N83447.AR.000134
NAS FORT WORTH
5090.3a

PHASE 2 GROUNDWATER SAMPLING AND SUBSURFACE SOIL DELINEATION AT U S AIR FORCE PLANT 4 NAS FORT WORTH TX

12/1/1993

GEOMARINE

File: 17G
A.F.

172000

NAVAL AIR STATION FORT WORTH JRB CARSWELL FIELD TEXAS

ADMINISTRATIVE RECORD COVER SHEET

AR File Number 172

172001

PHASE II REPORT
GROUNDWATER SAMPLING & SUBSURFACE SOIL DELINEATION

U.S. AIR FORCE PLANT NO. 4
CARSWELL AIR FORCE BASE
FORT WORTH, TEXAS

Prepared for

Department of the Army
Fort Worth District Corps of Engineers
Fort Worth, Texas 76102-0300

Contract No. DACA63-91-D-0061
Modification to Delivery Order No. 052

Prepared by

Geo-Marine, Inc.
550 East 15th Street
Plano, Texas 75074

December 1993

172002

TABLE OF CONTENTS

		Page
EXECUTIVE SUMMARY		v
1.0	INTRODUCTION - SCOPE AND OBJECTIVES	1
2.0	HISTORY OF SITE INVESTIGATION	4
2.1	Previous Geological Studies (1984-1991)	4
2.2	Groundwater Investigations at Carswell Air Force Base	7
2.2.1	Investigations in the Flightline Area	7
2.2.2	Investigations on the East Side	11
2.3	Groundwater Investigations at Air Force Plant No. 4	13
2.4	Quarterly Groundwater Monitoring Program (1991-1992)	14
2.5	1993 Comprehensive Monitor Well Sampling Program	14
2.6	1993 Monitor/Extraction Well Installation along White Settlement Road	16
2.7	1992 Geo-Marine, Inc. Phase I Investigation	16
3.0	FIELD PROCEDURES	20
3.1	Introduction	20
3.2	Sample Site Location and Utility Clearance	21
3.3	Soil Boring Operations	27
3.3.1	Soil Descriptions	27
3.3.2	Water Sampling	28
3.4	Cone Penetrometer Locations	28
3.4 1	Subsurface Delineation	29
3.4.2	Water Sampling	29
3.5	Sample Analysis	30
3.6	Static Water Level Measurement and Hole Closure	30
3.7	Quality Control	30
3.7.1	Sampling	31
3.7.2	Analytic	31
3.8	Decontamination	31
3.9	Disposal	32
3.9.1	Soil Boring Cuttings	32
3.9.2	Decon Water	32
3.10	Safety, Health, and Emergency Response	33
4.0	DISCUSSION AND INTERPRETATION OF FINDINGS	35
4.1	Introduction	35
4.2	Subsurface Stratigraphy	45
4.3	Groundwater Gradient and Distribution of Water	60

TABLE OF CONTENTS
(cont.)

Page

4.4 Data Distribution 67
4.4.1 Chlorinated Solvents 71
4.4.2 Petroleum Hydrocarbons 75
4.5 Source(s) and/or Derivation of Contaminants 75

5.0 CONCLUSIONS AND RECOMMENDATIONS 78

5.1 Conclusions 78
5.2 Recommendations 80

6.0 REFERENCES 81

7.0 ACRONYMS AND ABBREVIATIONS 82

APPENDICES

Appendix A Site Photographs

Appendix B Soil Logs

Appendix C Analytic Results, Chain-of-Custody Forms, and QA/QC

Appendix D Cone Penetrometer Plots

Appendix E Field Log Book

Appendix F Drum Disposal Documentation

Appendix G Safety, Health, and Emergency Response Plan (SHERP)

172004

LIST OF FIGURES

No.		Page
1	Regional location map of Carswell Air Force Base, Fort Worth, Texas	2
2	General location map of the potential hazardous waste sites identified during the Installation Restoration Program at Carswell Air Force Base	5
3	General hydrogeologic column in the area of Carswell Air Force Base	6
4	The four sites identified as potential sources of contamination in the Flightline area	8
5	The two sites identified as potential sources of contamination in and near GMI 1993 south sampling area	12
6	The TCE plume in the area of GMI 1992 and 1993 sampling as defined from monitor well data in June 1993	15
7	Recovery/extraction wells installed along White Settlement Road in May 1993	17
8	Phase I TCE distribution in golf course area	19
9	Index map for the four areas sampled in Phase II plus Phase I sampling area	22
10	Cone penetrometer site location map (north)	23
11	Cone penetrometer site location map (south)	25
12	Cone penetrometer and soil boring site location map (west)	26
13	Comparative soil profiles from visual description and cone penetrometer data	46
14	Location of sedimentologic cross sections in the north area	48
15	Representative sedimentologic cross sections in north area	49
16	Location of sedimentologic cross sections in the south area	50
17	Representative sedimentologic cross sections in south area	51
18	Location of sedimentologic cross sections in the west area	52
19	Representative sedimentologic cross sections in west area	53
20	Typical geologic cross-section constructed from sedimentologic logs showing variance in water levels	66

LIST OF FIGURES
(cont.)

No.		Page
21	Trichloroethene concentration distribution map (north) with groundwater gradient and plume boundary	68
22	Trichloroethene concentration distribution map (south) with groundwater gradient and plume boundary	69
23	Trichloroethene concentration distribution map (west) with groundwater gradient and plume boundary	70
24	BTEX concentration distribution map (south)	72
25	The chemical process called hydrogenolysis	77
26	Trichloroethene plume boundaries and BTEX area defined by Phase I and Phase II sampling	79

LIST OF TABLES

No.		Page
1	Summary of Sample Acquisition and Results	36
2	Summary of Sedimentologic Data	54
3	Summary of Static Water Level Data	61
4	Laboratory Results/EPA Method 8021	73

EXECUTIVE SUMMARY

Geo-Marine, Inc. (GMI) has completed the Phase II groundwater sampling program on a portion of Carswell Air Force Base (CAFB) located in Fort Worth, Texas, for the Fort Worth District Corps of Engineers (USACE) under Contract No. DACA63-91-D-0061, Delivery Order No. 52. Phase II included the collection of soil descriptions, groundwater samples, and static water level measurements from five bore holes drilled by a conventional truck-mounted drill rig and 140 holes punched by a cone penetrometer. The 145 locations (which were in three discrete areas labelled north, south, and west) were selected by the USACE. Water samples were analyzed at a mobile laboratory on-site for purgeable halocarbons and light hydrocarbons using Environmental Protection Agency (EPA) method 8021. The purpose was to determine the limits and overall dimensions of the trichloroethene (TCE) plume previously identified in the area (Radian Corporation 1991) as well as to check for the presence of fuel(s). This work defines the extent of the TCE plume in the north, northeast, and southern directions; plume boundary was previously defined on the southeast (Geo-Marine, Inc. 1992). Hydrocarbons were identified in the south area only.

Field work, including soil description, water sampling, and water level measuring, was conducted between July 28 and September 9, 1993. The soil borings were performed using GMI's truck-mounted drill rig. The penetrometer holes were done by equipment and crew contracted from Fugro Geosciences, Inc. (Fugro) of Houston, Texas. Proper decontamination practices were followed for all equipment involved in sampling. Samples were contained in approved bottles and retained on ice without additional preservative for transportation to the laboratory, either on-site or off-site. Soil cuttings and decon water were retained at CAFB in closed barrels prior to being transported off-site for proper disposal; PVC pipe used for temporary well installation was deconned and disposed of off-site.

Static water levels were obtained from each sampled site. All sites have been surveyed, and so water gradient and direction with reference to ground surface were determined for the three areas. The local groundwater direction in the north area is to the east; in the south and west it is to the east-southeast. These directions are consistent with other data.

Subsurface soils information was obtained at each location. At the soil boring locations, actual soil samples were examined and described. At the remaining sites, the cone penetrometer recorded physical

parameters while punching the hole, from which soil profiles based on textural changes were derived mathematically and then plotted. At two locations, holes were deliberately drilled and punched side-by-side in order to "calibrate" the electronic soil profile to the described one.

Analytic work for the three water samples collected during the soil boring operation was done by NDRC Laboratories of Richardson, Texas, a USACE-approved facility. Analytic work for the remainder of the Phase II samples collected from cone penetrometer holes was done on-site in a mobile laboratory contracted from Transglobal Environmental Geochemistry (TEG), Austin, Texas, also approved by the USACE. During the sampling process, 145 holes were either drilled or pushed, and 91 water samples were collected. Duplicate quality analysis/quality control (QA/QC) samples were collected every ten sample sites for analysis by both TEG and the USACE Southwestern Division Laboratory (SWDL) in Dallas, Texas.

Results for 22 analytes (18 halocarbons plus four petroleum hydrocarbons) have been received for 91 samples plus the trip blanks, rinsate samples, and duplicate samples included as proper QA/QC procedure. The results indicate the following:

- In the north area the TCE plume has been defined to the north, east, and south. The area open to the west and southwest is inaccessible in part because of concrete runways and aprons.
- In the south area the TCE plume has been defined to the north and east. The area open to the west and northwest is inaccessible in part because of concrete runways, while the area to the south and southwest overlaps other sampling data.
- In the west area the TCE plume has been defined to the south and east. The area to the north overlaps other sampling data, and the area open to the west overlaps widely spaced data from monitor wells.
- Two other halocarbons (cis-1,2-DCE and trans-1,2-DCE) were identified in the three sampling areas. Distribution is similar to TCE, but values are generally lower except that concentration highs are offset in the down gradient direction.
- Sample areas which overlap data previously produced by GMI or others do not duplicate sample results; however, the patterns of relative high and low values are similar.
- BTEX components were present only on the east side of the south area near the truck fueling station on Knights Lake Road which is approximately one block down dip from the POL (petroleum, oil, and lubricant) Tank Farm and Flightline Drainage Ditch.

Depending on access, additional groundwater data from the west sides of the sampling areas could determine whether the TCE is traveling in more than one discrete plume and whether there is one of more sources for the TCE on CAFB in addition to those identified on Air Force Plant 4 (AFP4).

Procedural recommendations for additional sampling work done at CAFB include the following:

- The choice of equipment to obtain the soil and/or water samples should be dependent on the sampling area, i.e., around and to the south of White Settlement Road, the drill rig should be used, while in the GMI 1993 north and south sampling areas the penetrometer works well.

- A mobile laboratory should be used for reconnaissance plume delineation because rapid sample results maximize the usefulness of each sample site location.

- Each water sample should be analyzed for a variety of contaminants, regardless of the immediate objective of a project, because of the diverse and widespread problems known to exist at CAFB and the cost of sample acquisition.

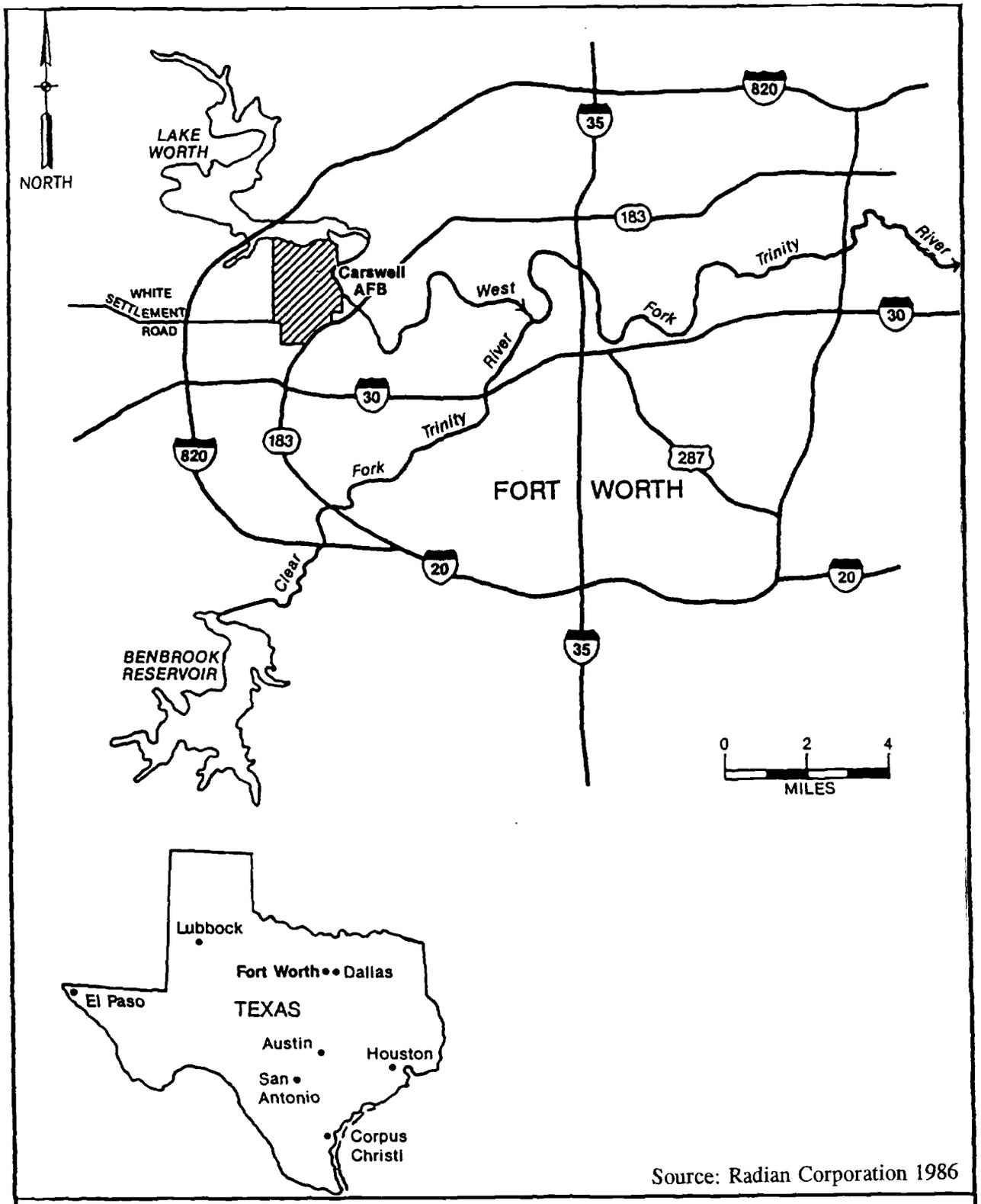
1.0 INTRODUCTION - SCOPE AND OBJECTIVES

The Fort Worth District Corps of Engineers (USACE) contracted Geo-Marine, Inc. (GMI) to perform two phases of groundwater sampling at Air Force Plant No. 4, Carswell Air Force Base (CAFB), Fort Worth, Texas, under Contract No. DACA63-91-D-0061, Delivery Order No. 52 (Figure 1). This report covers the Phase II sampling operations and results. The Phase I report was delivered in November 1992.

The objective of Phase II was the specific delineation in several separate areas of the trichloroethene (TCE) plume previously identified in the groundwater; all water samples collected were also analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX) to check for the presence of fuel. During this phase five soil borings were drilled with a truck-mounted rig and 140 sites were punched with a cone penetrometer rig resulting in the collection of 91 groundwater samples. Water samples from the soil borings were analyzed at an off-site laboratory; however, the cone penetrometer water samples were analyzed within 24 hours at a mobile laboratory on-site. The on-site analyses allowed redistribution of sample locations in response to analytic results, and a number of sites were moved from the eastern edge of the south area to the eastern edge of the north area and also to the golf course (also referred to as west area) for plume boundary delineation and along a railroad spur south of Air Force Plant No. 4 (AFP4) for alluvium identification.

Other additions to the Phase II Scope of Work (SOW) included subsurface delineation at each station in terms of soil description and measuring the static water level in temporarily cased and screened holes. The descriptions were visual for the five soil borings and interpreted from electronically collected friction and tip resistance data acquired at each penetrometer location. The penetrometer data were "standardized" to the local soil profile at two locations where both visual and electronic descriptions were done. The purpose for the soils data was to define paleochannels in the sampling areas which would both complement and supplement existing soil distribution from well logs and soil borings and identify possible preferable pathways for the lateral migration of water and contaminants.

Static water levels were measured in each water-containing hole the day after it was punched, at which time the temporary screen and casing were pulled and the holes grouted to the surface. The purpose for the groundwater depths was to define the water gradient and direction using the survey data (Carter and



Source: Radian Corporation 1986

Figure 1. Regional location map of Carswell Air Force Base, Fort Worth, Texas

Burgess 1993) measured at each location. The subsurface flow direction combined with the current contaminant distribution and the location of subsurface sand and gravel channels should provide predictive information regarding future contaminant migration in the subsurface.

2.0 HISTORY OF SITE INVESTIGATION

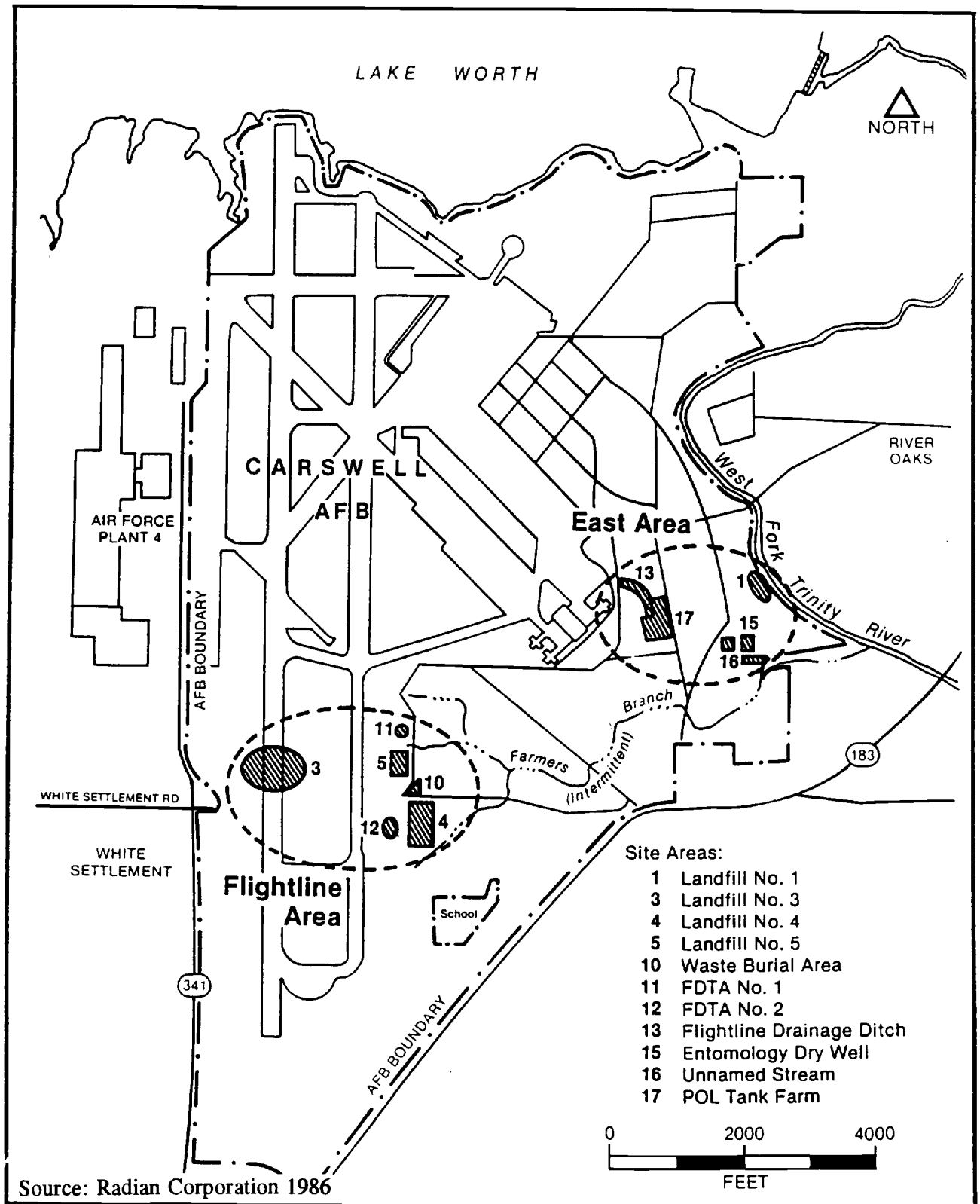
Investigations of subsurface conditions at CAFB and at the adjacent AFP4 have been ongoing since the early 1980s. Until recently, individual studies tended to be restricted to either one side or the other of the western CAFB boundary. However, this boundary is an administrative rather than an engineering or geologic one, and the 1993 formation of the Partnering Team (Partnering Meeting Minutes 1993) has resulted in enhanced cooperation between the various participants in the ongoing investigations at both AFP4 and CAFB.

Early work at CAFB, under the Department of Defense Installation Restoration Program (IRP), included Phase I (Initial Assessment/Records Search) by CH2M Hill (1984) which identified a number of sites of potential contamination (Figure 2), and Phase II Stage 1 (Problem Confirmation/Quantification) and Phase II Stage 2 (Remedial Investigation Report for the Flightline Area) by Radian Corporation (1986, 1991). Early work at AFP4 included Remedial Investigations (1983, 1989) by Hargis and Montgomery. More recent work has included quarterly monitoring of various wells (Jacobs Engineering), Phase I plume delineation (Geo-Marine, Inc. 1992), and the development of a remediation system including the installation and sampling of extraction wells (International Technology Corporation 1993).

2.1 Previous Geological Studies (1984-1991)

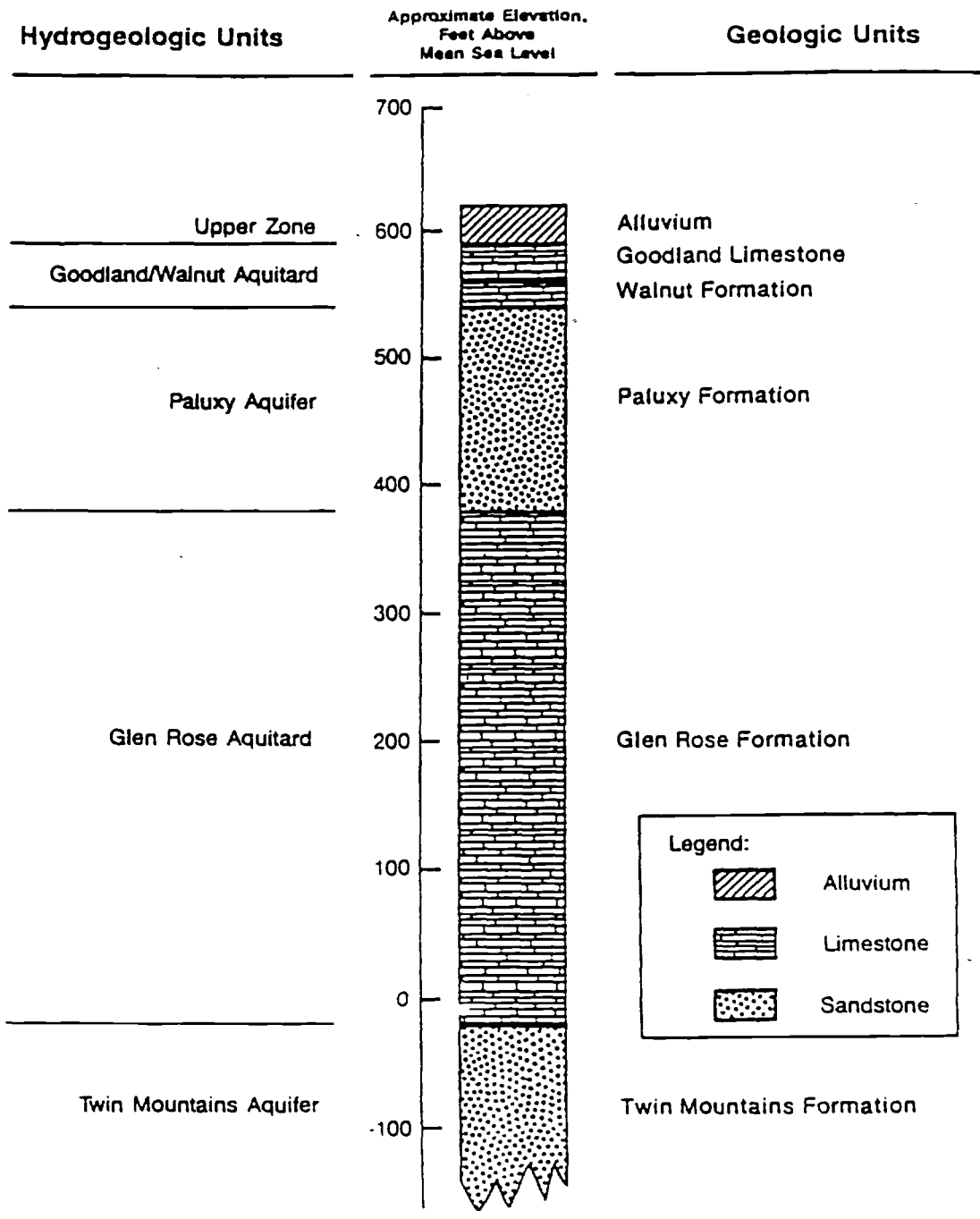
Unconsolidated surficial deposits in the Flightline Area (here defined as the area around the southern end of the flightline at CAFB and labelled on Figure 2) consist of alluvium with floodplain and fluviatile terrace deposits (Figure 3). These deposits constitute the Upper Zone which lies unconformably on the Cretaceous-aged Goodland and Walnut Formations (Fms), the local limestone and shale bedrock, respectively. Where the Goodland and Walnut Fms are continuous, they form an aquitard between the Upper Zone and the underlying Paluxy aquifers (Radian Corporation 1991). In the "window area" at AFP4, the Walnut Fm is either absent or thin enough to allow leakage from the Upper Zone to recharge and contaminate the upper Paluxy sand (Hargis and Associates 1989).

In the Flightline Area, the alluvium thickness ranges from about 13 feet to more than 40 feet thick. The top five to ten feet are generally silt and clay with variable amounts of sand and gravel. Below this, sand and gravel gradually dominate with depth, and grain size increases. Paleochannel features appear to have



Source: Radian Corporation 1986

Figure 2. General location map of the potential hazardous waste sites identified during the Installation Restoration Program at Carswell Air Force Base



Source: Radian Corporation 1986

Figure 3. General hydrogeologic column in the area of Carswell Air Force Base

eroded into the bedrock with basal deposits of gravel-sized limestone and shell fragments. The bedrock has been described as being essentially level across the taxiway, but irregular locally, which is typical of an erosional surface modified by fluvial processes (Radian Corporation 1991).

2.2 Groundwater Investigations at CAFB

During the Phase I study by CH2M Hill (Radian Corporation 1986), 22 sites were investigated for the possibility of hazardous materials. Five of these sites were located at the Weapons Storage Area 11 miles west of CAFB (see Figure 1). Of the remaining 17 sites local to CAFB, a significant concern regarding the environment and human health was identified at 11 sites.

The 11 CAFB sites were further investigated under Phase II Stage 1 (Radian Corporation 1986). The purpose of this investigation was (1) to determine if the environment had been contaminated as a result of spills and disposal practices at these sites, (2) to estimate the extent of contamination, (3) to identify the consequences of migrating pollutants, and (4) to recommend future investigations to define the boundaries of contamination and direction(s) of movement. Of the 11 sites investigated, six were determined to pose a threat in the flightline/golf course area. The six sites on or near the Flightline Area are Landfill No. 3, 4 and 5; Fire Department Training Areas 1 and 2; and a Waste Burial Area. The other five locations, which are all located on the East Side, are Landfill No.1, Flightline Drainage Ditch, Entomology Well, Unnamed Steam, and POL Tank Farm (see Figure 2).

STREAM

2.2.1 Investigations in the Flightline Area

At the end of the Phase II Stage 1 investigation performed by Radian Corporation (1986), six sites were suspected of being probable sources of contamination. The data obtained during Phase II Stage 2 showed that Landfill No. 3 and Fire Department Training Area 1 posed no threat to the environment or human health (Radian Corporation 1991). A *Decision Summary Technical Document to Support No Further Action* was prepared for each site in 1990.

Previous IRP studies in the Flightline Area had documented contamination in the soil and groundwater and found TCE and chromium (Cr) to be the primary contaminants. The remaining four sites (Figure 4)

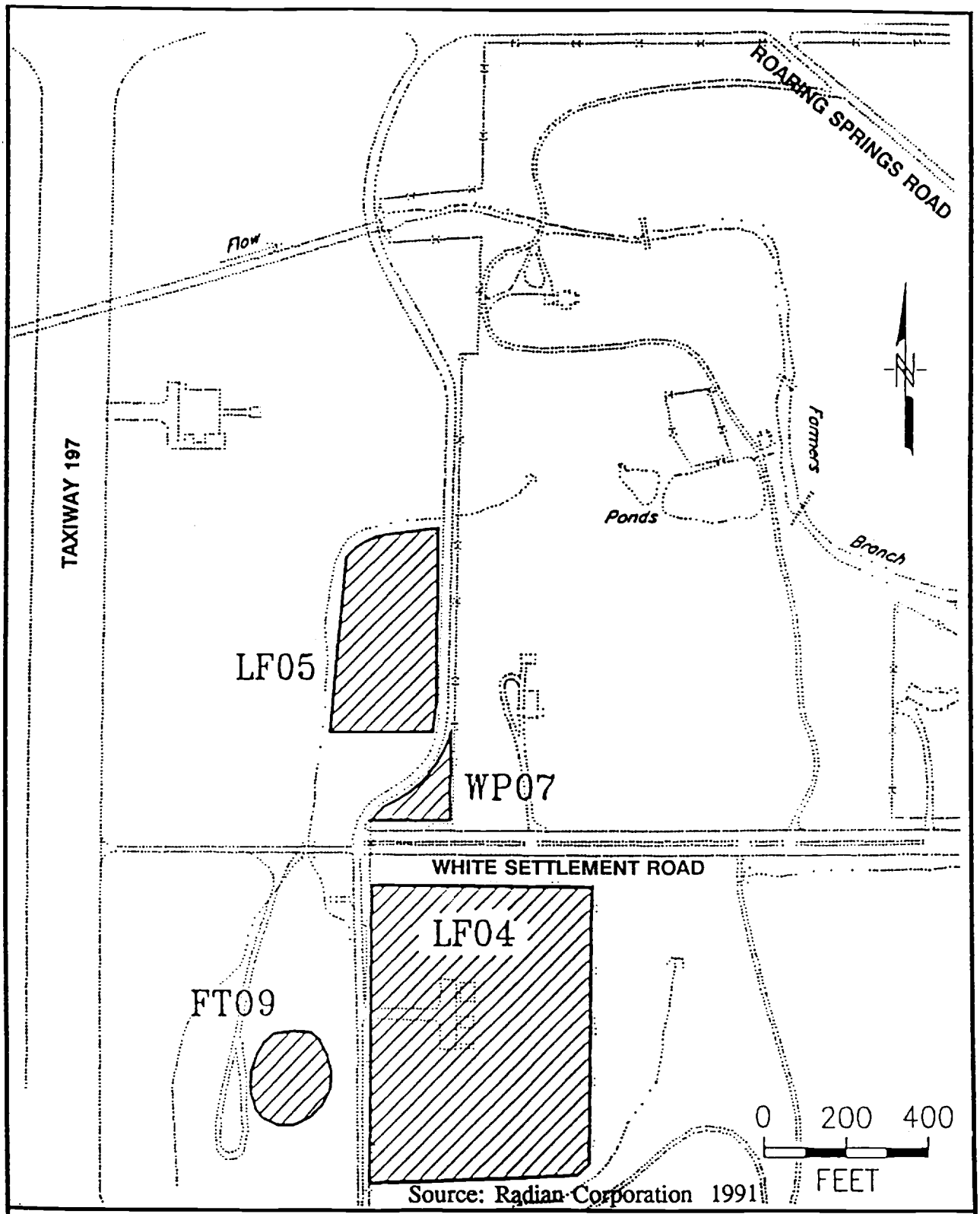


Figure 4. The four sites identified as potential sources of contamination in the Flightline area include two landfills (LF04 and LF05), one fire department training area (FT09), and one waste burial area (WP07).

were studied in 1990 as potential sources: Landfill No. 4 (LF04), Landfill No. 5 (LF05), Waste Burial Area (WP07), and Fire Department Training Area 2 (FT09) (Radian Corporation 1991).

Initial field examination methods included geophysical surveys, borings, and monitor well installation and groundwater sampling. In this area geophysical surveys, including magnetometer, electromagnetic, and electrical resistivity surveys, were conducted in an attempt to identify buried drums. Based on available records, the following descriptions of the four sites were developed (Radian Corporation 1991).

LF04

LF04, an approximate 10-acre area, is located east of Taxiway 197 and south of White Settlement Road. The landfill consisted of six large pits filled with refuse which was burned and buried. This site was reported to contain drums of liquid wastes, partially full paint cans, and cadmium batteries. Subsequently it became the site of a radar station which has since been dismantled.

LF05

LF05 is located northwest of LF04 on the flightline side (west) of the fence which encloses the secured portion of CAFB. A clay berm was constructed along the creek running beside the landfill. The landfill received flightline wastes and refuse such as oils, thinners, strippers, and paints. Materials were burned regularly and buried.

WP07

WP07, on the west side of the fence, is located between Landfills No. 4 and 5 north of White Settlement Road which here dead-ends at the runway area. During the 1960s, various types of hazardous wastes such as drums of cleaning solvents, leaded sludge, and possibly ordnance were disposed of at this site.

FT09

FT09 is located west of the fence between Taxiway 197 and LF04. This site has been used since 1963 for fire department training exercises. It consisted of a pit lined with gravel and enclosed by an earthen berm. A second pit, no longer in existence, was built to collect runoff materials from the training pit.

The findings of the Phase II Stage 2 Flightline Area investigation (Radian 1991) with respect to the nature and extent of groundwater contamination are:

- Free product was not detected in the monitor wells installed to determine if the base of the Upper Zone contained dense non-aqueous phase liquids (DNAPL) in the Flightline Area.
- TCE, vinyl chloride (VC), tetrachloroethene (PCE), and the cis- and trans- isomers of 1,2-dichloroethene (1,2-DCE) are the leading contaminants in the groundwater and surface waters.
- Concentrations of TCE exceeded the federal maximum contaminant level (MCL) of 5 micrograms per liter (μg/l) in 27 of the 35 monitor wells and VC exceeded the MCL of 2 μg/l in seven of the wells.
- AFP4, which is upgradient to CAFB, may be a source of organic contamination as well as Sites WP07, LF04, LF05, and FT09. The existence of upgradient sources in addition to the known sources on CAFB is supported by documented TCE contamination in the Upper Zone beneath AFP4 (Hargis and Associates 1989).
- None of the limits of the TCE plume is precisely defined, but the apex is migrating downgradient (eastward). Evidence suggests the plume is preferentially migrating along accumulations of sand and gravel deposited in paleochannels and identified from soil borings (Radian Corporation 1991).
- The vertical extent of the TCE plume is limited downward by the surface of the Goodland/Walnut Fm, which here underlies the Upper Zone. No contaminants were detected in the two Paluxy Aquifer monitor wells in this part of CAFB.
- Similarities in groundwater and surface water TCE concentrations (based on results from the unnamed tributary to Farmers Branch) plus observed elevation differences suggests that the stream is a zone of groundwater discharge.

2.2.2 Investigations on the East Side

The five locations identified as possible contaminant sources on the East Side of CAFB (Figure 5) are (Radian Corporation 1986):

- Landfill No. 1 (LF01), near the Trinity River, where grease and oil were detected along with detection limits of heavy metals, phenols, and purgeable hydrocarbons.
- Flightline Drainage Ditch (Ditch), where grease, oils, and heavy metals were found, probably due to detergents from the wash racks or JP-4 from the Fuels Systems Shop.
- Entomology Dry Well (Well) which had not affected the groundwater.
- Unnamed Stream (Stream), which emerges from the oil-water separator, had oil and grease in the sediments, PCE in the stream, and TCE in the groundwater in addition to other purgeable organic compounds associated with fuels which probably originated from a former gasoline station.
- POL Tank Farm (POL) had groundwater highly contaminated with total organic carbon (TOC) and total organic halide (TOX), probably from more than one source, migrating toward Farmers Branch.

Two of these sites fall within the Phase II south sampling area: the Ditch and the POL. Previous investigative work by Radian in 1985 at these two sites included the collection, description, and analysis of soil from borings (POL), hand-augered holes (Ditch), and surface samples (Ditch). No wells were installed in this area; however, water was collected from the borings and analyzed and the water depths were measured.

Analyses of soil from the Ditch showed elevated values of oil and grease and of some metals. However, the distribution of values was so irregular that no firm conclusions were drawn regarding source(s) (Radian Corporation 1986). Analyses of soil and water from the borings at the POL showed high but inconsistent levels of oil and grease (in the soils) and uniformly high organic indicators (in the water). Radian Corporation (1986) concluded that organic contamination is widespread, but that the source of the plume was not completely defined. Definition of the extent of contamination in the groundwater in the area of the POL is scheduled to begin in fall 1993 (Partnering Meeting Minutes 1993).

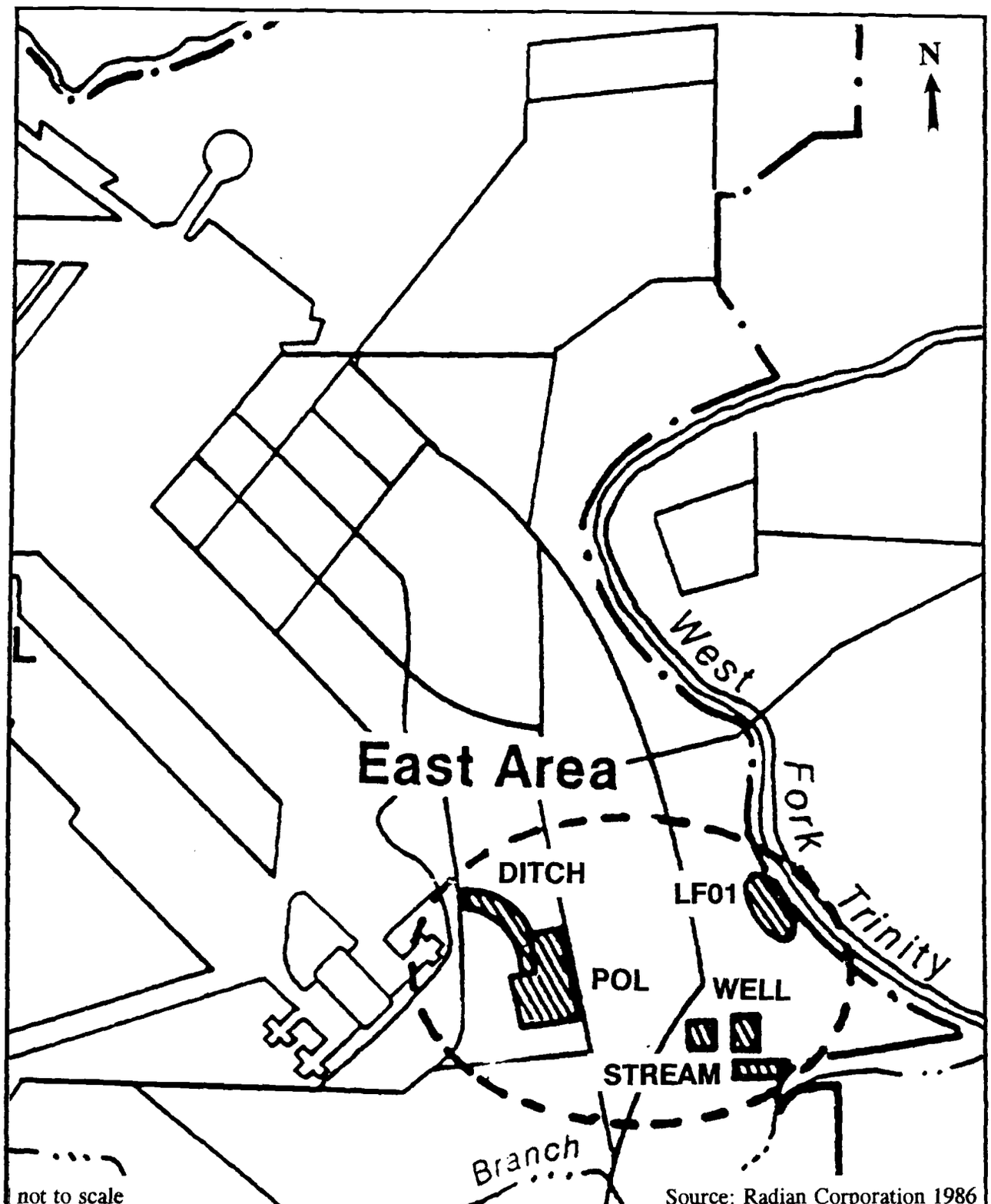


Figure 5. The five sites identified as potential sources of contamination in and near GMI 1993 south sampling area include one landfill (LF01), the Flightline Drainage Ditch (DITCH), the Entomology Dry Well (WELL), an Unnamed Stream (STREAM), and the POL Tank Farm (POL).

2.3 Groundwater Investigations at Air Force Plant No. 4

Early investigations at AFP4, west of the flightline, were performed by Hargis and Associates, Inc. (1987, 1989) and focused on the groundwater conditions of the Paluxy Aquifer as well as those in the Upper Zone unconsolidated sediments. The summary which follows emphasizes the investigations of the TCE plume on the golf course and other areas of CAFB because of the greater relevance of these results to the GMI Phase I and II Groundwater Sampling Programs (Hargis & Associates, Inc. 1989).

- Basal sand and gravel defined in the Upper Zone as paleochannel deposits are potential pathways for contaminant migration. Groundwater flow direction is generally to the east in this area.

- The most commonly detected contaminants were TCE, trans-1,2-DCE, and Cr. Their distribution was influenced by an erosional channel into the Walnut Fm and by the direction of groundwater flow.

- The contaminants migrating from AFP4 originated from a different source than the contaminants detected in the monitor wells on CAFB.

- The Walnut Fm is thin or absent in the area of the East Parking Lot along Grants Lane/Highway 341 (see Figure 2), referred to as the "window area". Trans-1,2-DCE and TCE detected in water samples from the Paluxy Fm upper sand unit were lower in concentration than in the Upper Zone. The primary source of recharge to the Paluxy upper sand appeared to be vertical leakage from the overlying Upper Zone near Grants Lane. The Paluxy Fm is composed of four aquifers. The aquifers are (in descending order) Paluxy upper sand, upper Paluxy aquifer, middle Paluxy aquifer, and lower Paluxy aquifer.

- The upper Paluxy aquifer, a separate groundwater unit below the Paluxy upper sand, is unconfined and has a groundwater gradient to the southeast. The upper Paluxy aquifer is recharged by Lake Worth and potentially by vertical seepage from the Paluxy upper sand unit in the area of the East Parking Lot. Thus, the TCE contamination in the upper Paluxy aquifer may be leakage from the Paluxy upper sand.

Hargis & Associates' recommendations for the east side of AFP4 included: (1) collect samples from the Upper Zone Radian wells on the CAFB side concurrently with the Hargis & Associates monitor wells on the AFP4 side to develop an updated plume map, to determine the concentrations of contaminants, and to assess the extent of contamination; (2) drill additional monitor wells east of Grants Lane in the Upper Zone; and (3) conduct more aquifer tests in Upper Zone monitor wells to estimate hydrologic parameters. These recommendations have recently been followed (see Sections 2.5 and 2.6).

2.4 Quarterly Groundwater Monitoring Program (1991-1992)

Since October 1991 Jacobs Engineering Group Inc. has performed the quarterly groundwater monitoring activities at selected wells at AFP4 and a few on CAFB to aid in the remedial action plan under the IRP. The objectives are to monitor changes in groundwater quality in the Upper Zone and Paluxy aquifers, map contaminant plumes, assess the potential for movement of plumes across AFP4 and CAFB boundaries, monitor changes in water table levels, check for free product and monitor its thickness, monitor water quality in White Settlement municipal drinking water wells, and detect contaminants seeping into surface waters (Jacobs Engineering 1991).

The results of the first sampling event (1991) revealed that the principle volatile organic compounds (VOC) identified at AFP4 were TCE, cis-1,2-DCE, and VC. The wells on the east flightline area and the golf course area contained levels of TCE between 880 and 3,800 μg/l, and monitor wells LF04-02, LF04-04, WP07-10A, LF05-01, and LF05-5A were approximately aligned along the southeastern projection of the plume. At that time, the plume defined on the AFP4 facility extended southeasterly onto CAFB past LF04-04 (Jacobs Engineering 1991).

The second quarterly sampling event results (February 1992) for CAFB landfill wells were comparable to the first quarter results. The VOC results from the wells which are upgradient of the landfills were lower than those downgradient, suggesting that the CAFB landfills were contributing TCE and DCE to the AFP4 plume. It was noted that more upgradient wells on the flightline are needed to quantify this contribution (Jacobs Engineering 1992). The high concentrations of TCE and DCE found in the unnamed tributary to Farmers Branch on the far east side of the sample area supported Radian's description of the tributary as "the principal pathway for offsite and offbase migration" (Radian Corporation 1991).

2.5 1993 Comprehensive Monitor Well Sampling Program

In May and June 1993 all accessible wells on both CAFB and AFP4 were sampled together for the first time (Jacobs Engineering 1993) so that an accurate picture of groundwater contamination at a single time could be established across the entire area; in addition a few surface water samples were collected from creeks. Approximately 20 of the sample points were located east of Runway 197 near the golf course, including ten which overlap GMI Phase I and Phase II-west sampling areas (Figure 6). Three wells were

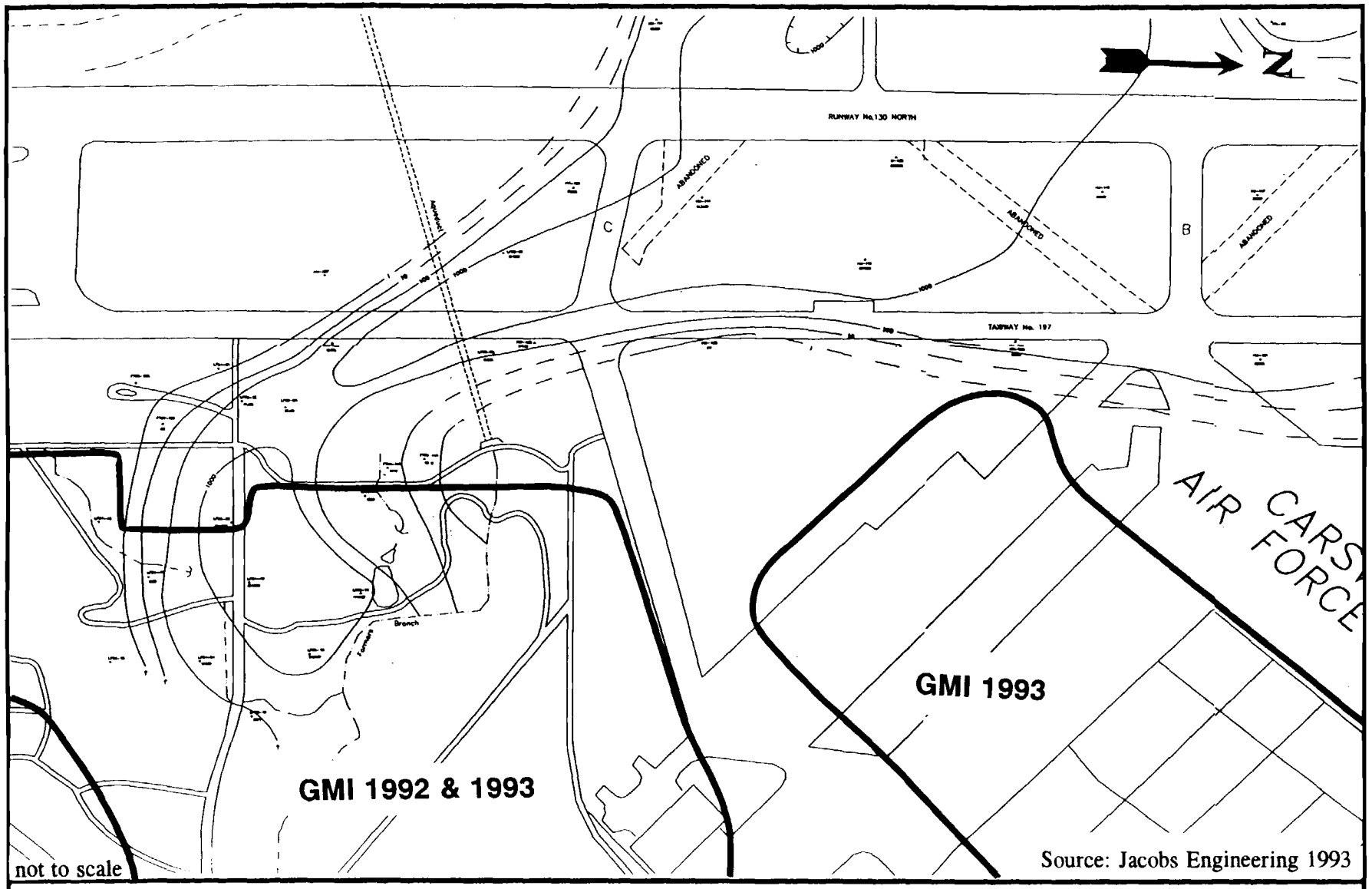


Figure 6. The TCE plume in the area of GMI 1992 and 1993 sampling, as defined from monitor well data in June 1993

172025

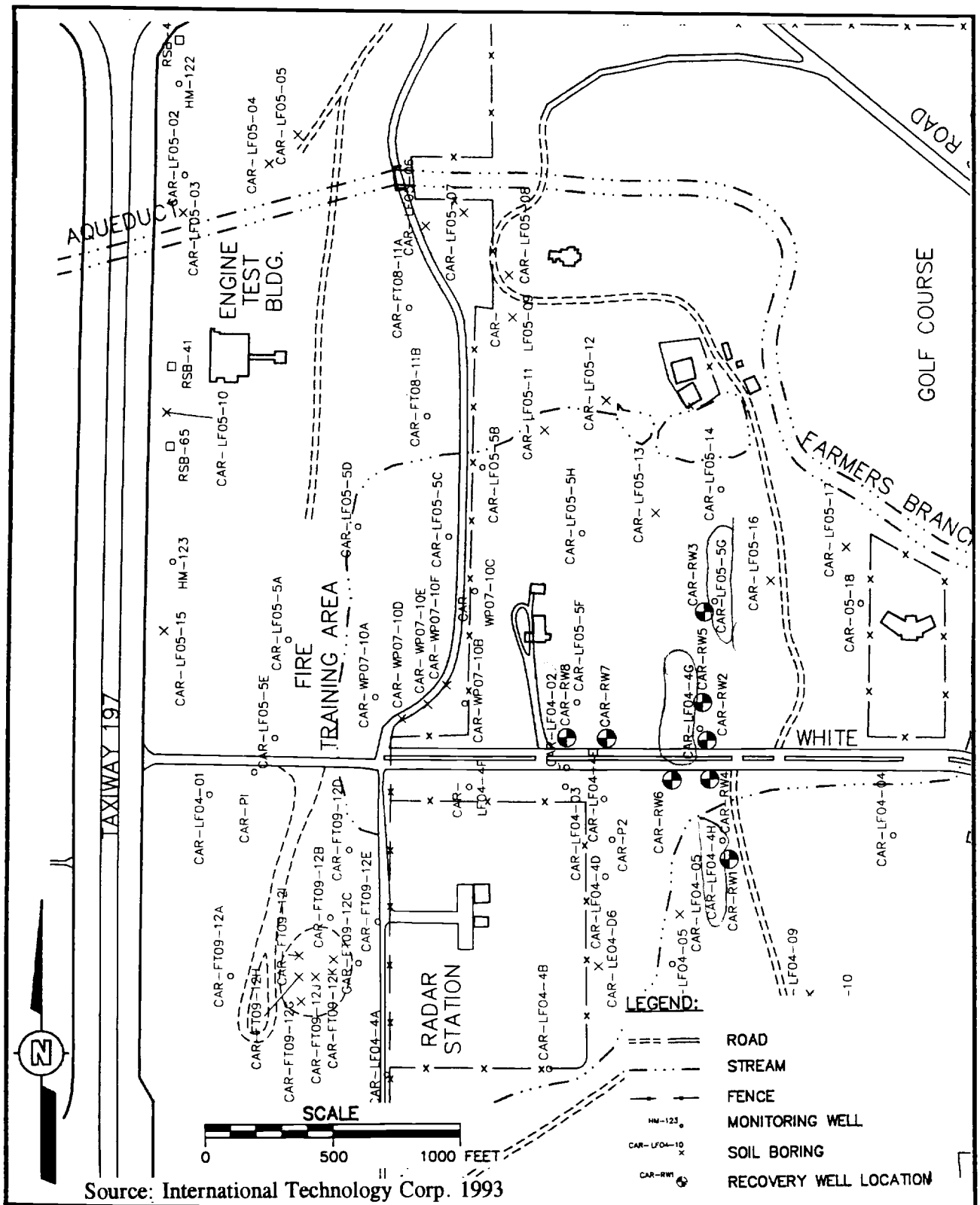
located in the GMI 1993 north sampling area and none in the GMI 1993 south sampling area. The monitor well data are generally consistent with both 1992 and 1993 GMI results in the golf course area to the extent that they do not substantially alter plume boundaries, where defined, or the distribution of relative concentration highs and lows. Absolute values are a function of sample location, laboratory technique, collection and transportation methods, time lapse to analysis, temperature and pressure, moisture level, etc., and are not expected to replicate exactly. The Jacobs Engineering data are too sparse in the GMI north and south areas to support any comparison. The total number of sample sites was 261, and it included 247 monitor wells, seven production wells, and seven surface water sites.

2.6 1993 Monitor/Extraction Well Installation along White Settlement Road

Eight groundwater recovery wells were installed along White Settlement Road in the area of LF04 and LF05 during the spring of 1993 by International Technology Corporation (Figure 7); the facility for treatment of water extracted from this and other areas is scheduled for installation in fall 1993. The work was performed in two phases so that results from aquifer characterization tests on the first three wells could be factored into the design and placement of the subsequent five wells. Locations for the second set of wells were also based on TCE concentrations and the distribution of paleochannels as determined from sand and gravel thicknesses observed in the subsurface. Water samples were collected from the first three wells during the pump test and from the remaining five following installation and development. Analyses showed that TCE values ranged from 580 μg/l to 5,000 μg/l with all of the sample results above analytic detection levels. This area was within GMI's Phase I program and proximal to the GMI Phase II west sampling area. The nearest GMI Phase II penetrometer location to one of the extraction wells is GMI-8W located approximately 600 feet south of well #CAR-RW1. GMI-8W was dry, and sedimentologic comparison would be tenuous because of the distance between the two locations.

2.7 1992 Geo-Marine, Inc. Phase I Investigation

In 1992 during Phase I GMI collected 32 groundwater samples (one was subsequently broken) using a cone penetrometer at 90 locations selected by the USACE on and near the golf course for analysis for purgeable halocarbons using method 8010. The purpose of the program was to determine the overall dimensions and extent of the known TCE plume previously identified in the area. The results indicated that the plume was only defined in the eastern direction where a row of points with non-detect (ND)

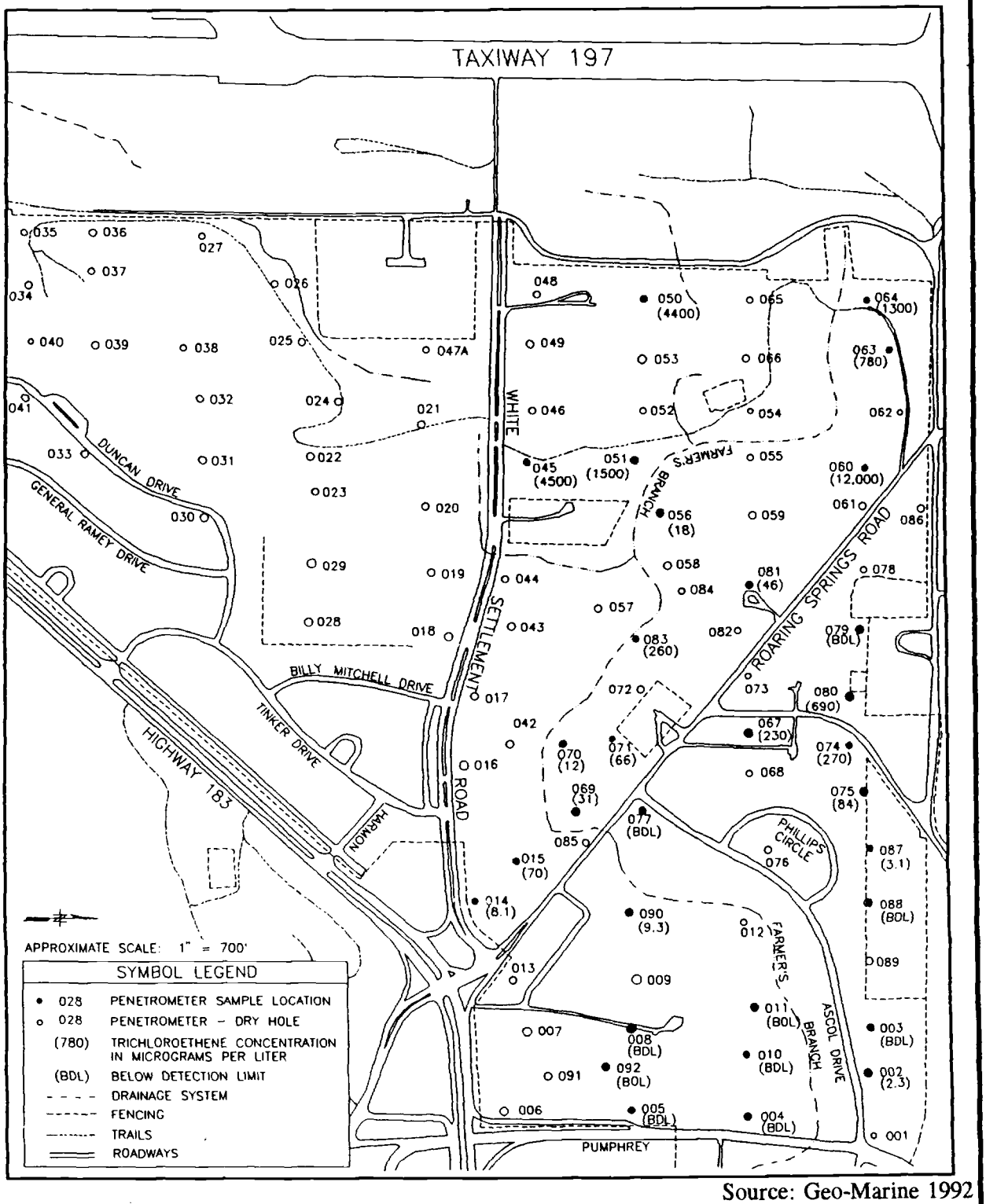


Source: International Technology Corp. 1993

Figure 7. Recovery/extraction wells installed along White Settlement Road in May 1993

results indicated that it had not yet migrated off-site across Pumphrey Road (Figure 8). The TCE plume has spread laterally to the north where it extends outside the designated Phase I area onto other portions of CAFB despite the reported east and south groundwater gradient directions. The extent of the plume to the south was not determined because water samples could not be obtained south of White Settlement Road. The inconsistency with which water was available for sampling was unexpected. The TCE values appeared to have increased since the previous analyses, e.g., the peak value was 12,000 μg/l versus the previously recorded high in the area of 6,400 μg/l.

Recommendations for the Phase II portion of the project included a change in sampling equipment. The difficulty in collecting water samples is not completely understood; however, it is believed to be a combination of seasonal low water and slow recharge, failure in some locations to reach true bedrock because of intervening thin isolated hard layers, and difficulty in accessing water trapped in sediment lenses other than at the soil-bedrock interface. A conventional, truck-mounted drill rig was proposed to auger small diameter soil borings to bedrock in the area south of White Settlement Road, while the cone penetrometer would continue to be used in areas where it was previously successful. Water collection would be delayed up to 24 hours in areas where water was not immediately available for sampling.



Source: Geo-Marine 1992

Figure 8. Phase I TCE distribution in the golf course area

3.0 FIELD PROCEDURES

3.1 Introduction

The USACE supplied GMI with three site maps of the sampling areas for Phase II. One of the maps, referred to as the north (which includes the restricted flightline sites), had superimposed 500-foot by 500-foot grids, while the south area map had a superimposed 300-foot by 300-foot grid. These were to be used as guides for the location of the 140 penetrometer sample sites. The third map showed the five soil boring locations along the east edge of the golf course south of White Settlement Road. Specific sample sites were located by GMI personnel using a compass, measuring wheel, and known mapped points for reference. Mr. Alan Flolo of the Base Disposal Agency coordinated the utility clearance efforts of base personnel, public utilities, and private companies for each location.

Descriptive soil information and water samples were collected from the five soil borings by GMI personnel. Water, where present, was sampled using a 1.66-inch diameter three-foot long stainless steel bailer (Appendix A - Site Photographs). Water samples were transported to an off-site laboratory in 40-milligram (mg) glass VOA vials on ice without any other preservatives.

Sample and data collection using a penetrometer rig was subcontracted to Fugro Geosciences, Inc. of Houston, Texas, which had participated in Phase I. A hydraulically driven steel probe (a cone penetrometer) was used to penetrate the unconsolidated surface material to point-of-refusal and to collect sleeve friction and tip resistance data from which soil profiles are derived. Water samples collected from penetrometer holes were analyzed on-site by a mobile gas chromatograph laboratory sub-contracted from TEG of Austin, Texas. One-inch diameter PVC pipe with screen was set temporarily in each hole with water or moist soil so that static water levels could be measured the next day.

Penetrometer components and sampling bailers were decontaminated between each station. All wash water was collected in 55-gallon drums on site for later treatment and proper disposal. Drill cuttings from the soil borings were stored and subsequently disposed of in a like manner. Following water level measurement, the temporary casing was pulled from each hole and the holes were grouted to the surface. All dry holes were also grouted to the surface.

NDRC Laboratories of Richardson, Texas, a USACE-approved facility, analyzed water samples from the soil borings for purgeable halocarbons and petroleum hydrocarbons using EPA method 8021. TEG personnel performed the same analyses in the mobile laboratory on water samples from the penetrometer holes with results available within one to five hours of sampling. Daily rinsate samples and trip blanks were also analyzed. A duplicate sample for every 10 sampled sites was collected and shipped to USACE SWDL in Dallas, Texas, as a quality assurance sample. Rinsate blanks and trip blanks were included with each shipment of duplicates for quality control.

A Safety, Health, and Emergency Response Plan (SHERP) was developed and submitted to Mr. Randy Niebuhr of the Fort Worth District USACE for approval by an industrial hygienist prior to the commencement of Phase II field activities. A GMI safety officer was on site at all times to convene safety meetings as needed and to assure compliance with the SHERP. Breathing zone air was monitored for organic vapors using an HNu instrument at each sampling site following penetration and emplacement of the temporary casing.

3.2 Sample Site Location and Utility Clearance

Sample site locations were marked in the north and south areas using the site maps supplied by the USACE which included suggested grids with 500-foot spacing in the north-south and east-west directions in the north area and 300-foot spacing in the north-south and east-west directions in the south area. The five soil borings were located along the east side of the golf course south of White Settlement Road as closely as possible to the locations indicated in the SOW. Grid points in the north, south, and west sampling areas (Figure 9) were located using a compass and measuring wheel. Permanent structures such as roads, buildings, and some fences were used as reference marks. Obstructions such as restricted areas, utilities, streams, concrete and/or asphalt surfaces, structures, and golf course greens and fairways resulted in deviation from the original grid. Individual locations were flagged and labeled with two-foot high ½" by 2" wooden stakes. A surplus of locations was marked for utility clearance to cover the possibility of non-clearance, shallow subsurface obstructions, or difficulty with site access. All sample locations were surveyed, so that accurate maps and subsurface diagrams could be prepared.

The map of the north area supplied by the USACE in the SOW shows 34 sample locations. Forty were originally staked, and 39 were initially used (Figure 10). Twenty-two of the sites were in the flightline,

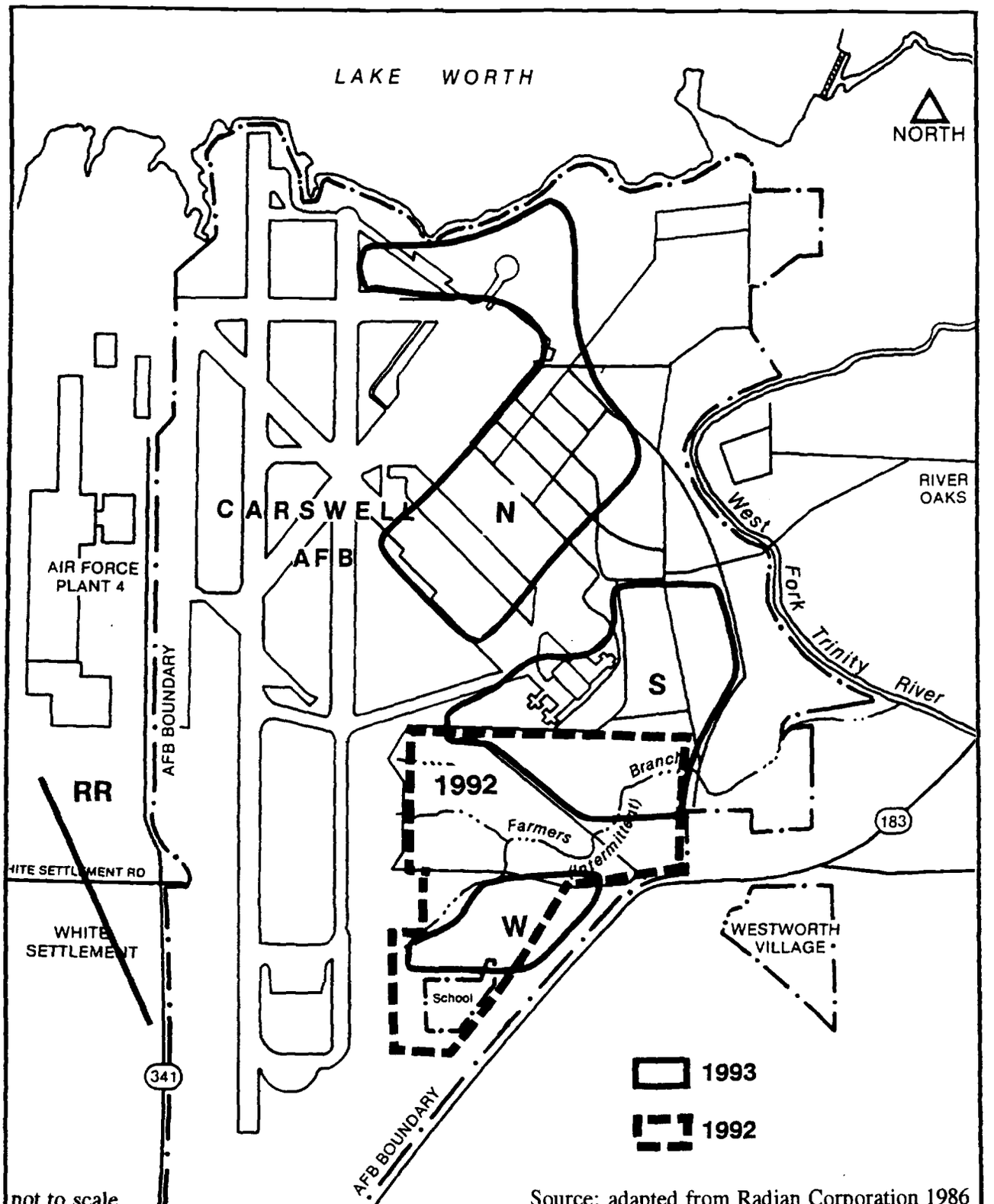


Figure 9. Index map for the four areas sampled in Phase II: north (N), south (S), west (W), and railroad spur (RR), plus the area sampled in Phase I (1992)

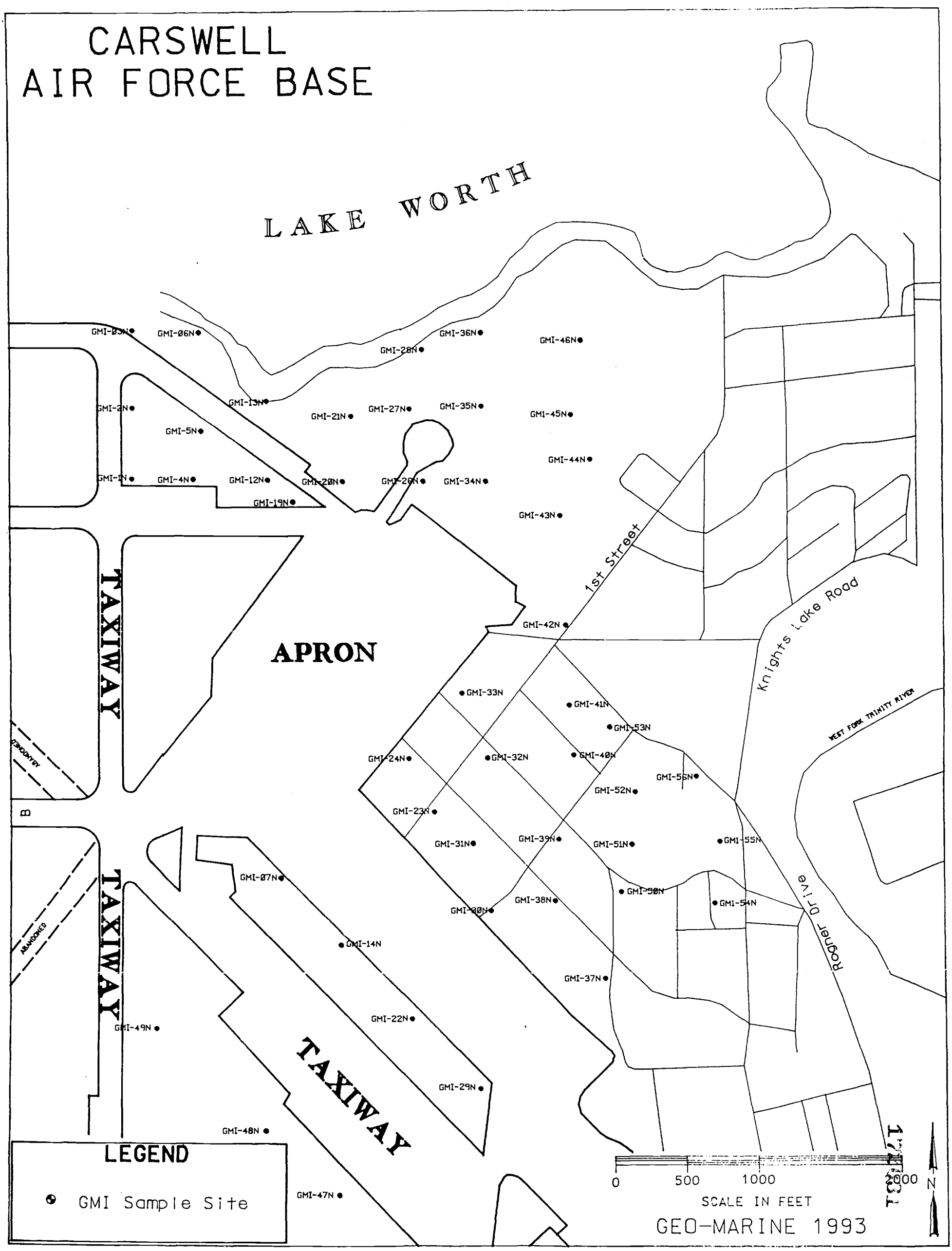


FIGURE 10. Cone Penetrometer Site Location Map (North)

requiring special training for all GMI and Fugro personnel. The map of the south area supplied by the USACE in the SOW shows 106 sample locations. Ninety-seven were originally staked, and 69 were initially used, including 21 in the flightline area (Figure 11). Available roads, driveways, parking lots, and runways provided ready access to all sites and minimized the potential for surface damage.

The rapid turnaround analytic data showing a row of sample sites with ND results permitted Mr. Niebuhr of the USACE office to eliminate 19 sites east of Rogner Road, an area apparently contaminant-free. The real-time data also showed that the TCE plume boundary had not been defined in the area immediately to the east of sample sites 39, 40, and 41 in the north area. An additional seven sites were added to fill in the gap in data. Other "surplus" locations were used to stake an additional nine sites directly south of the south area as well as 20 sites on and near the golf course on the south side of White Settlement Road in the "west area." Six sites, primarily to resolve questions of soil type and overburden thickness, were located along the railroad spur between Clifford Road and Grants Lane south of AFP 4. Access to most sites was readily available by road or parking area; cart trails were used for access to the golf course to minimize damage to ground surface soil and vegetation and the shallow irrigation system.

The third map in the SOW showed five bore hole locations south of White Settlement Road and along the west perimeter of the military housing area on Highway 183 south as far as the school/day care center (Figure 12). These locations were readily accessed either from White Settlement Road or Dungan Street.

Following an earlier directive from Mr. Bobby Hernandez, Community Planner for CAFB, a minimum distance of 100 feet was maintained from the several historic sites on the base (including buildings and a small cemetery), and a minimum of 50 feet was maintained from occupied residences when holes were to be pushed in grass areas so that any resultant ruts would not adversely impact the inhabitants. In other areas, care was taken not to impact traffic flow by the sampling procedures.

GMI contacted the following utility representatives: Marv Reynolds (CAFB Plumbing Shop), Ricky Palacios (CAFB golf course maintenance), Sgt. Walker (CAFB Communications), Ron Allen (CAFB Electrical and Fuel Maintenance), Syed Zaidi (Water Department, City of Fort Worth), Larry Davis (Lone Star Gas Co.), Dale Fissler and John Young (Engineering Division, City of Fort Worth), Paul Bounds (Director of Public Utilities, City of White Settlement), Gary Melton (TU Electric), and Luis Cardoza (SM & P Conduit Co., locator for Southwestern Bell Telephone). Maps were provided with

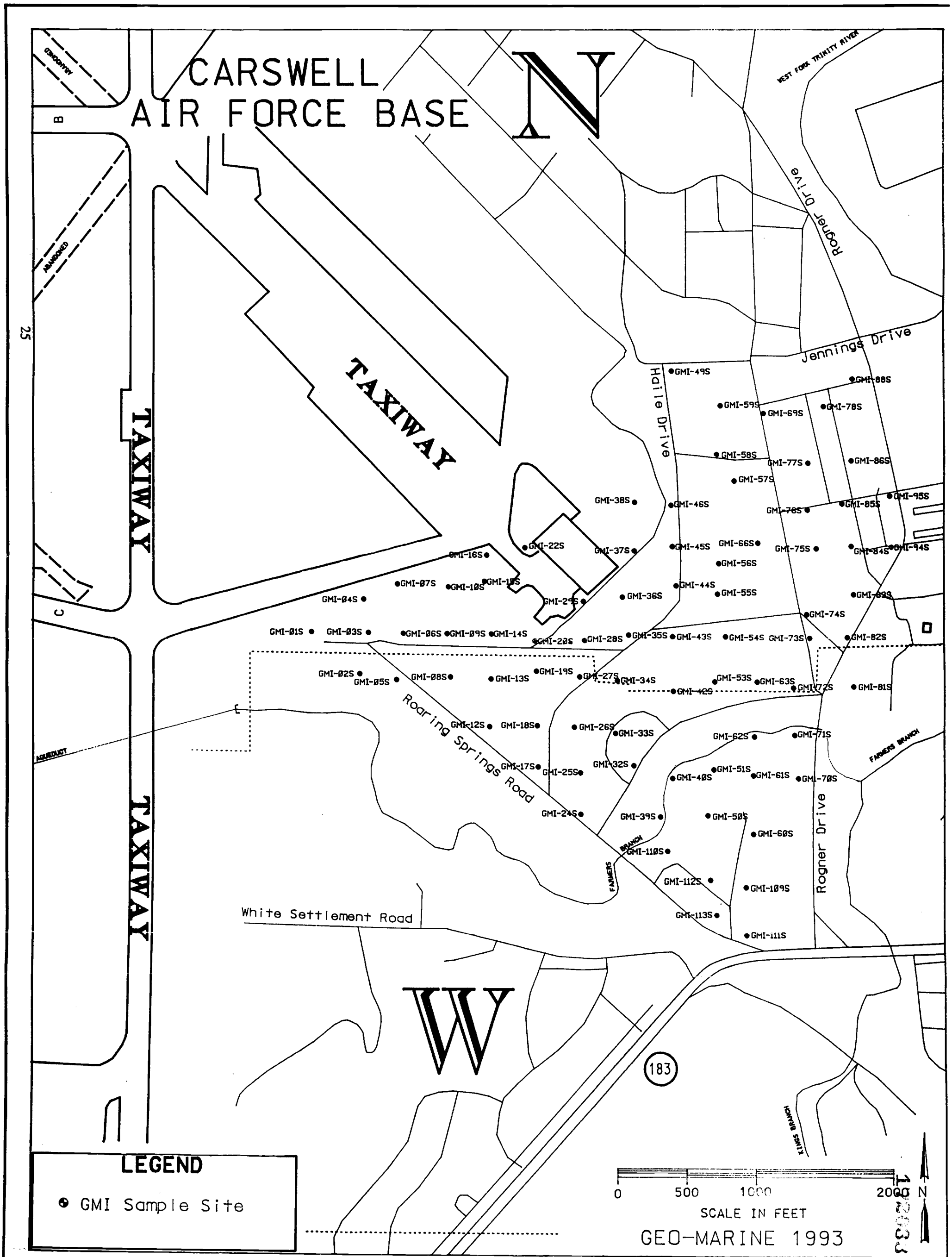


FIGURE 11. Cone Penetrometer Site Locction Map (South)

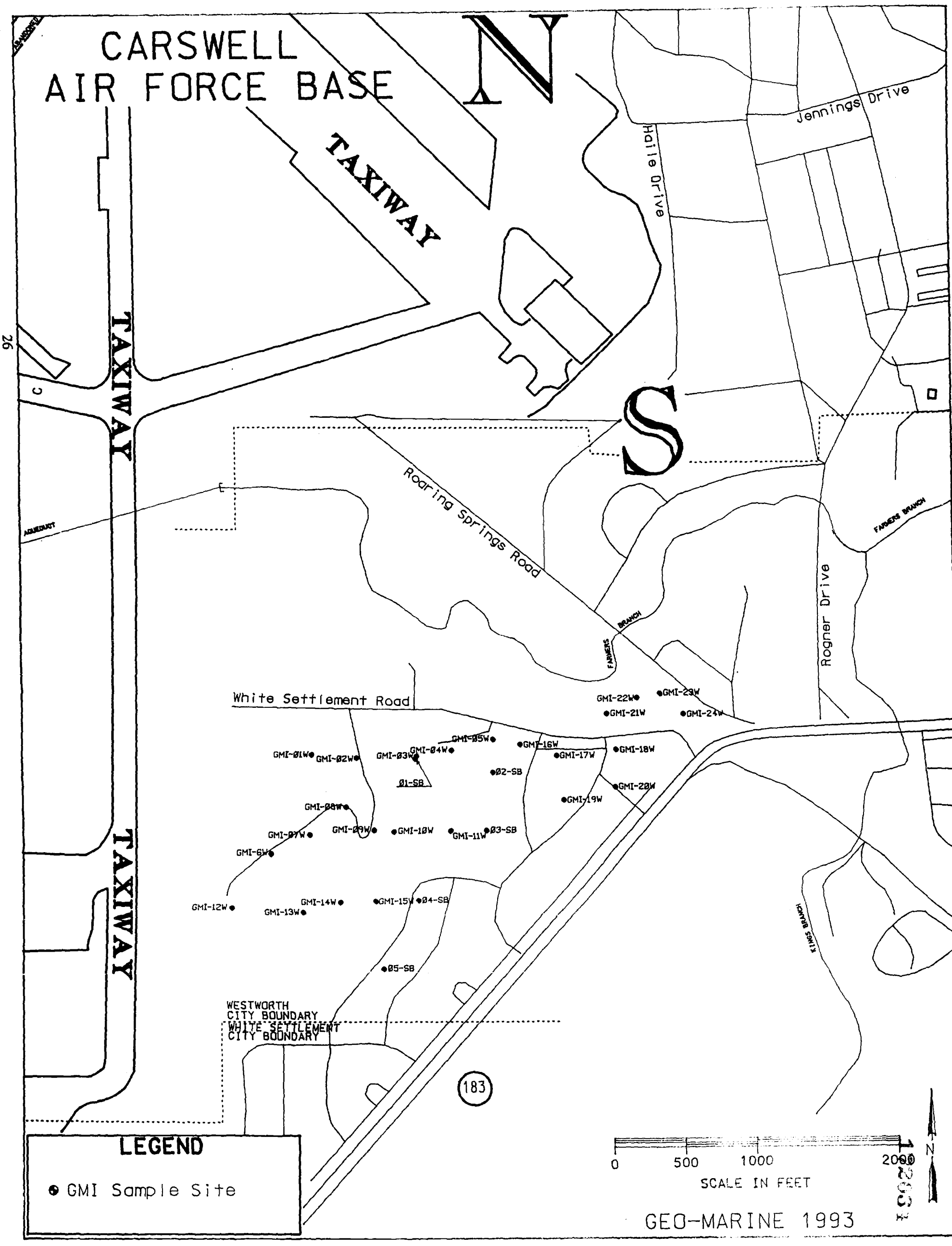


FIGURE 12. Cone Penetrometer & Soil Boring Site Location Map (West

underground utilities marked including gas lines, water lines, sewer lines (storm and sanitary), phone cables, and liquid fuel pipelines. A map of the golf course irrigation system was also provided. However, each flagged location was checked individually by the relevant utilities to assure non-impact and safety. Where appropriate, subsurface utilities were located with colored flags and/or lines spray-painted on the ground surface.

Golf course personnel were consulted because of the complexity of the several generations of irrigation systems. These systems can be broken merely by driving over them because of the generally shallow depths and the inherent weakness of small diameter, thin-shelled PVC pipe. The other subsurface conduits require actual penetration to sustain damage. During Phase II no subsurface utilities were hit and damaged by either the drill rig or the penetrometer.

3.3 Soil Boring Operations

The five bore holes were drilled by GMI using a truck-mounted Simco model 2800 drill rig with 7-5/8" outside diameter hollow stem augers. The holes were drilled either five feet into the water bearing zone or to limestone bedrock, whichever was encountered first. In order to measure static water levels, 2" or 4" schedule 40 PVC pipe was temporarily installed with five to 15 feet of screen at the base of each hole with signs of moisture. Casing was removed and each hole grouted to surface within 24 hours. Core barrels, drill stem, and samplers were deconned between each location. Drill cuttings were collected and drummed, and the drums were stored at a location at CAFB specified by Mr. Alan Flolo, pending analysis and appropriate disposal off base.

3.3.1 Soil Descriptions

Two borings (#3 and #2) were cored continuously, so that cored samples could be described in detail. Soil profiles for the other three (#1, #4, and #5) were prepared from examination of the drill cuttings plus the driller's observations (Appendix B). The described soil logs also recorded the depth to water, hard layers encountered while drilling, color changes, cohesivity, drilling parameters, and other unusual features. Penetrometer logs were generated at holes which directly offset two of the soil borings (GMI-3SB and GMI-4SB) to provide a basis for comparison for the electronic soil profiles generated by Fugro at each of the 140 penetrometer sites.

3.3.2 Water Sampling

Water, when encountered during drilling, was sampled immediately after total depth (TD) was reached, using a 1.66-inch diameter stainless steel bailer and emptied directly into three 40-ml vials per location for analyses. Initially damp holes were checked for water the next day when static water levels were measured. Water samples were checked for color, odor, and turbidity. Samples were sealed only after an undisturbed meniscus was visible. Following capping, each vial was carefully checked for bubbles; if any were found, the sample was retaken. NDRC Laboratories performed the chemical analyses (EPA method 8021); both NDRC and the USACE SWDL analyzed duplicates taken for every ten samples.

Each sample was individually labeled as to site designation, date, time, and sampler and sealed in the field. Samples were immediately wrapped in bubble wrap to protect from breakage and stored in ice-filled coolers for daily transportation to the two laboratories. At laboratory recommendation and with USACE approval, no preservative other than ice was used; this was the practice followed during Phase I. Chain-of-custody forms were prepared for all samples noting time and date of sampling with continuous custody documented by signatures with date and time. Copies of the forms are included with the analytic results in Appendix C.

3.4 Cone Penetrometer Locations

Hole penetration and data and sample collection were conducted by equipment and personnel from Fugro (see Appendix A). The patented truck-mounted cone penetrometer system is hydraulically driven with a maximum pushing force of 20 tons. The probe is two-inches in diameter and has a stainless steel friction cone at the tip equipped with an array of sensors. It is driven into the ground at a constant rate of two centimeters per second (cps) which can penetrate most soils and some soft weathered rock. Probe refusal and instrument response generally indicate fresh bedrock. The cone and pipe are removed and one-inch diameter PVC casing with a five-foot screened interval at the base temporarily installed for immediate water sampling and later static water level measurement. The casing is removed, usually the next afternoon, and the hole grouted to the surface.

3.4.1 Subsurface Delineation

The patented Fugro friction cone measures two physical parameters while pushing through the soil column to bedrock, namely friction against the sleeve of the probe and resistance against the tip. These two parameters are digitally collected and soil types, primarily defined by grain size(s), are interpreted from their ratio (friction/tip resistance) (Appendix D). At two of the borehole locations, both visual and electronic soil descriptions were available so that the electronic curve could be standardized against the distribution of soil types commonly present in the CAFB area. The interpreted soil profiles are used to trace soil types and boundaries across the project areas, especially the presence of relatively permeable paleochannels which might provide preferential migration pathways for groundwater and contaminants.

3.4.2 Water Sampling

When TD was reached, the probe and pipe were pulled out of the hole. If water had been encountered, it was sampled immediately using a small diameter bailer. If the hole was bottomed on bedrock and was initially dry or only moist, it was sampled at the time of static water level measurement the next day, if sufficient water had accumulated in the interval. If still dry, the hole was designated "dry" and plugged. Occasionally sufficient water accumulated in a "moist" hole overnight for sampling; however, initially dry holes invariably remained "dry".

Water samples were checked for color, odor, and turbidity and then emptied directly into 40-ml VOA glass vials used to transport the samples to the laboratories. As with the bore hole samples, they were sealed only when an undisturbed meniscus was visible, and following capping each vial was carefully checked for bubbles. TEG Laboratories did the analyses on-site within one to five hours with the sample refrigerated in the interim. Both TEG and the USACE SWDL analyzed duplicates taken for every ten samples.

Each sample was individually labeled as to site designation, date, time, and sampler and sealed in the field. Samples were immediately wrapped in bubble wrap to protect from breakage and stored in ice-filled coolers for transportation to the laboratories; samples were usually delivered to TEG within two hours of being collected and to USACE SWDL within three days of collection. Chain-of-custody forms

were prepared for all samples noting time and date of sampling with continuous custody documented by signatures with date and time. Copies of the forms are included with the analytic results in Appendix C.

3.5 Sample Analyses

Per the SOW, all samples sent to either lab were analyzed using EPA method 8021 for volatile organics. EPA method 8021 is a gas chromatographic method which can identify a large number of analytes, including TCE and its degradation products, as well as BTEX. Halogenated solvents and hydrocarbons (fuels) have both been identified as groups of compounds of concern in the area. In particular, TCE, its breakdown product VC, and benzene, an indicator of both jet fuel and gasoline, are proven carcinogens (Proctor, et al. 1989). All sample preparation and analyses were done within the maximum allowable holding time of 14 days.

3.6 Static Water Level Measurement and Hole Closure

One-inch diameter casing with five feet of screen at the base was placed in each hole with signs of moisture, whether or not it initially encountered free water. The casing was emplaced by hand where possible; if the hole slumped or bridged, a disposable 2.2-inch "dummy" tip was used with the push-in water sampler (GMF) casing to reopen the hole. The PVC casing was then installed from inside the GMF casing with the disposable tip left in the hole when the pipe was withdrawn. The tops of the casing were temporarily closed with a slip-on cap to prevent accidental placement of foreign material into the hole. Occasionally the surface was sealed with bentonite and plastic sheeting if rain were in the forecast. The following day the unplugged holes were visited and reopened in order of completion, and static water levels measured from ground surface with a Well Wizard Water Level Meter Model 6000 wherever water was present. At this time samples were taken from previously unsampled holes where water had accumulated. Using the survey data for locations and surface elevations, the elevation of water across the project areas was determined (see Section 4.3).

3.7 Quality Control

Field procedures were carried out in a systematic manner by trained, experienced, and properly equipped individuals to assure consistency in data collection. Breathing zone air measurements, done at each

sample location for the protection of the crew, were performed at the same point in the data collection sequence with the same equipment by a GMI employee. The equipment, HNu model PI-101, was calibrated each morning, and the zero point was checked frequently during the day. Project meetings and field activities are described chronologically in a complete field notebook maintained on site at all times. A copy of the notebook is included as Appendix E.

3.7.1 Sampling

Rinsate samples for both laboratories (TEG and USACE SWDL) were prepared daily by collecting deionized water used for the final rinse of the sampling equipment decon procedures. Each cooler of samples transported to the USACE SWDL also included a trip blank which was prepared using deionized water tested and approved by the lab and transported in the same type of 40-ml glass vial under the same conditions as the field-collected samples. A pair of duplicate samples was collected for each tenth sample; one sample was submitted to the TEG on-site mobile laboratory; the second was analyzed by the USACE SWDL per the SOW.

3.7.2 Analytic

Documentation of laboratory QA/QC procedures, as required by the USACE, are included with the analytic results in Appendix C.

3.8 Decontamination

All equipment which came in contact with the water samples, and therefore had the potential to be contaminated, was decontaminated between each sample station to avoid cross contamination. Cone tips, protective steel casing and steel well screen sections, and samplers were cleaned with hot water and alconox, an approved detergent. New PVC screen was used in each penetrometer hole for sampling and static water level measurement. Used PVC pipe and screen was deconned per Texas Natural Resource Conservation Commission (TNRCC) directives prior to disposal. All wash water was retained in closed and labeled 55-gallon metal drums at CAFB at a location specified by Base Closure Office personnel.

Other cross contamination-minimization precautions included: (1) the use of disposable surgical gloves by those handling the sample and (2) grouting all holes as soon as possible after the temporary casing had been pulled in order to protect other horizons from possible exposure to contaminated groundwater.

3.9 Disposal

Following the SOW all solid and liquid waste generated during the Phase II sampling has been placed in 55-gallon drums and temporarily stored at CAFB in a locked and fenced location specified by Mr. Alan Flolo of the Base Disposal Agency; this did not include the PVC pipe used for temporary casing. The pipe was decontaminated and transported back to GMI at the close of the field phase for proper disposal which is now pending receipt of paperwork from the TNRCC. The drum inventory included five drums of soil cuttings from the soil borings, one drum of wash water from the decon operations associated with the five soil borings, and three drums of wash water from the decon operations associated with the 140 penetrometer sampling sites.

3.9.1 Soil Boring Cuttings

The contents of five drums of drill cuttings were sampled for analysis by Mr. Bruce MacDonald of Heat Energy Advanced Technology, Inc. (HEAT) on August 18, 1993. HEAT removed the drums, which are classified as containing the same waste stream, on September 15, 1993, for disposal by incineration. Copies of the documentation are in Appendix F.

3.9.2 Decon Water

The contents of four drums of decon water were sampled for analysis by Mr. Bruce MacDonald of HEAT on August 18, 1993. HEAT removed the drums, which are classified as containing the same waste stream, on September 15, 1993, for appropriate disposal. Copies of the documentation are in Appendix F.

3.10 Safety, Health, and Emergency Response

Prior to the initiation of the Phase II field activities, a SHERP was prepared for approval by USACE industrial hygiene personnel. The SHERP addressed the subjects of designated safety personnel, required/recommended personal protective equipment (PPE), breathing air monitoring procedures and allowable limits, characteristics of anticipated contaminants (including the Material Safety Data Sheets [MSDS]), and applicable certifications for field personnel. The SHERP also included plans to be used in the case of an emergency including key names and phone numbers, directions to the nearest hospital with appropriate care facilities, and reference to the hospital route map which was kept at all times in each vehicle.

Prior to the initiation of Phase II sampling, a site safety meeting was held and attended by all field personnel to discuss pertinent safety issues and assure that all members had reviewed the SHERP and were familiar with the hospital route. Additional safety issues discussions were convened by the Site Safety Officer on an "as needed basis". A complete copy of the SHERP is included as Appendix G.

Per the SOW the breathing zone air was monitored at each sample location for volatile organics for the protection of the field crew and others in the area. The instrument used was an HNu model #PI-101 which measures total organic vapors in parts per million (ppm). Although it does not identify specific compounds, elevated readings (those above 2 ppm) would provide an indication of possible concern. The decision of whether or not to instruct the crew to use air purifying respirators (APR) with chemical filter cartridges would be made by the Site Safety Officer. All field personnel had APRs available during the sampling phase of the project; however, their use was never warranted as the HNu readings in the breathing zone never exceeded the 2 ppm action level. If readings had exceeded 5 ppm, the Site Safety Officer would have evacuated the immediate area, including both field personnel and others nearby (such as CAFB personnel or visitors).

Flightline training at CAFB is required for any person working on or near any of the runways or taxiways. This training includes an illustrated lecture and a tour of the areas under the jurisdiction of this training. The key elements of the training are: (1) aircraft always has the right-of-way, (2) posted speed limits are strictly enforced, and (3) red lines painted on the pavement indicate restricted areas and are not to be crossed by either individuals or vehicles. GMI and Fugro staff members who worked on the

flightline section of the project underwent this training and received the necessary clearance passes. The mobile laboratory was never required in the flightline area, and so TEG personnel did not undergo the training.

4.0 DISCUSSION AND INTERPRETATION OF FINDINGS

4.1 Introduction

Five soil boring locations and 140 cone penetrometer locations were completed for subsurface information and water samples. Two of the penetrometer locations directly offset two of the soil borings to aid in calibrating the derived soil profiles with the observed local soil section. At each sample station the soil profile from ground surface to point of penetrometer refusal was recorded and, where water was encountered, a sample was collected and the static water level measured.

Water samples from three soil boring and 88 penetrometer locations were submitted for laboratory analyses using EPA method 8021 (Table 1). Water was not encountered at the other two soil boring locations and 52 penetrometer sites; real-time data provided by the on-site laboratory allowed a number of the initially staked sample sites to be moved to other areas, specifically along the eastern margin of the north area and in the golf course (west area), for better definition of the contaminant plume(s). In addition six of the locations were moved to the railroad spur south of AFP4 between the western frontage road to Grants Lane and Clifford Avenue for subsurface stratigraphic delineation.

EPA method 8021 supplies analytic results for 18 purgeable halocarbons and four petroleum hydrocarbons; these include the nine halocarbon compounds and four petroleum hydrocarbons of interest specified in the SOW. Three of the nine halocarbons (cis-1,2 dichloroethene [DCE]; trans-1,2-DCE; and trichloroethene [TCE];) as well as the four petroleum hydrocarbons (benzene [B], toluene [T], ethyl benzene [E], and xylenes [X]) had results elevated above their respective laboratory detection limits at one or more locations. Results for the remaining six compounds of interest (1,1 DCE; vinyl chloride [VC]; 1,1-dichloroethane [DCA]; 1,1,1-trichloroethane [TCA]; 1,1,2-TCA; and tetrachloroethane [PCE]) were ND for all compounds at all sample sites. No other compounds of the purgeable halocarbon family which were tested had elevated values at any location in the project area (see Appendix C).

The results obtained for the north area established the TCE plume boundaries on the north and east toward Lake Worth and Rogner Road, respectively, while the plume is open to the south and west. The south area, which overlaps a small portion of the 1992 Phase I project area, has TCE plume boundaries defined on the north, east, and southeast, with the plume open to west and southwest. The west area,

TABLE 1

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-01SB	yes	7/28/93	cis-DCE, TCE
GMI-02SB	yes	7/28/93	TCE
GMI-03SB	yes	7/28/93 & 8/09/93	none
GMI-04SB	yes	no	
GMI-05SB	yes	no	
GMI-1N	yes	8/18/93	none
GMI-2N	yes	no	
GMI-3N	yes	no	
GMI-4N	yes	8/19/93	none
GMI-5N	yes	8/20/93	none
GMI-6N	yes	no	
GMI-7N	yes	8/23/93	none
GMI-8N	no		
GMI-9N	no		
GMI-10N	no		
GMI-11N	no		
GMI-12N	yes	no	
GMI-13N	no		
GMI-14N	yes	8/23/93	none
GMI-15N	no[3]		
GMI-16N	no[3]		
GMI-17N	no[3]		
GMI-18N	no[3]		
GMI-19N	yes	no	

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-20N	yes	8/20/93	none
GMI-21N	yes	no	
GMI-22N	yes	no	
GMI-23N	yes	8/24/93	TCE
GMI-24N	yes	9/01/93	TCE
GMI-25N	no[3]		
GMI-26N	yes	8/12/93	none
GMI-27N	yes	8/20/93	none
GMI-28N	yes	8/31/93	none
GMI-29N	yes	8/23/93	none
GMI-30N	yes	8/24/93	none
GMI-31N	yes	9/01/93	
GMI-32N	yes	9/01/93	
GMI-33N	yes	9/01/93	
GMI-34N	yes	no	
GMI-35N	yes	8/20/93	none
GMI-36N	yes	8/31/93	none
GMI-37N	yes	9/03/93	none
GMI-38N	yes	no	
GMI-39N	yes	9/01/93	
GMI-40N	yes	9/01/93	
GMI-41N	yes	9/01/93	
GMI-42N	yes	9/01/93	TCE
GMI-43N	yes	9/01/93	none
GMI-44N	yes	9/02/93	none

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-45N	yes	9/02/93	none
GMI-46N	yes	9/02/93	none
GMI-47N	yes	8/23/93	TCE
GMI-48N	yes	8/23/93	TCE
GMI-49N	yes	8/23/93	cis-DCE, TCE
GMI-50N	yes	no	
GMI-51N	yes	9/09/93	trans-DCE, cis-DCE, TCE
GMI-52N	yes	9/09/93	trans-DCE, cis-DCE
GMI-53N	yes	9/09/93	none
GMI-54N	yes	no[4]	
GMI-55N	yes	no	
GMI-56N	yes	9/09/93	none
GMI-1S	yes	8/16/93	cis-DCE, TCE
GMI-2S	yes	8/09/93	cis-DCE, TCE
GMI-3S	yes	no	
GMI-4S	yes	8/12/93	cis-DCE, TCE
GMI-5S	yes	8/12/93	cis-DCE, TCE
GMI-6S	yes	8/12/93	TCE
GMI-7S	yes	no	
GMI-8S	yes	no	
GMI-9S	yes	8/12/93	cis-DCE, TCE
GMI-10S	yes	no	
GMI-11S	no[3]		
GMI-12S	yes	8/09/93	TCE
GMI-13S	yes	no	

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-14S	yes	8/13/93	cis-DCE, TCE
GMI-15S	yes	no	
GMI-16S	yes	8/13/93	TCE
GMI-17S	yes	no	
GMI-18S	yes	8/10/93	cis-DCE, TCE
GMI-19S	yes	no	
GMI-20S	yes	8/13/93	cis-DCE, TCE
GMI-21S	no[3]		
GMI-22S	yes	8/13/93	cis-DCE, TCE
GMI-23S	no[3]		
GMI-24S	yes	no	
GMI-25S	yes	8/10/93	cis-DCE, TCE
GMI-26S	yes	8/10/93	cis-DCE, TCE
GMI-27S	yes	8/17/93	trans-DCE, cis-DCE, TCE
GMI-28S	yes	8/13/93	none
GMI-29S	yes	no	
GMI-30S	no[3]		
GMI-31S	no[3]		
GMI-32S	yes	no	
GMI-33S	yes	no	
GMI-34S	yes	8/17/93	none
GMI-35S	yes	no	
GMI-36S	yes	8/16/93	TCE
GMI-37S	yes	8/16/93	none
GMI-38S	yes	8/16/93	none

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-39S	no		
GMI-40S	yes	no	
GMI-41S	no		
GMI-42S	yes	8/17/93	none
GMI-43S	no		
GMI-44S	yes	no	
GMI-45S	yes	no	
GMI-46S	yes	no	
GMI-47S	no[3]		
GMI-48S	no[3]		
GMI-49S	no		
GMI-50S	yes	no	
GMI-51S	yes	8/11/93	none
GMI-52S	no[3]		
GMI-53S	yes	no	
GMI-54S	yes	8/17/93	none
GMI-55S	yes	8/17/93	none
GMI-56S	yes	8/17/93	none
GMI-57S	yes	8/19/93	none
GMI-58S	yes	8/19/93	none
GMI-59S	yes	8/18/93	none
GMI-60S	yes	8/11/93	none
GMI-61S	yes	8/11/93	none
GMI-62S	yes	8/11/93	none
GMI-63S	yes	8/10/93	none

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-64S	no		
GMI-65S	no		
GMI-66S	yes	8/19/93	none
GMI-67S	no[3]		
GMI-68S	no[3]		
GMI-69S	no		
GMI-70S	yes	8/12/93	none
GMI-71S	yes	no	
GMI-72S	yes	8/12/93	none
GMI-73S	yes	8/17/93	none
GMI-74S	yes	8/17/93	none
GMI-75S	yes	8/18/93	E
GMI-76S	yes	8/18/93	none
GMI-77S	yes	8/18/93	none
GMI-78S	yes	8/18/93	none
GMI-79S	no		
GMI-80S	no		
GMI-81S	no		
GMI-82S	yes	9/08/93	none
GMI-83S	yes	8/18/93	B, E
GMI-84S	yes	8/18/93	B, T, E, X
GMI-85S	yes	8/18/93	none
GMI-86S	yes	8/18/93	none
GMI-87S	no[3]		
GMI-88S	yes	8/18/93	none

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-89S	no		
GMI-90S	no		
GMI-91S	no		
GMI-92S	no		
GMI-93S	no		
GMI-94S	yes	8/19/93	none
GMI-95S	yes	8/19/93	none
GMI-96S	no		
GMI-97S	no		
GMI-98S	no		
GMI-99S	no		
GMI-100S	no		
GMI-101S	no		
GMI-102S	no		
GMI-103S	no		
GMI-104S	no		
GMI-105S	no		
GMI-106S	no		
GMI-107S	no		
GMI-108S	no		
GMI-109S	no		
GMI-110S	no		
GMI-111S	no		
GMI-112S	no		
GMI-113S	no		

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
GMI-1W	no		
GMI-2W	no		
GMI-3W	no		
GMI-4W	yes	yes	TCE
GMI-5W	yes	no	
GMI-6W	yes	no	
GMI-7W	yes	no	
GMI-8W	yes	no	
GMI-9W	yes	no	
GMI-10W	yes	no	
GMI-11W	yes	no	
GMI-12W	yes	no	
GMI-13W	yes	no	
GMI-14W	yes	no	
GMI-15W	yes	no	
GMI-16W	yes	no	
GMI-17W	yes	no	
GMI-18W	yes	yes	none
GMI-19W	yes	no	
GMI-20W	yes	yes	none
GMI-21W	yes	no	
GMI-22W	no		
GMI-23W	yes	no	
GMI-24W	no		
USGS-1	yes[5]	no	

TABLE 1 (CONT'D)

SUMMARY OF SAMPLE ACQUISITION AND RESULTS

Location No.[1]	Drilled or Punched[2]	Sampled (Date)	Results (Compound[s] Listed Where Present)
USGS-2	yes[5]	no	
USGS-3	yes[5]	no	
USGS-4	yes[5]	no	
USGS-5	yes[5]	no	
USGS-6	yes[5]	no	

[1] N, S, and W in the location name refer to the north, south, or west sampling areas on CAFB; USGS holes are located along a railroad spur south of AFP4.

[2] Sites marked SB were drilled; remainder were punched. Sites GMI-03SB and GMI-04SB were drilled and subsequently "twinned" with the penetrometer.

[3] Holes were staked, but not surveyed or punched/drilled.

[4] Holes had sufficient water for static level measurement, but not for sampling.

[5] Holes labelled USGS because of U.S. Geological Survey (USGS) interest in the shallow sub-surface stratigraphy in this area

[6] Holes were staked and punched, but not surveyed because of the remote location compared to the other sampling areas

added when real-time data made sample sites available, is in the golf course along and south of White Settlement Road. This overlays the area of 1993 soil boring and also part of the 1992 grid where no water could be sampled; data were again too sparse to identify a plume boundary to the south with any degree of confidence.

Analyses for TCE and 17 other purgeable halocarbon compounds plus BTEX under EPA method 8021 demonstrated a general consistency in distribution of elevated values of TCE and the TCE degradation product cis-1,2-dichloroethene (DCE). One other TCE degradation product (trans-1,2-DCE) plus the four

hydrocarbons showed isolated elevated spikes. The other halocarbons were all ND. Where project areas overlap, peak concentrations generally are comparable to values measured by others in 1993 (International Technology Corporation and Jacobs Engineering) and measured by GMI in 1992, although there are a few exceptions.

4.2 Subsurface Stratigraphy

Previous work (Radian Corporation 1991; Hargis and Associates 1989) has suggested that one or more paleochannels exist in the shallow subsurface under the project area which provide preferential conduits for both groundwater and contaminant migration. These channels in places reportedly cut into the local bedrock of limestone and marl; they are filled with relatively coarse, unconsolidated clastics, dominantly sands and gravels, which were carried into the area as well as derived locally. The objective of the subsurface delineation component of the SOW was to describe the soil types encountered as well as the water depths and characteristics.

The soil profiles are developed from two physical parameters recorded digitally while the cone penetrometer is being pushed from ground surface to point-of-refusal. The two parameters are tip resistance measured at the tip of the cone and friction measured along the sleeve of the probe. Both are quantified in the same unit, tons per square foot, and friction divided by tip resistance results in a ratio which generally falls within the range of 0% to 10%. The ratio corresponds to a single soil or to a mix of soil textural types which is plotted in profile next to the three curves. In general terms, values over 5 or 6% are clay-rich, while values under 1 or 2% are sand and gravel (see Appendix D for annotated profiles). Intermediate values are interpreted as mixtures of different grain size sediments.

The cones are not calibrated specifically to different sites, and so direct comparison with an actual local soil profile is advisable; this was done at two locations, GMI-03SB and GMI-04SB, where recently drilled and described bore holes were closely offset (less than five feet) by the penetrometer truck (Figure 13). The two pairs of soil profiles are similar with regard to major shifts in grain size, especially GMI-04SB. The smaller scale textural variations are less consistently tracked; however, the purpose of the penetrometer curves is to identify the location and extent of coarser sediments which may indicate stream channel deposits and preferential migration pathways.

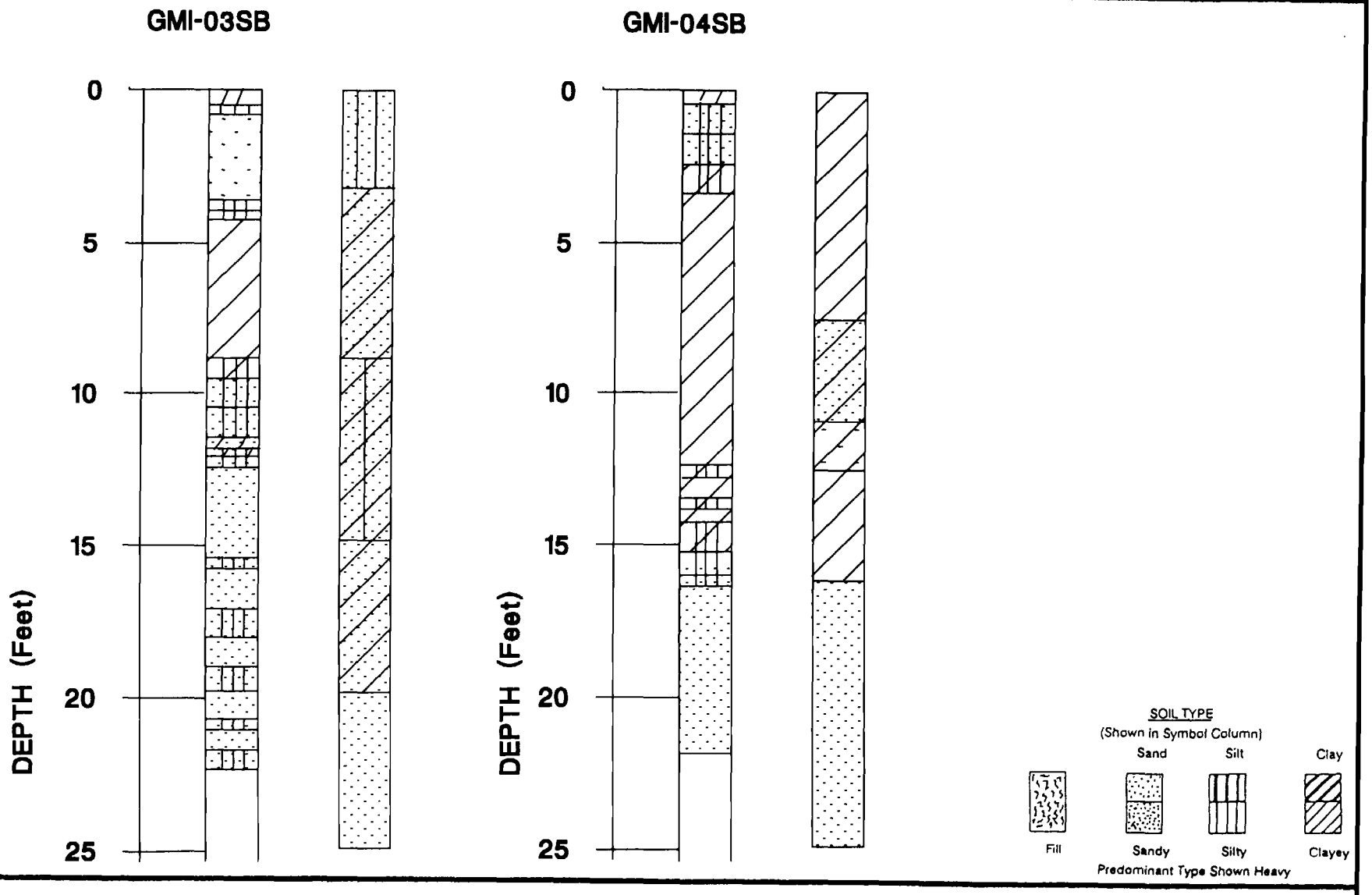


Figure 13. Comparative soil profiles from visual description (on the right of each pair) and cone penetrometer data (on the left of each pair). The described soils are shown using the soil type patterns plotted from the CPT data to aid in comparison.

172054

There are six other examples of visually described soil profiles located within 250 feet of penetrometer soil profiles. At GMI soil borings #1 and #2, there are 1993 GMI penetrometer locations 100 to 230 feet away. Soil boring #1 and penetrometer location 4W have a similar section (sand is dominant below approximately five feet) and TD (25 feet). They both had water which contained TCE. Soil boring #2 and penetrometer locations 5W and 16W may explain some of the dry holes, because they both bottomed at the approximate depth of hard layers identified in the soil column. The soil boring had water while both shallower penetrometer holes did not.

At an additional four penetrometer sites in the south area, general (i.e., sand versus fines) soil descriptions were available from nearby (up to 170 feet away) soil borings done by Radian Corporation (1991). The comparisons between GMI-66S and Radian 17C/17B and between GMI-56S and Radian 17A are not exact, but comparisons between GMI-74S and Radian 17F and between GMI-75S and Radian 17G show comparable depths for the clay to sand boundaries.

The degree of correlation of textural changes in sediments in adjacent logs in cross section format varies across the three sampling areas (north, south, and west) both in the reported general direction (west-east) of the paleochannel axes and across strike, i.e. perpendicular to them (north-south). This is consistent with lensing sands encased in finer-grained sediments (and vice versa) which is typical of fluvial sedimentation processes (Figures 14, 15, 16, 17, 18, and 19). Unambiguous channel margins were not identified in the project areas; they may not be consistently defined by a lateral shift from sand and gravel-sized particles to silt and clay-size which would be represented by a thinning in the sand section (Table 2). Clay and silt size particles generally have lower porosity and permeability and do not transmit fluids as readily as the coarser-grained sediments. However, during this project several examples were seen of clay-rich holes which produced water for samples and water level measurements and of sand-rich holes which were dry, even when left open overnight. Channels can also be defined by linear depressions scoured into the bedrock by stream action. However, many penetrometer holes did not reach bedrock, so this delineation method is not applicable here.

Six holes were punched along a 4,000-foot section of railroad spur between Clifford Road and Grants Lane south of AFP4 (see Figure 9). The purpose of these holes was to determine if they lay within the bounds of a paleochannel. All six were dry (depth range: 2.5 to 16.5 feet), but three had relatively well developed sand sections. A cross-section of these holes was not constructed, because they were not

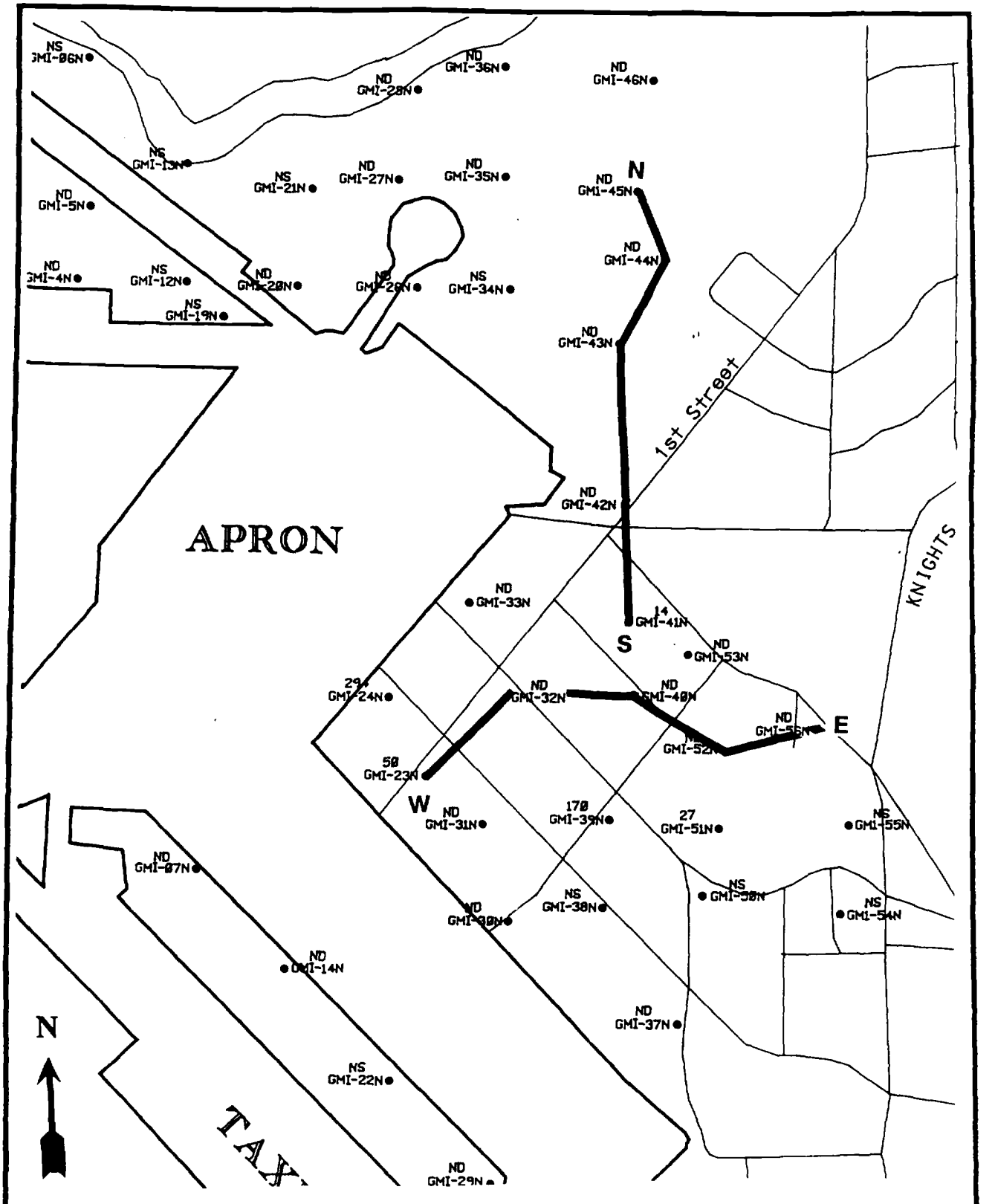


Figure 14. Location of sedimentologic cross sections in the north area

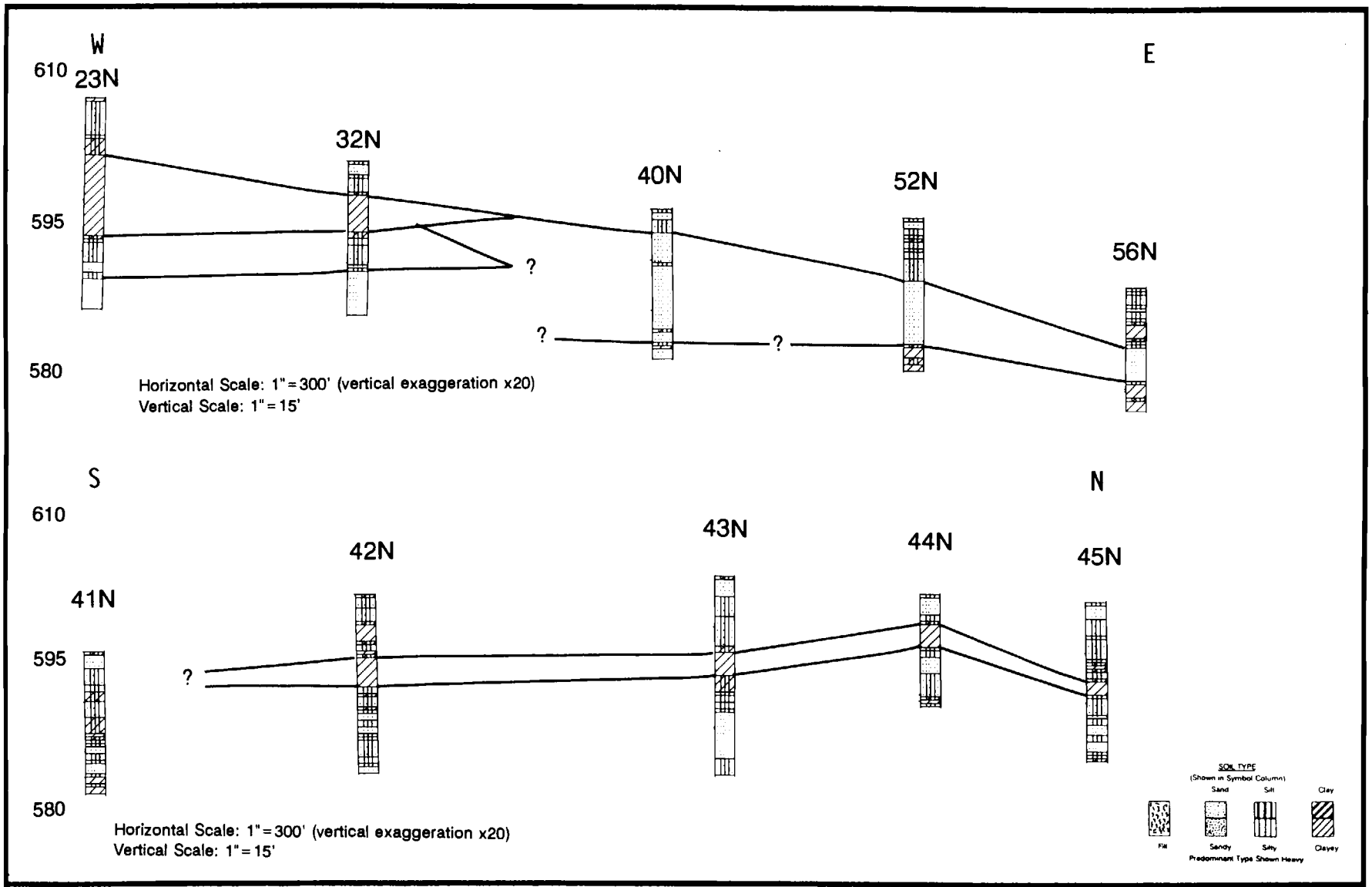


Figure 15. Representative sedimentologic cross sections in north area; vertical scale is in feet above sea level

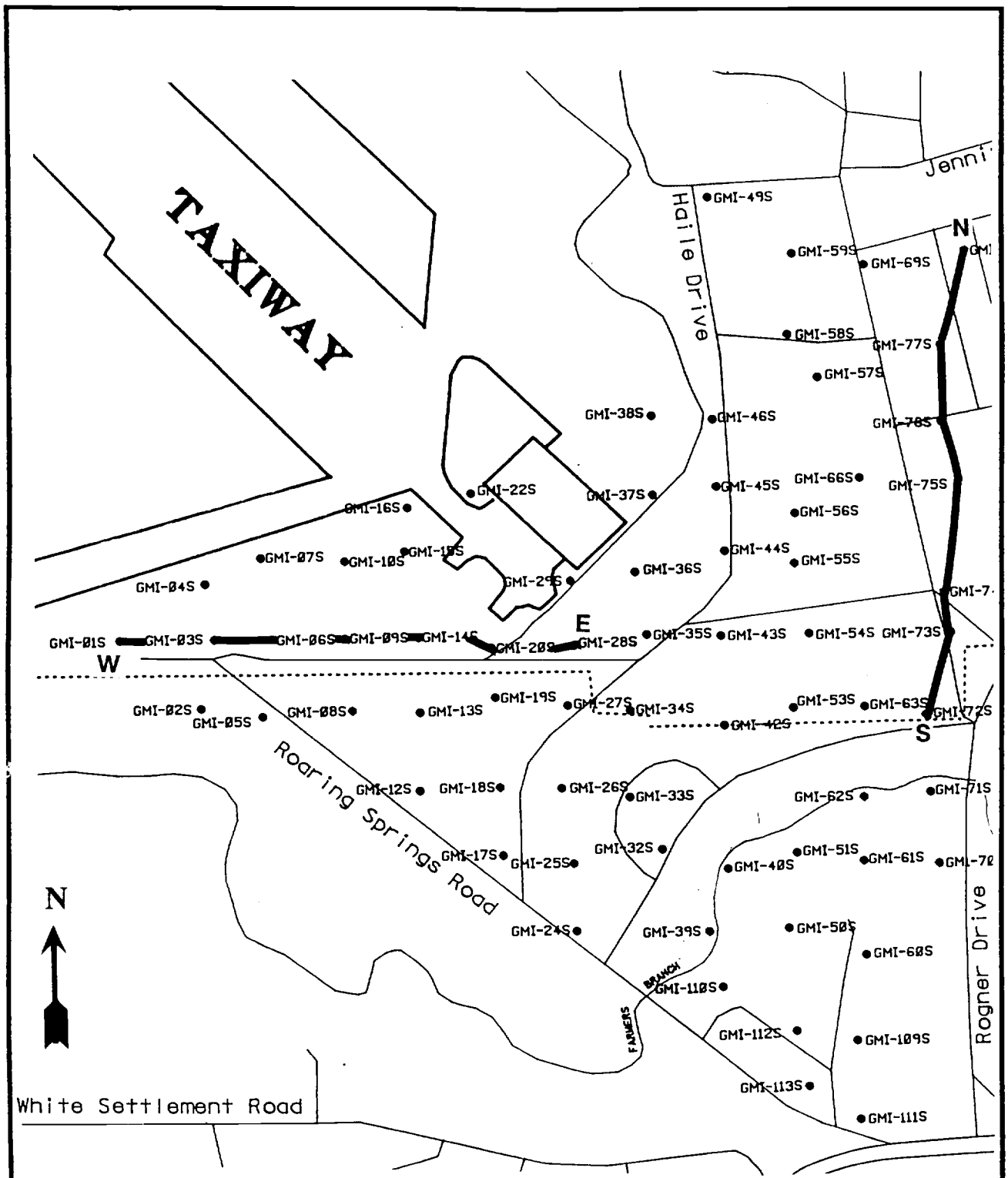


Figure 16. Location of sedimentologic cross sections in the south area

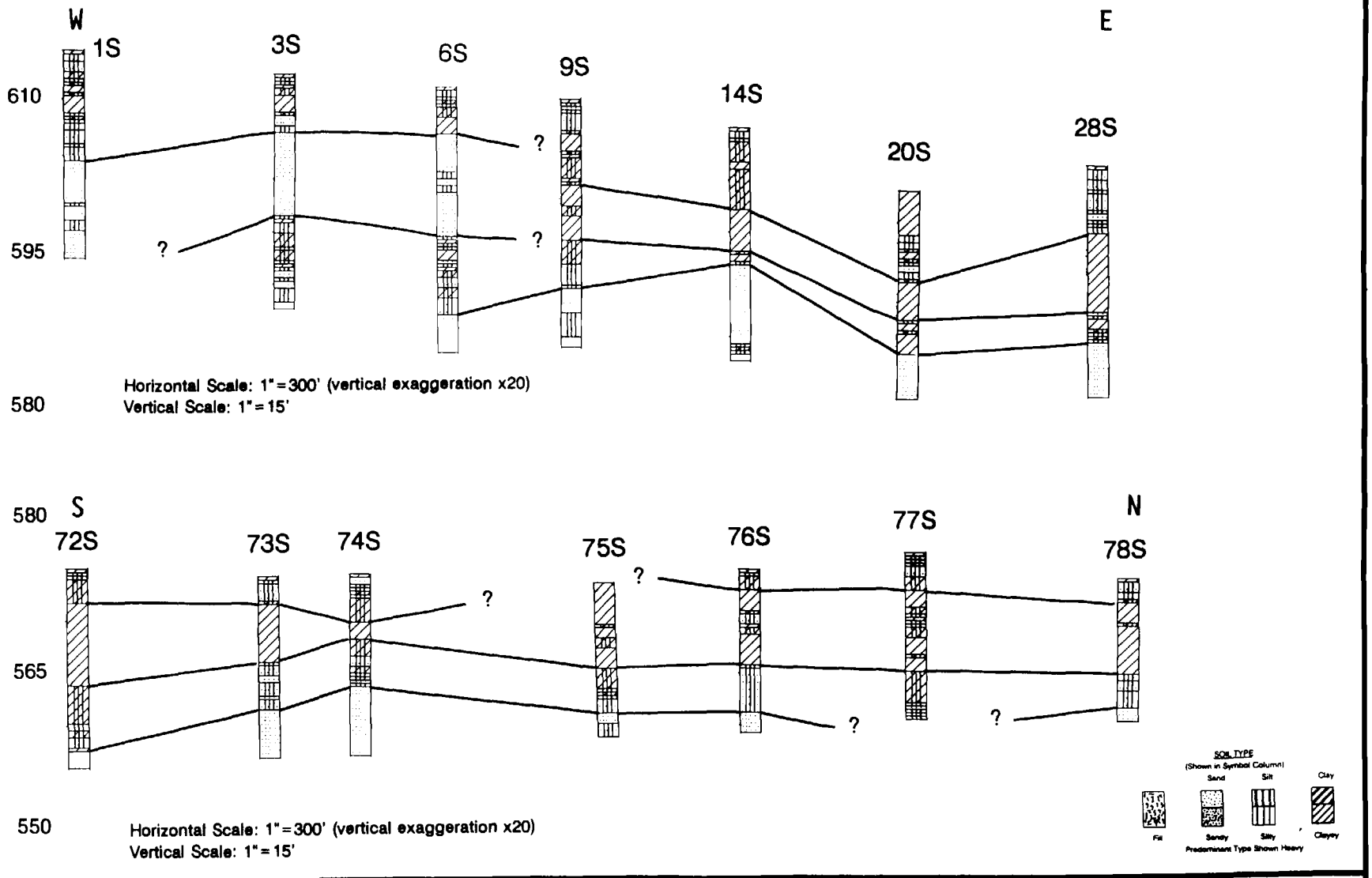


Figure 17. Representative sedimentologic cross sections in south area; vertical scale is in feet above sea level

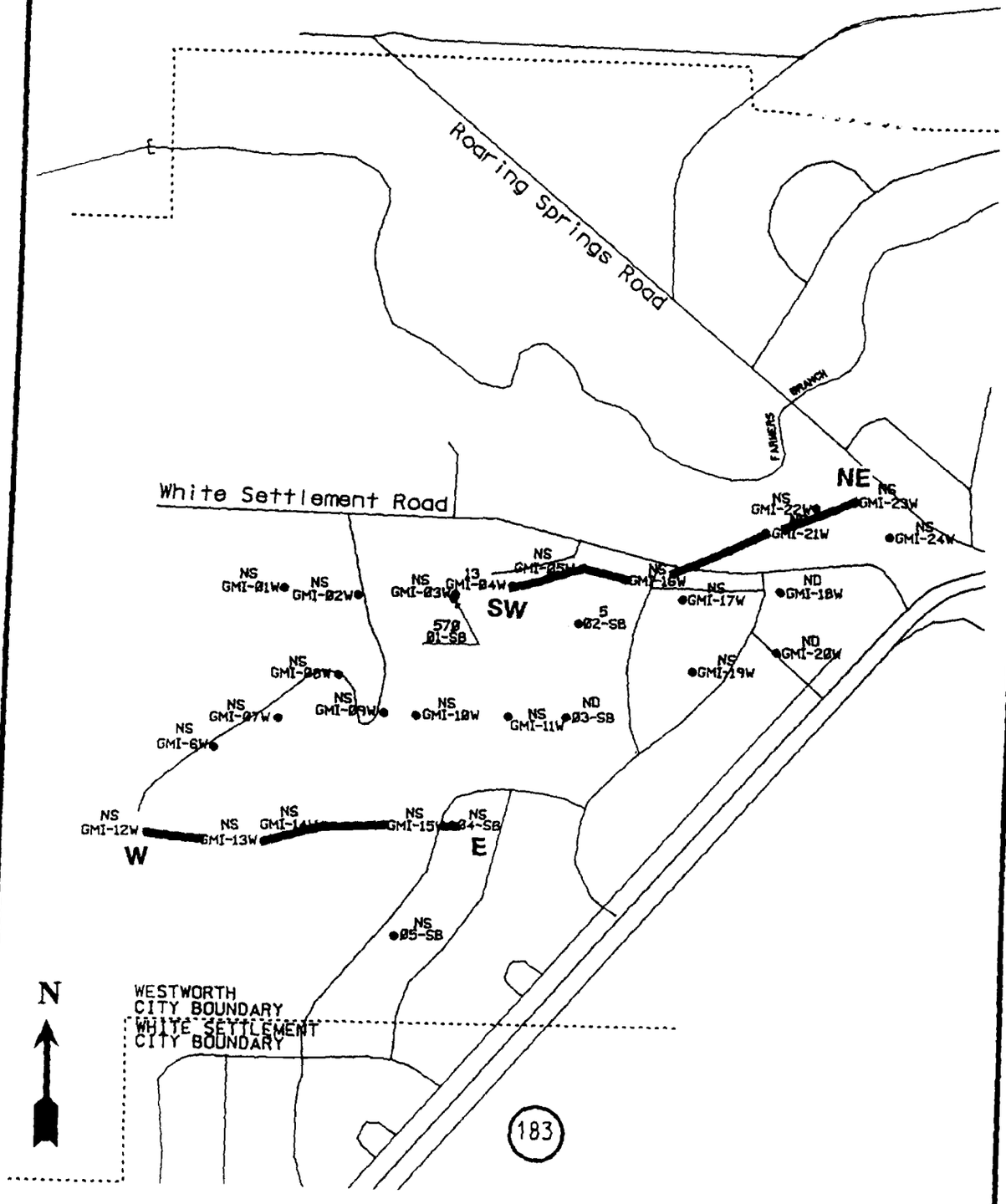


Figure 18. Location of sedimentologic cross sections in the west area

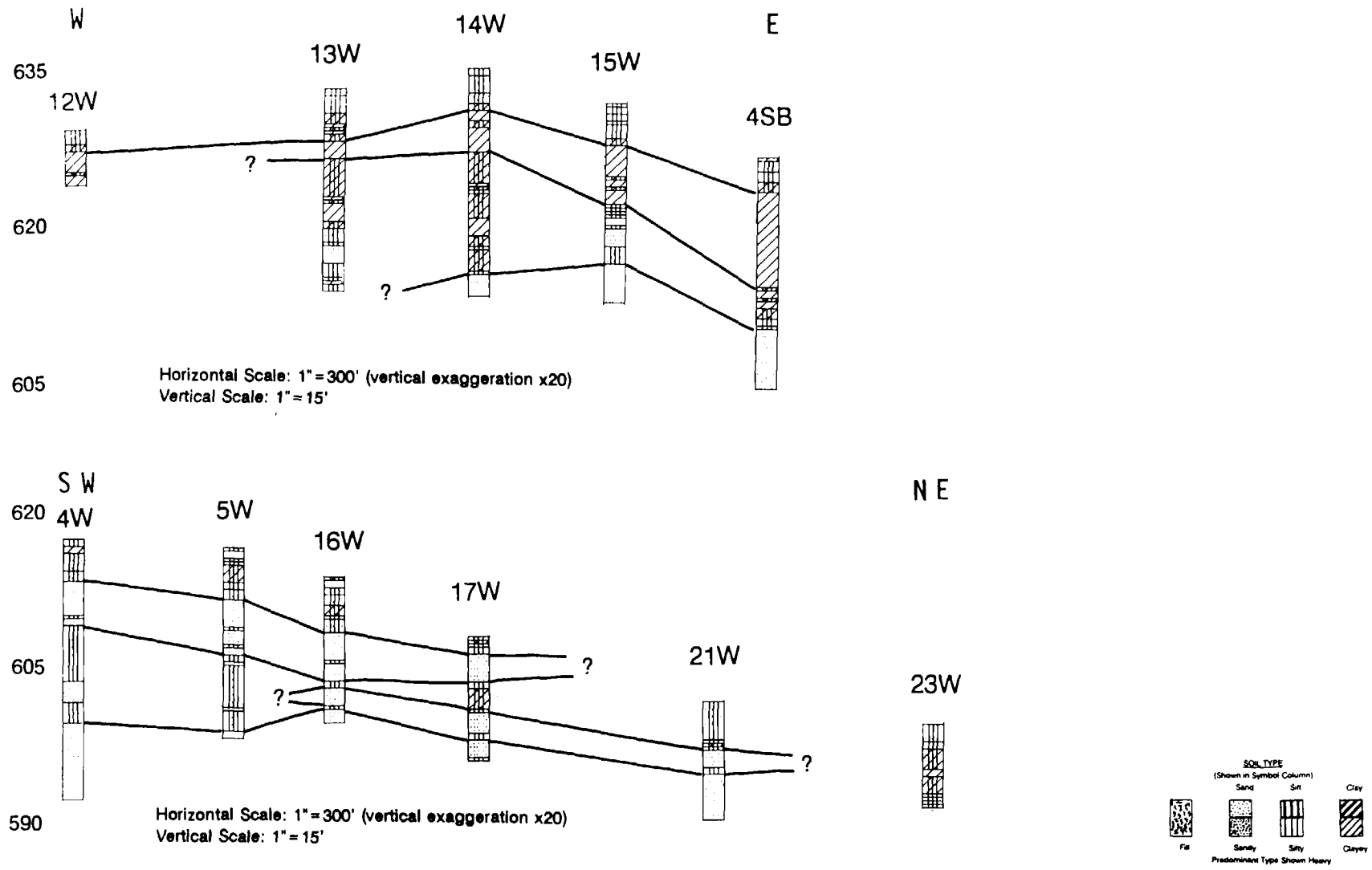


Figure 19. Representative sedimentologic cross sections in west area; vertical scale is in feet above sea level

172061

TABLE 2

SUMMARY OF SEDIMENTOLOGIC DATA

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-01SB	613.2	5	20	608.2	588.2
GMI-02SB	615.4	6	18	609.4	591.4
GMI-03SB	614	1	24	613	589
GMI-04SB	626.5	16	9	610.5	601.5
GMI-05SB	637.5	24.5	5.5	613	607.5
GMI-1N	619.6	8	4.5	611.6	607.1
GMI-2N	618.3	9.5	2.5	608.8	606.3
GMI-3N	618.3	*	0	*	*
GMI-4N	615.8	*	0	*	*
GMI-5N	615.3	*	0	*	*
GMI-6N	602.2	*	0	*	*
GMI-7N	618.5	11	7	607.5	600.5
GMI-12N	611.6	*	0	*	*
GMI-14N	615.4	19	9	596.4	587.4
GMI-19N	609.3	10.5	8.5	598.8	590.3
GMI-20N	608.8	8	11	600.8	589.8
GMI-21N	606.8	9.5	8.5	597.3	588.8
GMI-22N	610.8	15	7	595.8	588.8
GMI-23N	607.6	14	6.5	593.6	587.1
GMI-24N	610.9	15.5	8	595.4	587.4
GMI-26N	605.7	8	11	597.7	586.7
GMI-27N	605.3	1	18	604.3	586.3
GMI-28N	605.6	13	5.5	592.6	587.1
GMI-29N	606.9	10	13	596.9	583.9
GMI-30N	607.3	12.5	13.5	594.8	581.3

TABLE 2 (CONT'D)

SUMMARY OF SEDIMENTOLOGIC DATA

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-31N	606.9	12	10.5	594.9	584.4
GMI-32N	600.6	10.5	4.5	590.1	585.6
GMI-33N	606.9	11	8	595.9	587.9
GMI-34N	604.8	*	0	*	*
GMI-35N	603.5	12.5	4	591	587
GMI-36N	604.9	9.5	6	595.4	589.4
GMI-37N	602.9	14.5	11	588.4	577.4
GMI-38N	607	15.5	3.5	591.5	588
GMI-39N	603.9	17	6	586.9	580.9
GMI-40N	596.6	0.5	14	596.1	582.1
GMI-41N	595.9	9.5	25	586.4	561.4
GMI-42N	600.3	9	8.5	591.3	582.8
GMI-43N	603.8	13	7	590.8	583.8
GMI-44N	601.3	5	5	596.3	591.3
GMI-45N	601.7	9.5	5.5	592.2	586.7
GMI-46N	603.4	12	7.5	591.4	583.9
GMI-47N	614	11.5	14.5	602.5	588
GMI-48N	617.1	13.5	0.5	603.6	603.1
GMI-49N	625.9	6.5	12.5	619.4	606.9
GMI-50N	604	12	16.5	592	575.5
GMI-51N	603	10	9.5	593	583.5
GMI-52N	595.6	6	7	589.6	582.6
GMI-53N	594	7	6.5	587	580.5
GMI-54N	598.2	5.5	6.5	592.7	586.2
GMI-55N	583.2	*	0	*	*

TABLE 2 (CONT'D)

SUMMARY OF SEDIMENTOLOGIC DATA

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-56N	588.5	6	3.5	582.5	579
GMI-1S	614.1	9.5	10	604.6	594.6
GMI-2S	602.3	8.5	3.5	593.8	590.3
GMI-3S	610.5	18	4	592.5	588.5
GMI-4S	612.8	22.5	2	590.3	588.3
GMI-5S	601.6	5	8	596.6	588.6
GMI-6S	610	20	5.5	590	584.5
GMI-7S	612	11.5	6.5	600.5	594
GMI-8S	617.6	18.5	22	599.1	577.1
GMI-9S	609.3	15.5	8	593.8	585.8
GMI-10S	609.3	*	0	*	*
GMI-12S	598.5	10.5	6	588	582
GMI-13S	603.6	*	0	*	*
GMI-14S	606.3	13	7.5	593.3	585.8
GMI-15S	605.8	16	1.5	589.8	588.3
GMI-16S	607.8	14	9	593.8	584.8
GMI-17S	585.9	*	0	*	*
GMI-18S	595.8	10.5	2	585.3	583.3
GMI-19S	600.9	*	0	600.9	600.9
GMI-20S	600.4	15.5	4.5	584.9	580.4
GMI-22S	608	15	22	593	571
GMI-24S	582.8	*	0	582.8	582.8
GMI-25S	589.5	1.5	8.5	588	579.5
GMI-26S	591.2	6.5	3	584.7	581.7
GMI-27S	599.1	15	3	584.1	581.1

TABLE 2 (CONT'D)

172065

SUMMARY OF SEDIMENTOLOGIC DATA

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-28S	602.2	16.5	6	585.7	579.7
GMI-29S	606.9	*	0	*	*
GMI-32S	578.4	6.5	0.5	571.9	571.4
GMI-33S	583.4	*	0	*	*
GMI-34S	599.8	10	6.5	589.8	583.3
GMI-35S	602.6	*	0	*	*
GMI-36S	604.4	11.5	4.5	592.9	588.4
GMI-37S	603.5	20	3.5	583.5	580
GMI-38S	600.3	*	0	*	*
GMI-40S	569.4	*	0	*	*
GMI-42S	592.6	*	0	*	*
GMI-44S	601.9	*	0	*	*
GMI-45S	597.6	*	0	*	*
GMI-46S	598.6	*	0	*	*
GMI-50S	593.2	1.5	5.5	591.7	586.2
GMI-51S	574.1	*	0	*	*
GMI-53S	586.7	*	0	*	*
GMI-54S	589.8	24.5	0.5	565.3	564.8
GMI-55S	584.3	20	1.5	564.3	562.8
GMI-56S	582.8	*	0	*	*
GMI-57S	581.5	20.5	5	561	556
GMI-58S	586.5	*	0	*	*
GMI-59S	587.8	*	0	*	*
GMI-60S	593.4	*	0	593.4	593.4
GMI-61S	569.5	10	4	559.5	555.5

TABLE 2 (CONT'D)

SUMMARY OF SEDIMENTOLOGIC DATA

172063

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-62S	565.4	*	0	*	*
GMI-63S	577.2	15	8	562.2	554.2
GMI-66S	575.2	15	4	560.2	556.2
GMI-70S	568	10	3	558	555
GMI-71S	565.8	3	8	562.8	554.8
GMI-72S	574.8	16	3	558.8	555.8
GMI-73S	573.3	9	8	564.3	556.3
GMI-74S	573.5	11	12	562.5	550.5
GMI-75S	572.6	11	3.5	561.6	558.1
GMI-76S	573.4	10	5.5	563.4	557.9
GMI-77S	575.1	*	0	*	*
GMI-78S	573.5	9.5	4	564	560
GMI-82S	569.8	5.5	9	564.3	555.3
GMI-83S	573.1	9	8	564.1	556.1
GMI-84S	574.6	10.5	5.5	564.1	558.6
GMI-85S	574.3	10	6.5	564.3	557.8
GMI-86S	573.3	9.5	2.5	563.8	561.3
GMI-88S	568.7	*	0	*	*
GMI-94S	573.9	8	7	565.9	558.9
GMI-95S	573.1	10	4	563.1	559.1
GMI-4W	617.2	17	8	600.2	592.2
GMI-5W	615.4	5	13	610.4	597.4
GMI-6W	624.1	12	4	612.1	608.1
GMI-7W	622.8	6	17	616.8	599.8
GMI-8W	622.3	4.5	7.5	617.8	610.3

TABLE 2 (CONT'D)

172867

SUMMARY OF SEDIMENTOLOGIC DATA

Location No.[1]	Elevation (ft.)	Depth to Basal Sand	Sand Thickness	Elev. Top of Sand	Elev. Base of Sand
GMI-9W	630.2	13.5	11	616.7	605.7
GMI-10W	628.4	8.5	9.5	619.9	610.4
GMI-11W	621.1	7	2	614.1	612.1
GMI-12W	629.2	*	0	*	*
GMI-13W	634.1	15	3	619.1	616.1
GMI-14W	635.1	19.5	2	615.6	613.6
GMI-15W	631.6	10.5	8	621.1	613.1
GMI-16W	613.5	5	9	608.5	599.5
GMI-17W	607.9	7	4.5	600.9	596.4
GMI-18W	605.4	16.5	4	588.9	584.9
GMI-19W	607.8	8	5.5	599.8	594.3
GMI-20W	601.8	9	7.5	592.8	585.3
GMI-21W	602.3	5	6.5	597.3	590.8
GMI-23W	599.9	8	0.5	591.9	591.4
USGS-1	NA	0.5	2		
USGS-2	NA	0.5	2.5	*	*
USGS-3	NA	9	3		
USGS-4	NA	0.5	4		
USGS-5	NA	5.5	5		
USGS-6	NA	15	1.5		

[1] N, S, and W in the location name refer to the north, south, or west sampling areas
* No basal sand observed; in some cases hole was not deep enough for valid sand check
NA - not surveyed

surveyed and have neither elevations nor precise locations. USGS-5 and USGS-6 have the sequence of sand under clay so often seen on CAFB, and USGS-3 has sand in the base of the hole underlying silty sand (see Appendix D). The other three (USGS-1, USGS-2, and USGS-4) are all less than five feet deep and may not have penetrated below surficial, recent deposits; the cone penetrometer point of refusal does not always occur at the soil-bedrock interface, and it could not be determined at this location if the bedrock was shallow. The creek named Farmers Branch (which crosses the northern portion of the golf course on CAFB) intersects the spur between White Settlement Road and Clifford Avenue closest to USGS-3 and USGS-4, which are the two center holes. A soil section, approximately eight feet thick, was exposed in the creek bed with a few inches of limestone bedrock visible at the base. This is consistent with the section described in the holes by the penetrometer curves.

4.3 Groundwater Gradient and Distribution of Water

The erratic distribution of water was similar to that experienced in Phase I, although the overall percentage of holes containing water was higher in Phase II (63% rather than the previous 35%), despite the recent period of sustained drought. Previous conclusions, based on earlier work done in the area, that the interface between the soil and the less permeable bedrock provided the most likely locus for groundwater collection were supported by the drilling information in Phase II; therefore, each temporary casing had five feet of screen at the base.

Water samples and static water levels were available from approximately 60% of the punched or drilled locations (Table 3). All sites on CAFB were surveyed, and so water gradient and direction with reference to ground surface elevation were determined for the north and south sampling areas; the west area had insufficient data to develop a coherent picture of the groundwater surface. The local groundwater direction in the north area is to the east, while in the south area the direction is east-southeast. There are minor deviations, but these directions are basically consistent with previous reports.

All but one of the sampled locations contained free water at the time they were punched and could be sampled immediately. The hole in which sufficient water collected in the temporary casing overnight was initially damp (defined by the water level indicator). Two other initially damp holes, which did not initially have sufficient water, subsequently accumulated enough volume for a static water measurement,

TABLE 3

SUMMARY OF STATIC WATER LEVEL DATA

Location No.[1,2]	Ground Elevation (ft.)	Total Depth (ft.)	Depth to Water (ft.)	Water Level Elevation (ft.)
GMI-01SB	613.2	25.0	19.5[3]	593.7
GMI-02SB	615.4	24.2	22.0[3]	593.4
GMI-03SB	614.0	24.5	21.0[3]	593.0
GMI-1N	619.6	12.5	7.48	612.12
GMI-4N	615.8	9.0	5.55	610.25
GMI-5N	615.3	16.2	5.8	609.5
GMI-7N	618.5	29.6	7.4	611.1
GMI-14N	615.4	28.4	19.15	596.25
GMI-20N	608.8	19.2	14.75	594.05
GMI-21N	606.8	18.2	13.2	593.6
GMI-23N	607.6	21.0	17.05	590.55
GMI-24N	610.9	24.2	17.3	593.6
GMI-26N	605.7	19.4	12.85	592.85
GMI-27N	605.3	19.0	12.2	593.1
GMI-28N	605.6	19.5	12.7	592.9
GMI-29N	606.9	23.0	18.16	588.74
GMI-30N	607.3	26.0	18.85	588.45
GMI-31N	606.9	19.0	17.44	589.46
GMI-32N	600.6	15.4	10.5	590.1
GMI-33N	606.9	19.0	14.66	592.24
GMI-35N	603.5	17.0	10.8	592.9
GMI-36N	604.9	17.5	12.55	592.35
GMI-37N	602.9	26.0	15.22	587.68
GMI-38N	607.0	19.5	19.0[4]	588.0
GMI-39N	603.9	23.2	15.45	588.45

TABLE 3 (CONT'D)

173679

SUMMARY OF STATIC WATER LEVEL DATA

Location No.[1,2]	Ground Elevation (ft.)	Total Depth (ft.)	Depth to Water (ft.)	Water Level Elevation (ft.)
GMI-40N	596.6	14.0	8.6	588.0
GMI-41N	595.9	14.5	7.15	588.75
GMI-42N	600.3	18.0	11.5	588.8
GMI-43N	603.8	20.2	11.0	592.8
GMI-44N	601.3	18.3	12.15	589.15
GMI-45N	601.7	16.6	11.6	590.1
GMI-46N	603.4	19.5	12.95	590.45
GMI-47N	614.0	26.5	23.5	590.5
GMI-48N	617.1	14.0	9.94	607.16
GMI-49N	625.9	19.0	12.35	613.55
GMI-51N	603.0	23.7	15.82	587.18
GMI-52N	595.6	16.0	8.6	587.0
GMI-53N	594.0	14.0	8.52	585.48
GMI-54N	598.2	11.7	11.6[4]	586.6
GMI-56N	588.5	12.0	5.5	583.0
GMI-1S	614.1	20.5	19.1	595.0
GMI-2S	602.3	13.2	11.33	590.97
GMI-4S	612.8	25.0	19.7	593.1
GMI-5S	601.6	15.6	no depth[5]	N.A.
GMI-6S	610.0	25.7	20.63	589.37
GMI-9S	609.3	24.2	20.55	588.75
GMI-12S	598.5	16.8	14.25	584.25
GMI-14S	606.3	22.7	17.95	588.35
GMI-16S	607.8	23.0	18.9	588.9
GMI-18S	595.8	16.8	11.8	584.0

TABLE 3 (CONT'D)

172071

SUMMARY OF STATIC WATER LEVEL DATA

Location No.[1,2]	Ground Elevation (ft.)	Total Depth (ft.)	Depth to Water (ft.)	Water Level Elevation (ft.)
GMI-20S	600.4	20.0	12.8	587.6
GMI-22S	608.0	22.5	19.15	588.85
GMI-25S	589.5	12.7	no depth[5]	N.A.
GMI-26S	591.2	14.4	7.35	583.85
GMI-27S	599.1	19.0	13.5	585.6
GMI-28S	602.2	22.8	12.55	589.65
GMI-34S	599.8	17.0	14.8	585.0
GMI-36S	604.4	16.0	16.44	587.96
GMI-37S	603.5	23.0	13.88	589.62
GMI-38S	600.3	14.0	10.23	590.07
GMI-42S	592.6	13.5	8.2	584.4
GMI-51S	574.1	13.7	11.6	562.5
GMI-54S	589.8	28.3	18.8	571.0
GMI-55S	584.3	21.5	15.83	568.47
GMI-56S	582.8	26.2	15.8	567.0
GMI-57S	581.5	26.0	11.58	569.92
GMI-58S	586.5	17.8	7.06	579.44
GMI-59S	587.8	6.5	1.0	586.8
GMI-60S	593.4	19.2	11.55	581.85
GMI-61S	569.5	14.0	11.55	557.95
GMI-62S	565.4	11.2	9.45	555.95
GMI-63S	577.2	23.5	>14.4	<562.8
GMI-66S	575.2	19.	6.6	568.6
GMI-70S	568.0	14.5	no depth[5]	N.A.
GMI-72S	574.8	18.6	no depth[5]	N.A.

TABLE 3 (CONT'D)

SUMMARY OF STATIC WATER LEVEL DATA

Location No.[1,2]	Ground Elevation (ft.)	Total Depth (ft.)	Depth to Water (ft.)	Water Level Elevation (ft.)
GMI-73S	573.3	17.5	11.85	561.45
GMI-74S	573.5	17.7	10.5	563.0
GMI-75S	572.6	15.0	7.8	564.8
GMI-76S	573.4	15.5	7.64	565.76
GMI-77S	575.1	16.5	8.73	566.37
GMI-78S	573.5	14.1	9.32	564.18
GMI-82S	569.8	14.4	8.75	561.05
GMI-83S	573.1	17.0	10.35	562.75
GMI-84S	574.6	16.5	10.95	563.65
GMI-85S	574.3	17.0	9.7	564.6
GMI-86S	573.3	12.5	9.0	564.3
GMI-88S	568.7	7.0	5.33	563.37
GMI-94S	573.9	15.2	11.18	562.72
GMI-95S	573.1	14.1	11.23	561.87
GMI-4W	617.2	24.8	23.83	593.37
GMI-18W	605.4	23.0	14.5	590.9
GMI-20W	607.8	18.4	14.93	592.87

[1] N, S, and W in the location name refer to the north, south, or west sampling areas

[2] Sites marked SB were drilled; remainder were punched. Site GMI-03SB was drilled and subsequently twinned with the penetrometer tool

[3] Water level at time of drilling

[4] Holes had sufficient water for static level measurement, but not for sampling

[5] Water was sampled at this location, but no water level was obtained

but not a sample. GMI-4W was a deliberate attempt to duplicate the location of the 1992 hole GMI-019 on the south side of White Settlement Road. A water sample from the original hole was broken by lab personnel, and multiple subsequent attempts to obtain another sample were unsuccessful, even though these attempts were made within a few feet of the original hole and to comparable depths. Both a sample and a water level were collected from GMI-4W in 1993; depths were comparable to the 1992 depths of GMI-019.

Soil boring GMI-SB2 (TD = 23 feet) contained water; however, penetrometer locations #5W and #16W, located approximately 230 feet away to the north and northeast, respectively, were both dry. The TDs were dissimilar with 16W bottoming at 14 feet and 5W bottoming at 18 feet, both depths at which the GMI-1SB descriptive soil log records hard layers which caused difficult drilling. Other lithologic logs also report occasional relatively hard layers up to several inches thick variously referred to as sandstone, limestone, or marl. These layers, if thick and hard enough, could act as "pseudo-bedrock" and halt the penetrometer some unknown distance above actual bedrock and above the water-bearing strata. The two 1993 logs in the area of GMI-2SB suggest a location where the penetrometer was not able to reach a sufficient depth for water sampling. It must be concluded that other potentially water-bearing holes in the project area were dry because of inadequate depth or that the lengthy dry spell which preceded the field sampling period impacted available water and had an adverse affect on sample collection.

Most sampled holes include a sand section at or near the bottom of the hole, while the holes which could be determined to be "genuinely" dry (based on comparison with nearby penetrometer profiles or with soil boring descriptions) have a dominantly clay/silt character. However, some holes are anomalous with clay and/or silt which were water-bearing or substantial sand sections near the bottom which were dry.

In 1992 hole GMI-019 was the only (initially) successful attempt to get a water sample south of White Settlement Road from 25 sites. In 1993 three penetrometer holes in 15 attempts hit water as did three of the five soil borings. Both types of sample sites (drilling and punching) tended to be dry toward the south, i.e., away from White Settlement Road. This was not strictly a function of shallow depth, because, while there were shallow penetrometer holes, there were also seven dry holes which approached or exceeded 20 feet at TD. Previous work with monitor well installation and monitoring (Radian Corporation 1991; Jacobs Engineering 1993) has also indicated variable water levels over relatively short distances (Figure 20).

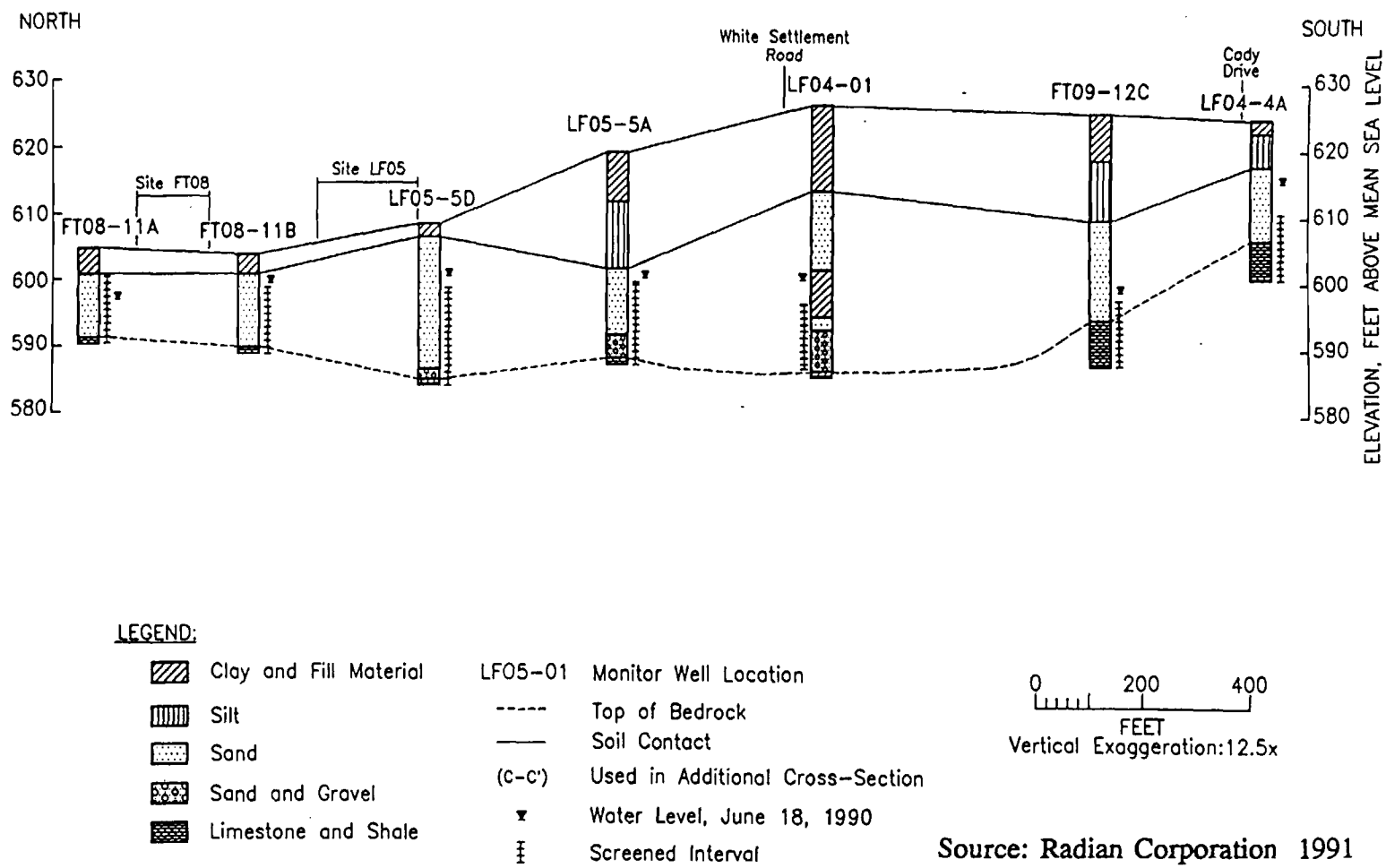


Figure 20. Typical geologic cross-section constructed from sedimentologic logs showing variance in water levels

172071

Phase II results have not substantively altered the conclusions expressed in the Phase I report (Geo-Marine, Inc 1992) regarding the four factors thought to be responsible for the variable occurrence of water.

(1) The cone penetrometer can be stopped by the first hard layer; if this is an isolated layer within the soil profile, rather than the top of continuous bedrock, the water-bearing horizon may lie below. This was clearly the case with GMI-5W and GMI-16W both punched in 1993 near GMI-1SB where hard layers identified in the soil boring coincide with the TDs (at the point-of-refusal) of the two nearby penetrometer holes.

(2) The 1993 sampling took place in late July and through August during which time the area received virtually no rainfall and followed a two-month hot and dry period. Recharge to shallow groundwater in this area is almost exclusively from the surface, either through downward percolation or more directly from local surface water such as Lake Worth and Farmers Branch. There had not been any heavy rains prior to Phase II sampling since May.

(3) Recovery in at least some of the monitor and production wells is documented by others as being slow. Only three initially moist holes left open up to 24 hours by GMI accumulated sufficient water for either sampling or static water level measuring; no initially dry holes accumulated water overnight.

(4) It is possible that water may occasionally occur at levels other than the soil-rock interface, although this was not directly observed. If these relatively porous lenses encased within less permeable material occurred more than five feet above the base of the hole, they would be sealed off as long as the casing and screen remain in the ground.

4.4 Data Distribution

Analytic data distribution reflects water distribution as well as deviations in the sample grid necessitated by restricted areas, utilities, buildings, historic structures, roads, and golf course considerations. GMI believes that some holes were genuinely dry while some were not deep enough; it is not possible to differentiate between the two cases with certainty at all dry locations. Contoured concentration maps have been prepared with general groundwater gradient and TCE plume boundary indicated. Neither the continuity nor the boundary of the contamination plume can be unequivocally established in all areas; it is indicated by a dashed line.

Figures 21, 22, and 23 show concentration values of TCE in the north, south, and west areas, respectively. The three maps indicate local groundwater gradient direction as determined from the

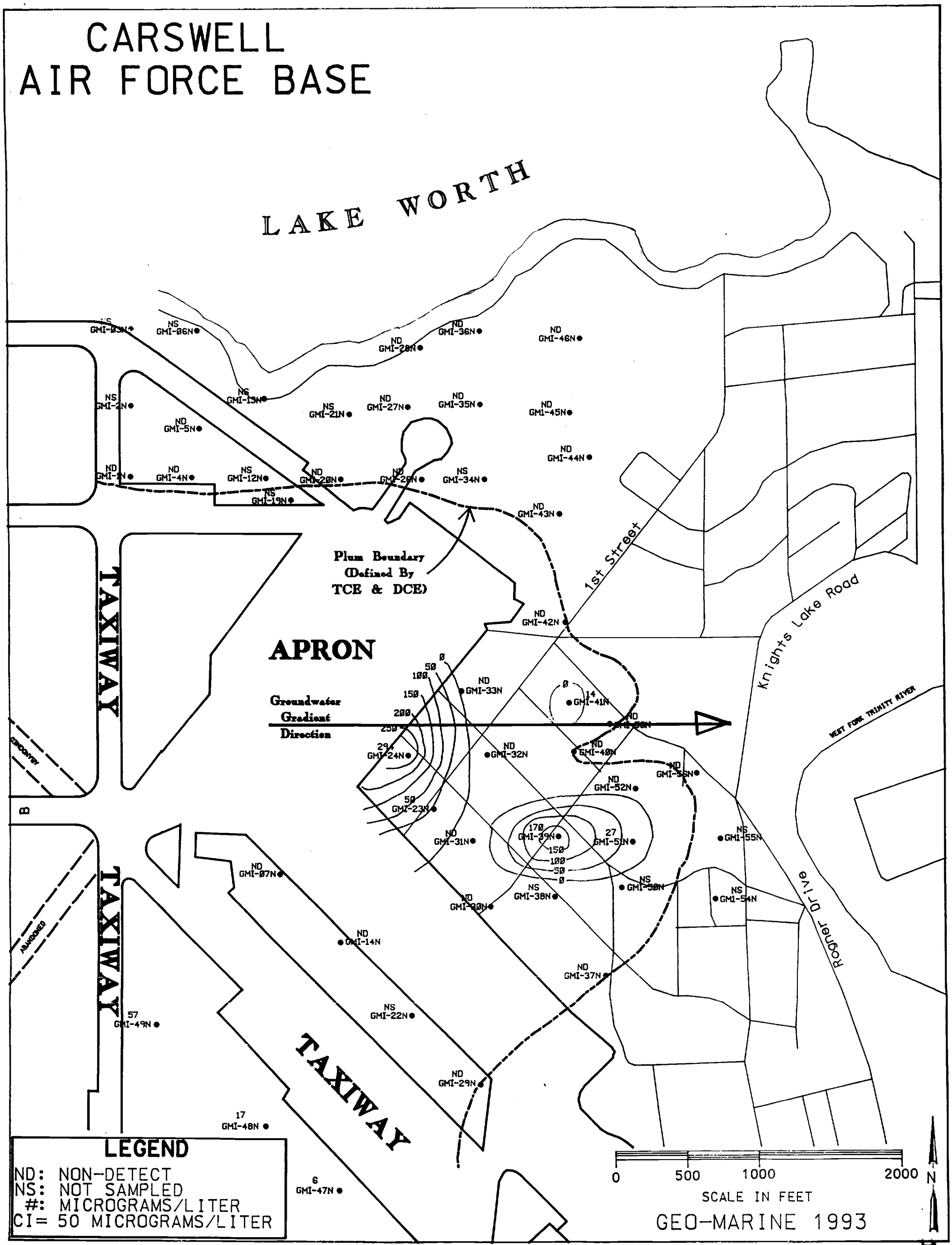


FIGURE 21. Trichloroethene Concentration Distribution Map (North)

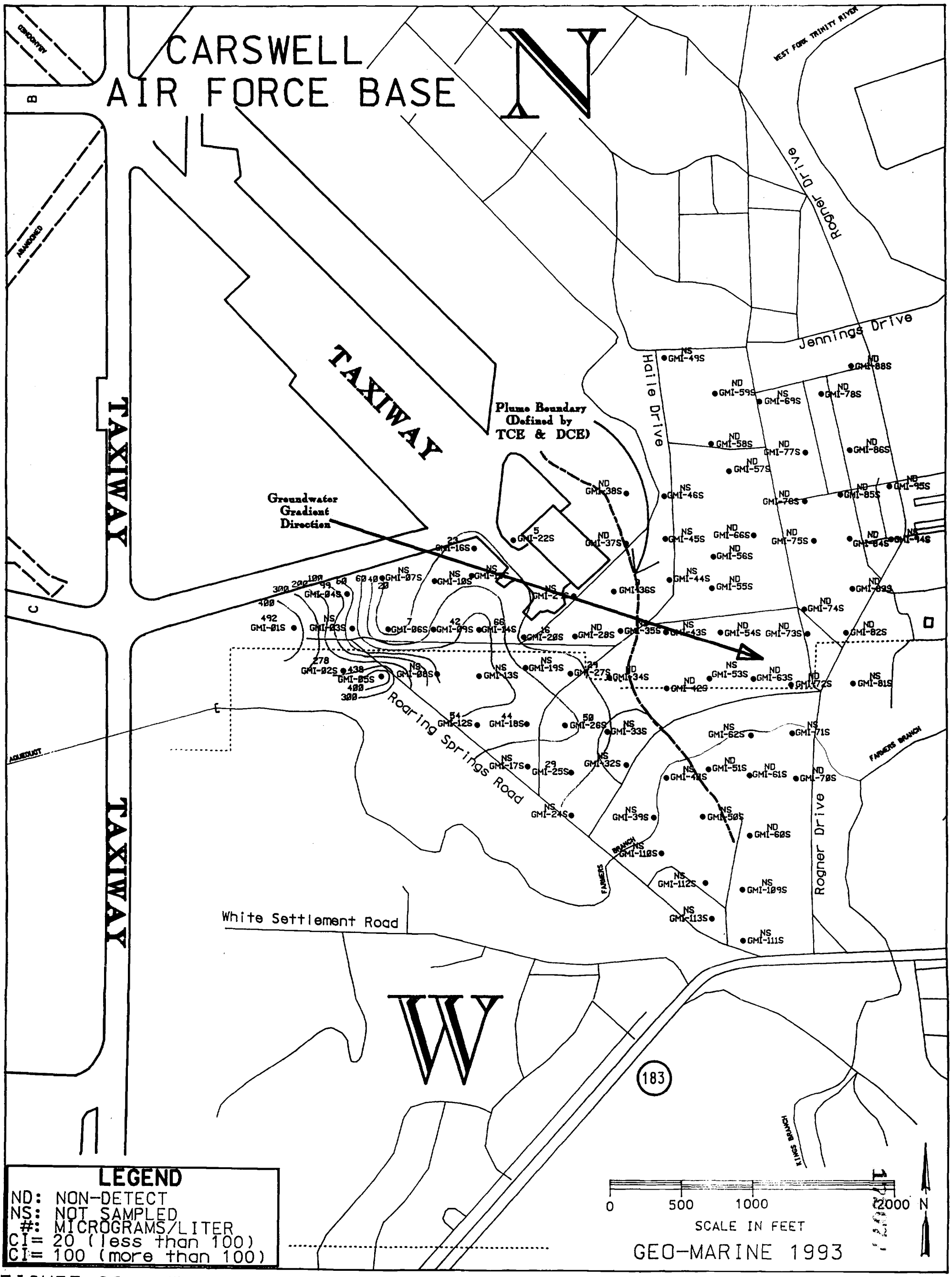


FIGURE 22. Trichloroethene Concentration Distribution Map (South)

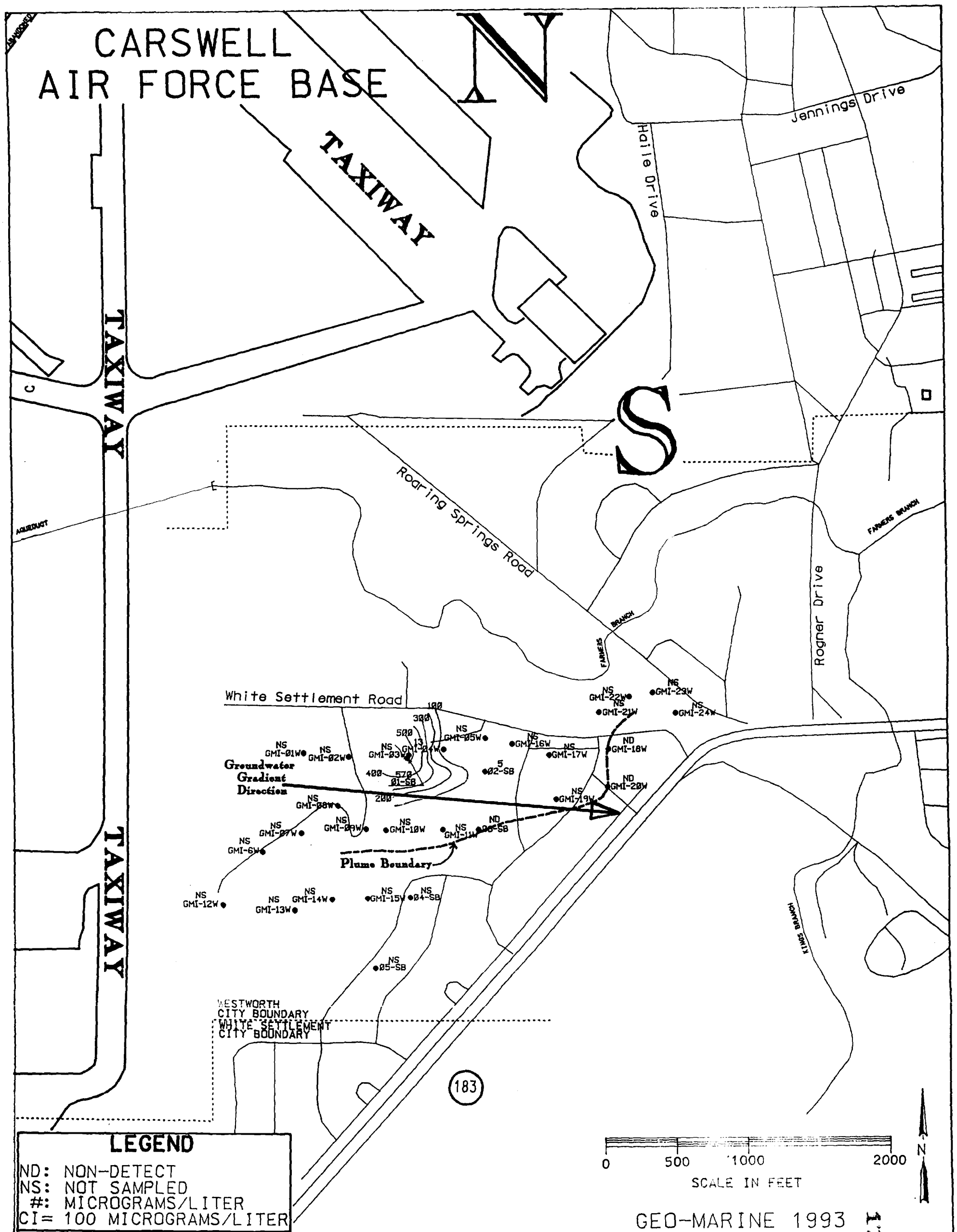


FIGURE 23. Trichloroethene Concentration Distribution Map (West)

relative elevations of static water levels in sampling holes, as well as the plume boundaries. Distribution of 1,2-DCE (both cis- and trans-) helped determine these boundaries, because occasionally samples which are ND for TCE tested positive for DCE. Figure 24 shows the distribution of BTEX in the south area; it was not detected in any samples from the other two areas (Table 4).

4.4.1 Chlorinated Solvents

In the north area the highest values of TCE (> 100 μg/l) occur in two close, but separately defined areas, east of the intersection of Apron 160 and 161 and are defined by values at sample points 23N and 24N and around sample sites 39N and 51N. Plume boundaries have been defined to the north toward Lake Worth and to the east and southeast (see Figure 21). They are open ended to the south toward the south sampling area and to the west and southwest where restricted areas plus the extensive concrete cover of the runways inhibited sample collection.

Positive values for cis-1,2-DCE and trans-1,2-DCE are also clustered in the central part of the north area adjacent to Aprons 160 and 161; however, some of the higher values are offset to the east of the TCE in the downgradient direction, particularly around sample points 41N and 51N, while the western margin of the two compounds is essentially the same. The plume boundaries discussed above reflect the distribution of DCE as well as TCE and therefore sometimes include sample sites which tested ND for one or the other compound (e.g., sites GMI-31N, GMI-32N, and GMI-33N were ND for TCE, but had positive values for DCE).

In the south area the highest values for TCE are concentrated in the far west corner on either side of the east-west road which runs between Haile Drive and Roaring Springs Road; the highest values are at sample sites GMI-1S, GMI-2S, and GMI-5S. There are no positive values for either TCE or DCE east of sample point GMI-36S. Plume boundaries are defined to the east and to the south across Roaring Springs Road into the golf course where values are continuous with GMI 1992 data (see Figure ?). As in the north area, relative values for DCE mimic TCE, except that the values are lower and the higher values are offset slightly in the downgradient direction (east-southeast) at sample points GMI-18S, GMI-22S, and GMI-25S.

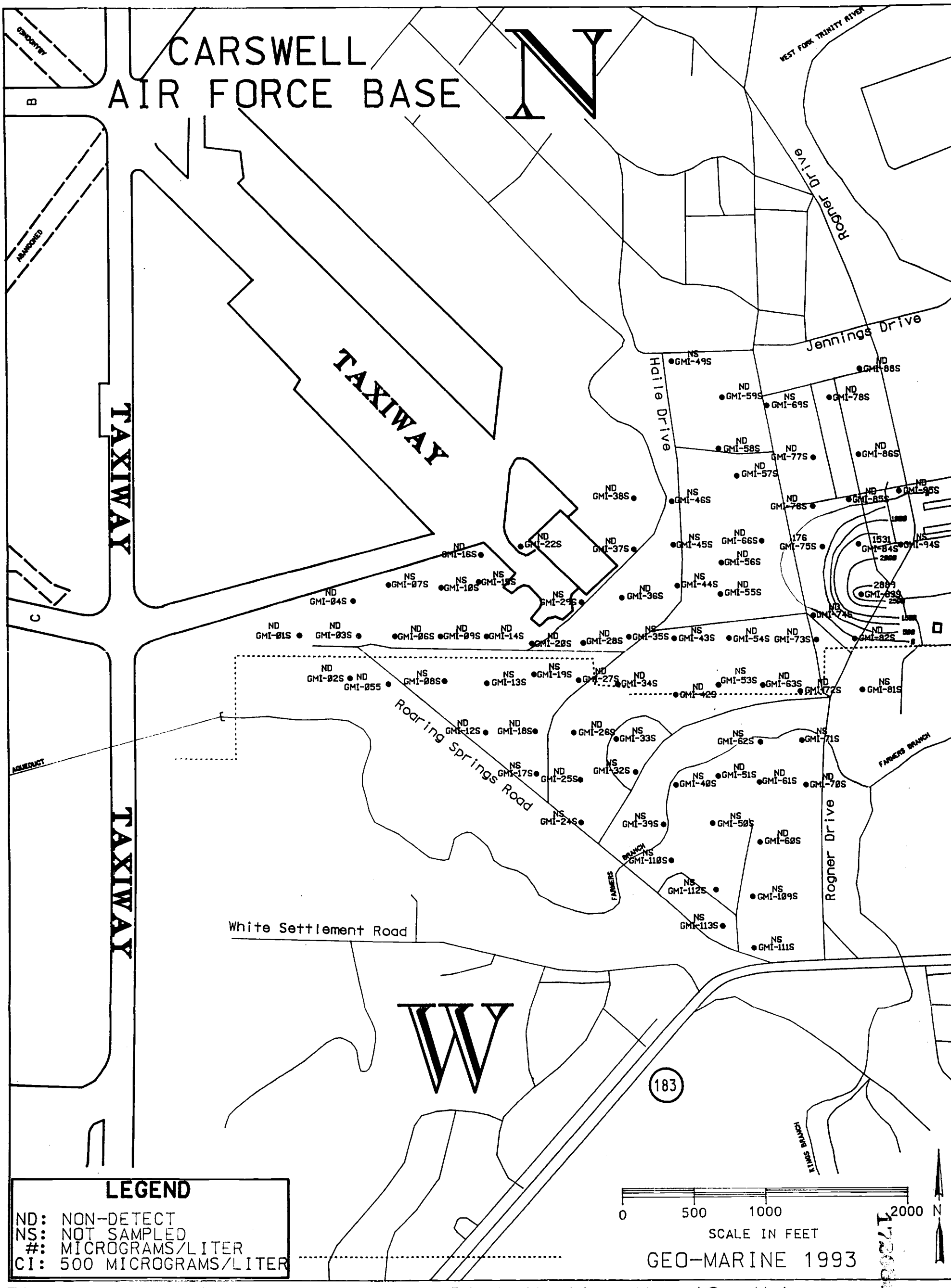


FIGURE 24. BTEX Concentration Distribution Map (South)

TABLE 4

LABORATORY RESULTS/EPA METHOD 8021

Sample No.	TCE	c-1,2-DCE	t-1,2-DCE	B	T	E	X
GMI-01SB	570	320					
GMI-02SB	4.8						
GMI-23N	50	19	9				
GMI-24N	294	138					
GMI-31N		32	48				
GMI-32N		57	48				
GMI-33N		74	51				
GMI-39N	170		15				
GMI-40N		5	4				
GMI-41N	14	76	91				
GMI-42N	3						
GMI-47N	6						
GMI-48N	17						
GMI-49N	57	11					
GMI-51N	27	61	72				
GMI-52N		6	8				
GMI-1S	492	73					
GMI-2S	278	32					
GMI-4S	99	14					
GMI-5S	438	66					
GMI-6S	7						
GMI-9S	42	7					
GMI-12S	54	10					
GMI-14S	66	15					
GMI-16S	23						

TABLE 4 (CONT'D)

172082

LABORATORY RESULTS/EPA METHOD 8021

Sample No.	TCE	c-1,2-DCE	t-1,2-DCE	B	T	E	X
GMI-18S	44	60					
GMI-20S	16	14					
GMI-22S	5	59					
GMI-25S	29	37					
GMI-26S	50	12					
GMI-27S	29	30	19				
GMI-36S	3						
GMI-75S						176	
GMI-83S				633		2256	
GMI-84S				852	115	465	99
GMI-4W	13						

Blank indicates the result was bdl
All results in μg/l (ppb)

In the west area there are two soil boring sites and one penetrometer site with positive values and two other sampled penetrometer sites with ND results. This probably does not adequately characterize the interior of the area, because of the problems with achieving adequate depths (see Section 4.3). However, two cone penetrometer sites and one soil boring along the east side of the golf course (GMI-18W, GMI-20W, and GMI-3SB) define the eastern plume boundary south of White Settlement Road in line with GMI Phase I results (1992) which defined the plume on the west side of Pumphrey Road north of White Settlement Road (see Figure 23). The plume is also believed to be defined to the south of White Settlement Road across the golf course by the east-west line of dry penetrometer locations GMI-12W, 13W, 14W, and 15W and soil boring GMI-4SB. The latter bottomed on dry bedrock and is correlative with the logs of the other four penetrometer sites (see Figure 19).

At this time it appears that the TCE plume is contained on CAFB as off-base migration has not been documented in any direction. However, the plume or plumes on CAFB are not defined to the west toward AFP4. Therefore, location of the source or sources of the TCE,especially with regard to the border between CAFB and AFP4, cannot be confirmed from these data.

All of the six locations along the railroad spur west of CAFB and south of AFP4 were dry; however, their primary purpose was to determine the presence and depth of alluvium in the area (see Section 4.2).

The other six halocarbons specified in the SOW (1,1-DCE, 1,1-DCA; 1,1,1-TCA; 1,1,2-TCA; PCE; and VC) had no positive results from the holes from which water was obtained during this phase; in contrast data for the 1992 GMI Phase I work included results for PCE and 1,1-DCE. None of the other compounds which are included in the EPA method 8021 scan had positive results in any of the samples. The number of chlorinated compounds identified at CAFB in Phase II investigation is much narrower than during Phase I (1992). At that time a total of nine halocarbons showed positive, although four of them appeared only in isolated spikes which were not deemed significant.

4.4.2 Petroleum Hydrocarbons

The BTEX components were only identified in the south area at three locations, all directly east of the truck fueling facility on Knights Lake Road. This is only a block east of POL and the Ditch, two of the sites originally identified as possible contaminant sources (see Figure 5). Site GMI-75S (E only), site GMI-83S (B and E), and site GMI-84S (B,T,E, and X) are all down gradient from the two sites. Sites GMI-57S, 58S, and 66S are all closer to the tank farm and ditch, but the samples tested ND for all components, including halocarbons as well as BTEX (see Table 4). This suggests subsurface leakage at the truck fueling facility may account for the elevated values. The BTEX area is confined, except to the east (see Figure 24).

4.5 Source(s) and/or Derivation of Contaminants

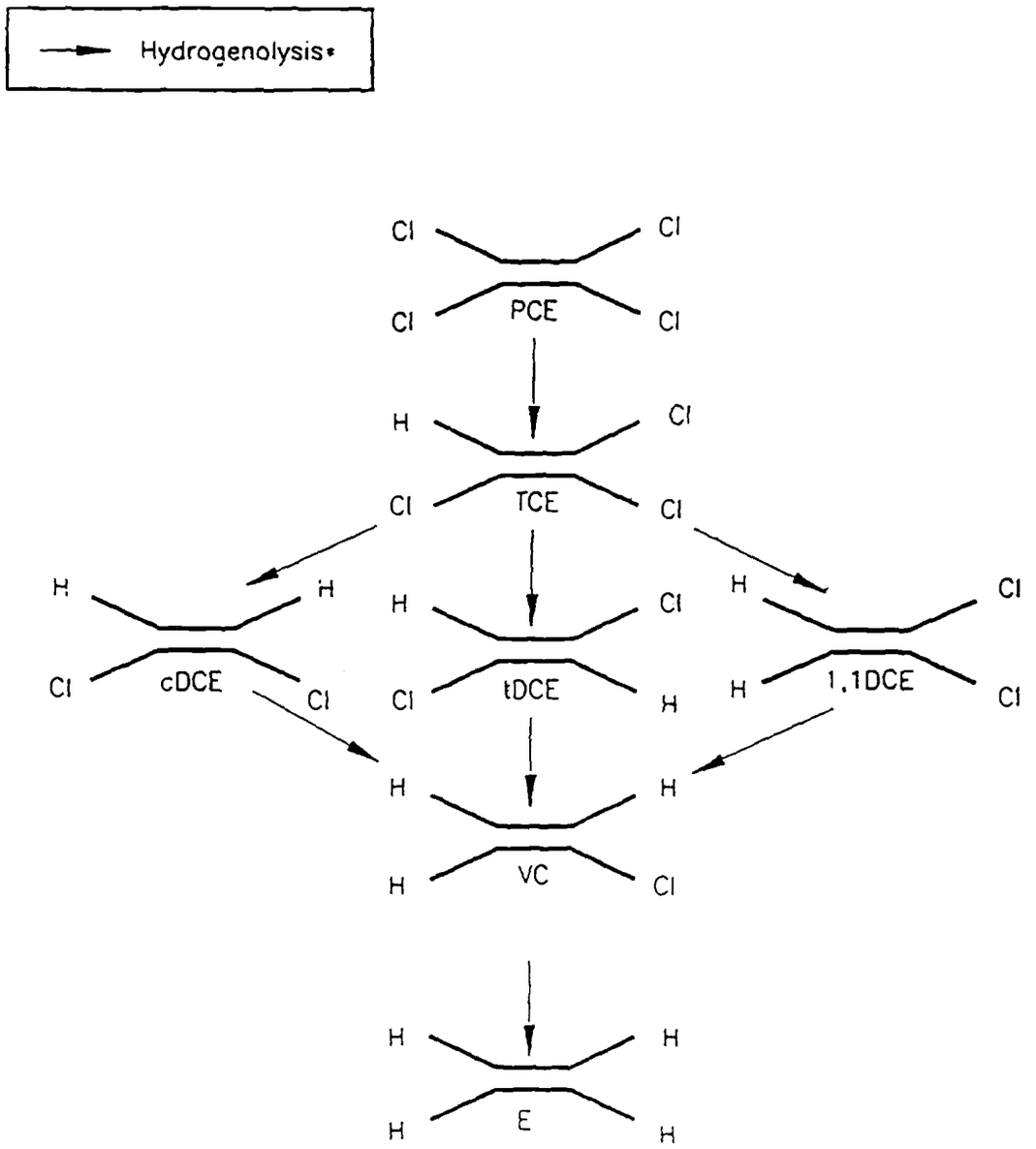
Purgeable halocarbons have the potential to degrade into other compounds analogous to the decay of radioactive elements. Therefore, not all of those compounds identified in the water under CAFB are directly explained by disposal or leaks. According to Radian Corporation (1991), TCE can react via

hydrogenolysis to form the DCE group and so on to an end product of ethene (Figure 25). Hydrogenolysis is a reduction reaction which in series can progressively replace the halogen ions (in this case chloride) by hydrogen. The timing of these reactions is believed to be relatively short (days to a few years) and may account for some of the variety of compounds and diversity of occurrence observed at CAFB. It is not known if variables influencing the hydrogenolysis process in any way explains the reduction in number of compounds identified in this phase as compared with the 1992 work.

The requirements under the SOW do not include source identification. It can be noted, however, that clusters of positive halocarbon values in the north sampling area are not near any of the suspected contaminant sources originally identified (see Figure 2). In general this area had virtually no groundwater data (e.g., from monitor wells sampled by Jacobs Engineering) prior to the GMI Phase II sampling. The halocarbon results in the south area are also not near suspected sources and have little monitor well or other data nearby, except on the south edge where the sites are contiguous to GMI 1992 Phase I data. The hydrocarbon sites in the south area (as previously noted) are near the POL tank farm, a possible source area (Radian Corporation 1986); however, the closest potential source, the truck fueling facility, was not identified in the Radian Corporation report (1986).

Both the north and south areas have elevated TCE/DCE values open to the west. The widespread use of TCE in the past at both AFP4 and CAFB means the potential for multiple sources exists, and additional delineation west of the GMI 1993 north and south areas is needed for specific source identification. This effort, if pursued, could be impeded by the extensive concrete cover in the runway/taxiway areas.

The west sampling area is better supplemented than the other two both by 1992 GMI results and the intermittent monitoring of wells installed in the area by Radian Corporation, International Technology Corporation, and others. Results south of Farmer Branch suggest that AFP4 is the source, but that waste burial area WP-07 on CAFB has contributed to the plume. Elevated values north of Framers Branch, especially near Roaring Springs Road, may be supplemented by materials disposed of at Landfill 6 (Niebuhr 1993).



PCE - tetrachloroethene
TCE - trichloroethene
cDCE - cis-1,2-dichloroethene
DCE - trans-1,2-dichloroethene
1,1DCE - 1,1-dichloroethene
VC - vinyl chloride
E - ethene

* A reduction reaction in which a carbon-halogen bond is broken and hydrogen replaces the halogen

Source: Radian Corporation 1991

Figure 25. The chemical process called hydrogenolysis, which results in the breakdown of trichloroethene to a number of other compounds, including vinyl chloride

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Phase II program of water sampling, soil delineation, and static water level measurements at CAFB have led to the following conclusions:

(1) Groundwater contamination by TCE and some of its breakdown products is widespread on CAFB; however, in the areas studied to date there does not appear to have been migration outside the boundaries of CAFB.

(2) The boundaries of the TCE plume or plumes on CAFB have been generally defined to the north, east, and south (Figure 26). However, elevated TCE values are open to the west in all three 1993 sampling areas. Therefore, it is not known at this time if AFP4, supplemented by WP07, is the only primary source, or if one or more additional sources exist on CAFB.

(3) Groundwater contamination by jet fuel and/or gasoline is not defined, but was identified in the GMI 1993 south sampling area at three sites near the truck fueling facility which is a block from the POL Tank Farm and Flightline Drainage Ditch.

(4) The rapid analytic results available from the on-site mobile laboratory allowed changes in site locations during the project based on those results.

(5) Successful use of the cone penetrometer to sample water in the area around and to the south of White Settlement Road (in the golf course area) has been inconsistent because of isolated hard layers within the sediment column above true bedrock. Based on soil boring profiles, these hard layers are believed to have caused probe refusal in some locations before the water-bearing horizon was reached.

(6) The penetrometer worked well in the 1993 north and south sampling areas where there were relatively few dry holes.

(7) The use of the electronically generated soil profiles to identify sand and gravel and, therefore, delineate channels in the subsurface has had limited success. Comparisons of soil descriptions with nearby cone profiles show varying degrees of correlation; however, this could reflect the inherent sedimentologic variations in the area.

(8) Based on the cone penetrometer profiles, water can be present in holes with a continuous section of fine-grained sediments, while some thick sand sections were dry holes. This suggests that small scale sedimentologic variations, not visible on the profiles, can influence fluid migration.

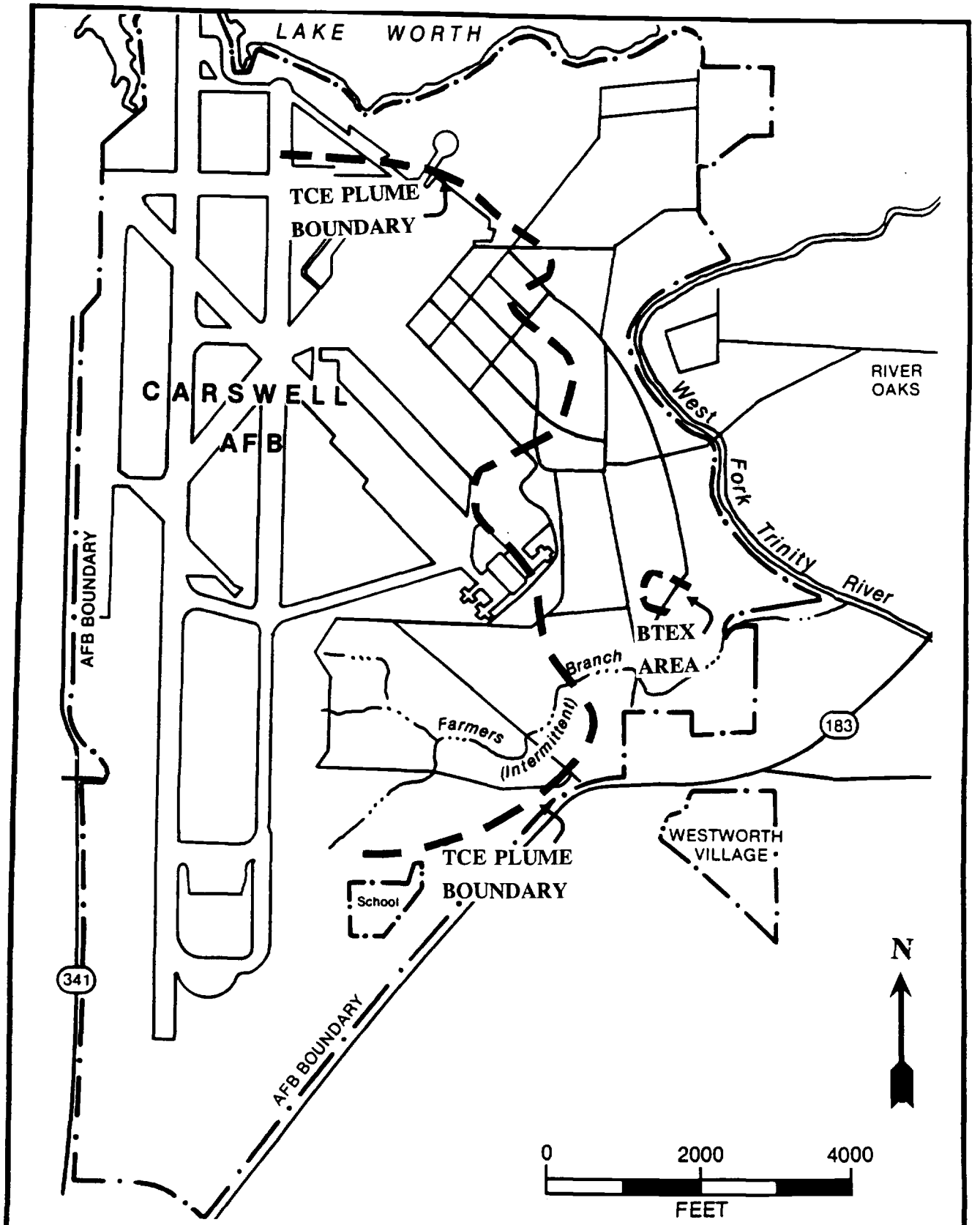


Figure 26. Trichloroethene plume boundaries and BTEX area defined by Phase I and Phase II sampling

(9) Groundwater gradient direction measured in the north sampling area is to the east and in the south and west areas groundwater flow is to the east-southeast, which is consistent with previous determinations.

5.2 Recommendations

Additional sampling to the west of the 1993 north and south sampling areas would have the potential to answer the following questions.

(1) Is there more than one TCE plume on CAFB?

(2) Is there one or more TCE sources on CAFB in addition to the sources previously identified on AFP4 and waste burial area WP07, previously identified on CAFB?

(3) Is the plume or plumes as irregular and discontinuous as current detailed data suggest?

For future groundwater investigation work conducted at CAFB, the following are recommended:

(1) The choice of equipment to obtain the soil and/or water samples should be dependent on the sampling area, i.e., around and to the south of White Settlement Road, a drill rig should be used for greater depth, while in the GMI 1993 north and south sampling areas the penetrometer truck should be used.

(2) An on-site mobile laboratory should be used for reconnaissance plume delineation because rapid sample results maximize the usefulness of each sample site location.

(3) Each water sample should be analyzed for a variety of contaminants, regardless of the immediate objective of a project, because of the diverse and widespread problems known to exist at CAFB.

172689

6.0 REFERENCES

Carter and Burgess Inc. 1993. Survey of Carswell Air Force Base Sample Locations.

Fugro Geosciences, Inc. 1993. Cone Penetrometer Testing and Related Services Carswell Air Force Base, Texas.

Geo-Marine, Inc. 1992. Groundwater Sampling Report - Phase I. 1992

Hargis and Associates. 1989. Summary of Interim Remedial Investigations January 1987 to April 1989, U.S. Air Force Plant No. 4, Fort Worth, Texas, Vol. I, II, and III.

Hargis and Montgomery. 1983. Phase I Investigation of Subsurface Conditions at U.S. Air Force Plant No. 4, Fort Worth, Texas, Vol. 1.

International Technology Corporation. 1993. Phase I and II Report: Field Sampling, Analysis, and Testing, Carswell Air Force Base, Landfills 4 and 5, Fort Worth, Texas.

Jacobs Engineering Group Inc. 1991. Installation Restoration Program (IRP) Quarterly Groundwater Monitoring Quarterly Letter Report. Air Force Plant 4, Texas.

Jacobs Engineering Group Inc. 1992. Installation Restoration Program (IRP) Quarterly Groundwater Monitoring Quarterly Letter Report. Air Force Plant 4, Texas.

Jacobs Engineering Group Inc. 1993. Installation Restoration Program (IRP) Quarterly Groundwater Monitoring Comprehensive Sampling Round Letter Report. Air Force Plant 4, Texas.

Niebuhr, Randy. 1993. Personal communication between Mr. Randy Niebuhr, USACE, and Lyle Winnette, Geo-Marine, Inc. November 18.

Partnering Meeting. 1993. Minutes of 6/29/93 Meeting and Attachments.

Proctor, N.H., J.P. Hughes, and M.L. Fischman. 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold, New York.

Radian Corporation. 1986. Installation Restoration Program (IRP) Phase II, Stage 1, Vol. 1 Final Report, Carswell AFB, Texas, for Period 12/84-4/85.

Radian Corporation. 1991. Installation Restoration Program (IRP) Phase II, Stage 2, Vol. 1 and 2, Final Report, Carswell AFB, Texas, for Period 1988-1991.

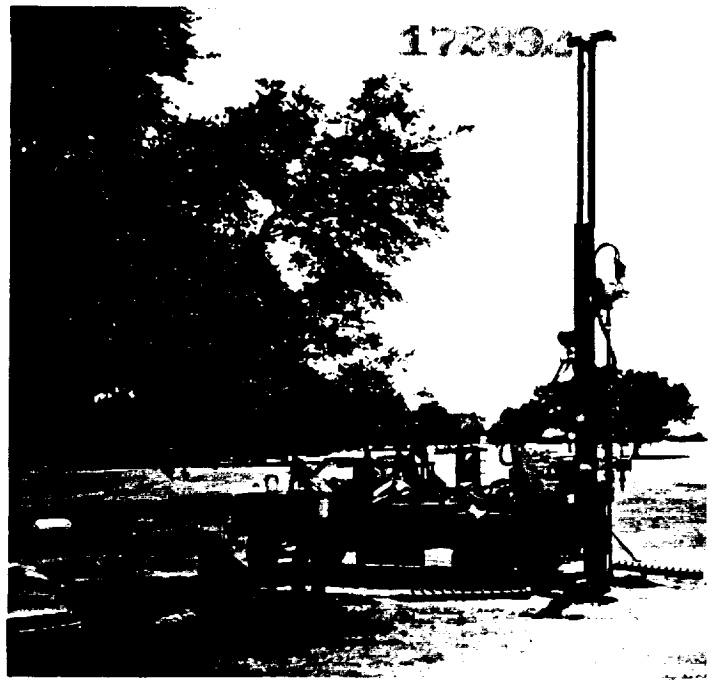
Transglobal Environmental Geochemistry Inc. 1993. Data Reports and Plots.

Wagner, R. E. (ed.). 1992. Guide to Environmental Analytical Methods: Genium Publishing Corp., Schenectady, N.Y.

7.0 ACRONYMS AND ABBREVIATIONS

AFP4	Air Force Plant No. 4
BTEX	benzene, toluene, ethyl-benzene, and xylenes
CAFB	Carswell Air Force Base
cps	centimeters per second
Cr	chromium
DCA	dichloroethane
DCB	dichlorobenzene
DCE	dichloroethene
DCP	dichloropentene
DNAPL	dense non-aqueous phase liquid
EPA	Environmental Protection Agency
FDTA	fire department training area
Fm	Formation
GMI	Geo-Marine, Inc.
HNu	a photo-ionization detector for organic vapors
IT	International Technology Corporation
IRP	Installation Restoration Program
JP-4	jet fuel
LF	landfill
MCL	maximum contaminant level
μg/l	micrograms per liter
ml	milliliters
MSDS	material safety data sheet
msl	mean sea level
ND	non-detect
PCE	tetrachloroethene
POL	petroleum, oil, and lubricants
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
QA	quality assurance
QC	quality control
SHERP	Safety, Health, and Emergency Response Plan
SOW	scope of work
SWDL	Southwestern Division Laboratory
TCA	trichloroethane
TCE	trichloroethene
TD	total depth
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon
TOX	total organic halides
USACE	U.S. Army Corps of Engineers
VC	vinyl chloride
VOA	volatile organic analysis
VOC	volatile organic compound
WP	waste burial area

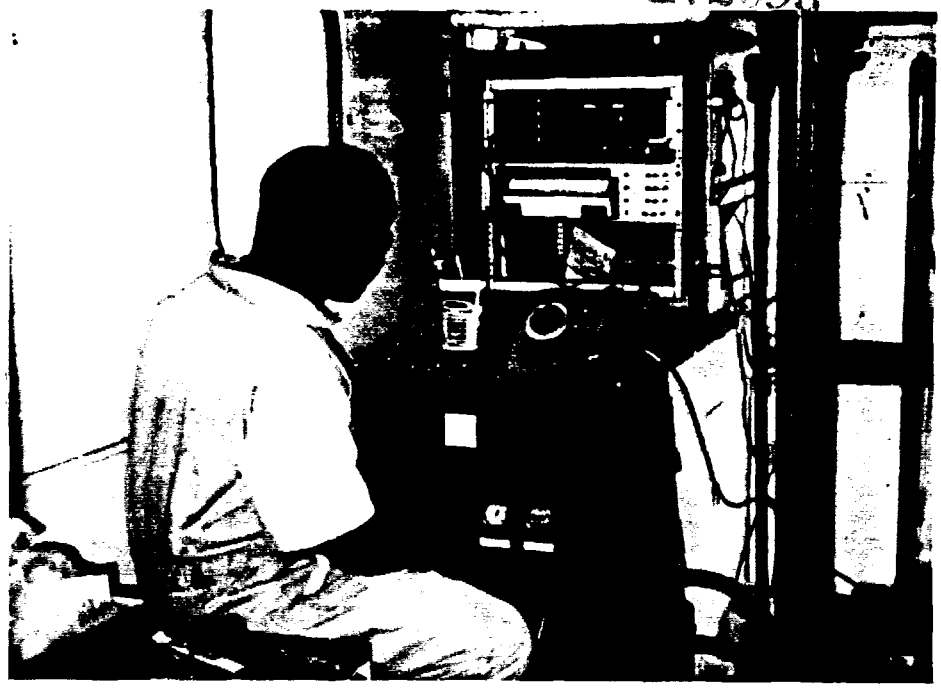
Representative samples were taken from drums of soil cuttings and decontamination water for analysis to determine the appropriate disposal procedure.



Geo-Marine's truck-mounted drill rig was used at five locations to collect water samples and static water levels and to obtain visual soil descriptions. This is soil boring #2 at the edge of the golf course.

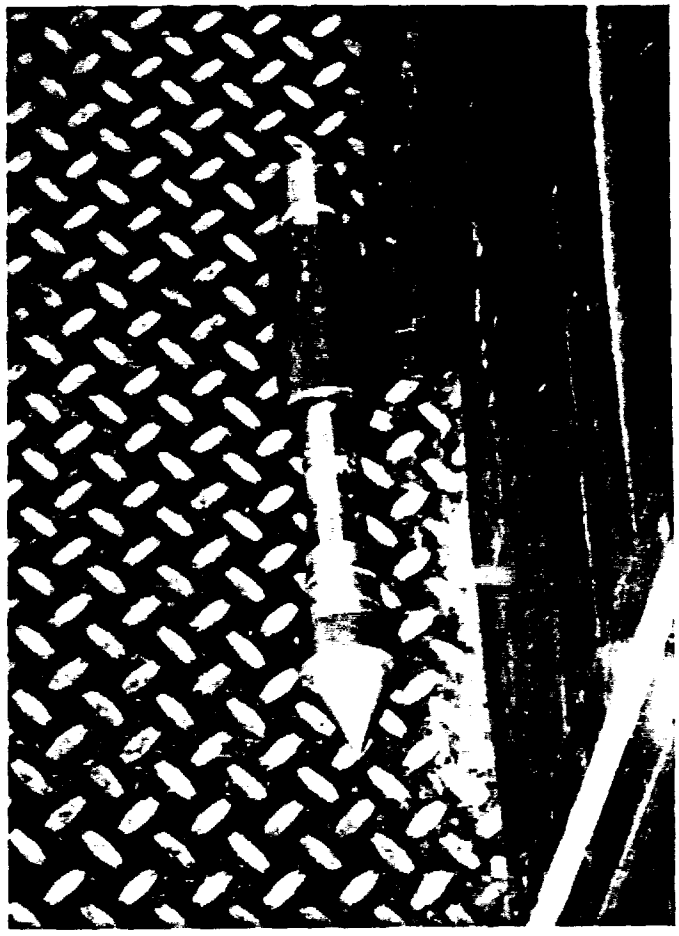
Several soil cores from the upper part of boring #3 laid out for description with soil from the deepest horizon in the foreground. The gray, more cohesive portion on the far side of the dark plastic is part of the upper clay-rich section, the medium yellow-brown section in the middle is transitional with more sand, and the tan material in the foreground is loose, clean sand which is often water bearing. This sequence of the sand component of the soil increasing with depth was commonly seen during the project.

The operator's control center consists of hydraulic controls and an analog and digital logging system. Data can be stored on strip chart recorder and on computer disk simultaneously.



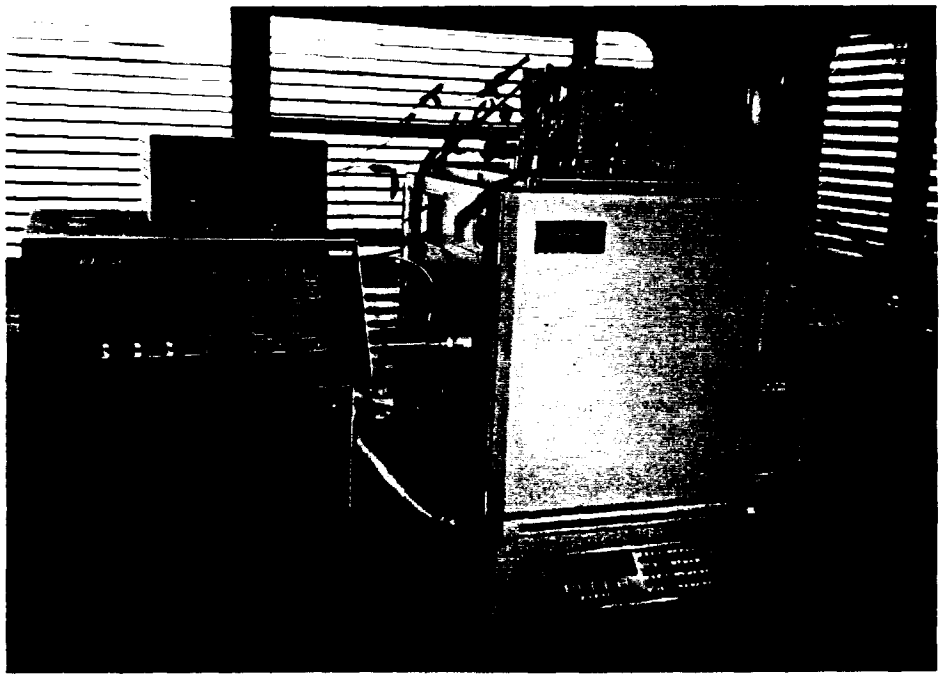
Immediately after a CPT test, inserting one-inch diameter PVC screen and riser was the most efficient tool for sampling groundwater and recording static water level. Occasionally the hole would collapse, and the PVC would be placed in the ground via GMF casing with a "dummy tip" (right). On the left, PVC is inserted to the bottom inside the GMF casing. The disposable dummy tip remains in the hole.

The Fugro Cone Penetrometer Truck is shown leveled by hydraulic jacks and ready to record CPT data. The CPT probe is not visible.



The Fugro Penetrometer System uses two different types of tubing. On the left, the friction cone, used for recording the CPT data, is shown resting on a stack of GMF casing after completing a CPT test. Decontamination of the cone usually took place immediately before punching the next hole. On the right, the Push-in Water Sampler with GMF casing were occasionally used for water sampling. The built-in stainless steel screen is displayed open and exposed as it would be while sampling. A mini-bailer would simply be dropped down the casing to retrieve a sample.

Groundwater was sampled as soon as the truck moved off location. Both stainless steel and transparent teflon mini-bailers were used in collecting samples. Two to three 40 ml vials were filled depending on the lab's request.



Transglobal Environmental Geochemistry (TEG) mobile lab utilizes a gas chromatograph (right) with a headspace analyzer (left). The Shimadzu GC incorporates a Hall electron capture detector. Samples can be analyzed within one hour.

172097

GEO-MARINE

RECORD OF SUBSURFACE EXPLORATION

Project No.: 1161-052
Project: CARSWELL PH 2
Drilling Co: GMI
Driller: HST
Drilling Method: HSA

Well/Boring #: GMI-01SB
Depth of Boring: 25.
Depth of Well: NR
Length of Screen: 5'
Length of Casing: 20'
Logged By: LLD & TCM

Date Drilled: 7/28/93
Diameter of Boring: 6"
Diameter of Screen: } 4" (temp.)
Diameter of Casing: }
Slot Size: .01
Well Material: PVC Sch 40

DEPTH FEET	SOIL DESCRIPTION	~~SAMPLE NUMBER~~	~~SAMPLE TYPE~~	OVA (PPM)	~~WELL DESIGN~~	REMARKS
0	CLAY, sandy dark red-brown			<1		No cores
2.5	CLAY, as above, sandier					
5.0	SAND, clean, quartz, rounded grains, well-sorted, tan					
7.5						
10.0	as above					drilled rapidly to bottom - occasional large (≤ 2") pebble gravel
12.5						
15.0						
17.5						
20.0						water @ 19.5
22.5						
25.0						T.D. @ 25.'
27.5						
30.0						

ABBREVIATIONS AND SYMBOLS

SS-Driven Split Spoon
ST-Pressed Shelby Tube
CA-Continuous Flight Auger
RC-Rock Core
THD-Texas Highway Department Cone
CT-5' Continuous Sampler

HSA-Hollow Stem Augers
CFA-Continuous Flight Augers
DC-Driving Casing
MD-Mud Drilling

WATER LEVEL
▽ At Completion
▼ After Hours
● Water on Rods

Bottom Cap
Sand Pack
Bentonite Seal
Factory-Slotted Well Screen
Well Casing
Volclay Grout Seal

172698

GEO-MARINE

RECORD OF SUBSURFACE EXPLORATION

Project No.: 1161-052
Project: CARSWELL PH 2
Drilling Co: GMI
Driller: HST
Drilling Method: CT-5'

Well/Boring #: GMI-025B
Depth of Boring: 24.2'
Depth of Well: NR
Length of Screen: 5'
Length of Casing: 19'
Logged By: LLD

Date Drilled: 7/28
Diameter of Boring: 6"
Diameter of Screen: } 4" (temp.
Diameter of Casing: }
Slot Size: .01
Well Material: PVC Sch. 40

DEPTH FEET	SOIL DESCRIPTION	~~SAMPLE NUMBER~~	~~SAMPLE TYPE~~	OVA (PPM)	~~WELL DESIGN~~	REMARKS
0	MIXED CLAY & SAND, medium red-brown, coarse grained to gravel size, no laminations, sand increases w/ depth			<1		Continues Core root zone
2.5						
5.0	SAND, gravelly, clay as above					recovered 1'4"/5'
7.5	SAND, light brown, loose, clean, quartz, sub-rounded, well sorted					
10.0	SAND, as above, but finer-grained					recovered 1'/5'
12.5						
15.0	SAND & GRAVEL, loose, clean, dry, light gray-light brown, variable size, rounding & sorting — pebbles of limestone, marl, chert					hard layer @ 14' recovered 1'6"/5'
17.5						hard layer @ 18'
20.0	Gravel, as above, but wet, sub-angular limestone pebbles to 2"					
22.5						water @ 22' recovered 1'6"/4'2"
25.0						
27.5						
30.0						

ABBREVIATIONS AND SYMBOLS

SS-Driven Split Spoon
ST-Pressed Shelby Tube
CA-Continuous Flight Auger
RC-Rock Core
THD-Texas Highway Department Cone
CT-5' Continuous Sampler

HSA-Hollow Stem Augers
CFA-Continuous Flight Augers
DC-Driving Casing
MD-Mud Drilling

WATER LEVEL
▽ At Completion
▼ After Hours
● Water on Rods

Bottom Cap
Sand Pack
Bentonite Seal
Factory-Slotted Well Screen
Well Casing
Volclay Grout Seal

172999

GEO-MARINE

RECORD OF SUBSURFACE EXPLORATION

Project No.: 1161-052
Project: CARSWELL PH. 2
Drilling Co: GMI
Driller: HST
Drilling Method: C.T. 5

Well/Boring #: GMI-035B
Depth of Boring: 25'
Depth of Well: N.R.
Length of Screen: 5'
Length of Casing: 20'
Logged By: LLD

Date Drilled: 7/28/93
Diameter of Boring: 6"
Diameter of Screen: } 4" (temp.)
Diameter of Casing: }
Slot Size: .01
Well Material: PVC SCH 40

DEPTH FEET	SOIL DESCRIPTION	~~SAMPLE NUMBER~~	~~SAMPLE TYPE~~	OVA (PPM)	~~WELL DESIGN~~	REMARKS
0	SAND, fine-grained, silty, medium yellow-brown			<1		
2.5	SAND, silty, w/ small pebbles, dark red-brown					
5.0	SAND, fine-grained, clayey, w/ small pebbles, yellow-brown w/ gray mottling					
7.5	SAND, fine-grained, more clay than above, mottled dark red-brown					
10.0	SAND, as above, but less clay					
12.5	SAND, some clay, medium gray-green, subrounded, no pebbles					
15.0	SAND, minor clay, loose, light brown, subrounded well-sorted					
17.5						recovered 3'/5'
20.0	SAND, loose, wet, clean, medium grained, as above					hard layer @ 21.' water @ 21.'
22.5						
25.0	T.D. @ 25.'					
27.5						
30.0						

ABBREVIATIONS AND SYMBOLS

SS-Driven Split Spoon
ST-Pressed Shelby Tube
CA-Continuous Flight Auger
RC-Rock Core
THD-Texas Highway Department Cone
CT-5' Continuous Sampler

HSA-Hollow Stem Augers
CFA-Continuous Flight Augers
DC-Driving Casing
MD-Mud Drilling

WATER LEVEL
▽ At Completion
▼ After Hours
● Water on Rods

Bottom Cap
Sand Pack
Bentonite Seal
Factory-Slotted Well Screen
Well Casing
Voloclay Grout Seal

17240

GEO-MARINE

RECORD OF SUBSURFACE EXPLORATION

Project No.: 1161-052
Project: CALSWELL PH2

Drilling Co: GMI
Driller: HST
Drilling Method: HSA

Well/Boring #: GMI-04SB
Depth of Boring: 25'
Depth of Well: N.R.
Length of Screen: 3'
Length of Casing: 20'
Logged By: TCT

Date Drilled: 7/29/73
Diameter of Boring: 6"
Diameter of Screen: 4" } trap
Diameter of Casing: 4" }
Slot Size: .01
Well Material: PVC Sch. 40

DEPTH FEET	SOIL DESCRIPTION	~~SAMPLE NUMBER~~	~~SAMPLE TYPE~~	OVA (PPM)	~~WELL DESIGN~~	REMARKS
0	CLAY, black, dry, hard			<1		top soil @ surface
2.5						
5.0						
7.5	CLAY, reddish-brown, moist					
10.0	CLAY, as above w/ minor coarse calcareous(?) sand					
12.5	CLAY as above w/ coarse sand to pebble-size grains					
15.0	CLAY, light red-tan					
17.5	SAND, fine-grained, reddish-tan					
	SAND, as above w/ pebbles					
20.0	SAND, fine-grained, brown					
22.5						
25.0						bedrock @ 25'?
	T.D. @ 25					Dry hole
27.5						
30.0						

ABBREVIATIONS AND SYMBOLS

SS-Driven Split Spoon
ST-Pressed Shelby Tube
CA-Continuous Flight Auger
RC-Rock Core
THD-Texas Highway Department Cone
CT-5' Continuous Sampler

HSA-Hollow Stem Augers
CFA-Continuous Flight Augers
DC-Driving Casing
MD-Mud Drilling

WATER LEVEL
▽ At Completion
▼ After Hours
● Water on Rods

Bottom Cap
Sand Pack
Bentonite Seal
Factory-Slotted Well Screen
Well Casing
Volclay Grout Seal

GEO-MARINE

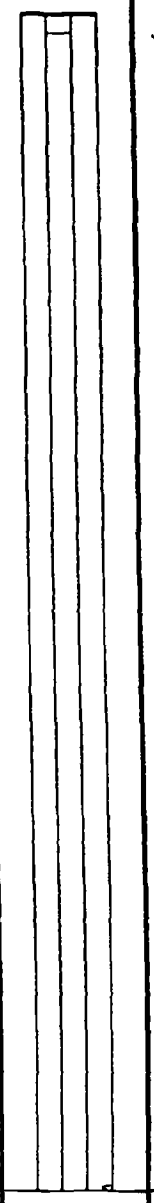
RECORD OF SUBSURFACE EXPLORATION

Project No.: 1161-052
Project: CARSWELL PH 2
Drilling Co: GMI
Driller: HST
Drilling Method: HSA

Well/Boring #: GM1-05SB
Depth of Boring: 30'
Depth of Well: 30'
Length of Screen: 25'
Length of Casing: 5'
Logged By: TCM

Date Drilled: 7/29/93
Diameter of Boring: 6"
Diameter of Screen: 4" (temp)
Diameter of Casing: 4"
Slot Size: .01
Well Material: PVC Sch. 40

DEPTH FEET	SOIL DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	OVA (PPM)	WELL DESIGN	REMARKS
0	CLAY, black			<1		top soil @ surface
2.5						
5.0						
7.5	CLAY, light brown-tan, moist					
10.0	CLAY, silty, calcareous grains, tan, moist					
12.5						
15.0	CLAY, as above w/ smooth, angular limestone pebbles					
17.5	CLAY, loose, tan					
20.0						
22.5						
25.0	Gravel, hard, 1" pebbles, in clay matrix					
27.5	CLAY, loose					
	GRAVEL LAYER, hard					Limestone @ base of hole
30.0	T.D. @ 30'					Dry Hole



ABBREVIATIONS AND SYMBOLS

SS-Driven Split Spoon
ST-Pressed Shelby Tube
CA-Continuous Flight Auger
RC-Rock Core
THD-Texas Highway Department Cone
CT-5' Continuous Sampler

HSA-Hollow Stem Augers
CFA-Continuous Flight Augers
DC-Driving Casing
MD-Mud Drilling

WATER LEVEL
▽ At Completion
▼ After Hours
● Water on Rods

Bottom Cap
Sand Pack
Bentonite Seal
Factory-Slotted Well Screen
Well Casing
Voloclay Grout Seal

172102

APPENDIX C

Analytic Results, Chain-of Custody Forms, and QA/QC

172103

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/09/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB809 (ug/L)	TB809 (ug/L)	GMI-03SB2 (ug/L)	GMI-12S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	10	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	54	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	73.0	95.7	72.9	75.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Dr. Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172104

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/09/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %
Vinylchloride	ND	200
1,1-Dichloroethene	ND	100
Methylene Chloride	ND	100
trans-1,2-Dichloroethene	ND	100
1,1-Dichloroethane	ND	100
cis-1,2-Dichloroethene	ND	100
Benzene	ND	100
Chloroform	ND	100
1,1,1-Trichloroethane	ND	100
Carbon Tetrachloride	ND	100
Trichloroethene	ND	100
1,2-Dichloropropane	ND	100
Toluene	ND	100
Tetrachloroethene	ND	100
Ethylbenzene	ND	100
Xylenes	ND	100
Surrogate Recovery %	115.0	99.9

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172105

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/09/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	GMI-03SB2 MS	GMI-03SB2 MSD	% RPD
Vinylchloride	173	154	11.6
1,1-Dichloroethene	112	92	19.6
Methylene Chloride	108	85	23.8
trans-1,2-Dichloroethene	131	102	24.9
1,1-Dichloroethane	121	92	27.2
cis-1,2-Dichloroethene	131	103	23.9
Benzene	94	72	26.5
Chloroform	123	97	23.6
1,1,1-Trichloroethane	106	73	36.9
Carbon Tetrachloride	133	100	28.3
Trichloroethene	135	104	25.9
1,2-Dichloropropane	117	89	27.2
Toluene	97	75	25.6
Tetrachloroethene	122	92	28.0
Ethylbenzene	101	78	25.7
Xylenes	100	76	27.3
Surrogate Recovery %	109.0	79.8	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172106

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/10/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81093 (ug/L)	TB81093 (ug/L)	GMI-02S (ug/L)	GMI-18S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	18	15	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	21	21	32	60	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	278	44	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	151.0	153.0	152.0	88.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172177

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/10/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-25S (ug/L)	GMI-26S (ug/L)	GMI-63S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	37	12	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	29	50	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	118.0	133.8	114.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172108

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/10/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	155	134
1,1-Dichloroethene	ND	93	138
Methylene Chloride	ND	98	105
trans-1,2-Dichloroethene	ND	112	105
1,1-Dichloroethane	ND	107	100
cis-1,2-Dichloroethene	ND	117	112
Benzene	ND	101	114
Chloroform	ND	109	99
1,1,1-Trichloroethane	ND	119	78
Carbon Tetrachloride	ND	119	109
Trichloroethene	ND	105	112
1,2-Dichloropropane	ND	104	96
Toluene	ND	105	118
Tetrachloroethene	ND	115	101
Ethylbenzene	ND	107	123
Xylenes	ND	106	120
Surrogate Recovery %	146.7	104.0	107.1

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172109

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/10/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	TB81093 MS	TB81093 MSD	% RPD
Vinylchloride	163	130	22.5
1,1-Dichloroethene	202	151	28.9
Methylene Chloride	103	79	26.4
trans-1,2-Dichloroethene	104	81	24.9
1,1-Dichloroethane	105	78	29.5
cis-1,2-Dichloroethene	120	91	27.5
Benzene	129	104	21.5
Chloroform	89	69	25.3
1,1,1-Trichloroethane	24	18	28.6
Carbon Tetrachloride	124	88	34.0
Trichloroethene	130	99	27.1
1,2-Dichloropropane	110	84	26.8
Toluene	136	109	22.0
Tetrachloroethene	122	88	32.4
Ethylbenzene	144	117	20.7
Xylenes	140	113	21.3
Surrogate Recovery %	199.0	157.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

GEO-MARINE, INC. 173120

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/11/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81193 (ug/L)	TB81193 (ug/L)	GMI-51S (ug/L)	GMI-60S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	128.0	138.5	128.1	119.9	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

17211

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/11/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-61S (ug/L)	GMI-61D (ug/L)	GMI-62S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	125.1	152.3	142.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh. Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172112

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/11/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	155	180
1,1-Dichloroethene	ND	102	118
Methylene Chloride	ND	136	133
trans-1,2-Dichloroethene	ND	136	130
1,1-Dichloroethane	ND	124	133
cis-1,2-Dichloroethene	ND	135	139
Benzene	ND	126	106
Chloroform	ND	134	144
1,1,1-Trichloroethane	ND	88	91
Carbon Tetrachloride	ND	139	157
Trichloroethene	ND	120	140
1,2-Dichloropropane	ND	122	136
Toluene	ND	132	113
Tetrachloroethene	ND	131	150
Ethylbenzene	ND	137	118
Xylenes	ND	135	115
Surrogate Recovery %	136.7	130.6	135.9

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172113

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/11/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81193 MS	RB81193 MSD	% RPD
Vinylchloride	149	146	2.0
1,1-Dichloroethene	48	63	27.0
Methylene Chloride	119	119	0.0
trans-1,2-Dichloroethene	112	116	3.5
1,1-Dichloroethane	109	113	3.6
cis-1,2-Dichloroethene	123	122	0.8
Benzene	95	97	2.1
Chloroform	114	119	4.3
1,1,1-Trichloroethane	115	110	4.4
Carbon Tetrachloride	110	118	7.0
Trichloroethene	87	101	14.9
1,2-Dichloropropane	111	113	1.8
Toluene	95	99	4.1
Tetrachloroethene	108	115	6.3
Ethylbenzene	96	101	5.1
Xylenes	93	99	6.3
Surrogate Recovery %	113.5	119.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172114

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/12/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81293 (ug/L)	TB81293 (ug/L)	GMI-04S (ug/L)	GMI-05S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	14	66	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	99	438	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	172.7	132.9	108.1	164.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172115

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/12/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-06S (ug/L)	GMI-09S (ug/L)	GMI-70S (ug/L)	GMI-72S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	7	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	7	42	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	98.3	124.7	155.8	100.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172116

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/12/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	112	87
1,1-Dichloroethene	ND	106	88
Methylene Chloride	ND	119	82
trans-1,2-Dichloroethene	ND	113	99
1,1-Dichloroethane	ND	111	100
cis-1,2-Dichloroethene	ND	122	104
Benzene	ND	92	86
Chloroform	ND	116	109
1,1,1-Trichloroethane	ND	118	107
Carbon Tetrachloride	ND	119	110
Trichloroethene	ND	101	81
1,2-Dichloropropane	ND	116	104
Toluene	ND	100	89
Tetrachloroethene	ND	117	93
Ethylbenzene	ND	103	91
Xylenes	ND	101	89
Surrogate Recovery %	111.4	111.9	88.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

17211

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/12/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81293 MS	RB81293 MSD	% RPD
Vinylchloride	109	120	9.6
1,1-Dichloroethene	131	157	18.1
Methylene Chloride	97	107	9.8
trans-1,2-Dichloroethene	98	107	8.8
1,1-Dichloroethane	92	105	13.2
cis-1,2-Dichloroethene	100	115	14.0
Benzene	76	82	7.6
Chloroform	102	116	12.8
1,1,1-Trichloroethane	71	77	8.1
Carbon Tetrachloride	107	122	13.1
Trichloroethene	100	110	9.5
1,2-Dichloropropane	94	110	15.7
Toluene	80	87	8.4
Tetrachloroethene	107	118	9.8
Ethylbenzene	85	92	7.9
Xylenes	83	90	8.1
Surrogate Recovery %	96.0	97.9	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172113

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/13/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81393 (ug/L)	TB81393 (ug/L)	GMI-14S (ug/L)	GMI-16S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	15	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	66	23	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	116.9	117.4	129.3	141.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

17211J

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/13/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-16D (ug/L)	GMI-20S (ug/L)	GMI-22S (ug/L)	GMI-28S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	14	59	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	19	16	5	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	160.7	130.8	129.5	103.9	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172120

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/13/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	86	66
1,1-Dichloroethene	ND	95	101
Methylene Chloride	ND	90	77
trans-1,2-Dichloroethene	ND	117	87
1,1-Dichloroethane	ND	115	90
cis-1,2-Dichloroethene	ND	120	93
Benzene	ND	91	78
Chloroform	ND	123	102
1,1,1-Trichloroethane	ND	133	82
Carbon Tetrachloride	ND	135	99
Trichloroethene	ND	89	87
1,2-Dichloropropane	ND	116	98
Toluene	ND	96	88
Tetrachloroethene	ND	124	89
Ethylbenzene	ND	100	91
Xylenes	ND	97	91
Surrogate Recovery %	108.0	108.0	95.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172121

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/13/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81393 MS	RB81393 MSD	% RPD
Vinylchloride	105	113	7.3
1,1-Dichloroethene	171	198	14.6
Methylene Chloride	97	108	10.7
trans-1,2-Dichloroethene	120	109	9.6
1,1-Dichloroethane	121	123	1.6
cis-1,2-Dichloroethene	113	119	5.2
Benzene	97	103	6.0
Chloroform	134	144	7.2
1,1,1-Trichloroethane	108	112	3.6
Carbon Tetrachloride	151	162	7.0
Trichloroethene	113	123	8.5
1,2-Dichloropropane	124	135	8.5
Toluene	104	111	6.5
Tetrachloroethene	124	142	13.5
Ethylbenzene	99	117	16.7
Xylenes	108	115	6.3
Surrogate Recovery %	98.9	106.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172122

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/16/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81693 (ug/L)	TB81693 (ug/L)	GMI-01S (ug/L)	GMI-36S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	73	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	492	3	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	101.4	133.4	126.1	164.4	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172123

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/16/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-37S (ug/L)	GMI-38S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	10
1,1-Dichloroethene	ND	ND	4
Methylene Chloride	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	4
1,1-Dichloroethane	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	5
Benzene	ND	ND	4
Chloroform	ND	ND	4
1,1,1-Trichloroethane	ND	ND	4
Carbon Tetrachloride	ND	ND	3
Trichloroethene	ND	ND	2
1,2-Dichloropropane	ND	ND	5
Toluene	ND	ND	5
Tetrachloroethene	ND	ND	3
Ethylbenzene	ND	ND	5
Xylenes	ND	ND	5
Surrogate Recovery %	136.1	137.5	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172127

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/16/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	92	80
1,1-Dichloroethene	ND	99	134
Methylene Chloride	ND	100	88
trans-1,2-Dichloroethene	ND	128	93
1,1-Dichloroethane	ND	128	106
cis-1,2-Dichloroethene	ND	133	105
Benzene	ND	87	72
Chloroform	ND	134	124
1,1,1-Trichloroethane	ND	145	93
Carbon Tetrachloride	ND	147	122
Trichloroethene	ND	97	105
1,2-Dichloropropane	ND	127	119
Toluene	ND	92	77
Tetrachloroethene	ND	135	112
Ethylbenzene	ND	95	81
Xylenes	ND	92	82
Surrogate Recovery %	101.0	89.2	109.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172125

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/16/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81693 MS	RB81693 MSD	% RPD
Vinylchloride	95	105	10.0
1,1-Dichloroethene	163	213	26.6
Methylene Chloride	112	108	3.6
trans-1,2-Dichloroethene	104	94	10.1
1,1-Dichloroethane	134	135	0.7
cis-1,2-Dichloroethene	136	135	0.7
Benzene	93	92	1.1
Chloroform	156	155	0.6
1,1,1-Trichloroethane	124	118	5.0
Carbon Tetrachloride	154	167	8.1
Trichloroethene	129	124	4.0
1,2-Dichloropropane	152	134	12.6
Toluene	100	99	1.0
Tetrachloroethene	141	147	4.2
Ethylbenzene	106	106	0.0
Xylenes	103	105	1.9
Surrogate Recovery %	101.9	96.9	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

17212

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/17/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81793 (ug/L)	TB81793 (ug/L)	GMI-34S (ug/L)	GMI-34D (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	144.1	88.2	101.6	126.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

17212

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/17/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-42S (ug/L)	GMI-54S (ug/L)	GMI-55S (ug/L)	GMI-56S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	156.0	141.0	125.6	122.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172128

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/17/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-27S (ug/L)	GMI-73S (ug/L)	GMI-74S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	19	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	30	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	29	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	110.4	109.7	113.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172129

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/17/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	70	195
1,1-Dichloroethene	ND	82	100
Methylene Chloride	ND	68	107
trans-1,2-Dichloroethene	ND	93	110
1,1-Dichloroethane	ND	105	111
cis-1,2-Dichloroethene	ND	110	119
Benzene	ND	98	102
Chloroform	ND	119	115
1,1,1-Trichloroethane	ND	114	114
Carbon Tetrachloride	ND	125	116
Trichloroethene	ND	91	114
1,2-Dichloropropane	ND	115	109
Toluene	ND	103	109
Tetrachloroethene	ND	105	104
Ethylbenzene	ND	106	114
Xylenes	ND	107	112
Surrogate Recovery %	106.9	116.6	106.7

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

GEO-MARINE, INC.

17213

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/18/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81893 MS	RB81893 MSD	% RPD
Vinylchloride	194	189	2.6
1,1-Dichloroethene	148	148	0.0
Methylene Chloride	100	92	8.3
trans-1,2-Dichloroethene	106	98	7.8
1,1-Dichloroethane	105	100	4.9
cis-1,2-Dichloroethene	114	110	3.6
Benzene	90	81	10.5
Chloroform	110	109	0.9
1,1,1-Trichloroethane	79	60	27.3
Carbon Tetrachloride	118	101	15.5
Trichloroethene	125	111	11.9
1,2-Dichloropropane	101	102	1.0
Toluene	99	86	14.1
Tetrachloroethene	119	104	13.5
Ethylbenzene	104	89	15.5
Xylenes	102	87	15.9
Surrogate Recovery %	96.0	87.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172131

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/19/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB81993 (ug/L)	TB81993 (ug/L)	GMI-01N (ug/L)	GMI-57S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	79.2	110.7	81.5	105.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172132

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/19/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-58S (ug/L)	GMI-59S (ug/L)	GMI-66S (ug/L)	GMI-94S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	117.8	127.3	112.3	78.9	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172133

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/19/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-95S (ug/L)	GMI-04N (ug/L)	GMI-04D (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	115.0	97.9	104.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172134

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/19/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	156	169
1,1-Dichloroethene	ND	87	140
Methylene Chloride	ND	88	87
trans-1,2-Dichloroethene	ND	93	102
1,1-Dichloroethane	ND	96	107
cis-1,2-Dichloroethene	ND	107	116
Benzene	ND	84	78
Chloroform	ND	103	115
1,1,1-Trichloroethane	ND	92	94
Carbon Tetrachloride	ND	100	122
Trichloroethene	ND	104	126
1,2-Dichloropropane	ND	100	109
Toluene	ND	90	86
Tetrachloroethene	ND	103	124
Ethylbenzene	ND	94	91
Xylenes	ND	93	89
Surrogate Recovery %	113.0	119.0	83.7

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172135

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/19/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB81993 MS	RB81993 MSD	% RPD
Vinylchloride	145	175	18.8
1,1-Dichloroethene	82	104	23.7
Methylene Chloride	71	113	45.7
trans-1,2-Dichloroethene	79	116	37.9
1,1-Dichloroethane	80	124	43.1
cis-1,2-Dichloroethene	87	140	46.7
Benzene	62	87	33.6
Chloroform	86	133	42.9
1,1,1-Trichloroethane	68	105	42.8
Carbon Tetrachloride	82	121	38.4
Trichloroethene	87	132	41.1
1,2-Dichloropropane	82	129	44.5
Toluene	67	92	31.4
Tetrachloroethene	82	121	38.4
Ethylbenzene	69	94	30.7
Xylenes	67	91	30.4
Surrogate Recovery %	87.4	96.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172136

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/20/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB82093 (ug/L)	TB82093 (ug/L)	GMI-05N (ug/L)	GMI-20N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	58.2	73.0	74.2	103.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172137

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/20/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-26N (ug/L)	GMI-27N (ug/L)	GMI-35N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	109.9	95.3	48.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172138

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/20/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	142	149
1,1-Dichloroethene	ND	81	146
Methylene Chloride	ND	89	98
trans-1,2-Dichloroethene	ND	104	103
1,1-Dichloroethane	ND	107	112
cis-1,2-Dichloroethene	ND	112	124
Benzene	ND	78	77
Chloroform	ND	113	125
1,1,1-Trichloroethane	ND	115	86
Carbon Tetrachloride	ND	116	122
Trichloroethene	ND	107	135
1,2-Dichloropropane	ND	108	121
Toluene	ND	85	84
Tetrachloroethene	ND	116	126
Ethylbenzene	ND	89	79
Xylenes	ND	87	87
Surrogate Recovery %	83.9	131.0	140.9

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172139

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/20/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB82093 MS	RB82093 MSD	% RPD
Vinylchloride	138	145	4.9
1,1-Dichloroethene	101	116	13.8
Methylene Chloride	93	75	21.4
trans-1,2-Dichloroethene	101	85	17.2
1,1-Dichloroethane	107	87	20.6
cis-1,2-Dichloroethene	113	94	18.4
Benzene	85	69	20.8
Chloroform	115	98	16.0
1,1,1-Trichloroethane	93	68	31.1
Carbon Tetrachloride	108	95	12.8
Trichloroethene	113	101	11.2
1,2-Dichloropropane	113	91	21.6
Toluene	90	75	18.2
Tetrachloroethene	110	94	15.7
Ethylbenzene	93	79	16.3
Xylenes	91	77	16.7
Surrogate Recovery %	93.2	100.4	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh. Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172140

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/23/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB82393 (ug/L)	TB82393 (ug/L)	GMI-07N (ug/L)	GMI-07D (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	96.7	65.1	55.6	69.4	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172141

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/23/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-14N (ug/L)	GMI-29N (ug/L)	GMI-47N (ug/L)	GMI-48N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	6	17	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	94.0	90.6	89.3	95.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172142

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/23/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-49N (ug/L)	MDL (ug/L)
Vinylchloride	ND	10
1,1-Dichloroethene	ND	4
Methylene Chloride	ND	5
trans-1,2-Dichloroethene	ND	4
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	11	5
Benzene	ND	4
Chloroform	ND	4
1,1,1-Trichloroethane	ND	4
Carbon Tetrachloride	ND	3
Trichloroethene	57	2
1,2-Dichloropropane	ND	5
Toluene	ND	5
Tetrachloroethene	ND	3
Ethylbenzene	ND	5
Xylenes	ND	5
Surrogate Recovery %	80.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172143

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/23/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	143	122
1,1-Dichloroethene	ND	88	90
Methylene Chloride	ND	108	97
trans-1,2-Dichloroethene	ND	108	90
1,1-Dichloroethane	ND	110	93
cis-1,2-Dichloroethene	ND	121	105
Benzene	ND	83	70
Chloroform	ND	117	105
1,1,1-Trichloroethane	ND	122	84
Carbon Tetrachloride	ND	126	100
Trichloroethene	ND	117	110
1,2-Dichloropropane	ND	115	102
Toluene	ND	92	76
Tetrachloroethene	ND	132	102
Ethylbenzene	ND	99	81
Xylenes	ND	97	80
Surrogate Recovery %	104.4	103.6	79.1

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh. Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172144

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/23/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB82393 MS	RB82393 MSD	% RPD
Vinylchloride	138	157	12.9
1,1-Dichloroethene	82	97	16.8
Methylene Chloride	115	155	29.6
trans-1,2-Dichloroethene	103	138	29.0
1,1-Dichloroethane	110	149	30.1
cis-1,2-Dichloroethene	125	169	29.9
Benzene	80	106	28.0
Chloroform	123	163	28.0
1,1,1-Trichloroethane	104	149	35.6
Carbon Tetrachloride	107	145	30.2
Trichloroethene	116	142	20.2
1,2-Dichloropropane	120	161	29.2
Toluene	86	114	28.0
Tetrachloroethene	116	159	31.3
Ethylbenzene	89	118	28.0
Xylenes	86	116	29.7
Surrogate Recovery %	103.6	85.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172145

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/24/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB82493 (ug/L)	TB82493 (ug/L)	GMI-23N (ug/L)	GMI-30N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	9	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	19	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	50	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	66.7	67.2	66.4	96.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172146

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 08/24/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	125	139
1,1-Dichloroethene	ND	87	120
Methylene Chloride	ND	129	118
trans-1,2-Dichloroethene	ND	112	113
1,1-Dichloroethane	ND	136	116
cis-1,2-Dichloroethene	ND	155	129
Benzene	ND	113	92
Chloroform	ND	146	126
1,1,1-Trichloroethane	ND	130	108
Carbon Tetrachloride	ND	128	126
Trichloroethene	ND	139	139
1,2-Dichloropropane	ND	146	123
Toluene	ND	124	102
Tetrachloroethene	ND	142	135
Ethylbenzene	ND	130	109
Xylenes	ND	130	108
Surrogate Recovery %	47.2	126.0	114.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172147

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90193 (ug/L)	TB90193 (ug/L)	GMI-24N (ug/L)	GMI-28N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	138	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	294	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	151.5	149.2	161.6	149.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172143

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-32N (ug/L)	GMI-33N (ug/L)	GMI-36N (ug/L)	GMI-39N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	48	51	ND	15	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	57	74	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	170	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	141.3	147.0	156.4	147.3	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172149

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90193 MS	RB90193 MSD	% RPD
Vinylchloride	139	141	1.4
1,1-Dichloroethene	109	117	7.1
Methylene Chloride	110	109	0.9
trans-1,2-Dichloroethene	104	105	1.0
1,1-Dichloroethane	111	110	0.9
cis-1,2-Dichloroethene	112	114	1.8
Benzene	92	92	0.0
Chloroform	116	115	0.9
1,1,1-Trichloroethane	106	103	2.9
Carbon Tetrachloride	132	119	10.4
Trichloroethene	146	153	4.7
1,2-Dichloropropane	104	104	0.0
Toluene	93	95	2.1
Tetrachloroethene	117	124	5.8
Ethylbenzene	93	95	2.1
Xylenes	88	91	3.4
Surrogate Recovery %	93.3	94.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172150

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-40N (ug/L)	GMI-41N (ug/L)	GMI-42N (ug/L)	GMI-43N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	91	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	76	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	14	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	150.0	144.4	166.3	138.5	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172151

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB83193 (ug/L)	MDL (ug/L)
Vinylchloride	ND	10
1,1-Dichloroethene	ND	4
Methylene Chloride	ND	5
trans-1,2-Dichloroethene	ND	4
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
Benzene	ND	4
Chloroform	ND	4
1,1,1-Trichloroethane	ND	4
Carbon Tetrachloride	ND	3
Trichloroethene	ND	2
1,2-Dichloropropane	ND	5
Toluene	ND	5
Tetrachloroethene	ND	3
Ethylbenzene	ND	5
Xylenes	ND	5
Surrogate Recovery %	146.0	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172152

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	144	174
1,1-Dichloroethene	ND	99	163
Methylene Chloride	ND	98	113
trans-1,2-Dichloroethene	ND	100	84
1,1-Dichloroethane	ND	99	120
cis-1,2-Dichloroethene	ND	98	113
Benzene	ND	99	96
Chloroform	ND	99	127
1,1,1-Trichloroethane	ND	99	84
Carbon Tetrachloride	ND	99	146
Trichloroethene	ND	99	153
1,2-Dichloropropane	ND	99	112
Toluene	ND	99	100
Tetrachloroethene	ND	99	127
Ethylbenzene	ND	100	100
Xylenes	ND	101	95
Surrogate Recovery %	129.1	100.2	98.3

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172153

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/02/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-45N (ug/L)	GMI-45D (ug/L)	GMI-46N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	142.0	139.6	142.8	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172154

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/02/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	133	139
1,1-Dichloroethene	ND	108	118
Methylene Chloride	ND	113	120
trans-1,2-Dichloroethene	ND	111	117
1,1-Dichloroethane	ND	119	122
cis-1,2-Dichloroethene	ND	120	123
Benzene	ND	92	94
Chloroform	ND	122	129
1,1,1-Trichloroethane	ND	110	118
Carbon Tetrachloride	ND	115	125
Trichloroethene	ND	143	152
1,2-Dichloropropane	ND	110	117
Toluene	ND	95	96
Tetrachloroethene	ND	119	126
Ethylbenzene	ND	96	97
Xylenes	ND	90	91
Surrogate Recovery %	142.6	94.6	96.6

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172155

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/02/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90293 MS	RB90293 MSD	% RPD
Vinylchloride	149	152	2.0
1,1-Dichloroethene	136	148	8.5
Methylene Chloride	124	126	1.6
trans-1,2-Dichloroethene	118	107	9.8
1,1-Dichloroethane	127	133	4.6
cis-1,2-Dichloroethene	129	125	3.1
Benzene	96	96	0.0
Chloroform	139	144	3.5
1,1,1-Trichloroethane	117	118	0.9
Carbon Tetrachloride	130	133	2.3
Trichloroethene	165	166	0.6
1,2-Dichloropropane	122	124	1.6
Toluene	100	97	3.0
Tetrachloroethene	96	131	30.8
Ethylbenzene	98	97	1.0
Xylenes	92	93	1.1
Surrogate Recovery %	98.8	97.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172158

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/03/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90393 (ug/L)	TB90393 (ug/L)	GMI-37N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	140.1	137.9	133.8	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172157

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/03/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	99	113
1,1-Dichloroethene	ND	87	101
Methylene Chloride	ND	109	123
trans-1,2-Dichloroethene	ND	93	107
1,1-Dichloroethane	ND	97	107
cis-1,2-Dichloroethene	ND	99	114
Benzene	ND	89	87
Chloroform	ND	100	114
1,1,1-Trichloroethane	ND	89	105
Carbon Tetrachloride	ND	89	104
Trichloroethene	ND	134	136
1,2-Dichloropropane	ND	94	103
Toluene	ND	92	91
Tetrachloroethene	ND	116	132
Ethylbenzene	ND	92	92
Xylenes	ND	88	87
Surrogate Recovery %	133.8	92.6	93.3

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh. Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

172158

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/01/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90193 MS	RB90193 MSD	% RPD
Vinylchloride	139	141	1.4
1,1-Dichloroethene	109	117	7.1
Methylene Chloride	110	109	0.9
trans-1,2-Dichloroethene	104	105	1.0
1,1-Dichloroethane	111	110	0.9
cis-1,2-Dichloroethene	112	114	1.8
Benzene	92	92	0.0
Chloroform	116	115	0.9
1,1,1-Trichloroethane	106	103	2.9
Carbon Tetrachloride	132	119	10.4
Trichloroethene	146	153	4.7
1,2-Dichloropropane	104	104	0.0
Toluene	93	95	2.1
Tetrachloroethene	117	124	5.8
Ethylbenzene	93	95	2.1
Xylenes	88	91	3.4
Surrogate Recovery %	93.3	94.6	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

17215J

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/02/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90293 (ug/L)	TB90293 (ug/L)	GMI-31N (ug/L)	GMI-44N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	48	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	32	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	148.1	131.2	137.9	135.5	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172160

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/03/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90393 MS	RB90393 MSD	% RPD
Vinylchloride	110	124	12.0
1,1-Dichloroethene	102	115	12.0
Methylene Chloride	127	130	2.3
trans-1,2-Dichloroethene	109	111	1.8
1,1-Dichloroethane	110	116	5.3
cis-1,2-Dichloroethene	115	120	4.3
Benzene	95	95	0.0
Chloroform	113	122	7.7
1,1,1-Trichloroethane	105	109	3.7
Carbon Tetrachloride	104	112	7.4
Trichloroethene	154	163	5.7
1,2-Dichloropropane	104	113	8.3
Toluene	96	99	3.1
Tetrachloroethene	131	140	6.6
Ethylbenzene	98	99	1.0
Xylenes	92	94	2.2
Surrogate Recovery %	96.8	99.4	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172161

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/08/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90793 (ug/L)	RB90893 (ug/L)	TB90793 (ug/L)	GMI-04W (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	ND	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	ND	13	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	145.6	119.9	125.3	145.8	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172162

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/08/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-18W (ug/L)	GMI-20W (ug/L)	GMI-82S (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	3	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	157.6	147.6	136.4	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172163

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/08/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	99	110
1,1-Dichloroethene	ND	100	98
Methylene Chloride	ND	100	101
trans-1,2-Dichloroethene	ND	100	98
1,1-Dichloroethane	ND	101	99
cis-1,2-Dichloroethene	ND	101	101
Benzene	ND	101	82
Chloroform	ND	100	96
1,1,1-Trichloroethane	ND	100	100
Carbon Tetrachloride	ND	100	96
Trichloroethene	ND	100	71
1,2-Dichloropropane	ND	100	95
Toluene	ND	100	85
Tetrachloroethene	ND	100	93
Ethylbenzene	ND	101	64
Xylenes	ND	176	122
Surrogate Recovery %	98.0	102.0	108.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

17216

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/08/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90893 MS	RB90893 MSD	% RPD
Vinylchloride	133	123	7.8
1,1-Dichloroethene	183	167	9.1
Methylene Chloride	124	113	9.3
trans-1,2-Dichloroethene	110	99	10.5
1,1-Dichloroethane	123	114	7.6
cis-1,2-Dichloroethene	118	117	0.9
Benzene	106	107	0.9
Chloroform	126	119	5.7
1,1,1-Trichloroethane	100	103	3.0
Carbon Tetrachloride	151	101	39.7
Trichloroethene	124	122	1.6
1,2-Dichloropropane	117	117	0.0
Toluene	108	113	4.5
Tetrachloroethene	119	122	2.5
Ethylbenzene	110	109	0.9
Xylenes	191	186	2.7
Surrogate Recovery %	104.9	102.7	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172165

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90993 MS	RB90993 MSD	% RPD
Vinylchloride	89	114	24.6
1,1-Dichloroethene	113	154	30.7
Methylene Chloride	120	146	19.5
trans-1,2-Dichloroethene	118	146	21.2
1,1-Dichloroethane	121	154	24.0
cis-1,2-Dichloroethene	128	152	17.1
Benzene	91	110	18.9
Chloroform	127	150	16.6
1,1,1-Trichloroethane	125	143	13.4
Carbon Tetrachloride	121	145	18.0
Trichloroethene	113	145	24.8
1,2-Dichloropropane	114	143	22.6
Toluene	95	118	21.6
Tetrachloroethene	115	139	18.9
Ethylbenzene	94	112	17.5
Xylenes	162	194	18.0
Surrogate Recovery %	96.4	108.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

178166

teg

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	103	116
1,1-Dichloroethene	ND	127	145
Methylene Chloride	ND	127	150
trans-1,2-Dichloroethene	ND	124	146
1,1-Dichloroethane	ND	118	145
cis-1,2-Dichloroethene	ND	128	152
Benzene	ND	107	105
Chloroform	ND	119	144
1,1,1-Trichloroethane	ND	126	134
Carbon Tetrachloride	ND	124	144
Trichloroethene	ND	125	145
1,2-Dichloropropane	ND	115	144
Toluene	ND	111	106
Tetrachloroethene	ND	127	136
Ethylbenzene	ND	111	91
Xylenes	ND	198	176
Surrogate Recovery %	127.6	129.1	150.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172167

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-52D (ug/L)	GMI-53N (ug/L)	GMI-56N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	7	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	9	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	140.7	126.7	119.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Derh-Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172163

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90993 (ug/L)	TB90993 (ug/L)	GMI-51N (ug/L)	GMI-52N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	72	8	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	61	6	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	27	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	118.0	128.4	121.8	119.3	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172169

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
QUALITY CONTROL CHECK (QCC) - % ACCURACY

TARGET COMPOUNDS	BLANK (ug/L)	QCC#1 %	QCC#2 %
Vinylchloride	ND	103	116
1,1-Dichloroethene	ND	127	145
Methylene Chloride	ND	127	150
trans-1,2-Dichloroethene	ND	124	146
1,1-Dichloroethane	ND	118	145
cis-1,2-Dichloroethene	ND	128	152
Benzene	ND	107	105
Chloroform	ND	119	144
1,1,1-Trichloroethane	ND	126	134
Carbon Tetrachloride	ND	124	144
Trichloroethene	ND	125	145
1,2-Dichloropropane	ND	115	144
Toluene	ND	111	106
Tetrachloroethene	ND	127	136
Ethylbenzene	ND	111	91
Xylenes	ND	198	176
Surrogate Recovery %	127.6	129.1	150.0

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172170

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
% RECOVERY FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

TARGET COMPOUNDS	RB90993 MS	RB90993 MSD	% RPD
Vinylchloride	89	114	24.6
1,1-Dichloroethene	113	154	30.7
Methylene Chloride	120	146	19.5
trans-1,2-Dichloroethene	118	146	21.2
1,1-Dichloroethane	121	154	24.0
cis-1,2-Dichloroethene	128	152	17.1
Benzene	91	110	18.9
Chloroform	127	150	16.6
1,1,1-Trichloroethane	125	143	13.4
Carbon Tetrachloride	121	145	18.0
Trichloroethene	113	145	24.8
1,2-Dichloropropane	114	143	22.6
Toluene	95	118	21.6
Tetrachloroethene	115	139	18.9
Ethylbenzene	94	112	17.5
Xylenes	162	194	18.0
Surrogate Recovery %	96.4	108.1	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172171

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	RB90993 (ug/L)	TB90993 (ug/L)	GMI-51N (ug/L)	GMI-52N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	ND	5
trans-1,2-Dichloroethene	ND	ND	72	8	4
1,1-Dichloroethane	ND	ND	ND	ND	5
cis-1,2-Dichloroethene	ND	ND	61	6	5
Benzene	ND	ND	ND	ND	4
Chloroform	ND	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	ND	3
Trichloroethene	ND	ND	27	ND	2
1,2-Dichloropropane	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	ND	5
Xylenes	ND	ND	ND	ND	5
Surrogate Recovery %	118.0	128.4	121.8	119.3	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

172172

GEO-MARINE, INC.

Location: CARSWELL AFB, FORT WORTH, TEXAS
Project #: 1161-052

TEG Project #930809T2

DATE OF ANALYSES: 09/09/93
WATER ANALYSES BY EPA 8021

TARGET COMPOUNDS	GMI-52D (ug/L)	GMI-53N (ug/L)	GMI-56N (ug/L)	MDL (ug/L)
Vinylchloride	ND	ND	ND	10
1,1-Dichloroethene	ND	ND	ND	4
Methylene Chloride	ND	ND	ND	5
trans-1,2-Dichloroethene	7	ND	ND	4
1,1-Dichloroethane	ND	ND	ND	5
cis-1,2-Dichloroethene	9	ND	ND	5
Benzene	ND	ND	ND	4
Chloroform	ND	ND	ND	4
1,1,1-Trichloroethane	ND	ND	ND	4
Carbon Tetrachloride	ND	ND	ND	3
Trichloroethene	ND	ND	ND	2
1,2-Dichloropropane	ND	ND	ND	5
Toluene	ND	ND	ND	5
Tetrachloroethene	ND	ND	ND	3
Ethylbenzene	ND	ND	ND	5
Xylenes	ND	ND	ND	5
Surrogate Recovery %	140.7	126.7	119.2	

ND INDICATES NOT DETECTED AT LISTED DETECTION LIMITS

ANALYSES PERFORMED ON-SITE IN TEG'S TWC APPROVED MOBILE LABORATORY

ANALYSES PERFORMED BY: Paul Schleicher Paul Schleicher

DATA REVIEWED BY: Dr. Derhsing Luu Der-Hsing Luu

Transglobal Environmental Geochemistry, Texas
10805 Metric Boulevard, Austin, TX 78758 (512) 835-9299 FAX (512) 835-9297

teg

...NSE...AL
ENVIRONMENTAL
GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, Tx.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/9/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/9/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
GMI035B2		11:50	H_2O	40ml/VOA	X	X																2
RB809		11:10	H_2O	" "	X	X																2
GMI125		17:30	H_2O	" "	X	X																2
TB809			H_2O	" "	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8-09-93 1800	[illegible]	8-9-93 1800
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

LABORATORY NOTES:

CLIENT

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/10/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/10/93

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES: VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS						FIELD NOTES	Total Number Of Containers	Laboratory Note Number
GMI-18S		1050	H_2O	40ml VOA	X	X																					2
GMI-25S		1300	H_2O	40ml VOA	X	X																					2
GMI-26S		1200	H_2O	40ml VOA	X	X																					2
GMI-02S		1620	H_2O	40ml VOA	X	X																					2
GMI-63S		1650	H_2O	40ml VOA	X	X																					2
TB 81093		1510	H_2O	40ml VOA	X	X																					2
RB 81093		1515	H_2O	40ml VOA	X	X																					2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills 8-10-93	1525	Paul [illegible]	8/10/93 1525
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

TEG DISPOSAL @ $2.00 each | Return | Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

LABORATORY NOTES:

172174

teg

NSG L
ENVIRONMENTAL
GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Kyle Winnette

DATE: 8/11/93 PAGE ___ OF ___
TEG PROJECT #: 9308097T2
LOCATION: Carswell AFB, Ft Worth, TX
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/11/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
GMI-60S		1250	H_2O	40ml VOA	X	X																2
GMI-61S		1415	"	"	X	X																2
GMI-61D		1505	"	"	X	X																2
RB 81193		1120	"	"	X	X																2
TB 81193		1255	"	"	X	X																2
GMI-62S		1525	"	"	X	X																2
GMI-51S		1628	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8/11/93 1800	[illegible]	1800 8/11/93
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

17721

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/12/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth, TX.
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/12/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB 81293		9:40	H_2O	40ml VOA	X	X																2
GMI-70S		9:50	"	"	X	X																3
GMI-72S		8:55	"	"	X	X																2
GMI-05S		11:35	"	"	X	X																2
GMI-00/3		1300	"	"	X	X																2
GMI-06S		1510	"	"	X	X																2
GMI-09S		1650	"	"	X	X																2
TB 81293		09:00	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8-12-93 5:49pm	[signature]	8/12/93 5:49 pm
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

[ ] TEG DISPOSAL @ $2.00 each [ ] Return [ ] Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

1726170

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE

ADDRESS: 550 East 15th St. Plano, TX.

PHONE: (214) 423-5480 FAX:

CLIENT PROJECT #: 1161-052 PROJECT MANAGER:

DATE: 8/13/93 PAGE ___ OF ___

TEG PROJECT #: 930809T2

LOCATION: Carswell AFB - Ft. Worth, TX.

COLLECTOR: Tony Mills DATE OF COLLECTION: 8/13/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB-81393		8:40	H_2O	40ml VOA	X	X																2
GMI-14S		9:20	"	"	X	X																2
GMI-16S		11:00	"	"	X	X																2
GMI-16D		11:35	"	"	X	X																2
GMI-22S		12:00	"	"	X	X																2
GMI-20S		13:40	"	"	X	X																2
GMI-28S		14:50	"	"	X	X																2
TB-81393		9:45	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8-13-93 1507	[signature]	8/13/93 1507
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

172471

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/16/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB - Ft. Worth, TX.
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/16/93

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES: VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB81693		9:30	H_2O	40ml VOA	X	X																2
GMI-36S		9:50	"	"	X	X																1
GMI-38S		11:45	"	"	X	X																2
GMI-37S		13:20	"	"	X	X																2
GMI-01S		15:00	"	"	X	X																2
TB81693		10:05	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8/16/93 1516	[signature]	8/16/93 15:16
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

172173

teg TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE
ADDRESS: 550 East 15th St. Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/17/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB - Ft. Worth, TX
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/17/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RBS1793		8:00	H_2O	40ml VOA	X	X																2
GMI-42S		9:20	"	"	X	X																2
GMI-54S		9:35	"	"	X	X																2
GMI-34S		11:05	"	"	X	X																2
GMI-34D		11:05	"	"	X	X																2
GMI-55S		13:30	"	"	X	X																2
GMI-56S		11:30	"	"	X	X																1
GMI-27S		17:10	"	"	X	X																2
GMI-73S		15:50	"	"	X	X																2
GMI-74S		15:25	"	"	X	X																2
TBS1793		9:25	"	"	X	X																2
																						-

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C Mills	8/17/93 1741	[illegible]	8/17/93 17:41
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

LABORATORY NOTES:

17241

teg

NSG ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEOMARINE

ADDRESS: 550 East 15th St. Plano, TX.

PHONE: (214) 423-5480 FAX:

CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/18/93 PAGE ___ OF ___

TEG PROJECT #: 930809T2

LOCATION: Carswell AFB, - Ft Worth, TX.

COLLECTOR: Tony Mills DATE OF COLLECTION: 8/18/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB81893		9:00	H_2O	40ml VOA	X	X																2
GMI-75S		9:40	"	"	X	X																2
GMI-76S		9:05	"	"	X	X																2
GMI-83S		10:15	"	"	X	X																2
GMI-84S		11:00	"	"	X	X																2
GMI-85S		11:40	"	"	X	X																2
GMI-85D		11:40	"	"	X	X																2
GMI-77S		14:30	"	"	X	X																2
GMI-78S		15:30	"	"	X	X																2
GMI-86S		14:05	"	"	X	X																2
GMI-88S		16:15	"	"	X	X																2
TB81893		9:30	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8/18/93 17:54	[illegible]	8/18/93 17:54
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

[ ] TEG DISPOSAL @ $2.00 each [ ] Return [ ] Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS

CHAIN OF CUSTODY SEALS Y/N/NA

SEALS INTACT? Y/N/NA

RECEIVED GOOD COND./COLD

NOTES:

LABORATORY NOTES: 172180

teg

TRANSCONTINENTAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEO-MARINE

ADDRESS: 550 East 15th St. Plano, TX.

PHONE: (214) 423-5480 FAX:

CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/19/93 PAGE ___ OF ___

TEG PROJECT #: 930809T2

LOCATION: Carswell AFB, Ft Worth, TX.

COLLECTOR: Tony Mills DATE OF COLLECTION: 8/19/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB81993		10:00	H_2O	40ml VOA	X	X																2
GMI-58S		10:25	"	"	X	X																2
GMI-66S		10:35	"	"	X	X																2
GMI-57S		12:05	"	"	X	X																2
GMI-57S		12:15	"	"	X	X																2
GMI-94S		14:25	"	"	X	X																2
GMI-95S		14:50	"	"	X	X																2
GMI-01N		17:20	"	"	X	X																2
GMI-04N		17:50	"	"	X	X																2
GMI-04D		17:50	"	"	X	X																2
TB81993		10:10	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8/19/93 18:10	[signature]	8/19/93 18:10
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

172181

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine
ADDRESS: 550 East 15th St Plano, TX.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/20/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, - Ft Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 8/20/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
GMI-05N		10:00	H_2O	4/1 liter VOA	X	X																2
GMI-20N		12:00	H_2O	4/1 liter VOA	X	X																2
RB82093		07:50	"	"	X	X																2
GMI-27N		15:35	"	"	X	X																2
GMI-35N		16:17	"	"	X	X																2
TB82093		09:40	"	"	X	X																2
GMI-20N		17:15	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	8/20/93 17:30	[signature]	8/20/93 17:30
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

[ ] TEG DISPOSAL @ $2.00 each [ ] Return [ ] Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES: 17218

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine

ADDRESS: 550 East 15th St. Plano, Tx.

PHONE: (214) 423-5480 FAX:

CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/23/93 PAGE ___ OF ___

TEG PROJECT #: 930809T2

LOCATION: Carswell AFB, Ft. Worth, TX.

COLLECTOR: Tony Mills DATE OF COLLECTION: 8/23/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB82393		10:40	H_2O	40ml VOA	X	X																2
GMI-48N		11:20	"	"	X	X																2
GMI-47N		14:35	"	"	X	X																2
GMI-49N		13:35	"	"	X	X																2
GMI-14N		18:20	"	"	X	X																2
GMI-29N		15:45	"	"	X	X																2
GMI-07N		19:35	"	"	X	X																2
TB82393		11:40	"	"	X	X																2
GMI-07D		19:35	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C Mills	8-23-93/2000	[signature]	8/23/93 20:00
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

[ ] TEG DISPOSAL @ $2.00 each [ ] Return [ ] Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS

CHAIN OF CUSTODY SEALS Y/N/NA

SEALS INTACT? Y/N/NA

RECEIVED GOOD COND./COLD

NOTES:

LABORATORY NOTES:

17218

teg

ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: GEO-MARINE

ADDRESS: 550 East 15th St. Plano, TX.

PHONE: (214) 423-5480 FAX:

CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 8/24/93 PAGE ___ OF ___

TEG PROJECT #: 930809T2

LOCATION: Carswell AFB, Ft. Worth, TX.

COLLECTOR: Tony Mills DATE OF COLLECTION: 8/24/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB82493		09.45	H2O	40ml VOA	X	X																2
GMI-30N		11:30	"	"	X	X																2
GMI-23N		12:30	"	"	X	X																2
TB82493		09.45	"	"	X	X																2

RELINQUISHED BY (Signature): Tony C. Mills DATE/TIME: 8-24-93/1710 RECEIVED BY (Signature): [illegible] DATE/TIME: 8/24/93 17:10

RELINQUISHED BY (Signature) DATE/TIME RECEIVED BY (Signature) DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS

CHAIN OF CUSTODY SEALS Y/N/NA

SEALS INTACT? Y/N/NA

RECEIVED GOOD COND./COLD

NOTES:

LABORATORY NOTES: 122183

teg

NSG... L
ENVIRONMENTAL
GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine
ADDRESS: 550 East 15th St Plano, TX
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Kyle Winnette

DATE: 9/1/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 9/1/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB83193		9:30	H_2O	40ml VOA	X	X														collected 8/31/93		2
GMI-36N		17:20	"	"	X	X														"		2
GMI-28N		17:50	"	"	X	X														"		2
RB90193		7:20	"	"	X	X																2
GMI-24N		9:00	"	"	X	X																2
GMI-32N		10:20	"	"	X	X																2
GMI-39N		11:20	"	"	X	X																2
GMI-40N		14:00	"	"	X	X																2
GMI-33N		15:10	"	"	X	X																2
GMI-41N		14:30	"	"	X	X																2
GMI-42N		17:10	"	"	X	X																2
TB83193		10:00	"	"	X	X																2
GMI-43N		17:50	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills 9/1/93	1900	Paul Schlenker	9/01/93 1900
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

17218

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine, Inc
ADDRESS: 550 East 15th Street
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Kyle Wiancette

DATE: 9/02/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 9/2/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB90293		7:05	H_2O	40ml VOA	X	X																2
GMI-45N		9:00	"	"	X	X																2
GMI-45D		9:00	"	"	X	X																2
GMI-46N		12:00	"	"	X	X																2
GMI-31N		15:10	"	"	X	X																2
TB90293		7:05	"	"	X	X																2
GMI-44N		14:40	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	9/2/93 1800	[illegible]	9/2/93 1900
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

LABORATORY NOTES: 172180

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine, Inc
ADDRESS: 550 East 15th St
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 9/03/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth
COLLECTOR: Tony Mills DATE OF COLLECTION: 9/2/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB90393		8:15	H_2O	40ml VOA	X	X																2
GMI-37N		9:30	"	"	X	X																2
TB90393		8:30	"	"	X	X																2

RELINQUISHED BY (Signature): Tony C. Mills DATE/TIME: 9/3/93 1600
RECEIVED BY (Signature): [illegible] DATE/TIME: 9/3/93 1600
RELINQUISHED BY (Signature): DATE/TIME:
RECEIVED BY (Signature): DATE/TIME:

SAMPLE DISPOSAL INSTRUCTIONS

TEG DISPOSAL @ $2.00 each Return Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

LABORATORY NOTES:

172187

teg

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine, Inc.
ADDRESS: 550 East 15th St. Plano, Texas
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 9/8/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth, TX.
COLLECTOR: Tony Mills DATE OF COLLECTION: 9/7/93 9/8/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
~~RB09~~																						
RB90793			H_2O	40ml VOA	X	X														Collected 9/7/93		2
GMI-04W			"	"	X	X														"	1	[redacted] PS
GMI-18W			"	"	X	X														"		2
GMI-20W			"	"	X	X														"		2
TB90793			"	"	X	X														"		2
RB90893			"	"	X	X																2
GMI-82S			"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C Mills	9/8/93	[signature]	9/8/93
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

172188

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY, INC.

CHAIN-OF-CUSTODY RECORD

CLIENT: Geo-Marine
ADDRESS: 550 East 15th St. Plano, Tx.
PHONE: (214) 423-5480 FAX:
CLIENT PROJECT #: 1161-052 PROJECT MANAGER: Lyle Winnette

DATE: 9/9/93 PAGE ___ OF ___
TEG PROJECT #: 930809T2
LOCATION: Carswell AFB, Ft. Worth, Tx.
COLLECTOR: Tony Mills DATE OF COLLECTION: 9/9/93

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (g & d)	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TOTAL LEAD	pH	ASBESTOS	FIELD NOTES	Total Number Of Containers	Laboratory Note Number
RB-90993		1040	H_2O	40ml VOA	X	X																2
GMI-51N		1100	"	"	X	X																2
GMI-52N		1200	"	"	X	X																2
GMI-52D		1200	"	"	X	X																2
GMI-53N		1410	"	"	X	X																2
GMI-54N		1445	"	"	X	X																2
TB-90993		1135	"	"	X	X																2

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
Tony C. Mills	9/9/93 16:25	Paul [illegible]	9/9/93 16:25
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

[ ] TEG DISPOSAL @ $2.00 each [ ] Return [ ] Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS Y/N/NA
SEALS INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
NOTES:

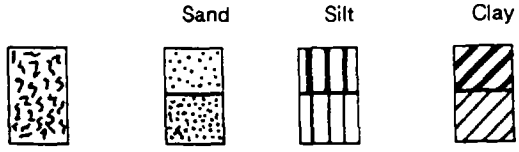
LABORATORY NOTES:

1-1-93

Key To Soil Classification and Symbols

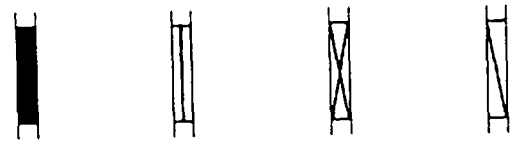
172101

SOIL TYPE
(Shown in Symbol Column)



Predominant Type Shown Heavy

SAMPLE TYPE
(Shown in Samples Column)



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (Major portion Retained on No. 200 Sieve)
Includes (1) clean gravels and sand described as fine, medium or course, depending on distribution of grain sizes (2) silty or clayey gravels and sands and (3) fine grained low plasticity soils (PI < 10) such as sandy silts. Condition is rated according to relative density, as determined by lab tests or estimated from resistance to sampler penetration.

Descriptive Term	Penetration Resistance*	Relative Density
Loose	0 - 10	0 to 40%
Medium Dense	10 - 30	40 to 70%
Dense	30 - 50	70 to 90%
Very Dense	Over 50	90 to 100%

* Blows/Foot, 140# Hammer, 30" Drop

FINE GRAINED SOILS (Major Portion Passing No. 200 Sieve)
Includes (1) inorganic and organic silts and clays, (2) sandy, gravelly or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with PI $\geq$ 10.

Descriptive Term	Cohesive Shear Strength Tons/Square Foot
Very Soft	Less Than 0.125
Soft	0.125 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very Stiff	1.00 to 2.00
Hard	2.00 and Higher

Note: Slickensided and fissured clay may have lower unconfined compressive strengths than shown above because of planes of weakness or shrinkage cracks; consistency ratings of such soils are based on hand penetrometer readings.

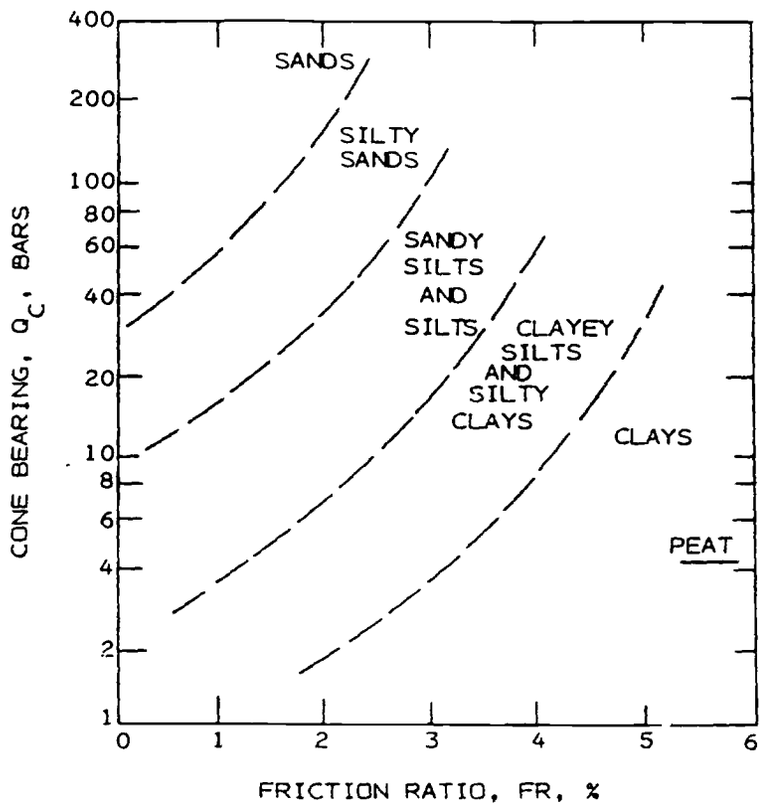
TERMS CHARACTERIZING SOIL STRUCTURE

Parting:	paper thin in size
Seam:	1/8" to 3" thick
Layer:	greater than 3"
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical
Sensitive:	pertaining to cohesive soils that are subject to appreciable loss of strength when remolded
Interbedded:	composed of alternate layers of different soil types
Laminated:	composed of thin layers of varying color and texture
Calcareous:	containing appreciable quantities of calcium carbonate
Well Graded:	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly Graded:	predominantly of one grain size, or having a range of sizes with some intermediate size missing
Flocculated:	pertaining to cohesive soils that exhibit a loose knit or flakey structure
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.

Degree of Slickensided Development

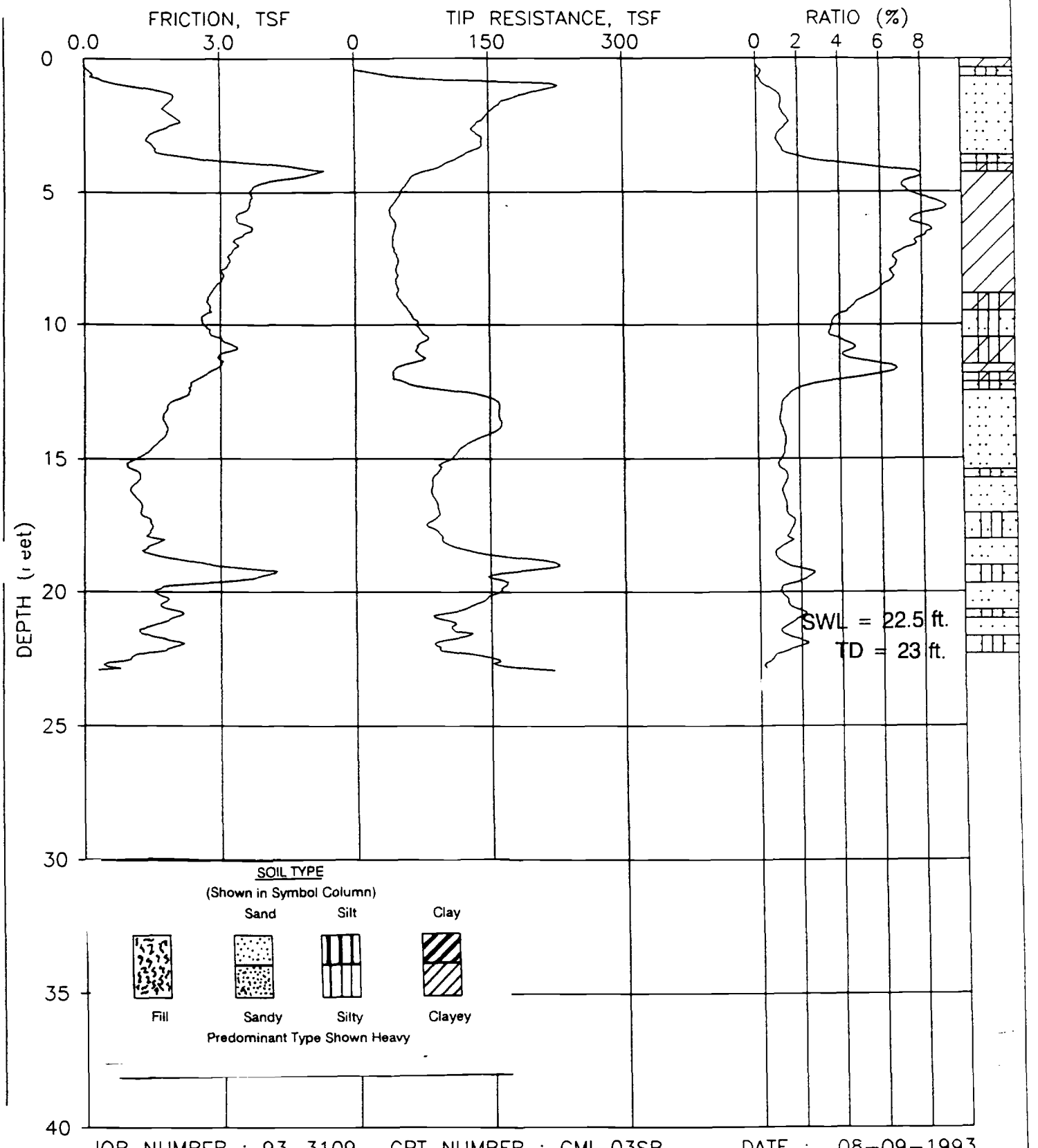
Slightly Slickensided:	slickensides present at intervals of 1' to 2', soil does not easily break along these plates
Moderately Slickensided:	slickensides spaced at intervals of 1' to 2', soil breaks easily along these planes
Extremely Slickensided:	continuous and interconnected slickensides spaced at intervals of 4" to 12', soil breaks along the slickensides into pieces 3" to 6" in size
Intensely Slickensided:	slickensides spaced at intervals of less than 4", continuous in all directions; soil breaks down along planes into nodules 1/4" to 2" in size.

1 BAR = 100KPA = 1.02 KG/CM^2



CAMPANELLA AND ROBERTSON CLASSIFICATION CHART

GMI-3SB

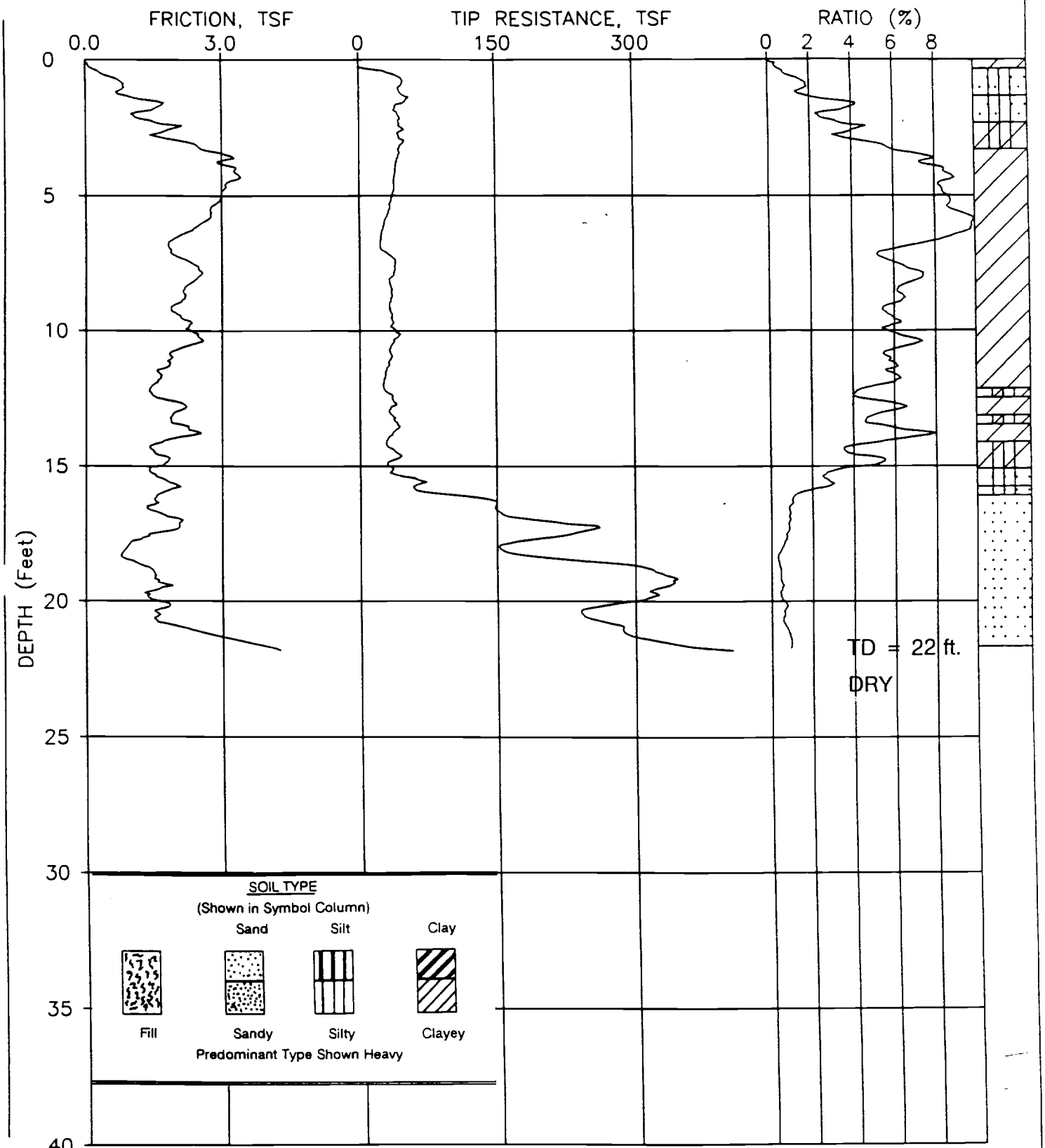


JOB NUMBER : 93-3109 CPT NUMBER : GMI-03SB DATE : 08-09-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

GMI-4SB

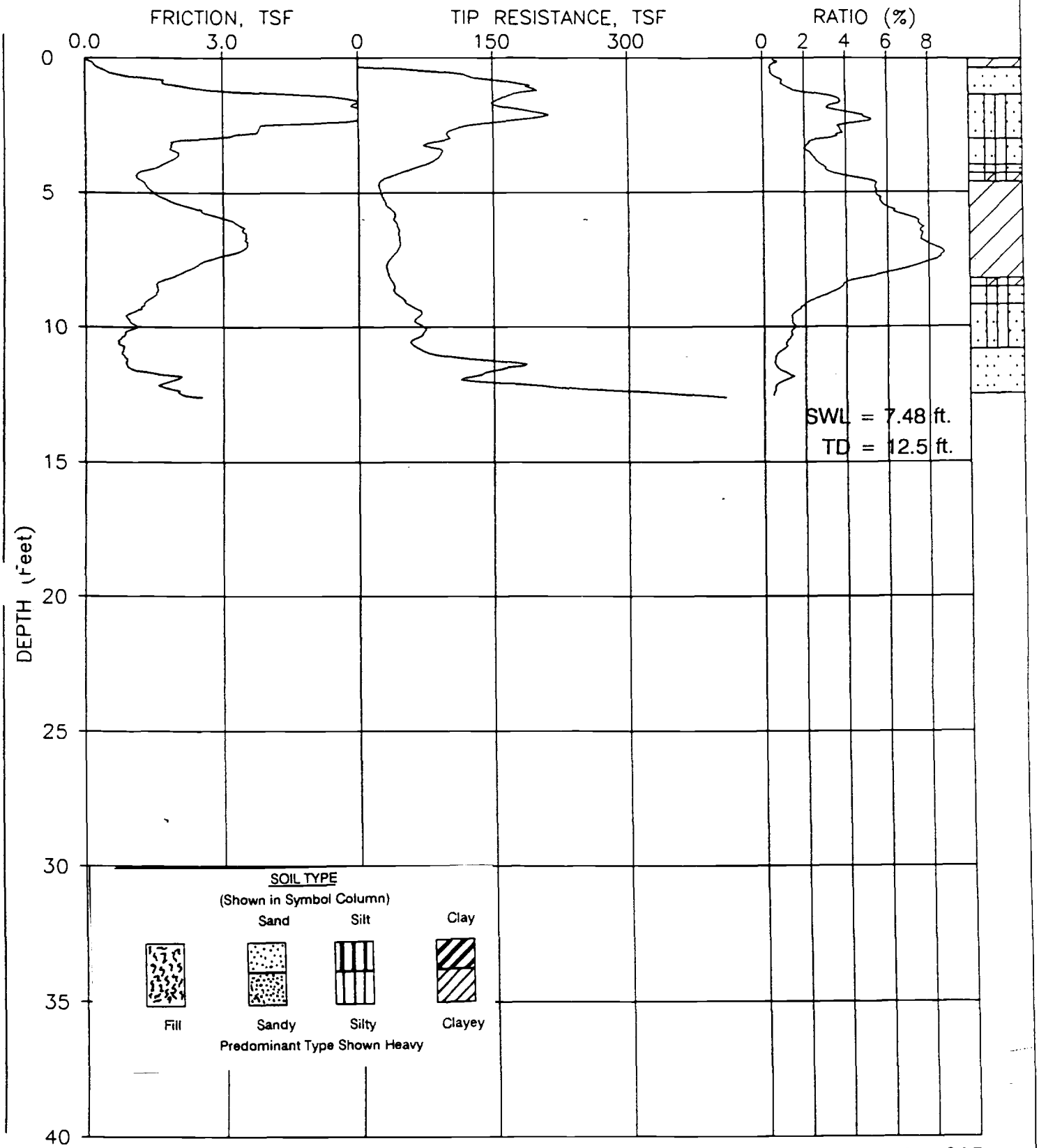


JOB NUMBER : 93-3109 CPT NUMBER : GMI-04SB DATE : 08-09-1993
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES,INC

172193

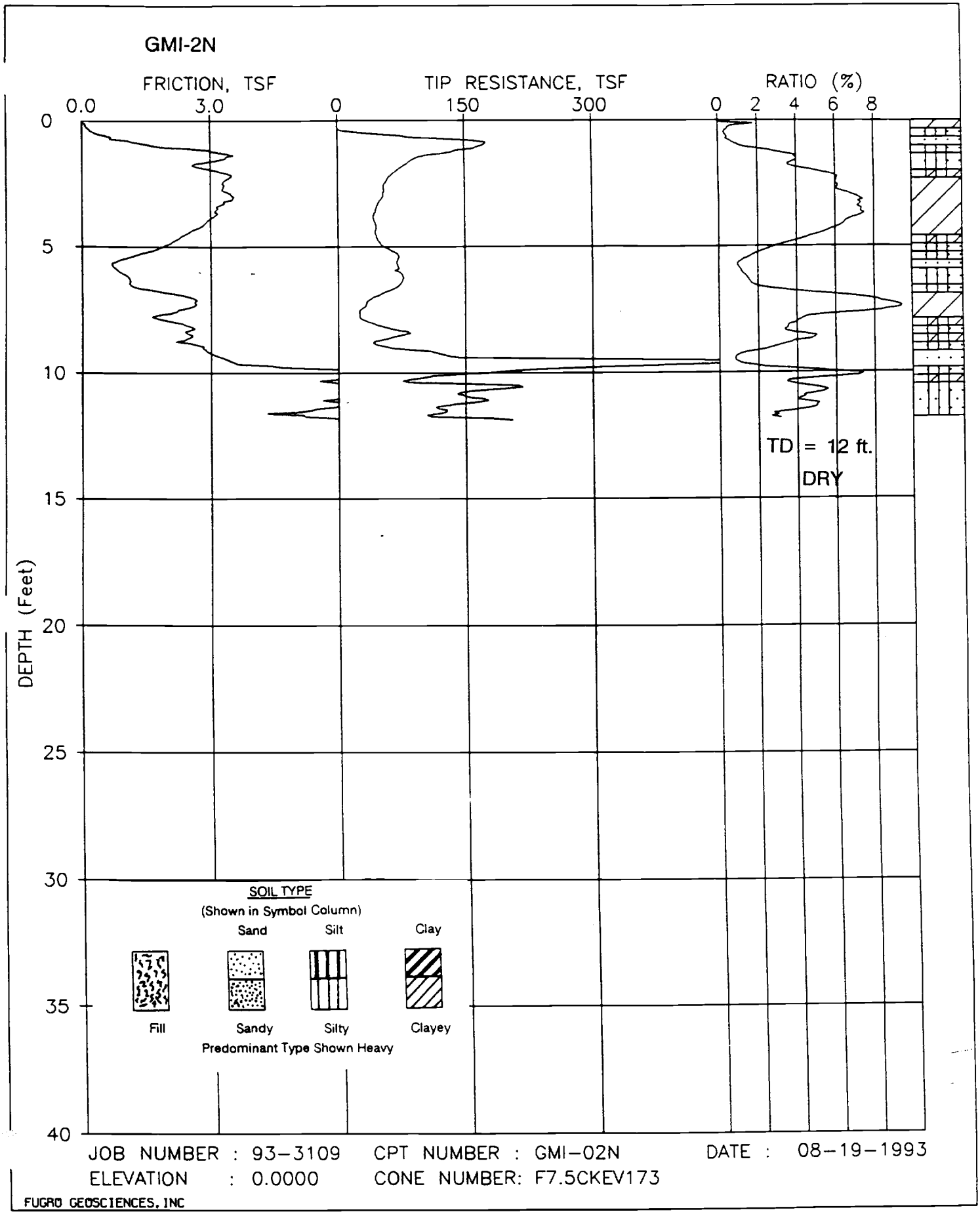
GMI-1N

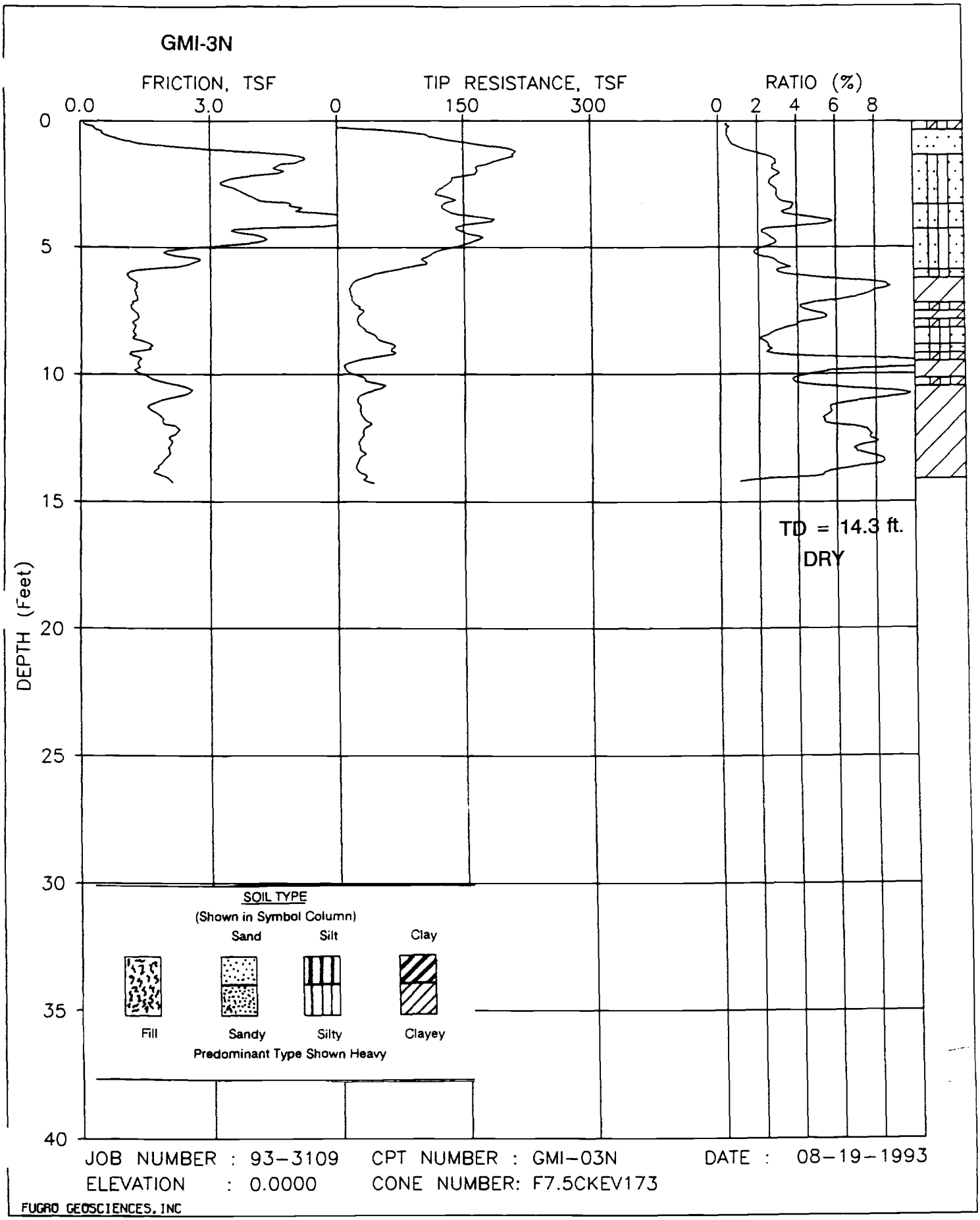


JOB NUMBER : 93-3109 CPT NUMBER : GMI-01N DATE : 08-19-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC


GMI-2N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 12 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-02N
DATE : 08-19-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

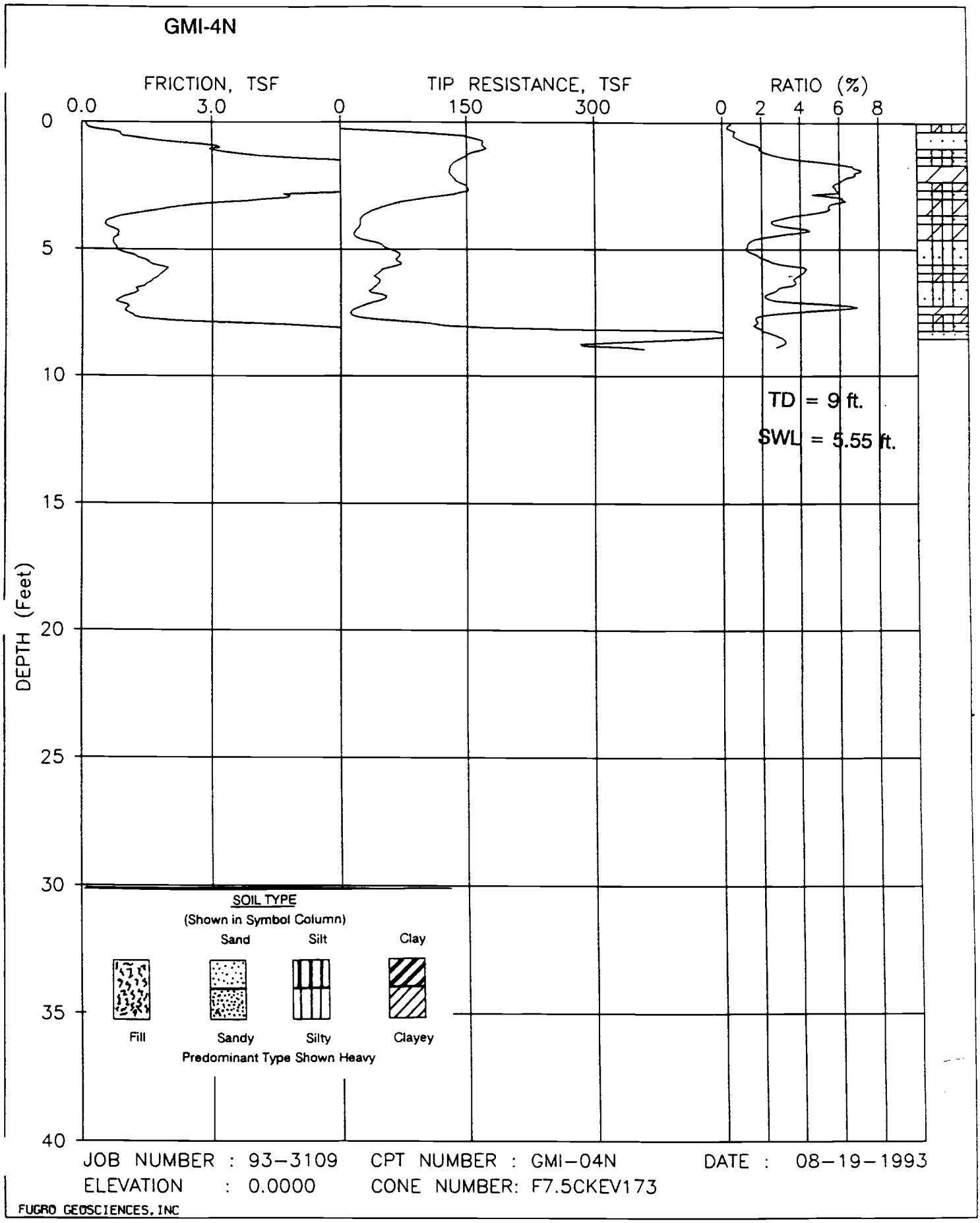


JOB NUMBER : 93-3109 CPT NUMBER : GMI-03N DATE : 08-19-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

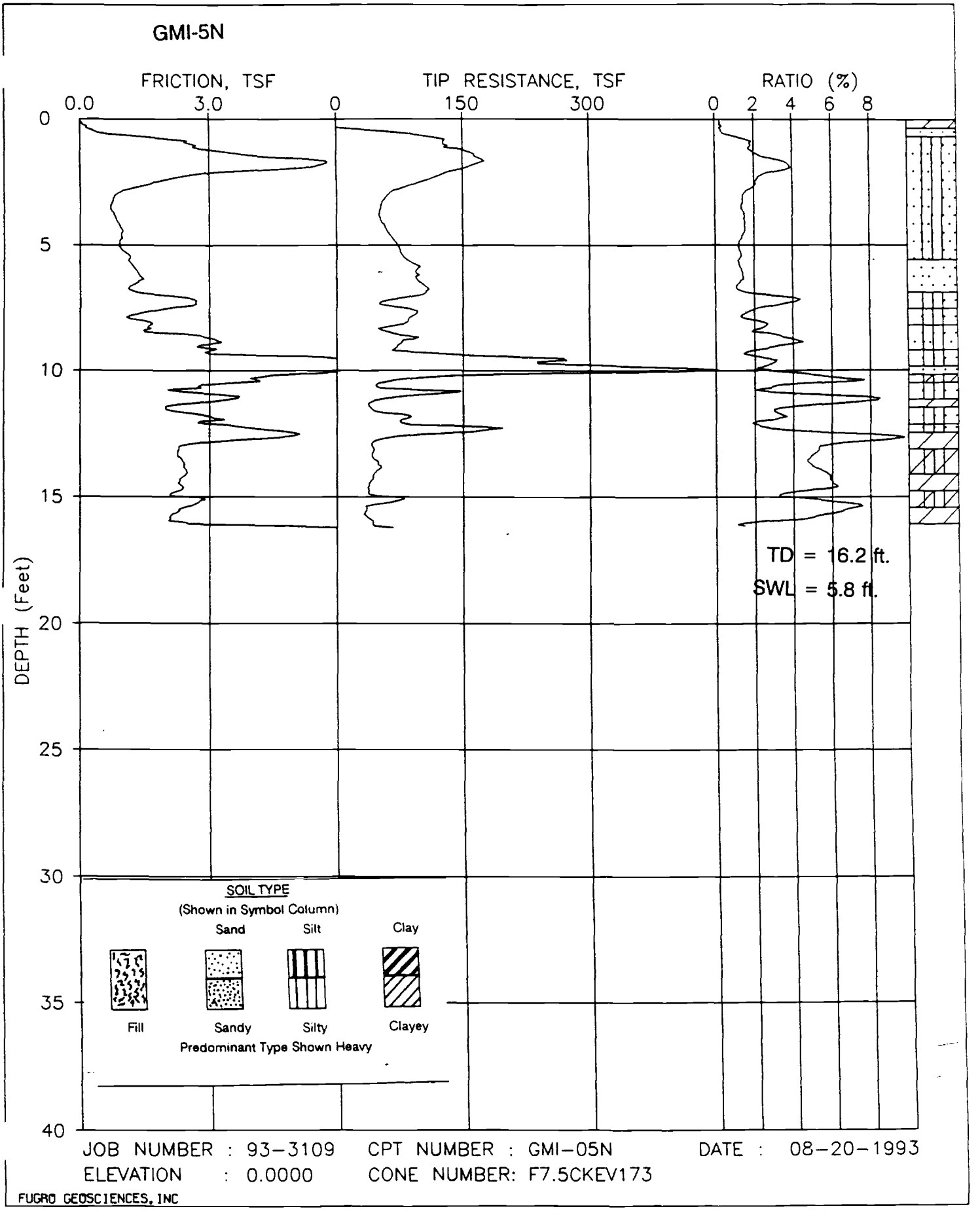
172193



JOB NUMBER : 93-3109 CPT NUMBER : GMI-04N DATE : 08-19-1993

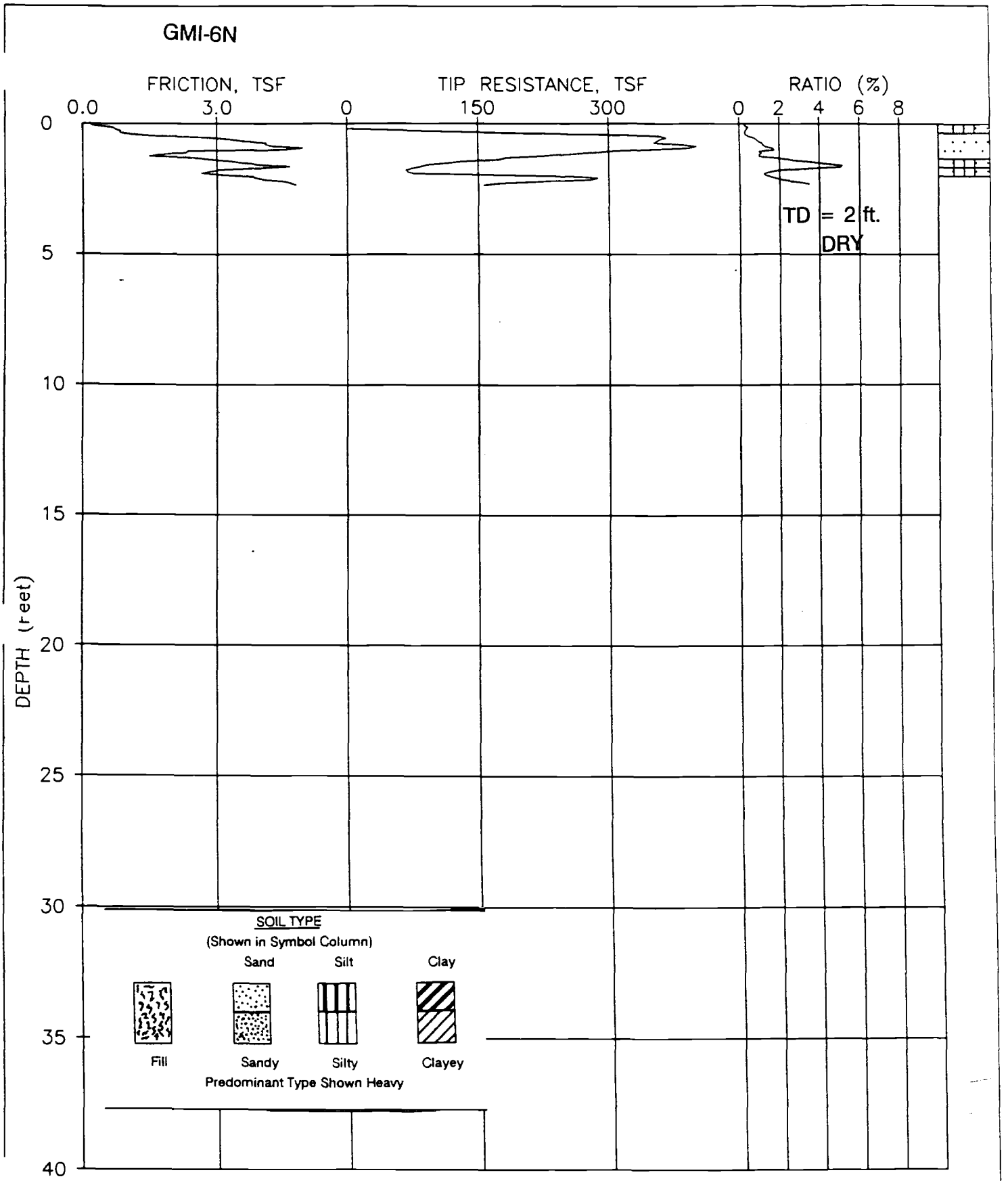
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-05N DATE : 08-20-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

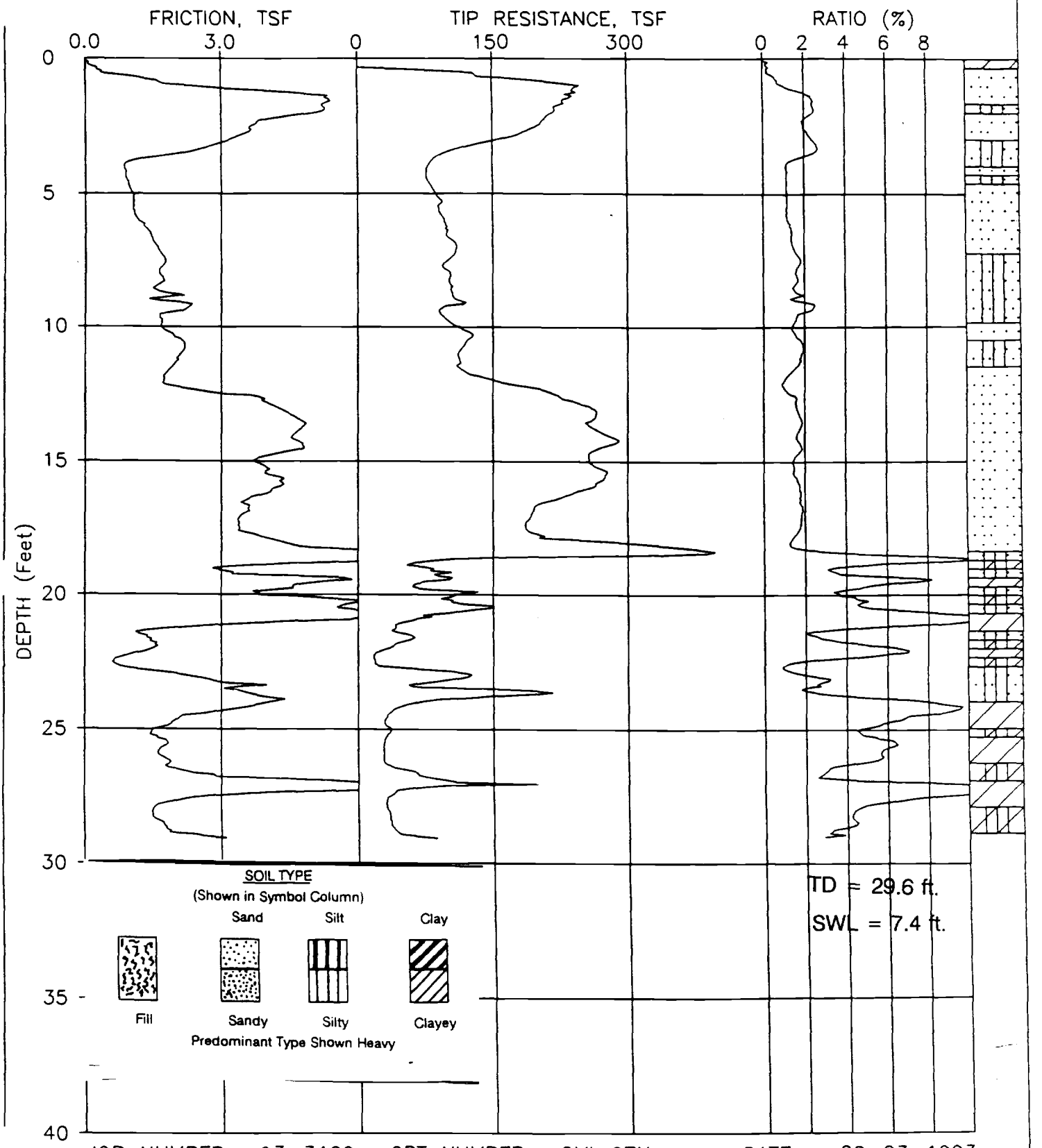


JOB NUMBER : 93-3109 CPT NUMBER : GM1-06N DATE : 08-23-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172201

GMI-7N

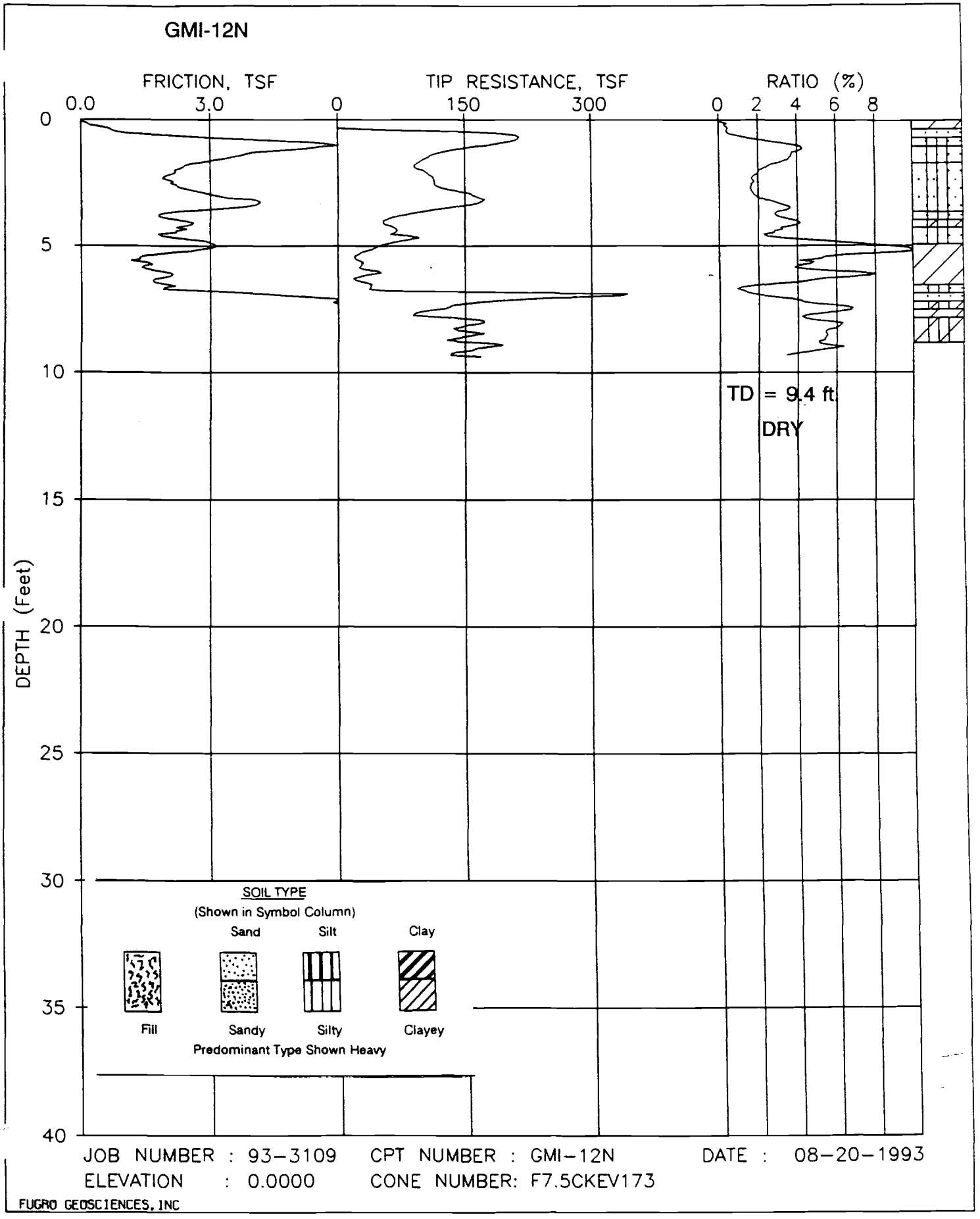


JOB NUMBER : 93-3109 CPT NUMBER : GMI-07N DATE : 08-23-1993

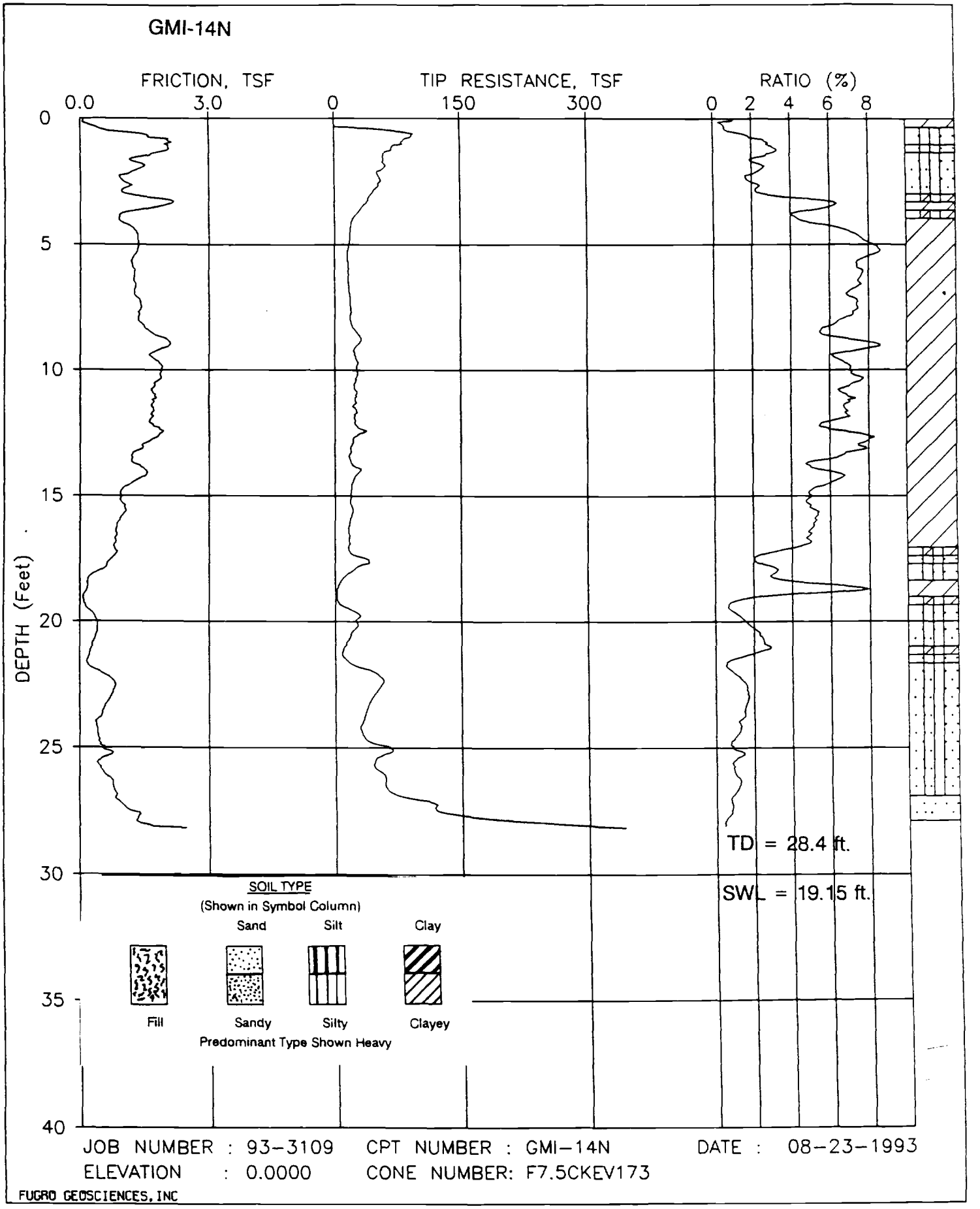
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES,INC

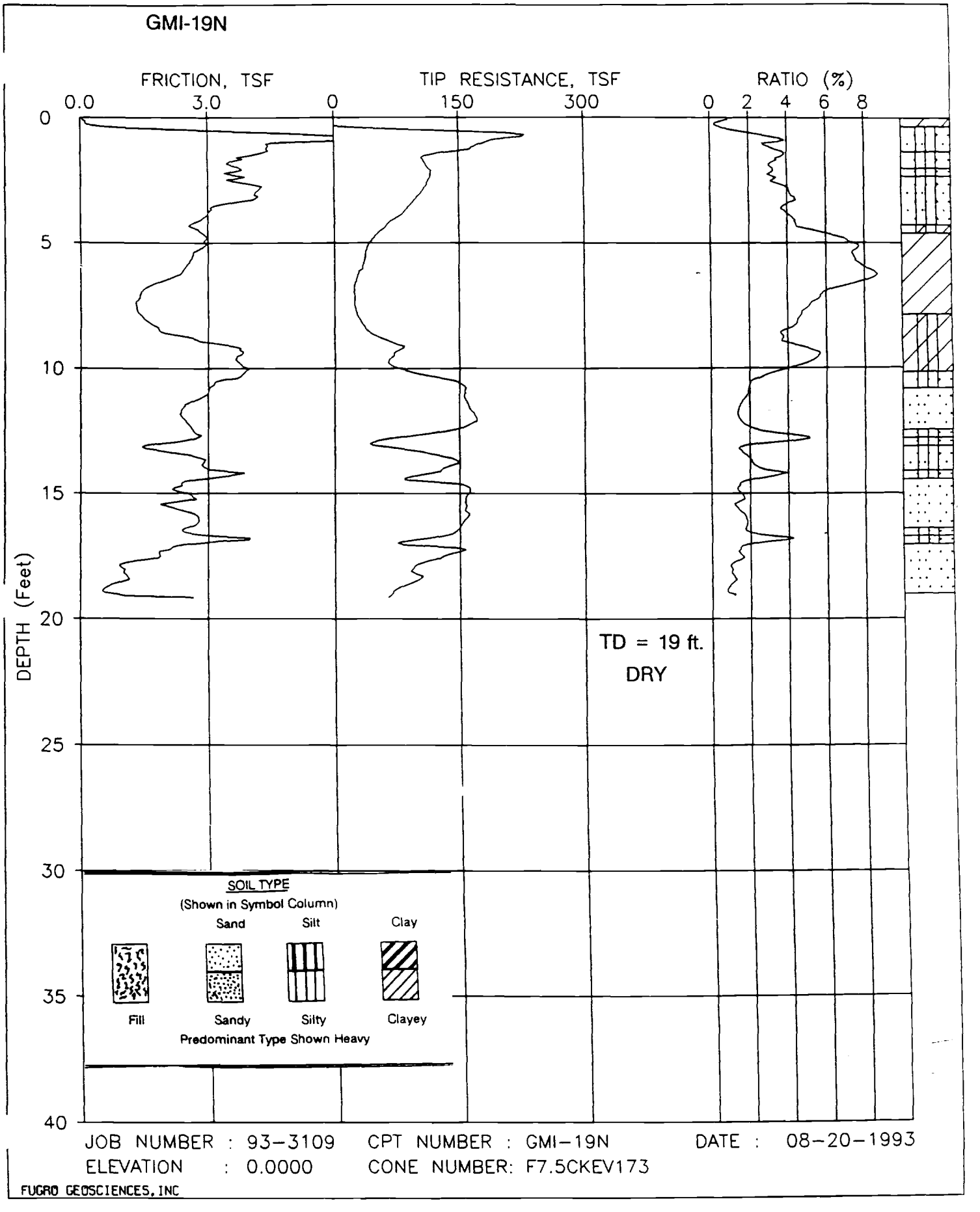
172202


GMI-12N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 9.4 ft
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-12N
DATE : 08-20-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172203


GMI-14N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 28.4 ft.
SWL = 19.15 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-14N
DATE : 08-23-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172204

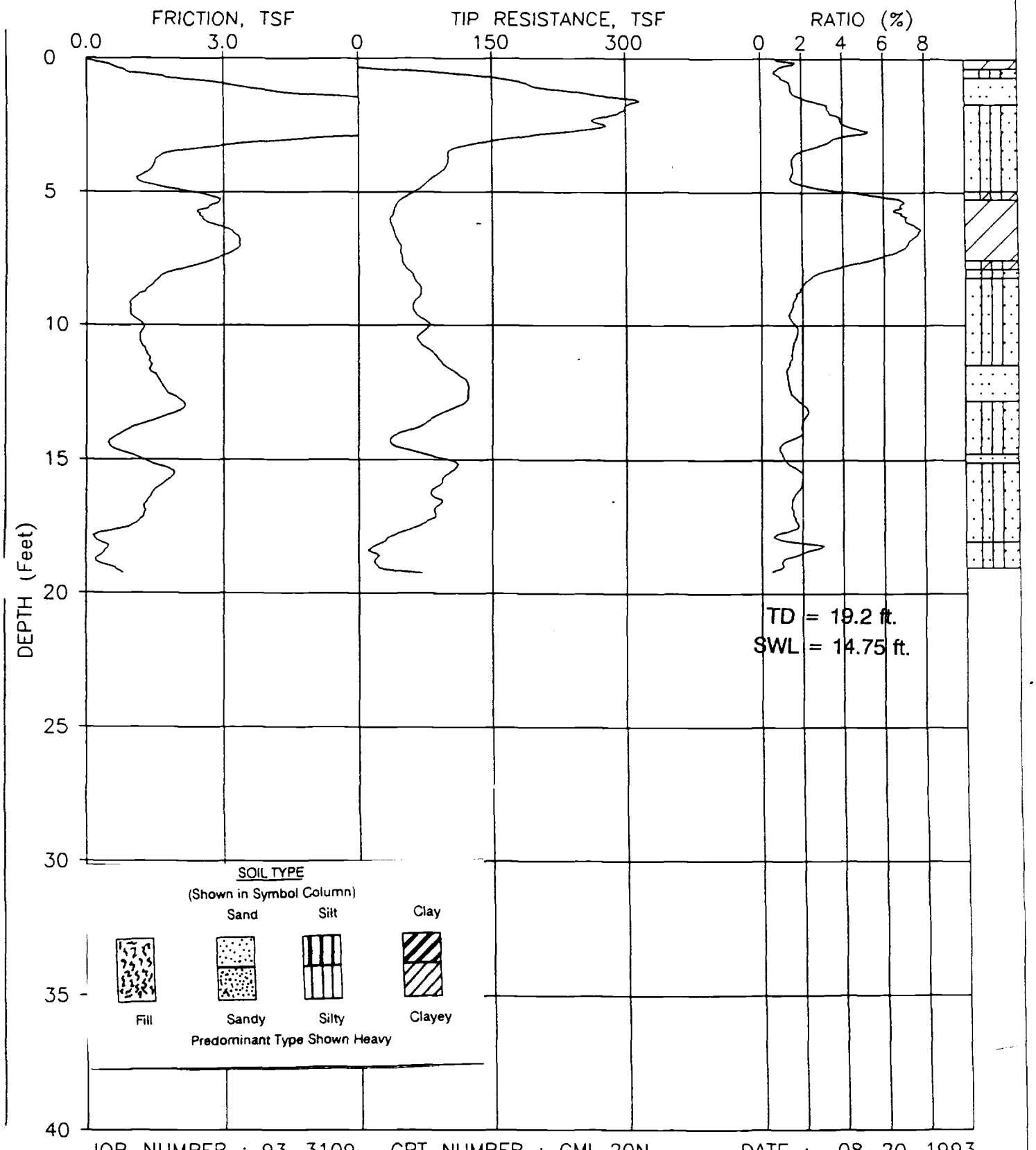


JOB NUMBER : 93-3109 CPT NUMBER : GMI-19N DATE : 08-20-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

GMI-20N

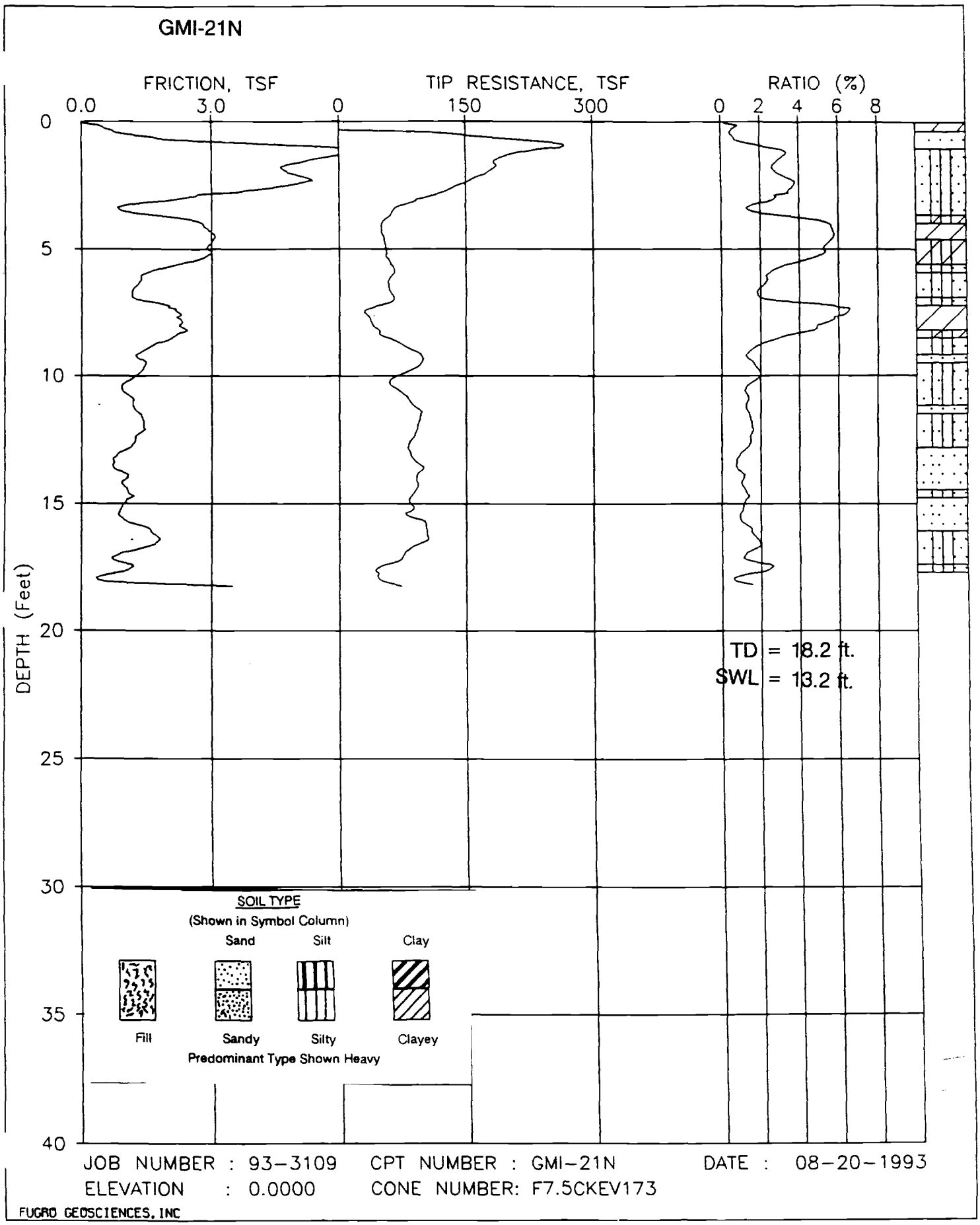


JOB NUMBER : 93-3109 CPT NUMBER : GMI-20N DATE : 08-20-1993

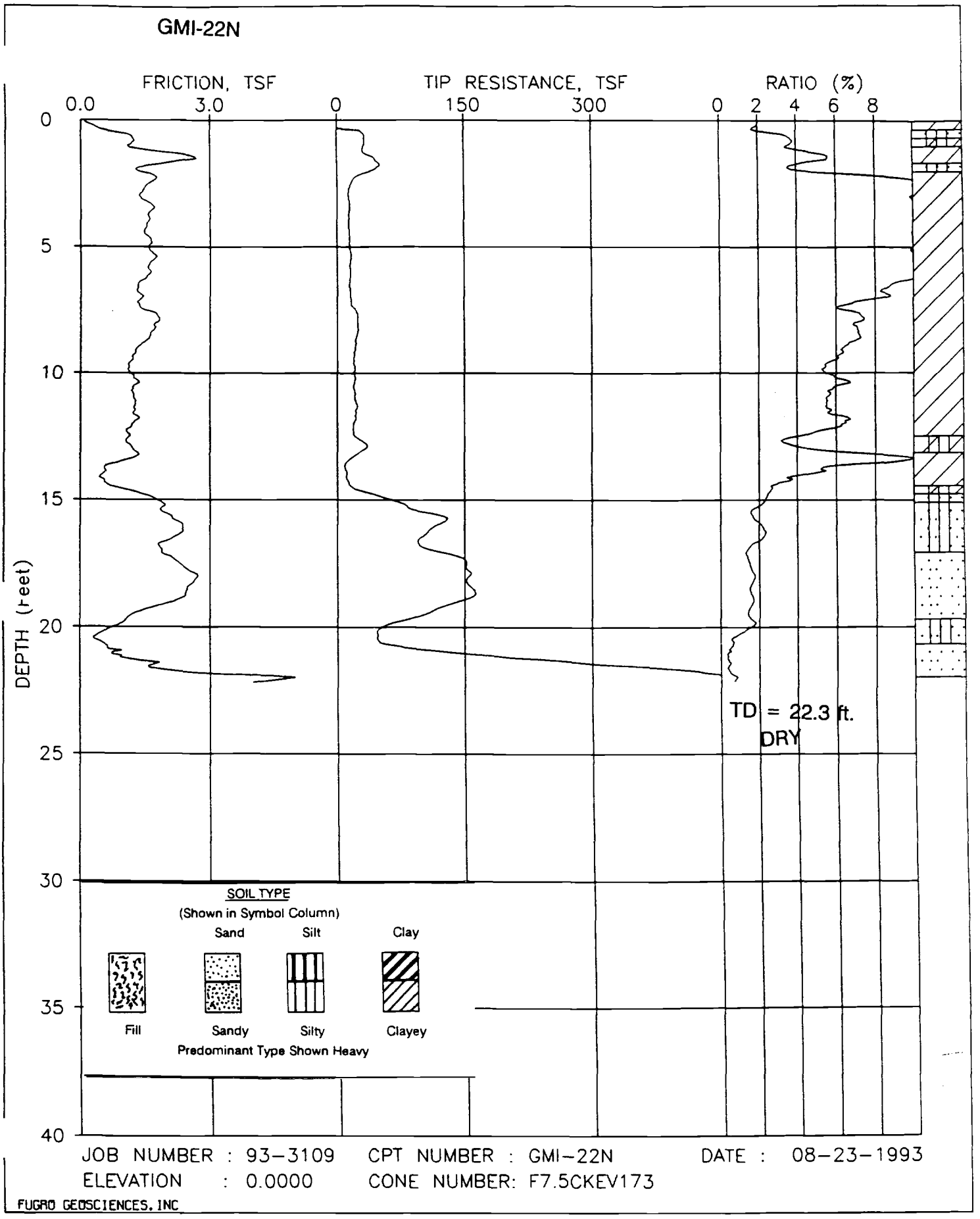
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172206


GMI-21N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18.2 ft.
SWL = 13.2 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-21N
DATE : 08-20-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172207

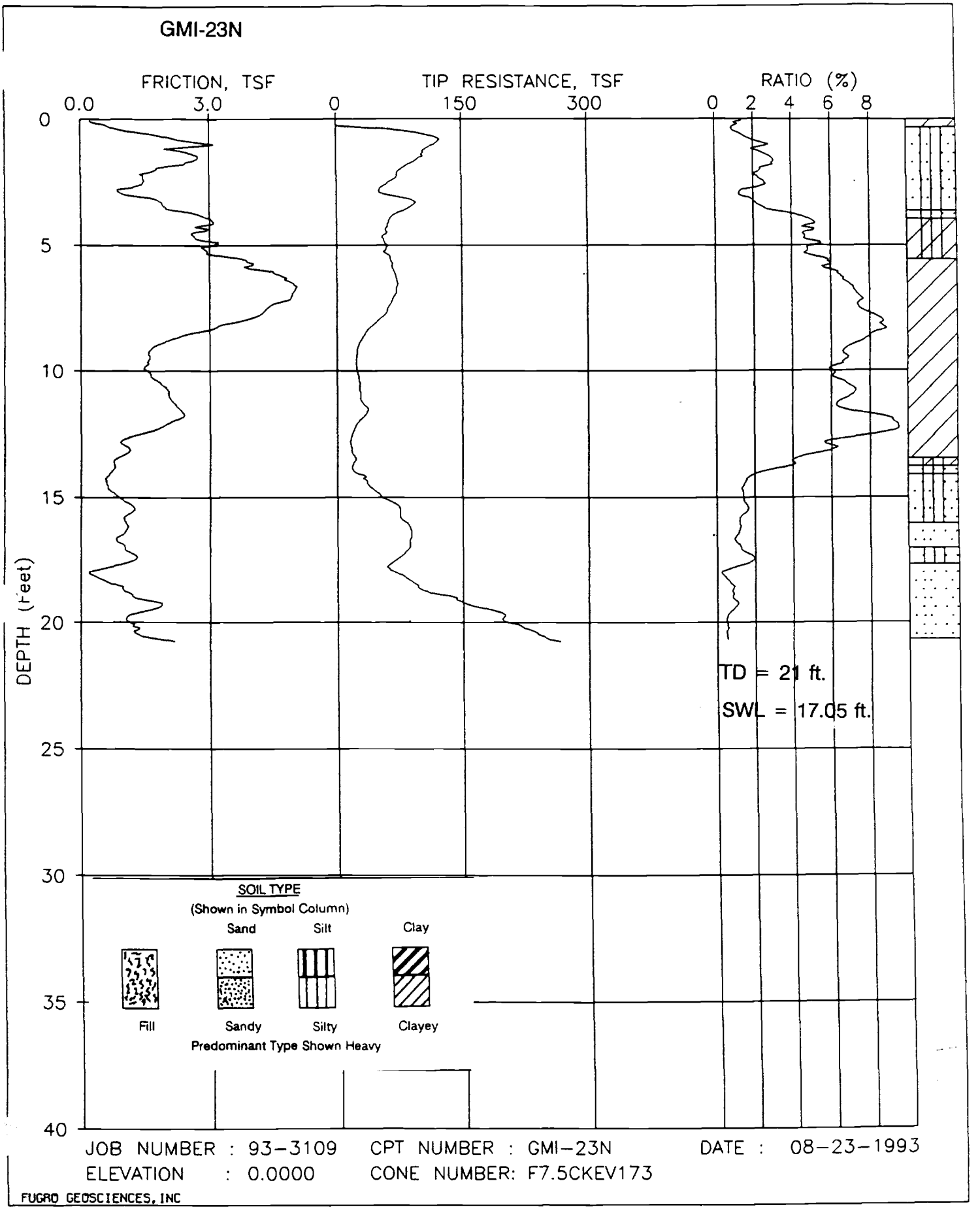


JOB NUMBER : 93-3109 CPT NUMBER : GMI-22N DATE : 08-23-1993

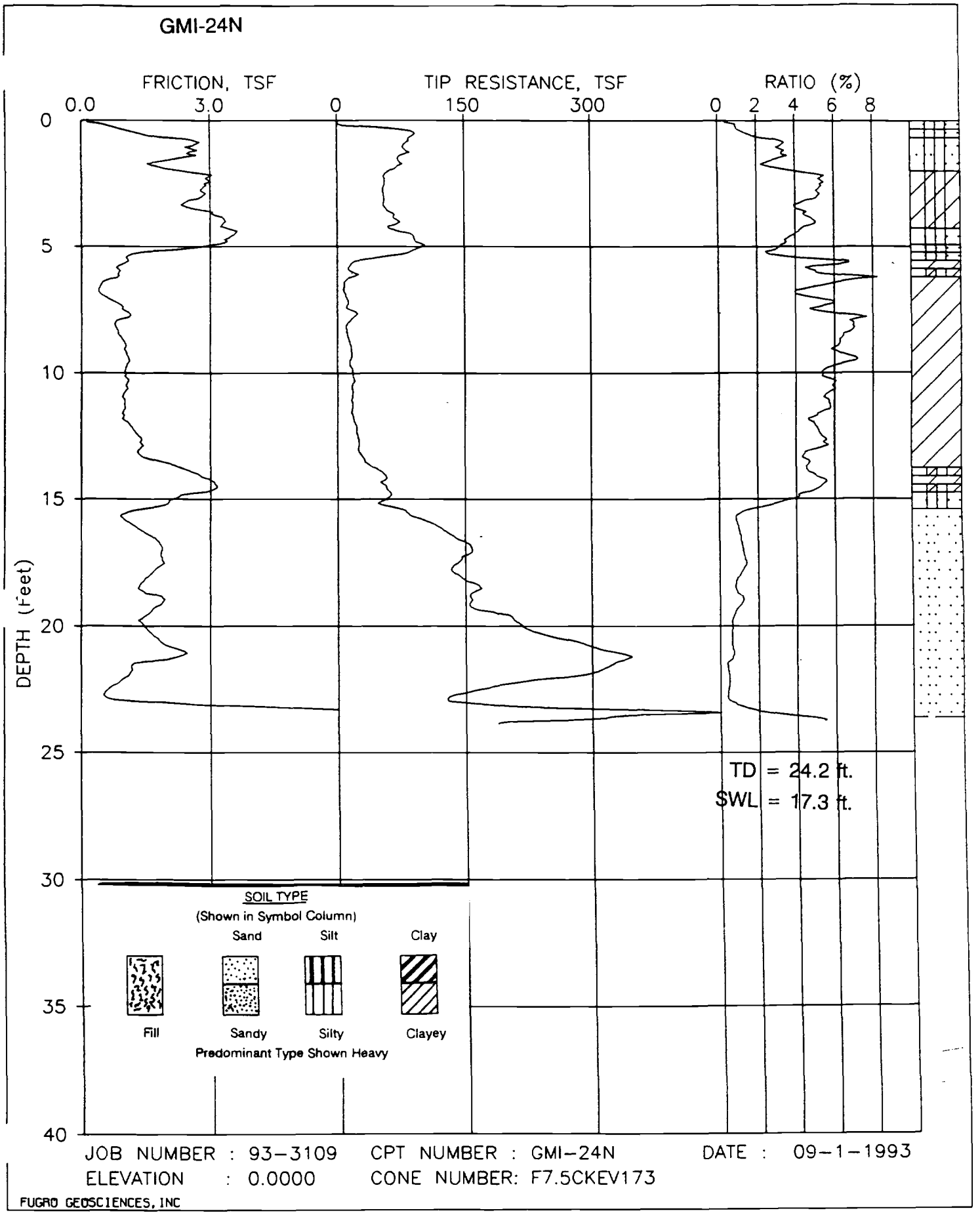
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172203


GMI-23N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 21 ft.
SWL = 17.05 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-23N
DATE : 08-23-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172203



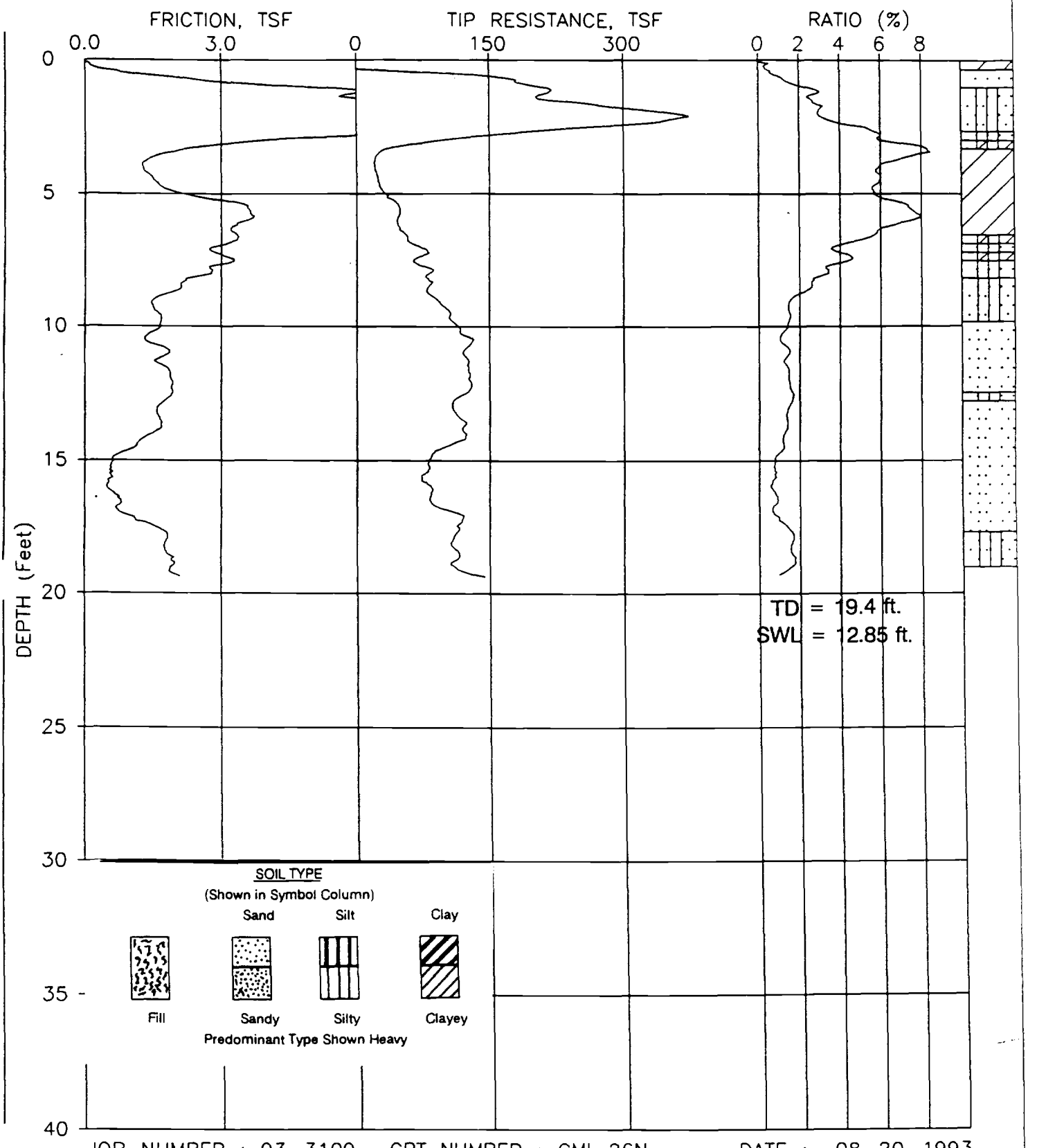
JOB NUMBER : 93-3109 CPT NUMBER : GMI-24N DATE : 09-1-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172210

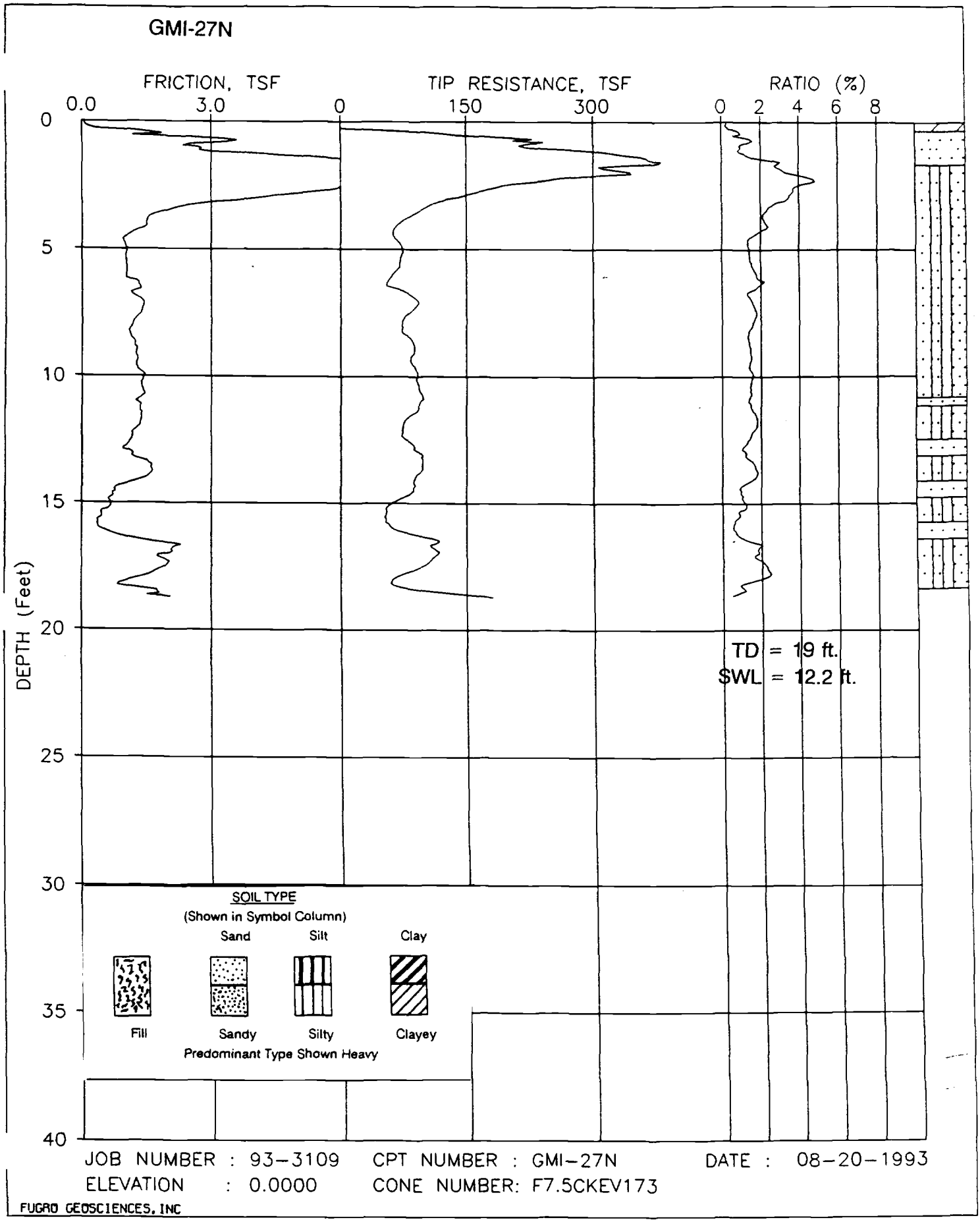
GMI-26N



JOB NUMBER : 93-3109 CPT NUMBER : GMI-26N DATE : 08-20-1993

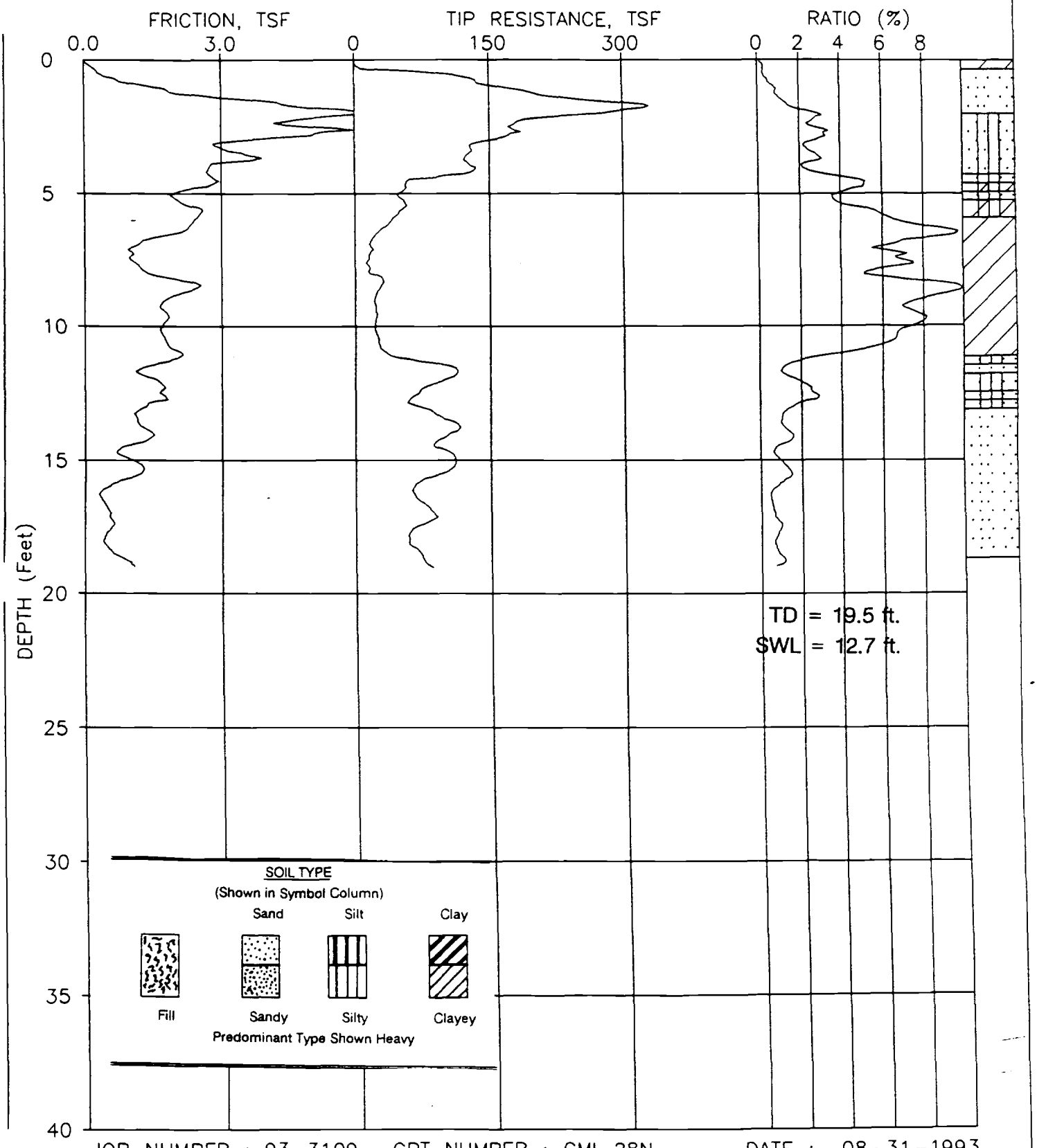
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC


GMI-27N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19 ft.
SWL = 12.2 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-27N
DATE : 08-20-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172212

GMI-28N

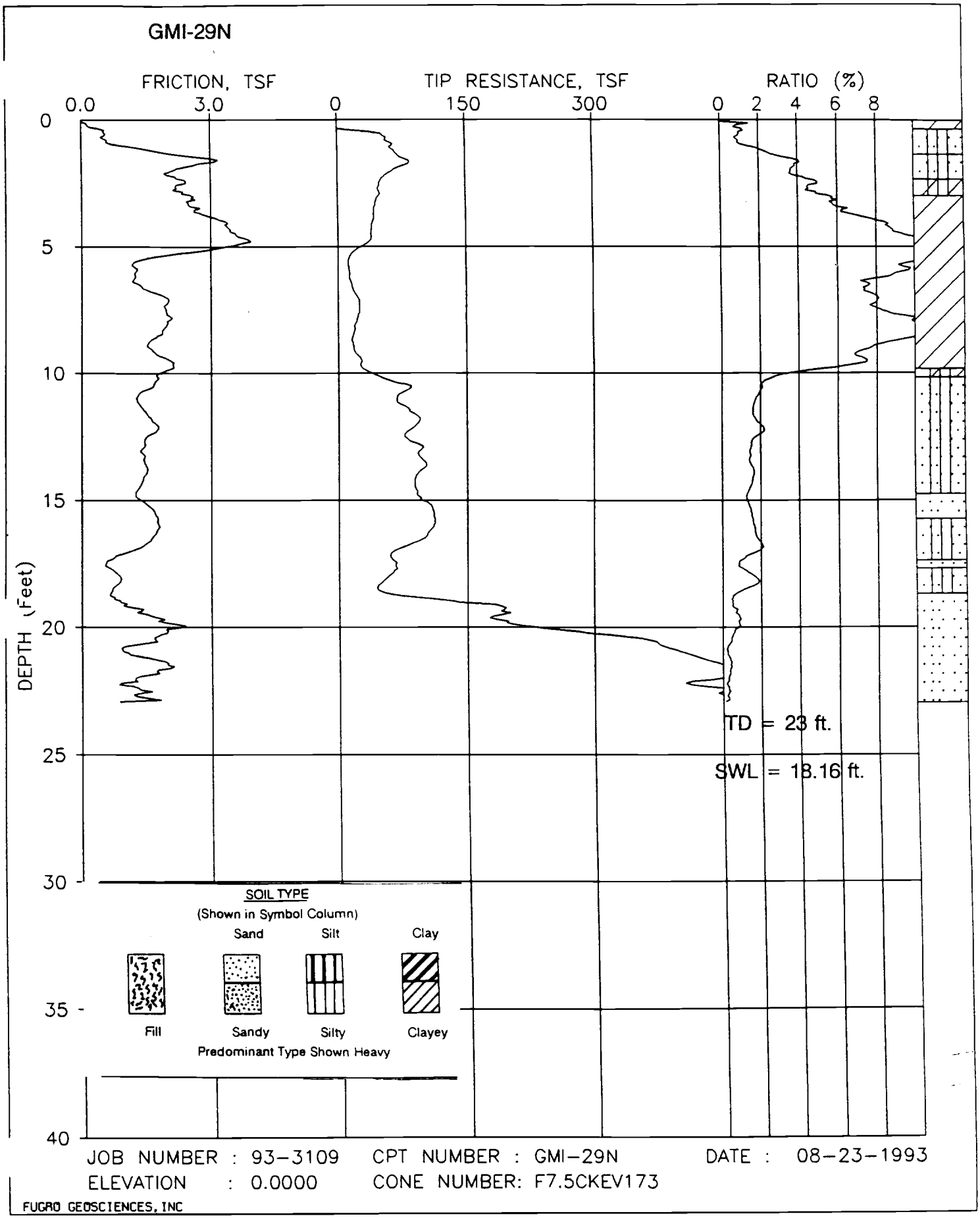


JOB NUMBER : 93-3109 CPT NUMBER : GMI-28N DATE : 08-31-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

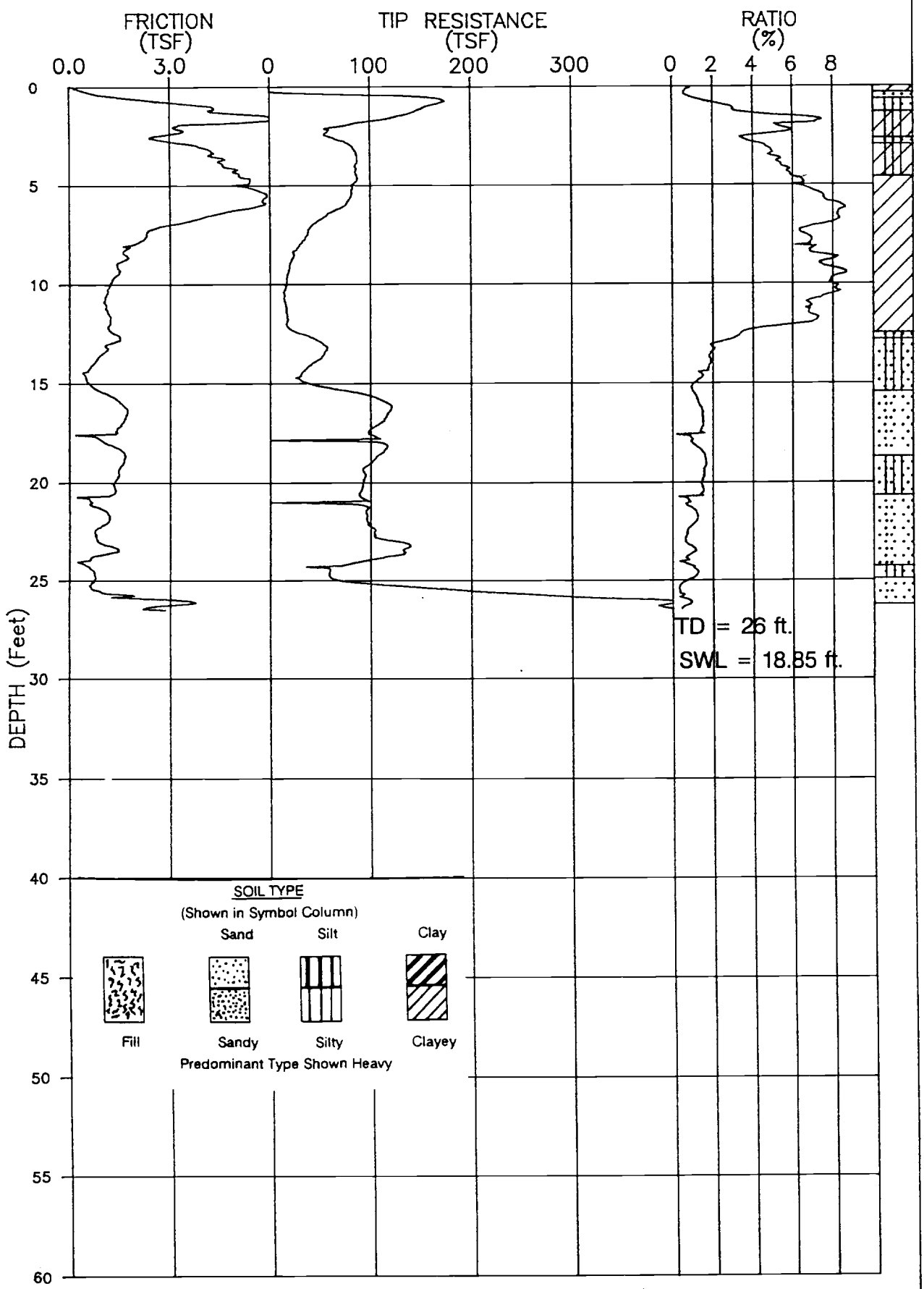
FUGRO GEOSCIENCES, INC

172213


GMI-29N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 23 ft.
SWL = 18.16 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-29N
DATE : 08-23-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172214

GMI-30N

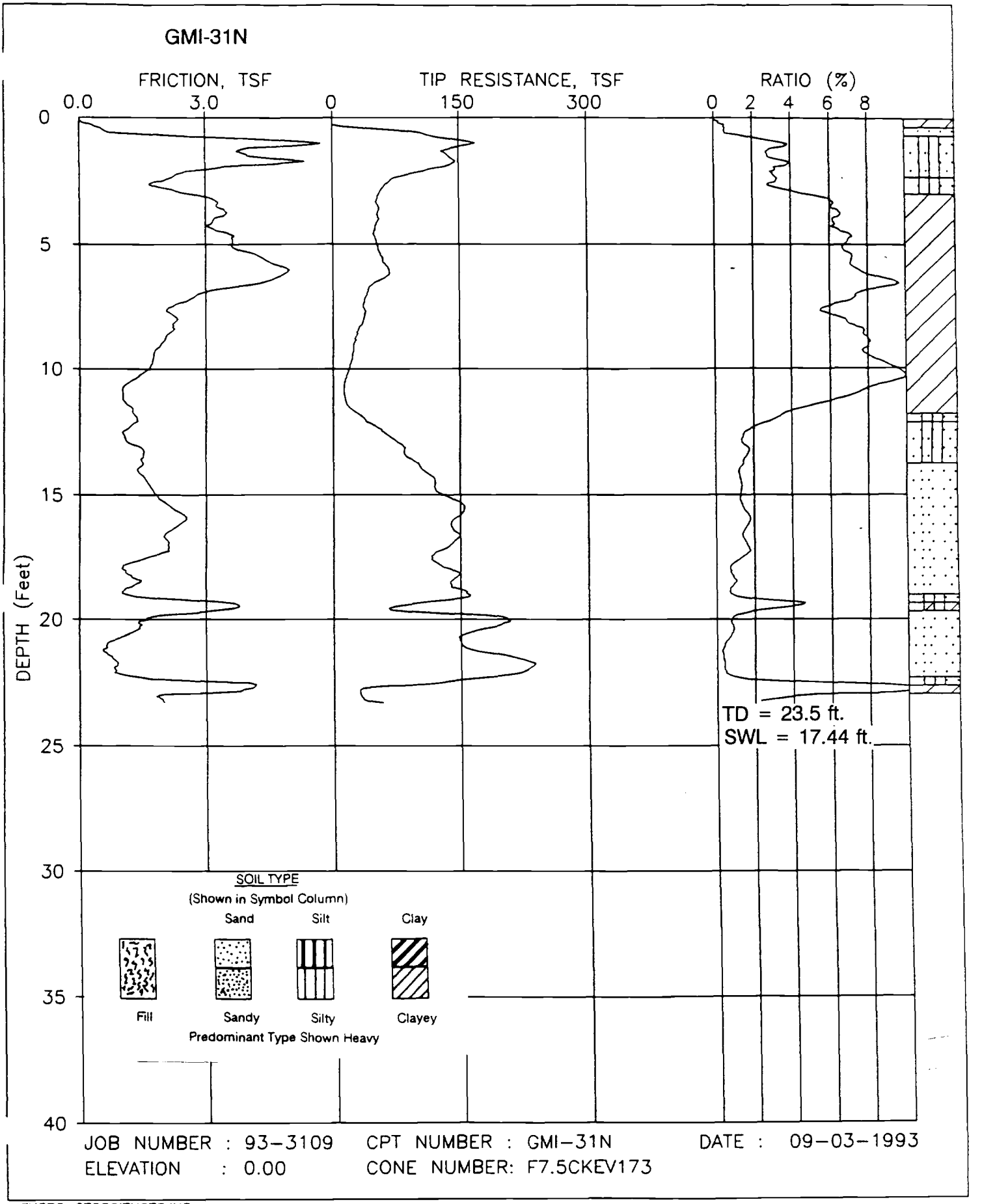


JOB NUMBER : 93-3109 CPT NUMBER : GMI-30N DATE : 08-23-1993

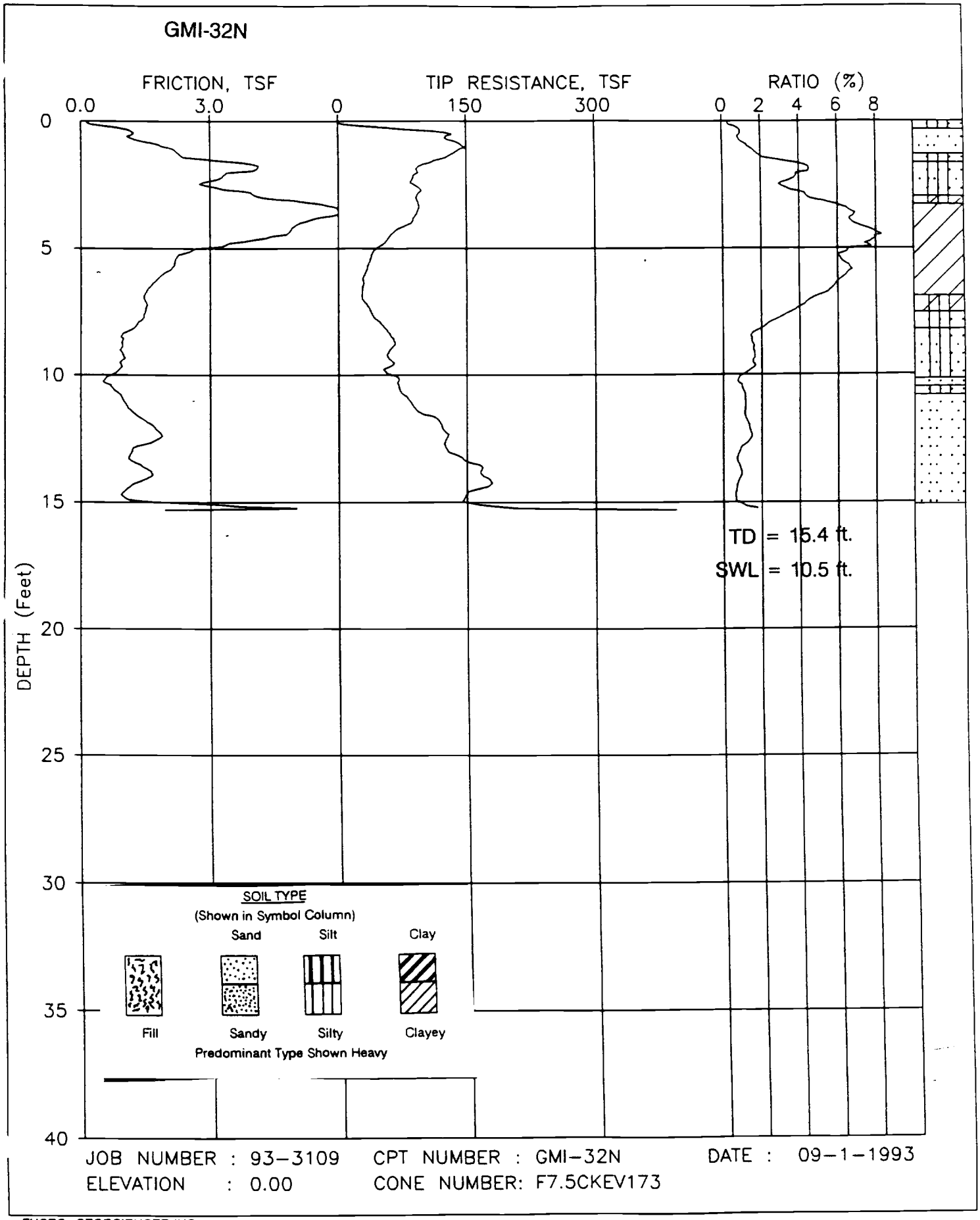
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172215



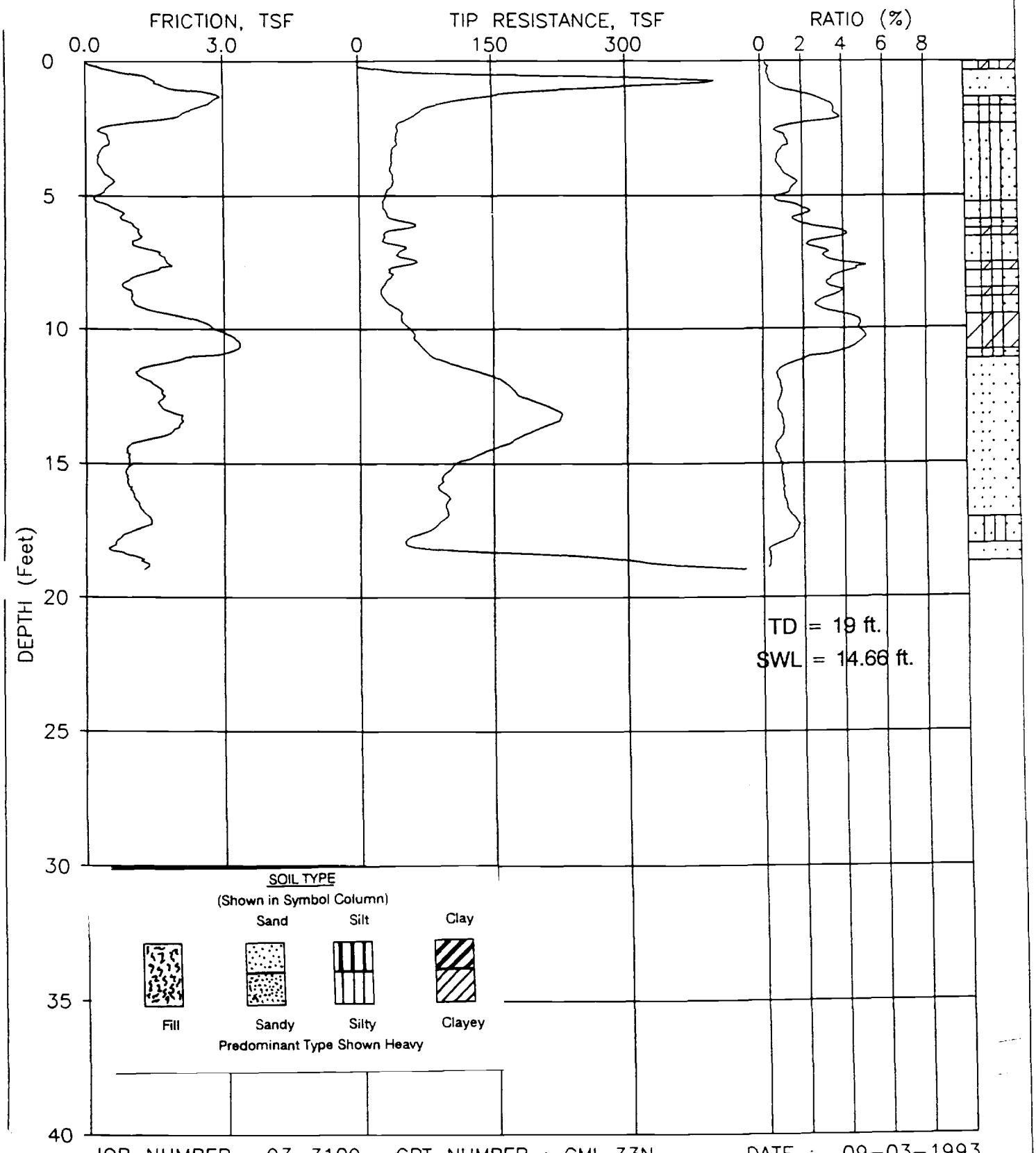
FUGRO GEOSCIENCES,INC



FUGRO GEOSCIENCES,INC

172217

GMI-33N



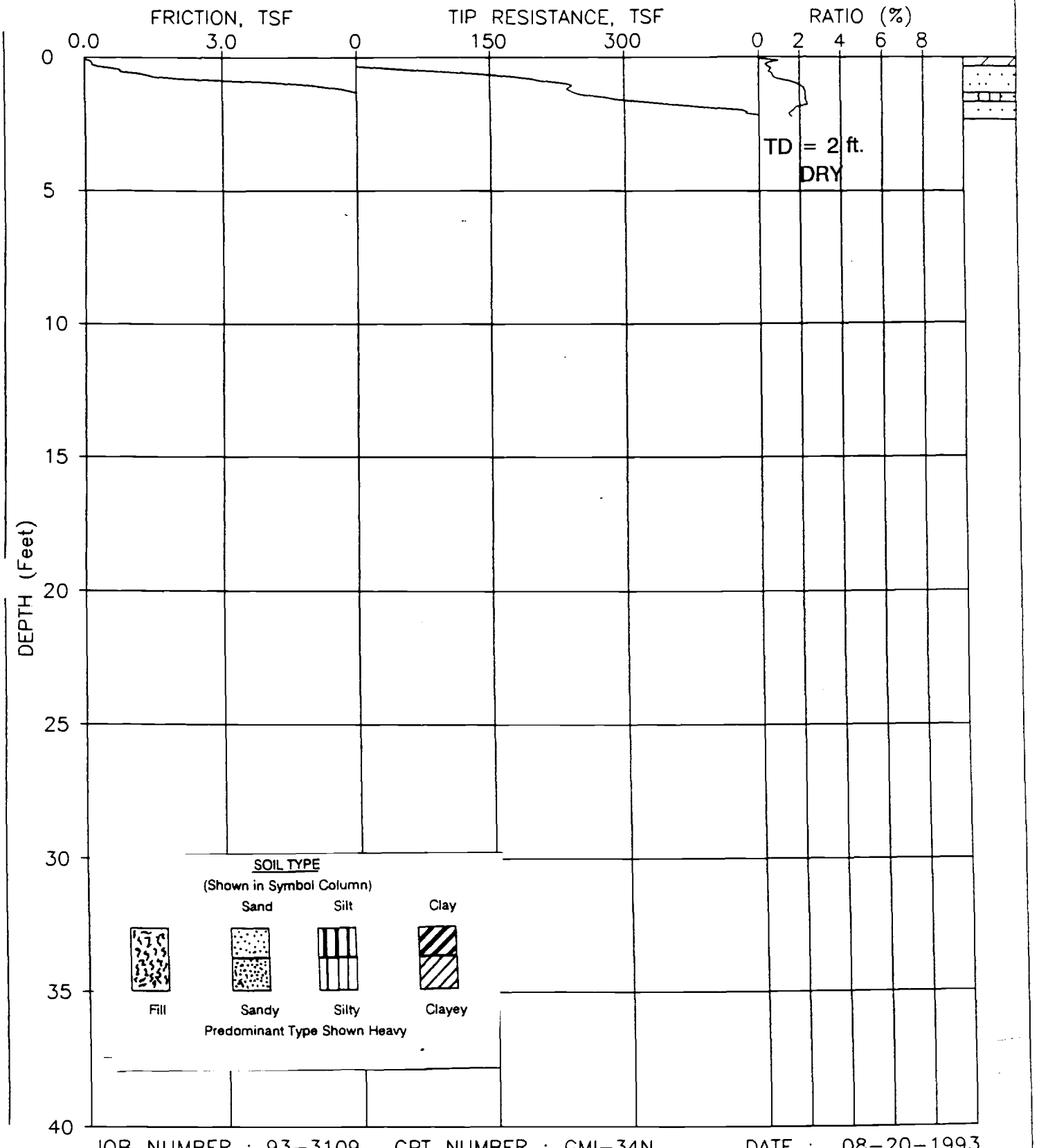
JOB NUMBER : 93-3109 CPT NUMBER : GMI-33N DATE : 09-03-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172218

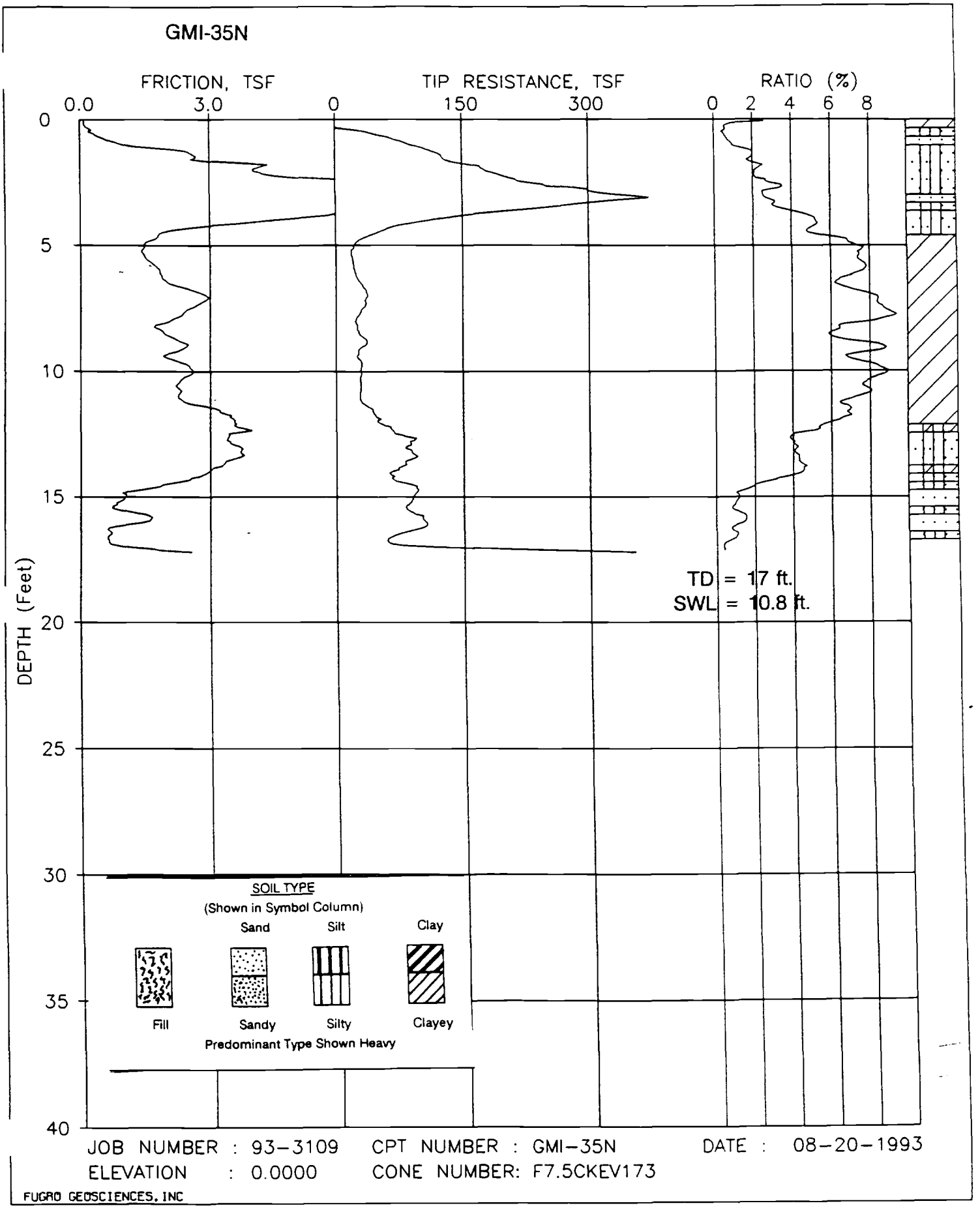
GMI-34N



JOB NUMBER : 93-3109 CPT NUMBER : GMI-34N DATE : 08-20-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

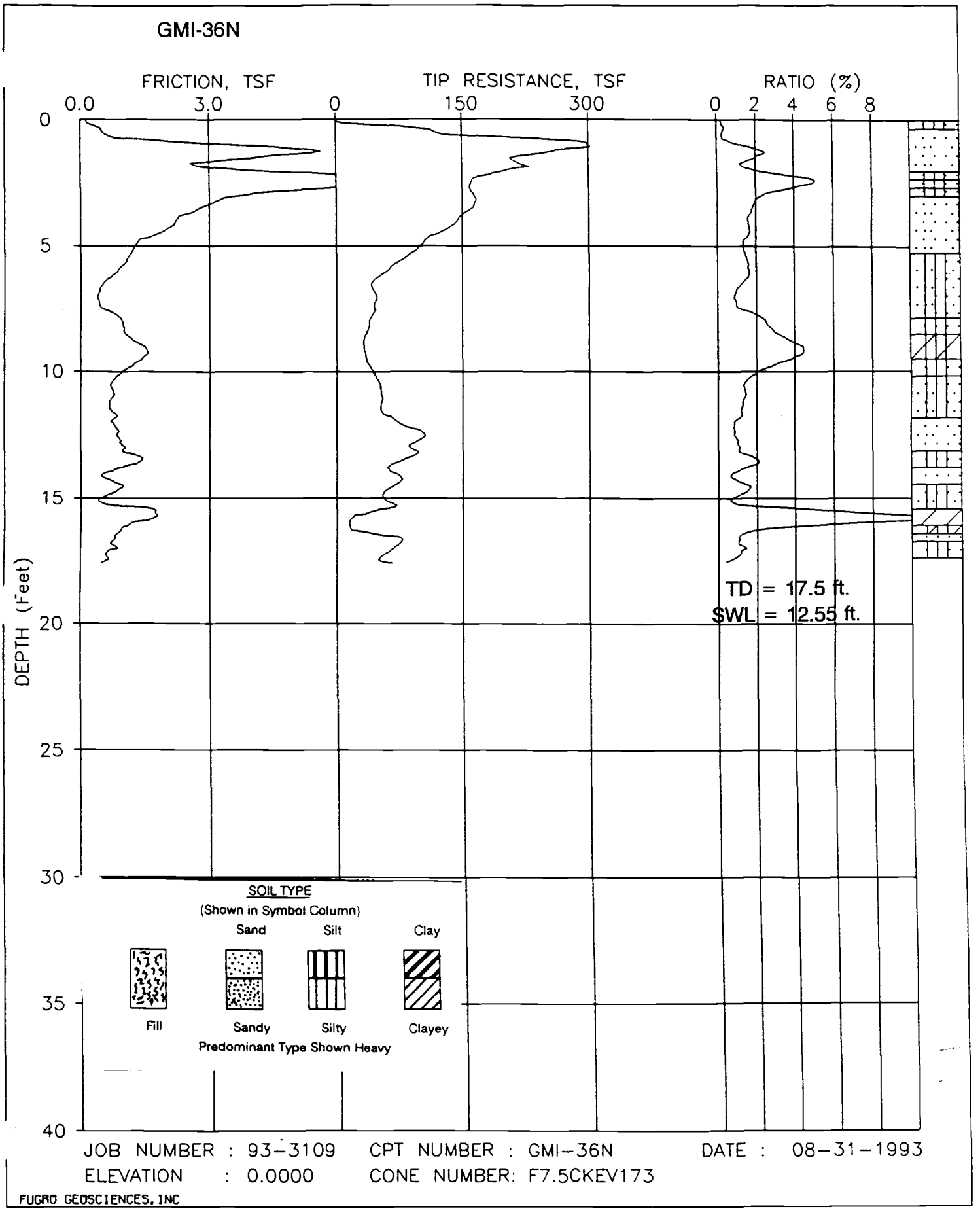
FUGRO GEOSCIENCES, INC



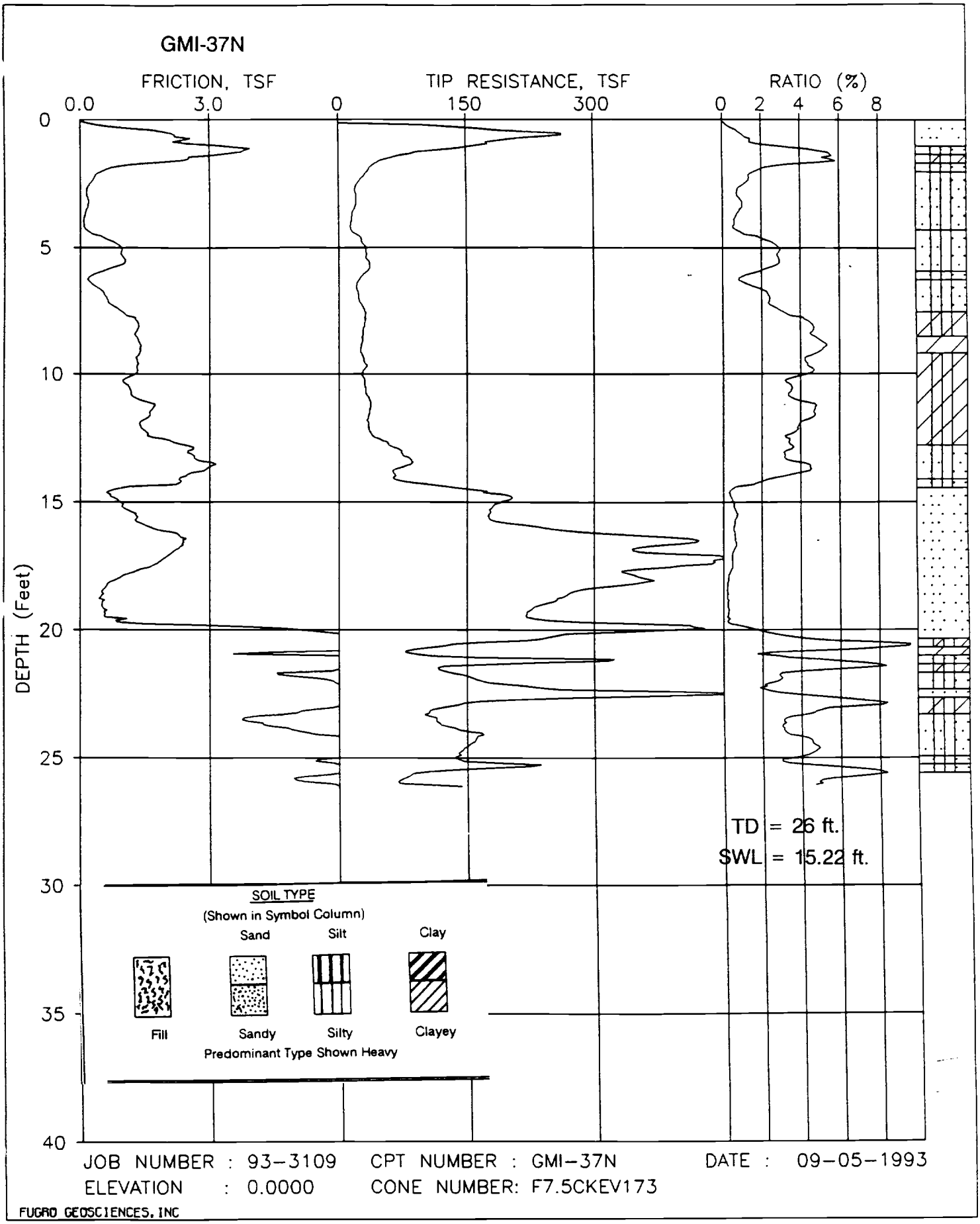
JOB NUMBER : 93-3109 CPT NUMBER : GMI-35N DATE : 08-20-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

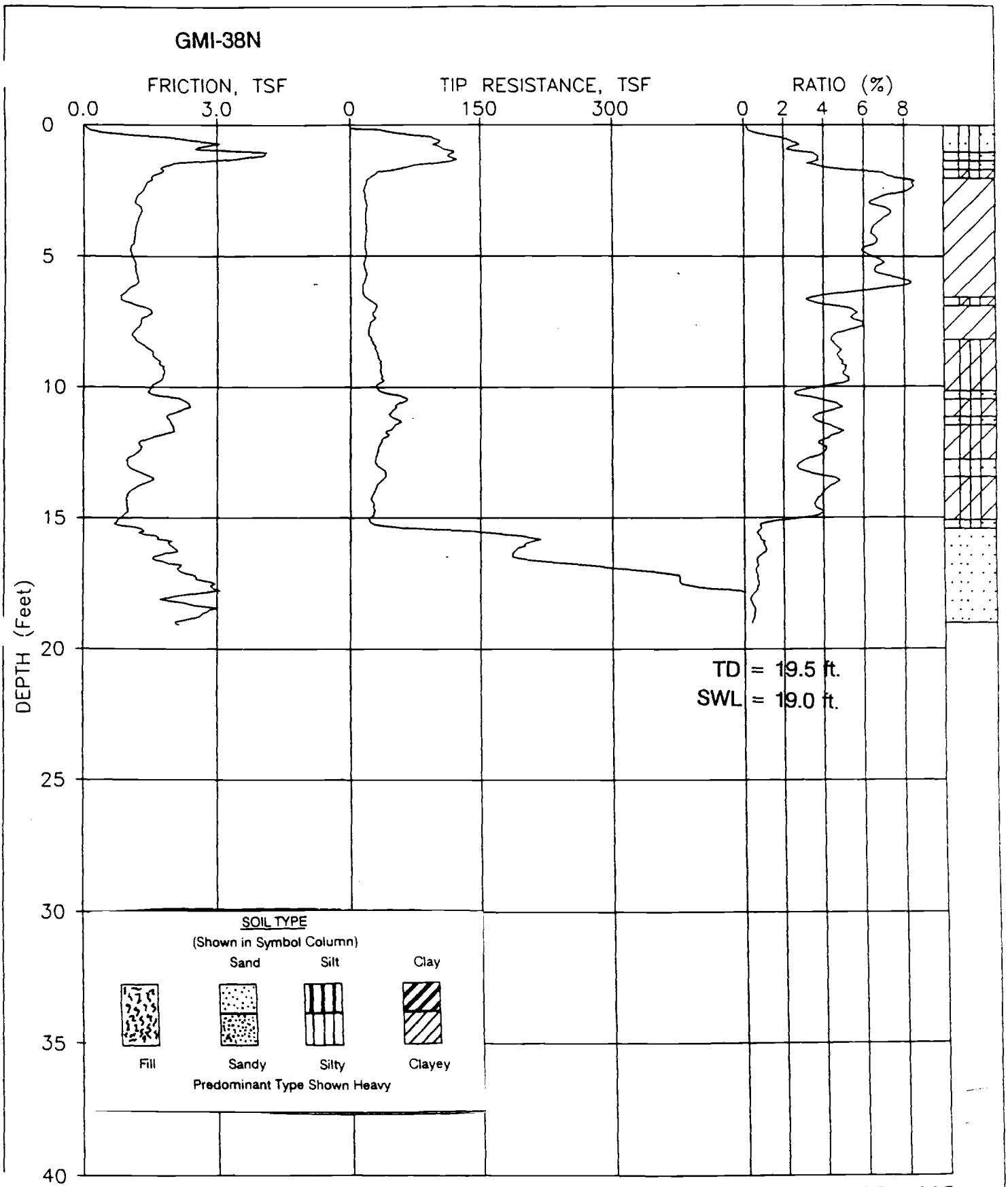
172220


GMI-36N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 17.5 ft.
SWL = 12.55 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-36N
DATE : 08-31-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172221


GMI-37N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 26 ft.
SWL = 15.22 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-37N
DATE : 09-05-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172222

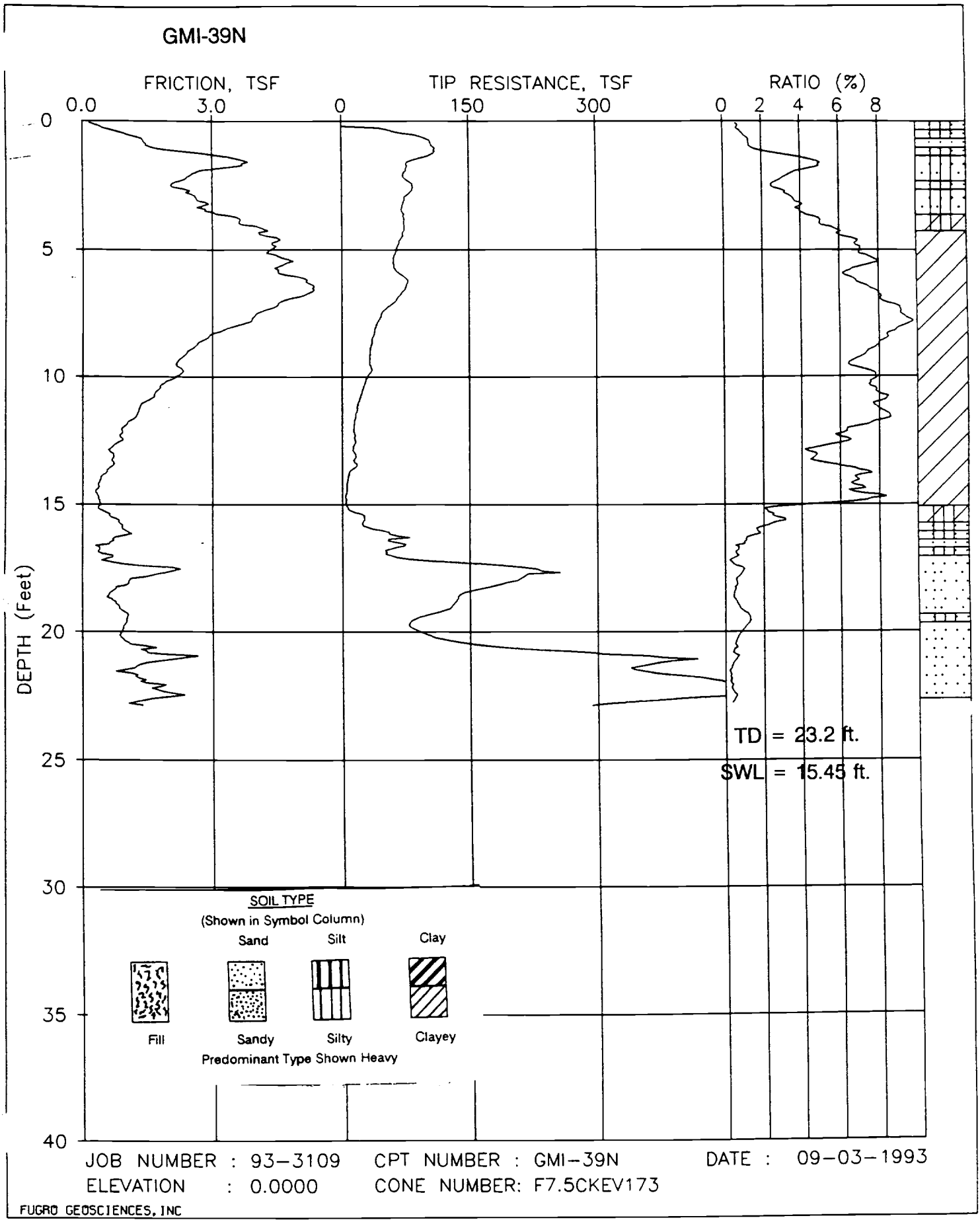


JOB NUMBER : 93-3109 CPT NUMBER : GMI-38N DATE : 09-03-1993

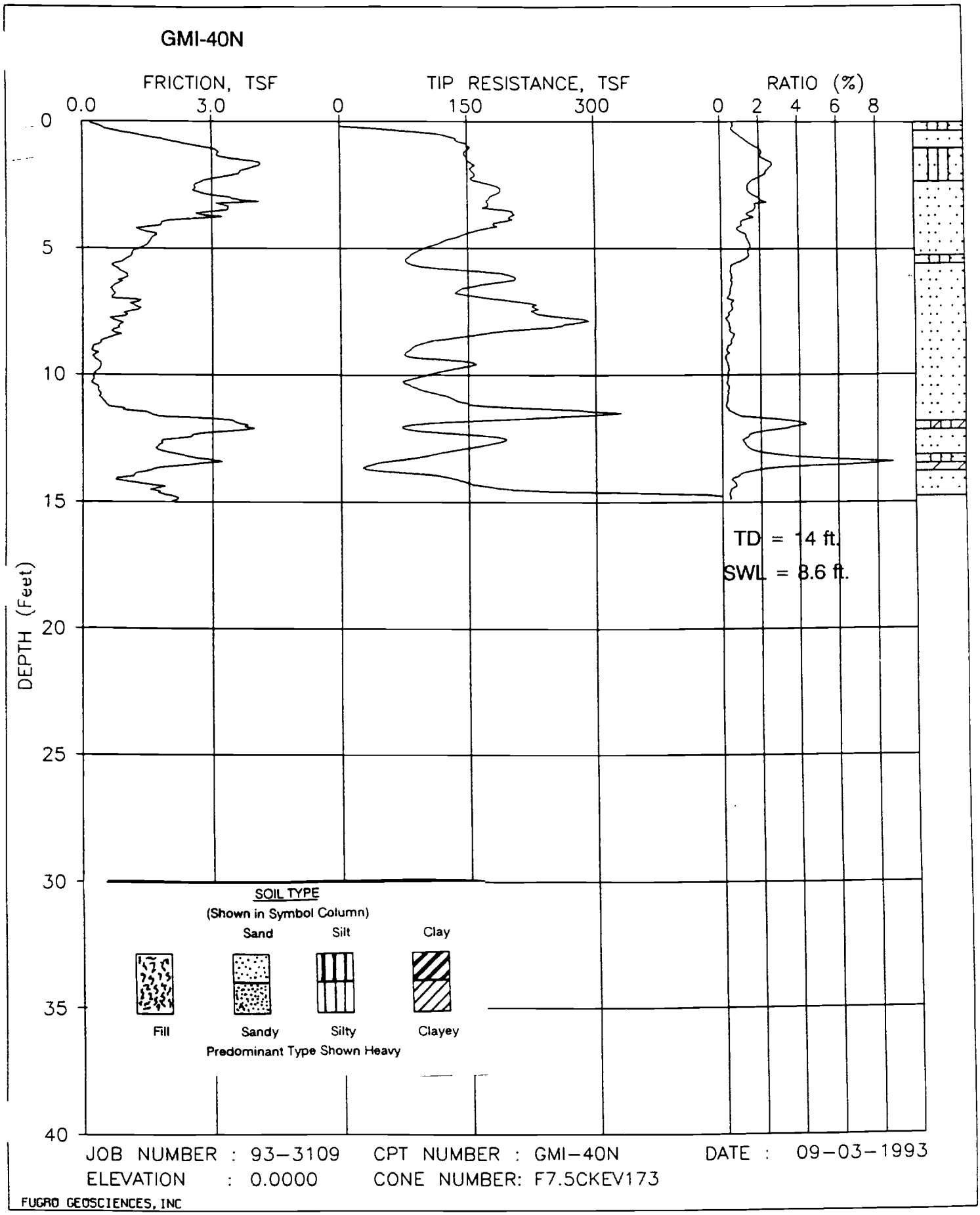
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172223

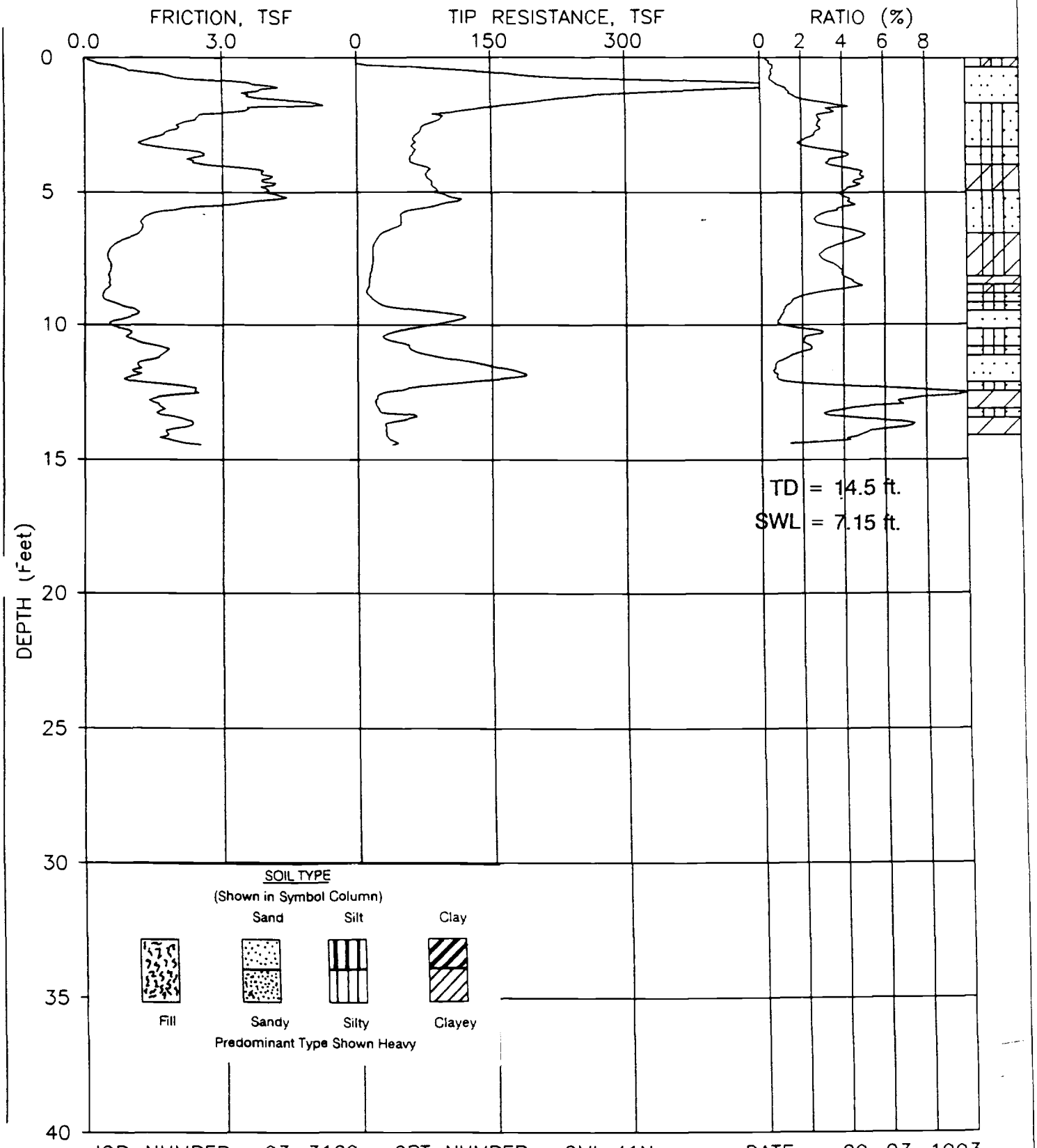

GMI-39N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 23.2 ft.
SWL = 15.45 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-39N
DATE : 09-03-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172224


GMI-40N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 14 ft.
SWL = 8.6 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-40N
DATE : 09-03-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172225

GMI-41N

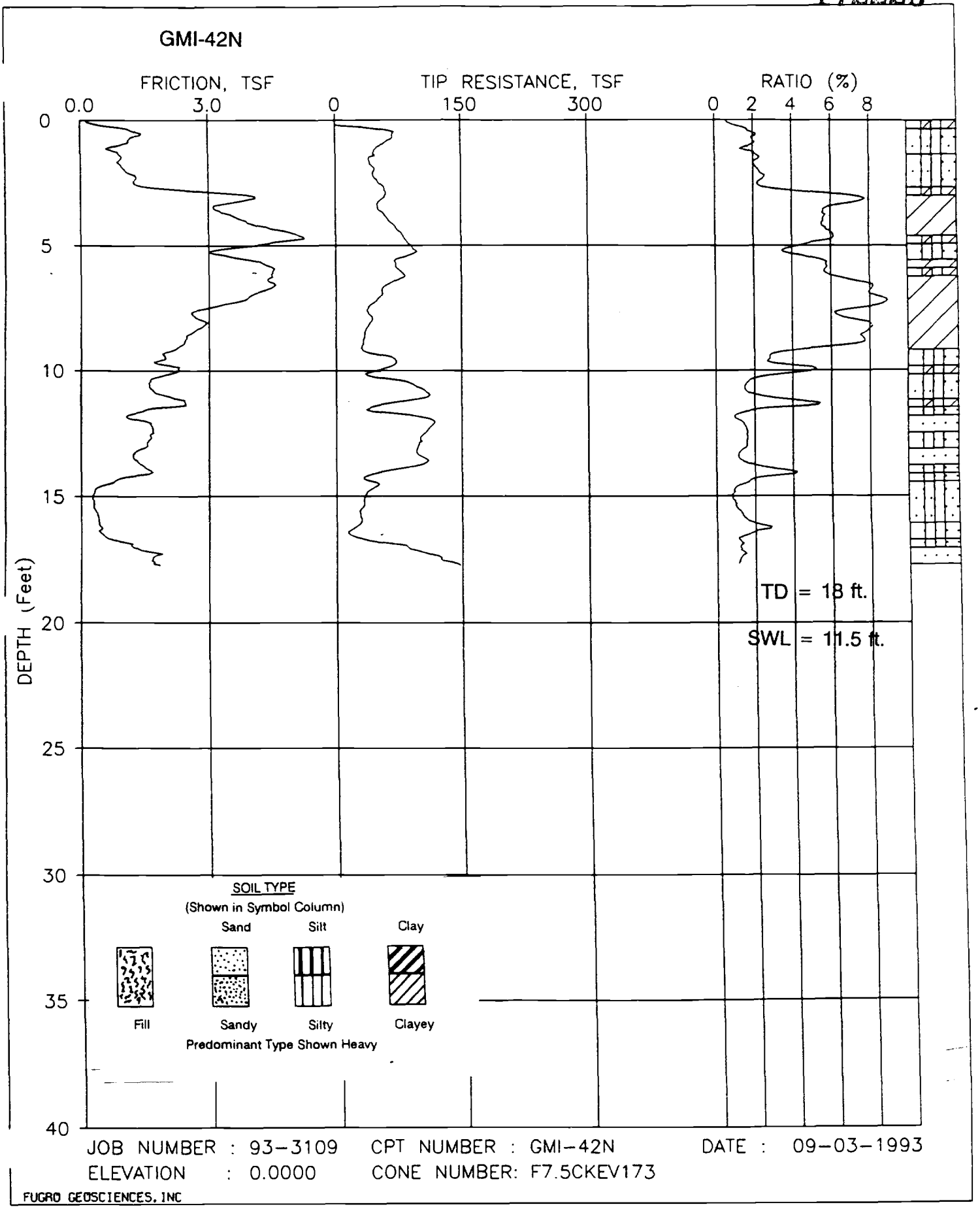


JOB NUMBER : 93-3109 CPT NUMBER : GMI-41N DATE : 09-03-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172226

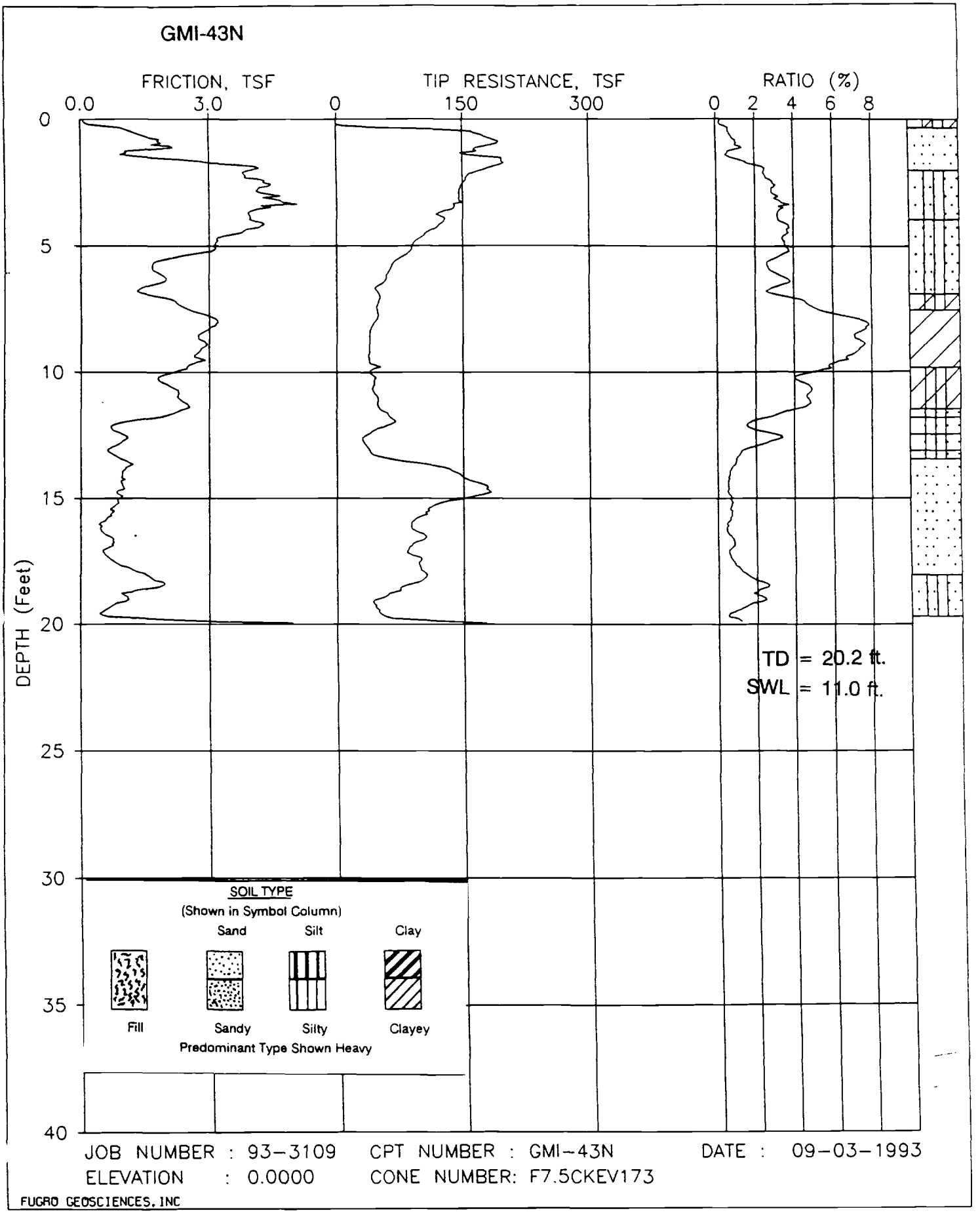


JOB NUMBER : 93-3109 CPT NUMBER : GMI-42N DATE : 09-03-1993

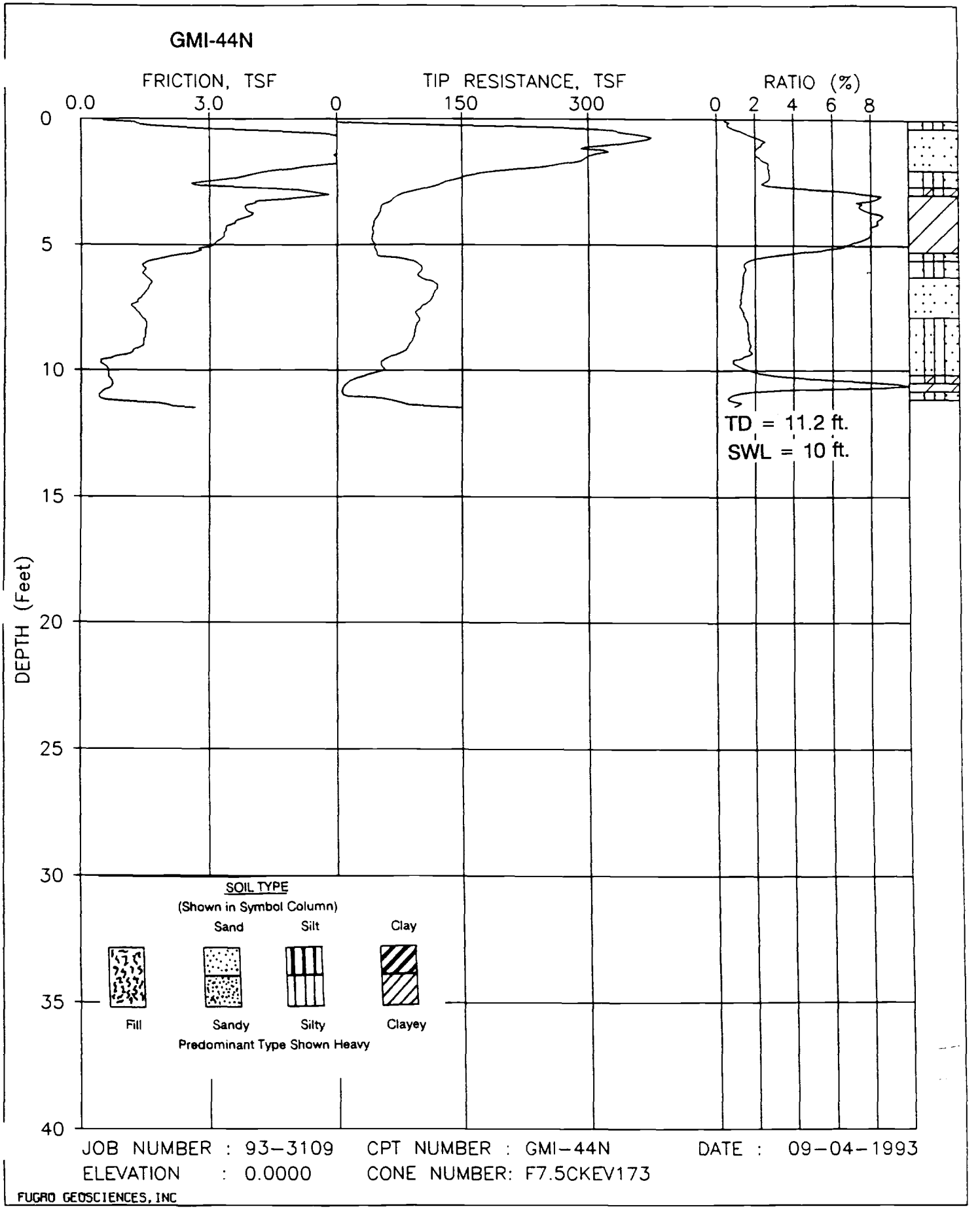
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172227


GMI-43N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 20.2 ft.
SWL = 11.0 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-43N
DATE : 09-03-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172223

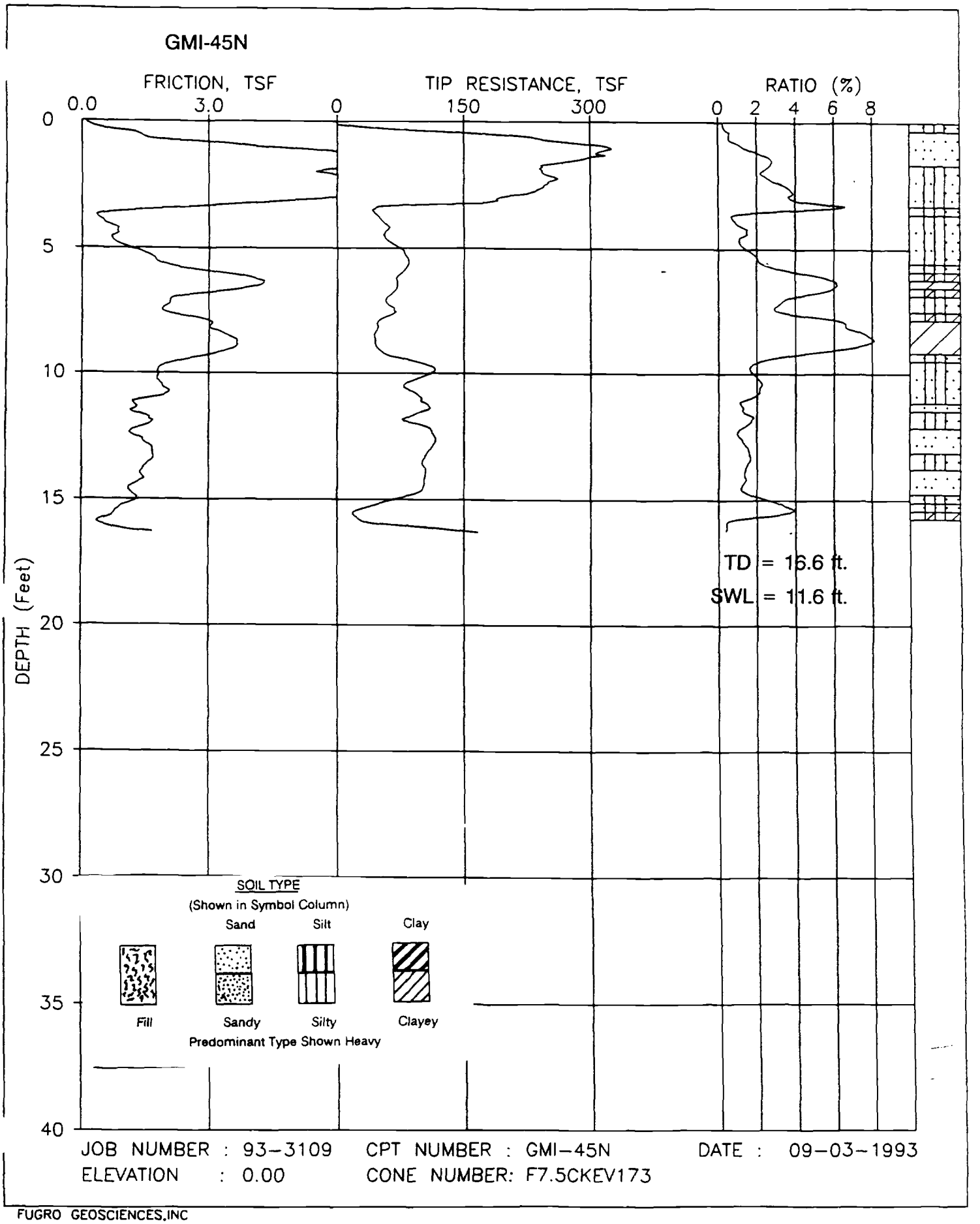


JOB NUMBER : 93-3109 CPT NUMBER : GMI-44N DATE : 09-04-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

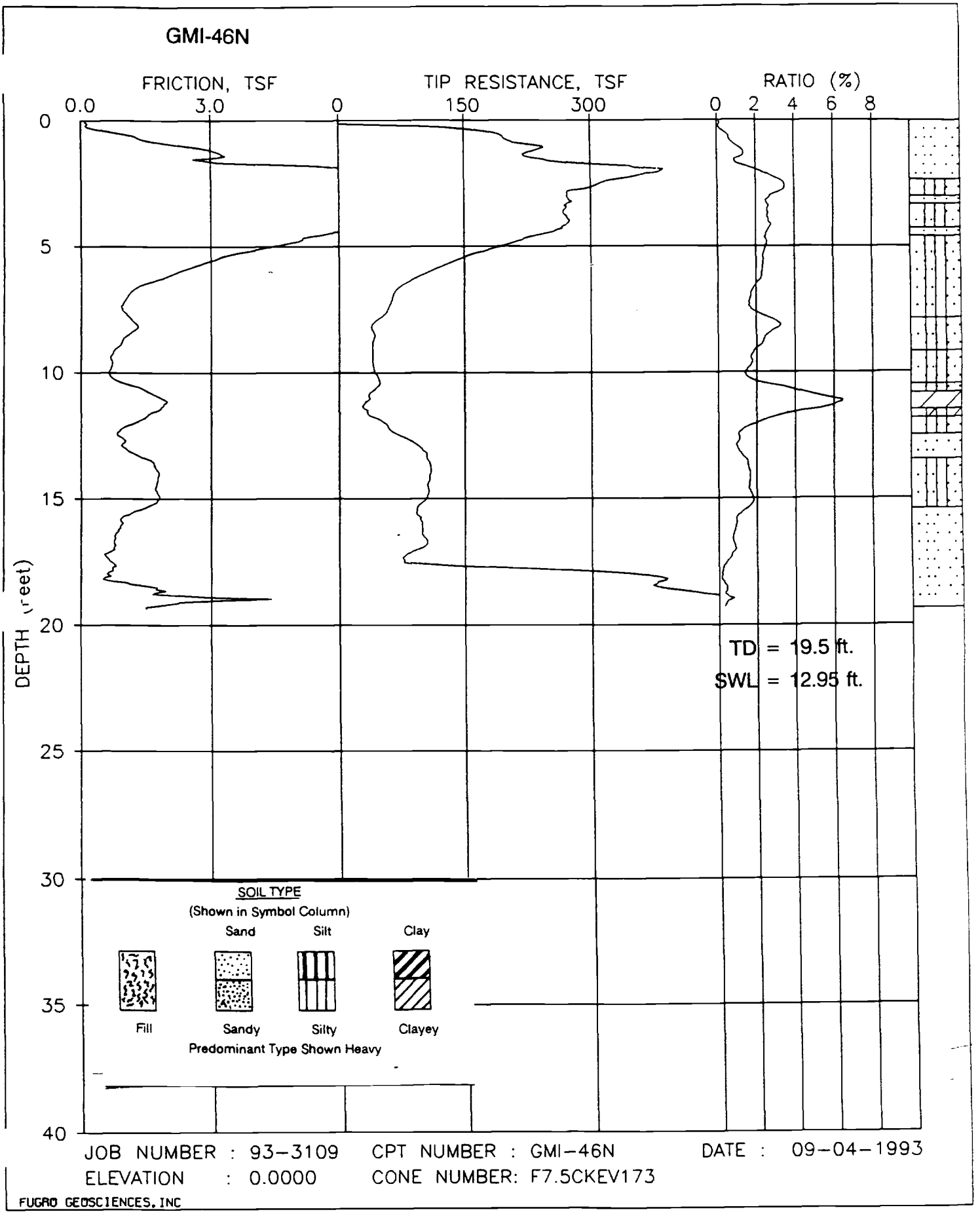
FUGRO GEOSCIENCES, INC

172229



FUGRO GEOSCIENCES,INC

172230

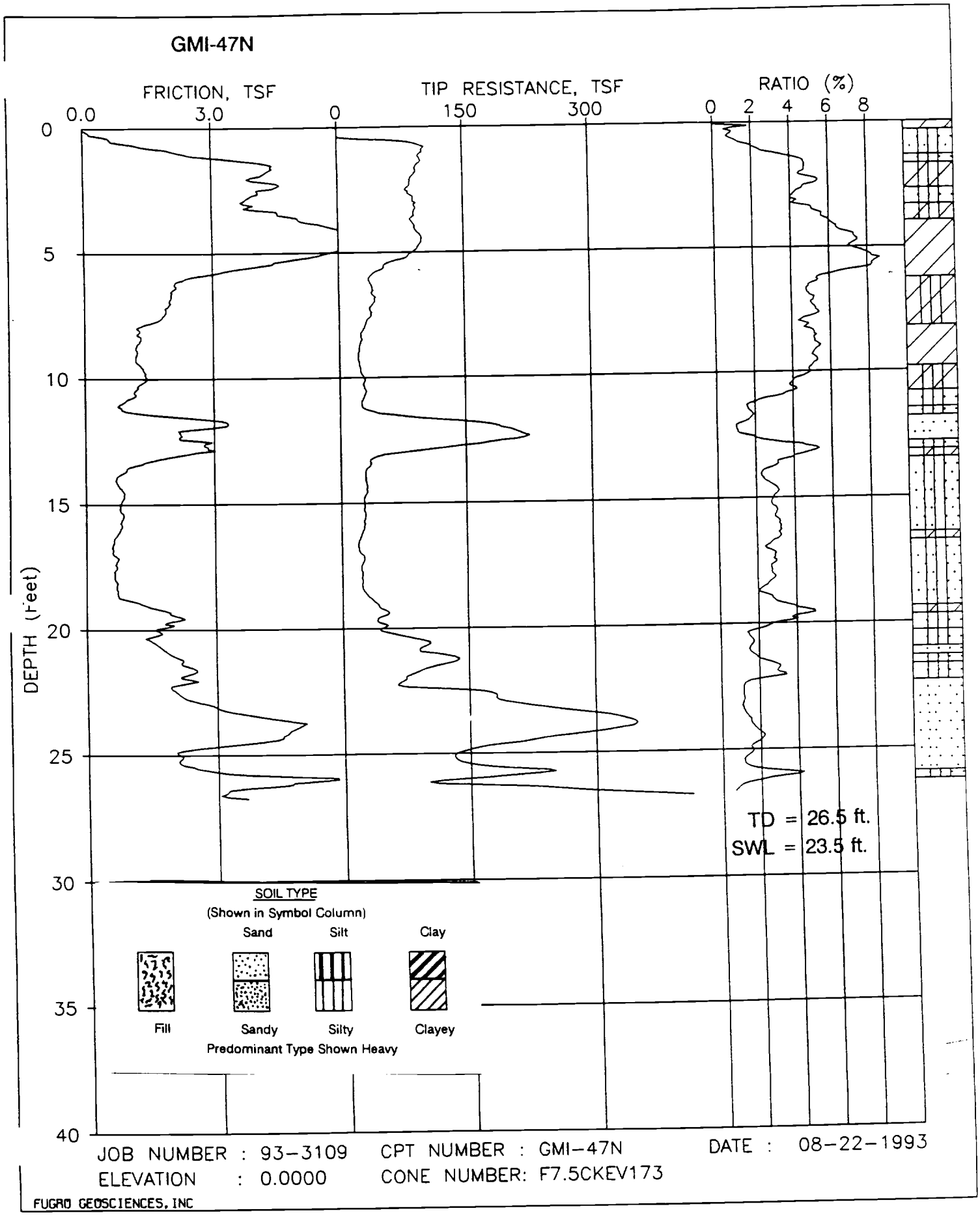


JOB NUMBER : 93-3109 CPT NUMBER : GMI-46N DATE : 09-04-1993

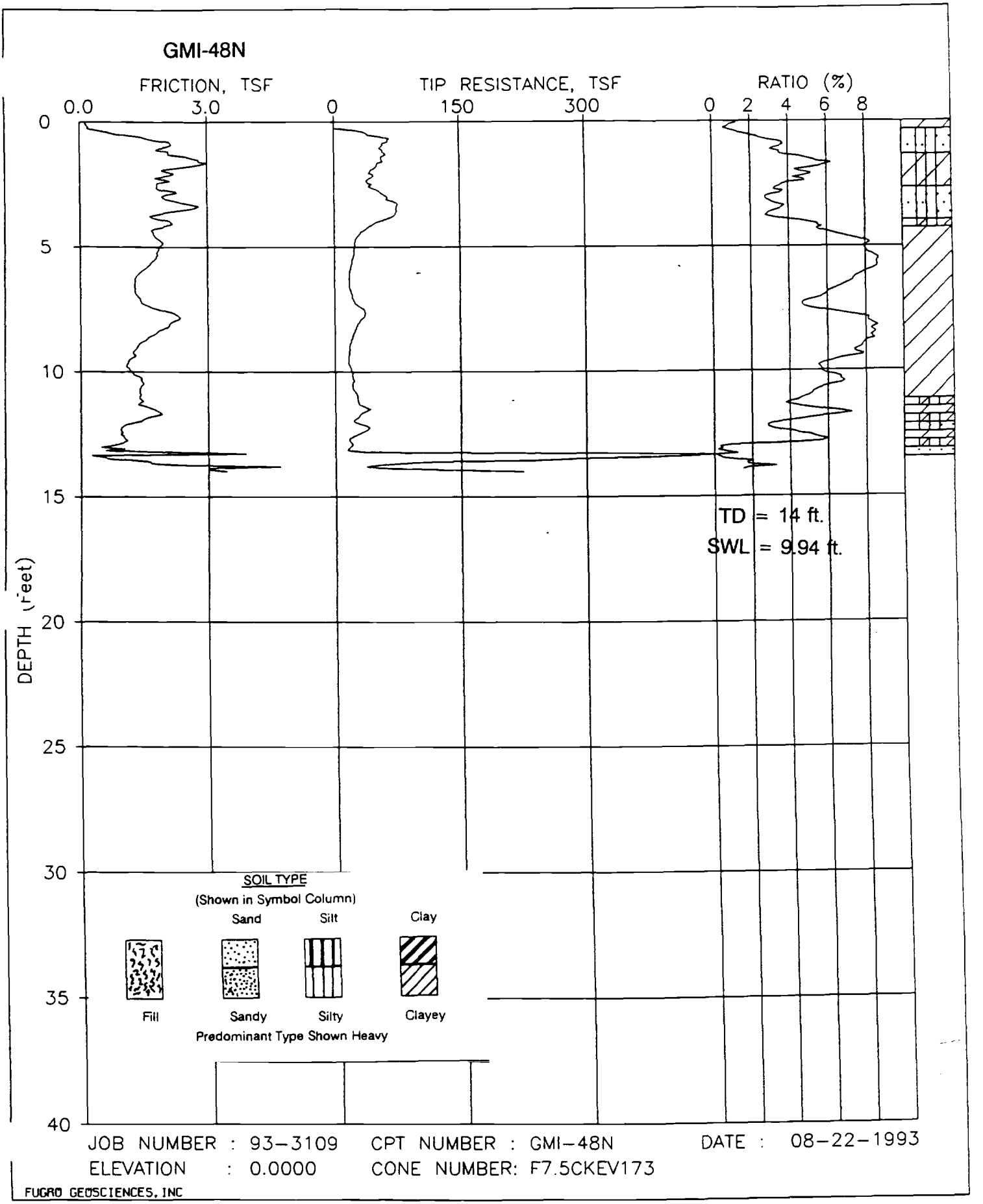
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172231


GMI-47N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 26.5 ft.
SWL = 23.5 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-47N
DATE : 08-22-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172232

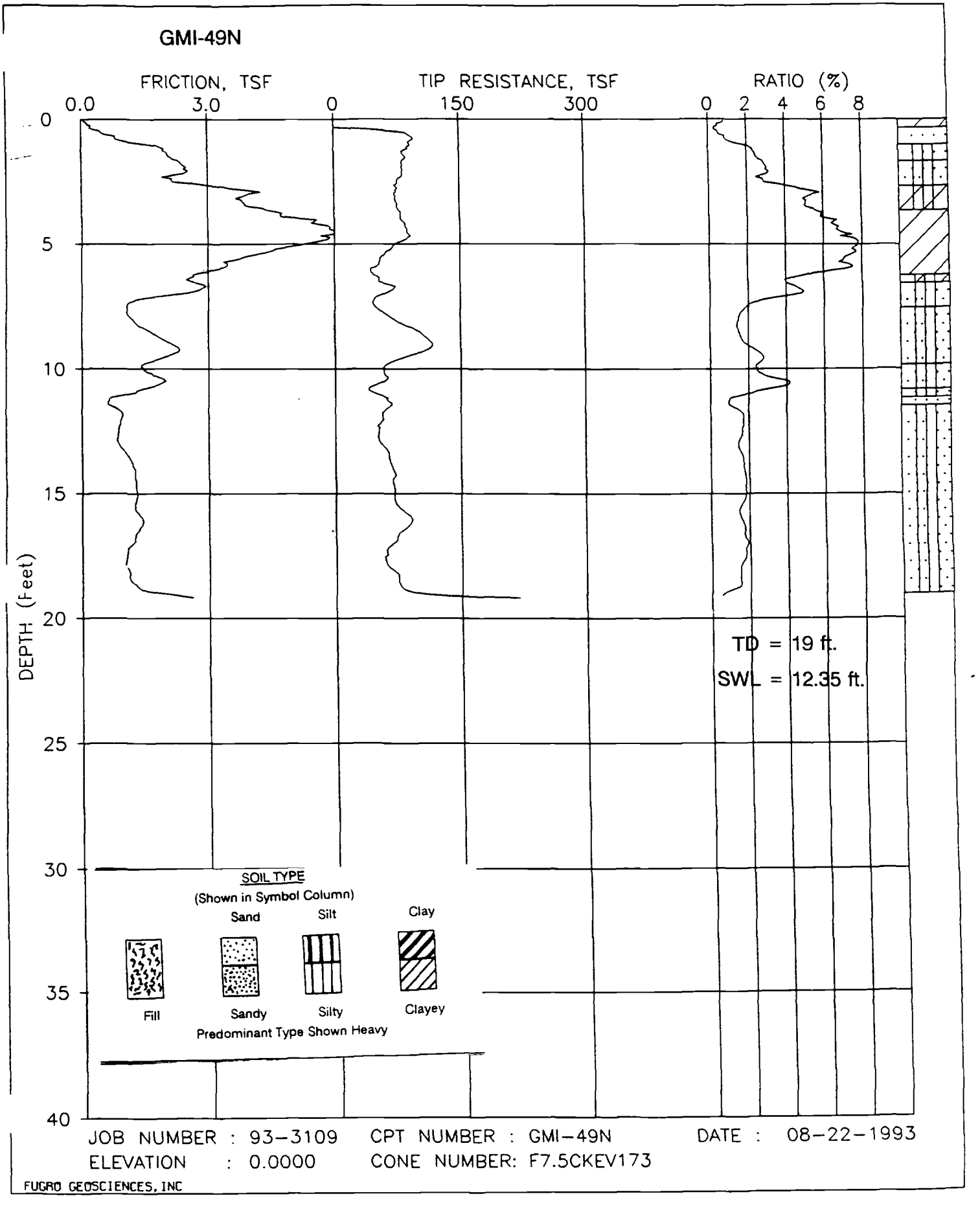


JOB NUMBER : 93-3109 CPT NUMBER : GMI-48N DATE : 08-22-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

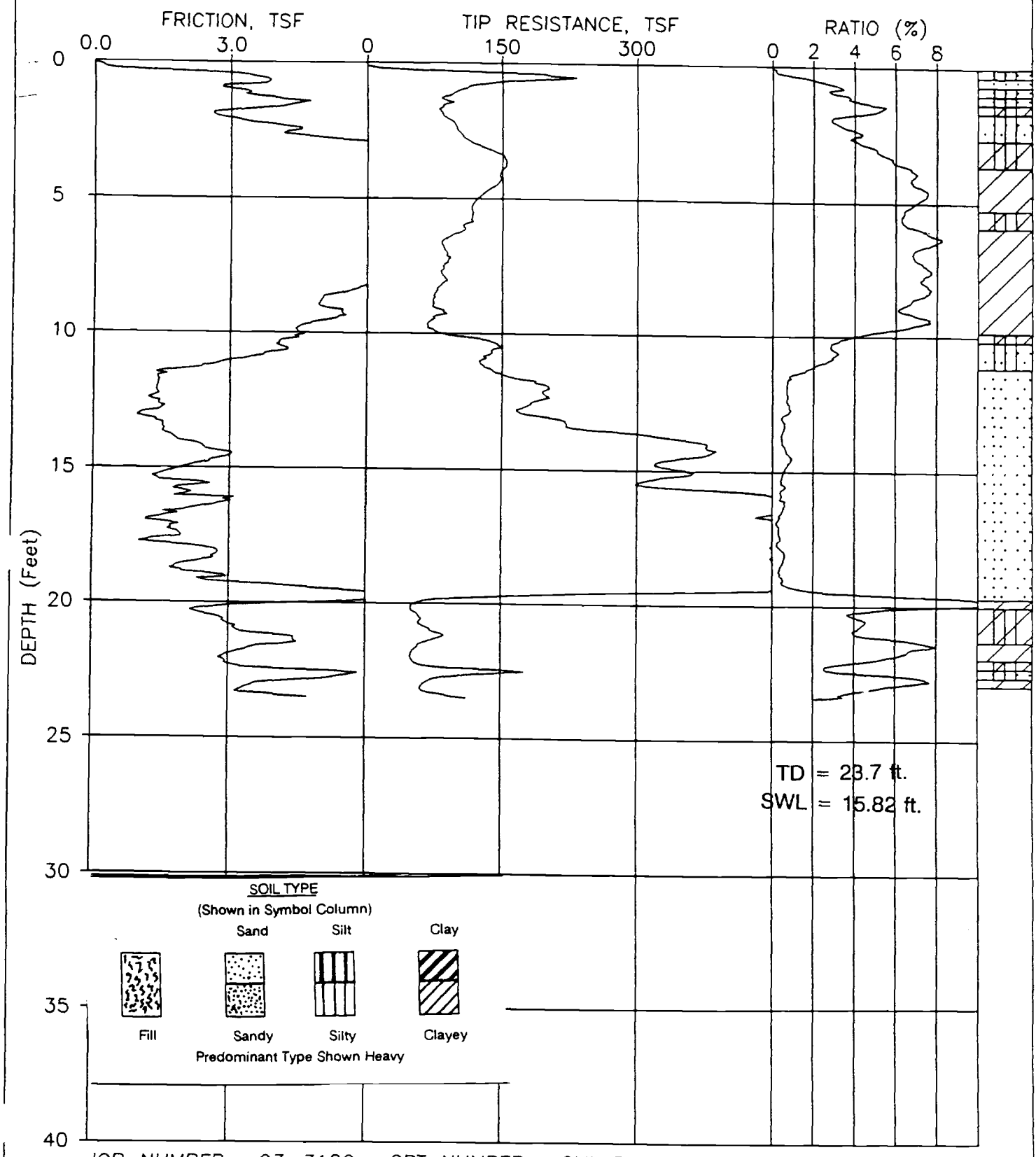
FUGRO GEOSCIENCES, INC

172233


GMI-49N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19 ft.
SWL = 12.35 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-49N
DATE : 08-22-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172235

GMI-51N

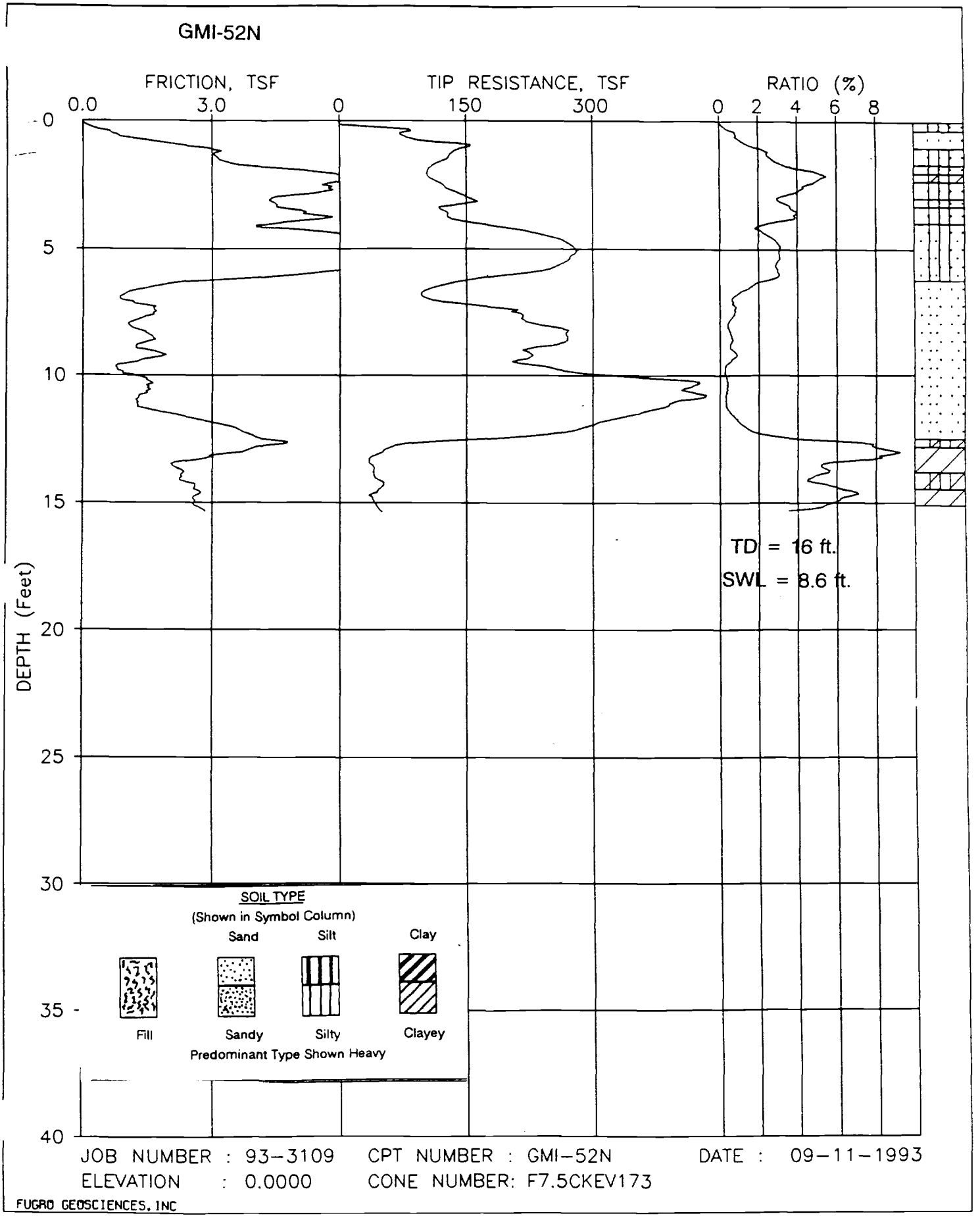


JOB NUMBER : 93-3109 CPT NUMBER : GMI-51N DATE : 09-11-1993

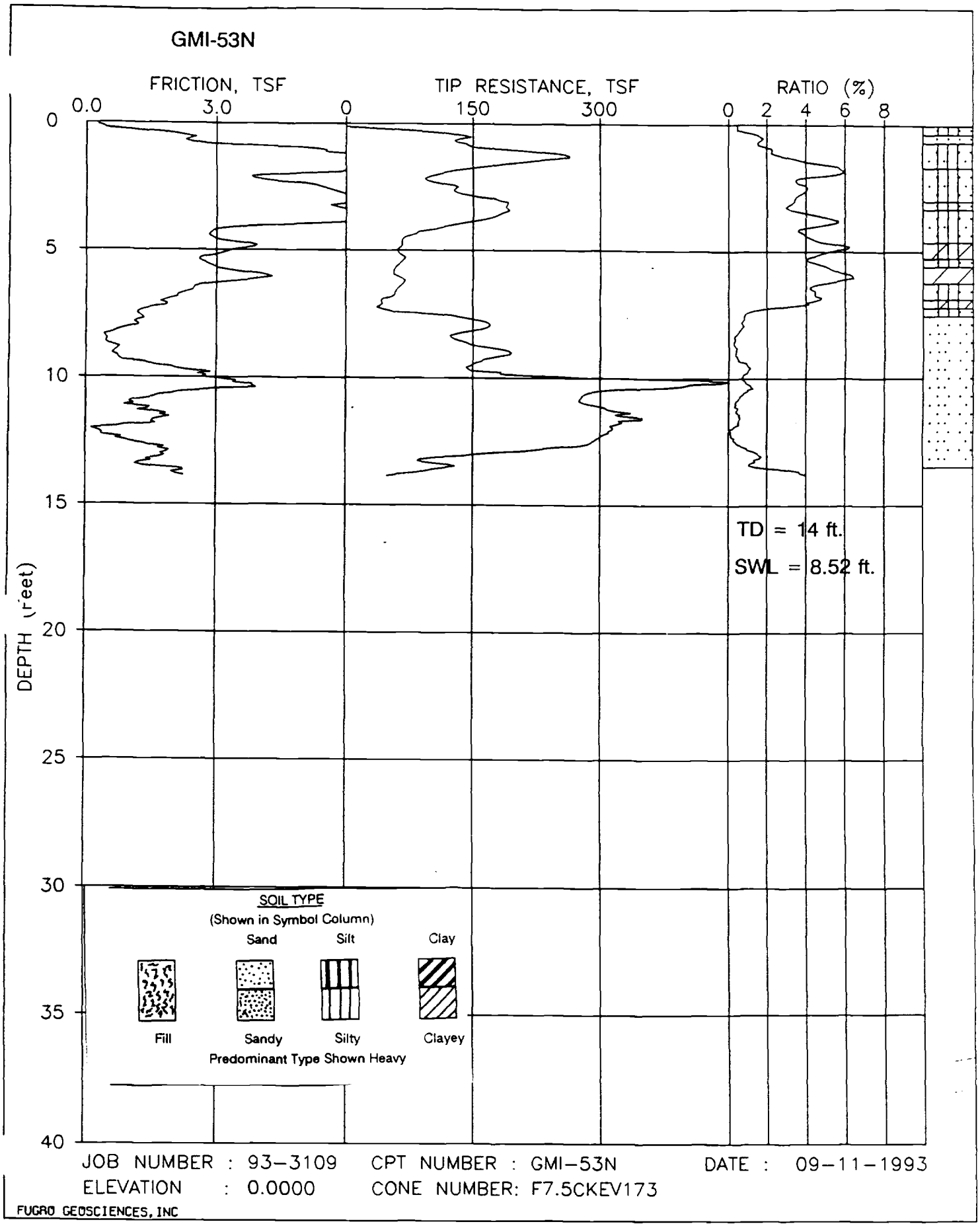
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172236


GMI-52N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 16 ft.
SWL = 8.6 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-52N
DATE : 09-11-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172237

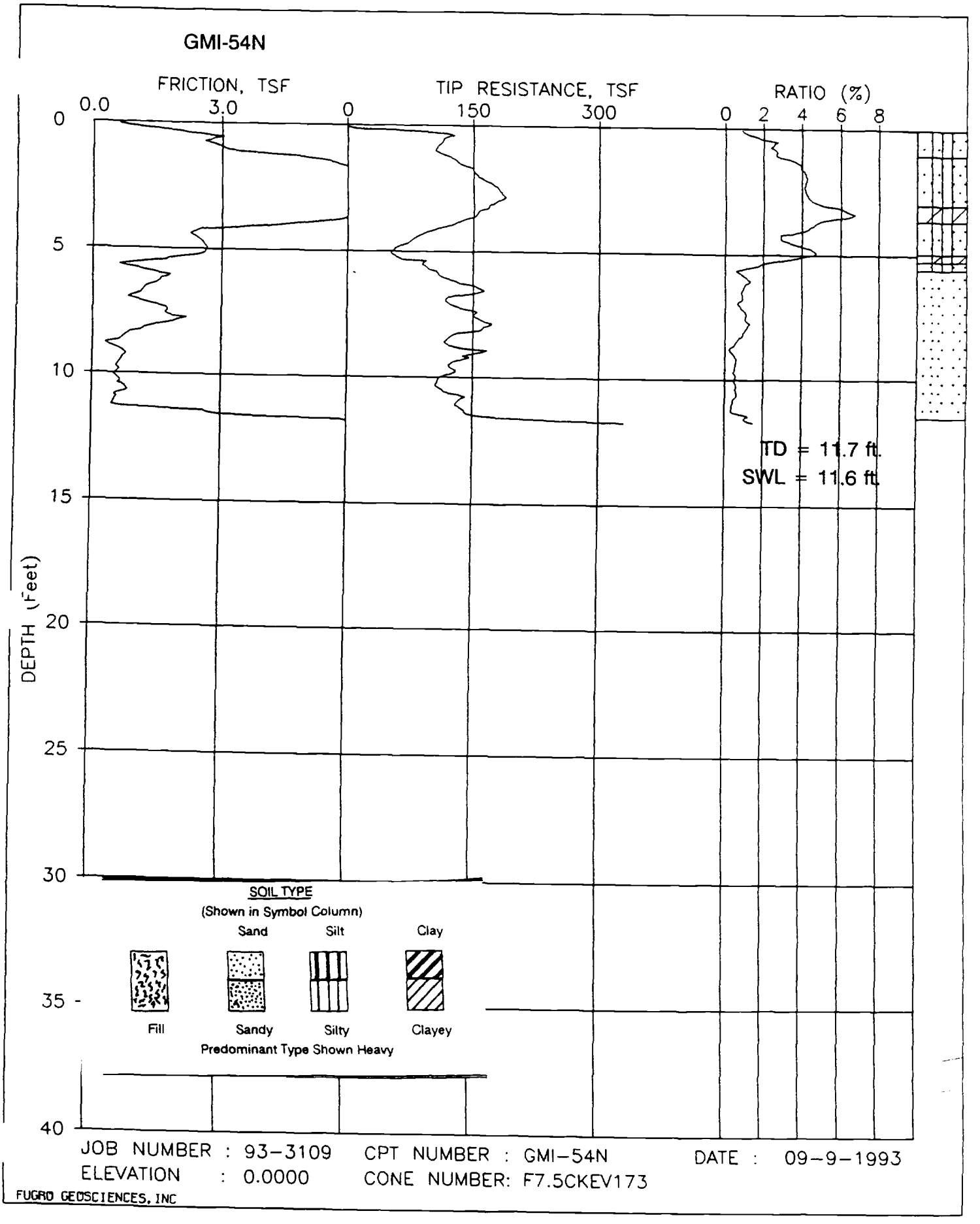


JOB NUMBER : 93-3109 CPT NUMBER : GMI-53N DATE : 09-11-1993

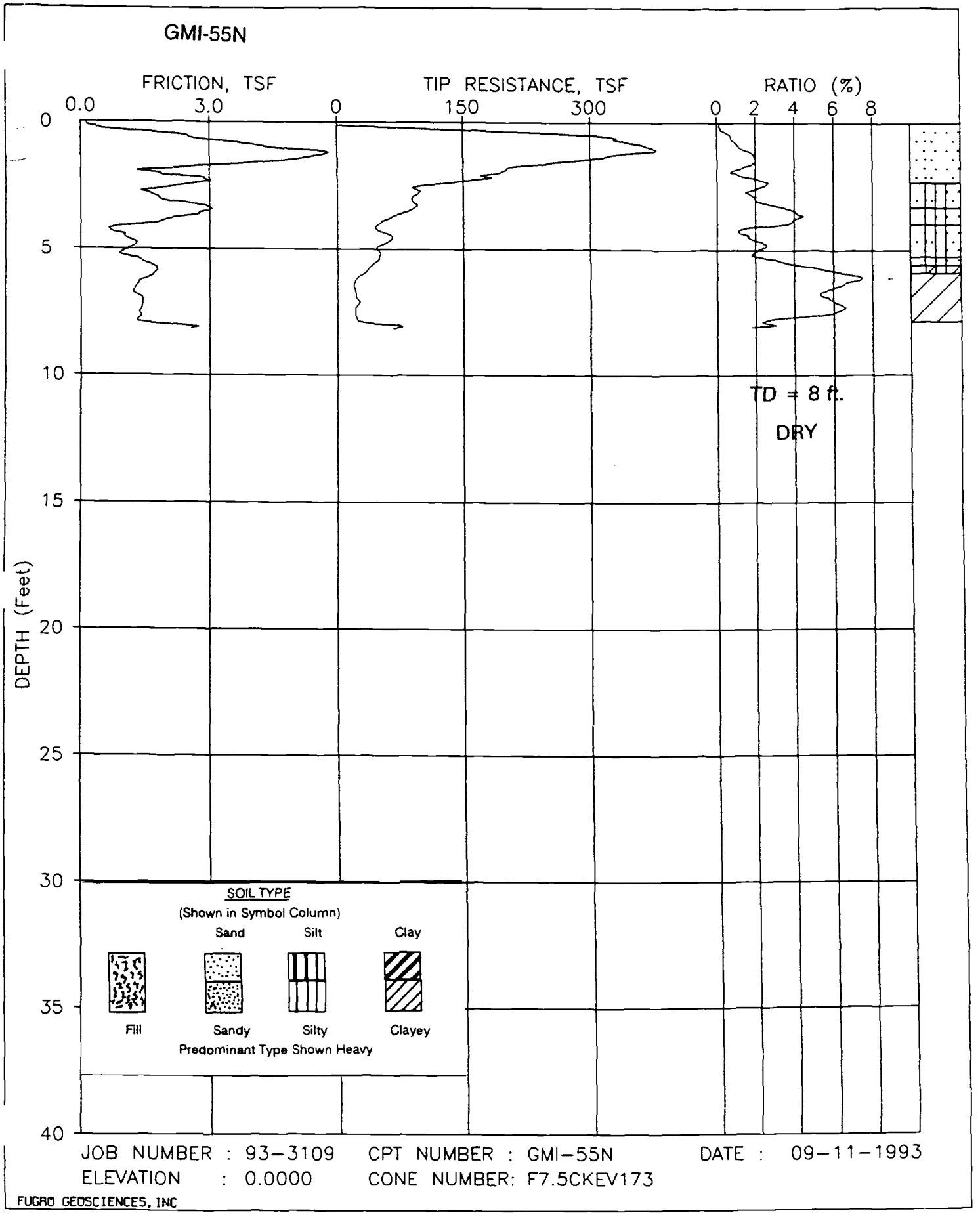
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172238


GMI-54N
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 11.7 ft.
SWL = 11.6 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-54N
DATE : 09-9-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

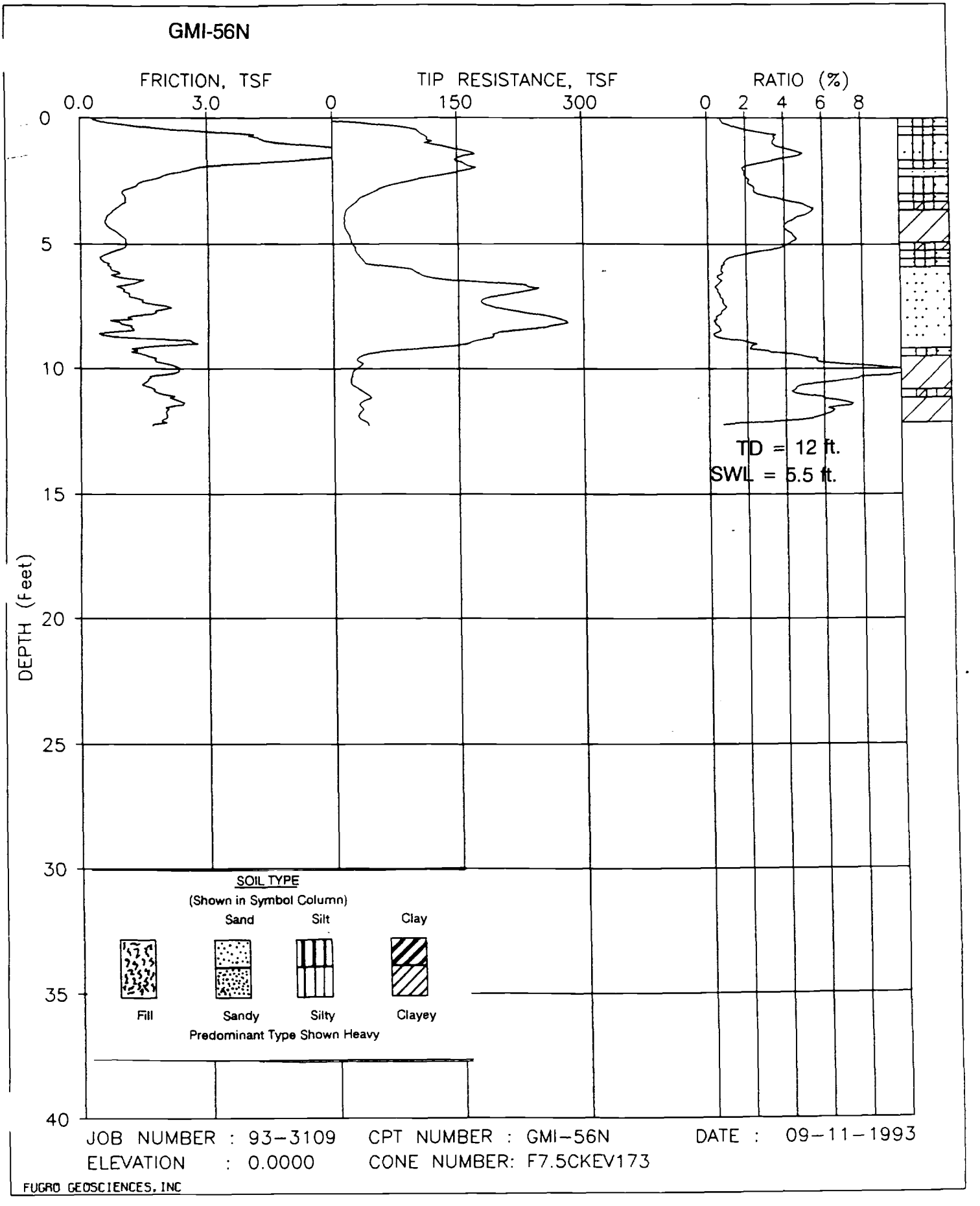
172239



JOB NUMBER : 93-3109 CPT NUMBER : GMI-55N DATE : 09-11-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172240

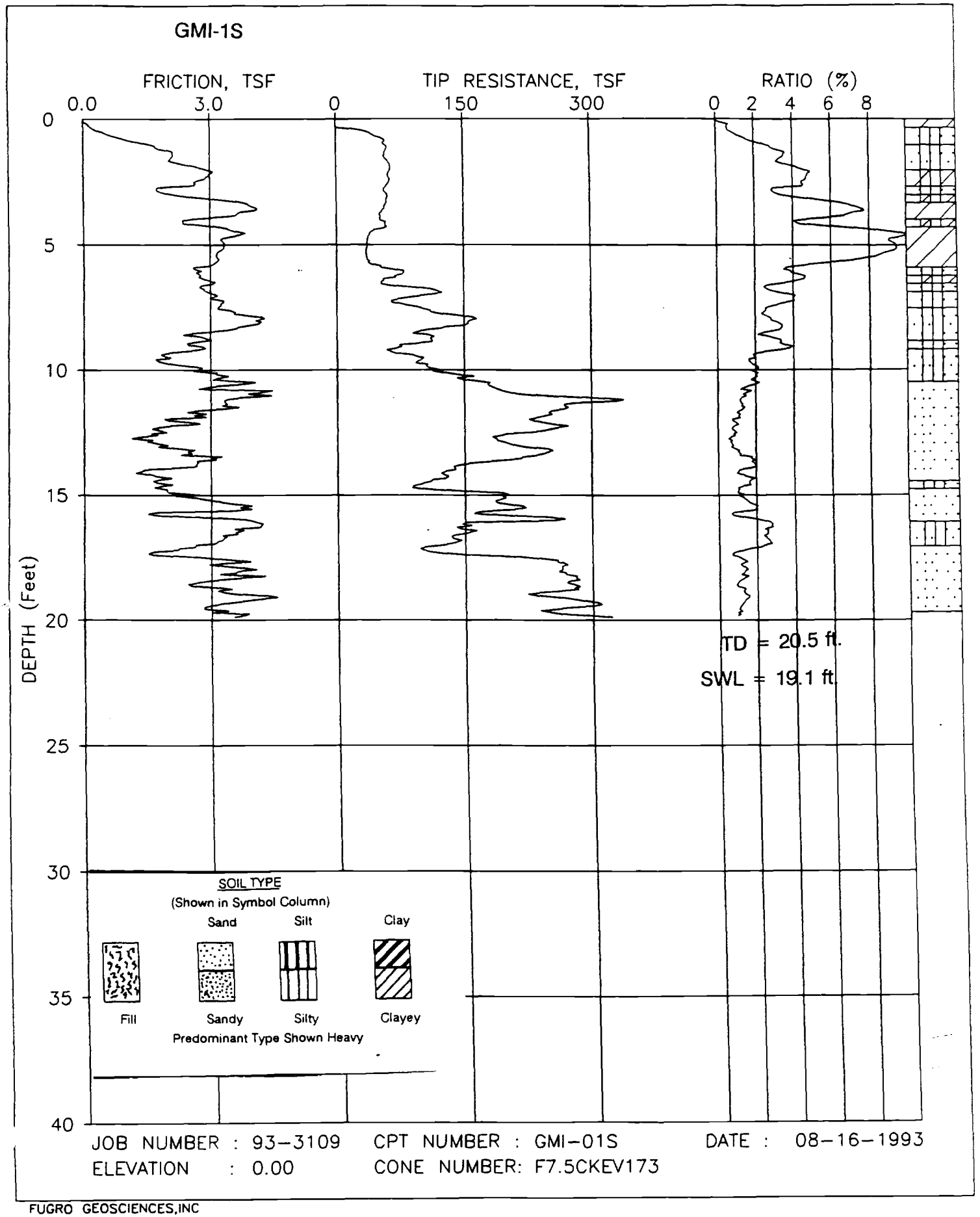


JOB NUMBER : 93-3109 CPT NUMBER : GMI-56N DATE : 09-11-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

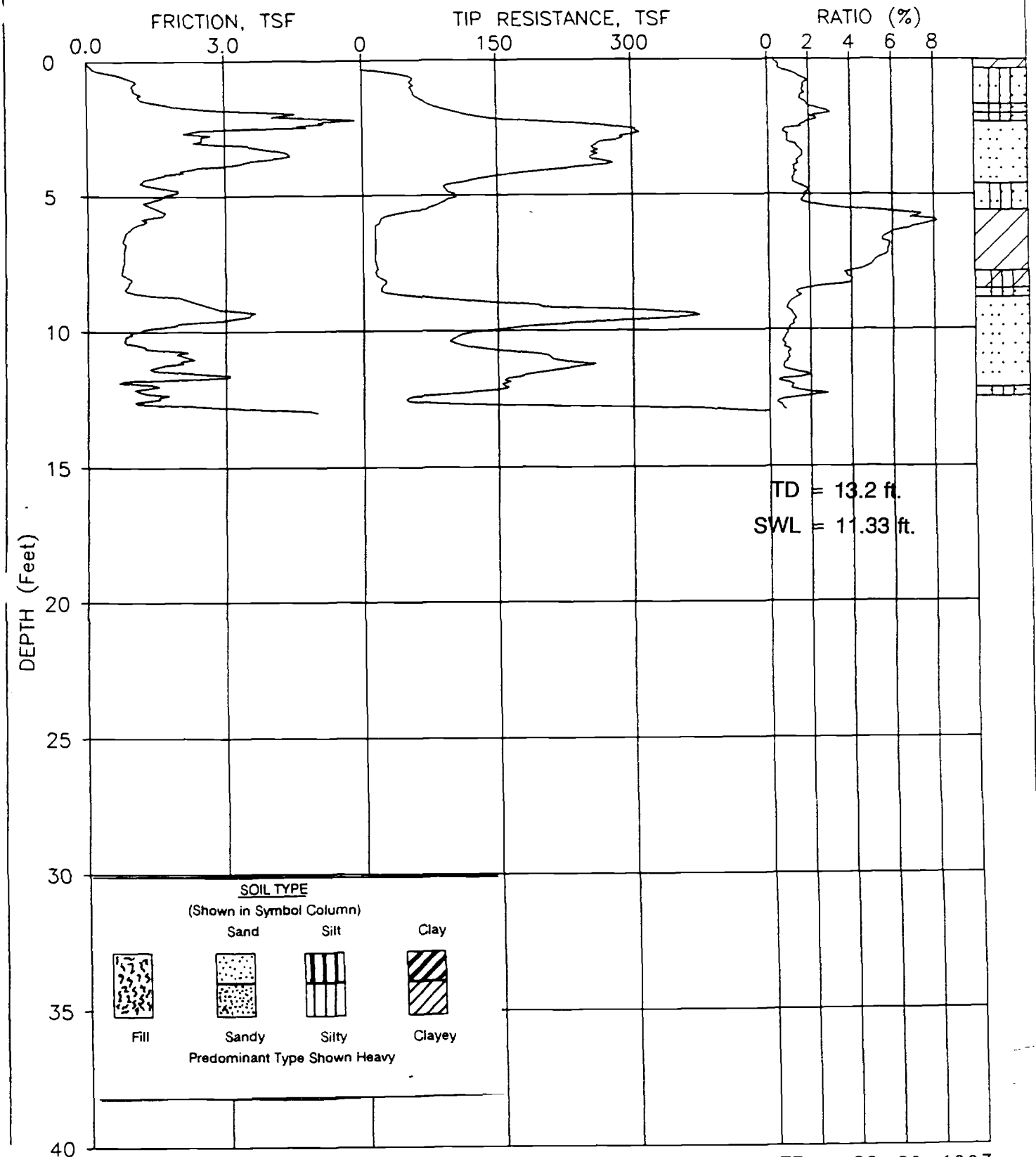
172241



FUGRO GEOSCIENCES,INC

172242

GMI-2S

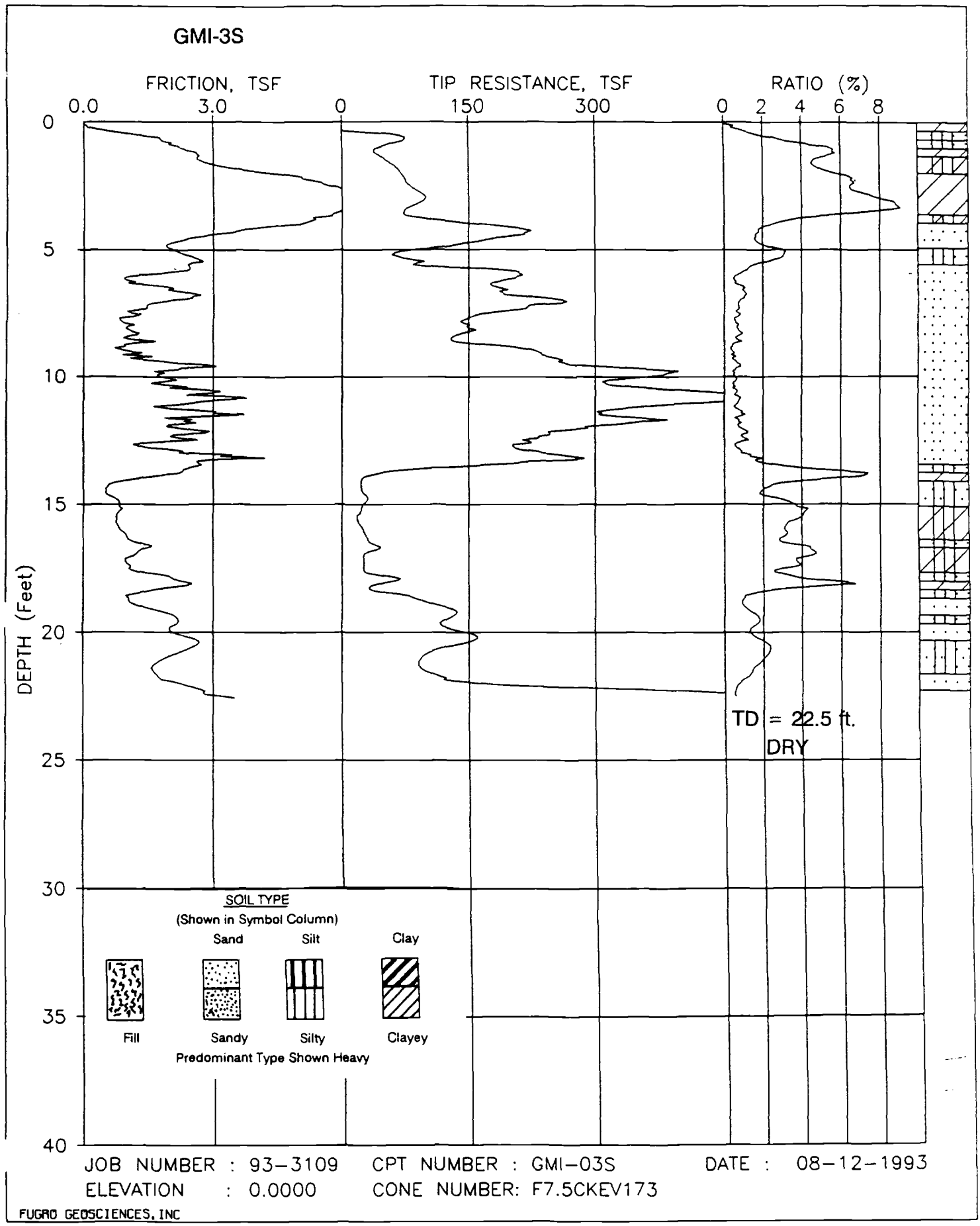


JOB NUMBER : 93-3109 CPT NUMBER : GMI-02S DATE : 08-09-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

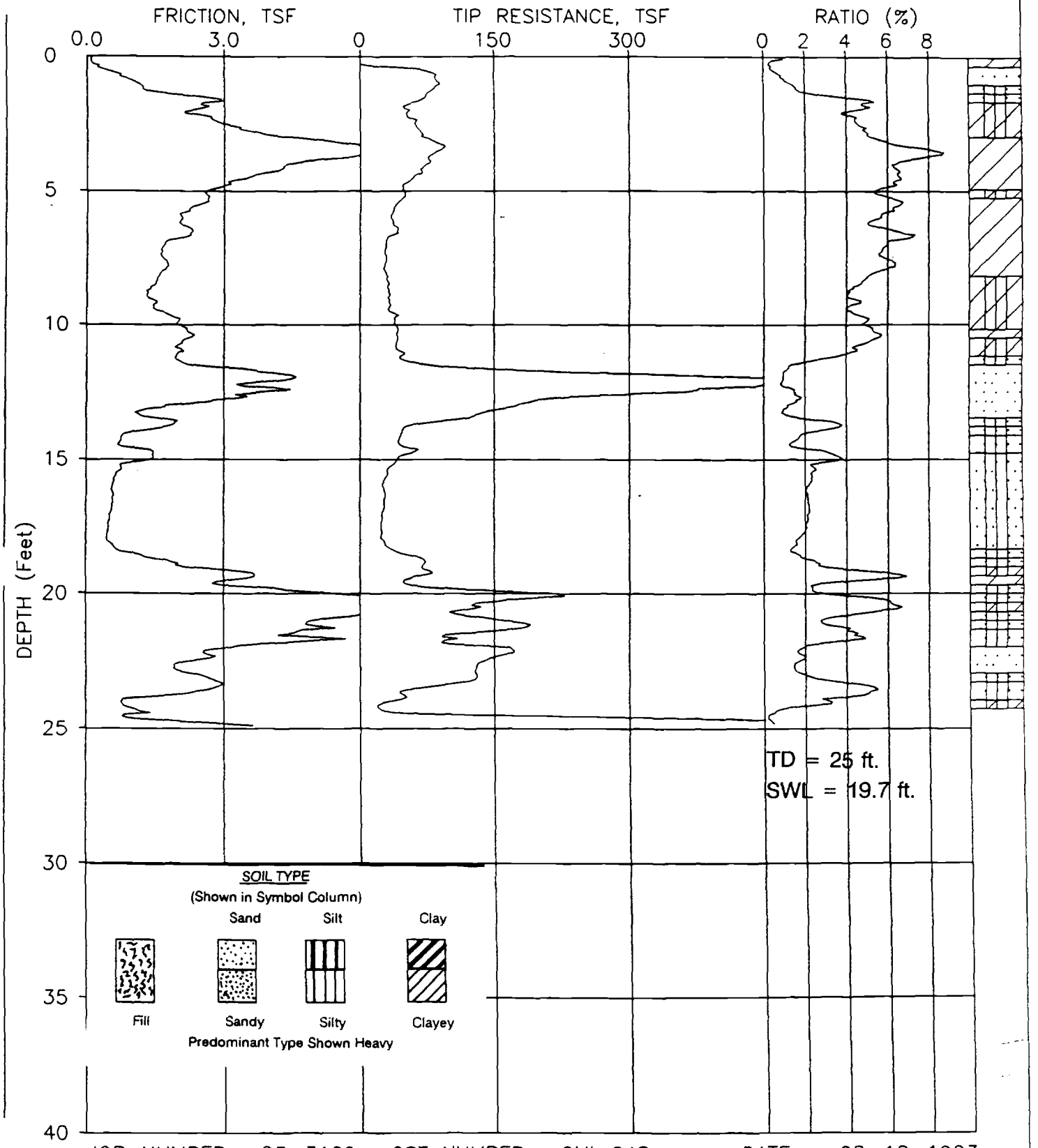
FUGRO GEOSCIENCES, INC

172243


GMI-3S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 22.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-03S
DATE : 08-12-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172244

GMI-4S

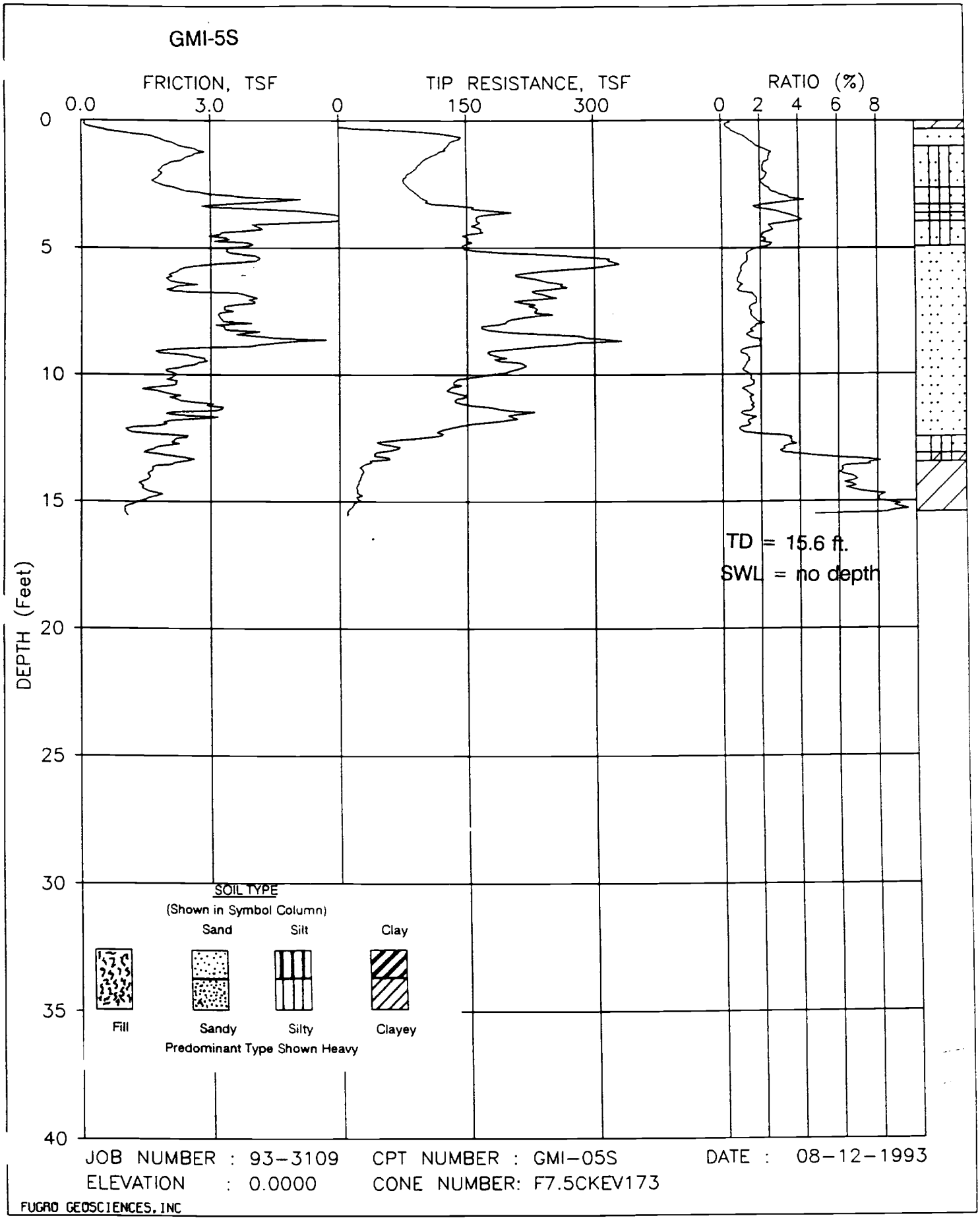


JOB NUMBER : 93-3109 CPT NUMBER : GMI-04S DATE : 08-12-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172245

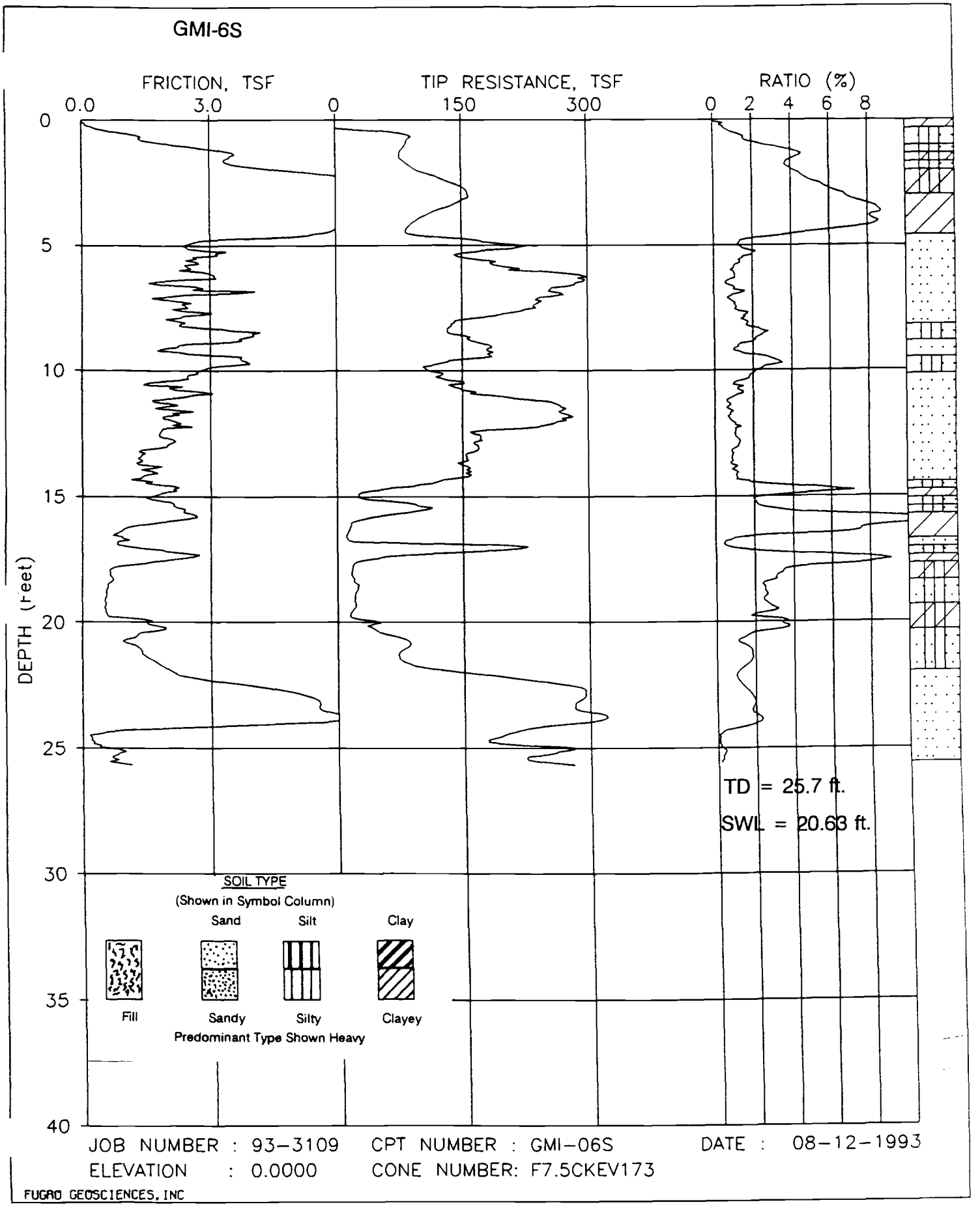


JOB NUMBER : 93-3109 CPT NUMBER : GMI-05S DATE : 08-12-1993

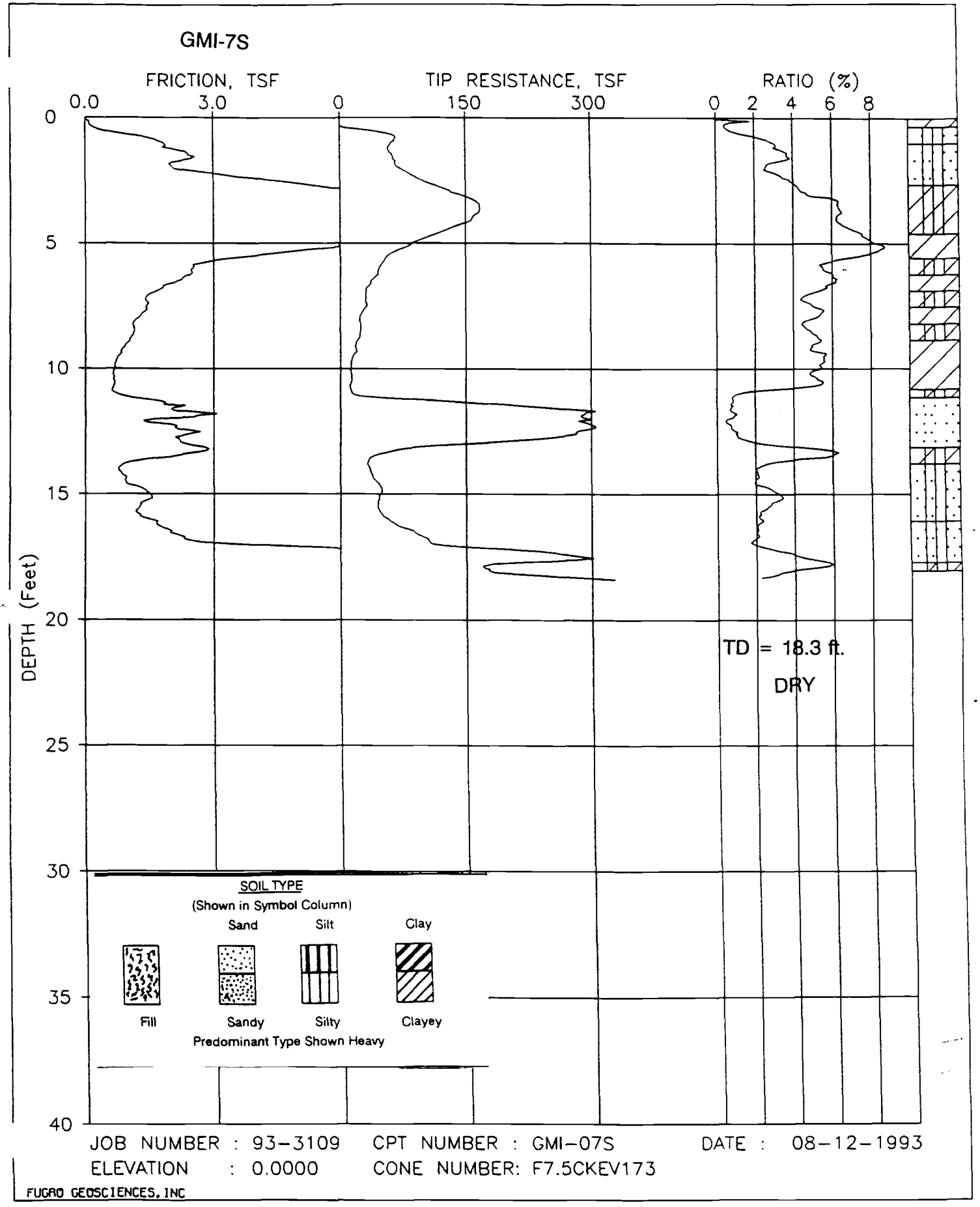
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

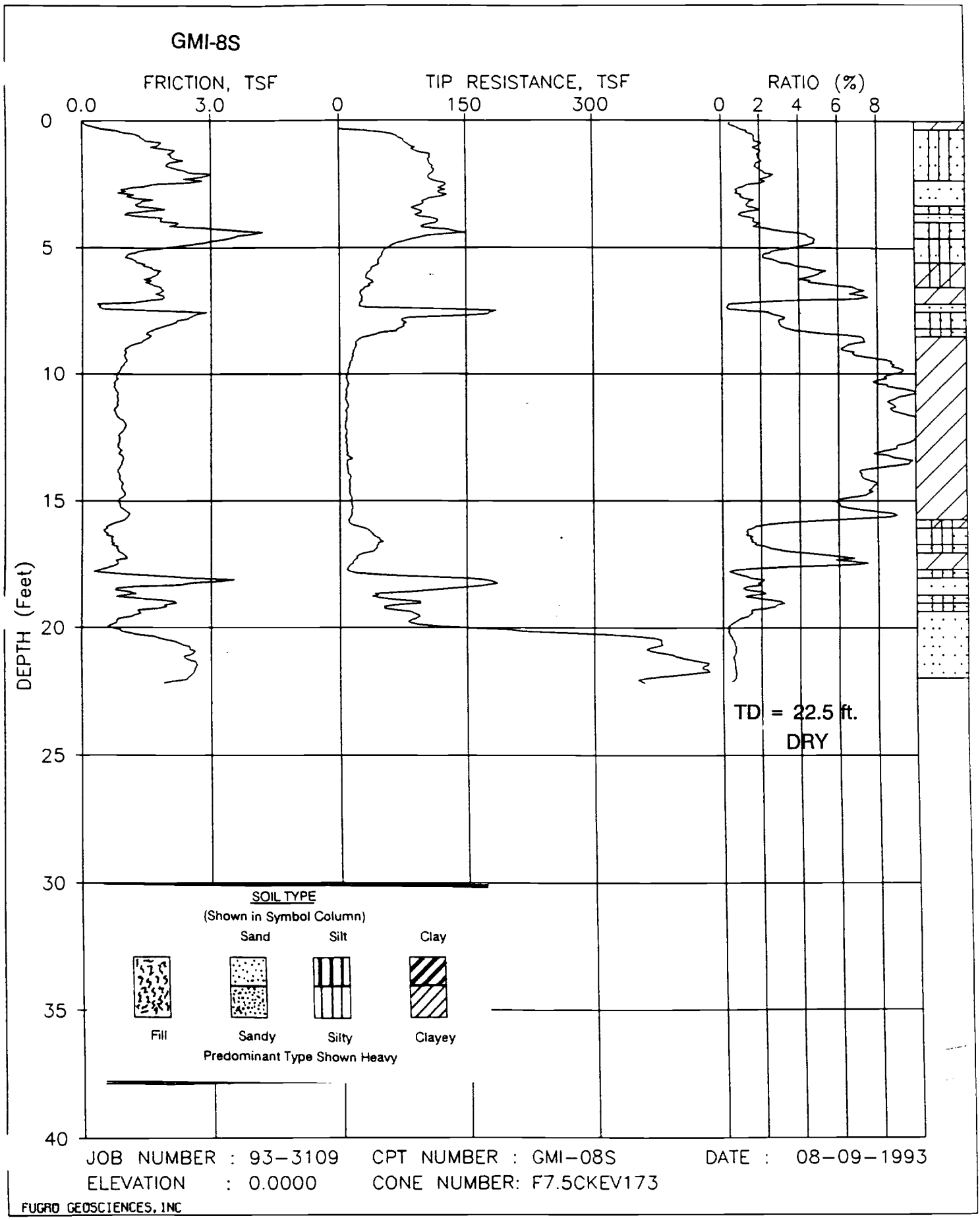
172246


GMI-6S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (feet)
0
5
10
15
20
25
30
35
40
TD = 25.7 ft.
SWL = 20.63 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-06S
DATE : 08-12-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

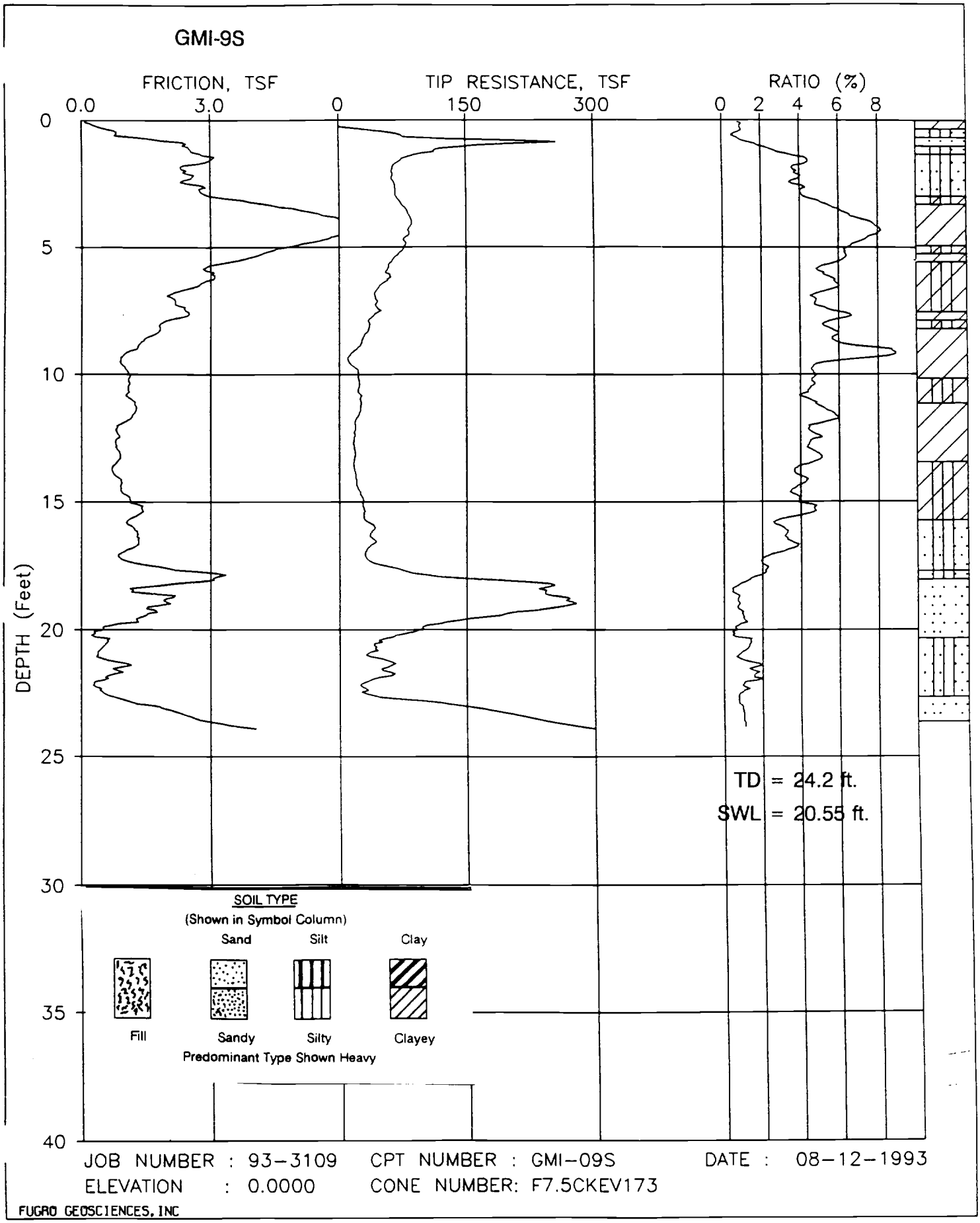
172247


GMI-7S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18.3 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-07S
DATE : 08-12-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172243


GMI-8S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 22.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-08S
DATE : 08-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172249

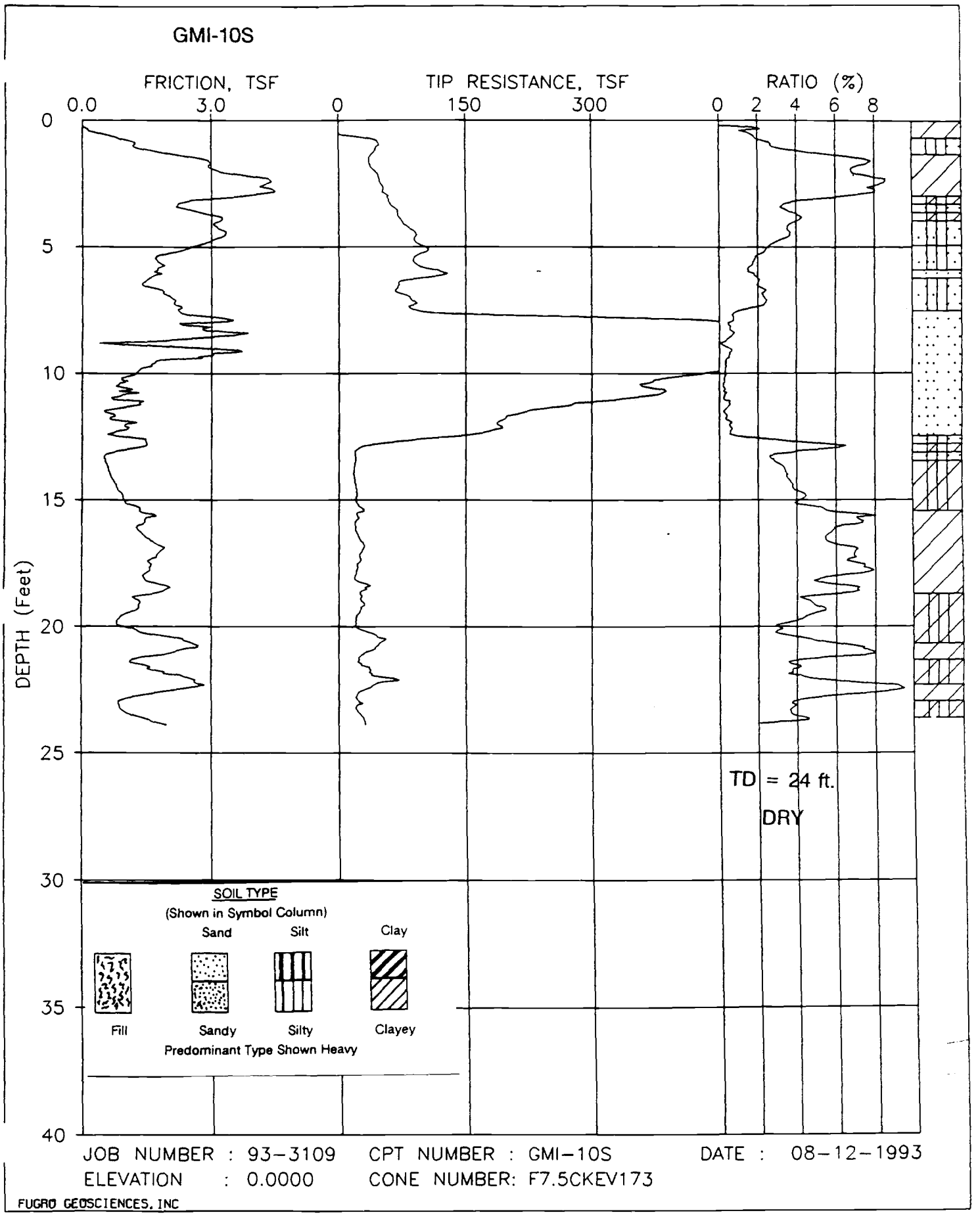


JOB NUMBER : 93-3109 CPT NUMBER : GMI-09S DATE : 08-12-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172250

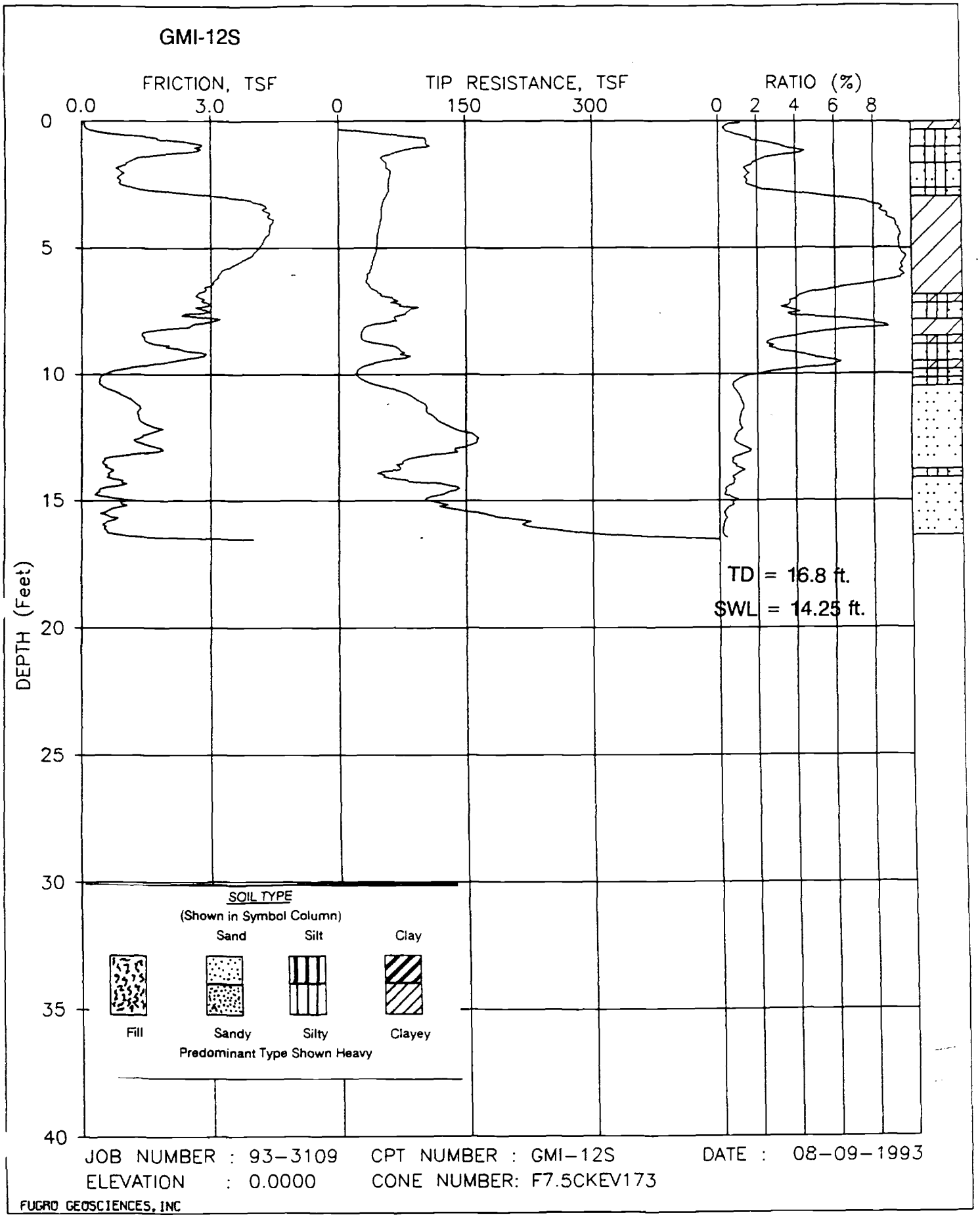


JOB NUMBER : 93-3109 CPT NUMBER : GMI-10S DATE : 08-12-1993

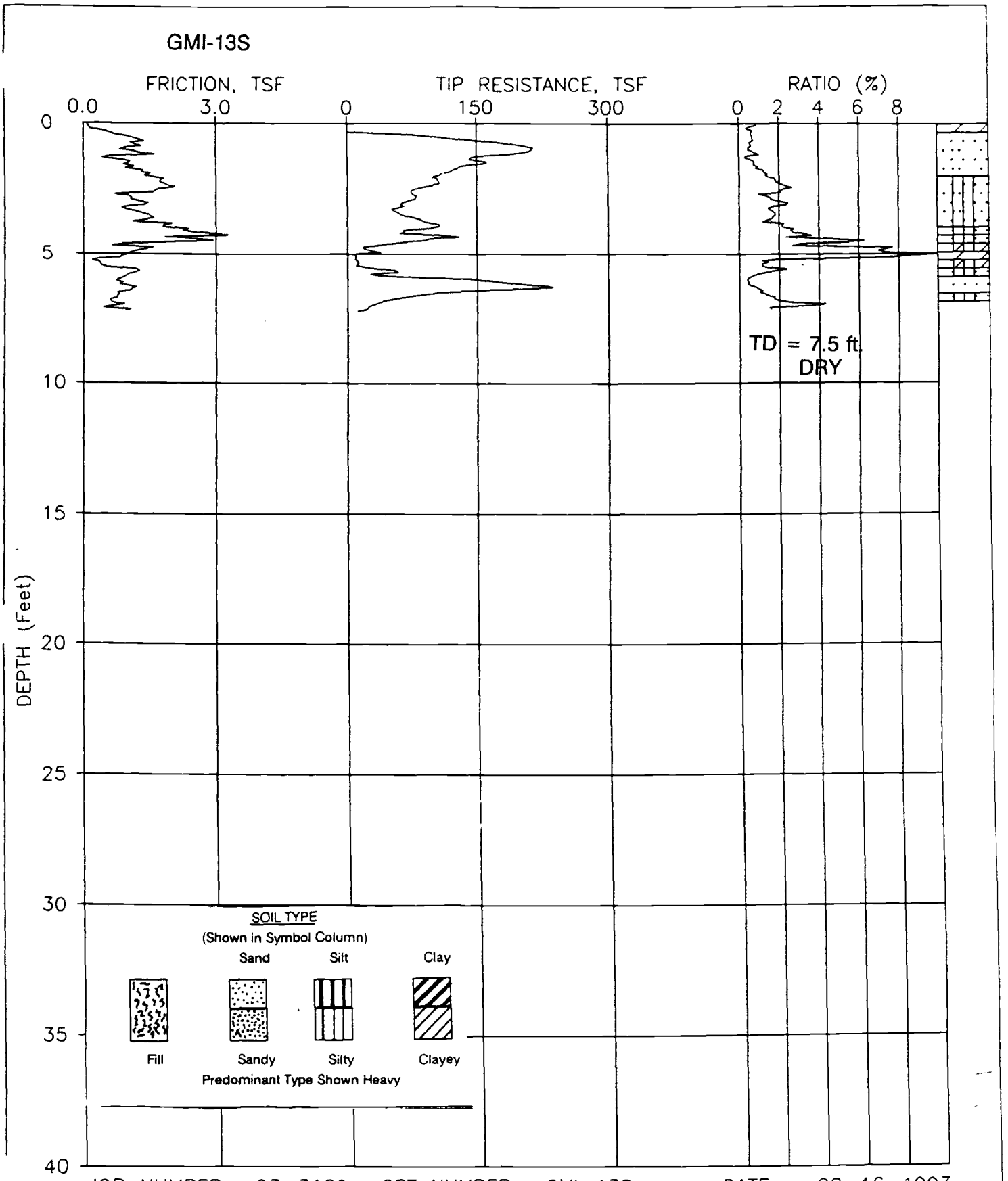
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172251


GMI-12S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 16.8 ft.
SWL = 14.25 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-12S
DATE : 08-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172252

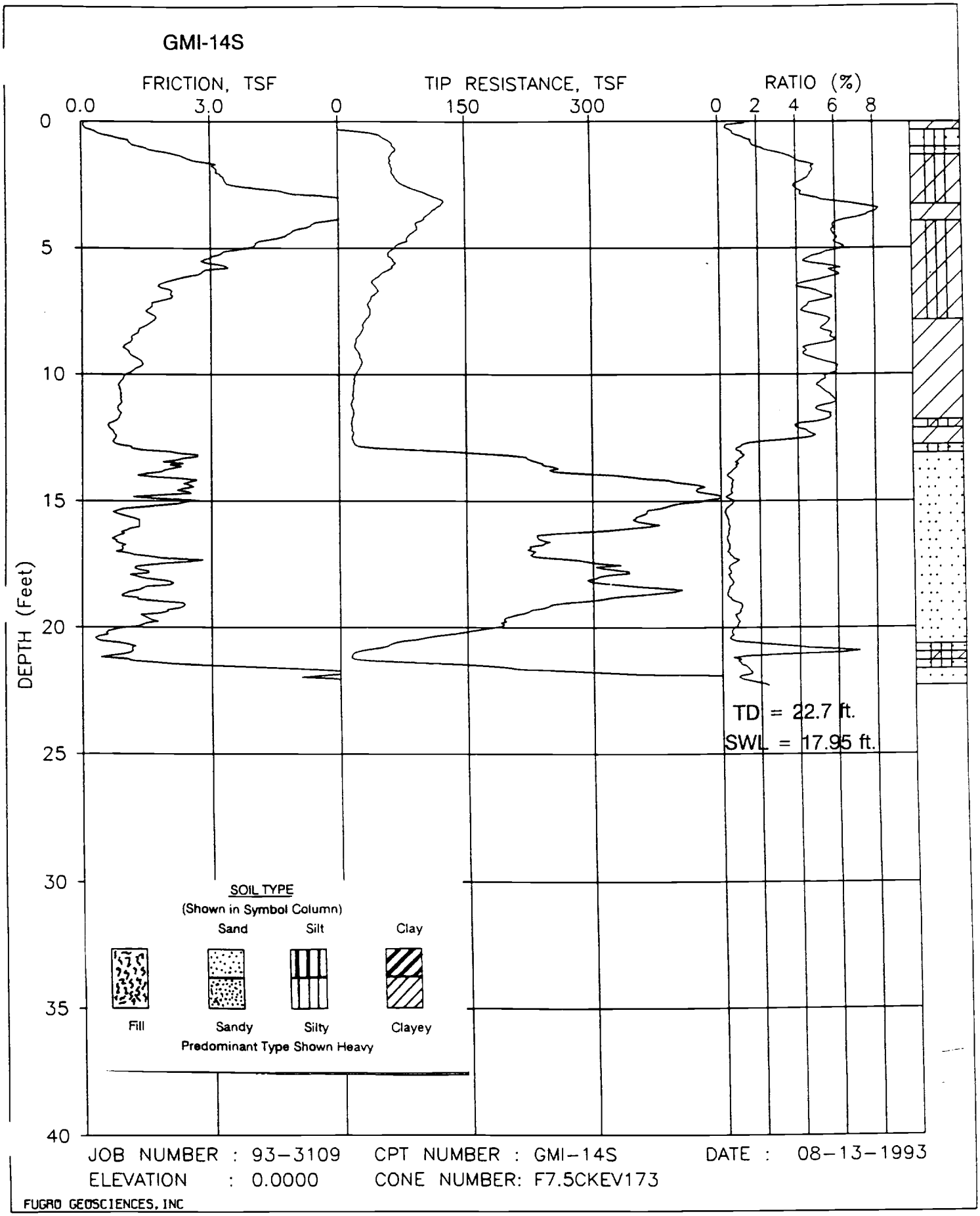


JOB NUMBER : 93-3109 CPT NUMBER : GMI-13S DATE : 08-16-1993

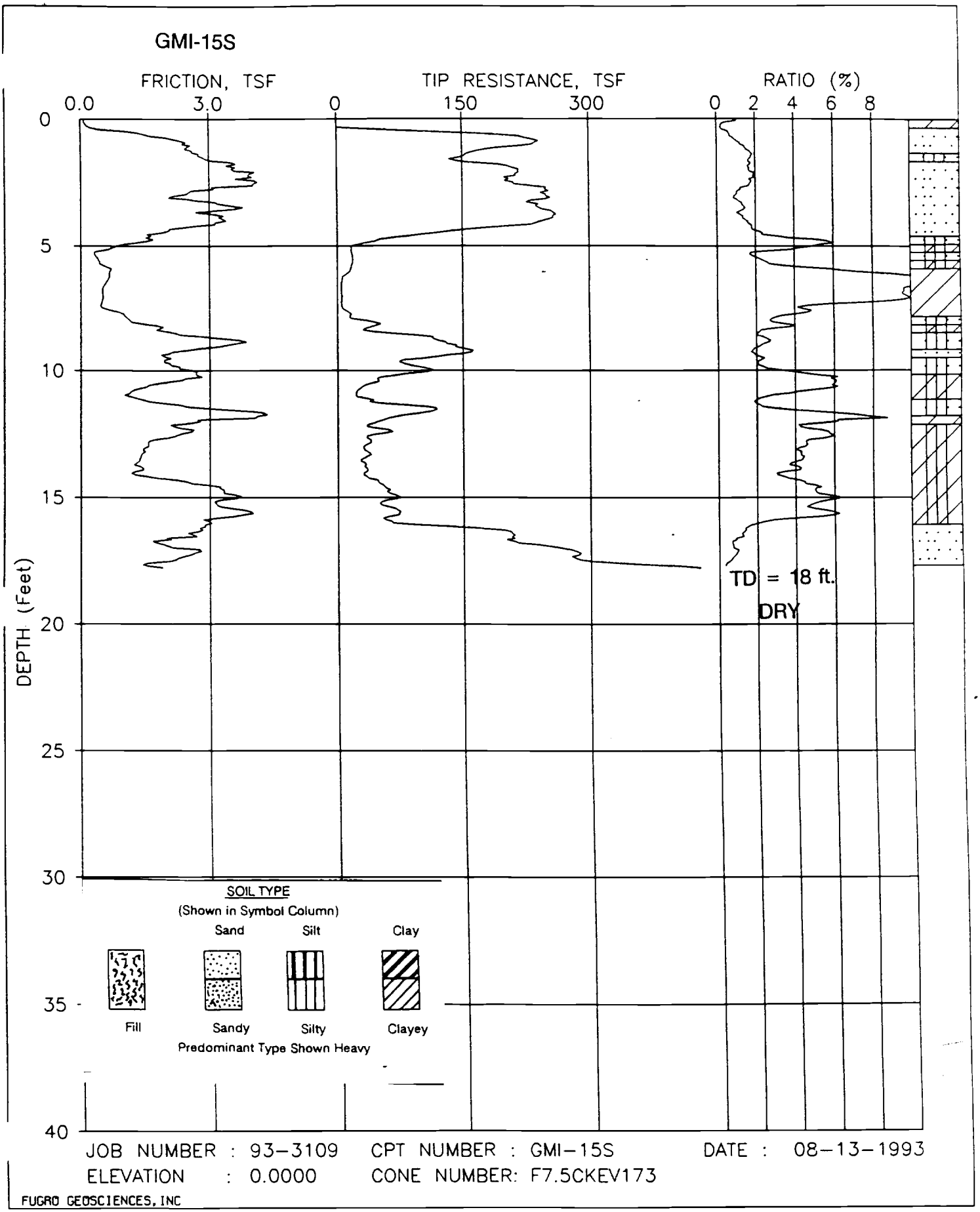
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

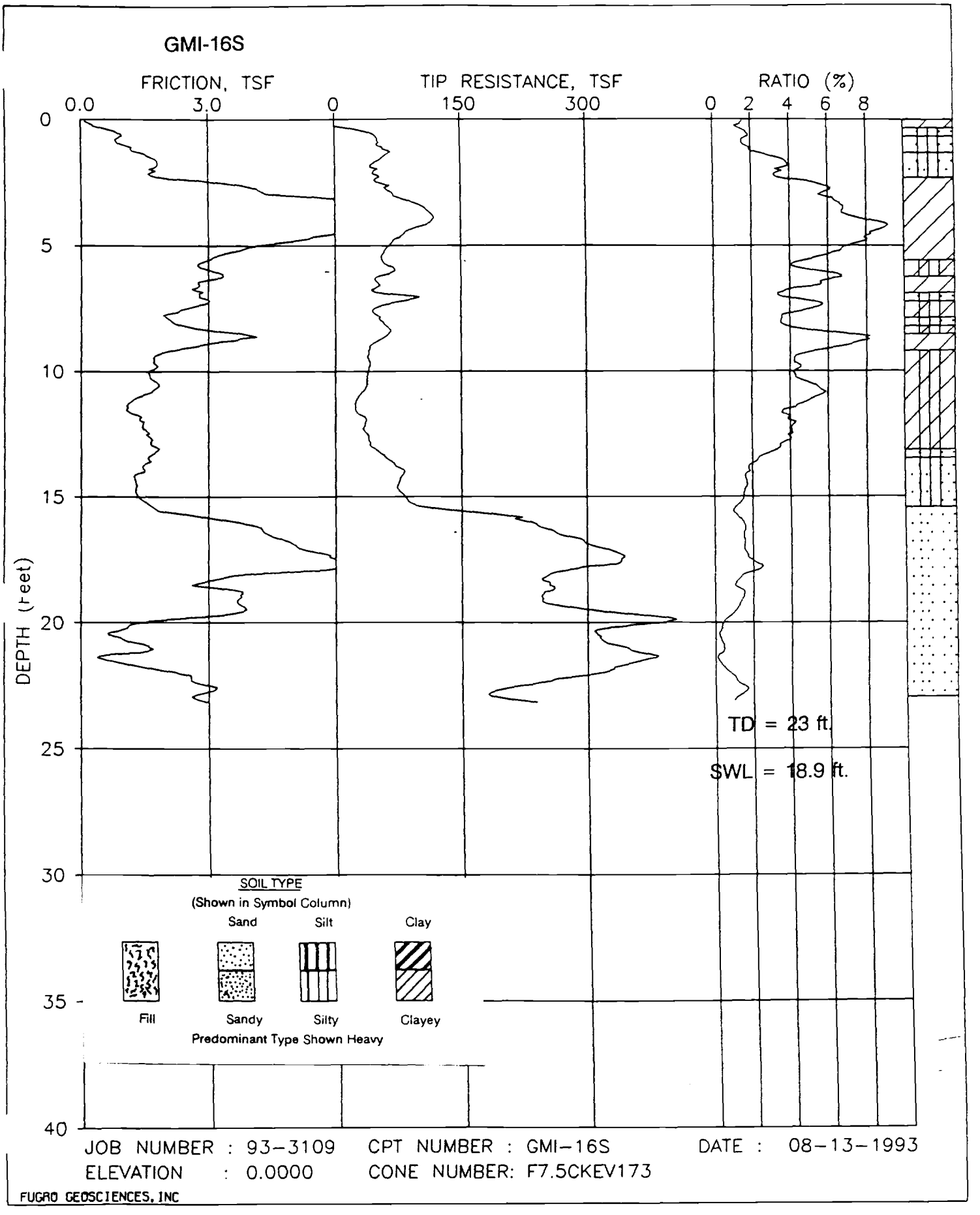
172253


GMI-14S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 22.7 ft.
SWL = 17.95 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-14S
DATE : 08-13-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172254


GMI-15S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-15S
DATE : 08-13-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172255

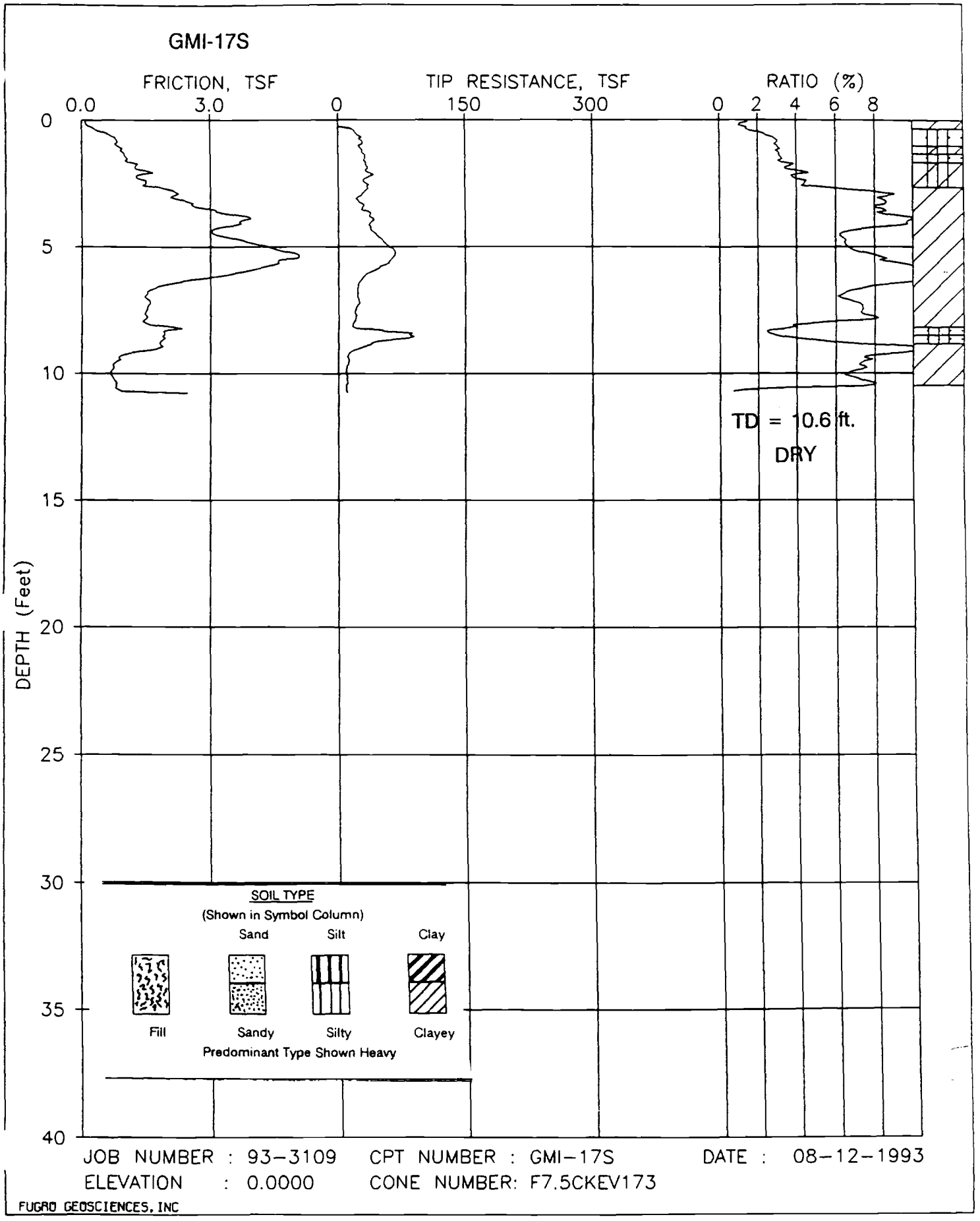


JOB NUMBER : 93-3109 CPT NUMBER : GMI-16S DATE : 08-13-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

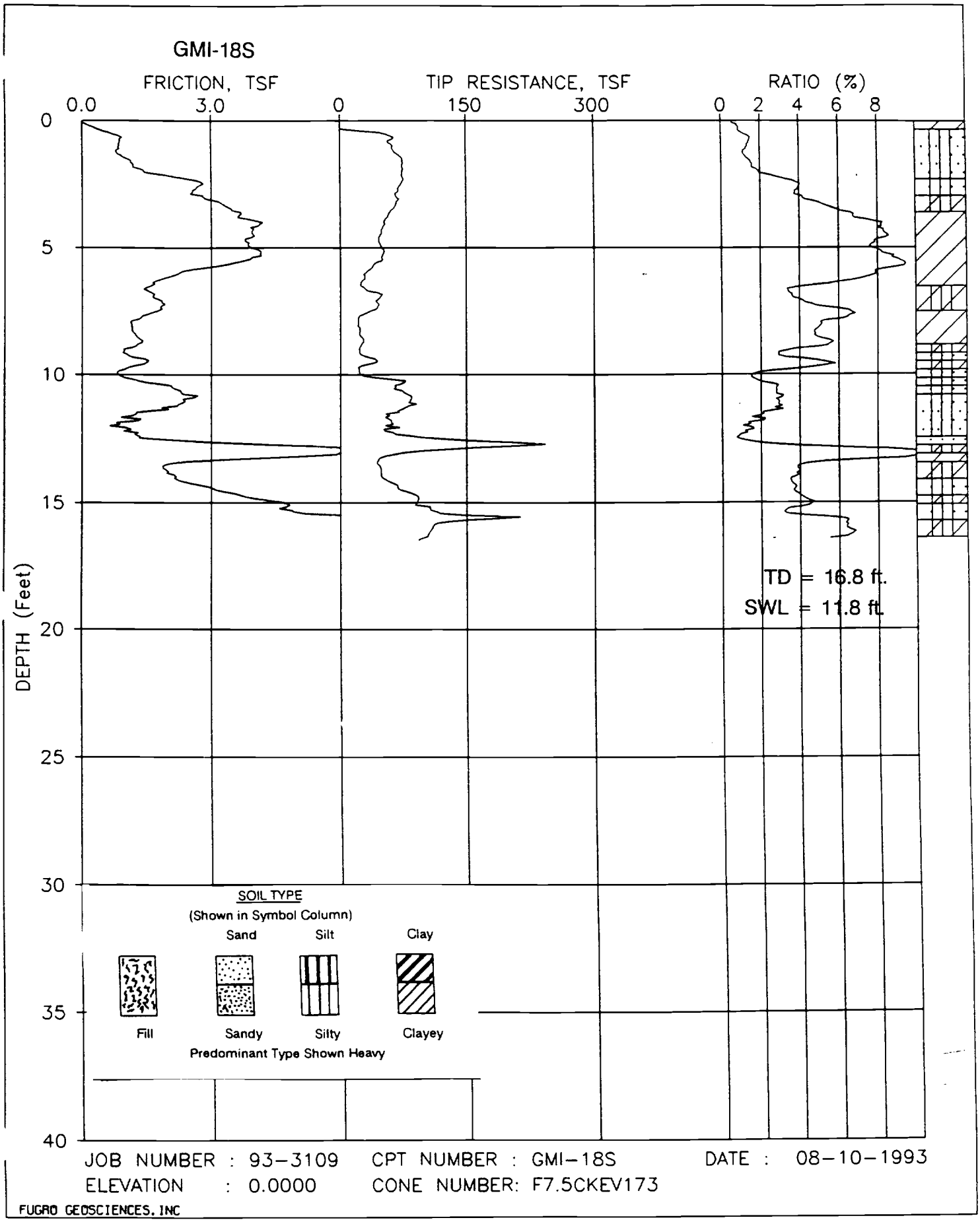
172256



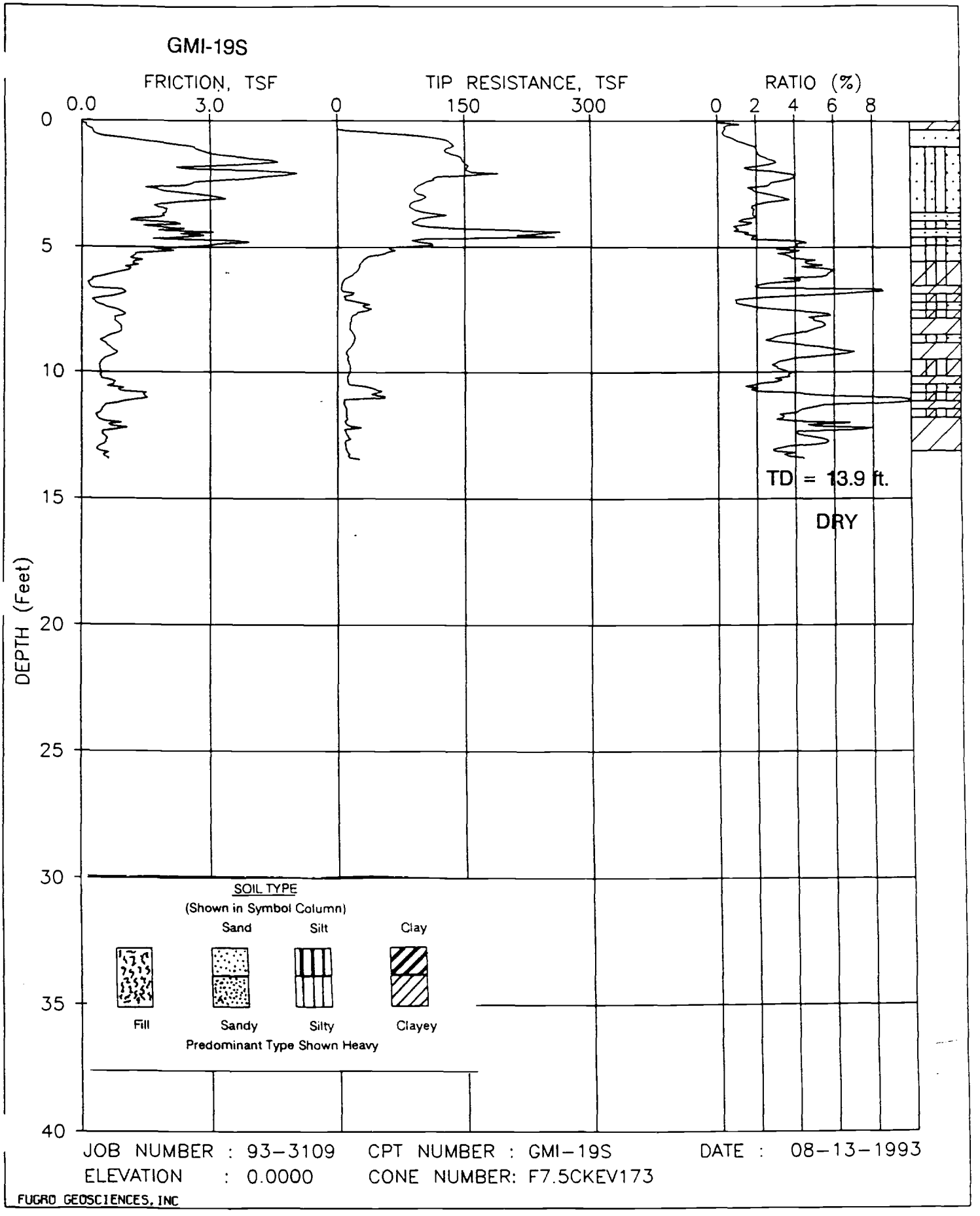
JOB NUMBER : 93-3109 CPT NUMBER : GMI-17S DATE : 08-12-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172257


GMI-18S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 16.8 ft.
SWL = 11.8 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-18S
DATE : 08-10-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

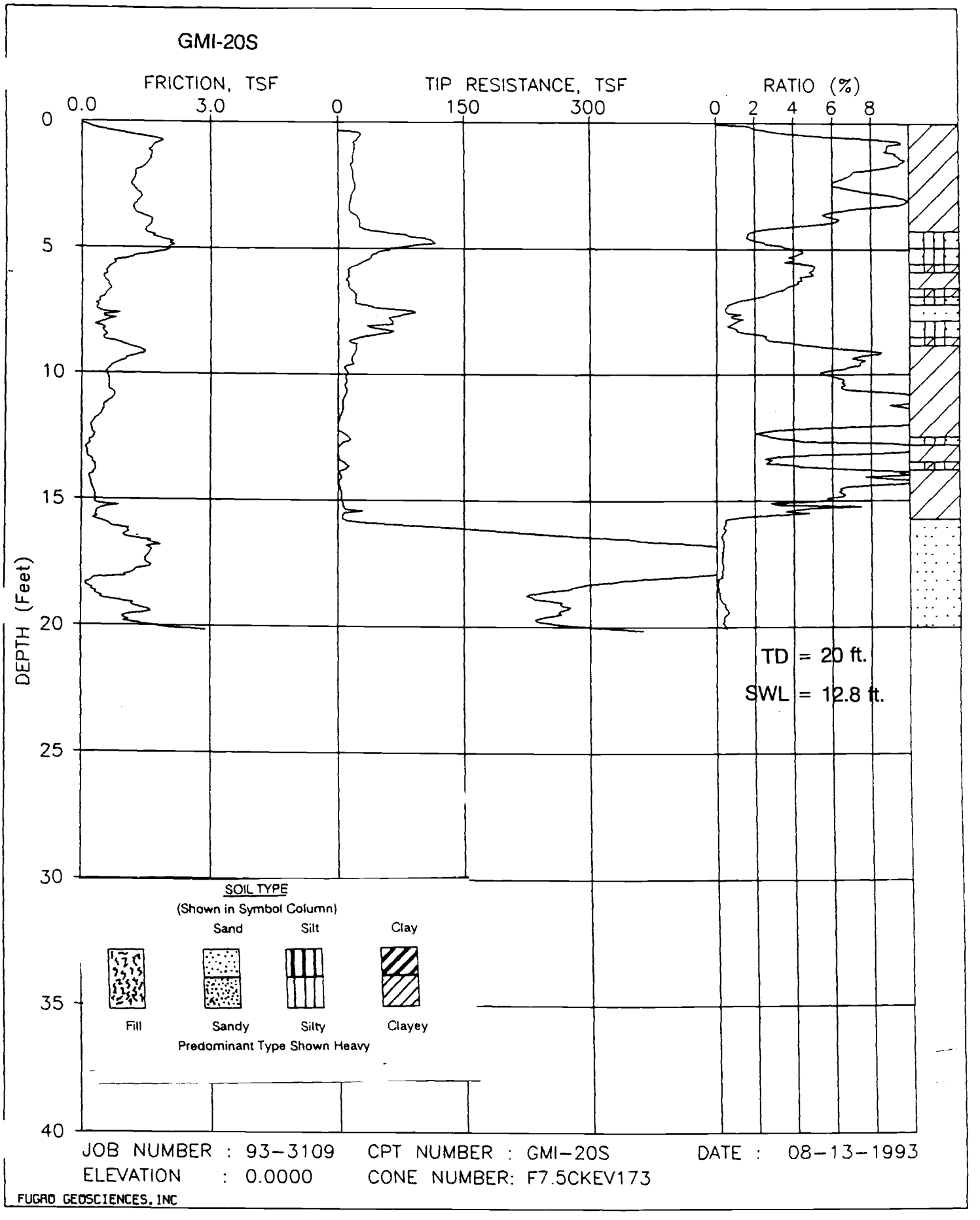
172253



JOB NUMBER : 93-3109 CPT NUMBER : GMI-19S DATE : 08-13-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

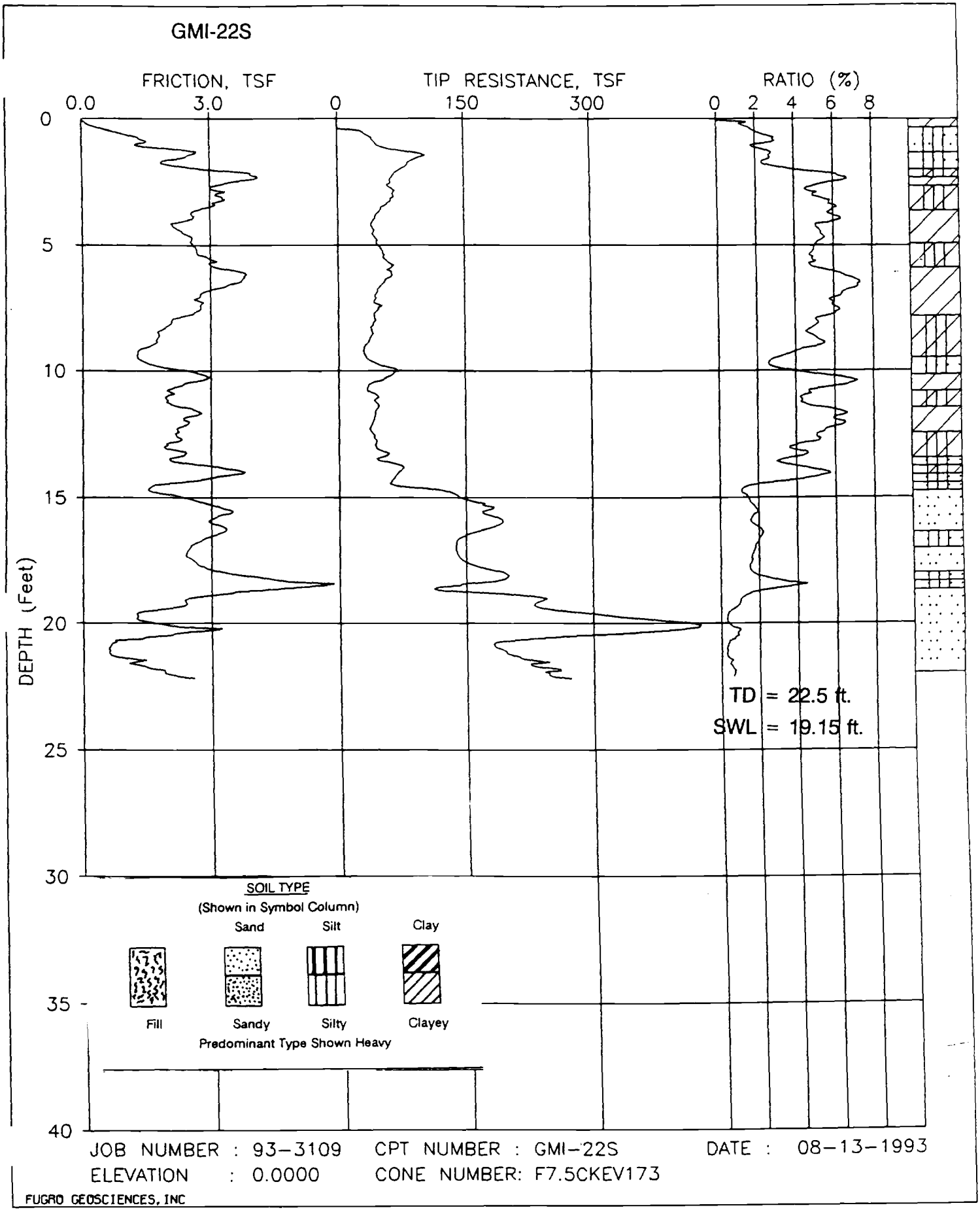
172259



JOB NUMBER : 93-3109 CPT NUMBER : GMI-20S DATE : 08-13-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

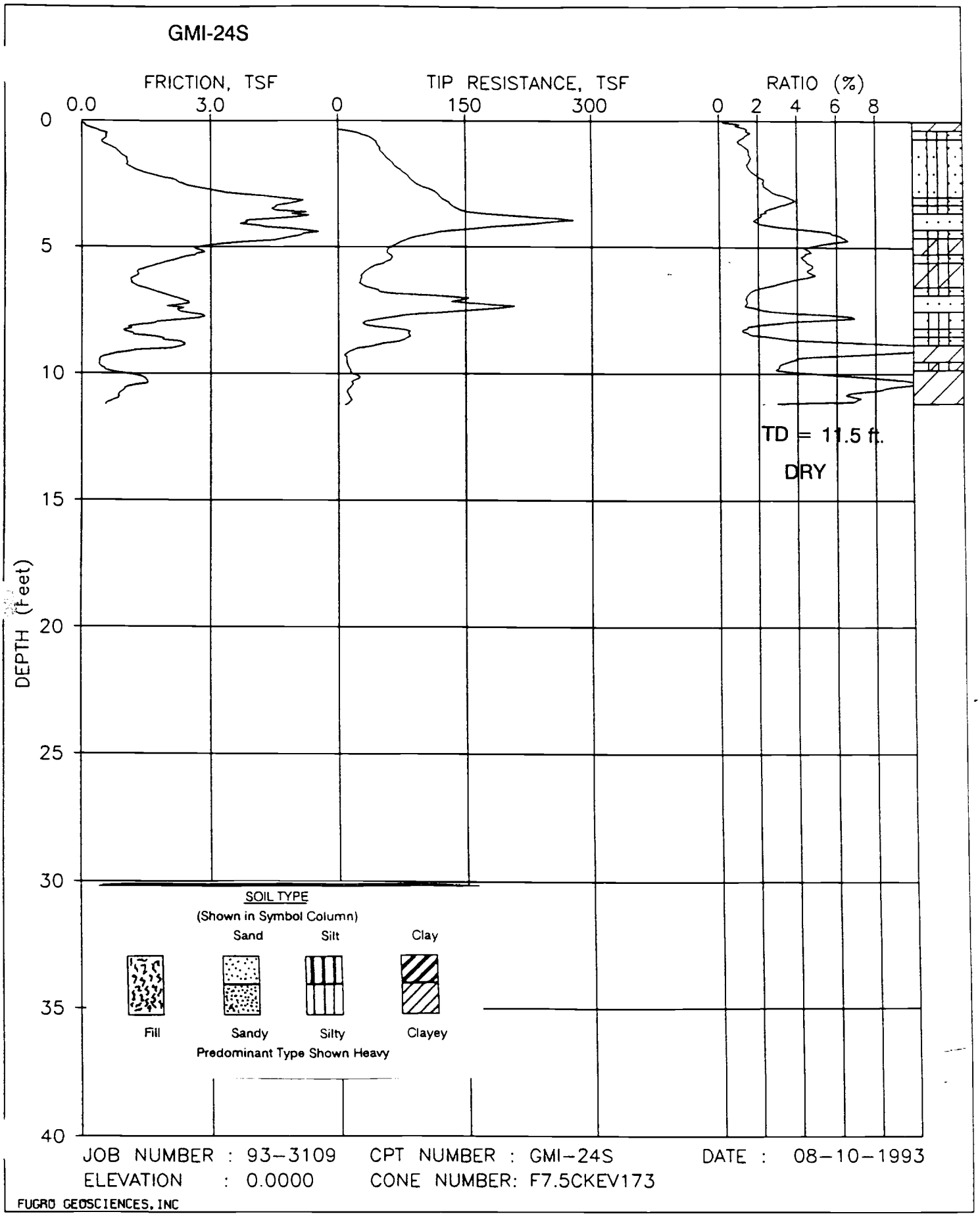


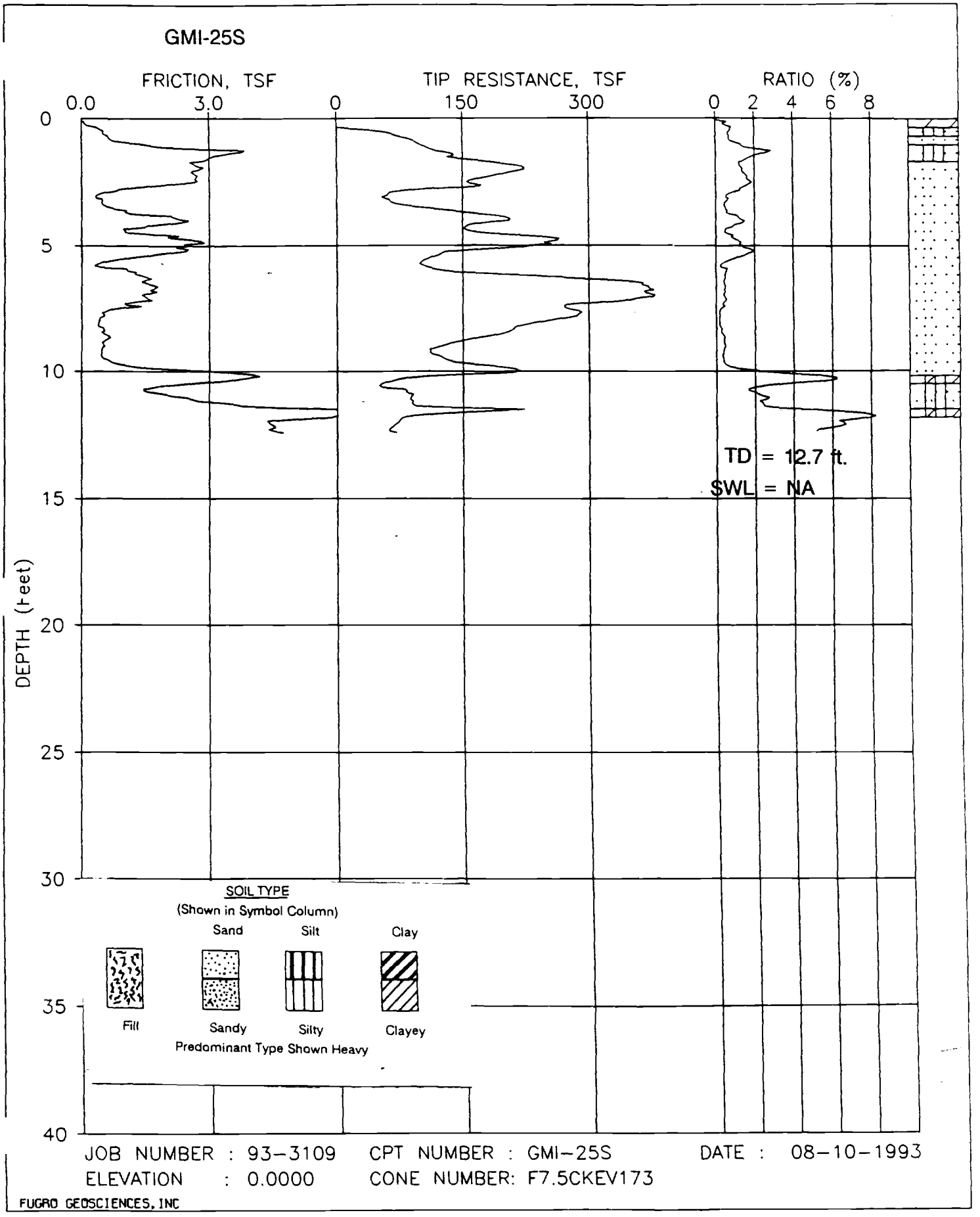
JOB NUMBER : 93-3109 CPT NUMBER : GMI-22S DATE : 08-13-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172261

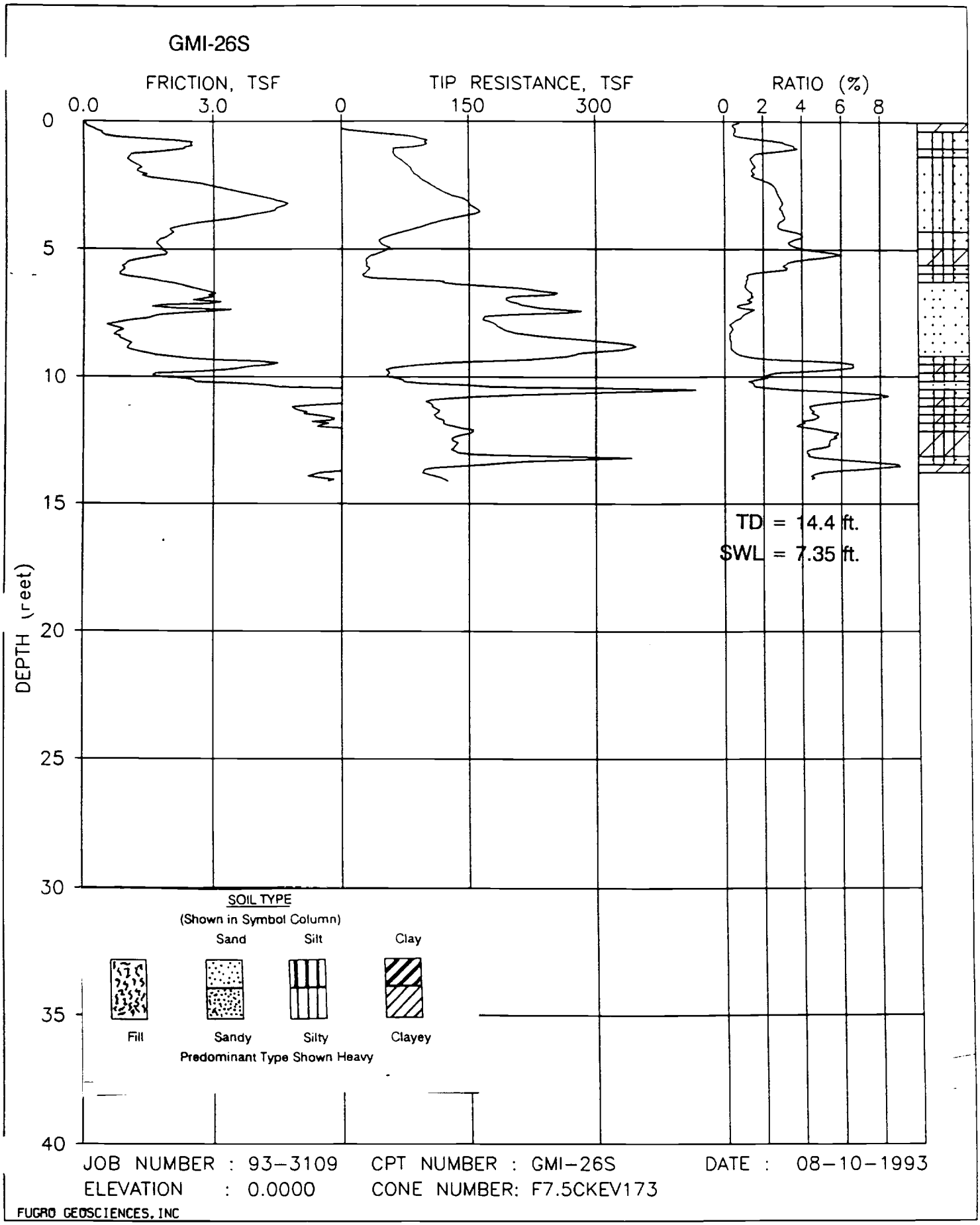

GMI-24S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 11.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-24S
DATE : 08-10-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-25S DATE : 08-10-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172263

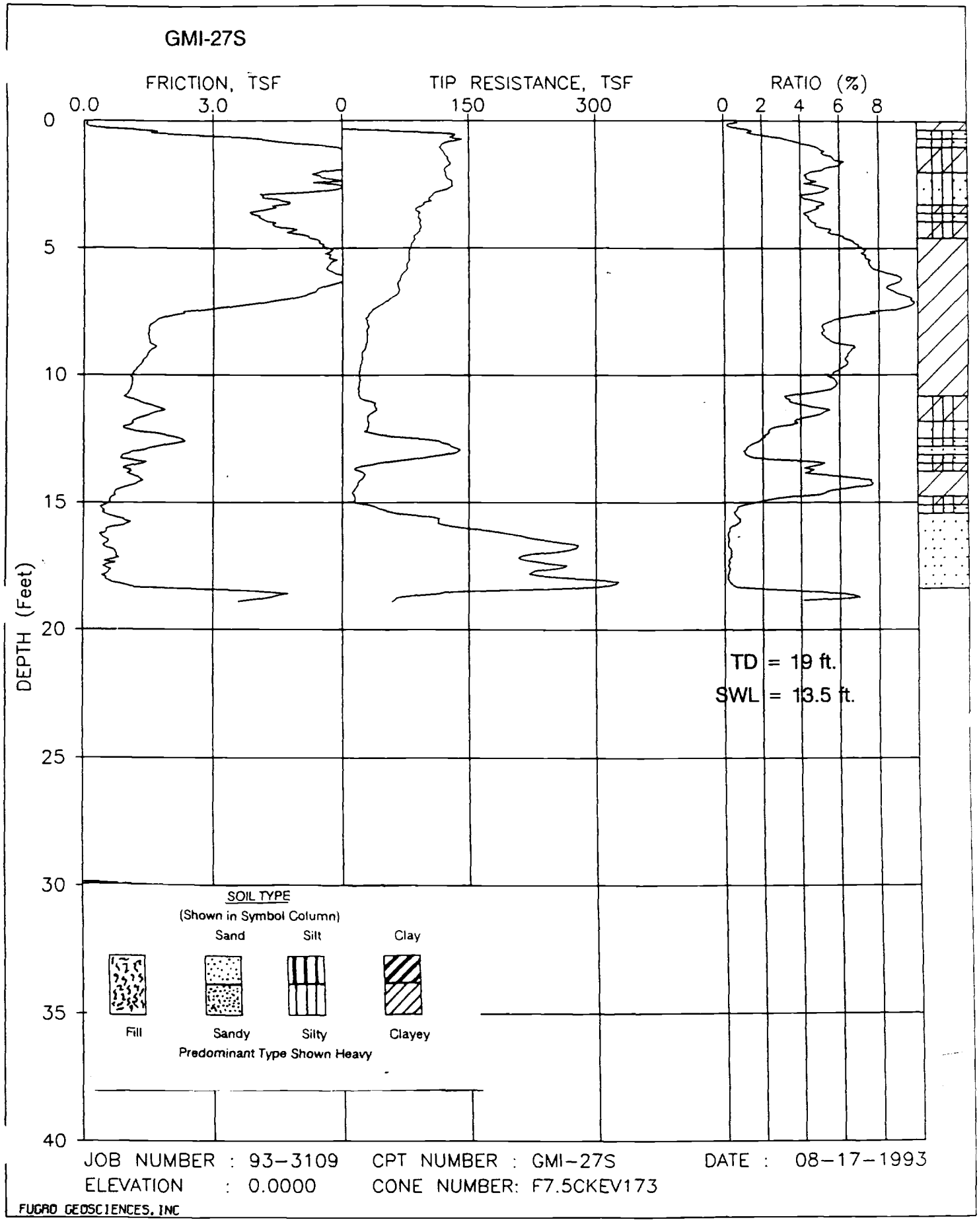


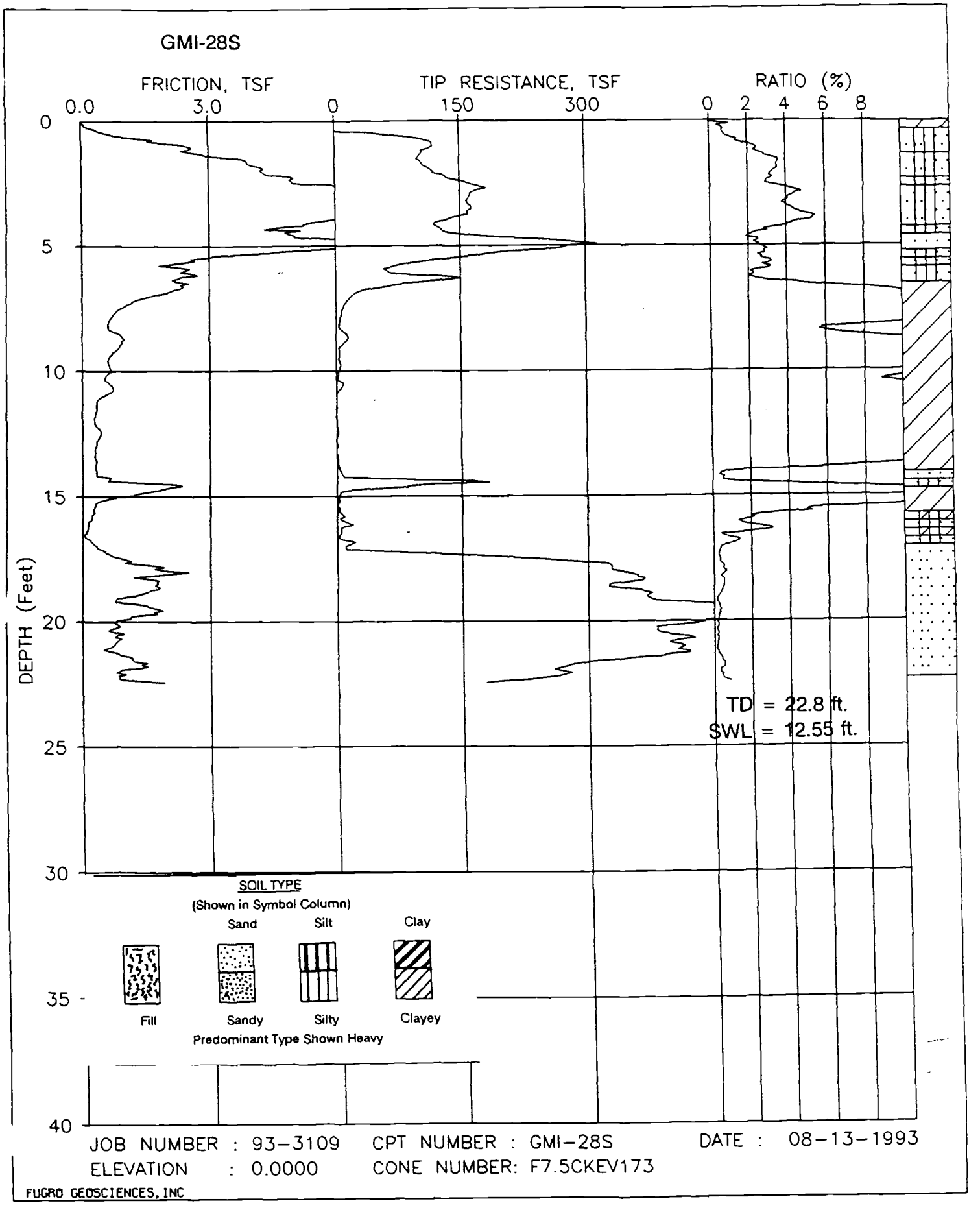
JOB NUMBER : 93-3109 CPT NUMBER : GMI-26S DATE : 08-10-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172264

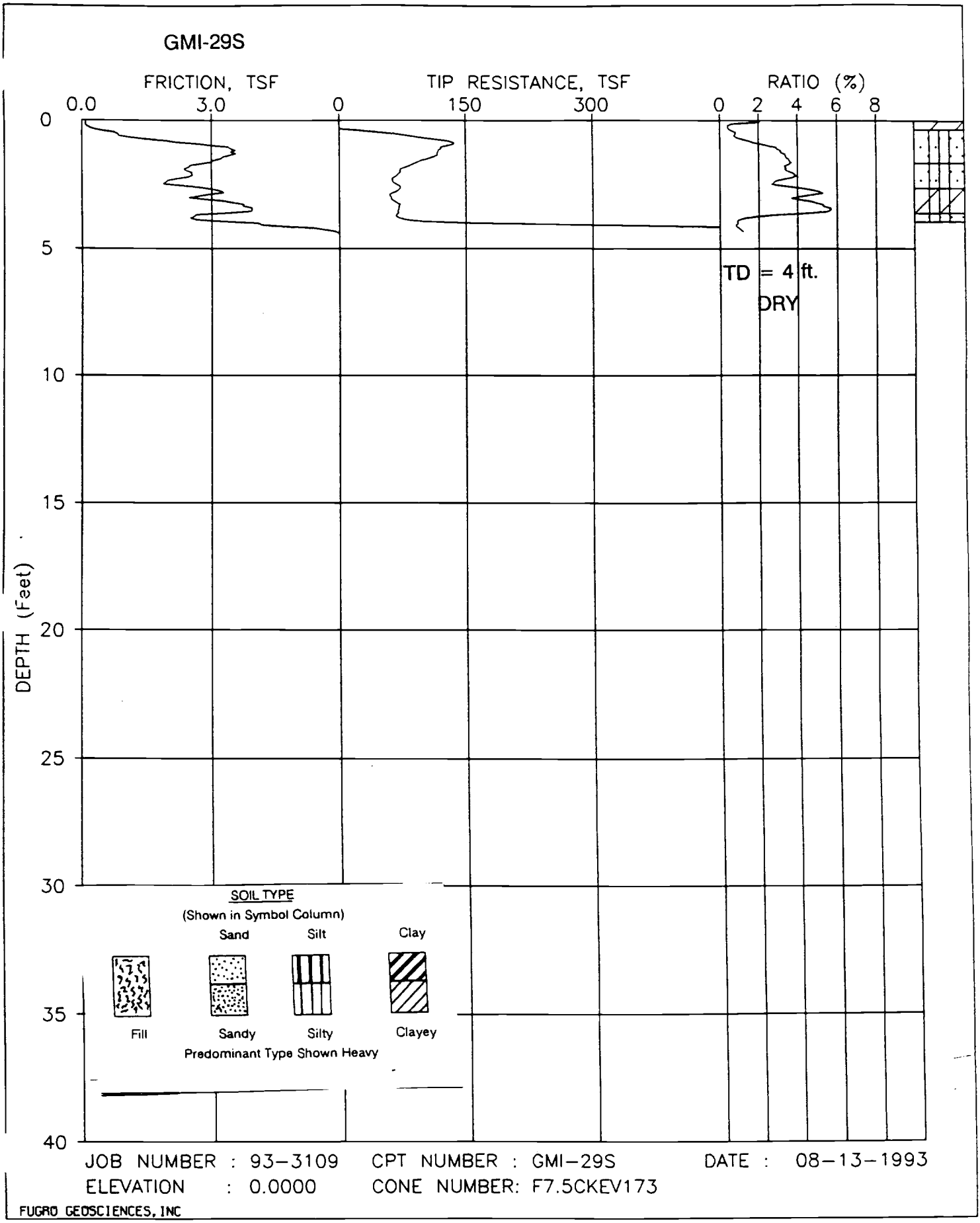

GMI-27S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19 ft.
SWL = 13.5 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-27S
DATE : 08-17-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-28S DATE : 08-13-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

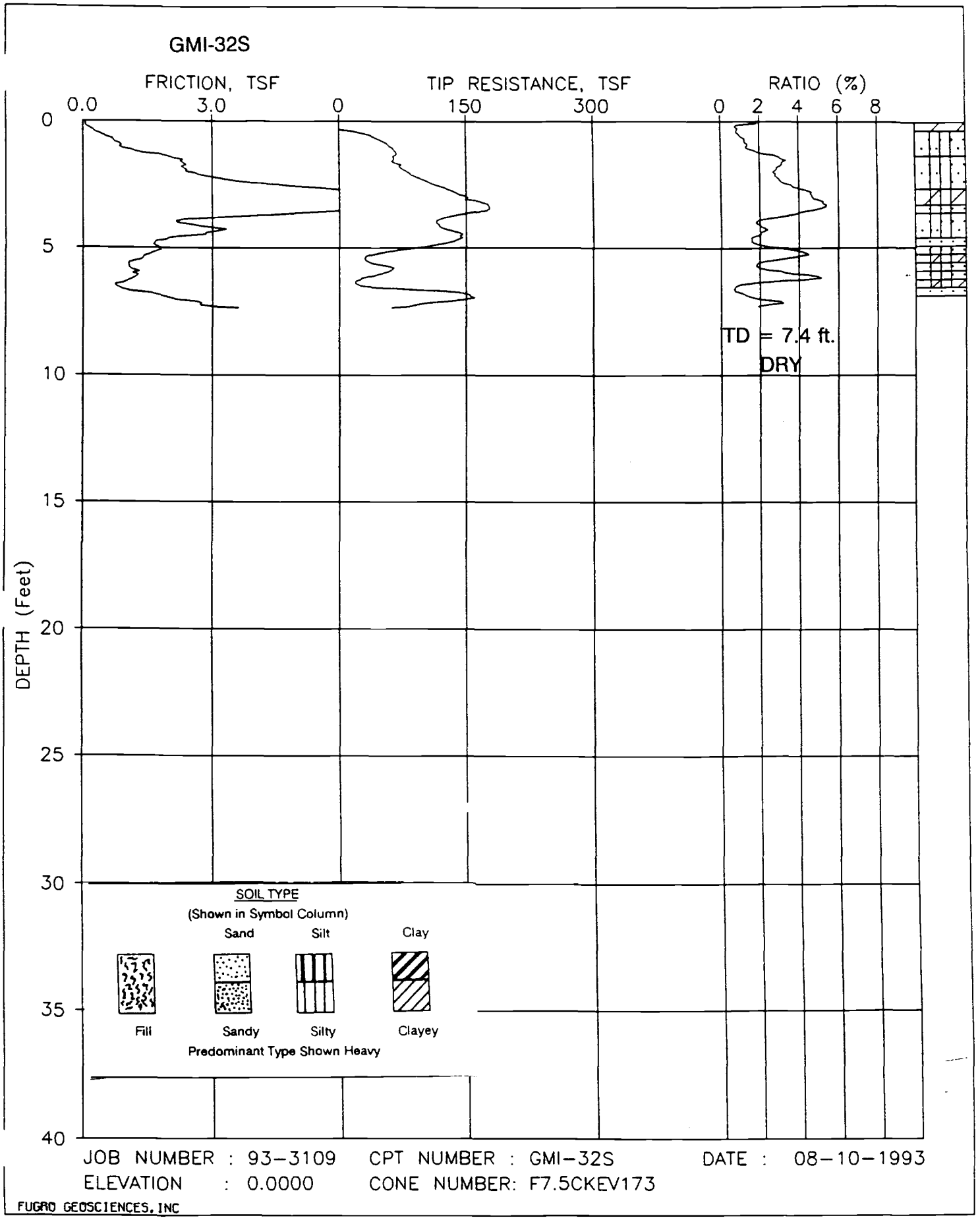
172266

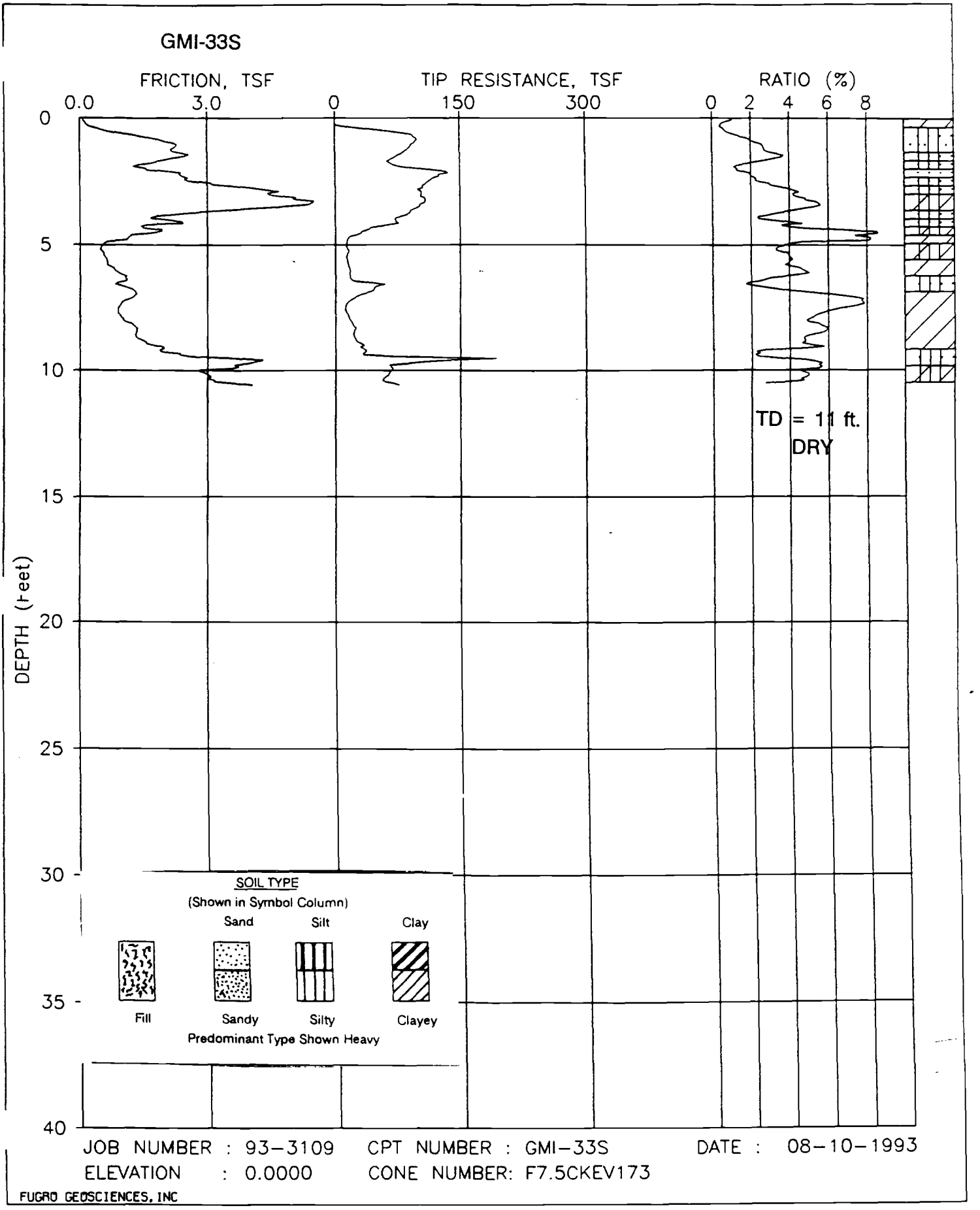


JOB NUMBER : 93-3109 CPT NUMBER : GMI-29S DATE : 08-13-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

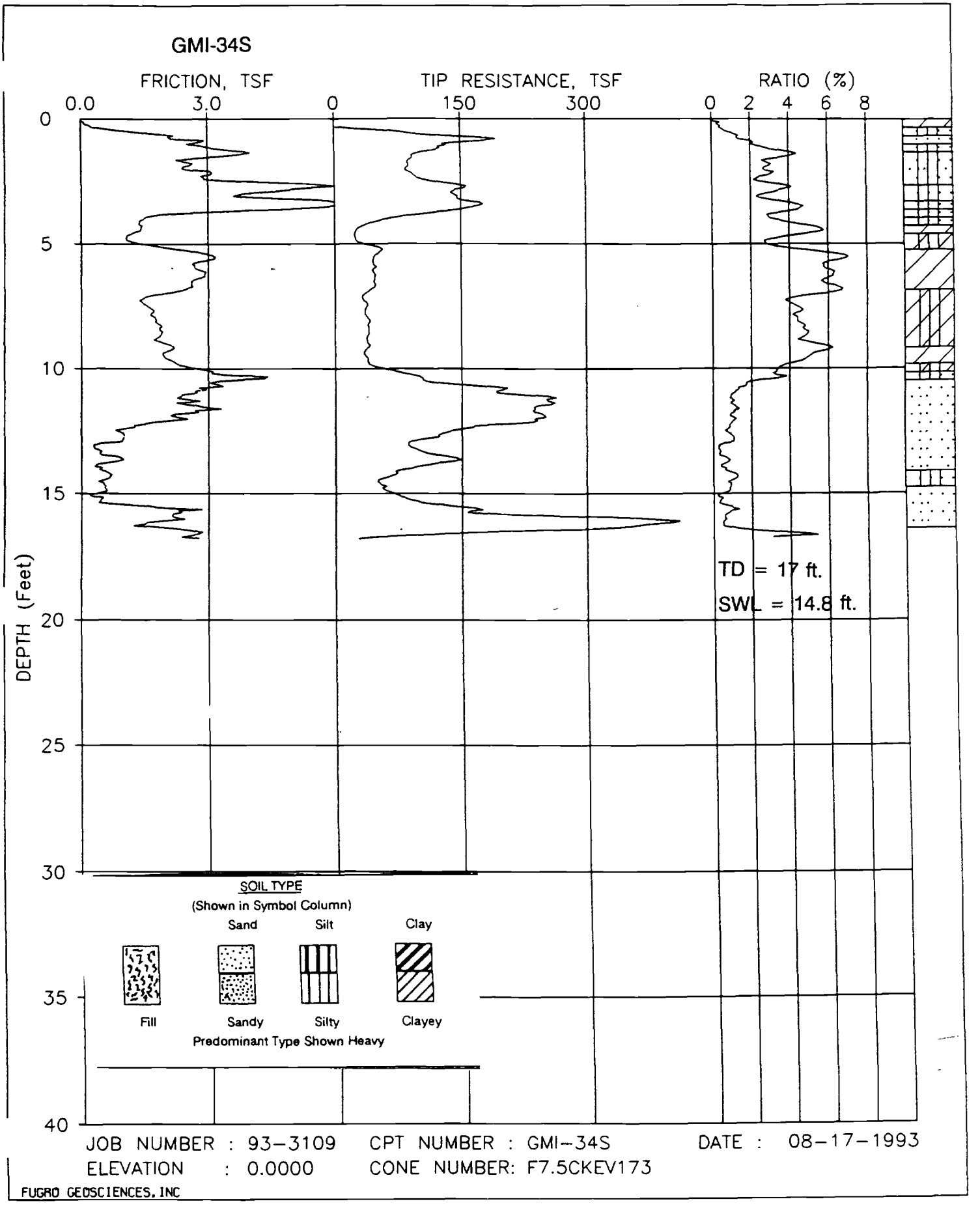
FUGRO GEOSCIENCES, INC


GMI-32S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 7.4 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-32S
DATE : 08-10-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-33S DATE : 08-10-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

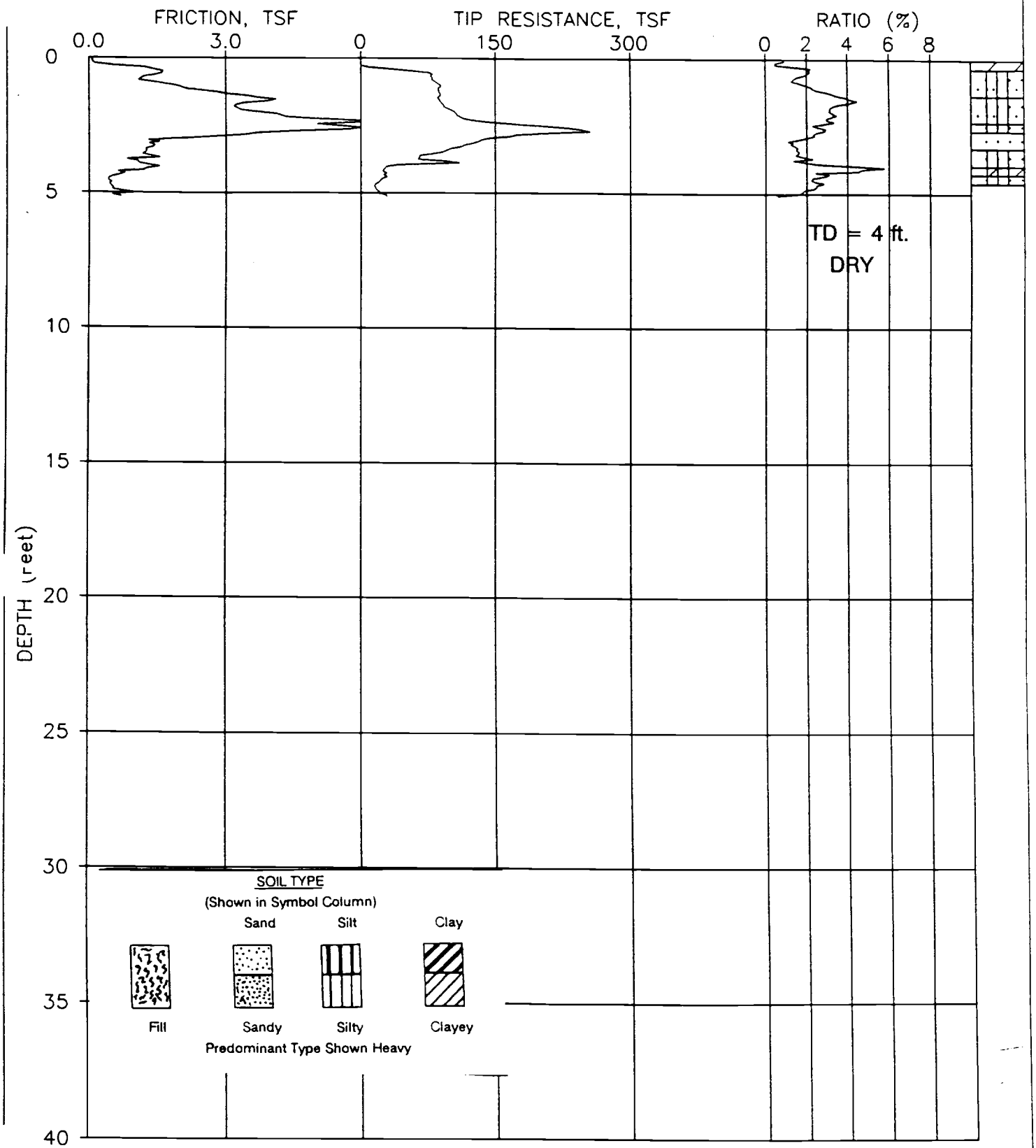


JOB NUMBER : 93-3109 CPT NUMBER : GMI-34S DATE : 08-17-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172270

GMI-35S

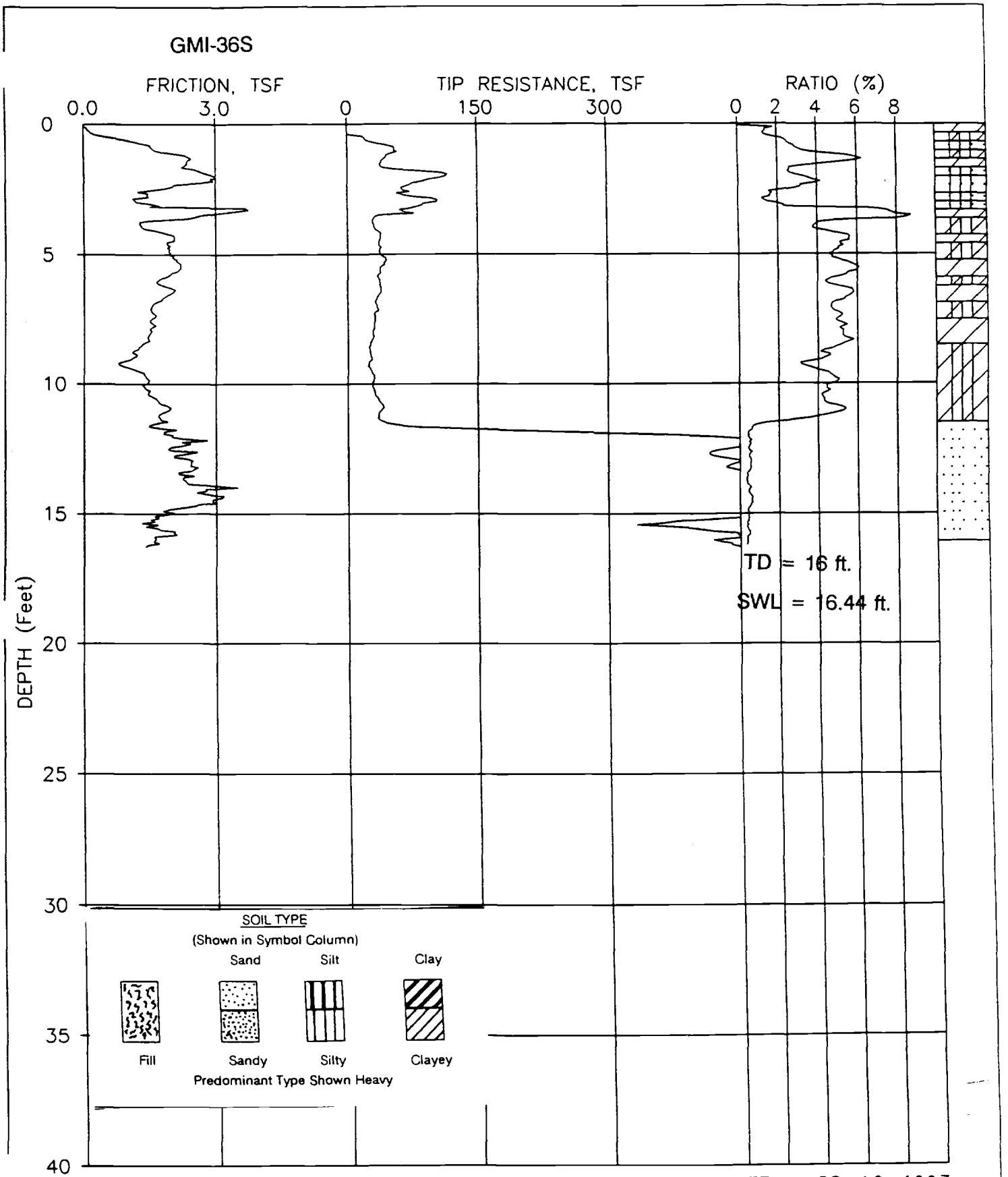


JOB NUMBER : 93-3109 CPT NUMBER : GMI-35S DATE : 08-16-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172271

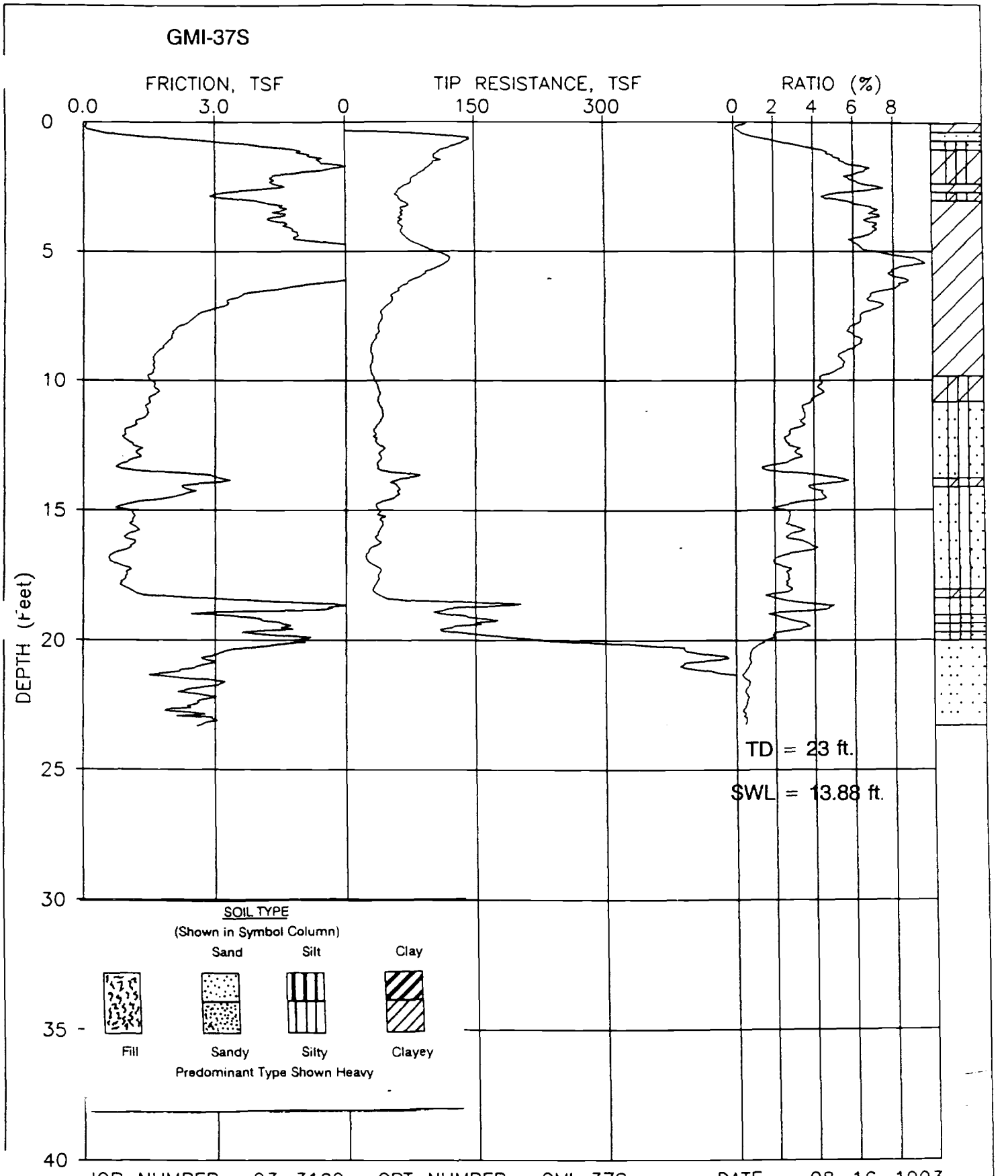


JOB NUMBER : 93-3109 CPT NUMBER : GMI-36S DATE : 08-16-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172274

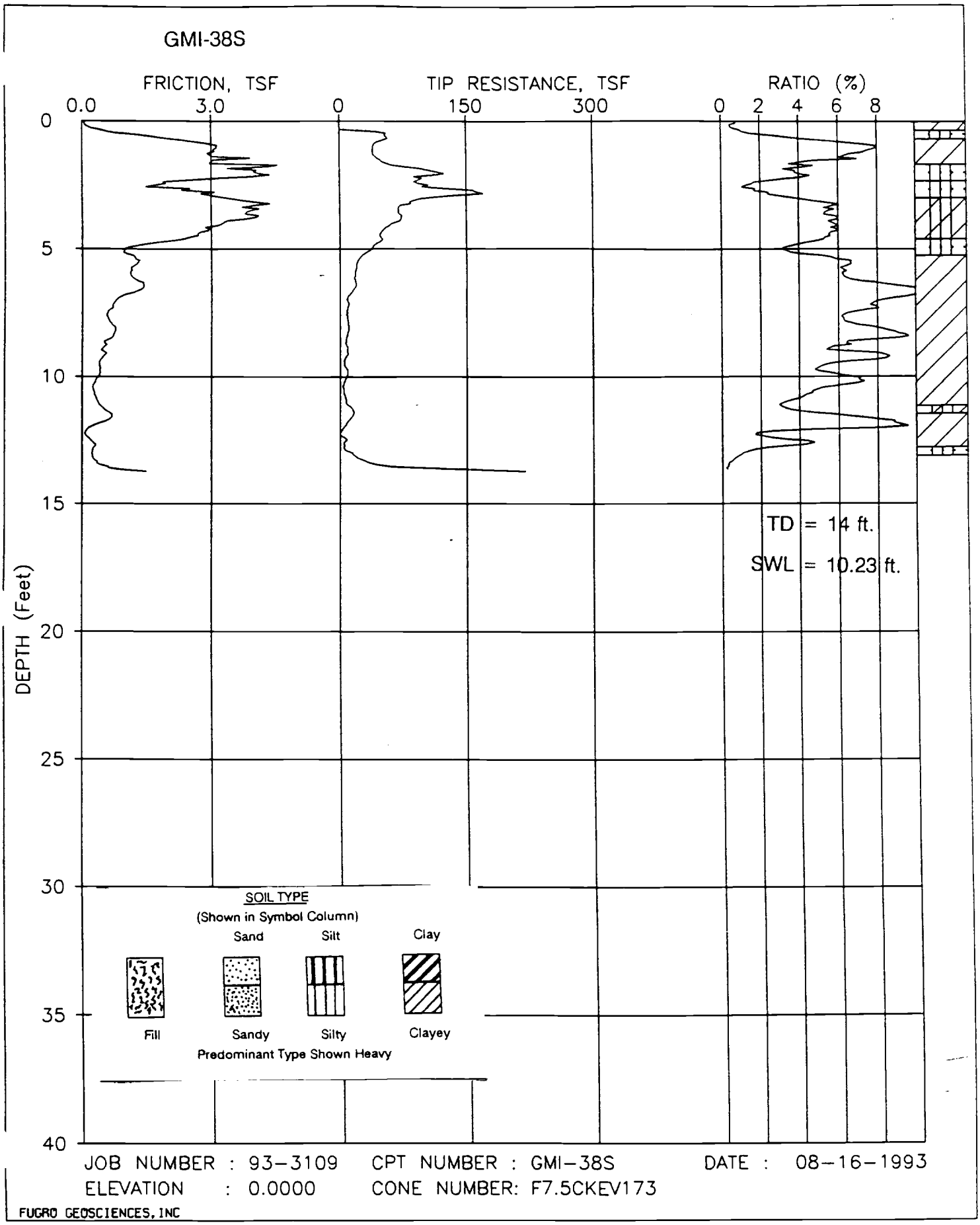


JOB NUMBER : 93-3109 CPT NUMBER : GMI-37S DATE : 08-16-1993

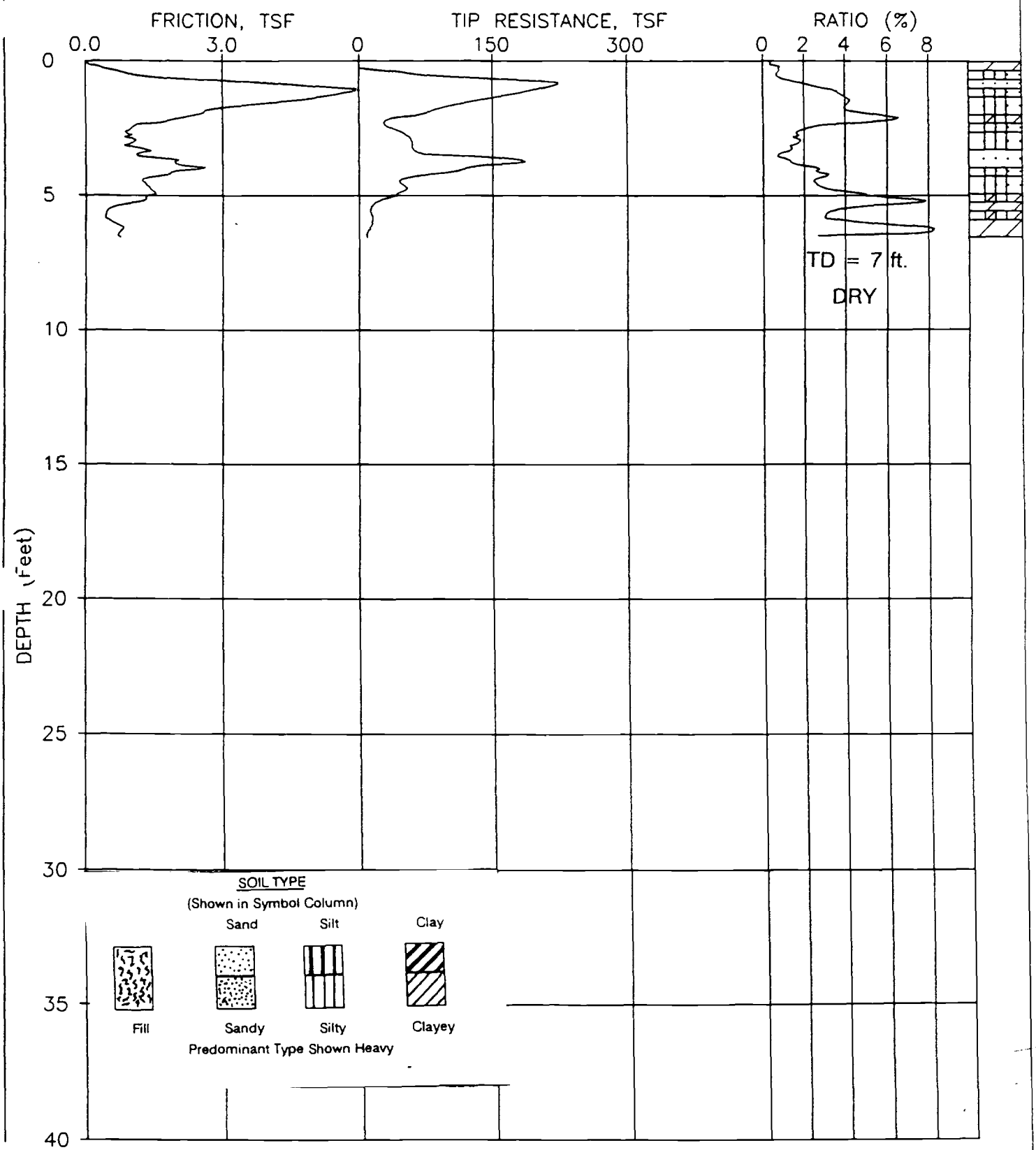
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172273


GMI-38S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 14 ft.
SWL = 10.23 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-38S
DATE : 08-16-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

GMI-40S

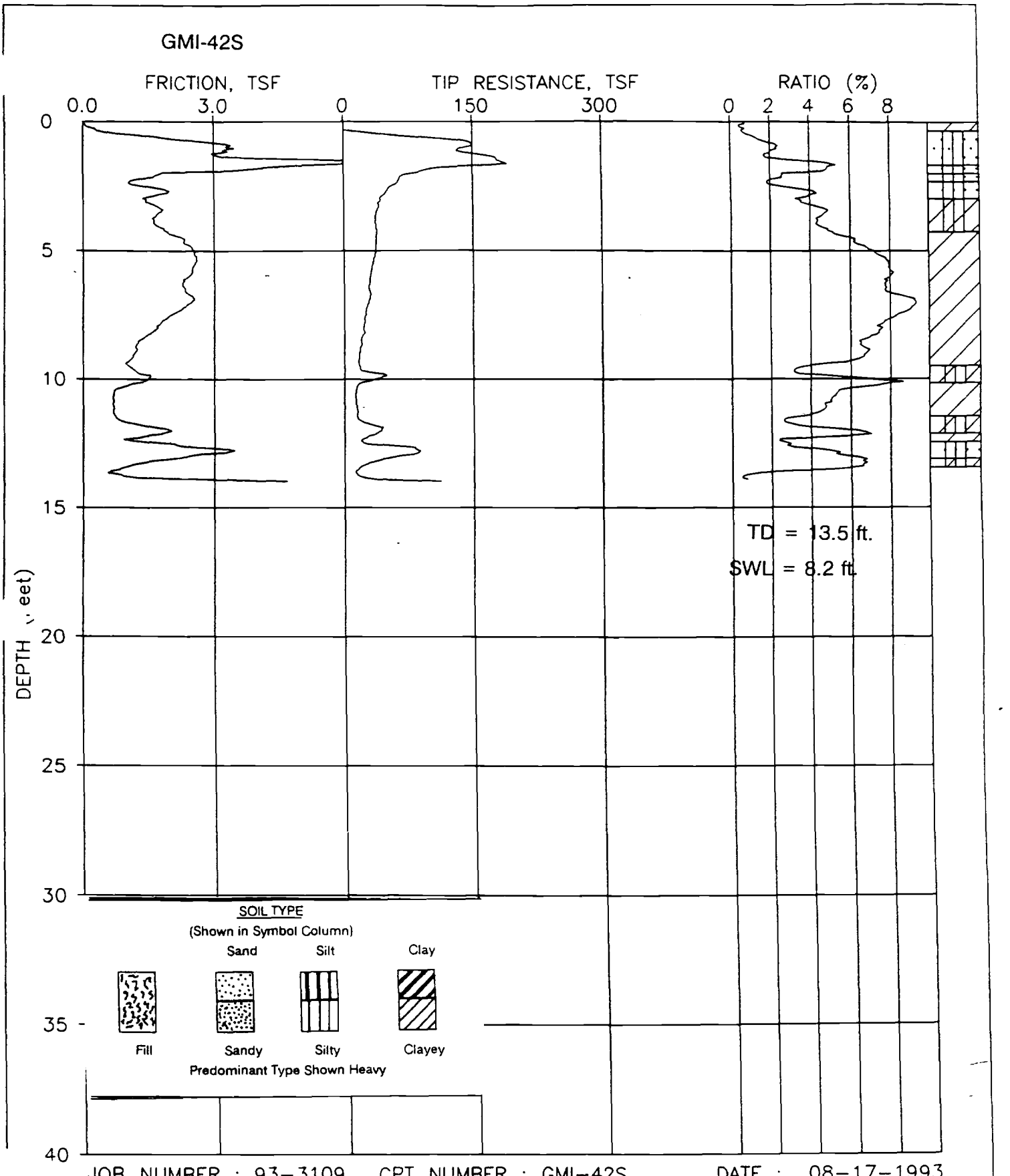


JOB NUMBER : 93-3109 CPT NUMBER : GMI-40S DATE : 08-11-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

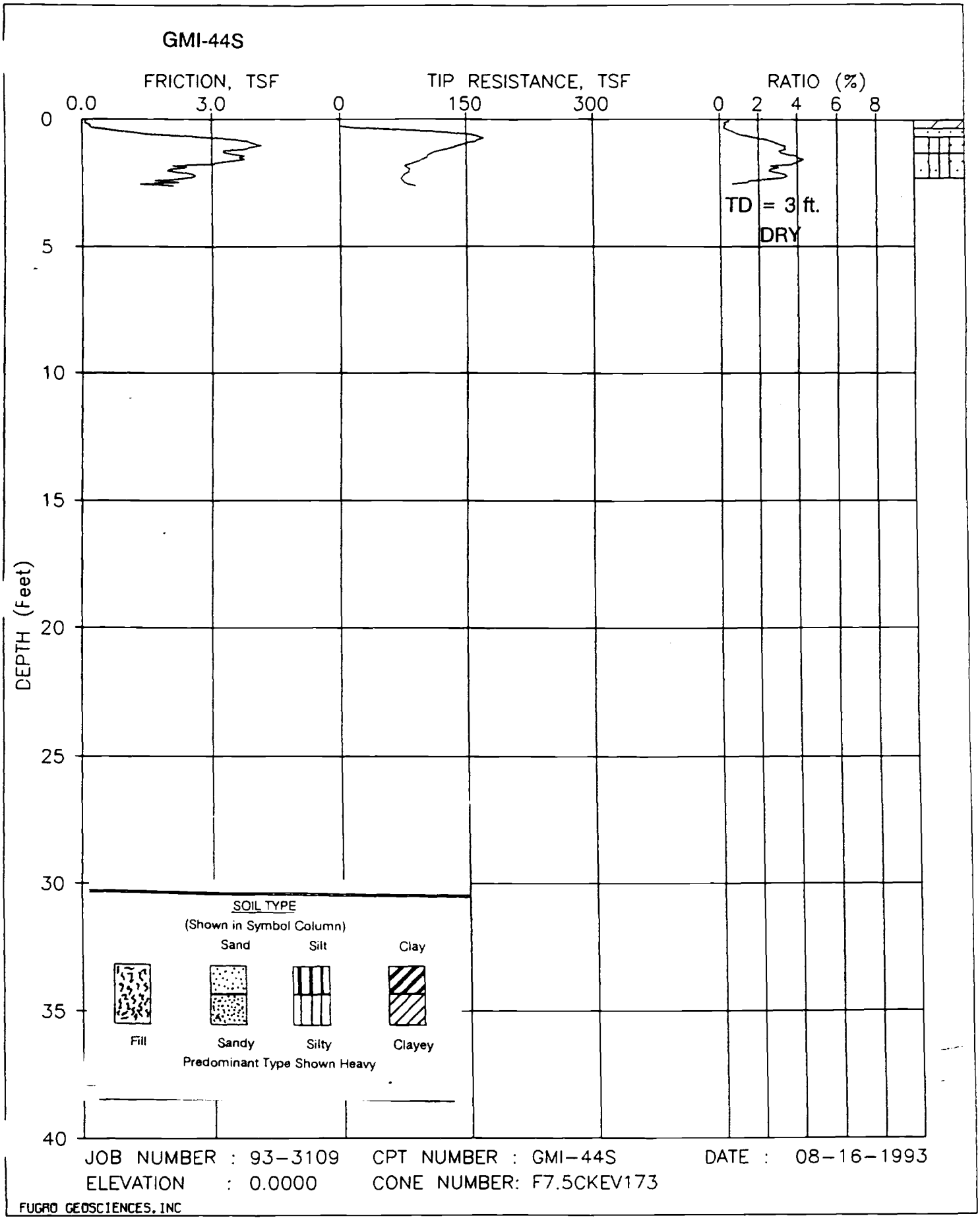
FUGRO GEOSCIENCES, INC

172275



JOB NUMBER : 93-3109 CPT NUMBER : GMI-42S DATE : 08-17-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

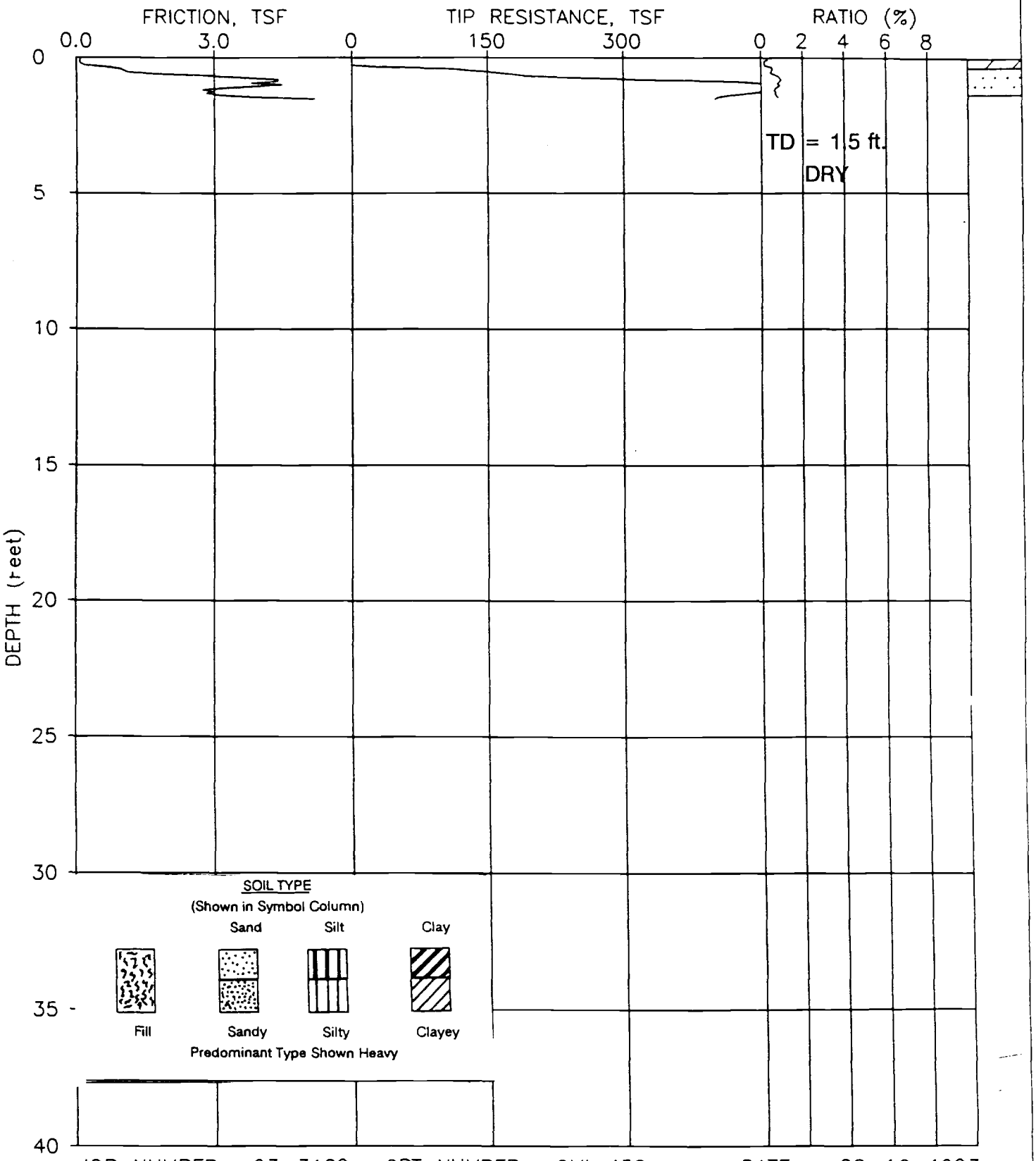


JOB NUMBER : 93-3109 CPT NUMBER : GMI-44S DATE : 08-16-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172277

GMI-45S

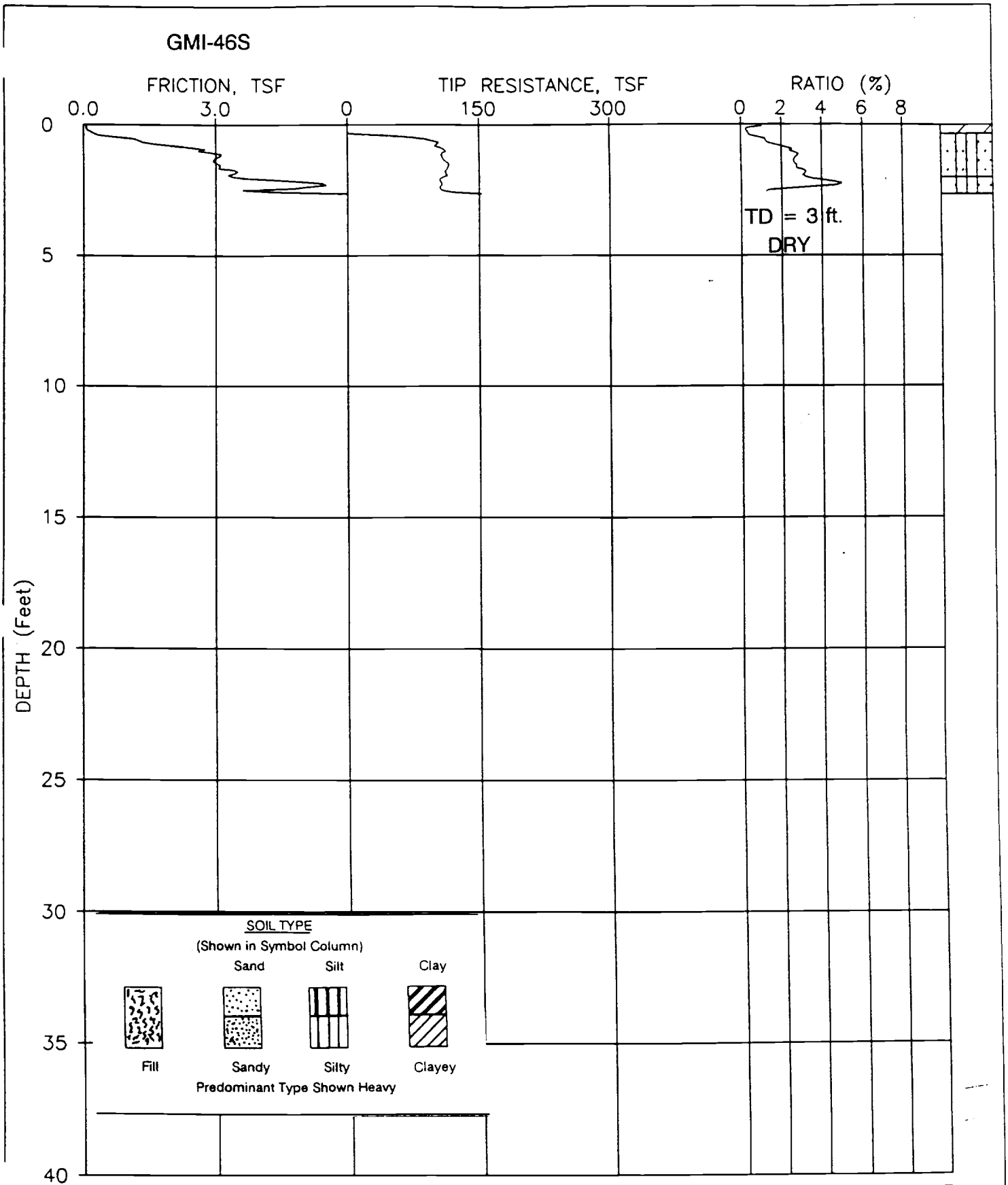


JOB NUMBER : 93-3109 CPT NUMBER : GMI-45S DATE : 08-16-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

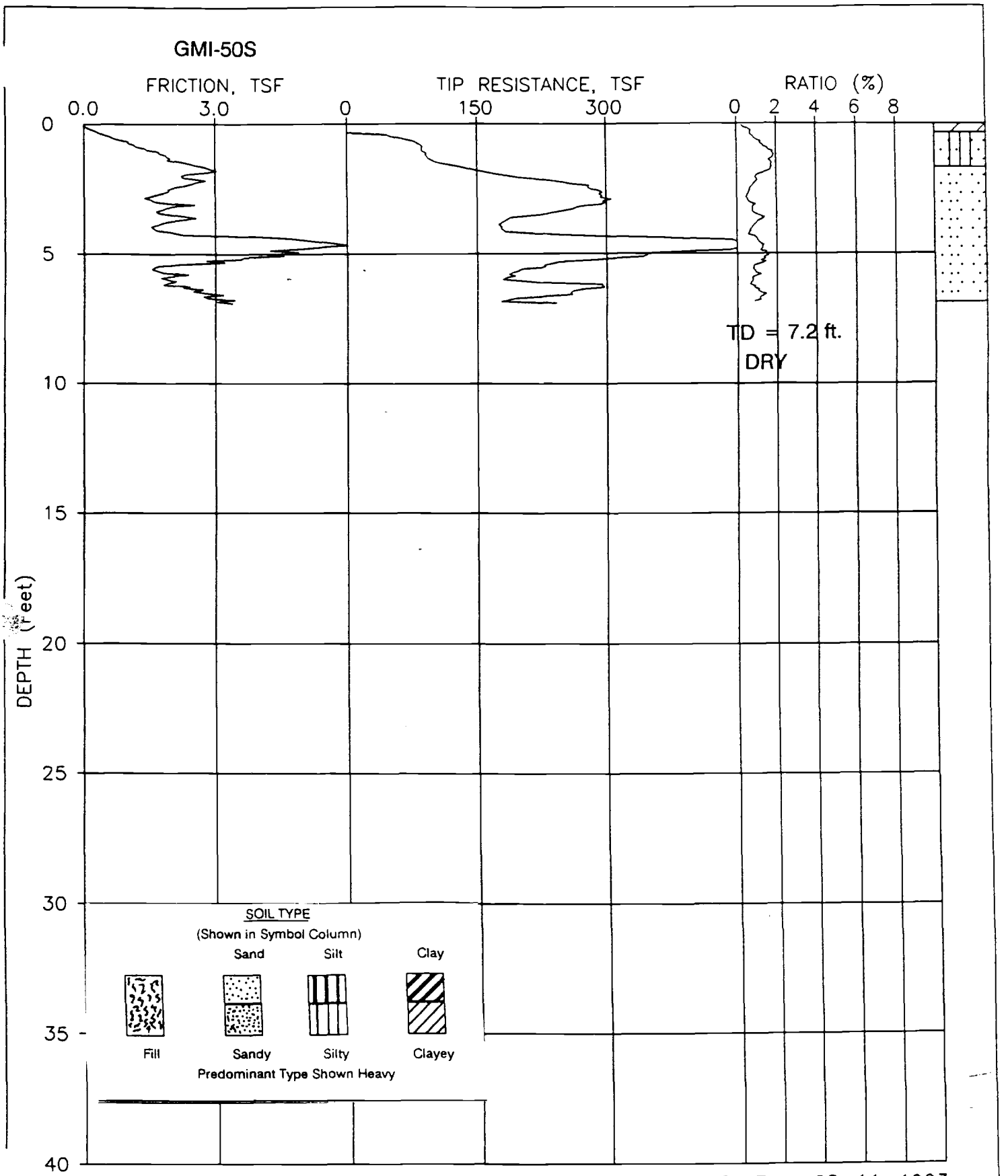
172273



JOB NUMBER : 93-3109 CPT NUMBER : GMI-46S DATE : 08-16-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

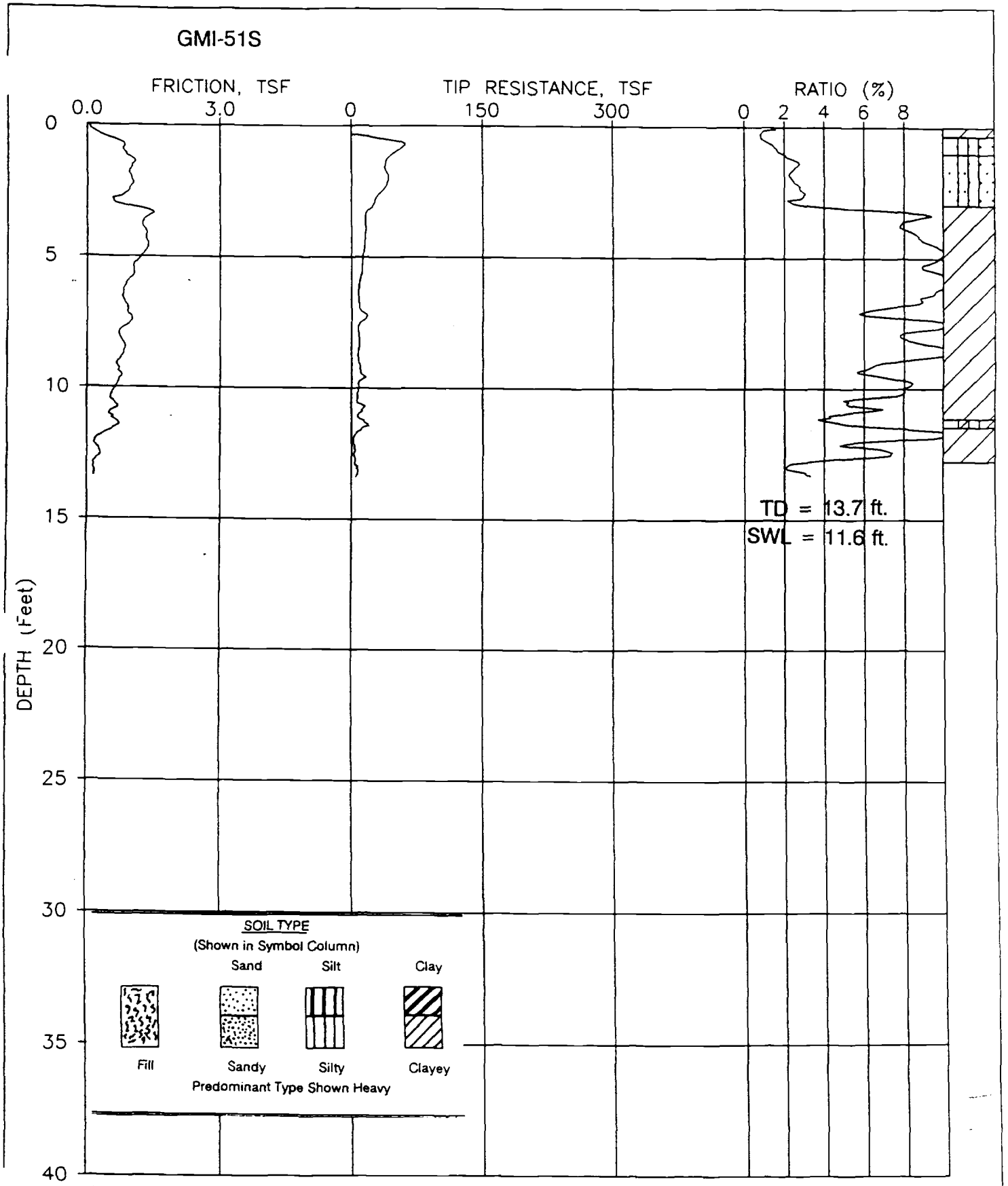


JOB NUMBER : 93-3109 CPT NUMBER : GMI-50S DATE : 08-11-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172250

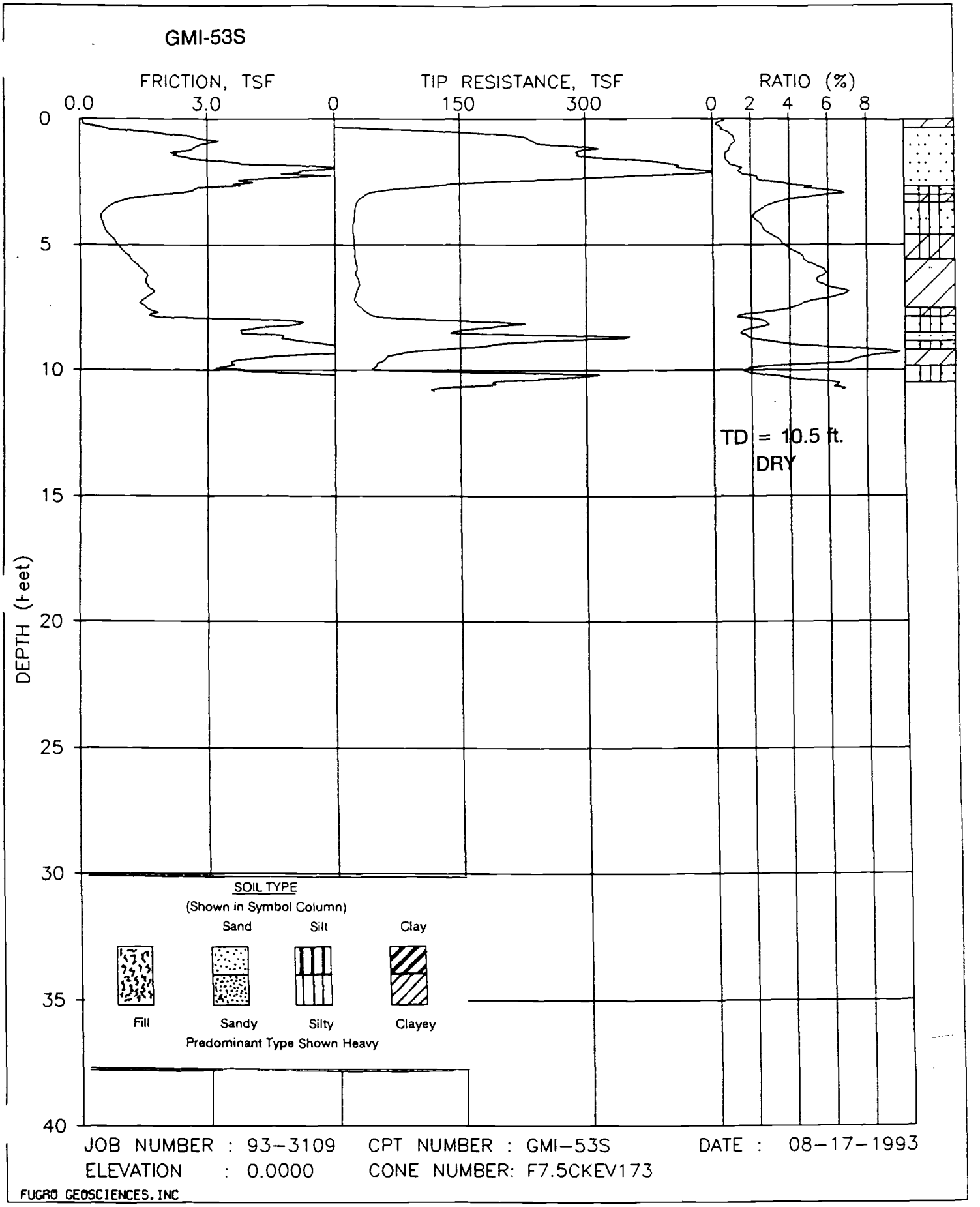


JOB NUMBER : 93-3109 CPT NUMBER : GMI-51S DATE : 08-11-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172281

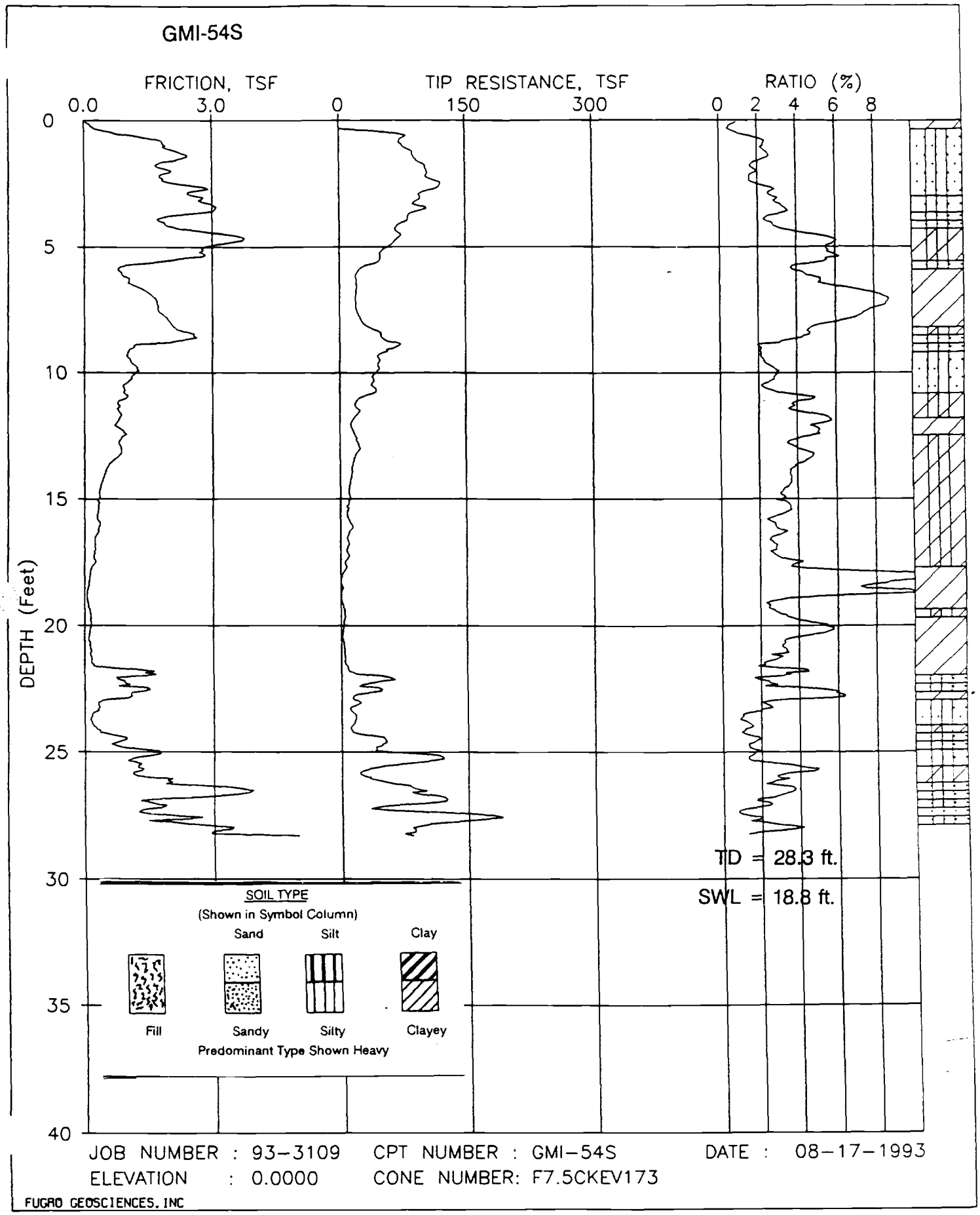


JOB NUMBER : 93-3109 CPT NUMBER : GMI-53S DATE : 08-17-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172282

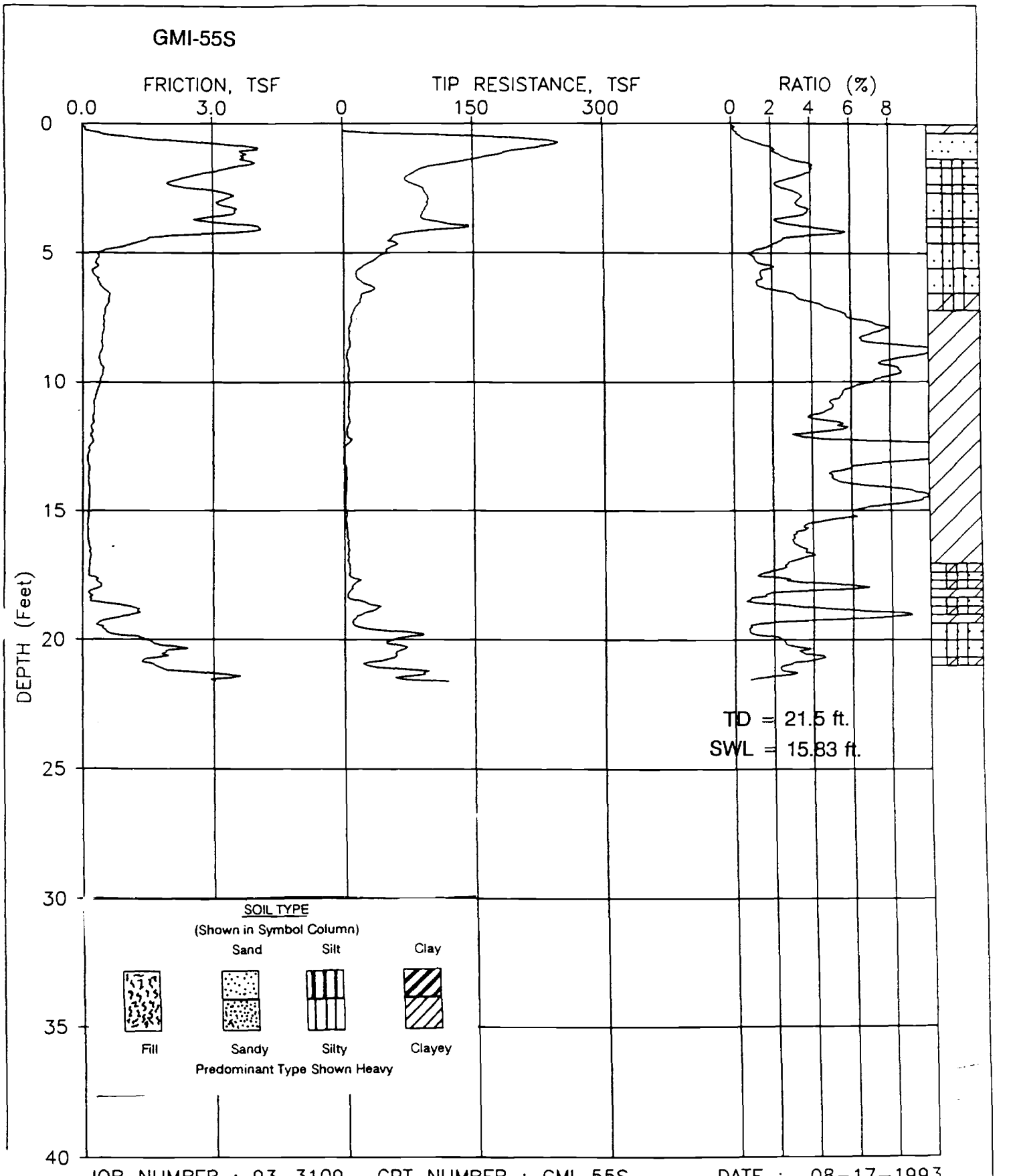


JOB NUMBER : 93-3109 CPT NUMBER : GMI-54S DATE : 08-17-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

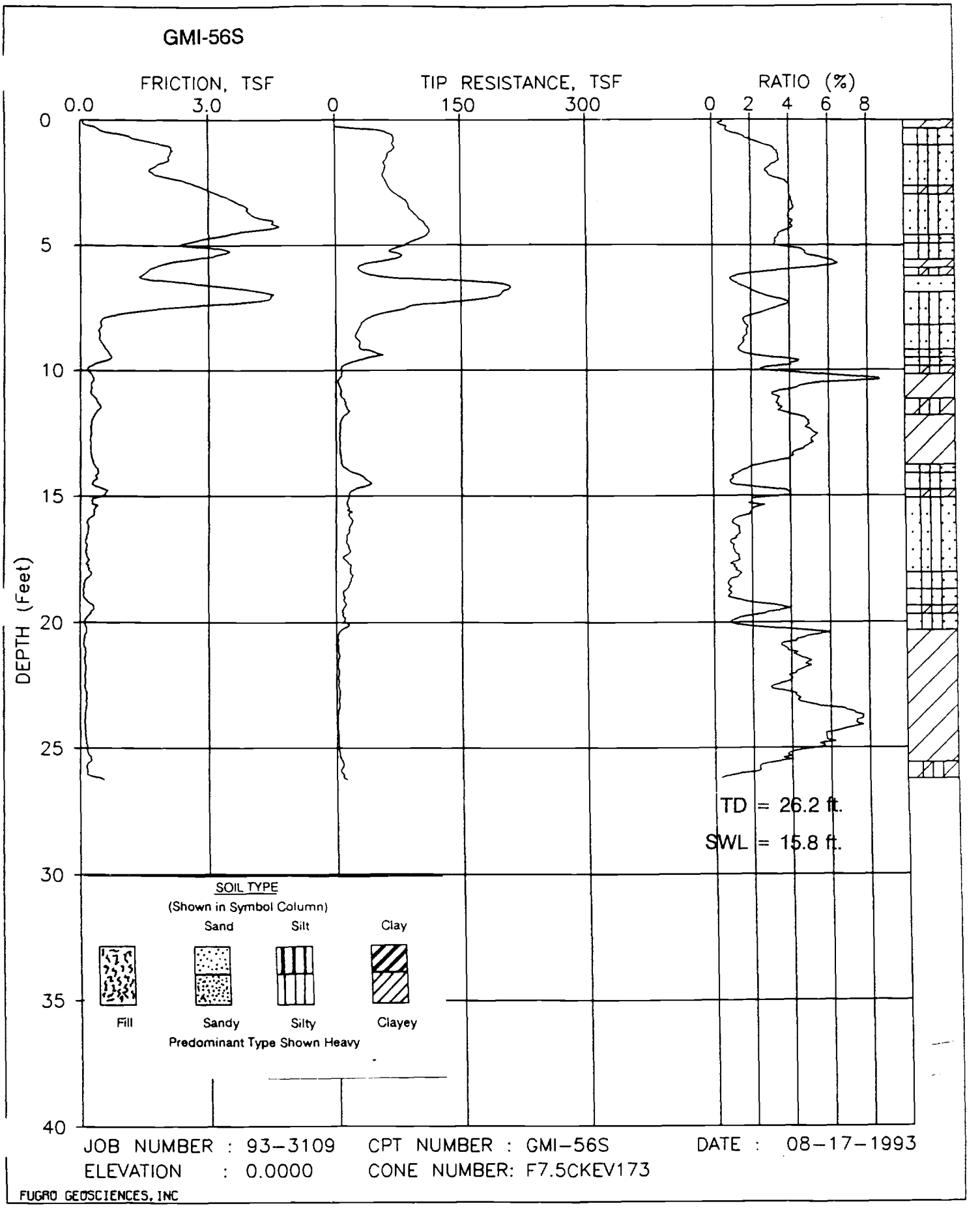
FUGRO GEOSCIENCES, INC

172283

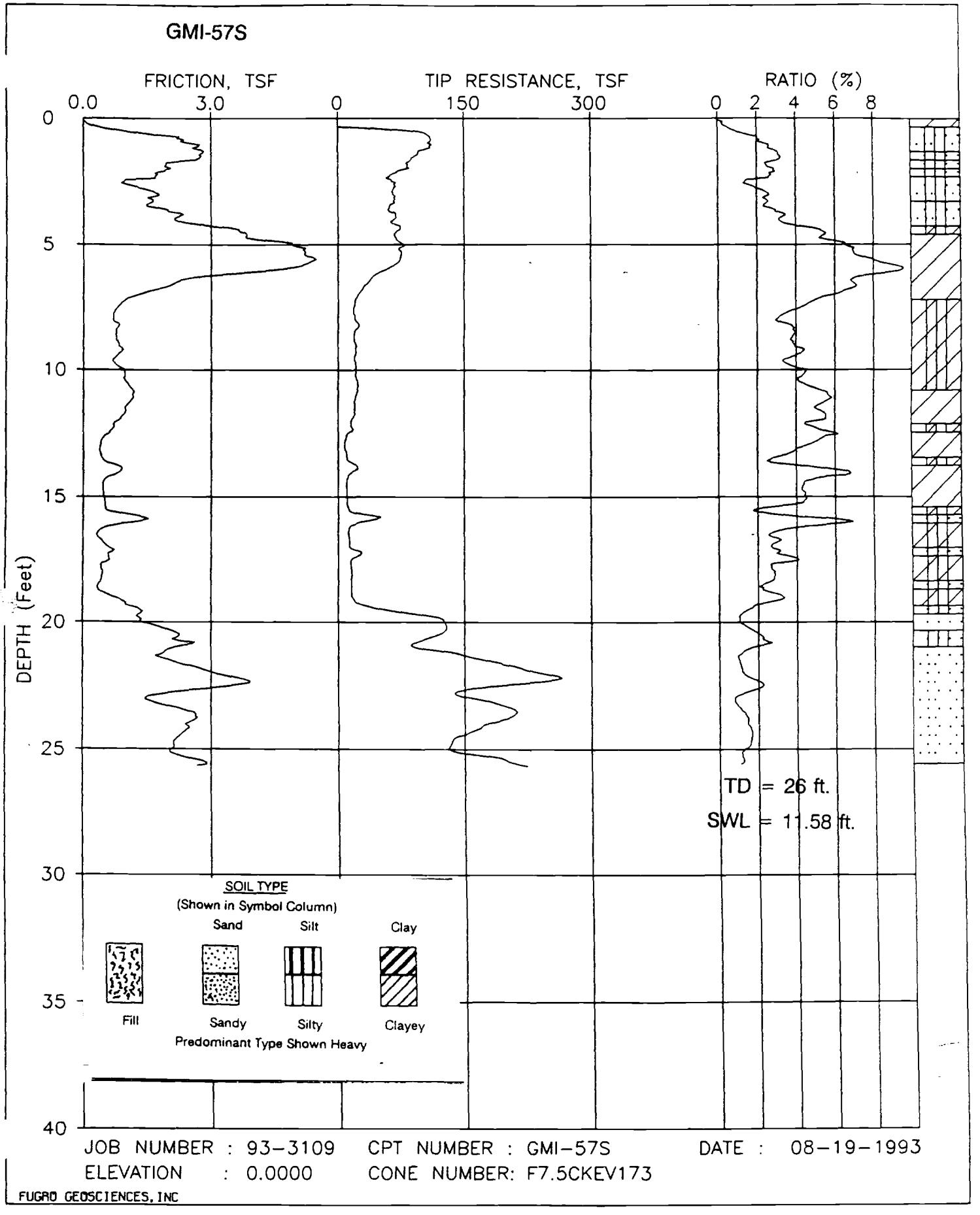


JOB NUMBER : 93-3109 CPT NUMBER : GMI-55S DATE : 08-17-1993
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

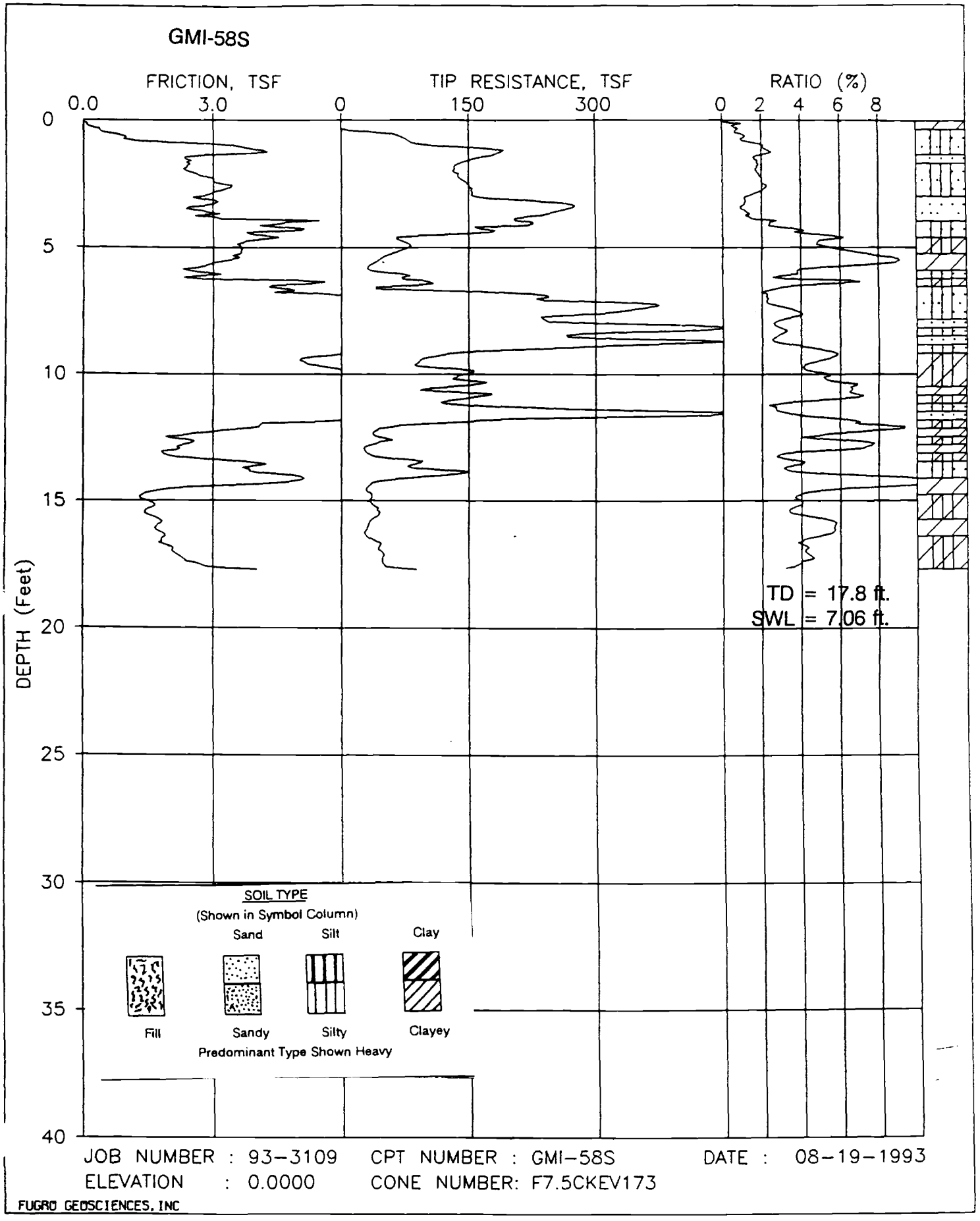
FUGRO GEOSCIENCES,INC

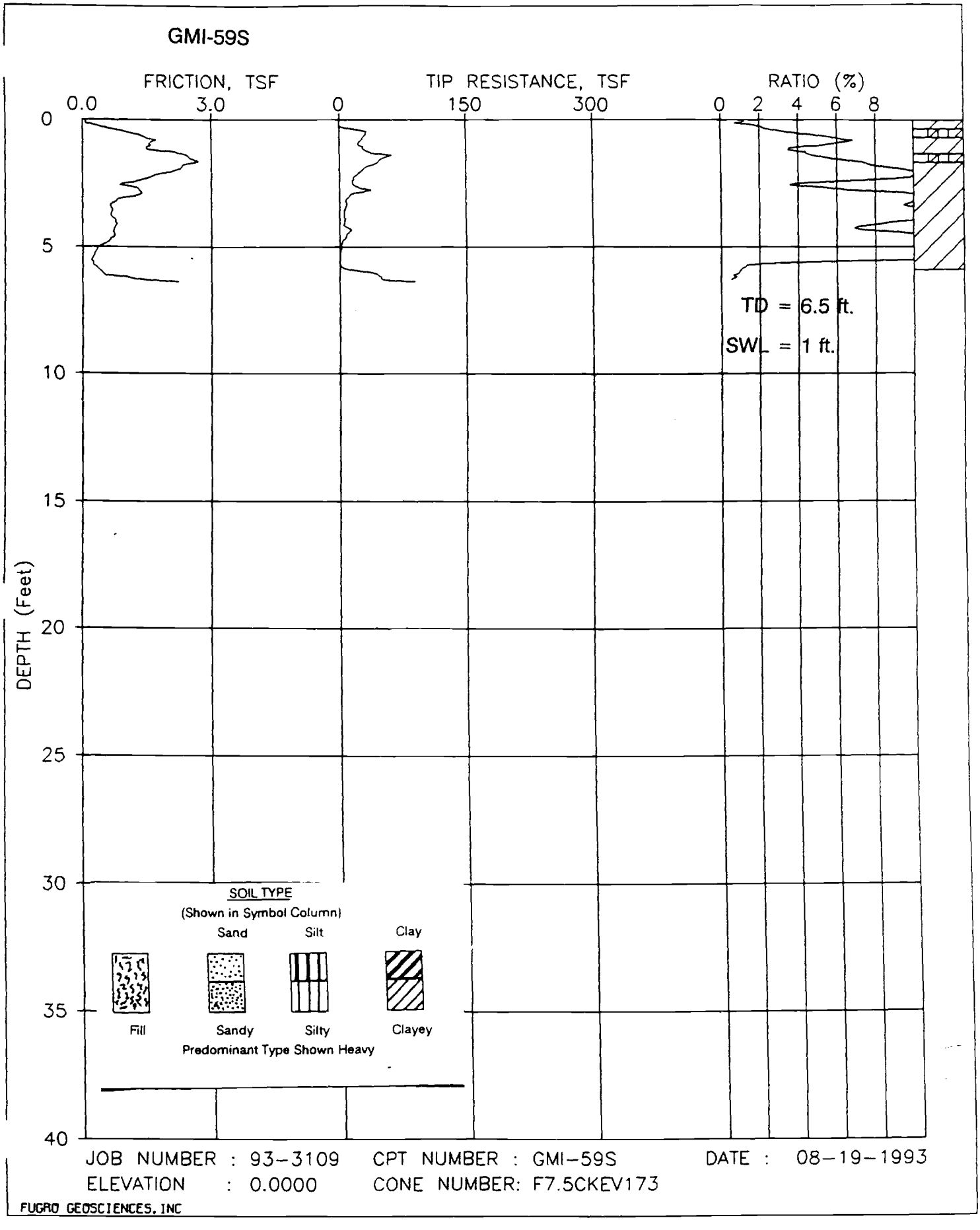

GMI-56S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 26.2 ft.
SWL = 15.8 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-56S
DATE : 08-17-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172285


GMI-57S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 26 ft.
SWL = 11.58 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-57S
DATE : 08-19-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172286

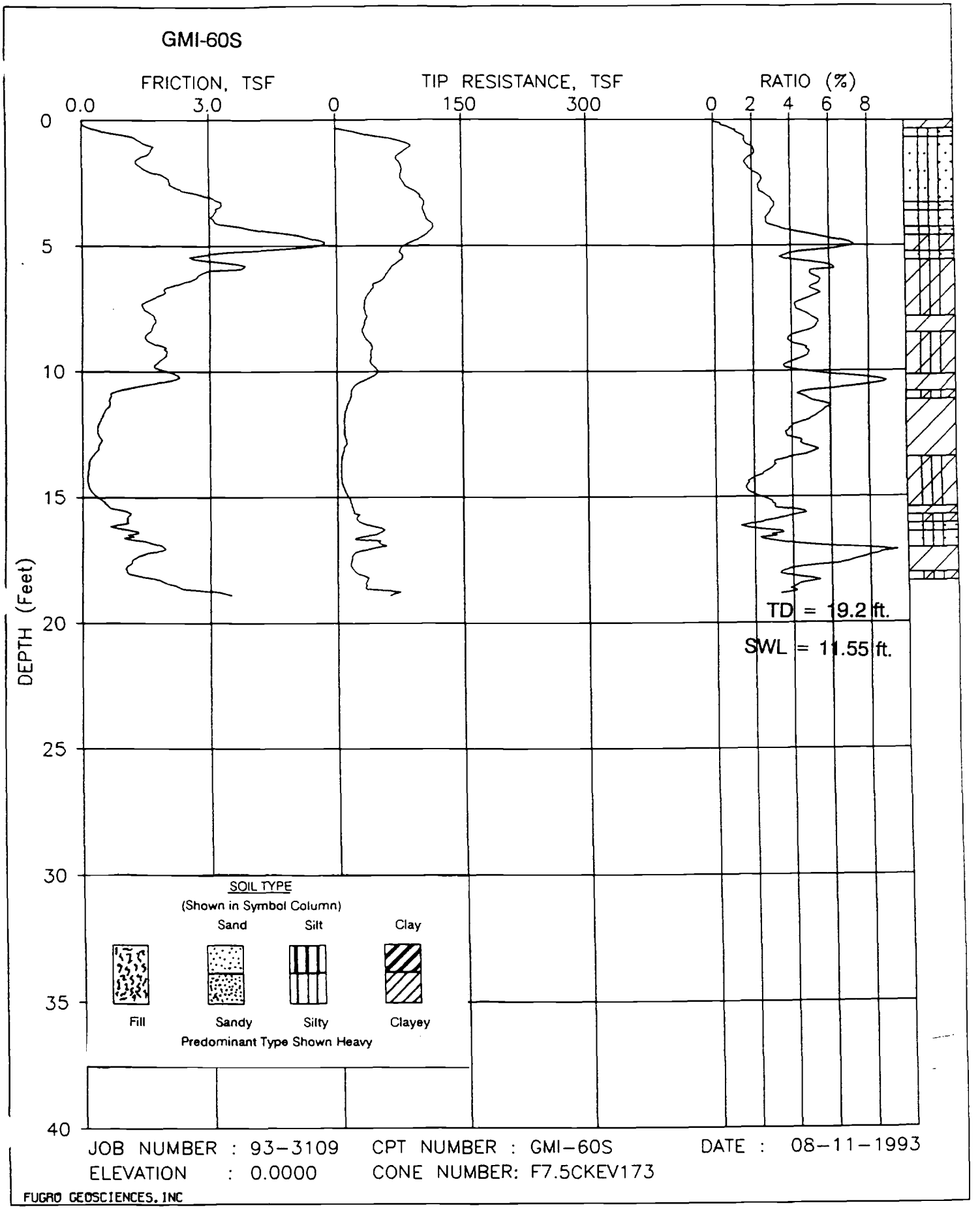

GMI-58S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 17.8 ft.
SWL = 7.06 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-58S
DATE : 08-19-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



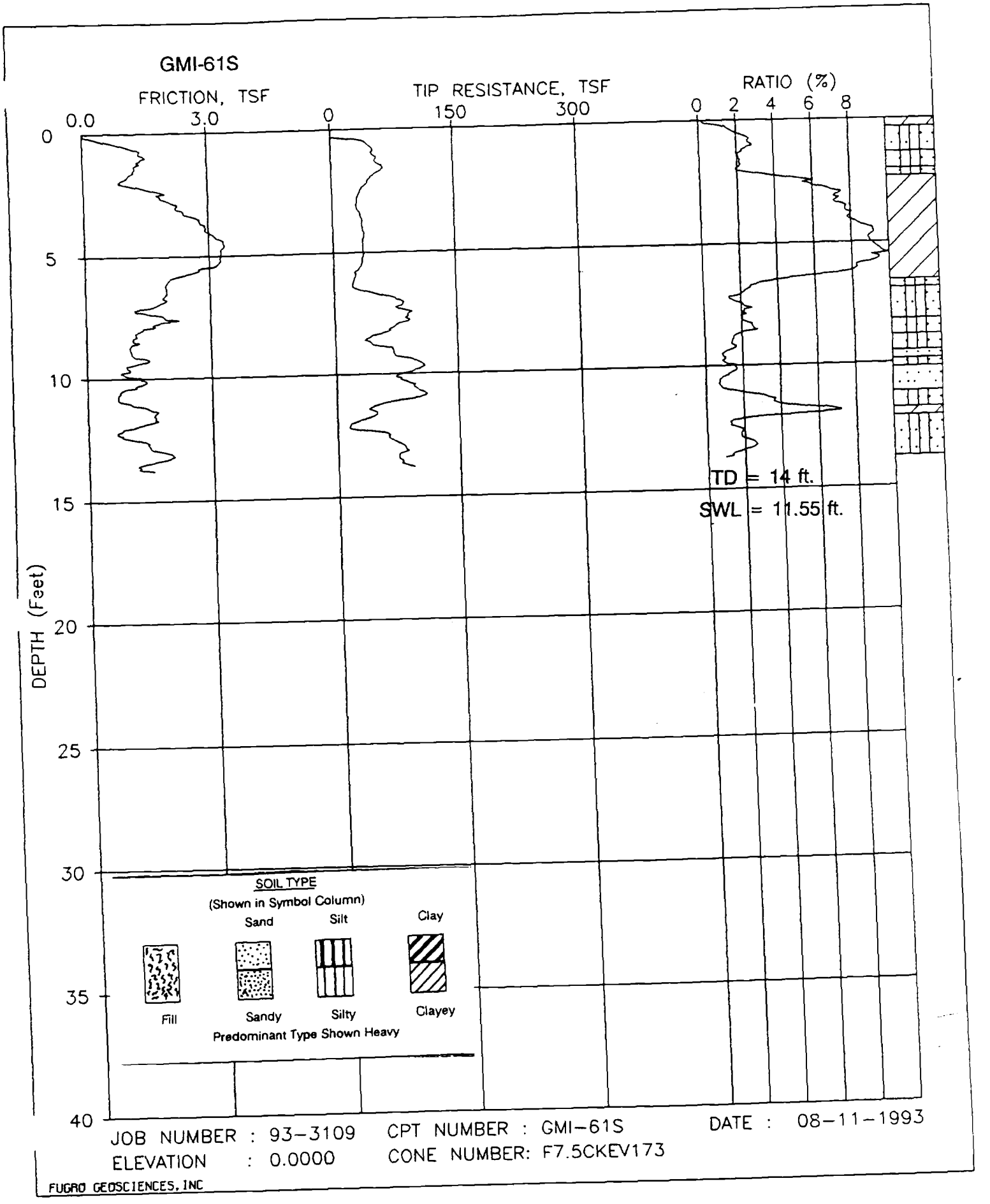
JOB NUMBER : 93-3109 CPT NUMBER : GMI-59S DATE : 08-19-1993

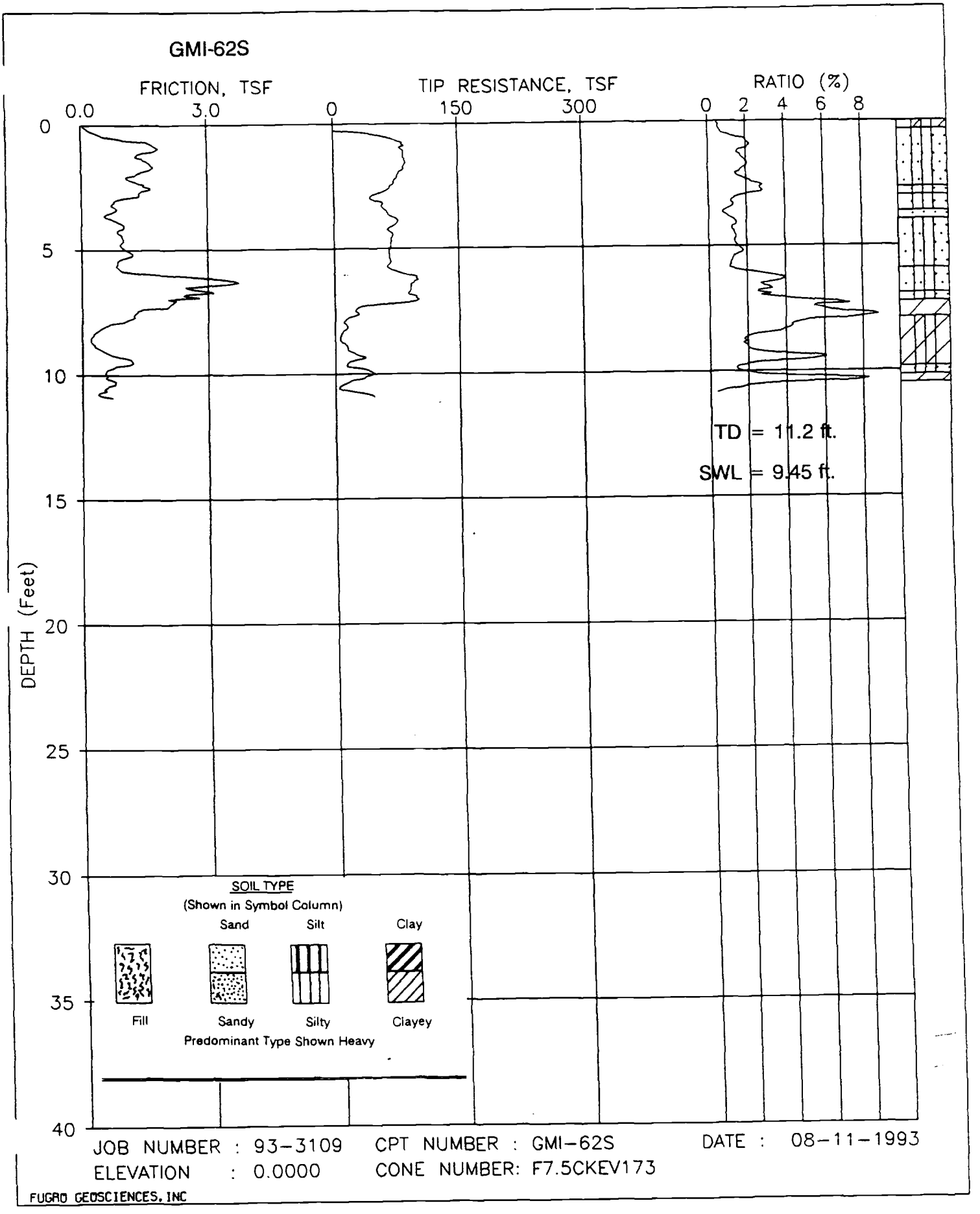
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC


GMI-60S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19.2 ft.
SWL = 11.55 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-60S
DATE : 08-11-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172280

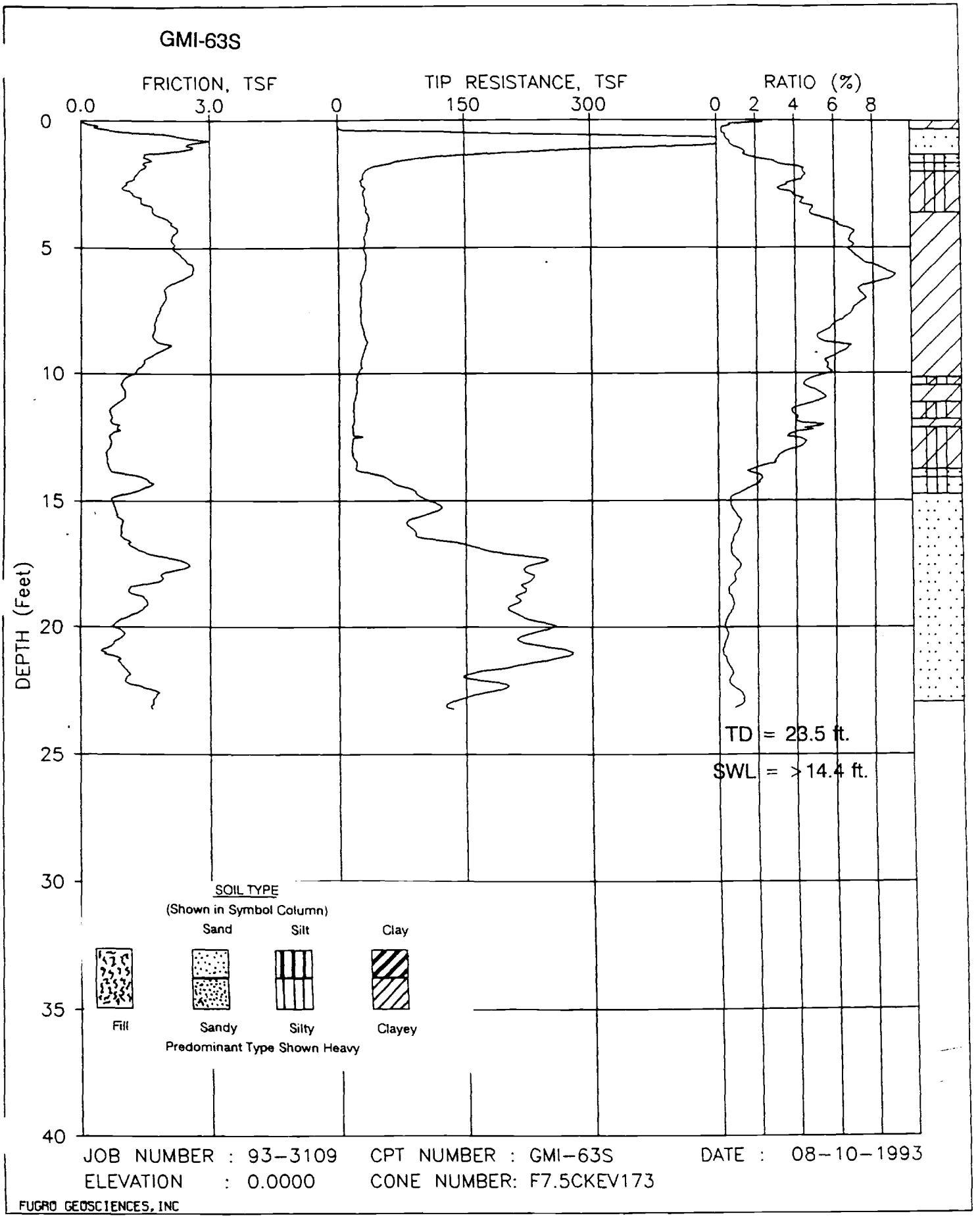

GMI-61S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 14 ft.
SWL = 11.55 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
ELEVATION : 0.0000
CPT NUMBER : GMI-61S
CONE NUMBER: F7.5CKEV173
DATE : 08-11-1993
FUGRO GEOSCIENCES, INC



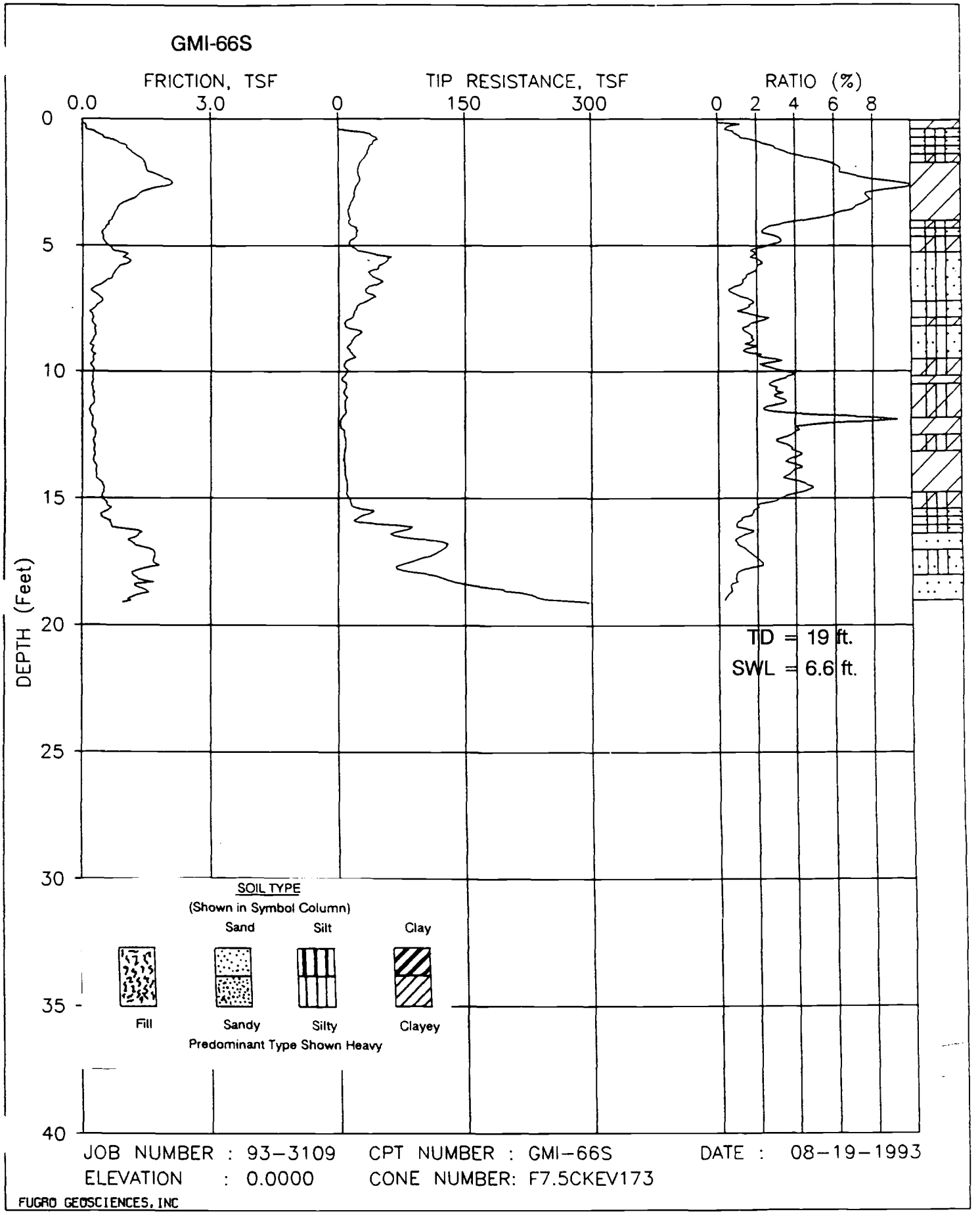
JOB NUMBER : 93-3109 CPT NUMBER : GMI-62S DATE : 08-11-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

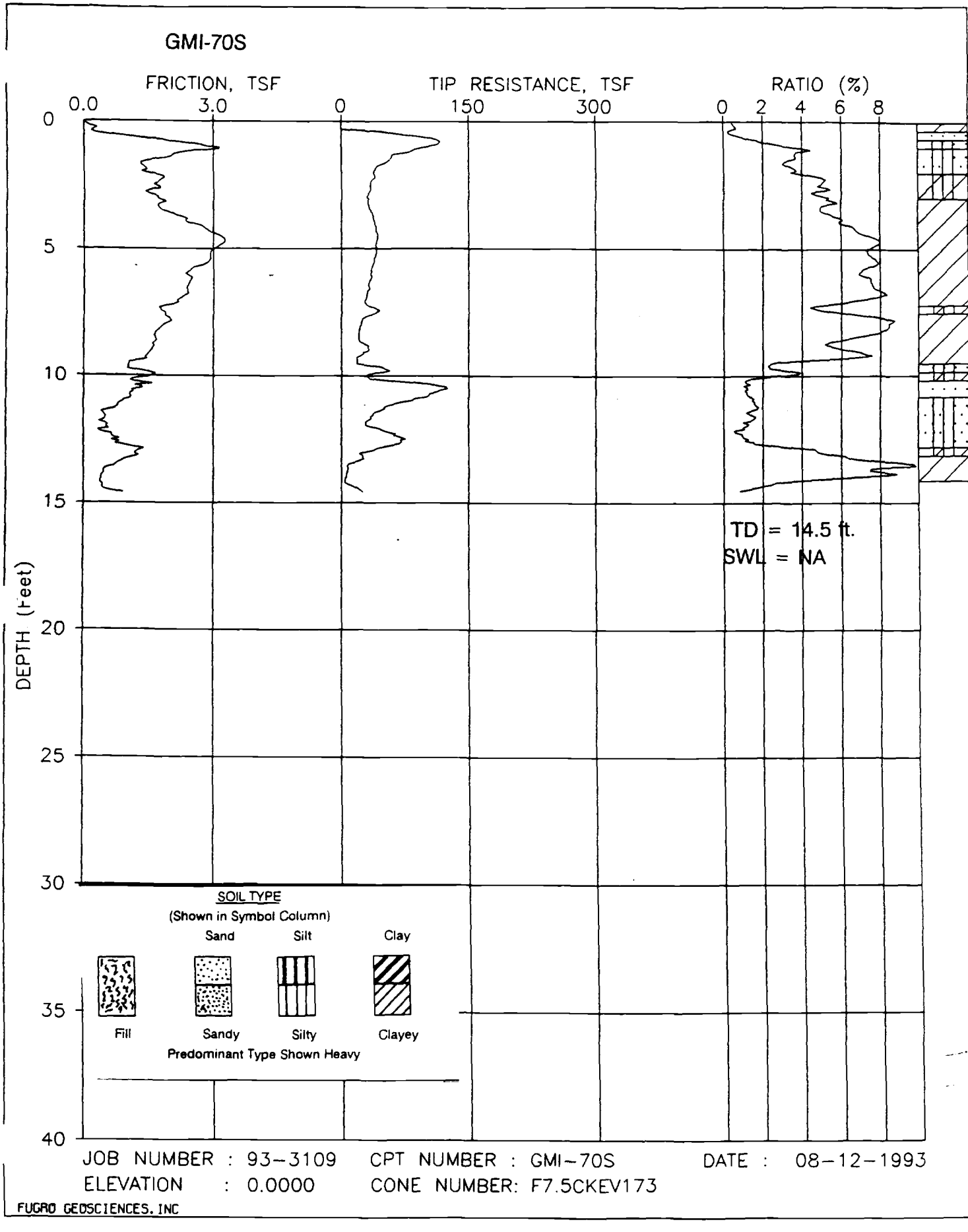
172291


GMI-63S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 23.5 ft.
SWL = >14.4 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-63S
DATE : 08-10-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172292


GMI-66S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19 ft.
SWL = 6.6 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-66S
DATE : 08-19-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172293

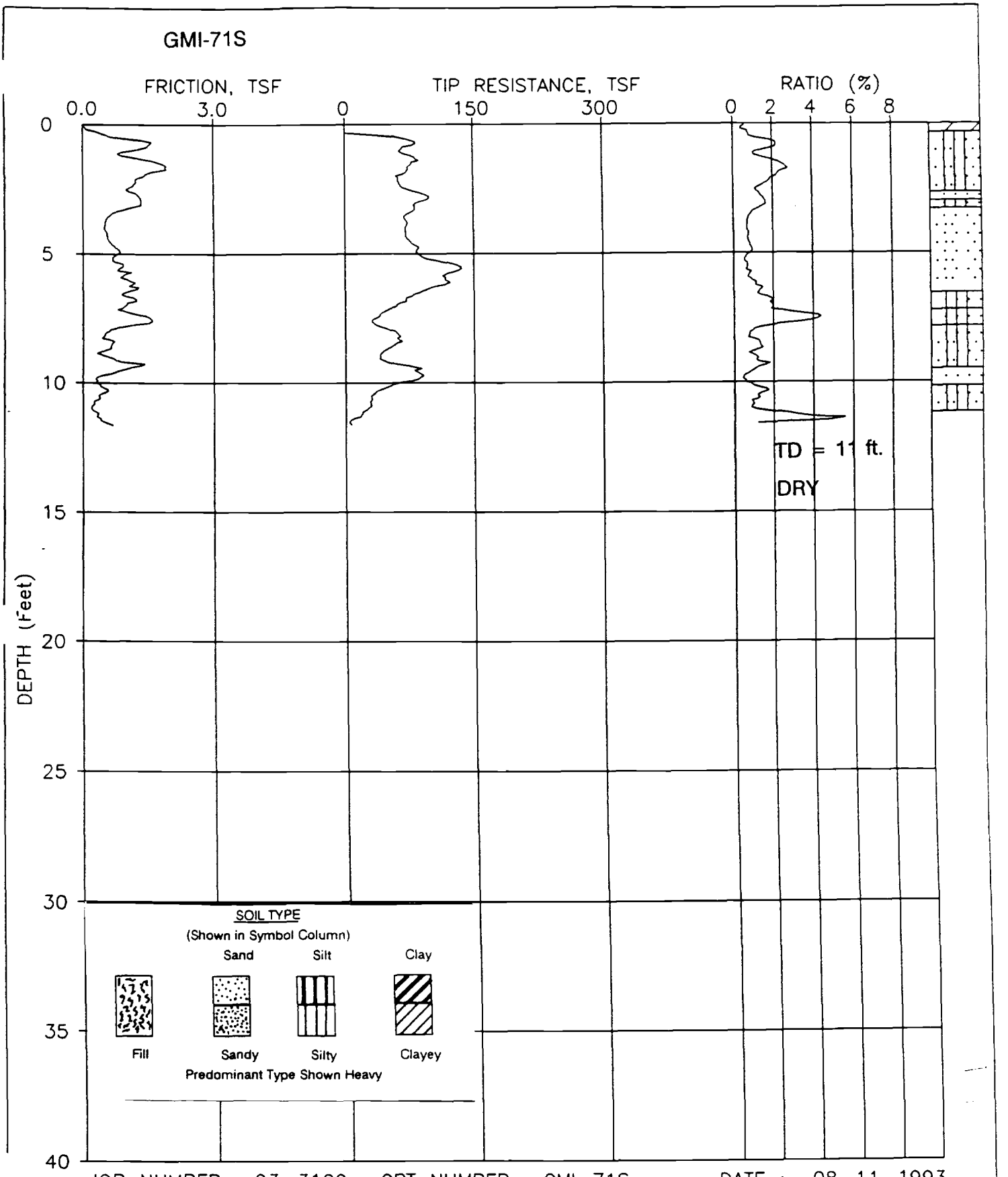


JOB NUMBER : 93-3109 CPT NUMBER : GMI-70S DATE : 08-12-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

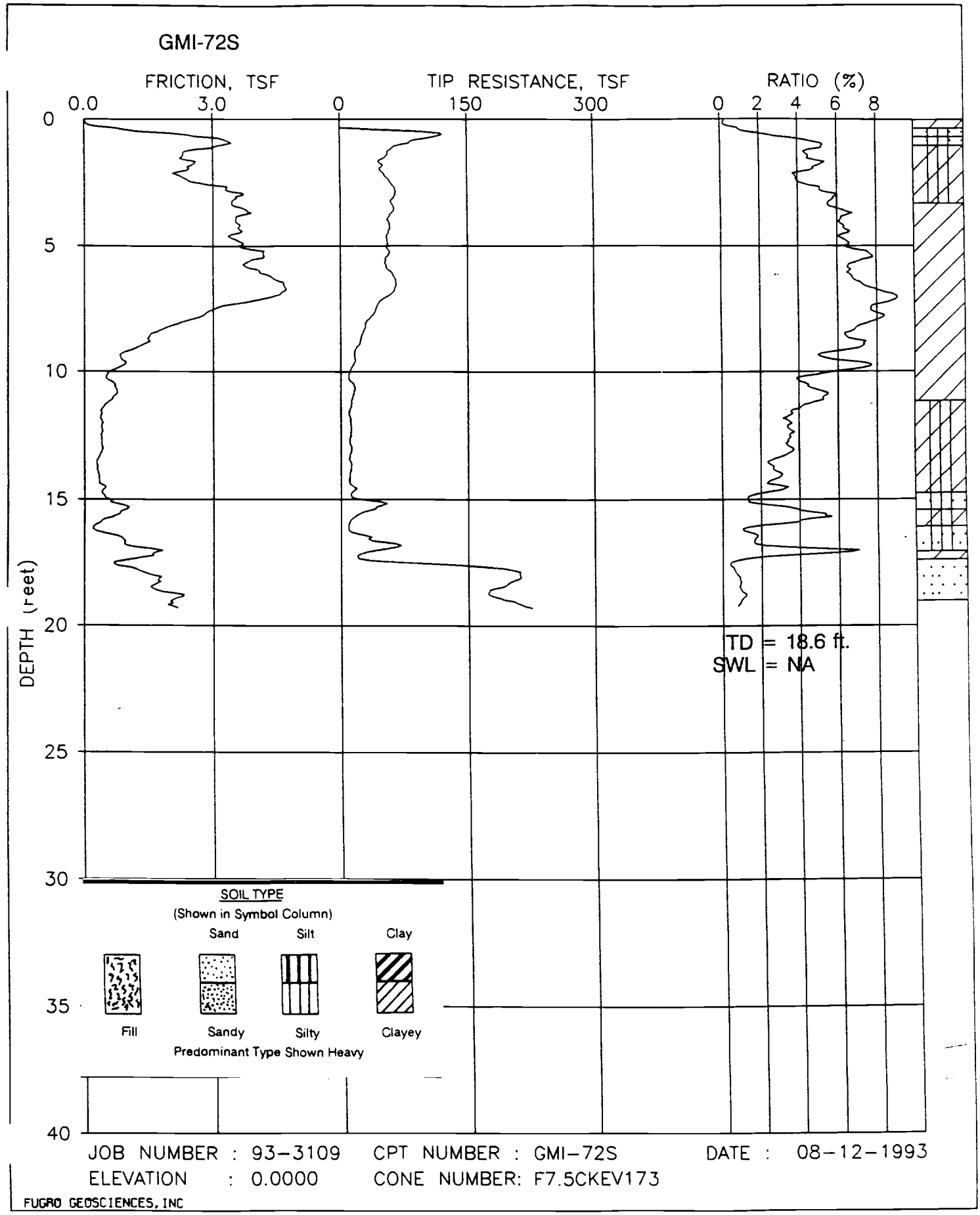
172294



JOB NUMBER : 93-3109 CPT NUMBER : GMI-71S DATE : 08-11-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

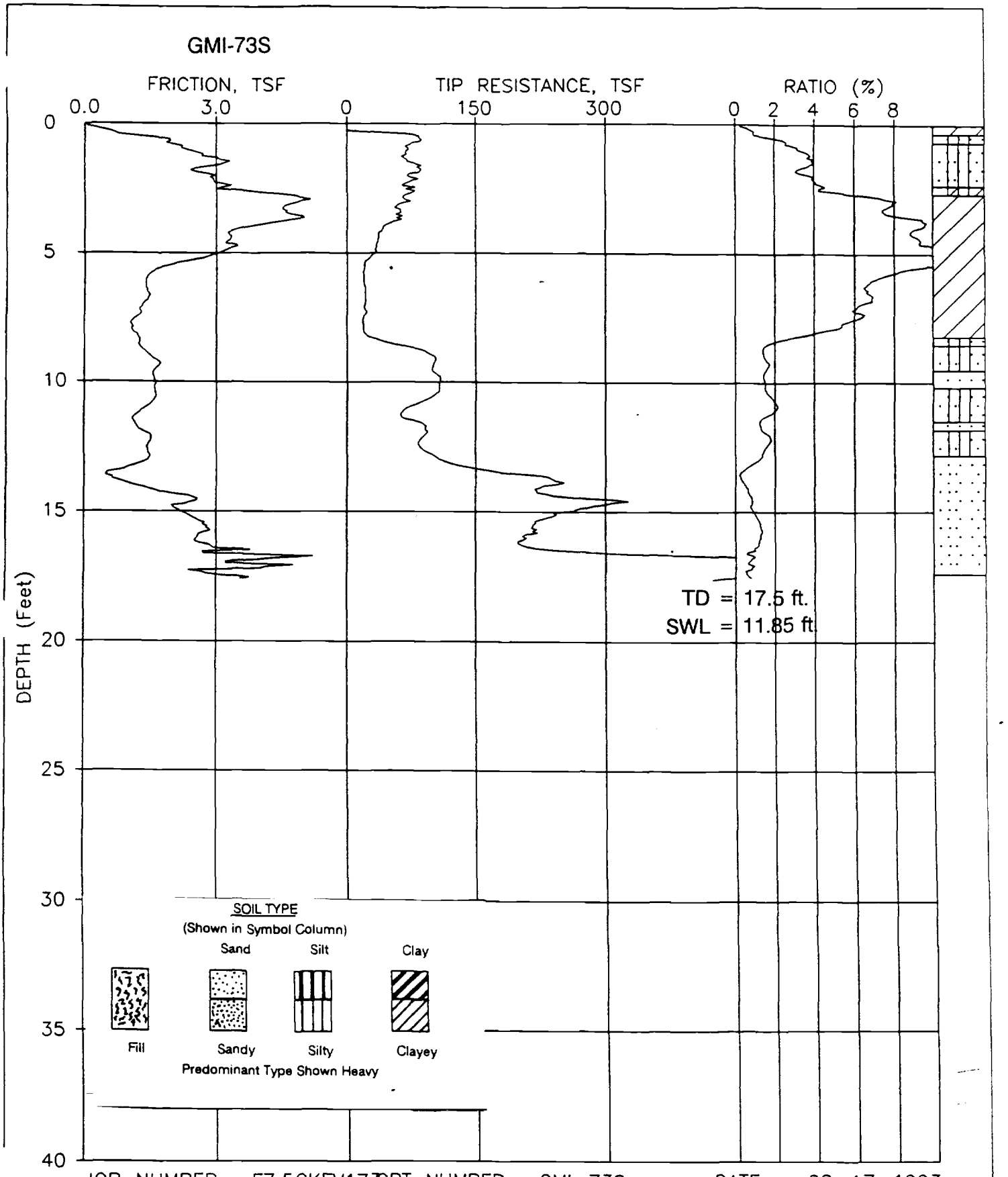
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-72S DATE : 08-12-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

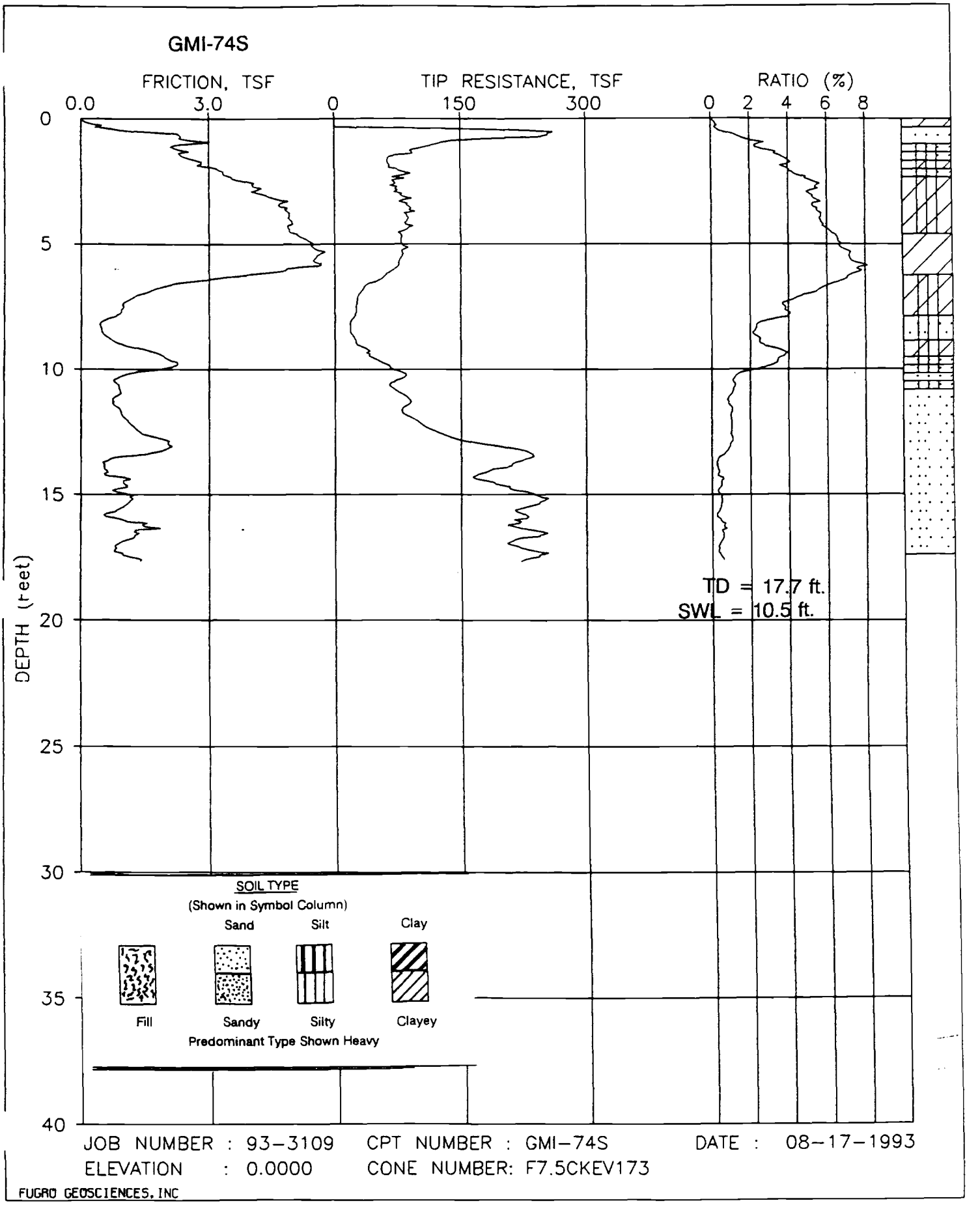
FUGRO GEOSCIENCES, INC



JOB NUMBER : F7.5CKEV173 CPT NUMBER : GMI-73S DATE : 08-17-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172297

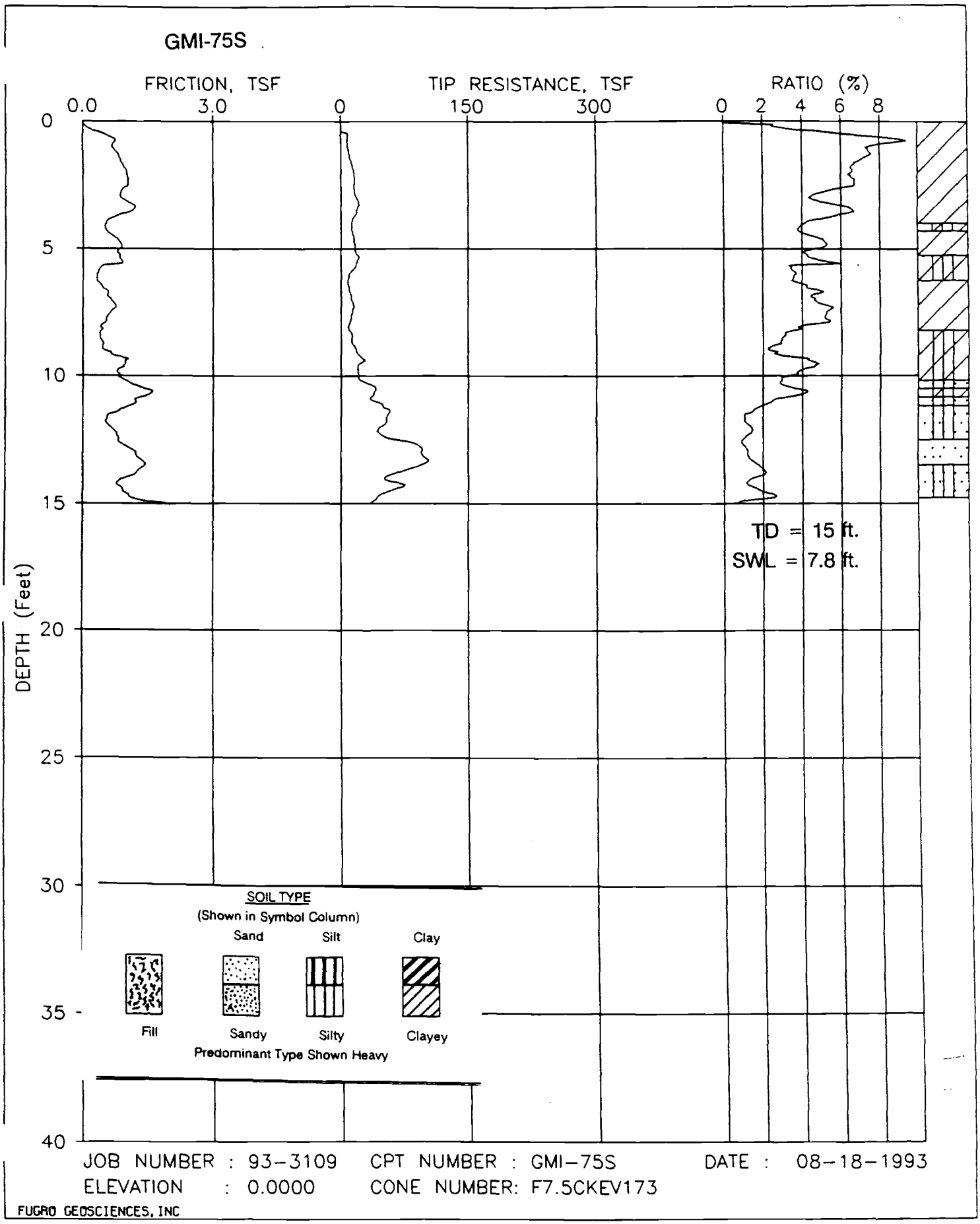


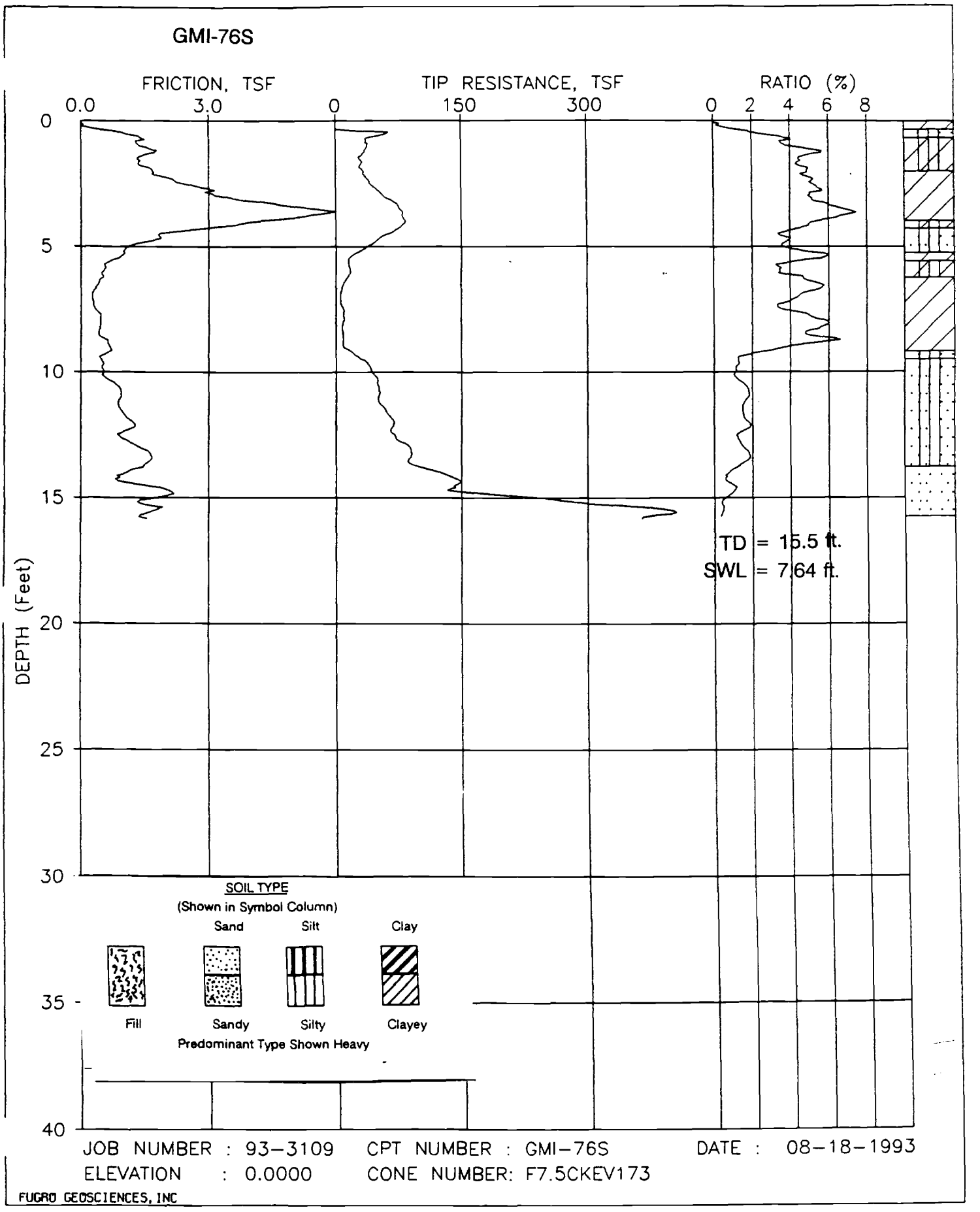
JOB NUMBER : 93-3109 CPT NUMBER : GMI-74S DATE : 08-17-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

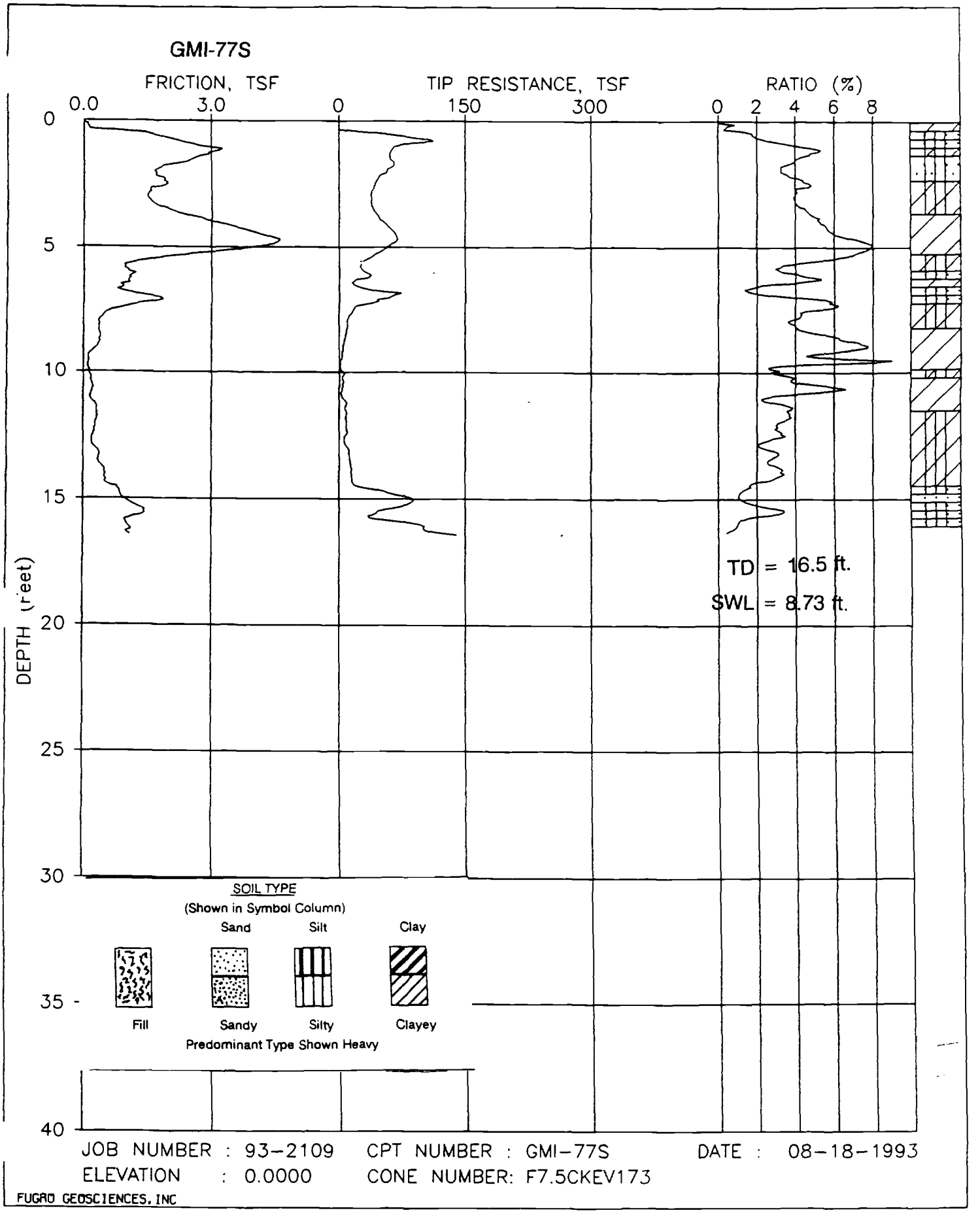
172293


GMI-75S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 15 ft.
SWL = 7.8 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-75S
DATE : 08-18-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-76S DATE : 08-18-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

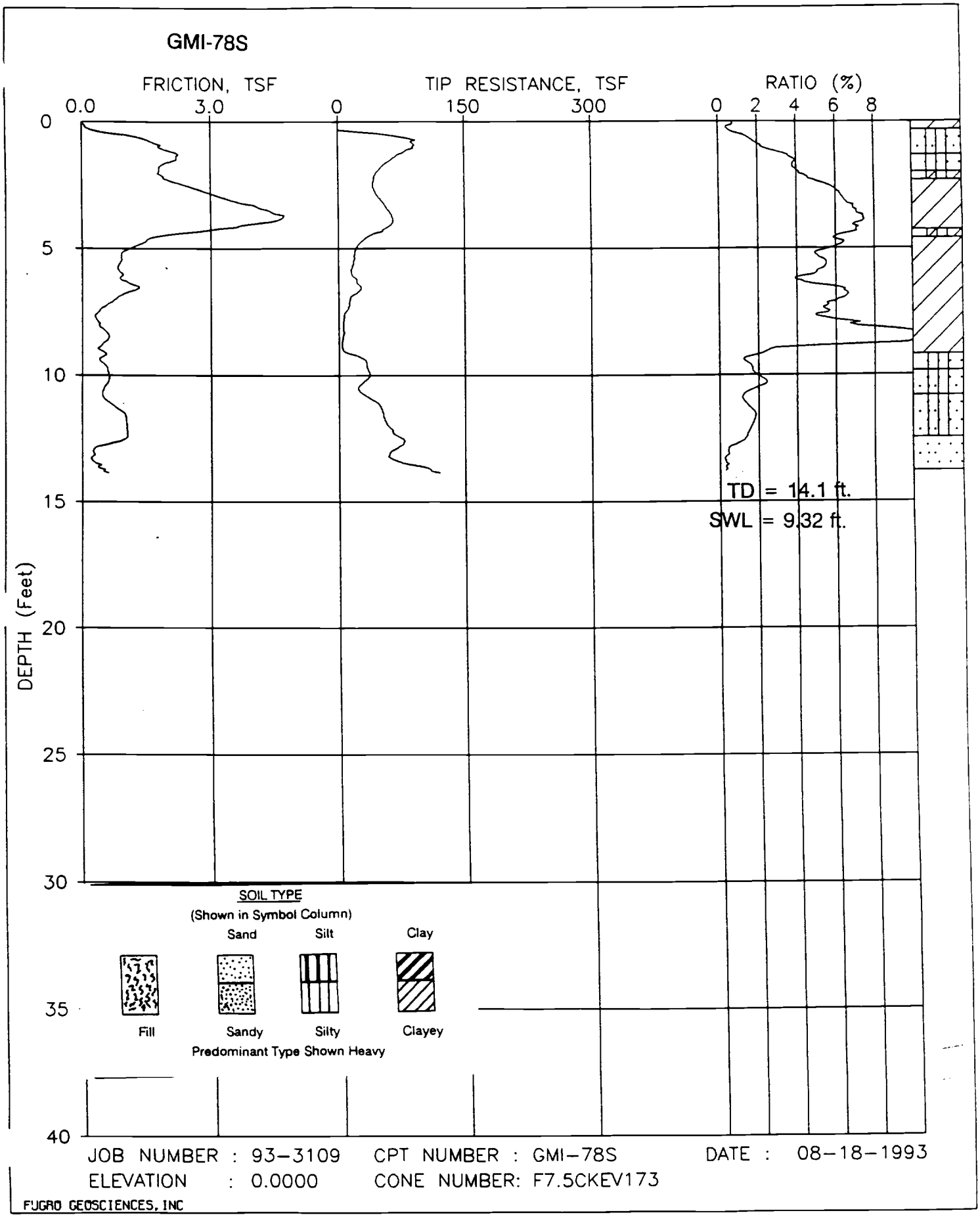
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-2109 CPT NUMBER : GMI-77S DATE : 08-18-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172304

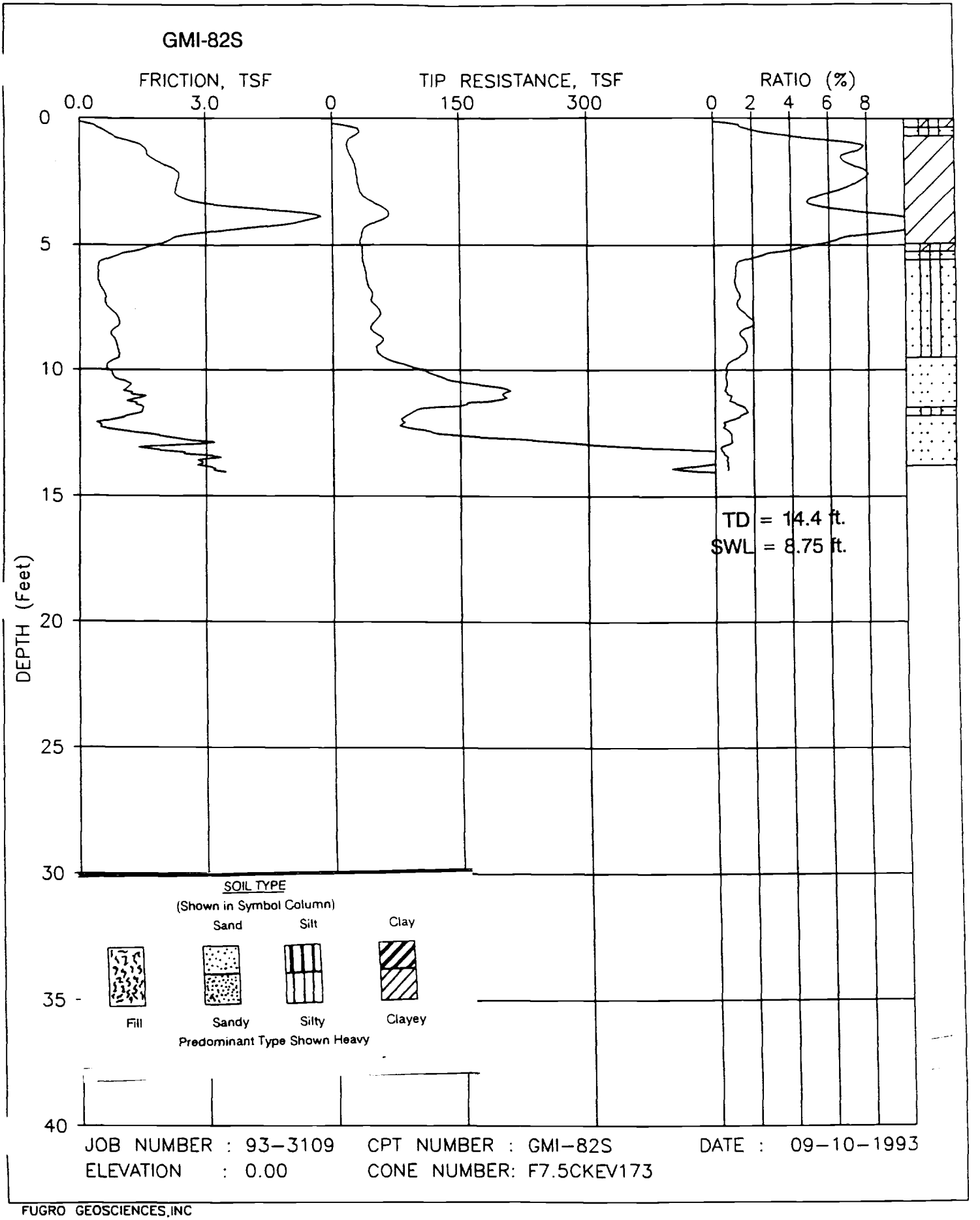


JOB NUMBER : 93-3109 CPT NUMBER : GMI-78S DATE : 08-18-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172302

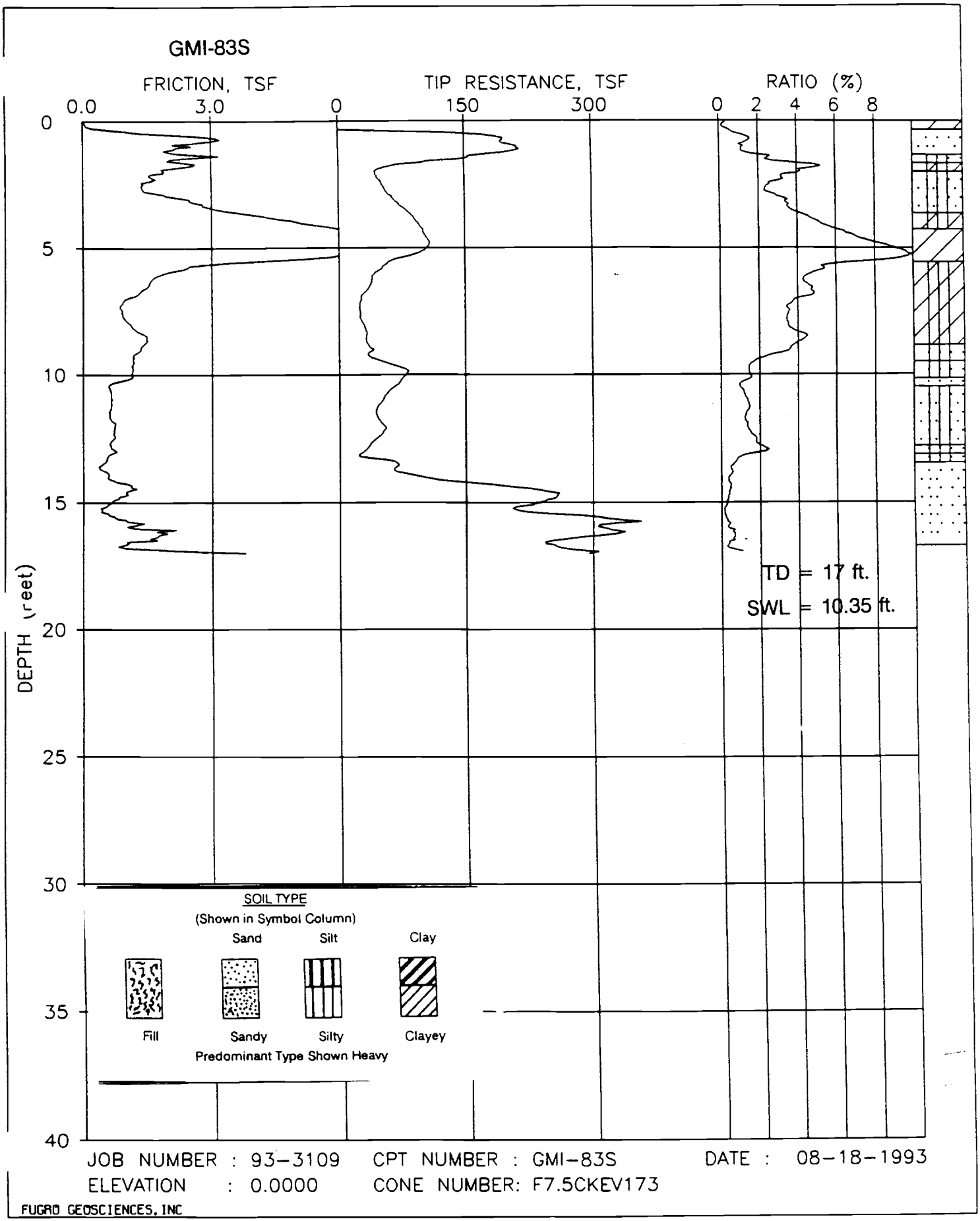


JOB NUMBER : 93-3109 CPT NUMBER : GMI-82S DATE : 09-10-1993

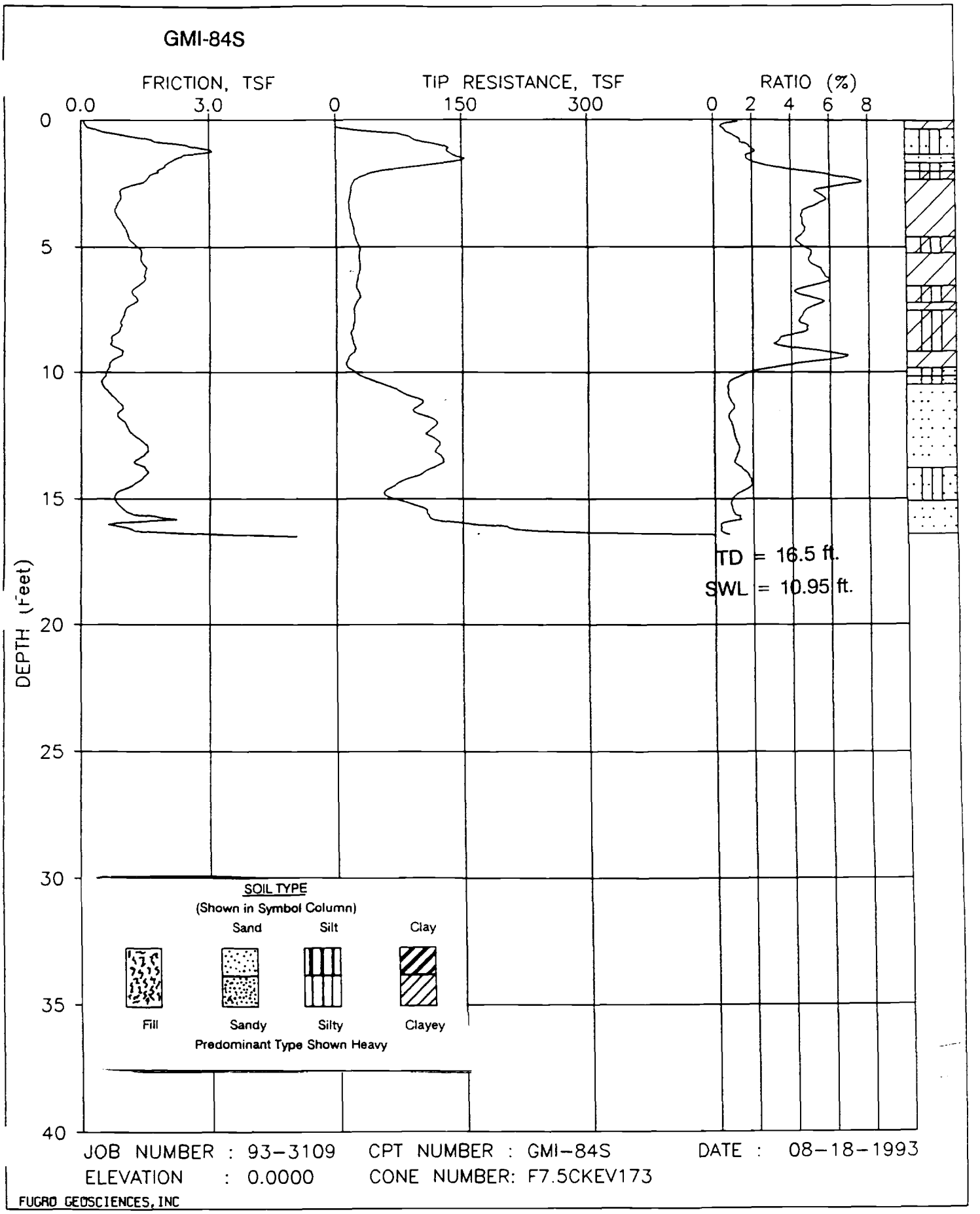
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

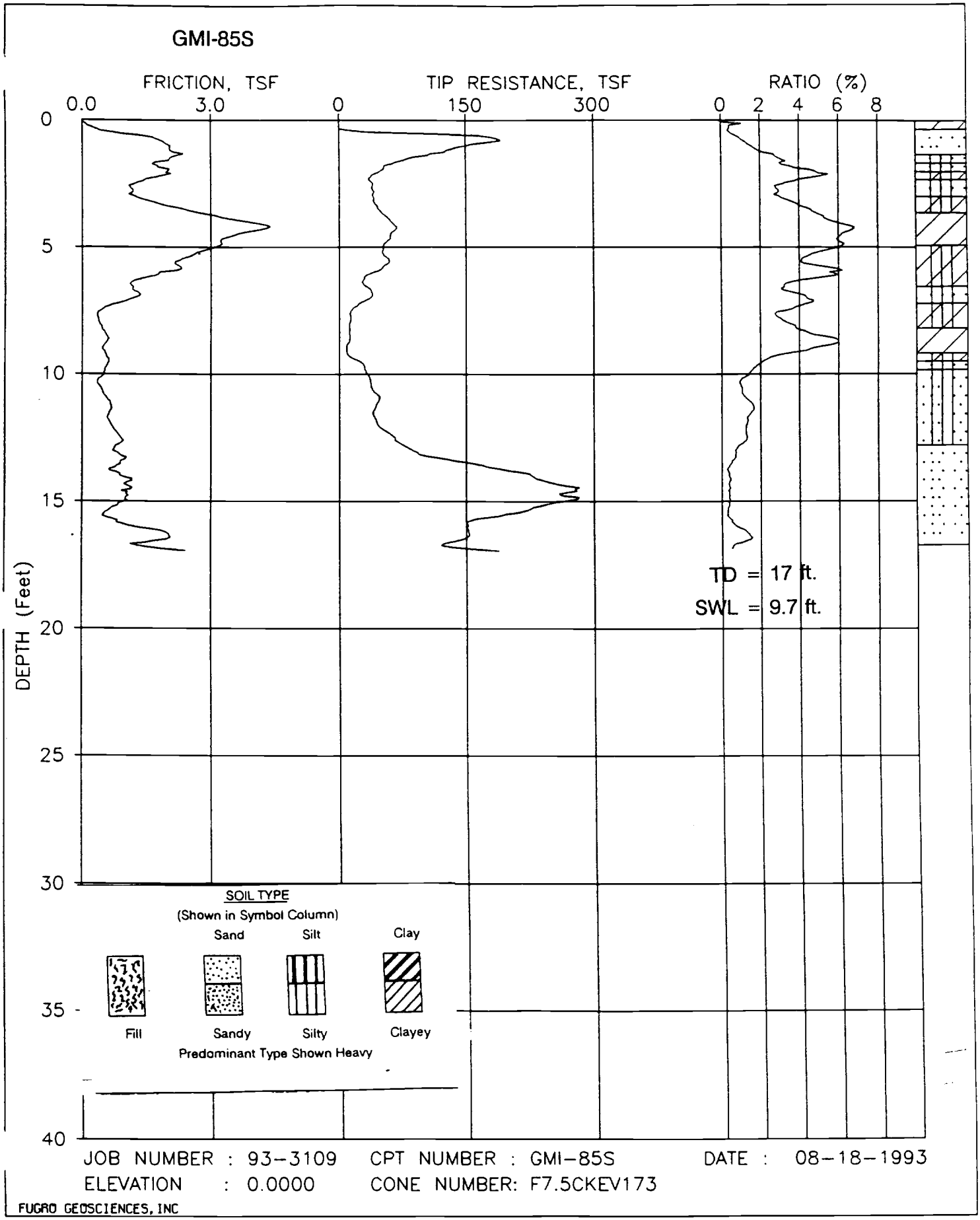
FUGRO GEOSCIENCES,INC

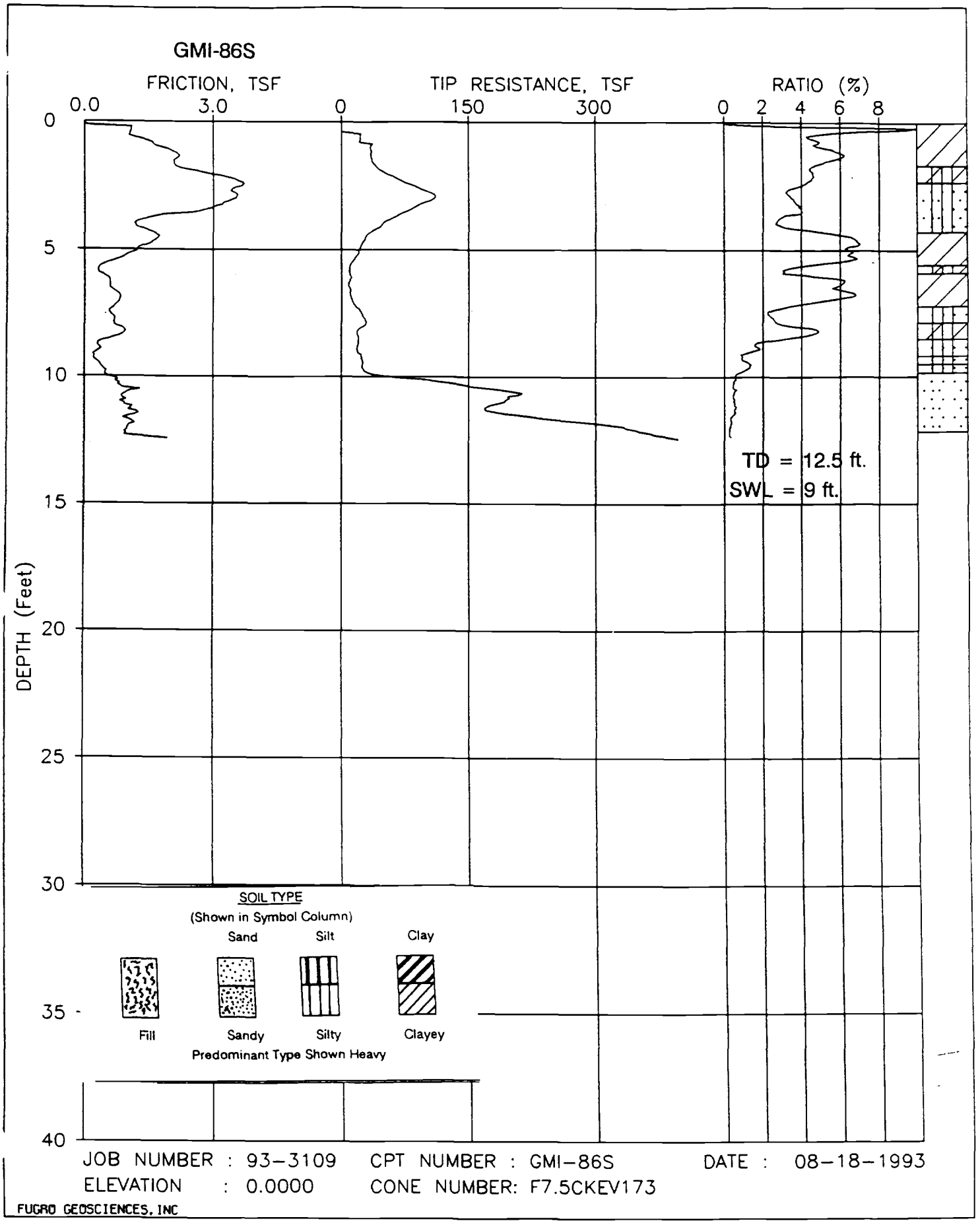
172303


GMI-83S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (feet)
0
5
10
15
20
25
30
35
40
TD = 17 ft.
SWL = 10.35 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-83S
DATE : 08-18-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172394

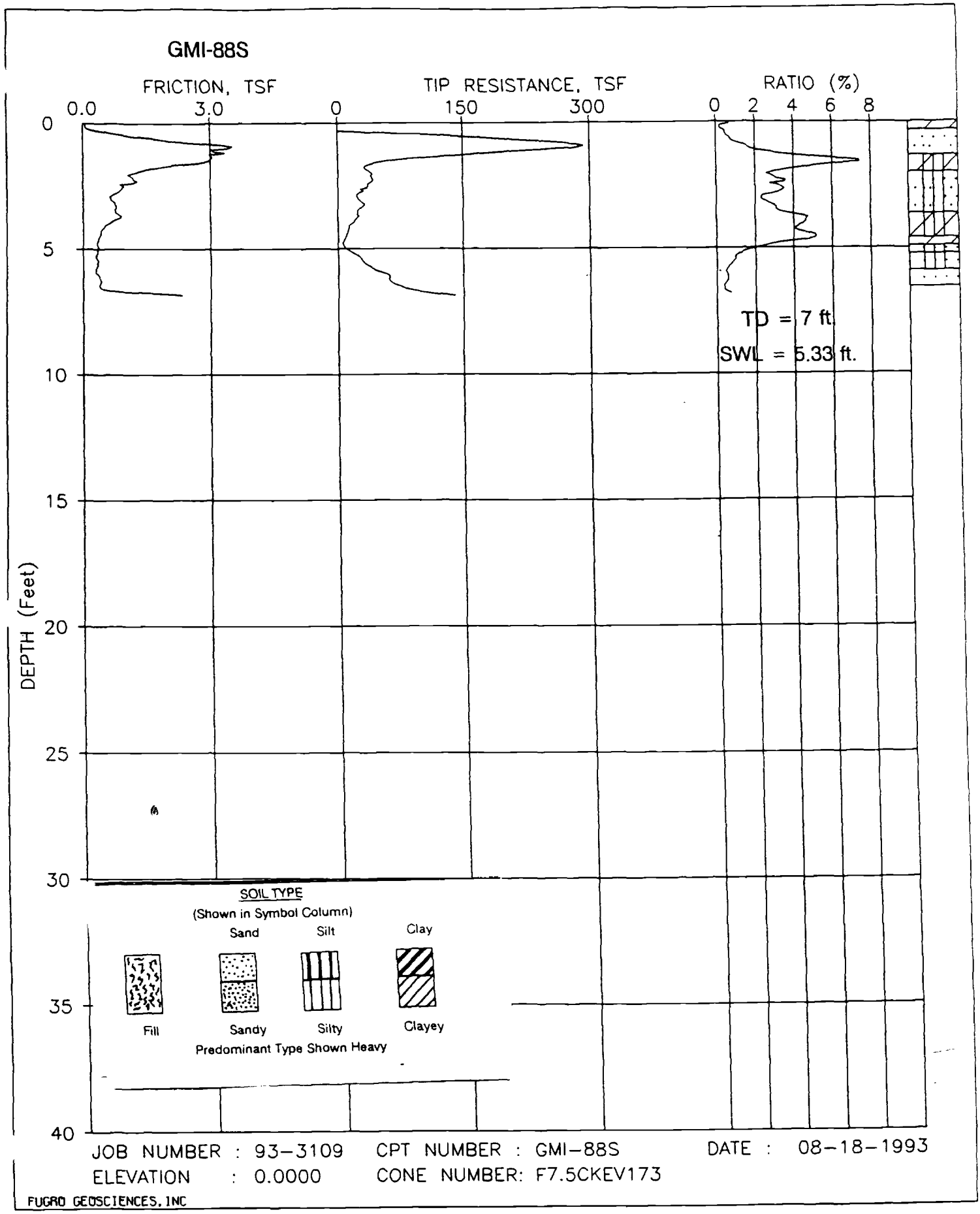

GMI-84S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 16.5 ft.
SWL = 10.95 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-84S
DATE : 08-18-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC


GMI-85S
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 17 ft.
SWL = 9.7 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-85S
DATE : 08-18-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-86S DATE : 08-18-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

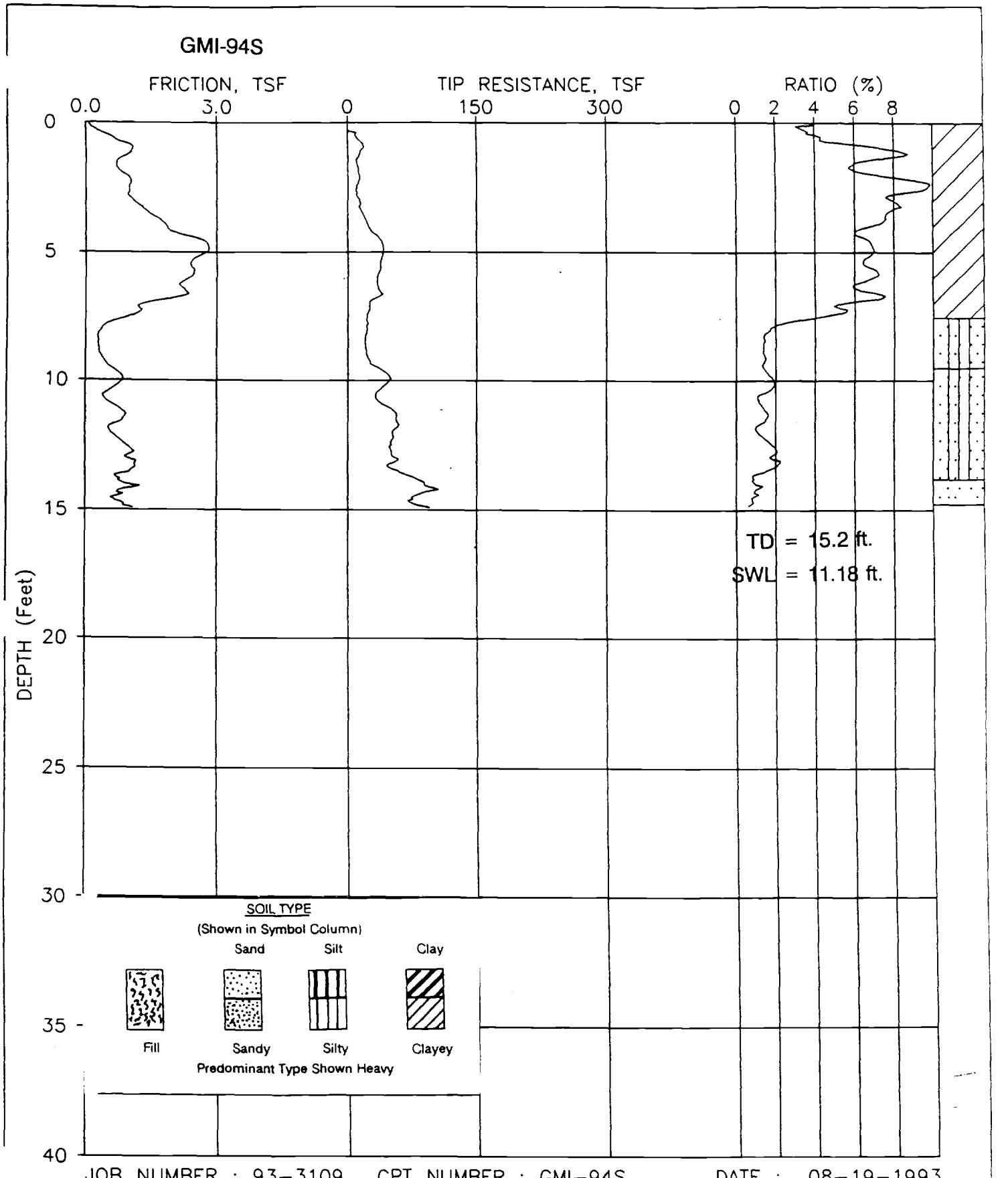
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-88S DATE : 08-18-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

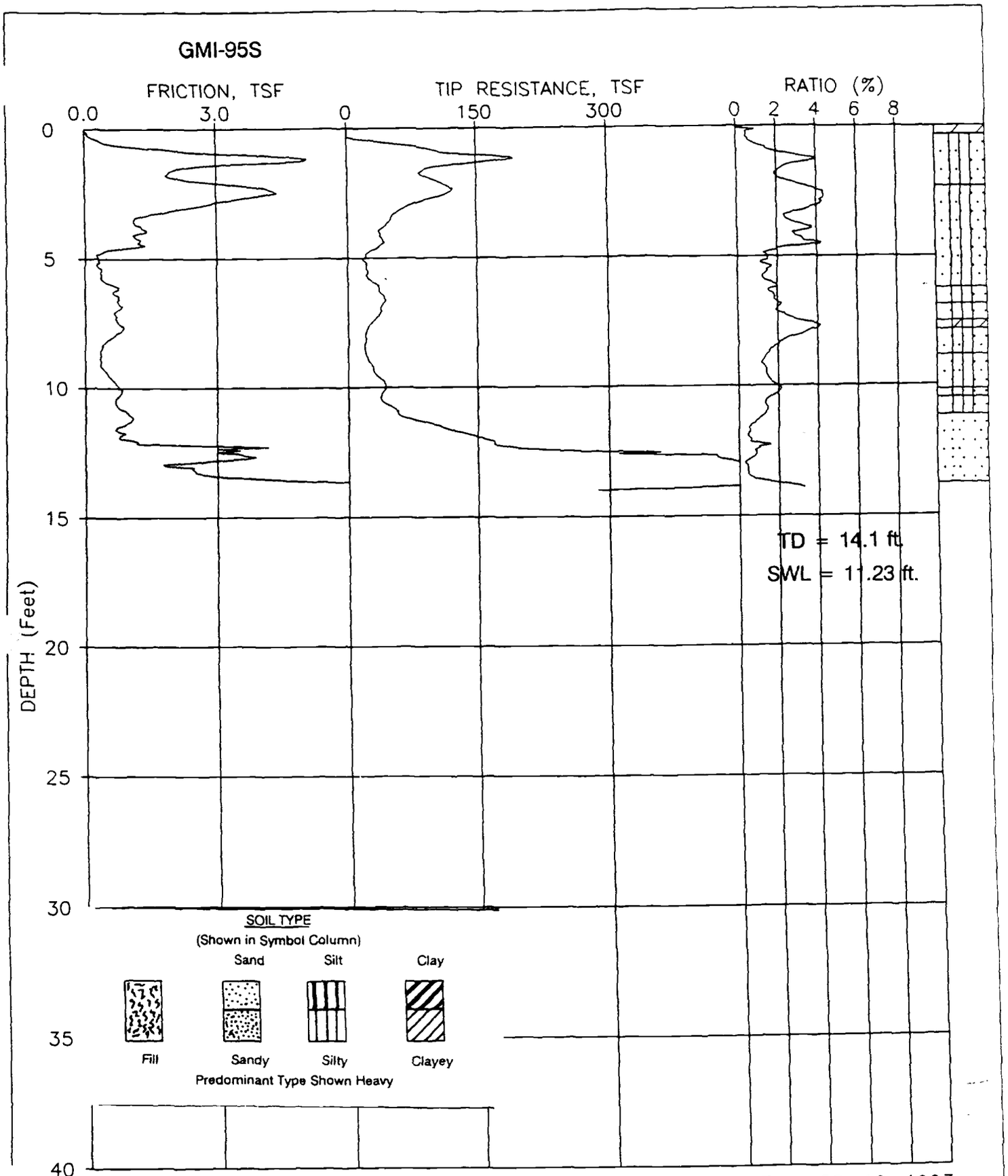


JOB NUMBER : 93-3109 CPT NUMBER : GMI-94S DATE : 08-19-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172309

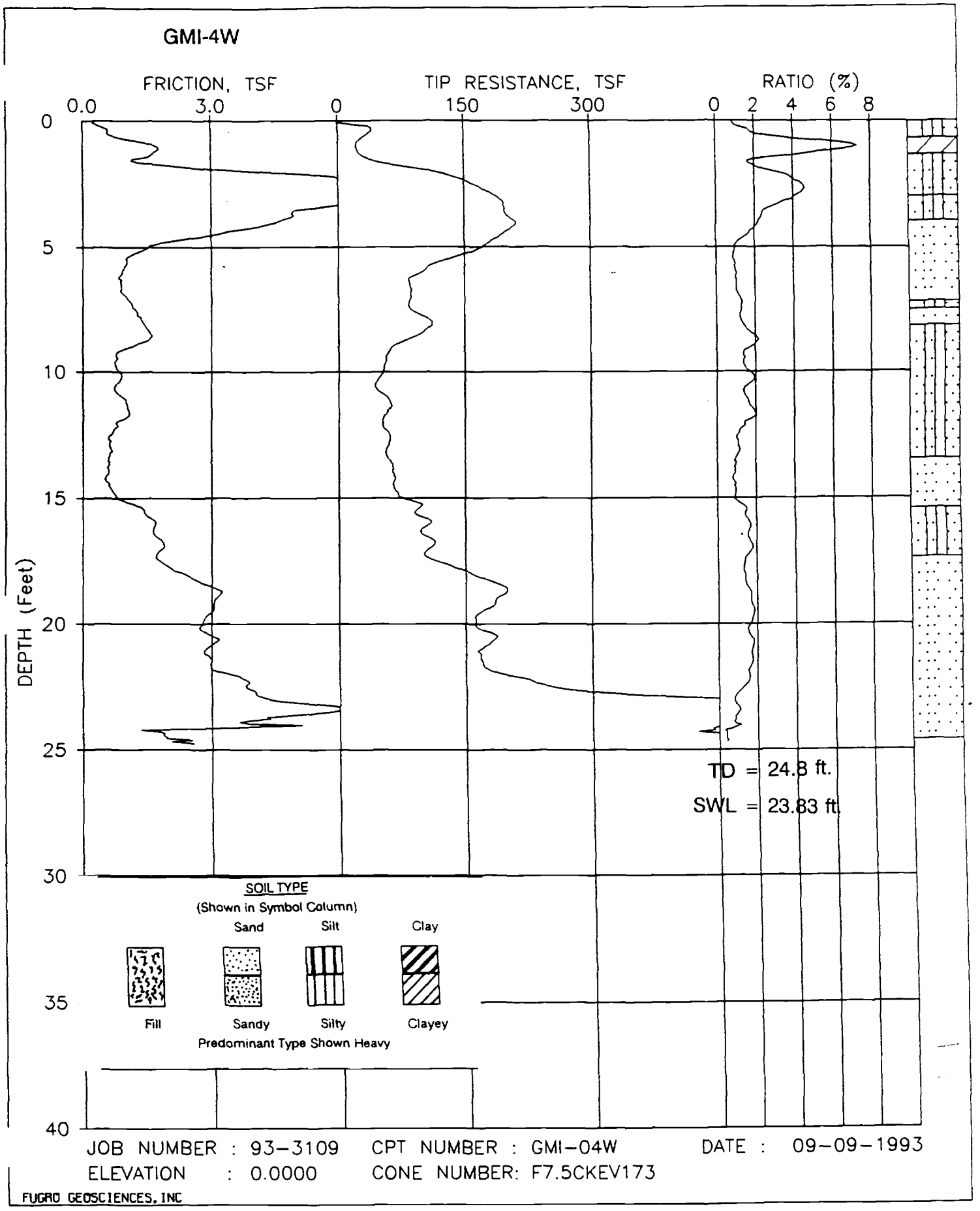


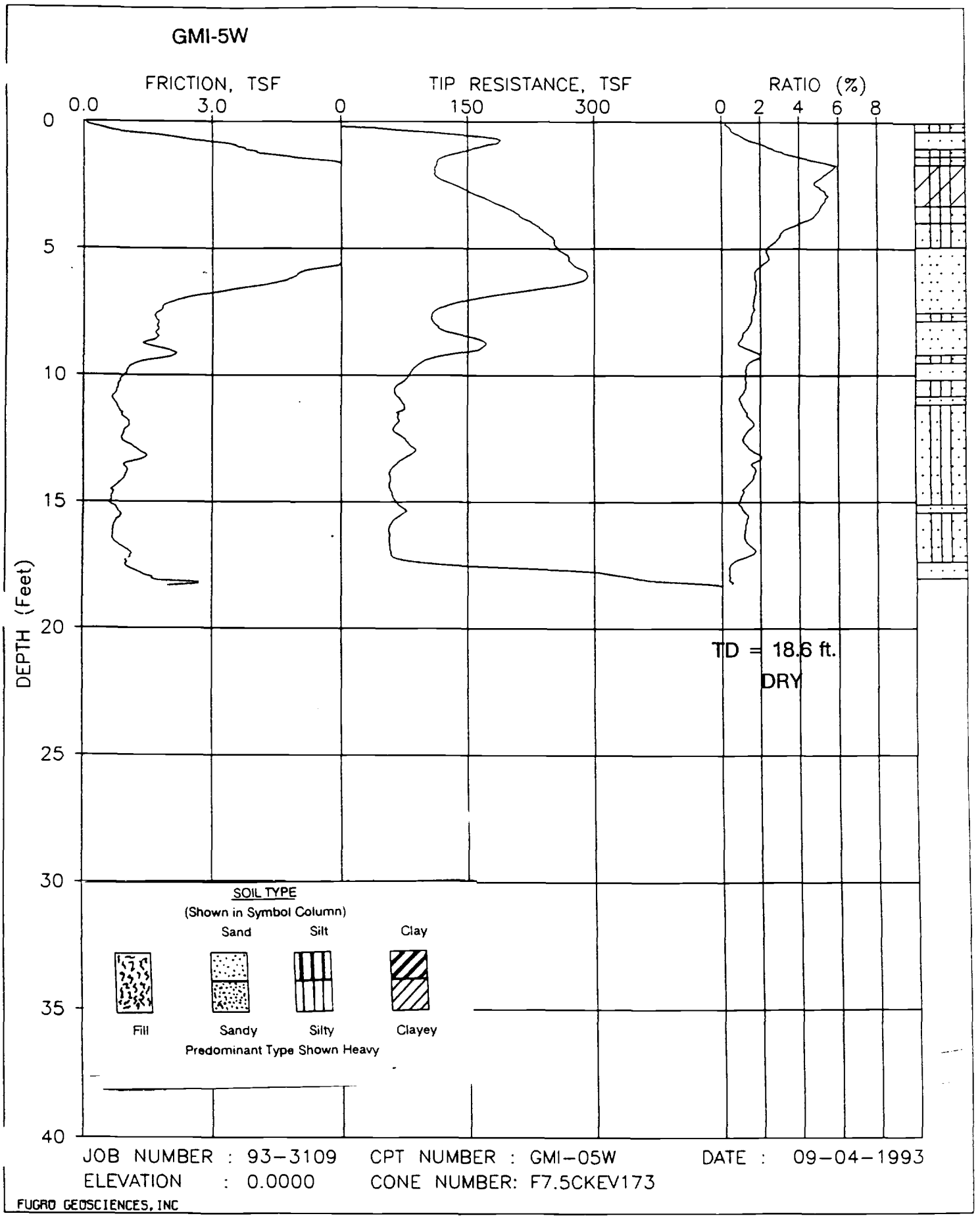
JOB NUMBER : 93-3109 CPT NUMBER : GMI-95S DATE : 08-19-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

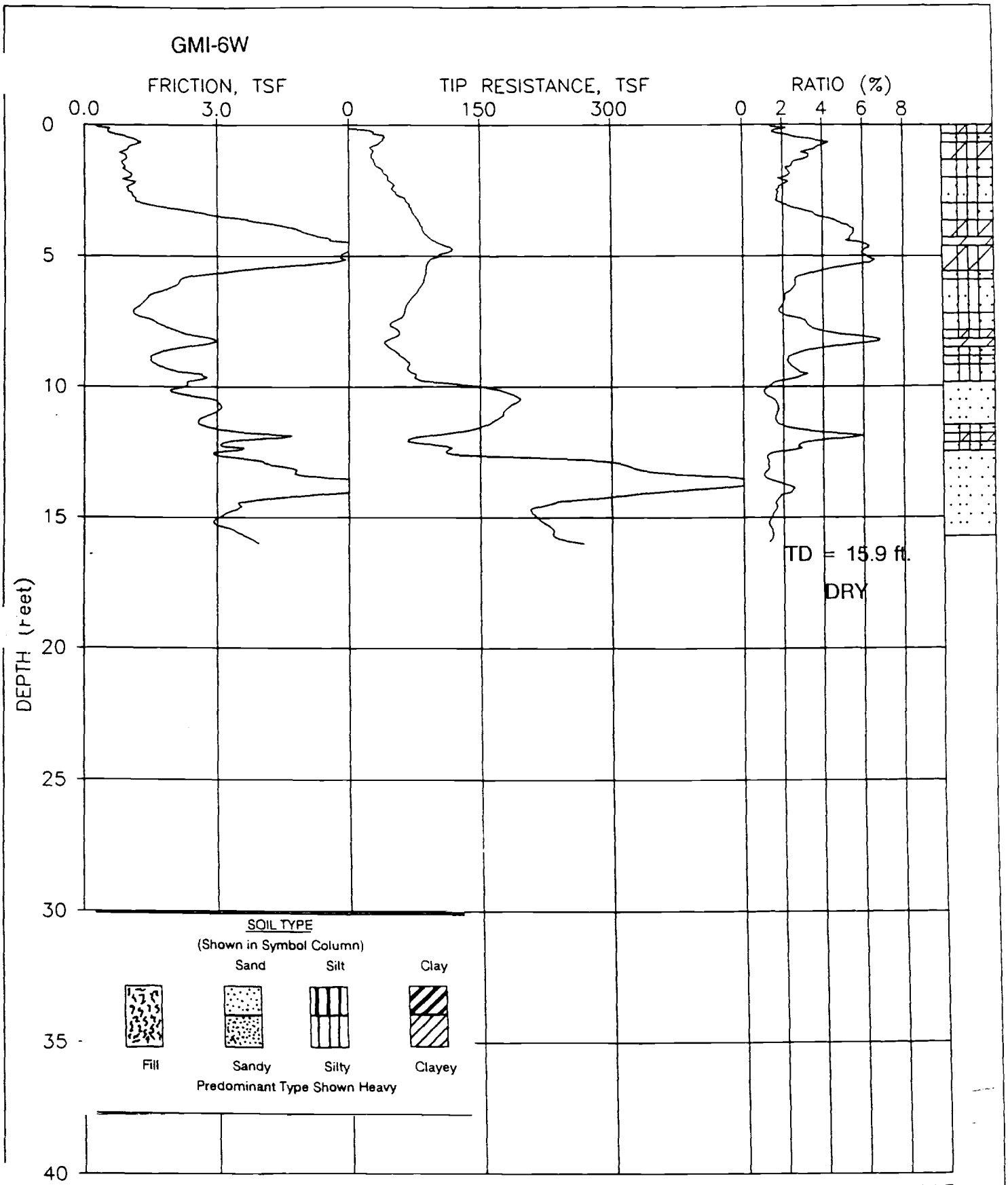
FUGRO GEOSCIENCES, INC

172310


GMI-4W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 24.8 ft.
SWL = 23.83 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-04W
DATE : 09-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC


GMI-5W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18.6 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-05W
DATE : 09-04-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

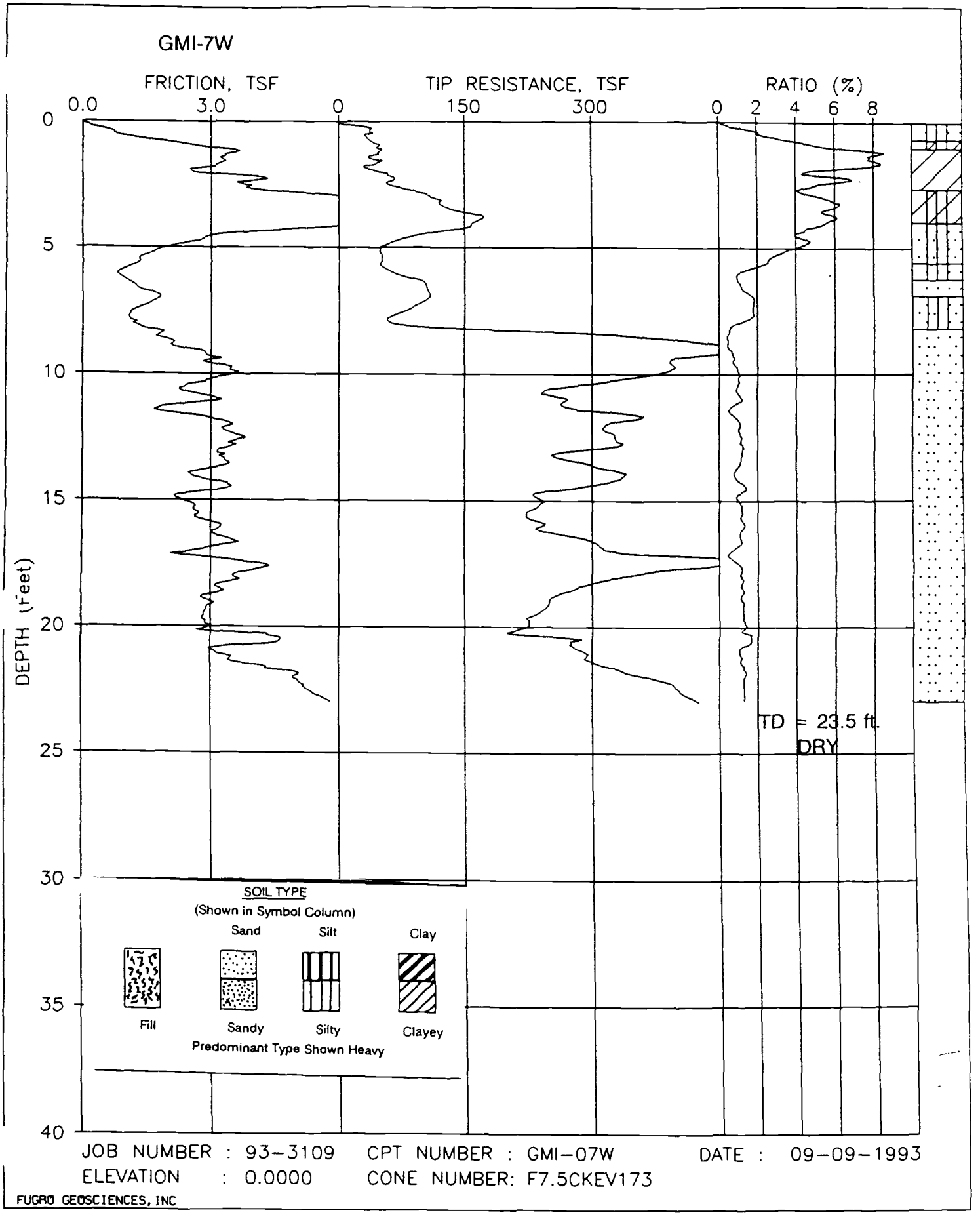
172312



JOB NUMBER : 93-3109 CPT NUMBER : GMI-06W DATE : 09-09-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

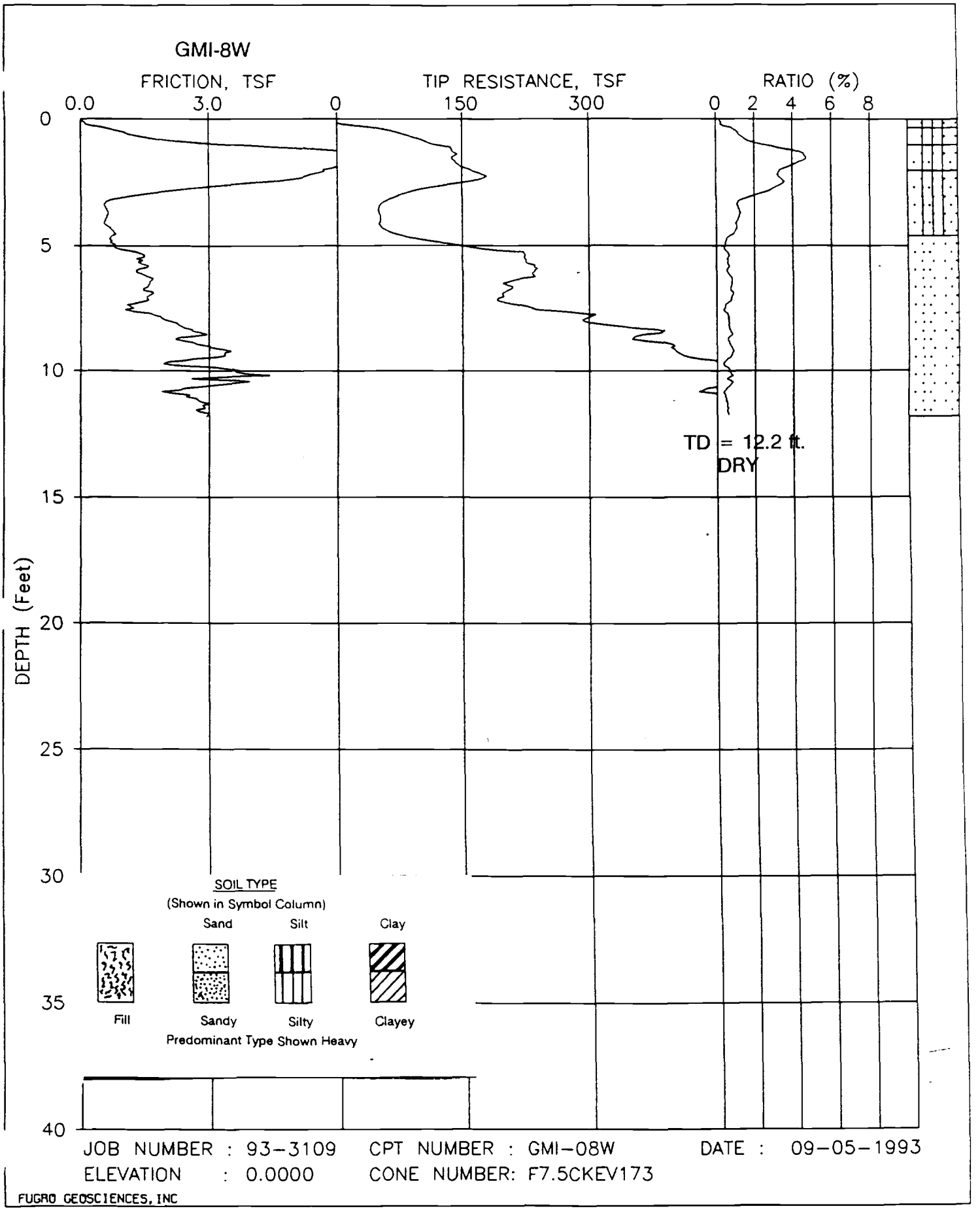
FUGRO GEOSCIENCES, INC

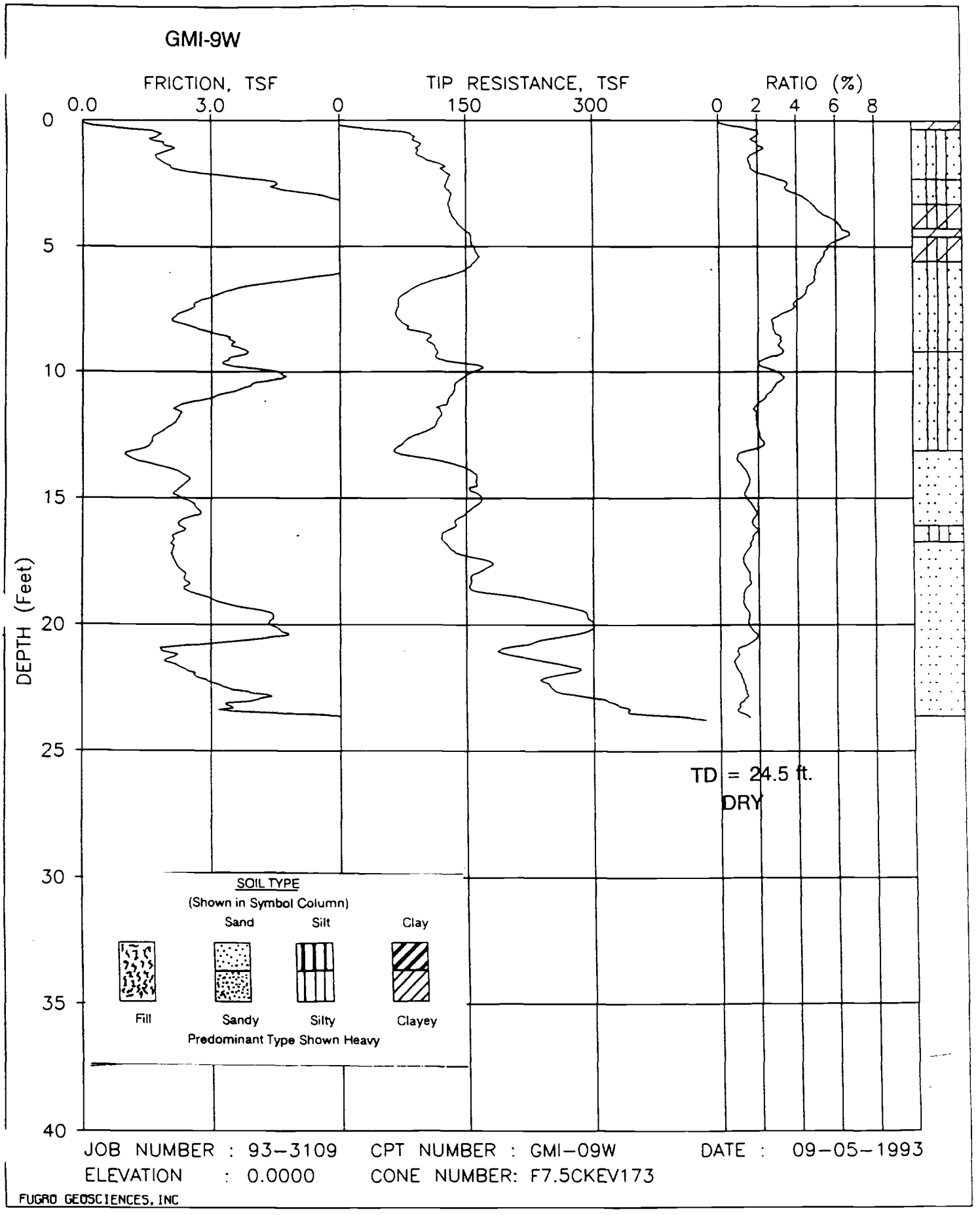


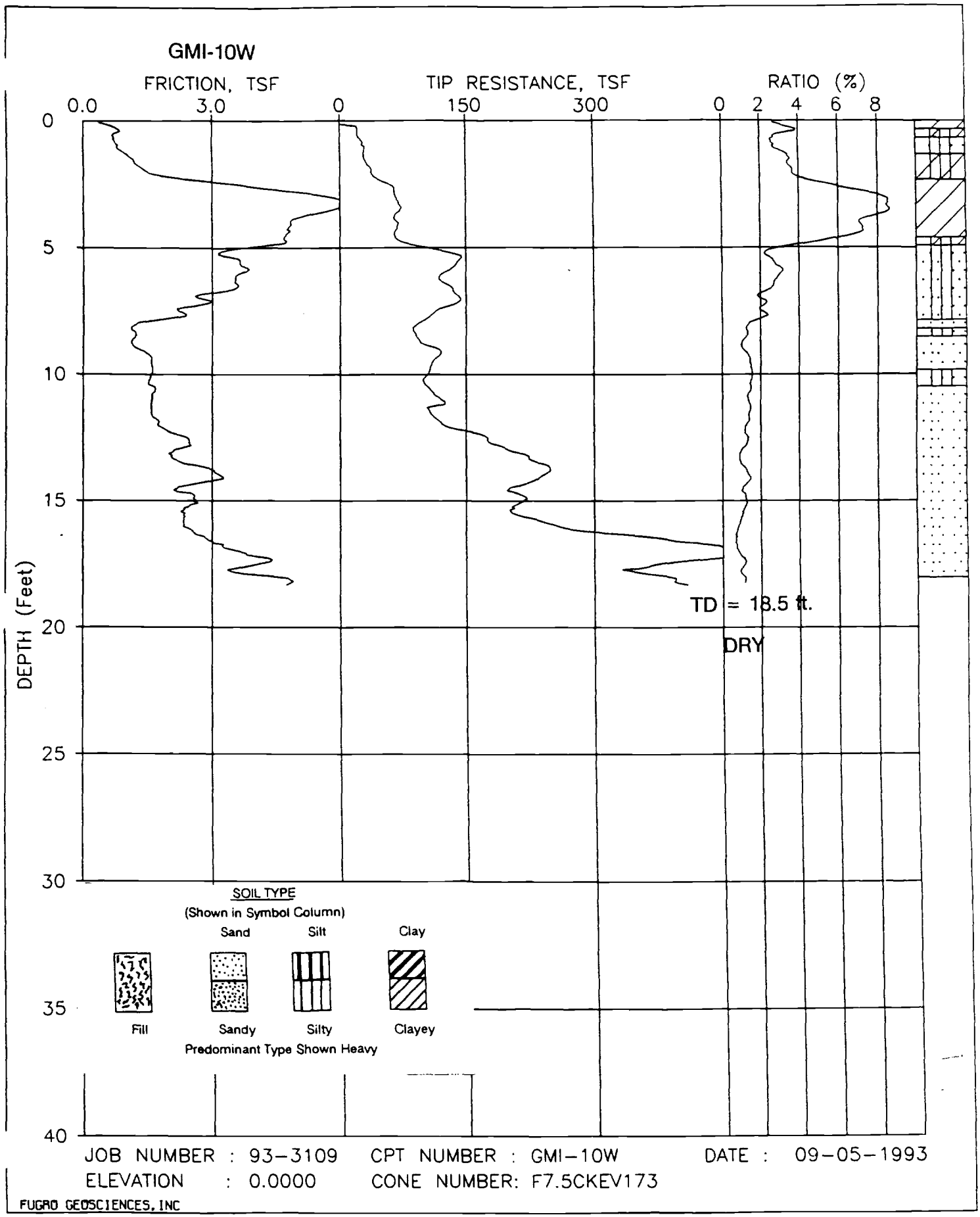
JOB NUMBER : 93-3109 CPT NUMBER : GMI-07W DATE : 09-09-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

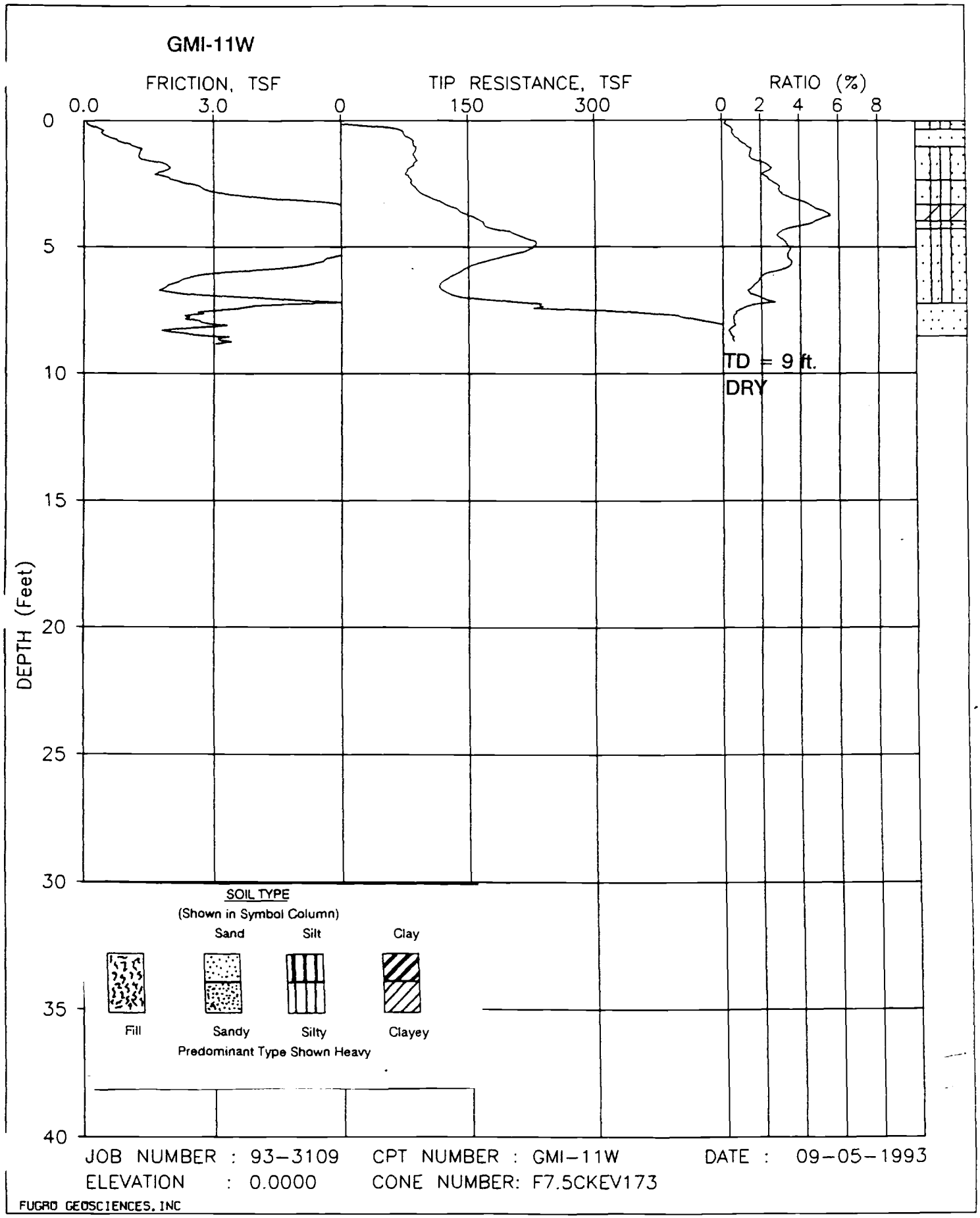
FUGRO GEOSCIENCES, INC

172314


GMI-8W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 12.2 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-08W
DATE : 09-05-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC


GMI-9W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 24.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-09W
DATE : 09-05-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

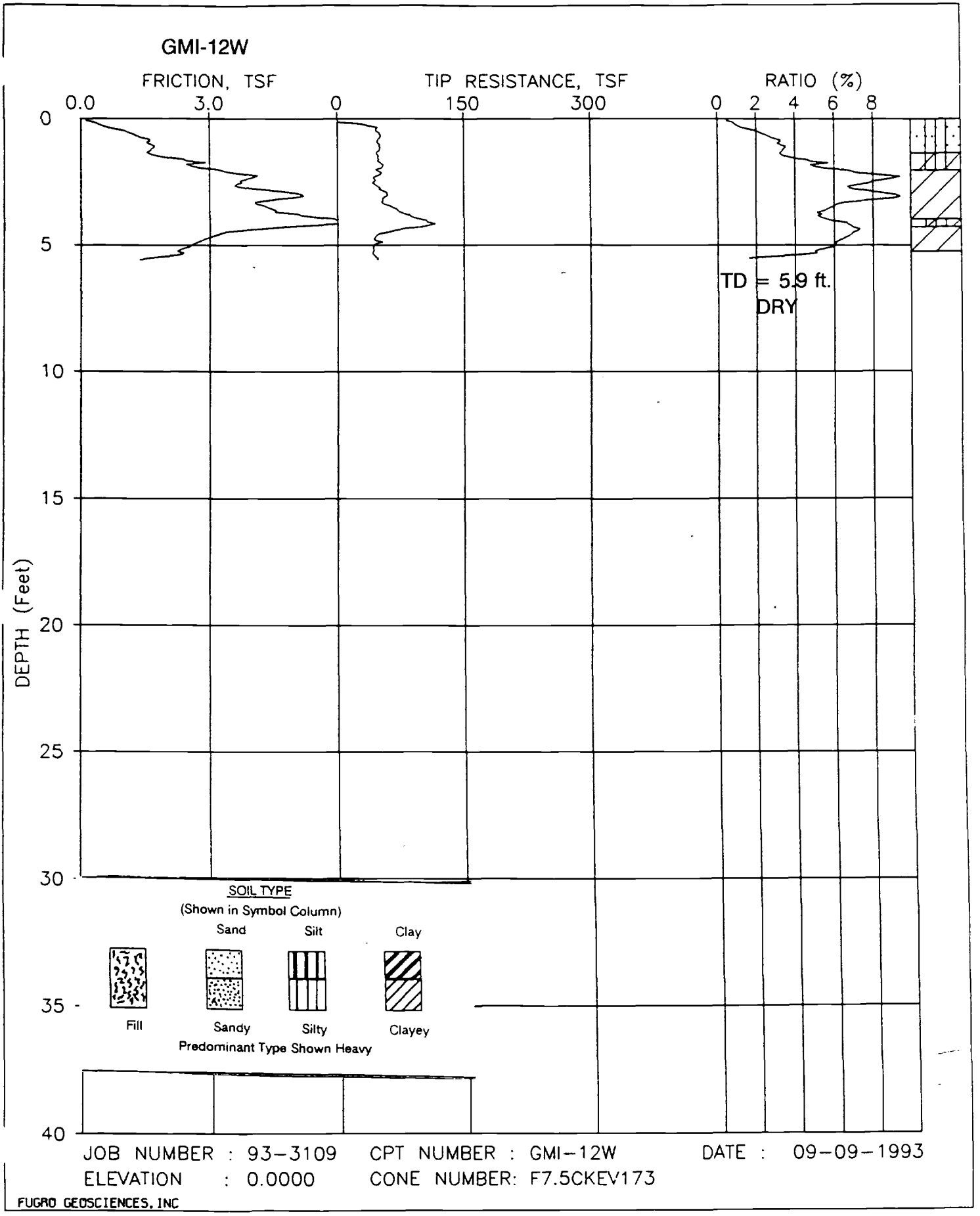

GMI-10W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-10W
DATE : 09-05-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : GMI-11W DATE : 09-05-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172318

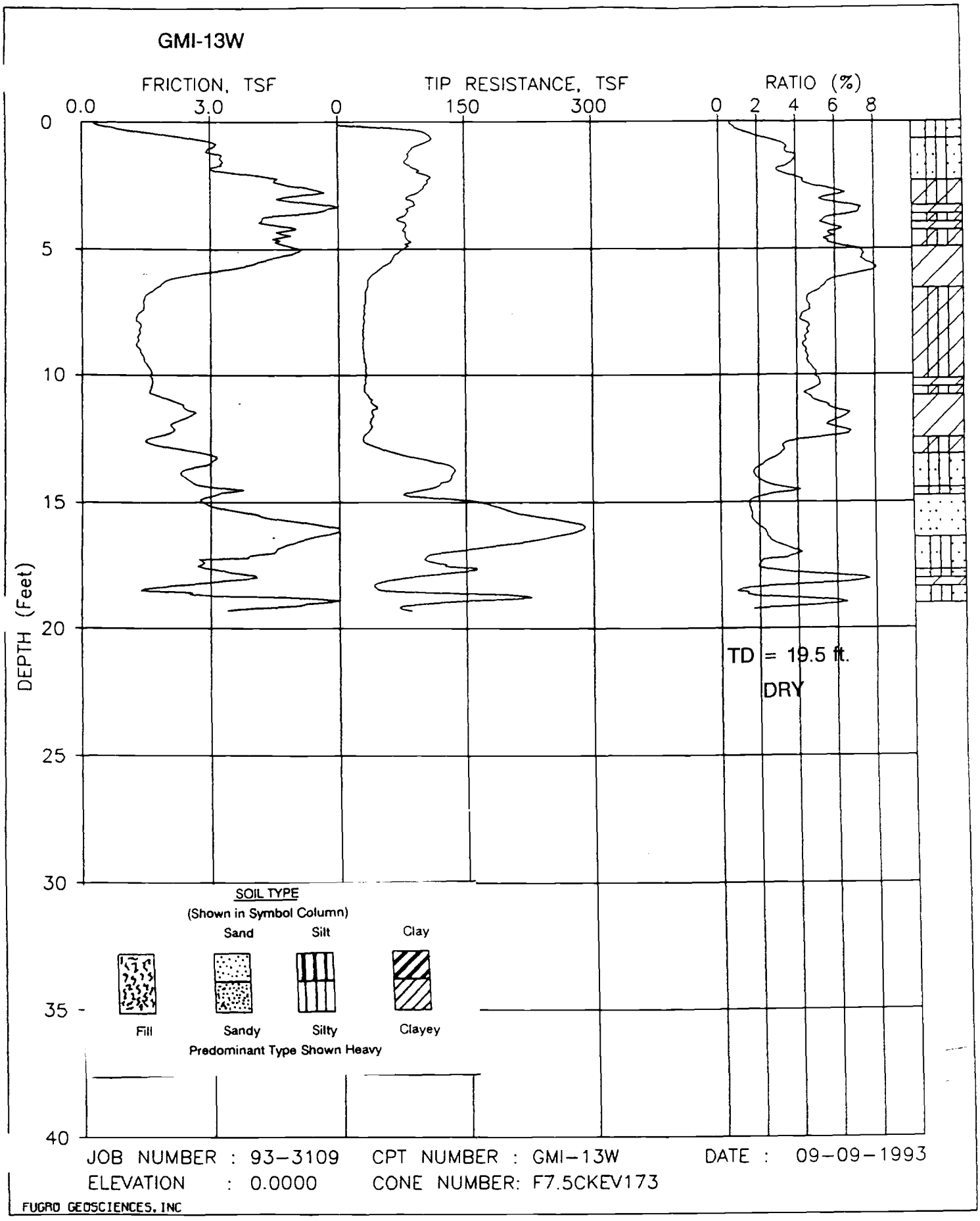


JOB NUMBER : 93-3109 CPT NUMBER : GMI-12W DATE : 09-09-1993

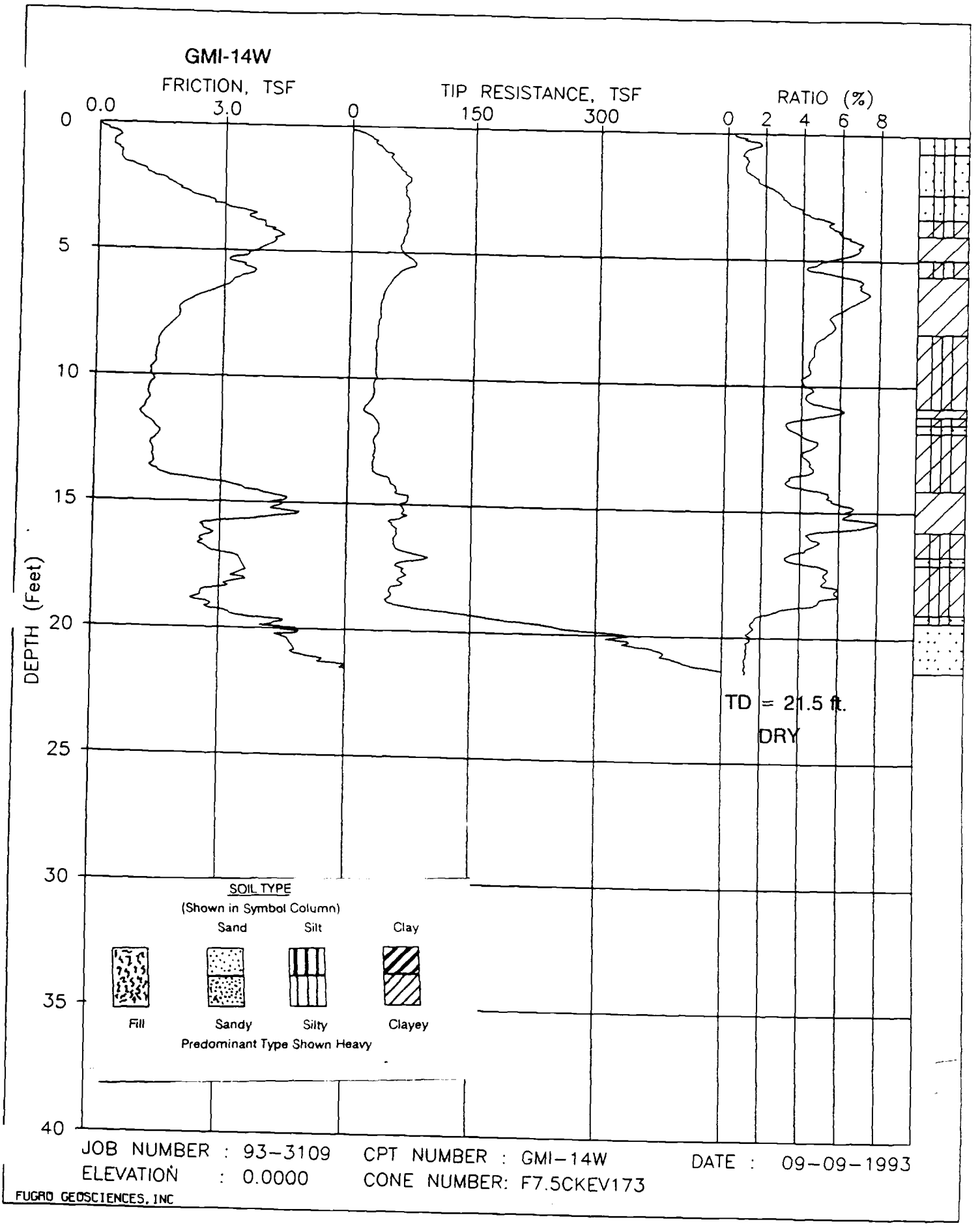
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172319

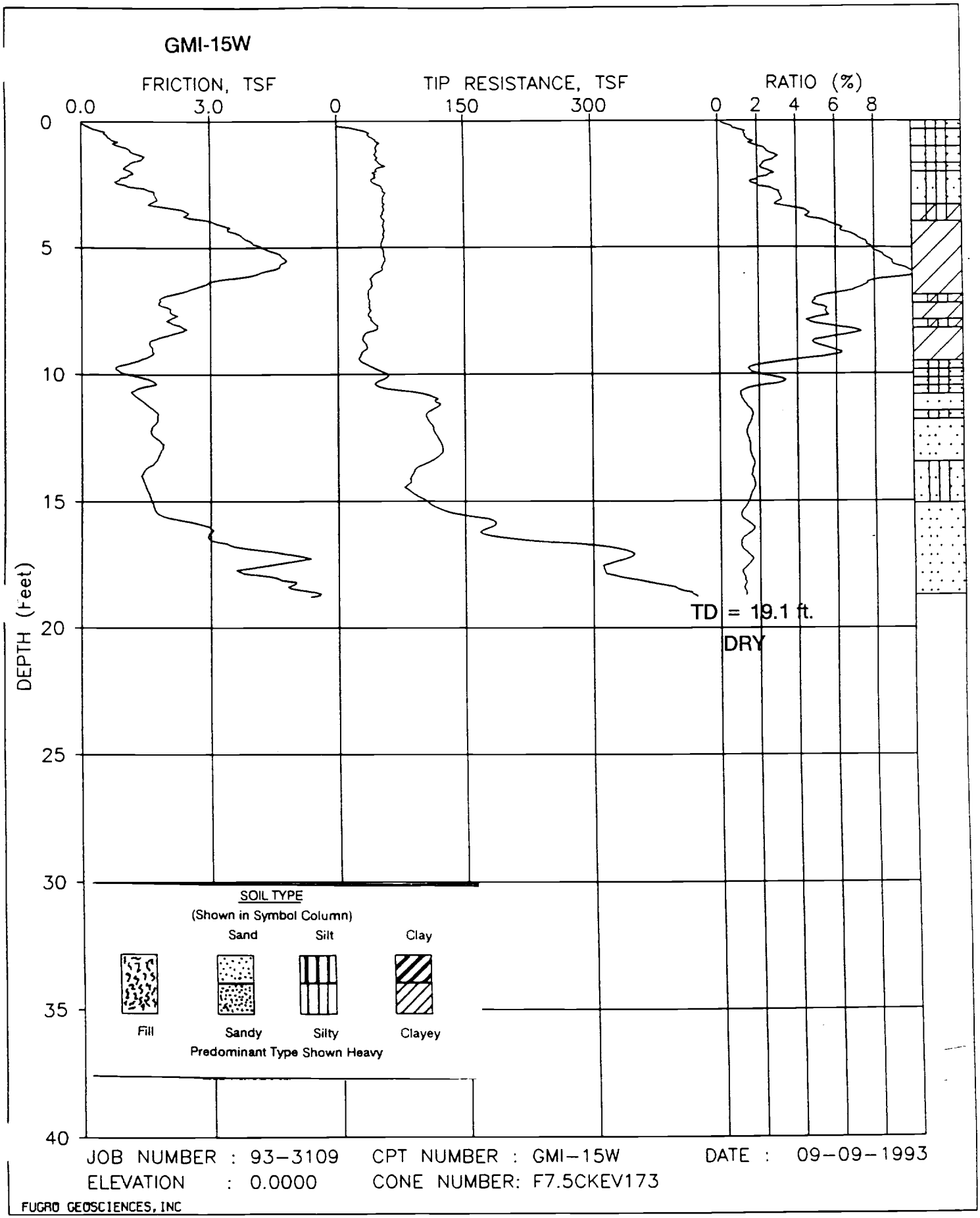

GMI-13W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19.5 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-13W
DATE : 09-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

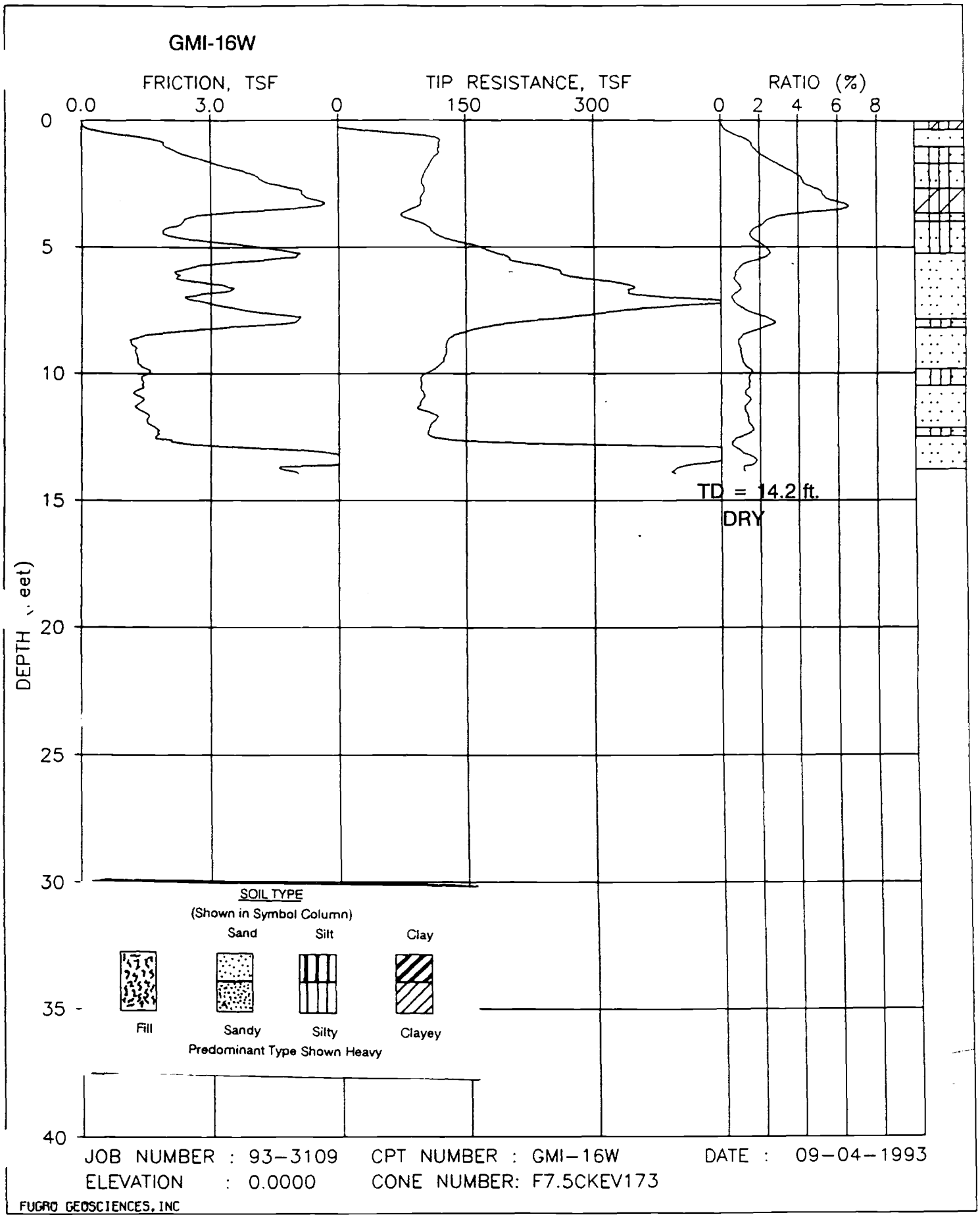
172320



JOB NUMBER : 93-3109 CPT NUMBER : GMI-14W DATE : 09-09-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

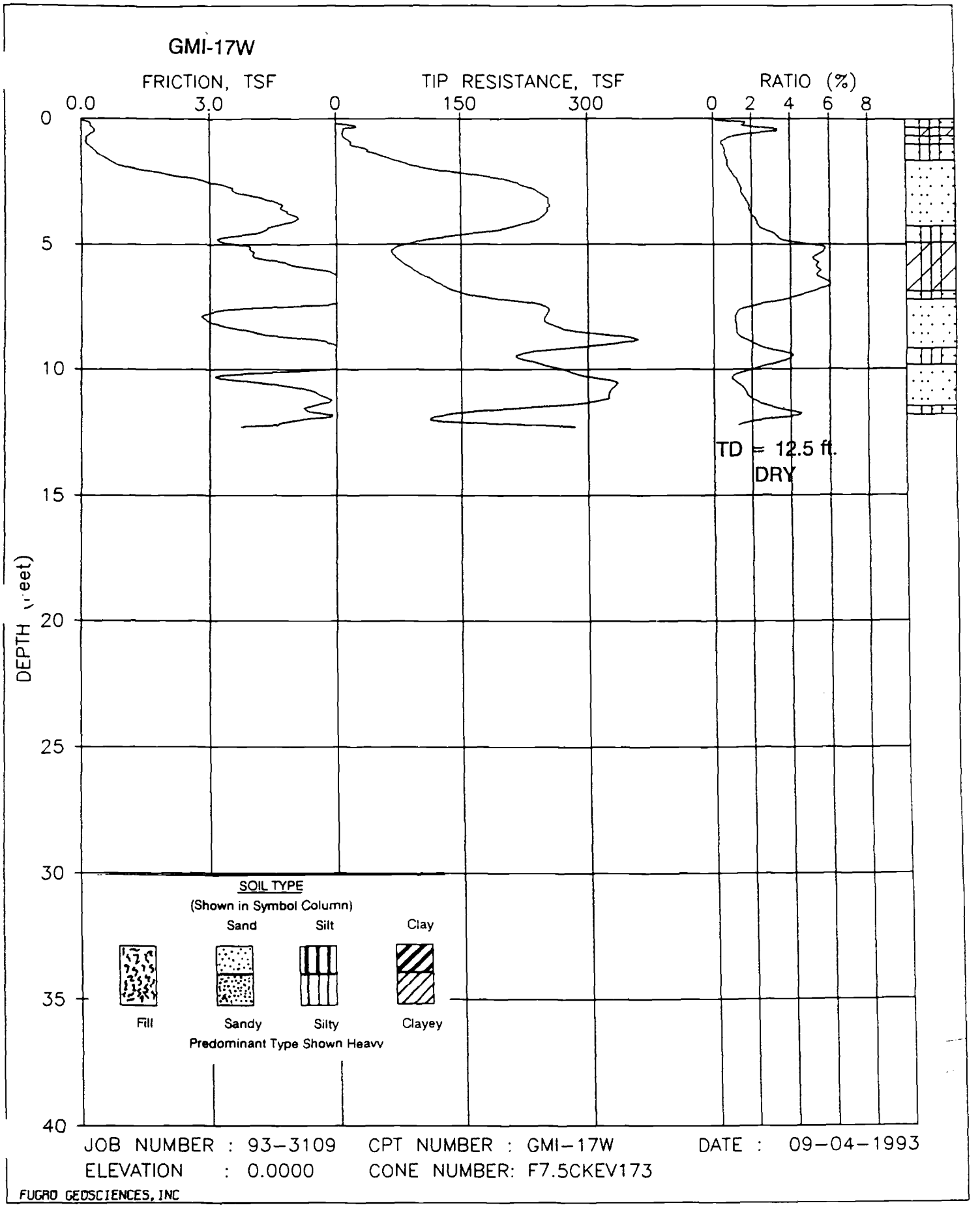
FUGRO GEOSCIENCES, INC


GMI-15W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 19.1 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-15W
DATE : 09-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC



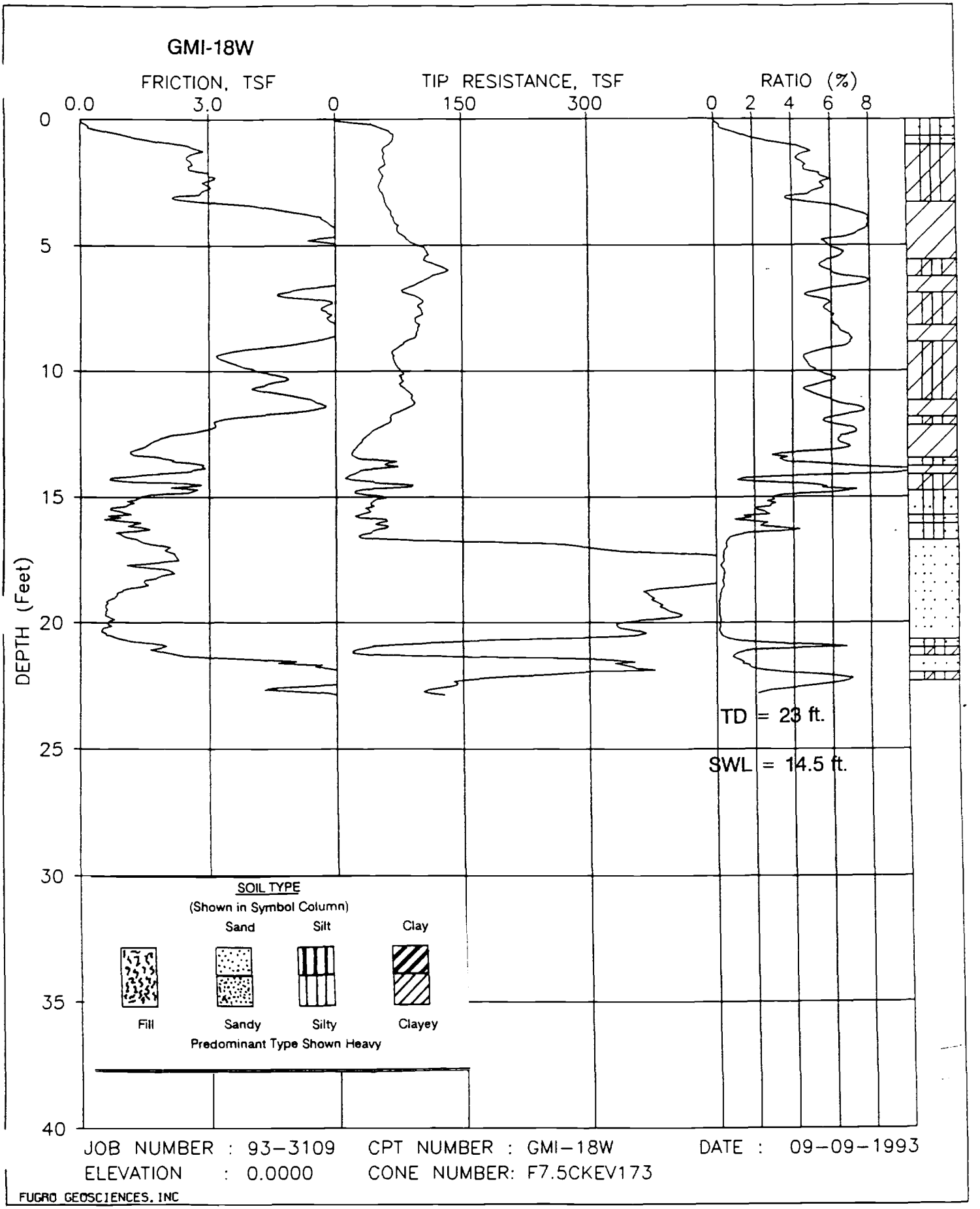
JOB NUMBER : 93-3109 CPT NUMBER : GMI-16W DATE : 09-04-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

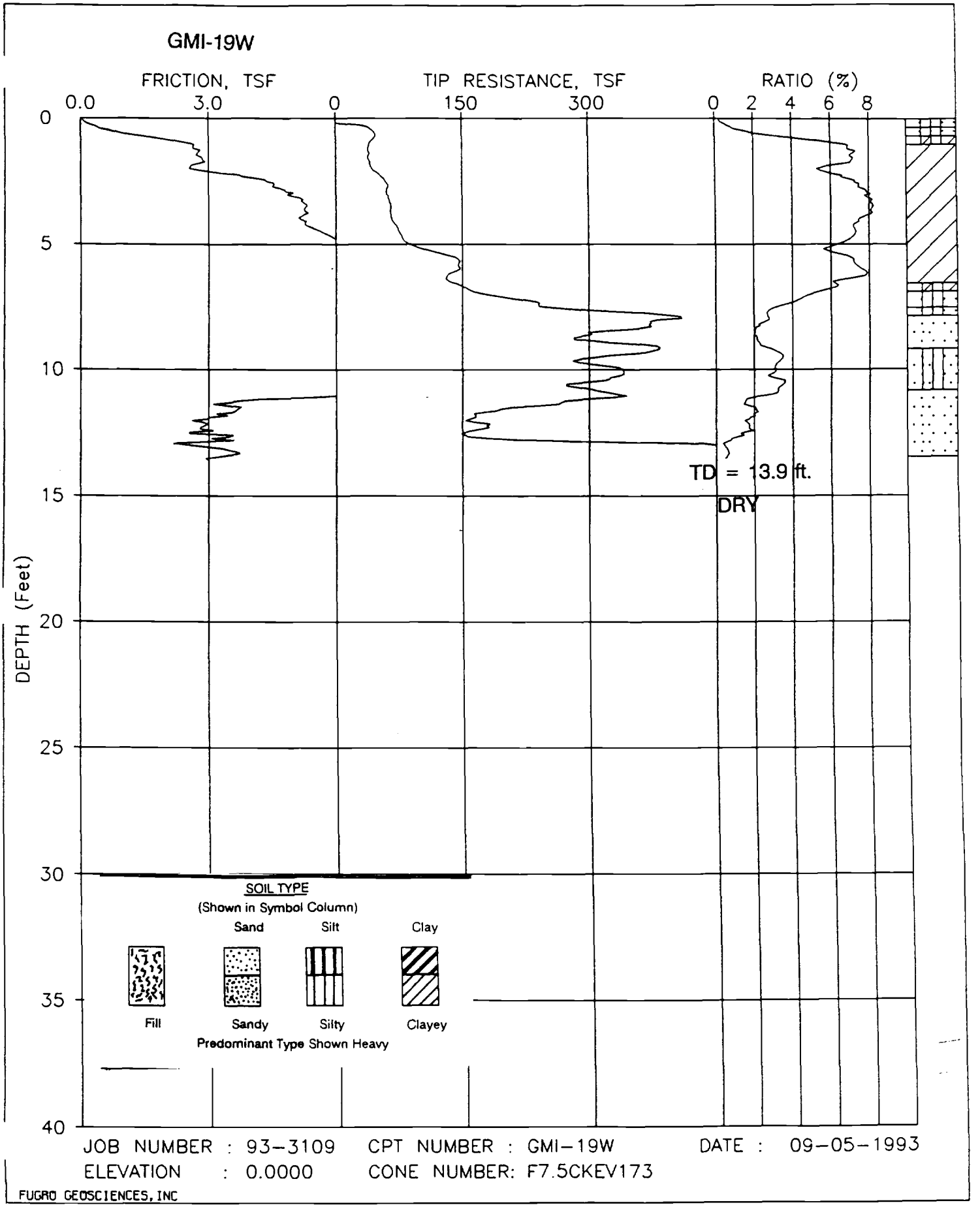


JOB NUMBER : 93-3109 CPT NUMBER : GMI-17W DATE : 09-04-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC


GMI-18W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 23 ft.
SWL = 14.5 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-18W
DATE : 09-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

172325

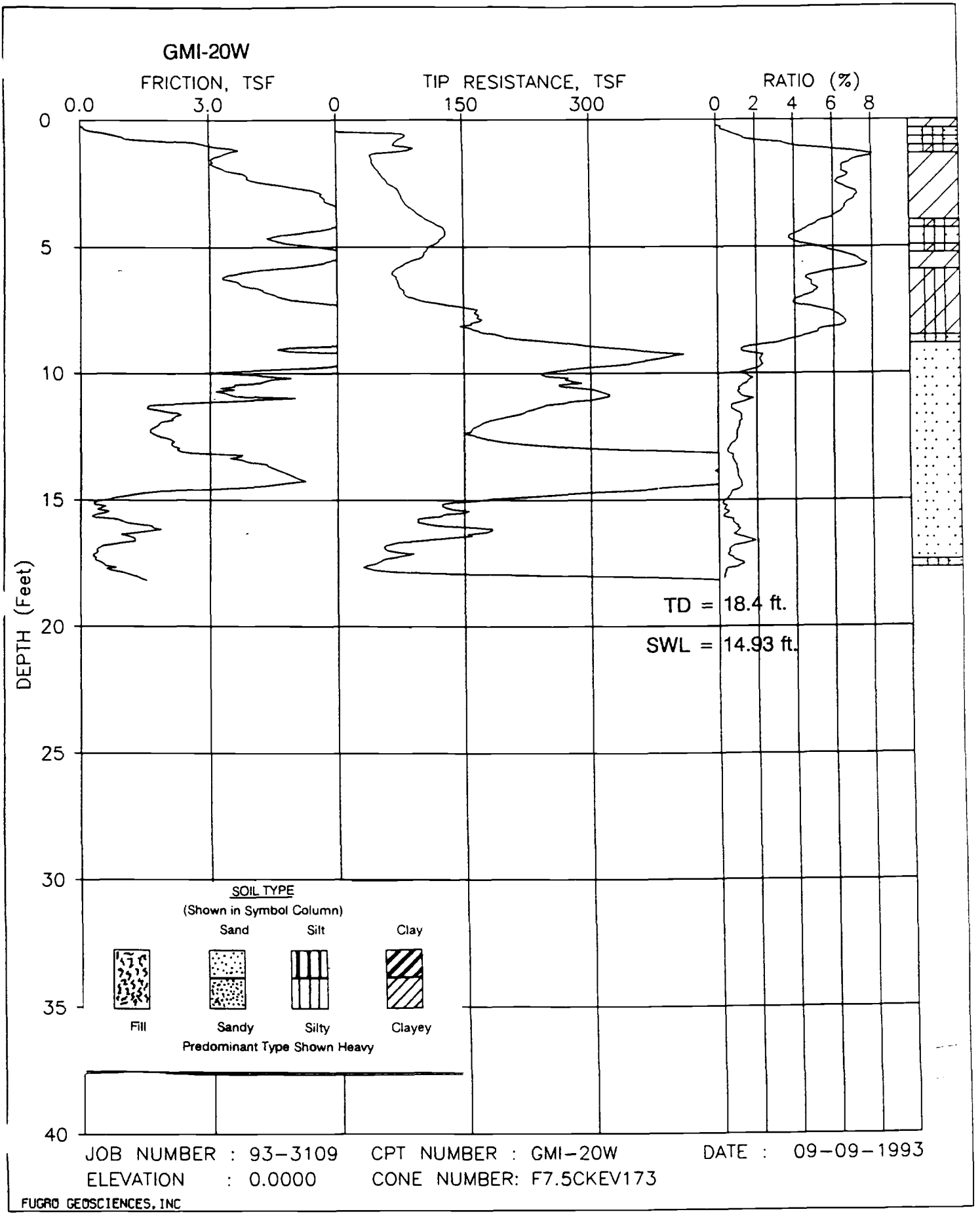


JOB NUMBER : 93-3109 CPT NUMBER : GMI-19W DATE : 09-05-1993

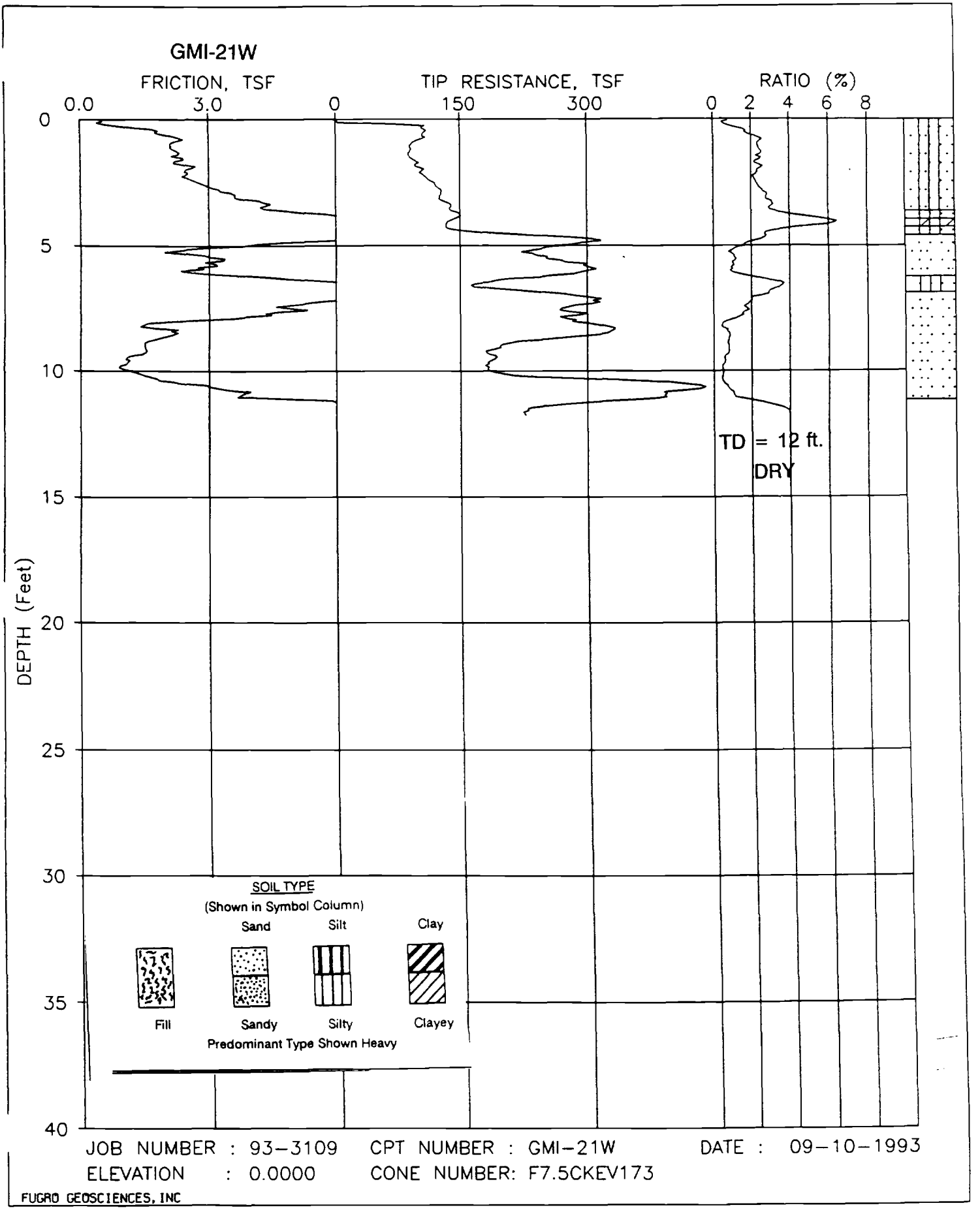
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

172326


GMI-20W
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 18.4 ft.
SWL = 14.93 ft.
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : GMI-20W
DATE : 09-09-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

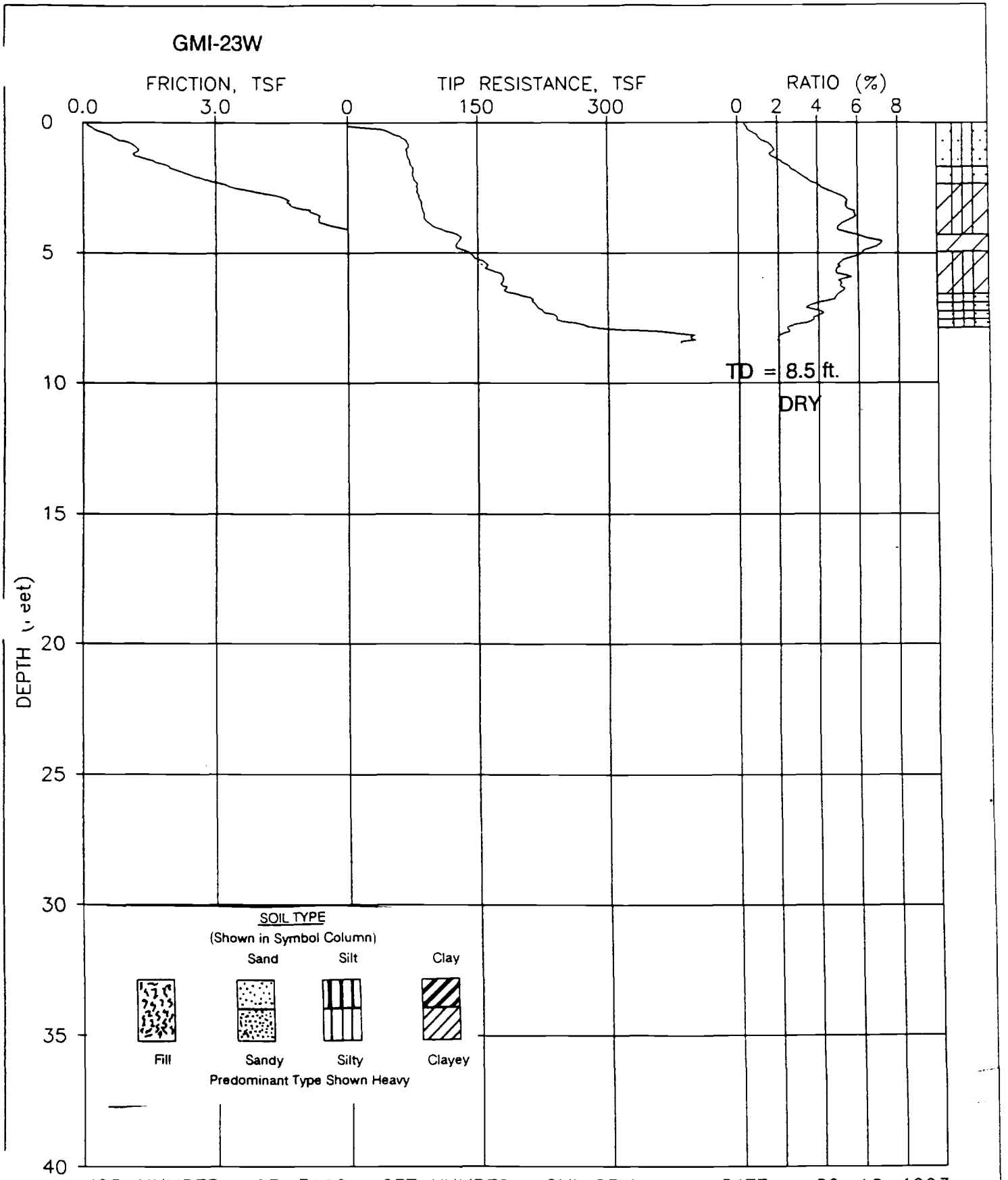
172327



JOB NUMBER : 93-3109 CPT NUMBER : GMI-21W DATE : 09-10-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

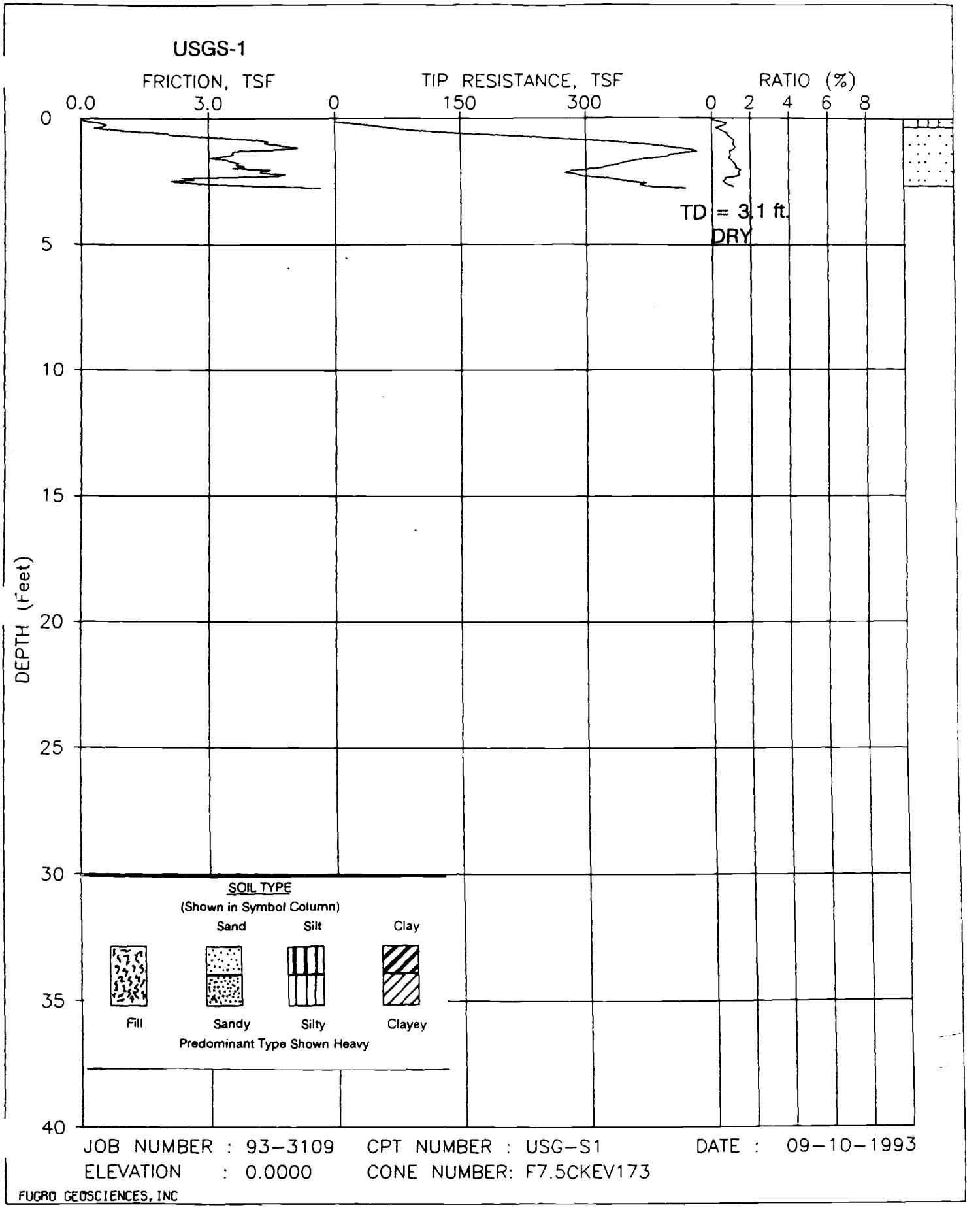
172328



JOB NUMBER : 93-3109 CPT NUMBER : GMI-23W DATE : 09-10-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

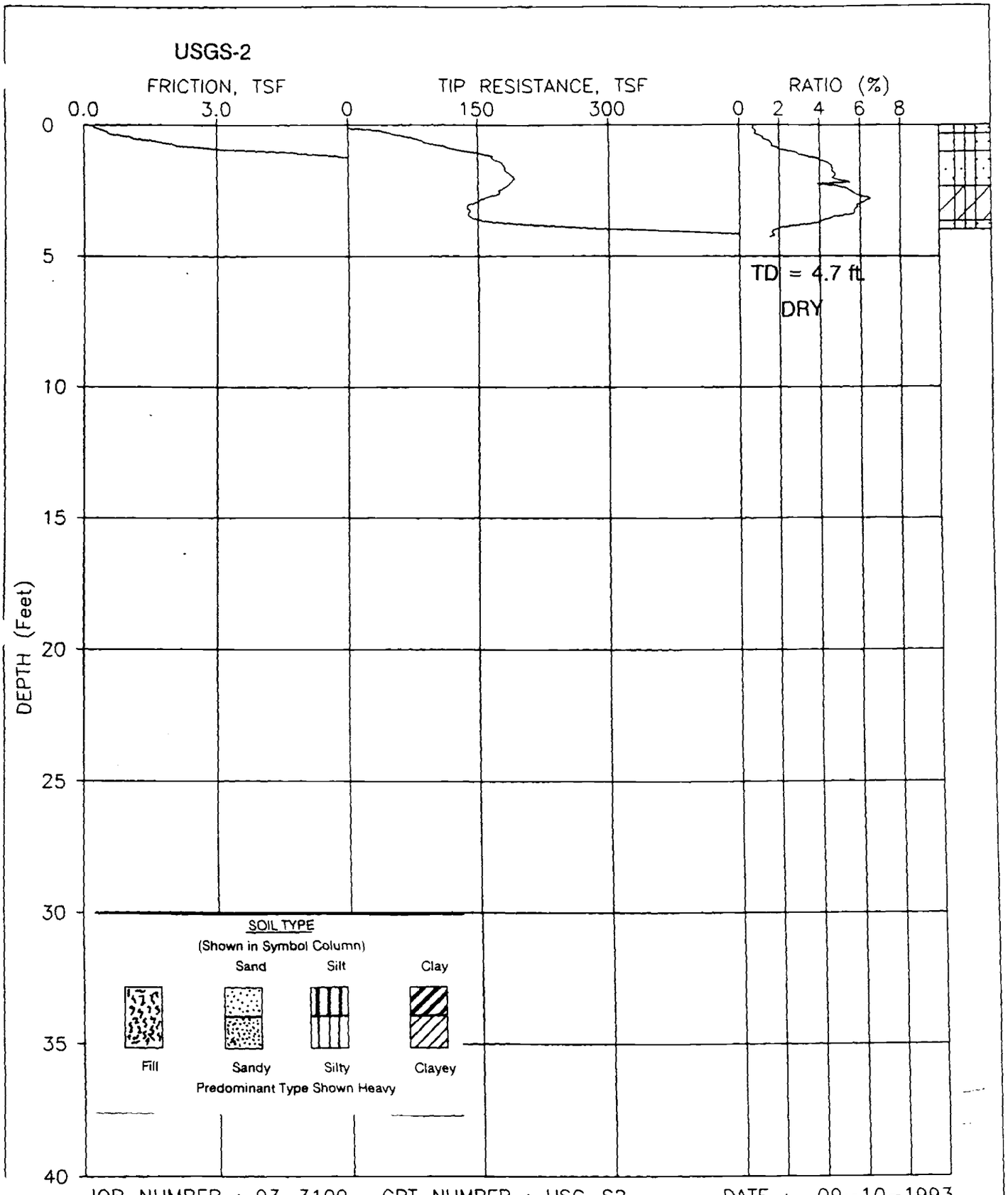
FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : USG-S1 DATE : 09-10-1993
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC

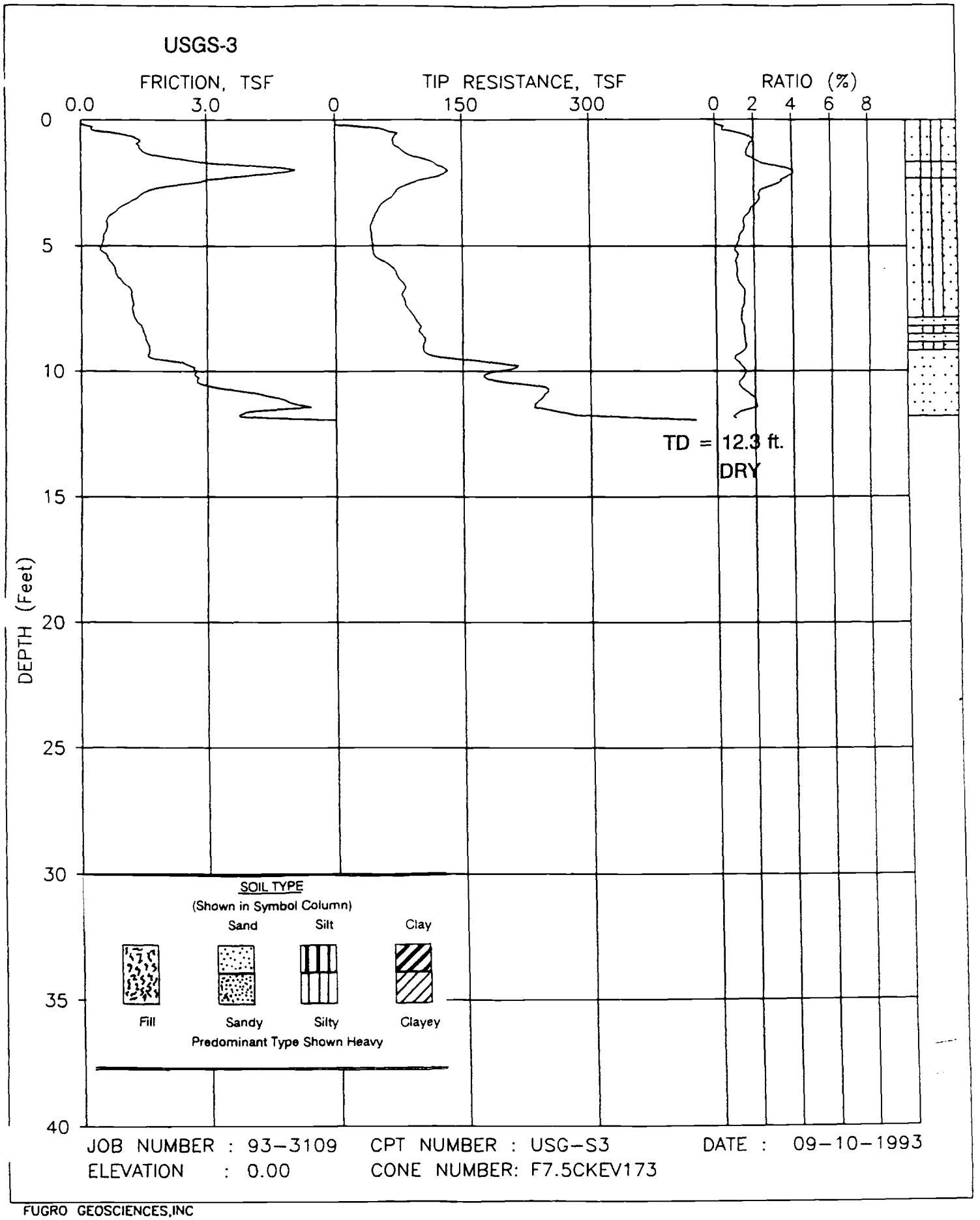
172330



JOB NUMBER : 93-3109 CPT NUMBER : USG-S2 DATE : 09-10-1993

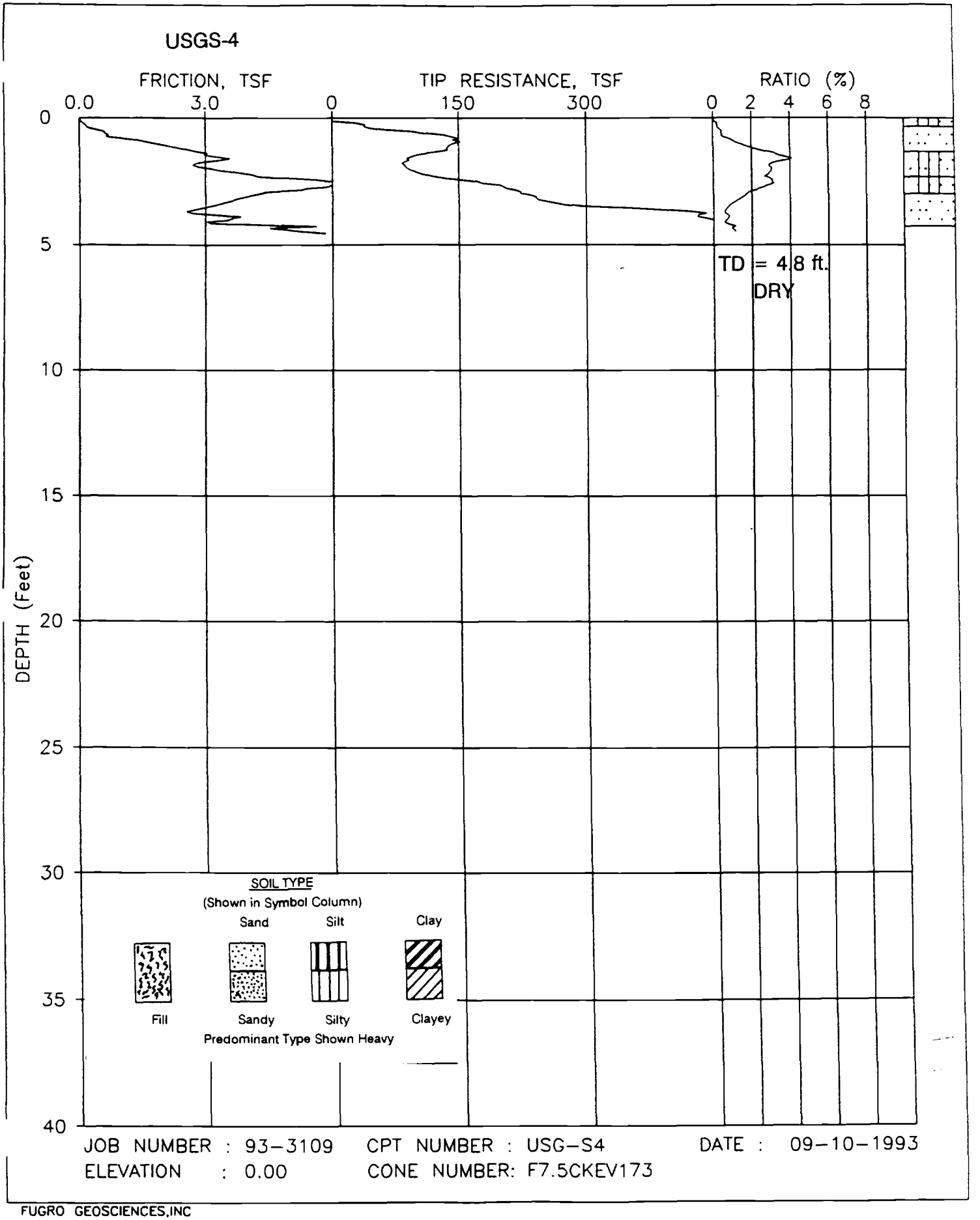
ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC



JOB NUMBER : 93-3109 CPT NUMBER : USG-S3 DATE : 09-10-1993
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

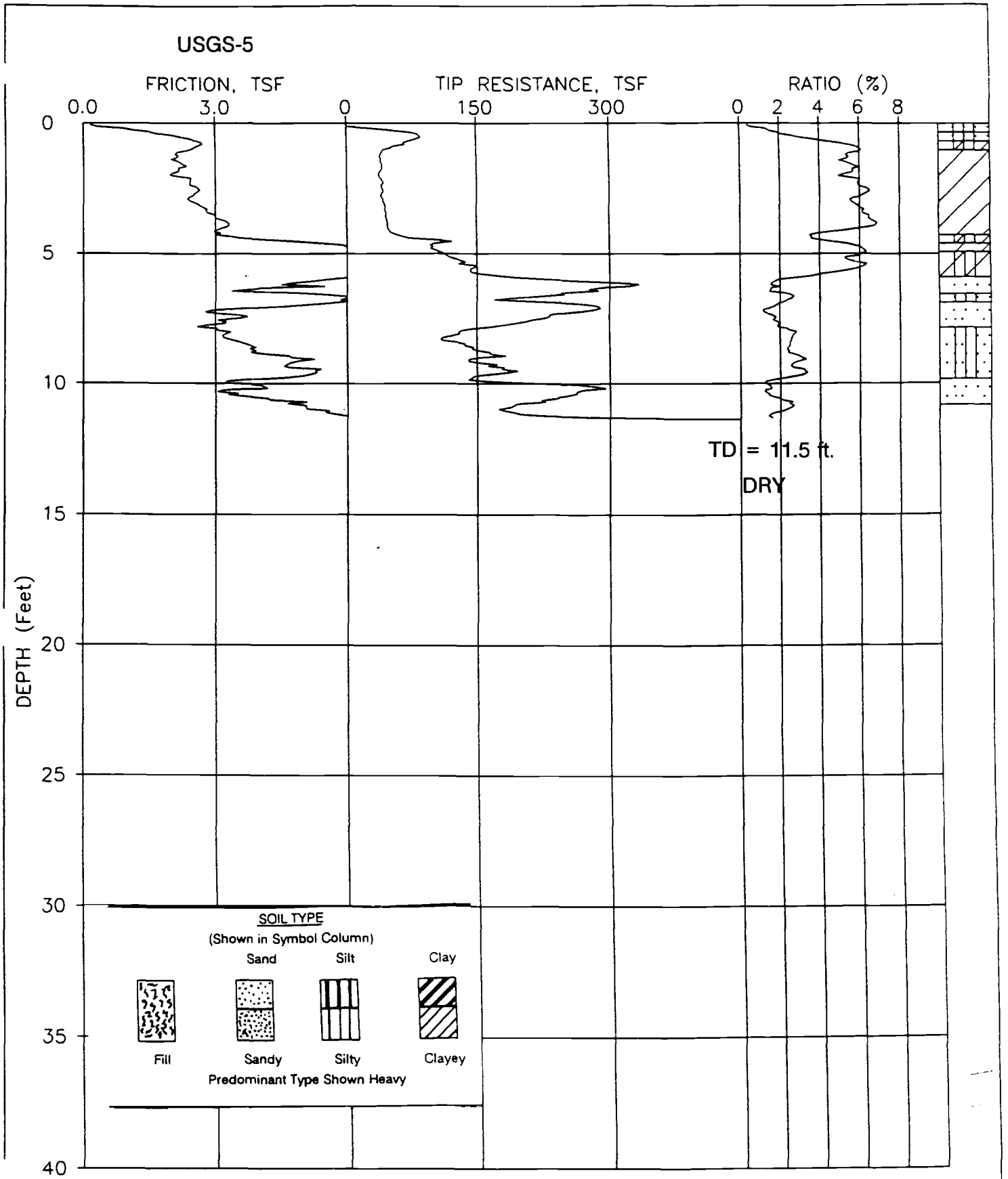
FUGRO GEOSCIENCES,INC



JOB NUMBER : 93-3109 CPT NUMBER : USG-S4 DATE : 09-10-1993
ELEVATION : 0.00 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES,INC

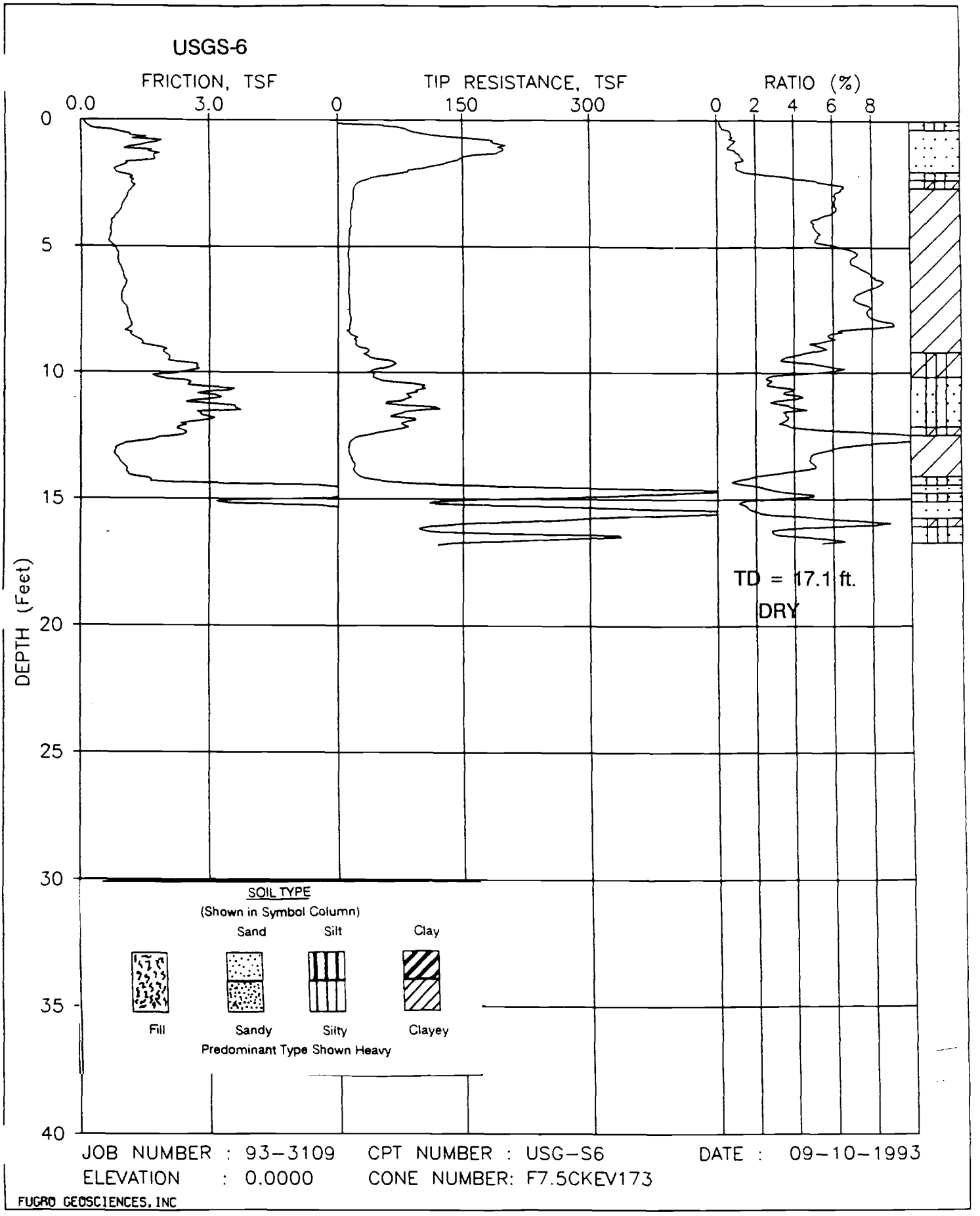
172333



JOB NUMBER : 93-3109 CPT NUMBER : USG-S5 DATE : 09-10-1993

ELEVATION : 0.0000 CONE NUMBER: F7.5CKEV173

FUGRO GEOSCIENCES, INC


USGS-6
FRICTION, TSF
0.0
3.0
TIP RESISTANCE, TSF
0
150
300
RATIO (%)
0
2
4
6
8
DEPTH (Feet)
0
5
10
15
20
25
30
35
40
TD = 17.1 ft.
DRY
SOIL TYPE
(Shown in Symbol Column)
Sand
Silt
Clay
Fill
Sandy
Silty
Clayey
Predominant Type Shown Heavy
JOB NUMBER : 93-3109
CPT NUMBER : USG-S6
DATE : 09-10-1993
ELEVATION : 0.0000
CONE NUMBER: F7.5CKEV173
FUGRO GEOSCIENCES, INC

CONTENTS

PAGE NO.	REFERENCE	DATE

Golf Course management Brooks & Baine
Superintendent Scott Peck
assistant Ricky Palacios
phone #
clubhouse 738-8402

Communications 7325
SGT WALKER

TU-ELECTRIC 336-9454

BASEOPS 782-5527
7532 or 7531

TEG (Mobile Lab)
FAX (512) 835-9297
Mobile Phone (512) 517-6573

FUGRO - JEFFREY NESS
FAX (713) 778-5501

BASE DISPOSAL AGENCY
FRANK GREY 782-9130
ALAN FLOLO (817) 282-6304

COE - FT. WORTH POC
RANDY NIEBUHR (817) 334-3223

SWDL LAB
STEPHEN BROOKS (214) 905-9130

CAFB UTILITIES (Plumbing Shop)
782-5779 (Mr Reynolds marvin Superintendent
PAM & Jeff 782-6270
FIRE Dpt 782-6339 6300
CARSWELL Golf Course (817) 738-1341
EARL UPCHURCH
RAY THOMAS
SM & P LUIS CARDOZA Beeper - 671-773 office - 595-4055

CHIEF LOFTUS 7533 ~~4160~~ ~~Security Police~~

NOTES

BARRELS OF WASTE GENERATED	DATE OF ACCUMULATION
5 Soil cuttings & 1 Decon water	7/28/93
1 DECON WATER FROM Cone Penetrometer	9/02/93

1-23-93 FRIDAY

TONY MILLS - GMI
ARRIVED AT CARSWELL AT 10:00am
MARKED SOIL BORING LOCATION
GMI - 01SB WITH 1x2"x36"
STAKE, LABELED, PAINTED FLUORESENT
ORANGE WITH YELLOW FLAGGING.

CALLED ALAN FIDLO AT 11:00 Am - LEFT
MESSAGE THAT I WOULD BE ON
GOLF COURSE ALL DAY.

MARKED GMI-01SB
-02SB, 03SB ... 05SB
IN SAME MANNER AS GMI-01SB.
Locations are marked on map and
approximate distances recorded in field
notes.

LEFT FOR LUNCH AT 12:00 Am.
BACK AT 1:00 Am

MARKED PENETROMETER LOCATIONS (Priority 1)
GMI-41S, -17S, 78S, -26S, -33S,
-32S, -39S, 40S, 51S, 50S, 24S,
25S, 12S, 08S, 05S. S designates
the "south" area.
LEFT SITE AT 4:45

July 28 1993

7:15 Am load equipment, buy supplies, transportation to Carswell AFB, Fort Worth

9:30 Tony Mills, Hubert Thompson, Bruce Moring? house Debris arrive at Carswell. Get water. Set up on soil boring location GMI 03SB. Decon station set up south of GMI 03SB. Augers deconned. Jeffrey Harvey (USAF) stopped by site to say he would check w/ Alan Flolo that all 5 sites cleared for utilities (10:55 Am) Tony Mills held safety review meeting @ 11 Am for field crew At 11:10 J. Harvey came back to confirm clearance of 5 sites

11:40 Pm Started drilling @ GMI03SB with continuous coring for sample examination.

12:05 Pm Reached 15 ft. depth. Alan Flolo arrived. Stayed a few minutes

1245 Bottomed GMI03SB @ 24.5 ft. Water encountered @ 21 ft. Pulled augers off bottom 1 ft. to allow water access

1255 LUNCH BREAK

1330 Sampled water in GMI03SB - Samples turbid and odor free. Samples collected also for COE lab QA/QC Randy Nietzke arrived at site. Samples logged on chain of custody forms. Temporary PVC casing/screen set in hole (to get static water level). Drilling and sampling equipment deconned. Moved to GMI02SB

1445 Set up on GMI02SB & started drilling (continuous core for logging)

1525 Randy Nietzke left

1600 T.D. @ 24.2 ft. with water @ 22 ft.

1610 Sampled GMI02SB - turbid. odor free

July 28 1993

1635 moved out of hole - set temporary PVC casing, deconned equipment, moved to GMI01SB and set up

1705 Started drilling GMI01SB. Not continuously cored. Sub-surface logging done from cuttings & driller's observations.

1750 T.D @ 25.ft. Water @ 19.5 ft.

1800 Sampled hole

1820 Pulled out of hole and set temporary PVC casing

1830 Moved rig to GMI04SB & set up Deconned equipment

1900 Started drilling GMI04SB - no cores. Pulled auger @ 25 ft. to change bit

2030 Hit limestone bedrock at 25.ft. No water. Set temporary PVC casing w/ screened interval 20-25 ft.

2100 Pulled out of hole. Shut equipment down for night. Drove to Plano

2300 Arrived GMI shop.

L L Delano

July 29, 1993

ARRIVED AT CARSWELL AT 1130 TONY MILLS, HUBERT THOMPSON, BRUCE MORING RIG UP FOR SOIL BORING AT GMI-05 SB. In hole AT 1150.

1240 POSSIBLE T.D. NO WATER YET. TRY TO GET 1 or 2' deeper.

1305 Pull out of HOLE. TD = 30' LINE AT 29.5

1330 H.S. THOPSON AND BRUCE MORING to cement holes. TONY MILLS to measure static water levels.

1355 GMI-03 SB FILLED IN TO 20'2" WITH 2" MUD ON PROBE.

1408 GMI-02 SB FILLED INTO 21'6" with 4" MUD on PROBE

1426 GMI-01 SB SANDED IN AT 18'4" AND DRY.

1500 MILLS CALLED FLOLO ABOUT STAGING BARRELS

1530 FLOLO CAME BY GMI-01 SB WHILE GROUTING HOLE. HE LEFT TO GET A KEY FOR DRUM STORAGE AREA. BRUCE M. AND TONY M. LOADED DRUMS WHILE HUBERT T. GETS MORE PORTLAND CEMENT.

172339

July 29, 1993

1630 FLOLO MET US AT -04SB. WENT TO GET PERMISSION TO ENTER AT MAIN GATE.

1650 LOADED LAST BARREL AND WENT TO GATE TO UNLOAD. GATE KEEPER LET US IN. FLOLO MET US AND UNLOCKED GATE. UNLOADED 5 BARRELS OF CUTTINGS AND ONE BARREL OF DECON WATER. EACH HAD yellow HAZARDOUS WASTE LABELS WITH CARSWELL AS GENERATOR, RANDY NIEBUHR AS CONTACT, phone # AND SAMPLE LOCATION NUMBERS, DATE COLLECTED, ETC.

~~1730~~

1730 CEMENTED GMI-05SB WITHOUT CASING. DEFINITE DRY HOLE.

1800 LEFT CARSWELL FOR GMI. PLANO.

Tony C. Mills

JULY 30, 1993 FRIDAY

TONY MILLS, GMI, WENT TO CARSWELL TO MARK SAMPLE LOCATIONS ON GOLF COURSE, AND NEAR FLIGHTLINE (SOUTH AREA) AND GET BASE PASS.

1110 TONY MILLS MET ALAN FLOLO, CAFBDA, FLOLO RODE W/ ME TO BLDG ~~1658~~. 1654 TCM RECEIVED A PASS FOR ME (TCM) AND WHITE VAN BV7-787. ALSO GOT ONE FOR LOUISE DELANO. BOTH HAVE "F" FOR FLIGHTLINE.

1230 TO 1300 LUNCH

1314 MARKED GMI-02S 30'S. OF ROAD. (yellow pin flags & orange paint on the grass)

-27S

1350 -34S 150'E OF CORNER
120'N OF FENCE

1354 -42S 550'E OF Same Corner
2' FROM CURB

-53S 80'W. OF FENCE
118' N. OF FENCE

ALL LOCATIONS INSIDE GATE LINE
MARKED WITH 18" OR 24" STAKES (ORANGE)

JULY 30, 93 FRIDAY (MARKING LOCATION)

1419	GME-44S	70' SE OF BLDG'S SE corner
		110' NE OF HAZMAT SHED
1430	-45S	150' FROM NE CORNER OF BLDG
		30' FROM FENCE
	-46S	305' FROM 45S / 30' FROM FENCE
		90' FROM TRAILOR
*	-47S	NO FLAGGING / NOT MARKED
*	-48S	" "
1458	-38S	28' N OF NE CORNER OF BLDG
*	-30S	ON CONCRETE NOT MARKED
1508	-37S	
1529	-29S	30' W OF BLDG 1050 (SOUTH END)
1518	-36S	
	-19S	30' E OF FENCE / 180' N OF FENCE
1550	-20S	220' N OF 19S
	-14S	40' E OF FENCE / 120' N OF ROAD
	-9S	
	-10S	
	-15S	
1645	TONY MILLS LEFT CARSWELL	

Tony C. Mills

AUGUST 02, '93 MONDAY

TONY MILLS & ROBERT WOOD
PURPOSE: MARK LOCATIONS AT SOUTH SECTION AT CARSWELL, OBTAIN BASE PASS FOR WOOD.
1000 ARRIVED ON BASE
ROBERT WOOD AND TONY MARKED AREAS ON EAST END OF GOLF COURSE WITH PIN FLAGS. WOOD CONTINUED IN THE AREA WHILE T. MILLS FINISHED IN WEST END NEAR FLIGHTLINE.

1100 FLOLO HAD WOOD'S SECURITY CLEARANCE DONE BY 1000. SENT US TO GET A PASS. JACK ? WOULD NOT OK IT UNTIL HAVING LETTER SIGNED BY SP'S. (security police) COULD NOT CALL FLOLO OR SP'S. TONY & Robert LEFT TO FIND FLOLO. MET FLOLO AT ENGINEERING. HE JUST GOT A CALL FROM JACK... SAYING HE GOT INTOUCH W/ SP'S. WENT BACK TO GET A PASS BY 1145.

172341

AUGUST 02, '93

1145 WENT TO LUNCH

1245 BACK AT CARSWELL.
TONY & ROBERT MARKED LOCATIONS ON SOUTH AREA UP TO SAMPLE NO. GMI - 78S
EXCLUDING:
11, 16, 21, 22, 23, 30, 52, 47, 48, 66, 67, 68, 13,
LOCATIONS ARE MARKED ON MAP AND MARKED ON THE GROUND WITH ORANGE PAINTED 1"x2"x24" WOOD STAKES W/ SAMPLE LOCATION NUMBER AND ORANGE OR YELLOW FLAGGING.
INSIDE GATE = WOOD STAKES
ON GOLF COURSE & HOUSING = yellow pinflag with GMI LOGO, AND SAMPLE LOCATION NUMBER
LEFT BASE AT 1730 GAVE COPY OF MAP TO FLOLO

Jay C. Miller

August 3, '93 TUESDAY

TONY MILLS ROBERT WOOD
GEO-MARINE, INC
PURPOSE MARK REST OF LOCATIONS IN SOUTH AREA & GO TO NORTH AREA IF POSSIBLE.
ARRIVED AT CARSWELL AT 1000
HAD FLAT IN DALLAS FROM 800 TO 900 AM.

TONY MILLS FINISHED WITH 16S, 13S, 66S. DECIDED NOT TO MARK 30S. GOT KEY FROM FLOLO FOR POL TANKS (66S) SAME KEY FITS THE LOX AREA (13S) MET WORKERS AT LOX. THEY ARE IN BLDG 1101 NEAR GMI-34S & 35S IF WE NEED HELP OR HAVE QUESTIONS ABOUT LOX. (LIQUID OXYGEN)

ROBERT WOOD MARKED 92 TO 98 AND 103 TO 108. TONY MILLS FOLLOWED UP WITH STAKES AND MET ROBERT TO COMPLETE 90, 91, 100, 101, 102.

1730 LEFT FOR LUNCH
CALLED GMI, TALKED TO LOUISE DELANO. ENGINEERING NEEDS TRUCK.

1430 BACK TO CARSWELL. STOPPED TO CALL BOBBY SCALF GMI. INSTRUCTED US TO COME ON TO OFFICE IN PLANO.

~~1500~~ MET LARRY DAVIS - LONE STAR GAS. HE PLANNED TO MEET US AT 1030 TOMORROW TO DRIVE OUT HIS MAIN GAS LINE.

1510 SHOWED MAP TO FLOLO OF WHAT IS MARKED AND WHAT IS NOT. SO FAR, NEED TO DO 82S TO 88S.

THOSE IN SOUTH AREA THAT WILL NOT BE SAMPLED ?? ARE 11, 23, 30, 52, 47, 48, 67, 68, 89, 99,

1500 LEFT ~~[illegible]~~ CARSWELL TO GMI

~~1545 CALLED LYLE WINNETTE AT SERVICE~~

Tony C. Mills

August 4, '93 WEDNESDAY

TONY MILLS - ROBERT WOOD (GMI)

PURPOSE: MARK LOCATIONS IN NORTH AREA, GET FLIGHTLINE TRAINING AND PASS, MEET LARRY DAVIS.

930 ARRIVED AT CARSWELL. LOOKED FOR FLOLO, NOT AVAILABLE.

945 BEGIN MARKING LOCATIONS 82S TO 88S.
- 87S CANNOT BE SAMPLED

1030 WAIT FOR LARRY DAVIS.

1040 FLOLO STOPPED BY THE GATE AND SAID TO MEET DAVIS AT 1300 TO 1330. TOOK US TO BASE OPERATIONS TOWER BLDG 1425 TO MEET ROY QUERETARO. FOUND OUT WHERE RESTRICTED AREA IS. (LOCATIONS 29N, 22N, 14N AND 07N) WILL ALLOW US TO DRIVE STAKES TODAY & TOMORROW ONLY. WILL BE CLOSED UNTIL SEPT. 5 '93. (APRON 161, 160 AND TB 182)

8-04-93

ASK QUERETARO TO GIVE ROBERT FLIGHTLINE TRAINING TODAY. DAVID ? GAVE THE TRAINING AND FLOYD WRITE A LETTER OF REQUEST AND SIGNED BY QUERETARO.
"DO NOT CROSS RED LINES IN TANKER ROW OR F-16 AREAS"
DRIVE 15 MPH. 30 IN MAIN TAXIWAYS.

1130 GOT FLIGHTLINE PASS FOR ROBERT WOOD AT BLDG 1654.

1145 LEFT FOR LUNCH

1245 MET LARRY DAVIS (LONESTAR GAS) WAITING AT GATE - WE RODE WITH HIM TO CLEAR HIS LINES. SAID HE WOULD GET ANOTHER BATTERY TO CHECK #'S 73S, 82S AND 103S. WOULD LET FLOYD KNOW TODAY OR TOMORROW

1330 AT TOWER TO ASK ROY Q ABOUT GETTING INTO RESTRICTED AREA IN THE FUTURE. SAID IF WE TALK TO HIM FIRST, HE WILL LET US GO IN W/ TRUCK TO SAMPLE & WATER

8-04-93

1330 TO 1645
MARKED LOCATIONS IN NORTH AREA. GMT - 29N, 22, 14, 07, 47, 48, 49, 01, 02, 03, 04, 05, 12, 19, 20, 21, 27, 35, 34

LEFT BASE AT 1645

TONY MILLS

August 5 '93 THURSDAY

TONY MILLS & ROBERT WOOD (GME)

PURPOSE: FINISH MARKING LOCATIONS AT NORTH AREA AT CARSWELL.

900 ARRIVED AT CARSWELL
TOOK FUGRO'S PERSONNEL INFO TO FLOLO FOR SECURITY CHECK.

915 MARKED, #26 N COULD NOT GET IN GATE TO 06 AND 13.
MARKED 28, 36, 46, 45, 44, 43, 42, 41, 40, 39, 38, 32, 32, 31.

1200 CALLED TO GET PERMISSION TO ENTER GATE NEAR LAKE TO DO 06N AND 13N. BAD MAN WAS HEADED THAT DIRECTION. MET MAINTENANCE MAN. LET US IN TO MARK 06N AN 13N. PUSH LEVER ON GATE TO OPEN IT.

1240 MARKED 24, 30, 23 AND 33

1315 GATE LEFT A COPY OF MAP ON FLOLO'S DESK AND LEFT BASE

Tony C. Mills

August 9 '93 MONDAY

PURPOSE: WATER SAMPLING W/PENETROMETER

750 TONY MILLS & LYLE WINNETTE (GME)
DENNIS STAUFFER
EMORY GRIMMETT } FUGRO
LARRY ZARATE

820 NICK MOERICKE 820 BROUGHT EQUIPMENT - GONE TO GET DECON TROUGH & BARREL

750 ALAN FLOLO - CAFBDA

840 DERHSING LUCK
PAUL SCHLEICHER
390-58-6963
S.S.B.I. INVESTIGATION

940 FUGRO DECON UNIT ARRIVES. W/HORSE TROUGH AND BARRELS.

950 FUGRO READY TO BEGIN

1005 AT SITE GME - 03SB FOR CPT TEST & WATER SAMPLE
TD 23. @ 1030
HIT WATER

AUG 9, '93

LOCATION	TIME ON LOCATION	CPT TIME ~~FINISH~~ ON BOTTOM	SAMPLE TIME ~~AT BOTTOM~~	DEPTH	STATIC WATER LEVEL ~~WATER SAMPLE~~ 22.5? ~~yes/yes~~
GMI-03SB2	1005	1030	1150	23'	
GMI-04SB	~~1315~~ ~~215~~	~~1355~~ ~~1245~~	TO SAMPLE RUN	22'	NONE
GMI-02S	1415/	1445	NA TRIED SAMPLER 1620 8-10	13.2'	SLIGHTLY WET USED TUBING 11.33 FGL
GMI-08S	1543/	1606	NO SAMPLER RUN	22.47'	DRY HOLE NO TUBING
GMI-12S	1625/	1650	TRIED SAMPLER 17:28	16.8'	USED TUBING 14.25 BGL 8-10-93 1630

1640 ALAN FLOLO BROUGHT MAP FOR FUGRO. AND GOT SS # FOR EMERY Grimmett 463-57-0066

1700 HNU > 20 PPM IN HOLE AT GMI-12S

1740 TOOK DENNIS TO DECON AREA TO GET RITUBING. TOOK TUBING TO GMI-04SB WHERE FUGRO WAS WAITING.

1815 FUGRO BACK AT DECON AREA OUT OF GAS W/ Grout pump. WERE NOT USING TREMIE PIPE AT -04SB.

1820 TONY & LYLE LEFT SITE. FUGRO STAYING TO GROUT THE 3 HOLES WITH VOLCLAY.

Tony C. Mills

1045 LYLE WENT TO GET FUGRO MEN W/ SAMPLER

1030 TB809C FOR CORP LAB

1040 TB809 FOR TEG

1010 RB809C FOR CORP LAB
RB809 FOR TEG

LEFT GMI-03SB AT 1215 FOR LUNCH. ARRIVED AT GMI-04SB

~~1215~~ BACK FROM LUNCH

1315 TCM CALIBRATED EXPLOSIMETER.

1515 ALAN FLOLO AND LEWIS CARDOZA (SWBECC) came by meet LEWIS 8:00 WEDNESDAY. (2HRS)

1525 RIG DOWN / PUT PIPE IN HOLE -02S

1543 Arrived @ GMI 08S (NO WATER)
FLOLO SETUP FLIGTLINE TRAINING AND PASSES FOR TEG & FUGRO. WHILE TONY MILLS MEETS WITH LUIS CARDOZA AND HOPEFULLY WATER/SEWER/ELECTRIC. 8:00 WED.

1750 TO 1800 Fugro grout to LES

172345

8-10-93

	T O FF LOCATION	CPT Time / SAMPLE Time	DEPTH	STATIC WATER LEVEL	CASING / GROUTED in SAMPLE HOLE
GMI-18S	910 / 1045	935 / 1050	16.8' 12.1	11.75 at 1010 / 11.8 at 1317 8-11	yes
GMI-26S	1050 / 1210	1110 / 1200	14.4	7.35 at 1230 / 7.35 at 1320 8-11	yes

GMI 18S - SAMPLED in open hole in water sampler hole because CPT hole caved in. Sampler hole not deep enough for casing at the time so used open hole - not good samples - may have volatilized somewhat. Put casing in for a static water level

1125 GMI-26S used sampler in CPT hole. SAMPLER STOPPED 6" ABOVE CPT depth. Water in hole but not in SAMPLER.

1155 put screen in hole. SAMPLED WATER FROM screen

GMI-25S	1235 / 1300	1250 / 1300	12.7		yes
	water taken above SAND?				
GMI-24S	1310?		11.5?	DRY	no / yes
GMI-33S	1410 / 1425	1420	11.0	DRY	no
GMI-32S	1430 / 1500	1450 None	7.4'	DRY	no
GMI-41S	1505 / 1525	HIT something AT 4' (waterpipe?)		NO HOLE	
GMI-63S	1530 / 1650	1555 / 1650	23.5'	14.4' to mud	yes TO [illegible]

Tony C. Mills
8-10-93

August 10, '93 TUESDAY

8:00 Tony Mills GMI ARRIVED ON SITE
DENNIS STAUFFER & Emery Grimmett (Fugro) were here. Luu - TEG CAME BY. SAID D.I. WATER HAD 6 or 7 ppb chloroform. He bought new water. Luu also is set up w/electric at BLDG 1215.

8:25 Drive in To 1215 TO HAVE SAFETY MEETING AT LAB. FLOLO WAS THERE. WILL TAKE TEG MEN TO GET A BASE PASS THIS AM. WILL TAKE FUGRO TOMORROW HAD SAFETY MEETING

900 FUGRO TO SET up ON GMI-18S
Tony Mills CALL LYLE WINNETTE. DENNIS STAUFFER MENTIONED USING SCREEN & RISER ON EACH HOLE THAT HAS WATER AND SAMPLING FROM THAT. Decon screen and use it again.

6ppm
<2ppm
1.5ppm
<2ppm

LYLE SAID TALK TO Luu about chain of custody. & Do water sampling like yesterday. Get daily billing sheet from Fugro & TEG. Collect rinsate from PVC pipe.

17234

8-10-93

935 HIT WATER AT 18S W/CPT. DISCUSSED GETTING WATER SAMPLE W/ Dennis's WE WILL USE WATERSAMPLER AND PUNCH A NEW HOLE. TAKES TIME TO SWITCH OUT. "FASTER TO DO ALL CPT'S THEN WATER SAMPLE LATER.

955 TRIED TO calibrate HNU ... OUT OF isobutylene

1040 LARRY ZARATE (FUGRO) SHOWED UP ON SITE - CAR WOULD NOT START?

1200 TONY DROVE WITH DENNIS ON GOLF COURSE TO DECIDE WHERE TO DRIVE IN AND WHAT ROUTE TO TAKE.

1230 MEASURED WATER LEVEL AT 26S - 7.35' BGL

1240 measured STATIC WL AT 02S @ 11.33' BGL DID NOT SAMPLE BECAUSE NEEDED BAILER TO Be Decontaminated.

1345 ~~02S~~ 6.47' BGL water level

1620 02S TOOK water sample GMI-02S

1630 GMI-12S STATIC 14.25' BGL

1510 TOOK Rinsate Blank & Trip blank RB81093 and TB81093

1650 LUU (TEG) picked up 2 samples and QC. Will leave at 1800 to catch plane.

1710 ~~TCM Call Life~~. TCM TALK TO LUU about chain of custody

1730 STAKED HOLES.

1745 GET DASH FROM DENNIS

1815 LEFT SITE, FUGRO GROUTING.

8-10-93

1300 Randy Niebuhr - COE came by talked to him about methods of punching holes, using PVC sampling, etc.

He is in agreement w/ using same CPT hole for sampler hole. ALSO OK TO use clean (new) PVC to take samples from. Can use Deconned PVC for static water level but not for sampling.

1530 RANDY LEFT SITE.

Tony C. Mills

172343

8-11-93	Time of Pump Shutoff	Time of Sample Pump	Depth	Static Water Level	Casing Grouted
GMI-60S	1110 / 1305	1135 / 1250	19.2	11.55 BGL	yes / yes
GMI-50S	1310 / 1340	NA	7.2	NA	no / yes
GMI-61S	1340 / 1450	1350 / 1422	14.0	11.55 BGL	yes /
duplicate	GMI-61D	1505	"	"	"
GMI-62S	1455 / 1550	1515 / 1525	11.2	9.4 BGL 1535 / 9.45 @ 1730	no / yes
GMI-51S	1550 / 1615	1610 / 1628	13.7	11.6 BGL	yes
GMI-51SC AT 1628 FOR COE LAB					
GMI-40S	1615 / 1645		7'	NA	no / yes
GMI-71S	1650 / 1720			NA DRY	no

1530? Paul SCHLEICHER - TEG picked up 4 samples
1525 check SWL at 63S - 14.4 to mud / no water
1628 GMI - 51SC FOR COE LAB
1615 TRIPBLANK FOR COE LAB TB81193C
1650 Kyle left site with 3 COE SAMPLES.
1730 Tried to sample GMI - 71S / DRY
1740 Decomned sampler & water level tester
1735 Test SWL @ GMI - 62S @ 9.45 BGL
1745 Take samples to TEG LAB.
1800 Left Page TCM.

Tony C. Mills

8-11-93 WEDNESDAY

HNU

<1ppm

<1ppm

<1ppm

805 TONY MILLS GMI ARRIVED AT Crawford
DENNIS STAUFFER, EMERY GRIMMETT, LARRY CARR
OF FUGRO were here.
815 CALLED LYLE WINNETTE (GMI)
CALLED FOR ALAN FLOCO RE: FLOWLINE
TRAINING - FUGRO Could not get in
touch with him.
850 TONY MILLS Rode with LUIS CARDOZA
(SW. BELL)
910 FUGRO WAS NOT NEAR TRUCK -
must BE w/ FLOCO.
1050 Tony Mills CAME BACK TO GET
MORE HOLES PUNCHED WILL MEET
LUIS CARDOZA LATER IN THE WEEK
IF HE HAS PROBLEMS.
1120 RB81193
1130 RB81193C
1155 calibrate HNU
GMI-60S HAVE some water above the
clay on bottom. TD 19.2. WATER
30' min) have lunch & sample at
~~12 45~~ 1250 pulled sampler up to 16.07 ft BGL
1330 Randy NIEBUHR CAME BY (COE)

Tony C. Mills

172349

8-12-93 THURSDAY

805 Tony Mills (GMI) ARRIVED. Fuchs

810 Tony Mills TO SEE PLAN FLOLO. FLOLO CALLED COMMUNICATIONS. THEY SAID THEY WOULD CHECK THE MANHOLES ETC NEAR LOCATION 3 AND 46. Copied AMBR.

840 RETURNED TO #72S where Fuchs HAD water SAMPLER PENETRATING

910 HOSE BROKE ON DECON 4 & 17

915 Calibrate HNU

900 TB81293 TRIP BLANK FOR TEGLAB

940 RB81293 Rinsate from GMI teflon bailer

1050 Paul Schleicher picked up 3 samples will bring ice. SAID there is an unknown spike in all of yesterday's samples, TB's, RB's. Could not be the preservative he says.

1150 TALK TO FLOLO before STARTING ON FLIGHTLINE Communication is clear. MAY BE PROBLEM WITH ELECTRIC AT 46S near transformers. Call Steve (FLOLO will). ALSO Comm person & Steve needs to be present at 66S. FLOLO will contact them.

1210 TAKE RIG INSIDE GATE TO WEST LOCATIONS. GMI 01S has no flagging (red white blue) indicating - not OK.

8-12-93

	Time on Location	CPT Time	DEPTH (ft)	Water Sample	Sample time	Time of Location	STATIC WATER	Screen used	HNU	Gravity
GMI-72S	810	820	13.6	yes	855	905				
GMI-70S	910	930	14.5 ~~19.2~~	no	open 950	940			3	
GMI-17S	950	1010	10.6	NO	NA	1020		NO	<1	
GMI-05S	1025	1045	15.6	yes	screen 1135	1140		(new) yes	<2	
FLIGHTLINE										
GMI-04S	1220	1240	25	NO	screen 1300	1305	19.7	(new) yes	<.2	
-03S	1305		22.5	NO	—	1425		NO	<.2	
GMI-06S	1425	1500	25.7	no	screen 1510	1505	20.63	(new) yes	2	
GMI-07S	1510	1525	18.3	NO	dry	1540		NO	<.2	
-10S	1545	1600	24	NO	dry	1610		NO	<.2	
GMI-09S	1610	1635	24.2	NO	screen 1650	1655	20.55	(new) yes	3	
8-13-93 FRIDAY										
GMI-19S	820	830	13.9	No	dry	845		no		(FILL MATERIAL?)
GMI-14S	845	905	22.7	no	920	923	17.95	yes	4	
GMI-15S	925	955	18	no	dry	1010		no		
GMI-16S	1010	1030	23	yes	1100	1125	18.9	yes	3	
duplicate GMI-16D										
~~GMI-22S~~	~~1125~~	~~1150~~	~~22.5~~		~~1200~~	~~1200~~				TCM
GMI-22S	1125	1150	22.5	no	screen 1200	~~1200~~	19.15	(new) yes	50 to 80	HAS OILY SUBSTANCE IN HOLE.
duplicate SWDC GMI-22SD										19 ly - petroleum odor w/ specks of oil/black sands like petroleum high sediments.
GMI-20S	1200		20	no	1340	1345	12.80	(new) yes	6	
GMI-29S	1345	~~1330~~	4	no	—	1405		no	2	no hole
GMI-28S	1405	1430	22.8	no	screen 1450		12.55	(new) yes	8 to 12	oily like the previous

Tony C. Mills

1215 to 1245 Lunch

1350 call Lyle about concentration map for TEG & about Surfer. Randy wants us to clean the CPT probe each time.

1430 measure SWL @ 60S = 11.55 BGL
" @ 61S = 11.55 BGL
" @ 51S = 11.6 BGL

1500 Paul Schleicher was by for 1 sample. Had taken 1 around noon also.

1700 Pulled truck to Decon area. Fugro will begin grouting holes. Tony Mills will copy map for Paul and take 3 samples to Hm. 1

1825 Tony Mills (GMI) left base

Tony C Mills
8-12-93

8-13-93 Friday

SAMPLE INFO ON PREVIOUS PAGE

740 Tony Mills arrived on base at Flolo's office. Tried to call Lyle. Met Dennis Stauffer & Emery Grimmett at truck @ 755. Larry not here

820 on first location # GMI-19S.

840 Rinsate from GMI bailer RB81393

855 Calibrate HNU

905 Flolo came by and said 46S is clear w/ electrical. Larry Zarate (Fugro showed up at Decon area)

930 to 940 Went to pick up Decon equip from truck. Downtime.

945 Trip blank TB81393

1010 Took 2 samples to Paul (TEG). Pickup DI water & TCE concentration maps.

1045 measured SWL @ GMI-04S @ 19.7' BGL

1055 Flolo came by - said base utilities OK'D # 13S (LOX) & # 28S. However # 01S is not OK since they had no map for it.

1130 Drive to Decon area to pickup deconned pipe for 16S.

1140 measured SWL @ 14S @ 17.95' BGL
@ 09S @ 20.55' BGL
@ 06S @ 20.63' BGL

172351

1200 COE LAB SAMPLE GMI-22SC
1230 TB81393C FOR COE LAB
1250 CACEOLYCE
1330 DECON BAILER & TOOK RINSATE
RB81393C FOR COE LAB
1340 SAMPLED GMI-20S HAS petroleum
~~1215 TO 12~~ FUGRO HAD LUNCH 1200 TO 1230
1510 TOOK SAMPLES TO TEG AND LEFT
BASE TO TAKE SAMPLES TO COE LAB.
FUGRO - grout holes and Decon

Tony C. Mills

August 16, 1995 | [illegible]

TONY MILLS ARRIVED 850. DENNIS
STAUFFER & EMERY GRIMMETT (FUGRO)
HERE AT 7:00. 2 HRS STANDBY.
905 ARRIVED AT LOCATION # GMI-36S.
calibrated HNU
930 Rinsate Blank RB81693
950 TOOK SAMPLE (AVIAL) GMI-36S
1005 Trip Blank TB81693
~~1020~~ 1040 ~~WHEN~~ TO CALLED MR
REYNOLDS AT PLUMBING SHOP.
LEFT MESSAGE THAT WE NEED
UTILITIES CLEARED FOR THIS
AFTERNOON.
1200 LEFT FOR LUNCH
1245 BACK TO GMI-37S
1510 Tony Mills drove to see if LOCATIONS
outside of flightline area are
clear of utilities. none were flagged.
AT 1335 TONY Mills MET A MAINTENANCE
MAN TO ENTER LOX (liquid oxygen)
area. RANDY NIEBUHR WAS
THERE AT LOX
1510 RANDY LEFT SITE. Tony Mills
CALLED SW. BELL'S LOCATOR
SM & P TO GET THEM OUT HERE
for digging permit. Operator/Secretary
said he was on base.

172352

8-16-93

So Tony Mills drove to find him (them). Pat Pam and Jeff with Plumbing Shop. They had been marking areas and found Sm's P (Lots) - I Mills, HAD TM TO LOOK AT LOCATIONS TO SEE which was done and directed GMB altitude Pam & Jeff to mark where Sm's Provided.

1530 Mills called Lyle Wannette about SITUATION AND DISCUSSED pricing. ALSO NEED TO TAKE DUPLICATE OF RINSATE FOR COE EACH DAY.

Mills ASKED Fuerte to Grout holes and measure Static water level in Friday holes and grout all that needed it.

1630 Mills had been driving around which Sm's P truck parked by golf course but could not find the man. So TCM drove marker stakes at locations near the gate.

~1800 Dennis S. was back with pipe tube decorned and Emery was back with grouting unit which was not working properly. Paul came to get last samples.

1735 called Sm's P. They said Paul & Ide meet me at gate and I showed him some of the hussad. However, he and his partner had been doing

8-16-93

	Time Water Taken	Depth (ft)	Water Level Sample Time	Time Water Level Sample Taken	Sample Water Level	Screen Sample (ppm)	Glass 20	Sample
GMII-36S	905 910	16	NO	950	1005	16.44 (new) yes	900	1S sample 40 min
GMII-35S	1005	HIT FILL 4'	NA	NA	1020	NA	NO	40	hit fill
GMII-44S	1020	FILL 3'	NA	NA	1040	NA	NO	10	hit fill
GMII-45S	1040	15'	NA	NA	1055	NA	NO	10	hit fill
GMII-46S	1100	3'	NA	NA	1109	NA	NO	5	"
GMII-38S	1110	14	NO	1145	1200	10.23 (new) yes		20	
GMII-37S	1251	23	no	1320		19.88 new yes		10	
GMII-13S	1325	7.5	NO	NA	1410	NA	no	15	hit fill?
GMII-01S	1420	20.5	no	1500	1505	19.10	yes	2	

8-17-93 (TIMES ARE CLOSE TO ACTUAL)

GMII-54S	740	800	28.3	no	935 (back)	810	18.8 (new) yes	5		
GMII-53S	820	835	10.5	no		845	dry	no	10	
-42S	848	900	13.5	no	920	910	8.24 (new) yes	3		
~~54S G~~										
-34S	930	945	17'	no	1005	1002	14.3 (new) yes	3		not much water so waited for sample
duplicate GMII-~~35D~~ 34 FOR TEG										
duplicate for COE GMII-~~35S~~ 34 C										
-27S	1010	A'	no	~~dry~~ 1710	1035	13.5	(new) yes	<2		deep enough?
-56S	1045	1110	26.2	no	1130	1122	15.8 (new) yes	9		
-55S	1126	1532	21.5	1245 yes	1330		15.83 (new) yes	4	1	105 Bailer 245 TO 400 DID NOT PUNCH
-65S	1400					1420				
-74S	1425	1455	12.7	no	1525	1515	10.5 (new) yes	<2		
-73S	1515	1532	17.5	no	1550	1542	11.85 (new) yes	<2		

8-16-93 Monday

Done, but not where the CAFB people had been. So, we made sure enough were done for tomorrow and Luis stayed one more hour and planned to come 7:00 am to do more... also with CAFB simultaneously.

~~1845~~ 1745 Tony Mills called Kyle Grimmett about good news. He will come out WED. when Randy and Debbie F. with COE come out.

1745 or 1730 Dennis AND Emery with Fugro leave to get tools for grout machine etc. Be back tomorrow 7 to 730 AM.

1800 TOM FINISHED DRIVING STAKES on golf course AREA. - Gone TO MOTEL at 1830 or 1845.

Tony C. Mills

8-17-93 Tuesday

730 TONY MILLS ARRIVED ON SITE (FUGRO) DENNIS STAUFFER EMERY Grimmett LARRY ZARATE ALL HERE. Moved to FIRST LOCATION GMT-54S at 735.

800 TOOK RINSATE BLANKS RB81793 FOR TEG
RB81793C FOR SWDL

830 CALIBRATE HNU

910 TB81793C Trip Blank FOR SWDL

925 TB81793 " FOR TEG

910 TO 930 DENNIS MADE PHONE CALL. EMERY helped decon bailer Stake water sample.

TODAY TONY MILLS IS KEEPING MORE ACCURATE TIME OF SCREEN SETTING, TIME ON & OFF LOCATION WATER SAMPLE TIME ETC.

1020 JEFF PAM CAFB PLUMBING SHOP CAME BY AMS SAID ALL IS CLEAR WEST OF ROGNER EXCEPT

49, 78, 69

1025 Gone to check corner of HAILE & HOBBY SHOP TO check water/sewer/gas. Decided not to sample at 43

LUNCH 1210 TO 1245

1305 can 78 be moved? 88 is not marked (flagged CAFB) 59 not flagged. 82 also (CAFB) 58, 94

122354

1400 to 420 Looked for pipelines Decided not to try 65S even though BASE UTILITIES & SW Bell cleared it. MAY BE JP-4?

1420 TO 1455 Tony Mills LOOKED FOR CLEARED LOCATIONS. FOUND NONE. Called SM&P. Luis Cardoza will be here as soon as He is FINISHED.

1455 TO 1510 FUGRO UNLOADED BENSEAL GROUT AND PIPE.

1515 finish drilling on -74S AND -73S.

1600 FUGRO FINISH CPT & water sampling. Emery had to go to Houston. Doing from Houston brought Benseal and picked up Emery. Dennis will grout holes. Tony Mills will take samples to calib & measure SWL in Monday's holes.

1626 SWL IN GMI -36S @ 16.44 BGL
1631 -37S @ 13.88 BGL
1635 -38S @ 10.23 BGL
1642 -01S @ 19.1 BGL
1658 27S @ 13.5 BGL
1710 Sampled hole GMI -27S
1710 TO 1730 Decon BAILERS
1720 PAUL CAME AND PICKED UP Rest of Samples.
1800 DENNIS S. (Fugro) left site
1817 TC Mills checked SM&P MARKINGS. MISSED 57, 58, 59, 82, 83
1830 TONY MILLS STOPPED AT LAB TO GET Prelim. Reports & MAPS. LEFT BASE AT 1945.

8-18-93 WEDNESDAY

725 TONY MILLS (GMI) ARRIVED. DENNIS STAUFFER (FUGRO) HERE. NICK MOERICKE CAME AT 730. 457-87-1204
730 CALIBRATED HNu
740 SAFETY MEETING
800 ON LOCATION NUMBER -76S
810 GET FLOLO AND WORK OUT UTILITIES WITH BASE & SM&P
88 OK 82
94 - leaky pipe?
checking 58, 54, 94, 78

LOIS (SM&P) SHOULD BE OUT HERE.
845 BACK TO 76S. FUGRO Ready to water sample. Lois came by; talked ABOUT which ones I need him to do.
900 Rinsate Blank for COE SWDL RB81893C
TEG RB81893
905 water sample GMI -76S
930 Trip Blank TB81893
9[illegible] LUIS SAID ALL IS CLEAR W/ SW BELL EXCEPT 82. TOLD HIM NOT TO DO 49. He SAID STAY 18" either side of his line where it is marked.
1140 Trip Blank TB81893C for SWDL
1145 NICK LEFT TO GET PARTS FOR CORE TRUCK
1145 TO 1200 Dennis helped me sample 85S while truck is on 86S.

172855

8-18

1210 Gone to Lunch. BACK AT 1300 DROVE TO LAB DELIVERED SAMPLES AND BACK AT CONTRACTOR BY 1325. NICK PULLED up w/ Repaired PHOT (CAGE).

1330 BEGIN PUNCHING. LYLE WINNETTE, LOUISE DELANO (GMI) / RANDY NEBOR, DEBBIE ~~FITZGERALD~~ FITZGERALD (COE)

1505 TO 1520 TONY MILLS TALK TO FLOYD ABOUT GETTING CLEARANCE FOR NORTH AREA. Dennis called ORDER FOR PVC.

1630 FUGRO SHUT DOWN DRILLING. START DOWN GRADE. T.C. Mills measure STATIC WATER LEVEL AT MONDAY HOLES.

1730 TAKE LAST SAMPLE TO LAB.

1535 T. Mills TOOK SWDL SAMPLES (2) + 2 RINSATE BLANKS AND 1 TRIP BLANK TO LYLE WINNETTE TO TAKE TO SWD LAB TOMORROW.

1800 TONY MILLS LEFT BASE TALK TO LYLE.

Tony C. Mills

8-18-93

	Time Collected	QT Time	Depth (ft)	Water Standing Level	Sample Time	Time Pumped	SWL Standing Level	Water Level	Flow Rate	Flow Test	Remarks
GMI-76S	800	?	15.5	no	905	?	7.64	new yes	<1 PM	✓	Gray color, smell like fuel
GMI-75S	908		150	no	940	930	7.8	new yes	15	✓	
GMI-83S	940	955	17.0	no	1015	1005	10.3	new yes	400	✓	diesel fuel smells
GMI-84S	1023	1042	16.5	no	1100	1049	10.7	new yes	60	✓	SLIGHT ODOR GRAY, SILTY
GMI-85S	1100	1115	17.0	no	1140	1120	7.7	new yes	29	✓	25 no odor Brown, Silty
GMI-86S	1125	1145 1365TM	12.5	no	1405	1400	7.0	new yes	9	✓	"
Dup. GMI-85D		?			GMI-85SC						for SWDL
GMI-77S	1405	1415	16.5	no	1430	1425	8.73	new yes	5	✓	BROWN SILTY
GMI-78S	1455	1453	14.1	no	1530	1505	9.3	new yes	<1	✓	no odor
GMI-88S	1550 ?		7	no	1605	1610	5.3	new yes	5	✓	↓
8/19/93											
GMI-60S	900		19	NA	1035		6.6	new yes	5	✓	FUGRO STANDBY TIME 1010 TO 1045 = 35 MIN
GMI-58S	950		17.8	no	1025 1030	1047	7.06	new yes	<1	✓	GRAY SILTY NO ODOR
GMI-57S	1050	1110	26	no	1215	1120	11.58	new yes	40	✓	FUGRO STANDBY TIME 1150 TO 1230 40 min
GMI-59S			6.5	no	1205	1150	1.0	new yes	3	✓	
GMI-94S	1355		15.2	no	1425	1410	11.18	new yes	3	✓	[illegible]
GMI-95S	1415		14.1	no	1450	1410	15.28	new yes	20	✓	SLIGHTLY [illegible] NO ODOR
8-19-93											
GMI-03N	1530		14.3 15	no	NA	1600		no	<.2	✓	DRY
GMI-02N	1605	1620	12	yes 8/20-93 no	NA	1632		no	<.2	✓	DRY
GMI-01N	1635	1705	12.5	no	1720	1715	7.18	new yes	<.2	✓	Orange Brown Silty NO ODOR
SWDL Duplicate GMI-01NC											dark red brown NO ODOR
GMI-04N	1720		9	no	1750		5.5	new yes	2	✓	
TEB Duplicate GMI-04D											

7-P 93 THURSDAY

730 Tony Mills (GMI) and Dennis Stauffer, Nick Moericke (Fugro) on site.

730 to 830 Fugro did maintenance on truck.

730 to 830 Tony Mills rode with Luis Cord (SM, P) and talked to Flolo and Jeff & Pam (CAFB utilities) about clearing 66, 57, 58, 59, also discussed North Area. Flolo called Queretaro about flightline training for Nick P.

830 Fugro pulled truck to -66S. Waited for Pam & Jeff.

845 -66S is clear 57 & 58 clear parking lot is clear

915 Tony Mills left to make calls & talk to fuels - Ron Allen; sites in parking lot. Electric maint. back at 1000

930 T Mills called Lyle. BTEX is good analysis for JP-4. Sample volume remains at 80 ml.

941 Moved Fugro to -58S.

950 Called at: HNU

1000 Rosate blanks RB81993C for SVOL
RB81993 for TEG

1020 Trip blank - TB81993 for TEG

1045 Tony Mills gone to talk to electric maintenance about clearance in parking lot.

1057 Paul picked up 3 samples

1115 Take Nick to get flightline pass

1200 Back from getting pass

1205 Sample GMI-59S

1230 Finished sampling -59S and -57S
Fugro gone to lunch - back 1330

1343 Tony Mills back on site. Got to 94S

1500 Drive to North Area dropoff samples at LBB.

1530 Pull on to GMI-03N & Delon Cone.

1545 Begin pushing penetrometer.

1800 Finished punching holes at GMI-04N. Begin measuring static water level (SWL) and grout holes.

1900 Quit work

1918 Left site - T Mills & Fugro

Tony C. Mills
8-20-93

17235

8-23 Friday

710 Tony Mills arrived on Base.

750 Rinsate Blanks RB82093C for SWDL
RB82093 for TEG

750 Dennis Stauffer arrived on north side of base. Nick Moericke " " @ 8:00

807 Fugro set up on GMI-02N again to try Fugro water sampler. Tony Mills go to Fromm Gate to meet Luis w/ SM & P.

845 T. Mills arrived back at GMI-02N. Water sampler did not produce at 11', 10 off.

905 Pulled sampler. Bridged off at 4'. No water

910 SWL @ -01N @ 7.48' BGL

940 Trip Blank TB82093 for TEG

1100 GMI-19N bridged off @ 7'. 1" PVC would not go down.

1205 Take off for lunch. Back 1305

1306 Set up at GMI-21N

* 1330 To 1350 water sample time - no sample (dry hole)

1418 hole caved in at -27N. Will try dummy tip with water damping tube and set screen via water sampler to preclude sand sloughoff. Wait for decon steel pipe.

1500 Fugro back w/ pipe & continue punching dummy tip at -27N. 30 min standby?

1500 Pull pipe until 1520. Pull off 1530

1535 to 1545 - Standby Fix Rig Rods.

8-20-93

	Time to Location	Cattit	Depth (ft)	Used Fugro Water Sa	Time of Sample	Time off Location	Start Water	Screen Used (PVC)	Hnu in Hole (ppm)	Grouted	Characteristics
GMI-05N	920	945	16.2	no	1000	1054	5.7 58	(new) yes	6		Reddish Brown sandy with no odor
GMI-12N	1005	1020	9.4	no		1030		no			Dry?
GMI-19N	1035	1045 1055	19.0	no		1120		no	55		Dry Bridged off
GMI-20N	1125	1135	19.2	no	1200	1150	14.75	(new) yes	1500		Same Rubble Bri Silty water No odor
* GMI-21N	1310	1325	18.2	no	*	1330	13.2 NA	no	<1		Dry (time on core)
GMI-27N	1350	1410	19.0	dummy yes	1535	1520	12.2	(new) yes	<1		Sample Time = 40 Standby = 40
GMI-35N	1545	1600	17	no	1617	1610	10.8	(new) yes	<1		Same water tapered down
GMI-34N	1620		2	NO	HOLE						
GMI-26N	1638	1700	19.4	no	1715	1710	12.85	(new) yes			some reddish brown water no odor

Tony C. Mills

8-23-93

GMI-47N	1010		26.5			1095	23.5	(new) yes		✓	Hole caved in - wait before sample
GMI-48N	1055	1108	14.0	no	1120	1115	9.94	(new) yes	<1	✓	Lt. Grey Tan fine sand
GMI-49N	1130	1145	19.0	(dummy) yes	1335	1330	12.35	(new) yes	<1	✓	Same bridged off on 1st run. Same water
GMI-47N	1340		26.5	(dummy) yes	1435	1425	23.5	yes	180	✓	Lt Brown silty water no odor
GMI-47NC				SWDL			Sample				
GMI-29N			23.0	no	1545		18.16	(new) yes	<1	✓	"
GMI-22N			22.3	no					4	✓	1st Run = Dry
GMI-14N	1645	1705	28.4	(dummy) yes	1820	1815	19.15 19.15	(new) yes	<1	✓	Brown fine silty water no odor
decon time 1715 to 1740 / water sample 1740 to 1820											
GMI-07N	1820	1839	29.6	dummy yes	1935	1930	7.55 7.4	new yes	10	✓	
water sample w/ dummy tip								yes	1845 to 1945		

Duplicate GMI-07D for TEG

Tony C. Mills

1723

8-22-93 0 23 13

FLOLO DROUGHT DIGGING PERMITS APPROX. 1500.

1730 FINISHED AT GMI-26.
FUGRO GROUT HOLES & DECON PVC
WHILE TONY MILLS measures
STATIC WATER LEVEL (SWL)
1830 Tony Mills LEFT BASE.

8-23-93 Monday

8:00 Tony Mills (GMI) ARRIVED ON BASE
DENNIS STAUFFER & NICK MOERICKE (FUGRO)
8:15 ENTERED GATE. TALKED TO FLOLO
ABOUT MEETING Roy Queretaro AND
UTILITIES.
830 DROVE TO WEST END OF NORTH
AREA. STAKES NEED TO BE MOVED.
WILL CALL BASE PLUMBING SHOP.
900 CALLED BASE PLUMBING; WILL MEET ME
AT GMI - 47 N - 49 N
910 BASE PLUMBING cleared 47-49 AND
CALLED fuels & electric.
945 Tony Mills staked behind blast.
fence again, while plumbing were
there (JEFF, HERNANDEZ). ALL is clear
with fuels & electric. Also got clearance
1030 ARRIVED AT 47N WHERE FUGRO IS READY
TO PUNCH.

1040 Rinsate Blanks RB 82393C for SWDL
RB 82393 for TEG
1130 Calibrate HNu
1140 Trip Blank TB82393 for TEG
1200 H GMI 49 N CAVED IN AT 11'. TOOK
OFF FOR LUNCH. WILL USE DUMMY TIP.

1325 MILLS AND WINNETTE BACK AT
LOCATION - 49 N. FUGRO HAS PVC
IN HOLE AFTER DUMMY TIP.
1445 TRIP BLANK TB82393C FOR SWDL
1540 BACK TO 29N. FUGRO HAD PIPE
in hole, took sample
1550 Tony Mills mailed SWDL samples
1957 FUGRO PULLED OFF SITE TO PARK
AT DECON AREA.
2000 TONY MILLS TOOK LAST SAMPLE
TO TEG LAB.
2045 TONY MILLS FINISHED MEASURING
STATIC WATER LEVEL IN GMI - 05 N,
12N, 20N, 21N, 35N, 27N, 26N
~~N5~~

122359

8-24-93 Tuesday

Bruce Milton
SS# 437-96-1129
14854860
Ellis Campbell
433-57-5969
12229535

Fugro new crew.

720 Tony Mills (GMI) ARRIVED ON BASE FUGRO HERE.

730 FUGRO FILL DECON TANK TONY MILLS GET FLOLO TO BEGIN BASE PASS CLEARANCE FOR BRUCE AND ELLIS.

CHIEF LOFTUS ~~4100~~ ~~5241~~ 7533

840 Tony Mills called to get ESCORT

855 ESCOT LET US INSIDE GASE WAITING ON FUGRO, & TO GET LUVIS. Could not find Luvis (SM & P) FOUND FUGRO (Bruce & Ellis).

935 AT LOCATION NUMBER GMII-06N NEAR LAKEWORTH. STILL NEED KEY TO THE communication manhole AT -13N.

945 Rinsate Blanks RB 82493C for SWOL

1030 SET up on RB 82493 for TEG GMI-30N, went to get letter from FLOLO. could not find him (1043). went to PASS & ID, FLOLO was at his office typing the letter. TOOK Bruce & Ellis to BASE OPS. FLOLO brought letter and got them flightline training

8-24-93

	Time on Cottage	Depth (ft)	Fugro Lunch Stage	Time of Sample	Time of Location	Static Water	Screen used	HNU	Granted
GMI-06N	935	955							DRY HOLE
GMI-30N 1030		26.5	no	1130	1136	18.85	(new) yes		
GMI-23N 1140		21	no	1230	1228	17.05	(new) yes		

Tony C. Mills

1145 Took Bruce & Wolis to get a Pass.
1200 Came back to Reg. AT -23 N.
Fugro just pulled CPT out. Pulled Truck off hole and pushed PVC IN TO water took sample AT 1230.
1240 Nick took Bruce to get pickup. Nick TOOK Dennis to air Port.
1230 Lunch to 1330.
1245 NICK AND Dennis left BASE.
1320 TONY MILLS AND PAUL SCHLEICHER WENT TO LUNCH (NO HOLES CLEARED)
1440 RETURNED TO MEET FUGRO AT -23 N. ONLY 2 HOLES TO DO NEAR THE LAKE. CONSIDERING SENDING FUGRO & TEG BACK HOME UNTIL NEXT WEEK. CALLED LYLE WINNETTE (GEO-MARINE) AT 1420 HE IS IN FAVOR OF SENDING CONTRACTORS HOME UNTIL CLEARANCE (DIGGING PERMIT) IS COMPLETE.
1520 SENT FUGRO TO THE TAXIWAY 185 area to ground holes.
1525 AT FLOLO'S OFFICE TO GET HIM TO NEGOTIATE UTILITY MEETING.

8-24-93

1610 Tony Mills DISCUSSED WITH FLOLO ABOUT SENDING FUGRO AND TEG HOME. HE WANTED TO TALK TO THE UTILITIES SUPERVISOR AND FIND OUT WHY CLEARANCE IS NOT GETTING DONE. MR. CALLED PAM, WHO WAS CLEARING LOCATIONS AT THE TIME. SHE CAME IN AND EXPLAINED TO US WHICH ONES WERE CLEAR. THESE WERE THE SAME ONES THAT TONY MILLS ASKED HER TO DO EARLIER TODAY. HOWEVER, MANY DID NOT HAVE FLAGGING, INDICATING THAT SHE HAD BEEN THERE. APPROXIMATELY SEVEN HOLES WERE CLEAR AT THE TIME.
1640 TONY MILLS CALLED LYLE WINNETTE. (GMI). HE SAID TO STICK WITH THE ORIGINAL PLAN OF SENDING CONTRACTORS HOME AND GETTING THEM BACK ON TUESDAY.
1700 MET ELLIS CAMPBELL (FUGRO) BEFORE THEY LEFT. THEN DROVE TO TEG LAB TO GET THE TCE CONCENTRATION MAP ETC.
1730 TONY MILLS LEFT BASE.

Tony C. Mills

172361

8-25-93 WEDNESDAY

730 TONY MILLS (GMI) ARRIVED ON BASE. CALLED LYLE WINNETTE AND LEFT VOICE MAIL TO PICK UP Southwestern Division laboratory sample. Drove around north area looking for utility locators. Replaced a missing flag - 39 N. DROVE TO ENVIRONMENTAL Support office WHERE JEFF AND PAM WERE HEADING OUT TO A PIPE REPAIR SITE. MET LUIS CARDOZA (SM&P) at the site. ALL ARE BUSY AT THAT JOBSITE DUE TO A BROKEN Communications line. Plumbing locators (PAM; JEFF) will be free afternoon.

945 Tony Mills WENT TO ALAN FLOLOS OFFICE AT THE BASE DISPOSAL AGENCY, WHERE LYLE WINNETTE WILL BE CALLING OR STOPPING BY. GEORGE R. WALTERS WITH THE AIR FORCE ? (AQUISITION ENVIRONMENTAL MANAGEMENT) AT WRIGHT PATTERSON, DAYTON OHIO. HE IS WORKING WITH FRED OELRICH ON THIS PROJECT AND RELATED TCE PLUMES.

1130 Randy Niebuhr - USCOE. Lyle Winnette came by after their meeting showed me the areas, 18 CPT locations on golf course

8-25-93

South of White Settlement Road. We looked at the railroad track coming into Lockheed where six CPT's will be.

1300 Lunch with Lyle and Randy Niebuhr.

1400 TONY MILLS CAME BACK TO THE BASE, ~~MET~~ FOUND THE SURVEYORS NEAR POINT # 31 N. TOLD THEN NOT TO DO THE AREA EAST OF ROGNER, but do all of the northarea excluding 13 N.

1430 TALKED TO PAM, JEFF AND HERNANDEZ, BASE PLUMBING. They will FINISH NORTH AREA TODAY. HERNANDEZ SAID SOUTH OF WHITE SETTLEMENT IS CLEAR.

1500 TOOK OUTLINED MAP OFF THE AREA SOUTH OF White Settlement Road to Alan Flolo to begin digging permit.

1530 called Randy Niebuhr about CPT location numbering system on golf course. Decided on GMI-01 W through GMI-15 W.

1540 JEFF AND PAM STOPPED BY THE GATE AND TOLD ME THE NORTH AREA IS ALL CLEAR W/ PLUMBING. LUIS CARDOZA will come tomorrow.

1600 TONY MILLS WENT TO STAKE POINTS ON GOLF Course. DID 11 Locations. LEFT BASE AT 1745

Tony C. Mills

172362

740 TONY MILLS ARRIVED ON BASE. DROVE AROUND TO FIND LUIS CARDOZA. NO more stakes have been cleared by (SM&P)

755 Drove to maintenance shop at Golf Course. Met Ricky Palacios (maintenance and supervisors assistant) with Fort Worth Water. ALSO met Syd ZAIDI 871-8307 FT Worth Water Production. Talked to them about the project on the Golf Course.

815 TONY MILLS MARKED LOCATIONS GMI-02W 03W, 04W AND 05W ON GOLF COURSE.

850 STOPPED TO TALK TO THE SURVEYORS. ASKED THEM TO GET THE WORD FROM RANDY NIEBUHR AS TO WHETHER THEY SHOULD SURVEY EAST OF ROGNER. FIXED A MAP OF THE (WEST) AREA WITH STATION NUMBERS AND GAVE THEM A COPY. MAP INCLUDES THE 5 Soil Borings and told them those 5 are OK to survey; Once again to get instructions from Niebuhr about starting the 15 on the golf course.

930 ALAN FLOLO PREPARED THE Digging permit for the area, had it signed by Base Electrician and gave it to me to have signed by Communications and Water, gas, sewer.

1015 found Sgt. Hernandez. He sig. 'On the water, gas, & sewer. Sent me to Communications. They gave me a copy, and will contact Alan Flolo to come and pick it up when it is ready.

1030 Tony Mills back at AFBDA office to work on CPT data.

1100 TO DATE 91 CPT'S ARE DONE. THE NORTH AND SOUTH AREAS HAVE 110 locations with 3 OF THOSE NOT YET ATTEMPTED. AS PLANNED, 15 ADDITIONAL POINTS ARE MARKED ON THE GOLF COURSE AND SIX ARE PLANNED FOR THE RAILROAD RIGHT-OF-WAY SOUTH OF LOCKHEED. THAT LEAVES 9 LEFT TO WORK WITH.

1115 CALLED Lyle Winnette (Geo-Marine) Concerning the above number of points left to do. He said the GMI-01SB and GMI-02SB had levels of TCE. So we need to mark some locations on South of White Settlement Road and East of Golf Course in housing area also cover the part of Golf Course East of Roaring Springs, near Hy 183 on golf Course. LEFT FLOLO a note of above info.

. 26 .3 TH .DA,

1200 Tony Mills gone to lunch.

Carter & Burgess (Surveyors)
LEON ELLSWORTH - INSTRUMENT MAN
STAN BREWER - INSTI PARTY CHIEF
mobile 239-9053
WILL COX 735-6072

1300 TONY Mills STAKED 10 ADDITIONAL LOCATIONS GMI-16W THROUGH GMI-23W AND GMI-109S AND 110S.

1455 AT CE BLDG 1215 (BDA) Complete map for utilities. TOLD FLOLO ABOUT THE CHANGES. DRIVE TO Communications gave them the map. HE SAID LUIS CARDOZA MIGHT NOT BE ABLE TO DO IT UNTIL MONDAY. TOOK MAP TO PLUMBING. JEFF will do it in the morning. Call him 2:00 TO 2:30.

1620 CALLED Syed Zaidi Fort Worth Water Department. He will talk to their field Operations and give me a call 8:00 AM Tomorrow in Plano.

338-4400 Lone Star Gas. FT. WORTH
Larry Davis FAX 817 [922-6910]
Ref #2727 Aug. 30
→ Beeper

1700 CALLED LYLE WINNETTE & LUIS CARDOZA
LUIS will be here tomorrow to finish northarea and start on west (golf course).

1715 STARTED TO measure SWL in Monday wells. THEY could not be done because of storm on Tuesday. DID NOT HAVE WATER LEVEL METER.

1745 BEGAN TO MARK THE 6 LOCATIONS ON RAILROAD RIGHT-OF-WAY FROM GRANTS LANE TO LOCKHEED. LOCATED USGS 1 150' Down the trail on EAST SIDE OF TRACKS FROM THE WEST SERVICE ROAD OF GRANTS LANE. USGS 2 is 600' from the road or approx 195' from the next intersection (~~Wyatt~~ Lyon Drive). ALSO DID USGS 4 which is 200' NORTH OF the next intersection (White Settlement Road) and on the west side of tracks. Got rained out.

1815 left the site to go to Plano.

172364

Call Lyle before noon.

930 TONY MILLS ARRIVED AT CARSWELL; drove around north area to see if it is clear of utilities. IS complete except need to move 39 N and 40 N. Moved 42 N 2 feet.

945 Stopped in at FLOLO'S OFFICE TO SEE IF LUIS CARDOZA HAD BEEN THERE. ALAN SAID HE HAD NOT. ALAN FLOLO ALSO FOUND OUT THAT THE BDA SHOULD HAVE A MAINTENANCE CONTRACTOR IN PLACE BY OCTOBER 1, in time for the next groundwater project.

1000 TONY MILLS WENT TO THE Communications office to get the digging permit. No one who knew where it is was there. SO Mills went to golf course to STAKE 34 EXTRA LOCATIONS. AND TO MEET LARRY DAVIS W/ Lone STAR GAS.

1130 MILLS CHECKED WITH JEFF AND HERNANDEZ ABOUT THE PLUMBING (water, sewer, gas) on the golf course (west) area. They said all was ok and will check the extra 4 today.

1200 called Lyle Winnette left message that utilities should be finished today.

1315 called SM & P. Luis said he would be here at the main gate in 1/2 to 1 hour. Tony Mills drove to Base Shoppette called to find out where Larry Davis (Lone Star Gas) is. He was at the Lockheed Plant at the railroad tracks. Said all his lines were clear of tracks in those areas. (MILLS DROVE TO LOCKHEED AT RAILROAD TO TALK TO HIM) LARRY SIGNED A GAS LINE LOCATION FORM FOR LONE STAR.

1415 MILLS WAS BACK AT MAIN GATE. LET SUPERVISOR, LYLE WINNETTE, KNOW ABOUT WHAT HAS BEEN COMPLETED. HE PLANS TO GET FLORO OUT HERE TUESDAY, TOMORROW, AND TEG the next day.

1430 LUIS CARDOZA DROVE UP. DID 24 N. HE SAID TO MOVE IT IN JOUTH TOWARD THE BUILDING SOME MORE. HE ALSO WARNED US THAT WE HAVE 11 working days to work after the date on his LOCATE FORM.

1630 LUIS; TONY MILLS STOPPED BY FLOLO'S OFFICE TO GET A KEY TO GET INTO THE SCHOOL'S MECHANICAL ROOM.

1150 Luis Cardoza left the base. Plans to return on the morning to finish up.

1650 Tony Mills is at Railroad near Lockheed ~~USGS 3~~ Tom Station # USGS 3 is 25' East of tracks and 65' South of White Settlement Road.

1710 At Lockheed Between Clifford avenue and Harwell St. USGS 5 is 60' north of Harwell on east side of tracks. USGS 6 is 460' North of Harwell and on east side of tracks.

1720 Called Lyle Winnette. Fugro will be here at 1000. Left for Geo Marine

Tony C. Mills

0-31-13 Tuesday

805 - Tony Mills arrived at Carswell. Stopped By Plumbing Shop and had Hernandez and Jeff Follow me to 4 locations and move the markers per Luis Cardoza's request.

900 Get coolers ready, make up trip blanks and rinsate blanks.

930 RB83193C for SWDL (Southwestern Division Laboratory)
RB83193 for TEG

1000 Trip blank
TB83193C for SWDL
TB83193 for TEG LAB

1030 to 1100 Called Louise Delano (GMI) Lyle was not available. Talked about Fugro arriving at noon. Told her about 4 locations that were moved, and she said to have them surveyed again. Also talked about grouting and Degon and a third person coming w/ Fugro.

1115 Tony Mills called Dale Fissler at the Department of Engineering to request utility locate (water & sewer). He said land owner needs to request (letter) that it be done - usually a fee involved. Otherwise come to the City Hall, 1000 Throckmorten to request utility's maps. 2nd floor, talk to John Young at Dept. of Engineering.

172366

1120 [illegible] Talked to Lee [illegible]
Tr Roy 336-9454. Gave line locations
USGS 1 through 6. Said he would call
Lyle if they have problems locating the
stakes.

1135 TO 1150 TALKED TO LYLE ABOUT UTILITIES
AT T&P Railway. ALSO INFORMED him of
what Louise DeFano and I discussed.
He said to wait and see if Louise will be
able to help me pick up a map at
Dept of Engineering. ALSO call Duane
Slater at Lockheed.

1155 LEFT FOR LUNCH

1230 TONY MILLS RETURNED. CALLED
LOCKHEED SWITCHBOARD 777-2000 FOR THE NUMBER
OF DUANNE SLATER. LEFT A MESSAGE
WITH DIRECTORY SERVICES TO CALL Lyle.

1245 ELLIS CAMPBELL AND BRUCE MILTON
(FUGRO) ARRIVED ON SITE. WILL
BEGIN NEAR THE LAKE

1305 TONY MILLS CALLED Southwestern Bell
for a requestion some cable locates.
The date of expiration (11 working days)
will be up today for many of the
remaining locations on the north side.
Luis Cardoza advised that I call and
request it again.

-31-93

LOCATION NUMBER (SAMPLE #)	TIME ON LOCATION	CPT	DEPTH (FT)	USED FLOW METER	TIME OF SAMPLE	TIME OFF LOCATION	STATIC WATER LEVEL (BL)	PVC SIZE USED	HNU (IN PPM)	GROUTED	N S
** GMI-28N	1712 1330	1555	19.5	yes 1100 Rm 1745	1745	1800	12.7	new yes	<3		CAVE IN 1ST RUN BRN. SILTY/NO ODOR
* DOWN TIME 1350 TO 1550								FUGRO		PC	FAILURE.
** GMI-36N	1605	1	18	dummy yes	1720	1712	12.55	new yes	4		CAVE IN 1ST RUN SAME WATER
water sample time w/ dummy trip 1635 TO 1745											

9-01-93 WEDNESDAY

** GMI-24N	815	843	24.2	no	900	853		(new) yes	100	Brown Silty water, no odor
GMI-33N	900					945				HIT SOMETHING A FEW INCHES BELOW
** GMI-32N	950	1005	15.4	no	1023	1012		(new) yes	no-200	Brown Sandy water, no odor
GMI-39N	1020	1100	13.2	no	1120	1115		(new) yes	450	Same water (silty)
AT 1020, NICK MERICKE BROUGHT REPLACEMENT COMPUTER										
GMI-40N	1120	1	14.7 ~~13.2~~	no	1400	1		(new) yes	3	same water
GMI-39NC FOR SWDC										
LUNCH 1200 TO 1300, BEGIN -40N AT 1300										
GMI-41N			14.5	no	1430	1420		new yes	<1	same water
GMI-33N	1420	1450	19.	no	1510	1455		(new) yes	4	same water No odor 1st RUN
GMI-38N		1525	19.5	no		1535		(new) yes	10	
GMI-31N	1540	1600 1642				1610				1st down to 19' PROBE WAS WET. TRY WATER
GMI-42N	1615		18'	no	1710	?		(new) yes	3	Muddy brown extremely silty no odor
GMI-43N	1705	1735	20.2	no	1750	1745		(new) yes	25	
GMI-45N	1748	1810	16.6			1815		(new) yes		PVC BROKEN OFF AT 12' NO SAMPLE TRY TOMORROW

** No computer - CPT By STRIP CHART

1310 Drove to location GMI-59S
AND measured SWL static water level = 1 ft
Grouted Hole.

1320 Drove to GMI-28 N.

1350 Calibrated HNU.

* 1350 TO 1510 Fugro HAD computer problems. Tony Mills Called Lyle and let him know about Fugro. ALSO TOLD HIM LUIS CARDOZA MIGHT CALL ABOUT RELOCATES IN NORTH AREA. HE ALSO TOLD ME TO CALL LUKE GILPIN ABOUT T&P RY.

1515 Fugro went to call HOUSTON OFFICE AGAIN. Tony Mills went to get key from FLOLO TO GROUT HOLE AT -66 S. Fugro CAN record CPT ON STRIP CHART AND PROCESS THE DATA BACK IN HOUSTON. Tony Mills ASKED LYLE WINNETTE IF HE IS IN FAVOR OFF THAT. HE SAID TO GO AHEAD AND DO A COUPLE OF HOLES TODAY. FUGRO IN HOUSTON WILL SEND A COMPUTER TO NICK MOERICKE IN Fort Worth.

1545 LUIS CARDOZA CAME BY AT PASS & ID BLDG. 1654. He had Begun locating at T&P railway. Also near 18 W AND 20 W. I ASK him to recheck 24N AND 37N. He will do the school and 24W tomorrow. ALSO finish at the tracks.

8-31-97

1745 PARK RIG AT DECON AREA

1800	Tony Mills leave		GMI-28N
1810	GMI-66S	@	6.6' BGL
	GMI-7N	@	7.4 TOC ~~6.4~~ BGL
	GMI-14N		19.15' BGL
	GMI-29N		18.16' BGL
	GMI-47N		23.5' BGL
	GMI-48N		9.94' BGL
	GMI-49N		12.35' BGL
	GMI-30N		18.85' BGL
1910	GMI-23N		17.05' BGL

1800 FUGRO LEFT SITE

1915 TONY Mills LEFT SITE

Tony C Mills 8-31-97

172368

9-1 93 WEDNESDAY

650 Calibrated Hnu

715 TONY Mills ARRIVED ON SITE

720 RINSATE BLANKS RB90193C for SWDL
RB90193 for TEG

730 FUGRO ON SITE. ELLIS Campbell and Bruce Milton.

730 TO 805 Decon PVC pipe AND GET TRUCK READY.

800 TONY Mills TALKED TO JEFF w/ BASE PLUMBING SHOP. HE SAID ALL OF OUR LOCATIONS ARE GOOD AS LONG AS WE STAY RIGHT ON THE STAKES. THE ELECTRIC AND FUELS MAINTENANCE MAN FOLLOWED US TO GMI-24N TO DOUBLE CHECK HIS UTILITIES AFTER THE STAKE WAS MOVED 50'. HE SAID O.K.

815 ARRIVED AT GMI-24N TO DO CPT.

1020 NICK MOERICKE (FUGRO) Brought computer by while we were sampling -32N.

945 WE LEFT -33N without getting a hole pushed. We hit something at < ½ ft. Need to get plumbing (JEFF) people back out. Since lines are obvious in the area.

1040 TO 1110 TALKED TO JEFF ABOUT moving #GMI-33N.

9-01-93

1120 JEFF CAME BY AT -39N. AFTER SHOOTING WE MOVED THE STAKE AT 33N.

1200 LUNCH

1300 FUGRO BACK.

1315 TONY Mills BACK AT 40N.

1320 Mills WENT TO BASE OPS TO CALL LUIS CARDOZA NO LUCK

1350 BACK TO SAMPLE 40N. TRUCK IS AT 41N.

1400 RANDY NIEBUHR WAS WITH TRUCK AT GMI-41N. HE BROUGHT MAPS FOR LYLE.

1420 Paul (TEG MOBILE LAB) PICKED UP SAMPLES.

1639 Called Luke Gilpin at Lockheed 777-8203
Geotech P30 m east side of RR, W15 7 west side of RR 8203
wells south of
1 well South side of plant near where well goes into plant alluvium is 5' thick then Goodland.

1655 called Lyle. need to fax timesheet.

1815 TO 1915 Fugro Grout HOLES.

1915 FUGRO LEFT BASE.

1930 Mills LEFT BASE

172369

9-02-93 THURSDAY

705 Tony mills arrived on base. Get ice for coolers and prepare rinsate blanks and TEG trip blank.

RB90293C — SWDL LAB
RB90293 } TEG
TB90293 }

730 Fugro arrived, Ellis Humbee & Bruce Milton

740 Tony mills made weekly at BDA office. Fugro went out to start punching back at GMI-45 N

810 Tony mills picked up Dredging permit from Communications and met at GMI-45 N where another attempt at a water sampler will be made via GMF casing with dummy tip.

925 calibrated HNu

930 Fugro was cleaning CPT tip.

1000 Mills took samples to Paul (TEG). Paul showed me the map w/ TCE at locations 23, 24, 32. Breakdown products at 39, 40, 41, 33. Need to plan on moving farther east.

*900 to 940 Fugro was cleaning cone tip. 1015 was finished with CPT and pulled off of the hole. Put down hole and could not get water sample. Tried to blow air in PVC to clean out the screen. 1040 Det rig back over hole to use dummy tip. used 2 tips.

9-02-93

	Time Location	CPT Time	Depth Collected	Water Sampled Time & Sample	Time off Location	Static water level (ft)	Pvc screen used	HNu (ppm)	Grouted	Notes and water characteristics
	GMF-45N	930	NA	dummy 900	855	11.6	extra screen	7	✓	Brown-orange water / No odor
*	GMF-46N	855	1010 195	Dummy yes 1200	1015 1433	2.15	yes (blue)	6	✓	Slow water
	GMI-45D			Duplicate for 11 Cr						
	at 45 N, water sample time was 75 minutes									
	at 46 N, water sample time was 90 minutes									
	GMI-44N	1300?	1040	13.3 dummy yes 1140	1433	12.15	yes (blue)	<1	✓	
	GMI-31N	Water sample entirely		1510				5	✓	Took water sample slow with no odor
9-02-93	Fugro standby while sampling approx 60 minutes									
	GMI-17W	1540	1605	12.5 no	1615		no	3	✓	Dry, hit lime
	GMI-16W	1620	1640	14.2 no	1650		no	<1	✓	" "
	GMF-05W	1655	1715	18.6 no	1740		no		✓	" "
9-03-93	GMI-37NC for SWDL									
	GMF-37N	800	835	26.5 no 930	850	15.22	yes	<1	✓	grey-brown water, no odor
	TRIED SAMPLING GMI-38N				950		yes	30		DRY HOLE
	GMI-12W	1010	1115	13.9 no	1115		no	10	✓	Dry Hole
	GMI-11W	1130	1200	9' no	1215		no	<1	✓	Dry Hole
	GMI-10W	1240	1255	18.5 no	1315		no	<1	✓	DRY
	GMI-09W		245	24.5 no	1410		no	<1	✓	DRY
	GMF-08W	1415		12.2 no	1510		no		✓	DRY

Tony C. Mills

1145 Fugro went to decon GMF casing and go to lunch
1215 Tony Mills and Louise Delaro left for lunch and errands.
1315 Tony Mills ARRIVED BACK AT GMI-44N
FUGRO CHECKING KPT RODS FOR BENT RODS.
1510 GMI-31N had water. Bailed muddy water out (2 bailers)
1740 PARKED RIG AT DECON AREA
Tony Mills GAVE Southwestern Division Lab Samples to Louise Delaro to take back to Dallas. Paul came by for last TEG Samples. Mills began taking static water level readings on all of yesterday's holes except 38N & 31N
Fugro will grout holes and pick up PVC casing.
1830 FINISHED GROUTING; FUGRO LEFT BASE
Tony Mills STOPPED IN AT TEG LAB.
1915 MILLS LEFT BASE

Tony C. Mills

9-03-93 FRIDAY

7:20 TONY MILLS ARRIVED ON BASE
7:25 TED FUGRO ARRIVED ON BASE. WEATHER FORECAST IS 40% chance of rain. It showered for approximately 15 minutes. Sky is overcast with a few breaks. Slight breeze from the north. 70 TO 75°F.
800 AT GMI-32N
815 MADE RINSATE BLANKS RB90393C for SWDL
RB90393 for TEG
830 made Trip Blanks TB90393C for SWDL
TB90393 for TEG
850 PUSHED SCREEN (PVC) THROUGH A BRIDGE AT 37N. HAD 2' OF WATER
900 TRIED TO SEE IF WATER WAS AT 38N. HOLE IS 19.5 FT deep. PVC IS AT BOTTOM OF HOLE. Could not detect water. PVC Screen is 6" off of bottom, so pulled Fugro Rig up over the hole. Ellis thought it would be dry, but we tried to cut the PVC so that the screen is at bottom & put a top cap on. Still no water only an inch of mud on water level detector probe. Capped the PVC and put bentonite around top to seal top of hole. Recheck next Tuesday. Hole had 30 ppm w/ HNu.

9-03-93

950 LEFT 38 N TO GO BACK TO GOLF Course. will try 19 W.

1040 HIT Something at GMI-19W @ 4'. Pulled over 10' or more and tried again. Might have hit a sewer line. 2nd hole to 13.9' - no water.

1130 AT GMI-11 W

1150 Called Louise Delano (GMI). She said to talk to Randy Niebuhr about ① extra holes at North area, ② Dry holes on golf course ③ Time for utility clearance ④ No Duplication of data near wells ⑤ CPT data on golf course.

1200 TRIED TO CALL FLOLO ABOUT Possible PVC BReak. NO ANSWER.

1215 TOOK OFF FOR LUNCH. GMI-11W WAS DRY. 9' deep compared to last year which was 10'.

1305 Called Randy Niebuhr (Corp of Engineer) secretary said he will be on his way out soon.

1320 Tony Mills arrived at rig. Checked out the trail to next location for sprinkler heads.

1340 Showed up at GMI-10 W with rig. Ellis said the only flight they could get was a 5:30 flight to Houston. NEED to quit punching holes at 1300. Then grout.

9-03-93

Do 6 in North area. No Duplication.

1440 GMI-09 W WAS 24.5' to bedrock as opposed to last year's 12'. STILL DRY.

1410 RANDY NIEBUHR CAME BY WHILE WE WERE AT GMI-10W. HE SAID TO SAVE 6 locations to be used east of our North area. Plan to use the rest of the locations excluding the ones which are near wells and some of the shallower insignificant ones (my discretion). He asked for some information for Debbie Fitzgerald.

1510 FINISHED LAST HOLE. Tony mills LEFT TO measured water levels and call Louise. Bruce to grout holes, Ellis to plot CPT data.

1530 Tony Mills went to see Flolo to get Digging Permit started. No one was in the office due to a benzene spill in a nearby warehouse.

1540 Tony Mills drove to decon area to sign Fugro timesheets.

1630 FUGRO LEFT BASE. Tony Mills STOPPED BY LAB AND ASKED PAUL TO COME BACK WEDNESDAY.

1700 MILLS LOCATED 50 N TO 56 N.

1830 MILLS LEFT SITE.

172372

9-07-93 TUESDAY (AFTER LABOR DAY)

9:25 TONY MILLS W/ GEO-MARINE ARRIVED ON BASE AND STOPPED AT ALAN FLOLO'S OFFICE (BASE DISPOSAL AGENCY)

1005 TALKED TO FLOLO ABOUT GETTING A DIGGING PERMIT STARTED FOR THE ADDITIONAL 7 LOCATIONS IN THE EAST PART OF THE NORTH AREA.

1015 CALLED RANDY NIEBUHR ABOUT THE ONE EXTRA LOCATION THAT HE WILL NEED TO MODIFY HIS CONTRACT FOR. HE SAID HE WOULD BE HERE TOMORROW.

1030 CALLED LYLE WINNETTE TO SEE IF FUGRO HAS CALLED IN. NO WORD FROM THEM. HE TOLD ME FRIDAY IS THE LAST DAY FOR THE LAB TO BE HERE.

1014 JEFF HARVEY (AIRMAN) AND SGT. HERNANDEZ INSPECTED THE "LEAK" AT GMI-19W. THEY SAID IT DOESN'T LOOK LIKE WE HIT ANYTHING. ALSO SAID TO GROUT THE HOLE.

1045 PULLED VAN OVER TO DECON AREA TO WORK ON TABLES AND WAIT FOR FUGRO.

9-07-93

1125 JOSE HERRERA AND ELLIS CAMPBELL (FUGRO) ARRIVED ON SITE. TOOK TRUCK TO FUEL UP AND HAVE LUNCH. WILL BEGIN AROUND 1300.

1200 TONY MILLS TOOK OFF FOR LUNCH.

1305 FUGRO TRUCK ARRIVED AT SITE # GMI-15W. TONY MILLS CALLED TU ELECTRIC

1328 Called LUIS CARDOZA (SM & Pablo locators) He said #82S is clear. Also, USGS 5 and 6 need to be moved closer to the tracks at Lockheed. Call him one hour before we get there. I told him not to finish on the one near radar site, GMI-01W.

1350 calibrated HNU.

1400 TO 1438 TONY MILLS GONE TO T&P RR near Lockheed to see if TU Electric has been there. NO SIGN. They told me at 1315 that I should go check and call back. Roy was not there at the time.

1500 Zipcode for white settlement area 76108 ~~Rick Keaughan~~ Service Planner for Zipcode 76108 GARY MELTON - called TU ELECTRIC. will be there from 9:00 to 1000 AM. 735-3936 - west service center

1610 TALKED TO FLOYD ABOUT UTILITIES FOR ADDITIONAL 7 IN North area. ALL HAS SIGNED IT BUT Comm.

1730 TOOK TRIP BLANKS TB90793C -SWDL
TB90793 for TEG

1800 TOOK RINSATE BLANKS RB90793C for SWDL
TB90793 for TEG

1845 FLUSH PULLED OFF AND LEFT SITE

1910 WENT BACK TO GMI -04 W TO CHECK FOR WATER. HAD 1 VIAL OF WATER.

1940 TRIED TO GET ANOTHER VIAL. DRON BAILER AND LEFT SITE.

Tony C. Mills

9-07-93

Time on location	GET time	Depth to H2O	water sample time	Time to sample	Time left	STATIC water level (BGS)	PVC sounder used	HNu (ppm)	Checked	NOTES AND WATER CHARACTERISTICS
	GMI-15W 1305	19.1	no	—	1350	DRY	no	<1	✓	
	GMI-14W 1350	21.5	no	—		DRY	no	<1	✓	
	GMI-13W	19.5	no	—	1443	DRY	no	<1	✓	
	GMI-07W	23.5	no		1535	DRY	no	<1	✓	
	GMI-06W ~~1558~~	15.9	no		~~1558~~	DRY	no	<1	✓	
	GMI-12W ~~1603~~ 1538	5.9	no		1558	DRY	no	<1	✓	
	GMI-04W 1603	~~24.0~~	no	1931	2333	new	yes		✓	SAMPLED 3.5 HRS LATER. WITH yellow cloudy water
	GMI-18W 1650	1713 23.0	no	1745	1720	14.5	yes	<1	✓	water is silty yellow-brown no odor
	water sample time 1720 TO									
	GMI-20W 1745	18.4	no	1830		14.93	new yes	5	✓	SAME water
	SAMPLE TIME 1810 TO 1830									

9-08-93

	GMI-82S	805 850	14.4	no	930	935	8.75	new yes	✓	Reddish Brown silty water. no odor
	GMI-23W	950	8.5	no	—	1030	DRY	no	<1	✓ hit LIMESTONE
	GMI-21W	1040 1080	12.0	no	—	1100	DRY	no	<1	✓
	USGS 3	1120 1140	12.3	no	—	1150	DRY	no	<1	✓ BEDROCK?
	USGS 5	1320	11.5	no	—	~~1350~~ 1340	DRY	no	<1	✓ HIT LIME
	USGS 6	1343 1365	17.1	no	—	1405	DRY	no	<1	✓
	USGS 4	1420 1430	4.8	no	—	1440	DRY	no	<1	✓ HIT Something SHALLOW
	USGS 2	1450 1503	4.7	no	—	1510	DRY	no	<1	✓ HIT LIME
	USGS 1	1510 1525	3.1	no	—	1535	DRY	no	<1	✓ HIT LIME

Tony C. Mills

9-08-93 WEDNESDAY

6:15 Tony Mills calibrated the HNu.
725 Tony Mills ARRIVED ON SITE.
730 MADE RINSATE BLANKS RB90893C
RB90893
805 PULLED FUGRO TRUCK ON FIRST LOCATION, GMI-82 S inside the gate.
820 Tony Mills CALLED SM&P. TALKED TO DEB, LUIS CARDOZA'S SUPERVISOR AND ASKED IF HE COULD DO A LOCATE FOR US TODAY. SHE SAID CALL ABOUT AN HOUR BEFORE WE ARE READY.
CALLED RANDY NIEBUHR WITH CORPS OF ENGINEERS. LET HIM KNOW ABOUT DOING HOLES ON THE RAILROAD MOST OF THE DAY.
900 TO 935 set piezometer at -82 S,
935 TO 950 TRAVELED TO GMI-23 W
1000 Tony Mills took samples to Paul
1030 Moved Rig to -21 W.
1100 Moved Rig to T&P RR (Lockheed) USGS 3. Tony Mills called TU Electric could not get in touch with Gary Melton. Also called SM&P, ASKED FOR LUIS AT 1300.
(817) 735-3936

1150 WENT TO LUNCH AND MAKE TELEPHONE CALLS.
~~1300 T. Mills BACK ON SITE. LUIS CARDOZA HERE~~
1310 FUGRO BACK ON SITE
1230 T. Mills CALLED CYLE WINNETTE TO LET HIM KNOW WHAT THE STATUS IS.
* 1320 PULLED FUGRO TRUCK TO USGS 5. RANDY NIEBUHR CAME BY. TOOK MAPS TO MAKE COPIES. BOTH #5 AND #6 were moved closer to the tracks, within 4 feet of the rails.
1415 TO GET TRUCK LEVEL AT USGS 4, Fugro pulled up on tracks and pucked hole 3 ft from westside of rails (15 ft from the original STAKE) FT. WORTH SEWER LINE IS IN THE VICINITY OF THE RIGHT-OF-WAY.
* WHEN LUIS CARDOZA WAS HERE, HE SAID HE COULD NOT COME OUT TO NORTH AREA TO LOCATE HIS LINES. HE SAID HE WOULD BE THERE 7:30 TOMORROW MORNING.
1530 WE ARE FINISHED PUNCHING HOLES TODAY. WILL PULL WELLS AND GROUT HOLES.
1535 TO 1550 RELOCATE RIG BACK TO DEUM AREA. PAUL SCHLEICHER WAS WAITING FOR SAMPLES. HAD NONE TO GIVE HIM.

172375

1550 TO 1610 FUGRO EXCHANGING FLATBED 1 TON TRUCKS. ROBERT ANDERSON WITH FUGRO CAME OUT AFTER LUNCH AND STAYED MOST OF THE DAY, WAITING FOR HIS VEHICLE.

1620 FUGRO LEFT SITE. ELLIS Campbell took Jose Herrera to the airport.

1620 TONY MILLS CALLED LYLE WINNETTE. BRING 2 DRUM LIDS W/ BUNGS. TALK TO FRANK GREY ABOUT SIGNING DOCUMENTS FOR HEET. POSSIBLY FRIDAY. 5 DRUMS OF CUTTINGS
3 " OF Decon water.
PUT PLASTIC IN WITH SOLIDS.
LOUISE DELANO WILL BE HERE TOMORROW.

TELL LUIS TO SIGN PERMIT AT Comm.

1645 TONY MILLS measured STATIC WATER LEVELS AT GMI - 20W, 18W, 04W AND CHECK FOR WATER ON ALL Golf course holes GMI - 06W THROUGH 15W. Previous dry holes are all dry.

1715 TONY MILLS (GMI) LEFT SITE.

Tony C. Mills

9-09-93 THURSDAY

700 TONY MILLS CALIBRATED HAIN

720 TONY ARRIVED ON BASE. STOPPED TO FIND OUT IF PLUMBING SHOP HAD CLEARED UTILITIES. JEFF HAD IT COMPLETED AND SHOWED SOME PROBLEM AREAS ON THE MAP.

815 LUIS CARDOZA SHOWED UP ON BASE (SM&P - Southwestern Bell location). He proceeded to locate the new 7 areas while Tony Mills took STATIC water level measurements at -31N, 38N, 37N, ~~82N~~, 82S.

FUGRO ARRIVED. TOLD ELLIS Campbell TO HAVE the location grouted while waiting for a CPT location. Bruce Milton came today and began grouting those holes.

845 GMI - 38N has 4" of water will try to bail it out and take a sample later today.

900 Pulled Rig on to 50N. Location is clear. Found Luis Cardoza - Had one more to do.

910 Cardoza is done, all is clear.

9-09-93

900 TO 935 HIT SOMETHING AT SURFACE AT GMII-50N. MOVED RIG TOWARD THE SIDEWALK ABOUT 10'.

940 TONY MILLS WENT TO PICK UP DIGGING PERMIT FROM COMM. CARDOZA DID NOT SIGN IT.

1015 TRIED TO BAIL WATER OUT OF GMI-38N. HAD NO LUCK. PULLED THE SCREEN. HNu READ 5 TO 10 ppm IN THE HOLE. NOTHING FROM THE SCREEN.

1100 TO MOVE TO 52N. NEEDED BLOCKS TO LEVEL THE TRUCK.

1040 MADE RINSATE BLANKS RB90993C for SWDL
RB90993 for TEG

1135 MADE TRIP BLANK TB90993 for TEG

1215 TOOK SAMPLE to Paul Schleicher at TEG mobile lab. PICKED up all of the samples that were out of date.

1200 FUGRO LEFT FOR LUNCH

1225 TONY MILLS - LUNCH

1325 MILLS BACK AT 52N. Decon bailer.

1330 FUGRO ONSITE

1340 LOUISE DELANO COME OUT.

1600 FUGRO TOOK RIG TO DECON AREA. ELLIS WITH MAKE PLOTS WHILE MILLS CHECKS TIMESHEETS AND LOUISE AND BRUCE GROUTS HOLES.

9-09-93

	TIME LOCATION CPT TIME	DEPTH OF HOLE USED FUGRO SAMPLER	TIME OF SAMPLE	TIME OFF LOCATION	STATIC WATER LEVEL (FT. BLS)	PVC SCREEN USED	HNu (ppm)	GROUTED	NOTES AND WATER CHARACTERISTICS
GMI-50N	900	950	16.	NO —	1000	DRY	NO <1	✓	moved rig 10'
GMI-51N	1005	1035	23.7	no —	1100	1050	15.82 (new) yes	<1 ✓	LT BROWN, SILTY NO ODOR
GMI-52N	1110	16.	no	1155 1200	1145	8.60 (new) yes	<1 ✓		LIGHT BROWN LIGHT SILT NO ODOR
GMI-52ND	TEG Duplicate								
GMI-53N	1340	14.	no	1410	1400	8.52 (new) yes	<1 ✓		grayish brown silty, no odor
GMI-56N	1400	12.	no	1445	1410	5.5 (new) yes	<1 ✓		Brown silty no odor
GMI-55N	1445	8.	—	—	—	no	<1 ✓		dry
GMI-56NC	SWDL Duplicate								
GMI54N	1555	1556	12	no —	1600	11.6 (new) yes	<1 ✓		dry (3" of mud)

left screen in hole to check tomorrow.

1620 PAUL, (TEG) PICKED up LAST SAMPLE and TRIP BLANK.

1640 TALKED TO FLOYD AND FRANK GREY ABOUT HEET Coming WED. 15th at 9:00. GREY SHOULD BE HERE. FRANK Grey also stated that the PVC will probably have to be landfilled after decorning it.

1700 called Lyle Winnette Geo-Marine. He wants to let Fugro grout holes at $2.50 per foot. STANDBY time only for pulling wells.

1710 Fugro's DECON UNIT HAS BEEN TAKEN By the FORT WORTH OFFICE. Tony Mills called Lyle Winnette again.

9-09-93

1730 Lyle SAID to have Fugro bring the decon unit back and finish the job on the PVC. Then US to call local landfill about disposing it. J. Tony Mills, asked Ellis if he would call his office and get the unit out here. He is planning to have FT Worth office do it and also grout holes.

Lyle also mentioned (earlier) that Dr. Luu (TEG) SAID he would take the samples back to Austin.

1800 Counted leftover clean, unused
5', 1" riser 42
5', 1" Screen 23
Top caps 23
Bottom ends 34

1805 BRUCE & Louise BACK FROM grouting 22 holes. Bruce had to pull 4 wells.

1815 Received all of the plots except GMI - 54 N which will be digitized in Houston (did not get recorded).

1815 Gone to meet Paul at Lab to sign Chain of Custody and get preliminary lab reports.

9-09-93

1840 GAVE LOUISE DELANO SAMPLES FOR SWDL. SAE RECHECKED WATER LEVEL IN 54 N, 1" ON LEVEL INDICATOR PROBE. NOT ABLE TO SAMPLE THIS LOCATION.

1907 T Mills stopped at Decon area. Counted 92 risers and 79 screens that were used. Does not include what was in -51 N, 52 N, 53 N and 56 N.

1915 TO 1950 SIGNED TIMESHEETS AT LA QUINTA INN AT ELLIS & BRUCES ROOM. DISCUSSED TOMORROWS WORK.

1950 TONY MILLS ON WAY TO DALLAS.

Tony Mills

172378

9-10-93 FRIDAY

800 Tony Mills (Geo-Marine) arrived on SITE AT Decon Area. Fugro has been here, some pipe has been deconned and grout loaded and barrels loaded. Decon unit and crew are not here

805 Mills gone to measure static water levels and pull PVC.
@ GMI-54N SWL = 11.6' BGL BUT NOT ENOUGH water for a sample.

USED SCREEN & RISERS ON THESE HOLES
screen = 5
RISERS = 9
ESTIMATED TOTAL FOR JOB 84 screens
101 risers
Checked 50 N AND 55 N AGAIN.
BOTH STILL DRY.

900 FUGRO WAS BACK DECONNING PIPE HAD TO GET MORE WATER EARLIER. MILLS AND ELLIS PICKED UP THE REST OF THE PVC WHILE BRUCE Milton deconned. CLEANED UP THE AREA. ELLIS LEFT 2 bags OF GROUT IN CASE WE NEED IT.

930 ELLIS AND BRUCE LEFT TO GROUT 7 HOLES WHILE MILLS PUTS LABELS ON BARRELS AND LIDS W/CAPS.

1010 FUGRO LEFT SITE ON WAY TO HOUSTON.
ELLIS CAMPBELL
BRUCE MILTON

1020 ALAN FLOLO WAS NOT IN HIS OFFICE HE HAS THE KEY TO THE HAZ. WASTE / DRUM STORAGE AREA.

1025 TO 1100 TONY MILLS CHECKED HOLES FOR GROUT ON NORTH FLIGHTLINE.

1100 TO 1200 MILLS GOT BOBBY HERNANDEZ (BDA) TO HELP FIND A KEY. MR. JONES AT BLDG 1213 gave us his key to the Barrel STORage area near BLDG 1337. MILLS TOOK SOLID WASTES OUT OF the Decon water Drum and put it with another Drum of solid wastes.

1200 TO 1220 TOOK Key back and then wrapped PVC up in plastic.

1220 LEFT THE SITE FOR THE DAY.

172379

9-15-93 WEDNESDAY
DRUM DISPOSAL

TONY MILLS ARRIVED ON BASE AT 8:30 AND checked DRUMS (3) AT THE DECON AREA (PARKING LOT ACROSS THE STREET FROM THE VISITOR CENTER AT THE MAIN GATE). Tightened the LIDS AND LOADED ALL OF THE PVC PIPE. THE PIPE WILL BE DISPOSED OF IN A LANDFILL NEAR PLANO.
850 MILLS DROVE IN TO SEE FIDLO

900 FIDLO WILL NOT BE HERE. FRANK GREY SAID TO GO BY AFTER DRUMS ARE LOADED and He will sign the manifest etc.

905 TAD HALL WITH HEAT WAS WAITING AT THE GATE. MR. HALL BEGAN LOADING THE 3 DRUMS OUTSIDE OF THE GATE WHILE MILLS WENT INSIDE OF THE BASE TO GET ALLEY FOR DRUM DISPOSAL AREA.

920 MET A MAINTENANCE MAN AT THE GATE TO DRUM STORAGE AREA. LOADED the remaining 6 DRUMS. TOOK PAPERS TO FRANK GREY AT THE BASE DISPOSAL AGENCY (BDA) to have signed.

1015 TOOK TAD HALL BACK TO HIS TRUCK AFTER GREY signed the Uniform Hazardous Waste Manifest, Generator Notification Regarding Shipment of Wastes Restricted from Land Disposal, and the Bill of Lading.

1100 DROVE TO T&P R-R AFTER HEAT AND MYSELF LEFT BASE. TOOK PHOTOS OF pollo channel deposits in stream bed near tracks. (LOCKHEED) near white Settlement Road.

1130 T Mills on way to Plano.

17201

STRAIGHT BILL OF LADING—SHORT FORM—ORIGINAL—NOT NEGOTIABLE

NAME OF CARRIER	CARRIER'S NO.	DATE	SHIPPER'S NO.
H.E.A.T., INC.	30440	09/15/93	012021

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of this Bill of Lading.

the property described below in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

FROM: CARSWELL AIRFORCE BASE
SHIPPER (ORIGIN) CARSWELL AIRFORCE BASE
FORT WORTH, TX 76127

EMERGENCY RESPONSE PHONE NO. 214-637-6434

TO: H.E.A.T. ENERGY
CONSIGNEE
STREET Dallas, TX
DESTINATION ZIP 75212

DELIVERING CARRIER H.E.A.T., INC. ROUTE ####FRANK GREY VERBAL VEHICLE NUMBER 214 637-6434

NO. PACKAGES	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS		*WEIGHT (SUBJECT TO CORR.)	CLASS OR RATE	✔	CHARGES (FOR CARRIER USE ONLY)
		*** RECYCLED PRODUCTS ***					
~~2~~ 72		~~NON STOCK -METAL BUNGS~~	NONREG				
		*** WASTE PRODUCTS ***					
5DR(55)	X	1261303500-SOIL	NONREG				
~~4~~ 3DR(55) 72	X	1191303500-WATER	NONREG				

STARTING MILEAGE 84754 ENDING MILEAGE _____
ARRIVE TIME _____ DEPART TIME _____

file
met ~~[illegible]~~
[illegible]
9:00 A.M.

COD Amt. $

C.O.D. FEE: ☐ Prepaid ☐ Collect $

...veen two ports by a carrier by ...t the bill of lading shall state ...pper's weight".

...f stamp; not a part of bill of ...tate Commerce Commission.

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding
$ per

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
(Signature of Consignor)

TOTAL CHARGES $

Freight charges are PREPAID unless marked collect. ☐ Check box if charges are Collect.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation".

[signature] 9-15-93 (X) Shipper, Per AFBDA - Carswell (X) Agent, Per [signature] 15 Sept 93

Permanent post office address of shipper

+ MARK WITH "X" TO DESIGNATE HAZARDOUS MATERIAL AS DEFINED IN TITLE 49 OF FEDERAL REGULATIONS

[illegible] appropriate UN or NA number as defined in US DOT Emergency Response Communication Standard (HM-126C)

1

172382

CALL TOLL FREE 800-257-8534, FAX 800-451-8112
HOROFARE, N.J. 08086-9499
REORDER FR

TEXAS WATER COMMISSION
P.O. Box 13087, Capitol Station
Austin, Texas 78711-3087

172383

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form approved. OMB No. 2050-0039, expires 09 30 94

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. T X 0 5 7 1 9 2 4 0 4 2 — Manifest Document No.

2. Page 1 of

Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
CARSWELL AIR FORCE BASE
ATTN:
FRANK GREY
CARSWELL AIR FORCE BASE
FT. WORTH, TX. 76125-5000

4. Generator's Phone (817)782-6282

A. State Manifest Document Number 00418141

B. State Generator's ID 65004

5. Transporter 1 Company Name H.E.A.T., INC.

6. US EPA ID Number T X D 9 8 0 6 2 4 0 3 5

C. State Transporter's ID 30440

D. Transporter's Phone 214-637-6434

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
HEAT ENERGY ADVANCED TECHNOLOGY, INC.
4460 SINGLETON BLVD.
DALLAS, TEXAS 75212

10. US EPA ID Number T X D 9 8 0 6 2 4 0 3 5

G. State Facility's ID 50029

H. Facility's Phone 214-637-6434

11A. HM	11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
	a. NON HAZARDOUS ACCORDING TO 40 CFR (SOIL) NON REGULATED MATERIAL	5	DM	275	G	C9Z63191
	b. NON HAZARDOUS ACCORDING TO 40 CFR (RINZATE) NON REGULATED MATERIAL	4	DM	220	G	C9Z61191
	c.					
	d.					

J. Additional Descriptions for Materials Listed Above
11a. 1261303500
11b. 1191303500
HEAT INC. Prof. Ic No.

K. Handling Codes for Wastes Listed Above
11a. M061
11b. M061

15. Special Handling Instructions and Additional Information
24 HOUR EMERGENCY CONTACT: FRANK GREY (817)782-6282

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations, including applicable state regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name: Frank G. Grey JR.
Signature: Frank G. Grey Jr.
Month Day Year: 09 15 93

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: TAD K. HALL
Signature: Tad K. Hall
Date: Month Day Year 09 15 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name
Signature
Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name
Signature
Date: Month Day Year

TWC-0311 (Rev. 01/21/93)

White - original Pink-TSD Facility Yellow-Transporter Green-Generator's first copy

When using the Uniform Waste Manifest for rail or water (bulk shipment) or international shipments refer to the applicable TWC regulations.

REPORT SPILLS AND/OR DISCHARGES TO THE TEXAS SPILL RESPONSE CENTER AT 512/463-7727 (24 HOURS)

172384

INSTRUCTIONS TO GENERATOR (Please Type or Print Clearly)

(1) Enter the Generator's U.S. EPA twelve digit identification number and the unique five digit number assigned to this manifest by the generator if you are shipping hazardous waste.

(2) Enter the total number of pages used to complete this manifest.

(3) Enter the company name and mailing address.

(4) Provide a phone number where an authorized agent of your firm may be reached in the event of an emergency.

(5) Enter the company name of the first transporter and their U.S. EPA ID Number.

(6) If applicable, enter the company name of the second transporter and their U.S. EPA ID Number. If more than two transporters are used, enter each additional transporter's information on the Continuation Sheet (EPA form 8700-22A).

(7) Enter the company name, site address, and U.S. EPA ID Number of the facility designated to receive the waste listed on this manifest.

(8) **COMPLETE ALL STATE OF TEXAS INFORMATION A. THROUGH H. IN THE SHADED AREAS.**

(9) Complete the waste description table as follows:

(A) ITEM 11A - When shipping an EPA/DOT regulated hazardous waste or material in conjunction with solely state regulated waste enter an "x" in the HM box before each EPA/DOT regulated waste/material description.

(B) ITEM 11 - Enter the U.S. DOT Proper Shipping Name, Hazard Class, and ID Number (UN/NA) for each waste identified. If it is a Class I nonhazardous waste use the Texas Waste Code description.

(C) ITEM 12 - Enter the number of containers for each waste and the appropriate abbreviation for type located in Subchapter A of the TWC Industrial Solid Waste Rules.

(D) ITEM 13 - Enter the total quantity of waste described on each line.

(E) ITEM 14 - Enter the appropriate letter from the table below for the unit of measure.

G = Gallons (liquids only)	Y = Cubic Yards	M = Metric Tons (1000 kg.)
P = Pounds	L = Liter (Liquids Only)	N = Cubic Meters
T = Tons (2000 lbs.)	K = Kilograms	

(F) ITEM I - Enter the appropriate TWC State Waste Code for each waste you are shipping.

(10) The Generator must read, sign (by hand), and date the certification statement. If a mode other than highway is used, the word "highway" should be lined out and the appropriate mode (rail, water or air) inserted in the space below. In signing the waste minimization certification statement, those generators shipping hazardous waste who have not been exempted by statute or regulation from the duty to make a waste minimization certification are also certifying that they have complied with the waste minimization requirements.

(11) The manifest must be signed and dated by the first transporter in the presence of the Generator. If more than one transporter is to be used, the Generator must provide additional copies for their use.

* (12) Generator retains green copy, sending remaining copies with the driver.

INSTRUCTIONS FOR THE TRANSPORTER (Please Type or Print clearly)

(1) As driver of the transport vehicle, you are responsible for ensuring that all waste received by you arrives at the specified destination.

(2) Sign and date the space provided, certifying the waste amounts in **PART I** were received for transport. **NOTE:** If you are unable to carry out the delivery of the shipment as specified, dial the emergency phone numbers given in **PART I** notifying the **GENERATOR.**

(3) Upon delivery of the shipment, the TSD Facility Owner/Operator is to sign for the shipment in your presence and fill in "date received".

* (4) Separate the yellow copy and retain for your records. Leave the remaining copies with the **TSD** Facility Owner/Operator.

INSTRUCTIONS TO TREATMENT, STORAGE AND DISPOSAL (TSD) FACILITY OWNER/OPERATOR (Please Type or Print Clearly)

(1) The authorized representative of the designated (or alternate) facility's owner or operator must note in **ITEM 19** any significant discrepancy between the waste described on the manifest and the waste actually received at the facility.

(2) Enter date received and sign in the presence of the driver declaring receipt of the wastes and verifying the quantities in the table in **PART I.**

(3) Retain the pink copy for your records and return the completed original (white) copy to the **GENERATOR.**

* U.S. EPA and TWC regulations require that copies of this Uniform Hazardous Waste Manifest be retained for a period of three (3) years in your company records. Do **not** send to TWC unless otherwise notified by these departments.

Public reporting burden for this collection of information is estimated to average: 37 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment, storage and disposal facilities. This includes time for reviewing instructions, gathering data, and completing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing this burden, to: Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

GENERATOR NOTIFICATION REGARDING SHIPMENT OF WASTES RESTRICTED FROM LAND DISPOSAL UNDER 40 CFR 268.7 (a)(1)

This notification is submitted to HEAT ENERGY ADVANCED TECHNOLOGY, INC. in accordance with the Land Disposal Restrictions. Generators of an E.P.A. Hazardous wastes must provide the following information with each shipment delivered to a treatment facility. No waste which exceeds any ment standards or concentration limits may be utilized in land disposal until it can be certified by the treatment facility to meet the requirements. **The restricted wastes listed on this page are not a comprehensive list. This list represents only those restricted wastes which might be accepted for treatment by H.E.A.T., Inc.**

1. Generator Name and Address: CARSWELL AIR FORCE BASE, CARSWELL AIR FORCE BASE, FT. WORTH, TX.
2. H.E.A.T. Waste Profile Number: 1261303500
3. E.P.A. Hazardous Waste Code(s): NON REGULATED MATERIAL
   (Please list here all E.P.A. codes circled elsewhere on this form.)
4. Manifest number associated with this shipment: 00418141
5. Attach waste analysis, if available (first time only). NOTE: Generators using process knowledge must keep supporting data in their operating records.

A. "F" LISTED WASTE CODES (40 CFR 268.43, CCW)

INSTRUCTIONS: For each solvent waste constituent present in this waste or its extract, circle the treatment standard(s) which apply.

Solvent Constituents	TREATMENT STANDARD Wastewater Total Conc. (mg/l)	TREATMENT STANDARD Non-wastewater Total Conc. (mg/kg)	Solvent Constituents	TREATMENT STANDARD Wastewater Total Conc. (mg/l)	TREATMENT STANDARD Non-wastewater Total Conc. (mg/kg)
Acetone (F003)	0.280	160.0	Methylene Chloride (F001 or F002)	0.089	33.0
n-Butyl Alcohol (F003)	5.600	2.6	Methyl Ethyl Ketone (MEK) (F005)	0.280	36.0
Carbon Disulfide (F005)	0.014	4.8*	Methyl Isobutyl Ketone (MIBK) (F003)	0.140	33.0
Carbon Tetrachloride (F001)	0.057	5.6	Pyridine (F005)	0.014	16.0
Chlorobenzene (F002)	0.057	5.7	Tetrachloroethylene (F001 or F002)	0.056	5.6
Cyclohexanone (F003)	0.360	0.75*	Toluene (F005)	0.080	28.0
1,2-Dichlorobenzene (F002)	0.088	6.2	1,1,1-Trichloroethane (F001 or F002)	0.054	5.6
Ethyl Acetate (F003)	0.340	33.0	Trichloroethylene (F001 or F002)	0.054	5.6
Benzene (F003)	0.057	6.0	1,1,2-Trichloro-		
Ether (F003)	0.120	160.0	1,2,2-Trifluoroethane (F001 or F002)	0.057	28.0
Iso-Butanol (F005)	5.600	170.0	Trichlorofluoromethane (F001 or F002)	0.020	33.0
Methanol (F003)	5.600	0.75*	Xylenes–Total (F003)	0.320	28.0

* TCLP required if only one, two or three constituents are present.

B. CALIFORNIA LIST

1. Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing the following metals (or elements) or compounds of these metals (or elements) at concentrations greater than or equal to those specified below.

Instructions: Circle "YES" if the metals and/or compounds exceed the limits listed below.

(i) Arsenic and/or compounds (as As) 500 mg/l	YES	(v) Mercury and/or compounds (as Hg) 120 mg/l	YES
(ii) Cadmium and/or compounds (as Cd) 100 mg/l	YES	(vi) Nickel and/or compounds (as Ni) 134 mg/l	YES
(iii) Chromium and/or compounds (as Cr VI) 500 mg/l	YES	(vii) Selenium and/or compounds (as Se) 100 mg/l	YES
(iv) Lead and/or compounds (as Pb) 500 mg/l	YES	(viii) Thallium and/or compounds (as Tl) 130 mg/l	YES

2. Liquid hazardous wastes that are primarily water and contain halogenated organic compounds (HOC) in total concentration greater than or equal to 1,000 mg/l and less than 10,000 mg/l HOC's — YES

3. Liquid hazardous wastes that contain HOC's in total concentrations greater than or equal to 1,000 mg/l and are not already restricted by (2) above [268.32(a)(J)]. — YES

"D" CHARACTERISTIC WASTE CODES (40 CFR 268.42, TECH)

D001 – Ignitable Liquids, Wastewaters <1% TOC <1% TSS
D001 – Ignitable Liquids, < 10% TOC
D001 – Ignitable Liquids, ≥ 10% TOC

NOTICE! **Signature and date required on the *reverse side* of this document. Both sides must be supplied with shipping manifests.**

D. MAXIMUM CONCENTRATION OF CONTAMINANTS FOR THE TOXICITY CHARACTERISTIC

172386

D004	Arsenic	5.0 mg/l	D011	Silver	5.0 mg/l	D028	1,2 - Dichloroethane	0.5 mg/l
D005	Barium	100.0 mg/l	D018	Benzene	0.5 mg/l	D029	1,1 - Dichloroethylene	0.7 mg/l
06	Cadmium	1.0 mg/l	D019	Carbon Tetrachloride	0.5 mg/l	D035	Methyl Ethyl Ketone	200 mg/l
D007	Chromium	5.0 mg/l	D023	o-Cresol	200 mg/l	D038	Pyridine	5.0 mg/l
D008	Lead	5.0 mg/l	D024	m-Cresol	200 mg/l	D039	Tetrachloroethylene	0.7 mg/l
D009	Mercury	0.20 mg/l	D025	p-Cresol	200 mg/l	D040	Trichloroethylene	0.05 mg/l
D010	Selenium (nonwastewaters conc.	1.0 mg/l 5.7 mg/l)	D026	Cresol	200 mg/l			

D004-D011, 40 CFR 268.41, CCWE & 40 CFR 268.43, CCW (D018-D040, not currently regulated under LDR)

E. "U" LISTED WASTE CODES (40 CFR 268.42, TECH)

INSTRUCTIONS: Discarded Commercial Chemical and Off-Specification Products: Wastes listed in this section may be land disposed if it can be demonstrated that no practical alternatives for treatment or recovery exist (SEE: 40 CFR 268.8). Circle any "U" codes listed below that apply.

FIRST THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)	SECOND THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)	THIRD THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)
U019: Benzene	0.140	36.0	U002: Acetone	0.280	160.0	U052: Cresols (m-,p-)	0.770	3.2
U031: n-Butyl Alcohol	5.600	2.6				(Cresylic Acid) (0-)	0.110	5.6
14: Chloroform	0.046	5.6	U057: Cyclohexanone	0.360	NA	U056: Cyclohexane		
U051: Creosote	0.031	1.5	U070: o-Dichlorobenzene	0.088	6.2	U071: m-Dichlorobenzene	0.036	6.2
U077: Ethylene Dichloride	0.210	7.2	U110: Dipropylamine			U072: p-Dichlorobenzene	0.090	6.2
U078: 1,1-Dichloroethylene	0.025	33.0	U140: Isobutyl Alcohol	5.600	170.0	U075: Dichlorodifluoromethane	0.230	7.2
U108: 1,4-Dioxane	0.120	170.0	U161: Methyl Isobutyl Ketone	0.140	33.0	U079: 1,2-Dichloroethylene	0.054	33.0
U124: Furan			U165: Naphthalene	0.059	3.1	U088: Diethyl phthalate	0.540	28.0
U154: Methyl alcohol	5.600	NA	U169: Nitrobenzene	0.068	14.0	U112: Ethyl Acetate	0.34	33.0
U159: M E K	0.280	36.0	U196: Pyridine	0.014	16.0	U117: Ethyl Ether	0.12	160.0
U171: 2-Nitropropane			U213: Tetrahydrofuran			U123: Formic Acid		
U188: Phenol	0.039	6.2	U239: Xylene	0.32	28.0	U125: Furfural		
U211: Carbon Tetrachloride	0.057	5.6				U191: 2 Picoline		
U220: Toluene	0.080	28.0				U201: Resorcinol		

Frank G. Gray Jr.
SIGNATURE

15 Sept 93
DATE

172387

GENERATOR NOTIFICATION REGARDING SHIPMENT OF WASTES RESTRICTED FROM LAND DISPOSAL UNDER 40 CFR 268.7 (a)(1)

This notification is submitted to HEAT ENERGY ADVANCED TECHNOLOGY, INC. in accordance with the Land Disposal Restrictions. Generators of ...n E.P.A. Hazardous wastes must provide the following information with each shipment delivered to a treatment facility. No waste which exceeds any ...ment standards or concentration limits may be utilized in land disposal until it can be certified by the treatment facility to meet the requirements. **The restricted wastes listed on this page are not a comprehensive list. This list represents only those restricted wastes which might be accepted for treatment by H.E.A.T., Inc.**

1 Generator Name and Address: CARSWELL AIR FORCE BASE, CARSWELL AIR FORCE BASE, FT. WORTH, TX.

2 H.E.A.T. Waste Profile Number: 1191303500

3 E.P.A. Hazardous Waste Code(s): NON REGULATED MATERIAL

(Please list here all E.P.A. codes circled elsewhere on this form.)

4 Manifest number associated with this shipment: 00418141

5. Attach waste analysis, if available (first time only). NOTE: Generators using process knowledge must keep supporting data in their operating records.

A. "F" LISTED WASTE CODES (40 CFR 268.43, CCW)

INSTRUCTIONS: For each solvent waste constituent present in this waste or its extract, circle the treatment standard(s) which apply.

Solvent Constituents	TREATMENT STANDARD Wastewater Total Conc. (mg/l)	TREATMENT STANDARD Non-wastewater Total Conc. (mg/kg)	Solvent Constituents	TREATMENT STANDARD Wastewater Total Conc. (mg/l)	TREATMENT STANDARD Non-wasterwater Total Conc. (mg/kg)
Acetone (F003)	0.280	160.0	Methylene Chloride (F001 or F002)	0.089	33.0
n-Butyl Alcohol (F003)	5.600	2.6	Methyl Ethyl Ketone (MEK) (F005)	0.280	36.0
Carbon Disulfide (F005)	0.014	4.8*	Methyl Isobutyl Ketone (MIBK) (F003)	0.140	33.0
Carbon Tetrachloride (F001)	0.057	5.6	Pyridine (F005)	0.014	16.0
Chlorobenzene (F002)	0.057	5.7	Tetrachloroethylene (F001 or F002)	0.056	5.6
Cyclohexanone (F003)	0.360	0.75*	Toluene (F005)	0.080	28.0
1,2-Dichlorobenzene (F002)	0.088	6.2	1,1,1-Trichloroethane (F001 or F002)	0.054	5.6
Ethyl Acetate (F003)	0.340	33.0	Trichloroethylene (F001 or F002)	0.054	5.6
Benzene (F003)	0.057	6.0	1,1,2-Trichloro-		
...l Ether (F003)	0.120	160.0	1,2,2-Trifluoroethane (F001 or F002)	0.057	28.0
Iso-Butanol (F005)	5.600	170.0	Trichlorofluoromethane (F001 or F002)	0.020	33.0
Methanol (F003)	5.600	0.75*	Xylenes–Total (F003)	0.320	28.0

* TCLP required if only one, two or three constituents are present.

B. CALIFORNIA LIST

1. Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing the following metals (or elements) or compounds of these metals (or elements) at concentrations greater than or equal to those specified below.

Instructions: Circle "YES" if the metals and/or compounds exceed the limits listed below.

(i) Arsenic and/or compounds (as As) 500 mg/l	YES	(v) Mercury and/or compounds (as Hg) 120 mg/l	YES
(ii) Cadmium and/or compounds (as Cd) 100 mg/l	YES	(vi) Nickel and/or compounds (as Ni) 134 mg/l	YES
(iii) Chromium and/or compounds (as Cr VI) 500 mg/l	YES	(vii) Selenium and/or compounds (as Se) 100 mg/l	YES
(iv) Lead and/or compounds (as Pb) 500 mg/l	YES	(viii) Thallium and/or compounds (as Tl) 130 mg/l	YES

2. Liquid hazardous wastes that are primarily water and contain halogenated organic compounds (HOC) in total concentration greater than or equal to 1,000 mg/l and less than 10,000 mg/l HOC's — YES

3. Liquid hazardous wastes that contain HOC's in total concentrations greater than or equal to 1,000 mg/l and are not already restricted by (2) above [268.32(a)(J)]. — YES

"D" CHARACTERISTIC WASTE CODES (40 CFR 268.42, TECH)

D001 – Ignitable Liquids, Wastewaters <1% TOC <1% TSS
D001 – Ignitable Liquids, < 10% TOC
D001 – Ignitable Liquids, ≥ 10% TOC

NOTICE! **Signature and date required on the *reverse side* of this document. Both sides must be supplied with shipping manifests.**

D. MAXIMUM CONCENTRATION OF CONTAMINANTS FOR THE TOXICITY CHARACTERISTIC

172383

D004	Arsenic	5.0 mg/l	D011	Silver	5.0 mg/l	D028	1,2 - Dichloroethane	0.5 mg/l
D005	Barium	100.0 mg/l	D018	Benzene	0.5 mg/l	D029	1,1 - Dichloroethylene	0.7 mg/l
D006	Cadmium	1.0 mg/l	D019	Carbon Tetrachloride	0.5 mg/l	D035	Methyl Ethyl Ketone	200 mg/l
D007	Chromium	5.0 mg/l	D023	o-Cresol	200 mg/l	D038	Pyridine	5.0 mg/l
D008	Lead	5.0 mg/l	D024	m-Cresol	200 mg/l	D039	Tetrachloroethylene	0.7 mg/l
D009	Mercury	0.20 mg/l	D025	p-Cresol	200 mg/l	D040	Trichloroethylene	0.05 mg/l
D010	Selenium (nonwastewaters conc.	1.0 mg/l 5.7 mg/l)	D026	Cresol	200 mg/l			

D004-D011, 40 CFR 268.41, CCWE & 40 CFR 268.43, CCW (D018-D040, not currently regulated under LDR)

E. "U" LISTED WASTE CODES (40 CFR 268.42, TECH)

INSTRUCTIONS: Discarded Commercial Chemical and Off-Specification Products: Wastes listed in this section may be land disposed if it can be demonstrated that no practical alternatives for treatment or recovery exist (SEE: 40 CFR 268.8). Circle any "U" codes listed below that apply.

FIRST THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)
U019: Benzene	0.140	36.0
U031: n-Butyl Alcohol	5.600	2.6
U044: Chloroform	0.046	5.6
U051: Creosote	0.031	1.5
U077: Ethylene Dichloride	0.210	7.2
U078: 1,1-Dichloroethylene	0.025	33.0
U108: 1,4-Dioxane	0.120	170.0
U124: Furan		
U154: Methyl alcohol	5.600	NA
U159: M E K	0.280	36.0
U171: 2-Nitropropane		
U188: Phenol	0.039	6.2
U211: Carbon Tetrachloride	0.057	5.6
U220: Toluene	0.080	28.0

SECOND THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)
U002: Acetone	0.280	160.0
U057: Cyclohexanone	0.360	NA
U070: o-Dichlorobenzene	0.088	6.2
U110: Dipropylamine		
U140: Isobutyl Alcohol	5.600	170.0
U161: Methyl Isobutyl Ketone	0.140	33.0
U165: Naphthalene	0.059	3.1
U169: Nitrobenzene	0.068	14.0
U196: Pyridine	0.014	16.0
U213: Tetrahydrofuran		
U239: Xylene	0.32	28.0

THIRD THIRD LIST	Waste-waters Conc. (mg/liter)	Non-waste-waters Conc. (mg/kg)
U052: Cresols (m-,p-)	0.770	3.2
(Cresylic Acid) (0-)	0.110	5.6
U056: Cyclohexane		
U071: m-Dichlorobenzene	0.036	6.2
U072: p-Dichlorobenzene	0.090	6.2
U075: Dichlorodifluoromethane	0.230	7.2
U079: 1,2-Dichloroethylene	0.054	33.0
U088: Diethyl phthalate	0.540	28.0
U112: Ethyl Acetate	0.34	33.0
U117: Ethyl Ether	0.12	160.0
U123: Formic Acid		
U125: Furfural		
U191: 2 Picoline		
U201: Resorcinol		

Frank G. Ing Jr.
SIGNATURE

15 Sept 93
DATE

172389

DOT DESCRIPTIONS

(RQ) Waste Alcohols, n.o.s. 3, UN1987, PG I PG II PG III		ERG 26
(RQ) Waste Asphalt, 3, NA1999, PG III		ERG 27
(RQ) Waste Combustible liquid, n.o.s., combustible liquid, NA1993, PG III		ERG 27
(RQ) Waste Compounds, cleaning liquid, 3, NA 1993, PG I PG II PG III		ERG 27
(RQ) Waste Dichloromethane, 6.1, UN1593, PG III		ERG 74
(RQ) Waste Extracts, aromatic, liquid 3, UN1169, PG II PG III		ERG 26
(RQ) Waste Flammable liquids, n.o.s. 3, UN1993, PG I PG II PG III		ERG 27
(RQ) Waste Flammable solids, n.o.s. 4.1, UN1325, PG II PG III		ERG 32
(RQ) Waste Fuel, aviation, turbine engine, 3, UN1863, PG I PG II		ERG 27
(RQ) Waste Fuel oil, 3, NA1993, PG III		ERG 27
(RQ) Hazardous waste, liquid, n.o.s. 9, NA3082, PG III		ERG 31
OR		
Environmentally hazardous substances, liquid, n.o.s. 9, UN3082, PG III		ERG 31
(RQ) Hazardous waste, solid, n.o.s. 9, NA3077, PG III		ERG 31
OR		
Environmentally hazardous substances, solid, n.o.s. 9, UN3077, PG III		ERG 31

172390

13 September 1993

To: M. Britt
T. Donnette
T. Hall
From: J. Morrison
RE: Manifests

With the new HM-181 manifest descriptions taking effect Oct. 1, we anticipate that Tad and Tim will have to fill out more than their fair share of manifests.

Tad and Tim, Tony has requested that you carry extra manifests with you, at least until the end of the year. If you find that a customer is not using the new descriptions when you arrive for a pickup, please call Cheryl for assistance. I will provide you with a "cheat sheet" of the most common waste descriptions which Heat, Inc. will be using. This sheet will give you some idea of what the new descriptions will look like. There are two major changes to look for: "classes" will be denoted by numbers and packaging groups will be denoted by PG I, PG II and PG III. Please, do not attempt to fill out the manifests without the benefit of Customer Service.

Thank you.

cc: D. Bagrier
T. Clark
C. Woodham

(RQ) Waste Ink, printer's, flammable, 3, UN1210, PG II PG III		ERG 26
(RQ) Waste Naphtha, petroleum, 3, UN1255, PG I PG II		ERG 27
(RQ) Waste Naphtha, solvent, 3, UN1256, PG II PG III		ERG 27
(RQ) Waste Paint driers, paint or varnish, 3, UN1263, PG II PG III		ERG 26
(RQ) Waste Petroleum distillates, n.o.s. 3, UN1268, PG I PG II PG III		ERG 27
(RQ) Waste Petroleum oil, 3, UN1270, PG I PG II PG III		ERG 27
(RQ) Waste Tars, liquid, 3, UN1999, PG II PG III		ERG 27
(RQ) Waste Tetrachloroethylene, 6.1, UN1897, PG III		ERG 74
(RQ) Waste 1,1,1-Trichloroethane, 6.1, UN2831, PG III		ERG 74
(RQ) Waste Trichloroethylene, 6.1, UN1710, PG III		ERG 74

Class 3 - PG I - >140F
PG II - <73F
PG III - >73F and <140F

Class 4.1 - PG II burning rate >2.2 mm/s and the flame passes wetted zone
PG III burning rate >2.2 mm/s and the wetted zone stops the flame

The RQ value is dependent upon the predominant EPA waste code number.

172392

APPENDIX G

Safety, Health, and Emergency Response Plan (SHERP)

172393

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN (SHERP)

PHASE II
GROUNDWATER SAMPLING, SUBSURFACE SOIL DELINEATION, & MONITOR/EXTRACTION WELL INSTALLATION

FOR

US AIR FORCE PLANT NO. 4
FORT WORTH, TEXAS

Prepared for:

Department of the Army
Fort Worth District Corps of Engineers
Fort Worth, Texas 76102-0300

Contract # DACA63-91-D-0061
Modification to Delivery Order #0052

Prepared by:

Geo-Marine, Inc.
550 East 15th Street
Plano, Texas 75074
(214) 423-5480

July 1993

TABLE OF CONTENTS

		Page
1.0	Field Activities	2
2.0	Resources	3
3.0	Key Personnel	4
4.0	Personal Protective Equipment	7
5.0	Documents	7
Site Safety Plan		8
Hazardous Communication Program		17

ATTACHMENTS

1.0 FIELD ACTIVITIES

The Phase II Groundwater Sampling, Subsurface Soil Delineation, and Monitor/Extraction Well Installation field program at U.S. Air Force Plant No. 4 will include the following elements:

- Locate approximately 140 client-determined groundwater sampling locations
- Locate approximately five client-determined soil sample borehole locations
- Accurately plot all sampling locations on base map
- Check all sampling sites for surface obstructions, underground utilities and other structures with assistance of appropriate private utility and government personnel
- Sample groundwater using truck-mounted penetrometer sampler for solvent and petroleum analyses
- Drill boreholes through soil to bedrock and sample groundwater for solvent and petroleum analyses
- Drill and develop extraction/monitor wells as required by the client and sample the groundwater
- Analyze all groundwater samples on site using method 8021 in a mobile laboratory for client-specified compounds
- Describe subsurface soil column at all sample stations using either visual soil descriptions (borehole locations) or electronic ("piezocone") profiles which have been calibrated with an actual, described soil column (penetrometer locations)
- Pressure grout all penetrometer holes and boreholes to the surface and repair surface to pre-investigation condition
- Decontaminate all subsurface penetrometer, drilling, and sampling equipment between each station
- Drum all decontamination liquids and all drilling soil cuttings and fluids for future analyses as needed for proper disposal
- Monitor breathing space air with HNu at each sample location for elevated levels of organic vapors
- Monitor drilling operations with explosimeter for possible explosive atmosphere

2.0 RESOURCES

Reference documents used in the development of this Safety, Health, and Emergency Response Plan (SHERP) include:

- OSHA regulations in 29 CFR 1910
- US Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1
- Geo-Marine, Inc. Corporate Safety Manual
- NIOSH Pocket Guide to Chemical Hazards (1990)
- Chemical Hazards of the Workplace by Proctor, Hughes, & Fischman (1989)
- Merck Index: an Encyclopedia of Chemicals, Drugs, and Biologicals (1989)
- NIOSH Guidance Manual for Hazardous Waste Sites (1985)

3.0 KEY PERSONNEL

172397

Geo-Marine, Inc. (GMI) and subcontract personnel responsible for the safe completion of this project include:

- GMI Corporate Safety Committee Chair - Mary Alice Garza
- GMI Project Manager - Lyle Winnette
- GMI Field Supervisor - Louise Delano
- GMI Sampler - Tony Mills
- GMI Site Safety Officer - Tony Mills
- GMI Driller - Hubert Thompson
- GMI Driller's Helper - Bruce Moring
- GMI Decon Technician - Lambert Lewis
- Laboratory Subcontractor Supervisor - not available
- Laboratory Subcontractor Technician - not available
- Penetrometer Equipment Subcontractor Supervisor - not available
- Penetrometer Equipment Subcontractor Operator - not available

3.1 Corporate Safety Committee Chair/Project Manager

The GMI Corporate Safety Committee Chair and Project Manager will have the ultimate responsibility for implementation of all parts of the SHERP and to make certain that all applicable federal, state, and local safety regulations and guidelines are followed.

3.2 Field Supervisor

The Field Supervisor will observe field activities of GMI and subcontractor personnel to insure that safety and health procedures outlined in this SHERP are followed. The Field Supervisor will assure that daily calibration of the HNu, measuring of background ambient air for organic vapors, and recording of such data be done in the vicinity of each penetrometer or drilling site. The Field Supervisor will also assure that an explosimeter is used at each drilling site to monitor for explosive atmosphere. The meter will be periodically checked during operations.

3.3 Site Safety Officer

The Site Safety Officer will oversee all field procedures to check that SHERP guidelines are followed. The Site Safety Officer has the authority to invoke disciplinary action in the event any stipulations of the SHERP are willfully ignored and to suspend field activity for safety and/or health reasons. Specifically, the responsibilities of the Site Safety Officer include:

organizing the field sampling area so that support facilities are in uncontaminated areas

introducing the field operations to the local emergency response/accident personnel

overseeing appropriate use and care of personal protective equipment (PPE)

monitoring external physical conditions, especially temperature, wind strength and direction, and potential for electrical storms

running site safety meetings as needed (Site Safety Review form attached)

responsibility for all verbal and written notification of the COE in the event of any emergencies, accidents, or injuries

3.4 Field Sampler

The Field Sampler will make certain that the appropriate PPE is worn and used and that the samples are collected with decontaminated equipment using procedures which minimize the potential of exposure via either respiration or eye/skin contact. The Field Sampler will also monitor organic vapor levels in breathing air space and check for explosive atmosphere whenever one or both of these tasks are delegated to him.

3.5 Subcontractor Penetrometer Supervisor and Equipment Operator

Subcontractor personnel will operate the sampler in a safe manner and will insure that the appropriate PPE is worn and used and that proper decontamination procedures are carried out. They will insure that each sampling site is left clean and undisturbed.

3.6 Subcontractor Laboratory Technician and Supervisor

Subcontractor personnel will operate the mobile lab equipment in a safe manner and will wear and use appropriate PPE. They will insure that all required analytic methodology and QA/QC procedures are used and documented.

3.7 Driller and Technicians

Each member of the drilling crew will exercise care at all times around the drilling rig and associated equipment. Protective head gear and foot gear will be worn at all times, and appropriate PPE will be readily available to be used when necessary. Decontamination, using approved methods and materials, will be done at a client-designated location for all sampling-related equipment between each location.

3.8 Field Team

Each member of the field team individually has the responsibility to read, understand, and follow each section of this SHERP. Each team member will attend all site safety meetings called by the Site Safety Officer and will acknowledge his authority to upgrade PPE or to evacuate the site in the event of emergency health or safety situations. Any unsafe work practices will be reported to the Site Safety Officer immediately.

4.0 PERSONAL PROTECTIVE EQUIPMENT

The appropriate level of PPE for this project will be either level C or level D. The determinant will be the concentration of airborne organic vapors measured in the atmosphere in the sampling location area.

4.1 Level D PPE

Level D protection includes long sleeve shirt and trousers, hard hat, steel-toed boots, and gloves. When splashing is likely, boots and gloves should be made of rubber and clothes and skin protected with liquid-resistant coveralls like tyveks. Goggles or safety glasses will be available on site for eye protection.

4.2 Level C PPE

Level C protection includes all the elements of level D plus the addition of an air purifying respirator with the appropriate chemical cartridges, either half or full face. Air purifying respirators for all crew members will be readily available on site at all times.

5.0 DOCUMENTS

The GMI Project Manager will maintain safety and health records on file which document the following for each team member:

(a) annual occupational health examination with physician clearance to wear a respirator

(b) OSHA-approved 40-hour hazardous material handling course or 8-hour refresher within the last 12 months

(c) successful respirator fit-testing performed

In addition, one member of the GMI team has current certification as an OSHA Supervisor

Copies of OSHA certifications for the GMI team are attached. Other related documents are available for review on request.

GEO-MARINE, INC.
SITE SAFETY PLAN

GENERAL INFORMATION

PROJECT TITLE/NUMBER: Phase II - Groundwater Survey at U.S. Air Force Plant No. 4

PROJECT MANAGER: Lyle Winnette

PROJECT LOCATION(S): Fort Worth, Texas

PLAN PREPARED BY: Louise Delano and Tony Mills DATE: July 14, 1993

PLAN APPROVED BY: Lyle Winnette DATE: July 15, 1993

PLAN REVIEWED BY SITE SAFETY OFFICER: Tony Mills DATE: July 16, 1993

SCOPE/OBJECTIVE OF WORK: Sample groundwater at 140 client-determined penetrometer sites and at 5 client-determined soil boring sites for analysis for TCE, BTEX, and other organic compounds, in order to establish boundaries of plume(s) of affected water. Based on results, drill, install, and sample up to 20 monitor and/or extraction wells as client directs.

PROPOSED DATES OF FIELD ACTIVITIES: July 26 - August 20, 1993 - Phase II

SUMMARY:

Overall Chemical Hazard:	low [ ]	moderate [X]	serious [ ]	unknown [ ]
Overall Physical Hazard:	low [ ]	moderate [X]	serious [ ]	unknown [ ]

GEO-MARINE, INC.
SITE SAFETY PLAN

SITE/WASTE CHARACTERISTICS

WASTE TYPE(S):

gas/vapor [ ] liquid [X] sludge [ ] solid [X]

CHARACTERISTICS:

flammable/ ignitable [ ] volatile [X] corrosive [ ] acutely toxic [ ]

explosive [ ] reactive [ ] carcinogen [ ] radioactive [ ]

other:_____

PHYSICAL HAZARDS:

overhead [X] confined space [ ] below grade [ ] trip/fall [X]

puncture [ ] burn [ ] cut [ ] splash [X]

noise [ ] other:_____

BRIEF SITE HISTORY/DESCRIPTION, INCLUDING UNUSUAL FEATURES (see Scope of Work for details):

A confirmed plume of TCE has been migrating across the base from multiple sources presumed to include Plant #4 (Lockheed, formerly General Dynamics) and a drum storage area adjacent to the west side of the golf course. One or more jet fuel releases may also have affected local groundwater.

LOCATIONS OF CHEMICALS/WASTES: extent of plume(s) not yet delineated

ESTIMATED VOLUMES(S) OF CHEMICAL/WASTES: volume(s) of chemicals unknown

Site currently in operation yes [X] no [ ]

GEO-MARINE, INC.
SITE SAFETY PLAN

HAZARD EVALUATION

List hazard by task (i.e. drilling, sampling, etc.); number tasks; assign physical and chemical hazard(s) and evaluation (s):

NO.	TASK	CHEMICAL HAZARD/ EVALUATION	PHYSICAL HAZARD/ EVALUATION
1	air monitoring	fumes/slight	none/none
2	"punching" holes	fumes/slight	heavy equipment usage/slight
3	drilling holes	fumes/slight	heavy equipment usage/slight
4	collecting samples	splashing/slight	none/none
5	well development	splashing/slight	minor/slight
6	equipment decon	splashing/slight	steam burn/slight
7	sample analyses	splashing/slight	none/none
8	drum contents sampling	splashing/slight	drum moving/slight to none

Completed Hazard Evaluation forms attached for each major known contaminant?

yes [X] no [ ]

If not, why?

HAZARD CONTROL

Task-associated chemical hazards on the site include fumes and possible splashing by contaminated water. The possibility of either occurring is considered slight. Splashing can be prevented or mitigated by watchfulness, care, and the appropriate use of PPE. Fume accumulation is unlikely in the open air setting of the sampling locations; however, the consistent and regular use of an air monitor will detect any above-background levels of organic vapors so that chemical respirators can be put on and/or the site evacuated if needed.

Task-associated physical hazards on the site include injury from heavy equipment, back injury from improper lifting, and season-related heat stress. All are considered preventable. Potential

for injury from heavy equipment can be minimized by attentiveness to proper procedures. Injury from lifting or carrying can be minimized by sensible practices (including wearing a safety belt) and the appropriate use of transporting equipment such as a dolly for drums and drill stem. To minimize the possibility of heat stress, the Site Safety Officer will monitor temperature and heat index. Fluids will be available on site at all times and rest breaks will be taken as deemed appropriate by the Site Safety Officer.

GEO-MARINE, INC.
SITE SAFETY PLAN

SITE SAFETY WORK PLAN

SITE CONTROL: site maps are attached

perimeter identified [X]

work area(s) identified [X]
(by sample points pending utility clearance)

contaminated area(s) [ ]
(not yet delineated)

decontamination station(s) [ ]
(will be located near site)

ANTICIPATED LEVEL OF PROTECTION TO BE USED:
(cross-reference with task numbers from Hazard Evaluation section):

Task No.	Anticipated Protection Level*
1	level D
2	level D
3	level D
4	level D
5	level D
6	level D
7	level D
8	level D

* with capability to go immediately to level C if conditions (as described on the following page) warrant

NOTES:

1.) Anticipated amounts and contamination levels of hazardous materials will not require the specific designation of site control zones.

2.) All sampling procedures will be performed outdoors in an open air setting on level ground. Confined space and/or below ground situations will not be encountered.

SITE SAFETY WORK PLAN (cont.)

ACTION LEVELS FOR

(I.) UPGRADE TO LEVEL C PPE, INCLUDING USE OF CHEMICAL RESPIRATOR:
(II.) EVACUATION OF WORK ZONE FOR REASSESSMENT OF CONDITIONS:

I. If field team members are operating in level D PPE and organic vapors are 5 ppm or more above local background, they will either upgrade to level C PPE, including APRs with chemical cartridges, or evacuate the site at the discretion of the Site Safety Officer.

II. If field team members are operating in either level D or level C PPE and organic vapors exceed 1,000 ppm above local background, they will immediately evacuate the site following instructions from the Site Safety Officer.

Air monitoring to determine background levels and to check for the below listed organic vapor action levels and explosive limits will be performed at each sample location using an HNu and an explosimeter. Both machines will be calibrated daily using accepted calibration procedures and checked frequently during the day.

Samples of the two air monitoring forms are attached; complete monitoring records will be maintained on site throughout the project.

The HNu does not identify compounds; therefore, it will be assumed that readings above local background result from contaminant vapors. The numbers used below represent the worst case scenario, i.e., they are consistent with guidelines for benzene and vinyl chloride, the two most hazardous substance which might be encountered during this project.

Level D: O_2 < 19.5% or > 25%
explosive atmosphere 10% to 25% LEL
organic vapors 0 to 1 ppm
particulates > __ mg/m NOT APPLICABLE
other _____

Level C: O_2 < 19.5% or > 25%
explosive atmosphere > 25% LEL
unknown organic vapor 1 to 5 ppm
particulates > __ mg/m NOT APPLICABLE
other _____

SITE SAFETY WORK PLAN (cont.)

DECONTAMINATION SOLUTIONS & PROCEDURES:

All cone-penetrometer, drilling, and sampling equipment will be decontaminated between sample locations at a decon station picked by the client. Large equipment will be steam-cleaned with hot water and non-phosphate, non-volatile cleaner. Hand-sampling equipment will be decontaminated by hand, using the same cleaner. All equipment will be rinsed thoroughly, and the samplers will have distilled water final rinse.

PERSONNEL DECON PROTOCOL:

All disposable PPE will be decontaminated and disposed of as "clean trash". Goggles, outer gloves, and APR (if needed) will be cleaned with appropriate cleaners/sanitizers for reuse.

WORK LIMITATIONS (TIME OF DAY, WEATHER, ETC.):

Work limitations include: weekdays 8 A.M. to 5 P.M. (set by client), electrical storms (requiring shut-down), and heat stress. To reduce incidence of heat stress induced by temperature, frequent breaks will be taken and adequate fluids will be available at all atimes for consumption.

DISPOSAL OF INVESTIGATION-DERIVED MATERIALS (DECON WASTE, CUTTINGS, ETC.):

All investigation-derived waste materials, including but not limited to: (1) sampled water not retained for analyses, (2) drill cuttings, (3) groundwater encountered during drilling, and (4) decon waste water, will be contained on site in a client-designated location in sealed 55-gallon drums, until analytic results indicate proper mode and location of treatment and/or disposal.

SAMPLE HANDLING PROCEDURES (INCLUDING PPE):

Samples will be collected, handled, and analyzed by personnel wearing protective coveralls and latex surgical gloves if appropriate. Samples will be handled with care, kept on ice, and analyses will be conducted in a timely fashion.

GEO-MARINE, INC.
SITE SAFETY PLAN

EMERGENCY INFORMATION

LOCAL RESOURCES
PHONE NUMBERS/NAMES OF INDIVIDUALS/ADDRESSES AS APPLICABLE:

Ambulance: 911

Hospital Emergency Room: 882-3333
(map with route to hospital is attached)

Poison Control Center: 1-800-441-0040

Police (local, county, state): 911 (emergency) 335-4222 (non-emergency)

Fire Department: 911 (emergency) 332-2131 (non-emergency)

Airport: Meacham Airport 624-1127

Regulatory Agency Contact (EPA, TWC, etc.): EPA 214-655-6444 TWC (district) 214-298-6171

QA/QC Laboratory: US Army Corps of Engineers Southwestern Division Laboratory, 4815 Cass St., Dallas, TX 75235-8011 CONTACT: Steven Brooks at 905-9130

Client Contact: Randy Niebuhr (817) 334-3223

SITE RESOURCES
PHONE NUMBERS/NAMES OF INDIVIDUALS/ADDRESSES AS APPLICABLE

Site Contact: (817) 782-5000 (Carswell switchboard)

Site Emergency Contact: Bobby Hernandez (Environmental) 782-6264 Secretary 782-6207

Water Supply Source: available on site

Local Telephone Number (Base Utilites, etc.)/Location: Allan Flolo/Air Force Base Disposal Agency (817) 782-6304

GEO-MARINE INC.
HAZARDOUS COMMUNICATION PROGRAM

PROJECT NAME: Phase II - Groundwater Survey, US Air Force Plant No. 4, Fort Worth, Texas

PROJECT LOCATION: Carswell Air Force Base, Fort Worth, Texas

PROJECT NUMBER: 1161-052

DATE(S): July 26, 1993

This written hazardous communication program follows the requirements specified in 29 CFR 1910.1200 (OSHA) and includes the following components:

I. proper labelling of all containers of hazardous chemicals which includes accurate identification of contents, appropriate hazard warnings, and complete name and address of manufacturer

II. complete and readily available list of all chemicals present on site

III. readily available material safety data sheets (MSDS) for all chemicals either used or produced at the site

IV. employee training which includes:

- detection methods for hazardous chemicals
- monitoring methods for hazardous chemicals
- emergency procedures in the event of a release
- safe work habits
- types of personal protective equipment (PPE) and the appropriate usage of PPE

I. Are all containers of hazardous chemicals on site properly labelled?
yes no not applicable/reason

II. Is there a complete list of all hazardous chemicals on site readily available?
yes no not applicable/reason

III. Are there MSDS sheets readily available for all hazardous chemicals used or produced on site?
yes no not applicable/reason

IV. Employee Training:

OSHA 40 Hour Training?
yes no not applicable/reason

Other training? (specify) GIHI DRILLER HAS DRILLER'S PERMIT.
2 PERSONNEL HAVE HAZMAT SUPERVISOR'S TRAINING (OSHA)

What hazardous chemical detection method(s) are used on site?
Mobile lab will analyze all samples for halogenated hydrocarbons and for petroleum hydrocarbons using method 8021

What hazardous chemical monitoring method(s) are used on site?
HNu will be used for monitoring air space at each sample location
Explosimeter will be used to check for explosive atmosphere at each drilling site

What emergency procedures are in place in the event of a release?
Emergency Phone Numbers:

fire: 911 police: 911 ambulance: 911

Route to nearest hospital (map is attached):
Roaring Spring Rd. southeast from base to I-30. East on I-30 to Summit exit. South on Summit to Pennsylvania. East one block to Harris Methodist Hospital at 1301 Pennsylvania Ave.

What level of PPE is used at the site? (include specifics of clothing and equipment):

Level D with hardhats, steel-toes boots, safety goggles, and latex gloves.
Rubber boots, rain suits, and impervious coveralls will be available.
APR with organic vapor cartridges will be available in case action level exceeded.

Printed name of person completing form: TONY C. MILLS Title: GEOLOGIST

Signature: Tony C. Mills

Date: _____

172412

ATTACHMENTS

Site Safety Review Form
GMI Employee OSHA Certifications
Hazard Evaluation Forms
Site Maps
Air Monitoring Forms
Route Map to Hospital
Equipment List

172413

GEO-MARINE INC.
HAZARDOUS & TOXIC MATERIALS PLAN
SITE SAFETY REVIEW

PROJECT NAME: Phase II - Groundwater Survey, Carswell AFB **PROJECT NUMBER:** 1161-052
Site Location: Carswell Air Force Base, Fort Worth, Texas
Date: _____ Time: _____ Location of review: _____

GMI Representative(s): _____

Client Representative(s): _____
_____

Meeting Conducted by: _____

Meeting Objective(s): _____
_____
_____

Chemicals Anticipated: TCE and BTEX
Other Hazardous Substance(s) and/or Condition(s) Anticipated: _____
_____

TOPICS DISCUSSED:
Physical Hazards _____
Chemical Hazards _____
Radiation Hazards _____
Personal Protective Clothing/Equipment _____
Emergency Procedures _____
Specific Individual Responsibilities _____
Decontamination Procedures _____
Special Site Considerations _____

Checklist
Emergency information reviewed by ALL team members? ___
Route to nearest hospital known by ALL team members? ___
Site safety plan on site and readily available to ALL team members? ___
Copy(ies) of appropriate licensing/certification available? ___

Signatures of those present:

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Economic Environmental Services, Inc.

Certificate of Completion

This is to certify that

Lyle Winnette

461-94-3130

has successfully completed an

8 Hr. Training Course in

29 CFR Part 1910.120 and DOT HM-126F

Hazardous Operations and Emergency Response

on this 15th day of February, 1993.

Thomas H Bentley-Smith

Trainer

No. 930878

172414

Economic Environmental Services, Inc.

Certificate of Completion

This is to certify that

Louise Delano

006-48-1402

has successfully completed an

8 Hr. Training Course in

29 CFR Part 1910.120 and DOT HM-126F

Hazardous Operations and Emergency Response

on this 15th day of February, 1993.

Thomas G. Bentley-Smith

Trainer

No. 930880

172415

Economic Environmental Services, Inc.

Certificate of Completion

This is to certify that

Louise L. Delano

006-48-1402

has successfully completed an

8 Hr. Managers/Supervisors Training Course in

29 CFR Part 1910.120 and DOT HM-126F

Hazardous Waste Operations and Emergency Response

on this 26th day of March, 1993.

Thomas H Bentley-Smith

Trainer

No. 930952

172416

172417

Mayhew Environmental Training Associates

Certificate Number
7ME070293002HM
Soc. Sec. #530-48-1550

Accreditation Expires
07/02/94

This is to certify that

Hubert S. Thompson Jr.

has successfully completed
8 hours of annual recertification training in

Hazardous Waste Operations & Emergency Response

in accordance with OSHA 29 CFR 1910.120
July 2, 1993 in Dallas, Texas
and passed the associated examination.

Conducted By:

META

P.O. Box 786 Lawrence, Kansas 66044
1-800-444-6382
For further information contact: Patsy Kemp, Registrar

T. Bradford Mayhew, President

172428

THE STATE OF TEXAS

THIS IS TO CERTIFY THAT

HUBERT SHARP THOMPSON, JR.

HAVING GIVEN SATISFACTORY EVIDENCE OF QUALIFICATIONS REQUIRED BY THE TEXAS WATER WELL DRILLERS ACT, ARTICLE 7621e, VERNON'S TEXAS CIVIL STATUTES, IS GRANTED THIS

LICENSE

AND IS HEREBY AUTHORIZED TO PRACTICE AS A

WATER WELL DRILLER

SO LONG AS THIS LICENSE IS NOT REVOKED AND IS RENEWED ACCORDING TO LAW

IN WITNESS WHEREOF,
THE TEXAS WATER WELL DRILLERS BOARD
HAS AFFIXED ITS HAND AND THE SEAL OF
THE BOARD THIS 12th DAY OF March, 1984

BY Murray Don McKinley
Chairman

LICENSE
NUMBER
2413

TEXAS ENGINEERING EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM

Occupational and Environmental Safety Training Division

This is to certify that

Tony C. Mills

has satisfactorily completed the 40 hour Hazardous Materials Emergency Response Training in accordance with 29 CFR 1910.120

August 31 - September 4, 1992
Date

446-62-1135
Certificate Number

Division Head

Director, Texas Engineering Extension Service

172420

Economic Environmental Services, Inc.

Certificate of Completion

This is to certify that

Lambert Lewis

455-70-4202

has successfully completed an

8 Hr. Training Course in

29 CFR Part 1910.120 and DOT HM-126F

Hazardous Operations and Emergency Response

on this 15th day of February, 1993.

Thomas H Bentley-Smith

Trainer

No. 930883

172430

Economic Environmental Services, Inc.

Certificate of Completion

This is to certify that

Bruce Moring

585-21-0623

has successfully completed an

8 Hr. Training Course in

29 CFR Part 1910.120 and DOT HM-126F

Hazardous Operations and Emergency Response

on this 15th day of February, 1993.

Thomas H Bentley-Smith

Trainer

No. 930881

172431

172432

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Trichloroethene** DOT Name/UN Number: **UN1710** CAS Number: **79-01-6**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren **Merck** Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other_____

Chemical Properties:

Chemical Formula: **$CHCl=CCl_2$** Odor Characteristic: **chloroform-like** LEL: **8%** UEL: **10.5%**

Molecular Weight: **131.4** Physical State: **liquid** Solubility (Water): **non-soluble (0.1% @ 77°F.)** Boiling Point: **189°F.**

Flash Point: **90°F.** Freezing Point: **-99°F.** Specific Gravity: **1.46** Vapor Pressure/Density: **58 mm.**

Incompatibilities: **strong caustics, chemically active metals, e.g. Na, Be, Li, Mg, Ti, & Ba**

Biological Properties

TLV-TWA: **25 ppm (NIOSH)** PEL: **50 ppm** STEL: **200 ppm** Odor/Odor Threshold:

IDLH: Human: **1000 ppm** Aquatic: Rat/Mouse: **LD_{50} = 4.92 ml/kg**
LC = 8000 ppm

Route(s) of Exposure: **inhalation, ingestion, skin/eye contact**

Carcinogen: **suspected** Teratogen: Mutagen:

Handling Recommendations (including personal protective clothing, equipment, & measures):
use goggles and impervious clothing if possibility of splashing
use respirators if strong fumes identified

Monitoring Recommendations: **area air monitoring with OVA, HNu: IP = 9.45 eV**

Disposal/Waste Treatment:
Allow area of spill or leak to ventilate and remove ignition sources. Follow EPA, DOT, State and Local disposal regulations.

Health Hazard & First Aid: **irrigate eyes immediately if splashed; seek immediate medical attention if ingested; wash skin with sap if splashed; remove to fresh air and administer resuscitation if necessary if overcome with fumes.**

Symptoms: Acute: **vertigo, nausea, eye/skin irritation, cardiac arrhythmia**
Chronic: **target organs include respiratory system, heart, liver, kidneys, skin**

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Vinyl Chloride** DOT Name/UN Number: **Vinyl Chloride/UN1086** CAS Number: **75-01-4**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other 29 CFR 1910.1017

Chemical Properties:

Chemical Formula: $CH_2=CHCl$ Odor Characteristic: **pleasant at high conc.** Flammable Limits:

Molecular Weight: **62.5** Physical State: **Gas/Liquid** Solubility (Water): **0.01%** Boiling Point: **7° F**

Flash Point: **-112°F** Freezing Point: **-256°F** Specific Gravity: **0.9** Vapor Pressure/Density: **> 1 atm.**

Incompatibilities: **Copper, oxidizers, aluminum, peroxides, iron, steel** LEL: **3.6%** UEL: **33%**

Biological Properties:

TLV-TWA: **0.5 ppm** PEL: **1 ppm** STEL: **5 ppm** Odor/Odor Threshold:

IDLH: Human: **Carcinogen** Aquatic: Rat/Mouse:

Route(s) of Exposure: **Inhalation.**

Carcinogen: **confirmed in humans** Teratogen: Mutagen:

Handling Recommendations (including personal protective clothing, equipment, & measures):
At 2 ppm above background use APR with OV cartridges; above 10 ppm use gas mask APR or full face powered APR; above 25 ppm use supplied air respirator; above 100 ppm use SCBA. Remove or control ignition sources. Keep fire extinguisher available. Keep containers in a well ventilated area.

Monitoring Recommendations: **HNu, GC/FID, OVA, Drager tube for Vinyl Chloride** IP = **9.99 eV**

Disposal/Waste Treatment:
Allow ventilation in area of leak and remove ignition sources. Follow EPA, DOT, State and Local disposal regulations.

Health Hazard & First Aid:
Flammable Gas. If inhaled, give respiratory support. Skin contact can result in frostbite. Get medical attention immediately. Narcotic in high concentrations.

Symptoms:	Acute:	Weakness; abdominal pain
	Chronic:	GI bleeding; heptomegaly; pallor or cyan of extremities

172434

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Benzene** DOT Name/UN Number: **Benzene/UN1114** CAS Number: **71-43-2**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other 29 CFR 1910.1028

Chemical Properties:

Chemical Formula: C_6H_6 Odor Characteristic: **pleasant, sweet, aromatic** LEL: **1.3%** UEL: **7.9%**

Molecular Weight: **78** Physical State: **Liquid** Solubility (Water): **0.07%** Boiling Point: **176°F**

Flash Point: **12°F** Freezing Point: **42°F** Specific Gravity: **0.879** Vapor Pressure/Density: **75 mm Hg/2.7**

Incompatibilities: **Strong oxidizers, many fluorides & perchlorates, nitric acid**

Biological Properties:

TLV-TWA: **0.5 ppm** PEL: **1 ppm** STEL: **5 ppm** Odor/Odor Threshold:

IDLH: Human: **2000 ppm** Aquatic: Rat/Mouse: **LD_{50} orally = 3.8 ml/kg**

Route(s) of Exposure: **Inhalation, ingestion, dermal contact, eye contact.**

Carcinogen: **suspected in humans** Teratogen: Mutagen:

Handling Recommendations (including personal protective clothing, equipment, & measures):
At 2 ppm above background to 10 ppm, use half mask with OV cartridges; above 10 ppm use full-face APR. Above 50 ppm use PAPR (powered APR); above 100 ppm use supplied air positive pressure air respirator; above 1000 ppm use SCBA. Remove or control ignition sources. Keep fire extinguisher available. Keep containers in a well ventilated area.

Monitoring Recommendations: **HNu, GC/FID, OVA, Drager tube for Benzene** IP = **9.24 eV**

Disposal/Waste Treatment: **Keep area ventilated near spill or leak, and remove ignition sources. Follow EPA, DOT, State and Local disposal regulations.**

Health Hazard & First Aid:
Highly Flammable Liquid. Immediately wash with water if eye contact. Use soap and water when skin contact has occurred. If inhaled, move person to fresh air. Use mouth to mouth resuscitation if person has stopped breathing. Get medical attention immediately if swallowed; do not induce vomiting.

Symptoms:	Acute:	Due to ingestion and inhalation: dizziness, staggering gait, nausea, headaches, restlessness, convulsions, euphoria, pulmonary edema.
	Chronic:	Fatigue, nervousness, red skin, leukemia, bone marrow depression.

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Toluene** DOT Name/UN Number: **Toluene/UN1294** CAS Number: **108-88-3**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other _____

Chemical Properties:

Chemical Formula: $C_6H_5CH_3$ Odor Characteristic: **pungent, sweet, aromatic** Flammable Limits:

Molecular Weight: **92.1** Physical State: **Liquid** Solubility (Water): **0.05%** Boiling Point: **232°F**

Flash Point: **40°F** Freezing Point: **-139°F** Specific Gravity: **0.87** Vapor Pressure/Density: **20 mm Hg**

Incompatibilities: **Strong oxidizers** LEL: **1.2%** UEL: **7.1%**

Biological Properties:

TLV-TWA: **100 ppm** PEL: **100 ppm** Ceiling: **150 ppm (REL)** Odor/Odor Threshold:

IDLH: Human: **2000 ppm** Aquatic: Rat/Mouse: **LD_{50} orally = 7.53 g/kg**

Route(s) of Exposure: **Inhalation, ingestion, dermal contact, eye contact.**

Carcinogen: Teratogen: Mutagen:

Handling Recommendations (including personal protective clothing, equipment, & measures):
Use APR with chemical cartridges above 1000 ppm (Level C). Above 2000 ppm use SCBA or evacuate site.

Monitoring Recommendations:
HNu, GC/FID, OVA, Drager tube for Toluene
IP: 8.82 eV

Disposal/Waste Treatment:
Ventilate spill or leak and remove ignition sources. Follow EPA, DOT, State and Local disposal regulations.

Health Hazard & First Aid:
Flammable Liquid. Immediately wash with water if eye contact. Use soap and water when skin contact has occurred. If inhaled, move person to fresh air. Use mouth to mouth resuscitation if person has stopped breathing. Get medical attention immediately if swallowed; do not induce vomiting.

Symptoms:	Acute:	**Fatigue, weakness, confusion, euphoria, dizziness, headaches, dilated pupils, insomnia, nervousness**
	Chronic:	**Paresthesia, dermatitis, kidney or liver damage, anemia, bone marrow depression.**

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Ethylbenzene** DOT Name/UN Number: **Ethylbenzene/UN1175** CAS Number: **100-41-4**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other **Firefighter's Hazardous Materials Reference Book**

Chemical Properties:

Chemical Formula: $C_2H_5C_6H_5$ Odor Characteristic: **aromatic** Flammable Limits:

Molecular Weight: **106.2** Physical State: **Liquid** Solubility (Water): **0.01%** Boiling Point: **277°F**

Flash Point: **55° - 64°F** Freezing Point: **-139°F** Specific Gravity: **0.87** Vapor Pressure/Density: **10 mm @ 79°F**

Incompatibilities: **Strong oxidizers** LEL: **1.0%** UEL: **6.7%**

Biological Properties:

TLV-TWA: **100 ppm** PEL: **100 ppm** STEL: **125 ppm** Odor/Odor Threshold:

IDLH: Human: **2000 ppm** Aquatic: Rat/Mouse: **LD_{50} orally = 5.46 g/kg**

Route(s) of Exposure: **Inhalation, ingestion, dermal contact, eye contact.**

Carcinogen: Teratogen: Mutagen:

Handling Recommendations (including personal protective clothing, equipment, & measures):
Use APR with chemical cartridges above 1000 ppm (Level C). Above 2000 ppm use SCBA or evacuate site. Remove or control ignition sources. Keep fire extinguisher available. Keep containers in a well ventilated area.

Monitoring Recommendations: **HNu, GC/FID, OVA, Drager tube for Ethylbenzene**
IP = **8.76 eV**

Disposal/Waste Treatment:
Ventilate spill or leak and remove ignition sources. Follow EPA, DOT, State and Local disposal regulations.

Health Hazard & First Aid:
Flammable Liquid. Immediately wash with water if eye contact. Use soap and water when skin contact has occurred. If inhaled, move victim to fresh air. Use CPR if person has stopped breathing. If breathing is difficult administer oxygen. Get medical attention immediately if swallowed; do not induce vomiting.

Symptoms:	Acute:	**Irritation of skin, eyes, nose, mucous membranes, and in high concentraions, narcotic.**
	Chronic:	**Skin contact may cause erythema and skin inflammation.**

172437

GEO-MARINE INC.

HAZARD EVALUATION OF CHEMICALS

Project Number/Name: **1161-052/Groundwater Survey at USAF Plant #4, Fort Worth, Texas**

Chemical Name: **Xylene** DOT Name/UN Number: **Xylene/UN1307** CAS Number: **1330-20-7**

References Consulted: (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Hazardline Chris ACGIH

Toxic & Hazardous Safety Manual Other **Firefighter's Hazardous Materials Reference Book**

Chemical Properties:

Chemical Formula: $C_6H_4(CH_3)_2$ Odor Characteristic: **sweet, aromatic** Flammable Limits:

Molecular Weight: **106.2** Physical State: **Liquid** Solubility (Water): **insoluble** Boiling Point: **269° - 292°F**

Flash Point: **63° to 90°F** Freezing Point: **-54° to 56°F** Specific Gravity: **0.87** Vapor Pressure/Density: **9 mm**

Incompatibilities: **Strong oxidizers, hypochlorite bleaches** LEL: **1.1%** UEL: **7.0%**

Biological Properties:

TLV-TWA: **100 ppm** PEL: **100 ppm** STEL: **150 ppm** Odor/Odor Threshold:

IDLH: Human: **1000 ppm** Aquatic: Rat/Mouse: **LD_{50} orally = 7.71 ml/kg**

Route(s) of Exposure: **Inhalation, ingestion, dermal contact, eye contact, skin absorption.**

Carcinogen: Teratogen: Mutagen:

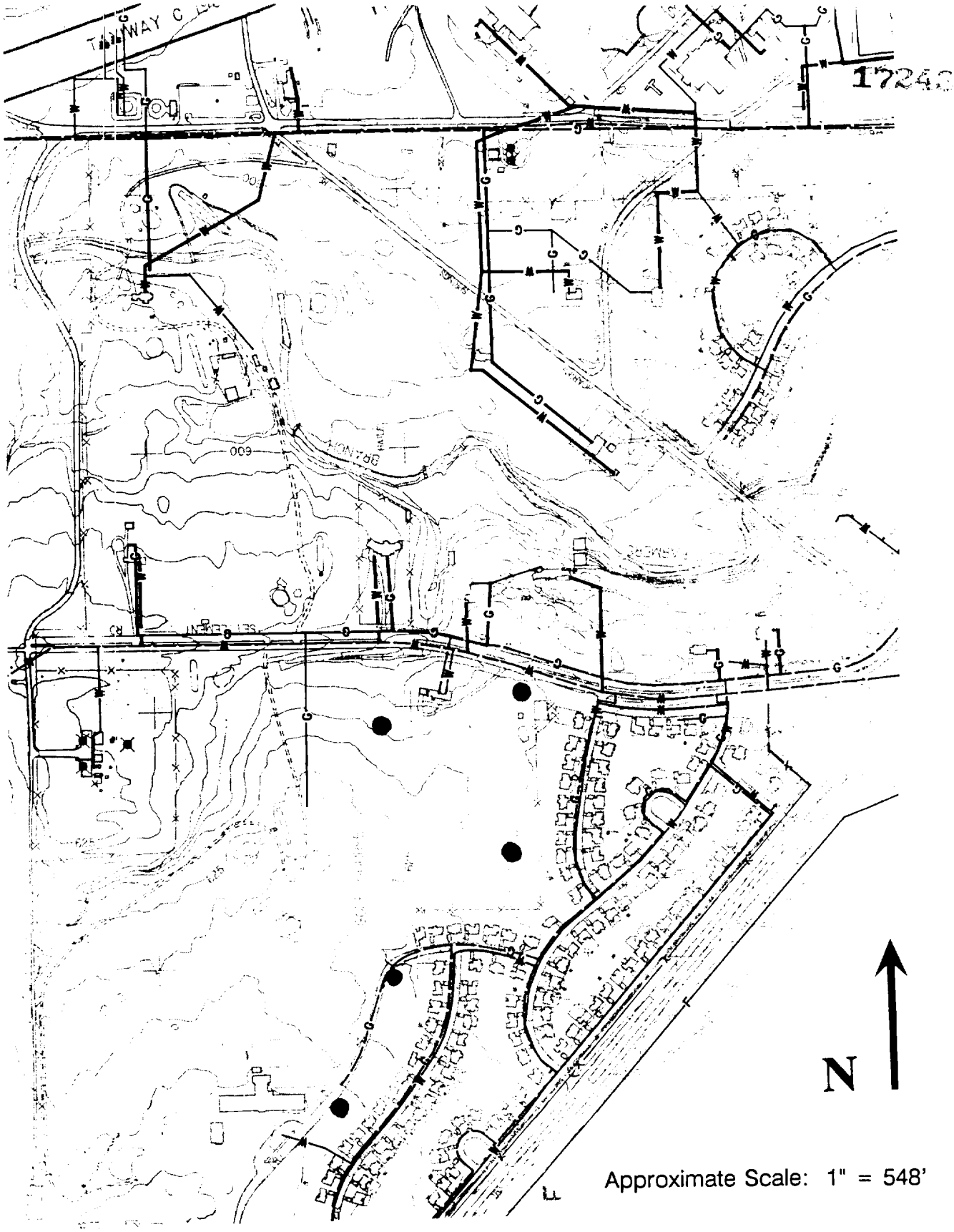
Handling Recommendations (including personal protective clothing, equipment, & measures):
Use APR with chemical cartridges above 1000 ppm (Level C). Above 2000 ppm use SCBA or evacuate site. Remove or control ignition sources. Keep fire extinguisher available. Keep containers in a well ventilated area.

Monitoring Recommendations: **HNu, GC/FID, OVA, Drager tube for Xylene** IP = **8.44 to 8.56 eV**

Disposal/Waste Treatment:
Ventilate spill or leak and remove ignition sources. Incinerate in an absorbed sand. Follow EPA, DOT, State and Local disposal regulations.

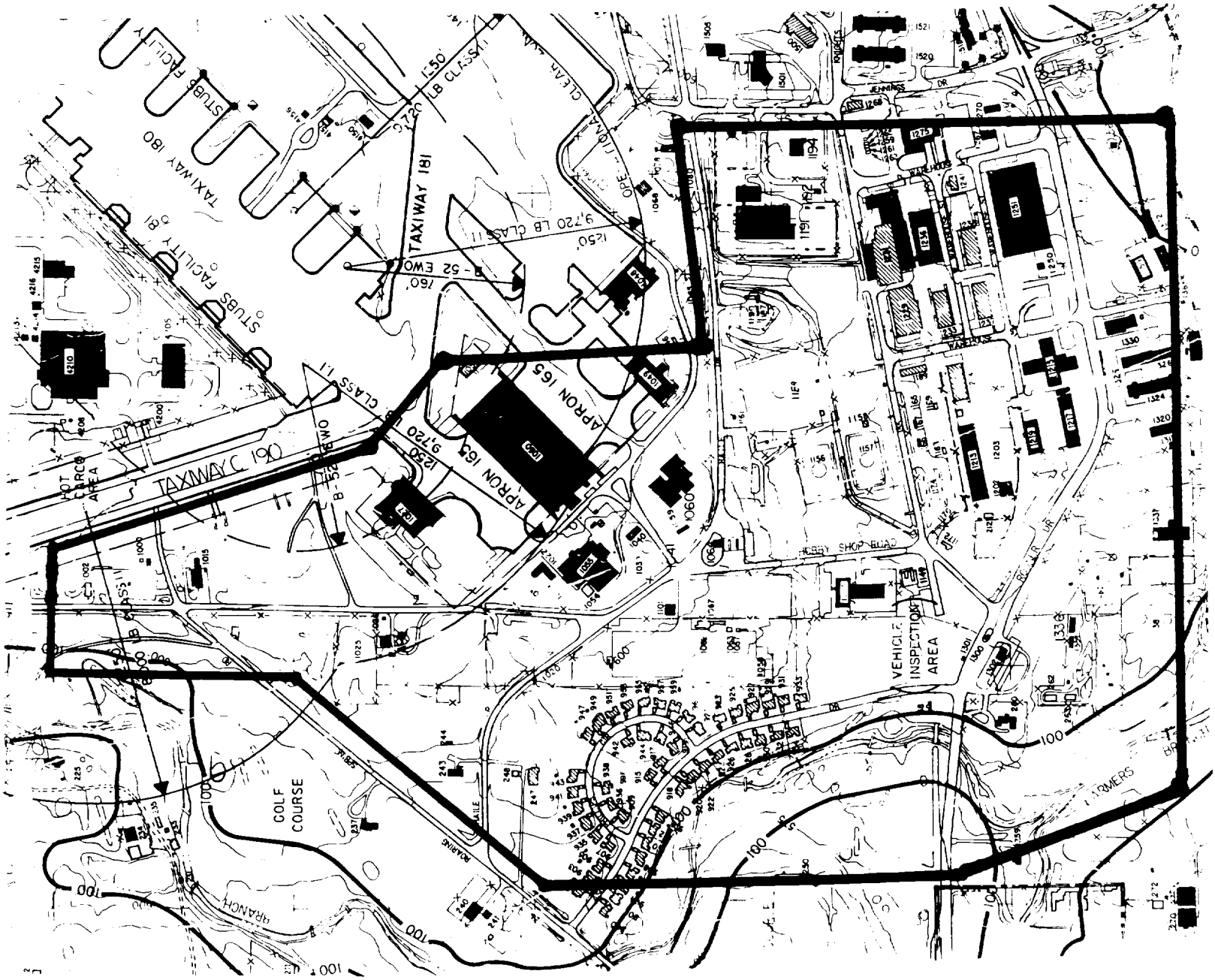
Health Hazard & First Aid:
Flammable Liquid. Immediately wash with water if eye contact. Use soap and water when skin contact has occurred. If inhaled, move victim to fresh air. Use CPR if person has stopped breathing. If breathing is difficult administer oxygen. Get medical attention immediately if swallowed; do not induce vomiting.

Symptoms:	Acute:	Irritation of skin, eyes, nose, mucous membranes, and in high concentraions, narcotic; nausea, vomiting, loss of conciousness
	Chronic:	Skin rash, possible liver/kidney damage



BOREHOLE LOCATIONS IN PHASE I AREA

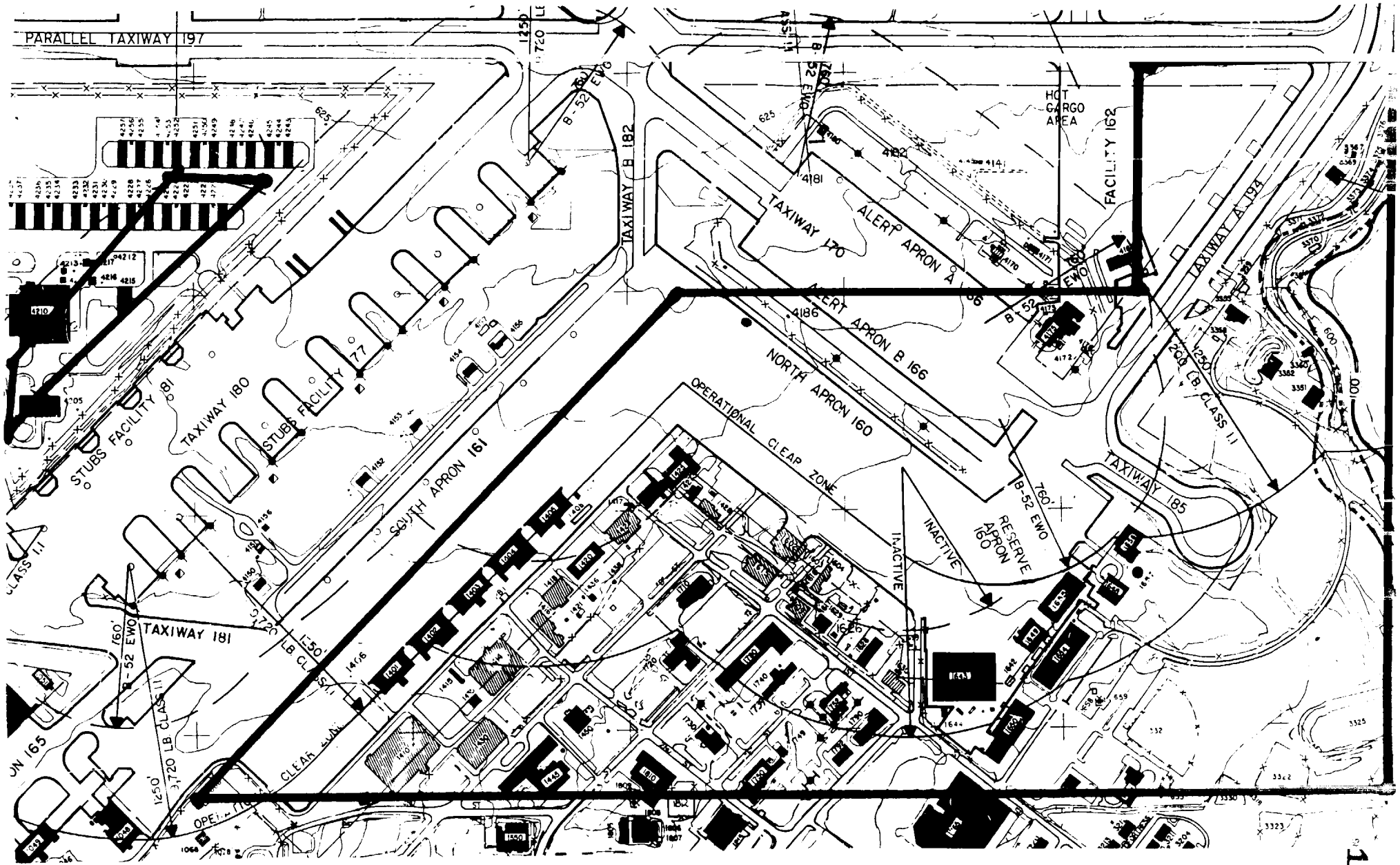
172439



Approximate Scale: 1" = 615'

SITE MAP OF SOUTH AREA

N



SITE MAP NORTH AREA

Approximate Scale: 1" = 615'

GEO-MARINE, INC.

AIR MONITORING FORMS (daily calibration unless noted)

Contaminant(s) of Interest: TCE (trichloroethylene) & break-down products
BTEX (benzene, toluene, ethyl-benzene, & xylenes)

Type of Sample (area, personal): area

Equipment Make & Model: HNu Systems, Inc. model PI-101

DATE	TIME	INSTRUMENT READING	SAMPLER INITIALS

172442

GEO-MARINE, INC.

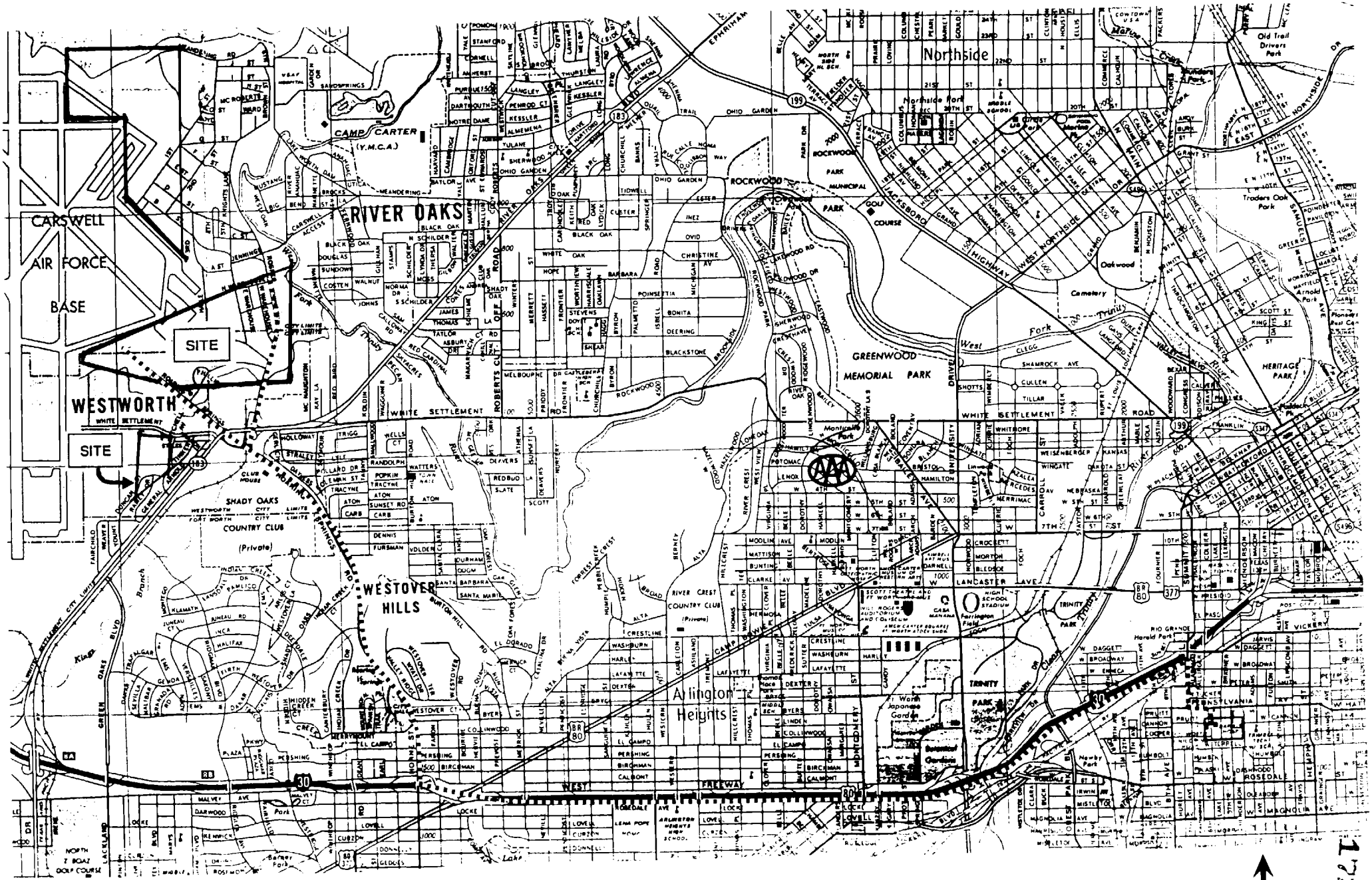
AIR MONITORING FORMS (daily calibration unless noted)

Contaminant(s) of Interest: TCE (trichloroethylene) & break-down products
BTEX (benzene, toluene, ethyl-benzene, & xylenes)

Type of Sample (area, personal): area

Equipment Make & Model: ENMET Corp. model CGS-80R (explosimeter)

DATE	TIME	INSTRUMENT READING	SAMPLER INITIALS



ROUTE TO HARRIS HOSPITAL

172443

GEO-MARINE, INC.
SITE SAFETY PLAN
EQUIPMENT LIST

PPE

Level A

Item	No(s).
SCBA	
spare air tanks	
encapsulating suit (type _____)	
surgical gloves	
gloves (type _____)	
outer work gloves	
neoprene safety boots	
steel-toed boots	
booties	
hard hat	
5-minute escape cooling vest	

Level C

Item	No(s).
respirator (type _____)	
cartridge (type _____)	
5-minute escape mask	
protective coveralls (type _____)	
rain suit available	
butyl apron	
surgical gloves	
gloves (type _____)	
outer work gloves	
neoprene safety boots	
steel-toed boots	
booties	
hard hat with face shield	

Level B

Item	No(s).
SCBA	
spare air tanks	
protective coverall (type _____)	
rain suit	
butyl apron	
surgical gloves	
gloves (type _____)	
outer work gloves	
neoprene safety boots	
steel-toed boots	
booties	
hard hat with face shield	

Level D

Item	No(s).
respirator available (type SCOTT FF)	✓
cartridges available (type ORGANIC VAPOR)	✓
5-minute escape mask available	
protective coverall (type _____)	✓
splash apron	
rain suit available	
neoprene safety boots	✓
steel-toed boots	✓
booties	✓
work gloves	✓
surgical gloves	✓
hardhat	✓
safety glasses or goggles	✓

EQUIPMENT LIST (cont.)

GENERAL INSTRUMENTS	No(s).
OVA (model no. _____)	
HNu (model no. _____)	✓
O^2 explosimeter with calibration kit	✓
magnetometer (model no. _____)	
pipe locator	
Draeger tubes (type _____)	
heat stress monitor	
noise equipment (type _____)	
monitox cyanide	
personal sampling pumps	
conductivity meter	
pH meter	
metal detector	

RADIATION	No(s).
Geiger counter	
ion chamber	
alert dosimeter	
pocket dosimeter	
portable ratemeter	
scaler/ratemeter (type _____)	
micro meter	

FIRST AID	No(s).
first aid kit	✓
oxygen administrator	
stretcher	
portable eye wash	
blood pressure monitor	
thermometer	
blanket	

EQUIPMENT LIST (cont.)

VEHICLE

No(s). _____

vehicle (description & license number_____)
gas ( )
oil ( )
antifreeze ( )
battery water level ( )
windshield washing fluid ( )
tire pressure ( )
tire pressure - spare(s) ( )
other _____ ( )
vehicle insurance proof ( )
vehicle registration current ( )
vehicle inspection current ( )
tool kit . . . . . ✓
hydraulic jack . . . . . ✓
spare tire(s) . . . . . ✓
lug wrench . . . . . ✓
tow chain . . . . . ✓
fire extinguisher (date tested/filled _____) . . . . . ✓
generator . . . . . ✓
steam cleaner . . . . . ✓
. . . . . .
. . . . . .

DECON

No(s). _____

wash tubs . . . . . ✓
buckets . . . . . ✓
scrub brushes . . . . . ✓
pressurized sprayer . . . . . ✓
detergent (type _____) . . . . . ✓
solvent (type _____) . . . . . .
plastic sheeting . . . . . ✓
containment dams . . . . . ✓
tarps and poles . . . . . ✓
trash bags . . . . . ✓
trash containers . . . . . .
masking tape . . . . . ✓
duct tape . . . . . ✓
paper towels . . . . . ✓
face mask sanitizer . . . . . .
respirator cleaners . . . . . .
goggle cleaners . . . . . .
chairs . . . . . .
step ladder . . . . . .
distilled water . . . . . ✓
. . . . . .
. . . . . .

172447

EQUIPMENT LIST (cont.)

SAMPLING AND SHORT-TERM SAMPLE STORAGE	No(s).
clear glass bottles	
8 oz	
16 oz.	
32 oz.	
64 oz.	
amber glass bottles (1 liter)	
VOA vials	✓
acid for preservation (type: HCl)	✓
funnel	✓
string	
hand bailer	
1.66 inch	✓
2 inch	
4 inch	
bottle labels	✓
water proof pen	✓
chain-of-custody forms	✓
sample description forms	
custody seals	✓
QA/QC seals	✓
baggies	✓
spoons	✓
knives	✓
measuring tape	✓
filter paper	
coolers	✓
ice	✓
personal pump sampling supplies	
thieving rods with bulbs	

SAMPLE SHIPMENT	No(s).
heavy duty plastic coolers with labels	✓
paint cans with lids, 7 clips each	
shipping labels	
DOT labels	
labels **UP**	✓
FRAGILE	✓
HAZARDOUS	✓
other _____	
strapping tape	✓
clear packing tape	
express shipping forms	
vermiculite	
"bubble" wrap	✓

EQUIPMENT LIST (cont.)

MISCELLANEOUS	No(s).
surveyor's tape	
100-foot metal tape	
flagging	✓
stakes	✓
surveying flags	✓
surveying meter stick	✓
compass (type _____)	✓
measuring ("wonder") wheel	✓
300 foot nylon rope	
nylon string	
camera	✓
film	✓
banner tape	
binoculars	
megaphone	
walkie-talkies	
chaining pin and ring	
bailing pump	✓
55-gallon storage drums	✓
drum dolly	✓
bung wrench	✓
wheel barrow	✓
pick	✓
shovel	✓
soil auger	
weather radio	

122440

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

172450

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE