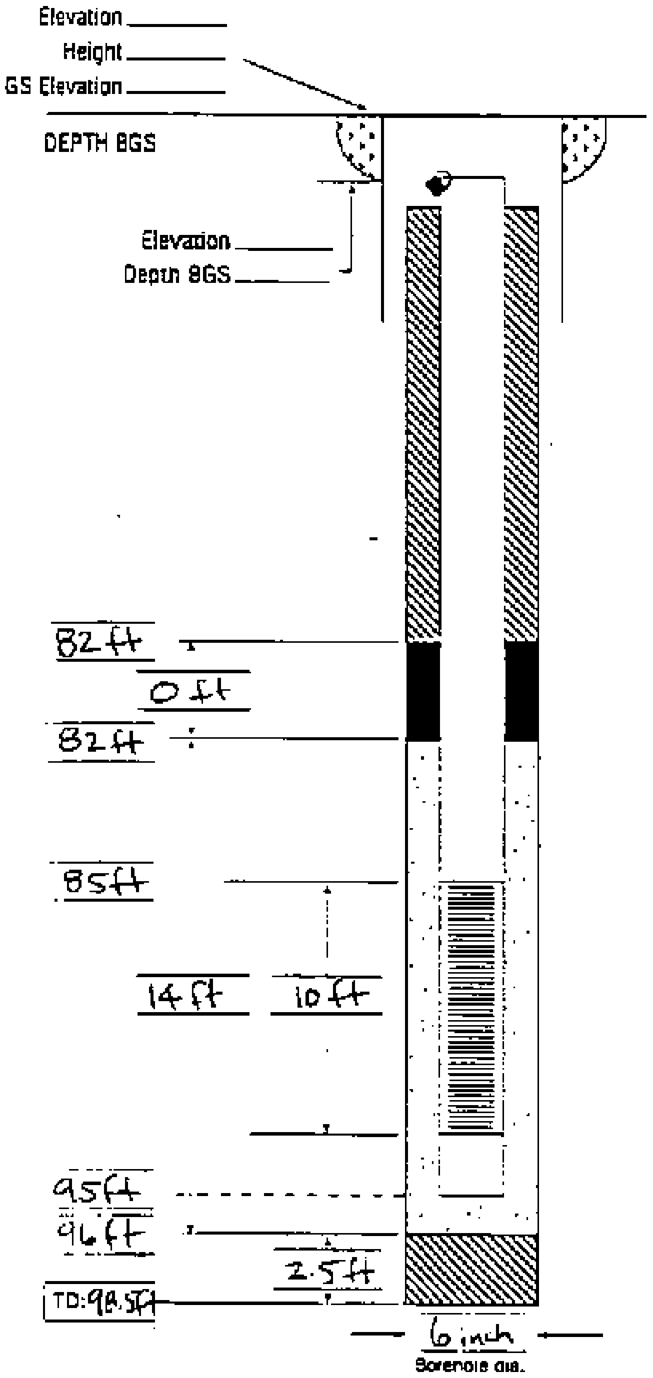
Well Number MW-40 (0)

Client/Project DDMT Groundwater Invest.

Starting date 10 JAN 96 time 1025

Completion date 11 JAN 96 time 1500

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size Concrete 3ft x 3ft

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 85 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied ([✓ Y] / N)

Interval BGS 0 ft to 82 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type Sand 20/40

Amount Used 6 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade DON

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 85 ft to 95 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 161

Installation DDMT

Site West of Dunn Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

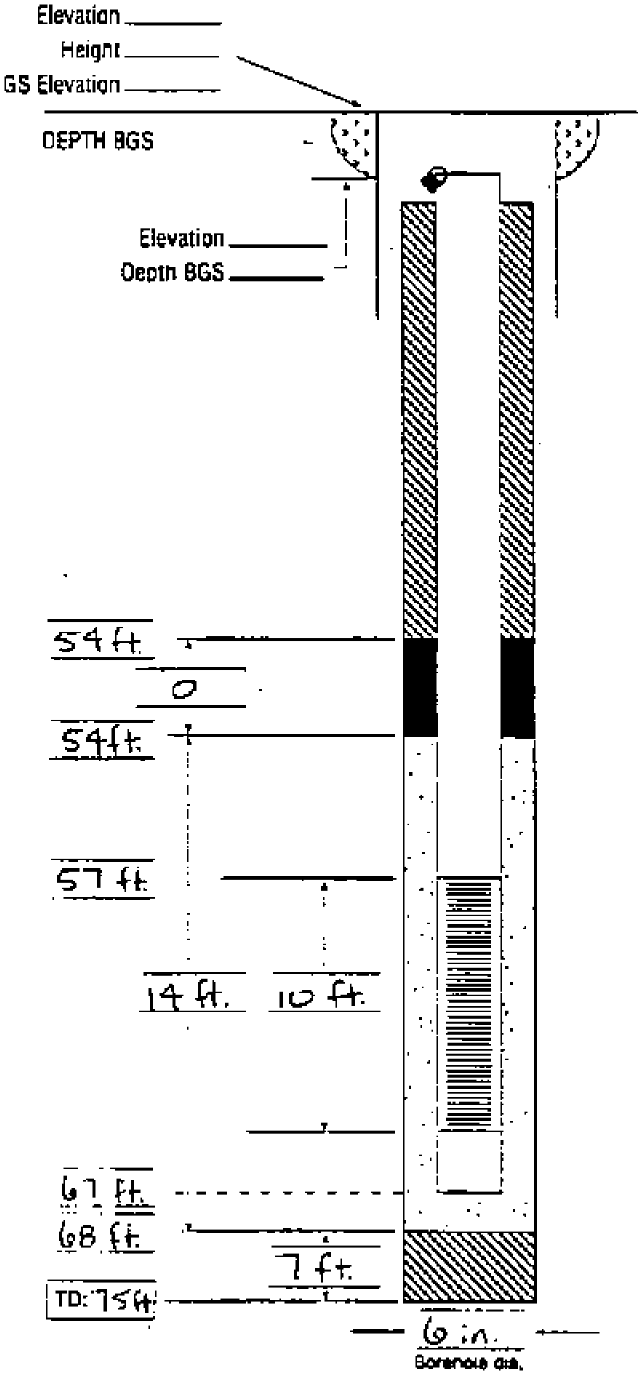
Well Number MW-41 (K)

Client/Project DDMT Groundwater Investig

Starting date 12 JAN96 time 0915

Completion date 13 JAN96 time 1100

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch

Water Tight Seal ([✓ Y] / N)

Depth BGS

Weep Hole (Y / N)

SURFACE PAD

Composition & Size Concrete

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 57 ft.

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] / N)

Interval BGS 0 ft - 54 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time

Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type Sand 20/40

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 57 ft - 67 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 162

Installation DDMT

Site NW of Dunn Field

Project Number 113630.41.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

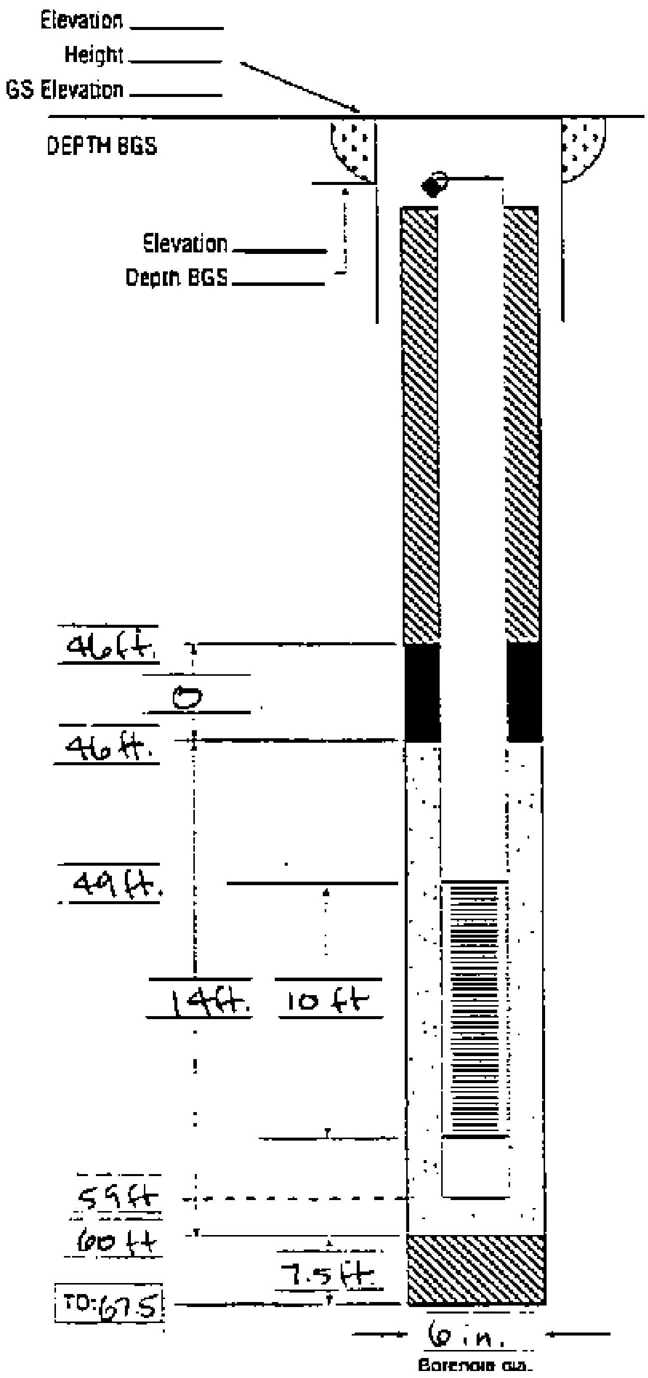
Well Number MW-42 (N)

Client/Project DDMT Groundwater Invest.

Starting date 13 JAN96 time 0935

Completion date 14 JAN96 time 1300

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch

Water Tight Seal ([✓ Y] N)

Depth BGS

Weep Hole (Y / N)

SURFACE PAD

Composition & Size Concrete

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 49 ft.

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] N)

Interval BGS 0 ft. - 46 ft.

CENTRALIZERS (Y [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time

Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type Sand 20/40

Amount Used 4 50# bags

Tremied (Y [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010

Interval BGS 49 ft. - 59. ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 164

Installation DDMT

Site West of Dunn Field

Project Number 11363 0. 01. ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

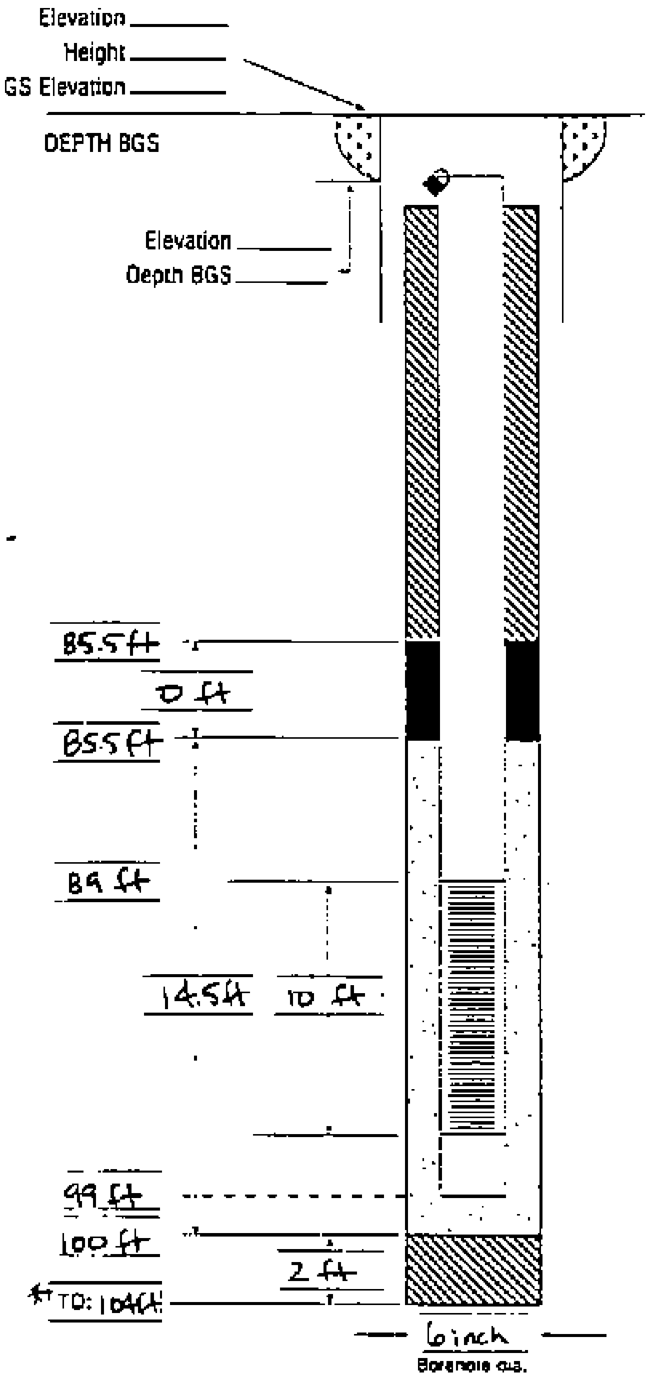
Well Number MW-43 (L)

Client/Project DDMT Groundwater Inv.

Starting date 14 JAN 96 time 0915

Completion date 15 JAN 96 time 1400

Well Coordinates



* 2 feet of borehole collapsed prior to installing Bentonite Plug

PROTECTIVE CSG
Material / Type Steel
Diameter 4 inch Water Tight Seal ([✓ Y] / N)
Depth BGS Weep Hole (Y / N)

SURFACE PAD
Composition & Size Concrete 2 ft x 2 ft

RISER PIPE
Type Schedule 40 PVC
Diameter 2 inch
Total Length (TOC to TOS) 89 ft

GROUT
Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold
Tremied ([✓ Y] / N)
Interval BGS 0 ft to 85.5 ft

CENTRALIZERS (Y / [✓ N])
Depth(s) BGS

SEAL
Type N/A
Source
Hydration Time Volume of Fluid Added
Tremied (Y / N)

FILTER PACK
Type 20/40 Sand
Amount Used 4 50# bags
Tremied (Y / [✓ N])
Source The Morie Company
Gr. Size Dist. Grade 00N

SCREEN
Type Schedule 40 PVC
Diameter 2 inch
Slot Size & Type 0.010 inch
Interval BGS 89 ft to 99 ft

BACKFILL PLUG
Material Bentonite Pellets
Hydration Time
Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

Installation DDMT

Site West of Dunn Field

Project Number 113630. 01. ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

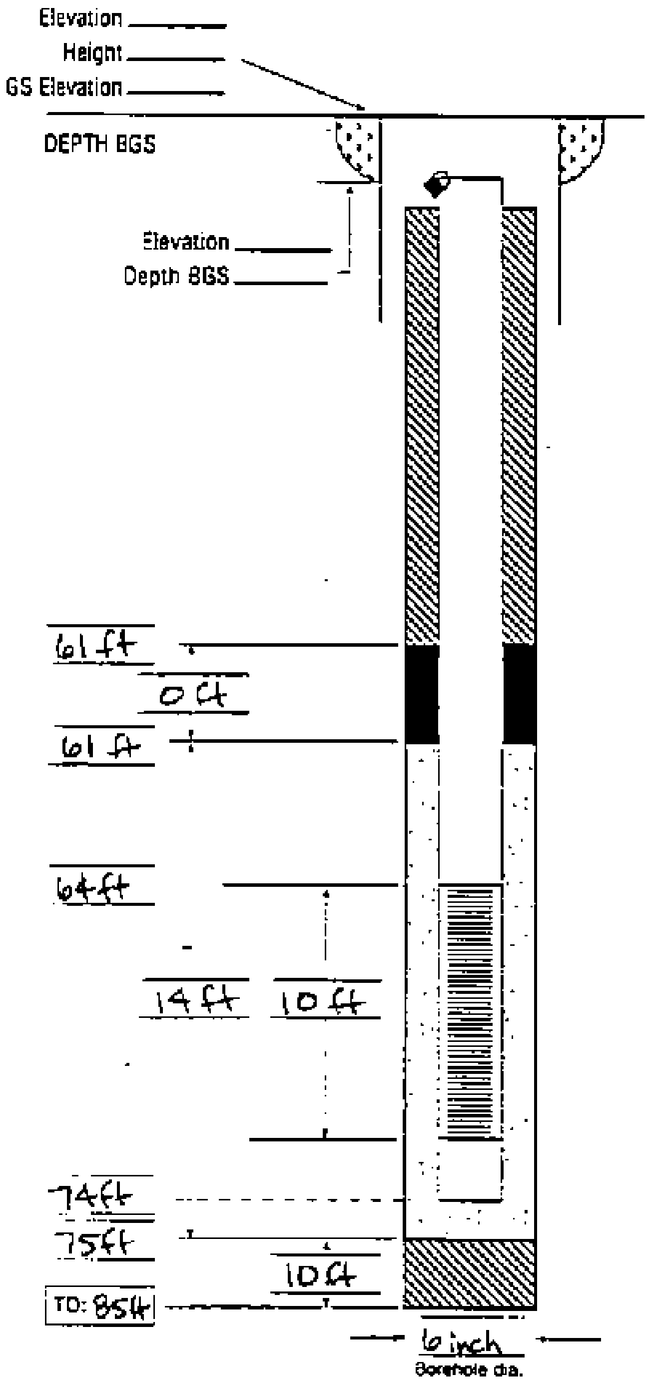
Well Number MW-44 (m)

Client/Project DDMT Groundwater Inv.

Starting date 15 JAN96 time 0945

*Temporary Completion date 16 JAN96 time 1400

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 64 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied (Y / N)

Interval BGS 0 ft to 61 ft

CENTRALIZERS (Y [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50 lb bags

Tremied (Y [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 64 ft to 74 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 166

Installation DDMT

Site East of Dunn Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

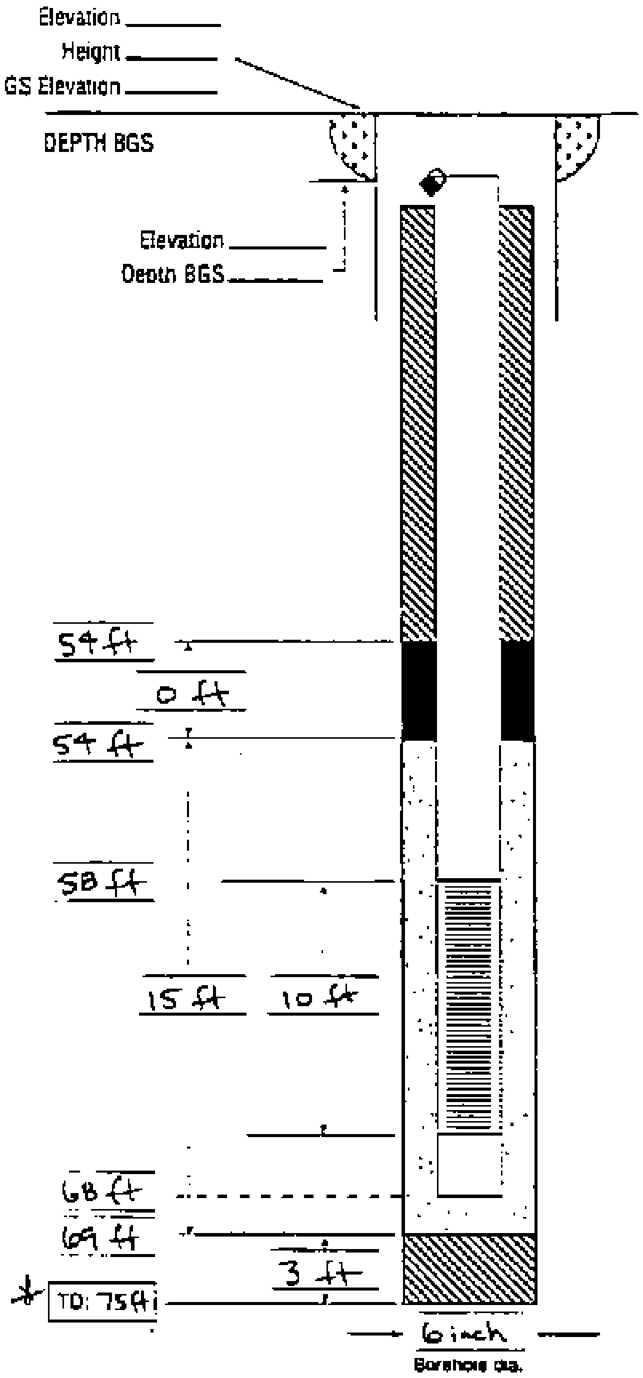
Well Number MW-45 (C)

Client/Project DDMT Groundwater Invest.

Starting date 16 JAN96 time 0915

Completion date 17 JAN96 time 1000

Well Coordinates



* 3 feet of borehole collapse prior to installation of backfill plug

PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size Concrete 2 ft x 2 ft

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 58 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite - PureGold 10.3 lbs/gal

Tremied ([✓ Y] / N)

Interval BGS 0 ft to 54 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

HydrationTime Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50 lb. bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 58 ft to 68 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

Installation DDMT

Site Dunn Field

Project Number 113634.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

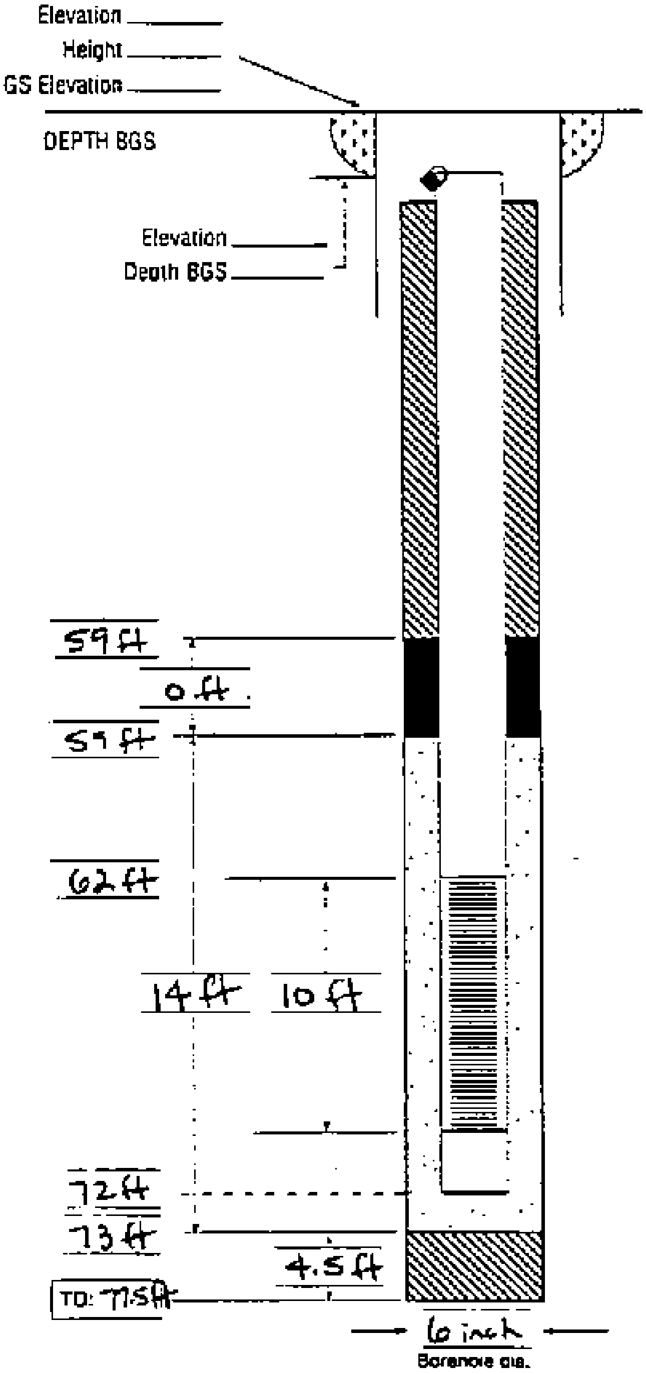
Well Number MW-46 (B)

Client/Project DDMT Groundwater Invest.

Starting date 22 JAN96 time 1048

Completion date 27 JAN96 time

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 62 feet

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 59 ft

CENTRALIZERS (Y [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 62 ft to 72 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

256 168

Standard Flush Mount

Installation DDMT

Site SW of Main Installation

Project Number 113630 01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

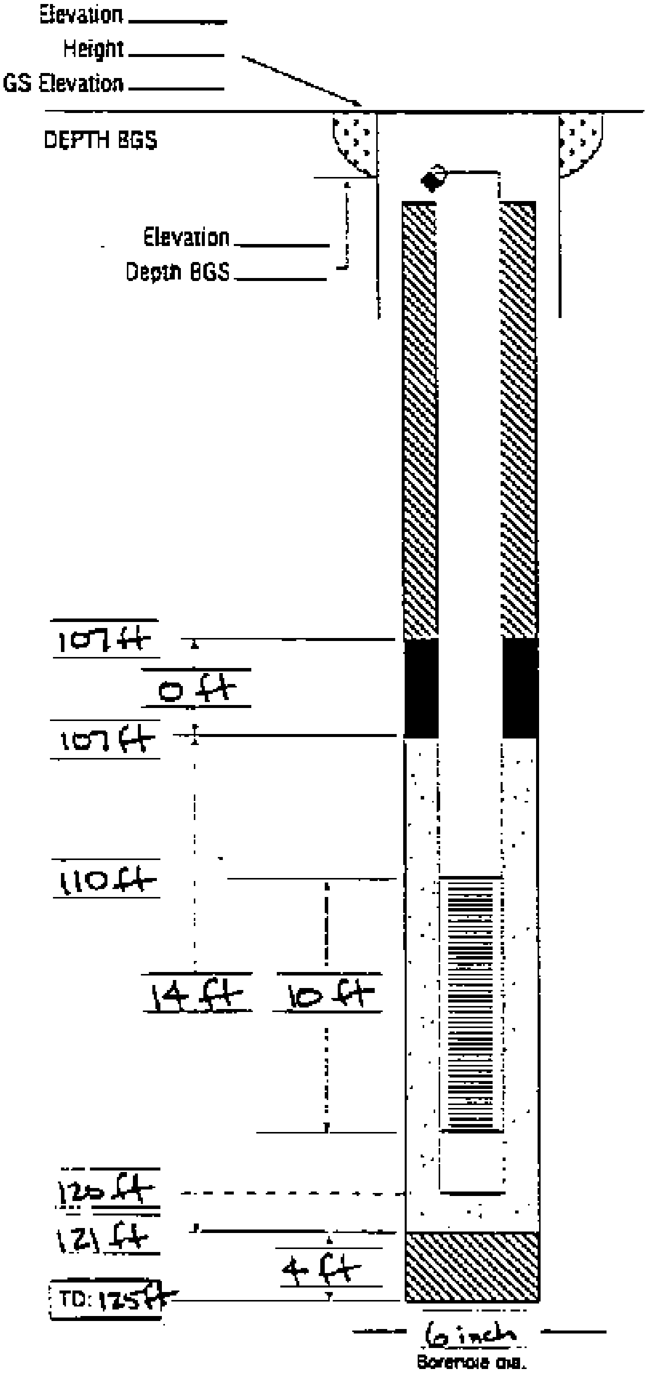
Well Number MW-47 (H)

Client/Project DDMT Groundwater Inv.

Starting date 23 JAN96 time 0855

Completion date ____ time ____

Well Coordinates ____



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS ____ Weep Hole (Y / N)

SURFACE PAD

Composition & Size ____

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 110 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] / N)

Interval BGS 0 ft to 107 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS ____

SEAL

Type N/A

Source ____

HydrationTime ____ Volume of Fluid Added ____

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Moric Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 110 ft to 120 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time ____

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 169

Installation DDMT

Site West of Main Installation

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

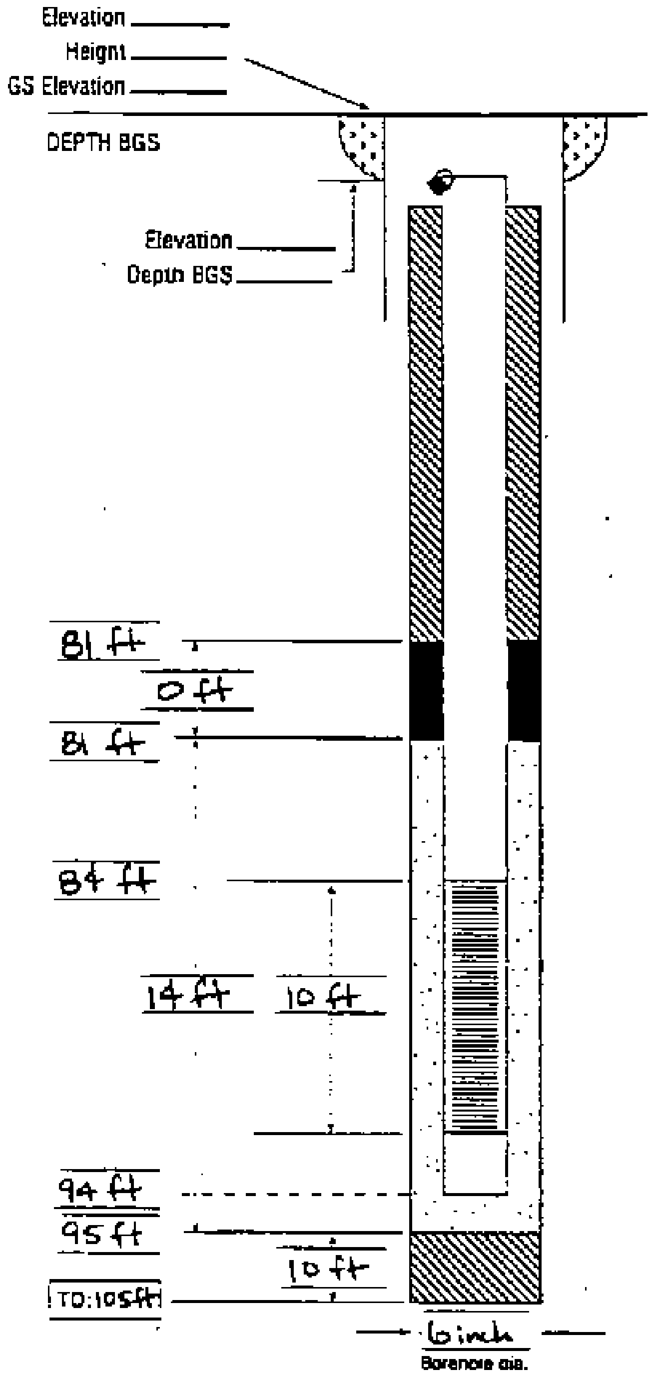
Well Number MW-48 (I)

Client/Project DDMT Groundwater Inv.

Starting date 24 JAN 96 time 0955

Completion date 25 JAN 96 time

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 84 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 81 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 84 ft to 94 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 170

Installation DDMT

Site Dunn Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

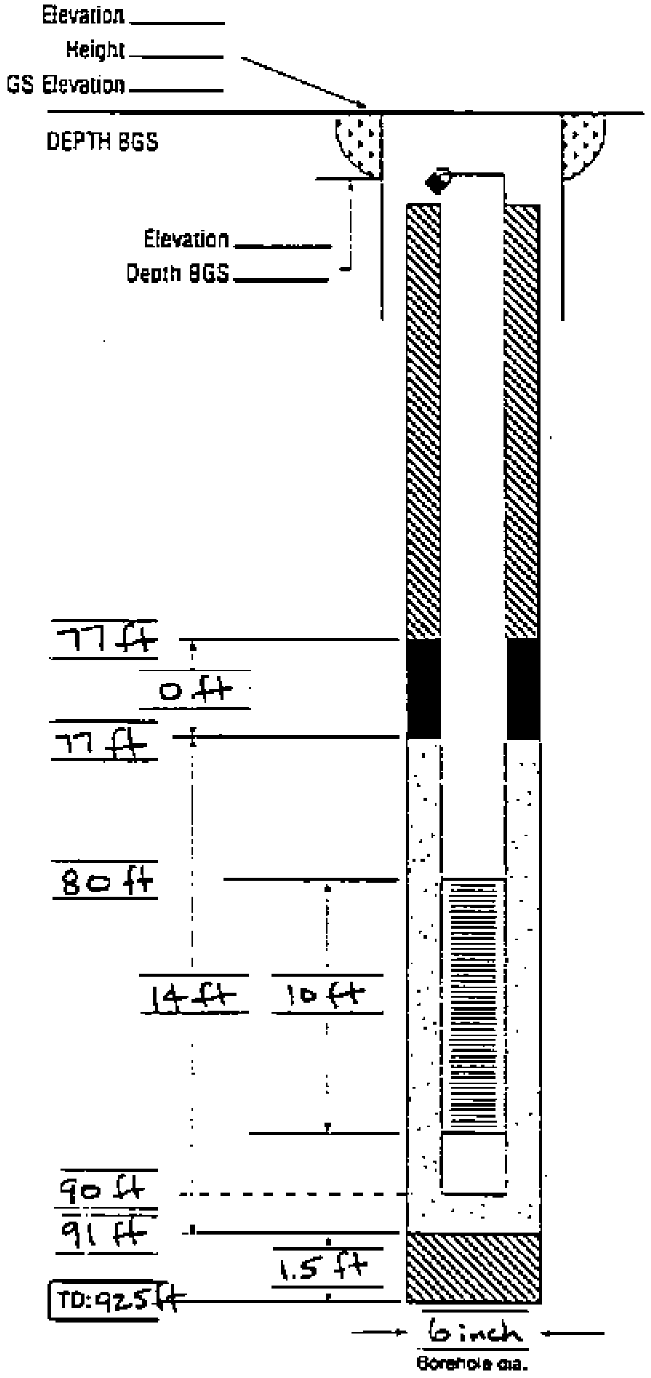
Well Number MW-49 (D)

Client/Project DDMT Groundwater Inv.

Starting date 25JAN96 time 1010

Completion date 27JAN96 time

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 80 feet

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied ([✓ Y] / N)

Interval BGS 0 ft to 77 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 80 ft to 90 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 171

Installation DDMT

Well Number MW-50 (F)

Site Eastern Edge of Main Installation

Client/Project DDMT Groundwater Inv.

Project Number 113630.01.ZZ

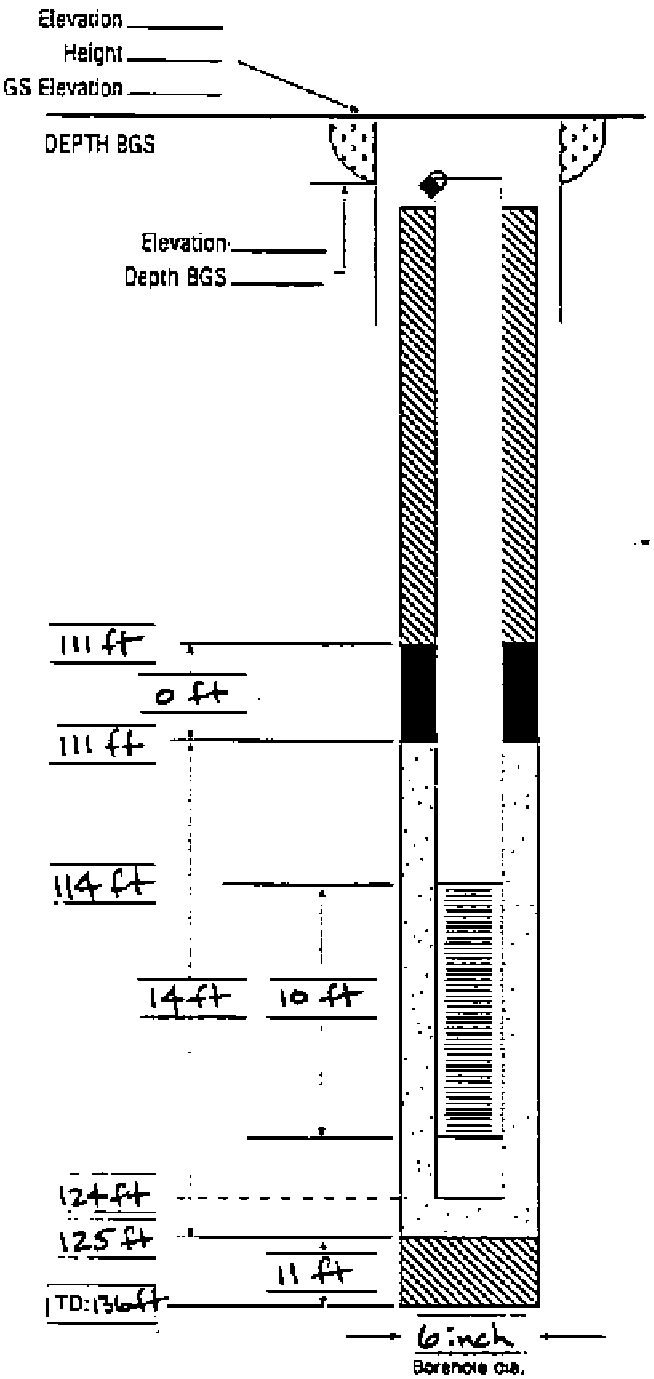
Starting date 26 JAN96 time 1045

Drilling Contractor Boart Longyear

Completion date ____ time ____

Built By Boart Longyear

Well Coordinates ____



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] N)

Depth BGS ____ Weep Hole (Y / N)

SURFACE PAD

Composition & Size Asphalt

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 114 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 111 ft

CENTRALIZERS (Y [✓ N])

Depth(s) BGS ____

SEAL

Type N/A

Source ____

Hydration Time ____ Volume of Fluid Added ____

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 114 ft to 124 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time ____

Tremied (Y [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 172

Installation DDMT

Site North of Dunn Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

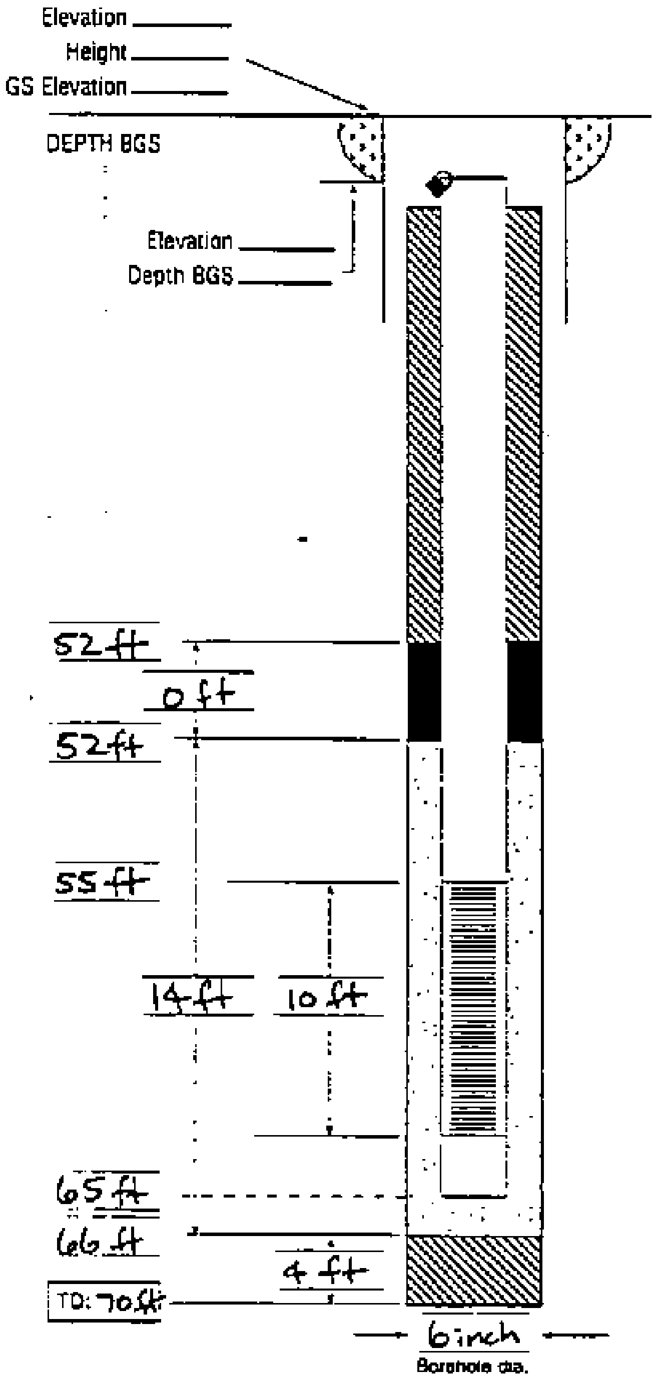
Well Number MW-51 (A)

Client/Project DDMT Groundwater Invest.

Starting date 28 JAN96 time 0842

Completion date time

Well Coordinates



PROTECTIVE CSG

Material / Type Steel

Diameter 4 inch Water Tight Seal ([✓ Y] N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 55 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 52 ft

CENTRALIZERS (Y [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 55 ft to 65 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 173

Installation DDMT

Site Southern Edge of Main Installation

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

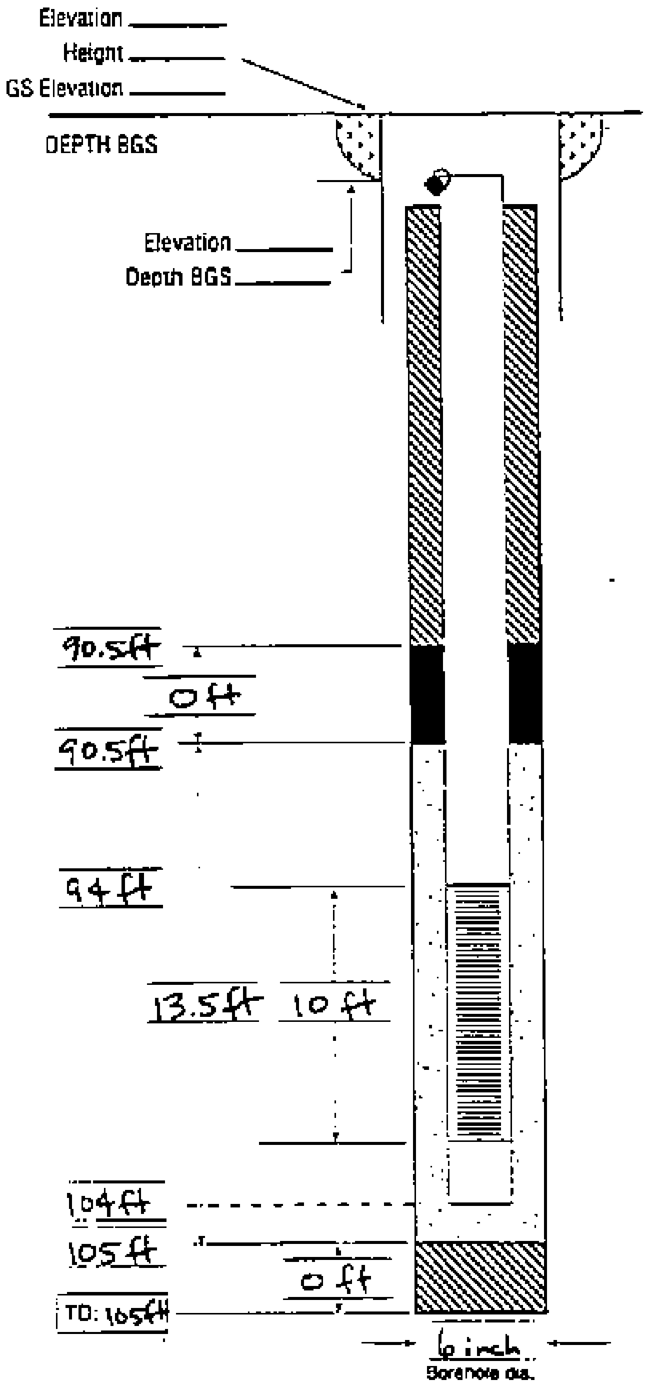
Well Number MW-52 (G)

Client/Project DDMT Groundwater Inv.

Starting date 06FEB96 time 1015

Completion date time

Well Coordinates



PROTECTIVE CSG

Material / Type

Diameter Water Tight Seal (Y / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 94 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 90.5 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50 # bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 94 ft to 104 ft

BACKFILL PLUG

Material N/A

Hydration Time

Tremied (Y / N)

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 174

Installation DDMT

Site North of Main Installation

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

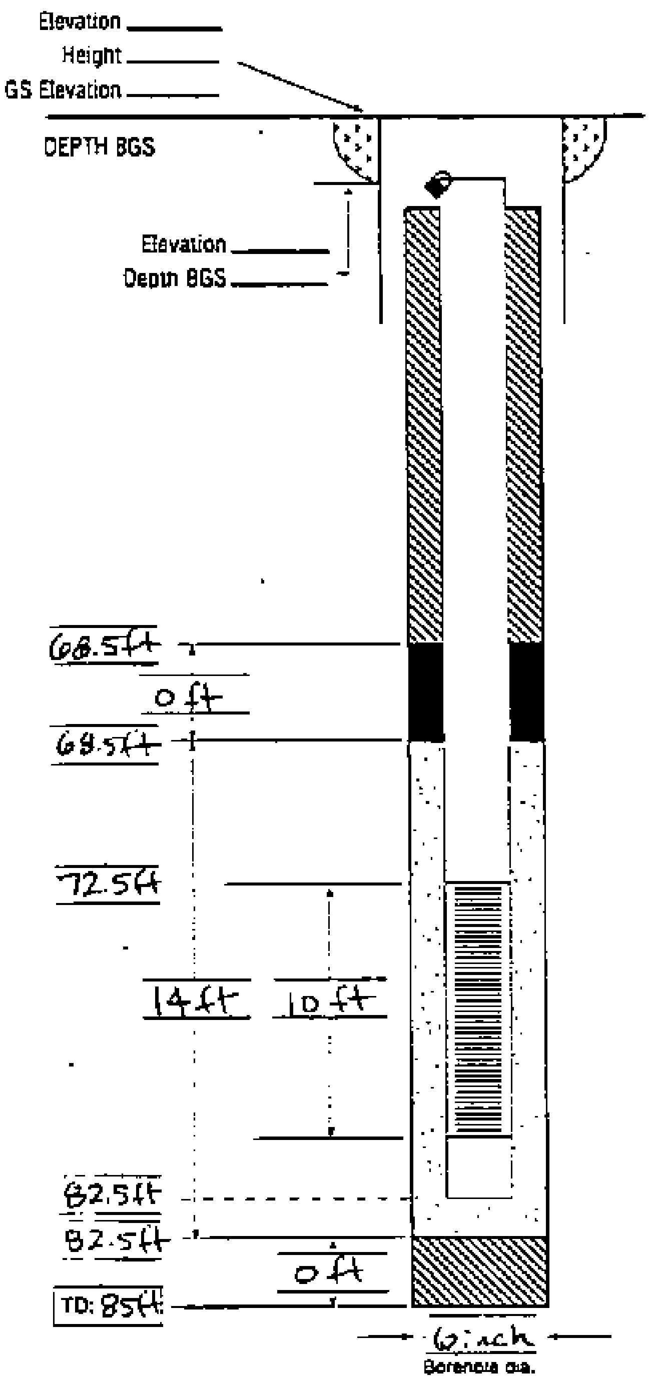
Well Number MW-53 (E)

Client/Project DDMT GW Invest.

Starting date 07FEB96 time 0955

Completion date 09FEB96 time 1245

Well Coordinates



PROTECTIVE CSG

Material / Type

Diameter Water Tight Seal (Y / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS)

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] / N)

Interval BGS

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 5 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS

BACKFILL PLUG

Material N/A

Hydration Time

Tremied (Y / N)

CH2M HILL MONITORING WELL CONSTRUCTION LOG

Standard Flush Mount

256 175

Installation DOMT

Site West of Ouna Field

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

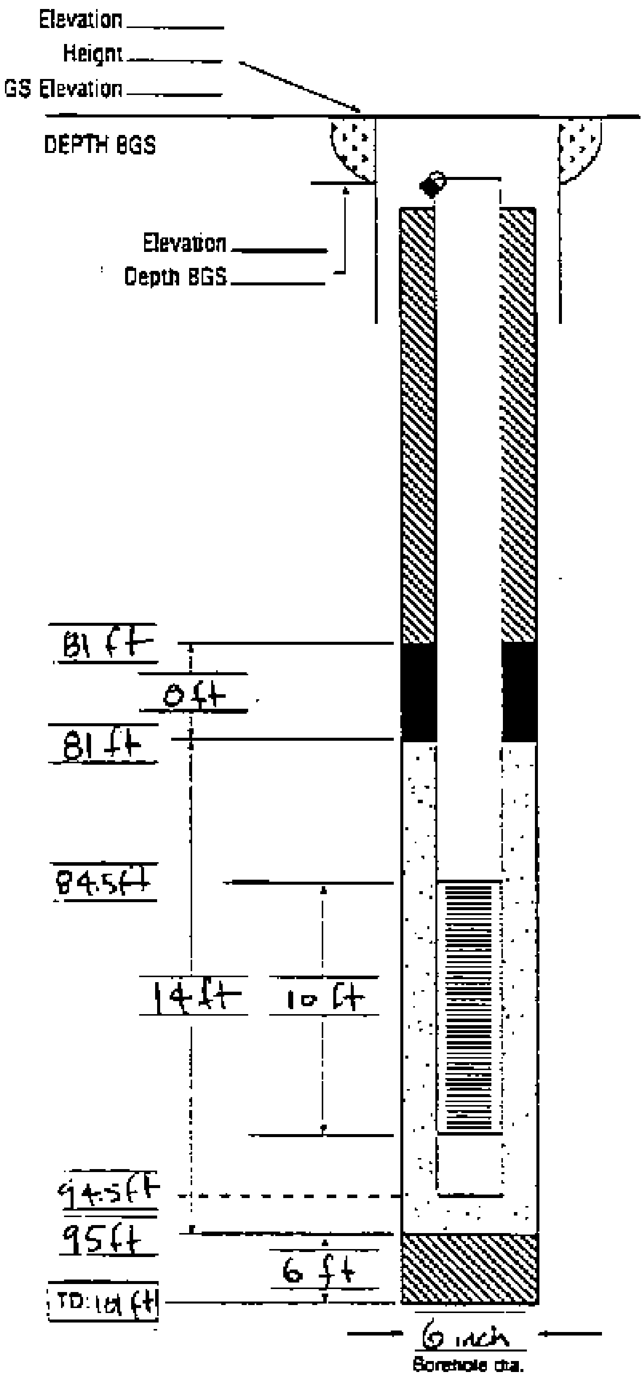
Well Number MW-54 (J)

Client/Project DDMT GW Investigation

Starting date 09 FEB96 time 0840

Completion date time

Well Coordinates



PROTECTIVE CSG

Material / Type

Diameter Water Tight Seal (Y / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) 84.5 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - Pure Gold

Tremied ([✓ Y] N)

Interval BGS 0 ft to 81 ft

CENTRALIZERS (Y [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50 # bags

Tremied (Y [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 84.5 ft to 94.5 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

CH2M HILL MONITORING WELL CONSTRUCTION LOG

256 176

Standard

Installation DDMT

Site Main Installation

Project Number 113630.01.ZZ

Drilling Contractor Boart Longyear

Built By Boart Longyear

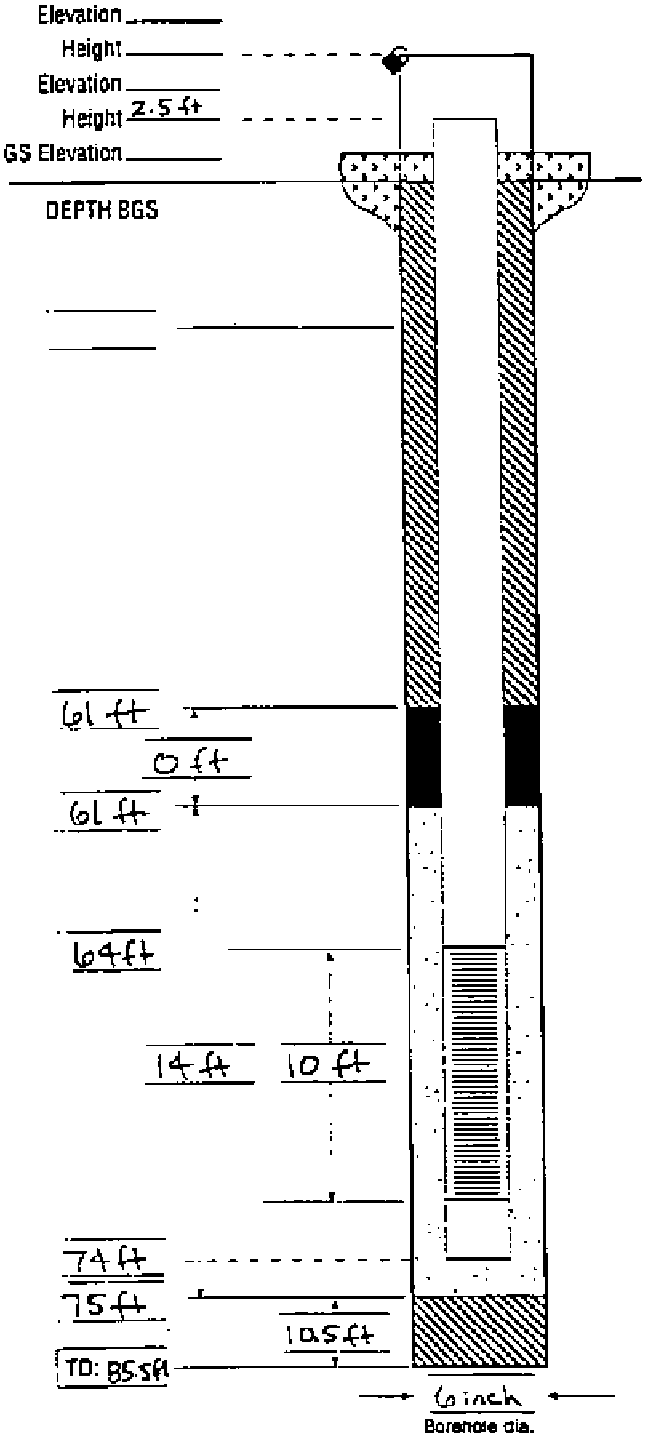
Well Number MW-55 (U)

Client/Project DDMT GW Investigation

Starting date 10 FEB96 time 1030

Completion date time

Well Coordinates



PROTECTIVE CSG

Material / Type

Diameter Water Tight Seal (Y / N)

Depth BGS Weep Hole (Y / N)

SURFACE PAD

Composition & Size

RISER PIPE

Type Schedule 40 PVC

Diameter 2 inch

Total Length (TOC to TOS) ~~to~~ 66.5 ft

GROUT

Composition & Proportions High Solids (30%) Bentonite Clay - PureGold

Tremied ([✓ Y] / N)

Interval BGS 0 ft to 61 ft

CENTRALIZERS (Y / [✓ N])

Depth(s) BGS

SEAL

Type N/A

Source

Hydration Time Volume of Fluid Added

Tremied (Y / N)

FILTER PACK

Type 20/40 Silica Sand

Amount Used 4 50# bags

Tremied (Y / [✓ N])

Source The Morie Company

Gr. Size Dist. Grade 00N

SCREEN

Type Schedule 40 PVC

Diameter 2 inch

Slot Size & Type 0.010 inch

Interval BGS 64 ft to 74 ft

BACKFILL PLUG

Material Bentonite Pellets

Hydration Time

Tremied (Y / [✓ N])

Appendix C

Well Sampling and Development Logs

CH2M HILL MONITORING WELL SAMPLING LOG

256 178

Installation DOMT

Well Number MW-2

Site/Project Groundwater Investigation

Sample ID Number MWC21

Project Number 113630.03.ZZ

Sample Start date 02/12/96 time 0930

Sampled by LThompson, LBaciwelds

Sample End date 2/12/96 time 1000

Original Static Water Level 64.52 ft BTOC

Final Static Water Level 64.52 ft BTOC

Screen interval unknown ft BTOC no well construction diagram available

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0929	12.6	5.91	0.288	7999		0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

DO meter not functioning

Sampling Method

Submersible Pump _ Dedicated Bladder Pump Bladder Pump _ Bailer X SS _ Tef X PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/ Displacement Pump _ Other

Sampling Equipment (Make, Model, Etc.) disposable Teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set — ft BTOC

Weather Cold, clear, windy, app 35 °F

Lab Analyses

VOC ✓ SVOC TM Metals X Pesticides/PCBs _ Herbicides _ TPH _ Dioxin/Furans _

Other Al

Metals: Filtered _ Unfiltered X Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 179

Installation DDMT

Well Number MW3

Site/Project DO4

Sample ID Number MW31

Project Number 113630.03.ZZ

Sample Start date 2/13/96 time 1145

Sampled by Dale Jayne/Mike Marable

Sample End date 2/13/96 time 1145

Original Static Water Level 64.60 ft BTOC

Final Static Water Level NA ft BTOC

Screen interval ______ — ______ ft BTOC Unknown - no construction log

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1127	17.8	6.09	0.342	10	8.10	0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ______

Sampling Equipment (Make, Model, Etc.) GrundFos Submersible Pump and Disposable Teflon Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer, depth(s) where pump set 72' ft BTOC

Weather Sunny 55 °F

Lab Analyses

VOC ☒ SVOC Metals ☒ ppm Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other Al, Fe, SO4, Cl, TOC, NO3/NO2, NH4

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DD:AT

Well Number MW-4

Site/Project Groundwater Investigation

Sample ID Number MW041

Project Number 113630.03.ZZ

Sample Start date 2/12/96 time 1105

Sampled by LBlackwelder, LThompson

Sample End date 2/12/96 time 1125

Original Static Water Level 72.06' ft BTOC

Final Static Water Level 72.06 ft BTOC

Screen Interval Unknown ft BTOC no well construction diagram available

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1100	14.5	6.07	0.188	>999		0.00

DO meter not functioning

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes ______

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ______

Sampling Equipment (Make, Model, Etc.) disposable Teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set ______ ft BTOC

Weather Cold, clear, windy, app 35 °F

Lab Analyses

VOC ☒ SVOC ☐ Metals ☒ PPM Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other AL

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample [✓ Y] / N w/ Terry Templeton - TDEC

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 181

Installation DDMT

Well Number MW 6

Site/Project D04

Sample ID Number MW61

Project Number 113630.03.ZZ

Sample Start date 1/12/96 time 1615

Sampled by Dale Jayne / Mike Mandle

Sample End date 1/12/96 time 1615

Original Static Water Level 60.34 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval unknown - no construction log ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1556	17.6	5.69	0.886	148	7.95	0.04

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Teflon ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer for VOCS

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer; depth(s) where pump set 67' ft BTOC

Weather Sunny 50 °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ (PPm) Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other TOC, SO4, Cl, NO3/NO2, NH4, Fe, Al

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DC4

Project Number 113630.03.ZZ

Sampled by Dale Jayne/mike [illegible]

Well Number MW7

Sample ID Number MW71

Sample Start date 2/12/96 time 1145

Sample End date 2/12/96 time 1145

Original Static Water Level 66.15' ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval unknown - ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1141	16.5	6.12	0.282	101	7.17	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump X — Dedicated Bladder Pump _ — Bladder Pump _ — Bailer X — SS _ Tef X PVC _ — Centrifugal Pump _ — Peristaltic Pump _ — Hand Pump _ — Gas Lift/ Displacement Pump _ — Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer faucets

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 71' ft BTOC

Weather ______ °F

Lab Analyses

VOC X — SVOC X — TAL Metals X — Pesticides/PCBs X — Herbicides X — TPH _ — Dioxin/Furans _

Other ______

Metals: Filtered _ Unfiltered X Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments Split w/ Terry Templeton - TDEC

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation ODMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by L Blackwelder, L Thompson

Well Number MW-8

Sample ID Number MW081

Sample Start date 2/13/96 time 1055

Sample End date 2/13/96 time 1115

Original Static Water Level AB ~~67.44~~ 60.58 ft BTOC

Final Static Water Level 61.60 ft BTOC

Screen Interval 56.5 – 106.5 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1051	17.1	5.41	0.286	251		0.01

DO meter not working

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Grundfos #22953, Disposable Teflon bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 65 ft BTOC

Weather Cool, clear, breezy, app 50 °F

Lab Analyses

VOC ☒ SVOC ☐ PPM Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other AL, FS (TOC, Sulfate, NO3/NO2, Cl⁻, NH4, Fe)

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

256 184

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number Mw9

Site/Project D04

Sample ID Number MW91

Project Number 1136.30 03.ZZ

Sample Start date 2/11/96 time 1400

Sampled by D. Jayne, M. Marable

Sample End date 2/11/96 time 1430

Original Static Water Level 74.02 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 70.1 – 80.1 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1401	16.0	6.12	0.274	999	9.05	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ✓ (SS ☐ Tef ✓ PVC ☐) Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather cloudy 50 °F

Lab Analyses

(ppm)

VOC ☒ SVOC ☐ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other Aluminum

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 185

Installation DDMT

Well Number MW10

Site/Project DO4

Sample ID Number MW107

Project Number 113630.03.ZZ

Sample Start date 2/13/96 time 1500

Sampled by Dale Jayne/mike Marcille

Sample End date 2/13/96 time 1500

Original Static Water Level 60.10 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 58.6 – 68.6 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1435	16.9	6.08	0.333	10	8.84	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump X Dedicated Bladder Pump ___ Bladder Pump ___ Bailer X SS ___ Tef X PVC ___ Centrifugal Pump ___ Peristaltic Pump ___ Hand Pump ___ Gas Lift/ Displacement Pump ___ Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos Submersible Pump and Disposable Teflon Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 65' ft BTOC

Weather Sunny and windy 55 °F

Lab Analyses

VOC X SVOC X Metals X TAL Pesticides/PCBs X Herbicides X TPH ___ Dioxin/Furans ___

Other ___

Metals: Filtered ___ Unfiltered X Both ___

Field Duplicates Y / [✓ N]

Split Sample [✓ Y] / N

MS/MSD Y / [✓ N]

Comments Split Sample with Corp of Engineers

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 186

Installation DOMT

Well Number MW11

Site/Project Groundwater Invest

Sample ID Number MW111

Project Number 113630.03.ZZ

Sample Start date 2/12/96 time 1320

Sampled by Bob Trebble, Jeff Dillener

Sample End date 2/12/96 time 1335

Original Static Water Level 71.75' ft BTOC

Final Static Water Level 71.75' ft BTOC

Screen Interval 68' - 83' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1335	16.2	5.63	204	80	7.11	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes 5 vol TOTAL

Sampling Method

Submersible Pump X Dedicated Bladder Pump Bladder Pump Bailer X SS Tef PVC Centrifugal Pump Peristaltic Pump Hand Pump Gas Lift/Displacement Pump Other

Sampling Equipment (Make, Model, Etc. Grundfos 2" Submersible Pump, Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 79' ft BTOC

Weather Sunny, Breezy, 50°F °F

Lab Analyses

VOC X SVOC Metals X Pesticides/PCBs Herbicides TPH Dioxin/Furans

Other AL, IODINE, PH

Metals: Filtered Unfiltered X Both

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments VOC's collected with a disposible bailer

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project 1204

Project Number 113630.03.FF

Sampled by Dale Jayne / Lee Thompson

Well Number MW 13

Sample ID Number MW121

Sample Start date 2/13/96 time 1800

Sample End date 2/13/96 time 1800

Original Static Water Level 72.74 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 69.4 - 84.4 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1258	16.1	6.06	0.160	999	8.11	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather ______ °F

Lab Analyses ppm

VOC ☒ SVOC ☐ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other AL

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments Level C Sampling

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DC-U

Project Number 113630.03.ZZ

Sampled by Dale Jayne/mike marable

Well Number MW13

Sample ID Number MW132

Sample Start date 2/12/96 time 1430

Sample End date 2/12/96 time 1430

Original Static Water Level 72.36 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 66 – 81 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1416	16.5	6.02	0.213	143	7.32	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer for VOC's

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 77' ft BTOC

Weather Sunny 50 °F

Lab Analyses

ppm

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other TOC, SO_4, Cl^-, NO_3/NO_2, NH_4, Fe, Al

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project D04

Project Number 13630.03.ZZ

Sampled by Dale Jaque / mike Marable

Well Number MW14

Sample ID Number MW141

Sample Start date 7/11/96 time 1645

Sample End date 7/11/96 time 1645

Original Static Water Level 73.20 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 65 – 80 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
16:37	16.2	6.03	0.221	999	7.86	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump __ Dedicated Bladder Pump __ Bladder Pump __ Bailer [✓] SS __ Tef [✓] PVC __ Centrifugal Pump __ Peristaltic Pump __ Hand Pump __ Gas Lift/Displacement Pump __ Other __

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather cloudy 50 °F

Lab Analyses

VOC [✓] SVOC [✓] Metals [✓] TAL Pesticides/PCBs [✓] Herbicides [✓] TPH __ Dioxin/Furans __

Other TOC, SO4, Cl, NO3/NO2, NH4, Fe

Metals: Filtered Unfiltered [✓] Both __

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 190

Installation DDMT

Site/Project DO4

Project Number 113630.03.ZZ

Sampled by Dale Jayne/mike Maudble

Well Number MW15

Sample ID Number MW151

Sample Start date 2/7/96 time 1540

Sample End date 2/7/96 time 1540

Original Static Water Level DMJ ~~65~~ 65.76 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 63.4 – 78.4 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1508	15.9	6.28	0.186	867	8.94	0.00
1515	15.7	6.08	0.161	999	9.19	0.00
1522	15.7	6.31	0.170	999	9.05	0.00
1536	15.8	6.23	0.166	999	8.62	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? ~~Y~~ DMJ [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ☐

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer, depth(s) where pump set NA ft BTOC

Weather Cloudy 50 °F

Lab Analyses

VOC ☒ SVOC ☐ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other Aluminum

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 191

Installation DDMT

Site/Project Groundwater investigation

Project Number 113630.03.77

Sampled by LThompson, LBlackwelder

Well Number MW-16

Sample ID Number MW161

Sample Start date ~~085~~ 2/13/96. 0850

Sample End date 2/13/96 time 0905

Original Static Water Level 58.22 ft BTOC

Final Static Water Level 58.17 ft BTOC

Screen interval 58 – 73 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0850	17.4	6.58	0.630	757		002

DO meter not functioning

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump X

Dedicated Bladder Pump

Bladder Pump

Bailer X

SS

Tef X

PVC

Centrifugal Pump

Peristaltic Pump

Hand Pump

Gas Lift/ Displacement Pump

Other

Sampling Equipment (Make, Model, Etc.) Grundfos #22993; Disposable Teflon bailer for VOAs

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer, depth(s) where pump set 72 ft BTOC

Weather Cold, Clear, app. 40 °F

Lab Analyses

VOC X SVOC X TAL Metals X Pesticides/PCBs X Herbicides X TPH Dioxin/Furans

Other

Metals: Filtered Unfiltered X Both

Field Duplicates Y [✓ N]

Split Sample Y [✓ N]

MS/MSD Y [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW18

Site/Project Groundwater Investigation

Sample ID Number MW181

Project Number 113630.03.ZZ

Sample Start date 2/14/96 time

Sampled by Bob Trebble, Jeff Dilleane

Sample End date 2/14/96 time

Original Static Water Level 135.32 ft BTOC

Final Static Water Level DRY ft BTOC

Screen interval 122.6' – 137.6' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
Refer To Comments						

Are parameters 20% of purge values? Y / N

Repurge? Y / N

Number of repurge volumes ______

Sampling Method

Submersible Pump X Dedicated Bladder Pump Bladder Pump __ Bailer X SS __ Tef __ PVC __ Centrifugal Pump __ Peristaltic Pump __ Hand Pump __ Gas Lift/Displacement Pump __ Other ______

Sampling Equipment (Make, Model, Etc.) Grunfos 2" Submersible pump

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 138.0' ft BTOC

Weather Sunny, Breezy, 60°F °F

Lab Analyses

VOC X SVOC X TAL Metals X Pesticides/PCBs X Herbicides X TPH __ Dioxin/Furans __

Other TOC, SO4, CL, NO2/NO3/NH4, FE

Metals: Filtered __ Unfiltered X Both __

Field Duplicates [✓ Y] / N

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ~~VOC's Collected with a disposible bailer~~ UNABLE TO Collect Samples because of Lack of water in the well (Perched water table?)

BTOC = Below Top of Casing (or other measurement reference point)

256 193

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW19Z DFT

Site/Project DO4

Sample ID Number MW19Z

Project Number 113630.03.ZZ

Sample Start date 2/7/96 time 0930

Sampled by Dale Jayne/Mike Marable

Sample End date 2/7/96 time 0930

Original Static Water Level 87.42 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 83.1 — 93.1 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0855	16.0	5.45	0.195	10	7.82	0.01
0859	15.8	5.88	0.154	999	7.89	0.00
0905	15.8	5.93	0.190	999	7.86	0.00
0912	15.8	5.92	0.201	999	7.86	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump Dedicated Bladder Pump ☐ Bladder Pump Bailer ☒ (SS ☐ Tef ☒ PVC ☐) Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather Windy 45 °F

Lab Analyses

VOC ☒ SVOC Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered Unfiltered ☐ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD / O

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 194

Installation DDMT

Site/Project D04

Project Number 113630.03.ZZ

Sampled by Dale Jayne / Mike Mirabile

Well Number MW19

Sample ID Number MW191

Sample Start date 2/10/96 time 2

Sample End date 2/10/96 time

Original Static Water Level 87.70 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 83.1 – 93.1 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1600	17.8	6.25	0.228	7.5	9.60	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather Sunny 55 °F

Lab Analyses

VOC ☐ SVOC ☒ Metals ☐ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☐ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (for other measurement reference points)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW20

Site/Project DOU

Sample ID Number MW201

Project Number 113630.03.~~ZZ~~

Sample Start date 2/7/96 time 1145

Sampled by Dale Jayne/Mike Marable

Sample End date 2/7/96 time 1145

Original Static Water Level 84.11 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 83.1 – 98.1 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1057	15.7	6.08	0.270	10	7.67	0.00
1103	15.9	6.22	0.311	9	7.69	0.01
1115	15.7	6.30	0.318	9	7.71	0.01
1130	15.6	6.24	0.322	4	7.89	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump Dedicated Bladder Pump _ Bladder Pump _ Bailer X SS: _ Teflon X PVC: _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/ Displacement Pump _ Other _

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather windy 45 °F

Lab Analyses

VOC X SVOC Metals X Pesticides/PCBs _ Herbicides _ TPH _ Dioxin/Furans _

Other _

Metals: Filtered Unfiltered X Both _

Field Duplicates Y [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments _

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 196

Installation DDMT

Well Number MW 20

Site/Project GROUNDWATER Investigation

Sample ID Number MW 201

Project Number 113630.03.Z3

Sample Start date 2/11/96 time 1555

Sampled by Bob Trebble, Jeff Dilloner

Sample End date 2/11/96 time 1602

Original Static Water Level 84.66 ft BTOC

Final Static Water Level 84.70 ft BTOC

Screen Interval 83' — 98' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1602	18.5	5.65	263	10	10.08	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? [✓ Y] / N

Number of repurge volumes 2

7 TOTAL VOLS

Sampling Method

Submersible Pump X

Dedicated Bladder Pump ___

Bladder Pump ___

Bailer ___

SS ___ Tef ___ PVC ___

Centrifugal Pump ___

Peristaltic Pump ___

Hand Pump ___

Gas Lift/ Displacement Pump ___

Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos 2" Submersible Pump

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 92' ft BTOC

Weather Sunny, Breezy, 55°F °F

Lab Analyses

VOC ___ SVOC X Metals ___ Pesticides/PCBs X Herbicides X TPH ___ Dioxin/Furans ___

Other ___

Metals: Filtered ___ Unfiltered ___ Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ___

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 197

Installation DDMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by L Thompson, L Blackwelder

Well Number MW-21

Sample ID Number MW211

Sample Start date 2/10/96 time 0915

Sample End date 2/10/96 time 0923

Original Static Water Level 93.34 ft BTOC

Final Static Water Level 93.50 ft BTOC

Screen Interval 92 – 107 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0907	19.0	6.00	0.183	0	—	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump X Dedicated Bladder Pump _ Bladder Pump _ Bailer X SS _ Tef ☒ PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/ Displacement Pump _ Other

Sampling Equipment (Make, Model, Etc.) Grundfos * 22993, Teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer; depth(s) where pump set 100 ft BTOC

Weather Cool, Cloudy, app 55 °F

Lab Analyses

VOC X SVOC X Metals X Pesticides/PCBs ☒ Herbicides ☒ TPH _ Dioxin/Furans _

Other

Metals: Filtered Unfiltered X Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project D04

Project Number 113630.03.ZZ

Sampled by Dale Jayne / mike Morable

Well Number MW 22

Sample ID Number MW224

Sample Start date 2/10/96 time 1230

Sample End date 2/10/96 time 1230

Original Static Water Level 96.40 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 95.4 - 105.4 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1230	18.7	6.36	0.436	107	8.59	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

[✓ Submersible Pump] Dedicated Bladder Pump _ Bladder Pump _ [✓ Bailer] SS _ [✓ Tef] PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/ Displacement Pump _ Other ____

Sampling Equipment (Make, Model, Etc.) Grundfos Submersible Pump and Disposable Teflon Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 104 ft BTOC

Weather cloudy 50 °F

Lab Analyses

[✓ VOC] [✓ SVOC] [✓ Metals] [✓ Pesticides/PCBs] [✓ Herbicides] TPH _ Dioxin/Furans _

Other ____

Metals: Filtered _ [✓ Unfiltered] Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ____

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 199

Installation DOMT

Well Number MW-23

Site/Project Groundwater Investigation

Sample ID Number MW231

Project Number 113630.03.ZZ

Sample Start date 2/10/96 time 1110

Sampled by L Thompson, L Blackwelder

Sample End date 2/10/96 time 1215

Original Static Water Level 101 - 111 ft BTOC

Final Static Water Level 99.82 ft BTOC

Screen Interval 101 - 111 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1205	19.6	6.70	0.266	122	—	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes ______

DO metal not functioning

Sampling Method

Submersible Pump X

Dedicated Bladder Pump _

Bladder Pump _

Bailer X

SS _ Tef ✓ PVC _

Centrifugal Pump _

Peristaltic Pump _

Hand Pump _

Gas Lift/ Displacement Pump _

Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set ______ ft BTOC

Weather Cool, cloudy, app 55 °F

Lab Analyses

VOC X SVOC X TAL Metals X Pesticides/PCBs X Herbicides X TPH _ Dioxin/Furans _

Other ______

Metals: Filtered _ Unfiltered X Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 200

Installation DOMT

Well Number MW-24

Site/Project Groundwater Investigation

Sample ID Number MW241

Project Number 113630.03.ZZ

Sample Start date 2/10/96 time 1415

Sampled by L Blackwelder, I Thompson

Sample End date 2/10/96 time 1430

Original Static Water Level 106.43' ft BTOC

Final Static Water Level 106.53 ft BTOC

Screen Interval 97 - 112 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1414	19.9	6.26	0.181	131	—	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes ____

Sampling Method

Submersible Pump X Dedicated Bladder Pump _ Bladder Pump _ Bailer X SS _ Tef X PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/Displacement Pump _ Other ____

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993, disposable Teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 104 ft BTOC

Weather Cool, cloudy, breezy, app 60 °F

Lab Analyses

VOC X SVOC X TAL Metals X Pesticides/PCBs X Herbicides X TPH _ Dioxin/Furans _

Other ____

Metals: Filtered _ Unfiltered X Both _

Field Duplicates [✓ Y] N

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ____

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation ____________

Well Number MW 25

Site/Project Memphis Depot

Sample ID Number MW251

Project Number 113630.03.ZZ

Sample Start date 2/9/96 time 1630

Sampled by Bob Trebble, Jeff Dillener

Sample End date 2/9/96 time 1650

Original Static Water Level 72.40 ft BTOC

Final Static Water Level 72.40 ft BTOC

Screen Interval 66 – 76 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1650	19.5	5.70	245	83	8.78	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? [✓ Y] / N

Number of repurge volumes 5

Sampling Method

Submersible Pump X
Dedicated Bladder Pump __
Bladder Pump __
Bailer X
SS __
Tef __
PVC __
Centrifugal Pump __
Peristaltic Pump __
Hand Pump __
Gas Lift/ Displacement Pump __
Other ____

Sampling Equipment (Make, Model, Etc.) Grunfos 2" Submersible, Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer; depth(s) where pump set 74 ft BTOC

Weather Sunny, CALM, 65° °F

Lab Analyses

VOC X SVOC X Metals X Pesticides/PCBs X Herbicides X TPH __ Dioxin/Furans __

Other ____________

Metals: Filtered Unfiltered X Both __

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ~~A~~ Disposible Bailer was used to collect the VOC's

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation ______

Well Number MW-26

Site/Project Memphis Depot

Sample ID Number MW261

Project Number 113630.03.ZZ

Sample Start date 2/8/96 time ~~1530~~ 1630

Sampled by Bob Trebble, Jeff Dillinger

Sample End date 2/8/96 time 1645

TOTAL DEPTH = 110.0' BTOC

Original Static Water Level 99.98 ft BTOC

Final Static Water Level 99.98 ft BTOC

Screen Interval ______ — ______ ft BTOC

	Vol Gals	Time	Temperature °C	pH	Conductivity	Turbidity	DO	Salinity
	0	1605	17.2	5.73	215	>100	8.88	0.00
1	1.7	1607	18.6	5.54	295	>100	8.86	0.01
2	3.4	1611	19.4	5.55	340	>100	8.53	0.01
3	5.1	1615	19.9	5.46	338	84	7.39	0.01
4	6.8	1618	20.6	5.52	339	71	6.67	0.01
5	8.5	1621	20.7	5.53	346	28	7.93	0.01
6	10.2	1624	20.4	5.54	346	27	7.91	0.01
	[illegible]	1645	19.2	5.59	358	>100	8.14	0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? [✓ Y] / N

Number of repurge volumes 1

TOTAL of 6 Vols Purged

Sampling Method

Submersible Pump X   Dedicated Bladder Pump ___   Bladder Pump ___   Bailer ___ SS ___ Tef ___ PVC ___   Centrifugal Pump ___   Peristaltic Pump ___   Hand Pump ___   Gas Lift/ Displacement Pump ___   Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos 2" Submersible Pump

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set ~~107.0~~ 107.0' ft BTOC

Weather OVERCAST, CALM, 55°F °F

Lab Analyses

VOC X   SVOC X   Metals X   Pesticides/PCBs X   Herbicides X   TPH ___   Dioxin/Furans ___

Other ______

Metals: Filtered ___   Unfiltered X   Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments TOTAL METALS Preserved w/ HNO3 in 1 l Poly

~~Both~~ Samples ID MW261 3x40mL VOA w/ HCL

1x 1 l Poly w/ HNO3

1x 2 l amber - Pest/PCB - 4°C

1x 2 l amber - Herbicides - 4°C

1x 2 l amber - SVOCs - 4°C

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 203

Installation DDMT

Well Number MW26

Site/Project GROUNDWATER INVST.

Sample ID Number MW261

Project Number 113630.Ø3.ZZ

Sample Start date 2/8/96 time 1630

Sampled by Bob Trebble, Jeff Dillener

Sample End date 2/8/96 time 1645

Original Static Water Level 99.98 ft BTOC

Final Static Water Level 99.40' ~~100.20~~'@ ft BTOC

Screen Interval 97' – 107' ft BTOC

Time	Temperature°C	pH	Conductivity	Turbidity	DO	Salinity
1645	19.2	5.59	358	7100	8.14	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? [✓ Y] / N

Number of repurge volumes 1

6 TOTAL

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) 2" Grundfos Submersible Pump, Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 107.0 ft BTOC

Weather Overcast, Breezy, 50°F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other ____

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ____

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

nstallation DDMT

Site/Project D04

Project Number 113630.03.ZZ

Sampled by Dale Jayne/Mike Marable

Well Number MW28

Sample ID Number MW287

Sample Start date 2/7/96 time 1630

Sample End date 2/7/96 time 1630

Original Static Water Level 59.10 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 54.3 – 69.3 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1628	16.0	5.05	0.187	999	8.11	0.00
1631	16.1	5.78	0.172	995	8.13	0.00
1635	15.4	5.81	0.1777	995	8.20	0.00
1645	15.8	5.84	0.181	995	8.27	0.00
1652	15.9	5.78	0.186	999	8.11	0.00
1657	16.0	5.67	0.184	999	8.04	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

ling Method

Submersible Pump
Dedicated Bladder Pump ☐
Bladder Pump ☐
Bailer ☒
SS ☐
Tef ☒
PVC ☐
Centrifugal Pump ☐
Peristaltic Pump ☐
Hand Pump ☐
Gas Lift/Displacement Pump ☐
Other ☐

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather windy 45 °F

Lab Analyses

VOC
SVOC
Metals ☒
Pesticides/PCBs ☐
Herbicides ☐
TPH ☐
Dioxin/Furans ☐

Other

Metals, Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DO4

Project Number 113630.03.ZZ

Sampled by Dale Jaye / Mike Mumble

Well Number MW 29

Sample ID Number MW29Z

Sample Start date 2/11/96 time 1120

Sample End date 2/11/96 time 1120

Original Static Water Level 39.32 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 34.2 — 54.2 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1116	17.3	6.18	0.400	40	8.97	0.0

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump X

Dedicated Bladder Pump __

Bladder Pump __

Bailer X

SS __

Teflon X

PVC __

Centrifugal Pump __

Peristaltic Pump __

Hand Pump __

Gas Lift/ Displacement Pump __

Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer for VOCs!

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer, depth(s) where pump set 50' ft BTOC

Weather Sunny 50 °F

Lab Analyses

VOC X SVOC (Metals X PPM) Pesticides/PCBs __ Herbicides __ TPH __ Dioxin/Furans __

Other Aluminum

Metals: Filtered __ Unfiltered X Both __

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW-30

Site/Project Groundwater Investigation

Sample ID Number MW301

Project Number 113630.03.ZZ

Sample Start date 2/7/96 time 1356

Sampled by L. Thompson L. Blackwelder

Sample End date 2/7/96 time 1410

Original Static Water Level 45.53 ft BTOC

Final Static Water Level ______ ft BTOC

Screen Interval 39 - 59 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1321	14	4.06	0.293	>999	9.13	0.01
1324	16.2	5.90	0.249	>999	8.09	0.00
1328	16.8	6.37	0.275	878	7.92	0.01
1333	17.2	6.39	0.270	220	9.11	0.01
1337	17.2	6.66	0.275	186	8.07	0.01
1346	17.4	6.54	0.274	120	8.04	0.01
1350	17.4	6.64	0.278	57	8.01	0.01
1354	17.5	6.65	0.276	35	8.03	0.01

Sampled directly after purging

Are parameters 20% of purge values? Y / N

Repurge? Y / [✓ N]

Number of repurge volumes ______

Sampling Method

Submersible Pump ✓ Dedicated Bladder Pump ___ Bladder Pump ___ Bailer ✓ SS ___ Tef ___ PVC ___ Centrifugal Pump ___ Peristaltic Pump ___ Hand Pump ___ Gas Lift/ Displacement Pump ___ Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos #HS15077, disposable teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 54 ft BTOC

Weather Cloudy, breezy, app 50 °F

Lab Analyses

VOC ✓ SVOC ✓ Metals ✓ Pesticides/PCBs ___ Herbicides ___ TPH ___ Dioxin/Furans ___

Other ______

Metals: Filtered ___ Unfiltered ✓ Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 207

Installation DDMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by Bob Tribble, Jeff Dillenae

Well Number MW30

Sample ID Number MW301

Sample Start date 2/10/96 time 1245

Sample End date 2/10/96 time 1248

Original Static Water Level 45.75 ft BTOC

Final Static Water Level 45.60 ft BTOC

Screen Interval 39' - 59' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1248	18.6	5.82	282	26	7.64	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? [✓ Y] / N

Number of repurge volumes 5

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☐ SS ☐ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Grundfos 2" Submersible Pump

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 54' ft BTOC

Weather OVERCAST, FOG, MIST, 55°F °F

Lab Analyses

VOC ☐ SVOC ☐ Metals ☐ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other ____

Metals: Filtered ☐ Unfiltered ☐ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments OTHER ANALYTES PREVIOUSLY Collected on 2/7/96

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW31

Site/Project Groundwater Sampling

Sample ID Number MW311

Project Number 113630.03.ZZ

Sample Start date 2/12/96 time 1530

Sampled by Bob Trebble, Jeff Dillene

Sample End date 2/12/96 time 1550

Original Static Water Level 66.60 ft BTOC

Final Static Water Level 66.60' ft BTOC

Screen Interval 64' - 79' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1550	15.1	5.62	297	7100	6.12	0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

5 TOTAL VOLS

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Grundfos 2" Submersible Pump, Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 76' ft BTOC

Weather Sunny, Slight Breeze, 60°F °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other AL

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates [✓ Y] / N

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments VOC'S COLLECTED WITH a disposible bailer
Duplicate Samples ALSO TAKEN MW311A
VOC, SVOC, Metals, AL

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 209

Installation DAMT

Site/Project D04

Project Number 113630.03.ZZ

Sampled by Dale Joyne / mike Marable

Well Number MW32

Sample ID Number MW321

Sample Start date 2/6/96 time 1550

Sample End date 2/6/96 time 1625

Original Static Water Level 60.32 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 52.7 – 67.7 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1520	1 gal	5.40	0.491	10	8.76	0.01
1526	2	5.45	0.556	93	8.30	0.02
1540	3	5.45	0.556	471	8.39	0.02
1545	4	5.47	0.560	94	8.43	0.02

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump _ Dedicated Bladder Pump _ Bladder Pump _ [✓ Bailer] SS _ [✓ Tef] PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/ Displacement Pump _ Other ___

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather Cloudy 50 °F

Lab Analyses

[✓ VOC] SVOC [✓ Metals] Pesticides/PCBs _ Herbicides _ TPH _ Dioxin/Furans _

Other Al, NO_3/NO_2, NH_4, HCO_3, SO_4, Cl, Fl, NO_3, TDS, Tritium, Fe, Hardness, TOC

Metals: Filtered [✓ Unfiltered] Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 210

Installation DDMT
Site/Project Groundwater Investigation
Project Number 113630.03 ZZ
Sampled by L. Thompson, L. Blackwelder

Well Number MW-33
Sample ID Number MW331
Sample Start date 2/8/96 time 1100
Sample End date 2/8/96 time 1102

Original Static Water Level 99.05 ft BTOC
Final Static Water Level ______ ft BTOC

Screen Interval 44 - 59 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
See monitoring well purging log for a table of water parameters; sampled immediately after purging.						

Are parameters 20% of purge values? Y / N
Repurge? Y / [✓ N]
Number of repurge volumes N/A

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☐ SS ☒ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos # HS15077

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 52 ft BTOC

Weather Cool, Cloudy, ~55 °F

Lab Analyses 4/3

VOC ☐ SVOC ☒ Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other Al,

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation POMT

Well Number MW33

Site/Project Groundwater Investigation

Sample ID Number MW331

Project Number 113630.03.ZZ

Sample Start date 3/8/96 time 1045

Sampled by Jim Harvey / ATL

Sample End date 3/8/96 time 1046

Original Static Water Level 48.98 ft BTOC

Final Static Water Level ______ ft BTOC

Screen Interval 44 — 59 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1043	15.4°c	5.69	0.160	NA	NA	NA

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes ______

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ______

Sampling Equipment (Make, Model, Etc.) Disposable bottom-loading teflon bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set ~~45~~ 52 ft BTOC

Weather p. Cloudy & cold (≈ 36°F) °F

Lab Analyses

VOC ☒ SVOC Metals ☐ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other ______

Metals: Filtered ☐ Unfiltered ☐ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 212

Installation DDMT

Site/Project GROUNDWATER INVEST.

Project Number 113630.03.ZZ

Sampled by Bob Trebble, Jeff DILLENER

Well Number MW 34

Sample ID Number MW341

Sample Start 2/9/96 1350

Sample End 2/9/96 1417

Original Static Water Level 140.53 ft BTOC

Final Static Water Level 140.42 ft BTOC

Screen interval 140' - 160' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1418	19.1	5.48	110	79	10.13	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump X
Dedicated Bladder Pump __
Bladder Pump __
Bailer X SS __ Tefl __ PVC __
Centrifugal Pump __
Peristaltic Pump __
Hand Pump __
Gas Lift/Displacement Pump __
Other __

Sampling Equipment (Make, Model, Etc.) Grunfos 2" Submersible pump, Disposible Bailer

Sampling Equipment Decontaminated? [✓ Y] N

If pump or discrete bailer, depth(s) where pump set 150' ft BTOC

Weather Sunny, Calm, 55°F °F

Lab Analyses

VOC X SVOC X Metals X Pesticides/PCBs X Herbicides X TPH __ Dioxin/Furans __

Other NO2/NO3/NH4, TOC, FE, SO4/CL

Metals: Filtered __ Unfiltered X Both __

Field Duplicates Y [✓ N]

Split Sample Y [✓ N]

MS/MSD Y [✓ N]

Comments A DISPOSIBLE BAILER WAS USED TO COLLECT VOC'S

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 213

Installation DPMT

Site/Project Groundwater Investigation

Project Number 113630.03.22

Sampled by LThompson LBlackwelder

Well Number MW-35

Sample ID Number MW351

Sample Start date 2/13/96 time

Sample End date 2/13/96 time

Original Static Water Level 71.90 ft BTOC

Final Static Water Level 72.19 ft BTOC

Screen Interval 69 - 89 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
fb ~~1036~~	~~15.5~~	~~6.08~~	~~0137~~			
1056	17.6	6.06	0.204	126		000

DO meter not functioning

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Grundfos #2993, disposable teflon bailer for VOCs

Sampling Equipment Decontaminated [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 83 ft BTOC

Weather Cool, breezy, clear, app 60 °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y [✓ N]

Split Sample Y [✓ N]

MS/MSD Y [✓ N]

Comments Level C Sampling

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW-36

Site/Project Groundwater Investigation

Sample ID Number MW361

Project Number 113630.03.ZZ

Sample Start date 2/9/96 time 1630

Sampled by L Blackwelder, L. Thompson

Sample End date 2/9/96 time 1632

Original Static Water Level 159.23 ft BTOC

Final Static Water Level ___ ft BTOC

Screen Interval 192 - 207 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
see Monitoring Well Purging log					for table	
of parameters. sampled well					immediately	
after purging.						

Are parameters 20% of purge values? Y / N

Repurge? Y [✓ N]

Number of repurge volumes ___

Sampling Method

Submersible Pump X

Dedicated Bladder Pump ___

Bladder Pump ___

Bailer ___ SS ___ Tef ___ PVC ___

Centrifugal Pump ___

Peristaltic Pump ___

Hand Pump ___

Gas Lift/Displacement Pump ___

Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer, depth(s) where pump set 179 ft BTOC

Weather warm, sunny, app 60 °F

Lab Analyses

VOC ___ SVOC ___ PPM Metals X Pesticides/PCBs ___ Herbicides ___ TPH ___ Dioxin/Furans ___

Other ES, Al

Metals: Filtered ___ Unfiltered X Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ___

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation ODMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by L.Thompson, L.Blackwelder

Well Number MW-37

Sample ID Number MW371

Sample Start date 2/9/96 time 1000

Sample End date 2/9/96 time 1003

Original Static Water Level 134.05 ft BTOC

Final Static Water Level 148.3 ft BTOC

Screen Interval 166 — 181 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
see Monitoring well purging log for table of parameters. Sampled well immediately after purging.						

Are parameters 20% of purge values? Y / N

Repurge? Y [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump ✓ · Dedicated Bladder Pump ☐ · Bladder Pump ☐ · Bailer ☐ SS ☐ Tef ☐ PVC ☐ · Centrifugal Pump ☐ · Peristaltic Pump ☐ · Hand Pump ☐ · Gas Lift/Displacement Pump ☐ · Other

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993

Sampling Equipment Decontaminated [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 154 ft BTOC

Weather Cool, breezy, app 55 °F

Lab Analyses

VOC ☐ SVOC · Metals PPM ☒ · Pesticides/PCBs ☐ · Herbicides ☐ · TPH ☐ · Dioxin/Furans ☐

Other AL, WQ

Metals: Filtered · Unfiltered ☒ · Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by LThompson / Blackwelder

Well Number MW-38

Sample ID Number MW381

Sample Start date 2/11/96 time 1400

Sample End date 2/11/96 time 1434

Original Static Water Level 134.55 ft BTOC

Final Static Water Level 138.35 ft BTOC

Screen Interval 140 - 155 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1358	21.8	6.45	0.263	10		0.00

DO meter not functioning

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump X Dedicated Bladder Pump Bladder Pump _ Bailer X SS _ Tel X PVC _ Centrifugal Pump _ Peristaltic Pump _ Hand Pump _ Gas Lift/Displacement Pump _ Other

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993, Teflon bailer for VOAs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set ____ ft BTOC

Weather Cold, clear, windy, app 45 °F

Lab Analyses

VOC X SVOC Y TAL Metals X Pesticides/PCBs X Herbicides X TPH _ Dioxin/Furans _

Other ES (TOC, NO_3/NO_4, NH_4, SO_4, CL, Fe)

Metals: Filtered _ Unfiltered X Both _

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation RDMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by Bob Tribble, Jeff Dillenor

Well Number MW39

Sample ID Number MW3901

Sample Start date 2/10/96 time

Sample End date 2/10/96 time

Original Static Water Level 102.10 ft BTOC

Final Static Water Level 102.40 ft BTOC

Screen Interval 95' – 115' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1010	17.8	5.90	265	>100	8.53	0.01

Are parameters 20% of purge values? Y / N

Repurge? Y / N

Number of repurge volumes

Sampling Method

Submersible Pump ☐ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) 2" Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 102'–105' ft BTOC

Weather Overcast, breezy, 55°F, Damp

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments Purged well DRY 2 Times – TOTAL Purge = 3.3 gals
Will collect all samples using a disposible bailer

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project Groundwater Investigation

Project Number 113630.Q3.ZZ

Sampled by Dale Jayne / Lee Thompson

Well Number mw40 (0)

Sample ID Number MW400115-96

Sample Start date 1/15/96 time 1055

Sample End date 1/15/96 time 1130

Original Static Water Level 81.86' ft BTOC

Final Static Water Level ______ ft BTOC

Screen Interval 85 – 95 ft BTOC

Time	Temperature °C	pH	Conductivity mS-cm	Turbidity	DO mg/L	Salinity
1033	16.1°C	6.12	0.726	159	9.83	10.05
1036	17.6°C	6.23	0.220	44	9.21	.0
1041	19.1°C	6.17	0.701	194	8.74	0.05
1046	19.8°C	6.17	0.724	6	8.71	0.05

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes ______

Sampling Method

Submersible Pump X Dedicated Bladder Pump ___ Bladder Pump ___ Bailer X SS ___ [✓ Tef] PVC ___ Centrifugal Pump ___ Peristaltic Pump ___ Hand Pump ___ Gas Lift/ Displacement Pump ___ Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Teflon Disposable Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 93' ft BTOC

Weather Sunny 55 °F

Lab Analyses

VOC X SVOC Metals X Pesticides/PCBs ___ Herbicides ___ TPH ___ Dioxin/Furans ___

Other ______

Metals: Filtered ___ Unfiltered X Both ___

Field Duplicates [✓ Y] / N

Split Sample [✓ Y] / N

MS/MSD [✓ Y] / N

Comments TDEC collected split samples.

BTOC = Below Top of Casing (or other measurement reference point)

256 219

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW 41 (IL)

Site/Project D04

Sample ID Number MW41011796

Project Number ~~3603~~ DPJ 111630.03.ZL

Sample Start date 1/17/96 time 0815

Sampled by Dale Jayne / Lee Thompson

Sample End date 1/17/96 time 0815

Original Static Water Level 65.82 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 57 – 67 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
— not enough water for parameters —						

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump

Dedicated Bladder Pump

Bladder Pump

Bailer X

SS

Tef X

PVC

Centrifugal Pump

Peristaltic Pump

Hand Pump

Gas Lift/ Displacement Pump

Other

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather Sunny 55 °F

Lab Analyses

VOC X SVOC Metals Pesticides/PCBs Herbicides TPH Dioxin/Furans

Other

Metals: Filtered Unfiltered Both

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments Purged well dry (~0.25 gal) on 1/14/96. Repurged well dry on 1/15/96 (~0.25 gal) well dry on 1/16/96. Collected sample (VOCs) on 1/17/96

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 220

Installation DDMT

Site/Project DDMT-D04

Project Number 113630.03.ZZ

Sampled by Dale Jayne/Lee Thompson

DFJ
Well Number N(~~[illegible]~~) (MW42)

Sample ID Number MW42011996

Sample Start date 1/19/96 time 0955

Sample End date 1/19/96 time 0955

Original Static Water Level 54.45 1/15/96 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 49 — 59 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1110	17.1	6.65	0.303	999	10.17	0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / N

Number of repurge volumes

Sampling Method

Submersible Pump __ Dedicated Bladder Pump Bladder Pump __ Bailer X SS __ Teflon X PVC __ Centrifugal Pump __ Peristaltic Pump __ Hand Pump __ Gas Lift/Displacement Pump __ Other __

Sampling Equipment (Make, Model, Etc.) Disposable Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather clear, cold 25 °F

Lab Analyses

VOC X SVOC Metals X Pesticides/PCBs __ Herbicides __ TPH __ Dioxin/Furans __

Other

Metals: Filtered __ Unfiltered X Both __

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments well purged dry on 1/18/96 - Sampled 1/19/96

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number M (mw44)

Site/Project DDMT-D04

Sample ID Number MW44011996

Project Number 113620.03.ZZ

Sample Start date 1/19/96 time 0918

Sampled by Dale Jayne/Lee Thompson

Sample End date 1/19/96 time 0920

Original Static Water Level 51.94 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 64 - 74 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0914	13.3	9.43	0.440	785	8.39	0.01
0917	15.5	7.76	0.379	531	7.42	0.01
0919	15.8	10.51	0.354	235	7.54	0.01
0920	15.8	6.42	0.346	117	7.66	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / N

Number of repurge volumes

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/ Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc.) Grundfos Pump and Teflon Disposable Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 69 ft BTOC

Weather Clear cold 20 °F

Lab Analyses

VOC ☒ SVOC Metals ☒ Pesticides/PCBs ☐ Herbicides ☐ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

256 222

Installation DDMT

Well Number Well C (MW-45)

Site/Project Groundwater Investigation

Sample ID Number MW451

Project Number 113630.03.ZZ

Sample Start date 2/8/96 time 1510

Sampled by L. Thompson, L. Blackwelder

Sample End date 2/8/96 time 1530

Original Static Water Level 55.39 ft BTOC

Final Static Water Level ______ ft BTOC

Screen Interval 58 – 68 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
See Monitoring Well Purging Log for						
table of parameters. Sample collected						
immediately following purging.						

Are parameters 20% of purge values? Y / N

Repurge? Y [✓ N]

Number of repurge volumes ______

Sampling Method

Submersible Pump __ Dedicated Bladder Pump __ Bladder Pump __ Bailer X SS __ Tef X PVC __ Centrifugal Pump __ Peristaltic Pump __ Hand Pump __ Gas Lift/Displacement Pump __ Other ______

Sampling Equipment (Make, Model, Etc.) Teflon bailer - app 1 qt capacity

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer; depth(s) where pump set NA ft BTOC

Weather Cloudy, breezy, app 55 °F

Lab Analyses

VOC X SVOC X Metals X Pesticides/PCBs X Herbicides X TPH __ Dioxin/Furans __

Other ______

Metals: Filtered __ Unfiltered X Both __

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DO4

Project Number 113630.03.ZZ

Sampled by Dale Jayne/mike mcnabb

Well Number MW46 (B)

Sample ID Number MW46I

Sample Start date 2/9/96 time 0930

Sample End date 2/9/96 time 0930

Original Static Water Level 53.37 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 62 – 72 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0906	14.7	5.75	0.111	257	9.27	0.00
0908	16.0	5.92	0.146	577	8.50	0.00
0914	17.2	5.99	0.235	10	8.32	0.00
0919	17.5	6.05	0.266	10	8.35	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ______

Sampling Equipment (Make, Model, Etc.) Grundfos Submersible Pump and Disposable Teflon Bailer for VOCS.

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 60' ft BTOC

Weather Sunny 50 °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other ______

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ______

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DO 4

Project Number 113630.03.ZZ

Sampled by Dale Gayne / mike Marable

Well Number MW 47 (A)

Sample ID Number MW47I

Sample Start date 2/9/96 time 1515

Sample End date 2/9/96 time 1515

Original Static Water Level 101.85 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 110 - 120 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1444	19	6.51	0.070	51	9.99	0.00
1447	19.5	6.10	0.185	284	9.78	0.00
1451	20.3	6.15	0.276	16	9.45	0.00
1454	20.4	6.46	0.310	10	9.43	0.01
1458	20.7	6.37	0.333	10	9.34	0.01
1503	20.4	6.38	0.344	10	9.58	0.01

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

[✓ Submersible Pump] Dedicated Bladder Pump ___ Bladder Pump ___ [✓ Bailer] SS ___ [✓ Tef] PVC ___ Centrifugal Pump ___ Peristaltic Pump ___ Hand Pump ___ Gas Lift/ Displacement Pump ___ Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set ______ ft BTOC

Weather Sunny 55 °F

Lab Analyses

[✓ VOC] [✓ SVOC] [✓ Metals] [✓ Pesticides/PCBs] [✓ Herbicides] TPH ___ Dioxin/Furans ___

Other ______

Metals: Filtered ___ [✓ Unfiltered] Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD [✓ Y] / N

Comments MS/MSD

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project D04

Project Number 113630.03.ZZ

Sampled by Dale Jayne / Mike Mauble

Well Number MW 48 (I)

Sample ID Number MW 48I

Sample Start date 2/8/96 time

Sample End date 2/8/96 time

Original Static Water Level 78.94 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 84 - 94 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1543	16.5	6.76	0.110	676	9.59	0.00
1545	17.4	6.33	0.212	264	9.12	0.00
1547	18.8	6.33	0.244	10	8.51	0.00
1553	19.1	6.11	0.248	36	8.30	0.00
1555	19.2	6.32	0.257	10	8.26	0.00

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump X
Dedicated Bladder Pump
Bladder Pump
Bailer X
SS
Tef X
PVC
Centrifugal Pump
Peristaltic Pump
Hand Pump
Gas Lift/ Displacement Pump
Other

Sampling Equipment (Make, Model, Etc.) Grund POS Submersible Pump and Disposable Teflon Bailer for VOCS

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 90' ft BTOC

Weather cloudy 55 °F

Lab Analyses

VOC X
SVOC X
Metals X
Pesticides/PCBs X
Herbicides X
TPH
Dioxin/Furans

Other

Metals: Filtered
Unfiltered X
Both

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW49 (D)

Site/Project D04

Sample ID Number MW497

Project Number 113630.03.ZZ

Sample Start date 2/9/96 time 1235

Sampled by Dale Jayne / mike Meriable

Sample End date 2/9/96 time 1235

Original Static Water Level 70.06 ft BTOC

Final Static Water Level NA ft BTOC

Screen Interval 80 – 90 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1216	17.1	6.07	0.105	201	9.23	0.00
1222	18.9	5.82	0.213	31	8.66	0.00
1226	19.1	5.95	0.222	10	8.58	0.00
1230	19.1	5.91	0.222	10	8.73	0.00
1234	18.9	5.90	0.222	10	8.92	0.00
			0.222			

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) Grundfos submersible Pump and Disposable Teflon Bailer for VOAs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer, depth(s) where pump set 86' ft BTOC

Weather Sunny 55 °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other ____

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ____

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project 113630.03.ZZ

Project Number Groundwater Investigation

Sampled by L Blackwelder, L Thompson

Well Number MC11 F (MW-50)

Sample ID Number MMW501

Sample Start date 2/11/96 time 0900

Sample End date 2/11/96 time 0905

Original Static Water Level 85.96 ft BTOC

Final Static Water Level 87.26 ft BTOC

Screen Interval 114 – 124 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
0854	18.4	6.01	0.796	10		0.03

DO meter not functioning

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes

Sampling Method

Submersible Pump X

Dedicated Bladder Pump

Bladder Pump

Bailer X

SS

Tef X

PVC

Centrifugal Pump

Peristaltic Pump

Hand Pump

Gas Lift/Displacement Pump

Other

Sampling Equipment (Make, Model, Etc.) Grundfos # 22993, Teflon bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set 120 ft BTOC

Weather Cold, clear, gusty wind app 45 °F

Lab Analyses

VOC X

SVOC X

Metals X

Pesticides/PCBs X

Herbicides X

TPH

Dioxin/Furans

Other

Metals: Filtered

Unfiltered X

Both

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

256 228

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project DO4

Project Number 113630.03.ZZ

Sampled by Dale Jayne/mike Marable

Well Number MW 51 (A)

Sample ID Number MW 51 J

Sample Start date 2/8/96 time 1345

Sample End date 2/8/96 time 1345

Original Static Water Level 40.78 ft BTOC

Final Static Water Level N/A ft BTOC

Screen Interval 55 - 65 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1311	14.3	5.85	0.137	994	10.02	0.00
1317	16.2	5.66	0.291	293	8.85	0.00
1321	17.6	5.93	0.290	10	8.52	0.01
1327	17.7	5.99	0.287	8	8.59	0.01
1330	17.7	6.05	0.287	10	8.63	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes NA

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☒ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other ____

Sampling Equipment (Make, Model, Etc.) GrundFOS Submersible Pump and Disposable Teflon Bailer for VOCs

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 63' ft BTOC

Weather Cloudy 55 °F

Lab Analyses

VOC ☒ SVOC ☒ Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates [✓ Y] / N

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Site/Project Groundwater Investigation

Project Number 113630.03.ZZ

Sampled by LThompson LBlackwelder

Well Number Well 6 (MW-52)

Sample ID Number MW521

Sample Start date 2/1/96 time 1024

Sample End date 2/1/96 time 1030

Original Static Water Level 80.46 ft BTOC

Final Static Water Level 81.20 ft BTOC

Screen interval 94 – 104 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1024	17.3	6.16	0.795	10		0.03

Are parameters 20% of purge values? [✓ Y] / N

Repurge? Y / [✓ N]

Number of repurge volumes ___

DO meter not functioning

Sampling Method

Submersible Pump X
Dedicated Bladder Pump ___
Bladder Pump ___
Bailer X (SS ___ Tef X PVC ___)
Centrifugal Pump ___
Peristaltic Pump ___
Hand Pump ___
Gas Lift/Displacement Pump ___
Other ___

Sampling Equipment (Make, Model, Etc.) Grundfos #22493, Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer: depth(s) where pump set 99 ft BTOC

Weather clear, cold, breezy, app 45 °F

Lab Analyses

VOC X SVOC X Metals X Pesticides/PCBs X Herbicides X TPH ___ Dioxin/Furans ___

Other ___

Metals: Filtered ___ Unfiltered X Both ___

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments ___

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW53 (Well E)

Site/Project Groundwater Investigation

Sample ID Number MW531

Project Number 113630.03.ZZ

Sample Start date 2/13/96 time 1520

Sampled by Bob Trebble, Jeff Dillone

Sample End date 2/13/96 time 1600

Original Static Water Level 73.84' ft BTOC

Final Static Water Level 73.60' ft BTOC

Screen Interval 72.5 - 82.5 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1600	18.1	5.81	364	33	8.75	0.01

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes

5 VOLS TOTAL

Sampling Method

Submersible Pump X

Dedicated Bladder Pump

Bladder Pump ☐

Bailer X

SS ☐ Tel ☐ PVC ☐

Centrifugal Pump ☐

Peristaltic Pump ☐

Hand Pump ☐

Gas Lift/ Displacement Pump ☐

Other

Sampling Equipment (Make, Model, Etc.) Grundfos 2" Submersible Pump, Disposable Bailers

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer, depth(s) where pump set 76.0 ft BTOC

Weather Sunny, Breezy, 60°F °F

Lab Analyses

VOC X SVOC X TAL Metals X Pesticides/PCBs X Herbicides X TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered X Both ☐

Field Duplicates Y / [✓ N]

Split Sample Y / [✓ N]

MS/MSD [✓ Y] N

Comments Collect 3X the Sample For MS/MSD - Collect VOC's using a disposable bailer

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation DDMT

Well Number MW54 (Well J)

Site/Project GROUNDWATER Investigation

Sample ID Number MW541, MW541A

Project Number 113630.03.ZZ

Sample Start date 2/13/96 time 1330

Sampled by Bob Trebble, Jeff Dillevan

Sample End date 2/13/96 time 1350

Original Static Water Level 76.40' ft BTOC

Final Static Water Level 76.35 ft BTOC

Screen interval 84.5 – 94.5 ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	DO	Salinity
1350	17.3	6.12	0.967	9	10.38	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y / [✓ N]

Number of repurge volumes

5 VOLS TOTAL

Sampling Method

Submersible Pump ☒ Dedicated Bladder Pump ☐ Bladder Pump ☐ Bailer ☒ SS ☐ Tef ☐ PVC ☐ Centrifugal Pump ☐ Peristaltic Pump ☐ Hand Pump ☐ Gas Lift/Displacement Pump ☐ Other

Sampling Equipment (Make, Model, Etc. GRUNFOS 2" Submersible Pump, Disposible Bailer

Sampling Equipment Decontaminated ? [✓ Y] / N

If pump or discrete bailer, depth(s) where pump set ft BTOC

Weather SUNNY, BREEZY, 55°F °F

Lab Analyses

VOC ☒ SVOC ☒ TAL Metals ☒ Pesticides/PCBs ☒ Herbicides ☒ TPH ☐ Dioxin/Furans ☐

Other

Metals: Filtered ☐ Unfiltered ☒ Both ☐

Field Duplicates [✓ Y] / N

Split Sample Y / [✓ N]

MS/MSD Y / [✓ N]

Comments Duplicate Sample MW541A, VOC's collected with a disposible bailer

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL MONITORING WELL SAMPLING LOG

Installation PDMT

Well Number MW55 (Well U)

Site/Project Groundwater Investigation

Sample ID Number MW551

Project Number 113630.03

Sample Start date 2/14/96 time 0905

Sampled by Bob Trebble, Jeff Dillenck

Sample End date 2/14/96 time 0930

Original Static Water Level 70.62 ft BTOC

Final Static Water Level 70.68 ft BTOC

Screen Interval 64' – 74' ft BTOC

Time	Temperature	pH	Conductivity	Turbidity	OD	Salinity
0930	17.0	5.54	226	>100	10.91	0.00

Are parameters 20% of purge values? [✓ Y] N

Repurge? Y [✓ N]

Number of repurge volumes 3 D

Three volumes total

Sampling Method

Submersible Pump ___ Dedicated Bladder Pump Bladder Pump ___ Bailer X SS ___ Tef ___ PVC ___ Centrifugal Pump ___ Peristaltic Pump ___ Hand Pump ___ Gas Lift/Displacement Pump ___ Other ___

Sampling Equipment (Make, Model, Etc.) 2" Teflon Bailer

Sampling Equipment Decontaminated ? [✓ Y] N

If pump or discrete bailer: depth(s) where pump set NA ft BTOC

Weather Sunny, Calm, 40°F °F

Lab Analyses

VOC X SVOC PDM Metals X Pesticides/PCBs ___ Herbicides ___ TPH ___ Dioxin/Furans ___

Other ___

Metals: Filtered ___ Unfiltered X Both ___

Field Duplicates Y [✓ N]

Split Sample Y [✓ N] Split w/ TDEC

MS/MSD Y [✓ N]

Comments VOCs & PPM metals collected with a deconned Teflon Bailer

BTOC = Below Top of Casing (or other measurement reference point)

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT
Well Number O (MW40)
Site/Project Groundwater Investigation
Sample ID Number NA
Project Number 113630.03.ZZ
Development Start date 1/14/96 time 1317
Developed by Dale Jayne / Lee Thompson
Development End date 1/14/96 time 1407

Development Method Will surge with Grundfos pump in well and pump till water is clean

Development Equipment: Grundfos Pump

Quantity of Water Loss During Drilling (if applicable) NA gal
Casing Diameter 2 in

Pre-Dev Static Water Level 80.80' BTOC Well TD 95.05 ft BTOC Maximum Pumping Rate ~2 gpm

One Well Volume of Water V = TD-WL x .17 14.25 x .17 = 2.42 gal

Total Quantity of Water Bailed NA gal

Total Quantity of Water Discharged by Pumping 14 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 55 gallon Drum

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity (mS/cm)	DO mg/L	Salinity	Remarks
1317	3		676		20.6	6.29	0.241	10.31	0	
1324	6		248		21.5	6.30	0.513	9.88	0.02	water clean
1326	7	← NA							→	pumped well dry
1346	10		145		21.3	6.30	0.642	10.21	0.02	restarted pump at 1340
1351	12	← NA							→	pumped well dry
1405	13		330		21.5	6.34	0.657	9.91	0.02	resumed pumping at 1402
1407	14	← NA							→	pumped well dry

CH2M HILL WELL DEVELOPMENT LOG

256 234

Installation DDMT

Well Number MW41 (K)

Site/Project Groundwater Investigation

Sample ID Number NA

Project Number 113630.03.ZZ

Development Start date 1/14/96 time 1519

Developed by Dale Jayne/ Lee Thompson

Development End date 1/14/96 time 1615

Development Method Surge well with Disposable Teflon Bailer

Development Equipment: Disposable Teflon Bailer

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2. in

Pre-Dev Static Water Level 65.82' BTOC

Well TD 66.80 ft BTOC

Maximum Pumping Rate NA gpm

One Well Volume of Water 66.80 - 65.82 × 1.17 = 0.17 gal per well volume

Total Quantity of Water Bailed ________ gal

Total Quantity of Water Discharged by Pumping NA gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 55 gallon drum

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity (mS/cm)	DO mg/L	Salinity	Remarks
1519	0.25		133		18.6	7.29	0.170	10.12	0	
1524	0.25	← NA →								purged well dry
1615	← well dry			NA →						Attempted to repurge 16:10

CH2M HILL WELL DEVELOPMENT LOG

256 235

Installation DDMT

Well Number N (mw 42)

Site/Project Groundwater Investigation

Sample ID Number NA

Project Number 13630.03.ZZ

Development Start date 1/15/96 time 1424

Developed by Dale Jayne/Lee Thompson

Development End date 1/17/96 time 0850

Development Method wsu surge and pump well with a Grundfos submersible pump.

Development Equipment: Submersible Grundfos pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2 in

Pre-Dev Static Water Level 54.45 Well TD 58.81 ft BTOC Maximum Pumping Rate ____ gpm

One Well Volume of Water 58.81-54.45 x 0.16 = 0.70 gal

Total Quantity of Water Bailed ____ gal

Total Quantity of Water Discharged by Pumping 4.25 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 55 gallon drum

	Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) mS-cm	DO	Salinity	Remarks
	1424	0.25	NA	10	NA	17.6	7.58	0.217	9.67	0	water muddy
	1427	1.0	NA	999 ~~TOO DET~~	↓	17.3	7.20	0.211	9.87	0	
	1433	2.5	NA	999		17.2	7.45	0.292	9.88	0.01	
	1439	3.5	NA								purged well dry
1/16/96	0848	4	NA	241	NA	17.3	5.87	0.348	9.79	0.01	
1/17/96	0850	4.25	NA	362	NA	17.2	5.55	0.341	9.78	0.01	purged well dry.

CH2M HILL WELL DEVELOPMENT LOG

256 236

Installation DDMT

Well Number L (MW43)

Site/Project D04

Sample ID Number NA

Project Number 113630.03.ZZ

Development Start date 1/16/96 time

Developed by Dale Jayne / Lee Thompson

Development End date time

Development Method Will surge and pump well using a Grundfos submersible pump

Development Equipment: Grundfos Redi-Flo submersible pump

Quantity of Water Loss During Drilling (if applicable) gal

Casing Diameter 2 in

Pre-Dev Static Water Level dry Well TD 100' ft BTOC Maximum Pumping Rate gpm

One Well Volume of Water NA gal

Could not develop. well is dry

Total Quantity of Water Bailed NA gal

Total Quantity of Water Discharged by Pumping NA gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 55 gallon drum

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
NA	←								→	Well is dry

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number M (MW 44)

Site/Project DO4

Sample ID Number NA

Project Number 113630.03.ZZ

Development Start date 1/16/96 time 1336

Developed by Dale Jayne/ [illegible] Thompson

Development End date 1/16/96 time 1435

Development Method Will surge well with a GrundFOS submersible pump and pump well until water is clean

Development Equipment: GrundFOS submersible pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2 in

Pre-Dev Static Water Level 51.87 1/16/96

Well TD 73.37 ft BTOC

Maximum Pumping Rate 2 gpm

One Well Volume of Water 73.27 51.87 *0.16 = 3.42 gal

Total Quantity of Water Bailed 0 gal

Total Quantity of Water Discharged by Pumping 100 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 55 gallon drum

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) mS	DO mg/L	Salinity	Remarks
1336	1		391		14.1	11.41	0.746	9.82	0.03	
1340	7.5		368		15.6	8.50	0.358	8.64	0.01	
1347	15		853		14.5	7.46	0.345	7.95	0.01	
1354	25		999		15.6	7.06	0.347	7.64	0.01	
1400	35		999		16.3	6.79	0.342	7.56	0.01	
1406	50		999		16.4	6.47	0.316	7.45	0.01	
1425	85		346		15.8	6.44	0.308	7.75	0.01	
1435	100									purging complete

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW-C (MW 45)

Site/Project Memphis Depot

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 2/7/96 time 0920

Developed by Bob Trobble, Jeff Dillinger

Development End date 2/7/96 time 1015

Development Method overpump

Development Equipment: 2" Grundfos Submersible Pump

Quantity of Water Loss During Drilling (if applicable) — gal

Casing Diameter 2" in

Pre-Dev Static Water Level 55.72' Well TD 68.0' ft BTOC Maximum Pumping Rate 1.0 gpm

min — 1.0 gpm

One Well Volume of Water 20 gal

Total Quantity of Water Bailed gal

Total Quantity of Water Discharged by Pumping 50 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 5 gal Bucket → 55 gal Drum → Poly Tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
0920	1	55.72'	145	—	12.9	5.69	384	11.6	0.01	Silty
0925	2	56.71	138	—	15.4	5.76	368	10.3	001	Silty
0935	10		~~206~~ 110	Semi Clear	17.9	5.74	381	9.5	0.01	Silty
0945	20	56.68	48	Semi Cloudy	17.6	5.81	371	9.6	0.01	Semi Cloudy
0955	30	56.66	27	Semi Clear	17.7	5.84	376	9.7	0.01	Semi-Clear
1005	40		15	Clear	18.1	5.87	380	9.3	0.01	Clear
Pump off 1015	50	56.66	24	Clear	17.9	5.87	380	9.9	0.01	Clear
1010		5572								

EVELOPMENT LOG

M T

d / 004

630.03.ZZ

efer / S. Bwer

Well Number MW 46 (Well B)

Sample ID Number NA

Development Start date 1/24/96 time 1355

Development End date 1/29/96 time 1500

ailing

flon (3-ft) Bottom-loading Bailer

Casing Diameter 2 in

lling (if applicable) _____ gal

53.72' bgs Well TD 71.5 ft BGS ~~ft BTOC~~ Maximum Pumping Rate NA gpm

3.0 gal

12.4 gal

mping — gal

? [✓ Y] / N Type of Containment 5gal buckets transferred to 55g poly tanks

Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity (ms/cm)	DO	Salinity	Remarks
—	—	light brown	17.3	6.44	0.206	2.62	0.00	Turbidity meter not reading
—	—	″	17.2	6.36	0.234	8.53	0.00	″
—	—	″	17.0	6.54	0.235	2.69	0.00	″
—	—	″	17.2	6.35	0.286	9.38	0.00	″
—	269	″	17.0	6.34	0.210	8.83	0.01	
								Well development continued on 2/7/96 using Submersible pump.

---

46 (B)

A

29/96 time 1355

/7/96 time 1734

evelopment started on

ell 2)

eter 2 in

ping Rate 1.5 gpm

→ Poly tank

inity	Remarks
0	Silty
0	Cloudy
1	Cloudy
	Cloudy
	Clear
	Clear
	Pump off Clear
	—

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW-H (MW47)

Site/Project Memphis Depot

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 2/8/96 time 1245

Developed by Bob Trebble, Jeff Dillinger

Development End date 2/8/96 time 1915

Development Method OverPump

Development Equipment: 2" Grunfos Submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2" in

Pre-Dev Static Water Level 101.96'

Well TD 124.30' ft BTOC

Maximum Pumping Rate 1.0 gpm

One Well Volume of Water 4 gal

Total Quantity of Water Bailed NA gal

Total Quantity of Water Discharged by Pumping 100 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 5gal Bucket → 55gal Drum → Poly Tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity ( )	Remarks
1245	12	102.65	>100	Cloudy	17.6	2 ~~6.93~~	208	10.13	—	Yellowish Silty
1300	27		102	Semi Clear	18.6	5.91	333	10.78	—	Semi Clear
1315	42		8	Clear	18.7	5.87	327	9.20	—	Clear
1330	57	102.65	3	Clear	18.5	5.85	331	10.48	—	Clear
1345	72		8	Clear	18.7	5.77	338	8.97	—	Clear
1400	87	102.65	7	Clear	18.7	5.78	339	8.96	—	Clear
1415	102		3	Clear	18.9	5.78	347	8.89	-	Clear
1417		101.96								Recovered

Pump off

CH2M HILL WELL DEVELOPMENT LOG

256 241

Installation DDMT

Well Number Well I (MW 48)

Site/Project Groundwater Investigation

Sample ID Number

Project Number 113630.03.ZZ

Development Start date 2/6/96 time 1630

Developed by L. Thompson, L. Blackwelder

Development End date 2/6/96 time 1658

Development Method Pump using 2" submersible (Redi-Flow 2) Grunfos pump

Development Equipment: Grundfos (Ser # HS15077) Redi-Flow 2

Quantity of Water Loss During Drilling (if applicable) ______ gal

Casing Diameter 2 in

Pre-Dev Static Water Level DTW 79.9 ft. Well TD 93.53 ft BTOC Maximum Pumping Rate ~1.09 gpm

One Well Volume of Water 2.3 gal

Total Quantity of Water Bailed — gal

Total Quantity of Water Discharged by Pumping 15 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 55 gal drum, then transferred to poly tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
1646	1	79.90	off scale	cloudy/ orange brown	10.3	6.95	0.103	10.27	0.00	
1648	4		741	"	14.7	6.33	0.219	8.21	0.00	
1650	7		420	Slightly Cloudy	16.4	6.36	0.253	7.59	0.00	
1653	10		158	"	16.8	6.36	0.253	7.21	0.00	
1655	13		114	"	17.4	6.39	0.249	6.88	0.00	
1657	15		56	"	17.5	6.31	0.263	7.00	0.00	

CH2M HILL WELL DEVELOPMENT LOG

256 242

Installation DDMT

Well Number MW-49 (D)

Site/Project DDMT GW Investigation

Sample ID Number

Project Number 113630.03.ZZ

Development Start date 30 JAN96 time 0945

Developed by S. Bruer/MGM G. Schaefer/ORO

Development End date 2/8/96 time 1025

Development Method 2-inch submersible pump and disposable Teflon bailer

Development Equipment: 2-inch submersible pump - Grundfos Redi-Flow 2

Quantity of Water Loss During Drilling (if applicable) gal

Casing Diameter 2 in

Pre-Dev Static Water Level 78.52 Well TD 90.8 ft BTOC Maximum Pumping Rate gpm

One Well Volume of Water 2.1 gal

Total Quantity of Water Bailed 0.3 gal

Total Quantity of Water Discharged by Pumping 6.0 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 5 gallon buckets transferred to poly tanks

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
0955	0		-	light brown	11.7	5.07	.186	10.43	0.00	initial readings
0957	2.5		339	light brown to clear	16.0	5.69	.124	8.43	0.001	
1000	6.0		-	clear	–	–	–	–	-	well dry
1035	-	78.52	–	–	–	–	-	–	–	well recharged
1104	6.1	-	902	light brown	14.2	5.87	.192	8.03	0.00	pulled pump; used disposable teflon bailer
1110	6.3	-	-	light brown	14.8	6.13	.225	7.70	0.00	
										Continued development of well using 2" submersible pump on 2/8/96

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW 49 (D)

Site/Project Dunn Field /004

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 1/30/96 time 0945

Developed by B. Trebble \ J. Dillener

Development End date 2/8/96 time 1025

Development Method 2" pump (overpump) + bailing

Development Equipment: Teflon disposable bailer / 2" Grunfos submersible pump

Quantity of Water Loss During Drilling (if applicable) — gal

Casing Diameter 2 in

Pre-Dev Static Water Level 78.08' Well TD 91.92 ft BTOC Maximum Pumping Rate 1.7 gpm

One Well Volume of Water 2.5 gal

Total Quantity of Water Bailed 0.3 gal (from 1/30/96)

Total Quantity of Water Discharged by Pumping 106 gal (6 gal from 1/30/96)

Discharge Water Containerized? [✓ Y] / N Type of Containment 5 gal bucket → 55 gal drum → poly tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) mS-cm	DO	Salinity	Remarks
0905	1	78.48	>100	Cloudy	15.7	5.63	189	12.22	—	
0908	3.5		>100	Semi-Cloudy	16.9	5.57	202	11.44	—	
0911	6		64	"	17.3	5.56	215	10.87	—	
0915	17		47	"	17.9	5.57	217	10.68	—	
0925	34	78.48	21	"	17.9	5.58	222	10.65	—	
0935	51		2	Clear	17.7	5.57	214	11.33	—	
0945	68		>1	Semi-Cloudy	17.6	5.55	213	11.89	—	Pump disruption
0955	85		3	Clear	17.5	5.54	210	11.94	—	
1025	100		3	Clear	17.7	5.59	210	11.52	—	
1027	—	78.08	—	—	—	—	—			Recovered

CH2M HILL WELL DEVELOPMENT LOG

256 244

Installation DDMT

Well Number MW-F (MW 50)

Site/Project Memphis Depot

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 2/7/96 time 1345

Developed by Bob Trebble, Jeff Dillinger

Development End date 2/7/96 time 1515

Development Method Overpumping

Development Equipment 2" Grunfos submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2" in

Pre-Dev Static Water Level 85.82'

Well TD 127.60' ft BTOC

Maximum Pumping Rate 1.0 gpm

min — 1.0 GPM

One Well Volume of Water 7.0 gal

Total Quanity of Water Bailed NA gal

Total Quanity of Water Discharged by Pumping 88 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 5 gal Bucket → 55 gal Drum → Poly Tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
1345	1	85.82	7/100	Brown	17.0	6.50	729	11.0	0.03	SILTY
1355	8		147	Cloudy	18.5	5.98	671	10.67	0.02	Cloudy
1402	15	87.30	12	Clear	18.7	5.85	676	10.63	0.02	Clearer
1416	29	87.30	5	Clear	18.7	5.84	691	10.33	0.02	Clear
1430	43		4	Clear	18.6	5.75	701	10.68	0.03	Clear
1444	57	87.35	2	Clear	18.8	5.73	705	10.42	0.03	Clear
1458	71		1	Clear	18.5	5.71	707	10.53	0.03	Clear
p off 1515	88		1	Clear	18.7	5.70	716	10.26	0.03	Clear
1520		85.82								

CH2M HILL WELL DEVELOPMENT LOG

256 245

Installation DDMT

Well Number 2B (~~MW~~ Well - F) MW 50

Site/Project Groundwater Investigation

Sample ID Number

Project Number 113630.03.22

Development Start date 2/6/96 time 1400

Developed by L. Thompson, L Blackwelder

Development End date 2/6/96 time 1530

Development Method Pump - Redi-Flow 2 Submersible

Development Equipment: Grundfos. (Ser # HS15077)

Quantity of Water Loss During Drilling (if applicable) gal

Casing Diameter 2 in

Pre-Dev Static Water Level DTW 85.66' Well TD 124.85 ft BTOC Maximum Pumping Rate ~1.09 gpm

One Well Volume of Water 6.66 gal

Total Quantity of Water Bailed ~~35~~ LB gal

Total Quantity of Water Discharged by Pumping 35 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 55gal drum then transferred to poly tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) mS-cm	DO	Salinity	Remarks
1450	1		363	Mod. Cloudy/ tan	17.6	6.5	0.126	9.72	0	
1500	7		off scale	Cloudy/ tan	20.1	6.4	0.454	7.49	0.001	
1508	15		off scale	Cloudy/ tan	19.3	6.3	0.609	7.52	0.002	
1514	21		393	Mod. Cloudy/ tan	18.7	6.1	0.649	8.00	0.002	
1522	27		490	Mod Cloudy/ tan	19.1	6.2	0.656	9.57	0.002	
1529	35		245	Slightly Cloudy/ tan	19.1	6.1	0.667	8.92	0.002	

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW-A (51)

Site/Project Memphis Depot

Sample ID Number

Project Number 113630.03.ZZ

Development Start date 2/6/96 time 1510

Developed by Bob Trebble, Jeff Dillener

Development End date 2/6/96 time 1610

Development Method 2" Submersible Grunfos Pump - Overpump, Parameters taken

Development Equipment: 2" Submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2" in

Pre-Dev Static Water Level 30.72' Well TD 67.30' ft BTOC Maximum Pumping Rate ____ gpm

Minimum - 1.0 gpm

One Well Volume of Water 6.25 gal

Total Quantity of Water Bailed NA gal

Total Quantity of Water Discharged by Pumping 55 gal

Discharge Water Containerized? [✓ Y] / N Type of Containment 5gal Bucket → 55gal DRUM → Poly Tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
1510	1	30.72'	71000	Yellowish	15.5	5.58	322	8.60	0.01	Silty
1520	6.25		7200	Semi Cloudy	15.5	5.43	278	7.94	0.01	Cloudy Yellowish
1525	12.50		65	"	16.6	5.60	280	7.59	0.01	Cloudy. Yellowish
1530	18.75		60	"	16.0	5.60	279	7.60	0.01	Semi-Cloudy
1550	25.0	41.65	110	"	16.7	5.51	274	7.72	0.01	"
1556	31.25		78	"	16.8	5.54	273	7.58	0.01	"
1604	37.50		12	Slightly ~~Cloudy~~ Clear	16.8	5.54	270	7.79	0.01	Slightly ~~Cloudy~~ Clear
1610	55.00		6	Clear	16.6	5.60	269	8.28	0.01	Clear
1615		~~30.72'~~								
1622		40.90'								

1540 Turned

Pump off

1630 40.90'

CH2M HILL WELL DEVELOPMENT LOG

256 247

Installation DOMT

Well Number MW-G (MW52)

Site/Project Memphis Depot

Sample ID Number

Project Number 113630.Ø1.ZZ

Development Start date 2/9/96 time 0900

Developed by Bob Treble, Jeff Dillinger

Development End date 2/9/96 time 1028

Development Method OVERPUMP

Development Equipment: 2" Grunfos Submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2 in

Pre-Dev Static Water Level 80.64'

Well TD 103.90 ft BTOC

Maximum Pumping Rate 1.3 gpm

One Well Volume of Water 4.0 gal

MIN — 1.3 gpm

Total Quantity of Water Bailed Ø gal

Total Quantity of Water Discharged by Pumping 100 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 55gal DRUM → Poly TANK

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
0912	12	81.40	14	Clear	18.0	5.95	787	15.56	0.03	Clear
0921	24	81.51	4	Clear	18.1	6.02	689	14.77	0.02	Clear
0931	36		2	Clear	18.1	6.05	695	15.56	0.02	Clear
0940	48		70	Semi-clear Clear	18.4	6.04	683	15.46	0.03	Semi-Clear
0950	60		2	Clear	18.4	6.01	678	17.60	0.02	Clear
0959	72	81.64	2	Clear	19.0	6.00	663	16.64	0.02	Clear
1009	84		2	Clear	18.8	5.97	663	15.79	0.02	Clear
1018	96		2	Clear	18.7	5.98	666	15.60	0.03	Clear
1028	100		2	Clear	18.7	5.96	667	15.15	0.02	Clear
1029		80.64								

Recov

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW-E (MW53)

Site/Project Groundwater Investigation

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 2/10/96 time 1500-15

Developed by Bob Trebble, Jeff Dillener

Development End date 2/11/96 time 0450/1030

Development Method OVERPUMP

Development Equipment: Grunfos 2" Submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2" in

Pre-Dev Static Water Level 73.58

Well TD 82.80 ft BTOC

Maximum Pumping Rate 1.0 gpm

One Well Volume of Water 1.6 gal

Total Quantity of Water Bailed 0 gal

Total Quantity of Water Discharged by Pumping 100 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 55gal DRUM → Poly TANK

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( )	DO	Salinity	Remarks
1505	4.8	74.0	59	SILTY	19.5	6.02	387	8.62	0.01	SILTY Yellow
1520	21	74.1	41	Clear	19.5	5.89	400	8.61	0.01	Clear
1530	31		35	Clear	19.7	5.87	403	9.10	0.01	Clear
1540	41	START up 1.0GPM								Pump Quit Operating
1550	51									Startup SILTY Yellow
1600	61	74.50	24	Clear	17.1	5.89	468	6.65	0.01	~~Silty Yellowish~~ Clear
1610	71	74.50	2	Clear	17.3	5.71	436	8.92	0.01	Clear
1620	81	74.50	2	Clear	17.0	5.67	435	9.33	0.01	Clear
1630	91	74.50	2	Clear	17.4	5.68	431	8.00	0.01	Clear
1640	100	74.50	2	Clear	17.4	5.70	418	8.75	0.01	Clear

2/10/96

2/11/96

Jeff Parandols

CH2M HILL WELL DEVELOPMENT LOG

Installation DDMT

Well Number MW-J (MW 54)

Site/Project Groundwater Investigation

Sample ID Number MW

Project Number 113630.01.ZZ

Development Start date 2/12/96 time 0855

Developed by Bob Tribble, Jeff Allcock

Development End date 2/12/96 time 1020

Development Method OVERPUMP

Development Equipment Grundfos 2" Submersible Pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2" in

Pre-Dev Static Water Level 76.04' BTOC Well TD 94.70' ft BTOC

Maximum Pumping Rate 1.0 gpm

MIN — 1.0 gpm

One Well Volume of Water 3.0 gal

Total Quantity of Water Bailed 0 gal

Total Quantity of Water Discharged by Pumping 100 gal

Discharge Water Containerized? [✓ Y] / N

Type of Containment 55 gal DRUM → Poly Tank

Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) µs-cm	DO	Salinity	Remarks
0850	15	79.26	>100	SILTY yellow	14.8	5.72	271	7.47 ~~248~~	0.00	SILTY Yellow
0900	25	79.28	40	Cloudy	15.9	6.07	262	10.29	0.01	Cloudy
0910	35		30	Semi Clear	15.7	6.02	257	9.21	0.01	Semi-Clear
0920	45		>100	Cloudy	15.7	5.77	249	6.06	0.01	Cloudy
0930	55	79.44	80	Cloudy	15.9	6.04	241	6.11	0.01	Cloudy
0940	65		45	Semi Cloudy	16.3	6.08	240	6.03	0.01	Semi-Cloudy
0950	75		25	Clear	16.4	6.06	244	6.04	0.01	Clear
1000	85		20	Clear	16.7	6.03	236	6.21	0.01	Clear
1010	95		18	Clear	16.9	6.05	236	6.28	0.01	Clear
1020	100		15	Clear	16.4	5.98	231	5.97	0.01	Clear

CH2M HILL WELL DEVELOPMENT LOG

256 250

Installation DDMT

Well Number MW55 (U)

Site/Project Main Installation / 004

Sample ID Number

Project Number 113630.01.ZZ

Development Start date 2/13/96 time 0830

Developed by B. Trebble / J. Dillener

Development End date 2/13/96 time 1130

Development Method Overpump using 2" submersible pump

Development Equipment: Grunfos Redi-Flow 2 submersible pump

Quantity of Water Loss During Drilling (if applicable) NA gal

Casing Diameter 2 in

Pre-Dev Static Water Level 70.92' Well TD 73.92 ft BTOC Maximum Pumping Rate 0.3 - 0.2 gpm

One Well Volume of Water 0.5 gal

Screen at 64' - 74' BTOC
Pump set at 72.5' BTOC

Total Quantity of Water Bailed 0 gal

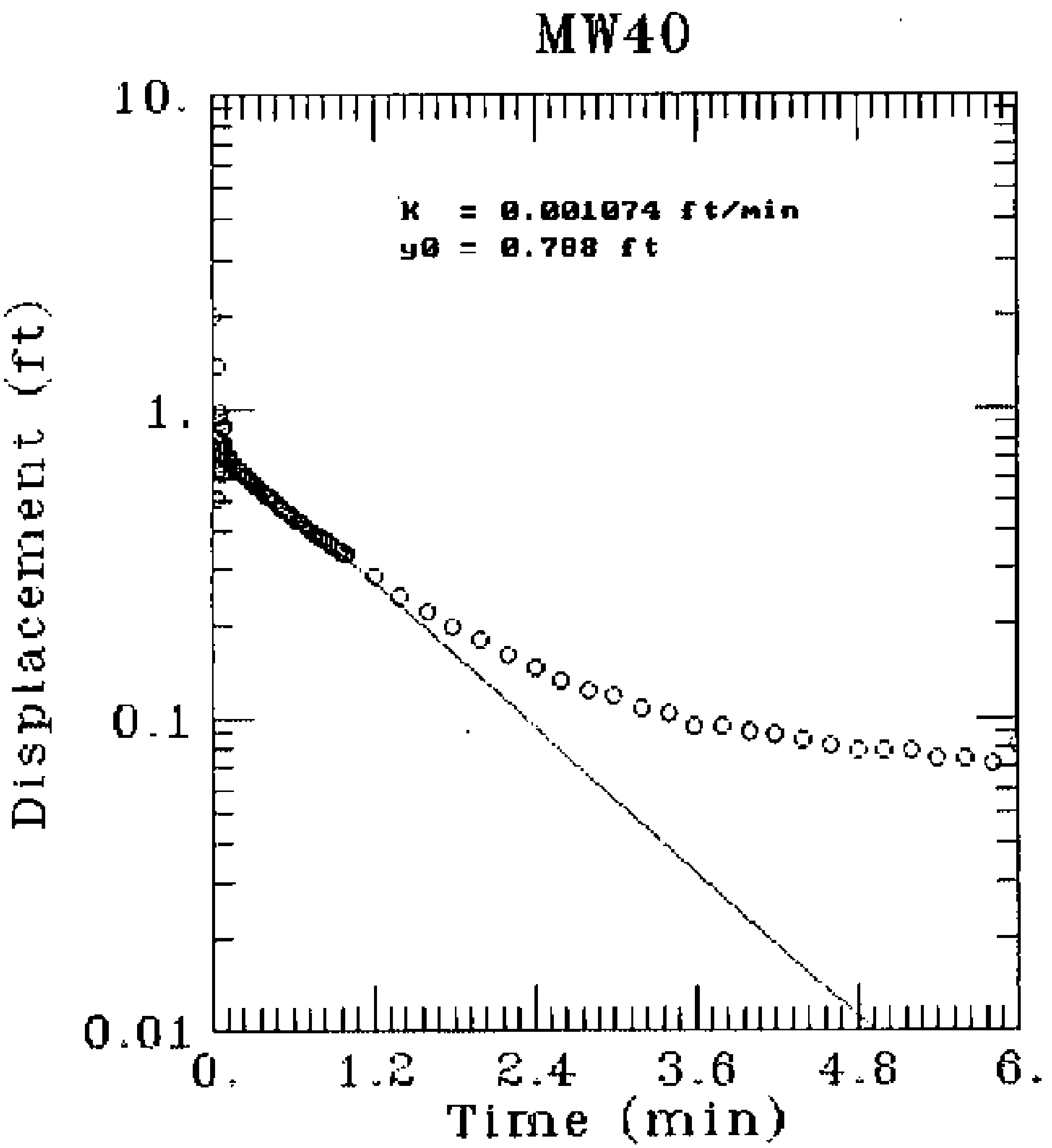
Total Quantity of Water Discharged by Pumping 43 gal

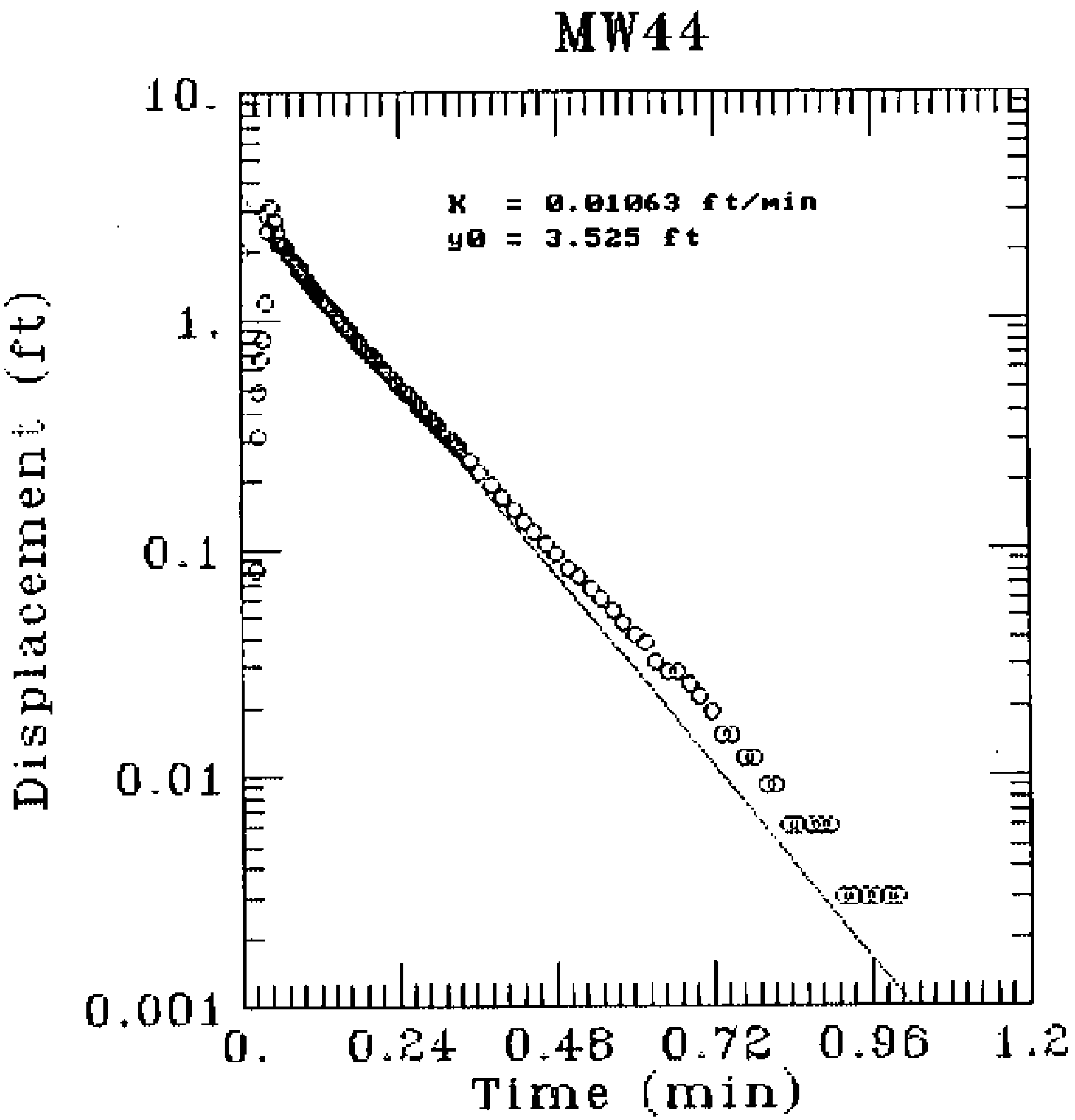
Discharge Water Containerized? [✓ Y] / N Type of Containment 55 gal drum → Poly tank

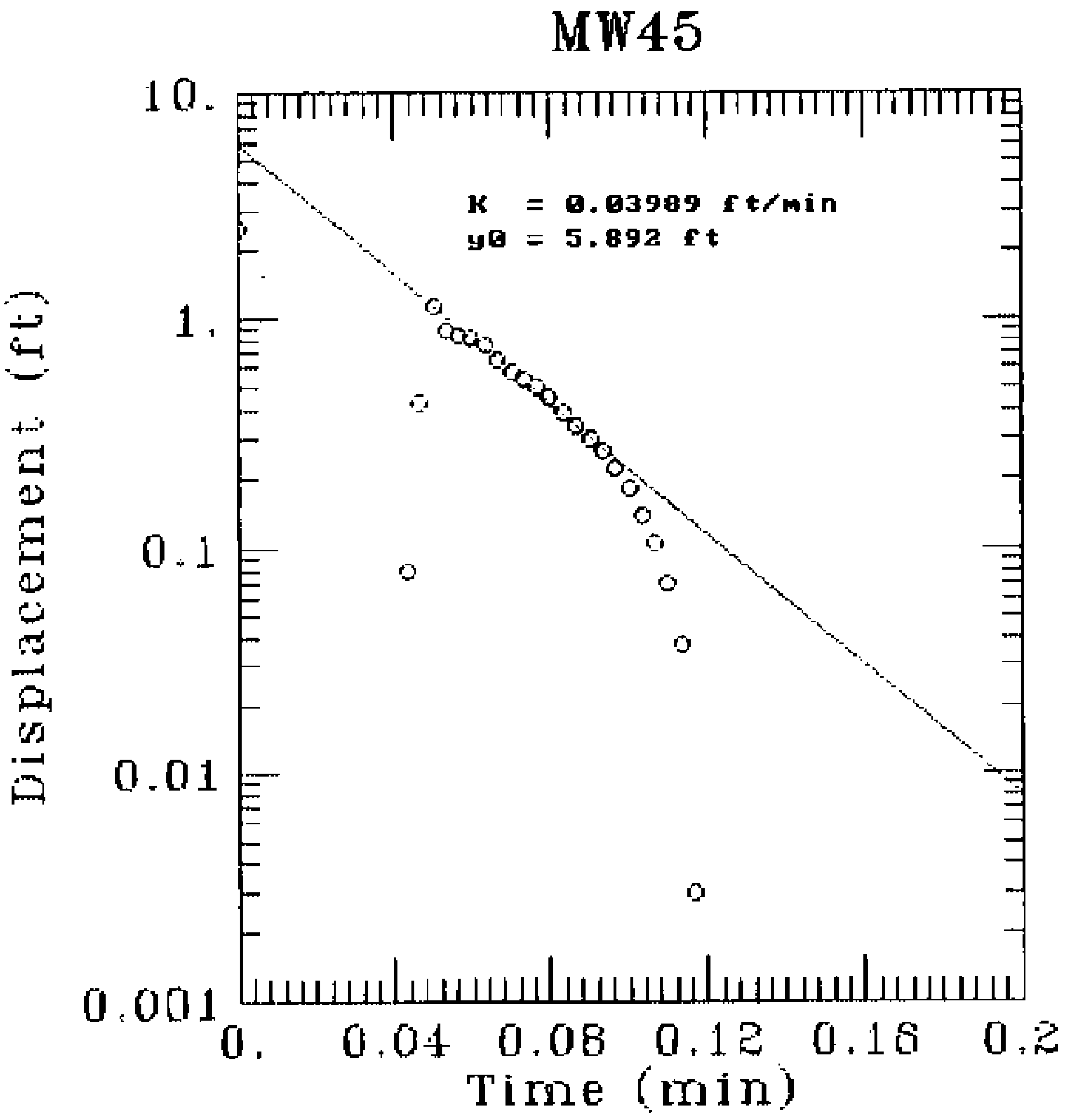
Time	Volume Removed (gallons)	Water Level (ft BTOC)	Turbidity	Clarity / Color	Temp °C	pH	Conductivity ( ) MS-CM	DO	Salinity	Remarks
0925	10	72.92	>100	Silty Yellow	18.5	5.39	309	6.32	0.01	Very silty Yellow
1030	20	72.92	"	"	18.9	5.61	235	7.33	0.00	"
1045	30	72.92	"	Very Cloudy	19.5	5.68	221	7.29	↓	Very Cloudy
1110	35	72.92	25	Semi-clear	19.7	5.70	227	7.63		Semi-clear
1130	43	72.92	10	Clear	20.1	5.64	221	7.45		Clear

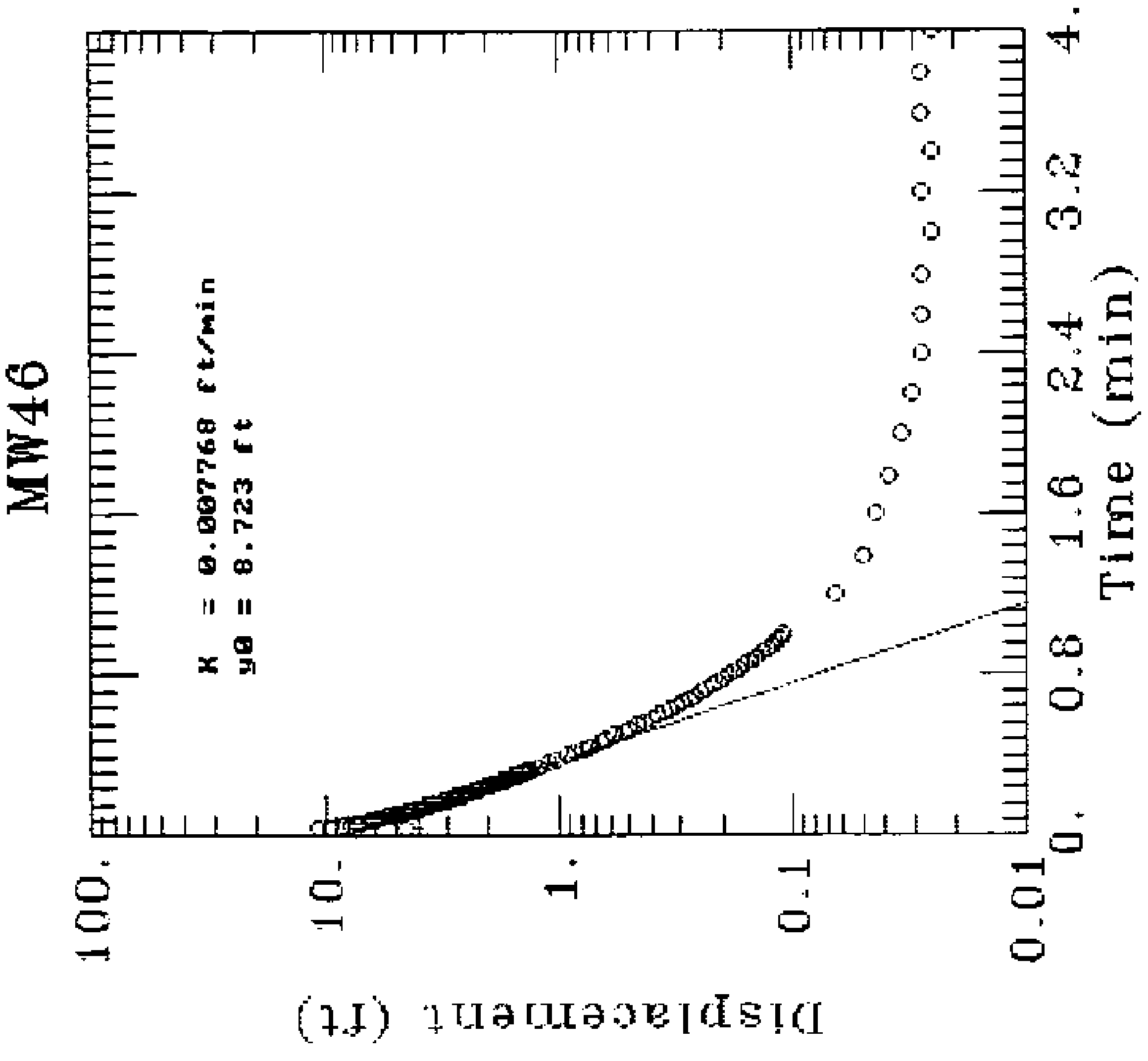
Appendix D

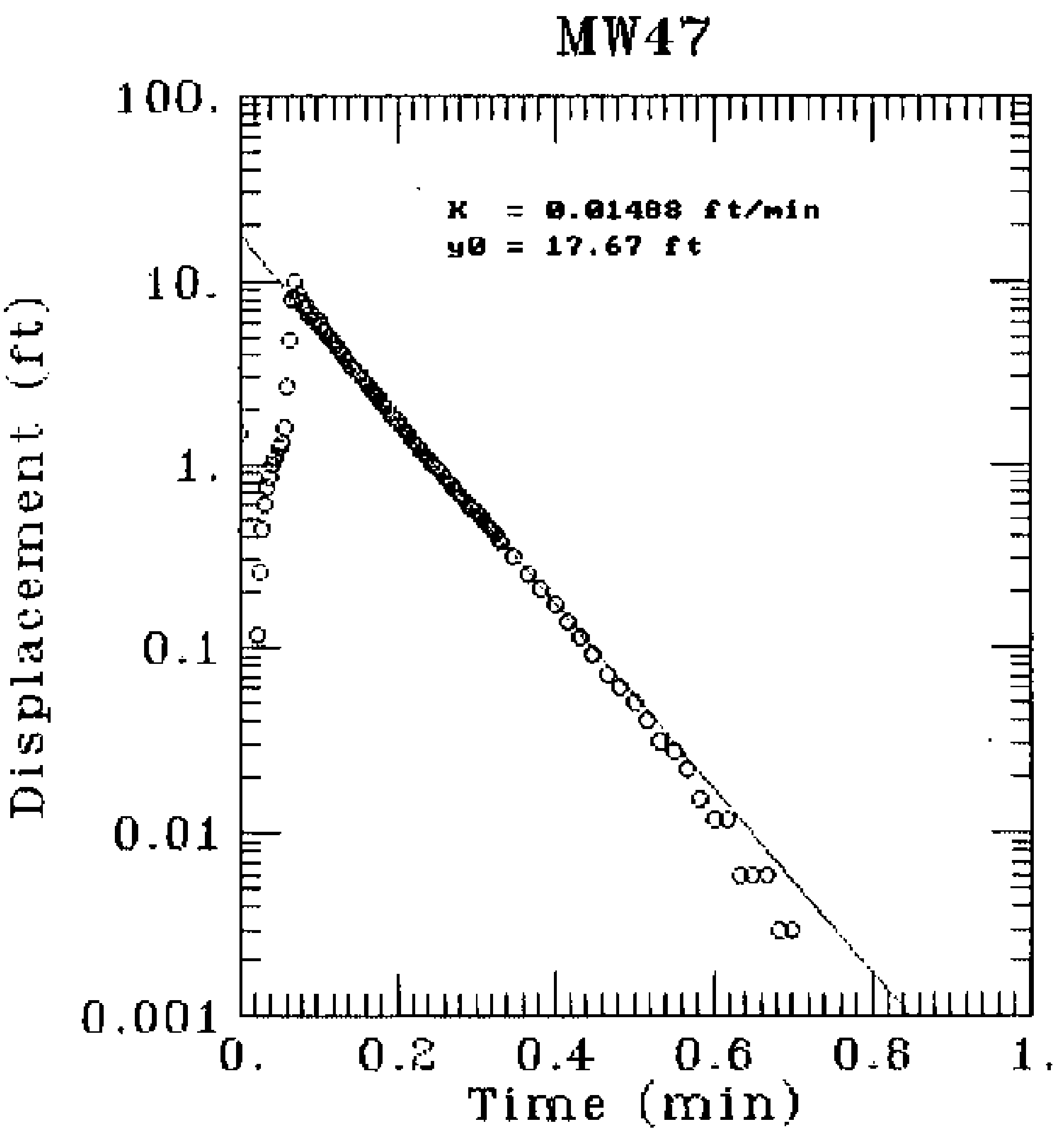
Slug Test Results

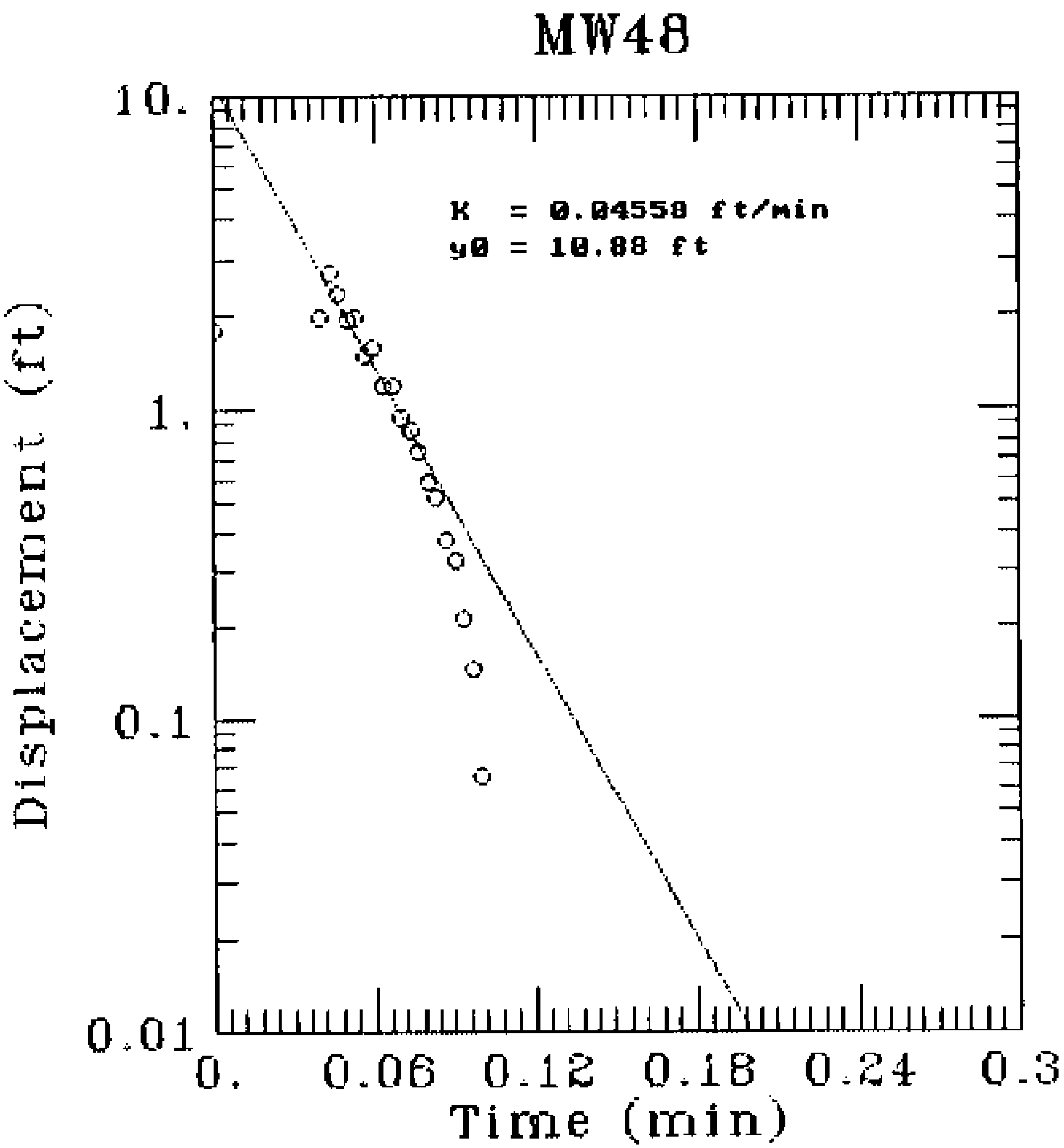

MW40
K = 0.001074 ft/min
y0 = 0.788 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
1.2
2.4
3.6
4.8
6.
Time (min)

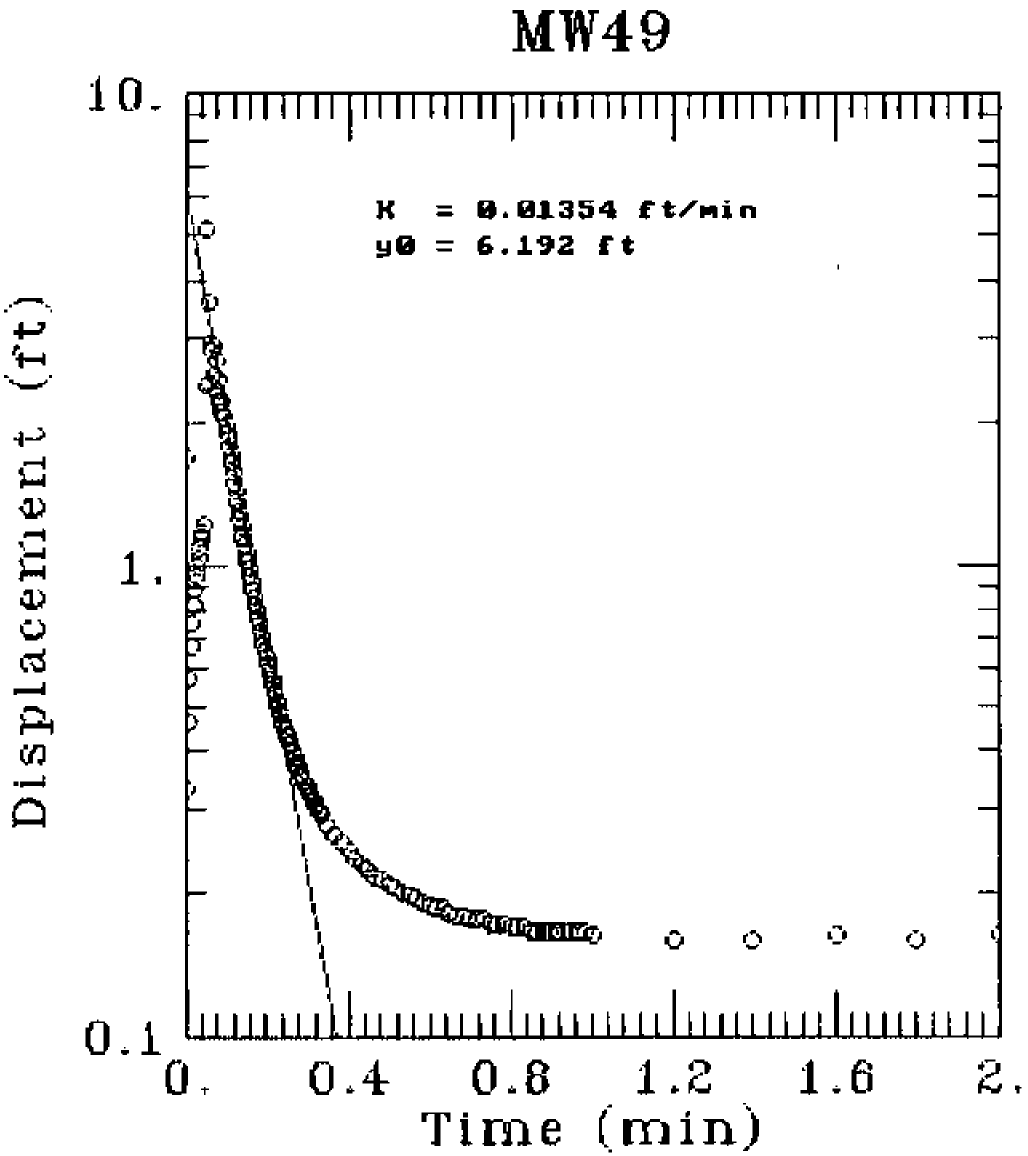

MW44
K = 0.01063 ft/min
y0 = 3.525 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
0.24
0.48
0.72
0.96
1.2
Time (min)

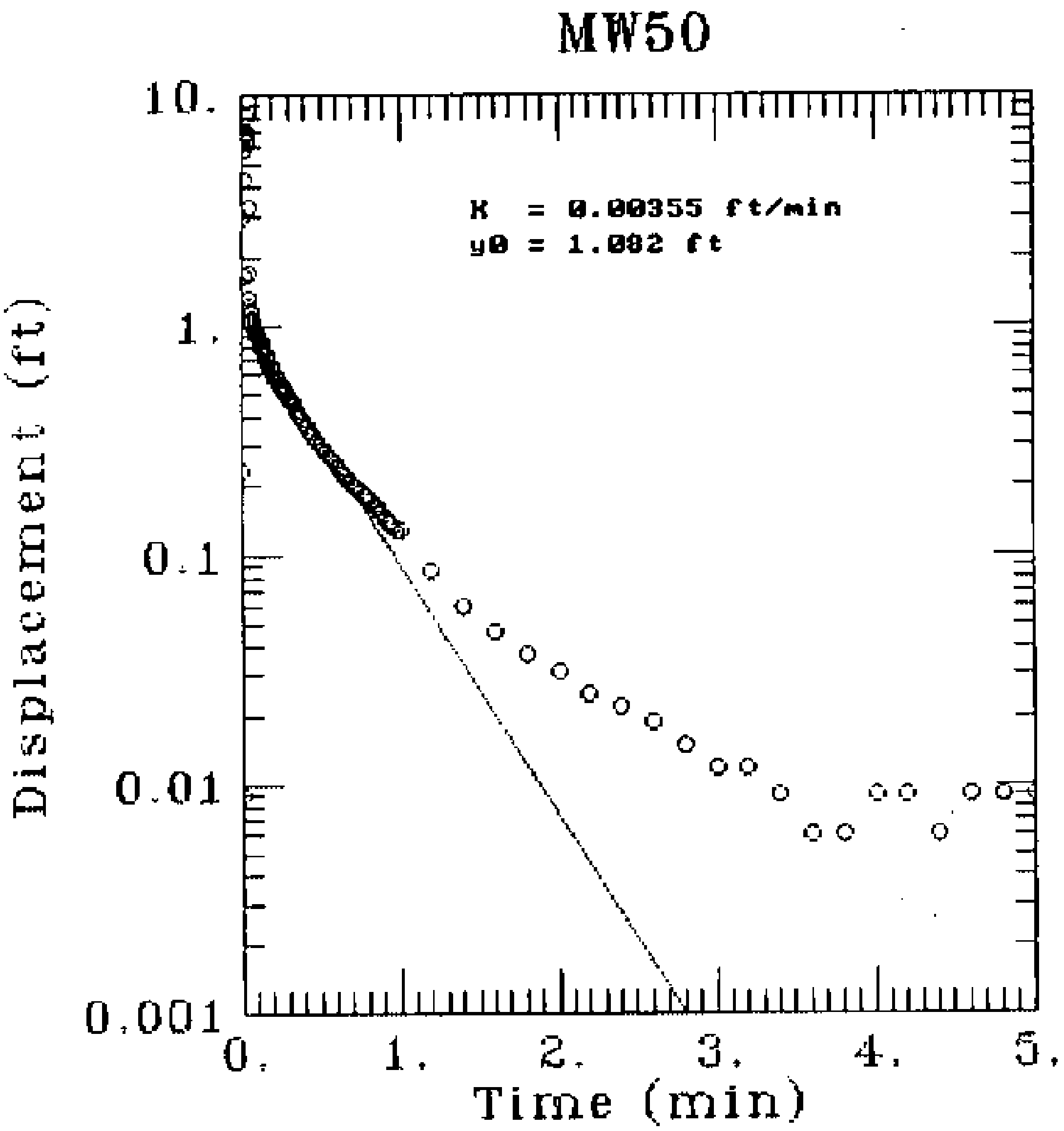

MW45
K = 0.03989 ft/min
y0 = 5.892 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
0.04
0.08
0.12
0.16
0.2
Time (min)

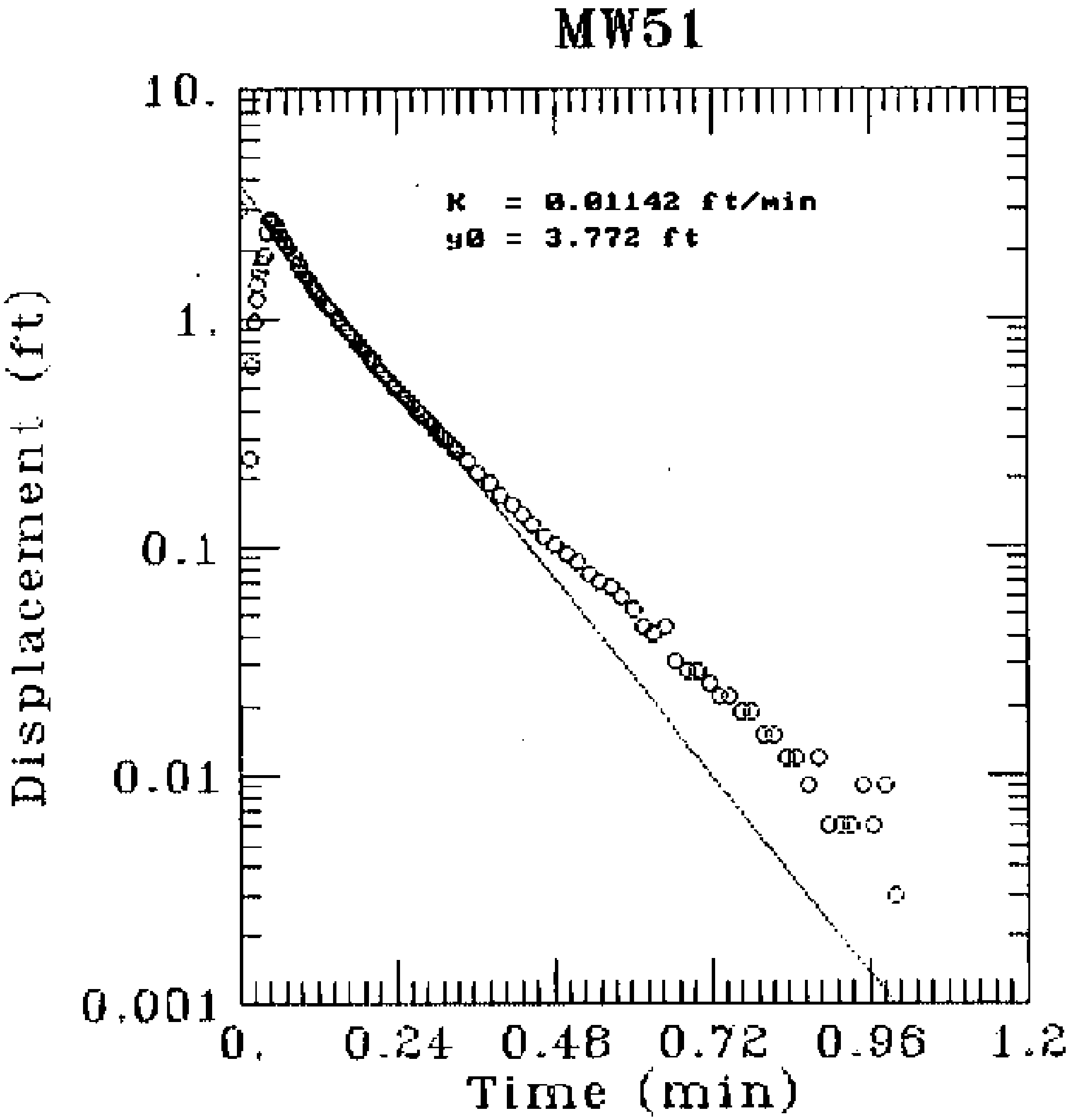

MW46
K = 0.007768 ft/min
y0 = 8.723 ft
Displacement (ft)
100.
10.
1.
0.1
0.01
0.
0.8
1.6
2.4
3.2
4.
Time (min)

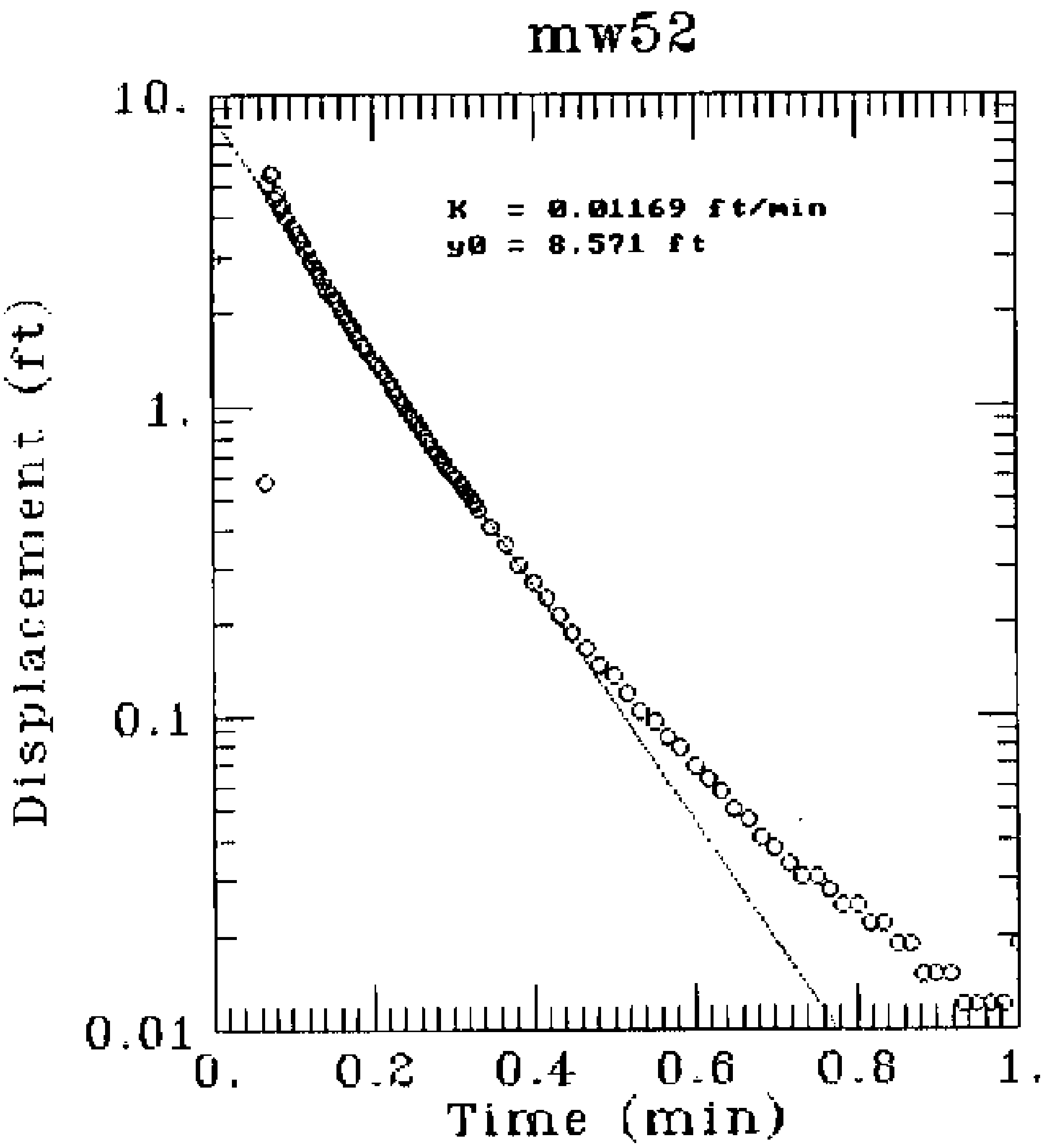

MW47
K = 0.01488 ft/min
y0 = 17.67 ft
Displacement (ft)
100.
10.
1.
0.1
0.01
0.001
Time (min)
0.
0.2
0.4
0.6
0.8
1.

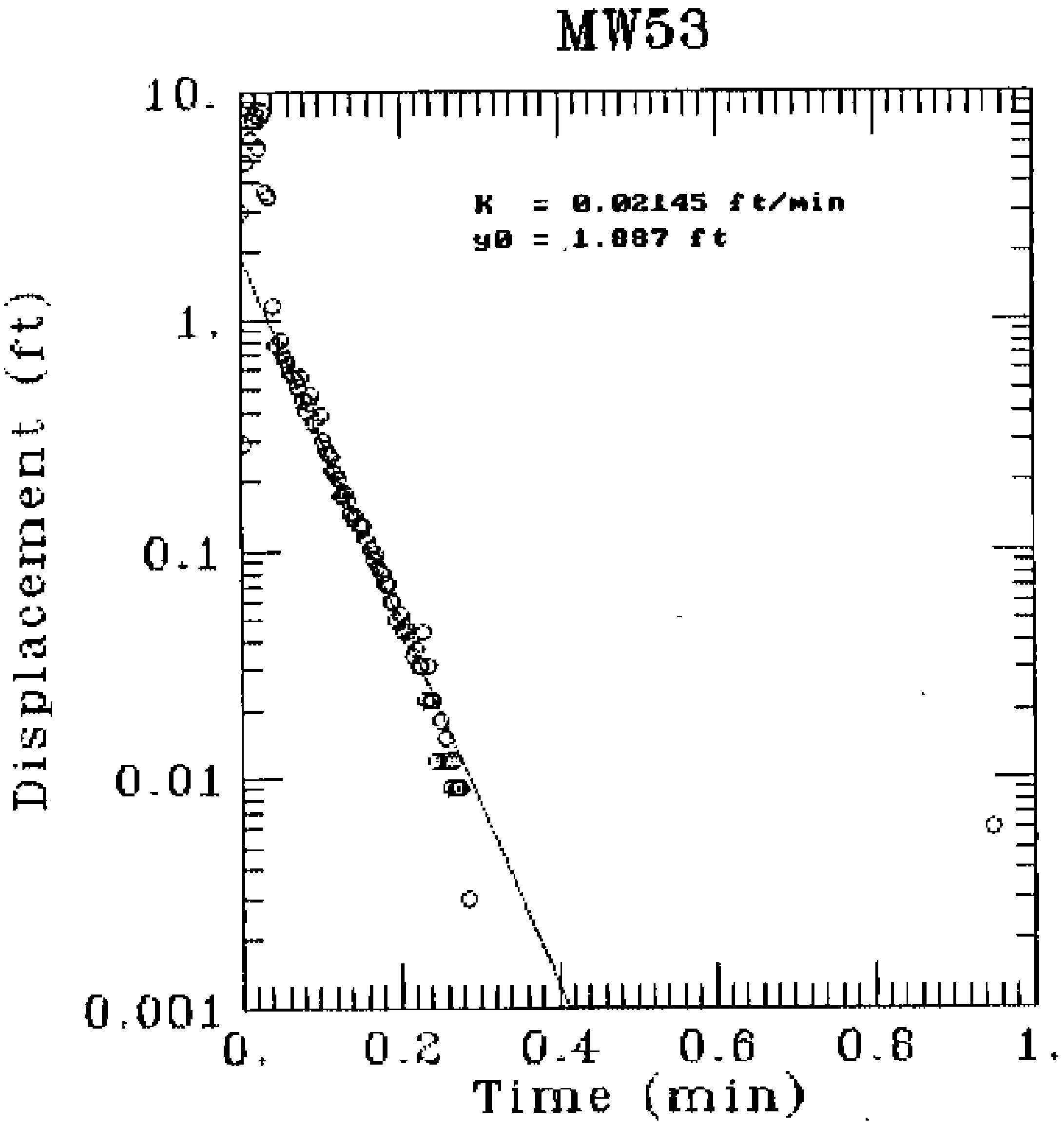

MW48
K = 0.04558 ft/min
y0 = 10.88 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
0.06
0.12
0.18
0.24
0.3
Time (min)

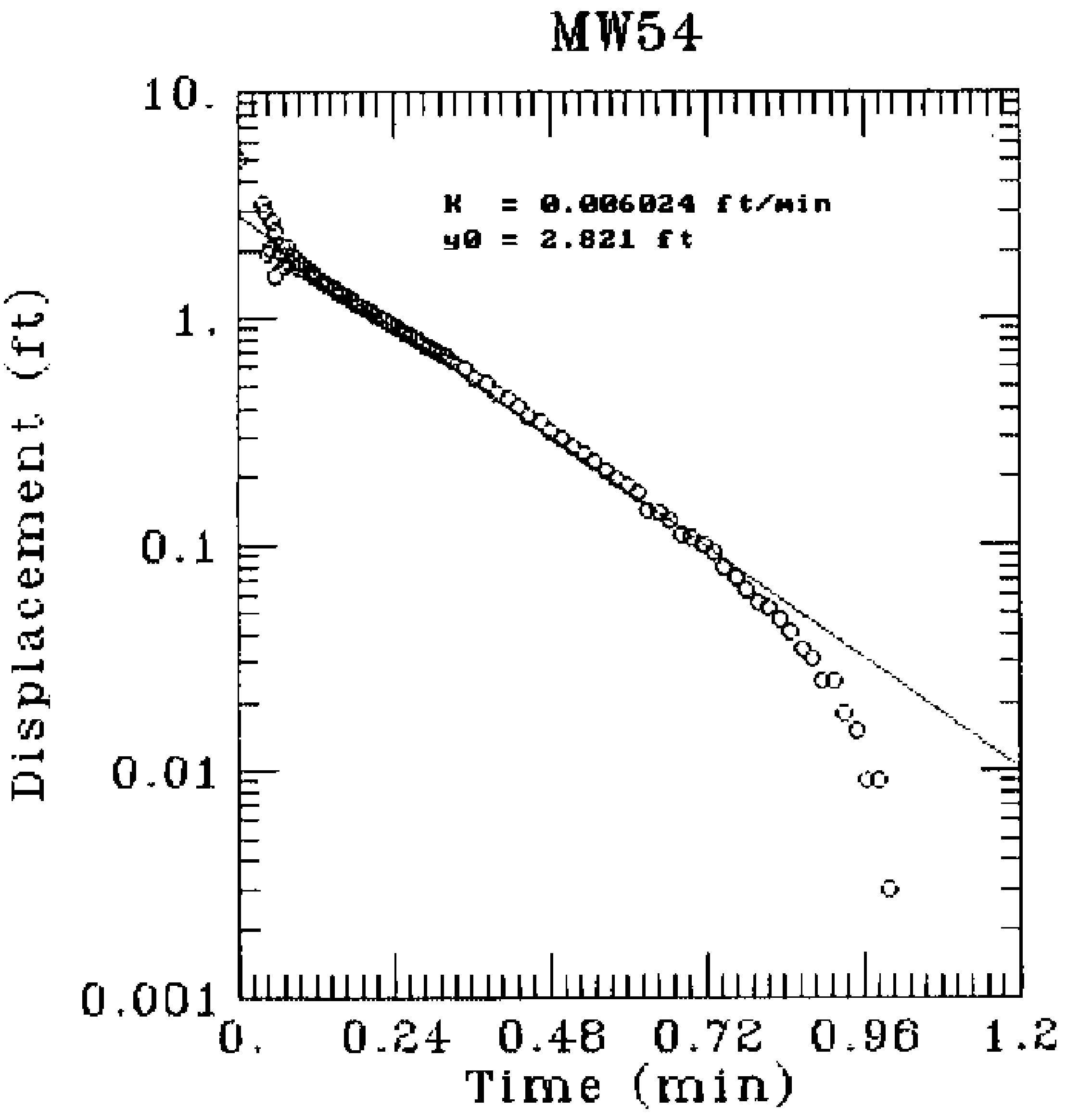

MW49
K = 0.01354 ft/min
y0 = 6.192 ft
Displacement (ft)
10.
1.
0.1
Time (min)
0.
0.4
0.8
1.2
1.6
2.


MW50
K = 0.00355 ft/min
y0 = 1.082 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
Time (min)
0.
1.
2.
3.
4.
5.


MW51
K = 0.01142 ft/min
y0 = 3.772 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
0.24
0.48
0.72
0.96
1.2
Time (min)


mw52
K = 0.01169 ft/min
y0 = 8.571 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
0.2
0.4
0.6
0.8
1.
Time (min)


MW53
K = 0.02145 ft/min
y0 = 1.887 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
0.2
0.4
0.6
0.8
1.
Time (min)


MW54
K = 0.006024 ft/min
y0 = 2.821 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
Time (min)
0.
0.24
0.48
0.72
0.96
1.2

256 264

Appendix E

Geotechnical Analyses

REPORT OF LABORATORY ANALYSIS

Project: DDMT D04
Location: Memphis, TN
Client: CH2M Hill
Our job no.: CM-603-96
Date: January 18, 1996
Lab no.: 1484996

Location	Depth	Sample No.	% Water Content
MW-41	65-67'	#1	18.8
MW-42	57-59'	#2	14.4
MW-43	100-102'	#3	9.3
MW-44	76-77'	#4	16.6
MW-45	68-70'	#5	18.0

Jon N. Christian
Director of Technical Services

CCI

REPORT OF LABORATORY ANALYSIS

Project: DDMT D04
Location: Memphis, TN
Client: CH2M Hill
Our job no.: CM-603-96
Date: February 5, 1996
Lab no.: 1485496

Location	Depth	Sample No.	% Water Content
MW-46	71-73'	#6	18.8
MW-47	117.5-118.5'	#7	19.9
MW-48	93.5-94.5'	#8	13.0
MW-49	88-90'	#9	14.1
MW-50	120-125'	#10	8.3

Jon N. Christian
Director of Technical Services

CCI

REPORT OF LABORATORY ANALYSIS

Project: DDMT D04
Location: Memphis, TN
Client: CH2M Hill
Our job no.: CM-603-96
Date: February 9, 1996
Lab no.: 1485796

Location	Depth	Sample No.	% Water Content
MW-51	55-60'	#11	13.8
MW-52	102-104'	#12	20.4

Jon N. Christian
Director of Technical Services

CCI

REPORT OF LABORATORY ANALYSIS

Project: DDMT D04
Location: Memphis, TN
Client: CH2M Hill
Our job no.: CM-603-96
Date: March 18, 1996
Lab no.: 39096

Location	Depth	Sample No.	% Water Content
MW-53	82-83'	#14	14.3
MW-54	93-95'	#15	18.6
MW-55	73-74'	#16	9.8
MW-49	90-92.5'	S-1(49)	20.4
MW-54	100-101'	S-1(54)	27.7
MW-55(u)	83-85.5'	S-1(55)	22.8

Jon N. Christian
Director of Technical Services

CCI

CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

Project DDMT D04 - Memphis, TN

113630.01.ZZ

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below

Client CH2M Hill

Sampled by CH2M Hill

Submitted by Mr. Greg Underberg

Date Sampled 1/12/96

Date Tested 1/18/96

Lab Report No. 14844

Sample No. #1

Source MW-41 (65-67')

Depth

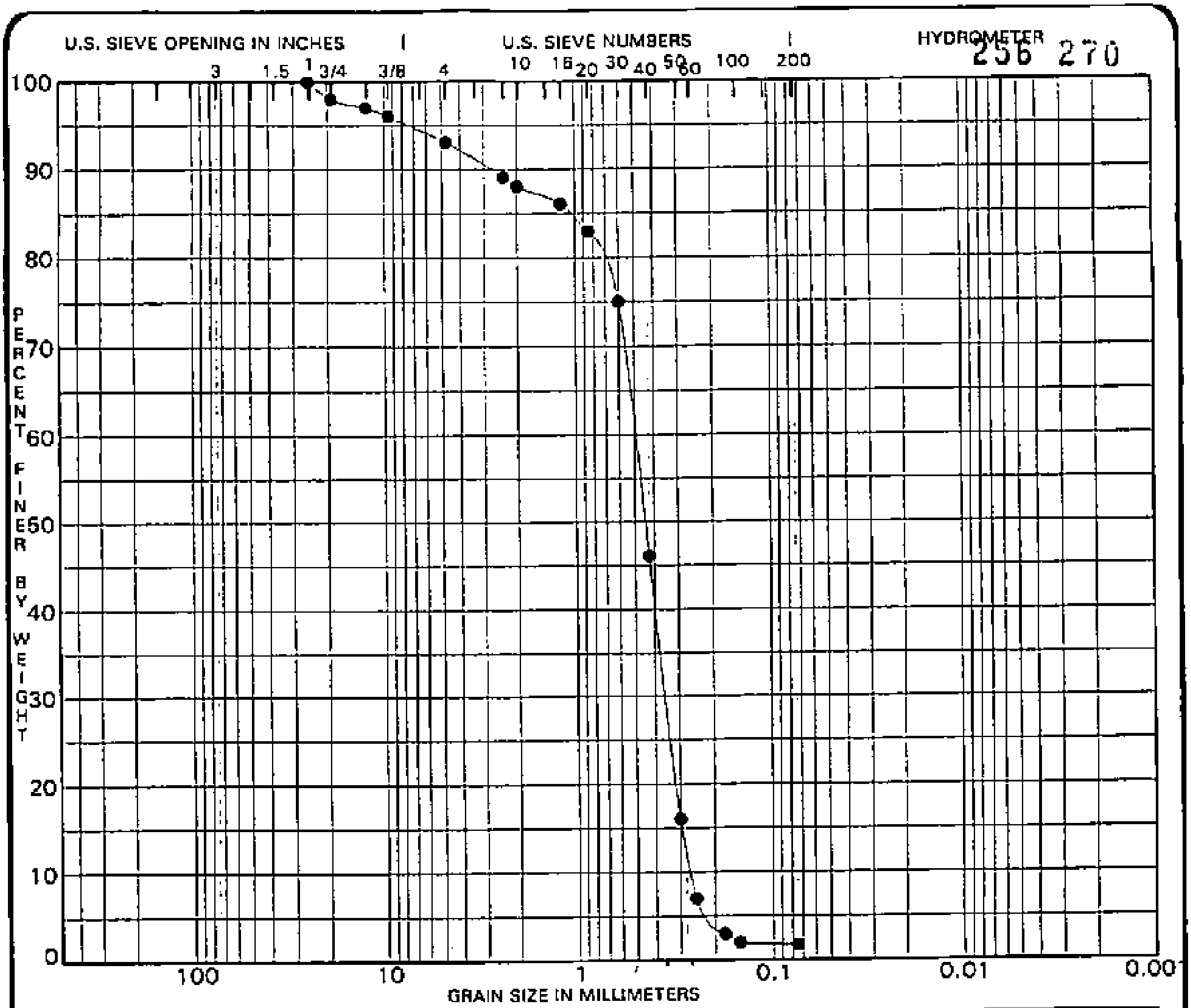
Description of Materials Tan Medium Sand w/a trace of Gravel

SCREEN SIZES

	1 1/2 inch screen	
	1 inch screen	100
	3/4 inch screen	98
	1/2 inch screen	97
	3/8 inch screen	96
No.	4 mesh sieve	93
No.	8 mesh sieve	89
No.	10 mesh sieve	88
No.	16 mesh sieve	86
No.	20 mesh sieve	83
No.	30 mesh sieve	75
No.	40 mesh sieve	46
No.	50 mesh sieve	16
No.	60 mesh sieve	7
No.	80 mesh sieve	3
No.	100 mesh sieve	2
No.	200 mesh sieve	1.7

Jon N. Christian
Director of Technical Services

CCI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#1	Tan Medium Sand w/a trace of Gravel		14	16	NP	0.93	1.9

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#1	25.00	0.50	0.353	0.2657	7.0	91.3	1.7	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 1/18/96

GRADATION CURVES

CHRISTIAN,CARMICHAEL & ASSOCIATES
MONTGOMERY, ALABAMA

CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

Project DDMT D04 - Memphis, TN
256 271

113630.01.ZZ

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

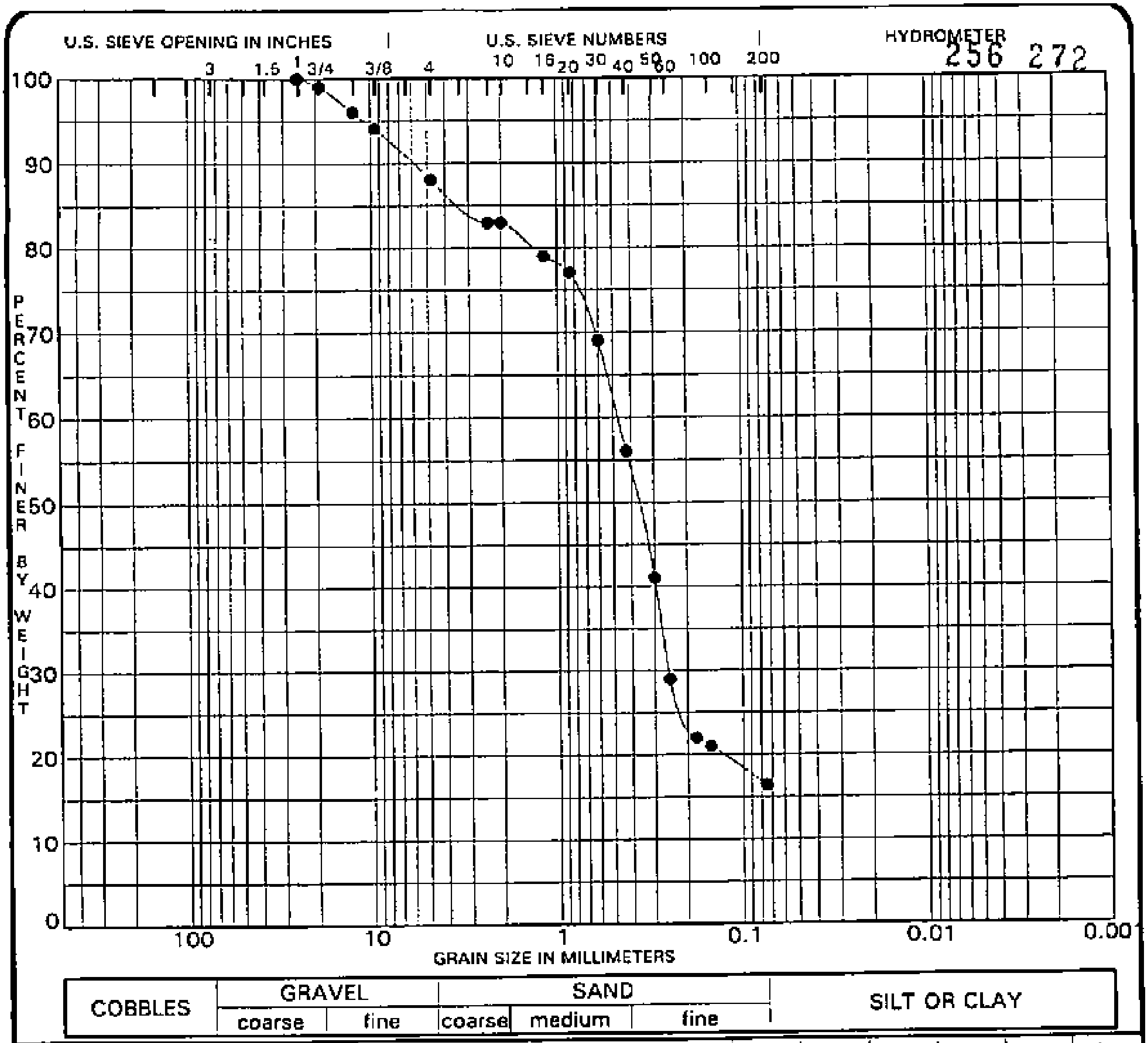
Date Sampled 1/13/96 Date Tested 1/18/96 Lab Report No. 14845

Sample No.	#2
Source	MW-42 (57-59')
Depth	
Description of Materials	Tan Silty Sand w/a little Gravel

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	100
3/4 inch screen	99
1/2 inch screen	96
3/8 inch screen	94
No. 4 mesh sieve	88
No. 8 mesh sieve	83
No. 10 mesh sieve	83
No. 16 mesh sieve	79
No. 20 mesh sieve	77
No. 30 mesh sieve	69
No. 40 mesh sieve	56
No. 50 mesh sieve	41
No. 60 mesh sieve	29
No. 80 mesh sieve	22
No. 100 mesh sieve	21
No. 200 mesh sieve	16.4

Jon N. Christian
Director of Technical Services



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#2	Tan Silty Sand w/a little Gravel						

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#2	25.00	0.47	0.254		12.0	71.6	16.4	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 1/18/96

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Montgomery, Alabama 36110
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Project DDMT D04 - Memphis, TN

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/14/96 Date Tested 1/18/96 Lab Report No. 14846

Sample No. #3

Source MW-43 (100-102')

Depth

Description of Materials Tan Silty Sand

SCREEN SIZES

1 1/2	inch screen	
1	inch screen	
3/4	inch screen	
1/2	inch screen	
3/8	inch screen	100
No. 4	mesh sieve	99
No. 8	mesh sieve	98
No. 10	mesh sieve	97
No. 16	mesh sieve	96
No. 20	mesh sieve	93
No. 30	mesh sieve	87
No. 40	mesh sieve	69
No. 50	mesh sieve	44
No. 60	mesh sieve	30
No. 80	mesh sieve	22
No. 100	mesh sieve	20
No. 200	mesh sieve	15.4

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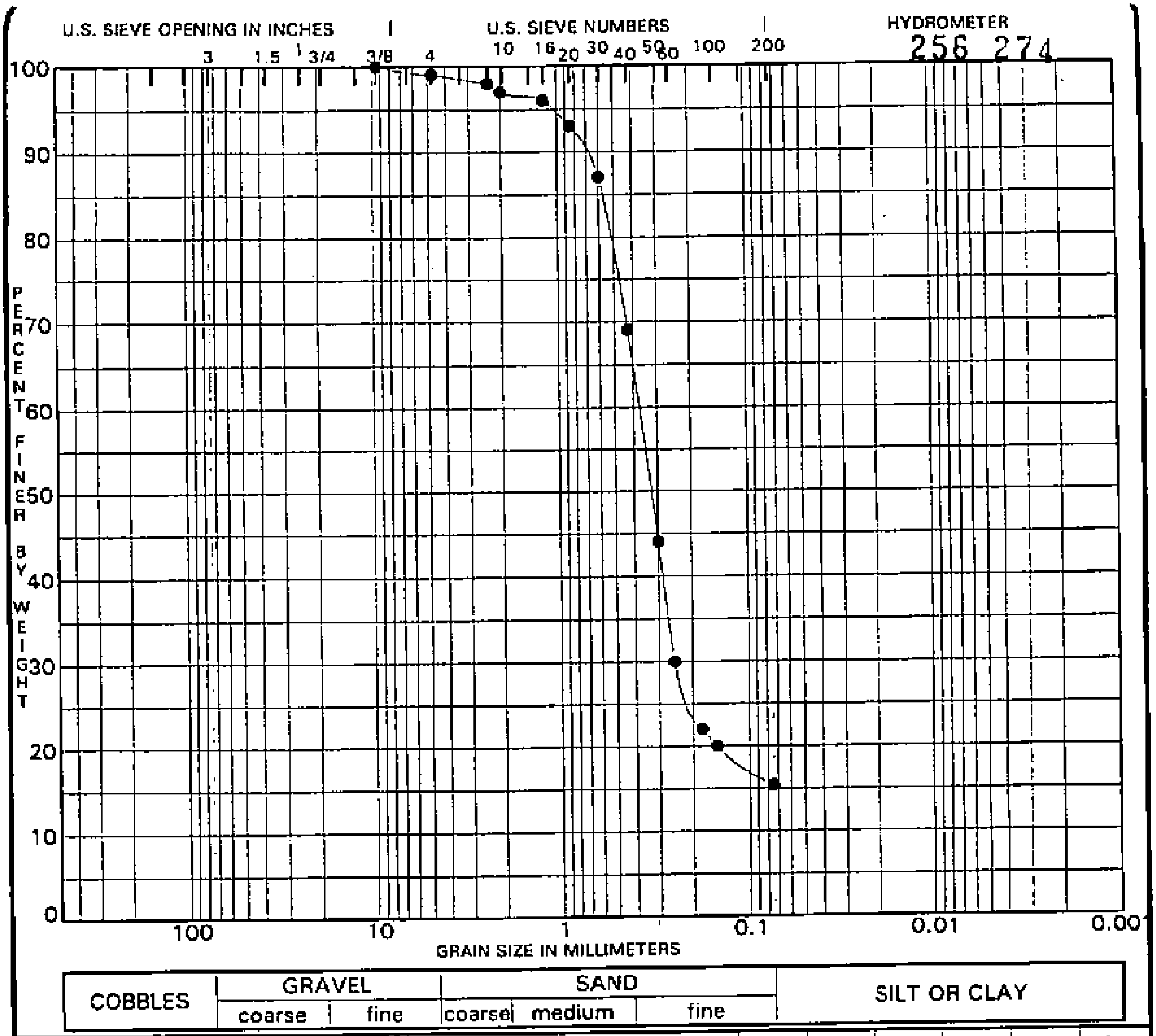

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#3	Tan Silty Sand						

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#3	9.50	0.37	0.250		1.0	83.6	15.4	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 1/18/96

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& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/15/96 Date Tested 1/18/96 Lab Report No. 14847

Sample No. #4

Source MW-44 (76-77')

Depth

Description of Materials Tan Medium Sand w/a trace of Gravel

SCREEN SIZES

1 1/2 inch screen	100
1 inch screen	96
3/4 inch screen	95
1/2 inch screen	93
3/8 inch screen	93
No. 4 mesh sieve	90
No. 8 mesh sieve	89
No. 10 mesh sieve	88
No. 16 mesh sieve	87
No. 20 mesh sieve	86
No. 30 mesh sieve	76
No. 40 mesh sieve	37
No. 50 mesh sieve	16
No. 60 mesh sieve	11
No. 80 mesh sieve	9
No. 100 mesh sieve	8
No. 200 mesh sieve	5.1

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& ASSOCIATES, INC.
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REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Greg Underberg
Date Sampled 1/16/96 Date Tested 1/18/96 Lab Report No. 14848

Sample No.	#5
Source	MW-45 (68-70')
Depth	
Description of Materials	Tan Medium Sand w/a little of Gravel

SCREEN SIZES

1 1/2 inch screen	100
1 inch screen	96
3/4 inch screen	94
1/2 inch screen	91
3/8 inch screen	89
No. 4 mesh sieve	83
No. 8 mesh sieve	80
No. 10 mesh sieve	79
No. 16 mesh sieve	76
No. 20 mesh sieve	73
No. 30 mesh sieve	62
No. 40 mesh sieve	40
No. 50 mesh sieve	21
No. 60 mesh sieve	13
No. 80 mesh sieve	8
No. 100 mesh sieve	6
No. 200 mesh sieve	4.1

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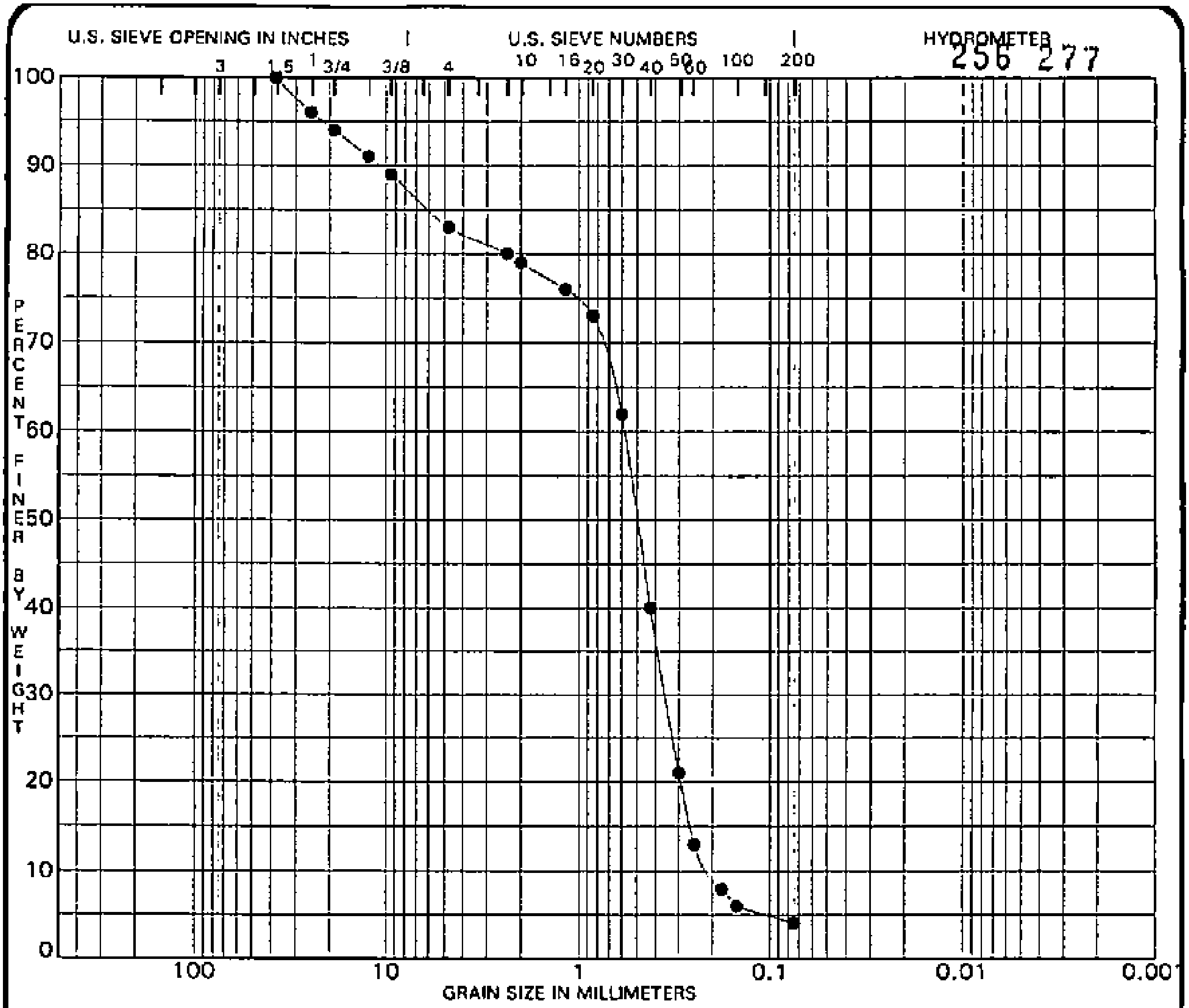

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#5	Tan Medium Sand w/a little of Gravel					1.05	2.8

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#5	38.10	0.58	0.354	0.2053	17.0	78.9	4.1	

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JOB NO. CM-603-96
DATE 1/18/96

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Greg Underberg
Date Sampled 1/22/96 Date Tested 2/5/96 Lab Report No. 14849

Sample No.	#6
Source	MW-46 (71-73')
Depth	
Description of Materials	Tan Medium Sand w/Silt

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	100
3/8 inch screen	99
No. 4 mesh sieve	97
No. 8 mesh sieve	96
No. 10 mesh sieve	95
No. 16 mesh sieve	93
No. 20 mesh sieve	90
No. 30 mesh sieve	75
No. 40 mesh sieve	37
No. 50 mesh sieve	17
No. 60 mesh sieve	13
No. 80 mesh sieve	10
No. 100 mesh sieve	9
No. 200 mesh sieve	7.8

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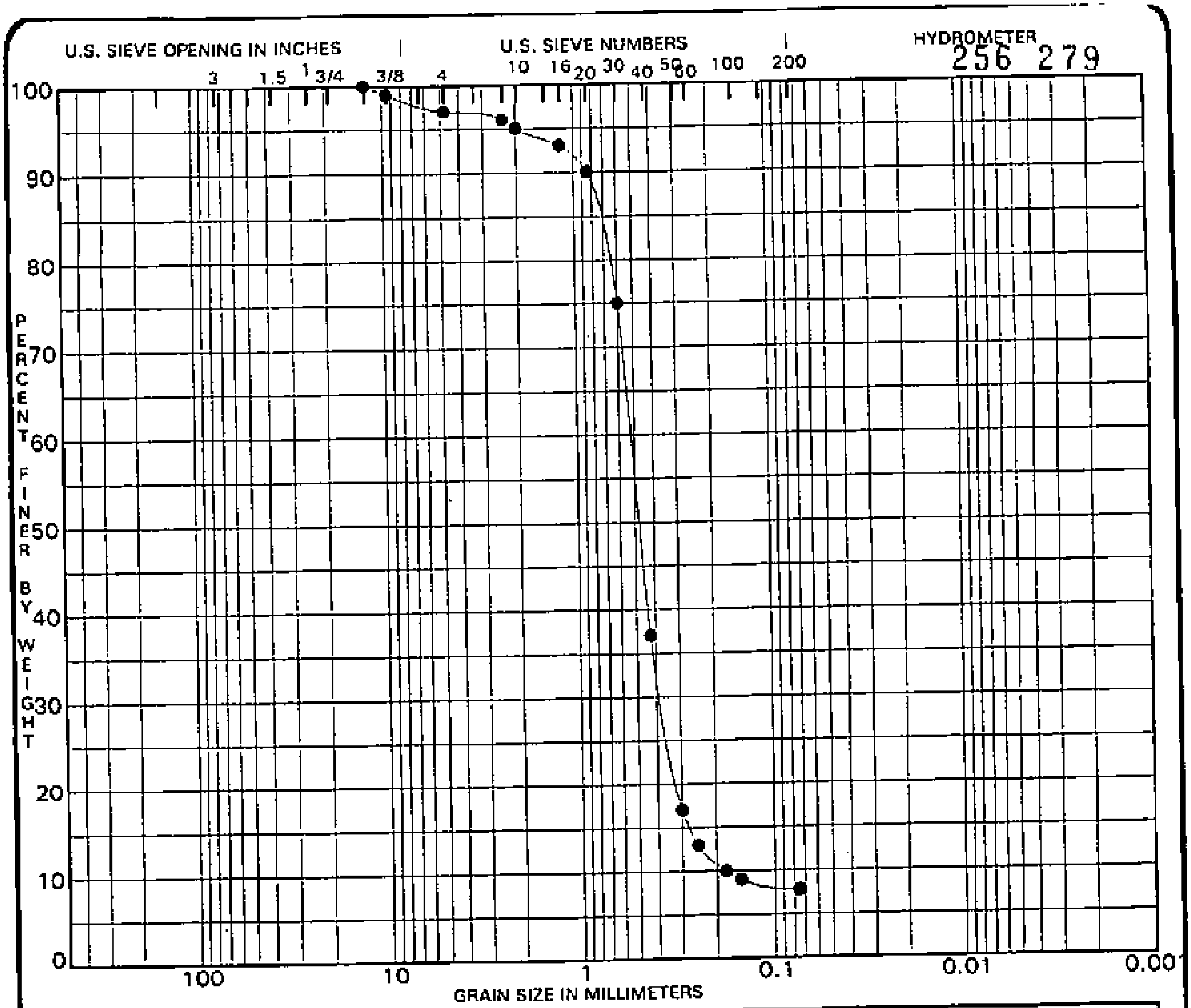

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#6	Tan Medium Sand w/Silt					1.50	2.9

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#6	12.50	0.52	0.376	0.1800	3.0	89.2	7.8	

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DATE 2/5/96

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Montgomery, Alabama 36110
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/23/96 Date Tested 2/5/96 Lab Report No. 14850

Sample No.	#7
Source	MW-47 (117.5-118.5')
Depth	
Description of Materials	Tan Medium Sand w/Silt

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	100
No. 20 mesh sieve	99
No. 30 mesh sieve	95
No. 40 mesh sieve	77
No. 50 mesh sieve	40
No. 60 mesh sieve	23
No. 80 mesh sieve	10
No. 100 mesh sieve	9
No. 200 mesh sieve	7.4

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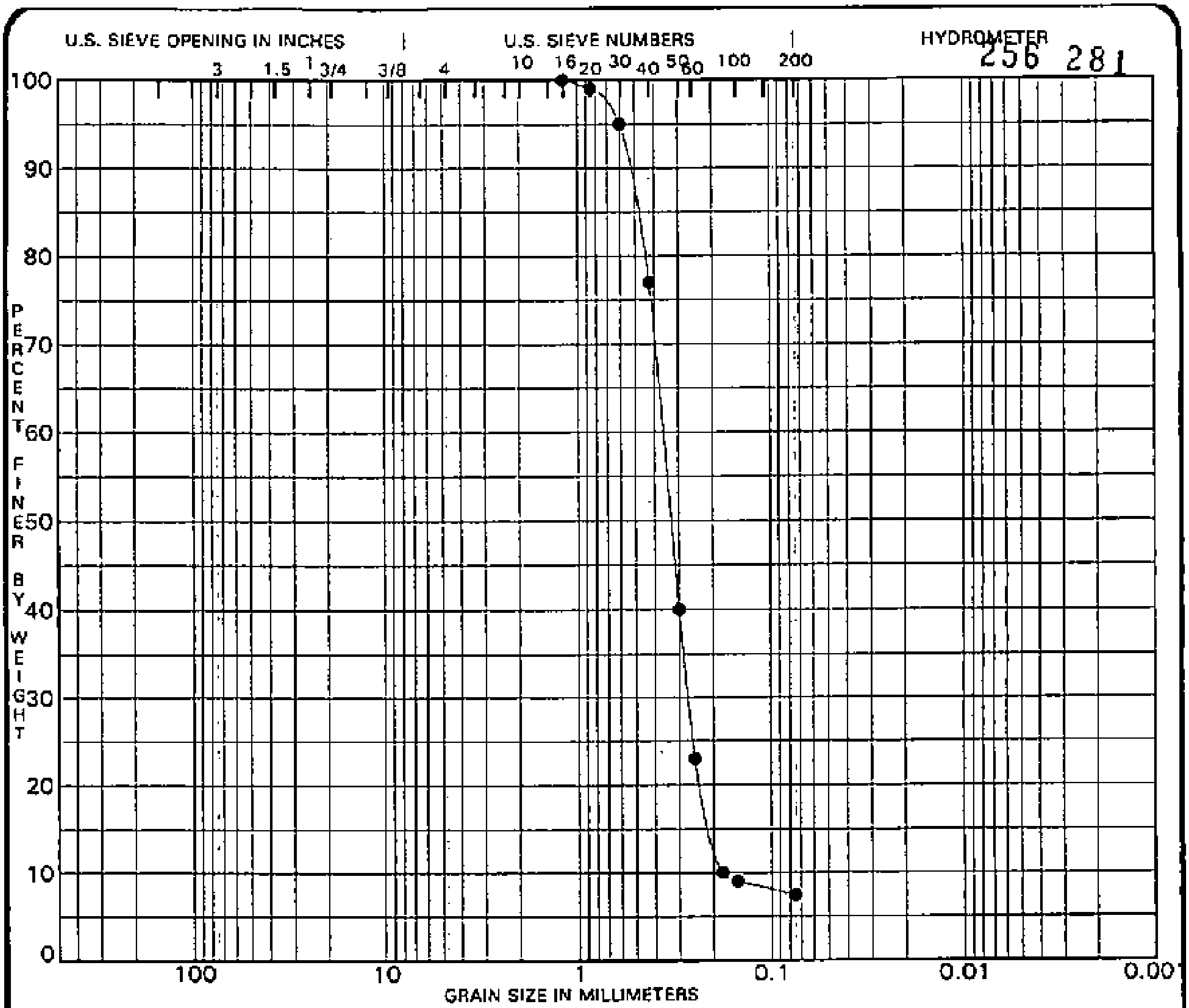

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#7	Tan Medium Sand w/Silt					1.11	2.0

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#7	1.18	0.36	0.270	0.1800	0.0	92.6	7.4	

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JOB NO. CM-603-96
DATE 2/5/96

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& ASSOCIATES, INC.
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Montgomery, Alabama 36110
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below

Client CH2M Hill

Sampled by CH2M Hill

Submitted by Mr. Greg Underberg

Date Sampled 1/24/96

Date Tested 2/5/96

Lab Report No. 14851

Sample No.	#8
Source	MW-48 (93.5-94.5')
Depth	
Description of Materials	Tan Medium Sand w/a little Gravel

SCREEN SIZES

	1 1/2	inch screen	100
	1	inch screen	98
	3/4	inch screen	96
	1/2	inch screen	94
	3/8	inch screen	92
No.	4	mesh sieve	87
No.	8	mesh sieve	82
No.	10	mesh sieve	81
No.	16	mesh sieve	77
No.	20	mesh sieve	72
No.	30	mesh sieve	56
No.	40	mesh sieve	27
No.	50	mesh sieve	12
No.	60	mesh sieve	9
No.	80	mesh sieve	7
No.	100	mesh sieve	6
No.	200	mesh sieve	3.8

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Director of Technical Services

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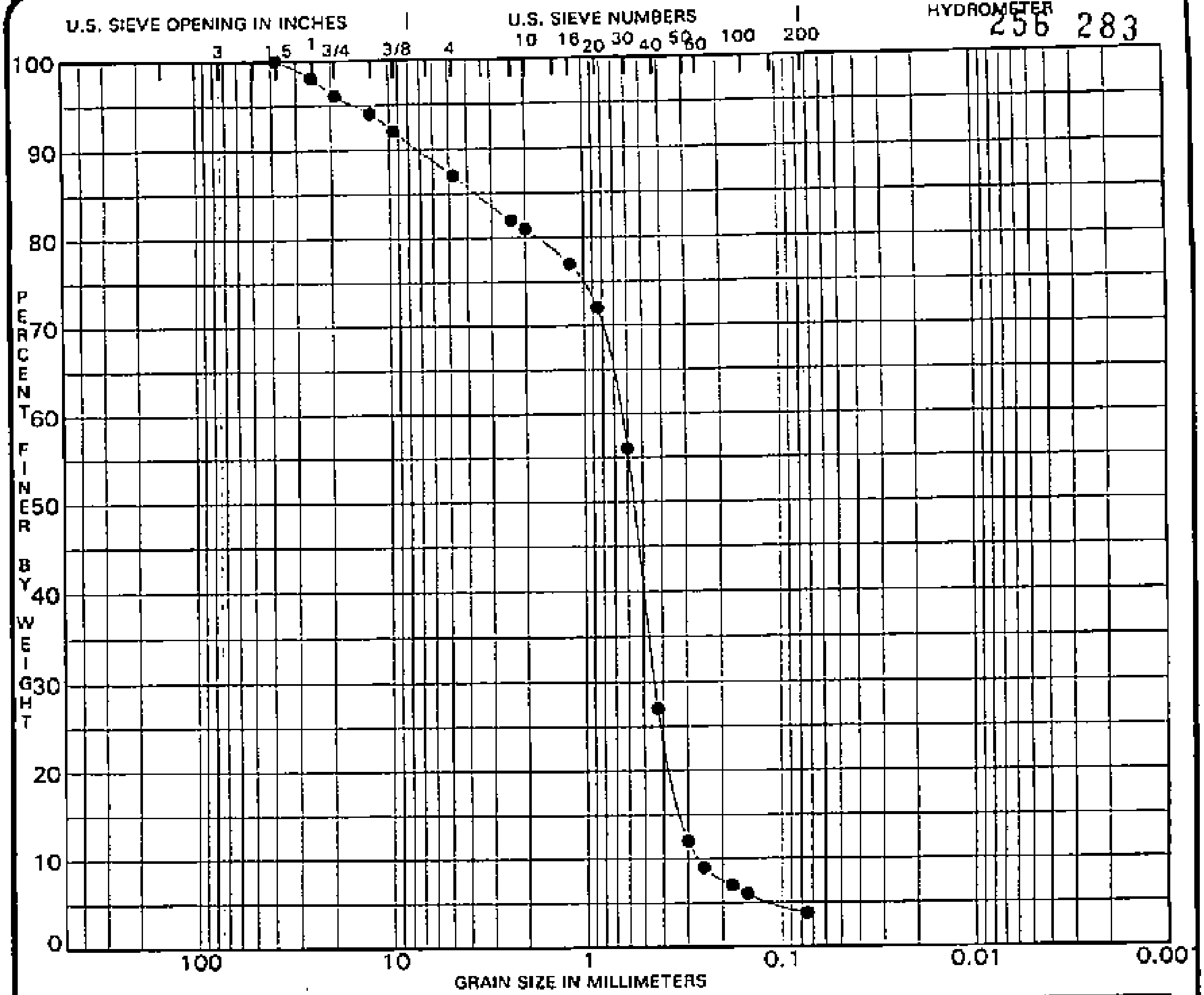

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#8	Tan Medium Sand w/a little Gravel					1.12	2.5

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#8	38.10	0.65	0.440	0.2657	13.0	83.2	3.8	

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JOB NO. CM-603-96
DATE 2/5/96

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& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below

Client CH2M Hill

Sampled by CH2M Hill

Submitted by Mr. Greg Underberg

Date Sampled 1/25/96

Date Tested 2/5/96

Lab Report No. 14852

Sample No.	#9
Source	MW-49 (88-90')
Depth	
Description of Materials	Tan Medium Sand w/Silt

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	100
1/2 inch screen	98
3/8 inch screen	98
No. 4 mesh sieve	96
No. 8 mesh sieve	95
No. 10 mesh sieve	94
No. 16 mesh sieve	94
No. 20 mesh sieve	92
No. 30 mesh sieve	87
No. 40 mesh sieve	64
No. 50 mesh sieve	31
No. 60 mesh sieve	20
No. 80 mesh sieve	11
No. 100 mesh sieve	10
No. 200 mesh sieve	6.1

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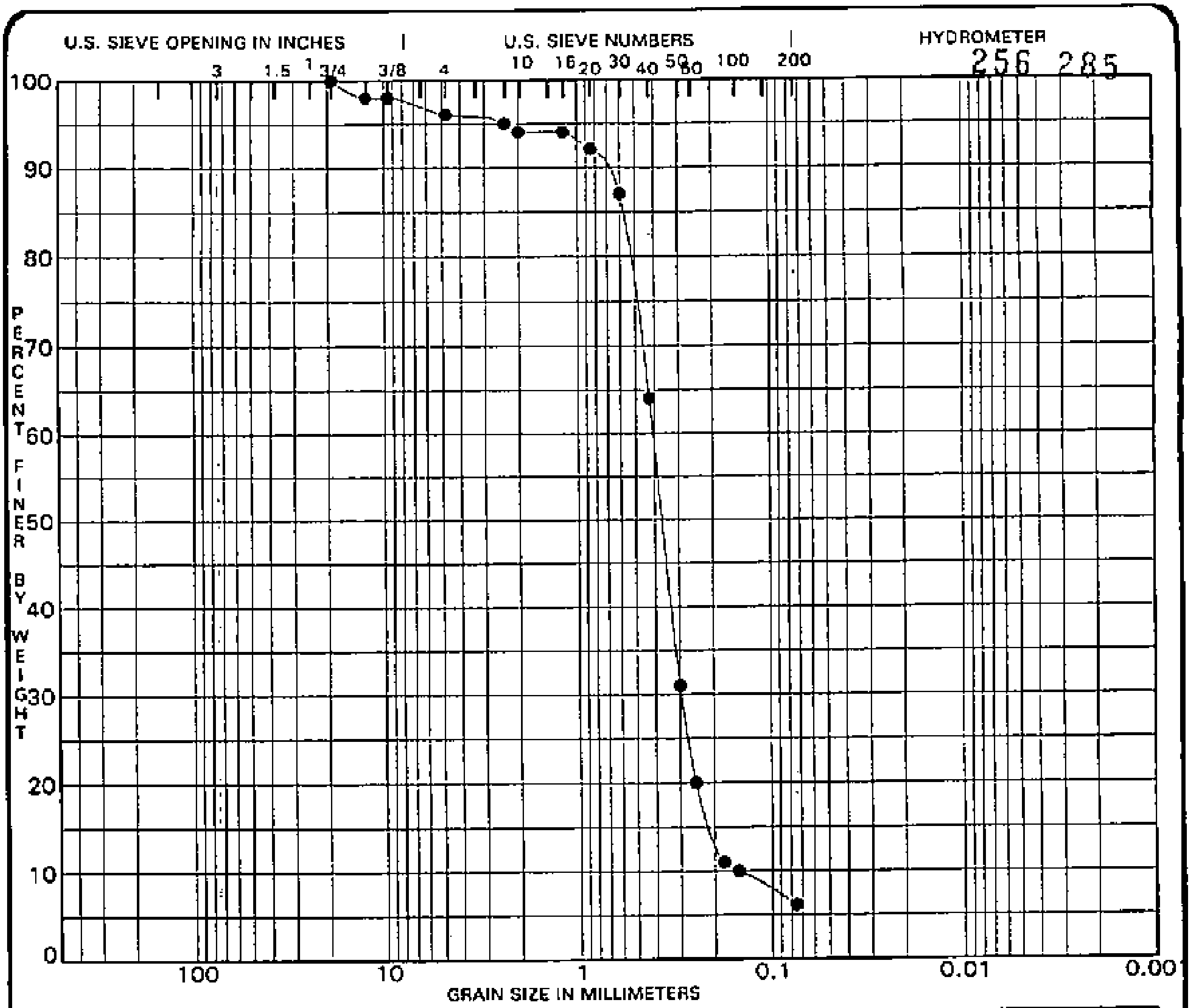
Director of Technical Services

256 285



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<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
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Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
● #9	Tan Medium Sand w/Silt					1.42	2.7

Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● #9	19.00	0.41	0.295	0.1500	4.0	89.9	6.1	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 2/5/96

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& ASSOCIATES, INC.
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below

Client CH2M Hill

Sampled by CH2M Hill

Submitted by Mr. Greg Underberg

Date Sampled 1/26/96

Date Tested 2/5/96

Lab Report No. 14853

Sample No.	#10
Source	MW-50 (120-125')
Depth	
Description of Materials	Tan Medium Sand & Gravel

SCREEN SIZES

	1 1/2	inch screen	100
	1	inch screen	98
	3/4	inch screen	94
	1/2	inch screen	85
	3/8	inch screen	78
No.	4	mesh sieve	56
No.	8	mesh sieve	35
No.	10	mesh sieve	31
No.	16	mesh sieve	23
No.	20	mesh sieve	20
No.	30	mesh sieve	16
No.	40	mesh sieve	13
No.	50	mesh sieve	9
No.	60	mesh sieve	8
No.	80	mesh sieve	6
No.	100	mesh sieve	5
No.	200	mesh sieve	3.6

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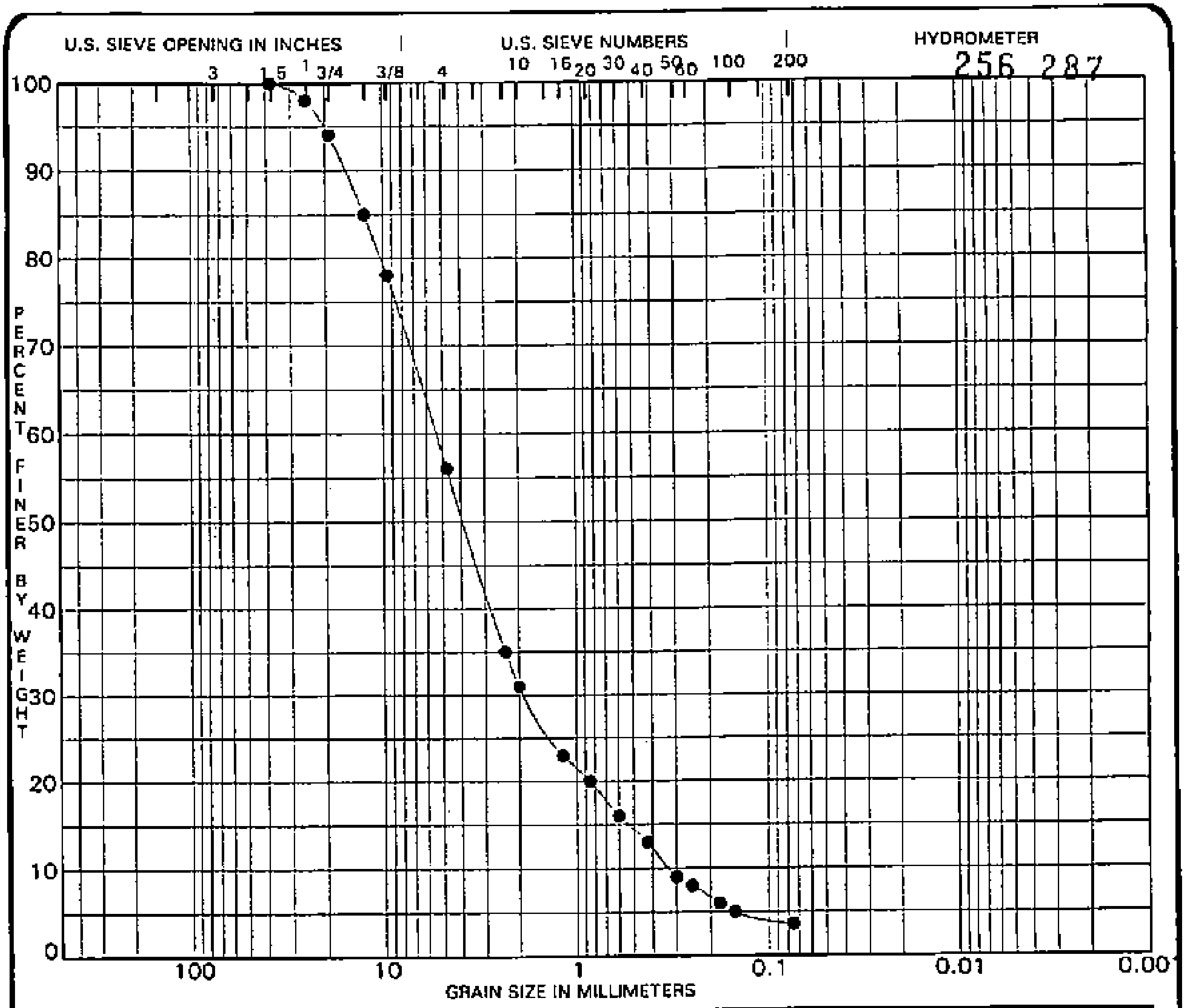

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#10	Tan Medium Sand & Gravel SW					1.99	16.5

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#10	38.10	5.39	1.872	0.3273	44.0	52.4	3.6	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 2/5/96

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/30/96 Date Tested 2/9/96 Lab Report No. 14855

Sample No.	#11
Source	MW-51 (55-60')
Depth	
Description of Materials	Tan Medium Sand w/Silt & Gravel

SCREEN SIZES

1 1/2 inch screen	100
1 inch screen	98
3/4 inch screen	96
1/2 inch screen	93
3/8 inch screen	91
No. 4 mesh sieve	85
No. 8 mesh sieve	81
No. 10 mesh sieve	80
No. 16 mesh sieve	76
No. 20 mesh sieve	71
No. 30 mesh sieve	57
No. 40 mesh sieve	36
No. 50 mesh sieve	26
No. 60 mesh sieve	23
No. 80 mesh sieve	18
No. 100 mesh sieve	16
No. 200 mesh sieve	11.0

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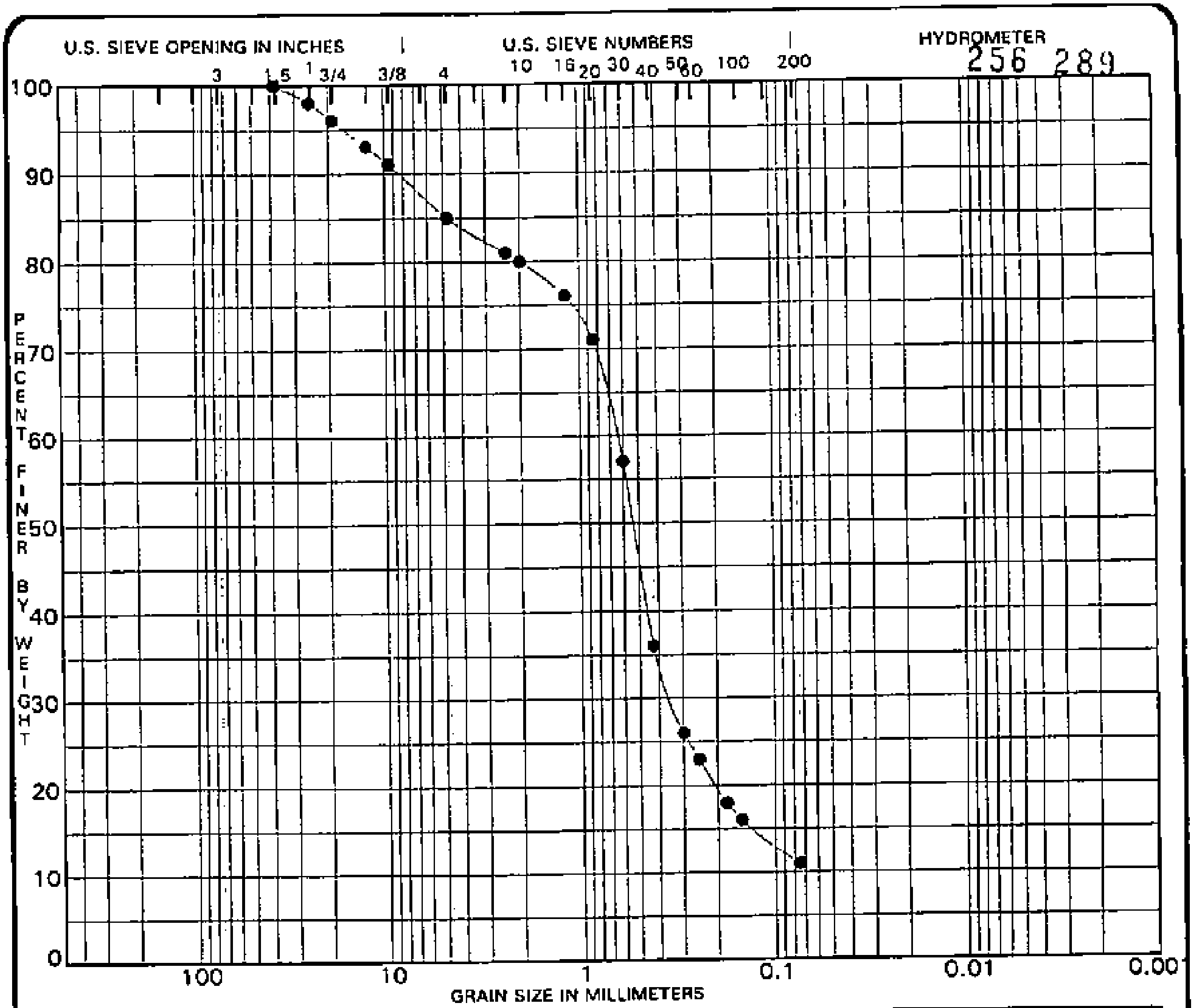

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#11	Tan Medium Sand w/Silt & Gravel					2.63	9.2

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#11	38.10	0.65	0.345		15.0	74.0	11.0	

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JOB NO. CM-603-96
DATE 2/9/96

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Greg Underberg
Date Sampled 2/6/96 Date Tested 2/9/96 Lab Report No. 14856

Sample No.	#12
Source	MW-52 (102-104')
Depth	
Description of Materials	Tan Medium Sand

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	100
No. 20 mesh sieve	99
No. 30 mesh sieve	93
No. 40 mesh sieve	54
No. 50 mesh sieve	19
No. 60 mesh sieve	14
No. 80 mesh sieve	9
No. 100 mesh sieve	7
No. 200 mesh sieve	2.6

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Director of Technical Services

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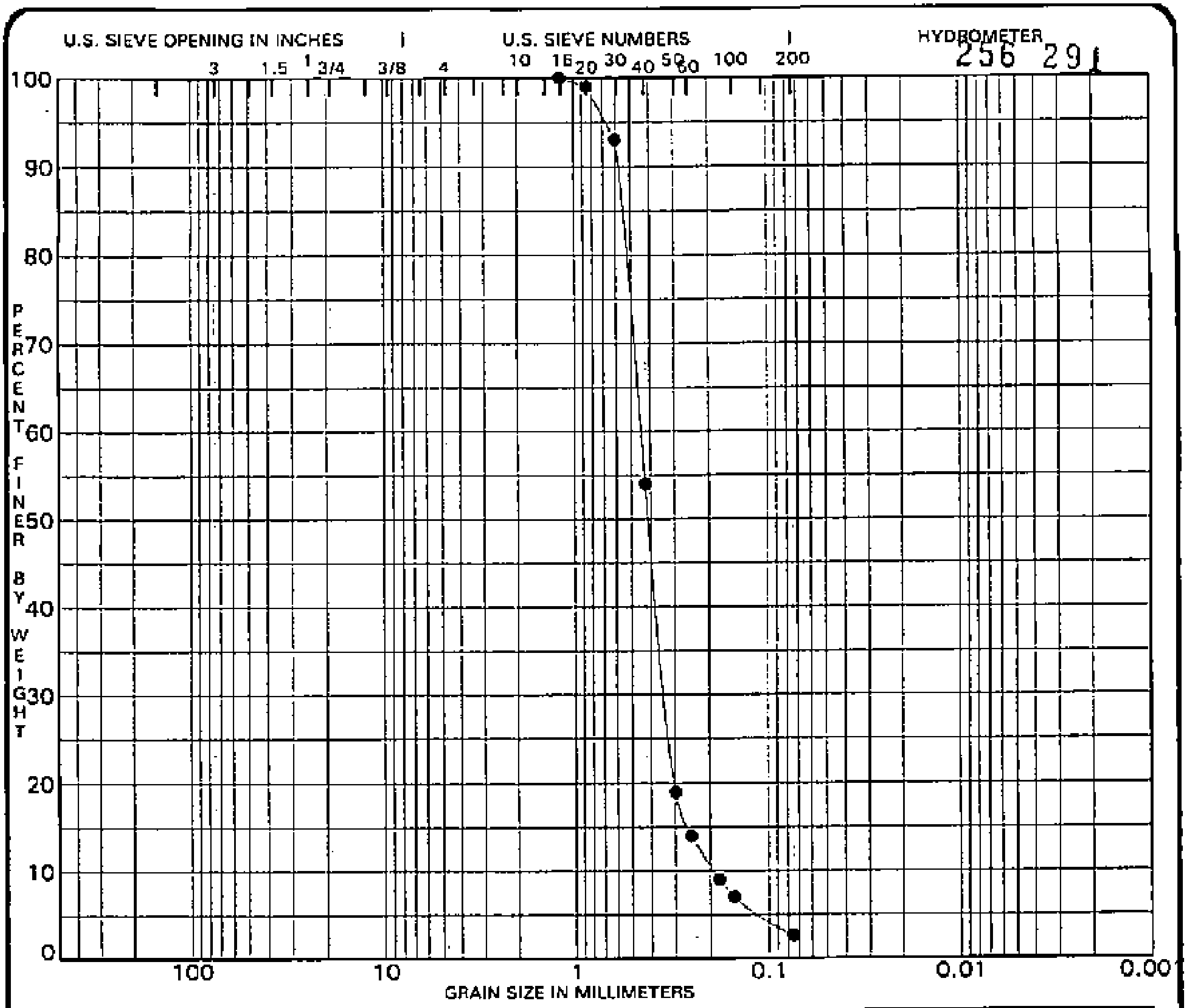

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#12	Tan Medium Sand					1.30	2.3

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#12	1.18	0.45	0.335	0.1922	0.0	97.4	2.6	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 2/9/96

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& ASSOCIATES, INC.
1211 Newell Parkway
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Steve Bruer

Date Sampled 2/15/96 Date Tested 2/29/96 Lab Report No. 38796

Sample No.	#13
Source	MW-46 (75-77.5')
Depth	
Description of Materials	Tan & Red Medium Sand

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	100
No. 4 mesh sieve	99
No. 8 mesh sieve	96
No. 10 mesh sieve	95
No. 16 mesh sieve	90
No. 20 mesh sieve	84
No. 30 mesh sieve	74
No. 40 mesh sieve	48
No. 50 mesh sieve	25
No. 60 mesh sieve	17
No. 80 mesh sieve	9
No. 100 mesh sieve	7
No. 200 mesh sieve	4.7

Jon N. Christian

Jon N. Christian
Director of Technical Services

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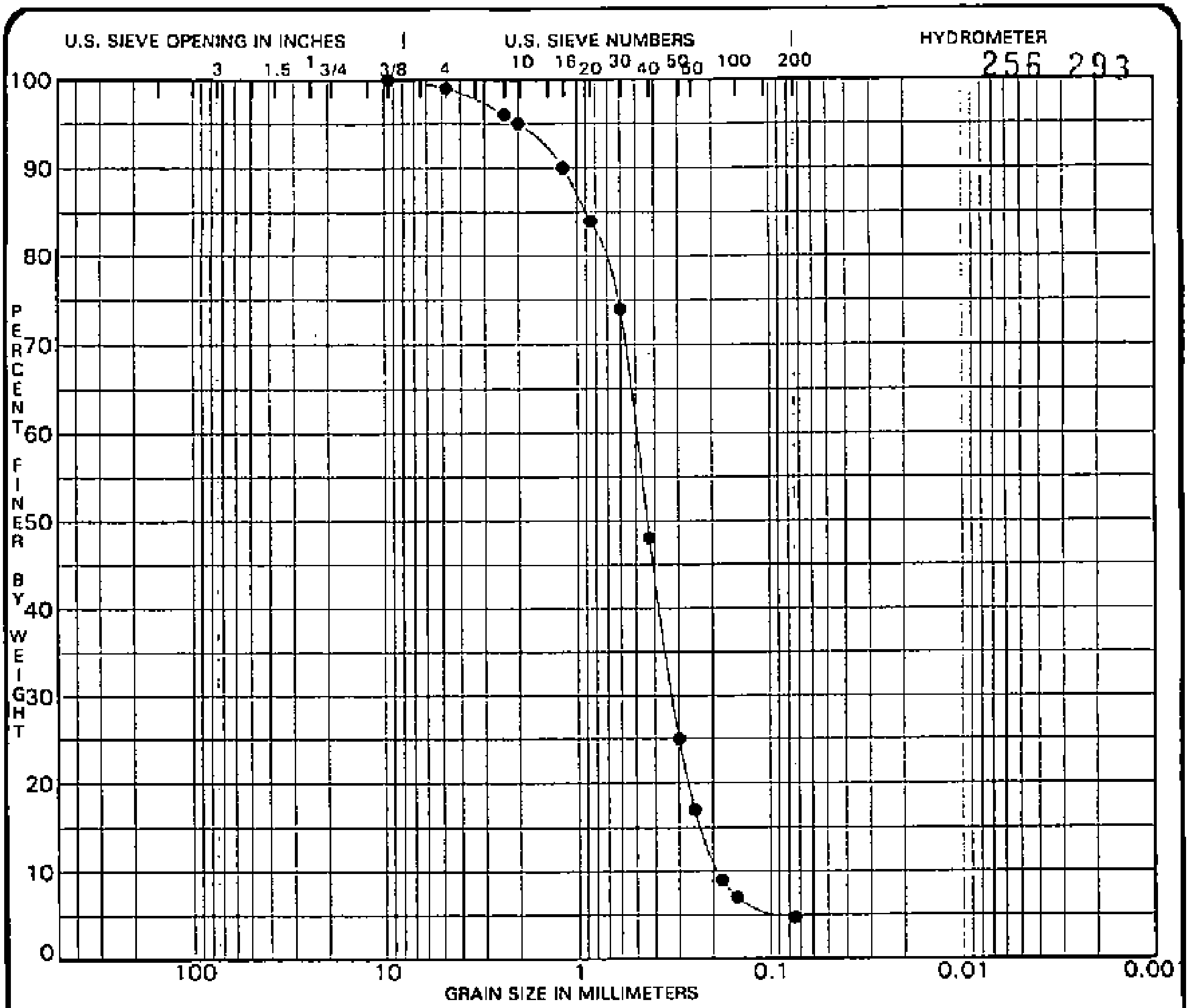

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#13	Tan & Red Medium Sand					1.12	2.7

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#13	9.50	0.50	0.324	0.1875	1.0	94.3	4.7	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 3/2/96

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Steve Bruer

Date Sampled 2/15/96 Date Tested 2/29/96 Lab Report No. 38696

Sample No. #14

Source MW-53 (82-83')

Depth

Description of Materials Tan Medium Sand w/some Gravel

SCREEN SIZES

	1 1/2	inch screen	
	1	inch screen	100
	3/4	inch screen	98
	1/2	inch screen	92
	3/8	inch screen	88
No.	4	mesh sieve	74
No.	8	mesh sieve	57
No.	10	mesh sieve	53
No.	16	mesh sieve	40
No.	20	mesh sieve	27
No.	30	mesh sieve	16
No.	40	mesh sieve	10
No.	50	mesh sieve	7
No.	60	mesh sieve	6
No.	80	mesh sieve	5
No.	100	mesh sieve	5
.No.	200	mesh sieve	4.1

Jon N. Christian
Director of Technical Services

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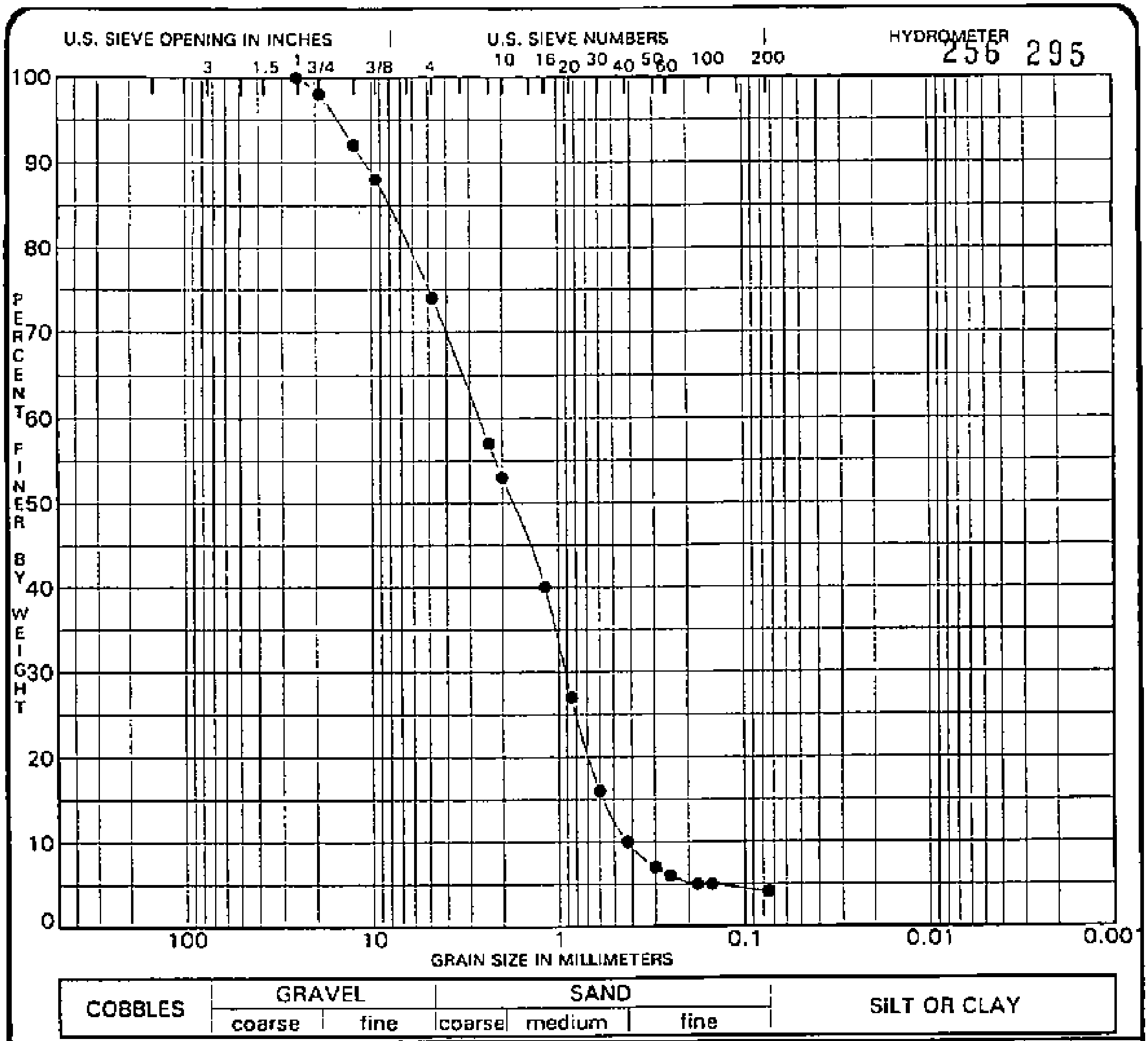
256 295



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#14	Tan Medium Sand w/some Gravel					0.74	6.3

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#14	25.00	2.67	0.917	0.4250	26.0	69.9	4.1	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 3/2/96

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

Project DDMT D04 - Memphis, TN

113630.01.ZZ

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Steve Bruer

Date Sampled 2/15/96 Date Tested 2/29/96 Lab Report No. 38896

Sample No.	#15
Source	MW-54 (93-95')
Depth	
Description of Materials	Tan Medium Sand

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	100
No. 16 mesh sieve	99
No. 20 mesh sieve	98
No. 30 mesh sieve	96
No. 40 mesh sieve	63
No. 50 mesh sieve	30
No. 60 mesh sieve	19
No. 80 mesh sieve	7
No. 100 mesh sieve	6
No. 200 mesh sieve	3.2

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Director of Technical Services

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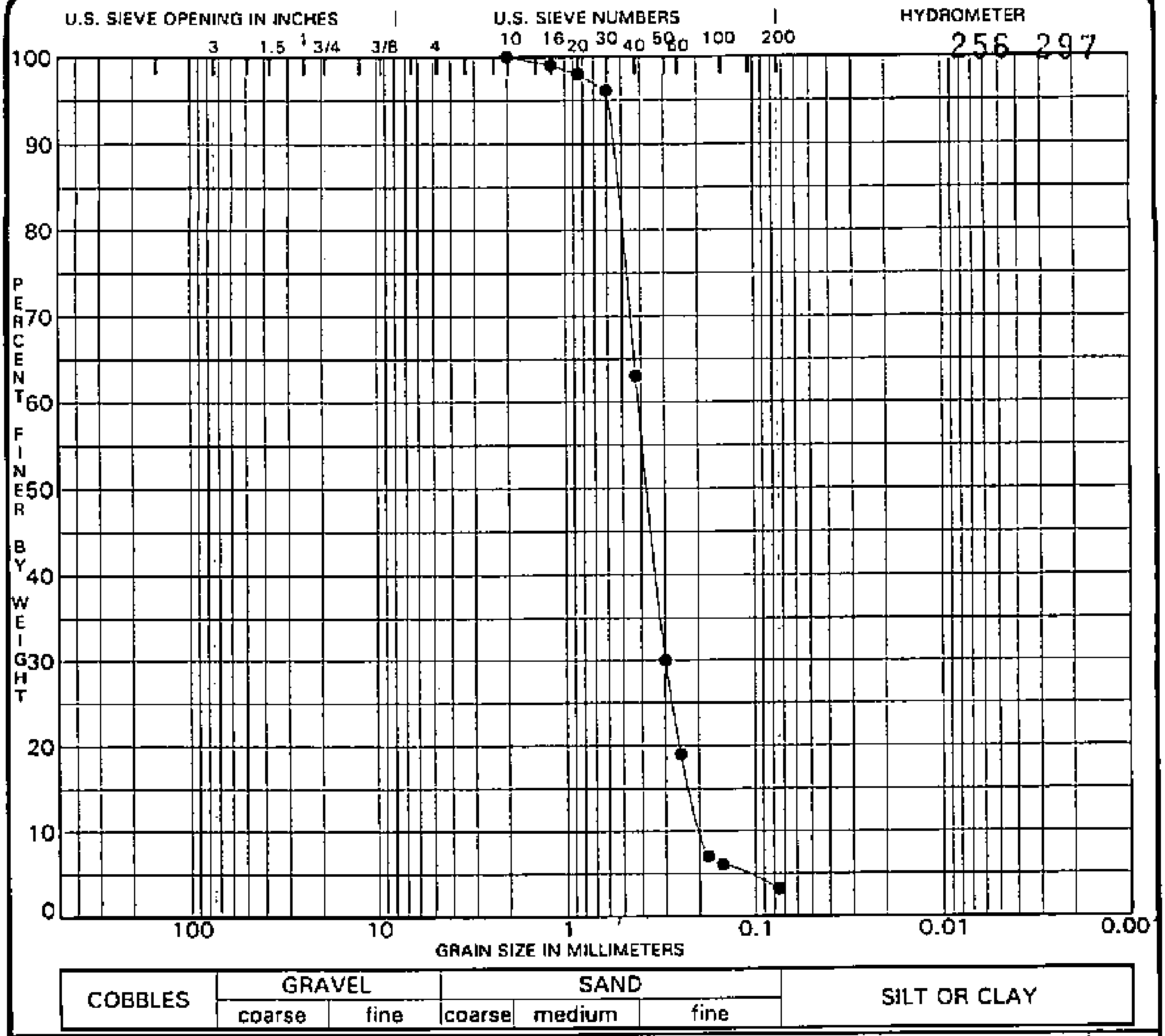
256 297



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#15	Tan Medium Sand					1.12	2.1

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#15	2.00	0.41	0.300	0.1954	0.0	96.8	3.2	

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DATE 3/2/96

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& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below

Client CH2M Hill

Sampled by CH2M Hill

Submitted by Mr. Steve Bruer

Date Sampled 2/15/96

Date Tested 2/29/96

Lab Report No. 38996

Sample No.	#16
Source	MW-55 (73-74')
Depth	
Description of Materials	Tan Medium Sand & Gravel

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	100
3/4 inch screen	95
1/2 inch screen	87
3/8 inch screen	82
No. 4 mesh sieve	69
No. 8 mesh sieve	60
No. 10 mesh sieve	58
No. 16 mesh sieve	57
No. 20 mesh sieve	55
No. 30 mesh sieve	51
No. 40 mesh sieve	42
No. 50 mesh sieve	26
No. 60 mesh sieve	19
No. 80 mesh sieve	11
No. 100 mesh sieve	10
No. 200 mesh sieve	5.8

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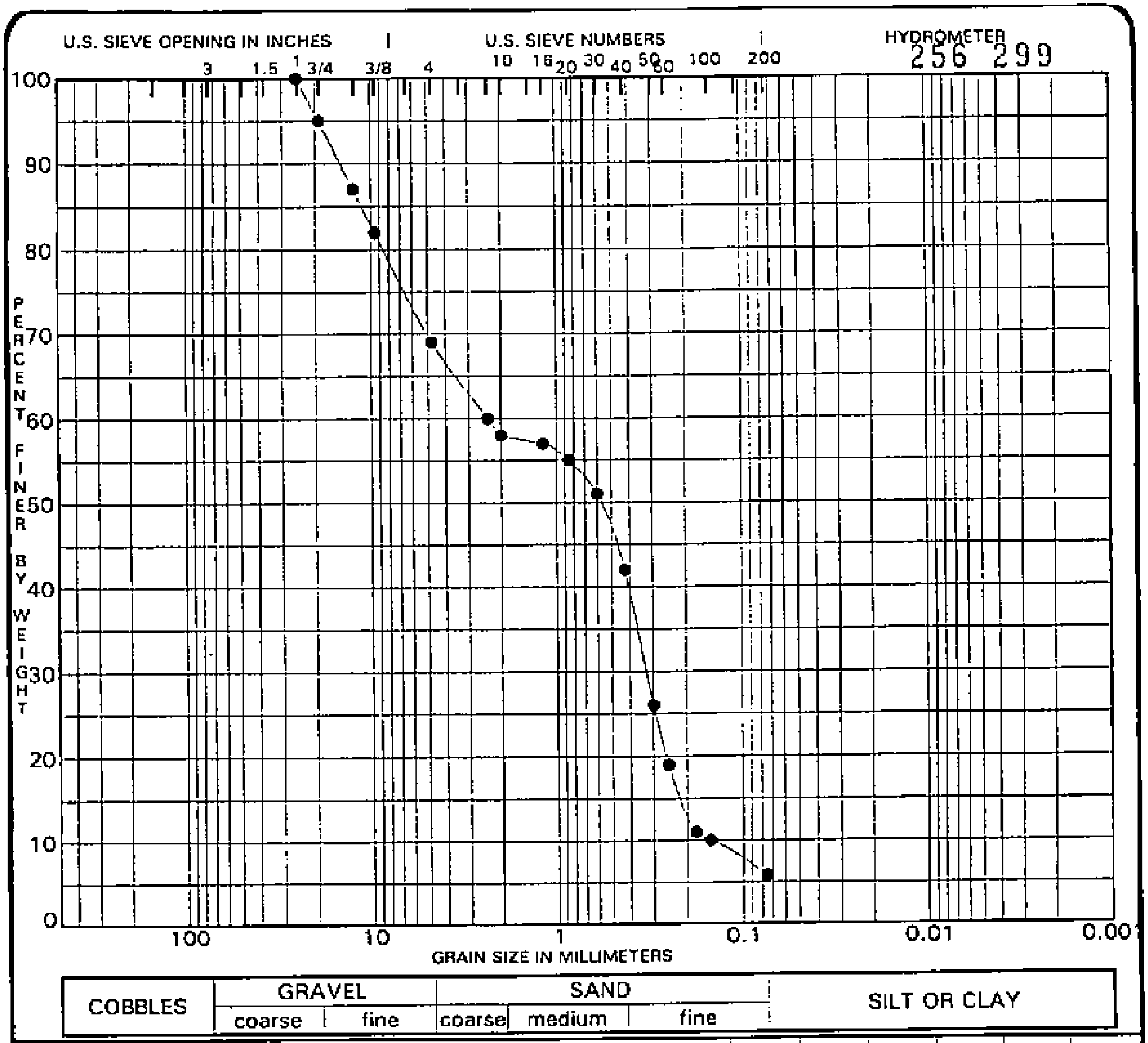
Director of Technical Services

256 299



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	#16	Tan Medium Sand & Gravel					0.30	15.7

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	#16	25.00	2.36	0.327	0.1500	31.0	63.2	5.8	

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DATE 3/2/96

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& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/12/96 Date Tested 2/23/96 Lab Report No. 14858

Sample No.	S-1
Source	MW-40 (96-98.5')
Depth	
Description of Materials	Gray Clay w/Sand

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	
No. 20 mesh sieve	
No. 30 mesh sieve	
No. 40 mesh sieve	
No. 50 mesh sieve	
No. 60 mesh sieve	
No. 80 mesh sieve	100
No. 100 mesh sieve	99
No. 200 mesh sieve	78.6

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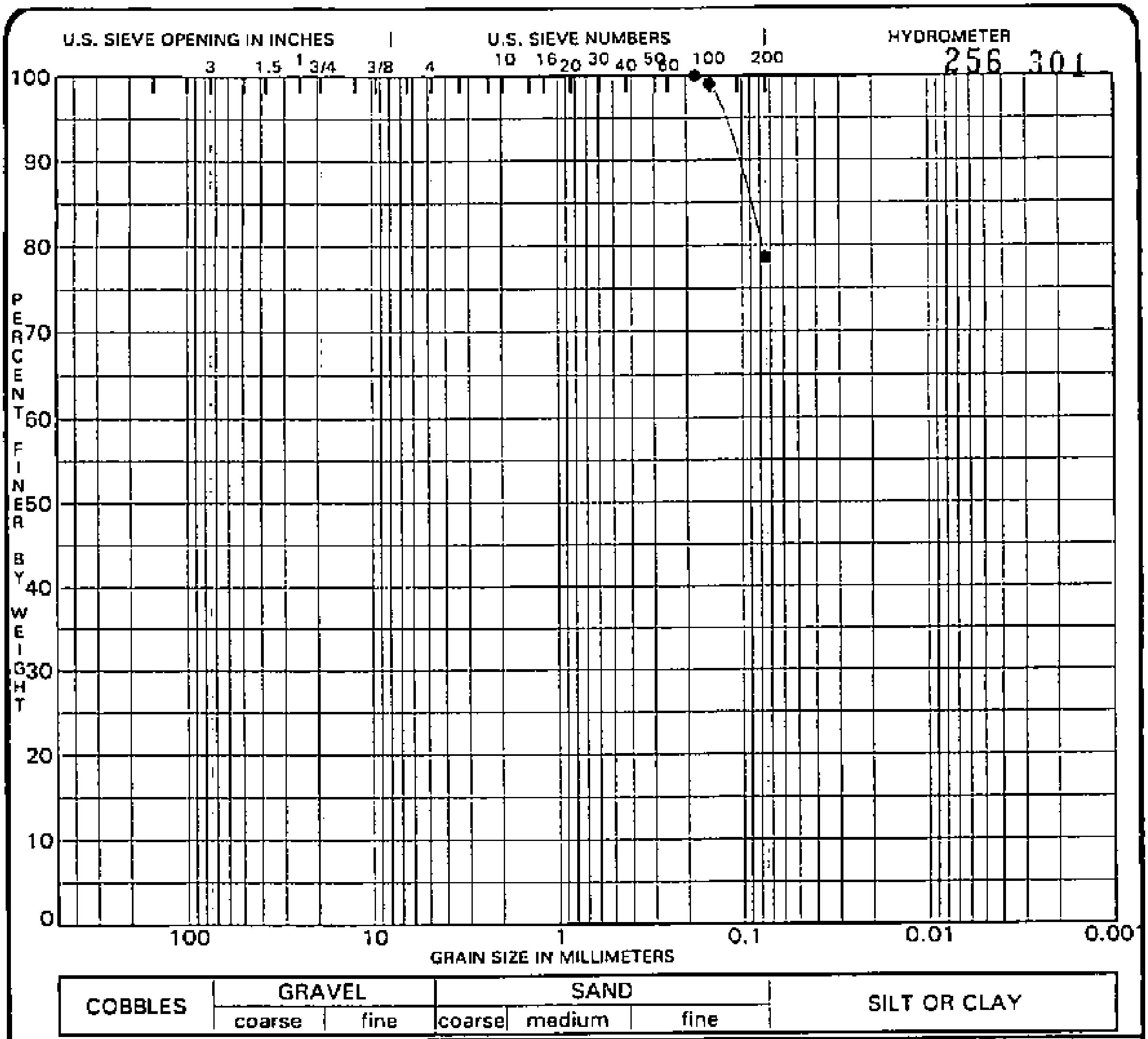

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	S-1	Gray Clay w/Sand CL		35	19	16		

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-1	0.18				0.0	21.4	78.6	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 3/4/96

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& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(205) 260-9174 FAX (205) 260-9177

Project DDMT D04 - Memphis, TN

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Greg Underberg
Date Sampled 1/12/96 Date Tested 2/23/96 Lab Report No. 14858

Sample No.	S-1
Source	MW-40 (96-98.5')
Depth	
Description of Materials	Gray Clay w/Sand

PERMEABILITY TEST RESULTS

Wet Unit Wt. (pcf)	120.4
Dry Unit Wt. (pcf)	99.7
Water Content (%)	20.8
Void Ratio	0.660
Porosity	0.398
Hydraulic Conductivity	(K) = 2.4E-08 cm/sec

NOTE : The test specimen was trimmed from a shelby tube sample to dimensions of 73.0 mm x 98.4 mm. Constant head permeability tests were completed on the sample maintaining a constant head of permeant liquid @ 305 mm, 1219 mm, and 2438 mm. The reported hydraulic conductivity is the average of 3 runs at each head differential and corrected for a temperature of 20 degrees Celsius.

Jon N. Christian
Director of Technical Services

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/13/96 Date Tested 2/25/96 Lab Report No. 14859

Sample No.	S-1(42)
Source	MW-42 (65-67.5')
Depth	
Description of Materials	Gray Clay

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	
No. 20 mesh sieve	
No. 30 mesh sieve	
No. 40 mesh sieve	
No. 50 mesh sieve	
No. 60 mesh sieve	100
No. 80 mesh sieve	99
No. 100 mesh sieve	98
No. 200 mesh sieve	94.6

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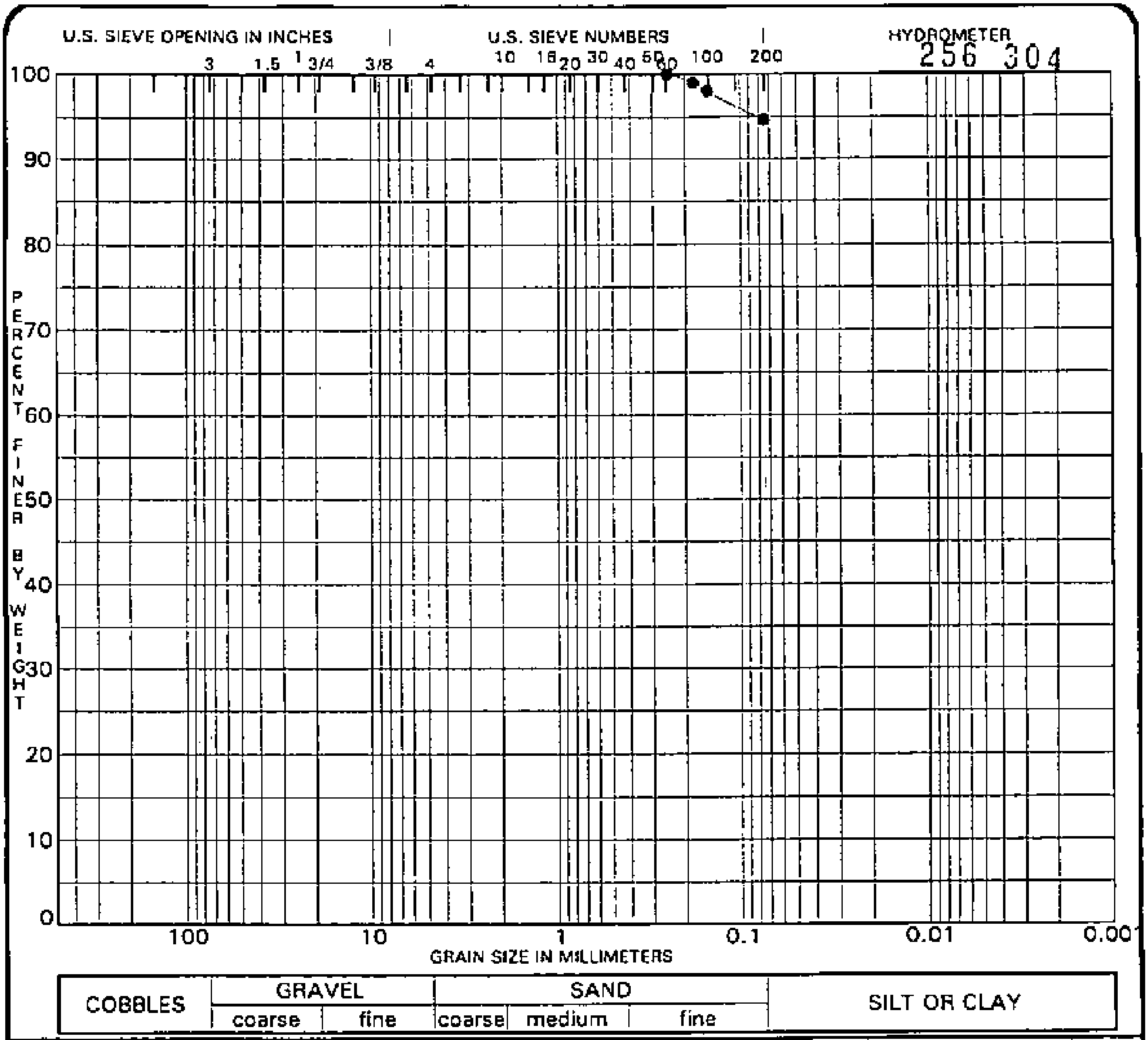
256 304



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	S-1(42)	Gray Clay CL		47	27	20		

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-1(42)	0.25				0.0	5.4	94.6	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 3/4/96

GRADATION CURVES

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(205) 260-9174 FAX (205) 260-9177

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256 305

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Greg Underberg

Date Sampled 1/13/96 Date Tested 2/25/96 Lab Report No. 14859

Sample No.	S-1(42)
Source	MW-42 (65-67.5')
Depth	
Description of Materials	Gray Clay

PERMEABILITY TEST RESULTS

Wet Unit Wt. (pcf)	117.4
Dry Unit Wt. (pcf)	92.6
Water Content (%)	26.7
Void Ratio	0.793
Porosity	0.442
Hydraulic Conductivity	(K) = 2.0E-08 cm/sec

NOTE : The test specimen was trimmed from a shelby tube sample to dimensions of 73.0 mm x 63.5 mm. Constant head permeability tests were completed on the sample maintaining a constant head of permeant liquid @ 305 mm, 1219 mm, and 2438 mm. The reported hydraulic conductivity is the average of 3 runs at each head differential and corrected for a temperature of 20 degrees Celsius.

Jon N. Christian
Director of Technical Services

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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256 306

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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Steve Bruer
Date Sampled 2/25/96 Date Tested 3/5/96 Lab Report No. 39296

Sample No. S-1(49)
Source MW-49 (90-92.5')
Depth
Description of Materials Gray Clay w/Sand

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	
No. 20 mesh sieve	
No. 30 mesh sieve	
No. 40 mesh sieve	
No. 50 mesh sieve	
No. 60 mesh sieve	100
No. 80 mesh sieve	99
No. 100 mesh sieve	95
No. 200 mesh sieve	82.4

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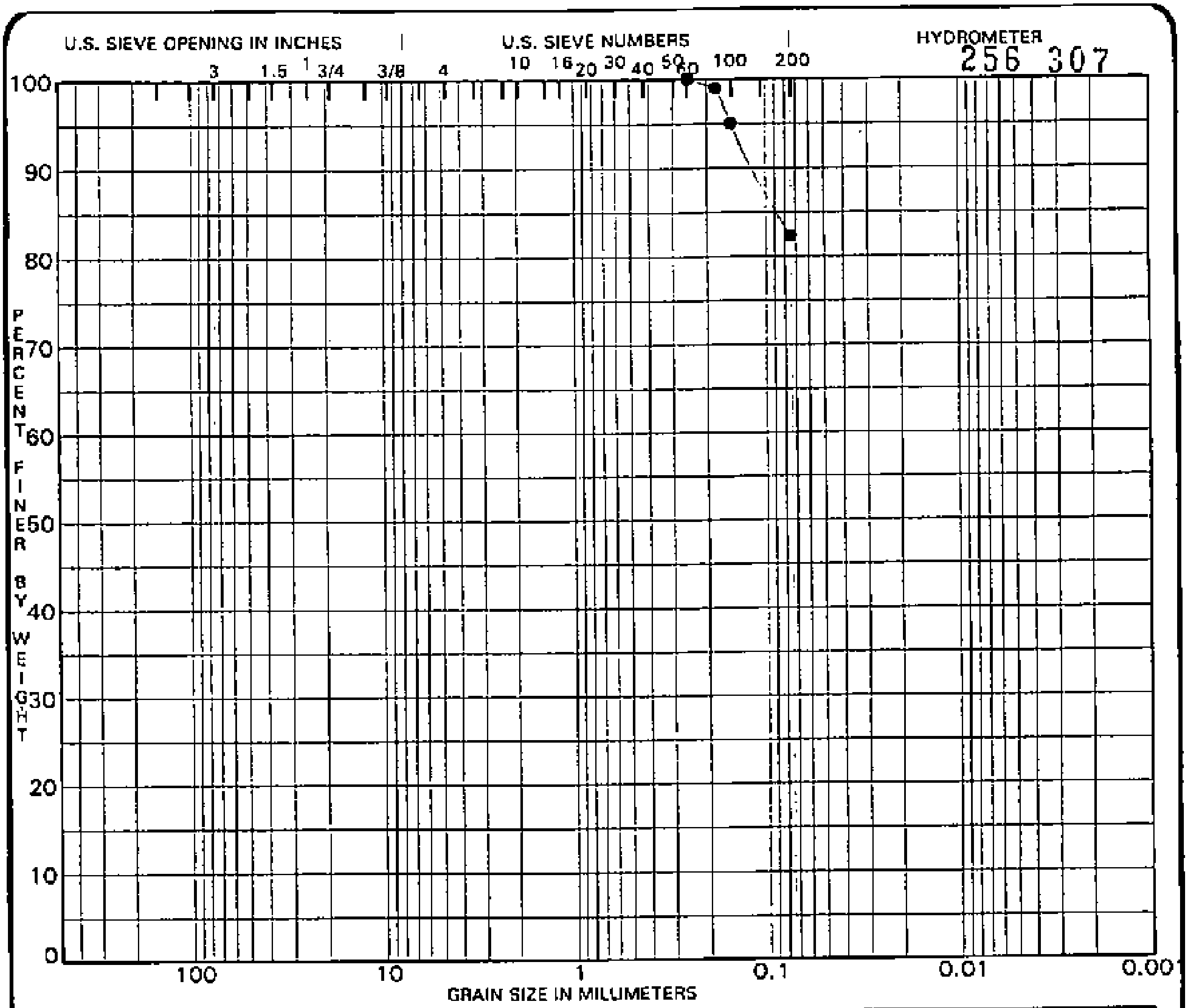

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	S-1(49)	Gray Clay w/Sand CL		41	25	16		

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-1(49)	0.25				0.0	17.6	82.4	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96

DATE 3/5/96

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110

(205) 260-9174 FAX (205) 260-9177

Project DDMT D04 - Memphis, TN

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below   Client CH2M Hill

Sampled by CH2M Hill   Submitted by Mr. Steve Bruer

Date Sampled 2/25/96   Date Tested 3/5/96   Lab Report No. 39296

Sample No.	S-1(49)
Source	MW-49 (90-92.5')
Depth	
Description of Materials	Gray Clay w/Sand

PERMEABILITY TEST RESULTS

Wet Unit Wt. (pcf)	124.6
Dry Unit Wt. (pcf)	103.5
Water Content (%)	20.4
Void Ratio	0.652
Porosity	0.395
Hydraulic Conductivity	(K) = 1.2E-08 cm/sec

NOTE : The test specimen was trimmed from a shelby tube sample to dimensions of 73.0 mm x 46.7 mm. Constant head permeability tests were completed on the sample maintaining a constant head of permeant liquid @ 305 mm, 1219 mm, and 2438 mm. The reported hydraulic conductivity is the average of 3 runs at each head differential and corrected for a temperature of 20 degrees Celsius.

Jon N. Christian
Director of Technical Services

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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256 309
113630.01.ZZ
Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Steve Bruer
Date Sampled 2/25/96 Date Tested 3/10/96 Lab Report No. 39396

Sample No.	S-1(54)
Source	MW-54 (100-101')
Depth	
Description of Materials	Gray Clay

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	
No. 20 mesh sieve	
No. 30 mesh sieve	
No. 40 mesh sieve	
No. 50 mesh sieve	
No. 60 mesh sieve	100
No. 80 mesh sieve	99
No. 100 mesh sieve	98
No. 200 mesh sieve	97.4

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Director of Technical Services

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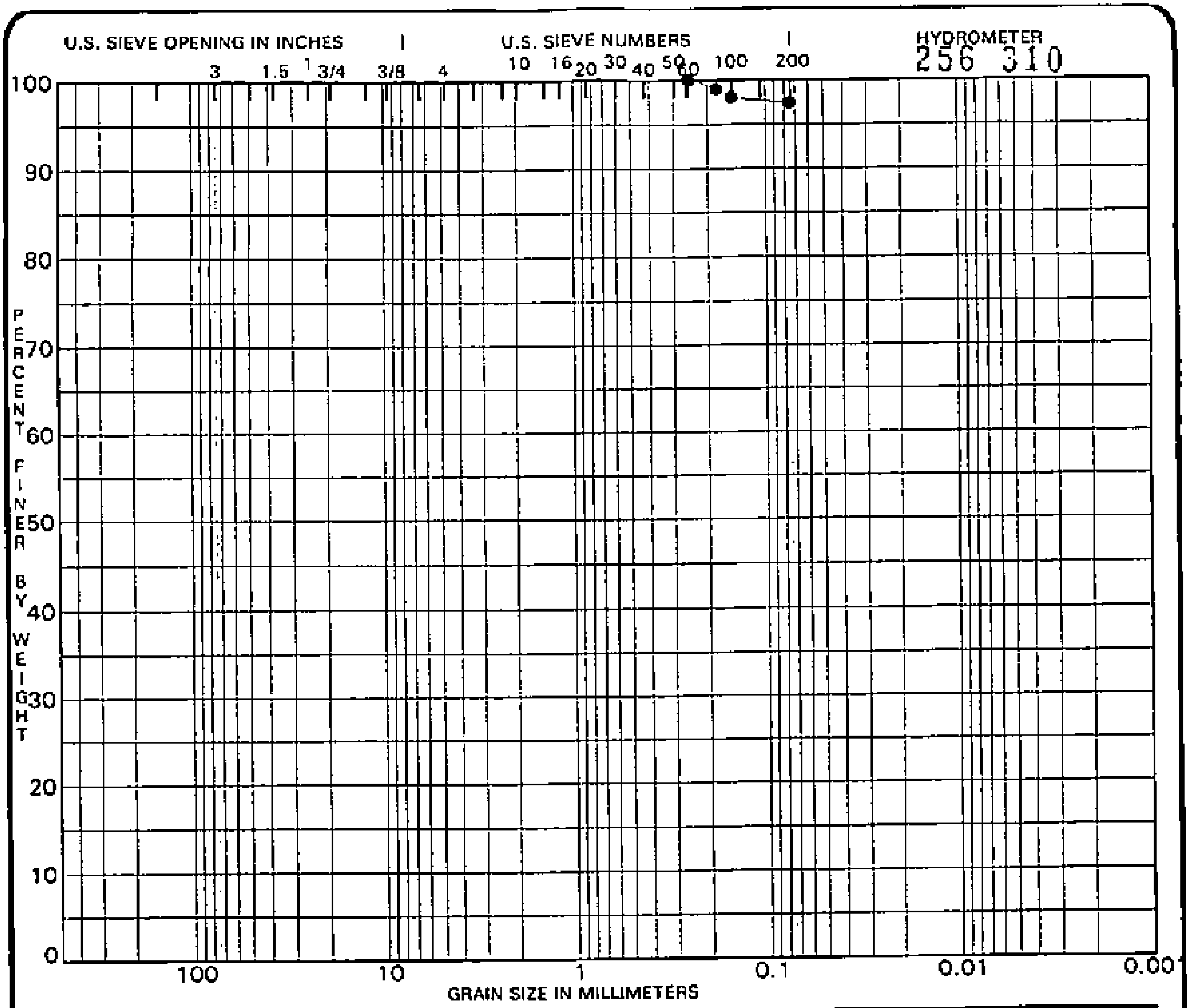

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	S-1(54)	Gray Clay CL		46	25	21		

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-1(54)	0.25				0.0	2.6	97.4	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96

DATE 3/10/96

GRADATION CURVES

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(205) 260-9174 FAX (205) 260-9177

Project DDMT D04 - Memphis, TN
256 311

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Steve Bruer
Date Sampled 2/25/96 Date Tested 3/10/96 Lab Report No. 39396

Sample No.	S-1(54)
Source	MW-54 (100-101')
Depth	
Description of Materials	Gray Clay

PERMEABILITY TEST RESULTS

Wet Unit Wt. (pcf)	123.8
Dry Unit Wt. (pcf)	97.0
Water Content (%)	27.7
Void Ratio	0.790
Porosity	0.441
Hydraulic Conductivity	(K) = 1.6E-08 cm/sec

NOTE : The test specimen was trimmed from a shelby tube sample to dimensions of 72.0 mm x 49.7 mm. Constant head permeability tests were completed on the sample maintaining a constant head of permeant liquid @ 305 mm, 1219 mm, and 2438 mm. The reported hydraulic conductivity is the average of 3 runs at each head differential and corrected for a temperature of 20 degrees Celsius.

Jon N. Christian
Director of Technical Services

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(334) 260-9174 FAX (334) 260-9177

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256 312
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Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils
Source of Material See Below Client CH2M Hill
Sampled by CH2M Hill Submitted by Mr. Steve Bruer
Date Sampled 2/25/96 Date Tested 3/13/96 Lab Report No. 39196

Sample No.	S-1(55)
Source	MW-55(u) (83-85.5')
Depth	
Description of Materials	Tan & Gray Sandy Clay

SCREEN SIZES

1 1/2 inch screen	
1 inch screen	
3/4 inch screen	
1/2 inch screen	
3/8 inch screen	
No. 4 mesh sieve	
No. 8 mesh sieve	
No. 10 mesh sieve	
No. 16 mesh sieve	
No. 20 mesh sieve	
No. 30 mesh sieve	
No. 40 mesh sieve	
No. 50 mesh sieve	100
No. 60 mesh sieve	99
No. 80 mesh sieve	98
No. 100 mesh sieve	96
No. 200 mesh sieve	68.9

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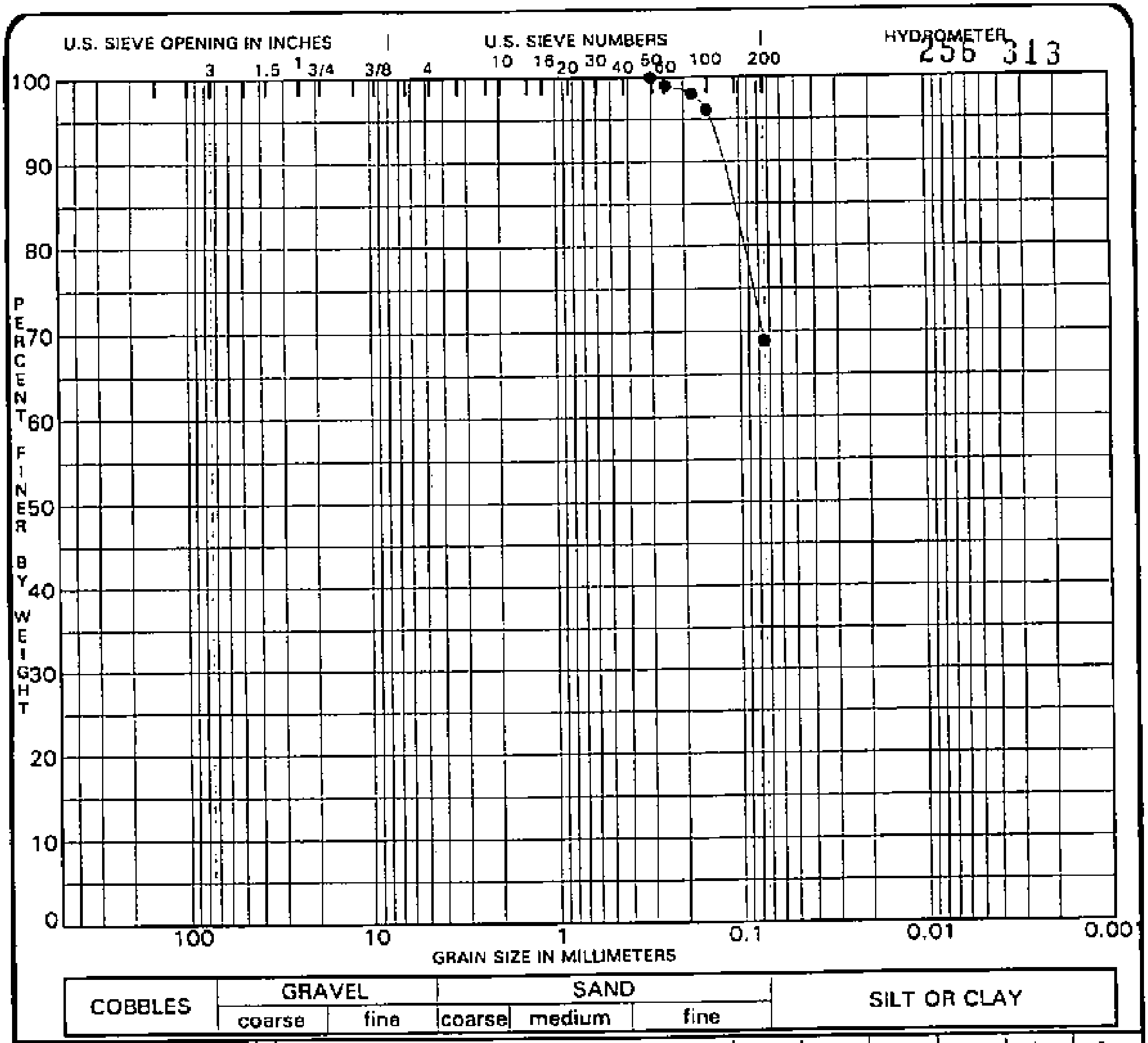
Director of Technical Services

256 313



	Sample ID	Classification	MC%	LL	PL	PI	Cc	Cu
●	S-1(55)	Tan & Gray Sandy Clay						

	Sample ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-1(55)	0.30				0.0	31.1	68.9	

PROJECT DDMT D04 - Memphis, TN

JOB NO. CM-603-96
DATE 3/13/96

GRADATION CURVES

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CHRISTIAN, CARMICHAEL
& ASSOCIATES, INC.
1211 Newell Parkway
Montgomery, Alabama 36110
(205) 260-9174 FAX (205) 260-9177

256 314

Project ODMT D04 - Memphis, TN

Our Job No. CM-603-96

REPORT OF ANALYSIS ON SAMPLE OF Subsurface Soils

Source of Material See Below Client CH2M Hill

Sampled by CH2M Hill Submitted by Mr. Steve Bruer

Date Sampled 2/25/96 Date Tested 3/13/96 Lab Report No. 39196

Sample No.	S-1(55)
Source	MW-55(u) (83-85.5')
Depth	
Description of Materials	Tan & Gray Sandy Clay

PERMEABILITY TEST RESULTS

Wet Unit Wt. (pcf)	117.5
Dry Unit Wt. (pcf)	95.7
Water Content (%)	22.8
Void Ratio	0.716
Porosity	0.417
Hydraulic Conductivity	(K) = 2.5E-07 cm/sec

NOTE : The test specimen was trimmed from a shelby tube sample to dimensions of 72.8 mm x 71.9 mm. Constant head permeability tests were completed on the sample maintaining a constant head of permeant liquid @ 305 mm, 1219 mm, and 2438 mm. The reported hydraulic conductivity is the average of 3 runs at each head differential and corrected for a temperature of 20 degrees Celsius.

Jon N. Christian
Director of Technical Services

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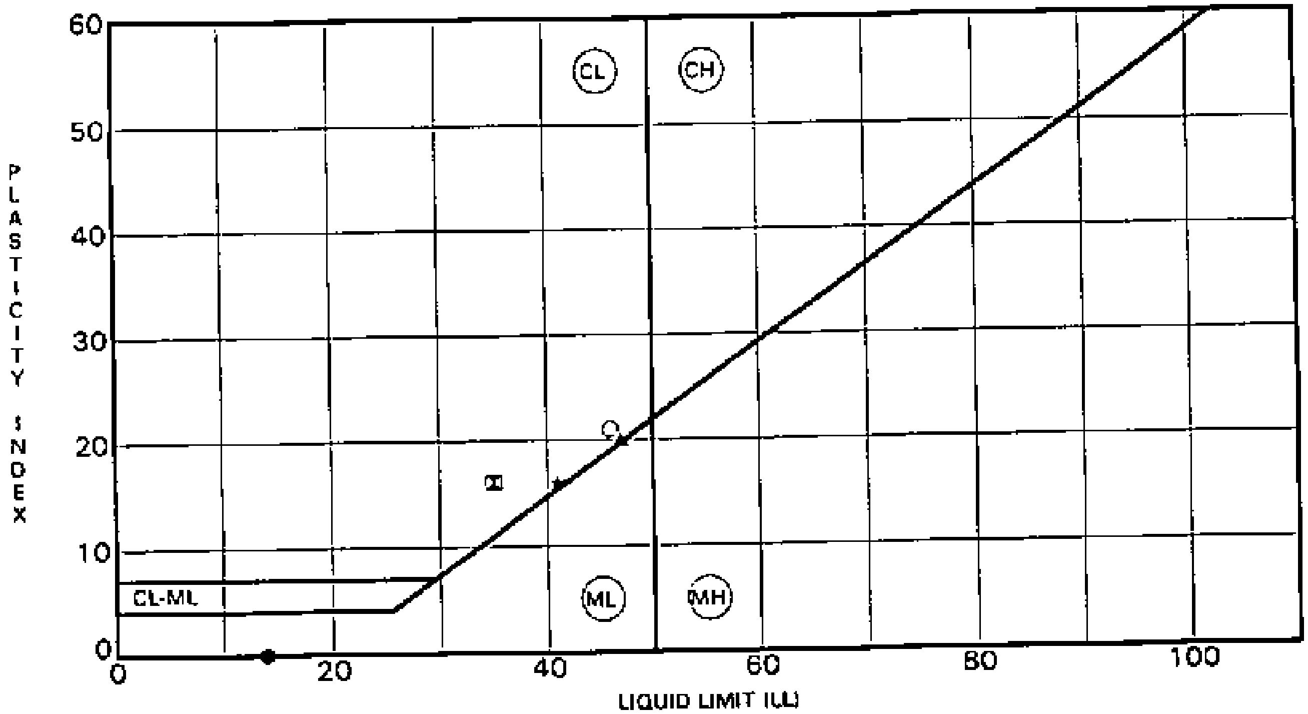


Specimen Identification		LL	PL	PI	Fines	Location
●	#1	14	16	NP	1.7	MW-41 (65-67')
⊡	S-1	35	19	16	78.6	MW-40 (96-98.5')
▲	S-1(42)	47	27	20	94.6	MW-42 (65-67.5')
*	S-1(49)	41	25	16	82.4	MW-49 (90-92.5')
○	S-1(54)	46	25	21	97.4	MW-54 (100-101')

PROJECT DDMT D04 - Memphis, TN

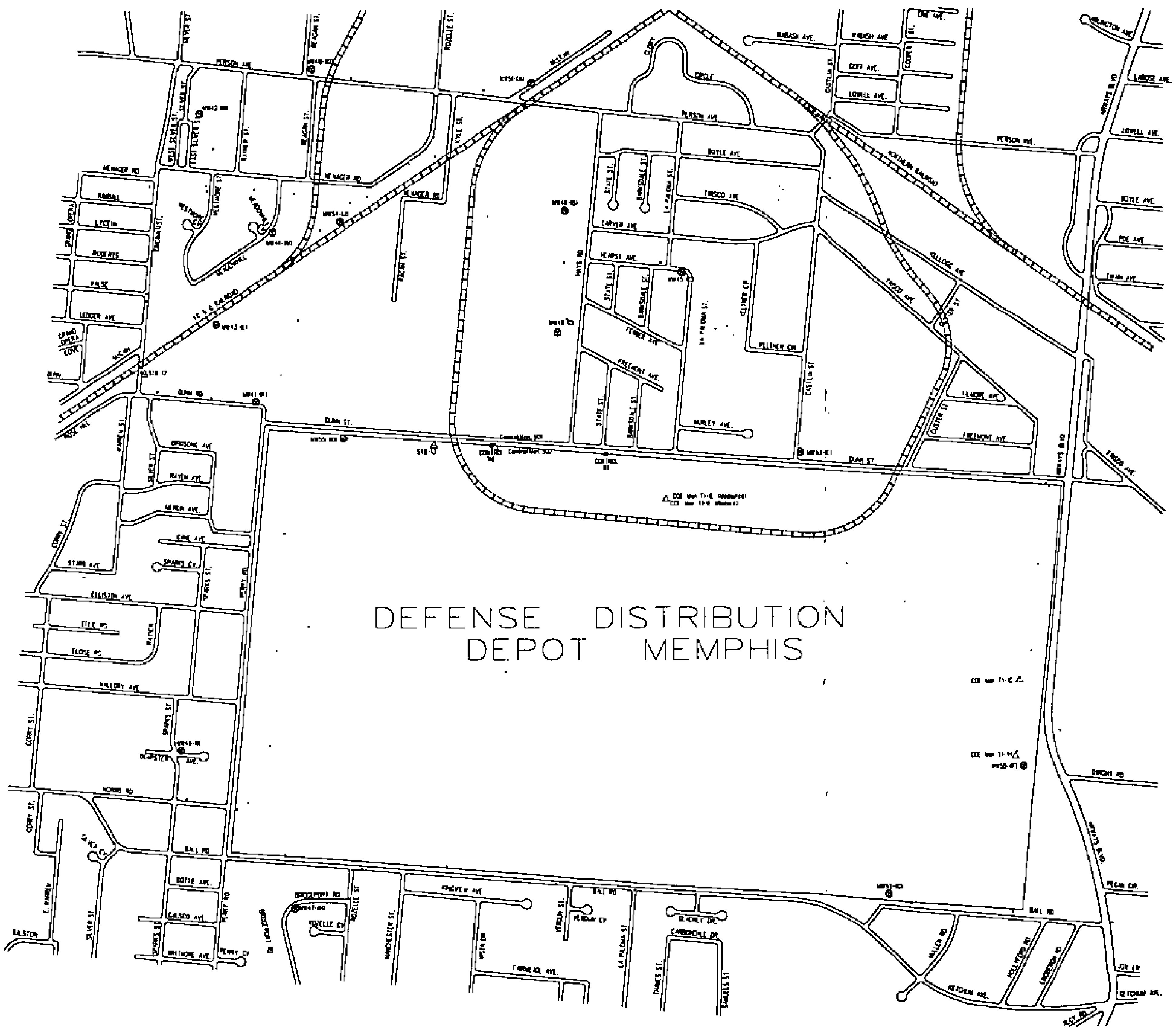
JOB NO. CM-603-96
DATE 3/18/96

ATTERBERG LIMITS' RESULTS

CHRISTIAN,CARMICHAEL & ASSOCIATES
MONTGOMERY, ALABAMA

Appendix F

Surveying Notes



MONITORING WELL, STB, & CONTROL MONUMENT DATA TABLE

	Control Grid		Elevations			Ctr. Well/Borings	
Station ID	North Coord.	East Coord.	Top Dep.	Top PVC	Ground	North Coord	East Coord
Control Mon. 301	279255.337	802504.591	319.353	------	318.5		
Control Mon. 302	279732.716	802505.003	308.877	------	308.8		
COE Mon. 11-H	276550.070	806984.370	304.280	------	304.3		
COE Mon. 11-G	277207.780	807038.450	303.170	------	303.3		
COE Mon. 11-E (Record)	278783.810	803983.650	318.72	------	318.9		
COE Mon. 11-E (Recovered)	278784.913	803983.341	318.816	------	318.9		
MW-40	282460.522	800948.728	282.513	282.75	282.4	282459.8	800950.8
MW-41	279621.835	800457.314	284.076	283.81	283.8		
MW-42	281863.821	800182.407	275.335	274.87	275.1	281864.6	800181.9
MW-43	280284.377	800111.734	285.531	285.23	285.5	280284.5	800111.1
MW-44	281073.314	800601.069	288.920	288.07	288.4	281073.7	800601.5
MW-45	280728.081	804175.990	283.148	287.81	283.1	280727.8	804175.6
MW-46	281258.805	803115.981	287.844	287.58	287.8	281258.7	803115.7
MW-47	275361.836	800780.883	306.770	306.38	306.7	275360.8	800781.1
MW-48	274616.176	799783.921	284.743	284.49	284.7	274615.4	799783.3
MW-49	280211.943	803051.314	310.805	310.49	310.7	280212.3	803050.8
MW-50	278455.807	807085.284	298.330	298.76	298.3	278455.3	807085.4
MW-51	282345.856	802828.670	275.581	275.24	275.5	282345.7	802829.3
MW-52	275371.971	805887.554	278.976	278.19	278.3	275371.4	805887.8
MW-53	278178.654	805134.046	308.741	308.38	308.7	279178.1	805133.6
MW-54	281160.404	800983.315	285.58	285.36	285.5	281159.8	800983.8
MW-55	278304.049	801204.616	282.447	282.05	282.4	278300.4	801205.3
STB-12 Boring	278880.600	799487.800	-------	------	289.2		
STB-13 Boring	279233.100	801885.600	-------	------	301.9		

Note: Elevations are based on NAVD 88 (North American Vertical Datum) and tied to NGS BM A-308 1985 located in a concrete support near the NW corner of the Airways Blvd. Bridge over the Railroad.
The Horizontal Coordinates are based on the Tennessee State Plane System, NAD 83/83 Datum and is tied to COE monuments 11-E 1975, 11-G 1975, and 11-H 1975, allocated within the Defense Depot Boundary

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NO.	DATE	REVISION	BY	APVD

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BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DEFENSE DISTRIBUTION DEPOT
MEMPHIS, TN.

FIGURE F-1
SURVEY LOCATIONS AND DATA
FOR WELLS INSTALLED IN 1996
AT DDMT

SHEET 1
DWG NO. WELLS.DGN
DATE 2/27/97
PROJ NO. 10830

DEFENSE DEPOT MEMPHIS, TENNESSEE
MONITORING WELL TABULATION

Field Work Performed - June 1996

Station ID	Control Disk North Coord.	Control Disk East Coord.	Elevations Top Disk	Elevations Top PVC	Elevations Ground	Ctr. Well/Borings North Coord.	Ctr. Well/Borings East Coord.
Control MON. 501	279233.037	802504.591	318.353	------	318.3		
Control Mon. 502	279232.716	802505.007	308.672	------	308.6		
COE Mon. T1-1H	276550.07	806994.37	304.280	------	304.3		
COE Mon. T1-1G	277207.78	807028.45	303.170	------	303.2		
COE Mon. T1-1E (Record)	278783.81	803983.65	316.72	------	316.9		
COE Mon. T1-1E (Measured)	278784.013	803983.364	316.846	------	316.9		
MW-40	282460.422	800948.226	262.513	262.25	262.4	282459.9	800948.9
MW-41	279621.635	800457.214	284.078	283.81	283.9		
MW-42	281883.921	800182.402	275.273	274.87	275.1	281884.8	800181.9
MW-43	280284.327	800111.734	285.524	285.23	285.5	280284.5	800111.1
MW-44	281073.714	800601.089	269.420	269.07	269.4	281073.2	800601.5
MW-45	280728.081	804125.990	293.146	292.81	293.1	280727.2	804125.6
MW-46	281256.805	803115.961	287.944	287.56	287.9	281256.2	803115.7
MW-47	275261.636	800780.892	306.770	306.39	306.7	275260.9	800781.1
MW-48	276616.176	799793.921	284.743	284.49	284.7	276615.4	799793.3
MW-49	280211.842	803051.314	310.805	310.49	310.7	280212.3	803050.8
MW-50	276455.807	807065.284	299.330	298.78	299.3	276455.2	807065.4
MW-51	282345.856	802828.620	275.581	275.24	275.5	282345.7	802829.2
MW-52	275371.971	805897.358	279.676	278.19	279.5	275371.4	805897.9
MW-53	279176.659	805136.048	306.741	306.38	306.7	279176.1	805135.6
MW-54	281160.104	801183.315	295.59	295.36	295.5	281159.6	801183.9
MW-55	279301.049	801204.616	292.442	292.05	292.4	279300.4	801205.3
STB-12 Boring	279860.6	799487.6	-------	------	299.2		
STB-13 Boring	279233.1	801985.6	-------	------	301.9		

Note: Elevations are based on NAVD 88 (North American Vertical Datum) and tied to NGS BM A-308 1995 located in a concrete support near the NW corner of the Airways Blvd. Bridge over the Rail Road.
The Horizontal Coordinates are based on the Tennessee State Plane System, NAD 83/93 Datum and is tied to COE Monuments T1-1E 1975, T1-1G 1975, and T1-1H 1975, all located within the Defense Depot Boundary.

```
1
********************************************
*                                          *
*              COGO3D                      *
*     3-D COORDINATE GEOMETRY              *
*                                          *
*           CH2M Hill, Inc.                *
*       2300 NW Walnut Boulevard           *
*             P.O. Box 428                 *
*       Corvallis, Oregon  97330           *
*                                          *
*            VERSION  7.50                 *
*              03-JUN-92                   *
*                                          *
*         (C) COPYRIGHT 1992               *
*          CH2M-HILL N.W.                  *
*         ALL RIGHTS RESERVED              *
*                                          *
*     RUN ON 06/26/96 08:23:20.56          *
*                                          *
*     IN:DDCTL.CGI     OUT:DDCTL.CGO       *
*                                          *
*               NOTE                       *
* This page contains valuable information  *
* that should be saved.  If it becomes     *
* necessary to rerun this analysis in the  *
* future, this page will allow retrieval   *
* of the proper program and data files.    *
********************************************
SOJ /DDMT
1
DELETE COORDINATES
(1-9999)
STORE
64 281938.836 802610.199 300.18
    64
65 282167.957 803048.810 281.81
    65
116 279237.13 802476.71
    116
117 279163.23 803469.43
    117
130 279232.564 802504.585 307.60
    130
131 279166.722 803418.185 317.30
```

```
   131
500 274089.329 807989.437 278.30
   500
503 278783.81 803983.65 316.72
   503
504 276550.07 806994.37 304.10
   504
505 277207.78 807028.45 303.01
   505
430 282229.190 802013.959 273.934
   430
431 281651.528 801783.900 287.384
   431
441 279620.93 800457.60 284.078
   441
LOCATE ANGLE
431 430 213 -116-23-41 264.705 90-00-00 187 * NAIL TP
   213   282250.7845(N)   802277.7817(E)  187(F)

430 213 212 -175-35-39 505.95 90-00-00 181 * PK & WASHER, TP
   212   282253.2000(N)   802783.7259(E)  181(F)

213 212 211 -153-57-31 402.79 90-00-00 182 * RE BAR & CAP, TP
   211   282078.0969(N)   803146.4637(E)  182(F)

212 211 209 -112-08-57.5 1229.73 90-00-00 187 *NAIL, TP
   209   280850.8185(N)   803068.8514(E)  187(F)

211 209 210 -269-33-40.5 1088.225 90-00-00 181 * PK & WASHER, TP
   210   280773.8227(N)   804154.3491(E)  181(F)

209 210 208 -89-53-44 1645.28 90-00-00 185 * CHISLED "X", TP
   208   279132.8810(N)   804034.9483(E)  185(F)

210 208 207 -269-58-31 1054.70 90-00-00 181 * PK & WASHER, TP
   207   279055.8859(N)   805086.8342(E)  181(F)

208 207 206 -179-56-30 799.49 90-00-00 181 * PK & WASHER, TP
   206   278996.7100(N)   805884.1311(E)  181(F)

207 206 205 -182-47-48 1411.26 90-00-00 181 * PK & WASHER, TP
   205   278961.0461(N)   807294.9404(E)  181(F)

206 205 204 -87-09-34.5 810.30 90-00-00 181 * PK & WASHER, TP
   204   278153.0148(N)   807234.3475(E)  181(F)
```

```
205 204 203 -186-11-07.5 1118.675 90-00-00 187 * NAIL, TP
   203   277034.9528(N)   807271.3776(E)  187(F)

204 203 202 -198-40-03 1613.62 90-00-00 181 * PK & WASHER, TP
   202   275524.1564(N)   807838.1788(E)  181(F)

203 202 201 -180-12-03.5 424.03 90-00-00 180 * 2X2 H&T, TP
   201   275127.6714(N)   807988.5155(E)  180(F)

202 201 200 -65-09-48 1122.715 90-00-00 181 * PK & WASHER, TP
   200   275207.3806(N)   806868.6337(E)  181(F)

207 208 501 178-59-02 617.335 90-00-00 183 * CONC. MON. & 4" DISK
   501   279167.0223(N)   803418.5581(E)  183(F)

208 501 502 180-56-34 915.91 90-00-00 183 * CONC. MON. & 4" DISK
   502   279232.7164(N)   802505.0071(E)  183(F)

209 211 964 71-52-22.5 554.20 90-00-00 194 * FND. 2X2 H&T, PT. #64
   964   281939.2562(N)   802609.9370(E)  194(F)

209 211 965 129-05-32 133.28 90-00-00 194 * FND. 2X2 H&T, PT. #65
   965   282168.5004(N)   803048.5312(E)  194(F)

501 502 250 180-00-00 27.25 90-00-00 187 * NAIL, TP
   250   279234.6709(N)   802477.8273(E)  187(F)

501 250 251 167-01-48 1898.845 90-00-00 194 * FND. 2X2 H&T,PT.#70
   251   278942.3115(N)   800601.6241(E)  194(F)

250 251 260 103-12-36.5 2829.23 90-00-00 180 * 2X2 H&T, TP
   260   276121.2438(N)   800386.8700(E)  180(F)

251 260 261 272-38-30.5 544.825 90-00-00 181 * PK & WASHER, TP
   261   276187.5947(N)   799846.1003(E)  181(F)

261 260 252 239-36-54 516.505 90-00-00 195 * FND. PK & WASHER, PT. #72
   252   275647.1829(N)   800591.9155(E)  195(F)

260 252 253 118-08-41 682.04 90-00-00 195 * FND. PK & WASHER, PT. #73
   253   275590.6473(N)   801271.6083(E)  195(F)

252 253 254 173-48-07.5 911.645 90-00-00 182 * RE BAR & CAP, TP
   254   275613.6065(N)   802182.9641(E)  182(F)
```

```
253 254 255 187-59-32 1957.10 90-00-00 181 * PK & WASHER, TP
   255   275390.3894(N)   804127.2929(E)  181(F)

254 255 256 175-49-50 1867.405 90-00-00 182 * RE BAR & CAP, TP
   256   275312.8521(N)   805993.0875(E)  182(F)

255 256 9200 184-28-47 881.685 90-00-00 195 * FND. PK & WASHER, PT. #200
  9200   275207.5492(N)   806868.4616(E)  195(F)

256 9200 9201 177-12-42 1122.715 90-00-00 194 * FND 2X2 H&T, PT. #201
  9201   275127.8431(N)   807988.3437(E)  194(F)

INVERSE BEARINGS
(200 201)

             BEARING     DISTANCE (FT)
FROM  200 TO  201  S 85-55-43.5 E      1122.7150

ADJUST ANGULAR ERROR
(200 201-208 501 250 251 260 252-256 9200 9201) 9201 94-04-16.5 0-00-05

           SPECIFIED RECORD CLOSING AZIMUTH =  94- 4-16.5
UNADJUSTED FIELD CLOSING AZIMUTH FROM 9200 TO 9201 =  94- 4-15.9
                    AZIMUTH MISCLOSURE =-  0- 0- 0.6

NUMBER OF TRAVERSE ANGLES =   19 OF WHICH   19 MAY BE ADJUSTED
      CORRECTION PER ANGLE =   0- 0- 0.0
ALLOWABLE CORRECTION PER ANGLE =   0- 0- 5.0

      ADJUSTMENT PERFORMED WITH GRID FACTOR =      1.0000
ADJUST TRAVERSE COMPASS
(200 201-208 501 250 251 260 252-256 9200) 200 1

TRAVERSE CLOSURE FROM 9200  TO  200     S 47-33-42.6 E      0.2402

TRAVERSE LENGTH    21459.7400     CLOSURE IS 1.0 IN    89330.5350

INVERSE BEARINGS
(430 431)

             BEARING     DISTANCE (FT)
FROM  430 TO  431  S 21-42-55.3 W      621.7882    ELEV=     13.4500

(131 130 502 501)
```

```
                  BEARING     DISTANCE (FT)
FROM  131 TO  130  N 85-52-40.4 W      915.9695   ELEV=    -9.7000

FROM  130 TO  502  N 70- 8-44.0 E       0.4488

FROM  502 TO  501  S 85-52-59.8 E      915.9908

(64 65 965 964)

                  BEARING     DISTANCE (FT)
FROM   64 TO   65  N 62-25- 6.2 E      494.8495   ELEV=   -18.3700

FROM   65 TO  965  N 27- 9-32.8 W       0.6107

FROM  965 TO  964  S 62-24-17.5 W      494.8917

(9200 200)

                  BEARING     DISTANCE (FT)
FROM 9200 TO  200  N  0- 0- 0.0 E       0.0000

(204 203)

                  BEARING     DISTANCE (FT)
FROM  204 TO  203  S  1-53-47.2 E     1118.6662

LOCATE ANGLE
200 201 9500 265-50-52.5 1037.33 90-00-00 196 * USC&GS MON. AIRWAY
   9500    274090.3338(N)    807989.9808(E)  196(F)

502 501 9503 210-00-19 682.735 90-00-00 196 * COE MON. T1-1E
   9503    278783.9739(N)    803983.8333(E)  196(F)

204 203 9504 211-35-43.5 557.535 90-00-00 196 * COE MON. T1-1H
   9504    276550.6317(N)    806995.1775(E)  196(F)

203 9504 9505 333-15-30 658.60 90-00-00 196 * COE MON. T1-1G
   9505    277208.3546(N)    807029.1561(E)  196(F)

9504 9505 9204 189-18-06 966.66 90-00-00 195 * FND PK & WASHER, PT. #204
   9204    278152.9726(N)    807234.4082(E)  195(F)

9505 9204 9203 345-50-47 1118.66 90-00-00 * FND. NAIL, PT. #203
   9203    277034.9241(N)    807271.3921(E)
```

```
ADJUST ANGULAR ERROR
(204 203 9504 9505 9204 9203) 9203 178-06-12.8 0-00-05

              SPECIFIED RECORD CLOSING AZIMUTH = 178- 6-12.8
UNADJUSTED FIELD CLOSING AZIMUTH FROM 9204 TO 9203 = 178- 6-19.5
                          AZIMUTH MISCLOSURE =  0- 0- 6.6

NUMBER OF TRAVERSE ANGLES =   5 OF WHICH   5 MAY BE ADJUSTED
     CORRECTION PER ANGLE =- 0- 0- 1.3
ALLOWABLE CORRECTION PER ANGLE =  0- 0- 5.0

     ADJUSTMENT PERFORMED WITH GRID FACTOR =    1.0000
ADJUST TRAVERSE COMPASS
(203 9504 9505 9204) 204 1

TRAVERSE CLOSURE FROM 9204  TO  204     N  2-38-58.5 W       0.0074

TRAVERSE LENGTH     2182.7950     CLOSURE IS 1.0 IN   294796.0390

INVERSE BEARINGS
(504 500 503 504 505 9505 9504 9503 9500)

                 BEARING     DISTANCE (FT)
FROM  504 TO  500  S 22- 1- 2.2 E      2654.3181    ELEV=   -25.8000

FROM  500 TO  503  N 40-28-26.5 W      6171.2625    ELEV=    38.4200

FROM  503 TO  504  S 53-25-38.0 E      3748.8704    ELEV=   -12.6200

FROM  504 TO  505  N  2-57-58.3 E       658.5924    ELEV=    -1.0900

FROM  505 TO 9505  N 50-48-52.4 E         0.9117

FROM 9505 TO 9504  S  2-57-22.3 W       658.6022

FROM 9504 TO 9503  N 53-26-16.4 W      3749.1463

FROM 9503 TO 9500  S 40-28-53.9 E      6170.8570

(251 250)

                 BEARING     DISTANCE (FT)
FROM  251 TO  250  N 81- 8-33.7 E      1898.8317
```

```
LOCATE ANGLE
430 431 214 210-36-24 495.59 90-00-00 187 * NAIL, TP
   214   281348.6121(N)   801391.6610(E)  187(F)

431 214 215 222-07-26 568.665 90-00-00 181 * PK & WASHER, TP
   215   281392.6940(N)   800824.7072(E)  181(F)

214 215 216 180-42-04.5 369.185 90-00-00 181 * PK & WASHER, TP
   216   281425.8153(N)   800457.0109(E)  181(F)

215 216 217 183-02-37 381.13 90-00-00 187 * NAIL, TP
   217   281480.1149(N)   800079.7688(E)  187(F)

216 217 218 173-29-20 533.625 90-00-00 181 * PK & WASHER, TP
   218   281495.7566(N)   799546.3731(E)  181(F)

217 218 219 91-12-51 1087.565 90-00-00 181 * PK & WASHER, TP
   219   280409.5785(N)   799491.4662(E)  181(F)

218 219 220 180-46-01 557.185 90-00-00 181 * PK & WASHER, TP
   220   279853.5304(N)   799455.8899(E)  181(F)

219 220 221 112-59-54 436.13 90-00-00 181 * PK & WASHER, TP
   221   279657.8467(N)   799845.6556(E)  181(F)

220 221 222 160-47-28 836.80 90-00-00 182 * RE BAR & CAP, TP
   222   279549.3424(N)   800675.3911(E)  182(F)

221 222 9251 269-29-49.5 611.46 90-00-00 194 * FND. 2X2 H&T, PT. #251
   9251   278942.3720(N)   800601.4304(E)  194(F)

222 9251 9250 74-12-11 1898.845 90-00-00 195 * FND. NAIL, PT. #250
   9250   279234.4918(N)   802477.6709(E)  195(F)

ADJUST ANGULAR ERROR
(207 208 210 209 211-213 431 430 214-222 9251 9250) 9250 81-08-33.7 0-00-05

              SPECIFIED RECORD CLOSING AZIMUTH =  81- 8-33.7
UNADJUSTED FIELD CLOSING AZIMUTH FROM 9251 TO 9250 =  81- 9- 1.5
                        AZIMUTH MISCLOSURE =   0- 0-27.8

NUMBER OF TRAVERSE ANGLES =   19 OF WHICH   19 MAY BE ADJUSTED
        CORRECTION PER ANGLE =-  0- 0- 1.5
ALLOWABLE CORRECTION PER ANGLE =   0- 0- 5.0
```

```
     ADJUSTMENT PERFORMED WITH GRID FACTOR =     1.0000
ADJUST TRAVERSE COMPASS
(208 210 209 211-213 431 430 214-222 9250) 250 1

TRAVERSE CLOSURE FROM 9250  TO  250     S 76-16-42.3 E       0.0258

TRAVERSE LENGTH     13948.4940     CLOSURE IS 1.0 IN    541191.5382

LOCATE ANGLE
202 203 450 40-06-02 613.89 90-00-00 196 * MW-50 4" DISK
   450   276456.3824(N)   807066.1206(E)  196(F)

204 203 9450 201-26-00 613.89 90-00-00 196
  9450   276456.3819(N)   807066.1220(E)  196(F)

206 207 453 288-00-59 130.735 90-00-00 196 * MW-53 4" DISK
   453   279176.8242(N)   805136.4221(E)  196(F)

208 207 9453 108-04-31 130.735 90-00-00 196
  9453   279176.8241(N)   805136.4224(E)  196(F)

208 210 445 27-29-48 53.79 90-00-00 196 * MW-45 4" DISK
   445   280728.0289(N)   804126.0990(E)  196(F)

209 210 9445 297-36-07 53.79 90-00-00 196
  9445   280728.0304(N)   804126.0966(E)  196(F)

210 209 449 87-29-37 639.42 90-00-00 196 * MW-49 4" DISK
   449   280211.6023(N)   803051.5389(E)  196(F)

211 209 9449 177-55-57 639.42 90-00-00 196
  9449   280211.6022(N)   803051.5403(E)  196(F)

210 209 446 272-34-25 408.50 90-00-00 196 * MW-46 4" `DISK
   446   281256.5568(N)   803115.9926(E)  196(F)

211 209 9446 3-00-48 408.50 90-00-00 196
  9446   281256.5563(N)   803115.9975(E)  196(F)

211 212 451 270-06-06 102.66 90-00-00 196 * MW-51 4" DISK
   451   282345.5326(N)   802828.4569(E)  196(F)

213 212 9451 116-08-30 102.66 90-00-00 196
  9451   282345.5340(N)   802828.4539(E)  196(F)
```

```
501 250 455 178-51-01 1274.57 90-00-00 196 * MW-55 4" DISK
   455   279300.4874(N)   801205.0457(E)  196(F)

251 250 9455 11-49-13 1274.57 90-00-00 196
  9455   279300.4853(N)   801205.0456(E)  196(F)

260 261 448 256-10-04 430.87 90-00-00 196 * MW-48 4" DISK
   448   276615.4087(N)   799794.8739(E)  196(F)

252 253 74 258-38-58 256.02 90-00-00 196
    74   275336.2094(N)   801301.1399(E)  196(F)

253 74 447 268-21-33 524.475 90-00-00 196 * MW-47 4" DISK
   447   275261.0775(N)   800782.0742(E)  196(F)

255 256 452 29-47-38 112.04 90-00-00 196 * MW-52 4" DISK
   452   275372.3531(N)   805898.4182(E)  196(F)

200 256 9452 205-19-04 112.04 90-00-00 196
  9452   275372.3591(N)   805898.4219(E)  196(F)

214 215 454 28-34-08 427.75 90-00-00 196 * MW-54 4" DISK
   454   281159.5014(N)   801183.4027(E)  196(F)

214 215 440 272-09-09 1074.32 90-00-00 196 * MW-40 4" DISK
   440   282459.7503(N)   800948.0792(E)  196(F)

214 215 444 120-31-46 389.94 90-00-00 196 * MW-44 4" DISK
   444   281073.0058(N)   800601.2047(E)  196(F)

216 215 9444 299-49-38 389.94 90-00-00 196
  9444   281073.0004(N)   800601.2123(E)  196(F)

216 217 230 259-09-02 276.92 90-00-00 181 * PK & WASHER, TP
   230   281756.5184(N)   800066.8922(E)  181(F)

218 217 9230 85-39-43 276.92 90-00-00 181
  9230   281756.5184(N)   800066.8915(E)  181(F)

217 230 442 225-02-16 171.37 90-00-00 196 * MW-42 4" DISK
   442   281883.1194(N)   800182.3905(E)  196(F)

219 220 443 53-04-53 784.49 90-00-00 196 * MW-43 4" DISK
   443   280283.5445(N)   800112.0047(E)  196(F)
```

```
221 220 9443 300-04-56 784.49 90-00-00 196
   9443   280283.5576(N)   800111.9961(E)  196(F)

219 220 312 74-55-12 32.52 90-00-00 586 * BORING STB-12
   312   279859.6956(N)   799487.9272(E)  586(F)

117 116 313 175-13-34 490.66 90-00-00 586 * BORING STB-13
   313   279232.7067(N)   801986.0699(E)  586(F)

502 501 9503 210-00-19 682.735 90-00-00 196 * COE MON.T1-1E 1975
   9503   278783.9739(N)   803983.8333(E)  196(F)

LOCATE AZIMUTH
450 650 171-00-00 0.65 90-00-00 581 * MW-50
   650   276455.7404(N)   807066.2223(E)  581(F)

453 653 218-00-00 0.65 90-00-00 581 * MW-53
   653   279176.3120(N)   805136.0219(E)  581(F)

445 645 201-00-00 0.95 90-00-00 581 * MW-45
   645   280727.1420(N)   804125.7585(E)  581(F)

446 646 207-00-00 0.65 90-00-00 581 * MW-46
   646   281255.9777(N)   803115.6975(E)  581(F)

449 649 315-00-00 0.70 90-00-00 581 * MW-49
   649   280212.0973(N)   803051.0439(E)  581(F)

451 651 104-00-00 0.60 90-00-00 581 * MW-51
   651   282345.3874(N)   802829.0391(E)  581(F)

455 655 134-00-00 0.90 90-00-00 581 * MW-55
   655   279299.8622(N)   801205.6931(E)  581(F)

448 648 217-00-00 0.95 90-00-00 581 * MW-48
   648   276614.6500(N)   799794.3022(E)  581(F)

452 652 140-00-00 0.80 90-00-00 581 * MW-52
   652   275371.7403(N)   805898.9324(E)  581(F)

454 654 130-00-00 0.80 90-00-00 581 * MW-54
   654   281158.9871(N)   801184.0156(E)  581(F)

440 640 129-00-00 0.85 90-00-00 581 * MW-40
   640   282459.2154(N)   800948.7397(E)  581(F)
```

```
444 644 140-00-00 0.60 90-00-00 581 * MW-44
   644   281072.5461(N)   800601.5904(E)  581(F)

442 642 331-00-00 1.00 90-00-00 581 * MW-42
   642   281883.9941(N)   800181.9057(E)  581(F)

443 643 282-00-00 0.65 90-00-00 581 * MW-43
   643   280283.6796(N)   800111.3689(E)  581(F)

447 647 165-00-00 0.75 90-00-00 581 * MW-47
   647   275260.3530(N)   800782.2683(E)  581(F)

CONVERT MERIDIAN
 (9504 9505 9503 200-222 230 250-256 260 261 312 313 430 431 440-455
640 642-655 501 502) (504 9505 9503 200-222 230 250-256 260 261 312
313 430 431 440-455 640 642-656 501 502) 9504 504 0-00-38 1.00002
                        SHIFT = 235-41- 3.7         0.9938
                 CONVERSION ANGLE =  0- 0-38.0
                    SCALE FACTOR = 0.100002000E+01

LIST COORDINATES
(500-505 9500-9505)
   500   274089.3290(N)   807989.4370(E)     278.3000(Z)

   501   279233.0370(N)   802504.5907(E)  183(F)

   502   279232.7164(N)   802505.0071(E)  183(F)

   503   278783.8100(N)   803983.6500(E)     316.7200(Z)

   504   276550.0700(N)   806994.3700(E)  196(F)

   505   277207.7800(N)   807028.4500(E)     303.0100(Z)

  9500    274090.3338(N)   807989.9808(E)  196(F)

  9503    278784.0131(N)   803983.3637(E)  196(F)

  9504    276550.6303(N)   806995.1908(E)  196(F)

  9505    277207.8027(N)   807028.4577(E)  196(F)

 (440-455 640-655)
   440   282460.4222(N)   800948.2261(E)  196(F)
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441	279621.6355(N)	800457.2142(E)	284.0780(Z)
442	281883.9209(N)	800182.4159(E)	196(F)
443	280284.3269(N)	800111.7340(E)	196(F)
444	281073.7138(N)	800601.0893(E)	196(F)
445	280728.0807(N)	804125.9904(E)	196(F)
446	281256.8053(N)	803115.9612(E)	196(F)
447	275261.6361(N)	800780.8916(E)	196(F)
448	276616.1763(N)	799793.9212(E)	196(F)
449	280211.8417(N)	803051.3137(E)	196(F)
450	276455.8072(N)	807065.2838(E)	196(F)
451	282345.8558(N)	802828.6204(E)	196(F)
452	275371.9714(N)	805897.3583(E)	196(F)
453	279176.6589(N)	805136.0480(E)	196(F)
454	281160.1039(N)	801183.3149(E)	196(F)
455	279301.0488(N)	801204.6157(E)	196(F)
640	282459.8872(N)	800948.8866(E)	581(F)
642	281884.7956(N)	800181.9313(E)	581(F)
643	280284.4622(N)	800111.0982(E)	581(F)
644	281073.2541(N)	800601.4749(E)	581(F)
645	280727.1939(N)	804125.6498(E)	581(F)
646	281256.2262(N)	803115.6660(E)	581(F)
647	275260.9116(N)	800781.0856(E)	581(F)

648	276615.4177(N)	799793.3493(E)	581(F)
649	280212.3368(N)	803050.8188(E)	581(F)
650	276455.1652(N)	807065.3854(E)	581(F)
651	282345.7105(N)	802829.2026(E)	581(F)
652	275371.3584(N)	805897.8725(E)	581(F)
653	279176.1467(N)	805135.6477(E)	581(F)
654	281159.5896(N)	801183.9276(E)	581(F)
655	279300.4235(N)	801205.2630(E)	581(F)

EOR
I

CH2MHILL

JOB NO.: 113630.08 ZZ PAGE: 1 of 5
BY: Kw DATE: 6-04-96

Defense Depot Memphis Tn
DDMT

113630.08 ZZ

Resurvey Hori & Vert.
Control, done by Toles
& Assoc. (Richard Phillips)
for 16 Wells & 2 Soil
Borings

Wild TC 1600
Wild NA-2

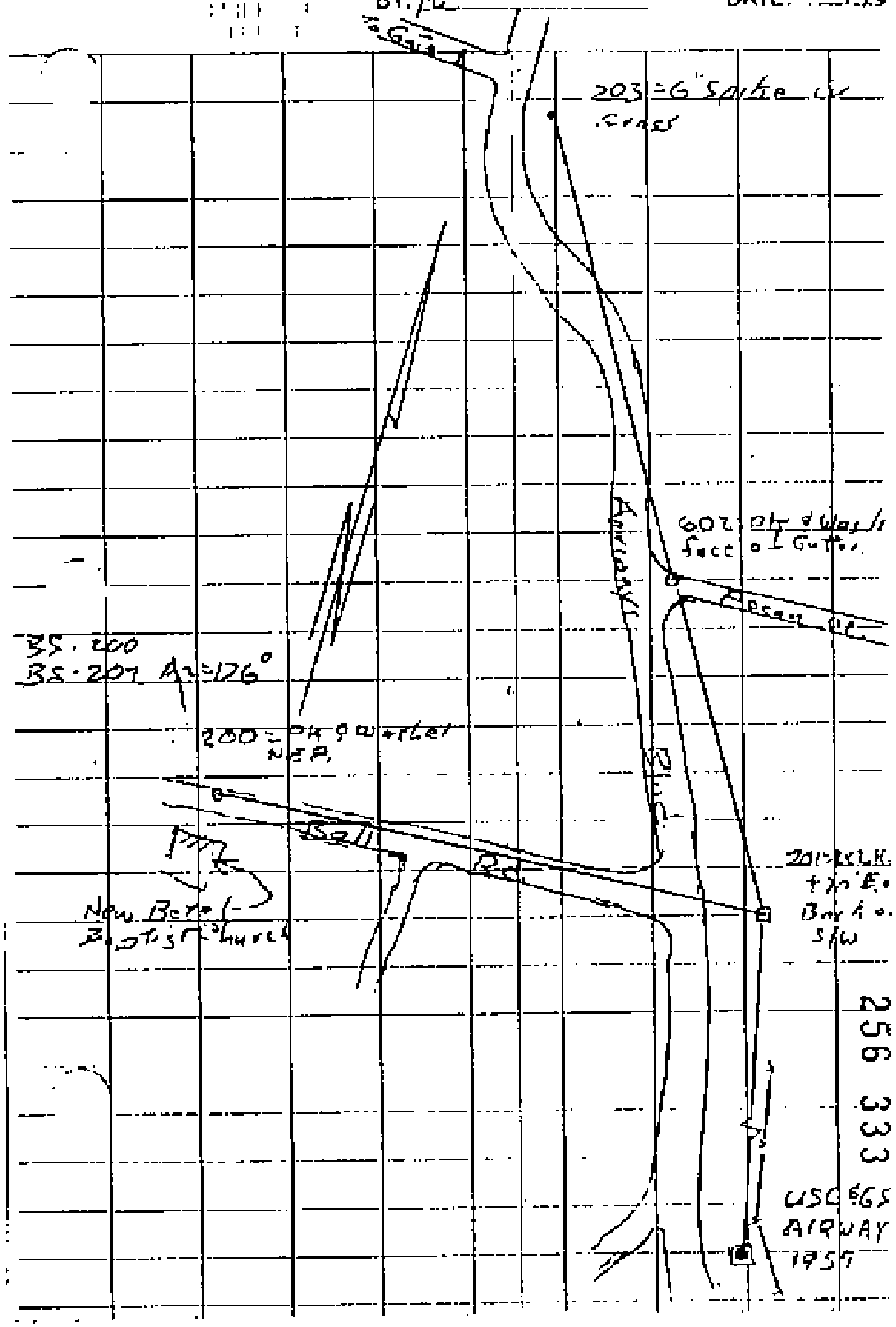
June 04, 1996

K Wengler
G. Ford

CH2MHILL

JOB NO.: 113630.08.23
PAGE: 2 of 4
BY: JC
DATE: 6-04-96

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	
	H.I.=5.70								
▷	203								
			.62 168.62			5.70	.77 +4.70		
			1613.62			5.69	92 -4.89		
	H.I.=5.64								
▷	202	120°12'.03 120°12'.03		180°	12'03.5"			179.49.56 179.47.56	
			129.245 424.03			5.69	.02 +0.05		
	Airway 500	265.50.53 200.41.02		1037.32 34		6.66	.54 -21.57	94.09.08 159.48.54	
◁									
			424.03			5.555	.93 -0.03		
	H.I.=5.545								
▷	201	65°09'.48 65°09'.50		65°09'48"				294.50.10 294.50.10	
			542.204 1122.72			5.655	.48 -10.51		
△	200								



256 333

CH2MHILL

JOB NO.: 1136.50.08.22
BY: KG
PAGE: 3 of 45
DATE: 6-04-96

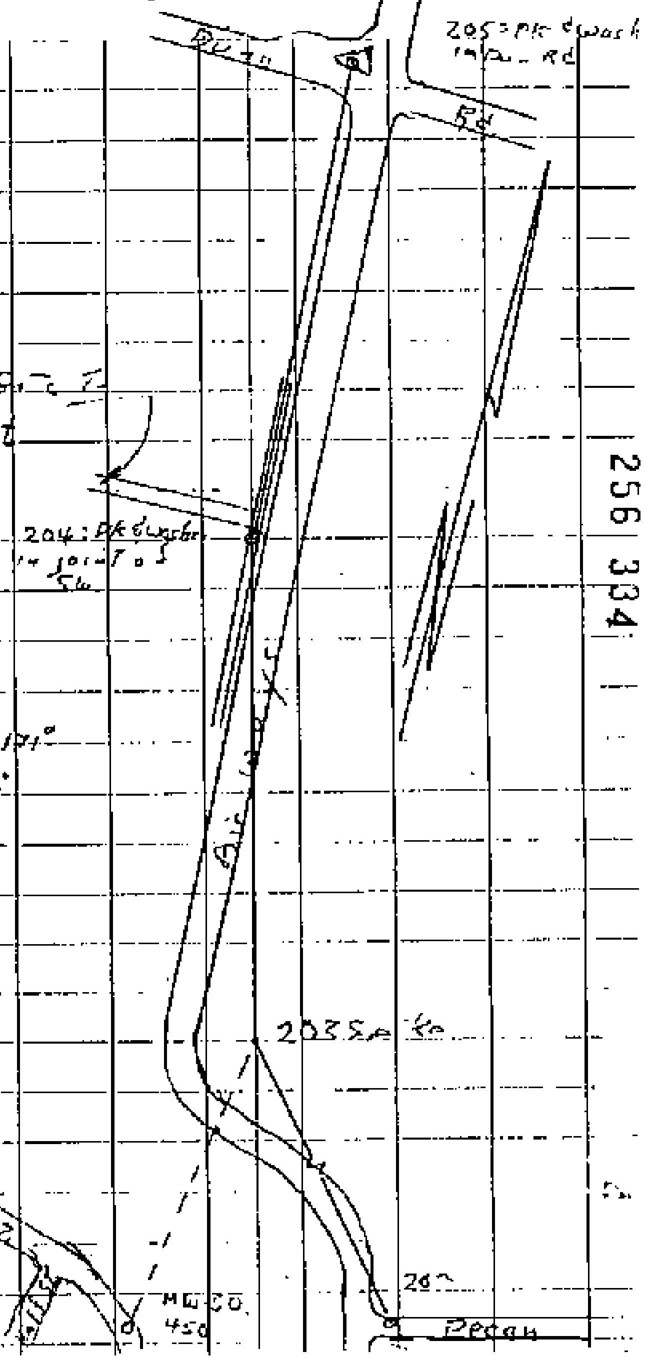
DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5.695							
Δ	205							
			.30 210.30			5.20	.95 -9.96	
Az=102°								
			210.30			5.73	.90 +9.90	
	HI=5.70							
Δ	204	186.11.12 186.11.07	12.5 12	186°11'07.5"				51.5 173.48.51 173.48.58
			.69 1118.67			5.73	.32 -4.34	
M	HI=5.705 MW.50 450	201.26.01 40.06.01		613.89		7.55	.48 -2.46	159.34.01 319.53.57
			613.99	613.89		5.71	.09 +6.09	
			1119.68			5.71	.25 +4.21	
	HI=5.70							
Δ	203	198.40.04 198.39.58		198°40'03"				161.19.56 161.19.57
Δ	202							

-9.935

Closed Gate
+9.765 Depot

BS. 204 0.65 @ 171°
BS-202 Az=196°

N.274455.8191
E 807065.2304
El. 299.11



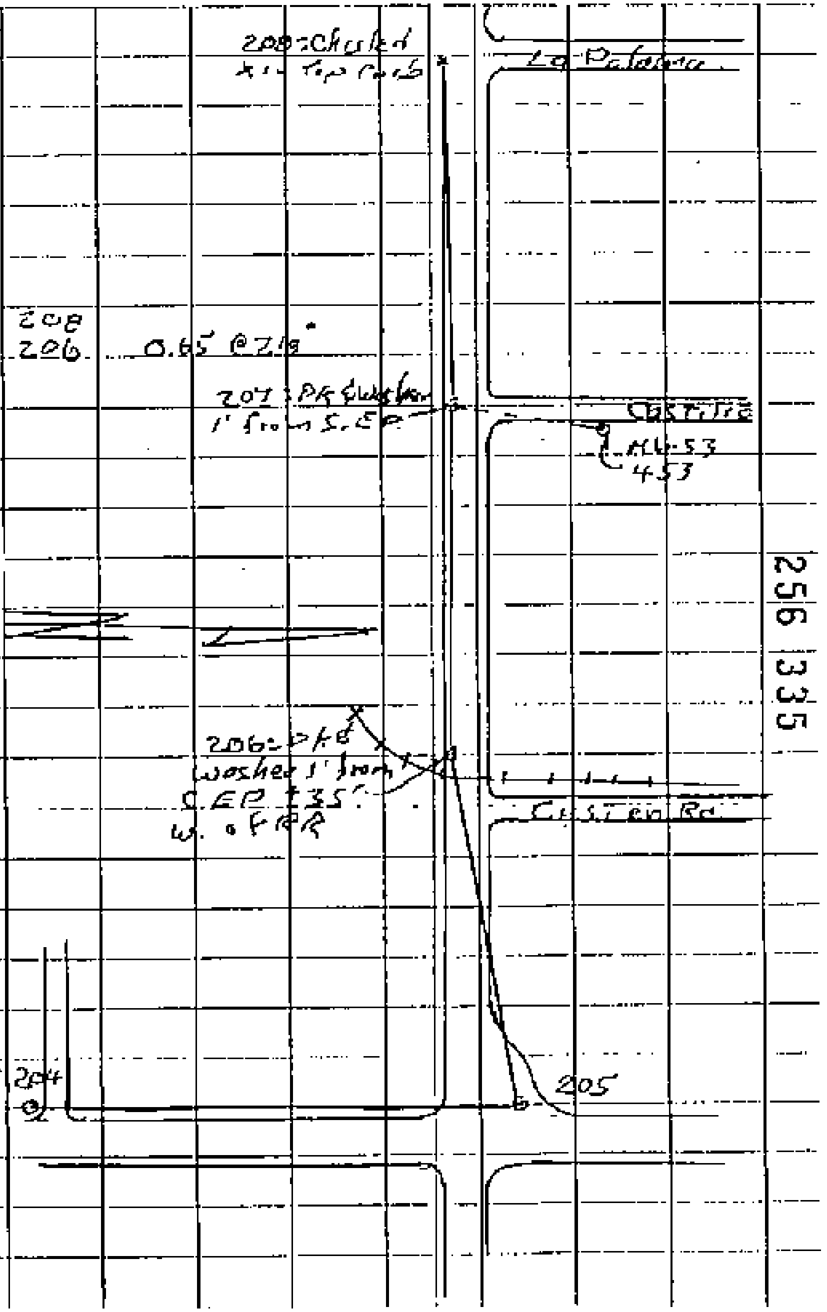
CH2MHILL

JOB NO.: 118630.08.22
BY: Ft.

PAGE: 9 of 45
DATE: 6-04-96

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	ROD	VERT. DIFF.	ELEV.
Δ	208							
			.70 1059.70			5.40	.19 +6.17	
NS	HI=5.72 HI=5.35 453	108 04 34 228 01 21		.73 130.75		5.42	.29 +4.27	251.55 51 71.57.04
				130.74		5.72	.64 -4.64	
	HI=5.63		1054.70			5.63	.64 -6.61	
Δ	207	179.56 50 179.56 26		179°56'30"		"		180 03 26 180.03.29
			.49 799.49			5.63	.73 +11.72	
			799.49			5.22	.78 +11.80	
Δ	HI=5.24 206	182.47 50 182.47 45	.24 1411.24	182°47'48"		5.77	.02 +.08	177.12.09 277.12.13
			1411.26			2.69	.91 +0.92	
Δ	HI=5.65 205	87.09 35 87.09 ~~25~~ 26		87°09'34.5"				272.50.27 272.50.26 24
Δ	204							

BS on 208
FS on 206 0.65 @ 21.9°

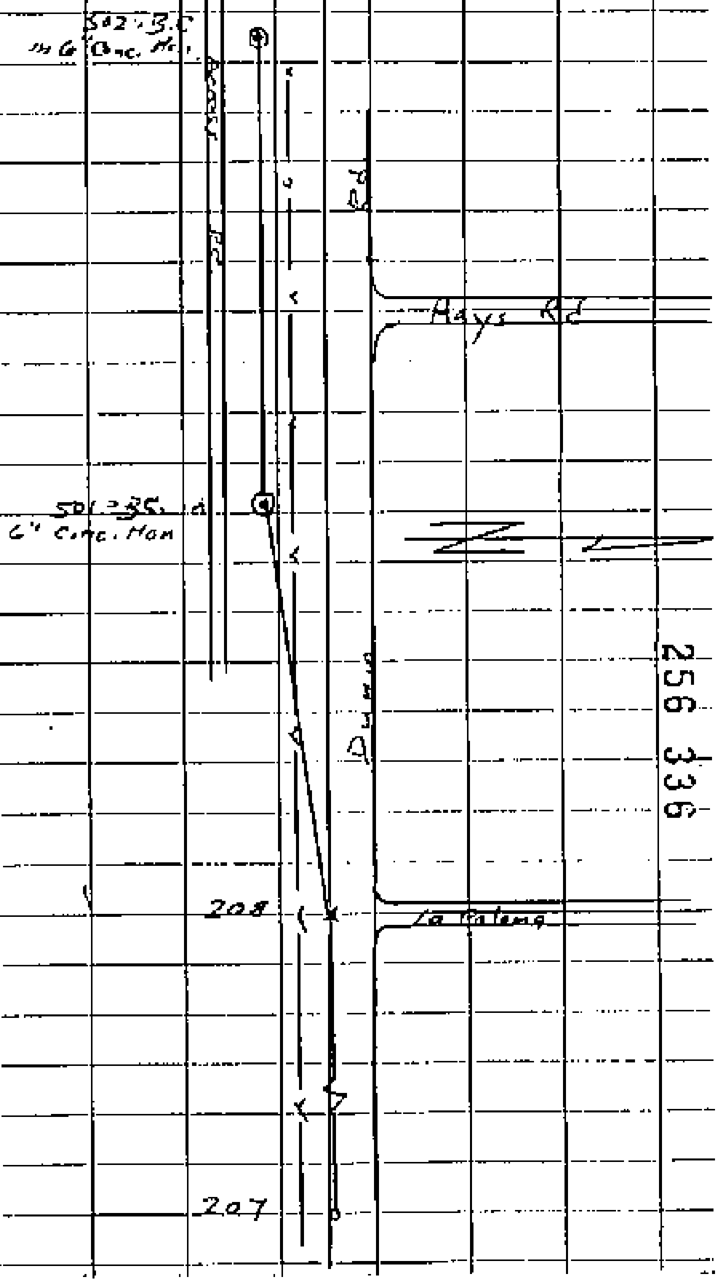


256 335

CH2MHILL

JOB NO.: 13630.08.Z3
BY: JG
PAGE: 50 of 45
DATE: 6-04-96

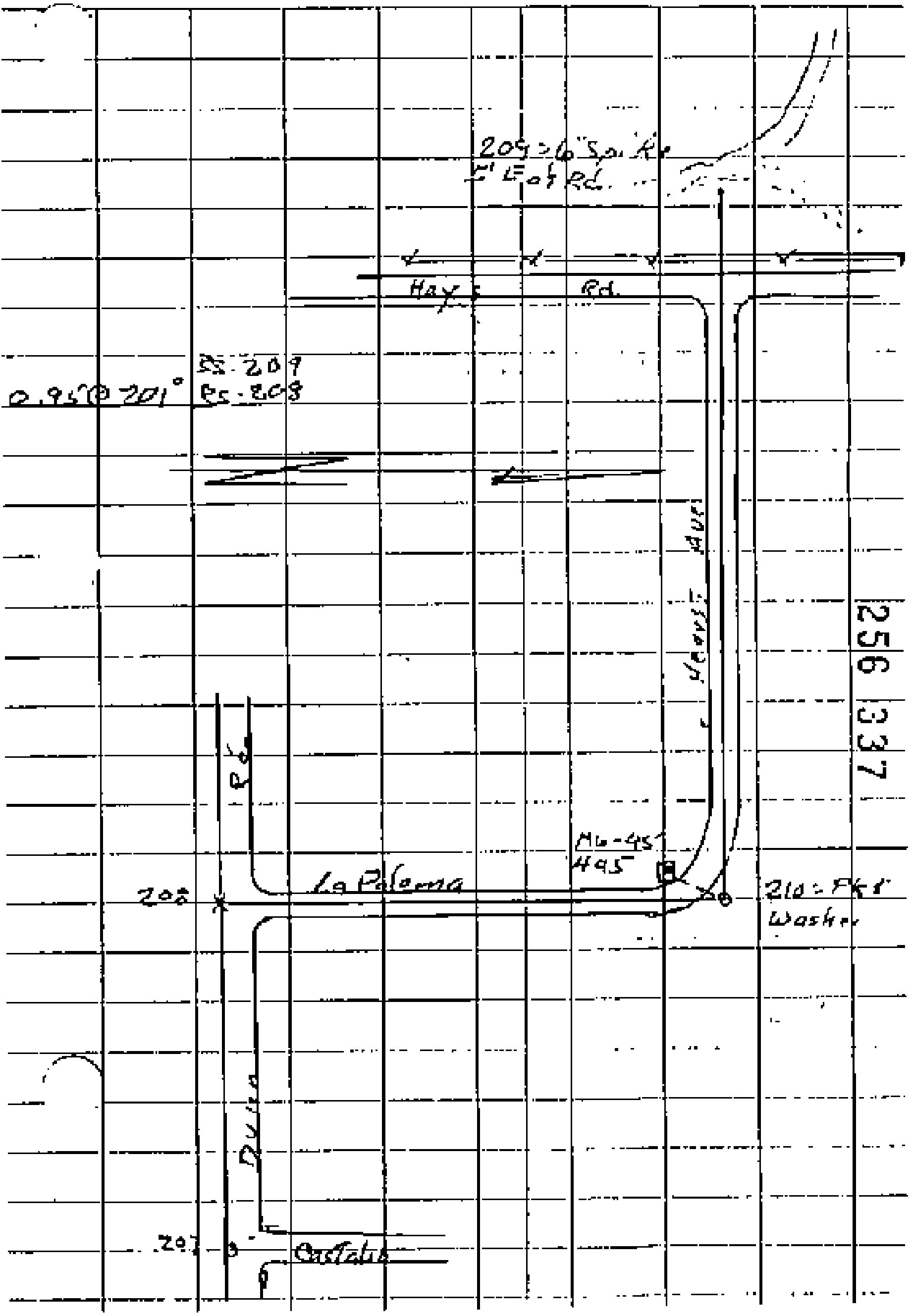
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
			Conti. Pg. 9 of 45					
	HI= 56							
△	502							
			91 915.91			5.15	.87 .9.90	
						5.17	.28 +9.29	
	HI= (1.31)	180.56.30	915.93					179.03.33
△	501	180.56.39		180°56'34"				179.03.19
			617.33			5.655	.58 +9.55	
			34 617.34			5.73	.77 -9.20	
	HI=5.72	177.59.05						181.0.82
△	208	178.59.00		178°59'02"				181.00.55
△	207							



CH2MHILL

JOB NO.: 113630.08.Z2
BY: K
PAGE: 6 of 1
DATE: 6-04-98

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI:5	26						
◁	209		23 24					
			1021.22 22			12.92	.23 +20.26	
115	MO-45 415	297.56.03 22.39.47		16395 23.79		5.295	.05 -2.05	62.23.49 332.30.11
			1021.22			13.47	.32 -5.33	
	HI:5.45							270.06.19
◁	210	29.53.42 29.53.41		29°53'44"				270.06.13
			.28 1645.26			5.60	13.92 -14.02	
0								
			1645.28			5.73	.90 +15.91	
	HI=5.22	269.58.30						90.01.28
◁	208	269.58.27		269°58'31"				90-01.28
◁	207							

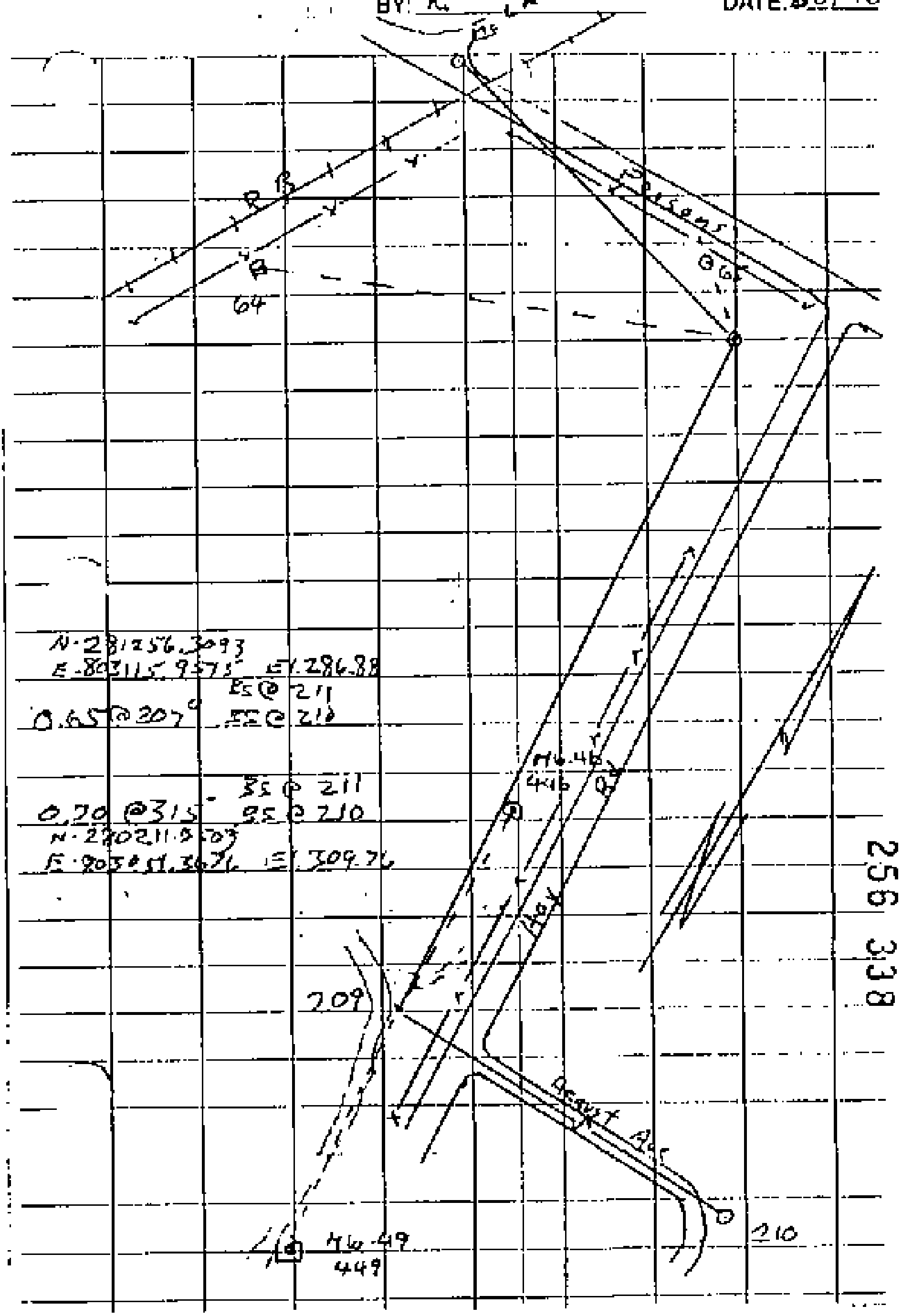


256 337

CH2MHILL

JOB NO.: 123630.05.23
BY: K
PAGE: 7 of 45
DATE: 6 OCT 96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5 20							
Δ	212							
			122.770 402.79 .79			5.47	34 -16.34	
AZ 265	.65 965	129.05.35 129.05.29		.22 133.28		5.66	.06 -9.05	230.54.25 230.54.31
	.64 964	71.52.22 71.52.19		.20 554.20		5.505	.12 +9.12	288.00.36 228.00.33
	HI=5 48				271.56.31 9203.25	2.95		
Δ	211	112.08.59 112.08.55		112°08'53.5"				247.51.02 247.51.02
			.75 1229.75			5.49	59 -16.97	
	HW.46 446	03.00.47 272.34.24		124.511 498.50		5.66	.61 -20.00	356.59.10 87.35.33
	HW.49 449	177.35.58 22.29.37		194.876 639.47		5.57	.69 +2.70	182.04.04 272.30.04
			1229.73			5.77	.94 +16.95	
	HI=5 76							
0	209	269.35.40 269.33.36		269°33'40.5"				90.26.20 90.26.14
Δ	210							



N. 281256.3093
E. 803115.9575 EL 286.88
0.65 @ 207° ES @ 211
ES @ 210

0.20 @ 315° BS @ 211
BS @ 210
N. 280211.9303
E. 803051.3676 EL 309.76

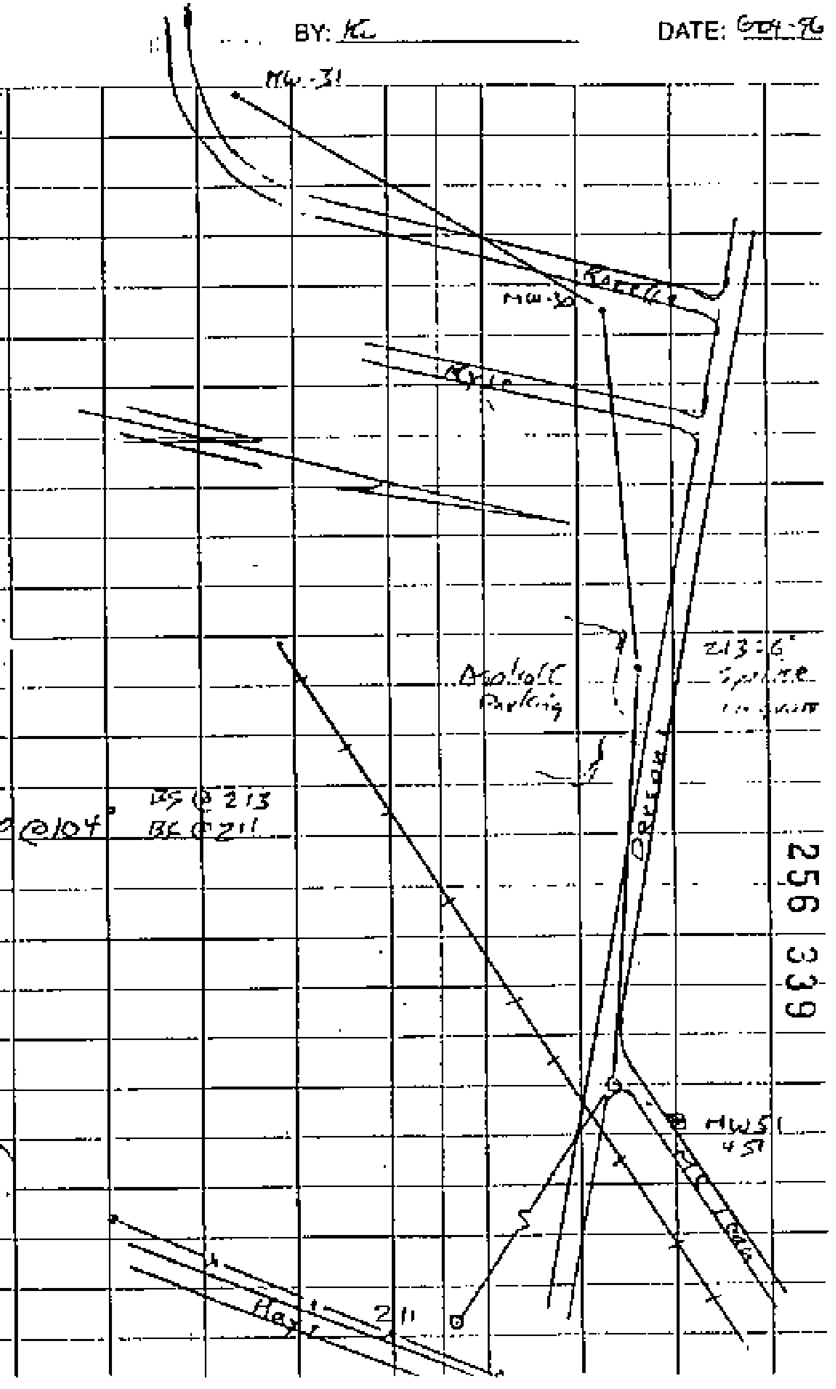
130-431 - 9[illegible]
430-431- 621.[illegible]

CH2MHILL

JOB NO.: 113630.08.ZZ PAGE: [illegible]
BY: KC DATE: [illegible]

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC/ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
Δ	MW-31 431							
[illegible]			.74 621.70			5.63	.49 +13.49	
	HI=5.43 MW-30 430	116.23.40 116.23.42		116°23'41"				243.36.22 243.36.17
			.71 264.71			5.49	.19 -10.19	
			264.70			5.60	.05 +10.05	
Δ	HI= 213	175.35.41 175.35.35		175°35'37"				184.24.18 184.24.22
			.95 505.95			5.46	.16 +9.16	
NS	MW-51 451	176.08.31 220.00.08		31.29 102.60		5.21	.83 +10.83	248.41.30 29.53.55
			505.95			5.60	.32 -9.32	
Δ	HI=5.60 212	153.57.30 153.57.32		153°57'31"				206.02.30 206.02.28
Δ	211							

0.60 @104° BS @ 213
BC @ 211



[illegible] 775.49

27.25

CH2MHILL

[illegible] 76"

N - 275321.7175
G - 805897.33
El - 279.04

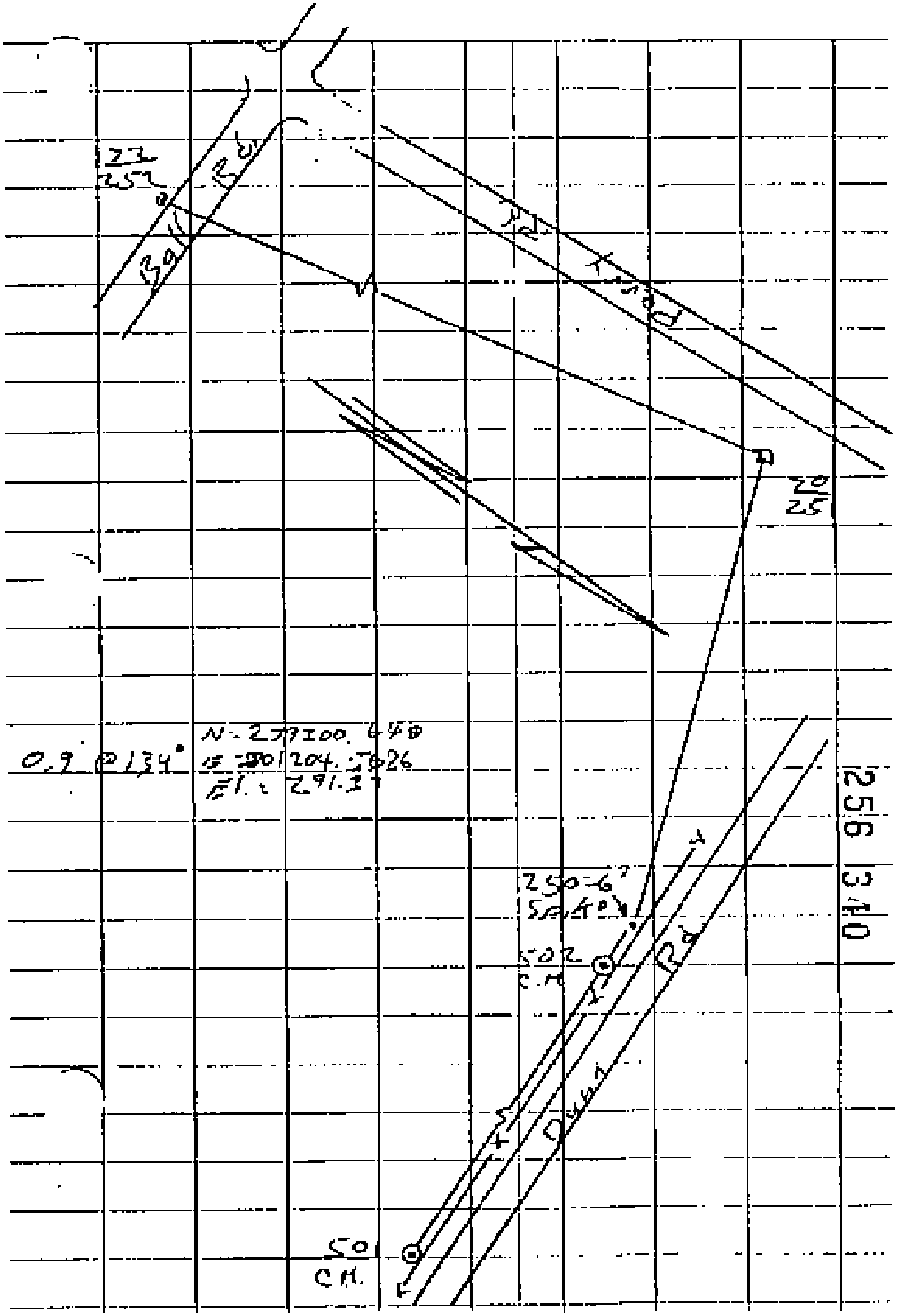
JOB NO.: 113630.08.22

BY: JC

PAGE: 9 of 45

DATE: 6-05-96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
○	72 252							
			5295.17			5.61		
△	70 221	71.01.36 99.01.33		99°01'34.5"				260.58.23 260.58.28
			83 1898.84					
	[illegible] 452	11.49.15 128.57.01		382.45 1224.57		5.86		348.10.99 181.02.59
△	HI 2.50	167.01.47 167.01.47		167°01'48"				192.58.10 192.58.13
			22.25					
△	502	180-00-00						
△	501							



0.9 @134°

N - 279200.648
E - 801204.5626
El = 291.3

256 340

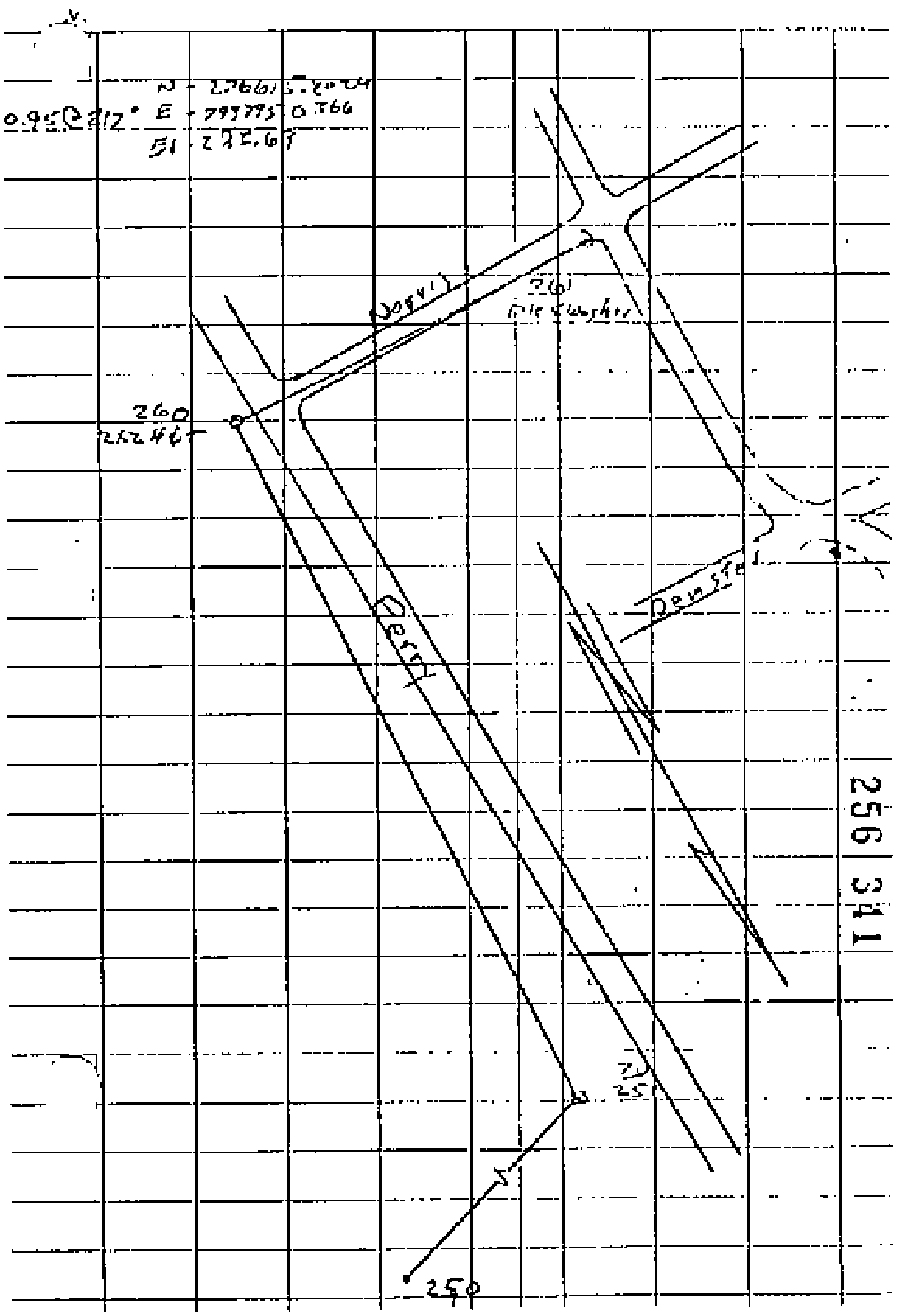
CH2MHILL

JOB NO.: 13630.08.22
BY: tc
PAGE: 10 of 4
DATE: 60594

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
∆	HO-712 144.8		131.330 4308.7 .87			5.17	.96 +3.96	
	HI=5	24 256 269 19.01						
∆	261	256-19-45		256°19'04.5"				103.40.57 103.41.05
			.72 544.82			5.40	.10 -0.10	
			85 544.83			5.63	.26 -0.26	
	HI=5.64							
∆	260	272.38.34 272.38.28		272°38'50.5"				272.21.26 272.21.34
			23 2829.22			5.12	.78 +5.81	
			2229.25			4.63	40 -6.43	
	HI=4.63							
∆	70 251	103-12.36 103-12.38		103°12'36.5"				256.47.0 256.47.23
∆	250							

A2-12274°

A2=13/3°

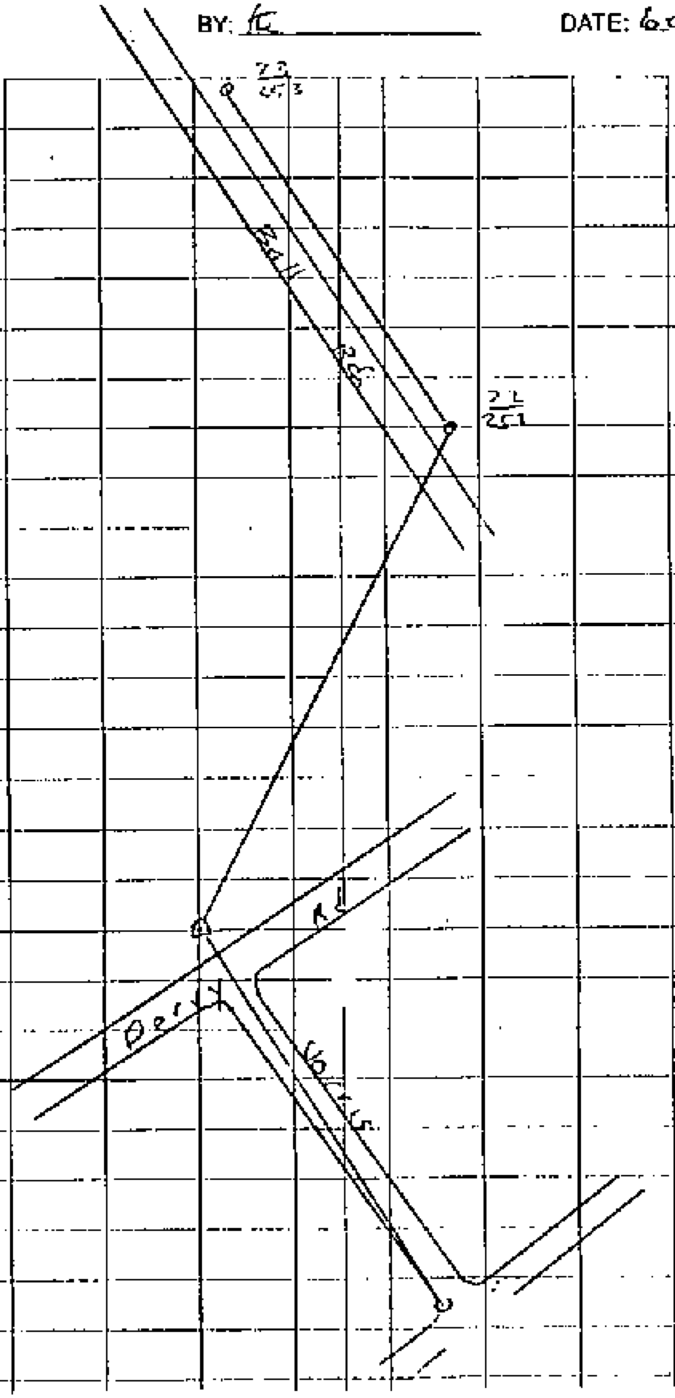


256 341

CH2MHILL

JOB NO.: 113630.08.22
BY: KC
PAGE: 11 of 11
DATE: 6.05.98

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
◬	23/253							
						2655		
◬	HI=5.60 23/252	11808.45 118.09 38		118°08'41"				241.51.19 241-51.20
			51 516.51			5.61	.39 123.39	
			.50 516.50			5.63	40 -23.41	
◬	HI=5.64 260	239.36.53 239.36.53		239°36'54"				120.23.04 120.23.06
◬	261							

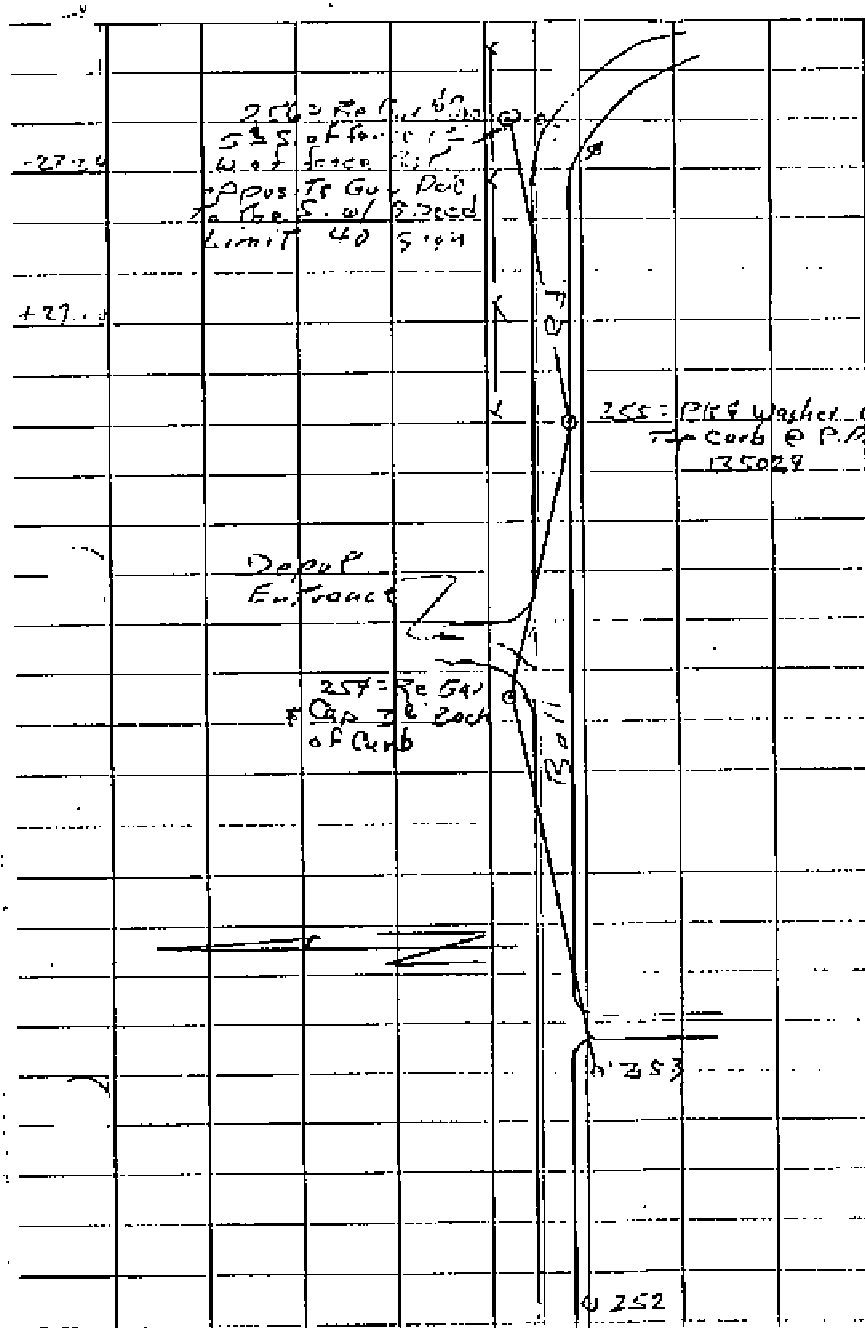


256 342

CH2MHILL

JOB NO.: 115630.09.37
BY: KC
PAGE: 12 of 14
DATE: 6-05-96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5 52							
△	256							
			41 1867.41			5.58	25 -26.89	
			40 1767.40			5.22	.76 +26.74	
	HI=5 31							
△	255	175-49.54 175-49-446		175°49'50"				184-10-07 124-10-124
			10 1757.17			5.22	.51 +1.47	
			1952.0				.62 -1.62	
	HI=5 94							
△	254	177.59.32 177.57.30		187°59'32"				178.00.25 172.00.30
↑			911.65			5.46	.40 -3.37	
			64 911.64			5.63	.25 +3.33	
	41=5 65 23 253	173.48.11 173.43.04		173°48'075"				186-11-48 186-11-57
			682.04			5.60	+14.00	
△	73 252							



CH2MHILL

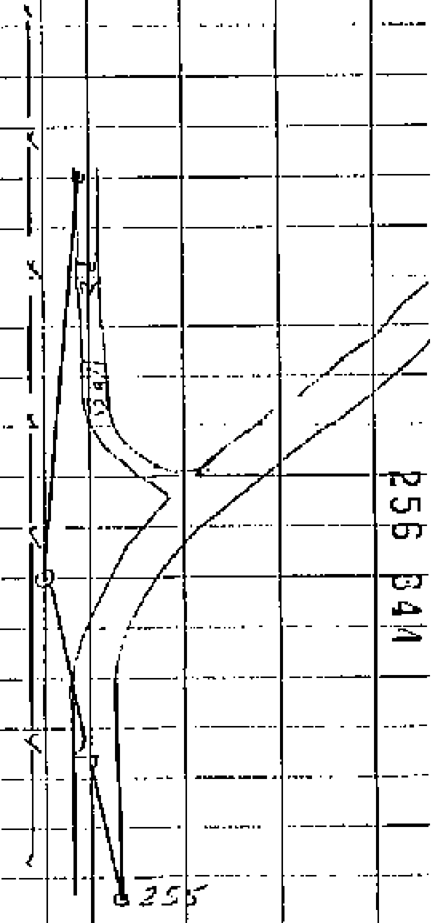
JOB NO.: 113630.98.ZZ
BY: K
PAGE: 15 of 4
DATE: 6-05-96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
▷	201							
			7 1122.7			5.46	.67 +10.65	
	H1:5	40						
▷	200	177.12.43 177.12.40		177°12'42"				182.47.15 182.47.20
			69 221.67			5.41	32 +11.34	
	HI:5 4:2	205-19.06 27-47.42	68 881.68	34.151 112.04		0.00 5.23	.70 -4.70 .71 -11.69	154.44.59 350.18+29
	H1-5	52						
▷	256	174.27.47 184-27.47		184°28'47"				175.31.16 175-31.10
▷	255							

h(69

35 @ 200
95 @ 255
-11.53

N-275527.1145
E-805897.3335
131.23444

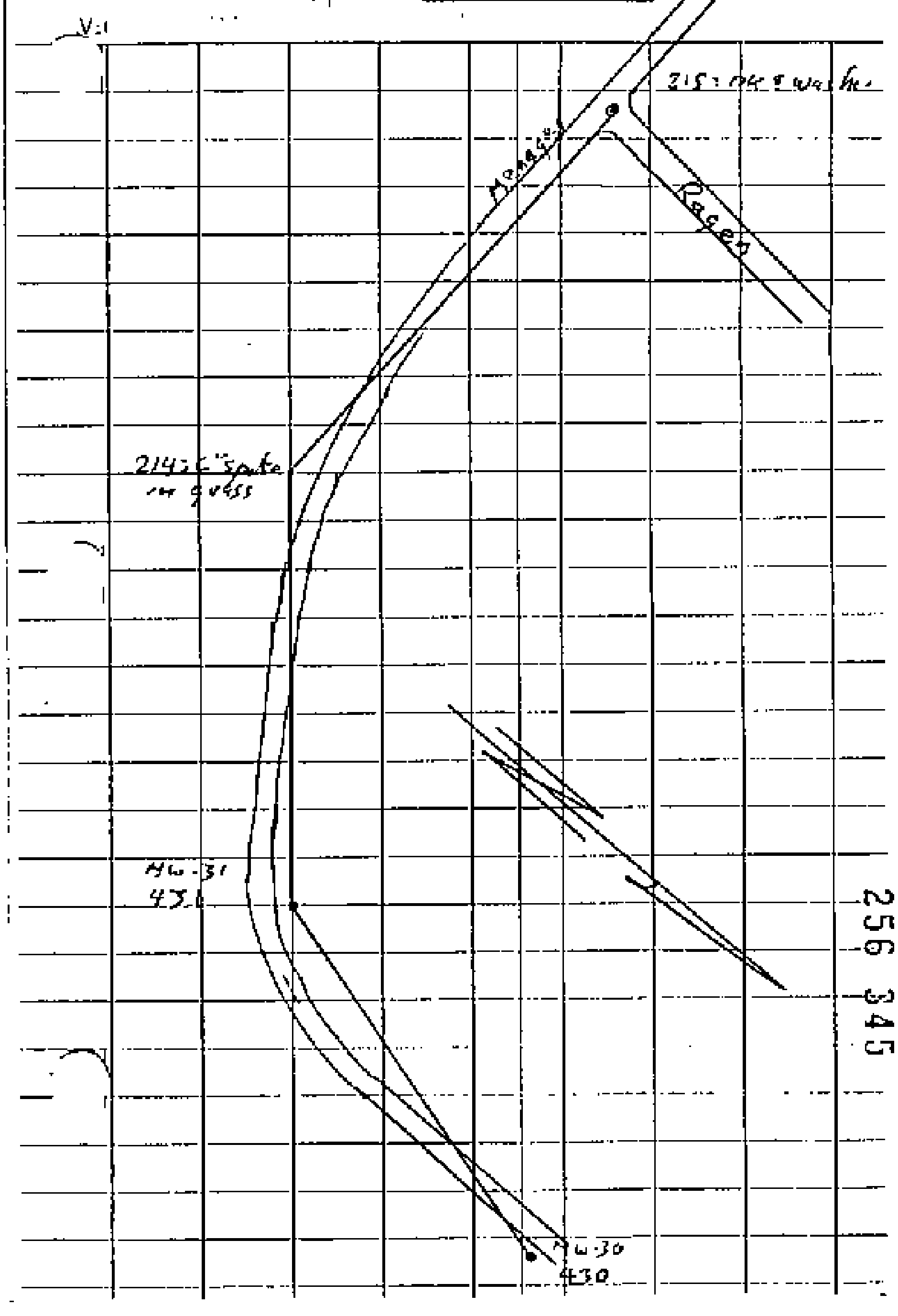


CH2MHILL

JOB NO.: 113630.08.22 PAGE: 14 of

BY: KC DATE: 6-05-?

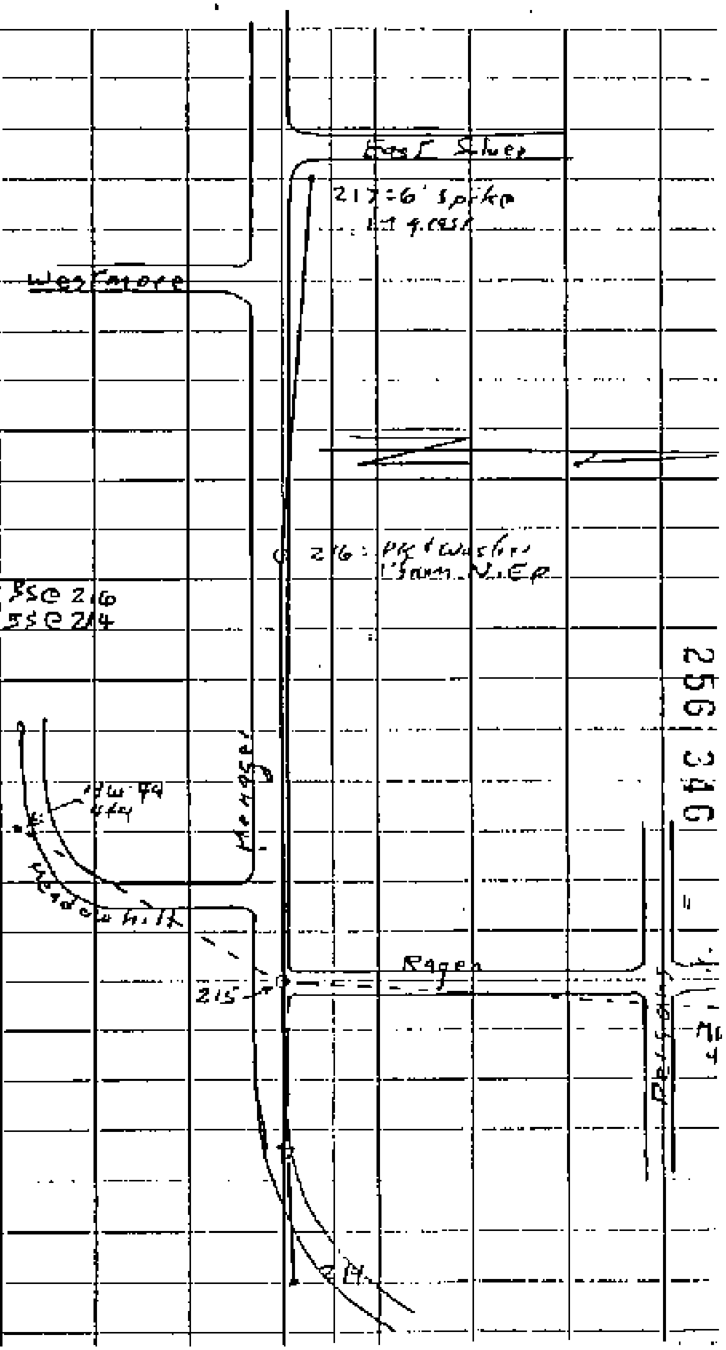
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5.69							
⊳	215							
			.66 568.66			5.69	.12 -9.12	
			.67 568.67			5.74	.10 19.10	
	HI=5.73							
⊳	214	222.07.23 222.07.51		222°07'26"				137.52.37 137.52.34
↑			.59 495.59			5.739	.31 18.28	
			495.55			5.50	.31 -8.30	
	HI=5.49							
⊳	431	210.36.24 210.36.25 L		210°36'24"				149.23.36 149.23.36
			621.70			5.495	.52 13.55	
⊳	430							



CH2MHILL

JOB NO.: 113630.02.22
BY: KC
PAGE: 150 L
DATE: 6-05-9

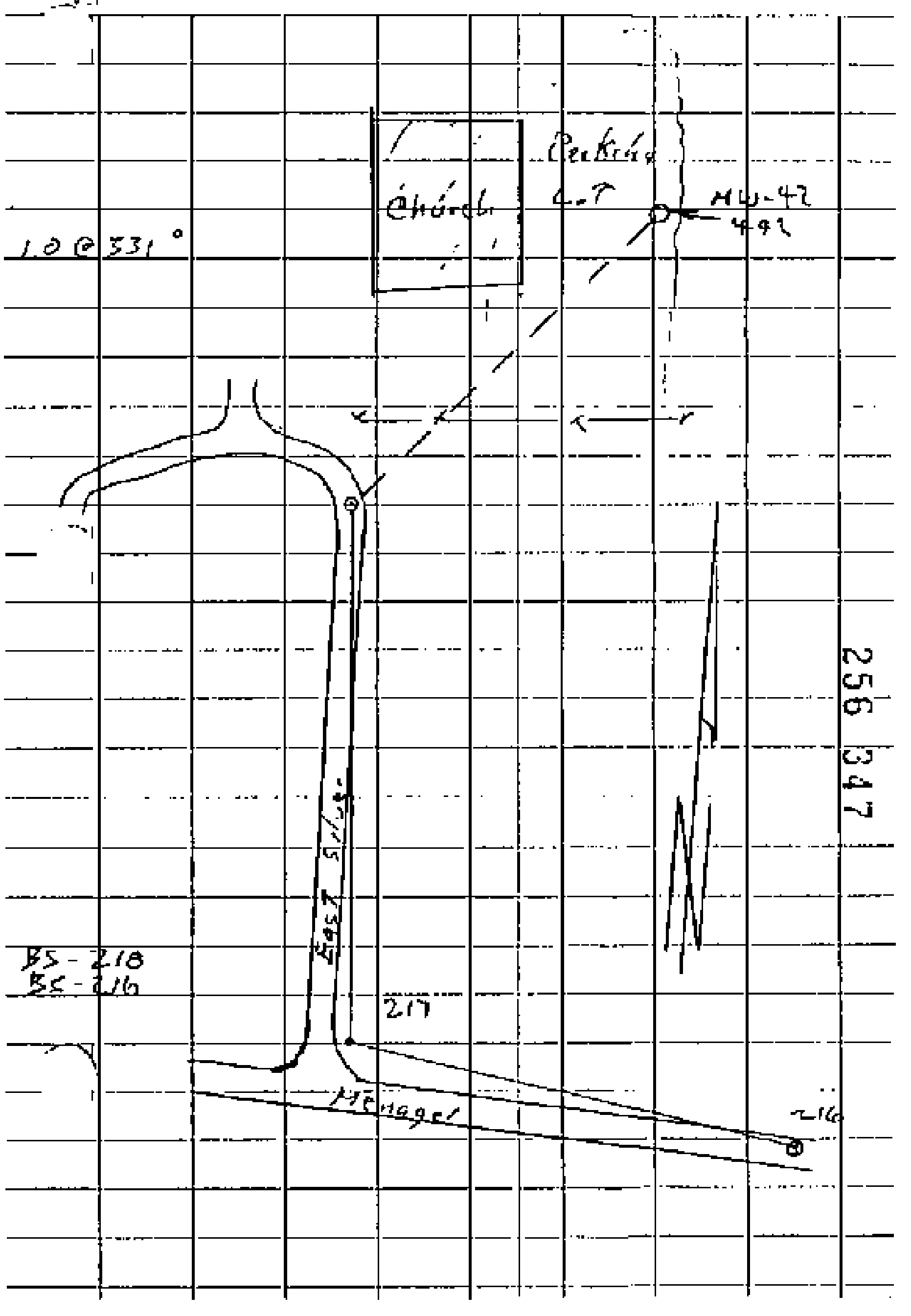
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.		
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	ROD	VERT. DIFF.	ELEV.		
	HI=5	66								
Δ	217									
			.13 321.13			5.66	.07 -10.06			
			321.13			5.66	06 +10.07			
	HI=5	66								
Δ	216	123.02.35 123.02.37			183°02'37"			176.57.23 176-57.21		
			.18 369.18			5.66	.36 -2.36			
	HW·49 444	299-49.59 120-31.44		118.855 387.94		5.43	.42 -17.41	10.24 239.78.41	0.68 @140°	BS@216 SS@214
DS	HW·40 440	272:09.09		.32 1074.32				87.50.51	0.85'@ 129°	
N.S.	HW·54 454	28.34-10		.75 427.75				351.25.55	0.80 @130°	
			.19 369.19			5.70	.35 +7.36			
	HI=5	63								
Δ	215	120.42.09 120:42:02			180°42'04.5"			179.17-59 179.17-59		
Δ	214									



CH2MHILL

JOB NO.: 113630.08.ZZ PAGE: 16 of 4
BY: Kw DATE: 6-05-9

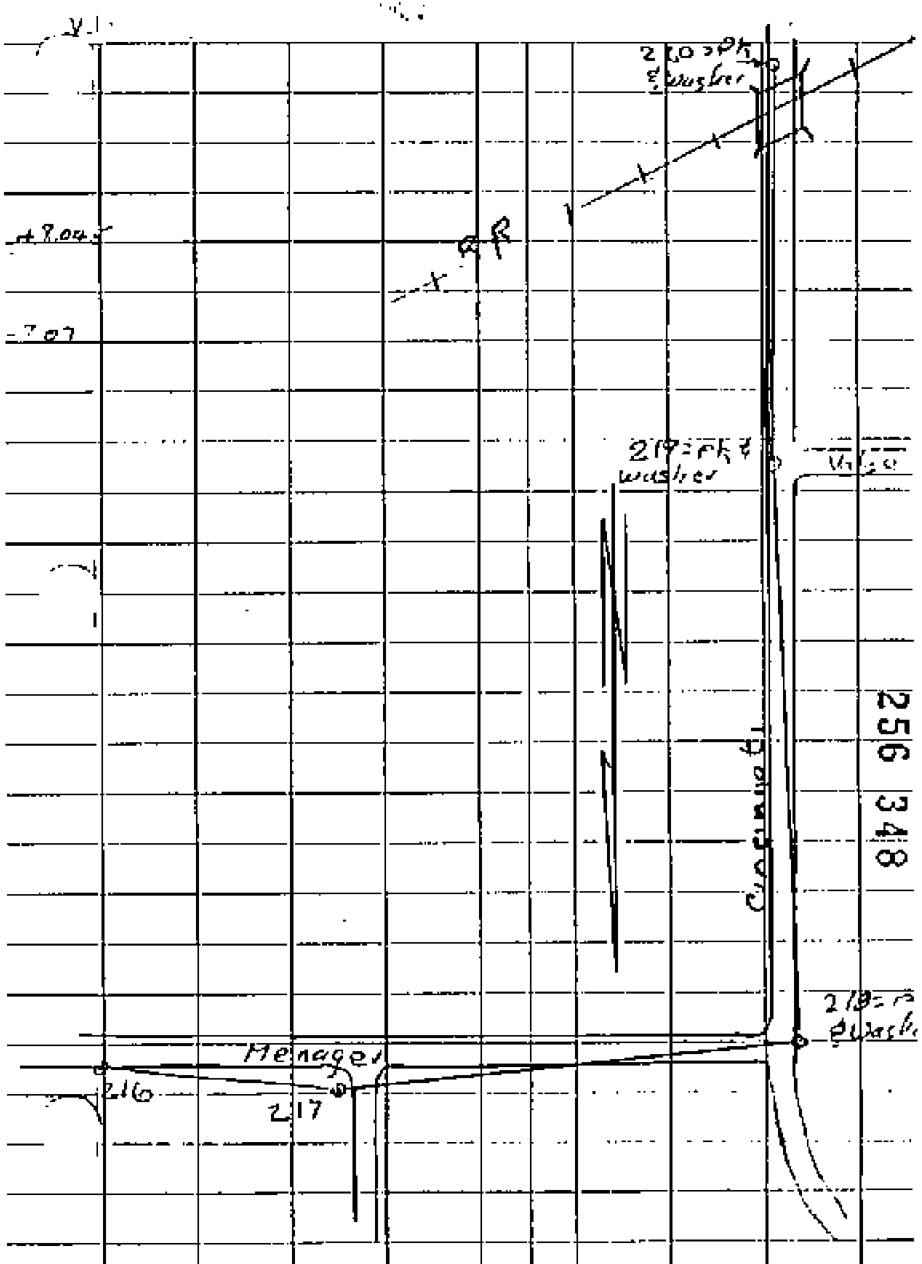
DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
N2	MW-42 449							
			22.235 171 37			5.51	75 +2 77	
M								
	$HI=5^{65}$							
0	220	225-02-17	34.406 276.92		225°02'16'	5.29	.21 -2.19	134 57-46
			276.92			5.60	24 +181	
	$HI=4^{66}$							
Δ	217	75-39-41 259-09-05			85°39'42" 259°09'03"			274 30-76 100-31-00
⊙	216							



CH2MHILL

JOB NO.: 113630.08.22
BY: K
PAGE: 17 of 4
DATE: 6-05-9

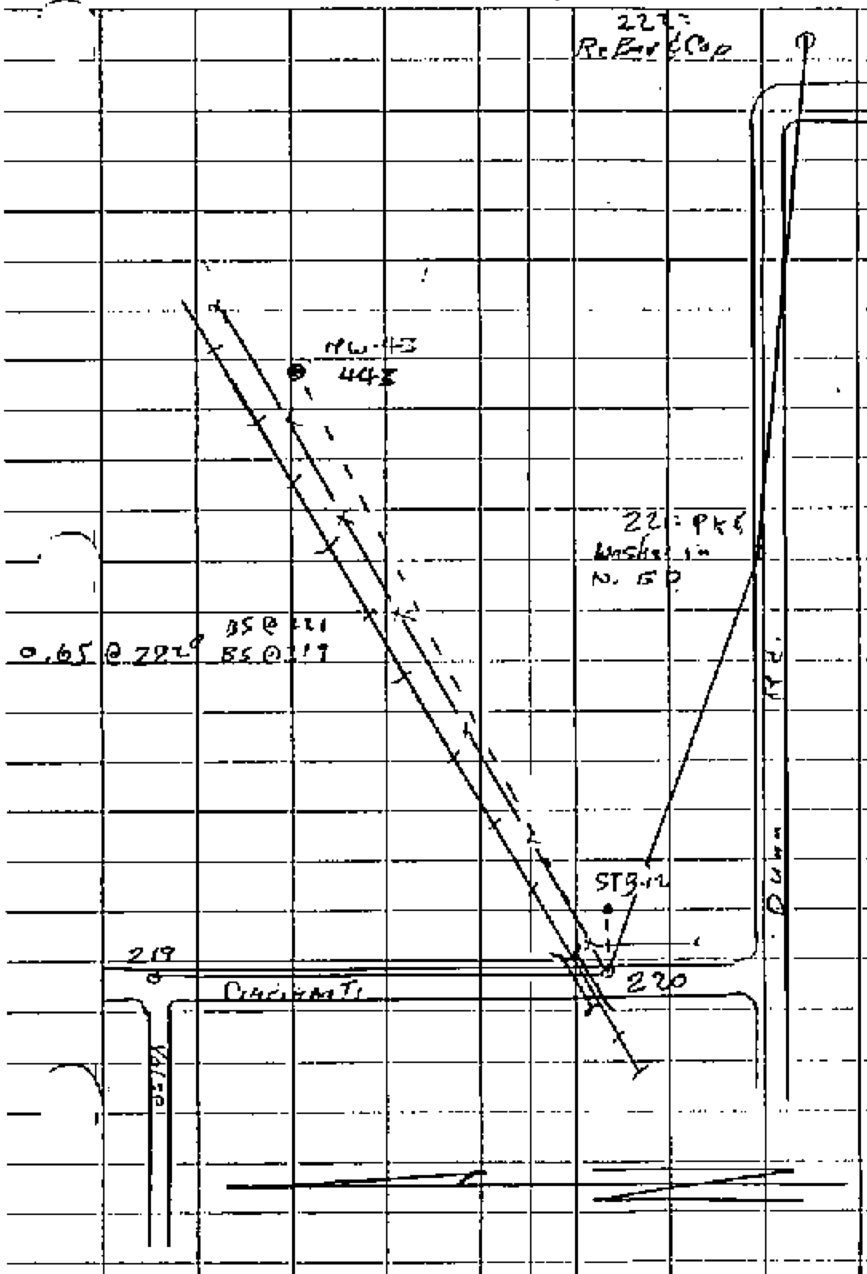
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	
	HI = 61								
◬	220								
			.17 557.19			5.62	.11 +8.12		
			.18 557.18			5.21	.47 -8.47		
	HI = 55								
◬	219	120·46·03 120·46·01		180°	46' 01"			179·14·03 179·13·57	
			.57 1027.57			5.565	.19 +32.06		
180°									
			.56 1087.56			2.245	.50 -37.51		
									16.5'
	HI = 525	775							
◬	216	91·13·03 91·12·54		91°	12' 51"			268·47·11 268·47·21	
			66 533.66			5.355	.56 -16.57		
			.63 533.63			5.205	84 +15.83		
	HI = 66								
◬	217	173-29 47 20 173-29·19		173°	29' 20"			41 186-30-43 186-30-39	
◬	216								



CH2MHILL

JOB NO.: 113630.08.E2
PAGE: 19 of u
BY: /c
DATE: 6-08-9

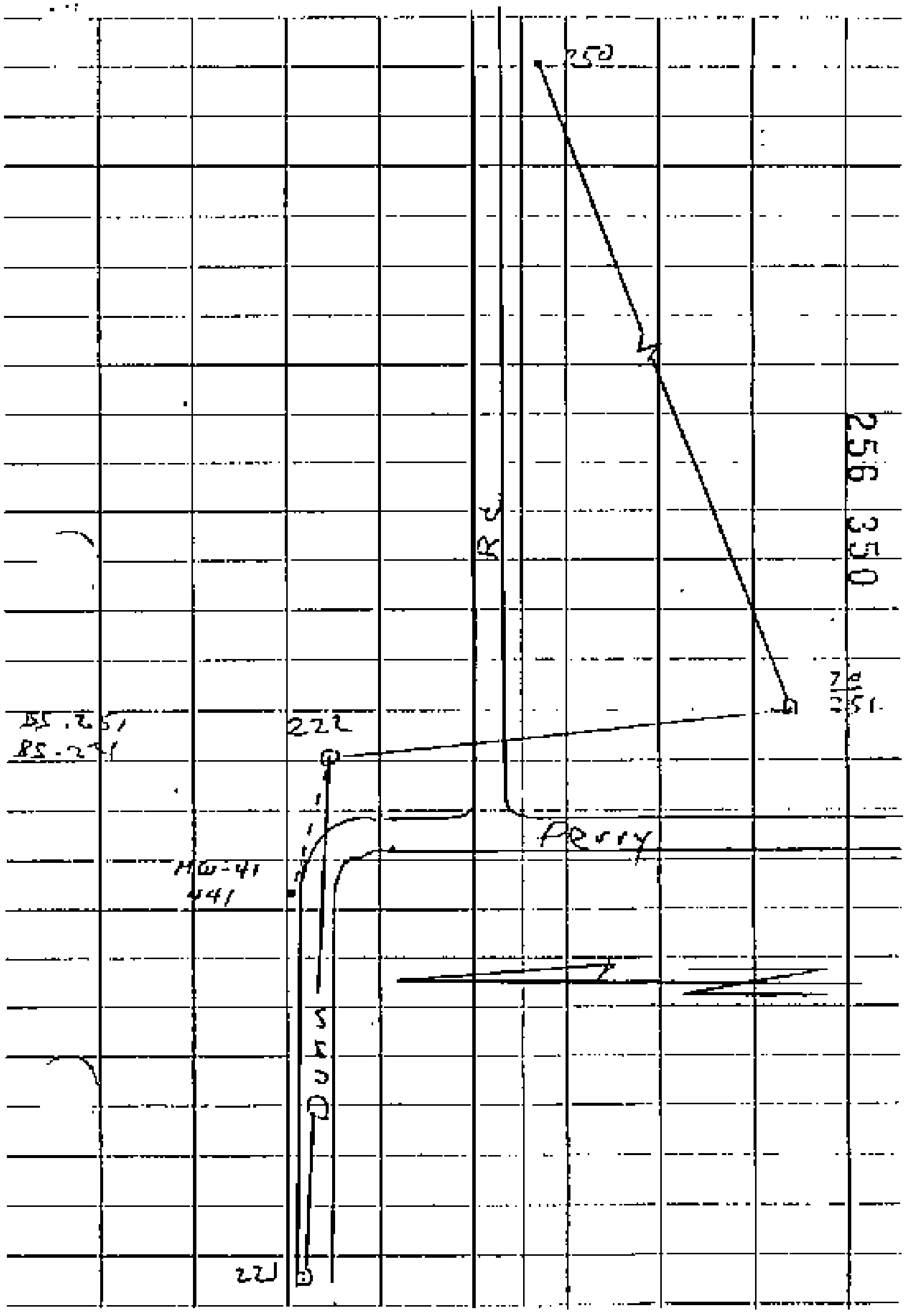
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5.57							
⊙	222							
			.70 836.80			5.58	.19 -2.14	
			836.84			5.77	.18 +2.15	
	HI=5.77							
⊙	221	160.47.23 160.47.50		160°47'28"				199.12.32 199.12.30
			.17 436.13			5.78	.68 -2.68	
NS	MW-43 4.43	300.04.55 53-04-53		239.11 234.49		5.68	.58 -17.58	59.55.02 306.55.16
	STB-12	74.55.12		32.51 .53		5.00	.62 -4.61	285.04.47
			436.13			5.61	.68 +2.67	
	HI=5.61							
△	220	112.59.55 112.59.50		112°59'54"				247.00.02 247.00.07
△	219							



CH2MHILL

JOB NO.: 1[3630.0E.22
BY: Kc
PAGE: 19 of 4
DATE: 6 09 9

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.
Ø	2 50							
	HI=5 51							
△	70 251	74-12-12 74-12-10		74°12'11"				285-47-49 285-47-50
			611.46			5.375	.00 -6.97	
NS	HW-41 441	101-27.10 10-53-02		229.85		5.45	.41 9.42	258-36-56 349-07-02
			611.46			5.70	.97 40.92	
	HI=5 57							
△	222	269-29-47 269-29-51		269°29'49.5"				90-30-13 90-30-07
△	22							



CH2MHILL

JOB NO.: 113630.08.ZZ PAGE: 20 of 4
BY: K. GF DATE: 6-06-96

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	BM	0.648 0.382 0.127	0.3857					296.919	BM A308 NOS 1995
	TP	6.468 5.676 4.892	5.6807		6.662 6.410 6.155	6.4097	725		RR spike
	TP	4.004 2.921 1.940	2.9717		7.605 6.947 6.291	6.9476			Rock
	TP	7.746 6.756 5.727	6.7363		7.217 7.251 7.286	7.2520			P.S.
	TP	9.469 8.466 7.465	8.4667		6.157 5.178 4.198	5.1777			PS
	TP	3.437 2.870 2.297	2.8687		5.680 4.726 3.771	4.7257			PS
	TP	5.527 5.085 4.604	5.0655		2.057 1.470 0.884	1.4705 1.4697			See Pg. 24 of 95 for return run
	COE 4W	2.774 2.214 1.653	2.2137		5.146 4.684 4.223	4.6843	293.472	293.462	4" BC in Conc. Mon. @ SW Cor. Airways & Dunn
	D205					5.235	91.441		PK & Washer
	TP	6.184 5.188 4.199	5.1903		7.521 7.143 6.766	7.1437			PS
	TP	8.149 7.069 5.991	7.0697		3.799 2.947 2.095	2.9470			"
	TP	5.638 4.706 3.774	4.7060		7.856 6.837 5.818	6.8377			"
	TP				7.259 6.726 6.193	6.7267			"

CH2MHILL

JOB NO.: 125650.08.33
BY: K. GF

PAGE: 21 of 45
DATE: 6-06-96

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
TD?	TD								
		6.544 6.070 5.597	6.0703						
	Δ206				5.729 5.139 4.552	5.1900	290.418		PK Washer
		7.084 6.094 5.105	6.0943						
	TP				4.410 3.490 2.570	3.4900			PS
		10.530 9.552 9.572	9.5533						
	Δ207				0.332		302.214		DK Washer
		8.306 7.959 7.611	7.9587						
	MW-53					3.817	306.385		TC
	4-53				3.213 3.458 3.103	3.4580	306.744		4" Disk (and same elev)
		5.428 4.607 3.785	4.6067						
	MW-53					4.962	306.[illegible]		TC
	TD				5.904 5.091 4.279	5.0913			PS
		5.074 4.320 3.566	4.3200						
	TP				4.979 4.228 3.478	4.2283			PS
		9.10 7.910 6.715	7.9085						
	TP				6.545 5.277 4.010	5.2773			PS on MH Cover
		5.972 5.631 5.290	5.6310						
	Δ208					5.290	306.717		Chiseled X in curb
	TP-A					0.600	314.034		Top E end Hash Mark sign on fence
	TP				11.306 10.830 10.355	10.8305			PS
		3.059 4.139 3.219	4.1390						
	TP				5.018 4.118 3.220	4.1177	233.9034		PS
									[illegible]

256 352

CH2MHILL

JOB NO.: 113652.08.ZZ
BY: K. GF
PAGE: 22.6
DATE: 6.06.9

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.		V.11
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.		
	TP									PS
		6.091 5.030	5.0313							
	TP	3.973			12.271 11.213	11.2140				PS
		1.787 0.988	0.9883		10.158					
	TP	0.190			9.508 8.756	8.7557				
		6.140 5.256	5.2573		8.002					
	MW 45	4.376				2.290	292.746			TC
	445				2.904 1.957	1.9570	293.176			Top 4" Disk
		10.440 9.792	7.7730		1.010					
	110.45	9.147				10.127	292.[illegible]			TC
	3210					8.051				PS & Washer
	TP				4.451 3.691	3.6913				PS
		8.910 8.247	2.2473		2.932					
	TP	7.585			1.359 0.708	0.7083				P.S.
		9.988 9.126	9.1263		0.058					
	TP	9.265			10.939 9.594	9.5937				P.S
		3.396 3.050	3.0500		3.758					
	TP "B	2.704			0.000		209399			Top Wly security arm of 2nd Post N. of P. Pole 244
		0.000								
	TP				11.859 11.470	11.4700				PS
		1.455 0.586	0.5860		11.101					
	TP	0.317			9.473 8.917	8.9163				PS on MH Cover
		5.628 4.916	4.9157		8.359					
	TP	4.203				3.958 3.26	3.2630			PS
						2.569				

CH2MHILL

JOB NO.: 113630.08.22 PAGE: 73ofL
BY: K.GE DATE: 6-26-96

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	TP								P.S.
		2.818 2.857	7.8530						
	TP	6.890			11.920 11.008 10.091	11.0027			P.S.
		2.024 2.295	7.2956						
	TP	6.508			2.718 1.959 1.200	1.9590			P.S.
		4.556 4.036	4.0360						
	TB "C"	3.524				0.000	297.768		Top of Cap Cor. Fence Post @ SW Cor. Hays & Parsons
	TP				12.159 11.659	11.6596			PS
		1.230 0.731	0.7310		11.167				
	TP	0.232			10.770 10.325	10.325			P.S.
		4.400 3.820	3.8210		9.831	5.057	275.224		
	MW-51	3.243			5.301 4.716	4.7153	275.619		T.C.
	" 51	4.420 4.101	4.1013		4.129				4" Disk
	MW-51	3.773				4.048	40 275.772		T.C.
	△212				5.018 4.823	4.8227	274.298		PK & washer
		8.688 7.898	7.8963		4.627				
	TP	7.109			1.474 0.907	0.9063			
		7.549 7.771	7.7730		5.338				
	TP	6.999			8.248 7.557	7.5573			
		1.218 0.692	0.6933		6.867				
	MW-30	0.170			9.222 8.664 8.107	8.6643	08 274.335		3" Disk
		2.211 1.239	1.2393						
	TP	0.218			3.708 2.885	2.853			PS
					1.903				

256 354

9.077
7.518 7.5183
7.960

6.151 6.[illegible]50
5.672

CH2MHILL

JOB NO.: 313650.08.23
BY: K.G.
PAGE: 24 Lg:
DATE: 6-06-91

256 355

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	TP								PS
		8.294 7.558 6.823	2.5577						
	TP				5.575 4.962 4.347	4.9623			PS
		3.219 2.555 1.471	2.3543						
	TP				8.792 2.972 7.152	2.9720			PS
		2.209 1.290 1.371	1.8900						
	MW 40					2.060	262.		T.C
	WWO				9.108 8.800 2.492	2.200	26[illegible].727		4" Dist
		7.537 6.944 6.351	6.9443						
	MW 40					2.207	262.167		TC
	TP				3.313 2.750 2.188	2.7503			PS
		10.302 9.825 9.350	9.8257						
	TP				7.941 1.470 1.001	1.4707			PS
		10.231 9.670 9.113	9.6713						
	TP				5.831 5.254 11.670	5.260			PS
		6.090 5.481 4.878	5.483						
	TP				1.267 0.750 0.235	0.7507			PS
		9.578 9.101 8.625	8.785						
	215			6.151	7.296 7.037 6.177	6.1520	286.571		PK & washer
		4.163 3.270 3.377	3.2713						
	216				6.571 5.604 4.639	5.6047			
		1.159 0.680 0.202	0.6803						
	TP				9.160 8.713 8.261	2.7133			-2.3642

Cont. Pg 27

CH2MHILL

JOB NO.: 113630.08.22 PAGE: 25.64
BY: G.G.E. DATE: 6-06-96

DIFFERENTIAL LEVELS → #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC/ADJ. ELEV. ELEV.	
	Ø215								
		9.779							
	MW-54					0.991	295.10		
	454				0.758		295.[illegible]		
		0.911							
	MW 54		/			.3 1.140	299.36		
	Ø215				9.732				EOR
	Ø215								
		0.045							
	TP				11.725				
		1.675							
	MW-44					7.491	262.21[illegible]		T.C
	447				7.140		269.169		Top 4' Disk
		7.149							
	MW-44					7.500			T.C
	TP				1.684				
		12.291							
	Ø215				0.613				
	TP-D							23.04	See Pg 27
		9.269							
	Ø230				6.540				PK (Washed)
		8.516							
	MW 4L					5.985	27[illegible].72		T.C
	447				5.591		275.[illegible]		Top 4" Disk

CH2MHILL

JOB NO.: 13630.08ZZ
PAGE: 26
BY: K. GF
DATE: 6-06-91

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	
	442								
		5.546							
	MW-42					5.950			
	2230				8.470				
		10.503							
	TP-D				8.830			273.624	
	TP-E							288.254	See Pg. 28
		4.367							
	IP				7.229				hammer
		4.711							
	MW-43					6.878	225.554		T.C
	443				6.535		225.550		T-P 4" Disk
		6.706							
	MW-43					6.998			T.C.
	TP				5.329				hammered
		7.378							
	TP-E				5.472		229.51		POB

7.599 7.5997
7.095

[illegible].9533

CH2MHILL

JOB NO.: 113630.08.32 PAGE: 27
BY: K. GF DATE: 6-16-96

256 358

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	TP			Cont. from Pg. 24					PS
		3.652 3.153 2.654	3.1530						
	TP 'D'				6.851 6.334 5.815	6.3327	[illegible]		PS on back SW
		2.550 1.830 1.111	1.2303						
	TP				11.057 10.326 9.600	10.3257			P.S.
		1.271 0.734 0.199	0.7347						
	Δ 218				8.023 7.330 6.639	7.3307	257950		PK & Washer
		5.603 4.721 3.840	4.7213						
	TP				5.531 4.764 3.995	4.7633			PS
		8.101 7.597 7.093	7.5997						
	TP				1.037 0.646 0.256	0.6460	[illegible]		PS
		8.768 8.405 8.043	8.4053						
	TP				1.358 1.069 0.780	1.0690			
		11.065 10.503 9.744	10.5040						
	TP				0.993 0.565 0.137	0.5657			
		9.019 8.710 8.408	8.7107						
	TBM-1				3.419 3.118 2.816	3.1177			Ely bolt on Top flange of Hydrant @ SW Cor. of
		7.065 7.530 7.996	7.5303						Circuit & Roberts
	TP				2.019 1.501 0.985	1.5017			PS
		7.094 7.330 6.567	7.3297						
	TP				5.425 4.714 4.003	4.7140			P.S.
		11.263 10.839 10.416	10.8393						
	TP				2.771 2.472 2.056	2.4730			PS on E side BR Bldg

5.319
4.791 1.7917 17.955
4.352

CH2MHILL

JOB NO.: 113630.08.22 PAGE: 28 of 60
BY: K. GF DATE: 6-06-9

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.
	TP							
		3.008 2.455	2.4557					
	TBM-2	1.864			9.471 8.771	8.9707	299.188	
		4.023 3.792 2.563	3.3921		8.470			
	TD				4.937 4.540	4.5400		
		3.759 2.950	2.9497		3.745			
	TP-E	2.140			12.132 11.407 10.682	11.4070	287.91	
		2.350 1.280	1.2807					
	110-41	0.212				~~5.874~~	~~284.72~~	
	1,41				7.297 6.752	6.953	294.11	
		1.723 11.085	11.0853		5.610			
		14.448				11.350		
	Δ222				2.445 1.788	1.7880		
		8.039 7.134	7.1353		1.131			
	TP	6.232			5.915 5.059	5.0605		
		4.324 3.671	3.6913		4.207			
	TP Δ221	3.063			7.199 6.522	6.5227	292.05	
		6.332 6.137	6.1570		5.847			
	TP	2.392			6.520 6.785	6.2880		
		1.356 0.999	1.0000		6.056			
	TP?	0.145			10.178 9.356	9.3563		
		2.355 1.758	1.7583		8.540			
	TP	0.962			10.691 9.899	9.9000		
					9.110			

V-1

Top Silly bolt in Top Flange of Hydrant @ NE Cor. of Cincinnati & Dunn (between Chiotti & Noega)

PS.

PS in gutter N. side Dunn E. side shed

T.C.

Top 4" Disk

TC

Re Bar & Cap

Hammer

ZR. HCF

PK-42

PK 43

PK-44

256 | 359

CH2MHILL

JOB NO.: 11363008 ZZ PAGE: 28 of

BY: KG-GF DATE: 6-07-

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	V.I
	TP								PK.44
		2.092 1.211	[illegible]						
	TP	0.530			8.33 7.547	7.5433			PK-45
		7.488 6.699	6.6997		6.756				
	TD	5.912			3.184 2.567	2.5677			PK-46
		11.441 10.638	10.6323		1.750				
	TD	9.230			1.467 0.894	0.8947			PS
		12.551 11.633	11.6336		0.329				
	TP	10.717			2.940 2.070	2.0700			PK.48
		7.051 6.270	6.2720		1.200				
	TP	5.515			5.187 4.405	4.4054			PK 49
		8.141 7.350	7.3497		3.625				
	TD	6.558			5.491 4.706	4.7057			PK-50
		5.081 4.562	4.5623		3.920				
	△260	4.043			4.799 4.277	4.2793	277.579 258.004		2KL
		7.200 6.410	6.4103		3.760				
	TP	5.621			1.471 0.790	0.7903			PS
		10.538 10.096	10.0957		0.110				
	TP	9.653			1.398 0.979	0.9797			horizontal
		10.053 9.499	9.5000		0.559				
	72 △252	8.978			1.395 0.910	3.2167	405 321.436		PK @ Wash
		5.548 4.831	4.8323		0.227				
	TP	4.218			7.439 8.750	8.7563			PS
					7.678				
				12	21				

256 360

CH2MHILL

JOB NO.: 113630.08.ZZ
BY: Kw-GF

PAGE: 30 of 4
DATE: 6-07-96

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	Δ260								2x2
		3.379							
	TP				6.883				PS
		2.218							
	TP				3.807				PS
		1.230							
	TP				10.576				P.S
		2.129							
	Hw 42					6.663	284491		TC
	447				6.411		284.743		Top 4" Disk
		0.562							
	Yw 48					6.812	.493		TC
	TP				2.227				PS
		10.863							
	Δ261				1.775		283.114		PK & Washer
		4.176							
	TP				2.828				PS
		6.692							
	Δ260				3.190				POB
				EOR					

256 361

CH2MHILL

JOB NO.: 113530.08.ZZ
BY: JC.GF
PAGE: 31 of 45
DATE: 6-07-93

256 362

DIFFERENTIAL LEVELS → #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	TP		Cont. from pg. 29						P.S.
		2.179 1.404	1.4023						
	TP	0.635			10.575 9.807 9.042	1.2190			P.S.
		3.070 2.254	2.2547						
	73 Δ253	1.490				3.920	307385		PK & Washer
	TP				9.283 8.518	7.5110			P.S.
		5.273 4.359	4.3320		7.750				
	TP	3.402			3.230 2.330 1.431	2.3305			P.S.
		5.716 4.919	4.7177						
	Δ254	4.124			6.444 5.561	5.5627	304203		Re Bar & Cap
		3.596 2.697	2.6973		4.683				
	TP	1.799			5.923 5.066	5.0670			P.S.
		5.413 4.498	4.4970		4.215				
	TP	3.580			8.966 8.190	[illegible]			P.S.
		1.811 0.984	[illegible]		7.417				
	TP	0.157			7.091 6.268	[illegible]			P.S.
		6.992 6.036	6.0360		5.446				
	TP	5.080			6.590 5.672 4.761	[illegible]			P.S.
		7.144 6.451	6.4513						
	TP	5.757			3.263 2.572	2.5723			P.S.
		12.997 12.146	12.1455		1.280				
	Δ255	11.297			4.020 3.240	3.2407	[illegible]		PK & Washer in Curb
		2.973 2.279	2.2797		2.462				
	TP	1.587			12.866 12.150	12.1493			P.S.
					11.434				

5.191

CH2MHILL

JOB NO.: 1C3630.08.22 PAGE: 32 of 6
BY: Fe GF DATE: 6-07-8

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	V:1
	TP								P.S
		1.959 1.002 0.050	1.0037						used double Trig Level (run)
	TP				9.024 8.178 7.335	8.1783			P.S ← Bad TP used Two diff. Pomts 0.08'
		1.178 0.656 0.135	0.6563						See Page 12 845 + 45
	TP				11.624 11.111 10.600	11.117			P.S Top old cut off post
		2.743 2.080 1.419	2.0807						
	TP-G				0.000		280.49		ander side NW Cor. of 2x6 Cap on 3x3 Guard Cable
	–	4.357 4.053 3.749	-4.0530						Sign @ SE Cor. of 3rd & N. Street
	TP				7.361 6.619 5.878	6.6193			P.S
		6.170 5.470 4.771	5.4703						
	TP				1.240 0.643 0.048	0.6433			PS.
		8.524 8.158 7.791	8.1577						
	HW.52					3.576	279.334		T. C.
	452				3.447 3.082 2.718	3.0823	279.212 612		Top 4' Disk
		5.289 4.423 3.678	14933						
	HW.52					4.972	279.22		T.C
	TP				12.496 11.799 11.101	11.7987			P.S.
		11.789 10.774 9.761	10.7743						
	TP				6.039 5.132 4.222	5.1292			PS.
		3.713 3.426 3.090	3.4263						
	TP				1.427 1.072 0.717	1.0726			P.S.
		13.221 12.513	12.8137						
	TPI	12.407			1.650 1.250 0.850	1.2520	281.254		27.053

256 363

CH2MHILL

JOB NO.: 113630.08.ZZ
BY: K. GF

PAGE: 53, [illegible]
DATE: 6-07-9

DIFFERENTIAL LEVELS #	STA.	+ ROD / ANG.	H.I. ELEV. / HOR. DIST.	SLOPE DIST.	T.P. - ROD / VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. / VERT. DIFF.	REC./ADJ. ELEV. / ELEV.	
	TP								P.S.
		7.276 7.113	7.1137						
	TP	6.357			5.059 4.2607	4.2610			P.S.
		4.861 4.079	4.0797		3.475				
	TP	3.299			8.321 7.999 6.677	7.9990			P.S.
		6.797 5.894	5.8957						
	TP	4.990			5.416 4.539 3.664	4.5397			P.S.
		7.988 7.319	7.3197						
	11½.50	6.652				1.248	298.754		
	4.50				1.327 0.700	0.7003	299.470 [illegible]		
		9.150 7.762	7.7620		0.074				
	11½.50	7.374				9.308	298.21		
	TP					0.000	208.112		Top reflector on E face of fence & Post
	COE T1-1H				4.058 3.812	3.8123	304.856		Top 4" COE Disk T1-1H 1975
		4.660 3.811 2.964	3.8112		3.567				
	TP				6.424 5.566	5.5633			
		6.406 5.595	5.5963		4.712				
	COE T1-16	4.778			5.735 4.949	4.9493	301.311		Top 4" COE Disk [illegible]
		6.167 5.205	5.2060		4.764				
	TP	4.246			7.579 6.688 5.799	6.6887			P.S.
		7.699 0.920	0.9200						
	TP	0.141			4.811 4.131 3.421	4.1310			P.S.
		8.229 7.276	7.2767						
	Δ204	6.245			5.328 4.425 3.542	4.4350	291.469 .55		PK & Washer

3.411
3.649
2.238

[illegible]
1.236

CH2MHILL

JOB NO.: 113630-08.2.k
BY: K. GF
PAGE: 54 of 4
DATE: 6-07-9

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	B201							
		5.016 4048 3.079	4.0477					
	TP				3.478 2.540 1.606	2.5413		
		4.459 3.612 2.768	3.6130					
	MT 3M COE 4W				3.839 2.984 2.128	2.024 2.9837	293.430 273	293.462
		5.164 4.419 3.673	4.4187					
	TP				10.225 9.623 9.021	9.6233		
		4.331 3.356 2.380	3.3557					
	TP				3.819 2.845 1.872	2.8453		
		5.292 4.304 3.316	4.3040					
	TP				7.201 6.254 5.299	6.2500		
		5.641 4.635 3.630	4.6353					
	TP				3.543 2.545 1.550	2.5460		
		8.823 7.931 7.039	7.9310					
	TP				4.606 4.232 3.858	4.232		
		7.259 6.563 5.870	6.5640					
	TP				5.643 4.683 3.725	4.6837		
		5.010 4.625 4.240	4.6250					
	BM A-308				1.595 1.184 0.773	1.1843	291.942	291.919

P4 ϕ washer

D.S

2" Sq Brass Tablet Mkd. Memphis Tenn. B M (No.
4' Disk (both @ SW Cor. Airways & Dunn

P.S. See Page 20 of 45 for orig. vert

A.S.

P.S.

P.K. RR spike

CH2MHILL

JOB NO.: 113630.08.22
BY: Ku GF
PAGE: 35 of 6
DATE: 6-07-96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	
	TP-B							309.366	Top security Arm on fence around Drive Tel
		0.000							
	Δ209				1.519		307.847		6" Spike
		6.200							
	TP				3.203				PS
		3.944							
	MW-49					4.898	310.490		TC
	449	/			4.579		319.209		Top 4" Disk
		4.561							
	MW-49					4.870			TC
	TP				3.917				PS
		3.297							
	Δ209				6.899		302.217		
		1.023							
	TP				9.050				
		0.529							
	TP				8.044				hammel
		2.791							
	MW-46					7.542	287.554		T.C.
	446				7.158		287.558		Top 4" Disk
		2.677							
	MW-46					8.064	[illegible]		TC
	TP				1.797				
									P.S.

256 366

CH2MHILL

JOB NO.: 113650.08.37
BY: K. GF

PAGE: 36 of 4
DATE: 6-07-9

DIFFERENTIAL LEVELS → #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.		
	TP									
		0.281								
	TP				2.440					
		5.047								
	HW-29					18.550	772.152			Top Casing
	"				18.273		773.5[illegible]			Top Disk
		18.323								
	HW-29					18.600	[illegible]			Top Casing
	DZ11				0.595		[illegible]			ReBar & Cap
		6.552								
	TP "C"				0.000			597.268		Top of Cap on Cor. fence Post

JOB NO.: 15630.08.23
BY: K.G.E.

PAGE: 32.L4
DATE: 6.08'96

DIFFERENTIAL LEVELS #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.	
	TP-"A"						314.613		
		0.000							
	TP				0.964 0.210 0.667	.2157			Punch
		6.711 5.869	5.8697						
	TP	5.020			3.515 2.770 2.023	2.2693			P.S
		7.499 6.921	6.9233						
	△501	6.350 5.234			6.059 5.462 4.867	5.4627	318.359		4"Disk in CM
		4.477	4.4765						
	TD	3.718			6.507 5.680 4.859	5.6820			P.S.
		4.373 3.665	3.6647						
	TP	2.958			2.432 2.243 2.054	2.2430			P.S
		4.017 3.207	3.2073						
	△502	2.398			8.401 7.603 6.805	7.6030	309.679		4" Disk in CM
		4.078 3.396	3.3960						
	TD	2.714 4.549			7.474 6.765 6.058	6.7657			RR spike
		3.682	3.6833						
	TD	2.819 3.600			7.220 7.005 6.795	7.0067			P.S.
		2.645	2.6450						
	TP	1.690 3.898			8.967 8.050 7.132	8.0497			PS.
		2.951	2.9510						
	HW55	2.004				7.472	[illegible]		TC
	455				7.110 7.080 6.055	7.0710	[illegible]		Top 4" Disk
		6.793 6.072 5.356	6.0723						
	HW55					6.462			TC.

256 368

CH2MHILL

JOB NO.: 113630.08.22
BY: 1 / 2 · GF
PAGE: 38 of 64
DATE: 6-28-96

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC/ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	TP				6.650 5.751	5.7533		
		5.030 4.648	7.6477		4.859			
	TP·F	4.265			0.000		297.418	297.443
		0.000						
	70 251				5.719 4.791	4.3907		
					4.262			

P.S

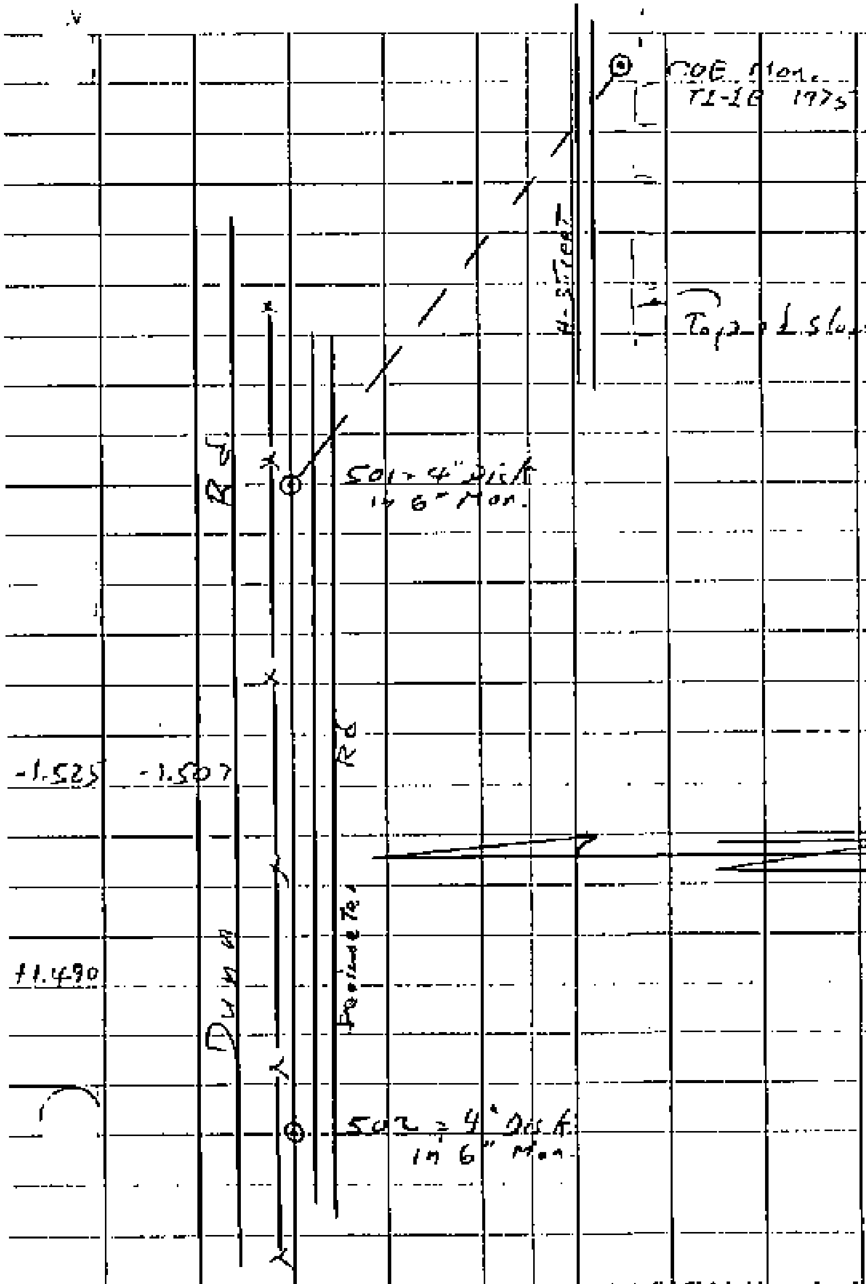
Top of wire

CH2MHILL

JOB NO.: 115630.08.23 PAGE: 39 [illegible]

BY: K- GF DATE: 4/08/96

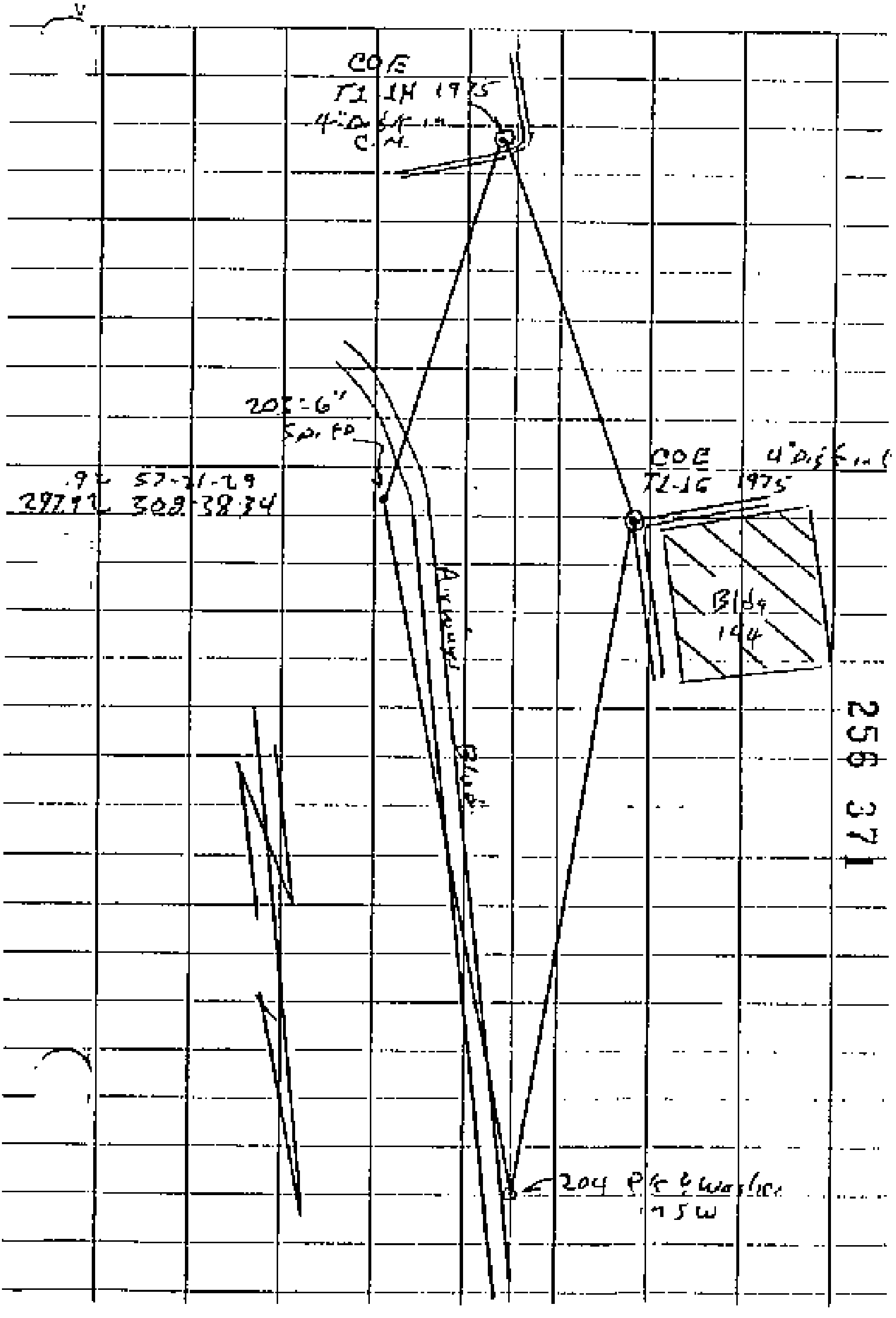
DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI-5^{32} TI-1G 503						316.852 .19	
			682.23			6.09	-1.18	
			692.74^{74}			5.75	.37 +1.37	
	HI-5^{75}							
△	501	210.00-21 210-00-16		210°00'19"				149-59-40 149-59-41
			915.93					
△	502							



JOB NO.: 136?3.08.2.4 PAGE: 40 of 4?

BY: L.GP DATE: 6-08-96

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	ROD	VERT. DIFF.	ELEV.
Δ	203							
			1112.64					
Δ	204	345-50-50 345-50-45	66 966.66	345°50'47"				14-09-11 14-09-15
			966.66					
Δ	505	129-18-04 129-18-11	60 658.60	189°18'06"				170-41-59 170-41-52
			658.60					
Δ	504	333-15-27 333-15-30		333°15'30"				26-44-28 26-44-28
			54 557.54					
			53 557.53					
Δ	203	211-35-42 211-35-49		211°35'43.5"				148-24-17 148-24-17
			1117.66					
Δ	204							



256 371

CH2MHILL

JOB NO.: K3658.08.23
BY: K. GF
PAGE: 41.64
DATE: 6/28/9

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.	
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.	
	TI-1G 205								COE 4" Disk TI-1G 1975
		4.461							
	TP				4.230				P.S.
		4.331							
	TP.				5.929				P.S.
		4.919							
	TP.				3.632				P.S
		5.235							
	TP				4.428				
		5.806							
	TP				9.559				
		1.895							
	TP				5.196				
		2.026							
	TP.				7.927				
		0911							
	TP				12.172				
		2.551							
	TP				7.010				
		3.862							
	Δ Airway				6225				USC&GS Mon. Airway 1959
		7.614							
✓	TP				5.610				

CH2MHILL

JOB NO.: 113630.08.21 PAGE: 42.54
BY: G. G DATE: 6-28-91

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	TD							
		7.800						
	TP				2.926			
		10903						
	TP				3.744			
		9.230						
	TP				2.057			
		5.442						
	TP				2.135			
		9.370						
	TP				5.611			
		4.409						
	TP				5.717			
		3.519						
	TP				4.798			
		6.024						
	TP				4.479			
		4.275						
	TI-1G 705				4.506			
				EOR				

POB

256 373

CH2MHILL

JOB NO.: 115630.08.22
BY: Kn · GP
PAGE: 43 of 49
DATE: 6-09-9

DIFFERENTIAL LEVELS → #	STA.	+ ROD ANG.	H.I. ELEV. HOR. DIST.	SLOPE DIST.	T.P. - ROD VERT. ANGLE	SIDE SHOT - ROD	FIELD ELEV. VERT. DIFF.	REC./ADJ. ELEV. ELEV.
	Δ200							
		5.587						
	TP "H"				0.000			
		0.000						
	TP "I"				3978			
	Δ256							
		4.108						
	TP "J"				0.000			
		3.000						
	457				3.230			
	CO E 4.10						293.462	
		1.140						
	Δ205					3.172		
	TP				4.825			
		2.299						
	TP				2.291			
		2.211						
	TP				5.991			
		4.712						
	Δ256				4.252			

Top wire 2nd Post E. of P Pole

Top E end of Warning Sign

CH2MHILL

JOB NO.: 123630.08-22
BY: K-GR
PAGE: 94.6
DATE: 6-09-9

DIFFERENTIAL LEVELS →		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	▷206							
		5.695						
	TP				2.905			
		7.359						
	TP				2.501			
		7.326						
	△207				3.135			
		7.824						
	TP				4.211			
		6.473						
	TP				3.252			
		5.550						
	TP 'A'					0.000	314.638	
	○208				5.897		302.741	

DIFFERENTIAL LEVELS		+ ROD	H.I. ELEV.		T.P. - ROD	SIDE SHOT	FIELD ELEV.	REC./ADJ. ELEV.
#	STA.	ANG.	HOR. DIST.	SLOPE DIST.	VERT. ANGLE	- ROD	VERT. DIFF.	ELEV.
	HI=5^{40}							
▷	452							
			978.85			5.90	$\overset{36}{-4.35}$	
	HI=5^{65}		782.26			5.65	$\overset{36}{14.34}$	
	TP							
			782.65			5.65	$\overset{93}{-21.94}$	
			782.15			5.41	$\overset{92}{+21.90}$	
	HI=5^{41}							
▷	255							

CH2MHILL

26.129

JOB NO.: 15630.08.22

BY: K-GF

PAGE: 45 [illegible]

DATE: 6-09-9

-26.263

-9.755

Trig Level Check between ▷255 & ▷452 (MW-52)

+9.750

-16.525

-16.5[illegible]

Appendix G

Quality Assurance/Quality Control

Appendix G
Quality Assurance/Quality Control

Level 1 and Level 3 (analytical laboratory) data were collected during the groundwater investigation. Level 1 field-screening data included pH, conductivity, temperature, DO, salinity, turbidity, and organic vapor concentrations. These measurements were made using a Horiba U-10 water quality meter and an HNu organic vapor analyzer. Level 5 data were generated and consisted of soil and groundwater samples sent to QAL Laboratory in Montgomery, Alabama.

The purpose of the data quality evaluation process is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interference. Evaluation of laboratory performance is a check for compliance with the method requirements—i.e., either the laboratory did or did not analyze the samples within the limits of the analytical method. Evaluation of matrix interference is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

Groundwater samples and soil boring samples (from well installation activities) were collected during the DDMT Groundwater Sampling Event in February 1996. All samples were analyzed using Level C quality control (QC) as described in the *Generic Quality Assurance Project Plan* (CH2M HILL, 1995). Level C is equivalent to EPA Level 3 QC requirements, which include collecting and analyzing field and laboratory QC samples at a specified frequency. The data from these samples are used to evaluate laboratory performance and matrix interference and to monitor potential field and laboratory contamination.

The following sections provide a discussion of the field and laboratory quality assurance (QA)/QC samples, an overview of the data review and validation process, and a summary of QA/QC parameters and data quality conclusions.

Field QA/QC

Sampling requirements for Level C Field QC include field blanks and duplicate field samples. Three types of field blank QC samples were collected to monitor the existence and magnitude of contamination problems potentially introduced by field errors. The three types are as follows:

Trip Blank (TB). Trip blanks were used to monitor any possible volatile organic compound (VOC) contamination introduced to samples during shipping and handling. The blanks are 40-milliliter vials of American Society for Testing and Materials (ASTM) Type II water that are filled in the laboratory, transported to the site with the sample bottles, and returned to the laboratory with VOC samples for analysis. The trip blank containers were not opened in the field. One trip blank sample was included with each shipping container that contained samples requiring VOC analysis.

Equipment Rinseate Blank (EB). Equipment rinseates are samples of organic-free water that is passed through and over decontaminated sampling equipment. The samples were used to monitor the effectiveness of the decontamination process. Equipment rinseate samples were collected at a rate of one per day per matrix. The equipment rinseate samples were analyzed for the same parameters as the associated field samples.

Field Blank (FB). The field blank consisted of a sample of the organic-free source water to be used for the final rinse during equipment decontamination. This blank was used to monitor contamination that may have been introduced by the rinse water. Field blanks were analyzed for the same parameters as field samples.

Field Duplicates. Field duplicates consisted of an original (or native) sample and an additional (or duplicate) sample that were collected from the same location at the same time. Duplicate field samples were collected at a frequency of 10 percent of the samples collected per matrix. These samples were used to monitor sampling and analytical precision.

Laboratory QA/QC

QA/QC samples analyzed by the laboratory during the DDMT Groundwater Sampling Event included method blanks and spiked samples. The type and frequency of each QA/QC sample is detailed in the analytical method. Results of these QA/QC samples and laboratory performance data (e.g., instrument calibration) were used to evaluate data quality during the data review and validation process.

Method blanks were analyzed each day prior to the analyses of any field samples. A method blank is a sample of ASTM Type II water that is analyzed by the same process as the corresponding field samples. Method blanks were used to monitor both laboratory performance and contamination potentially introduced during the analytical process.

Laboratory QC samples can be categorized as organic or inorganic QC samples. The two types of organic QC samples are as follows:

- **Surrogate spikes.** Surrogate compounds are the structural homologs of target compounds and are expected to behave in a similar manner during analysis. Surrogate spike recoveries were used to monitor matrix effects and laboratory performance and to estimate laboratory accuracy.
- **Matrix spike/matrix spike duplicates.** Matrix spike/matrix spike duplicates (MS/MSDs) were used to estimate the effect of the specific sample matrix on sample analyte recovery as well as on accuracy and precision. MS compounds are found on the method Target Compound List (TCL). The field sample was split into thirds, and two portions were spiked with known quantities of TCL compounds to ascertain the effects of the specific sample matrix on the recovery of these analytes. MS/MSD samples were collected and analyzed with 5 percent of the samples from each matrix (soil borings and groundwater).

The three types of inorganic QC samples are as follows:

- **Laboratory Control Standard.** A laboratory control standard (LCS) consists of an ideal matrix (usually ASTM Type II water) that has been spiked with a known amount of the analyte of interest; the LCS was prepared (digested) and analyzed with the field samples. The LCS is designed to monitor the efficiency of the overall analytical procedure (including sample preparation); the resulting analyte recoveries must fall within pre-established acceptance limits.

- **Spike samples**. Pre-digestion spikes are analogous to the MS/MSD spike recovery for organic analyses because they measure the effects of the sample matrix on the recovery of a known quantity of analyte after sample preparation and analysis. If the pre-digestion spike recovery did not fall within the acceptance window of 75 to 125 percent, then the post-digestion spike was added and the sample reanalyzed. The post-digestion spike monitors instrument performance and matrix effects. If both the pre- and post-digestion spike recoveries fell outside the acceptance limits, the data were flagged to indicate the non-conformance.
- **Laboratory duplicate samples**. Field samples were split in the laboratory, and the duplicate results were used to estimate precision. These samples are not replacements for field duplicate samples. Laboratory duplicate samples are analogous to the MS/MSD because they measure the effects of the sample matrix on precision after preparation and analysis. If the precision of the duplicate results were greater than 20 relative percent difference (RPD), then the results were qualified as estimated.

Data Review and Validation Approach

Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

The data packages were reviewed by the project chemists using the process outlined in the *Functional Guidelines for Evaluating Data* (EPA, 1994a/b). The data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decisionmaking processes. Areas of review included holding time compliance, initial and continuing calibration, spiked sample results, method blank results, and duplicate sample results. A data review worksheet was completed for each data package.

Samples that were not within the acceptance limits were flagged with a single- or double-letter abbreviation, which indicated a problem with the data. Although the qualifying flags originate during the data review and validation process, they are included in the data summary tables so that the data will not be used indiscriminately. The following flags were used during validation:

- U Undetected. Analyte was analyzed for but not detected above the method detection limit.
- UJ Detection limit estimated. Analyte was analyzed for but qualified as not detected. The numerical value is an estimate of the detection limit.

- **J** Estimated. The analyte was present, but the reported value may not be accurate or precise.
- **R** Rejected. The data are unusable. (Note: Analyte/compound may or may not be present.)

As required by the EPA, organic sample results that are greater than the Method Detection Limit (MDL), but less than the Contract-Required Quantitation Limit (CRQL), are qualified with a "J" for estimated. Similarly, inorganic sample results that are greater than the Instrument Detection Limit (IDL), but less than the Contract-Required Detection Limit (CRDL), are qualified with a J.

Once the data review and validation processes were completed, the entire data set was reviewed for chemical compound frequencies of detection, dilution factors that might affect data usability, and patterns of target compound distribution. The data set was also evaluated to identify potential data limitations, uncertainties, or both in the analytical results.

Holding Times

The holding times for each parameter were evaluated according to EPA Contract Laboratory Program (CLP) requirements. The holding time for metallic analytes is 180 days (except for mercury, at 28 days). All holding time requirements were met for elemental targets. The holding time for pH measurements is 6 hours. Samples were received by the laboratory outside of the holding times and were therefore qualified as estimated. However, pH measurements were taken in the field during sample collection (see Table 2.3).

Volatile organic holding times are 14 days from date of collection to analysis. For other organic analyses (SVOCs, pesticides, herbicides, and PCBs), extraction holding times are 7 days and analysis holding times are 40 days. All organic holding times were met except in instances where samples were re-extracted out of hold time in order to investigate low surrogate or low internal standard recoveries. All results from samples re-extracted out of hold time were qualified as estimated.

Potential Field Sampling and Laboratory Contamination

As discussed in the preceding sections, trip, equipment rinseate, and field blanks were used to monitor potential contamination introduced during field sampling, sample handling, and shipping activities. In addition to field blank samples, duplicate field samples were collected to provide information about sampling and analysis precision and accuracy. One duplicate sample was collected for every 10 field samples. Method blanks were used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was analyzed for every 10 samples, or one per analytical batch, whichever was more frequent.

According to *Functional Guidelines for Evaluating Data* (EPA, 1994), concentrations of common contaminants detected in samples at less than 10 times the maximum concentration in the blanks can be attributed to field sampling and laboratory contamination rather than to environmental contamination from site activities. Concentrations of less common blank contaminants are multiplied by 5 rather than 10. Common contaminants include acetone, methylene chloride, and phthalates.

Acetone and methylene chloride are used as extraction solvents in the laboratory and are common laboratory contaminants. Acetone and methylene chloride were detected in the field samples at concentrations greater than 10 times the highest concentration detected in the corresponding blanks. However, acetone and methylene chloride can most probably be attributed to field sampling and laboratory contamination because they were detected in the majority of the blanks and samples at similar concentrations indicative of systematic contamination.

Phthalates are used as plasticizers. The most common phthalates are bis(2-ethylhexyl) phthalate (BEHP) and di-n-butylphthalate (DNBP). These are often introduced into samples during handling. Wearing latex gloves, the field samplers physically transfer the soil samples from the sampling equipment (i.e., augers and stainless-steel bowls) to the sample containers. Latex gloves are used when handling groundwater sampling equipment such as pumps, hoses, and bailers. Also, laboratory personnel wear latex gloves when handling samples during the analytical process. The latex gloves are coated with plasticizers to facilitate release of the gloves from the skin. Therefore, the BEHP and DNBP can be attributed to field sampling and laboratory contamination. Similarly, other phthalates (e.g., butylbenzyl phthalate, diethylphthalate, and di-n-octylphthalate) were detected in samples but not in corresponding field or laboratory blanks. These sample results are most likely attributable to field sampling and laboratory contamination rather than to environmental conditions.

Inorganic target analytes (metals) were detected in field and laboratory blanks at concentrations at or near the IDL. These results can be attribute to instrument noise and are not indicative of contamination. Silicon was detected in several method blanks but not in field blanks. Silicon can be attributed to dissolution of the borosilicate glass beakers used in the sample digestion process. Target metals that were detected in field and laboratory blanks at significant levels are summarized in Table G-1. Sample results less than 5 times the maximum concentration detected in associated blanks were attributed to contamination and were qualified as undetected.

Table G-1
Target Analytes Detected in Lab and Field Blanks
DDMT Groundwater Characterization

Analyte (inorganic)	Detected/ Analyzed	Highest Concentration	CRDL	Probable Source
Aluminum	24/38	124	200	Field contamination
Barium	31/37	3.1	200	Field contamination
Calcium	35/37	211	5000	Field contamination
Chromium	3/13	9.5	10	Field contamination
Copper	9/20	3.2	25	Field contamination
Iron	36/39	410	100	Field contamination
Lead	4/20	14	3	Field contamination
Magnesium	12/30	68	5000	Field contamination
Manganese	27/37	8.9	15	Field contamination
Nickel	1/13	16	40	Field contamination
Sodium	37/37	10100	5000	Field contamination
Zinc	39/39	63.4	20	Field contamination

Notes:
Values in µg/L
CRDL = CLP Contract Required Detection Limit (for inorganics)

Chloroform and tetrachloroethene were detected in one equipment rinseate blank each, and 2-butanone was detected in two of the equipment rinseate blanks. Presence of these compounds in the equipment rinseate blanks is indicative of incomplete decontamination of field sampling equipment. Sample results for these target compounds at concentrations less than 5 times that in the associated equipment rinseate blanks were attributed to field sampling contamination and were qualified as undetected. Five times the maximum concentration of chloroform, tetrachloroethene, and 2-butanone in the blanks is less than or equal to the CRQL.

Tables G-1 and G-2 summarize the target analytes and target compounds detected in the field and laboratory QC blanks associated with the groundwater sampling event.

Table G-2
Target Compounds Detected in Lab and Field Blanks
DDMT Groundwater Characterization

Compound (organic)	Detected/ Analyzed	Highest Concentration	CRQL	Probable Source
BEHP	8/36	45	10	Sample handling
DNBP	16/36	26	10	Sample handling
Acetone	51/59	12	10	Lab contamination
Methylene chloride	42/59	3	10	Lab contamination
2-butanone	2/29	2	10	Field contamination
Chloroform	1/29	1	10	Field contamination
Tetrachloroethene	1/29	2	10	Field contamination

Notes:
Values in µg/L
CRQL = CLP Contract Required Quantitation Limit (for organics)

Surrogate Spike Recovery

Surrogate spike compounds were added to every sample analyzed for the organic parameter including field and laboratory blanks as well as field environmental samples. Surrogate spike compounds are the structural homologs of target compounds and are therefore expected to behave in a similar manner during analysis.

Surrogate spike recoveries were used to monitor both laboratory performance and matrix interference. Surrogate spike recoveries from field and laboratory blanks were used to evaluate laboratory performance because the field blanks represent an "ideal" sample matrix. Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences. For field samples, the samples were re-analyzed when the surrogate spike recoveries fall outside the method target acceptance windows. If the surrogate spike recovery is still outside the acceptance window for the re-analyzed sample, then the sample results are qualified as estimated because of matrix interference.

The VOC surrogate recoveries are clustered within a window of 90 to 115 percent, which is within the method target acceptance limits. A greater variation (and hence broader range of recoveries) in surrogate spike recovery was observed for the other organic analyses, but this is typical of these analyses and is reflected by the broader method target acceptance limits. Except for SVOC analyses, samples with surrogate recoveries outside the acceptance limits are flagged with J for estimated. For SVOC analysis (where there are eight surrogates), the method allows one surrogate recovery to be outside the acceptance limits before requiring that sample results be qualified.

Many surrogate recoveries of zero were a result of sample dilution. Samples are diluted because of the high target content or matrix interference, and surrogate compounds are not added to the diluted sample. Sample results with low surrogate recoveries that resulted from dilution were not qualified.

The majority of surrogate spike recoveries were within the method target acceptance limits, which indicates that the matrix did not influence the analytical process or sample result.

Matrix Spike Recoveries

For organic analysis, three aliquots of a single sample are analyzed: one native and two spiked with matrix spike compounds. Unlike the surrogate spike compounds, matrix spike compounds are found on the method target compound list. For inorganic analysis, two aliquots of a single sample are analyzed: one native and one spiked with target analytes. Spike recovery is used to evaluate potential matrix interference with and accuracy of the analytical process. The duplicate spike results are compared to evaluate precision.

More than 90 percent of matrix spike recoveries were within the method target acceptance ranges, indicating that the specific sample matrices did not influence the overall analytical process or the final numerical sample result.

Duplicate Sample Results

Duplicate sample analyses were used to evaluate the precision of the analytical data. Approximately one duplicate field sample was collected for every 10 field samples. Both the native and duplicate samples were analyzed for the same parameters. *Functional Guidelines for Evaluating Data* (EPA, 1994) sets advisory limits of 20 RPD for water and 35 RPD for soil when both values are more than 5 times the CRDL for inorganic analysis or 5 times the CRQL for organic analysis. If either one or both of the values is less than 5 times the CRDL or CRQL, then duplicate results should be within plus or minus the CRDL or CRQL for water, or plus or minus 2 times the CRDL or CRQL for soil. Overall, the field duplicate results indicate that precision was not compromised by either the matrices or the field sampling techniques.

Target parameters were detected 46 times in both native and duplicate samples. Seven of these had RPDs that were outside of the criteria described above; they are summarized in Table G-3. Although these results are outside of advisory limits, the degree of disagreement is not large enough to cast doubt on the usability of the data for project decisionmaking.

Table G-3
Field Sample Duplicate Precision Outside Acceptance Criteria
DDMT Groundwater Characterization

Sample ID	Element or Compound	Native Concentration	Duplicate Concentration	RPD (%)
MW241	Aluminum	718 µg/L	973 µg/L	30
	Iron	5190 µg/L	7450 µg/L	36

Table G-3 (continued)
Field Sample Duplicate Precision Outside Acceptance Criteria
DDMT Groundwater Characterization

Sample ID	Element or Compound	Native Concentration	Duplicate Concentration	RPD (%)
MW311	Trichloroethene	680 µg/L	1100 µg/L	47
	1,1,2,2-Tetrachloroethane	420 µg/L	280 µg/L	40
	(total) 1,2-dichloroethene	760 µg/L	480 µg/L	45
	Chloroform	35 µg/L(J)	23 µg/L(J)	41
SBSTB1202	Dieldrin	8 µg/kg	4.3 µg/kg	60

Notes:
RPD = Relative Percent Difference
J = estimated

Results for Metals Near the Instrument Detection Limit

The Instrument Detection Limit (IDL) is the constituent concentration that produces a signal greater than 5 times the signal-to-noise ratio of the instrument and is a calculated value rather than an experimentally demonstrated value. Therefore, sample results at or near the IDL may be caused by instrument noise or low-level background shifts rather than an analyte signal.

The samples were analyzed for the TAL list of metals (or parts thereof) consisting of antimony, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, iron, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, vanadium, and zinc. Silicon was occasionally added to the requested list of analytes.

Concentrations of metals near the IDL were reported for many of the target metals. These data were evaluated before they were used in the report preparation process.

The sample results were reported in terms of the CRDL. Sample results that were above the IDL but less than the CRDL were qualified as estimated values. The reporting limit, or CRDL, is typically 5 to 10 times the concentration of the IDL. Results at or near the CRDL are more "viable" results and are not suspect in the same way as results reported at or near the IDL.

Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC)

Precision—is defined as the agreement between duplicate results and was estimated by comparing duplicate matrix spike recoveries and field duplicate sample results. More than 90 percent of matrix spike recoveries were less than 20 percent RPD. More than 85 percent of RPDs for duplicate field sample results were less than 20 percent for water samples and 35 percent for soil samples. These parameters indicate that the sample matrix did not interfere with the analytical precision.

Accuracy—is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For the organic analyses, each of the samples was spiked with a surrogate compound; and for inorganic analyses, each sample was spiked with a known reference material before digestion. Each of these approaches provides a measure of the matrix effects on the analytical accuracy. Accuracy can be estimated from these analytical data but cannot be measured directly. More than 95 percent of the spike recoveries were within the method acceptance limits; therefore, there was no evidence of matrix interference.

Representativeness—is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness was demonstrated by providing full descriptions in the project scoping documents of the sampling techniques and the rationale used for selecting sampling locations.

Completeness—is defined as the percentage of measurements that are judged to be valid when compared with the total number of measurements made. A goal of 95 percent usable data was established in the project scoping document, and more than 99 percent of the data was determined to be invalid.

Comparability—is another qualitative measure designed to express the confidence for comparing data sets. Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from this investigation are comparable with other data collected at the site because only EPA methods were used to analyze the samples, and Level 2 QC data are available to support the quality of the data.

Data Quality Evaluation Conclusions

Conclusions of the data quality evaluation process are as follows:

- The laboratory analyzed the samples according to the EPA methods stated in the work plan as demonstrated by acceptable instrument calibration and blank spike.
- Concentrations of acetone, methylene chloride, and phthalates (including BEHP, di-n-butylphthalate, di-n-octylphthalate, butylbenzylphthalate, and diethylphthalate) can all be attributed to field sampling and laboratory contamination rather than to environmental contamination.
- Sample results for metals above the IDL but less than the CRDL may be attributed to instrument noise and not to site-related activities.
- Sample results for organics above MDL but less than the CRQL should be considered as uncertain but indicative of the presence of that compound at an estimated concentration.
- Spike recoveries and duplicate sample results indicate that the specific sample matrix did not interfere with the analytical process.

The data can be used in the project decisionmaking process without further qualification.

Executive Summary

This Technical Memorandum (TM) is an interim submittal of subsurface physical and groundwater chemical data collected during the first quarter of 1996. Additional evaluation and interpretation of the groundwater data including risk assessment, subsurface geological modeling, and fate and transport analysis will be presented in a subsequent Remedial Investigation Report. The objective of this groundwater investigation was to achieve a better understanding of the aquifer characteristics including direction and velocity of groundwater flow on a facility-wide basis and the horizontal and vertical extent of groundwater contamination. Specific objectives are as follows:

- Evaluate the groundwater quality and flow directions west of Dunn Field.
- Determine the quality of groundwater flowing onto the Defense Depot Memphis Tennessee (DDMT) main installation and Dunn Field.
- Evaluate the suspected area of vertical hydraulic interconnection between the uppermost and the underlying confined aquifer.
- Provide geologic, groundwater flow, and groundwater chemistry data to support the design of a groundwater extraction system proposed at Dunn Field.

To achieve these objectives, 16 new groundwater wells and 2 new geologic test borings were installed to provide hydrogeologic and geotechnical data. In addition, 54 new and existing wells were sampled and analyzed for organic and inorganic groundwater constituents.

Test boring and well installation west of Dunn Field have provided a general configuration of the dense clay that composes the base of the unconfined upper aquifer at DDMT. Across most of Dunn Field and the northern portion of the main installation, groundwater flow is largely controlled by the slope of the clay surface which is dominated by a depressed surface in the clay. It has not been determined if this depressed surface is an erosional feature or a gap in the deposition of the clay.

Volatile organic compounds (VOCs) detected above Applicable, Relevant, and Appropriate Requirements (ARARs) for groundwater include trichloroethene; tetrachloroethene; 1,1,1-trichloroethane; 1,1-dichloroethene; carbon tetrachloride; and 1,1,2,2-tetrachloroethylene. Inorganic constituents exceeding groundwater ARARs include beryllium, chromium, copper, lead, and nickel.

The configuration of the organic and inorganic contaminant plumes within Dunn Field and the main installation are similar to that previously reported by Law (1990) and ESE (1993). Data collected to the west of Dunn Field indicate that for most constituents the plumes are bounded by wells MW-40, -42, -43, and -41 (See Figure 1-2). Low concentrations of organic compounds in an offsite well at the northeast corner of Dunn Field indicate that the plume is not completely bounded there.

Inorganic constituents are elevated at Dunn Field and the northwest portion of the main installation. Overall, the inorganic constituents are lower in the 1996 sampling than during previous sampling efforts.

Groundwater quality data, regional stratigraphy, and water level data do not indicate that there is a hydraulic connection between the uppermost aquifer and underlying confined sand aquifers. Additional investigation will be performed to determine if the upper aquifer belongs to the regional aquifer, the Memphis Sand, or other water producing sands.

Appendix H

Analytical Data Summary: Supplemental

Analytical Data Summary

		Station ID:	MW02	MW03	MW04	MW05	MW06	MW07	MW08	MW09	MW10	MW10
		Sample ID:	MW021	MW31	MW041	MW051	MW61	MW71	MW081	MW91	MW101	MW101DL
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/12/96	2/12/96	2/12/96	2/13/96	2/11/96	2/13/96	2/13/96
Group	**Parameter**	**Units**										
GENERAL	IODIDE (As I)	MG/L				0.5 U						
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L		0.2 U			0.2 U		0.2 U			
GENERAL	CHLORIDE (AS CL)	MG/L		16.2 =			224 =		18.3 =			
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L		3.07 =			4.01 =		2.25 =			
GENERAL	SULFATE (AS SO4)	MG/L		45.9 =			11.2 =		44 =			
GENERAL	pH	pH				6.4 J						
GENERAL	TOTAL ORGANIC CARBON	MG/L		48.7 =			30.7 =		36.4 =			
GENERAL	BICARBONATE	MG/L										
GENERAL	FLUORIDE	MG/L										
GENERAL	HARDNESS (AS CaCO3)	MG/L										
GENERAL	NITROGEN, NITRATE (AS N)	MG/L										
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L										
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L										
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L										
Herb	DALAPON	UG/L				5 U		5 U			5 U	
Herb	DICAMBA	UG/L				0.5 U		0.5 U			0.5 U	
Herb	MCPA	UG/L				250 U		250 U			250 U	
Herb	MCPP	UG/L				250 U		250 U			250 U	
Herb	DICHLOROPROP	UG/L				2.5 U		2.5 U			2.5 U	
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L				2.5 U		2.5 U			2.5 U	
Herb	SILVEX (2,4,5-TP)	UG/L				0.5 U		0.5 U			0.5 U	
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L				0.5 U		0.5 U			0.5 U	
Herb	2,4 DB	UG/L				2.5 U		2.5 U			2.5 U	
Herb	DINOSEB	UG/L				0.5 U		0.5 U			0.5 U	
Metals TAL	ALUMINUM	UG/L	601 J	718 J	252 J	127 UJ	1120 J	679 J	3610 J	5210 J	730 =	

		StationID:	MW11	MW12	MW13	MW14	MW14	MW15	MW16	MW19	MW19	MW20
		Sample ID:	MW111	MW121	MW131	MW141	MW141RE	MW151	MW161	MW191	MW191RE	MW201
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/11/96	2/11/96	2/7/96	2/13/96	2/7/96	2/7/96	2/7/96
Group	Parameter	Units										
GENERAL	IODIDE (As I)	MG/L	0.5 U									
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L				0.4 =						
GENERAL	CHLORIDE (AS CL)	MG/L			11.7 =	10.1 =						
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L				4.69 =						
GENERAL	SULFATE (AS SO4)	MG/L			21.6 =	23.7 =						
GENERAL	pH	pH	6 J									
GENERAL	TOTAL ORGANIC CARBON	MG/L			26.3 =	27.8 =						
GENERAL	BICARBONATE	MG/L										
GENERAL	FLUORIDE	MG/L										
GENERAL	HARDNESS (AS CaCO3)	MG/L										
GENERAL	NITROGEN, NITRATE (AS N)	MG/L										
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L										
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L										
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L										
Herb	DALAPON	UG/L				5 U			5 U	5 U		5 U
Herb	DICAMBA	UG/L				0.5 U			0.5 U	0.5 U		0.5 U
Herb	MCPA	UG/L				250 U			250 U	250 U		250 U
Herb	MCPP	UG/L				250 U			250 U	250 U		250 U
Herb	DICHLOROPROP	UG/L				2.5 U			2.5 U	2.5 U		2.5 U
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L				2.5 U			2.5 U	2.5 U		2.5 U
Herb	SILVEX (2,4,5-TP)	UG/L				0.5 U			0.5 U	0.5 U		0.5 U
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L				0.5 U			0.5 U	0.5 U		0.5 U
Herb	2,4 DB	UG/L				2.5 U			2.5 U	2.5 U		2.5 U
Herb	DINOSEB	UG/L				0.5 U			0.5 U	0.5 U		0.5 U
Metals TAL	ALUMINUM	UG/L	115 UJ	20500 =	1270 J	22600 J		210 J	2670 =	235 J		635 J

256 391

		Station ID:	MW21	MW22	MW23	MW24	MW24	MW25	MW26	MW28	MW29	MW30
		Sample ID:	MW211	MW221	MW231	MW241	MW241A	MW251	MW261	MW281	MW291	MW301
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/10/96	2/10/96	2/10/96	2/10/96	2/10/96	2/9/96	2/8/96	2/7/96	2/11/96	2/10/96
Group	**Parameter**	**Units**										
GENERAL	IODIDE (As I)	MG/L										
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L										
GENERAL	CHLORIDE (AS CL)	MG/L										
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L										
GENERAL	SULFATE (AS SO4)	MG/L										
GENERAL	pH	pH										
GENERAL	TOTAL ORGANIC CARBON	MG/L										
GENERAL	BICARBONATE	MG/L										
GENERAL	FLUORIDE	MG/L										
GENERAL	HARDNESS (AS CaCO3)	MG/L										
GENERAL	NITROGEN, NITRATE (AS N)	MG/L										
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L										
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L										
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L										
Herb	DALAPON	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		5 U
Herb	DICAMBA	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U
Herb	MCPA	UG/L	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U		250 U
Herb	MCPP	UG/L	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U		250 U
Herb	DICHLOROPROP	UG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U		2.5 U
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U		2.5 U
Herb	SILVEX (2,4,5-TP)	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U
Herb	2,4 DB	UG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U		2.5 U
Herb	DINOSEB	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U
Metals TAL	ALUMINUM	UG/L	393 J	1580 J	545 J	718 J	973 J	110 UJ	83.2 UJ	287 J	768 J	166 UJ

Analytical Data Summary

		Station ID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
GENERAL	IODIDE (As I)	MG/L										
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L				0.2 U		0.2 U		0.2 U		0.2 U
GENERAL	CHLORIDE (AS CL)	MG/L				127 =		9.8 =		3.4 =	4.5 =	11.3 =
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L				3.97 =		3.85 =		0.05 U	0.05 U	4.08 =
GENERAL	SULFATE (AS SO4)	MG/L				17.4 =		6.2 =		4.2 =	4.9 =	15.3 =
GENERAL	pH	pH										
GENERAL	TOTAL ORGANIC CARBON	MG/L				24.6 =		28.1 =		33.2 =		26.2 =
GENERAL	BICARBONATE	MG/L				47 =					168 =	
GENERAL	FLUORIDE	MG/L				0.1 U					0.1 U	
GENERAL	HARDNESS (AS CaCO3)	MG/L				212 =					170 =	
GENERAL	NITROGEN, NITRATE (AS N)	MG/L				3.97 =					0.05 U	
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L				482 =					191 =	
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L										
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L										
Herb	DALAPON	UG/L						5 U	5 U			5 U
Herb	DICAMBA	UG/L						0.5 U	0.5 U			0.5 U
Herb	MCPA	UG/L						250 U	250 U			250 U
Herb	MCPP	UG/L						250 U	250 U			250 U
Herb	DICHLOROPROP	UG/L						2.5 U	2.5 U			2.5 U
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L						2.5 U	2.5 U			2.5 U
Herb	SILVEX (2,4,5-TP)	UG/L						0.5 U	0.5 U			0.5 U
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L						0.5 U	0.5 U			0.5 U
Herb	2,4 DB	UG/L						2.5 U	2.5 U			2.5 U
Herb	DINOSEB	UG/L						0.5 U	0.5 U			0.5 U
Metals TAL	ALUMINUM	UG/L	47.6 UJ	73.3 UJ		21.3 UJ	71.4 UJ	140 UJ	3850 =	406 J	478 J	1610 J

256 393

		StationID:	MW38	MW39	MW40	MW40	MW40	MW41	MW41	MW42	MW44
		Sample ID:	MW381RE	MW391	MW40	MW401	MW40A	MW413	MW411	MW421	MW441
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/11/96	2/10/96	1/15/96	1/15/96	1/15/96	1/17/96	1/17/96	1/19/96	1/19/96
Group	Parameter	Units									
GENERAL	IODIDE (As I)	MG/L									
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L									
GENERAL	CHLORIDE (AS CL)	MG/L									
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L									
GENERAL	SULFATE (AS SO4)	MG/L									
GENERAL	pH	pH									
GENERAL	TOTAL ORGANIC CARBON	MG/L									
GENERAL	BICARBONATE	MG/L									
GENERAL	FLUORIDE	MG/L									
GENERAL	HARDNESS (AS CaCO3)	MG/L									
GENERAL	NITROGEN, NITRATE (AS N)	MG/L									
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L									
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L									
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L									
Herb	DALAPON	UG/L		5 U							
Herb	DICAMBA	UG/L		0.5 U							
Herb	MCPA	UG/L		250 U							
Herb	MCPP	UG/L		250 U							
Herb	DICHLOROPROP	UG/L		2.5 U							
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L		2.5 U							
Herb	SILVEX (2,4,5-TP)	UG/L		0.5 U							
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L		0.5 U							
Herb	2,4 DB	UG/L		2.5 U							
Herb	DINOSEB	UG/L		0.5 U							
Metals TAL	ALUMINUM	UG/L		15900 J	66.7 U		255 =			2670 J	4720 J

256 394

Analytical Data Summary

		StationID:	MW45		MW46		MW47		MW48		MW49		MW50		MW51		MW51		MW52	
		Sample ID:	MW451		MW461		MW471		MW481		MW491		MW501		MW511		MW511A		MW521	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/8/96		2/9/96		2/9/96		2/8/96		2/9/96		2/11/96		2/8/96		2/8/96		2/11/96	
Group	Parameter	Units																		
GENERAL	IODIDE (As I)	MG/L																		
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L																		
GENERAL	CHLORIDE (AS CL)	MG/L																		
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L																		
GENERAL	SULFATE (AS SO4)	MG/L																		
GENERAL	pH	pH																		
GENERAL	TOTAL ORGANIC CARBON	MG/L																		
GENERAL	BICARBONATE	MG/L																		
GENERAL	FLUORIDE	MG/L																		
GENERAL	HARDNESS (AS CaCO3)	MG/L																		
GENERAL	NITROGEN, NITRATE (AS N)	MG/L																		
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L																		
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L																		
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L																		
Herb	DALAPON	UG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Herb	DICAMBA	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Herb	MCPA	UG/L	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Herb	MCPP	UG/L	250	U	250	U	250	U	1000	U	250	U	250	U	250	U	250	U	250	U
Herb	DICHLOROPROP	UG/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Herb	SILVEX (2,4,5-TP)	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Herb	2,4 DB	UG/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Herb	DINOSEB	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Metals TAL	ALUMINUM	UG/L	586	J	103	UJ	365	J	192	UJ	86.2	UJ	174	UJ	153	UJ	120	UJ	111	UJ

256 595

Analytical Data Summary

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
GENERAL	IODIDE (As I)	MG/L								
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L								
GENERAL	CHLORIDE (AS CL)	MG/L								
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L								
GENERAL	SULFATE (AS SO4)	MG/L								
GENERAL	pH	pH								
GENERAL	TOTAL ORGANIC CARBON	MG/L								
GENERAL	BICARBONATE	MG/L								
GENERAL	FLUORIDE	MG/L								
GENERAL	HARDNESS (AS CaCO3)	MG/L								
GENERAL	NITROGEN, NITRATE (AS N)	MG/L								
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L								
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L								
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L								
Herb	DALAPON	UG/L	5	U	5	U	5	U		
Herb	DICAMBA	UG/L	0.5	U	0.5	U	0.5	U		
Herb	MCPA	UG/L	250	U	250	U	250	U		
Herb	MCPP	UG/L	250	U	250	U	250	U		
Herb	DICHLOROPROP	UG/L	2.5	U	2.5	U	2.5	U		
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L	2.5	U	2.5	U	2.5	U		
Herb	SILVEX (2,4,5-TP)	UG/L	0.5	U	0.5	U	0.5	U		
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L	0.5	U	0.5	U	0.5	U		
Herb	2,4 DB	UG/L	2.5	U	2.5	U	2.5	U		
Herb	DINOSEB	UG/L	0.5	U	0.5	U	0.5	U		
Metals TAL	ALUMINUM	UG/L	203	U	173	U	143	U		

256 396

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
GENERAL	IODIDE (As I)	MG/L
GENERAL	NITROGEN, AMMONIA (AS N)	MG/L
GENERAL	CHLORIDE (AS CL)	MG/L
GENERAL	NITROGEN, NITRATE-NITRITE	MG/L
GENERAL	SULFATE (AS SO4)	MG/L
GENERAL	pH	pH
GENERAL	TOTAL ORGANIC CARBON	MG/L
GENERAL	BICARBONATE	MG/L
GENERAL	FLUORIDE	MG/L
GENERAL	HARDNESS (AS CaCO3)	MG/L
GENERAL	NITROGEN, NITRATE (AS N)	MG/L
GENERAL	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	MG/L
Herb/TCLP	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L
Herb/TCLP	SILVEX (2,4,5-TP)	UG/L
Herb	DALAPON	UG/L
Herb	DICAMBA	UG/L
Herb	MCPA	UG/L
Herb	MCPP	UG/L
Herb	DICHLOROPROP	UG/L
Herb	2,4-D (DICHLOROPHENOXYACETIC ACID)	UG/L
Herb	SILVEX (2,4,5-TP)	UG/L
Herb	2,4,5-T (TRICHLOROPHENOXYACETIC ACID)	UG/L
Herb	2,4 DB	UG/L
Herb	DINOSEB	UG/L
Metals TAL	ALUMINUM	UG/L

256 397

Analytical Data Summary

		Station ID:	MW02		MW03		MW04		MW05		MW06		MW07		MW08		MW09		MW10		MW10	
		Sample ID:	MW021		MW31		MW041		MW051		MW61		MW71		MW081		MW91		MW101		MW101DL	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/12/96		2/12/96		2/12/96		2/13/96		2/11/96		2/13/96		2/13/96	
Group	Parameter	Units																				
Metals TAL	ANTIMONY	UG/L	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U		
Metals TAL	ARSENIC	UG/L	0.68	UJ	0.68	UJ	0.68	UJ	0.68	UJ	0.68	UJ	1.2	J	0.68	UJ	0.68	UJ	0.81	UJ		
Metals TAL	BERYLLIUM	UG/L	3.7	J	0.19	U	1.1	U	0.15	U	0.25	U	0.15	U	0.39	U	0.96	U	0.15	U		
Metals TAL	CADMIUM	UG/L	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U		
Metals TAL	CHROMIUM, TOTAL	UG/L	2.2	U	9.9	J	2.2	U	2.2	U	21.9	=	7.4	U	26.4	=	12.4	U	10.8	=		
Metals TAL	COPPER	UG/L	32.5	=	2	U	2.8	J	2	U	2	U	2.2	U	2	U	33.9	=	14.2	U		
Metals TAL	LEAD	UG/L	9.9	=	1.8	J	9.4	=	1.4	U	5.2	=	1.4	U	6.7	=	18.4	=	3.5	=		
Metals TAL	MERCURY	UG/L	0.84	=	0.07	U	0.07	U	0.13	U	0.33	U	0.07	U	0.07	U	0.09	U	0.07	U		
Metals TAL	NICKEL	UG/L	7.7	U	10.4	J	7.7	U	7.7	U	25.3	J	10.3	U	16	J	7.7	U	8.7	J		
Metals TAL	SELENIUM	UG/L	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ		
Metals TAL	SILVER	UG/L	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U		
Metals TAL	THALLIUM	UG/L	0.86	UJ	0.86	U	0.86	U	0.86	UJ	0.86	J	0.86	UJ	0.86	UJ	0.86	U	0.86	UJ		
Metals TAL	ZINC	UG/L	53.1	U	18	U	10.8	U	4.3	U	21.6	U	18.1	U	19.3	U	38.8	U	23.6	U		
Metals TAL	BARIUM	UG/L							71.7	J			67.3	J					89.3	J		
Metals TAL	CALCIUM	UG/L							19400	=			16900	=					20100	=		
Metals TAL	COBALT	UG/L							1.8	U			1.6	U					1.5	U		
Metals TAL	IRON	UG/L			3810	J			160	UJ	4250	=	3270	J	12600	J			1450	=		
Metals TAL	MAGNESIUM	UG/L							10400	=			8300	=					10300	=		
Metals TAL	MANGANESE	UG/L							6.3	U			23.2	=					20.5	=		
Metals TAL	POTASSIUM	UG/L							1110	J			767	U					767	U		
Metals TAL	SODIUM	UG/L							48300	J			21700	J					25600	J		
Metals TAL	VANADIUM	UG/L							2	U			2.9	J					1.7	J		
Metals TAL	SILICON	UG/L																				
MetalsTCLP	Aluminum	UG/L																				
MetalsTCLP	Antimony	UG/L																				
MetalsTCLP	Arsenic	UG/L																				
MetalsTCLP	Barium	UG/L																				
MetalsTCLP	Beryllium	UG/L																				
MetalsTCLP	Cadmium	UG/L																				
MetalsTCLP	Calcium	UG/L																				

		StationID:	MW11		MW12		MW13		MW14		MW14		MW15		MW16		MW19		MW19		MW20	
		Sample ID:	MW111		MW121		MW131		MW141		MW141RE		MW151		MW161		MW191		MW191RE		MW201	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/11/96		2/11/96		2/7/96		2/13/96		2/7/96		2/7/96		2/7/96	
Group	Parameter	Units																				
Metals TAL	ANTIMONY	UG/L	10.9	U	10.9	U	10.9	U	10.9	U			10.9	U	10.9	U	16.9	U			10.9	U
Metals TAL	ARSENIC	UG/L	0.68	UJ	1.4	UJ	0.68	UJ	0.9	J			0.68	U	1.5	UJ	1.3	U			1.7	U
Metals TAL	BERYLLIUM	UG/L	0.15	U	2.9	J	0.18	U	2.9	J			0.53	J	0.15	U	0.15	U			1.1	J
Metals TAL	CADMIUM	UG/L	1.8	U	1.8	U	1.8	U	1.8	U			1.8	U	1.8	U	1.8	U			1.8	U
Metals TAL	CHROMIUM, TOTAL	UG/L	2.2	U	63	=	12.5	U	42.6	=			2.2	U	34	=	2.2	U			2.2	U
Metals TAL	COPPER	UG/L	2	U	105	=	3.2	U	36	=			75	=	12.3	U	315	=			207	=
Metals TAL	LEAD	UG/L	1.4	U	24.4	=	2.1	J	19.3	=			2.6	J	7.6	=	3.9	=			5.2	=
Metals TAL	MERCURY	UG/L	0.07	U	0.17	J	0.07	U	0.46	U			0.37	U	0.07	U	0.1	U			0.28	U
Metals TAL	NICKEL	UG/L	7.7	U	46	=	12.6	U	25.3	J			7.7	U	25.6	J	12.1	J			7.7	U
Metals TAL	SELENIUM	UG/L	2.3	UJ	6.9	UJ	2.3	UJ	2.3	UJ			2.3	UJ	2.3	UJ	2.3	UJ			2.3	UJ
Metals TAL	SILVER	UG/L	2.2	U	2.2	U	2.2	U	2.2	U			2.2	UJ	2.2	U	2.2	UJ			2.2	UJ
Metals TAL	THALLIUM	UG/L	0.86	U	0.86	UJ	0.86	U	0.86	UJ			0.86	UJ	0.86	UJ	0.86	UJ			0.86	UJ
Metals TAL	ZINC	UG/L	5.6	U	132	=	19.8	U	100	=			23.2	U	38.9	U	62.4	U			94.4	=
Metals TAL	BARIUM	UG/L							312	=			70.5	J	66.7	J	42.9	J			54.2	J
Metals TAL	CALCIUM	UG/L							16900	=			14300	=	44900	=	17800	=			28600	=
Metals TAL	COBALT	UG/L							61.9	=			4	U	12.3	J	6	U			3.1	U
Metals TAL	IRON	UG/L					5370	=	96100	J			271	UJ	3970	=	155	UJ			341	UJ
Metals TAL	MAGNESIUM	UG/L							8920	=			6280	=	19100	=	6160	=			11800	=
Metals TAL	MANGANESE	UG/L							1400	=			52.2	=	143	=	296	=			247	=
Metals TAL	POTASSIUM	UG/L							2470	J			1900	J	1330	J	4040	J			12700	=
Metals TAL	SODIUM	UG/L							16200	=			11600	UJ	45200	J	13200	UJ			20100	UJ
Metals TAL	VANADIUM	UG/L							101	=			8.2	J	6.5	J	2.6	J			19.9	J
Metals TAL	SILICON	UG/L																				
MetalsTCLP	Aluminum	UG/L																				
MetalsTCLP	Antimony	UG/L																				
MetalsTCLP	Arsenic	UG/L																				
MetalsTCLP	Barium	UG/L																				
MetalsTCLP	Beryllium	UG/L																				
MetalsTCLP	Cadmium	UG/L																				
MetalsTCLP	Calcium	UG/L																				

Analytical Data Summary

		Station ID:	MW21		MW22		MW23		MW24		MW24		MW25		MW26		MW28		MW29		MW30	
		Sample ID:	MW211		MW221		MW231		MW241		MW241A		MW251		MW261		MW281		MW291		MW301	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/10/96		2/10/96		2/10/96		2/10/96		2/10/96		2/9/96		2/8/96		2/7/96		2/11/96		2/10/96	
Group	Parameter	Units																				
Metals TAL	ANTIMONY	UG/L	10.9	U	10.9	U	11.6	U	10.9	U	10.9	U	10.9	U	10.9	U	19.7	U	10.9	U	11.8	U
Metals TAL	ARSENIC	UG/L	0.68	U	0.68	U	0.68	U	0.68	U	0.68	U	0.68	U	0.68	UJ	0.68	U	0.68	UJ	0.68	U
Metals TAL	BERYLLIUM	UG/L	0.15	U	0.18	J	0.15	U	0.15	U	0.15	J	0.15	U	0.15	U	0.21	J	0.15	U	0.15	U
Metals TAL	CADMIUM	UG/L	1.8	U	2.4	U	3	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
Metals TAL	CHROMIUM, TOTAL	UG/L	25	=	21.6	=	12.5	=	20.3	=	24.1	=	2.6	J	3.4	U	2.2	U	4	U	2.2	U
Metals TAL	COPPER	UG/L	3.4	U	2.6	U	2.2	U	4	U	3.6	U	2	U	3	J	4.4	J	2	U	2	U
Metals TAL	LEAD	UG/L	5	U	2.3	U	3.7	U	5.5	U	5.1	U	2.3	U	3.4	=	1.4	U	1.4	U	1.4	U
Metals TAL	MERCURY	UG/L	0.12	UJ	0.1	UJ	0.14	UJ	0.08	UJ	0.36	UJ	0.07	UJ	0.07	U	0.14	U	0.07	U	0.07	U
Metals TAL	NICKEL	UG/L	18.1	J	11.6	J	8.4	J	9.4	J	15.9	J	7.7	U	7.7	U	7.7	U	7.7	U	7.7	U
Metals TAL	SELENIUM	UG/L	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	UJ	2.3	U	4.6	UJ	2.3	UJ	2.3	UJ
Metals TAL	SILVER	UG/L	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	U	2.2	UJ
Metals TAL	THALLIUM	UG/L	0.86	U	0.86	UJ	0.86	UJ	0.86	UJ	0.86	UJ	0.86	UJ	0.86	UJ	0.86	UJ	0.86	U	0.86	UJ
Metals TAL	ZINC	UG/L	17.8	U	24.5	U	15.6	U	10.8	U	14	U	17.8	U	10.1	U	17.8	U	13.5	U	12.9	U
Metals TAL	BARIUM	UG/L	50.3	J	108	J	56.6	J	49.5	J	50.5	J	102	J	179	J	47.6	J			116	J
Metals TAL	CALCIUM	UG/L	13600	=	27300	=	39700	=	9950	=	9980	=	18500	=	21000	=	14000	=			22900	=
Metals TAL	COBALT	UG/L	1.6	J	1.5	U	1.8	J	2.2	J	4.2	J	1.8	J	2.8	U	6.1	U			1.8	U
Metals TAL	IRON	UG/L	891	=	8870	=	758	=	5190	=	7450	=	805	=	191	UJ	598	J			340	UJ
Metals TAL	MAGNESIUM	UG/L	7610	=	15100	=	10400	=	5250	=	5270	=	10000	=	10900	=	6470	=			12000	=
Metals TAL	MANGANESE	UG/L	5.6	U	11.4	J	12	J	17.2	=	19.3	=	42.4	=	7.6	U	75.6	=			3.2	U
Metals TAL	POTASSIUM	UG/L	767	U	1050	J	1120	J	962	J	953	J	767	U	2000	J	767	U			767	U
Metals TAL	SODIUM	UG/L	16600	UJ	39500	UJ	13100	UJ	21300	UJ	21600	UJ	19100	U	33800	UJ	15000	UJ			17000	UJ
Metals TAL	VANADIUM	UG/L	1.7	U	5.4	U	2.6	U	2.8	U	2.3	U	1.9	U	1.6	U	5.1	J			1.6	U
Metals TAL	SILICON	UG/L																				
MetalsTCLP	Aluminum	UG/L																				
MetalsTCLP	Antimony	UG/L																				
MetalsTCLP	Arsenic	UG/L																				
MetalsTCLP	Barium	UG/L																				
MetalsTCLP	Beryllium	UG/L																				
MetalsTCLP	Cadmium	UG/L																				
MetalsTCLP	Calcium	UG/L																				

256 400

Analytical Data Summary

		Station ID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
Metals TAL	ANTIMONY	UG/L	10.9 U	10.9 U		16.1 U	10.9 U	10.9 U	10.9 U	10.9 U	12.7 U	10.9 U
Metals TAL	ARSENIC	UG/L	0.81 J	0.68 UJ		0.68 U	0.68 UJ	0.68 U	0.68 UJ	2 U	0.88 U	0.68 UJ
Metals TAL	BERYLLIUM	UG/L	0.15 U	0.15 U		0.15 U	0.15 U	0.15 U	0.4 U	0.15 U	0.15 U	0.28 U
Metals TAL	CADMIUM	UG/L	1.8 U	1.8 U		1.8 U	1.8 U	1.8 U	1.8 U	2.2 U	2.6 U	1.8 U
Metals TAL	CHROMIUM, TOTAL	UG/L	2.2 U	2.2 U		2.2 U	2.2 U	4.8 U	23.4 =	14.4 U	24 =	278 =
Metals TAL	COPPER	UG/L	2 U	2 U		3 U	2 U	2 U	5.8 U	2.4 J	2 J	29.8 =
Metals TAL	LEAD	UG/L	1.4 U	1.4 U		1.5 J	2.3 UJ	2.3 U	8.4 =	3.3 =	4.2 =	30.2 =
Metals TAL	MERCURY	UG/L	0.07 U	0.07 U		0.55 U	0.07 U	0.07 UJ	0.07 U	0.07 UJ	0.07 UJ	0.08 U
Metals TAL	NICKEL	UG/L	7.7 U	7.7 U		8.6 J	7.7 U	7.7 U	13 J	11 J	20.7 J	212 =
Metals TAL	SELENIUM	UG/L	2.3 UJ	2.3 UJ		2.3 UJ	6.9 U	2.3 UJ	2.3 UJ	6.9 UJ	2.3 UJ	2.3 UJ
Metals TAL	SILVER	UG/L	2.2 U	2.2 U		2.2 UJ	2.2 UJ	2.2 UJ	2.2 U	2.2 UJ	2.2 UJ	2.2 U
Metals TAL	THALLIUM	UG/L	0.86 U	0.86 U		0.86 UJ	0.86 UJ	0.86 U	0.86 UJ	0.86 U	0.86 U	0.86 U
Metals TAL	ZINC	UG/L	4.4 U	4.9 U		13.5 U	9.8 U	15.2 U	29.6 U	11.6 U	12.3 U	99.5 =
Metals TAL	BARIUM	UG/L					53.3 J	117 J	124 J			79.8 J
Metals TAL	CALCIUM	UG/L				57400 =	8910 =	11300 =	13100 =	39900 =	40500 =	14100 =
Metals TAL	COBALT	UG/L					1.7 U	2.4 U	11.7 J			37.8 J
Metals TAL	IRON	UG/L				329 UJ	147 UJ	340 UJ	16200 =	5090 =	5260 =	4550 J
Metals TAL	MAGNESIUM	UG/L				13300 =	4750 J	5570 =	6700 =	10300 =	15500 =	6640 =
Metals TAL	MANGANESE	UG/L					5.2 U	5 U	142 =			134 =
Metals TAL	POTASSIUM	UG/L				1280 J	762 U	849 J	1170 J	5960 =	6340 =	920 J
Metals TAL	SODIUM	UG/L				19900 J	24100 UJ	10300 U	17800 J	9560 U	7390 U	29800 =
Metals TAL	VANADIUM	UG/L					1.6 U	1.6 U	12 J			4.9 J
Metals TAL	SILICON	UG/L				19500 =				15400 =	9120 =	
MetalsTCLP	Aluminum	UG/L										
MetalsTCLP	Antimony	UG/L										
MetalsTCLP	Arsenic	UG/L										
MetalsTCLP	Barium	UG/L										
MetalsTCLP	Beryllium	UG/L										
MetalsTCLP	Cadmium	UG/L										
MetalsTCLP	Calcium	UG/L										

Analytical Data Summary

256 402

		StationID:	MW38	MW39	MW40	MW40	MW40	MW41	MW41	MW42	MW44
		Sample ID:	MW38IRE	MW39I	MW40I	MW40I	MW40A	MW41I	MW41I	MW42I	MW44I
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/11/96	2/10/96	1/15/96	1/15/96	1/15/96	1/17/96	1/17/96	1/19/96	1/19/96
Group	Parameter	Units									
Metals TAL	ANTIMONY	UG/L		11.4 U	13.9 U	13.9 U	13.9 U			13.9 U	15 J
Metals TAL	ARSENIC	UG/L		9.2 J	0.68 U	1.6 U	1.5 U			1.4 U	4.4 U
Metals TAL	BERYLLIUM	UG/L		1.6 J	0.28 U	0.28 U	0.28 U			0.28 U	0.38 U
Metals TAL	CADMIUM	UG/L		5.1 U	2.2 U	2.2 U	2.2 U			2.2 U	2.2 U
Metals TAL	CHROMIUM, TOTAL	UG/L		215 =	2.6 U	5.2 J	6.1 J			4.4 J	9.7 J
Metals TAL	COPPER	UG/L		73.1 =	1.9 U	1.9 U	1.9 U			12.3 J	3.7 J
Metals TAL	LEAD	UG/L		99.8 =	1 U	1 U	1 U			5.8 U	1.7 U
Metals TAL	MERCURY	UG/L		0.17 UJ	0.13 U	0.13 U	0.13 U			0.13 U	0.15 U
Metals TAL	NICKEL	UG/L		164 =	7.3 U	7.3 U	7.3 U			7.3 U	7.5 J
Metals TAL	SELENIUM	UG/L		2.3 UJ	2.3 UJ	2.3 UJ	2.3 UJ			2.3 UJ	2.3 UJ
Metals TAL	SILVER	UG/L		2.8 J	2.3 U	2.3 U	2.8 J			2.3 UJ	2.4 J
Metals TAL	THALLIUM	UG/L		0.86 UJ	2.4 UJ	2.4 U	2.4 U			2.4 U	2.4 U
Metals TAL	ZINC	UG/L		255 =	14.3 U	33.4 B	35.6 U			45.6 =	19.6 U
Metals TAL	BARIUM	UG/L		201 J	362 =		317 =			168 J	166 J
Metals TAL	CALCIUM	UG/L		41400 =	49800 =		50800 =			20100 =	35200 =
Metals TAL	COBALT	UG/L		52.5 =	5.3 J		12.5 J			4.4 J	16.4 J
Metals TAL	IRON	UG/L		30400 =	1060 =		1300 =			3560 J	14000 J
Metals TAL	MAGNESIUM	UG/L		9760 =	27600 =		27300 =			8740 =	10200 =
Metals TAL	MANGANESE	UG/L		1720 =	1010 =		1050 =			383 =	755 =
Metals TAL	POTASSIUM	UG/L		2790 J	4670 J		4880 J			5320 =	2010 J
Metals TAL	SODIUM	UG/L		16400 UJ	63300 =		75900 =			368000 =	22200 =
Metals TAL	VANADIUM	UG/L		31.5 J	2 U		2.1 U			4.5 U	10.5 U
Metals TAL	SILICON	UG/L									
MetalsTCLP	Aluminum	UG/L									
MetalsTCLP	Antimony	UG/L									
MetalsTCLP	Arsenic	UG/L									
MetalsTCLP	Barium	UG/L									
MetalsTCLP	Beryllium	UG/L									
MetalsTCLP	Cadmium	UG/L									
MetalsTCLP	Calcium	UG/L									

Analytical Data Summary

		StationID:	MW45		MW46		MW47		MW48		MW49		MW50		MW51		MW51		MW52	
		Sample ID:	MW451		MW461		MW471		MW481		MW491		MW501		MW511		MW511A		MW521	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/8/96		2/9/96		2/9/96		2/8/96		2/9/96		2/11/96		2/8/96		2/8/96		2/11/96	
Group	Parameter	Units																		
Metals TAL	ANTIMONY	UG/L	17.2	J	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U	10.9	U
Metals TAL	ARSENIC	UG/L	1	UJ	0.68	U	0.68	U	0.68	UJ	0.68	U	0.68	U	0.68	UJ	0.68	UJ	0.68	U
Metals TAL	BERYLLIUM	UG/L	0.35	J	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U
Metals TAL	CADMIUM	UG/L	1.8	U	3.6	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
Metals TAL	CHROMIUM, TOTAL	UG/L	4.9	U	4.6	U	5.6	J	2.6	U	3	U	4.8	U	2.2	U	2.2	U	3.3	U
Metals TAL	COPPER	UG/L	3.8	J	2	U	2	U	2	J	2	U	2	U	2	U	2	U	2	U
Metals TAL	LEAD	UG/L	2.3	UJ	2.3	U	2.3	UJ	2.3	UJ	2.6	J	2.3	UJ	2.3	UJ	2.3	U	2.3	UJ
Metals TAL	MERCURY	UG/L	0.19	U	0.07	UJ	0.07	UJ	0.07	U	0.07	UJ	0.07	U	0.07	U	0.07	U	0.07	U
Metals TAL	NICKEL	UG/L	7.7	U	7.7	U	7.7	U	7.7	U	7.7	U	7.7	U	7.7	U	7.7	U	8.4	U
Metals TAL	SELENIUM	UG/L	2.3	UJ	2.3	UJ	2.3	UJ	2.3	U	2.3	UJ	2.9	UJ	2.3	UJ	2.3	UJ	2.3	UJ
Metals TAL	SILVER	UG/L	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ
Metals TAL	THALLIUM	UG/L	0.86	UJ	0.86	U	0.86	UJ	0.86	UJ	0.86	U	0.86	UJ	0.86	U	0.86	UJ	0.86	UJ
Metals TAL	ZINC	UG/L	12.2	U	54.9	U	12.7	U	11.3	U	15	U	13.2	U	15.2	U	12.9	U	7.2	U
Metals TAL	BARIUM	UG/L	127	J	99.3	J	99.6	J	91.1	J	96.4	J	307	=	86.4	J	85.9	J	177	J
Metals TAL	CALCIUM	UG/L	34700	=	17400	=	23700	=	16500	=	16500	=	49200	=	21600	=	21500	=	43700	=
Metals TAL	COBALT	UG/L	9.5	J	8.5	U	1.9	J	4.6	U	1.5	U	10.6	U	6.9	U	5	U	18.2	J
Metals TAL	IRON	UG/L	2280	J	648	=	1180	=	1120	J	328	U	4900	=	322	UJ	263	UJ	7960	=
Metals TAL	MAGNESIUM	UG/L	19500	=	8660	=	12600	=	8690	=	8140	=	24000	=	10500	=	10600	=	22500	=
Metals TAL	MANGANESE	UG/L	326	=	228	=	99.1	=	112	=	57.6	=	441	=	112	=	112	=	467	=
Metals TAL	POTASSIUM	UG/L	849	J	858	J	1630	J	1350	J	1260	J	3310	J	946	J	1110	J	1750	J
Metals TAL	SODIUM	UG/L	20300	UJ	27400	U	27600	U	23100	UJ	14600	U	61200	=	19100	UJ	19200	UJ	74600	=
Metals TAL	VANADIUM	UG/L	14.8	J	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U
Metals TAL	SILICON	UG/L																		
MetalsTCLP	Aluminum	UG/L																		
MetalsTCLP	Antimony	UG/L																		
MetalsTCLP	Arsenic	UG/L																		
MetalsTCLP	Barium	UG/L																		
MetalsTCLP	Beryllium	UG/L																		
MetalsTCLP	Cadmium	UG/L																		
MetalsTCLP	Calcium	UG/L																		

Analytical Data Summary

256 404

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
Metals TAL	ANTIMONY	UG/L	10.9	U	10.9	U	10.9	U	10.9	U
Metals TAL	ARSENIC	UG/L	0.68	UJ	1	UJ	0.72	UJ	2.8	UJ
Metals TAL	BERYLLIUM	UG/L	0.15	U	0.15	U	0.15	U	2	J
Metals TAL	CADMIUM	UG/L	1.8	U	1.8	U	1.8	U	1.8	U
Metals TAL	CHROMIUM, TOTAL	UG/L	2.2	U	2.2	U	2.2	U	96.7	=
Metals TAL	COPPER	UG/L	2	U	2.7	U	3.1	U	29.2	J
Metals TAL	LEAD	UG/L	1.4	U	1.4	U	1.4	U	20.4	=
Metals TAL	MERCURY	UG/L	0.07	U	0.07	U	0.07	U	0.16	J
Metals TAL	NICKEL	UG/L	7.7	U	7.7	U	7.7	U	45.9	=
Metals TAL	SELENIUM	UG/L	2.9	J	2.3	UJ	2.3	UJ	2.3	UJ
Metals TAL	SILVER	UG/L	2.2	U	2.2	U	2.2	U	2.2	U
Metals TAL	THALLIUM	UG/L	0.86	UJ	0.86	UJ	0.86	UJ	0.86	UJ
Metals TAL	ZINC	UG/L	10.4	U	7	U	19.4	U	130	=
Metals TAL	BARIUM	UG/L	122	J	106	J	105	J		
Metals TAL	CALCIUM	UG/L	29700	=	14900	=	14900	=		
Metals TAL	COBALT	UG/L	19.6	J	3.9	J	5.8	J		
Metals TAL	IRON	UG/L	3610	=	4660	=	4680	=		
Metals TAL	MAGNESIUM	UG/L	15800	=	7440	=	7410	=		
Metals TAL	MANGANESE	UG/L	917	=	445	=	444	=		
Metals TAL	POTASSIUM	UG/L	767	U	767	U	854	J		
Metals TAL	SODIUM	UG/L	32300	J	18400	J	18400	J		
Metals TAL	VANADIUM	UG/L	1.6	U	1.6	U	1.6	U		
Metals TAL	SILICON	UG/L								
MetalsTCLP	Aluminum	UG/L								
MetalsTCLP	Antimony	UG/L								
MetalsTCLP	Arsenic	UG/L								
MetalsTCLP	Barium	UG/L								
MetalsTCLP	Beryllium	UG/L								
MetalsTCLP	Cadmium	UG/L								
MetalsTCLP	Calcium	UG/L								

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
Metals TAL	ANTIMONY	UG/L
Metals TAL	ARSENIC	UG/L
Metals TAL	BERYLLIUM	UG/L
Metals TAL	CADMIUM	UG/L
Metals TAL	CHROMIUM, TOTAL	UG/L
Metals TAL	COPPER	UG/L
Metals TAL	LEAD	UG/L
Metals TAL	MERCURY	UG/L
Metals TAL	NICKEL	UG/L
Metals TAL	SELENIUM	UG/L
Metals TAL	SILVER	UG/L
Metals TAL	THALLIUM	UG/L
Metals TAL	ZINC	UG/L
Metals TAL	BARIUM	UG/L
Metals TAL	CALCIUM	UG/L
Metals TAL	COBALT	UG/L
Metals TAL	IRON	UG/L
Metals TAL	MAGNESIUM	UG/L
Metals TAL	MANGANESE	UG/L
Metals TAL	POTASSIUM	UG/L
Metals TAL	SODIUM	UG/L
Metals TAL	VANADIUM	UG/L
Metals TAL	SILICON	UG/L
MetalsTCLP	Aluminum	UG/L
MetalsTCLP	Antimony	UG/L
MetalsTCLP	Arsenic	UG/L
MetalsTCLP	Barium	UG/L
MetalsTCLP	Beryllium	UG/L
MetalsTCLP	Cadmium	UG/L
MetalsTCLP	Calcium	UG/L

		Station ID:	MW02		MW03		MW04		MW05		MW06		MW07		MW08		MW09		MW10		MW10	
		Sample ID:	MW021		MW31		MW041		MW051		MW61		MW71		MW081		MW91		MW101		MW101DL	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/12/96		2/12/96		2/12/96		2/13/96		2/11/96		2/13/96		2/13/96	
Group	Parameter	Units																				
MetalsTCLP	Chromium	UG/L																				
MetalsTCLP	Cobalt	UG/L																				
MetalsTCLP	Copper	UG/L																				
MetalsTCLP	Iron	UG/L																				
MetalsTCLP	Lead	UG/L																				
MetalsTCLP	Magnesium	UG/L																				
MetalsTCLP	Manganese	UG/L																				
MetalsTCLP	Mercury	UG/L																				
MetalsTCLP	Nickel	UG/L																				
MetalsTCLP	Potassium	UG/L																				
MetalsTCLP	Selenium	UG/L																				
MetalsTCLP	Silver	UG/L																				
MetalsTCLP	Thallium	UG/L																				
MetalsTCLP	Vanadium	UG/L																				
MetalsTCLP	Zinc	UG/L																				
Pest/PCB	ENDRIN KETONE	UG/L							0.1	U			0.1	U					0.1	U		
Pest/PCB	ENDRIN ALDEHYDE	UG/L							0.1	U			0.1	U					0.1	U		
Pest/PCB	ALPHA-CHLORDANE	UG/L							0.05	U			0.05	U					0.05	U		
Pest/PCB	GAMMA-CHLORDANE	UG/L							0.05	U			0.05	U					0.05	U		
Pest/PCB	TOXAPHENE	UG/L							5	U			5	U					5	U		
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L							1	U			1	U					1	U		
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L							2	U			2	U					2	U		
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L							1	U			1	U					1	U		
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L							1	U			1	U					1	U		
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L							1	U			1	U					1	U		
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L							1	U			1	U					1	U		
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L							1	U			1	U					1	U		
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L							0.05	U			0.05	U					0.05	U		
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L							0.05	U			0.05	U					0.05	U		

256 406

256 407

		Station ID:	MW11		MW12		MW13		MW14		MW14		MW15		MW16		MW19		MW19		MW20	
		Sample ID:	MW111		MW121		MW131		MW141		MW141RE		MW151		MW161		MW191		MW191RE		MW201	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/11/96		2/11/96		2/7/96		2/13/96		2/7/96		2/7/96		2/7/96	
Group	Parameter	Units																				
MetalsTCLP	Chromium	UG/L																				
MetalsTCLP	Cobalt	UG/L																				
MetalsTCLP	Copper	UG/L																				
MetalsTCLP	Iron	UG/L																				
MetalsTCLP	Lead	UG/L																				
MetalsTCLP	Magnesium	UG/L																				
MetalsTCLP	Manganese	UG/L																				
MetalsTCLP	Mercury	UG/L																				
MetalsTCLP	Nickel	UG/L																				
MetalsTCLP	Potassium	UG/L																				
MetalsTCLP	Selenium	UG/L																				
MetalsTCLP	Silver	UG/L																				
MetalsTCLP	Thallium	UG/L																				
MetalsTCLP	Vanadium	UG/L																				
MetalsTCLP	Zinc	UG/L																				
Pest/PCB	ENDRIN KETONE	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	ENDRIN ALDEHYDE	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	ALPHA-CHLORDANE	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	GAMMA-CHLORDANE	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	TOXAPHENE	UG/L							5	U	5	R			5	U	5	U	5	R	5	U
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L							2	U	2	R			2	U	2	U	2	R	2	U
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L							1	U	1	R			1	U	1	U	1	R	1	U
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U

		Station ID:	MW21		MW22		MW23		MW24		MW24		MW25		MW26		MW28		MW29		MW30	
		Sample ID:	MW211		MW221		MW231		MW241		MW241A		MW251		MW261		MW281		MW291		MW301	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/10/96		2/10/96		2/10/96		2/10/96		2/10/96		2/9/96		2/8/96		2/7/96		2/11/96		2/10/96	
Group	Parameter	Units																				
MetalsTCLP	Chromium	UG/L																				
MetalsTCLP	Cobalt	UG/L																				
MetalsTCLP	Copper	UG/L																				
MetalsTCLP	Iron	UG/L																				
MetalsTCLP	Lead	UG/L																				
MetalsTCLP	Magnesium	UG/L																				
MetalsTCLP	Manganese	UG/L																				
MetalsTCLP	Mercury	UG/L																				
MetalsTCLP	Nickel	UG/L																				
MetalsTCLP	Potassium	UG/L																				
MetalsTCLP	Selenium	UG/L																				
MetalsTCLP	Silver	UG/L																				
MetalsTCLP	Thallium	UG/L																				
MetalsTCLP	Vanadium	UG/L																				
MetalsTCLP	Zinc	UG/L																				
Pest/PCB	ENDRIN KETONE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	ENDRIN ALDEHYDE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	ALPHA-CHLORDANE	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	GAMMA-CHLORDANE	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	TOXAPHENE	UG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U			5	U
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U			2	U
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			1	U
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U

256 409

		Station ID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
MetalsTCLP	Chromium	UG/L										
MetalsTCLP	Cobalt	UG/L										
MetalsTCLP	Copper	UG/L										
MetalsTCLP	Iron	UG/L										
MetalsTCLP	Lead	UG/L										
MetalsTCLP	Magnesium	UG/L										
MetalsTCLP	Manganese	UG/L										
MetalsTCLP	Mercury	UG/L										
MetalsTCLP	Nickel	UG/L										
MetalsTCLP	Potassium	UG/L										
MetalsTCLP	Selenium	UG/L										
MetalsTCLP	Silver	UG/L										
MetalsTCLP	Thallium	UG/L										
MetalsTCLP	Vanadium	UG/L										
MetalsTCLP	Zinc	UG/L										
Pest/PCB	ENDRIN KETONE	UG/L						0.1 U	0.1 U			0.1 UJ
Pest/PCB	ENDRIN ALDEHYDE	UG/L						0.1 U	0.1 U			0.1 UJ
Pest/PCB	ALPHA-CHLORDANE	UG/L						0.05 U	0.05 U			0.05 UJ
Pest/PCB	GAMMA-CHLORDANE	UG/L						0.05 U	0.05 U			0.05 UJ
Pest/PCB	TOXAPHENE	UG/L						5 U	5 U			5 UJ
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L						1 U	1 U			1 UJ
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L						2 U	2 U			2 UJ
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L						1 U	1 U			1 UJ
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L						1 U	1 U			1 UJ
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L						1 U	1 U			1 UJ
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L						1 U	1 U			1 UJ
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L						1 U	1 U			1 UJ
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L						0.05 U	0.05 U			0.05 UJ
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L						0.05 U	0.05 U			0.05 UJ

		Station ID:	MW38		MW39		MW40		MW40		MW40		MW41		MW41		MW42		MW44	
		Sample ID:	MW381RE		MW391		MW40		MW401		MW40A		MW411		MW414		MW421		MW441	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/11/96		2/10/96		1/15/96		1/15/96		1/15/96		1/17/96		1/17/96		1/19/96		1/19/96	
Group	Parameter	Units																		
MetalsTCLP	Chromium	UG/L																		
MetalsTCLP	Cobalt	UG/L																		
MetalsTCLP	Copper	UG/L																		
MetalsTCLP	Iron	UG/L																		
MetalsTCLP	Lead	UG/L																		
MetalsTCLP	Magnesium	UG/L																		
MetalsTCLP	Manganese	UG/L																		
MetalsTCLP	Mercury	UG/L																		
MetalsTCLP	Nickel	UG/L																		
MetalsTCLP	Potassium	UG/L																		
MetalsTCLP	Selenium	UG/L																		
MetalsTCLP	Silver	UG/L																		
MetalsTCLP	Thallium	UG/L																		
MetalsTCLP	Vanadium	UG/L																		
MetalsTCLP	Zinc	UG/L																		
Pest/PCB	ENDRIN KETONE	UG/L	0.1	R	0.1	U														
Pest/PCB	ENDRIN ALDEHYDE	UG/L	0.1	R	0.1	U														
Pest/PCB	ALPHA-CHLORDANE	UG/L	0.05	R	0.05	U														
Pest/PCB	GAMMA-CHLORDANE	UG/L	0.05	R	0.05	U														
Pest/PCB	TOXAPHENE	UG/L	5	R	5	U														
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L	1	R	1	U														
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L	2	R	2	U														
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L	1	R	1	U														
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L	1	R	1	U														
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L	1	R	1	U														
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L	1	R	1	U														
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L	1	R	1	U														
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	R	0.05	U														
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	R	0.05	U														

256 410

Analytical Data Summary

		StationID:	MW45	MW46	MW47	MW48	MW49	MW50	MW51	MW51	MW52
		Sample ID:	MW451	MW461	MW471	MW481	MW491	MW501	MW511	MW511A	MW521
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/8/96	2/9/96	2/9/96	2/8/96	2/9/96	2/11/96	2/8/96	2/8/96	2/11/96
Group	Parameter	Units									
MetalsTCLP	Chromium	UG/L									
MetalsTCLP	Cobalt	UG/L									
MetalsTCLP	Copper	UG/L									
MetalsTCLP	Iron	UG/L									
MetalsTCLP	Lead	UG/L									
MetalsTCLP	Magnesium	UG/L									
MetalsTCLP	Manganese	UG/L									
MetalsTCLP	Mercury	UG/L									
MetalsTCLP	Nickel	UG/L									
MetalsTCLP	Potassium	UG/L									
MetalsTCLP	Selenium	UG/L									
MetalsTCLP	Silver	UG/L									
MetalsTCLP	Thallium	UG/L									
MetalsTCLP	Vanadium	UG/L									
MetalsTCLP	Zinc	UG/L									
Pest/PCB	ENDRIN KETONE	UG/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Pest/PCB	ENDRIN ALDEHYDE	UG/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Pest/PCB	ALPHA-CHLORDANE	UG/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Pest/PCB	GAMMA-CHLORDANE	UG/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Pest/PCB	TOXAPHENE	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

256 411

Analytical Data Summary

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
MetalsTCLP	Chromium	UG/L								
MetalsTCLP	Cobalt	UG/L								
MetalsTCLP	Copper	UG/L								
MetalsTCLP	Iron	UG/L								
MetalsTCLP	Lead	UG/L								
MetalsTCLP	Magnesium	UG/L								
MetalsTCLP	Manganese	UG/L								
MetalsTCLP	Mercury	UG/L								
MetalsTCLP	Nickel	UG/L								
MetalsTCLP	Potassium	UG/L								
MetalsTCLP	Selenium	UG/L								
MetalsTCLP	Silver	UG/L								
MetalsTCLP	Thallium	UG/L								
MetalsTCLP	Vanadium	UG/L								
MetalsTCLP	Zinc	UG/L								
Pest/PCB	ENDRIN KETONE	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	ENDRIN ALDEHYDE	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	ALPHA-CHLORDANE	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	GAMMA-CHLORDANE	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	TOXAPHENE	UG/L	5	U	5	U	5	U		
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L	1	U	1	U	1	U		
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L	2	U	2	U	2	U		
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L	1	U	1	U	1	U		
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L	1	U	1	U	1	U		
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L	1	U	1	U	1	U		
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L	1	U	1	U	1	U		
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L	1	U	1	U	1	U		
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U		

256 412

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
MetalsTCLP	Chromium	UG/L
MetalsTCLP	Cobalt	UG/L
MetalsTCLP	Copper	UG/L
MetalsTCLP	Iron	UG/L
MetalsTCLP	Lead	UG/L
MetalsTCLP	Magnesium	UG/L
MetalsTCLP	Manganese	UG/L
MetalsTCLP	Mercury	UG/L
MetalsTCLP	Nickel	UG/L
MetalsTCLP	Potassium	UG/L
MetalsTCLP	Selenium	UG/L
MetalsTCLP	Silver	UG/L
MetalsTCLP	Thallium	UG/L
MetalsTCLP	Vanadium	UG/L
MetalsTCLP	Zinc	UG/L
Pest/PCB	ENDRIN KETONE	UG/L
Pest/PCB	ENDRIN ALDEHYDE	UG/L
Pest/PCB	ALPHA-CHLORDANE	UG/L
Pest/PCB	GAMMA-CHLORDANE	UG/L
Pest/PCB	TOXAPHENE	UG/L
Pest/PCB	PCB-1016 (AROCHLOR 1016)	UG/L
Pest/PCB	PCB-1221 (AROCHLOR 1221)	UG/L
Pest/PCB	PCB-1232 (AROCHLOR 1232)	UG/L
Pest/PCB	PCB-1242 (AROCHLOR 1242)	UG/L
Pest/PCB	PCB-1248 (AROCHLOR 1248)	UG/L
Pest/PCB	PCB-1254 (AROCHLOR 1254)	UG/L
Pest/PCB	PCB-1260 (AROCHLOR 1260)	UG/L
Pest/PCB	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L
Pest/PCB	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L

256 414

		StationID:	MW02	MW03	MW04	MW05	MW06	MW07	MW08	MW09	MW10	MW10
		Sample ID:	MW021	MW31	MW041	MW051	MW61	MW71	MW081	MW91	MW101	MW101DL
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/12/96	2/12/96	2/12/96	2/13/96	2/11/96	2/13/96	2/13/96
Group	Parameter	Units										
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	GAMMA BHC (LINDANE)	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	HEPTACHLOR	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	ALDRIN	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	ALPHA ENDOSULFAN	UG/L				0.05 U		0.05 U			0.05 U	
Pest/PCB	DIELDRIN	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	p,p'-DDE	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	ENDRIN	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	BETA ENDOSULFAN	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	p,p'-DDD	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	ENDOSULFAN SULFATE	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	p,p'-DDT	UG/L				0.1 U		0.1 U			0.1 U	
Pest/PCB	METHOXYCHLOR	UG/L				0.5 U		0.5 U			0.5 U	
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L										
Pest/TCLP	HEPTACHLOR	UG/L										
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L										
Pest/TCLP	ENDRIN	UG/L										
Pest/TCLP	METHOXYCHLOR	UG/L										
Pest/TCLP	CHLORDANE	UG/L										
Pest/TCLP	TOXAPHENE	UG/L										
RAD	TRITIUM (HYDROGEN-3)	PCI/L										
SVOC/TCLP	PYRIDINE	UG/L										
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L										
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L										
SVOC/TCLP	CRESOLS, m & p	UG/L										
SVOC/TCLP	HEXACHLOROETHANE	UG/L										
SVOC/TCLP	NITROBENZENE	UG/L										
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L										
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L										

		StationID:	MW11		MW12		MW13		MW14		MW14		MW15		MW16		MW19		MW19		MW20	
		Sample ID:	MW111		MW121		MW131		MW141		MW141RE		MW151		MW161		MW191		MW191RE		MW201	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/11/96		2/11/96		2/7/96		2/13/96		2/7/96		2/7/96		2/7/96	
Group	Parameter	Units																				
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	GAMMA BHC (LINDANE)	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	HEPTACHLOR	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	ALDRIN	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	ALPHA ENDOSULFAN	UG/L							0.05	U	0.05	R			0.05	U	0.05	U	0.05	R	0.05	U
Pest/PCB	DIELDRIN	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	p,p'-DDE	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	ENDRIN	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	BETA ENDOSULFAN	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	p,p'-DDD	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	ENDOSULFAN SULFATE	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	p,p'-DDT	UG/L							0.1	U	0.1	R			0.1	U	0.1	U	0.1	R	0.1	U
Pest/PCB	METHOXYCHLOR	UG/L							0.5	U	0.5	R			0.5	U	0.5	U	0.5	R	0.5	U
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L																				
Pest/TCLP	HEPTACHLOR	UG/L																				
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L																				
Pest/TCLP	ENDRIN	UG/L																				
Pest/TCLP	METHOXYCHLOR	UG/L																				
Pest/TCLP	CHLORDANE	UG/L																				
Pest/TCLP	TOXAPHENE	UG/L																				
RAD	TRITIUM (HYDROGEN-3)	PCI/L																				
SVOC/TCLP	PYRIDINE	UG/L																				
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L																				
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L																				
SVOC/TCLP	CRESOLS, m & p	UG/L																				
SVOC/TCLP	HEXACHLOROETHANE	UG/L																				
SVOC/TCLP	NITROBENZENE	UG/L																				
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L																				
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L																				

256 415,

		StationID:	MW21		MW22		MW23		MW24		MW24		MW25		MW26		MW28		MW29		MW30	
		Sample ID:	MW211		MW221		MW231		MW241		MW241A		MW251		MW261		MW281		MW291		MW301	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/10/96		2/10/96		2/10/96		2/10/96		2/10/96		2/9/96		2/8/96		2/7/96		2/11/96		2/10/96	
Group	Parameter	Units																				
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	GAMMA BHC (LINDANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	HEPTACHLOR	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	ALDRIN	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	ALPHA ENDOSULFAN	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U			0.05	U
Pest/PCB	DIELDRIN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	p,p'-DDE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	ENDRIN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	BETA ENDOSULFAN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	p,p'-DDD	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	ENDOSULFAN SULFATE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	p,p'-DDT	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U
Pest/PCB	METHOXYCHLOR	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U			0.5	U
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L																				
Pest/TCLP	HEPTACHLOR	UG/L																				
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L																				
Pest/TCLP	ENDRIN	UG/L																				
Pest/TCLP	METHOXYCHLOR	UG/L																				
Pest/TCLP	CHLORDANE	UG/L																				
Pest/TCLP	TOXAPHENE	UG/L																				
RAD	TRITIUM (HYDROGEN-3)	PCI/L																				
SVOC/TCLP	PYRIDINE	UG/L																				
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L																				
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L																				
SVOC/TCLP	CRESOLS, m & p	UG/L																				
SVOC/TCLP	HEXACHLOROETHANE	UG/L																				
SVOC/TCLP	NITROBENZENE	UG/L																				
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L																				
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L																				

		Station ID:	MW31		MW31		MW31		MW32		MW33		MW34		MW35		MW36		MW37		MW38	
		Sample ID:	MW311		MW311A		MW311DL		MW321		MW331		MW341		MW351		MW361		MW371		MW381	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/12/96		2/12/96		2/6/96		2/8/96		2/9/96		2/13/96		2/9/96		2/9/96		2/11/96	
Group	Parameter	Units																				
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	GAMMA BHC (LINDANE)	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	HEPTACHLOR	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	ALDRIN	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	ALPHA ENDOSULFAN	UG/L											0.05	U	0.05	U					0.05	UJ
Pest/PCB	DIELDRIN	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	p,p'-DDE	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	ENDRIN	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	BETA ENDOSULFAN	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	p,p'-DDD	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	ENDOSULFAN SULFATE	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	p,p'-DDT	UG/L											0.1	U	0.1	U					0.1	UJ
Pest/PCB	METHOXYCHLOR	UG/L											0.5	U	0.5	U					0.5	UJ
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L																				
Pest/TCLP	HEPTACHLOR	UG/L																				
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L																				
Pest/TCLP	ENDRIN	UG/L																				
Pest/TCLP	METHOXYCHLOR	UG/L																				
Pest/TCLP	CHLORDANE	UG/L																				
Pest/TCLP	TOXAPHENE	UG/L																				
RAD	TRITIUM (HYDROGEN-3)	PCI/L							-620	=									-570	=		
SVOC/TCLP	PYRIDINE	UG/L																				
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L																				
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L																				
SVOC/TCLP	CRESOLS, m & p	UG/L																				
SVOC/TCLP	HEXACHLOROETHANE	UG/L																				
SVOC/TCLP	NITROBENZENE	UG/L																				
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L																				
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L																				

256 418

		Station ID:	MW38		MW39		MW40		MW40		MW40		MW41		MW41		MW42		MW44	
		Sample ID:	MW381RE		MW391		MW40		MW401		MW40A		MW411		MW414		MW421		MW441	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/11/96		2/10/96		1/15/96		1/15/96		1/15/96		1/17/96		1/17/96		1/19/96		1/19/96	
Group	Parameter	Units																		
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	R	0.05	U														
Pest/PCB	GAMMA BHC (LINDANE)	UG/L	0.05	R	0.05	U														
Pest/PCB	HEPTACHLOR	UG/L	0.05	R	0.05	U														
Pest/PCB	ALDRIN	UG/L	0.05	R	0.05	U														
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L	0.05	R	0.05	U														
Pest/PCB	ALPHA ENDOSULFAN	UG/L	0.05	R	0.05	U														
Pest/PCB	DIELDRIN	UG/L	0.1	R	0.1	U														
Pest/PCB	p,p'-DDE	UG/L	0.1	R	0.1	U														
Pest/PCB	ENDRIN	UG/L	0.1	R	0.1	U														
Pest/PCB	BETA ENDOSULFAN	UG/L	0.1	R	0.1	U														
Pest/PCB	p,p'-DDD	UG/L	0.1	R	0.1	U														
Pest/PCB	ENDOSULFAN SULFATE	UG/L	0.1	R	0.1	U														
Pest/PCB	p,p'-DDT	UG/L	0.1	R	0.1	U														
Pest/PCB	METHOXYCHLOR	UG/L	0.5	R	0.5	U														
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L																		
Pest/TCLP	HEPTACHLOR	UG/L																		
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L																		
Pest/TCLP	ENDRIN	UG/L																		
Pest/TCLP	METHOXYCHLOR	UG/L																		
Pest/TCLP	CHLORDANE	UG/L																		
Pest/TCLP	TOXAPHENE	UG/L																		
RAD	TRITIUM (HYDROGEN-3)	PCI/L																		
SVOC/TCLP	PYRIDINE	UG/L																		
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L																		
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L																		
SVOC/TCLP	CRESOLS, m & p	UG/L																		
SVOC/TCLP	HEXACHLOROETHANE	UG/L																		
SVOC/TCLP	NITROBENZENE	UG/L																		
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L																		
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L																		

256 419

		Station ID:	MW45		MW46		MW47		MW48		MW49		MW50		MW51		MW51		MW52	
		Sample ID:	MW451		MW461		MW471		MW481		MW491		MW501		MW511		MW511A		MW521	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/8/96		2/9/96		2/9/96		2/8/96		2/9/96		2/11/96		2/8/96		2/8/96		2/11/96	
Group	Parameter	Units																		
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	GAMMA BHC (LINDANE)	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	HEPTACHLOR	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	ALDRIN	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	ALPHA ENDOSULFAN	UG/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pest/PCB	DIELDRIN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	p,p'-DDE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	ENDRIN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	BETA ENDOSULFAN	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	p,p'-DDD	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	ENDOSULFAN SULFATE	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	p,p'-DDT	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pest/PCB	METHOXYCHLOR	UG/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L																		
Pest/TCLP	HEPTACHLOR	UG/L																		
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L																		
Pest/TCLP	ENDRIN	UG/L																		
Pest/TCLP	METHOXYCHLOR	UG/L																		
Pest/TCLP	CHLORDANE	UG/L																		
Pest/TCLP	TOXAPHENE	UG/L																		
RAD	TRITIUM (HYDROGEN-3)	PCI/L																		
SVOC/TCLP	PYRIDINE	UG/L																		
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L																		
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L																		
SVOC/TCLP	CRESOLS, m & p	UG/L																		
SVOC/TCLP	HEXACHLOROETHANE	UG/L																		
SVOC/TCLP	NITROBENZENE	UG/L																		
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L																		
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L																		

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	GAMMA BHC (LINDANE)	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	HEPTACHLOR	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	ALDRIN	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	ALPHA ENDOSULFAN	UG/L	0.05	U	0.05	U	0.05	U		
Pest/PCB	DIELDRIN	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	p,p'-DDE	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	ENDRIN	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	BETA ENDOSULFAN	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	p,p'-DDD	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	ENDOSULFAN SULFATE	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	p,p'-DDT	UG/L	0.1	U	0.1	U	0.1	U		
Pest/PCB	METHOXYCHLOR	UG/L	0.5	U	0.5	U	0.5	U		
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L								
Pest/TCLP	HEPTACHLOR	UG/L								
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L								
Pest/TCLP	ENDRIN	UG/L								
Pest/TCLP	METHOXYCHLOR	UG/L								
Pest/TCLP	CHLORDANE	UG/L								
Pest/TCLP	TOXAPHENE	UG/L								
RAD	TRITIUM (HYDROGEN-3)	PCI/L								
SVOC/TCLP	PYRIDINE	UG/L								
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L								
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L								
SVOC/TCLP	CRESOLS, m & p	UG/L								
SVOC/TCLP	HEXACHLOROETHANE	UG/L								
SVOC/TCLP	NITROBENZENE	UG/L								
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L								
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L								

256 420

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
Pest/PCB	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L
Pest/PCB	GAMMA BHC (LINDANE)	UG/L
Pest/PCB	HEPTACHLOR	UG/L
Pest/PCB	ALDRIN	UG/L
Pest/PCB	HEPTACHLOR EPOXIDE	UG/L
Pest/PCB	ALPHA ENDOSULFAN	UG/L
Pest/PCB	DIELDRIN	UG/L
Pest/PCB	p,p'-DDE	UG/L
Pest/PCB	ENDRIN	UG/L
Pest/PCB	BETA ENDOSULFAN	UG/L
Pest/PCB	p,p'-DDD	UG/L
Pest/PCB	ENDOSULFAN SULFATE	UG/L
Pest/PCB	p,p'-DDT	UG/L
Pest/PCB	METHOXYCHLOR	UG/L
Pest/TCLP	GAMMA BHC (LINDANE)	UG/L
Pest/TCLP	HEPTACHLOR	UG/L
Pest/TCLP	HEPTACHLOR EPOXIDE	UG/L
Pest/TCLP	ENDRIN	UG/L
Pest/TCLP	METHOXYCHLOR	UG/L
Pest/TCLP	CHLORDANE	UG/L
Pest/TCLP	TOXAPHENE	UG/L
RAD	TRITIUM (HYDROGEN-3)	PCI/L
SVOC/TCLP	PYRIDINE	UG/L
SVOC/TCLP	1,4-DICHLOROBENZENE	UG/L
SVOC/TCLP	2-METHYLPHENOL (o-CRESOL)	UG/L
SVOC/TCLP	CRESOLS, m & p	UG/L
SVOC/TCLP	HEXACHLOROETHANE	UG/L
SVOC/TCLP	NITROBENZENE	UG/L
SVOC/TCLP	HEXACHLOROBUTADIENE	UG/L
SVOC/TCLP	2,4,6-TRICHLOROPHENOL	UG/L

		StationID:	MW02		MW03		MW04		MW05		MW06		MW07		MW08		MW09		MW10		MW10	
		Sample ID:	MW021		MW31		MW041		MW051		MW61		MW71		MW081		MW91		MW101		MW101DL	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/12/96		2/12/96		2/12/96		2/13/96		2/11/96		2/13/96		2/13/96	
Group	Parameter	Units																				
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L																				
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L																				
SVOC/TCLP	HEXACHLOROBENZENE	UG/L																				
SVOC/TCLP	PENTACHLOROPHENOL	UG/L																				
SVOC	PHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L							10	U	10	U	10	U					10	U		
SVOC	HEXACHLOROETHANE	UG/L							10	U	10	U	10	U					10	U		
SVOC	NITROBENZENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	ISOPHORONE	UG/L							10	U	10	U	10	U					10	U		
SVOC	2-NITROPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	2,4-DIMETHYLPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L							10	U	10	U	10	U					10	U		
SVOC	2,4-DICHLOROPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	1,2,4-TRICHLOROBENZENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	NAPHTHALENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L							10	U	10	U	10	U					10	U		
SVOC	4-CHLOROANILINE	UG/L							10	U	10	U	10	U					10	U		
SVOC	HEXACHLOROBUTADIENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	2-METHYLNAPHTHALENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	2,4,6-TRICHLOROPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	2,4,5-TRICHLOROPHENOL	UG/L							25	U	25	U	25	U					25	U		
SVOC	2-CHLORONAPHTHALENE	UG/L							10	U	10	U	10	U					10	U		
SVOC	2-NITROANILINE	UG/L							25	U	25	U	25	U					25	U		
SVOC	DIMETHYL PHTHALATE	UG/L							10	U	10	U	10	U					10	U		
SVOC	2-CHLOROPHENOL	UG/L							10	U	10	U	10	U					10	U		
SVOC	2,6-DINITROTOLUENE	UG/L							10	U	10	U	10	U					10	U		

		StationID:	MW11	MW12	MW13	MW14	MW14	MW15	MW16	MW19	MW19	MW20
		Sample ID:	MW111	MW121	MW131	MW141	MW141RE	MW151	MW161	MW191	MW191RE	MW201
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/11/96	2/11/96	2/7/96	2/13/96	2/7/96	2/7/96	2/7/96
Group	Parameter	Units										
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L										
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L										
SVOC/TCLP	HEXACHLOROBENZENE	UG/L										
SVOC/TCLP	PENTACHLOROPHENOL	UG/L										
SVOC	PHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	HEXACHLOROETHANE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	NITROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	ISOPHORONE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2-NITROPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4-DIMETHYLPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4-DICHLOROPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	1,2,4-TRICHLOROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	NAPHTHALENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-CHLOROANILINE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	HEXACHLOROBUTADIENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2-METHYLNAPHTHALENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4,6-TRICHLOROPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4,5-TRICHLOROPHENOL	UG/L			25 U	25 U			25 U	25 U		25 U
SVOC	2-CHLORONAPHTHALENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2-NITROANILINE	UG/L			25 U	25 U			25 U	25 U		25 U
SVOC	DIMETHYL PHTHALATE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2-CHLOROPHENOL	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,6-DINITROTOLUENE	UG/L			10 U	10 U			10 U	10 U		10 U

256 423

Analytical Data Summary

		StationID:	MW21		MW22		MW23		MW24		MW24		MW25		MW26		MW28		MW29		MW30	
		Sample ID:	MW211		MW221		MW231		MW241		MW241A		MW251		MW261		MW281		MW291		MW301	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/10/96		2/10/96		2/10/96		2/10/96		2/11/96		2/9/96		2/8/96		2/7/96		2/11/96		2/10/96	
Group	Parameter	Units																				
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L																				
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L																				
SVOC/TCLP	HEXACHLOROBENZENE	UG/L																				
SVOC/TCLP	PENTACHLOROPHENOL	UG/L																				
SVOC	PHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	HEXACHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	NITROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	ISOPHORONE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2-NITROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2,4-DIMETHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2,4-DICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	1,2,4-TRICHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	NAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	4-CHLOROANILINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	HEXACHLOROBUTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2-METHYLNAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2,4,6-TRICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2,4,5-TRICHLOROPHENOL	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U			25	U
SVOC	2-CHLORONAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U			25	U
SVOC	DIMETHYL PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2-CHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U
SVOC	2,6-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U			10	U

256 425

		Station ID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L										
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L										
SVOC/TCLP	HEXACHLOROBENZENE	UG/L										
SVOC/TCLP	PENTACHLOROPHENOL	UG/L										
SVOC	PHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	HEXACHLOROETHANE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	NITROBENZENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	ISOPHORONE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2-NITROPHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4-DIMETHYLPHENOL	UG/L	10 U	10 UJ				10 U	10 U			10 U
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4-DICHLOROPHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	1,2,4-TRICHLOROBENZENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	NAPHTHALENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	4-CHLOROANILINE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	HEXACHLOROBUTADIENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2-METHYLNAPHTHALENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4,6-TRICHLOROPHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4,5-TRICHLOROPHENOL	UG/L	25 U	25 U				25 U	25 U			25 U
SVOC	2-CHLORONAPHTHALENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2-NITROANILINE	UG/L	25 U	25 U				25 U	25 U			25 U
SVOC	DIMETHYL PHTHALATE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2-CHLOROPHENOL	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,6-DINITROTOLUENE	UG/L	10 U	10 U				10 U	10 U			10 U

		StationID:	MW38		MW39		MW40		MW40		MW40		MW41		MW41		MW42		MW44	
		Sample ID:	MW381RE		MW391		MW40		MW401		MW40A		MW411		MW411		MW421		MW441	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/11/96		2/10/96		1/15/96		1/15/96		1/15/96		1/17/96		1/17/96		1/19/96		1/19/96	
Group	Parameter	Units																		
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L																		
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L																		
SVOC/TCLP	HEXACHLOROBENZENE	UG/L																		
SVOC/TCLP	PENTACHLOROPHENOL	UG/L																		
SVOC	PHENOL	UG/L			10	U														
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L			10	U														
SVOC	HEXACHLOROETHANE	UG/L			10	U														
SVOC	NITROBENZENE	UG/L			10	U														
SVOC	ISOPHORONE	UG/L			10	U														
SVOC	2-NITROPHENOL	UG/L			10	U														
SVOC	2,4-DIMETHYLPHENOL	UG/L			10	U														
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L			10	U														
SVOC	2,4-DICHLOROPHENOL	UG/L			10	U														
SVOC	1,2,4-TRICHLOROBENZENE	UG/L			10	U														
SVOC	NAPHTHALENE	UG/L			10	U														
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L			10	U														
SVOC	4-CHLOROANILINE	UG/L			10	U														
SVOC	HEXACHLOROBUTADIENE	UG/L			10	U														
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L			10	U														
SVOC	2-METHYLNAPHTHALENE	UG/L			10	U														
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L			10	U														
SVOC	2,4,6-TRICHLOROPHENOL	UG/L			10	U														
SVOC	2,4,5-TRICHLOROPHENOL	UG/L			25	U														
SVOC	2-CHLORONAPHTHALENE	UG/L			10	U														
SVOC	2-NITROANILINE	UG/L			25	U														
SVOC	DIMETHYL PHTHALATE	UG/L			10	U														
SVOC	2-CHLOROPHENOL	UG/L			10	U														
SVOC	2,6-DINITROTOLUENE	UG/L			10	U														

		Station ID:	MW45		MW46		MW47		MW48		MW49		MW50		MW51		MW51		MW52	
		Sample ID:	MW451		MW461		MW471		MW481		MW491		MW501		MW511		MW511A		MW521	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/8/96		2/9/96		2/9/96		2/8/96		2/9/96		2/11/96		2/8/96		2/8/96		2/11/96	
Group	Parameter	Units																		
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L																		
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L																		
SVOC/TCLP	HEXACHLOROBENZENE	UG/L																		
SVOC/TCLP	PENTACHLOROPHENOL	UG/L																		
SVOC	PHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	HEXACHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	NITROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	ISOPHORONE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2-NITROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4-DIMETHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4-DICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	1,2,4-TRICHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	NAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	4-CHLOROANILINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	HEXACHLOROBUTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2-METHYLNAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4,6-TRICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4,5-TRICHLOROPHENOL	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U
SVOC	2-CHLORONAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U
SVOC	DIMETHYL PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2-CHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,6-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U

256 427

Analytical Data Summary

		StationID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L								
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L								
SVOC/TCLP	HEXACHLOROBENZENE	UG/L								
SVOC/TCLP	PENTACHLOROPHENOL	UG/L								
SVOC	PHENOL	UG/L	10	U	10	U	10	U		
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L	10	U	10	U	10	U		
SVOC	HEXACHLOROETHANE	UG/L	10	U	10	U	10	U		
SVOC	NITROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	ISOPHORONE	UG/L	10	U	10	U	10	U		
SVOC	2-NITROPHENOL	UG/L	10	U	10	U	10	U		
SVOC	2,4-DIMETHYLPHENOL	UG/L	10	U	10	U	10	U		
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L	10	U	10	U	10	U		
SVOC	2,4-DICHLOROPHENOL	UG/L	10	U	10	U	10	U		
SVOC	1,2,4-TRICHLOROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	NAPHTHALENE	UG/L	10	U	10	U	10	U		
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10	U	10	U	10	U		
SVOC	4-CHLOROANILINE	UG/L	10	U	10	U	10	U		
SVOC	HEXACHLOROBUTADIENE	UG/L	10	U	10	U	10	U		
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L	10	U	10	U	10	U		
SVOC	2-METHYLNAPHTHALENE	UG/L	10	U	10	U	10	U		
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	10	U	10	U		
SVOC	2,4,6-TRICHLOROPHENOL	UG/L	10	U	10	U	10	U		
SVOC	2,4,5-TRICHLOROPHENOL	UG/L	25	U	25	U	25	U		
SVOC	2-CHLORONAPHTHALENE	UG/L	10	U	10	U	10	U		
SVOC	2-NITROANILINE	UG/L	25	U	25	U	25	U		
SVOC	DIMETHYL PHTHALATE	UG/L	10	U	10	U	10	U		
SVOC	2-CHLOROPHENOL	UG/L	10	U	10	U	10	U		
SVOC	2,6-DINITROTOLUENE	UG/L	10	U	10	U	10	U		

256 428

Station ID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
SVOC/TCLP	2,4,5-TRICHLOROPHENOL	UG/L
SVOC/TCLP	2,4-DINITROTOLUENE	UG/L
SVOC/TCLP	HEXACHLOROBENZENE	UG/L
SVOC/TCLP	PENTACHLOROPHENOL	UG/L
SVOC	PHENOL	UG/L
SVOC	N-NITROSODI-n-PROPYLAMINE	UG/L
SVOC	HEXACHLOROETHANE	UG/L
SVOC	NITROBENZENE	UG/L
SVOC	ISOPHORONE	UG/L
SVOC	2-NITROPHENOL	UG/L
SVOC	2,4-DIMETHYLPHENOL	UG/L
SVOC	bis(2-CHLOROETHOXY) METHANE	UG/L
SVOC	2,4-DICHLOROPHENOL	UG/L
SVOC	1,2,4-TRICHLOROBENZENE	UG/L
SVOC	NAPHTHALENE	UG/L
SVOC	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L
SVOC	4-CHLOROANILINE	UG/L
SVOC	HEXACHLOROBUTADIENE	UG/L
SVOC	4-CHLORO-3-METHYLPHENOL	UG/L
SVOC	2-METHYLNAPHTHALENE	UG/L
SVOC	HEXACHLOROCYCLOPENTADIENE	UG/L
SVOC	2,4,6-TRICHLOROPHENOL	UG/L
SVOC	2,4,5-TRICHLOROPHENOL	UG/L
SVOC	2-CHLORONAPHTHALENE	UG/L
SVOC	2-NITROANILINE	UG/L
SVOC	DIMETHYL PHTHALATE	UG/L
SVOC	2-CHLOROPHENOL	UG/L
SVOC	2,6-DINITROTOLUENE	UG/L

		StationID:	MW02	MW03	MW04	MW05	MW06	MW07	MW08	MW09	MW10	MW10
		Sample ID:	MW021	MW31	MW041	MW051	MW61	MW71	MW081	MW91	MW101	MW101DL
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/12/96	2/12/96	2/12/96	2/13/96	2/11/96	2/13/96	2/13/96
Group	Parameter	Units										
SVOC	ACENAPHTHYLENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	3-NITROANILINE	UG/L				25 U	25 U	25 U			25 U	
SVOC	ACENAPHTHENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	2,4-DINITROPHENOL	UG/L				25 UJ	25 UJ	25 UJ			25 UJ	
SVOC	4-NITROPHENOL	UG/L				25 U	25 U	25 U			25 U	
SVOC	DIBENZOFURAN	UG/L				10 U	10 U	10 U			10 U	
SVOC	2,4-DINITROTOLUENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	DIETHYL PHTHALATE	UG/L				10 U	10 U	10 U			10 U	
SVOC	FLUORENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	1,3-DICHLOROBENZENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L				10 U	10 U	10 U			10 U	
SVOC	4-NITROANILINE	UG/L				25 U	25 U	25 U			25 U	
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L				25 U	25 U	25 U			25 UJ	
SVOC	N-NITROSODIPHENYLAMINE	UG/L				10 U	10 U	10 U			10 U	
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L				10 U	10 U	10 U			10 U	
SVOC	HEXACHLOROBENZENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	PENTACHLOROPHENOL	UG/L				5 U	5 U	5 U			5 U	
SVOC	PHENANTHRENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	ANTHRACENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	CARBAZOLE	UG/L				10 U	10 U	10 U			10 U	
SVOC	1,4-DICHLOROBENZENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	DI-n-BUTYL PHTHALATE	UG/L				10 U	10 U	10 U			10 U	
SVOC	FLUORANTHENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	PYRENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	BENZYL BUTYL PHTHALATE	UG/L				10 U	10 U	10 U			10 U	
SVOC	BENZO(a)ANTHRACENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	3,3'-DICHLOROBENZIDINE	UG/L				10 U	10 U	10 U			10 U	
SVOC	CHRYSENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L				10 U	10 U	10 U			10 U	

256 430

		StationID:	MW11	MW12	MW13	MW14	MW14	MW15	MW16	MW19	MW19	MW20
		Sample ID:	MW111	MW121	MW131	MW141	MW141RE	MW151	MW161	MW191	MW191RE	MW201
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/11/96	2/11/96	2/7/96	2/13/96	2/7/96	2/7/96	2/7/96
Group	Parameter	Units										
SVOC	ACENAPHTHYLENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	3-NITROANILINE	UG/L			25 U	25 U			25 U	25 U		25 U
SVOC	ACENAPHTHENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4-DINITROPHENOL	UG/L			25 UJ	25 UJ			25 UJ	25 UJ		25 UJ
SVOC	4-NITROPHENOL	UG/L			25 U	25 U			25 U	25 U		25 U
SVOC	DIBENZOFURAN	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,4-DINITROTOLUENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	DIETHYL PHTHALATE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	FLUORENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	1,3-DICHLOROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-NITROANILINE	UG/L			25 U	25 U			25 U	25 U		25 U
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L			25 U	25 UJ			25 UJ	25 U		25 U
SVOC	N-NITROSODIPHENYLAMINE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	HEXACHLOROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	PENTACHLOROPHENOL	UG/L			5 U	5 U			5 U	5 U		5 U
SVOC	PHENANTHRENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	ANTHRACENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	CARBAZOLE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	1,4-DICHLOROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	DI-n-BUTYL PHTHALATE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	FLUORANTHENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	PYRENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	BENZYL BUTYL PHTHALATE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	BENZO(a)ANTHRACENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	3,3'-DICHLOROBENZIDINE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	CHRYSENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L			10 U	10 U			10 U	10 U		10 U

256 431

		Station ID:	MW21	MW22	MW23	MW24	MW24	MW25	MW26	MW28	MW29	MW30
		Sample ID:	MW211	MW221	MW231	MW241	MW241A	MW251	MW261	MW281	MW291	MW301
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/10/96	2/10/96	2/10/96	2/10/96	2/10/96	2/9/96	2/8/96	2/7/96	2/11/96	2/10/96
Group	**Parameter**	**Units**										
SVOC	ACENAPHTHYLENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	3-NITROANILINE	UG/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U		25 U
SVOC	ACENAPHTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	2,4-DINITROPHENOL	UG/L	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 U	25 U	25 UJ		25 U
SVOC	4-NITROPHENOL	UG/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U		25 U
SVOC	DIBENZOFURAN	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	2,4-DINITROTOLUENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	DIETHYL PHTHALATE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	FLUORENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	1,3-DICHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	4-NITROANILINE	UG/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U		25 U
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U		25 U
SVOC	N-NITROSODIPHENYLAMINE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	HEXACHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	PENTACHLOROPHENOL	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		5 U
SVOC	PHENANTHRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	ANTHRACENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	CARBAZOLE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	1,4-DICHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	DI-n-BUTYL PHTHALATE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	FLUORANTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	PYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	BENZYL BUTYL PHTHALATE	UG/L	10 U	10 U	10 U	2 J	10 U	10 U	10 U	10 U		10 U
SVOC	BENZO(a)ANTHRACENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	3,3'-DICHLOROBENZIDINE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	CHRYSENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U

256 432

		Station ID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
SVOC	ACENAPHTHYLENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	3-NITROANILINE	UG/L	25 U	25 U				25 U	25 U			25 U
SVOC	ACENAPHTHENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4-DINITROPHENOL	UG/L	25 UJ	25 UJ				25 UJ	25 UJ			25 UJ
SVOC	4-NITROPHENOL	UG/L	25 U	25 U				25 U	25 U			25 U
SVOC	DIBENZOFURAN	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	2,4-DINITROTOLUENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	DIETHYL PHTHALATE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	FLUORENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	1,3-DICHLOROBENZENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	4-NITROANILINE	UG/L	25 U	25 U				25 U	25 U			25 U
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L	25 U	25 U				25 U	25 UJ			25 U
SVOC	N-NITROSODIPHENYLAMINE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	HEXACHLOROBENZENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	PENTACHLOROPHENOL	UG/L	5 U	5 U				5 U	5 U			5 U
SVOC	PHENANTHRENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	ANTHRACENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	CARBAZOLE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	1,4-DICHLOROBENZENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	DI-n-BUTYL PHTHALATE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	FLUORANTHENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	PYRENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	BENZYL BUTYL PHTHALATE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	BENZO(a)ANTHRACENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	3,3'-DICHLOROBENZIDINE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	CHRYSENE	UG/L	10 U	10 U				10 U	10 U			10 U
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10 U	10 U				7.3 U	10 U			10 U

256 433

		Station ID:	MW38		MW39		MW40		MW40		MW40		MW41		MW41		MW42		MW44	
		Sample ID:	MW381RE		MW391		MW40		MW401		MW40A		MW411		MW411		MW421		MW441	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/11/96		2/10/96		1/15/96		1/15/96		1/15/96		1/17/96		1/17/96		1/19/96		1/19/96	
Group	Parameter	Units																		
SVOC	ACENAPHTHYLENE	UG/L			10	U														
SVOC	3-NITROANILINE	UG/L			25	U														
SVOC	ACENAPHTHENE	UG/L			10	U														
SVOC	2,4-DINITROPHENOL	UG/L			25	UJ														
SVOC	4-NITROPHENOL	UG/L			25	U														
SVOC	DIBENZOFURAN	UG/L			10	U														
SVOC	2,4-DINITROTOLUENE	UG/L			10	U														
SVOC	DIETHYL PHTHALATE	UG/L			10	U														
SVOC	FLUORENE	UG/L			10	U														
SVOC	1,3-DICHLOROBENZENE	UG/L			10	U														
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L			10	U														
SVOC	4-NITROANILINE	UG/L			25	U														
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L			25	U														
SVOC	N-NITROSODIPHENYLAMINE	UG/L			10	U														
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L			10	U														
SVOC	HEXACHLOROBENZENE	UG/L			10	U														
SVOC	PENTACHLOROPHENOL	UG/L			5	U														
SVOC	PHENANTHRENE	UG/L			10	U														
SVOC	ANTHRACENE	UG/L			10	U														
SVOC	CARBAZOLE	UG/L			10	U														
SVOC	1,4-DICHLOROBENZENE	UG/L			10	U														
SVOC	DI-n-BUTYL PHTHALATE	UG/L			10	U														
SVOC	FLUORANTHENE	UG/L			10	U														
SVOC	PYRENE	UG/L			10	U														
SVOC	BENZYL BUTYL PHTHALATE	UG/L			10	U														
SVOC	BENZO(a)ANTHRACENE	UG/L			10	U														
SVOC	3,3'-DICHLOROBENZIDINE	UG/L			10	U														
SVOC	CHRYSENE	UG/L			10	U														
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L			10	U														

		Station ID:	MW45		MW46		MW47		MW48		MW49		MW50		MW51		MW51		MW52	
		Sample ID:	MW451		MW461		MW471		MW481		MW491		MW501		MW511		MW511A		MW521	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/8/96		2/9/96		2/9/96		2/8/96		2/9/96		2/11/96		2/8/96		2/8/96		2/11/96	
Group	Parameter	Units																		
SVOC	ACENAPHTHYLENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	3-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U
SVOC	ACENAPHTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4-DINITROPHENOL	UG/L	25	U	25	UJ	25	U	25	U	25	U	25	UJ	25	U	25	U	25	UJ
SVOC	4-NITROPHENOL	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U
SVOC	DIBENZOFURAN	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	2,4-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	DIETHYL PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	FLUORENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	1,3-DICHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	4-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U	25	U
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L	25	U	25	U	25	U	25	U	25	U	25	UJ	25	U	25	U	25	UJ
SVOC	N-NITROSODIPHENYLAMINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	HEXACHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	PENTACHLOROPHENOL	UG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
SVOC	PHENANTHRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	CARBAZOLE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	1,4-DICHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	DI-n-BUTYL PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	PYRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	BENZYL BUTYL PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	BENZO(a)ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	3,3'-DICHLOROBENZIDINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	CHRYSENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U

Analytical Data Summary

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
SVOC	ACENAPHTHYLENE	UG/L	10	U	10	U	10	U		
SVOC	3-NITROANILINE	UG/L	25	U	25	U	25	U		
SVOC	ACENAPHTHENE	UG/L	10	U	10	U	10	U		
SVOC	2,4-DINITROPHENOL	UG/L	25	UJ	25	UJ	25	UJ		
SVOC	4-NITROPHENOL	UG/L	25	U	25	U	25	U		
SVOC	DIBENZOFURAN	UG/L	10	U	10	U	10	U		
SVOC	2,4-DINITROTOLUENE	UG/L	10	U	10	U	10	U		
SVOC	DIETHYL PHTHALATE	UG/L	10	U	10	U	10	U		
SVOC	FLUORENE	UG/L	10	U	10	U	10	U		
SVOC	1,3-DICHLOROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L	10	U	10	U	10	U		
SVOC	4-NITROANILINE	UG/L	25	U	25	U	25	U		
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L	25	UJ	25	UJ	25	UJ		
SVOC	N-NITROSODIPHENYLAMINE	UG/L	10	U	10	U	10	U		
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L	10	U	10	U	10	U		
SVOC	HEXACHLOROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	PENTACHLOROPHENOL	UG/L	5	U	5	U	5	U		
SVOC	PHENANTHRENE	UG/L	10	U	10	U	10	U		
SVOC	ANTHRACENE	UG/L	10	U	10	U	10	U		
SVOC	CARBAZOLE	UG/L	10	U	10	U	10	U		
SVOC	1,4-DICHLOROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	DI-n-BUTYL PHTHALATE	UG/L	10	U	10	U	10	U		
SVOC	FLUORANTHENE	UG/L	10	U	10	U	10	U		
SVOC	PYRENE	UG/L	10	U	10	U	10	U		
SVOC	BENZYL BUTYL PHTHALATE	UG/L	10	U	10	U	10	U		
SVOC	BENZO(a)ANTHRACENE	UG/L	10	U	10	U	10	U		
SVOC	3,3'-DICHLOROBENZIDINE	UG/L	10	U	10	U	10	U		
SVOC	CHRYSENE	UG/L	10	U	10	U	10	U		
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10	U	10	U	10	U		

256 436

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
SVOC	ACENAPHTHYLENE	UG/L
SVOC	3-NITROANILINE	UG/L
SVOC	ACENAPHTHENE	UG/L
SVOC	2,4-DINITROPHENOL	UG/L
SVOC	4-NITROPHENOL	UG/L
SVOC	DIBENZOFURAN	UG/L
SVOC	2,4-DINITROTOLUENE	UG/L
SVOC	DIETHYL PHTHALATE	UG/L
SVOC	FLUORENE	UG/L
SVOC	1,3-DICHLOROBENZENE	UG/L
SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/L
SVOC	4-NITROANILINE	UG/L
SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/L
SVOC	N-NITROSODIPHENYLAMINE	UG/L
SVOC	4-BROMOPHENYL PHENYL ETHER	UG/L
SVOC	HEXACHLOROBENZENE	UG/L
SVOC	PENTACHLOROPHENOL	UG/L
SVOC	PHENANTHRENE	UG/L
SVOC	ANTHRACENE	UG/L
SVOC	CARBAZOLE	UG/L
SVOC	1,4-DICHLOROBENZENE	UG/L
SVOC	DI-n-BUTYL PHTHALATE	UG/L
SVOC	FLUORANTHENE	UG/L
SVOC	PYRENE	UG/L
SVOC	BENZYL BUTYL PHTHALATE	UG/L
SVOC	BENZO(a)ANTHRACENE	UG/L
SVOC	3,3'-DICHLOROBENZIDINE	UG/L
SVOC	CHRYSENE	UG/L
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	UG/L

		StationID:	MW02	MW03	MW04	MW05	MW06	MW07	MW08	MW09	MW10	MW10
		Sample ID:	MW021	MW31	MW041	MW051	MW61	MW71	MW081	MW91	MW101	MW101DL
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/12/96	2/12/96	2/12/96	2/13/96	2/11/96	2/13/96	2/13/96
Group	Parameter	Units										
SVOC	DI-n-OCTYLPHTHALATE	UG/L				2 J	10 U	10 U			2 J	
SVOC	BENZO(b)FLUORANTHENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	1,2-DICHLOROBENZENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	BENZO(k)FLUORANTHENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	BENZO(a)PYRENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	BENZO(g,h,i)PERYLENE	UG/L				10 U	10 U	10 U			10 U	
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L				10 U	10 U	10 U			10 U	
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L				10 U	10 U	10 U			10 U	
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L				10 U	10 U	10 U			10 U	
VOC/TCLP	VINYL CHLORIDE	UG/L										
VOC/TCLP	1,1-DICHLOROETHENE	UG/L										
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L										
VOC/TCLP	CHLOROFORM	UG/L										
VOC/TCLP	CARBON TETRACHLORIDE	UG/L										
VOC/TCLP	BENZENE	UG/L										
VOC/TCLP	1,2-DICHLOROETHANE	UG/L										
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L										
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L										
VOC/TCLP	CHLOROBENZENE	UG/L										
VOC	CHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 R
VOC	VINYL CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 R
VOC	BROMOMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 R
VOC	CHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 R
VOC	ACETONE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5 R
VOC	1,1-DICHLOROETHENE	UG/L	7 J	14 =	10 U	10 U	10 U	54 =	26 =	1 J	48 =	53 R
VOC	CARBON DISULFIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 R
VOC	METHYLENE CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	8 R

256 438

		Station ID:	MW11	MW12	MW13	MW14	MW14	MW15	MW16	MW19	MW19	MW20
		Sample ID:	MW111	MW121	MW131	MW141	MW141RE	MW151	MW161	MW191	MW191RE	MW201
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/11/96	2/11/96	2/7/96	2/13/96	2/7/96	2/7/96	2/7/96
Group	**Parameter**	**Units**										
SVOC	DI-n-OCTYLPHTHALATE	UG/L			7 J	10 U			10 U	10 U		4 J
SVOC	BENZO(b)FLUORANTHENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	1,2-DICHLOROBENZENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	BENZO(k)FLUORANTHENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	BENZO(a)PYRENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	BENZO(g,h,i)PERYLENE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L			10 U	10 U			10 U	10 U		10 U
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L			10 U	10 U			10 U	10 U		10 U
VOC/TCLP	VINYL CHLORIDE	UG/L										
VOC/TCLP	1,1-DICHLOROETHENE	UG/L										
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L										
VOC/TCLP	CHLOROFORM	UG/L										
VOC/TCLP	CARBON TETRACHLORIDE	UG/L										
VOC/TCLP	BENZENE	UG/L										
VOC/TCLP	1,2-DICHLOROETHANE	UG/L										
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L										
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L										
VOC/TCLP	CHLOROBENZENE	UG/L										
VOC	CHLOROMETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	VINYL CHLORIDE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	BROMOMETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	CHLOROETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	ACETONE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	1,1-DICHLOROETHENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	CARBON DISULFIDE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	METHYLENE CHLORIDE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U

256 440

		Station ID:	MW21	MW22	MW23	MW24	MW24	MW25	MW26	MW28	MW29	MW30
		Sample ID:	MW211	MW221	MW231	MW241	MW241A	MW251	MW261	MW281	MW291	MW301
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/10/96	2/10/96	2/10/96	2/10/96	2/10/96	2/9/96	2/8/96	2/7/96	2/11/96	2/10/96
Group	Parameter	Units										
SVOC	DI-n-OCTYLPHTHALATE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	BENZO(b)FLUORANTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	1,2-DICHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	BENZO(k)FLUORANTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	BENZO(a)PYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	BENZO(g,h,i)PERYLENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U		10 U
VOC/TCLP	VINYL CHLORIDE	UG/L										
VOC/TCLP	1,1-DICHLOROETHENE	UG/L										
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L										
VOC/TCLP	CHLOROFORM	UG/L										
VOC/TCLP	CARBON TETRACHLORIDE	UG/L										
VOC/TCLP	BENZENE	UG/L										
VOC/TCLP	1,2-DICHLOROETHANE	UG/L										
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L										
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L										
VOC/TCLP	CHLOROBENZENE	UG/L										
VOC	CHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	VINYL CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMOMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	ACETONE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1-DICHLOROETHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	27 U	10 U
VOC	CARBON DISULFIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	METHYLENE CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

		Station ID:	MW31		MW31		MW31		MW32		MW33		MW34		MW35		MW36		MW37		MW38	
		Sample ID:	MW311		MW311A		MW311DL		MW321		MW331		MW341		MW351		MW361		MW371		MW381	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/12/96		2/12/96		2/6/96		2/8/96		2/9/96		2/13/96		2/9/96		2/9/96		2/11/96	
Group	Parameter	Units																				
SVOC	DI-n-OCTYLPHTHALATE	UG/L	2	J	10	U							10	U	10	U					10	U
SVOC	BENZO(b)FLUORANTHENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	1,2-DICHLOROBENZENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	BENZO(k)FLUORANTHENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	BENZO(a)PYRENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	BENZO(g,h,i)PERYLENE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10	U	10	U							10	U	10	U					10	U
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L	10	U	10	U							10	U	10	U					10	U
VOC/TCLP	VINYL CHLORIDE	UG/L																				
VOC/TCLP	1,1-DICHLOROETHENE	UG/L																				
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L																				
VOC/TCLP	CHLOROFORM	UG/L																				
VOC/TCLP	CARBON TETRACHLORIDE	UG/L																				
VOC/TCLP	BENZENE	UG/L																				
VOC/TCLP	1,2-DICHLOROETHANE	UG/L																				
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L																				
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L																				
VOC/TCLP	CHLOROBENZENE	UG/L																				
VOC	CHLOROMETHANE	UG/L	50	U	50	U	80	R	10	U	10	UJ	10	U	200	U					10	U
VOC	VINYL CHLORIDE	UG/L	50	U	50	U	80	R	10	U	10	U	10	U	200	U					10	U
VOC	BROMOMETHANE	UG/L	50	U	50	U	80	R	10	U	10	UJ	10	U	200	U					10	U
VOC	CHLOROETHANE	UG/L	50	U	50	U	80	R	10	U	10	U	10	U	200	U					10	U
VOC	ACETONE	UG/L	50	U	50	U	19	R	10	U	10	U	10	U	200	U					10	U
VOC	1,1-DICHLOROETHENE	UG/L	23	J	30	J	24	R	10	U	10	U	10	U	200	U					10	U
VOC	CARBON DISULFIDE	UG/L	50	U	50	U	80	R	10	U	10	U	10	U	200	U					10	U
VOC	METHYLENE CHLORIDE	UG/L	50	U	50	U	24	R	10	U	10	U	10	U	200	U					10	U

256 441

Analytical Data Summary

256 442

Group	Parameter	Units	MW38	MW39	MW40	MW40	MW40	MW41	MW41	MW42	MW44
		Sample ID:	MW381RE	MW391	MW40	MW401	MW40A	MW411	MW411	MW421	MW441
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/11/96	2/10/96	1/15/96	1/15/96	1/15/96	1/17/96	1/17/96	1/19/96	1/19/96
SVOC	DI-n-OCTYLPHTHALATE	UG/L		10 U							
SVOC	BENZO(b)FLUORANTHENE	UG/L		10 U							
SVOC	1,2-DICHLOROBENZENE	UG/L		10 U							
SVOC	BENZO(k)FLUORANTHENE	UG/L		10 U							
SVOC	BENZO(a)PYRENE	UG/L		10 U							
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L		10 U							
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L		10 U							
SVOC	BENZO(g,h,i)PERYLENE	UG/L		10 U							
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L		10 U							
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L		10 U							
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L		10 U							
VOC/TCLP	VINYL CHLORIDE	UG/L									
VOC/TCLP	1,1-DICHLOROETHENE	UG/L									
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L									
VOC/TCLP	CHLOROFORM	UG/L									
VOC/TCLP	CARBON TETRACHLORIDE	UG/L									
VOC/TCLP	BENZENE	UG/L									
VOC/TCLP	1,2-DICHLOROETHANE	UG/L									
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L									
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L									
VOC/TCLP	CHLOROBENZENE	UG/L									
VOC	CHLOROMETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	VINYL CHLORIDE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	BROMOMETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	CHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	ACETONE	UG/L		10 U	10 U	10 U	10 U	200 R	190 =	15 U	16 U
VOC	1,1-DICHLOROETHENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	CARBON DISULFIDE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	METHYLENE CHLORIDE	UG/L		10 U	2 J	10 U	10 U	10 U	3 R	10 U	10 U

Analytical Data Summary

		Station ID:	MW45	MW46	MW47	MW48	MW49	MW50	MW51	MW51	MW52
		Sample ID:	MW451	MW461	MW471	MW481	MW491	MW501	MW511	MW511A	MW521
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/8/96	2/9/96	2/9/96	2/8/96	2/9/96	2/11/96	2/8/96	2/8/96	2/11/96
Group	Parameter	Units									
SVOC	DI-n-OCTYLPHTHALATE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	BENZO(b)FLUORANTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	1,2-DICHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	BENZO(k)FLUORANTHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	BENZO(a)PYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	BENZO(g,h,i)PERYLENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC/TCLP	VINYL CHLORIDE	UG/L									
VOC/TCLP	1,1-DICHLOROETHENE	UG/L									
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L									
VOC/TCLP	CHLOROFORM	UG/L									
VOC/TCLP	CARBON TETRACHLORIDE	UG/L									
VOC/TCLP	BENZENE	UG/L									
VOC/TCLP	1,2-DICHLOROETHANE	UG/L									
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L									
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L									
VOC/TCLP	CHLOROBENZENE	UG/L									
VOC	CHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	VINYL CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMOMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	ACETONE	UG/L	10 U	10 U	10 U	18 U	10 U	48 U	10 U	10 U	56 U
VOC	1,1-DICHLOROETHENE	UG/L	2 J	10 U	10 U	10 U	10 U	10 U	4 J	4 J	10 U
VOC	CARBON DISULFIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	METHYLENE CHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

256 443

		Station ID:	MW53		MW54		MW54		MW55	
		Sample ID:	MW531		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
SVOC	DI-n-OCTYLPHTHALATE	UG/L	10	U	5	J	5	J		
SVOC	BENZO(b)FLUORANTHENE	UG/L	10	U	10	U	10	U		
SVOC	1,2-DICHLOROBENZENE	UG/L	10	U	10	U	10	U		
SVOC	BENZO(k)FLUORANTHENE	UG/L	10	U	10	U	10	U		
SVOC	BENZO(a)PYRENE	UG/L	10	U	10	U	10	U		
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L	10	U	10	U	10	U		
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L	10	U	10	U	10	U		
SVOC	BENZO(g,h,i)PERYLENE	UG/L	10	U	10	U	10	U		
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L	10	U	10	U	10	U		
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10	U	10	U	10	U		
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L	10	U	10	U	10	U		
VOC/TCLP	VINYL CHLORIDE	UG/L								
VOC/TCLP	1,1-DICHLOROETHENE	UG/L								
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L								
VOC/TCLP	CHLOROFORM	UG/L								
VOC/TCLP	CARBON TETRACHLORIDE	UG/L								
VOC/TCLP	BENZENE	UG/L								
VOC/TCLP	1,2-DICHLOROETHANE	UG/L								
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L								
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L								
VOC/TCLP	CHLOROBENZENE	UG/L								
VOC	CHLOROMETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	VINYL CHLORIDE	UG/L	10	U	10	U	10	U	10	U
VOC	BROMOMETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	CHLOROETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	ACETONE	UG/L	10	U	10	U	10	U	10	U
VOC	1,1-DICHLOROETHENE	UG/L	10	U	10	U	10	U	10	U
VOC	CARBON DISULFIDE	UG/L	10	U	10	U	10	U	10	U
VOC	METHYLENE CHLORIDE	UG/L	10	U	10	U	10	U	10	U

256 444

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
SVOC	DI-n-OCTYLPHTHALATE	UG/L
SVOC	BENZO(b)FLUORANTHENE	UG/L
SVOC	1,2-DICHLOROBENZENE	UG/L
SVOC	BENZO(k)FLUORANTHENE	UG/L
SVOC	BENZO(a)PYRENE	UG/L
SVOC	INDENO(1,2,3-c,d)PYRENE	UG/L
SVOC	DIBENZ(a,h)ANTHRACENE	UG/L
SVOC	BENZO(g,h,i)PERYLENE	UG/L
SVOC	2-METHYLPHENOL (o-CRESOL)	UG/L
SVOC	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L
SVOC	4-METHYLPHENOL (p-CRESOL)	UG/L
VOC/TCLP	VINYL CHLORIDE	UG/L
VOC/TCLP	1,1-DICHLOROETHENE	UG/L
VOC/TCLP	METHYL ETHYL KETONE (2-BUTANONE)	UG/L
VOC/TCLP	CHLOROFORM	UG/L
VOC/TCLP	CARBON TETRACHLORIDE	UG/L
VOC/TCLP	BENZENE	UG/L
VOC/TCLP	1,2-DICHLOROETHANE	UG/L
VOC/TCLP	TRICHLOROETHYLENE (TCE)	UG/L
VOC/TCLP	TETRACHLOROETHYLENE(PCE)	UG/L
VOC/TCLP	CHLOROBENZENE	UG/L
VOC	CHLOROMETHANE	UG/L
VOC	VINYL CHLORIDE	UG/L
VOC	BROMOMETHANE	UG/L
VOC	CHLOROETHANE	UG/L
VOC	ACETONE	UG/L
VOC	1,1-DICHLOROETHENE	UG/L
VOC	CARBON DISULFIDE	UG/L
VOC	METHYLENE CHLORIDE	UG/L

Analytical Data Summary

		StationID:	MW02		MW03		MW04		MW05		MW06		MW07		MW08		MW09		MW10		MW10	
		Sample ID:	MW021		MW31		MW041		MW051		MW61		MW71		MW081		MW91		MW101		MW101DL	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/12/96		2/13/96		2/12/96		2/12/96		2/12/96		2/12/96		2/13/96		2/11/96		2/13/96		2/13/96	
Group	Parameter	Units																				
VOC	1,1-DICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	2	J	2	J	10	U	2	J	20	R
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	10	=	2	J	10	U	2	J	200	=	10	U	10	U	10	U	110	=	120	R
VOC	CHLOROFORM	UG/L	8	J	7	J	10	U	5	J	10	=	8	J	10	U	2	J	14	=	15	R
VOC	1,1,1-TRICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	2	J	2	J	10	U	3	J	4	R
VOC	CARBON TETRACHLORIDE	UG/L	10	U	1	J	10	U	10	U	27	=	10	U	10	U	2	J	3	J	3	R
VOC	BENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	1,2-DICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	1	J	20	R
VOC	TRICHLOROETHYLENE (TCE)	UG/L	26	=	13	=	10	U	14	=	130	=	26	=	14	=	2	J	280	R	250	=
VOC	1,2-DICHLOROPROPANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	BROMODICHLOROMETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	cis-1,3-DICHLOROPROPENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	TOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	trans-1,3-DICHLOROPROPENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	1,1,2-TRICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	7	J	10	U	10	U	10	U	10	U	20	R
VOC	2-HEXANONE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	22	=	24	=	12	=	96	=	10	U	51	=	26	=	10	U	100	=	100	R
VOC	DIBROMOCHLOROMETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	CHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	ETHYLBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	Total Xylenes	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	STYRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	BROMOFORM	UG/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	20	R
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	10	U	1	J	10	U	10	U	100	=	10	U	10	U	10	U	12	=	12	R

Analytical Data Summary

		StationID:	MW11	MW12	MW13	MW14	MW14	MW15	MW16	MW19	MW19	MW20
		Sample ID:	MW111	MW121	MW131	MW141	MW141RE	MW151	MW161	MW191	MW191RE	MW201
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/13/96	2/12/96	2/11/96	2/11/96	2/7/96	2/13/96	2/7/96	2/7/96	2/7/96
Group	Parameter	Units										
VOC	1,1-DICHLOROETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	41 =	55 =	10 U	10 U		10 U	10 U	10 U		10 U
VOC	CHLOROFORM	UG/L	2 J	50 U	10 U	10 U		25 =	10 U	10 U		10 U
VOC	1,1,1-TRICHLOROETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	CARBON TETRACHLORIDE	UG/L	1 J	50 U	10 U	10 U		7 J	10 U	10 U		10 U
VOC	BENZENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	1,2-DICHLOROETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	TRICHLOROETHYLENE (TCE)	UG/L	46 =	650 =	2 J	10 U		11 =	10 U	10 U		10 U
VOC	1,2-DICHLOROPROPANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	BROMODICHLOROMETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	cis-1,3-DICHLOROPROPENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	TOLUENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	trans-1,3-DICHLOROPROPENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	1,1,2-TRICHLOROETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	2-HEXANONE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	16 =	12 J	5 J	10 U		2 J	10 U	10 U		10 U
VOC	DIBROMOCHLOROMETHANE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	CHLOROBENZENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	ETHYLBENZENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	Total Xylenes	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	STYRENE	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	BROMOFORM	UG/L	10 U	50 U	10 U	10 U		10 U	10 U	10 U		10 U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	4 J	130 =	1 J	10 U		10 U	10 U	10 U		10 U

		Station ID:	MW21	MW22	MW23	MW24	MW24	MW25	MW26	MW28	MW29	MW30
		Sample ID:	MW211	MW221	MW231	MW241	MW241A	MW251	MW261	MW281	MW291	MW301
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/10/96	2/10/96	2/10/96	2/10/96	2/10/96	2/9/96	2/8/96	2/7/96	2/11/96	2/10/96
Group	Parameter	Units										
VOC	1,1-DICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 J	10 U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROFORM	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	1 J	10 U	10 U	10 U
VOC	1,1,1-TRICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4 J	10 U
VOC	CARBON TETRACHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	4 J	10 U	10 U	10 U
VOC	BENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,2-DICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TRICHLOROETHYLENE (TCE)	UG/L	9 J	2 J	10 U	10 U	10 U	10 U	2 J	10 U	13 =	10 U
VOC	1,2-DICHLOROPROPANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMODICHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	cis-1,3-DICHLOROPROPENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TOLUENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	trans-1,3-DICHLOROPROPENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1,2-TRICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	2-HEXANONE	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 U	10 U	10 U	10 U
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	52 =	2 J	1 J	10 U	10 U	4 J	14 =	10 U	32 =	10 U
VOC	DIBROMOCHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	ETHYLBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	Total Xylenes	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	STYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMOFORM	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

		StationID:	MW31	MW31	MW31	MW32	MW33	MW34	MW35	MW36	MW37	MW38
		Sample ID:	MW311	MW311A	MW311DL	MW321	MW331	MW341	MW351	MW361	MW371	MW381
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/12/96	2/12/96	2/12/96	2/6/96	2/8/96	2/9/96	2/13/96	2/9/96	2/9/96	2/11/96
Group	Parameter	Units										
VOC	1,1-DICHLOROETHANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	760 =	480 =	760 R	87 =	10 U	10 U	160 J			10 U
VOC	CHLOROFORM	UG/L	35 J	23 J	36 R	7 J	10 U	5 J	200 U			10 U
VOC	1,1,1-TRICHLOROETHANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	CARBON TETRACHLORIDE	UG/L	6 J	50 U	80 R	22 =	10 U	1 J	200 U			10 U
VOC	BENZENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	1,2-DICHLOROETHANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	TRICHLOROETHYLENE (TCE)	UG/L	1000 R	680 =	1100 =	68 =	10 U	1 J	1900 =			10 U
VOC	1,2-DICHLOROPROPANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	BROMODICHLOROMETHANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	cis-1,3-DICHLOROPROPENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	TOLUENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	trans-1,3-DICHLOROPROPENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	1,1,2-TRICHLOROETHANE	UG/L	11 J	8 J	12 R	4 J	10 U	10 U	200 U			10 U
VOC	2-HEXANONE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 UJ
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	64 =	68 =	64 R	1 J	10 U	1 J	26 J			10 U
VOC	DIBROMOCHLOROMETHANE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	CHLOROBENZENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	ETHYLBENZENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	Total Xylenes	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	STYRENE	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	BROMOFORM	UG/L	50 U	50 U	80 R	10 U	10 U	10 U	200 U			10 U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	420 =	280 =	420 R	66 =	10 U	10 U	200 =			10 U

		StationID:	MW38	MW39	MW40	MW40	MW40	MW41	MW41	MW42	MW44
		Sample ID:	MW381RE	MW391	MW40	MW401	MW40A	MW411	MW411	MW421	MW441
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/11/96	2/10/96	1/15/96	1/15/96	1/15/96	1/17/96	1/17/96	1/19/96	1/19/96
Group	Parameter	Units									
VOC	1,1-DICHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	CHLOROFORM	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	1,1,1-TRICHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	3 J
VOC	CARBON TETRACHLORIDE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	BENZENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	1,2-DICHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	TRICHLOROETHYLENE (TCE)	UG/L		3 J	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	1,2-DICHLOROPROPANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	BROMODICHLOROMETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	cis-1,3-DICHLOROPROPENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	TOLUENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	trans-1,3-DICHLOROPROPENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	1,1,2-TRICHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	2-HEXANONE	UG/L		10 UJ	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	TETRACHLOROETHYLENE(PCE)	UG/L		3 J	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	DIBROMOCHLOROMETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	CHLOROBENZENE	UG/L		10 U	1 J	10 U	10 U	10 U	12 R	10 U	10 U
VOC	ETHYLBENZENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	Total Xylenes	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	STYRENE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	BROMOFORM	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L		10 U	10 U	10 U	10 U	10 U	12 R	10 U	10 U

256 450

		Station ID:	MW45	MW46	MW47	MW48	MW49	MW50	MW51	MW51	MW52
		Sample ID:	MW451	MW461	MW471	MW481	MW491	MW501	MW511	MW511A	MW521
		Sample Depth:	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
		Sample Date:	2/8/96	2/9/96	2/9/96	2/8/96	2/9/96	2/11/96	2/8/96	2/8/96	2/11/96
Group	Parameter	Units									
VOC	1,1-DICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	10 U	10 U	2 J	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROFORM	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1,1-TRICHLOROETHANE	UG/L	1 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CARBON TETRACHLORIDE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,2-DICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TRICHLOROETHYLENE (TCE)	UG/L	10 U	10 U	2 J	10 U	10 U	10 U	5 J	5 J	10 U
VOC	1,2-DICHLOROPROPANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMODICHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	cis-1,3-DICHLOROPROPENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TOLUENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	trans-1,3-DICHLOROPROPENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1,2-TRICHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	2-HEXANONE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	10 U	10 U	23 =	10 U	10 U	10 U	2 J	2 J	10 U
VOC	DIBROMOCHLOROMETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	CHLOROBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	ETHYLBENZENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	Total Xylenes	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	STYRENE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	BROMOFORM	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

256 452

		Station ID:	MW51		MW54		MW54		MW55	
		Sample ID:	MW511		MW541		MW541A		MW551	
		Sample Depth:	0 to 0		0 to 0		0 to 0		0 to 0	
		Sample Date:	2/13/96		2/13/96		2/13/96		2/10/96	
Group	Parameter	Units								
VOC	1,1-DICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10	U	10	U	10	U	10	U
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L	10	U	1	J	1	J	10	U
VOC	CHLOROFORM	UG/L	10	U	10	U	10	U	10	U
VOC	1,1,1-TRICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	CARBON TETRACHLORIDE	UG/L	10	U	10	U	10	U	10	U
VOC	BENZENE	UG/L	10	U	10	U	10	U	10	U
VOC	1,2-DICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	TRICHLOROETHYLENE (TCE)	UG/L	1	J	17	=	22	=	10	U
VOC	1,2-DICHLOROPROPANE	UG/L	10	U	10	U	10	U	10	U
VOC	BROMODICHLOROMETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10	U	10	U	10	U	10	U
VOC	cis-1,3-DICHLOROPROPENE	UG/L	10	U	10	U	10	U	10	U
VOC	TOLUENE	UG/L	10	U	10	U	10	U	10	U
VOC	trans-1,3-DICHLOROPROPENE	UG/L	10	U	10	U	10	U	10	U
VOC	1,1,2-TRICHLOROETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	2-HEXANONE	UG/L	10	U	10	U	10	U	10	U
VOC	TETRACHLOROETHYLENE(PCE)	UG/L	10	U	10	U	10	U	10	U
VOC	DIBROMOCHLOROMETHANE	UG/L	10	U	10	U	10	U	10	U
VOC	CHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U
VOC	ETHYLBENZENE	UG/L	10	U	10	U	10	U	10	U
VOC	Total Xylenes	UG/L	10	U	10	U	10	U	10	U
VOC	STYRENE	UG/L	10	U	10	U	10	U	10	U
VOC	BROMOFORM	UG/L	10	U	10	U	10	U	10	U
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L	10	U	10	U	10	U	10	U

StationID:
Sample ID:
Sample Depth:
Sample Date:

Group	Parameter	Units
VOC	1,1-DICHLOROETHANE	UG/L
VOC	METHYL ETHYL KETONE (2-BUTANONE)	UG/L
VOC	TOTAL 1,2-DICHLOROETHENE	UG/L
VOC	CHLOROFORM	UG/L
VOC	1,1,1-TRICHLOROETHANE	UG/L
VOC	CARBON TETRACHLORIDE	UG/L
VOC	BENZENE	UG/L
VOC	1,2-DICHLOROETHANE	UG/L
VOC	TRICHLOROETHYLENE (TCE)	UG/L
VOC	1,2-DICHLOROPROPANE	UG/L
VOC	BROMODICHLOROMETHANE	UG/L
VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L
VOC	cis-1,3-DICHLOROPROPENE	UG/L
VOC	TOLUENE	UG/L
VOC	trans-1,3-DICHLOROPROPENE	UG/L
VOC	1,1,2-TRICHLOROETHANE	UG/L
VOC	2-HEXANONE	UG/L
VOC	TETRACHLOROETHYLENE(PCE)	UG/L
VOC	DIBROMOCHLOROMETHANE	UG/L
VOC	CHLOROBENZENE	UG/L
VOC	ETHYLBENZENE	UG/L
VOC	Total Xylenes	UG/L
VOC	STYRENE	UG/L
VOC	BROMOFORM	UG/L
VOC	1,1,2,2-TETRACHLOROETHANE	UG/L

Appendix I

Downhole Geophysical Characterization of Monitoring Wells at DDMT: Technical Memorandum

TECHNICAL MEMORANDUM CH2MHILL

Downhole Geophysical Characterization of Monitoring Wells at the Defense Depot Memphis, Tennessee

PREPARED FOR:	Julian Savage/CEHND Julett Denton/CEHND U.S. Army Engineer Division, Huntsville P.O. Box 1600 Huntsville, AL 35807-4301
PREPARED BY:	Greg Underberg/CH2M HILL/ORO
COPIES:	Mark Corey/CH2M HILL/MGM
DATE:	November 26, 1996

Purpose and Scope of Work

The following technical memorandum summarizes results from downhole geophysical characterization of monitoring wells MW-36, MW-37, MW-19, MW-34, MW-38, and MW-39 conducted during February 1996 at the Defense Depot Memphis, Tennessee (DDMT). Conclusions and recommendations are herein proposed, following the summary of field activities and data results. The purposes for conducting the geophysical characterization study were as follows:

1. Assess the condition of the well casings and grout seals of monitoring wells that penetrate clays of the Jackson Formation/Upper Claiborne Group confining unit and that are completed in the underlying Memphis Sand Aquifer (MW-36 and MW-37). Assess the potential for leakage between the overlying Alluvial Aquifer and the Memphis Sand Aquifer at these wells.
2. Evaluate the lithology of other deeper wells completed in the alluvial sands (MW-19, MW-34, MW-38, MW-39) to confirm that the wells do not penetrate the Jackson Formation/Upper Claiborne Group confining unit or are not completed in another water-producing formation other than the Alluvial Aquifer.

Summary of Field Activities

The geophysical data summarized in this letter were collected by Colog, Inc., on February 20 through 21, 1996. During the field activities the following data were collected:

- Caliper logging from monitoring wells MW-36 and MW-37, to assess the structural integrity of the well casings.

- Gamma-gamma density and/or sonic bond (acoustic) logging to assess the integrity of the grout seal surrounding the well casings. Sonic logs were obtained from Memphis Sand wells MW-36 and MW-37. 4-pi density logs were obtained from Memphis Sand well MW-36, and the remaining minimal contracted footage was used on alluvial wells MW-34 and MW-38. Memphis Sand well MW-37 was not logged for 4-pi density, because the well is located off federal property and would have required special permitting with the State of Tennessee before the gamma source could be used.
- The casing of wells MW-36 and MW-37 were filled with organic-free deionized water to allow sonic logging above the static water level. The water was removed by bailing after logging. Permission from the City of Memphis Water Board was obtained prior to use of the water.
- To assess the depth to the Jackson Formation/Upper Claiborne Group confining unit and the distribution of clays within the upper alluvial aquifer, natural gamma ray logs were obtained from all of the monitoring wells, and a dual induction log was obtained from monitoring well MW-38. The dual induction log was provided by Colog, Inc., at no cost to the project.

Table 1 summarizes the list of logs collected at each monitoring well and the equipment used to collect the data.

Summary of Data Results

A review of the caliper logs collected in wells MW-36 and MW-37 indicated that the structural integrity of the well casings (in these wells) was good. No noticeable cracks or separations were observed in the well casings.

Figures 1 through 4 summarize the geophysical characterization results related to the grout seals around wells MW-34, MW-36, MW-37, and MW-38. The following information is included in each figure:

- Stratigraphy from Appendix B of Law Environmental (1990)
- Well construction details from Appendix D of Law Environmental (1990)
- The gamma-gamma density or sonic bond log for each respective well
- CH2M HILL's interpretation of the gamma-gamma density or sonic bond log collected for each respective well. A determination of "good" for the grout seal indicated that the gamma-gamma and/or sonic logs did not indicate any gaps or separations between the grout and the natural formation. A "poor" determination indicated numerous gaps; "fair" indicated isolated gaps.

Gamma-gamma density logs or sonic bond logs were not collected in wells MW-19 and MW-39 because no problems were anticipated with the grout seals for these wells. The raw data for all geophysical logs collected at each well are included in Appendix 1.

In general, the grout seals around wells MW-34, MW-36, MW-37, and MW-38 were in good condition. The geophysical data suggest that in well MW-34 a poor grout seal exists between zero and 69 feet and between 92 and 112 feet below ground surface (bgs).

However, the grout seal above the sand pack, between 112 and 142 feet bgs, was characterized as in good condition, providing adequate isolation of the water bearing zone above the well screen. Similarly, in MW-36, the grout seal between 40 and 100 feet bgs appeared poor. However, between 100 and 192 feet bgs (located just above the gravel pack and well screen), the grout seal appears to be in good condition.

The grout seals in monitoring wells MW-37 and MW-38 were characterized in fair-to-good condition with the exception of two zones in MW-37 (between 25 to 38 feet bgs and 72 to 92 feet bgs) where the grout seals were characterized in poor-to-fair condition. However, below the 72- to 92-foot interval, there is about 70 feet (between 92 and 160 feet bgs) of confining unit clay where the grout seal is in fair-to-good condition. The poor interval of grout seal therefore does not compromise the bulk of the confining unit clay at MW-37.

Stratigraphic/Lithologic Interpretation

The following stratigraphic/lithologic interpretations were derived from the natural gamma ray downhole geophysical logs recorded in February 1996 by Colog, Inc. The gamma ray log (recorded in counts per second) is a measure of the natural radioactivity emitted by the formation. In sedimentary formations, the gamma ray log normally reflects the clay or shale content of the formations. This is because radioactive elements tend to concentrate in clays and shales. Formations lacking clay, such as gravels, limestones, and dolomites, usually have a very low level of gamma radioactivity.

Natural gamma ray logs were recorded in four Fluvial Aquifer wells (MW-19, MW-34, MW-38, and MW-39) and two Memphis Sand Aquifer wells (MW-36 and MW-37) located on and adjacent to the DDMT property. The results of the gamma ray logs were compared with the field lithologic boring logs for these specific wells, and any discrepancies were noted.

Table 2 summarizes the elevation, at each well, for the contacts between the alluvium and the Jackson Formation/Upper Claiborne Group; and the elevation for the contact between the Jackson Formation/Upper Claiborne Group and Memphis Sand in wells MW-36, MW-37, and MW-38. Formation-specific interpretation of the gamma-ray logs is based on the gamma-ray signatures presented in Kingsbury and Parks (1993).

Fluvial Aquifer Wells

MW-19

The interval from the ground surface to a depth of 25 feet bgs displayed relatively higher gamma activity readings and represents a clay/silty clay. This material gradates to a sandy clay/clayey sand over the interval of 25 to 30 feet bgs. Lower gamma activity readings, representative of a sand/gravely sand, were recorded at a depth of 30 to 90 feet bgs. This interval is a water bearing zone and is defined as the Fluvial Aquifer. A high gamma radiation detection at 67 feet bgs indicates the presence of a distinct 2-foot clay layer within this sand interval at that depth. The gamma log also recorded higher activity readings at a depth of 90 feet bgs, indicating an additional clay layer. This contact represents the aquifer confining layer and is considered the base of the Fluvial Aquifer.

The geophysical gamma log from MW-19 generally correlates with the field lithologic boring log. The field log interpreted the distinct clay layer (located within the Fluvial Aquifer interval at a depth of 67 feet bgs) to be thinner (1-foot thick) and located at a slightly greater depth (73 feet bgs).

MW-34

Higher gamma activity readings from the ground surface to a depth of approximately 28 feet bgs indicate that a clay/silty clay is present within this interval. This layer gradates into a sandy clay/clayey sand over the interval of 28 to 32 feet bgs. Lower gamma activity, representative of a sand/gravely sand, was recorded over the interval of 32 feet bgs to the total depth of the gamma log (152 feet bgs). Higher gamma readings from 72 to 95 feet bgs indicate that layers of clay/sandy clay (7- to 10-feet thick) exist within this sand interval. At the base of this sand is a saturated water bearing zone that is considered the Fluvial Aquifer.

The gamma log from MW-34 generally correlates with the field lithologic boring log. The field log identified a gray silty clay (inferred aquifer confining layer) at 158.3 feet bgs. Because of the length of the geophysical probe, gamma activity readings were unobtainable from the bottom 5 feet of the borehole. Therefore, evidence of the aquifer confining clay layer does not appear on the gamma log, but is present in the lithologic log.

A contiguous clay layer similar to the Jackson Formation/Upper Claiborne Group confining unit clay was not encountered until a depth of 158.3 feet bgs in MW-34.

MW-38

A clay/silty clay interval is represented by higher gamma activity readings from the ground surface to a depth of approximately 30 feet bgs. This layer gradates into a sandy clay/clayey sand within the interval from 30 to 40 feet bgs. A continuous sand/gravely sand is present from 40 feet bgs to the end of the geophysical log (150 feet bgs). This sand contains layers of clayey sand/sandy clay within the interval of 80 to 106 feet bgs that range in thickness from 2 feet (95 to 97 feet bgs) to 6 feet (82 to 88 feet bgs).

The gamma log from MW-38 generally correlates with the field lithologic boring log. The field log identified a brown to gray silty clay (inferred aquifer confining layer) at a depth of 155 feet bgs. Because of the length of the geophysical probe, gamma activity readings were unobtainable from the bottom 5 feet of the borehole.

MW-39

Higher gamma activity readings from the ground surface to a depth of approximately 30 feet bgs indicate the presence of a clay/silty clay within this interval. This clay layer gradates into a sandy clay/clayey sand from 30 to 42 feet bgs. Lower gamma activity readings, an indication of a sand/gravely sand, were recorded from 42 feet bgs to the total depth of the gamma log (112 feet bgs).

The gamma ray log generally correlates with the field lithologic boring log from MW-39.

Memphis Sand Aquifer Wells

MW-36

Relatively high gamma activity readings from the ground surface to a depth of approximately 26 feet bgs indicate the presence of a silty clay/clayey silt within this interval. This material gradates into a sandy clay/clayey sand from 26 feet bgs to approximately 30 feet bgs. Consistent lower gamma readings from 30 feet bgs to a depth of 85 feet bgs indicate the presence of a relatively clean sand/gravely sand within this subsurface interval. An increase in gamma readings was recorded from 85 feet bgs to a depth of approximately 170 feet bgs. These high readings represent a consistent clay layer. Beneath this interval, the clay gradates from a sandy clay/clayey sand layer (170 to 188 feet bgs) to a cleaner clayey sand/sand layer (188 to 204 feet bgs).

Plate 5 of Kingsbury and Parks (1993) indicates that the thickness of the confining unit, consisting of the Jackson Formation and Upper Claiborne Group, varies from approximately 50 to more than 100 feet thick where it is present. The clay interval of 85 feet at well MW-36 is consistent with that observed at other locations in the Memphis area (e.g., 70 feet at Well Sh:J-167 at the Allen Wellfield).

MW-37

High gamma activity readings indicate the presence of a clay/silty clay from the ground surface to a depth of approximately 10 feet bgs. The clay gradates into a sandy clay over the interval from 10 to 20 feet bgs. Lower activity readings, representative of a relatively clean sand/gravely sand, were recorded from 20 feet bgs to a depth of 65 feet bgs. An increase in gamma activity readings, corresponding to a continuous clay layer, was recorded over the interval of 65 to 155 feet bgs. Beneath this clay interval, lower gamma readings indicate the presence of a sand/gravely sand layer from 155 feet bgs to the total depth of the gamma log (178 feet bgs).

The geophysical gamma log correlates well with the field lithologic boring log from MW-37. The 110-foot-thick confining unit clay interval is consistent with that observed at other locations in the Memphis area (Kingsbury and Parks, 1993).

Conclusions

CH2M HILL has drawn the following conclusions from the data collected during this study. These conclusions were made in accordance with well conditions at the time of this geophysical investigation.

- The structural integrity of the Memphis Sand monitoring well casings are good.
- In general, the grout seals that surround the well casings were in good condition and provide adequate seals around each well. In particular, the grout seals throughout the confining unit clay interval of the Memphis Sand wells are generally good. The gamma-gamma density and sonic logs do not indicate seal problems throughout the confining interval, which indicates that the annular space of the borehole has not breached the confining layer. The grout seals in the wells screened in the Memphis Sand Aquifer (MW-36 and MW-37) appear to adequately isolate the Memphis Sand from the upper water bearing units along each respective borehole.
- None of the wells screened in the upper Alluvial Aquifer (MW-19, MW-24, MW-38, and MW-39) appear to penetrate the confining unit between the upper Alluvial Aquifer and the Memphis Sand Aquifer.

Recommendations

Based on the above conclusions, the Memphis Sand wells do not show evidence of forming a breach between the Alluvial and Memphis Sand Aquifers. Geophysical data generally correspond with lithologic observations; therefore, no additional geophysical characterization work is needed at this time.

References

Law Environmental. *Remedial Investigation at DDMT, Final Report*. August 1990.

Kingsbury, James A., and William S. Parks. *Hydrogeology of the Principal Aquifers and Relation of Faults to Interaquifer Leakage in the Memphis Area, Tennessee*. U. S. Geological Survey Water-Resources Investigations Report 93-4075. 1993.

Table 1
Department of Defense Memphis Depot
Geophysical Data Collection Summary
February 1996

	Log Type				
Well Number	**Natural γ**	**4 pi Density[b]**	**3 Arm Caliper[c]**	**Sonic Bond[d]**	**Induction[e]**
MW-19	X				
MW-34	X	X			
MW-36	X	X	X	X	
MW-37	X		X	X	
MW-38	X	X			X
MW-39	X				

[a] Natural gamma (γ) log instrument: model ALP gamma logger with NaI detector. Logging speed was 15 feet/minute.

[b] 4 pi density log instrument model: 4 pi density logger with NaI detector. Logging speed was 15 feet/minute. Neutron source Cs-137 (100mCi).

[c] 3 arm caliper log instrument: model G1P caliper logger. Logging speed 12 feet/minute.

[d] Sonic bond log instrument: model CLP Acoustic logger with a ceramic detector with Tx-Rx spacing of 3/4 foot and Rx-Rx spacing 1 foot and a piezoelectric acoustic source. Logging speed was 11 feet/minute.

[e] Induction log instrument: model EM induction logger. Logging speed was 30 feet/minute.

Table 2
Department of Defense Memphis Depot
Summary Depth to Stratigraphic Contacts
February 1996

Well Number	Depth[a] (feet)	Elevation[a] (feet) NGVD[b]	Depth[a] to Top of Formation (feet)			Elevation[a] to Top of Formation (feet) msl		
			Alluvium	Clay	Sand	Alluvium	Clay	Sand
MW-19	95	291	30	90	[illegible]	261	201	[illegible]
MW-34	159	301	32	72	[illegible]	269	229	[illegible]
MW-36	212	311	29	87	162	282	224	149
MW-37	183	285	22	66	156	263	219	129
MW-38	159	309	34	82	138	275	227	171
MW-39	116	296	33	87	[illegible]	263	209	[illegible]

[a] All depths and elevations rounded to the nearest foot.

[b] NGVD: National Geodetic Vertical Datum. All elevations referenced to this datum

256 463

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PROJECT NUMBER	BORING NUMBER	
113630.09.ZZ	MW-34	SHEET 1 OF 1

Figure 1
Well MW-34 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee

DEPTH BELOW SURFACE (FT)

SOIL DESCRIPTION

SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY

0 **GRAVEL FILL**

CLAY (CL), brown, silty

30 **CLAYEY SAND (SP)**, brown to red, fine to medium grained

SAND (SP), tan, orange, white and brown, fine to medium grained gravelly

60

SAND (SP), silty, fine grained, white to brown with thin clay lenses

90

120

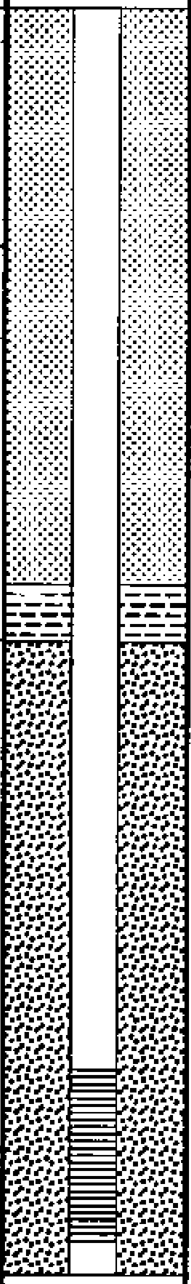
150 **SAND (SP)**, same as above but sand is coarse grained

CLAY (CL), gray, silty

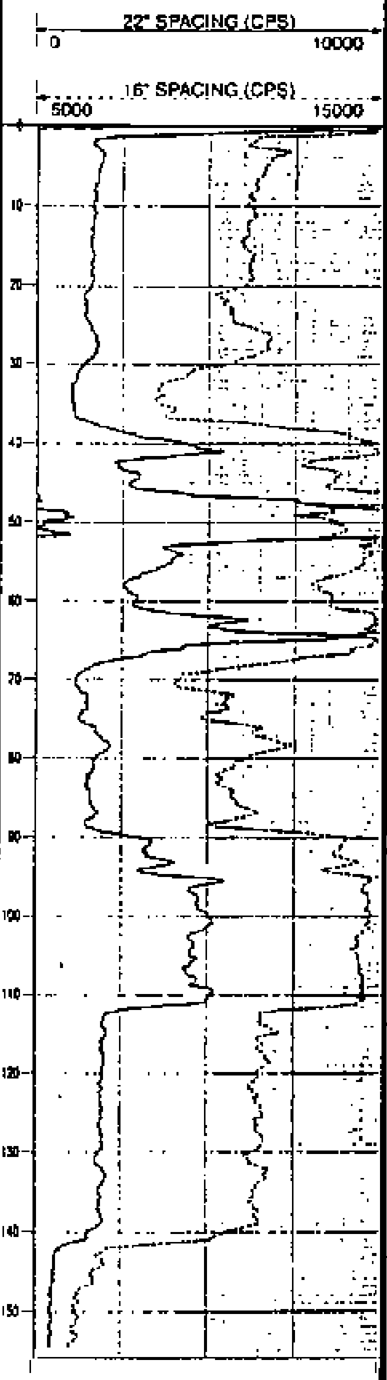
158.5 BORING TERMINATED

180

MONITORING WELL CONSTRUCTION DIAGRAM



4 PI DENSITY LOG



SYNOPSIS OF GEOPHYSICAL DATA

*Interpreted Seal Quality

0 - 41 feet
No SBL density logs indicates fill of some type in the annulus. Density generally low. Little or no grout present. Fill may be bentonite.
*poor to fair

41 -69 feet
Random voids in annulus fill. Fill material not identified. Generally low density
*poor to none

69 - 92 feet
Annulus filled, fill material not identified. Possible bentonite or bentonite/cement mixture. Medium density
*fair to good

92 - 112 feet
Void or partial void behind casing.
*poor to none

112 - 142 feet
Annulus filled, possibly with bentonite or bentonite/cement mixture. Uniformity of density of fill indicates good continuity of seal.
*good

142 - 160 feet
Increase in density indicates change from unsaturated to saturated condition. Possible sand pack outside casing.
*unknown

0
30
60
90
120
150
180

LEGEND ▨ Grout ▤ Bentonite ▨ Sand

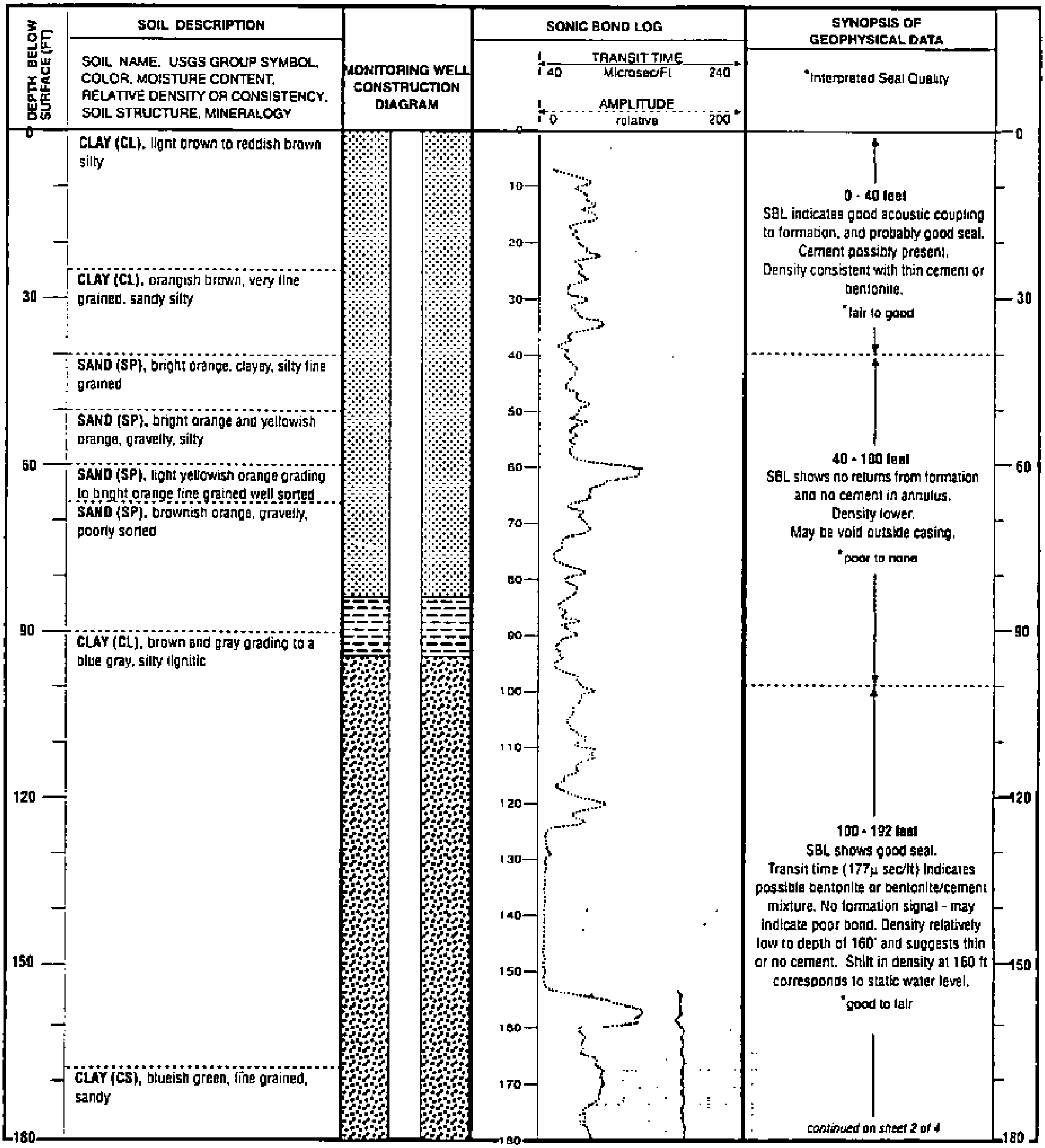
SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from CDLOG, Inc.

PROJECT NUMBER	BORING NUMBER	
113630.09.ZZ	MW-36	SHEET 1 OF 4

CH2MHILL

Figure 2
Well MW-36 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee



CLAY (CL), light brown to reddish brown silty

CLAY (CL), orangish brown, very fine grained, sandy silty

SAND (SP), bright orange, clayey, silty fine grained

SAND (SP), bright orange and yellowish orange, gravelly, silty

SAND (SP), light yellowish orange grading to bright orange fine grained well sorted

SAND (SP), brownish orange, gravelly, poorly sorted

CLAY (CL), brown and gray grading to a blue gray, silty lignitic

CLAY (CS), blueish green, fine grained, sandy

0 - 40 feet
SBL indicates good acoustic coupling to formation, and probably good seal. Cement possibly present. Density consistent with thin cement or bentonite.
*fair to good

40 - 100 feet
SBL shows no returns from formation and no cement in annulus. Density lower. May be void outside casing.
*poor to none

100 - 192 feet
SBL shows good seal. Transit time (177µ sec/ft) indicates possible bentonite or bentonite/cement mixture. No formation signal - may indicate poor bond. Density relatively low to depth of 160' and suggests thin or no cement. Shift in density at 160 ft corresponds to static water level.
*good to fair

continued on sheet 2 of 4

LEGEND ▨ Grout ☰ Bentonite ▦ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

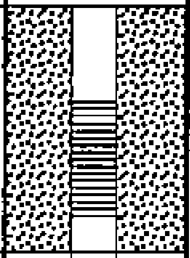
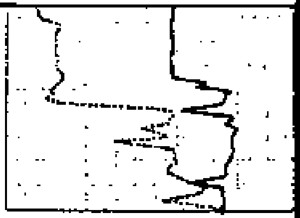
256 465

PROJECT NUMBER	BORING NUMBER	
113830.09.ZZ	MW-36	SHEET 2 OF 4

CH2MHILL

Figure 2
Well MW-36 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee

DEPTH BELOW SURFACE (FT)	SOIL DESCRIPTION SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	MONITORING WELL CONSTRUCTION DIAGRAM	SONIC BOND LOG TRANSIT TIME 40 Microsec/Ft 240 AMPLITUDE 0 relative 200	SYNOPSIS OF GEOPHYSICAL DATA *Interpreted Seal Quality	
180	**GRAVEL (GP)** **SAND (SP)**, very dense gray very slightly clayey line grained			*continued from sheet 2 of 2* **192 - 202 feet** SBL and Density Log consistent with sand packed screen interval *NA	180
210	***212' BORING TERMINATED***				210
240					240

LEGEND ▨ Grout ☰ Bentonite ▨ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

CH2MHILL

PROJECT NUMBER 113630.09.ZZ

BORING NUMBER MW-36 SHEET 3 OF 4

Figure 2
Well MW-36 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee

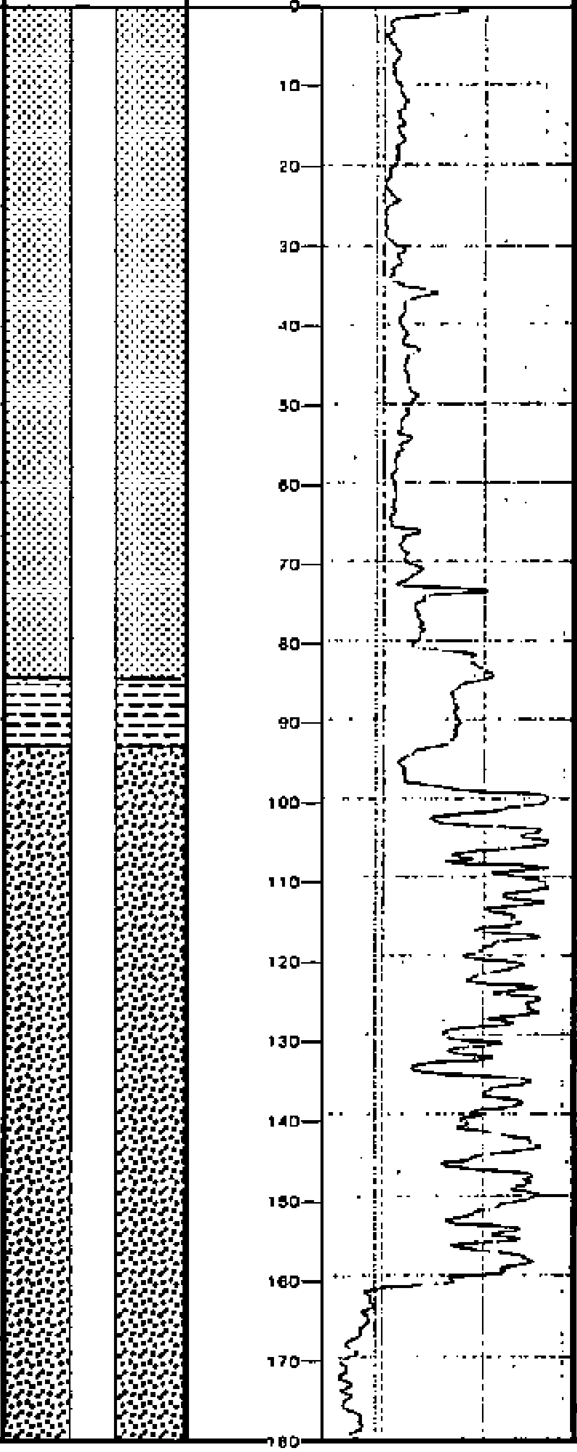
DEPTH BELOW SURFACE (FT)	SOIL DESCRIPTION SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY
0	**CLAY (CL)**, light brown to reddish brown silty
30	**CLAY (CL)**, orangish brown, very fine grained, sandy silty
	SAND (SP), bright orange, clayey, silty fine grained
	SAND (SP), bright orange and yellowish orange, gravelly, silty
60	**SAND (SP)**, light yellowish orange grading to bright orange fine grained well sorted
	SAND (SP), brownish orange, gravelly, poorly sorted
90	**CLAY (CL)**, brown and gray grading to a blue gray, silty lignitic
120	
150	
	CLAY (CS), blueish green, fine grained, sandy
180	

MONITORING WELL CONSTRUCTION DIAGRAM

4 PI DENSITY LOG

16" SPACING (CPS) 0 – 20000

3 ARM CALIPER 0.0 – 4.0



SYNOPSIS OF GEOPHYSICAL DATA

*Interpreted Seal Quality

0 - 40 feet
SBL indicates good acoustic coupling to formation, and probably good seal. Cement possibly present. Density consistent with thin cement or bentonite.

*fair to good

40 - 100 feet
SBL shows no returns from formation and no cement in annulus. Density lower. May be void outside casing.

*poor to none

100 - 192 feet
SBL shows good seal. Transit time (177µ sec/ft) indicates possible bentonite or bentonite/cement mixture. No formation signal - may indicate poor bond. Density relatively low to depth of 160' and suggests thin or no cement. Shift in density at 160 ft corresponds to static water level.

*good to fair

continued on sheet 4 of 4

LEGEND ▨ Grout ☰ Bentonite ▩ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

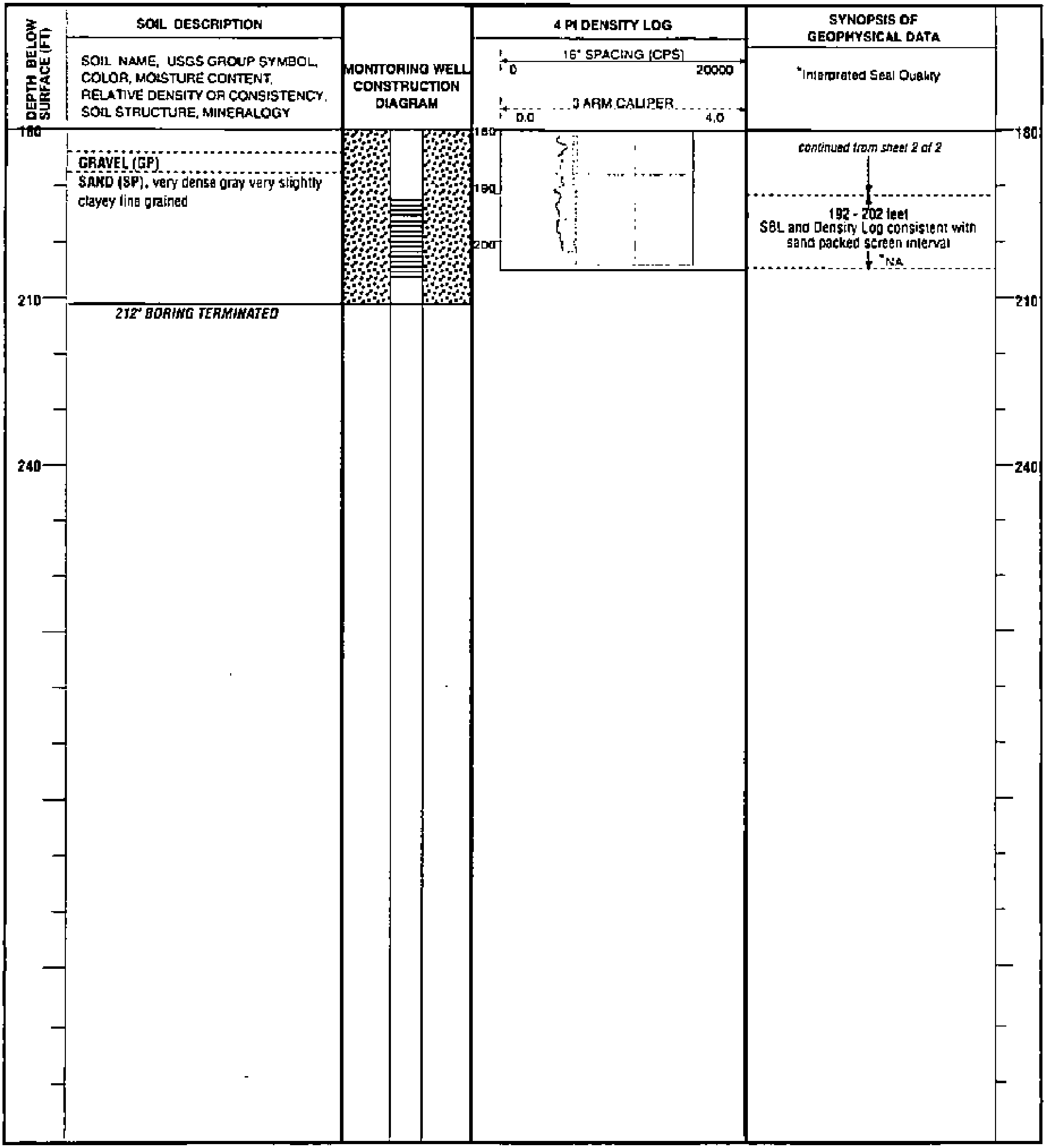
256 467

PROJECT NUMBER	BORING NUMBER	
113630.09.ZZ	MW-36	SHEET 4 OF 4

CH2MHILL

Figure 2
Well MW-36 Stratigraphic and Geophysical Evaluation

PROJECT **Defense Depot Memphis Tennessee** LOCATION **Memphis Tennessee**



*Interprated Seal Quality

GRAVEL (GP)

SAND (SP), very dense gray very slightly clayey fine grained

212' BORING TERMINATED

continued from sheet 2 of 2

192 - 202 feet
SBL and Density Log consistent with sand packed screen interval
*NA

LEGEND ▨ Grout ▤ Bentonite ▨ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

256 468

PROJECT NUMBER	BORING NUMBER	
113630.09.ZZ	MW-37	SHEET 1 OF 1

CH2MHILL

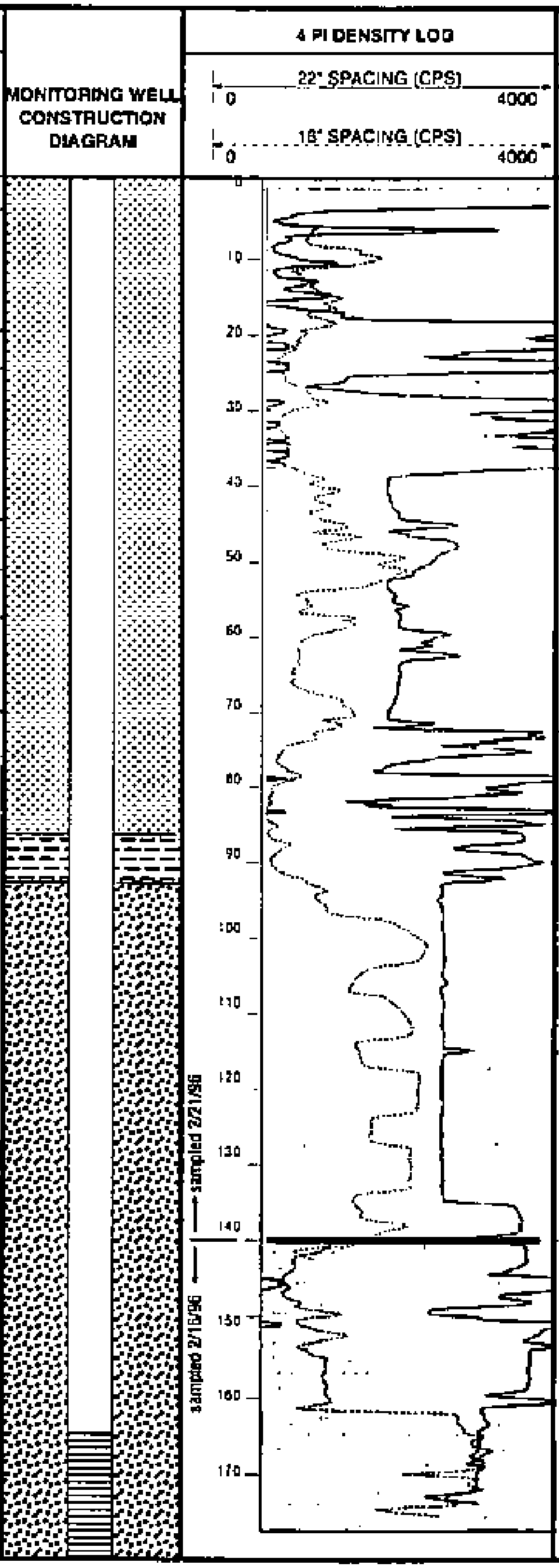
Figure 3
Well MW-37 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee

DEPTH BELOW SURFACE (FT)

SOIL DESCRIPTION

SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY



0 — **SILT (CL)**, stiff dry brown clayey

CLAY (CL), stiff brown sandy silty

SAND (SP), dense orange to white to tan fine to medium grained

30

SAND (SP), dense, orange, fine to coarse grained gravelly

SAND (SP), dense, orange, fine to medium grained well sorted

60 — **SAND (SM)**, dense orange gravelly

CLAY (CL), very stiff, brown to gray silty, containing zones that are slightly sandy and has lignite inclusions

90

120

CLAY (CL), same as above but becoming sandy. Thin lense of sand within the clay.

150

SAND (SP), very dense, light gray silty

183' BORING TERMINATED

180

SYNOPSIS OF GEOPHYSICAL DATA

*Interpreted Seal Quality

0 - 25 feet
(No Density Log) Sporadic apparent formation signals indicate good acoustic coupling with formation. Fast interval transit times (~100 micro-seconds/foot) indicate cement.
*good

25 - 38 feet
No formation of casing returns.
*poor to none

38 - 72 feet
Good returns from formation through most of interval. Some breaks may be voids.
*fair to good

72 - 92 feet
No formation or casing returns - log not diagnostic.
*poor to fair

92 - 140 feet
Log indicates presence of annulus fill material having relatively low density. No formation signal.
*fair

140 - 152 feet
Similar to 92' - 140' interval. Some formation signal.
*fair to good

0 30 60 90 120 150 180

LEGEND ▨ Grout ☰ Bentonite ▦ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

PROJECT NUMBER	BORING NUMBER	
113630.09.ZZ	MW-38	SHEET 1 OF 1

CH2MHILL

Figure 4
Well MW-38 Stratigraphic and Geophysical Evaluation

PROJECT Defense Depot Memphis Tennessee LOCATION Memphis Tennessee

DEPTH BELOW SURFACE (FT) — 0, 30, 60, 90, 120, 150, 180

SOIL DESCRIPTION

SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY

CLAY (CL), greenish brown gravelly

CLAY (CL), stiff reddish brown, silty

CLAYEY SAND (CL-SC), CLAY stiff. orange, sandy silty. with fine grained, SAND increasing downward.

SAND (SC), light orange, clean, fine to medium grained

SAND (SP), orange, gravelly, fine grained

SAND (SP), orange, clean, fine to medium grained

SAND (SC), brownish orange gravelly, with gravel increasing downward

SAND (SP-SM), very dense orange dirty with cobbles of black, iron cemented

SAND (SM), very dense brownish orange clian medium to fine grained

SAND (SM), dense grayish tan clean medium to fine grained

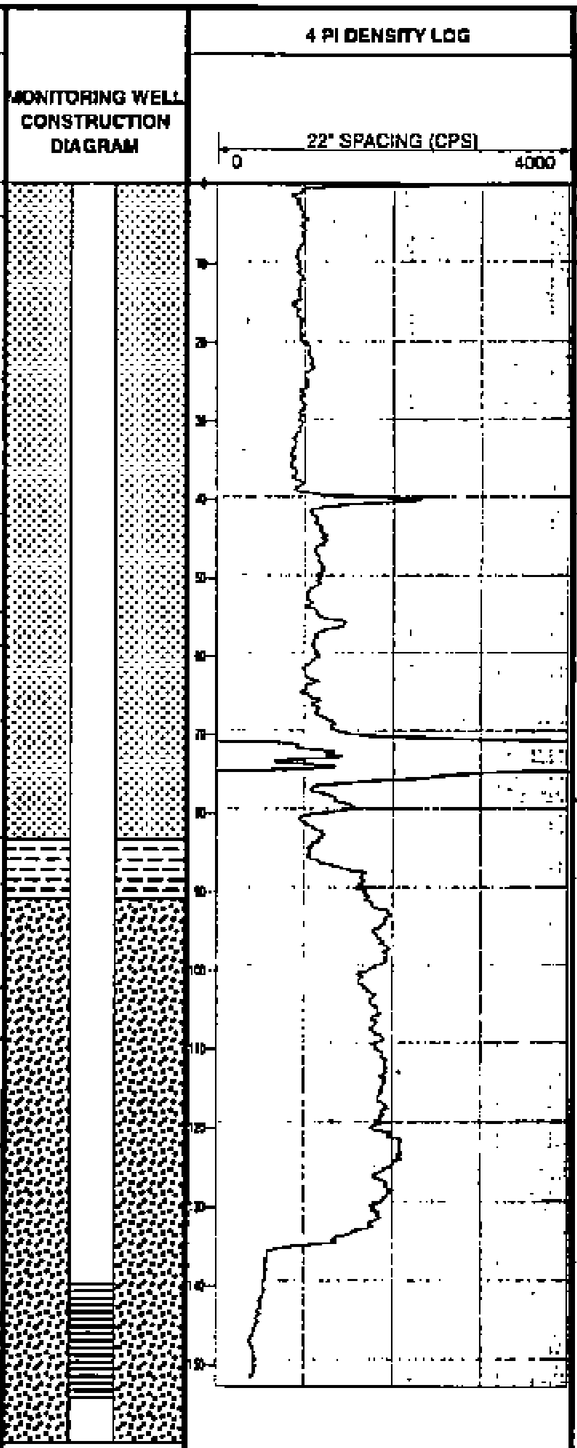
SAND (SM), firm gray slightly clayey sand with lenses of orange clayey sand

SAND (SM), dense, light orange grading into a tan, clean fine to medium grained

SAND (SP-SM), very dense, tannish yellow, slightly clayey fine to medium grained

CLAY (CL), brown to gray, silty

158' BORING TERMINATED



SYNOPSIS OF GEOPHYSICAL DATA

*Interpreted Seal Quality

0 - 42 feet
No SBL. Density log shows possible fill in the annulus to 40'. Long spacing of log (22') prevents adequate evaluation. Void at 40'-42'.
*fair

42 - 78 feet
Similar to above to 72'. Void 72' - 78'.
*fair

78 - 88 feet *fair
Possible fill in annulus. Log not diagnosed.

88 - 136 feet
Possible bentonite in annulus. Log not diagnosic. Uniform density suggests deliberately placed material and possibly good seal.
*fair to good

136 - 152 feet
Change to saturated conditions at 136'. May be sand pack. Log not diagnostic.
*NA

LEGEND ▨ Grout ☰ Bentonite ▩ Sand

SOURCE: Stratigraphic Data from Law Engineering; Geophysical Data from COLOG, Inc.

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE