APPENDIX 2H

Geotechnical Study Report

PRELIMINARY
GEOTECHNICAL INVESTIGATION REPORT
CPV VACAVILLE POWER PLANT
NWC FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

August 6, 2008

This document was prepared for use only by the client, only for the purposes stated, and within a reasonable time from issuance. Non-commercial, educational and scientific use of this report by regulatory agencies is regarded as a "fair use" and not a violation of copyright. Regulatory agencies may make additional copies of this document for internal use. Copies may also be made available to the public as required by law. The reprint must acknowledge the copyright and indicate that permission to reprint has been received.

Copyright 2008 Kleinfelder

Prepared For:

WorleyParsons
2330 E. Bidwell Street, Suite 150
Folsom, California 95630

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
CPV VACAVILLE POWER PLANT
NWC FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

Kleinfelder Job No.: 94660.GEO

Prepared by:

Neva M. Popenoe, EIT
Staff Engineer

Josue A. Montes, Jr., PE
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
JOSUE A. MONTES, JR.
No. C52610
Exp. 12-31-08
CIVIL
STATE OF CALIFORNIA

KLEINFELDER
1410 F Street
Fresno, California 93706
(559) 486-0750

August 6, 2008

Copyright 2008 Kleinfelder

KLEINFELDER
Bright People. Right Solutions.

1410 F Street
Fresno, CA
93706

p| 559.486.0750
f| 559.442.5081

kleinfelder.com

August 6, 2008
File No. 94660.GEO

Mr. Steven Blue, Project Manager
WorleyParsons
2330 East Bidwell Street, Suite 150
Folsom, California 95630

Subject: Preliminary Geotechnical Investigation Report
CPV Vacaville Power Plant
NWC Fry and Lewis Roads
Elmira, Solano County, California

Dear Mr. Blue:

Kleinfelder is pleased to present the results of our geotechnical services performed for the proposed CPV Vacaville Power Plant to be located adjacent to the existing Easterly Wastewater Treatment Plant east of Vacaville.

The purpose of the preliminary geotechnical investigation was to evaluate the suitability of the subsurface conditions for construction of the proposed subject project. Based on the present information, it is Kleinfelder's professional opinion that the proposed site is geotechnically suitable for construction of the proposed project. The recommendations presented in this report could be incorporated into the project conceptual design.

We appreciate the opportunity to be of service on this project. Please do not hesitate to contact the undersigned if you have any questions, comments, or require additional information.

Respectfully submitted,
KLEINFELDER

Neva M. Popenoe, EIT
Staff Engineer

Josue A. Montes, Jr., PE
Senior Engineer

NMP:JAM:llp

Copyright 2008 Kleinfelder

TABLE OF CONTENTS

Section	Page
EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	1
1.1 GENERAL	1
1.2 PROJECT DESCRIPTION	1
1.3 PURPOSE AND SCOPE OF SERVICES	2
2.0 FIELD EXPLORATION AND LABORATORY TESTING	4
2.1 FIELD EXPLORATION	4
2.2 FIELD AND LABORATORY TESTING	5
3.0 GEOLOGIC CONDITIONS	7
3.1 GEOLOGIC FRAMEWORK	7
3.2 SITE GEOLOGY	8
3.3 FAULTING AND SEISMICITY	9
3.3.1 Fault Rupture	9
3.3.2 IBC Seismic Design Parameters	10
3.3.3 Seismically Induced Ground Failure	11
3.3.3.1 Liquefaction	11
3.3.3.2 Cyclic Softening	12
3.4 OTHER GEOLOGIC HAZARDS	12
3.5 FLOODING	13
4.0 SITE AND SUBSURFACE CONDITIONS	14
4.1 SURFACE CONDITIONS	14
4.2 SUBSURFACE SOIL CONDITIONS	14
4.3 GROUNDWATER	15
5.0 PRELIMINARY EVALUATIONS AND RECOMMENDATIONS	16
5.1 GENERAL	16
5.2 SHALLOW FOUNDATIONS	16
5.2.1 Spread Footings and Mat Foundations	16
5.2.2 Ringwall Footings	17
5.3 ESTIMATED SETTLEMENT	17
5.3.1 Spread Footing and Mat Foundations	18
5.3.2 Tanks	19
5.4 LATERAL EARTH PRESSURES	20
5.5 RESISTANCE TO LATERAL LOADS	21
5.5.1 Foundations	21

Copyright 2008 Kleinfelder

5.5.2 Tank Bottom 22
5.6 DYNAMIC SOIL PARAMETERS 23
5.7 DEEP FOUNDATIONS 23
5.7.1 Axial Capacities 23
5.7.2 Lateral Pile Capacity 25
5.7.3 Pile Construction Considerations 28
5.8 CONVENTIONAL CONCRETE SLABS-ON-GRADE 28
5.8.1 Subgrade Preparation 28
5.8.2 Capillary and Moisture/Vapor Break 29
5.8.3 Conventional Slab Design 30
5.9 PIPE DESIGN 31
5.9.1 Vertical Loading 31
5.9.2 Resistance of Lateral Loads 32
5.10 SITE EARTHWORK 32
5.10.1 Stripping and Grubbing 32
5.10.2 Disturbed Soil, Undocumented Fill and Subsurface Obstructions 33
5.10.3 Scarification and Compaction 33
5.10.4 Engineered Fill 33
5.10.4.1 Materials 33
5.10.4.2 Compaction Criteria 35
5.10.5 Construction Considerations 35
5.11 TEMPORARY EXCAVATIONS 36
5.11.1 General 36
5.11.2 Temporary Slopes 36
5.11.3 Shoring 37
5.11.4 Dewatering 37
5.12 PRELIMINARY PAVEMENT SECTIONS 38
5.12.1 General 38
5.12.2 Asphalt Concrete Pavement 38
5.12.3 Portland Cement Concrete Pavement 39
5.12.4 Moisture Considerations 40
5.12.5 Construction Considerations 41
5.13 FIELD RESISTIVITY TESTING 41
5.14 CORROSION POTENTIAL 42

6.0 ADDITIONAL SERVICES 44
6.1 PLANS AND SPECIFICATION REVIEW 44
6.2 CONSTRUCTION OBSERVATION AND TESTING 44

7.0 LIMITATIONS 45

Copyright 2008 Kleinfelder

PLATES

Plate 1 Site Vicinity Map
Plate 2 Boring Location Plan

APPENDICES

Appendix A Field Exploration
Appendix B Laboratory Testing
Appendix C Cone Penetration Testing Readings
Appendix D Results of Field Resistivity Tests

Copyright 2008 Kleinfelder

EXECUTIVE SUMMARY

This report presents the results of the geotechnical investigation program for the proposed CPV Vacaville Power Plant (referred to as the Project in this report), located north east of City of Vacaville, California. The purposes of this investigation were to evaluate the general subsurface soil conditions, seismicity, and to provide recommendations for design of the foundations for the proposed structures.

Subsurface conditions at the locations for the proposed power plant facility were explored by drilling 11 exploratory borings and 11 cone penetration testing (CPT) in 22 locations. A laboratory testing program was performed on selected representative soil samples obtained from the borings to assess the geotechnical and corrosivity characteristics of the subsurface soils.

Based on review of available geologic maps and the results of the subsurface investigation, the project site is underlain by Holocene alluvial deposits. The site surface and subsurface soils encountered in the field exploration are predominantly clays with discontinuous layers of silty sand and sandy silt.

Groundwater was first encountered at a depth of 10 feet below the existing ground surface. Groundwater depths, measured after a minimum of 24 hours after first encountered, were at or near 4 feet below ground surface. Based on review of well information from California Department of Water Resources, groundwater depth has typically varied from 2 to 27 feet below ground surface (bgs) in the project vicinity.

There are no known faults, which cut through the local soil at the site. The project site is not located in an Alquist-Priolo Earthquake Fault Zone, as defined by Special Publication 42 (revised 2007) published by California Geological Survey (CGS).

The 2007 California Building Code (CBC) Maximum Considered Earthquake (MCE) (2% probability of exceedance in 50 years) and design earthquake (about 5% probability of exceedance in 50 years) PHGAs are 0.76g and 0.51g, respectively. It is understood

Copyright 2008 Kleinfelder

that the proposed structures will be designed and constructed in accordance with the requirements of the International Building Code (2006). Recommendations for seismic design parameters are presented in Section 3.3, Faulting and Seismicity.

Liquefaction evaluation utilized analytical methodology suggested by the 1997 NCEER Workshop and summarized by Youd et. al. (2001). The analysis indicated thin sand layers in the upper 7 to 12 feet may be susceptible to liquefaction during the design earthquake. Seismic settlement is anticipated to be on the order of 0.25 to 1.0 inch.

At this stage of the project, structural loads are not available. Foundation contact pressures for the various structures were assumed to be less than 2000 pounds per square foot (DL + LL). Preliminary foundation recommendations include data for both shallow spread and mats foundations, and pile foundations. Recommendations for foundation design are presented in Section 5.0.

It is anticipated site earthwork can be accomplished with conventional grading equipment and techniques. The on-site soils encountered during the investigation, excluding organics, debris, and/or other deleterious materials, are considered suitable for use as engineered fill. Site preparation should be performed in accordance to Section 5.10.

The executive summary presented herein briefly summarizes the results of the geotechnical investigation for the subject project and should be used only in conjunction with recommendations presented in the attached report.

Copyright 2008 Kleinfelder

1.0 INTRODUCTION

1.1 GENERAL

The proposed CPV Vacaville Plant (referred to as the "Project" in this report) facility is located in Elmira, Solano County, California, just southeast of the Vacaville Easterly Wastewater Treatment Plant. Kleinfelder West, Inc. (Kleinfelder) was retained by WorleyParsons Group, Inc. (WP) to provide geotechnical engineering services for the Project. The proposed plant site is shown on Plate 1, Site Vicinity Map. The scope of Kleinfelder's services was based on a WP document entitled "CPV Vacaville Power Plant, Technical Specification VACA-0-TS-02010, Revision 0, For Subsurface Investigation".

This report includes recommendations related to the geotechnical aspects of project design. Conclusions and recommendations presented in this report are based on subsurface conditions encountered at the locations of the exploration, as well as the provisions and requirements outlined in the "Additional Services" and "Limitation" sections of this report. Recommendations presented herein should not be extrapolated to other areas or used for other projects without prior review.

1.2 PROJECT DESCRIPTION

The proposed Project area consists of approximately 26 acres of land, at the northwest corner of Fry and Lewis Roads in Elmira outside of Vacaville in Solano County, California. The project plans to consist of a combined cycle power plant that will generate approximately 600 Mega Watts.

It is understood that the Project will include a cooling tower, storage tanks, water tanks, steam turbine, transformers, and several other smaller components. Foundations are planned to consist mostly of mat foundations and conventional shallow foundations. Mat foundations for the steam turbine generators may be as thick as 7 feet. Structural

Copyright 2008 Kleinfelder

loads are not available at this time. The water storage tanks will be about 80 feet in diameter.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this preliminary geotechnical investigation program was to explore the subsurface conditions at the proposed site and to provide evaluations and recommendations for design of the proposed power generating facilities. Kleinfelder's scope of services for this project consisted of:

Task 1 – Field Exploration

- Contacted Underground Service Alert (USA) to identify potential conflicts between planned geotechnical boring locations and existing underground utilities.
- Retained a drilling subcontractor to perform hollow stem auger and/or mud rotary borings. Approximate boring locations are shown on Plate 2. Eleven (11) borings were excavated.
- Retained a cone penetration test (CPT) subcontractor to perform CPT soundings to exploratory depths. Approximate CPT locations are shown on Plate 2. Eleven (11) CPT locations were penetrated.
- Provided full time supervision of the drilling operation by Kleinfelder field staff. The Kleinfelder representative maintained logs of subsurface materials encountered and obtained samples for visual classification and laboratory testing.
- Performed a series of field resistivity tests throughout the Project site.

Task 2 – Laboratory Testing

- Laboratory testing was performed on selected representative samples to evaluate the geotechnical characteristics and corrosion potentials of the subsurface materials encountered during subsurface exploration.

Copyright 2008 Kleinfelder

Task 3 – Analysis and Report

Conducted an engineering evaluation and prepared this report, which includes the following:

- A general description of the project.
- Discussion of the regional geologic settings, geologic features and hazards including potential of ground rupture due to surface faulting, liquefaction potential, and seismically induced settlement.
- Description of the subsurface investigation program, laboratory testing program, subsurface soil conditions, and groundwater conditions.
- Recommendations for seismic design parameters based on 2006 International Building Code.
- Preliminary foundation recommendations for shallow spread and mat foundations and deep or pile foundations, including bearing and potential settlement.
- Static and dynamic soil parameters for vibrating machine foundations.
- Recommendations for earthwork, including site preparation, engineered fill, guidelines for temporary excavations, pipe bedding and trench backfill.
- Presentation of corrosion test results.
- Presentation of field resistivity test results.
- Plates including Site Vicinity Map and Boring Location Plans for proposed facility.
- Appendices including boring logs, laboratory testing, and CPT results.

Copyright 2008 Kleinfelder

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

The field exploration, conducted on June 25 through July 3, 2008, consisted of exploring twenty-two (22) locations as indicated in the drawing, and a site reconnaissance. Eleven (11) of the 22 exploratory test locations were drilled using a truck mounted drilling rig; the remaining eleven (11) were explored using cone penetration testing (CPT). A CME 75 truck mounted drill rig using hollow-stem auger and/or mud rotary drilling techniques was used to explore the drilled 11 test borings. The drilled borings were advanced to depths ranging from 17 to 60 feet below the existing ground surface. The CPT soundings were extended to depths ranging from 30 feet to 60 feet below existing ground surface. The approximate locations of the drilled and CPT test borings are indicated on the Site Plan, Plate 2. Surface elevations indicated on the boring logs are estimates only, based on a supplied topographic map.

The soils encountered in the drilled test borings were visually classified in the field and a continuous log was recorded. Relatively undisturbed samples were collected from the borings at selected depths by driving a 2.5-inch I.D. split barrel sampler containing brass liners into the undisturbed soil with a 140-pound automatic hammer free falling a distance of 30 inches. The 2.5-inch sampler is in general conformance with ASTM D3550. Relatively undisturbed soil samples may experience some minor disturbance due to hammer impact, retrieval, and handling. Resistance to sampler penetration was noted as the number of blows per foot over 12 inches of sampler penetration after the first 6 inches, on the boring logs. The blow counts listed in the boring logs have not been corrected for the effects of overburden pressure, rod length, sampler size, or hammer efficiency. Bulk samples were also obtained from auger cuttings at several of the boring locations. Rock was not encountered in any of the borings. Each soil sample was classified in accordance with the Unified Soil Classification (USCS) system. Logs of the borings are attached in Appendix A, Field Exploration.

Copyright 2008 Kleinfelder

2.2 FIELD AND LABORATORY TESTING

Sampler penetration rates, determined in general accordance with ASTM D1586, and pocket penetrometer readings (TSF) were used to aid in evaluating the consistency, compression, and strength characteristics of the foundation soils. Penetration rates obtained using the 2.5-inch I.D. split barrel sampler could be converted to an unlined SPT value by multiplying the recorded blow count by 0.75. This conversion is based on penetration energy and sampler dimensions correlations indicated by Winterkorn and Fang.

Field resistivity tests were performed in the designated areas, as shown on the supplied drawing. The testing method is discussed and test results are presented in Section 5.12, Field Resistivity Testing.

Kleinfelder performed laboratory tests on selected samples to evaluate certain physical characteristics. The following laboratory tests were used to develop the design geotechnical parameters:

- Unit Weight (ASTM D2937)
- Moisture Content (ASTM D2216)
- Soluble Sulfate Content (California Test Method No. 417)
- Soluble Chloride Content (California Test Method No. 422)
- pH and Minimum Resistivity (California Test Method No. 643)
- Direct Shear (ASTM D3080)
- Sieve Analysis (ASTM D422)
- Consolidation (ASTM D2435)
- Amount of Material in Soils Finer than No. 200 Sieve (ASTM D1140)
- Plasticity Index (ASTM D4318)
- Resistance Value (California Test Method No. 301)

Copyright 2008 Kleinfelder

- Maximum Density/Optimum Moisture (ASTM D1557)

Test specimens for unit weight and moisture content, direct shear, and consolidation tests consisted of relatively undisturbed 2.5-inch I.D. samples. The dry density and moisture content test results are shown on the boring logs in Appendix A. The soluble sulfate, soluble chloride, pH, and minimum Resistivity results are presented in Section 5.14 ("Corrosion Potential"). The remaining test results are provided in Appendix B.

Copyright 2008 Kleinfelder

3.0 GEOLOGIC CONDITIONS

The proposed CPV Vacaville Power Plant will be situated on an undeveloped parcel located to the northwest of the intersection of Fry and Lewis Roads, east of Vacaville (longitude:-121.89941°W; latitude: 38.33912°N), located near the westerly edge of the Great Valley. Also called the Central Valley, it is a nearly flat alluvial plain that lies between the Sierra Nevada on the east and the Coast Ranges on the west. Its south end is defined by the Tehachapi Mountains north of Los Angeles, and its north end is defined by the Klamath Mountains. The valley has an average width of about 50 miles and is about 400 miles long overall. The Great Valley is subdivided into the Sacramento Valley to the north and the San Joaquin Valley to the south; the Sacramento Valley is drained by the south-flowing Sacramento River and the San Joaquin Valley is drained by the generally north-flowing San Joaquin River. The two rivers meet at the Sacramento-San Joaquin Delta, which empties into San Francisco Bay, ultimately connecting with the Pacific Ocean via the Golden Gate.

3.1 GEOLOGIC FRAMEWORK

The Great Valley is underlain by a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock allied to the plutons of the Sierra Nevada; to the west, basement rocks are believed to be Franciscan metasediments and/or melange. Mesozoic sedimentary rocks show the subsurface record to be marine deposition. They are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary alluvial strata recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (Norris and Webb 1990).

To the west, the Coast Ranges geomorphic province is characterized by en echelon northwest-trending mountain ranges formed over the past 10 million years or less by

Copyright 2008 Kleinfelder

active uplift related to complex tectonics of the San Andreas fault/plate boundary system (Norris and Webb 1990, Buising and Walker 1995, Atwater and Stock 1998). The eastern rangefront is defined by faults that have been interpreted as contractile features associated with shortening along an axis approximately normal to the rangefront (Wong et al. 1988, Sowers et al. 1992, Unruh et al. 1992), but may also locally accommodate a right-lateral component of motion.

East of the San Andreas fault, the Coast Ranges are broadly antiformal. The core of the uplift consists primarily of metasedimentary rocks and melange of the Mesozoic Franciscan Complex (Jennings 1977). The eastern Coast Range rangefront is flanked by a generally eastward-younging sequence of Cretaceous through Quaternary clastic sedimentary strata. The lower portion of this sequence, where it is present, typically records deep marine deposition, while the upper portion reflects progressive growth and erosional dissection of the Coast Range uplift (Unruh et al. 1992). Quaternary alluvial strata accumulated on essentially modern topography buttress against the rangefront, and are locally folded and/or faulted, particularly along the southern portion of the rangefront. Active alluvium and older Quaternary terrace deposits are present in the larger active stream valleys throughout the eastern portion of the Coast Ranges (Jennings, 1977, Wagner et al. 1990).

3.2 SITE GEOLOGY

The surface and near-surface material at the subject site consists of the Holocene age Alluvial fan deposits, Qhf, as mapped by Graymer et al., (2002). This material was noted in the soil borings as being medium stiff to hard, fine sandy clays. The lower portions of the soil profiles encountered appear to be of the mapped Alluvial Fan deposits, Qpf, of late Pleistocene age. Projected to underlie these soil strata is the Tehama formation, Tpth, of Pliocene age, which in turn would be underlain by the Neroly Sandstone, Tn, of late Miocene age.

Copyright 2008 Kleinfelder

3.3 FAULTING AND SEISMICITY

3.3.1 Fault Rupture

Alquist-Priolo Earthquake Fault Zoning Act (formerly Alquist-Priolo Earthquake Fault Zoning Act) of 1972 (revised in 2007) is the State law that addresses hazards from earthquake fault zones. The purpose of this law is to mitigate the hazard of surface fault rupture by regulating development near active faults. As required by the Act, the State has delineated Earthquake Fault Zones (formerly Special Study Zones) along known active faults in California. Based on the information provided in Hart and Bryant (1997), the site is not in an Alquist-Priolo Earthquake Fault Zone and no known active faults traverse the site. The nearest zoned faults are the Cordelia and the Green Valley-Concord faults located approximately 13½ and 15 miles, respectively, to the west.

The nearest active fault (evidence of movement within the last 11,000 years) would be Segment 4 of the Great Valley Fault System. This fault segment is a blind thrust fault that underlies the Vacaville area at a depth of approximately 4½ miles; there is no surface expression of the fault trace. It is predicted to have potential Moment Magnitudes in the range of 6.6 to 7.0.

The nearest mapped faults include the Lagoon Valley and the Vaca-Kirby Hills-Montezuma Hills faults. The northward trending Lagoon Valley fault has been mapped to pass approximately seven miles to the west of the site, and is shown as a Pleistocene-active fault on the 1994 California State Fault map (Jennings, 1994). The mapped trace of the Vaca-Kirby Hills-Montezuma Hills fault is associated with a north/north-west trending alignment of deep seismicity (i.e. 11 to 12+ miles) that can be traced from an area south of Pittsburg to the Kirby Hills, located approximately 15 miles south of the subject site. The trace of the fault is projected northward to pass approximately six miles to the west of the subject site. Since there are no known faults mapped on the site, or projected to cross the site or within the immediate vicinity, the potential for damage due to fault ground rupture is considered to be very low.

Copyright 2008 Kleinfelder

According to the latest forecast from the Working Group on California Earthquake Probabilities, the probability of a magnitude 6.7 or larger earthquake over the next 30 years striking the greater San Francisco Bay Area it is 63% (Working Group on California Earthquake Probabilities, 2007).

The PHGA for the 2007 CBC Maximum Considered Earthquake (MCE) would be 0.76g. The CBC design earthquake would have a PHGA of 0.51g. It is recommended that the CBC design earthquake PHGA of 0.51g be used in design.

3.3.2 IBC Seismic Design Parameters

It is assumed tank design will use AWWA (American Water Works Association) standards. The AWWA D100-05 is based on ASCE 7-05. The project site is underlain by significant depths of medium dense alluvial soil. The site profile would be categorized as "Site Class D" by AWWA D100-05 (Welded Steel Tanks).

Project facilities that require seismic design, use of the 2006 IBC design criteria (IBC is also based on ASCE 7-05) would be appropriate, unless the design engineer deems more specific data (e.g. elastic response spectra) necessary. The seismic design parameters presented below are applicable to structures and facilities following either IBC or AWWA seismic design criteria. The estimated Maximum Considered Earthquake (MCE) mapped spectral accelerations for 0.2 second and 1 second periods (S_S and S_1) and associated soil amplification factors (F_a and F_v) based on 2006 IBC are presented in Table 3.3-1 below. Corresponding site modified (S_{Ms} and S_{M1}) and design spectral accelerations (S_{DS} and S_{D1}) are also presented in Table 3.3-1.

Copyright 2008 Kleinfelder

TABLE 3.3-1
IBC SEISMIC DESIGN PARAMETERS

Parameter	Value
S_S	1.895g
S_1	0.600g
F_a	1.0
F_v	1.5
S_{MS}	1.895g
S_{M1}	0.900g
S_{DS}	1.263g
S_{D1}	0.600

The site is classified as Site Class D according to Table 1613.5.2 of the 2006 International Building Code, IBC. Site Class D is defined as a soil profile consisting of very stiff soils with a shear wave velocity between 600 ft/sec and 1,200 ft/sec or SPT N = 15 to 50, S_u = 1,000 to 2,000 pounds per square foot (psf) in the top 100 feet.

3.3.3 SEISMICALLY INDUCED GROUND FAILURE

3.3.3.1 Liquefaction

Soil liquefaction is a condition where saturated soils undergo a substantial loss of strength and deformation due to pore pressure increase resulting from cyclic stress application induced by earthquakes. In the process, the soil acquires mobility sufficient to permit both horizontal and vertical movements if the soil mass is not confined. Soils most susceptible to liquefaction are saturated, loose, clean, uniformly graded, and fine grained sand deposits. If liquefaction occurs, foundations resting on or within the liquefiable layer may undergo settlements. This will result in reduction of foundation stiffness and capacities.

Lateral spreading is a potential hazard commonly associated with liquefaction where extensional ground cracking and settlement occur as a response to lateral migration of subsurface liquefiable material.

Copyright 2008 Kleinfelder

Liquefaction evaluation utilized analytical methodology suggested by the 1997 NCEER Workshop and summarized by Youd et. al. (2001). The analysis indicated thin silty sand layers in the upper 7 to 12 feet may be susceptible to liquefaction during the design earthquake. Seismic settlement is anticipated to be on the order of 0.25 to 1.0 inch. If it is determined this range of seismic settlement is not tolerable, alternative mitigation methods can be provided. These methods may include dynamic compaction, earthquake drains, compaction groutings, or deep pile foundations.

3.3.3.2 Cyclic Softening

"Liquefaction" is the term used in describing the development of significant strains or strength loss in granular soils, while the term "cyclic softening" is used to describe similar phenomena in fine grained soils exhibiting clay-like behavior. Samples of the silty clays were evaluated for the potential development of cyclic softening using the criteria presented by Bray and Sancio (2006). Their analysis, using Liquid Limit (LL), Plasticity Index (PI), and soil water content (w_c), indicates the following: loose, clay-like soils with PI>18 were not susceptible to cyclic softening; soils having a 12<PI<18 and w_c/LL>0.8 may be moderately susceptible to cyclic softening; and, soils with the PI<12 and the w_c/LL>0.85 were found to be susceptible to cyclic softening. The Liquid Limit, Plasticity Index, and soil moisture content data of clayey soils indicates that the potential development of cyclic softening is considered to be very low.

3.4 OTHER GEOLOGIC HAZARDS

In considering other possible hazards to the site, evaluation included the potential for ground lurching, landslides, earthquake induced flooding, liquefaction, tsunamis, and seiches. Based on the topography and location of the site, it is highly improbable that damage would occur to the proposed structures as a result of any of these possible hazards.

Copyright 2008 Kleinfelder

3.5 FLOODING

The Flood Insurance Rate Map, Community Panel Number 060631-0275-C, dated September 27, 1991, prepared by the Federal Emergency Management Agency, indicates that the subject site is located in Flood Zone C, which is designated for areas that are subject to minimal flooding.

Copyright 2008 Kleinfelder

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 SURFACE CONDITIONS

The site is located east of City of Vacaville, at the northwest corner of Fry Road and Lewis Road, southeast of the Easterly Wastewater Treatment Plant in Elmira, Solano County, California. At the time of the field exploration, the approximately 26-acre site was relatively level, consisting of a disced field with scattered growth of weeds throughout. A drainage ditch up to 1.5 feet deep and a berm road covered with gravel adjoins the site to its east and west, respectively. Vacant farmland and an asphalt paved road are to its north and south, respectively. A groundwater monitoring well is located near the southeast corner of the site.

A topographic survey drawing indicated that the topographic relief across the site is approximately 7 feet, with the surface sloping generally downward west to east. The highest elevation is part of a gravel road; the lowest elevation is bottom of drainage ditch.

4.2 SUBSURFACE SOIL CONDITIONS

The encountered earth materials are Holocene age deposits overlying older alluvium. The near surface soils, predominantly medium stiff to hard, are fine sandy clays. These soils were underlain by interchanging discontinuous layers of sandy to silty clay, silty sand, and sandy silt. Pocket penetrometer readings of greater than 4.5 tons per square feet (tsf) were recorded on selected clay samples.

The preceding soil descriptions provide a general summary of the subsurface conditions encountered during the field exploration and further verified by the laboratory testing program. For a more thorough description of the actual conditions encountered at specific boring locations, refer to the boring logs presented in Appendix A (Plates A-1 through A-11) and Appendix C (CPT readings). All soils have been classified in general accordance to the Unified Soil Classification System (ASTM D2487).

Copyright 2008 Kleinfelder

4.3 GROUNDWATER

Groundwater measurements were obtained in selected borings. Measurements were made after groundwater was allowed to stabilize after a minimum 24 hours. Groundwater depths, measured after a minimum 24 hours after first encountered, were at or near 4 feet below ground surface. Groundwater was measured in the CPT borings between 3 and 5 feet below ground surface.

Research of the California Department of Water Resources groundwater level files for wells located in the immediate area determined the following groundwater level history:

Table 4.3-1: Water Well Data

Well Number	Well Coordinates	Distance from Site (kilometers)	Time Period	Water Level Measurements (depth from ground surface)
06N01E31A001M	38.3280°N -121.8975°W	1.2 south	1951-1967 1967-2006*	24-43 feet 4-24 feet
06N01E28N001M	38.3390°N -121.8780°W	1.9 east	1976-1997*	4-27 feet

* most recent record

Copyright 2008 Kleinfelder

5.0 PRELIMINARY EVALUATIONS AND RECOMMENDATIONS

5.1 GENERAL

The site foundation soils encountered in the field exploration generally consists of expansive fine-grained soils. Groundwater is shallow and will likely be encountered during construction. It is anticipated that construction dewatering will be required in excavations that will extend below the groundwater elevation at the time of construction.

5.2 SHALLOW FOUNDATIONS

Generally two geotechnical issues determine the design bearing pressure for conventional spread footing or mat foundations: (1) available soil bearing capacity based on the strength of the soil and/or (2) tolerable settlement. For moderate to large or deep spread foundations, the available shear bearing capacity is very large and settlement considerations or necessary foundation geometry will govern the design bearing.

5.2.1 Spread Footings and Mat Foundations

The available gross bearing capacity of the foundation soil is dependent upon the strength of the soil. Table 5.2-1 provides the expressions for the available allowable bearing capacity for static loading (D+L loads) and total combined loading (D+L+transient loads). Based on geotechnical considerations (i.e. expansive soils), conventional spread footings should be embedded a minimum of 24 inches below lowest adjacent grade. For deep excavation of underground structures, for every foot of foundation embedment below the adjacent exterior ground surface, the allowable recommended soil bearing pressures may be increased by 50 psf and 24 psf, for above and below the design groundwater table elevations, respectively.

Copyright 2008 Kleinfelder

TABLE 5.2-1
AVAILABLE VERTICAL BEARING CAPACITY

Loading Conditions	Available Bearing Capacity (psf)
Static	2000
Total Combined	3000
Ultimate	6000

For mat foundation design, a modulus of subgrade reaction (k-value) of 200 psi/in may be used. For below-grade mat foundations, it is recommended that the mat foundations be designed for hydrostatic uplift pressure unless an under-slab drainage system and sump is provided.

5.2.2 Ringwall Footings

The allowable bearing capacities for static (D.L. + any L.L.) and the total combined (D.L. + L.L. + dynamic) loading conditions on ringwall footings and column bearing plates is anticipated to be the same as for spread footings, as presented in Table 5.2-1.

5.3 ESTIMATED SETTLEMENT

Large foundations can have extremely high available bearing capacity. The design of such foundations would normally be governed by tolerable settlement. A range of design bearing pressures has been assumed to provide designers an indication of the variability in settlement. If furnished with information on foundation loads and geometry, additional data can be provided regarding foundation settlement. Settlement evaluation of the soils is based on consolidation data and methods by Schmertmann. If settlement exceeds structural tolerances, suggestions for improvement procedures such as surcharge, wick drains, or stone columns can be provided.

Copyright 2008 Kleinfelder

5.3.1 Spread Footing and Mat Foundations

Table 5.3-1 provides the estimated settlement for assumed loading on conventional footing foundations.

TABLE 5.3-1
ESTIMATED SETTLEMENT – CONVENTIONAL FOOTINGS

Plant Component	Foundation Load	Estimated Contact Pressure (psf)	Estimated Settlement (inch)
Structure Footings	4 kips/ft	2000	0.7
	25 kips	2000	0.7
	50 kips	2000	0.9
	100 kips	2000	1.3

The fine grained soils are anticipated to experience time dependent settlement. Structure foundations may take up to 6 months. Structure foundations will experience at least 90% of primary settlement within 3 months.

Table 5.3-2 provides the estimated settlement for assumed loading on equipment mat foundations.

Copyright 2008 Kleinfelder

TABLE 5.3-2
ESTIMATED SETTLEMENT –MAT

Plant Component	Dimension (feet)	Estimated Contact Pressure (psf)	Estimated Settlement (inch)		
			Rigid	Flexible	
				Edge	Center
Cooling Tower	65 x 580	650	0.8	0.9	1.8
		1150	3.4	2.2	3.9
Steam Turbine/Generator	55 x 100	1300	3.3	2.3	3.8
Heat Recovery Steam Generator	50 x 180	1300	3.5	2.4	4.0
Ammonia Storage Tank	30 x 75	400	0.5	0.3	0.6
		650	1.0	0.8	1.1
Miscellaneous	40 x 50	500	0.8	0.4	0.9
		1000	1.9	1.1	2.1

The fine grained soils are anticipated to experience time dependent settlement. Mat foundations may take up to 112 years. Mat foundations will experience at least 70% of primary settlement within 3 months and 80% within 6 months.

5.3.2 Tanks

Table 5.3-3 provides the estimated settlement for tank structures with ringwall foundations.

Copyright 2008 Kleinfelder

TABLE 5.3-3
ESTIMATED SETTLEMENT – TANKS ON RINGWALL

Plant Component	Tank Diameter (feet)	Estimated Contact Pressure (psf)	Estimated Settlement (inch)	
			Edge	Center
Storage Tanks	80	1100	1.5	3.5
		1650	2.7	5.0

The fine grained soils are anticipated to experience time dependent settlement. Tank footings may take up to 5 years to experience primary settlement. It is anticipated tank footings will experience at least 90% of primary settlement within 3 months.

It is estimated the settlement for a 2-foot wide ring footing and 2.5-foot column plate will be about 0.5 inch per 1000 psf of long-term (static) bearing. The anticipated settlement associated with transient loading is about 0.2 inch per 1000 psf of transient bearing. Settlement of the ringwall footing or column plate is based on loads applied to the footing (i.e. shell and roof and surge), exclusive of the static product load.

5.4 LATERAL EARTH PRESSURES

Table 5.4-1 provides the lateral earth pressures against buried structures and retaining walls. Data are presented for active, braced, and at-rest conditions for structures/walls supporting level ground surface. Lateral earth pressures are strain related. The active pressure would be applicable for walls capable of rotating 0.0005 radian. The braced values are for walls restrained at specific points from translation, but are capable to rotate 0.0005 radian at the midpoint between restraints (e.g., a 10-foot high wall restrained at the top and bottom, but capable to deflect 0.03 inch at its midpoint would be designed for the braced pressure). The at-rest pressures are applicable to walls fully fixed against translation or rotation. The at-rest pressures include the Jaky solution for normally consolidated soil plus consideration for the locked-in pressure associated with the pre-stressing due to backfill compaction (over-consolidation).

Copyright 2008 Kleinfelder

TABLE 5.4-1
LATERAL EARTH PRESSURES AGAINST RETAINING STRUCTURES

Condition	Lateral Pressure Static	
	Above Groundwater	Below Groundwater
Active (psf/ft)	65	31 + hydrostatic
Braced (psf)	42H	20H + hydrostatic
At-Rest (psf/ft)	115	55 + hydrostatic

Note: H is the retained height in feet

Where design considers seismic effects, the dynamic increment for the active, braced, and at-rest conditions, which would be added to static values, is 28 psf/ft of depth for above ground water and 13 psf/ft of depth for below ground water conditions. The resultant force determined for the dynamic increment should be applied at 0.6H above the bottom of the wall. To evaluate the stress distribution along the wall, the dynamic increment pressure diagram can be considered an inverted triangle.

The uniform lateral pressure against a retaining structure due to a uniform surcharge can be determined by multiplying the surcharge pressure by 0.28.

5.5 RESISTANCE TO LATERAL LOADS

5.5.1 Foundations

Lateral loads applied to foundations can be resisted by a combination of lateral bearing and sliding resistance due to adhesion. Table 5.5-1 provides the ultimate and allowable passive pressure and sliding resistance for use in evaluating resistance to lateral loading on structures.

Copyright 2008 Kleinfelder

TABLE 5.5-1
LATERAL RESISTANCE PARAMETERS

	Allowable		Ultimate
	Static	Total Combined	
Sliding Resistance (psf)	610	740	920
Passive Pressure (psf/ft)	1880	2500	3760
Lateral Translation Necessary to Develop Passive Pressure	0.015D	0.02D	0.03D

Note: D is the foundation depth below lowest adjacent grade. Lateral translation will be in the same units as D.

The static values are for use with D+L loads and the total combined values are for resistance of D+L+transient loads other than seismic. The allowable parameters include a safety factor and, as such, can be used for direct comparison of driving and resisting loads. If design approaches use a prescribed ratio of resisting loads to driving loads greater than unity, ultimate values can be used. Passive resistance is strain related (deformation necessary to mobilize shear resistance). If the translation necessary to develop the passive pressure is within structure tolerance, the sliding resistance and passive pressure can be used in combination without any reduction. Otherwise, passive pressure needs to be reduced to be compatible with tolerable deformation.

5.5.2 Tank Bottom

Lateral loads on the base of tanks can be resisted by friction between the tank bottom plate and supporting soil. The allowable frictional coefficients for static (D+L) and total combined (D+L+ transient) loads are provided in Table 5.5-2.

Copyright 2008 Kleinfelder

TABLE 5.5-2
FRICTIONAL RESISTANCE AT BOTTOM OF TANK

Base Material	Allowable Frictional Coefficient		Ultimate Frictional Coefficient
	Static Loads	Total Combined Loads	
Steel Tank Bottom on Imported Sand	0.22	0.26	0.32
Steel Tank Bottom on Imported Gravel	0.25	0.30	0.38

5.6 DYNAMIC SOIL PARAMETERS

The dynamic soil parameters are presented in Table 5.6-1.

TABLE 5.6-1
DYNAMIC SOIL PARAMETERS

Mass Density, lb-sec^2/ft^4	Poisson's Ratio	Shear Modulus (ksf)		Material Damping Ratio		Modulus of Elasticity (ksf)	Shear Wave Velocity (ft./sec)
		$\epsilon=10^{-3\%}$	$\epsilon=10^{-5\%}$	$\epsilon=10^{-3\%}$	$\epsilon=10^{-5\%}$		
3.9	0.35	1700	1880	0.02	0.05	4590	700

5.7 DEEP FOUNDATIONS

As an alternative to spread foundations, deep foundations can be used to support planned structures. Cast-in-drilled hole (CIDH) concrete pier foundations would require casing or slurry due to the presence of shallow groundwater and therefore, may be cost prohibitive. Driven piles would be an appropriate option. Consideration should be given to a pile indicator program if pile foundation system is selected.

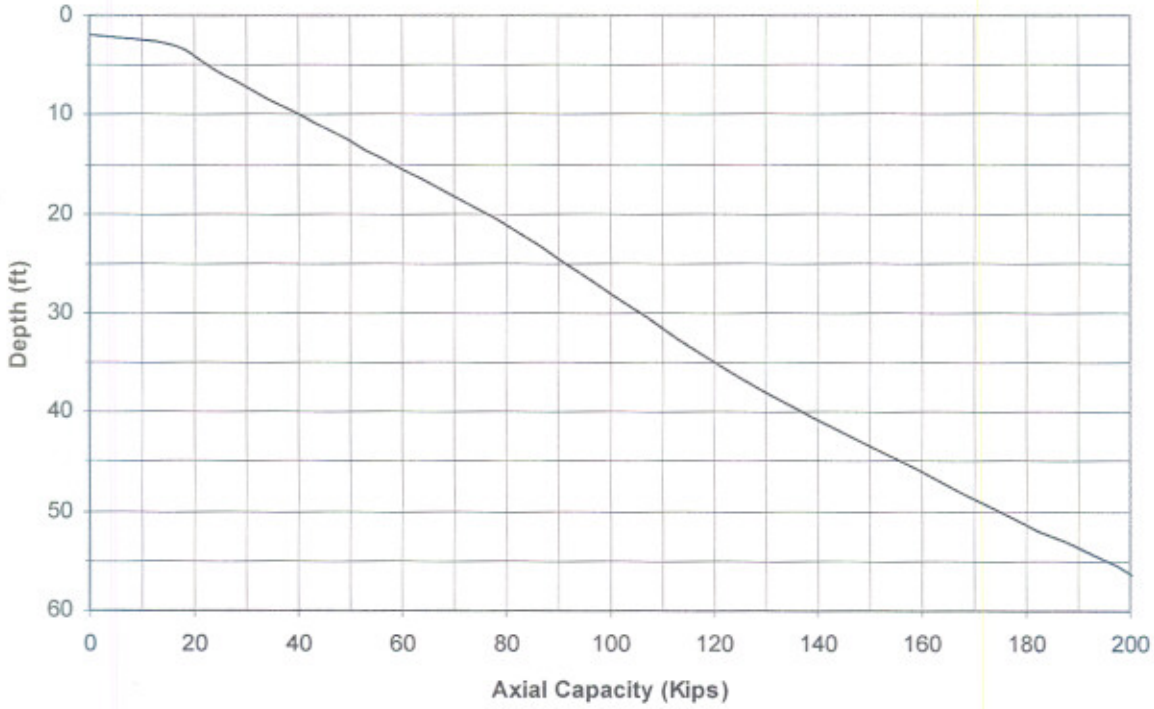
5.7.1 Axial Capacities

Driven 70 ton pre-cast concrete piles may be considered for support of pipe racks or to reduce effects from mat foundations. Analysis, based on the CPT data considers axial capacity based on side friction only in clay soils. Figure 5.7-1 provides axial

Copyright 2008 Kleinfelder

compressional capacity versus depth of embedment of a 12-inch square pile. The capacity of other pile diameters would be proportional to the pile perimeter. Uplift capacity may be used as 70 percent of the compressive frictional capacity plus the dead weight of the concrete pile. If groups of piles are necessary, the pile spacing should be a minimum of 3 pile diameters, center to center. If closer spacing is required, a capacity reduction for group effect will be required.

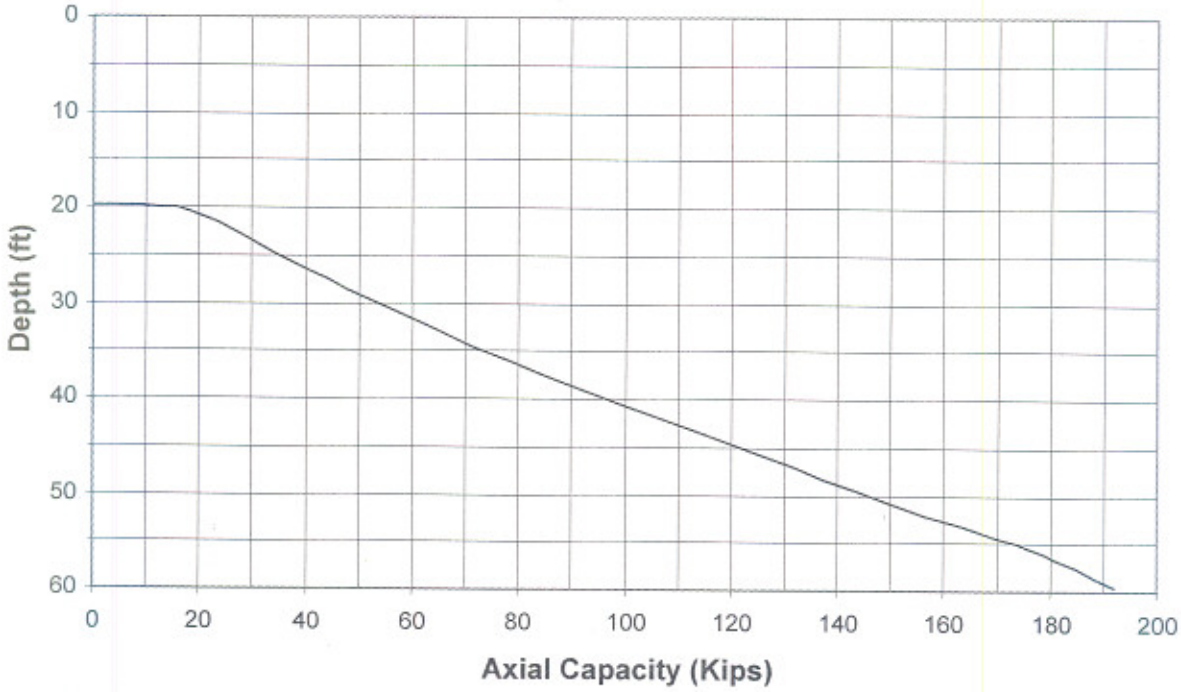
FIGURE 5.7-1
Allowable Axial Capacity vs Pile Depth
12-inch Driven Concrete Pile



In the design seismic event, liquefaction in thin sandy layers in the upper 7 to 12 feet of material will produce downdrag on the piles. The available capacity (DL + LL + Seismic load) is shown in Figure 5.7-2.

Copyright 2008 Kleinfelder

FIGURE 5.7-2
Allowable Axial Capacity vs Pile Depth During Seismic Event
12-inch Driven Concrete Pile



5.7.2 Lateral Pile Capacity

The lateral response of pile foundations were evaluated using LPILE Plus Version 4.0 for Windows (computer software developed by *Ensoft Inc.*). The geotechnical parameters summarized in Table 5.7-1 can be used for evaluation of lateral loading of piles.

Copyright 2008 Kleinfelder

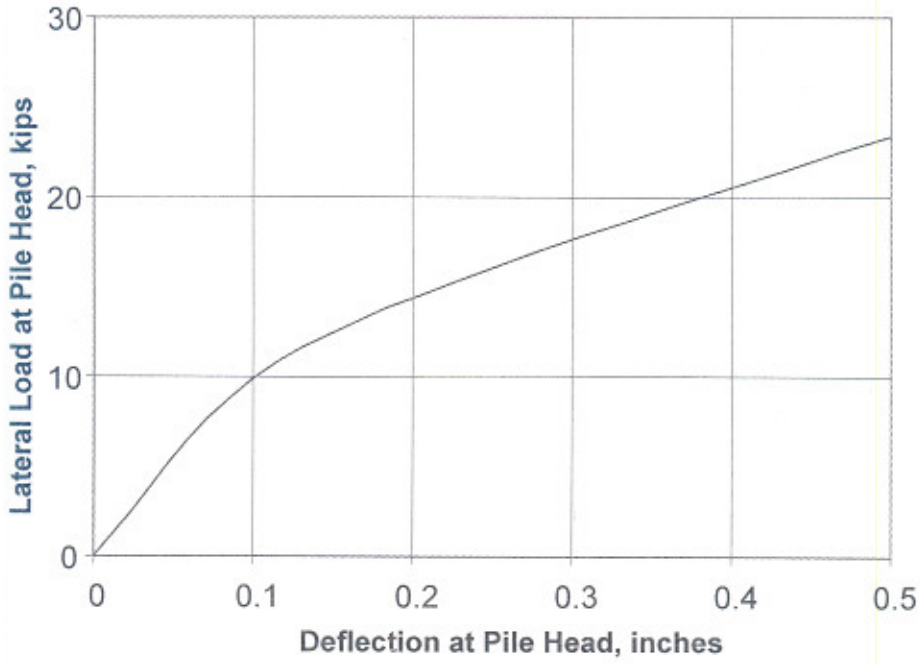
Table 5.7-1
SOIL INPUT PARAMETERS FOR LPILE

Depth Below Original Grade (ft)		p-y	K	γ'	ϕ	c	E_{50}
From	To	Curve	(pci)	(pci)	(°)	(psi)	
0	4	Stiff clay w/o free water	390	0.069	-	13.056	0.005
4	7	Stiff clay w/ free water	390	0.039	-	13.056	0.005
7	13	Sand	220	0.039	36	-	-
13	30	Stiff clay w/ free water	300	0.039	-	6.667	0.005
30	31	Silt	140	0.039	18	3.472	0.005
31	60	Stiff clay w/ free water	260	0.037	-	6.667	0.005

Figure 5.7-3 provides the lateral load versus deflection for a pile head deflection of up to 0.5 inch. Data are presented for a free head condition with the lateral load applied at the ground surface. Data can be provided for a partially embedded pile, if the point of load application above the ground surface or the shear and moment at the ground surface is provided.

Copyright 2008 Kleinfelder

Figure 5.7-3
Lateral Load Curve For 12" Driven Pile



Copyright 2008 Kleinfelder

Curves displaying the moment, shear, and displacement distribution along the pile can be provided for the final loading and pile geometry.

When considering the lateral capacity of a pile group, it will be necessary to reduce the single pile capacity of trailing piles. The reduction in capacity due to the effects of shaft interaction will be dependent upon the center-to-center (CTC) pile spacing. It is recommended that the capacity of individual trailing piles in a laterally loaded group be reduced according to the data in Table 5.7-3.

TABLE 5.7-3
GROUP AFFECT FOR LATERALLY LOADED PILE

CTC Spacing (In-line Loading)	Ratio of Lateral Resistance of Trailing Pile in Group to Isolated Single Pile
2B	0.4
3B	0.6
4B	0.8
5B	1.0

5.7.3 Pile Construction Considerations

Consideration should be given to a pile indicator program if pile foundation system is selected.

5.8 CONVENTIONAL CONCRETE SLABS-ON-GRADE

5.8.1 Subgrade Preparation

Slabs-on-grade should be supported on recompacted soils or engineered fill as described in Sections 5.10 and 5.11 of this report. Slab subgrade should have a necessary moisture content of + 5% of optimum to the required depth of 30 inches. The

Copyright 2008 Kleinfelder

moisture content should be verified immediately prior to placing the vapor retarding membrane or pouring concrete.

5.8.2 Capillary and Moisture/Vapor Break

Considering the depth to ground water and the soil types, a capillary break (i.e. clean sand or gravel layer) is recommended.

In buildings where equipment or other components are moisture-sensitive, it is recommended that design should incorporate a 4 inch minimum gravel subgrade layer, the membrane, such as polyorfin, should have a minimum thickness of 15-mil. As an added precaution, consideration could be given to extending the vapor retarding membrane around the footings to provide a more complete vapor barrier. The subgrade surface should be smooth and care should be exercised to avoid tearing, ripping, or otherwise puncturing the vapor retarding membrane. If the vapor retarding membrane becomes torn or disturbed, it should be removed and replaced or properly patched. It is recommended consideration be given to placing concrete directly on the vapor retarding membrane. If desired by designers, the vapor retarding membrane could be covered with approximately 1 to 2 inches of saturated surface dry (SSD), relatively clean sand to protect it during construction. Concrete should not be placed if sand overlying the vapor barrier has been allowed to attain a moisture content greater than about 5% (due to precipitation or excessive moistening). Excessive water beneath interior floor slabs could result in future significant vapor transmission through the slab, adversely affecting moisture-sensitive floor coverings or equipment and the indoor environment.

It should be noted that, although the slab support discussed above is currently the industry standard, this system might not be completely effective in preventing floor slab moisture vapor transmission problems. This system will not necessarily assure that floor slab moisture transmission rates will meet any component standards and that indoor humidity levels will not inhibit mold growth. A qualified specialist(s) with knowledge of slab moisture protection systems, flooring design and other potential components that may be influenced by moisture, should address these post-

Copyright 2008 Kleinfelder

construction conditions separately. The purpose of a geotechnical study is to address subgrade conditions only, and consequently, it does not evaluate future potential conditions.

5.8.3 Conventional Slab Design

Due to the expansive potential of soils, the minimum reinforcement of concrete floor systems should be #3s at 18 inches O.C., or equivalent. The reinforcement is based on engineering judgment and experience with expansive soils and is not based on any structural analysis. The reinforcement assumes a nominal slab thickness of 4 to 5 inches. Slab thickness and reinforcement must also satisfy structural considerations. Reinforcement for structural considerations should be provided by a structural engineer or building designer. A modulus of subgrade reaction, Kp (Bp = 1 foot), of 220 pci may be used for elastic analysis of slabs on properly compacted fill consisting of on-site clayey soil.

Slab concrete should have good density, a low water/cement ratio, and proper curing to promote a low porosity. It is recommended the water/cement ratio not exceed 0.45 to minimize vapor transfer.

Where more rigid floor covering (e.g. tile and glue-down hardwood flooring) is used, consideration should be given to using a good separation slip-sheet between the slab and flooring.

Consideration should be given to some form of reinforcement of exterior slabs to aid in crack control. Additionally, dowelling of exterior slabs should be considered at building doorways to minimize the potential for problematic differential heave between the exterior slab and door threshold.

Copyright 2008 Kleinfelder

5.9 PIPE DESIGN

5.9.1 Vertical Loading

Pipe zone (bedding, haunching and initial backfill) backfill compaction and material should be compatible with the pipe type and tolerable deformation. Randomly excavated site soil would result in a Class IVA backfill material as described in ASTM D2321. It is recommended pipe zone backfill material be Class III or better material. Table 5.9-1 provides estimated values for soil stiffness modulus (E'_b and E'_n) of the trench wall and pipe zone backfill and backfill density for use in evaluating initial pipe deflection and pipe zone backfill criteria that is compatible with pipe types.

TABLE 5.9-1
PIPE DESIGN PARAMETERS

Type of Soil	Soil Stiffness Modulus (psi)			Backfill Density (pcf)	
	E'_n (trench wall)	E'_b (backfill)		85% Compaction	90% Compaction
		85% Compaction	90% Compaction		
Class III or Better Material	3000	700	1000	111	118

E'_n represents the modulus for the undisturbed natural soil and is based on the relative density and data by Howard (1996). E'_b is the modulus for backfill derived from excavation of on-site soil and is based on data by Hartley and Duncan (1982) and Watkins and Anderson (2000). The design E' will be dependent upon the pipe diameter and trench width, which dictates the relative influence of E'_n and E'_b. Methods by Howard (1996) are suggested for evaluating the design E'.

In evaluating the maximum load (W_c) on pipes, a Ku' of 0.13 can be used in determining the load coefficient C_d.

Copyright 2008 Kleinfelder

5.9.2 Resistance of Lateral Loads

The lateral thrust on pressurized pipelines can be resisted by resistance to adhesion between the pipe and pipe zone backfill and lateral bearing on thrust blocks. Table 5.9-2 provides the recommended frictional resistance and lateral bearing for sustained loading and test loading conditions.

TABLE 5.9-2
LATERAL RESISTANCE FOR PIPES

Resistance Mode	Sustained Loading	Test Loading
Frictional Coefficient		
Smooth Pipe (plastic, steel)	0.19	0.23
Rough Pipe (corrugated, cement)	0.37	0.44
Lateral Bearing	1880 psf	2500 psf

The horizontal deflection associated with developing the allowable lateral bearing on shallow thrust blocks is about 0.015D for sustained loading and 0.02D for test loading. D represents the depth below the ground surface to the base of the thrust block. The estimated horizontal deflection associated with the lateral bearing on deep thrust blocks is about 0.25 inch per 2000 psf of lateral bearing.

5.10 SITE EARTHWORK

5.10.1 Stripping and Grubbing

At the time of the field exploration, scattered growth of weeds occupied the site. It is likely the amount of surface vegetation will vary with time. All surface vegetation and any miscellaneous surface obstructions should be removed from the project area, prior to any site grading. It is anticipated stripping of brush and seasonal vegetation could involve the upper 2 to 3 inches. Grubbing should include removal of bush root-balls and

Copyright 2008 Kleinfelder

isolated roots greater than 0.5 inch in diameter. Surface strippings should not be incorporated into fill unless they can be sufficiently blended to result in an organic content less than 3 percent by weight (ASTM D2974).

5.10.2 Disturbed Soil, Undocumented Fill and Subsurface Obstructions

Initial site grading should include a reasonable search to locate any disturbed soil, undocumented fill soils and abandoned underground structures that may exist within the area of construction. Any obstructions should be removed from the project area. Any disturbed soil, void spaces created by burrowing animals or undocumented fill, which are encountered, should be excavated to approved firm native material.

5.10.3 Scarification and Compaction

Following site stripping, grubbing and/or any required removal, it is recommended that areas to receive fill or to be used for support of shallow foundations, concrete slabs, and pavements should be scarified to a depth of 8 inches and moisture conditioned to at least 5% above optimum and compacted to at least 88%, but not more than 92%, of the maximum density. Scarification, moisture conditioning, and compaction will not be required in areas where mat foundations will be constructed.

Reference to maximum dry density and optimum moisture is in accordance to ASTM D1557.

5.10.4 Engineered Fill

5.10.4.1 Materials

All engineered fill soils should be nearly free of organic or other deleterious debris and less than 3 inches in maximum dimension. The native soil materials, exclusive of debris, may be used as engineered fill provided they contain less than 3 percent organics by weight (ASTM D2974).

Copyright 2008 Kleinfelder

Recommended requirements for any imported soil to be used as engineered fill, as well as applicable test procedures to verify material suitability are provided on Table 5.10-1.

TABLE 5.10-1
IMPORT SOIL MATERIALS

Gradation		Test Procedures	
Sieve Size	Percent Passing	ASTM[1]	Caltrans[2]
76 mm (3 inch)	100	C136	202
19 mm (¾ inch)	80 – 100	C136	202
No. 4	60 – 100	C136	202
No. 200	20 – 70	C136	202
Plasticity			
Liquid Limit	Plasticity Index		
< 25	<9	D4318	204
Soluble Sulfates			
< 2000 ppm		-	417
Soluble Chloride			
<300 ppm		-	422
Resistivity			
>1000 ohm-cm		-	643

Notes:

[1] American Society for Testing and Materials Standards (latest edition)

[2] State of California, Department of Transportation, Standard Test Methods (latest edition)

Copyright 2008 Kleinfelder

Any imported materials to be used for engineered fill should be sampled and tested by a representative of the project Geotechnical Engineer prior to being transported to the site.

5.10.4.2 Compaction Criteria

Table 5.10-1 indicates the minimum amount of moisture conditioning and range of required compaction based on the soils expansion potential. The required level of moisture conditioning and compaction should be determined based on tests performed during grading. Preliminary design could consider criteria for the PI range of greater than 25 for on-site clay soils.

TABLE 5.10-1
EXPANSIVE SOIL CONDITIONING

Expansion Potential of Subgrade Soils		Relative Compaction (min-max)	Minimum Moisture Conditioning (% Over Optimum)
PI	EI		
< 9	< 20	90%	+0%
9 to 15	21-40	90-95%	+3%
16 to 25	41-80	88-92%	+4%
> 25	> 80	88-92%	+5%

The general intent is to bring the expansive material to about 80% to 85% saturation at the time of construction. If desired, plasticity index (PI) tests may be conducted during grading in order to re-consider moisture conditioning.

5.10.5 Construction Considerations

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above optimum moisture content. These conditions could hamper equipment maneuverability and efforts to compact site soils to the

Copyright 2008 Kleinfelder

recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier material, stabilization with a geotextile fabric or grid, or other methods may be required to mitigate the effects of excessive soil moisture and facilitate earthwork operations.

If construction is performed during dry, hot or windy weather, it may be necessary to periodically apply surface watering to counter evaporative loss or re-establish moisture prior to constructing slabs.

5.11 TEMPORARY EXCAVATIONS

5.11.1 General

All excavations must comply with applicable local, state, and federal safety regulations including the current the Occupational Safety & Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. Kleinfelder is providing the information below solely as a service to the client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.11.2 Temporary Slopes

Near-surface soils encountered during the field investigation consisted predominantly of sandy silt and silty sand with some interbeds of poorly graded sand. These soils would be considered as a Type C soil with regard to OSHA regulations. Use of higher or steeper cut slopes for temporary excavations will require specific evaluation of strength, moisture content, and homogeneity of the soils and associated stability analysis.

Copyright 2008 Kleinfelder

5.11.3 Shoring

Shoring may be required where space or other restrictions do not allow for an adequately sloped excavation. A braced or cantilevered shoring system maybe used and should be designed utilizing the active and braced pressures presented in Table 5.4-1. The values assume a level ground surface adjacent to the top of the shoring and no surcharging.

Equipment or spoil placed within a horizontal distance equal to the shoring height may result in a lateral surcharge load. Twenty-five percent of a uniform areal surcharge placed adjacent to the shoring may be assumed to act as a uniform horizontal pressure against the shoring. Special cases such as combinations of slopes and shoring or other surcharge loading geometry would require specific evaluation to determine the surcharge effect. These conditions should be evaluated on a case-by-case basis.

Shoring must extend to a sufficient depth below the excavation bottom to provide the required lateral resistance. The allowable passive pressure against solid shoring, which extends below the level of excavation is 1880 psf/foot of depth. It is recommended that required embedment depths for cantilevered shoring be determined using methods for evaluating sheet pile walls and based on the principles of force and moment equilibrium. Isolated soldier piles with a spacing greater than 3D, where 'D' is the width of the shaft, may be designed for an allowable passive pressure of 500 psf/foot of depth. This value already considers arching. Consequently, no additional increases should be considered. The Contractor should be responsible for the structural design and safety of all temporary shoring systems.

5.11.4 Dewatering

If construction excavations (either shored or unsupported) encounter groundwater, adequate dewatering will be required. Dewatering methods should generally be capable of keeping the construction area free of water. Dewatering methods (e.g.,

Copyright 2008 Kleinfelder

manifold shallow well points or deep wells) should maintain the groundwater level at least 5 feet below the bottom of excavation.

5.12 PRELIMINARY PAVEMENT SECTIONS

5.12.1 General

The potential subgrade soil is anticipated to be clayey. The subgrade Resistance-value (R-value) for the granular on-site soil was evaluated in the laboratory. The test results indicated R-values of 13 by exudation. Expansion pressures were experienced which effectively reduced the R-value from 13 to 11 for a TI of 4.5. The laboratory testing was in conformance with Caltrans Test Method No. 301.

On-site soil could be improved by soil stabilization such as lime treatment. A separate report could be submitted to present pavement sections if lime treatment is selected.

5.12.2 Asphalt Concrete Pavement

Specifications indicated using HS20-44 loading for pavement areas. Detailed frequency information is not available for this project. Therefore, it was assumed that an average daily truck traffic (ADTT) of one HS 20-44 vehicle for a 20-year design period. The assumption translates to 18-kip ESAL (Equivalent Single Axle Loading) design repetitions of 163,907, which is equivalent to a Caltrans Traffic Index (TI) of 7.5. This traffic design assumption should be reviewed for compatibility with the actual development, and revised pavement sections developed, if necessary. For non-truck pavement areas, a design TI of 4.5 has been used. This TI would represent an average of about 200 vehicles under a GVW of 7,000 pounds per day.

The flexible pavement design recommendations presented are based upon the Caltrans procedures. The flexible pavement sections associated with the estimated T.I.'s are summarized in Table 5.12-1.

Copyright 2008 Kleinfelder

TABLE 5.12-1
RECOMMENDED PRELIMINARY PAVEMENT SECTIONS ON NATIVE SUBGRADE

Traffic Index	Design R-Value	Asphalt Concrete	Aggregate Base (Min. R-value: 78)	Aggregate Subbase (Min. R-value: 50)
4.5	11	2.5"	8.0" 4.0"	- 4.5"
7.5	13	4.5"	15.5" 5.5"	- 11.0"

The flexible pavement should conform to, and be placed in accordance with, Caltrans Standard Specifications, May 2006. The aggregate base (Class 2) and aggregate subbase (Class 2) should comply with Sections 26 and 25 of the Caltrans Standard Specifications. Aggregate base and aggregate subbase should be compacted to a minimum of 95 percent relative compaction as determined by California Test Method 216/231. The upper 12 inches of pavement subgrade should be moisture conditioned to 3% above optimum and compacted to at least 90%, but not more than 95%, of maximum density. It is recommended a dry method maximum density test procedure be used for the subgrade. Subgrade compaction should be achieved immediately prior to placing the pavement section.

5.12.3 Portland Cement Concrete Pavement

Design recommendations for PCCP are based on standard guidelines developed by the Portland Cement Association. For a T.I. of 4.5 (ESAL of 2960) it is recommended rigid pavement consist of 5.75 inches of PCCP over 4.0 inches of aggregate base. For a TI of 7.5 (ESAL of 164,000), the rigid pavement would be 7.0 inches of PCCP over 4.0 inches of aggregate base. If desired, a design analysis could be performed based on actual truck volumes and axial loading. Aggregate base should be compacted to a minimum of 95 percent relative compaction as determined by California Test Method 216/231. The upper 12 inches of pavement subgrade should be moisture conditioned

Copyright 2008 Kleinfelder

to 3% above optimum and compacted to at least 90%, but not more than 95%, of maximum density. It is recommended a dry method maximum density test procedure be used for the subgrade. Subgrade compaction should be achieved immediately prior to placing the pavement section.

The concrete mix design should provide a 28-day compressive strength of at least 4,000 pounds per square inch. The concrete mix should also be designed for a slump not exceeding 4 inches. Thickened edges should be used along outside edges of concrete pavements. Edge thickness should be at least 2 inches greater than the concrete pavement thickness and taper to the actual concrete pavement thickness 36 inches inward from the edge. Integral curbs may be used in lieu of thickened edges.

Continuous sections of concrete pavement should have construction or control joints in an approximately 12-foot square grid system or less. If a square system is impractical, rectangular panels having a maximum dimension of 12 feet can be used. All longitudinal or transverse control joint should be constructed by saw-cutting, hand forming or placing pre-molded fillers, such as zip strips. Longitudinal or transverse construction joints should be keyed or doweled to mitigate against differential movement. Expansion joints should be used to isolate fixed objects abutting or within the pavement area. The expansion joints should extend the full depth of the pavement. Joints should run continuously and extend through integral curbs and thickened edges. It is recommended that joint layout be adjusted to coincide with the corner of objects and structures.

5.12.4 Moisture Considerations

The pavement design should consider both the vehicular loading, as well as the environmental factors. The vehicular loading will depend on the amount and type of traffic anticipated for the pavement design life. Environmental factors include the potential for moisture variations beneath the pavement structural section. It is recommended that all pavement areas conform to the following criteria:

Copyright 2008 Kleinfelder

1. All trench backfill, including utility and sprinkler lines, should be properly placed and adequately compacted to provide a stable subgrade.

2. Adequate drainage should be provided to prevent ponding of surface water which could saturate the subgrade soil.

3. A periodic maintenance program should be incorporated to include sealing cracks and other measures.

4. All concrete curbs separating pavement and landscaped areas should extend to the subgrade.

5.12.5 Construction Considerations

In the event unstable (pumping) subgrades are encountered within planned pavement areas, we recommend a heavy, rubber-tired vehicle (typically a loaded water truck) be used to test the load/deflection characteristics of the finished subgrade materials. This vehicle should have a minimum rear axle load (at the time of testing) of 16,000 pounds with tires inflated to at least 65 psi pressure. If the tested surface shows a visible deflection extending more than 6 inches from the wheel track at the time of loading, or a visible crack remains after loading, corrective measures should be implemented. Such measures could include disking to aerate, chemical treatment, replacement with drier material, or other methods. It is recommended Kleinfelder be retained to assist in developing which method (or methods) would be applicable for this project.

5.13 FIELD RESISTIVITY TESTING

The resistivity of the soil was measured at the site to assist designers in evaluation of a potential grounding system. Soil resistivity was measured using the Wenner four-electrode method and a Model 4620 Ground Resistance Tester, manufactured by AEMC, Inc. The Wenner method involves the use of four metal probes or electrodes driven into the ground, along a straight line, an equal distance from each other. An alternating current from the soil resistance meter is induced into the soil. The current creates a voltage gradient that is proportional to the average resistance of the soil mass

Copyright 2008 Kleinfelder

to a depth equal to the distance between probes. The resistivity of each layer of soil was then calculated using the Megger Method as follows:

$$\rho = A\ 2\ \pi\ R$$

where;

ρ= soil resistivity at depth (ohm-cm)
A = distance between the electrodes (cm)
R = resistance of soil layer from a to b (ohms)
π= constant 3.1416

Ten resistivity test lines were performed at the project site. The test locations are shown on Plate 2. Resistance measurements were conducted with various probe spacings at the project site.

The results of the field resistivity testing are provided in Appendix D.

5.14 CORROSION POTENTIAL

Chemical analyses were performed on five samples of near surface soils to estimate pH, resistivity, soluble sulfate, and chloride contents in general accordance with Caltrans Standard Test Methods 643 (pH and resistivity), 417 (sulfates), and 422 (chlorides). The results of the corrosivity testing are provided in Table 5.14-1.

TABLE 5.14-1
CORROSION TEST RESULTS

Sample ID	Sulfates	Chloride	pH	Minimum Resistivity
RV-1 @ 0-5 ft.	40 ppm	20 ppm	6.2	1648 ohm-cm
RV-4 @ 0-5 ft.	60 ppm	20 ppm	6.1	1582 ohm-cm

Copyright 2008 Kleinfelder

The test results suggest that relatively low levels of soluble sulfate content and low levels of soluble chloride content are present in on-site soils. Normal Type II cement is anticipated to be adequate in foundation concrete that comes in contact with the foundation soils.

The minimum electrical resistivity is generally representative of an environment that could be corrosive to buried unprotected metals. Corrosion is dependent upon a complex variety of conditions, which are beyond the geotechnical practice. Kleinfelder does not practice corrosion engineering. It is recommended that a competent corrosion engineer evaluate the corrosion potential of the site to the proposed project, to recommend further testing as required, and to provide specific corrosion mitigation methods appropriate for the project. It is recommended that specific testing be performed once site-grading activities are near completion to provide a better assessment of the actual soils present in the areas of interest.

Copyright 2008 Kleinfelder

6.0 ADDITIONAL SERVICES

6.1 PLANS AND SPECIFICATION REVIEW

It is recommended Kleinfelder be retained to review preliminary foundation and earthwork plans and specifications. It has been Kleinfleder's experience that this service provides an opportunity to review whether or not the recommendations have been properly interpreted and to correct possible misunderstandings of the recommendations prior to the start of construction. In the event Kleinfelder is not retained to perform this recommended review, Kleinfelder will assume no responsibility for misinterpretation of the recommendations.

6.2 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that Kleinfelder be retained to provide observation and testing services during site earthwork and construction of foundations. This will allow us the opportunity to compare actual subsurface soil conditions with those encountered during the field exploration and, if necessary, to provide supplemental recommendations, if warranted due to unanticipated subsurface conditions.

Copyright 2008 Kleinfelder

7.0 LIMITATIONS

Recommendations contained in this report are based on the field observations, subsurface explorations, laboratory tests, and present knowledge of the proposed construction, as described in this report. It is possible that soil conditions vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, Kleinfelder should be notified immediately in order that a review may be made and any supplemental recommendations provided. If the scope of the proposed construction changes from that described in this report, the recommendations should also be reviewed. Kleinfelder has not reviewed the final grading plans or foundation plans for the Project.

Corrosion recommendations are preliminary. Kleinfelder is not a corrosion engineering consultant. Specific recommendations for corrosion protection should be obtained from a corrosion specialist.

Kleinfelder has strived to present the findings, conclusions and recommendations in this report in a manner consistent with the standards of care and skill ordinarily exercised by members of this profession practicing under similar conditions in Solano County, California, and at the time the services were performed. No warranty, express or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by Kleinfelder during Project construction in order to evaluate compliance with the recommendations and/or to provide supplemental recommendations, as needed, if anticipated subsurface conditions are encountered.

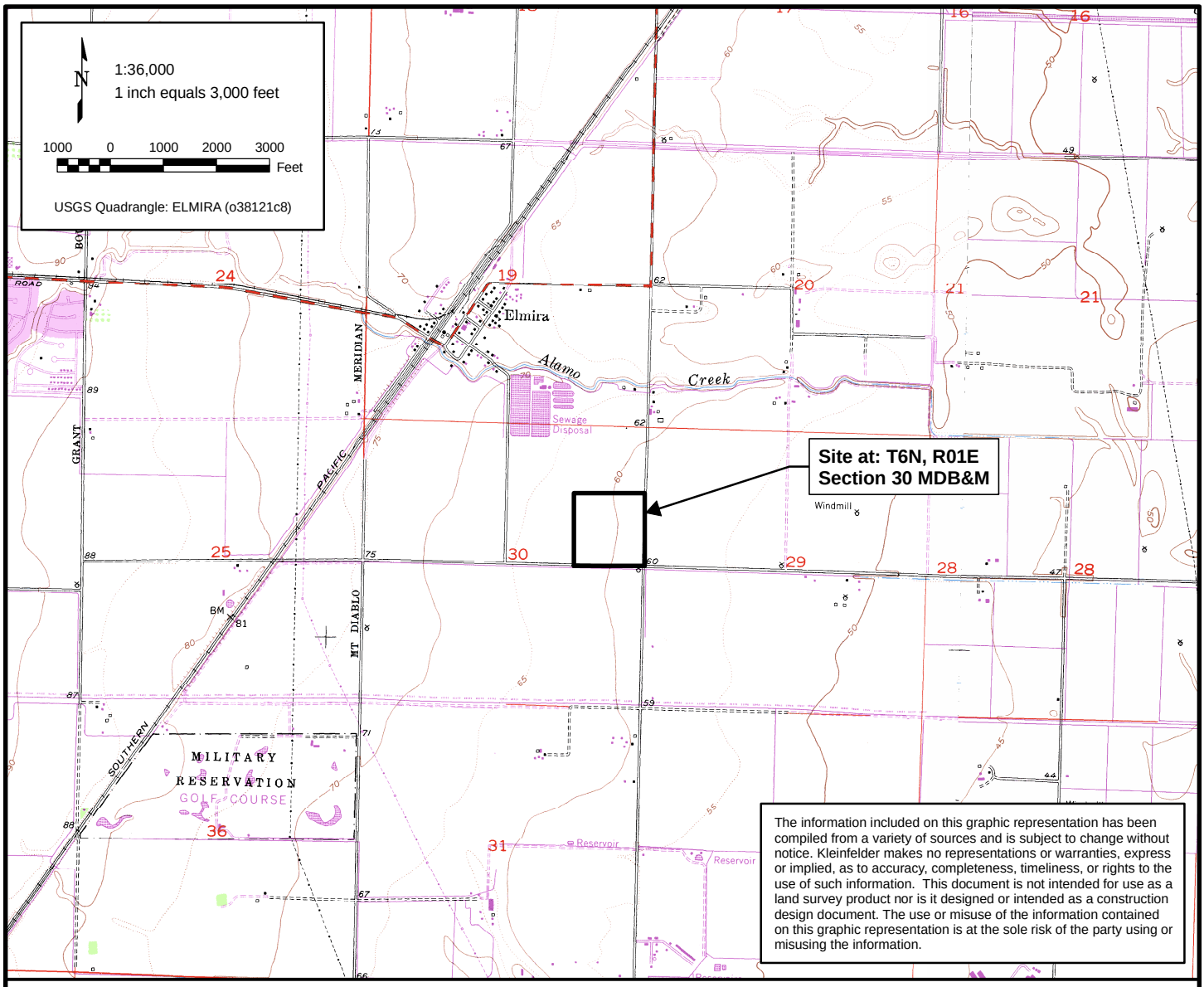
This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year (without review) from the date of the report. Land use, site conditions or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended

Copyright 2008 Kleinfelder

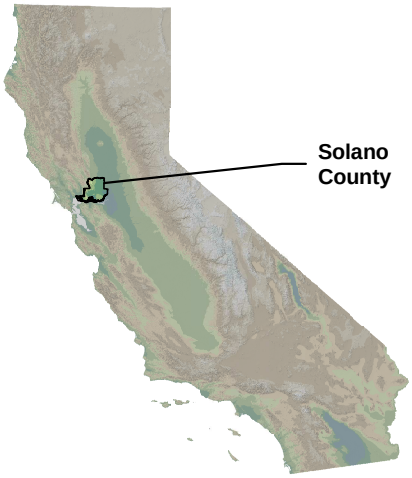
use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party, and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

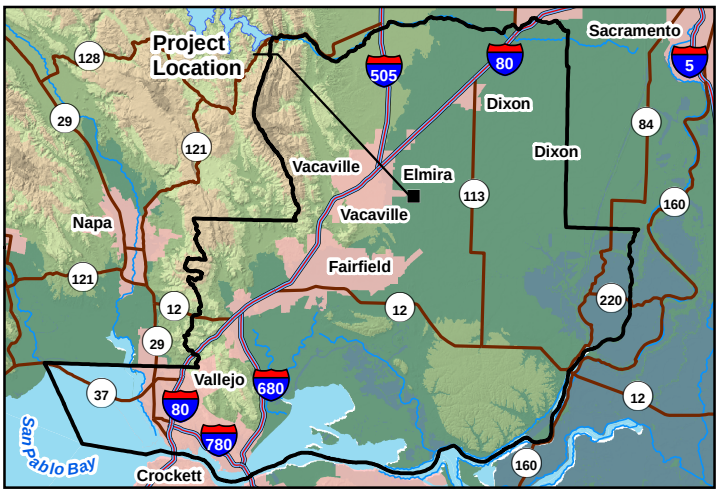
The scope of the geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

Copyright 2008 Kleinfelder



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.





KLEINFELDER
1410 F Street
Fresno, CA 93706
o| 559.486.0750 • f| 559.442.5081
www.kleinfelder.com

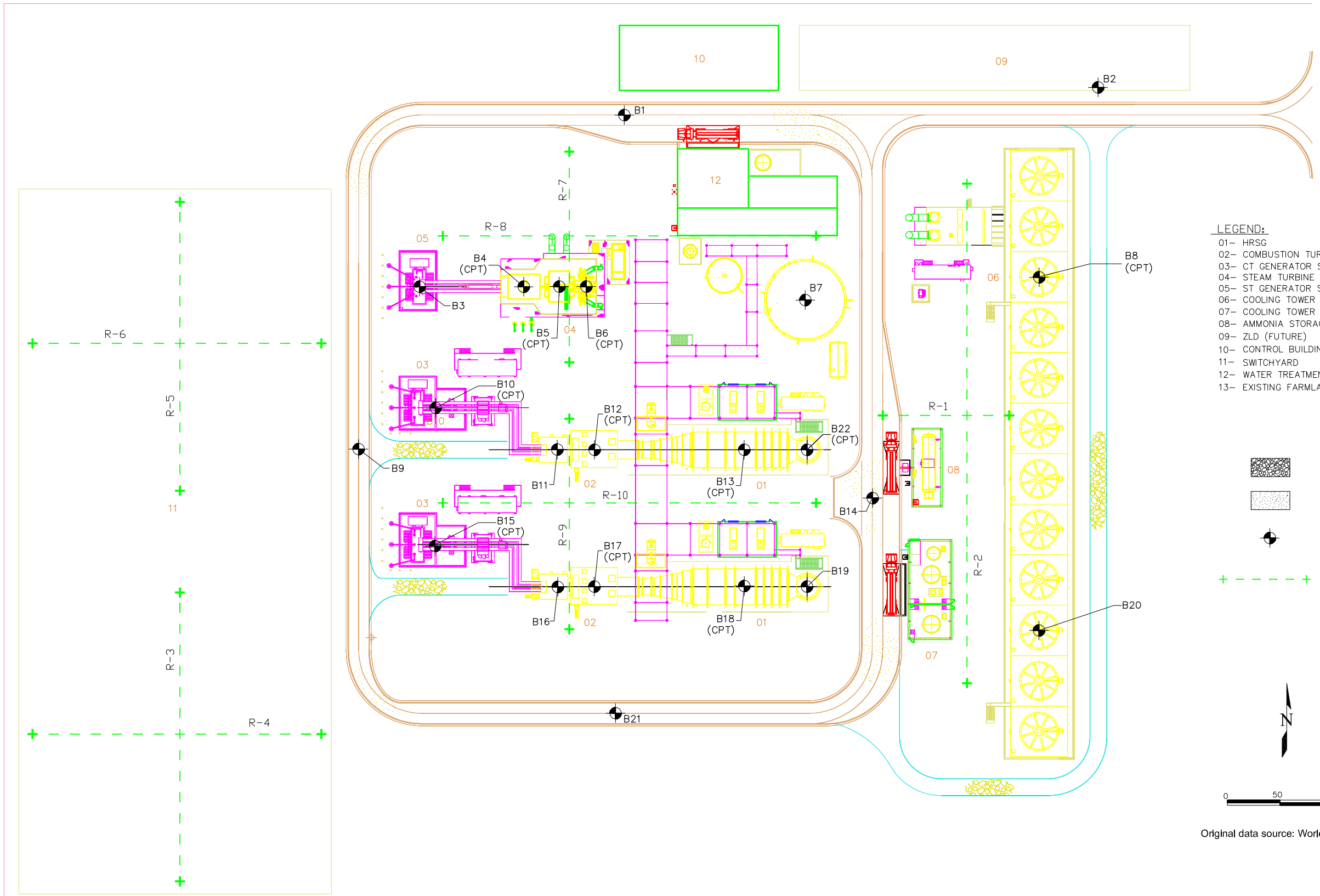
SITE VICINITY MAP

CPV VACAVILLE POWER PLANT
NWC FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

Plate 1

Cartography By: S. Kapoor	Date: 07/17/08	Project Number: 94660	File Name: 94660_P1_07-17-08.mxd

© 2008, Kleinfelder



LEGEND:

01– HRSG
02– COMBUSTION TURBINE GENERATOR
03– CT GENERATOR STEP–UP TRANSFORMER
04– STEAM TURBINE GENERATOR
05– ST GENERATOR STEP–UP TRANSFORMER
06– COOLING TOWER
07– COOLING TOWER CHEMICAL FEED BUILDING
08– AMMONIA STORAGE TANK
09– ZLD (FUTURE)
10– CONTROL BUILDING
11– SWITCHYARD
12– WATER TREATMENT BUILDING
13– EXISTING FARMLAND

GRAVEL

ASPHALT

APPROXIMATE BORING AND CPT LOCATIONS

APPROXIMATE ALIGNMENT OF RESISTIVITY TESTS

Original data source: Worley Parsons

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

13

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	94660
DRAWN:	07/16/08
DRAWN BY:	SK
CHECKED BY:	JM
FILE NAME:	94660_P2.DWG

SITE PLAN

CPV VACAVILLE POWER PLANT
NWC FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE

2

LOG SYMBOLS

	BULK / BAG SAMPLE	-4	PERCENT FINER THAN THE NO. 4 SIEVE (ASTM Test Method C 136)
	MODIFIED CALIFORNIA SAMPLER (2-1/2 inch outside diameter)	-200	PERCENT FINER THAN THE NO. 200 SIEVE (ASTM Test Method C 117)
	CALIFORNIA SAMPLER (3 inch outside diameter)	LL	LIQUID LIMIT (ASTM Test Method D 4318)
	STANDARD PENETRATION SPLIT SPOON SAMPLER (2 inch outside diameter)	PI	PLASTICITY INDEX (ASTM Test Method D 4318)
	NX SIZE CORE BARREL	EI	EXPANSION INDEX (UBC Standard 18-2)
		COL	COLLAPSE POTENTIAL
	CONTINUOUS SAMPLER (3 inch outside diameter)	UC	UNCONFINED COMPRESSION
	WATER LEVEL (level after completion)	MC	MOISTURE CONTENT
	WATER LEVEL (level where first encountered)	NFGWE	NO FREE GROUND WATER ENCOUNTERED
	SEEPAGE		

GENERAL NOTES

1. **Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.**
2. **No warranty is provided as to the continuity of soil conditions between individual sample locations.**
3. **Logs represent general soil conditions observed at the point of exploration on the date indicated.**
4. **In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.**
5. **A temporary benckmark for relative elevation was located at:**

KEYLOGG 94660.GPJ 8/8/08

KLEINFELDER
Bright People. Right Solutions.

Drafted By: CCD
Date: 8/7/2008
Project No.: 94660
File Number:

LOG KEY
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
A

Copyright Kleinfelder, Inc. 2008

Date Completed: 6/27/08

Logged By: S. PARSA

Total Depth: 17.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 4'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 63
		27	106.1	9.9				**SILTY CLAYEY SAND (SM-SC)** - gray to gray brown, dry to moist, fine grained sand
		19						
5		33						**CLAYEY SAND (SC)** - brown, moist, medium dense, fine grained
								SANDY LEAN CLAY (CL) - gray to gray brown, dry to moist, fine grained sand
		25						**SILTY SAND (SM)** - red brown, wet, medium dense, fine to medium grained
		12						
10				▽				
		18						
15								**SANDY SILT (ML)** - yellow brown, wet, medium dense, fine grained sand
		20						
								SANDY LEAN CLAY (CL) - brown, wet, fine grained sand
20								

Notes:

1.) **Bottom of boring at 17 feet.**
2.) **Free groundwater encountered at 10.3 feet.**
3.) **Boring backfilled with soil cuttings 6/26/08.**

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 1
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 1

A1

Date Completed: 6/25/08

Logged By: S. PARSA

Total Depth: 17.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 62
		15	91.4	11.0				**SANDY CLAY (CL)** - dark gray to black, moist, medium dense, fine grained sand
		15						
5		26						
		13						
		23						**SILTY SAND (SM)** - red brown, wet, medium dense, fine grained
10		19						
15		17						**CLAYEY SAND (SC)** - brown, wet, medium dense, fine grained sand
20								
25								

Notes:

1.) **Bottom of boring at 17 feet.**
2.) **Free groundwater encountered at 6 feet.**
3.) **Boring backfilled with soil cuttings 6/25/08.**

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 2
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE 1 of 1

A2

Date Completed: 6/26/08

Logged By: S. PARSA

Total Depth: 32.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION (Approximate Surface Elevation (feet): 64)
		26	106.2	11.9				**SANDY FAT CLAY (CHS)** - gray brown, moist, medium dense, fine grained sand
		22	108.6 ▽	17.7				**SANDY SILT (ML)** - yellow brown to brown, moist, medium dense, fine grained sand
5		28						
		7						**SANDY LEAN CLAY (CL)** - gray brown, wet, medium dense, fine grained sand
		15						
10								**SILTY SAND (SM)** - red brown, wet, medium dense, fine to coarse grained
		22						**SANDY LEAN CLAY (CL)** - yellow brown, wet, medium dense, fine grained sand
15								
		15						
20								
		13						
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 3
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 2

A3

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Approx. Saturation %	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		18						
30		11						
								SILTY SAND (SM) - brown, wet, medium dense, fine to medium grained
								Notes: **1.) Bottom of boring at 32 feet.** **2.) Free groundwater encountered at 4 feet.** **3.) Boring backfilled with soil cuttings 6/26/08.**
35								
40								
45								
50								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 3
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
2 of 2

A3

Date Completed: 6/27/08

Logged By: S. PARSA

Total Depth: 62.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 4.5'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 63
		23						**SANDY LEAN CLAY (CL)** - gray, moist, medium dense, fine grained sand with organics
								CLAY (CH) - black, moist, stiff, highly plastic
		27						**SANDY LEAN CLAY (CL)** - yellow brown, wet, medium dense, fine grained sand
5		26						
		15						**SILTY SAND (SM)** - yellow brown, moist, medium dense, fine to medium grained
		10						
10		9						
15		34						**SANDY LEAN CLAY (CL)** - light brown, moist, medium dense, fine grained sand
20		45						**SILTY SAND (SM)** - brown, moist, medium dense, fine to medium grained
								SANDY LEAN CLAY (CL) - light brown, moist, medium dense, fine grained sand
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 7
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 3

A4

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Approx. Saturation %	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		31						
30		25						
35		28						**SILTY CLAY (CL-ML)** - light brown, moist, medium dense, fine grained sand
40		49						**SANDY LEAN CLAY (CL)** - light brown, moist, dense, fine grained sand, moderately cemented
								SANDY SILT (ML) - light brown, moist, medium dense, fine grained sand
45		50/6"						
50		27						

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 7
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Approx. Saturation %	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
55		49						**SANDY LEAN CLAY (CL)** - light brown, moist, medium dense, fine grained sand
60		33						**SANDY SILT (ML)** - light brown, moist, medium dense, fine grained sand
65								**Notes:** **1.) Bottom of boring at 62 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/27/08.**
70								
75								
80								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 7
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
3 of 3

A4

Date Completed: 6/26/08

Logged By: S. PARSA

Total Depth: 17.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 4'.

Depth, ft	FIELD: Sample	FIELD: Blows/ ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Approx. Saturation %	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 64
		24						**SILTY CLAY (CL-ML)** - gray brown, moist, medium dense, fine grained sand
		24						
5		26		▽				**CLAYEY SAND (SC)** - brown, wet, medium dense, fine to coarse grained
		22						
		22						**SANDY LEAN CLAY (CL)** - yellow brown, wet, medium dense, fine grained sand
10		26						
15		25						
20								**Notes:** **1.) Bottom of boring at 17 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/26/08.**
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B - 9
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 1

A5

Date Completed: 6/26/08

Logged By: S. PARSA

Total Depth: 32.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 4'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 64
		22						**SILTY CLAY (CL-ML)** - black, moist, medium dense, with fine grained sand
		24						**CLAYEY SAND (SC)** - brown, moist, medium dense, fine to coarse grained
5		38	107.0	17.6				
		26						
		8						
10		14						**SILTY SAND (SM)** - brown, wet, medium dense, fine to coarse grained
15		15						**SANDY LEAN CLAY (CL)** - olive brown, wet, stiff, fine grained sand
20		10						
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-11
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 2

A6

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Approx. Saturation %	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		16						
30								
		6						
35								**Notes:** **1.) Bottom of boring at 32 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/26/08.**
40								
45								
50								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-11
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
2 of 2

A6

Date Completed: 6/27/08

Logged By: S. PARSA

Total Depth: 14.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 63
		32						**SILTY LEAN CLAY (CL)** - gray brown, moist, medium dense, fine grained sand
		40						
5		31						
		20						**SILTY SAND (SM)** - yellow brown, wet, medium dense, fine to medium grained
		13						
10		31						**SANDY LEAN CLAY (CL)** - yellow brown, wet, medium dense,
15		22						**SANDY SILT (ML)** - yellow brown, wet, medium dense, fine grained silt
20								**Notes:** **1.) Bottom of boring at 17 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/27/08.**
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-14
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 1

A7

Date Completed: 6/27/08

Logged By: S. PARSA

Total Depth: 32.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Unconf. Comp. Strength (tsf)	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 64
		19				2.13		**LEAN CLAY WITHSAND (CL)** - gray, moist, medium stiff, fine grained sand
		25						
5		42						
		13						**SANDY SILT (ML)** - yellow brown, wet, medium dense, fine grained sand
		15						**SILTY SAND (SM)** - brown, wet, medium dense, fine to medium grained
10		7						
								SANDY LEAN CLAY (CL) - brown, wet, medium dense, fine grained sand
15		35						
20		21						**SANDY SILT (ML)** - brown, wet, medium dense, fine grained sand
								SANDY LEAN CLAY (CL) - yellow brown, wet,
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-16
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 2

A8

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
								medium stiff, fine grained sand
		21						
30								
		9						
								SANDY SILT (ML) - brown, wet, medium dense, fine grained sand
								Notes: **1.) Bottom of boring at 32 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/27/08.**
35								
40								
45								
50								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-16
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
2 of 2

A8

Date Completed: 6/27/08
Logged By: S. PARSA
Total Depth: 42.0 feet

Surface Conditions: Level, Plowed
Rig Type: CME 75 Auger Type: 8" H.S.
Groundwater: Free groundwater stabilized at 4'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 63
		19	109.0	10.7				**SILTY CLAY (CL-ML)** - gray, moist, medium stiff
		28						
5		30						
		17						**SANDY SILT (ML)** - yellow brown, wet, medium dense, fine grained sand
		18						**SILTY SAND (SM)** - light brown, wet, medium dense, fine to medium grained
10		32						
15		21		18.1				**SANDY LEAN CLAY (CL)** - orange brown, wet, medium stiff, fine grained sand
								CLAYEY SAND (SC) - yellow brown, wet, medium dense, fine to medium grained
20		43						**SILTY SAND (SM)** - yellow brown, wet, medium dense, fine to medium grained
								CLAYEY SAND (SC) - orange brown, wet, medium dense, fine to medium grained
								SANDY SILT (ML) - light brown, wet, medium dense, fine grained sand
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-19
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 2

A9

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		15						**SILTY CLAY (CL-ML)** - light brown, wet, medium stiff with trace of fine grained sand
30		10						**SANDY SILT (ML)** - light brown, wet, medium dense, fine grained sand
								ELASTIC SILT (MH) - light brown, wet, medium stiff, moderately plastic
35		16	99.7	27.5				
40		27						**SANDY SILT (ML)** - brown, wet, medium dense, fine grained sand
45								**Notes:** **1.) Bottom of boring at 42 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/27/08.**
50								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-19
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
2 of 2

A9

Date Completed: 6/26/08

Logged By: S. PARSA

Total Depth: 32.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Unconf. Comp. Strength (tsf)	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 62
		15				1.63		**LEAN CLAY WITH SAND (CL)** - gray, moist, medium dense, fine grained sand
		27						
5		23		▽				
		30						
		23						
10								
								SANDY SILT (ML) - yellow brown, wet, medium, fine grained sand
15								**SANDY LEAN CLAY (CL)** - brown to black, wet, medium dense, fine grained sand
		24						
20								
		19						
25								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-20
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		19						
30		16						
35								**Notes:** **1.) Bottom of boring at 32 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/26/08.**
40								
45								
50								

KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-20
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
2 of 2

A10

Date Completed: 6/26/08

Logged By: S. PARSA

Total Depth: 17.0 feet

Surface Conditions: Level, Plowed

Rig Type: CME 75 Auger Type: 8" H.S.

Groundwater: Free groundwater stabilized at 3.8'.

Depth, ft	FIELD Sample	FIELD Blows/ ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Approx. Saturation %	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								Approximate Surface Elevation (feet): 63
		14						**SANDY LEAN CLAY (CL)** - dark gray, moist, medium dense, fine grained sand
		29						
5		38						
		21						
		19						**SILTY SAND (SM)** - yellow brown, wet, medium dense, fine to medium grained
10		18						
15		38						**SANDY LEAN CLAY (CL)** - brown with gray and white, wet, medium stif to stiff, fine grained sand
20								**Notes:** **1.) Bottom of boring at 17 feet.** **2.) Free groundwater encountered at 6 feet.** **3.) Boring backfilled with soil cuttings 6/26/08.**
25								

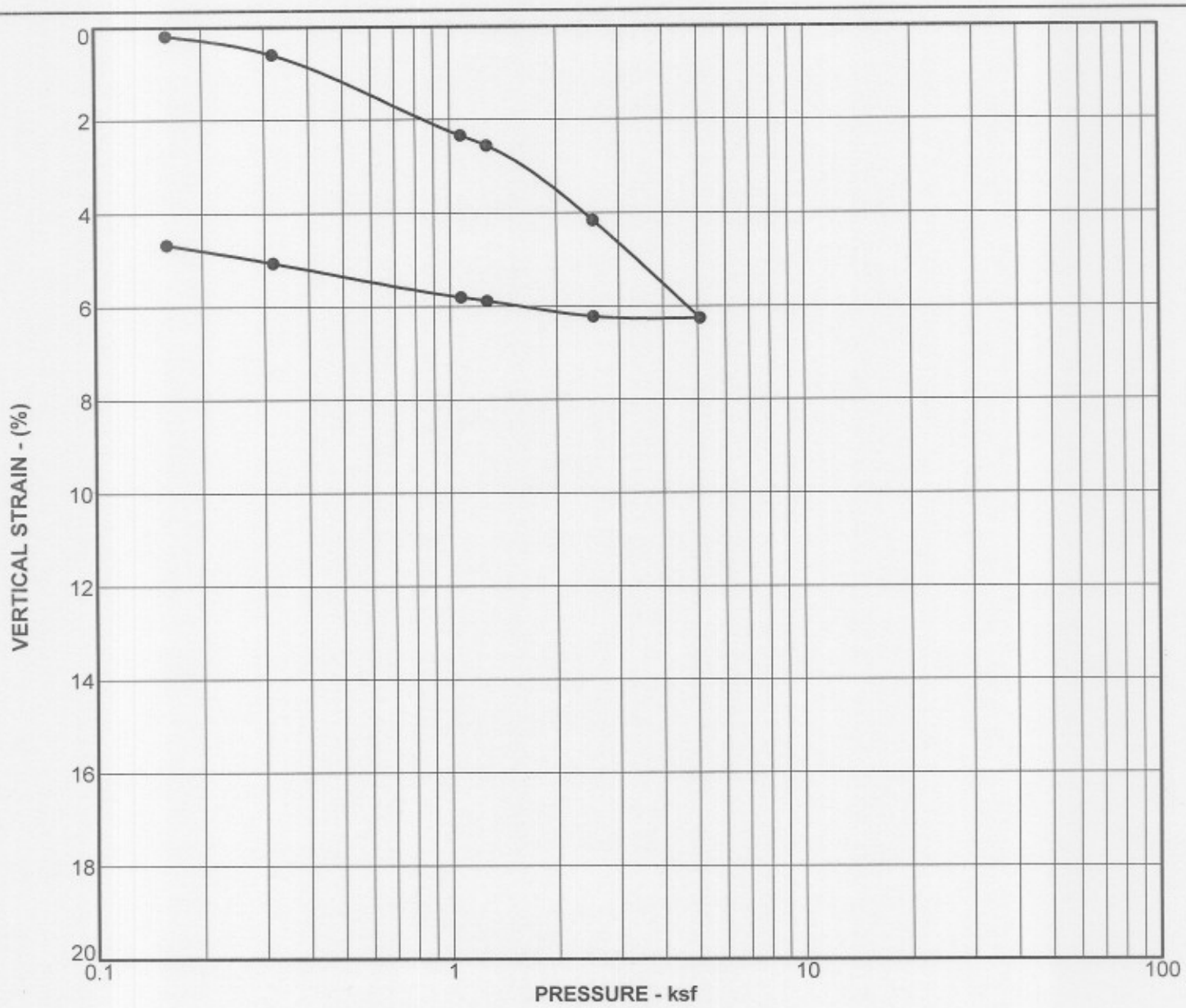
KLEINFELDER
Bright People. Right Solutions.

LOG OF BORING B-21
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PROJECT NO. 94660

PLATE
1 of 1

A11



Sample	B - 7
Depth	3.5 ft
Description	Sandy Lean Clay
Classification	CL

	Initial	Final
Dry density, pcf	106.3	105.2
Water content, %	19.5	22.5
Sample height, in.	1	.9534

KLEINFELDER
Bright People. Right Solutions.

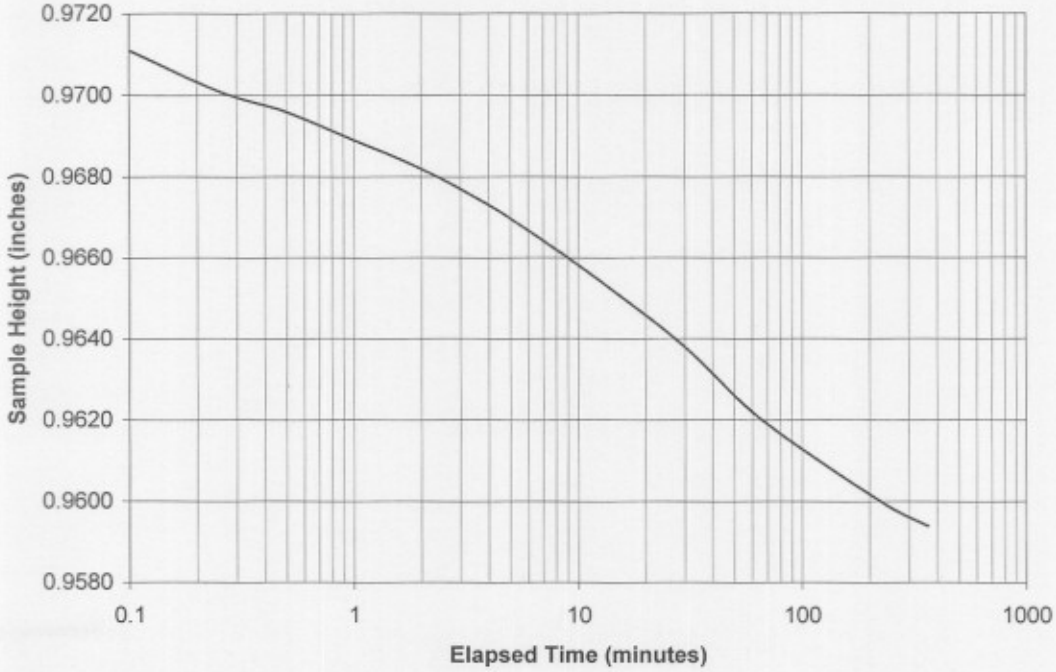
PROJECT NO. 94660

CONSOLIDATION TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE

B-1

TIME RATE OF CONSOLIDATION



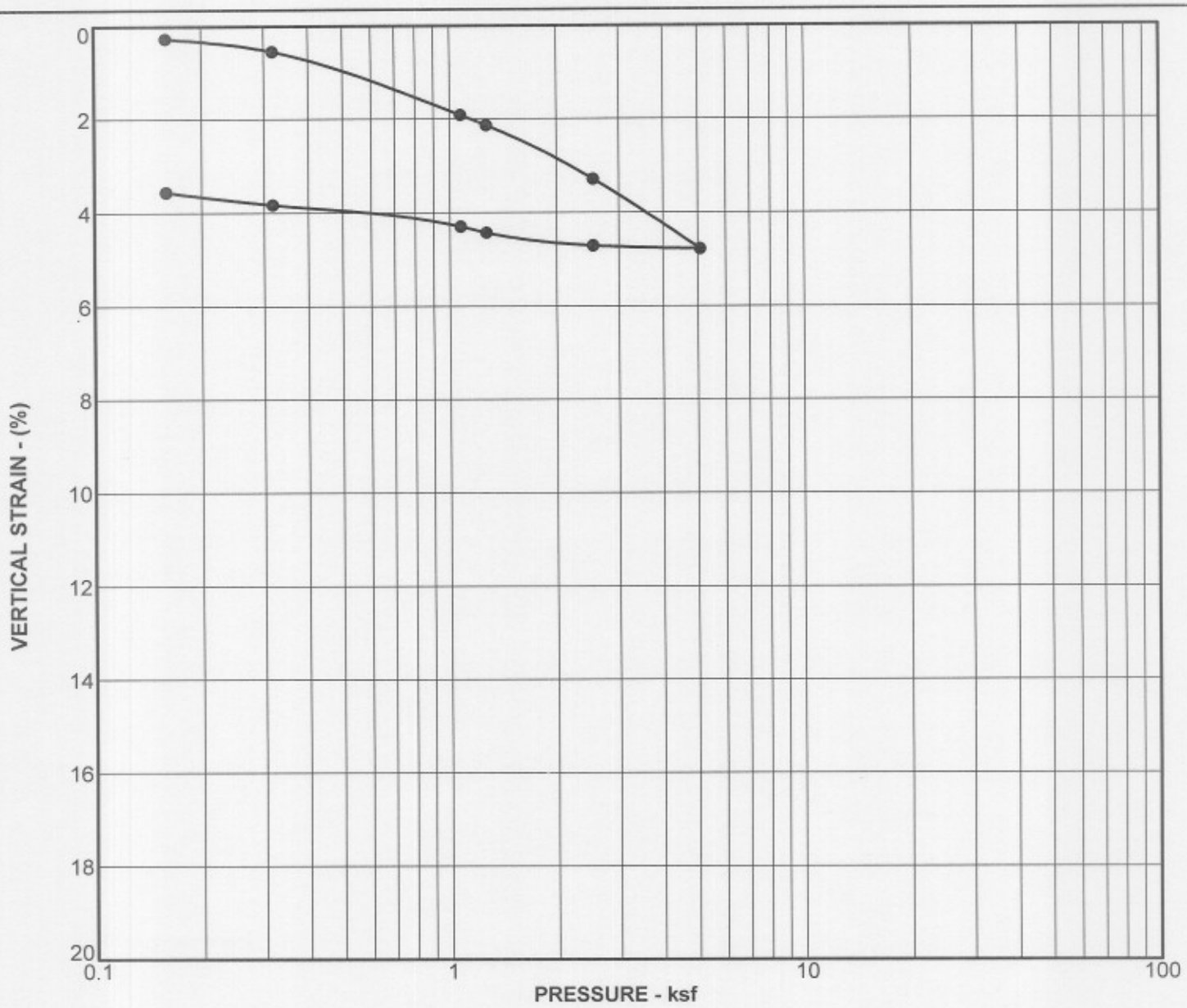
Boring:	B-7	Depth (ft):	3.5	Pressure (psf):	2540

t_{50} = 7.5	min
t_{100} = 210	min
C_v = 0.00657	in^2/min
C_α = 0.0017	

KLEINFELDER
Bright People. Right Solutions.

TIME RATE OF CONSOLIDATION
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

Plate
B-1A



Sample	B - 9
Depth	11.5 ft
Description	Sandy Lean Clay
Classification	CL

	Initial	Final
Dry density, pcf	109.7	111.0
Water content, %	18.1	18.9
Sample height, in.	1	.9612

KLEINFELDER
Bright People. Right Solutions.

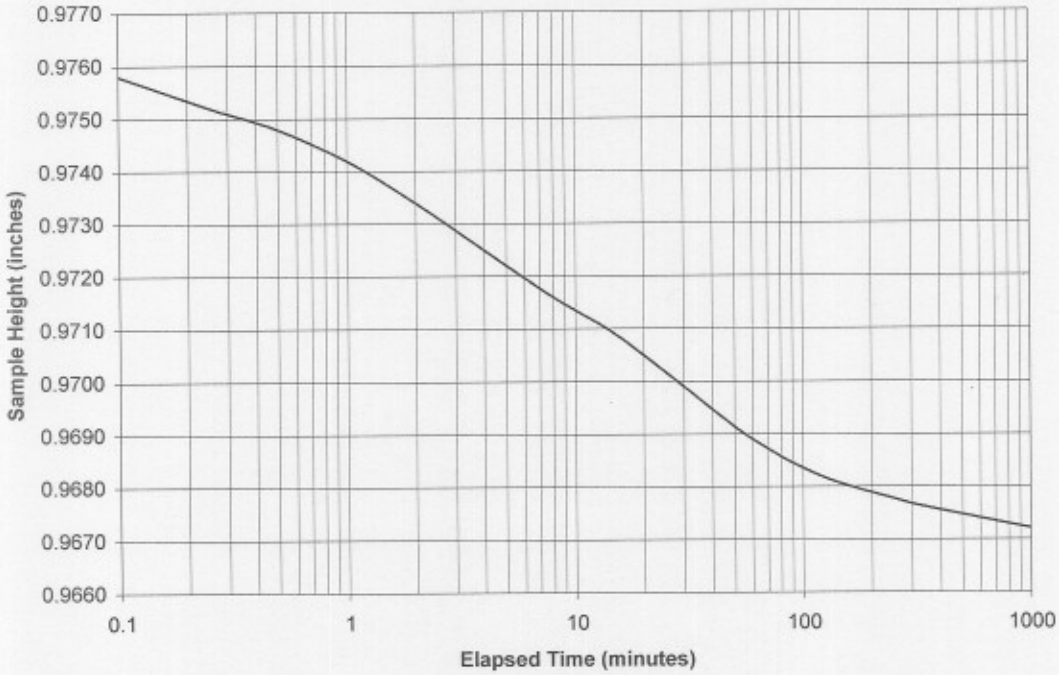
PROJECT NO. 94660

CONSOLIDATION TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE

B-2

TIME RATE OF CONSOLIDATION



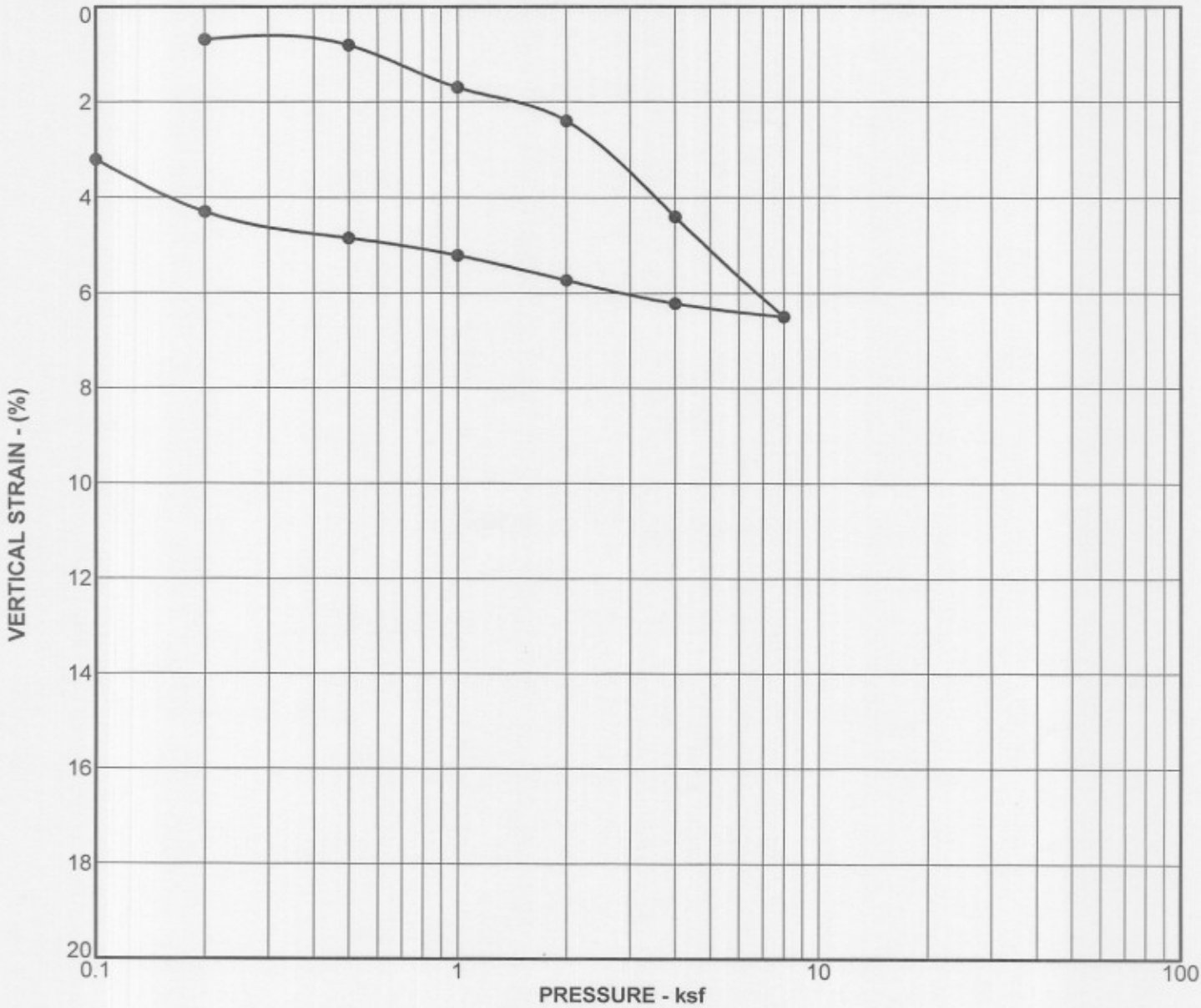
Boring:	B-9	Depth (ft):	11.5	Pressure (psf):	2540

t_{50} = 4.1	min
t_{100} = 100	min
C_v = 0.01201	in^2/min
C_α = 0.0004	

KLEINFELDER
Bright People. Right Solutions.

TIME RATE OF CONSOLIDATION
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

Plate
B-2A



Sample	B-11
Depth	4.5 ft
Description	Clayey Sand
Classification	SC

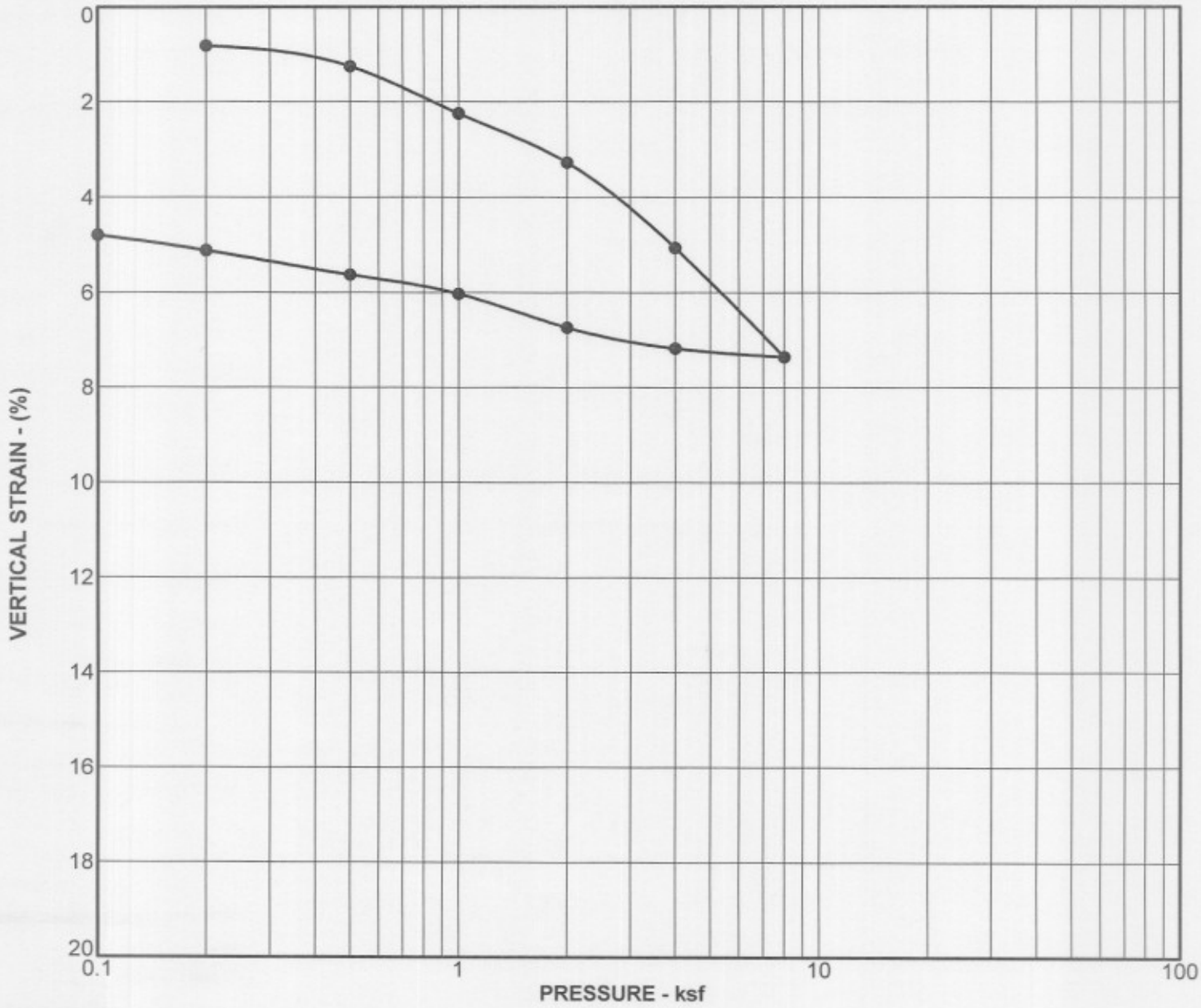
	Initial	Final
Dry density, pcf	107.1	111.2
Water content, %	17.5	16.8
Sample height, in.	1	0.9629

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

CONSOLIDATION TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-3



Sample	B-19
Depth	16.5 ft
Description	Sandy Lean Clay
Classification	CL

	Initial	Final
Dry density, pcf	100.8	110.9
Water content, %	18.1	18.9
Sample height, in.	1	0.952

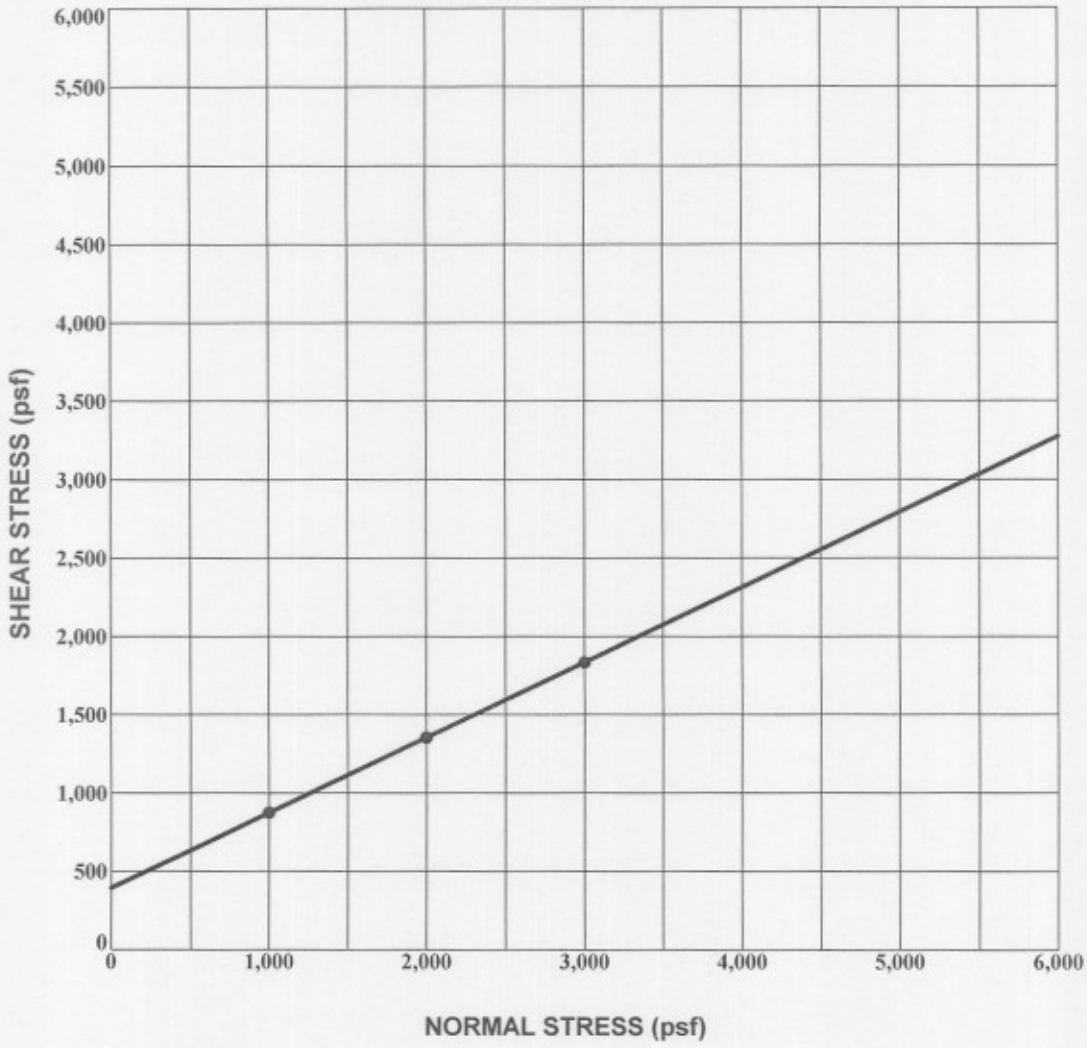
KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

CONSOLIDATION TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-4

DIRECT SHEAR



Source: B - 3
Depth: 4.5 ft
Test Type: Consolidated - Drained
Soil Description: Sandy Silt (ML)

Dry Density (pcf)	106.4	106.9	103.6
Initial Water Content (%)	17.0	17.0	17.0
Final Water Content (%)	31.2	29.7	27.0
Normal Stress (psf)	1000	2000	3000
Shear Stress(psf)	874	1353	1834

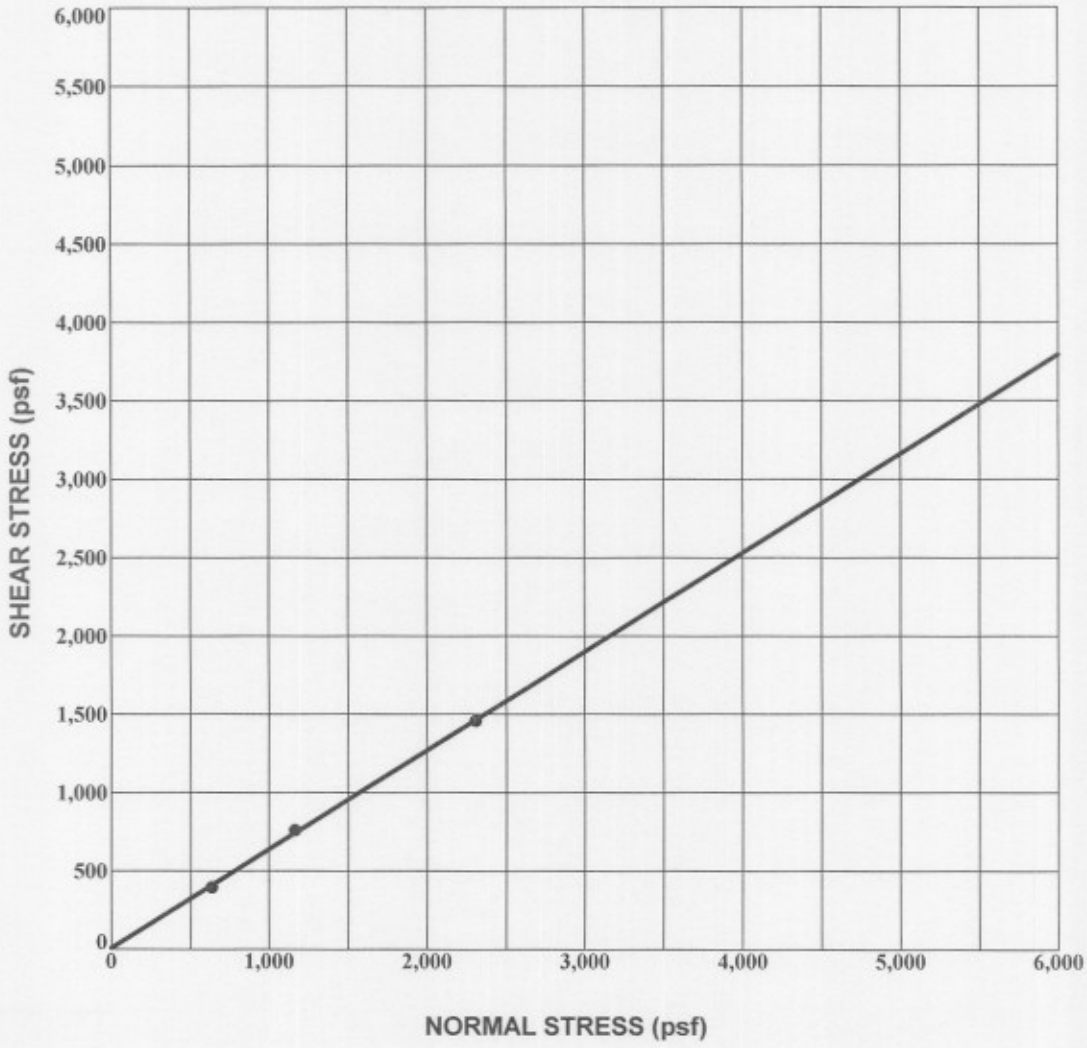
KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

DIRECT SHEAR TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-5

DIRECT SHEAR



Source: B-16
Depth: 32.0 ft
Test Type: Consolidated - Drained
Soil Description: Sandy Silt (ML)

Dry Density (pcf)	106.4	106.9	103.6
Initial Water Content (%)	12.1	12.4	15.5
Final Water Content (%)	31.2	29.7	27.0
Normal Stress (psf)	1000	2000	3000
Shear Stress(psf)	874	1353	1834

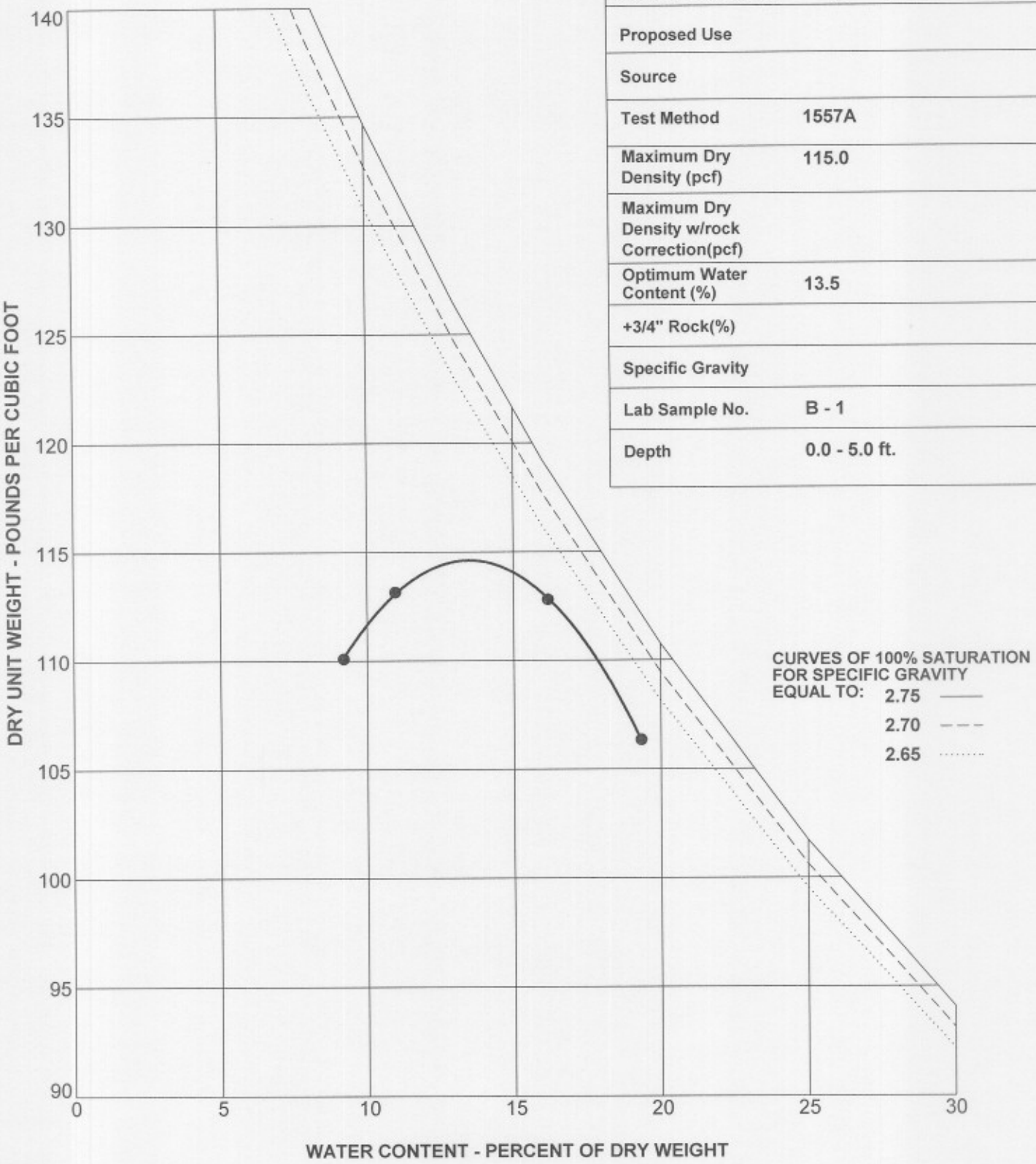
KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

DIRECT SHEAR TEST
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-6

SUMMARY OF TEST RESULTS	
Material Description	Silty, Clayey Sand
Proposed Use	
Source	
Test Method	1557A
Maximum Dry Density (pcf)	115.0
Maximum Dry Density w/rock Correction(pcf)	
Optimum Water Content (%)	13.5
+3/4" Rock(%)	
Specific Gravity	
Lab Sample No.	B - 1
Depth	0.0 - 5.0 ft.



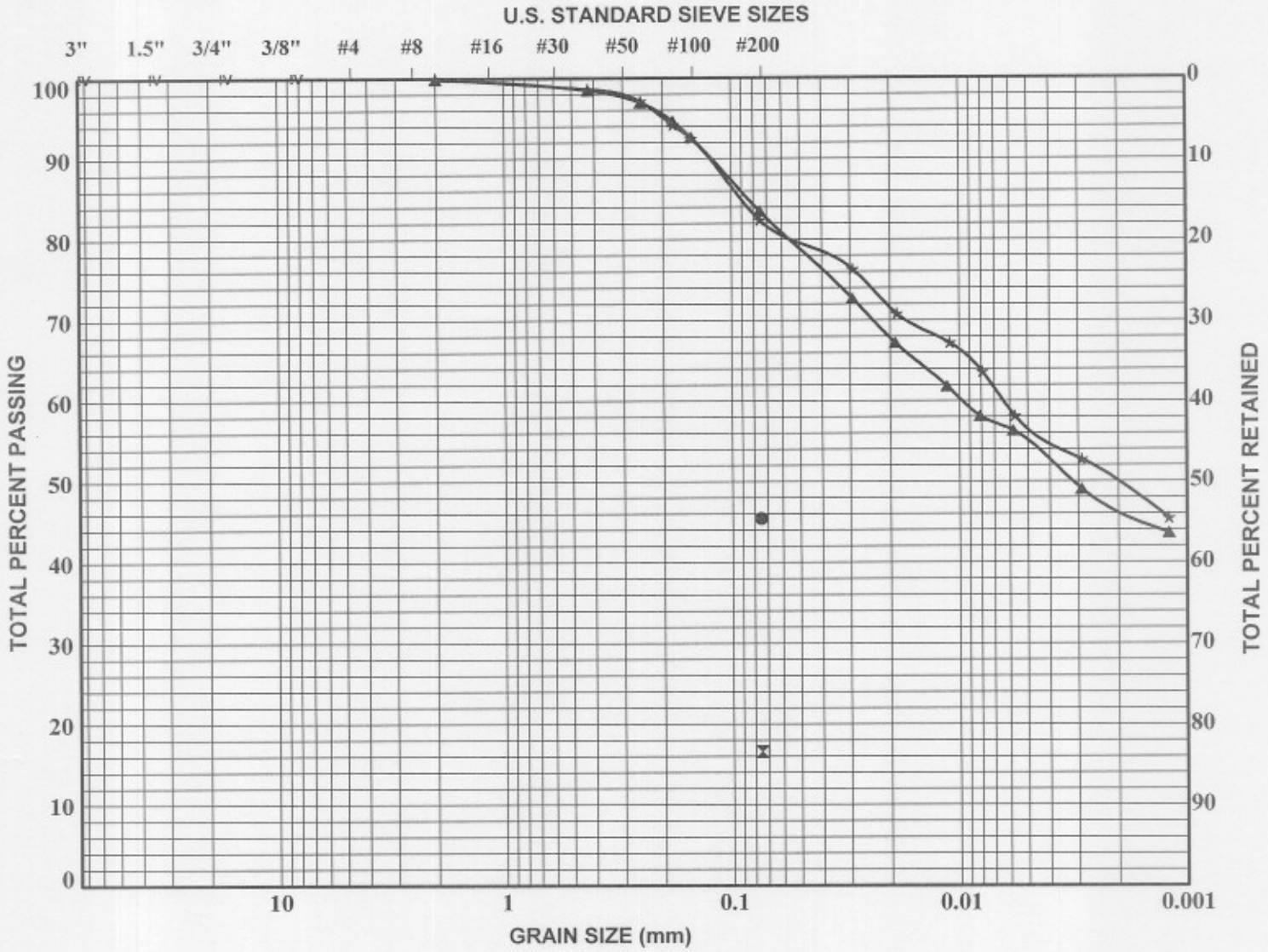
KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

MOISTURE DENSITY RELATIONSHIP
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-7

SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

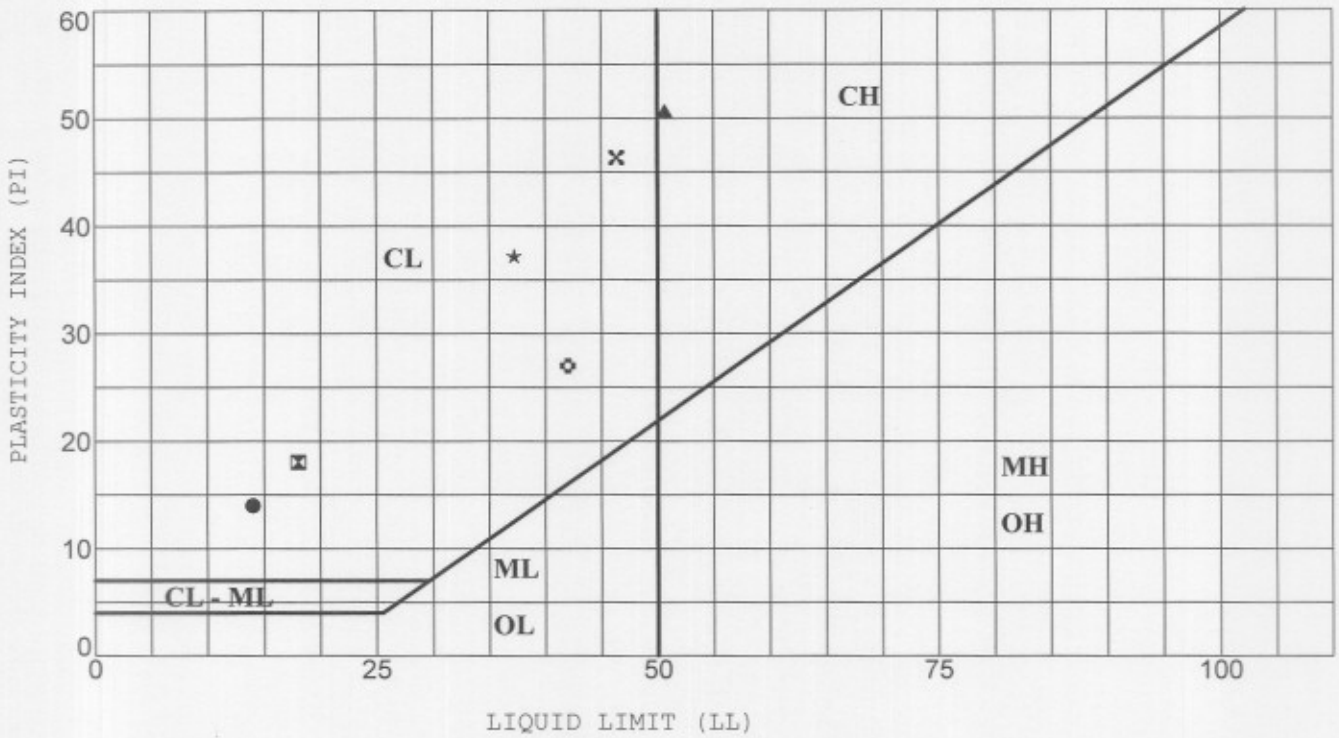
Symbol	Sample	Depth (ft)	Description	Classification
●	B - 3	9.5	Silty Sand	SM
⊠	B-11	10.5	Silty Sand	SM
▲	B-16	1.5	Lean Clay with Sand	CL
★	B-20	1.5	Lean Clay with Sand	CL

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

GRAIN SIZE DISTRIBUTION
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-8



	Sample	Depth (ft)	LL (%)	PL (%)	PI (%)	LI (-)	Description
●	B - 1	1.5	14.0	9.0	5.0		Silty, Clayey Sand
⊠	B - 2	1.5	19.0	12.0	7.0		Sandy Lean Clay
▲	B - 3	1.5	51.0	17.0	34.0		Sandy Fat Clay
★	B - 3	7.5	38.0	16.0	22.0		Sandy Lean Clay
✕	B - 3	26.5	47.0	21.0	26.0		Sandy Lean Clay
✿	B - 7	1.5	42.0	15.0	27.0		Sandy Lean Clay

LL - Liquid Limit
PL - Plasticity Limit
PI - Plasticity Index
LI - Liquidity Index

Unified Soil Classification
Fine Grained Soil Groups

	LL < 50
ML	Inorganic clayey silts to very fine sands of slight plasticity
CL	Inorganic clays of low to medium plasticity
OL	Organic silts and organic silty clays of low plasticity

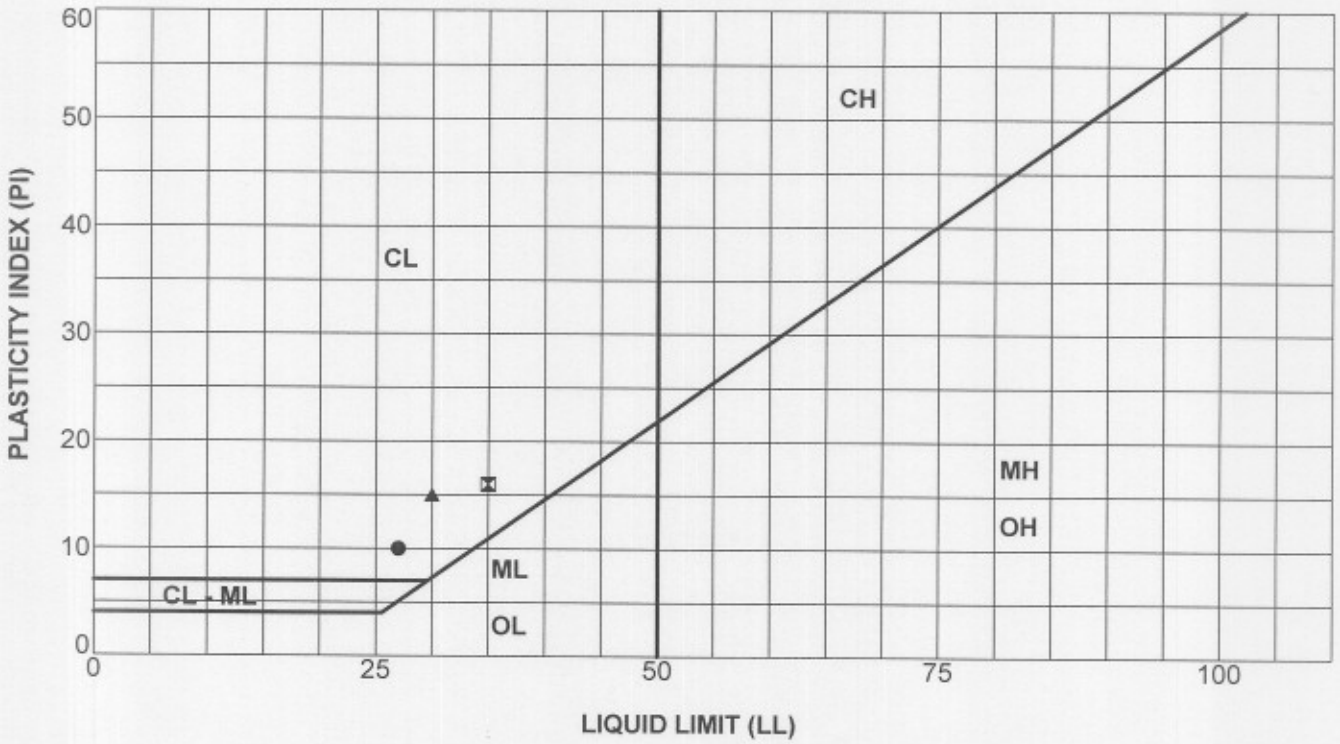
	LL > 50
MH	Inorganic silts and clayey silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity, organic silts

KLEINFELDER

PROJECT NO. 94660

PLASTICITY CHART
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

FIGURE
B-9



	Sample	Depth (ft)	LL (%)	PL (%)	PI (%)	LI (-)	Description
●	B - 7	31.5	27.0	17.0	10.0		Sandy Lean Clay
⊠	B-16	26.5	35.0	19.0	16.0		Sandy Lean Clay
▲	B-20	9.5	30.0	15.0	15.0		Lean Clay with Sand

LL - Liquid Limit

PL - Plasticity Limit

PI - Plasticity Index

LI - Liquidity Index

Unified Soil Classification
Fine Grained Soil Groups

	LL < 50
ML	Inorganic clayey silts to very fine sands of slight plasticity
CL	Inorganic clays of low to medium plasticity
OL	Organic silts and organic silty clays of low plasticity

	LL > 50
MH	Inorganic silts and clayey silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity, organic silts

KLEINFELDER

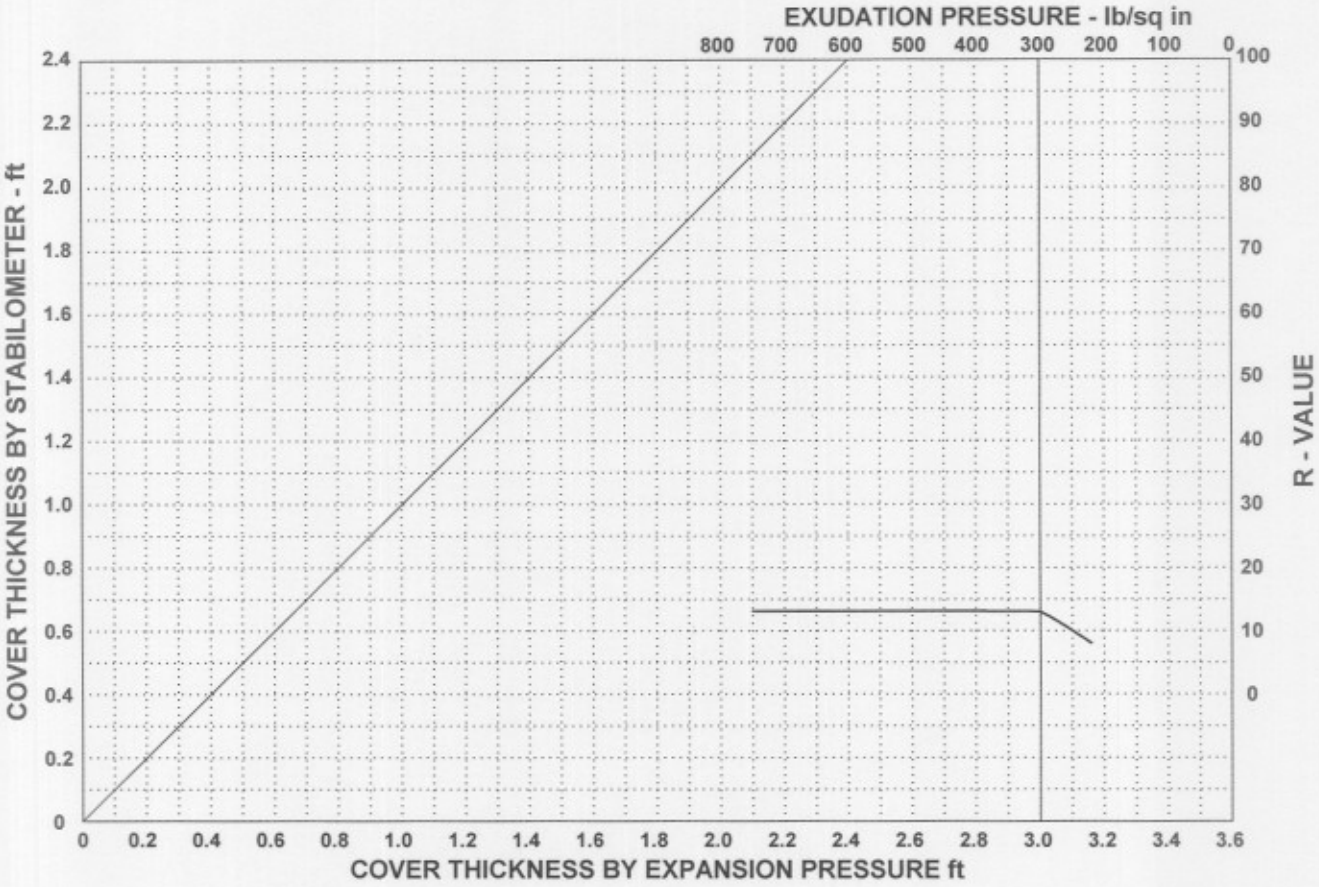
PROJECT NO. 94660

PLASTICITY INDEX
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-10

RESISTANCE VALUE

SAMPLE LOCATION: B - 1
SAMPLE DEPTH: 0.0 - 5.0 ft.
SAMPLE DESCRIPTION: Silty, Clayey Sand (SC-SM)



SPECIMEN	A	B	C
EXUDATION PRESSURE, lb/sq in	220	300	750
EXPANSION DIAL (0.0001")	21	33	42
EXPANSION PRESSURE, lb/sq ft	91	143	182
RESISTANCE VALUE, R	8	13	13.1
MOISTURE AT TEST, %	22.6	20.9	19.6
DRY DENSITY AT TEST, lb/cu ft	98.9	101.3	106.5
R-VALUE AT 300 lb/sq in EXUDATION PRESSURE		13	
R-VALUE BY EXPANSION PRESSURE(TI=)			

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 94660

RESISTANCE VALUE
CPV VACAVILLE POWER PLANT
NWC OF FRY AND LEWIS ROADS
ELMIRA, SOLANO COUNTY, CALIFORNIA

PLATE
B-11

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-4
DATE : 07-03-2008
TIME : 11:06:36
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.54	41.8	66.88	1.91	4.6	28	45	0.06	----	5.57	Silty CLAY to CLAY	130-140
1.01	51.0	81.60	2.72	5.3	51	82	0.13	----	6.79	CLAY	"
1.58	46.2	73.92	3.52	7.6	46	74	0.20	----	6.15	"	"
2.02	41.9	67.04	3.15	7.5	42	67	0.26	----	5.57	"	"
2.57	20.7	33.12	2.01	9.7	21	33	0.34	----	2.74	"	"
3.03	57.3	91.68	4.77	8.3	57	92	0.40	----	7.61	"	"
3.58	93.3	149.28	6.28	6.7	93	149	0.48	----	12.41	Very Stiff Fine Grained *	>140
4.03	37.1	59.36	2.64	7.1	37	59	0.54	----	4.91	CLAY	130-140
4.58	14.8	23.68	1.57	10.6	15	24	0.58	----	1.93	"	"
5.03	13.7	21.92	1.12	8.2	14	22	0.60	----	1.78	"	120-130
5.56	18.2	29.12	1.20	6.6	18	29	0.64	----	2.38	"	130-140
6.02	11.3	18.08	0.78	6.9	11	18	0.67	----	1.82	"	120-130
6.57	7.8	12.48	0.69	8.8	8	12	0.71	----	1.47	"	"
7.03	14.9	23.84	0.81	5.4	15	24	0.74	----	1.93	"	"
7.50	15.3	24.48	0.95	6.2	15	24	0.76	----	1.97	"	"
8.05	26.1	41.63	1.42	5.4	26	42	0.80	----	3.41	"	130-140
8.52	41.7	65.12	1.91	4.6	28	43	0.84	----	5.49	Silty CLAY to CLAY	"
9.00	17.3	26.40	1.62	9.4	17	26	0.87	----	2.23	CLAY	"
9.55	75.5	112.23	3.98	5.3	76	112	0.91	----	9.98	Very Stiff Fine Grained *	"
10.00	123.9	180.11	3.90	3.1	50	72	0.95	----	16.43	Sandy SILT to Clayey SILT	"
10.53	105.4	149.20	4.65	4.4	105	149	0.98	----	13.96	Very Stiff Fine Grained *	"
11.06	64.7	89.81	4.02	6.2	65	90	1.02	----	8.53	"	"
11.58	21.8	29.83	1.75	8.0	22	30	1.06	----	2.80	CLAY	"
12.01	33.7	45.57	1.90	5.6	34	46	1.09	----	4.39	"	"
12.53	28.5	37.97	1.67	5.9	29	38	1.13	----	3.69	"	"
13.07	21.9	28.74	1.28	5.8	22	29	1.17	----	2.80	"	"
13.52	23.8	30.83	1.22	5.1	24	31	1.20	----	3.05	"	"
14.06	31.5	40.16	1.63	5.2	32	40	1.24	----	4.08	"	"
14.51	20.3	25.55	1.15	5.7	20	26	1.27	----	2.58	"	"
15.05	19.1	23.68	1.03	5.4	19	24	1.31	----	2.41	"	"
15.50	16.6	20.36	0.96	5.8	17	20	1.34	----	2.08	"	120-130
16.05	20.5	24.75	1.02	5.0	21	25	1.38	----	2.59	"	130-140
16.59	30.9	36.73	1.45	4.7	21	24	1.42	----	3.97	Silty CLAY to CLAY	"
17.04	33.6	39.41	1.66	4.9	34	39	1.45	----	4.33	CLAY	"
17.56	40.6	46.87	2.30	5.7	41	47	1.49	----	5.26	"	"
18.00	40.0	45.67	2.08	5.2	40	46	1.52	----	5.17	"	"
18.58	42.5	47.88	2.29	5.4	43	48	1.56	----	5.50	"	"
19.02	41.4	46.17	2.32	5.6	41	46	1.60	----	5.35	"	"
19.54	38.2	42.08	2.05	5.4	38	42	1.63	----	4.92	"	"
20.07	35.0	38.08	2.01	5.7	35	38	1.67	----	4.49	"	"
20.59	39.5	42.44	2.31	5.8	40	42	1.71	----	5.08	"	"
21.02	42.3	44.97	2.51	5.9	42	45	1.74	----	5.45	"	"
21.52	38.3	40.34	2.48	6.5	38	40	1.78	----	4.92	"	"
22.04	40.4	42.19	2.36	5.8	40	42	1.82	----	5.19	"	"
22.55	37.7	39.03	2.26	6.0	38	39	1.85	----	4.83	"	"
23.05	39.3	40.34	2.27	5.8	39	40	1.89	----	5.03	"	"
23.57	25.3	25.75	1.82	7.2	25	26	1.93	----	3.16	"	"
24.08	16.7	16.84	1.12	6.7	17	17	1.96	----	2.01	"	"
24.58	17.2	17.22	0.89	5.2	17	17	2.00	----	2.07	"	120-130
25.01	19.4	19.39	1.02	5.3	19	19	2.03	----	2.36	"	130-140
25.52	17.6	17.58	0.96	5.5	18	18	2.06	----	2.12	"	"
26.04	15.5	15.47	0.86	5.5	16	15	2.10	----	1.84	"	120-130
26.54	19.7	19.65	1.18	6.0	20	20	2.13	----	2.39	"	130-140
27.05	36.9	36.77	2.23	6.0	37	37	2.17	----	4.68	"	"
27.56	30.7	30.57	2.60	8.5	31	31	2.21	----	3.85	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-4
DATE : 07-03-2008
TIME : 11:06:36
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.03	25.1	24.98	2.03	8.1	25	25	2.24	----	3.10	CLAY	130-140
28.52	64.2	63.85	2.98	4.6	43	43	2.28	----	8.31	Silty CLAY to CLAY	"
29.01	83.4	82.88	3.43	4.1	42	41	2.31	----	10.86	Clayey SILT to Silty CLAY	"
29.50	36.3	36.05	2.51	6.9	36	36	2.35	----	4.58	CLAY	"
30.07	37.2	36.91	3.11	8.4	37	37	2.39	----	4.69	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-5
DATE : 07-03-2008
TIME : 11:28:19
Groundwater measured at 4.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.55	31.4	50.24	2.24	7.1	31	50	0.06	----	4.18	CLAY	130-140
1.03	49.7	79.52	4.35	8.8	50	80	0.13	----	6.62	"	"
1.52	36.1	57.76	3.50	9.7	36	58	0.20	----	4.80	"	"
2.06	23.3	37.28	2.27	9.7	23	37	0.34	----	3.08	"	"
2.56	23.3	37.28	2.27	9.7	23	37	0.34	----	3.08	"	"
3.02	21.9	35.04	1.90	8.7	22	35	0.40	----	2.89	"	"
3.58	21.2	33.92	1.45	6.8	21	34	0.47	----	2.80	"	"
4.04	23.1	36.96	1.29	5.6	23	37	0.54	----	3.04	"	"
4.51	19.2	30.72	1.21	6.3	19	31	0.60	----	2.52	"	"
5.08	16.8	26.88	1.11	6.6	17	27	0.64	----	2.19	"	"
5.51	18.7	29.92	0.95	5.1	19	30	0.67	----	2.44	"	"
6.07	14.1	22.56	0.89	6.3	14	23	0.71	----	1.83	"	120-130
6.55	12.1	19.36	0.84	6.9	12	19	0.74	----	1.56	"	"
7.02	11.1	17.76	0.77	6.9	11	18	0.77	----	1.77	"	"
7.58	21.2	33.78	1.03	4.9	21	34	0.81	----	2.76	"	130-140
8.04	38.2	59.57	2.15	5.6	38	60	0.84	----	5.02	"	"
8.51	60.9	92.92	3.34	5.5	61	93	0.87	----	8.05	Very Stiff Fine Grained *	"
9.09	32.1	47.62	1.89	5.9	32	48	0.92	----	4.20	CLAY	"
9.55	72.1	104.56	2.66	3.7	36	52	0.95	----	9.53	Clayey SILT to Silty CLAY	"
10.09	45.5	64.18	2.74	6.0	46	64	0.99	----	5.98	CLAY	"
10.54	65.9	91.50	3.38	5.1	66	92	1.02	----	8.69	Very Stiff Fine Grained *	"
11.09	80.3	109.85	1.93	2.4	27	37	1.06	39	----	Silty SAND to Sandy SILT	"
11.55	21.7	29.31	1.67	7.7	22	29	1.09	----	2.79	CLAY	"
12.05	28.1	37.42	1.73	6.2	28	37	1.13	----	3.64	"	"
12.50	24.3	31.94	1.63	6.7	24	32	1.16	----	3.13	"	"
13.05	16.8	21.74	1.27	7.6	17	22	1.20	----	2.12	"	"
13.52	20.7	26.42	1.18	5.7	21	26	1.24	----	2.64	"	"
14.08	15.0	18.88	0.95	6.3	15	19	1.27	----	1.88	"	120-130
14.55	14.7	18.30	0.95	6.5	15	18	1.30	----	1.83	"	"
15.02	20.5	25.18	1.36	6.6	21	25	1.34	----	2.60	"	130-140
15.58	25.3	30.58	1.29	5.1	25	31	1.38	----	3.24	"	"
16.05	32.7	38.99	2.29	7.0	33	39	1.41	----	4.22	"	"
16.51	32.1	37.77	2.23	6.9	32	38	1.44	----	4.13	"	"
17.06	31.1	35.99	2.25	7.2	31	36	1.49	----	4.00	"	"
17.52	31.2	35.67	1.87	6.0	31	36	1.52	----	4.00	"	"
18.07	29.8	33.65	1.79	6.0	30	34	1.56	----	3.81	"	"
18.58	28.1	31.35	2.00	7.1	28	31	1.59	----	3.58	"	"
19.03	20.2	22.30	1.43	7.1	20	22	1.63	----	2.52	"	"
19.59	29.1	31.70	1.69	5.8	29	32	1.67	----	3.71	"	"
20.04	36.1	38.90	2.10	5.8	36	39	1.70	----	4.64	"	"
20.59	40.2	42.74	2.08	5.2	40	43	1.74	----	5.18	"	"
21.04	37.5	39.53	2.29	6.1	38	40	1.77	----	4.81	"	"
21.54	35.5	37.12	2.03	5.7	36	37	1.81	----	4.54	"	"
22.08	34.6	35.85	1.85	5.3	35	36	1.85	----	4.42	"	"
22.53	33.4	34.35	1.77	5.3	33	34	1.88	----	4.25	"	"
23.07	30.0	30.57	1.88	6.3	30	31	1.92	----	3.79	"	"
23.50	23.3	23.56	1.48	6.4	23	24	1.95	----	2.90	"	"
24.04	26.0	26.05	1.43	5.5	26	26	1.99	----	3.25	"	"
24.57	23.8	23.79	1.50	6.3	24	24	2.03	----	2.95	"	"
25.04	21.8	21.77	1.19	5.5	22	22	2.06	----	2.68	"	"
25.57	21.7	21.66	1.07	4.9	22	22	2.10	----	2.67	"	"
26.01	16.7	16.66	1.15	6.9	17	17	2.13	----	1.99	"	"
26.59	20.3	20.23	1.24	6.1	20	20	2.18	----	2.47	"	"
27.03	16.3	16.23	1.29	7.9	16	16	2.21	----	1.93	"	"
27.55	15.9	15.82	1.47	9.2	16	16	2.25	----	1.87	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-5
DATE : 07-03-2008
TIME : 11:28:19
Groundwater measured at 4.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.04	34.3	34.11	1.81	5.3	34	34	2.28	----	4.32	CLAY	130-140
28.57	37.0	36.76	2.36	6.4	37	37	2.32	----	4.68	"	"
29.01	34.5	34.26	2.30	6.7	35	34	2.35	----	4.34	"	"
29.52	35.5	35.22	2.17	6.1	36	35	2.39	----	4.47	"	"
30.05	35.1	34.80	2.23	6.4	35	35	2.43	----	4.41	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-6
DATE : 07-03-2008
TIME : 11:47:39
Groundwater measured at 4.1 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.51	44.8	71.68	1.92	4.3	30	48	0.06	----	5.97	Silty CLAY to CLAY	130-140
1.09	44.4	71.04	3.06	6.9	44	71	0.14	----	5.91	CLAY	"
1.58	40.9	65.44	3.58	8.8	41	65	0.20	----	5.44	"	"
2.01	35.5	56.80	3.56	10.0	36	57	0.26	----	4.72	"	"
2.50	26.6	42.56	2.41	9.1	27	43	0.33	----	3.52	"	"
3.09	21.5	34.40	1.65	7.7	22	34	0.41	----	2.84	"	"
3.57	42.0	67.20	3.23	7.7	42	67	0.47	----	5.57	"	"
4.05	49.4	79.04	3.32	6.7	49	79	0.54	----	6.55	"	"
4.55	32.6	52.16	2.26	6.9	33	52	0.57	----	4.31	"	"
5.04	20.4	32.64	1.61	7.9	20	33	0.61	----	2.68	"	"
5.59	10.5	16.80	0.80	7.6	11	17	0.64	----	1.69	"	120-130
6.08	13.7	21.92	0.76	5.5	14	22	0.67	----	1.77	"	"
6.58	9.9	15.84	0.56	5.7	10	16	0.71	----	1.58	"	"
7.08	11.0	17.60	0.63	5.7	11	18	0.74	----	1.76	"	"
7.58	14.9	23.84	0.83	5.6	15	24	0.77	----	1.92	"	"
8.08	13.3	21.28	0.51	3.8	9	14	0.80	----	1.70	Silty CLAY to CLAY	"
8.52	12.9	20.30	0.68	5.3	13	20	0.83	----	1.65	CLAY	"
9.02	51.2	78.71	3.01	5.9	51	79	0.86	----	6.75	"	130-140
9.50	99.4	149.30	3.77	3.8	50	75	0.90	----	13.17	Clayey SILT to Silty CLAY	"
10.08	54.6	79.71	1.23	2.3	22	32	0.94	----	7.19	Sandy SILT to Clayey SILT	"
10.57	14.2	20.30	0.80	5.6	14	20	0.97	----	1.80	CLAY	120-130
11.05	17.4	24.36	0.65	3.7	12	16	1.00	----	2.22	Silty CLAY to CLAY	"
11.52	24.0	33.17	1.40	5.8	24	33	1.03	----	3.10	CLAY	130-140
12.05	31.9	43.44	1.85	5.8	32	43	1.07	----	4.15	"	"
12.55	22.3	29.95	1.40	6.3	22	30	1.11	----	2.86	"	"
13.05	21.6	28.60	1.30	6.0	22	29	1.15	----	2.77	"	"
13.54	21.0	27.42	1.24	5.9	21	27	1.18	----	2.68	"	"
14.02	25.0	32.19	1.15	4.6	25	32	1.22	----	3.21	"	"
14.51	20.7	26.27	0.93	4.5	21	26	1.25	----	2.63	"	"
15.05	25.0	31.25	1.30	5.2	25	31	1.29	----	3.20	"	"
15.55	25.4	31.32	1.29	5.1	25	31	1.33	----	3.25	"	"
16.04	35.4	43.04	1.70	4.8	24	29	1.36	----	4.58	Silty CLAY to CLAY	"
16.52	37.8	45.32	2.14	5.7	38	45	1.40	----	4.89	CLAY	"
17.01	37.3	44.09	2.14	5.7	37	44	1.43	----	4.82	"	"
17.58	44.0	51.13	2.41	5.5	44	51	1.48	----	5.71	"	"
18.07	51.3	58.80	2.88	5.6	51	59	1.51	----	6.68	"	"
18.54	47.6	53.97	3.06	6.4	48	54	1.54	----	6.18	"	"
19.02	29.7	33.31	2.09	7.0	30	33	1.58	----	3.79	"	"
19.59	43.0	47.58	2.55	5.9	43	48	1.62	----	5.56	"	"
20.05	34.5	37.76	1.96	5.7	35	38	1.65	----	4.42	"	"
20.53	37.2	40.25	2.21	5.9	37	40	1.69	----	4.78	"	"
21.10	31.9	34.04	2.05	6.4	32	34	1.73	----	4.07	"	"
21.57	27.8	29.37	1.66	6.0	28	29	1.76	----	3.52	"	"
22.04	25.5	26.73	1.56	6.1	26	27	1.80	----	3.21	"	"
22.50	30.2	31.42	1.58	5.2	30	31	1.83	----	3.83	"	"
23.07	23.7	24.42	1.37	5.8	24	24	1.87	----	2.96	"	"
23.54	22.7	23.20	1.31	5.8	23	23	1.91	----	2.82	"	"
24.01	20.0	20.28	1.28	6.4	20	20	1.94	----	2.45	"	"
24.53	26.1	26.23	1.18	4.5	17	17	1.98	----	3.26	Silty CLAY to CLAY	"
25.09	27.1	27.09	1.34	4.9	27	27	2.02	----	3.39	CLAY	"
25.56	20.6	20.58	0.96	4.7	21	21	2.05	----	2.52	"	"
26.03	17.6	17.57	0.95	5.4	18	18	2.09	----	2.12	"	"
26.59	35.7	35.61	2.30	6.4	36	36	2.13	----	4.52	"	"
27.05	23.6	23.52	1.58	6.7	24	24	2.16	----	2.91	"	"
27.51	38.5	38.35	2.42	6.3	39	38	2.20	----	4.89	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-6
DATE : 07-03-2008
TIME : 11:47:39
Groundwater measured at 4.1 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.09	42.2	42.00	2.62	6.2	42	42	2.24	----	5.38	CLAY	130-140
28.54	46.1	45.85	2.67	5.8	46	46	2.27	----	5.89	"	"
29.08	43.4	43.13	2.65	6.1	43	43	2.31	----	5.53	"	"
29.53	30.2	29.99	2.04	6.8	30	30	2.34	----	3.76	"	"
30.08	17.7	17.56	1.22	6.9	18	18	2.38	----	2.09	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 50.0 feet

CPT NO.: CPT-B-8
DATE : 07-03-2008
TIME : 12:17:34
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.50	45.5	72.80	0.96	2.1	18	29	0.06	----	6.06	Sandy SILT to Clayey SILT	130-140
1.07	53.4	85.44	2.90	5.4	53	85	0.13	----	7.11	CLAY	"
1.53	36.6	58.56	2.14	5.8	37	59	0.20	----	4.87	"	"
2.08	39.3	62.88	3.12	7.9	39	63	0.27	----	5.22	"	"
2.55	38.2	61.12	3.72	9.7	38	61	0.33	----	5.07	"	"
3.01	33.7	53.92	3.36	10.0	34	54	0.40	----	4.47	"	"
3.56	21.0	33.60	1.98	9.4	21	34	0.47	----	2.77	"	"
4.01	20.9	33.44	1.60	7.7	21	33	0.50	----	2.75	"	"
4.55	20.2	32.32	1.71	8.5	20	32	0.54	----	2.65	"	"
5.02	30.9	49.44	2.10	6.8	31	49	0.58	----	4.08	"	"
5.55	29.6	47.36	2.10	7.1	30	47	0.61	----	3.90	"	"
6.05	21.6	34.56	1.57	7.3	22	35	0.65	----	2.83	"	"
6.54	18.3	29.28	1.24	6.8	18	29	0.69	----	2.38	"	"
7.03	18.4	29.44	1.19	6.5	18	29	0.72	----	2.39	"	"
7.52	25.1	40.16	1.60	6.4	25	40	0.76	----	3.28	"	"
8.01	22.4	35.84	1.27	5.7	22	36	0.79	----	2.92	"	"
8.51	16.3	25.60	1.32	8.1	16	26	0.83	----	2.10	"	"
9.07	26.5	40.53	1.35	5.1	27	41	0.87	----	3.45	"	"
9.56	19.5	29.13	1.19	6.1	20	29	0.91	----	2.51	"	"
10.06	28.4	41.40	1.45	5.1	28	41	0.94	----	3.70	"	"
10.54	36.1	51.36	2.01	5.6	36	51	0.98	----	4.72	"	"
11.03	32.1	44.73	2.20	6.9	32	45	1.01	----	4.18	"	"
11.51	33.1	45.52	2.10	6.3	33	46	1.05	----	4.31	"	"
12.06	42.8	57.97	2.72	6.4	43	58	1.09	----	5.60	"	"
12.55	32.3	43.16	2.21	6.8	32	43	1.12	----	4.19	"	"
13.03	27.5	36.24	1.64	6.0	28	36	1.16	----	3.55	"	"
13.51	30.2	39.25	1.67	5.5	30	39	1.19	----	3.91	"	"
14.09	24.3	31.05	1.45	6.0	24	31	1.24	----	3.11	"	"
14.58	24.2	30.50	1.29	5.3	24	30	1.27	----	3.10	"	"
15.06	25.8	32.08	1.36	5.3	26	32	1.31	----	3.31	"	"
15.57	26.6	32.60	1.29	4.8	27	33	1.34	----	3.41	"	"
16.05	35.7	43.15	1.99	5.6	36	43	1.38	----	4.62	"	"
16.53	34.9	41.61	2.23	6.4	35	42	1.41	----	4.51	"	"
17.01	35.0	41.14	2.16	6.2	35	41	1.45	----	4.51	"	"
17.58	32.1	37.09	2.06	6.4	32	37	1.49	----	4.12	"	"
18.06	30.0	34.25	1.49	5.0	30	34	1.52	----	3.84	"	"
18.57	37.1	41.86	1.66	4.5	25	28	1.56	----	4.78	Silty CLAY to CLAY	"
19.04	34.4	38.39	1.92	5.6	34	38	1.59	----	4.42	CLAY	"
19.52	32.1	35.42	1.74	5.4	32	35	1.63	----	4.10	"	"
20.08	42.6	46.39	2.47	5.8	43	46	1.67	----	5.50	"	"
20.54	41.1	44.26	2.60	6.3	41	44	1.70	----	5.30	"	"
21.01	40.0	42.58	2.70	6.8	40	43	1.74	----	5.14	"	"
21.57	38.6	40.66	2.49	6.5	39	41	1.78	----	4.95	"	"
22.03	30.9	32.30	2.29	7.4	31	32	1.81	----	3.92	"	"
22.58	26.3	27.24	1.90	7.2	26	27	1.85	----	3.30	"	"
23.04	21.1	21.68	1.26	6.0	21	22	1.88	----	2.61	"	"
23.51	20.3	20.70	1.33	6.6	20	21	1.92	----	2.50	"	"
24.06	20.4	20.60	1.13	5.5	20	21	1.96	----	2.50	"	"
24.53	13.4	13.44	0.70	5.2	13	13	1.99	----	1.57	"	120-130
25.01	13.7	13.70	0.79	5.8	14	14	2.02	----	1.60	"	"
25.57	10.0	9.99	0.63	6.3	10	10	2.05	----	1.38	"	"
26.03	11.5	11.48	0.62	5.4	12	11	2.08	----	1.63	"	"
26.59	18.4	18.35	1.49	8.1	18	18	2.12	----	2.22	"	130-140
27.05	25.1	25.02	1.78	7.1	25	25	2.16	----	3.11	"	"
27.50	72.7	72.43	3.24	4.5	36	36	2.19	----	9.45	Clayey SILT to Silty CLAY	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 50.0 feet

CPT NO.: CPT-B-8
DATE : 07-03-2008
TIME : 12:17:34
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.04	27.8	27.67	1.81	6.5	28	28	2.23	----	3.46	CLAY	130-140
28.56	32.1	31.93	2.02	6.3	32	32	2.27	----	4.02	"	"
29.02	33.4	33.20	2.01	6.0	33	33	2.30	----	4.19	"	"
29.56	37.6	37.35	2.23	5.9	38	37	2.34	----	4.75	"	"
30.01	39.6	39.31	2.45	6.2	40	39	2.37	----	5.01	"	"
30.55	30.3	30.05	2.13	7.0	30	30	2.41	----	3.77	"	"
31.01	21.1	20.91	1.43	6.8	21	21	2.44	----	2.54	"	"
31.56	20.4	20.20	1.34	6.6	20	20	2.48	----	2.44	"	"
32.02	17.0	16.73	1.31	7.7	17	17	2.52	----	1.98	"	"
32.58	39.4	38.25	2.22	5.6	39	38	2.56	----	4.96	"	"
33.05	25.5	24.47	1.75	6.9	26	24	2.59	----	3.10	"	"
33.52	20.9	19.83	1.81	8.7	21	20	2.63	----	2.49	"	"
34.07	19.6	18.33	1.22	6.2	20	18	2.67	----	2.31	"	"
34.55	20.7	19.12	1.23	5.9	21	19	2.70	----	2.45	"	"
35.01	20.4	18.62	1.14	5.6	20	19	2.73	----	2.41	"	"
35.59	25.0	22.47	1.49	6.0	25	22	2.78	----	3.01	"	"
36.06	22.0	19.53	1.24	5.6	22	20	2.81	----	2.61	"	"
36.53	21.4	18.75	1.06	5.0	21	19	2.84	----	2.53	"	"
37.02	23.6	20.41	1.45	6.1	24	20	2.88	----	2.82	"	"
37.58	43.5	37.03	4.25	9.8	44	37	2.92	----	5.46	"	"
38.03	49.6	41.68	3.63	7.3	50	42	2.95	----	6.27	"	"
38.59	23.8	19.68	1.49	6.3	24	20	2.99	----	2.83	"	"
39.07	22.4	18.41	1.33	5.9	22	18	3.03	----	2.64	"	"
39.53	31.0	25.35	1.46	4.7	21	17	3.06	----	3.78	Silty CLAY to CLAY	"
40.08	39.3	31.96	1.86	4.7	26	21	3.10	----	4.88	"	"
40.55	42.9	34.72	1.97	4.6	29	23	3.14	----	5.36	"	"
41.01	45.5	36.65	2.22	4.9	30	24	3.17	----	5.70	"	"
41.52	46.9	37.58	2.36	5.0	31	25	3.21	----	5.88	"	"
42.00	45.7	36.43	2.45	5.4	46	36	3.24	----	5.72	CLAY	"
42.56	49.1	38.92	2.90	5.9	49	39	3.28	----	6.17	"	"
43.02	45.1	35.57	2.13	4.7	30	24	3.32	----	5.63	Silty CLAY to CLAY	"
43.57	44.3	34.74	2.89	6.5	44	35	3.36	----	5.52	CLAY	"
44.08	39.6	30.88	1.92	4.8	26	21	3.39	----	4.89	Silty CLAY to CLAY	"
44.54	78.1	60.60	4.53	5.8	78	61	3.43	----	10.01	Very Stiff Fine Grained *	"
45.09	88.6	68.32	6.14	6.9	89	68	3.47	----	11.41	"	>140
45.53	60.2	46.20	4.72	7.8	60	46	3.50	----	7.62	"	130-140
46.04	47.1	35.95	3.19	6.8	47	36	3.54	----	5.87	CLAY	"
46.53	51.9	39.40	2.64	5.1	35	26	3.57	----	6.50	Silty CLAY to CLAY	"
47.00	56.2	42.44	3.42	6.1	56	42	3.61	----	7.07	CLAY	"
47.56	71.4	53.59	3.74	5.2	71	54	3.65	----	9.09	Very Stiff Fine Grained *	"
48.07	66.0	49.25	3.54	5.4	66	49	3.68	----	8.37	"	"
48.56	57.7	42.82	3.23	5.6	58	43	3.72	----	7.26	"	"
49.05	48.8	36.02	2.64	5.4	49	36	3.76	----	6.07	CLAY	"
49.54	37.9	27.82	2.29	6.0	38	28	3.79	----	4.61	"	"
50.03	36.9	26.93	2.34	6.3	37	27	3.83	----	4.47	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 50.0 feet

CPT NO.: CPT-B-10
DATE : 07-03-2008
TIME : 10:39:48
Groundwater measured at 4.3 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.52	59.4	95.04	1.00	1.7	20	32	0.06	38	----	Silty SAND to Sandy SILT	130-140
1.06	64.1	102.56	2.48	3.9	32	51	0.13	----	8.54	Clayey SILT to Silty CLAY	"
1.59	66.5	106.40	3.76	5.7	67	106	0.20	----	8.85	Very Stiff Fine Grained *	"
2.03	48.9	78.24	3.55	7.3	49	78	0.26	----	6.50	CLAY	"
2.51	42.0	67.20	3.23	7.7	42	67	0.33	----	5.58	"	"
3.05	17.7	28.32	1.65	9.3	18	28	0.40	----	2.33	"	"
3.57	21.4	34.24	1.41	6.6	21	34	0.47	----	2.82	"	"
4.04	28.6	45.76	1.47	5.1	29	46	0.54	----	3.78	"	"
4.59	26.8	42.88	1.51	5.6	27	43	0.58	----	3.53	"	"
5.04	29.7	47.52	1.83	6.2	30	48	0.61	----	3.92	"	"
5.51	50.6	80.96	2.50	4.9	34	54	0.64	----	6.70	Silty CLAY to CLAY	"
6.05	23.0	36.80	1.77	7.7	23	37	0.68	----	3.01	CLAY	"
6.58	55.3	88.48	2.31	4.2	28	44	0.72	----	7.31	Clayey SILT to Silty CLAY	"
7.03	43.7	69.92	2.99	6.8	44	70	0.75	----	5.76	CLAY	"
7.57	36.0	57.60	2.60	7.2	36	58	0.79	----	4.73	"	"
8.00	49.2	77.58	1.66	3.4	25	39	0.82	----	6.49	Clayey SILT to Silty CLAY	"
8.56	84.7	130.15	2.50	3.0	34	52	0.86	----	11.22	Sandy SILT to Clayey SILT	"
9.07	82.1	122.87	4.95	6.0	82	123	0.90	----	10.87	Very Stiff Fine Grained *	>140
9.52	33.8	49.49	2.21	6.5	34	49	0.94	----	4.42	CLAY	130-140
10.04	26.7	38.08	2.20	8.2	27	38	0.97	----	3.47	"	"
10.57	16.8	23.41	1.67	9.9	17	23	1.01	----	2.15	"	"
11.02	16.3	22.44	1.49	9.1	16	22	1.04	----	2.07	"	"
11.55	20.7	28.09	1.66	8.0	21	28	1.08	----	2.66	"	"
12.05	27.0	36.12	1.89	7.0	27	36	1.12	----	3.49	"	"
12.59	24.8	32.67	1.72	6.9	25	33	1.16	----	3.19	"	"
13.04	25.3	32.90	1.56	6.2	25	33	1.19	----	3.26	"	"
13.58	26.3	33.67	1.68	6.4	26	34	1.23	----	3.38	"	"
14.02	32.7	41.33	1.73	5.3	33	41	1.26	----	4.23	"	"
14.56	19.9	24.78	1.17	5.9	20	25	1.30	----	2.52	"	"
15.07	27.5	33.75	1.57	5.7	28	34	1.34	----	3.53	"	"
15.52	27.8	33.68	1.56	5.6	28	34	1.37	----	3.57	"	"
16.06	42.2	50.34	2.91	6.9	42	50	1.41	----	5.48	"	"
16.50	36.2	42.63	2.61	7.2	36	43	1.44	----	4.68	"	"
17.03	32.2	37.32	2.22	6.9	32	37	1.48	----	4.14	"	"
17.56	33.4	38.17	1.91	5.7	33	38	1.52	----	4.30	"	"
18.01	36.4	41.18	1.85	5.1	36	41	1.55	----	4.69	"	"
18.52	44.8	50.08	2.23	5.0	30	33	1.59	----	5.81	Silty CLAY to CLAY	"
19.05	38.1	42.06	1.93	5.1	38	42	1.63	----	4.91	CLAY	"
19.57	34.1	37.18	1.87	5.5	34	37	1.67	----	4.37	"	"
20.01	36.6	39.48	1.96	5.4	37	39	1.70	----	4.70	"	"
20.54	41.9	44.63	2.64	6.3	42	45	1.74	----	5.40	"	"
21.05	102.3	107.81	6.51	6.4	102	108	1.78	----	13.45	Very Stiff Fine Grained *	>140
21.58	76.9	80.29	5.10	6.6	77	80	1.82	----	10.06	"	"
22.00	43.5	45.09	3.41	7.8	44	45	1.85	----	5.60	CLAY	130-140
22.51	78.2	80.38	3.67	4.7	78	80	1.88	----	10.22	Very Stiff Fine Grained *	"
23.07	45.2	46.01	2.62	5.8	45	46	1.93	----	5.82	CLAY	"
23.56	41.9	42.30	2.94	7.0	42	42	1.96	----	5.37	"	"
24.06	28.8	28.82	2.14	7.4	29	29	2.00	----	3.62	"	"
24.56	21.4	21.39	1.29	6.0	21	21	2.03	----	2.63	"	"
25.05	18.3	18.27	1.04	5.7	18	18	2.07	----	2.21	"	"
25.57	20.8	20.76	1.19	5.7	21	21	2.11	----	2.54	"	"
26.07	21.5	21.44	1.03	4.8	22	21	2.14	----	2.63	"	"
26.50	17.5	17.44	1.02	5.8	18	17	2.17	----	2.09	"	"
27.02	20.4	20.31	1.11	5.4	20	20	2.21	----	2.48	"	"
27.53	21.1	21.00	1.06	5.0	21	21	2.25	----	2.57	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 50.0 feet

CPT NO.: CPT-B-10
DATE : 07-03-2008
TIME : 10:39:48
Groundwater measured at 4.3 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.06	18.5	18.39	0.97	5.2	19	18	2.29	----	2.21	CLAY	130-140
28.58	31.7	31.49	1.62	5.1	32	31	2.32	----	3.97	"	"
29.01	30.8	30.58	2.00	6.5	31	31	2.36	----	3.85	"	"
29.52	14.3	14.19	1.08	7.6	14	14	2.39	----	1.64	"	120-130
30.02	20.7	20.52	1.47	7.1	21	21	2.42	----	2.49	"	130-140
30.54	15.8	15.65	1.24	7.8	16	16	2.46	----	1.83	"	"
31.04	26.8	26.53	2.49	9.3	27	27	2.50	----	3.29	"	"
31.53	58.9	57.65	3.56	6.0	59	58	2.53	----	7.57	Very Stiff Fine Grained *	"
32.03	26.8	25.91	2.20	8.2	27	26	2.57	----	3.29	CLAY	"
32.53	19.2	18.33	1.08	5.6	19	18	2.61	----	2.27	"	"
33.03	14.4	13.60	0.94	6.5	14	14	2.64	----	1.62	"	120-130
33.53	19.1	17.81	1.01	5.3	19	18	2.67	----	2.25	"	130-140
34.03	22.1	20.34	1.07	4.8	22	20	2.71	----	2.64	"	"
34.51	23.5	21.36	1.26	5.4	24	21	2.75	----	2.82	"	"
35.03	45.4	40.71	1.94	4.3	30	27	2.78	----	5.74	Silty CLAY to CLAY	"
35.54	47.2	41.74	2.27	4.8	31	28	2.82	----	5.97	"	"
36.06	64.4	56.16	3.40	5.3	64	56	2.86	----	8.26	Very Stiff Fine Grained *	"
36.56	44.6	38.35	2.77	6.2	45	38	2.89	----	5.62	CLAY	"
37.07	31.6	26.79	2.38	7.5	32	27	2.93	----	3.88	"	"
37.52	34.0	28.45	2.25	6.6	34	28	2.96	----	4.20	"	"
38.06	26.9	22.18	1.87	7.0	27	22	3.00	----	3.24	"	"
38.56	26.8	21.99	1.83	6.8	27	22	3.04	----	3.23	"	"
39.06	29.0	23.67	1.98	6.8	29	24	3.08	----	3.52	"	"
39.56	22.0	17.87	1.76	8.0	22	18	3.11	----	2.58	"	"
40.07	23.3	18.82	1.67	7.2	23	19	3.15	----	2.75	"	"
40.58	16.1	12.94	1.20	7.5	16	13	3.19	----	1.78	"	"
41.02	20.1	16.08	1.43	7.1	20	16	3.22	----	2.31	"	"
41.53	37.2	29.60	2.21	5.9	37	30	3.25	----	4.59	"	"
42.03	66.2	52.40	3.51	5.3	66	52	3.29	----	8.45	Very Stiff Fine Grained *	"
42.52	40.7	32.05	2.79	6.9	41	32	3.33	----	5.04	CLAY	"
43.01	34.2	26.79	2.28	6.7	34	27	3.36	----	4.17	"	"
43.56	28.9	22.50	1.68	5.8	29	23	3.40	----	3.46	"	"
44.01	37.1	28.75	1.73	4.7	25	19	3.44	----	4.55	Silty CLAY to CLAY	"
44.50	41.5	31.99	1.84	4.4	28	21	3.47	----	5.13	"	"
45.03	51.6	39.55	2.75	5.3	52	40	3.51	----	6.48	CLAY	"
45.56	49.0	37.34	2.77	5.7	49	37	3.55	----	6.12	"	"
46.08	40.3	30.53	2.52	6.3	40	31	3.59	----	4.96	"	"
46.53	30.6	23.07	2.04	6.7	31	23	3.62	----	3.66	"	"
47.05	24.5	18.37	1.51	6.2	25	18	3.66	----	2.84	"	"
47.53	26.0	19.39	1.43	5.5	26	19	3.69	----	3.04	"	"
48.06	22.5	16.68	1.33	5.9	23	17	3.73	----	2.57	"	"
48.51	21.8	16.08	1.27	5.8	22	16	3.76	----	2.47	"	"
49.03	19.7	14.44	1.17	5.9	20	14	3.80	----	2.19	"	"
49.56	17.8	12.97	1.06	6.0	18	13	3.84	----	1.93	"	"
50.00	21.7	15.73	1.21	5.6	22	16	3.87	----	2.44	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-12
DATE : 07-03-2008
TIME : 13:43:22
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.52	44.0	70.40	0.50	1.1	15	23	0.06	36	----	Silty SAND to Sandy SILT	120-130
1.02	58.8	94.08	1.37	2.3	24	38	0.13	----	7.83	Sandy SILT to Clayey SILT	130-140
1.58	56.0	89.60	2.01	3.6	28	45	0.20	----	7.45	Clayey SILT to Silty CLAY	"
2.04	75.0	120.00	3.89	5.2	75	120	0.26	----	9.98	Very Stiff Fine Grained *	"
2.55	45.8	73.28	3.68	8.0	46	73	0.33	----	6.08	CLAY	"
3.06	16.7	26.72	1.38	8.3	17	27	0.40	----	2.20	"	"
3.54	20.5	32.80	1.42	6.9	21	33	0.47	----	2.70	"	"
4.04	29.7	47.52	1.71	5.8	30	48	0.53	----	3.92	"	"
4.54	33.6	53.76	1.86	5.5	34	54	0.57	----	4.44	"	"
5.05	35.7	57.12	2.33	6.5	36	57	0.61	----	4.72	"	"
5.52	39.7	63.52	3.31	8.3	40	64	0.64	----	5.24	"	"
6.07	18.5	29.60	1.50	8.1	19	30	0.68	----	2.41	"	"
6.51	19.8	31.68	1.34	6.8	20	32	0.71	----	2.58	"	"
7.03	19.1	30.56	1.10	5.8	19	31	0.75	----	2.48	"	"
7.57	24.1	38.56	1.86	7.7	24	39	0.79	----	3.15	"	"
8.02	39.1	61.62	3.47	8.9	39	62	0.82	----	5.14	"	"
8.56	64.4	98.98	3.36	5.2	64	99	0.86	----	8.51	Very Stiff Fine Grained *	"
9.03	57.2	85.96	1.75	3.1	23	34	0.90	----	7.55	Sandy SILT to Clayey SILT	"
9.57	51.1	75.06	0.82	1.6	17	25	0.93	36	----	Silty SAND to Sandy SILT	120-130
10.02	55.5	79.97	0.71	1.3	19	27	0.96	37	----	"	"
10.55	33.4	46.85	1.09	3.3	17	23	1.00	----	4.36	Clayey SILT to Silty CLAY	130-140
11.08	16.3	22.51	1.29	7.9	16	23	1.04	----	2.07	CLAY	"
11.53	58.9	80.50	0.88	1.5	20	27	1.06	37	----	Silty SAND to Sandy SILT	120-130
12.07	67.9	91.41	2.44	3.6	34	46	1.10	----	8.95	Clayey SILT to Silty CLAY	130-140
12.53	39.9	53.02	2.04	5.1	40	53	1.14	----	5.21	CLAY	"
13.06	46.1	60.33	2.15	4.7	31	40	1.18	----	6.03	Silty CLAY to CLAY	"
13.51	37.1	47.93	1.75	4.7	25	32	1.21	----	4.83	"	"
14.04	29.2	37.14	1.41	4.8	29	37	1.25	----	3.77	CLAY	"
14.58	26.0	32.57	1.43	5.5	26	33	1.29	----	3.34	"	"
15.02	24.8	30.69	1.26	5.1	25	31	1.32	----	3.17	"	"
15.55	27.0	32.92	1.38	5.1	27	33	1.36	----	3.46	"	"
16.08	29.4	35.29	1.45	4.9	29	35	1.40	----	3.78	"	"
16.52	30.3	35.91	1.50	5.0	30	36	1.43	----	3.89	"	"
17.06	28.3	33.01	1.53	5.4	28	33	1.47	----	3.62	"	"
17.51	27.2	31.30	1.22	4.5	18	21	1.50	----	3.47	Silty CLAY to CLAY	"
18.04	26.2	29.78	1.32	5.0	26	30	1.54	----	3.33	CLAY	"
18.59	47.7	53.54	2.11	4.4	32	36	1.58	----	6.19	Silty CLAY to CLAY	"
19.03	87.3	96.98	4.54	5.2	87	97	1.61	----	11.47	Very Stiff Fine Grained *	"
19.55	65.1	71.42	3.79	5.8	65	71	1.65	----	8.51	"	"
20.07	52.5	56.89	3.86	7.4	53	57	1.68	----	6.82	CLAY	"
20.50	45.9	49.22	3.72	8.1	46	49	1.72	----	5.94	"	"
21.04	44.1	46.70	2.77	6.3	44	47	1.75	----	5.69	"	"
21.56	38.9	40.84	2.41	6.2	39	41	1.79	----	4.99	"	"
22.07	34.6	36.01	2.01	5.8	35	36	1.83	----	4.42	"	"
22.51	35.0	36.17	2.06	5.9	35	36	1.86	----	4.47	"	"
23.06	31.3	32.04	1.94	6.2	31	32	1.90	----	3.97	"	"
23.58	23.0	23.34	1.41	6.1	23	23	1.94	----	2.86	"	"
24.01	24.2	24.37	1.30	5.4	24	24	1.97	----	3.01	"	"
24.50	30.0	30.00	1.47	4.9	30	30	2.01	----	3.78	"	"
25.01	31.3	31.27	1.38	4.4	21	21	2.04	----	3.95	Silty CLAY to CLAY	"
25.52	22.2	22.16	1.04	4.7	22	22	2.08	----	2.73	CLAY	"
26.04	18.0	17.96	0.95	5.3	18	18	2.12	----	2.17	"	"
26.55	16.7	16.65	0.84	5.0	17	17	2.15	----	1.99	"	120-130
27.06	18.1	18.03	1.16	6.4	18	18	2.19	----	2.17	"	130-140
27.55	16.7	16.63	0.93	5.6	17	17	2.22	----	1.98	"	120-130

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-12
DATE : 07-03-2008
TIME : 13:43:22
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.06	19.9	19.80	1.07	5.4	20	20	2.25	----	2.40	CLAY	130-140
28.56	31.5	31.32	2.45	7.8	32	31	2.29	----	3.95	"	"
29.06	92.5	91.89	5.04	5.4	93	92	2.33	----	12.07	Very Stiff Fine Grained *	>140
29.55	104.6	103.83	5.25	5.0	105	104	2.37	----	13.68	"	"
30.04	23.2	23.01	1.52	6.6	23	23	2.40	----	2.82	CLAY	130-140

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 40.0 feet

CPT NO.: CPT-B-13
DATE : 07-03-2008
TIME : 13:18:32
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.59	36.6	58.56	1.85	5.1	37	59	0.07	----	4.88	CLAY	130-140
1.05	44.2	70.72	2.99	6.8	44	71	0.13	----	5.88	"	"
1.51	61.8	98.88	3.89	6.3	62	99	0.19	----	8.23	Very Stiff Fine Grained *	"
2.05	49.6	79.36	3.70	7.5	50	79	0.27	----	6.60	CLAY	"
2.52	43.7	69.92	4.00	9.2	44	70	0.33	----	5.80	"	"
3.05	41.2	65.92	3.79	9.2	41	66	0.40	----	5.47	"	"
3.58	22.0	35.20	1.91	8.7	22	35	0.47	----	2.90	"	"
4.02	22.7	36.32	1.62	7.1	23	36	0.51	----	2.99	"	"
4.56	13.5	21.60	1.00	7.4	14	22	0.54	----	1.76	"	120-130
5.01	19.1	30.56	1.04	5.4	19	31	0.57	----	2.50	"	130-140
5.56	21.9	35.04	0.97	4.4	22	35	0.61	----	2.87	"	"
6.02	18.6	29.76	0.90	4.8	19	30	0.64	----	2.43	"	120-130
6.57	22.2	35.52	0.81	3.6	15	24	0.68	----	2.90	Silty CLAY to CLAY	130-140
7.03	20.8	33.28	0.95	4.6	21	33	0.71	----	2.71	CLAY	"
7.57	27.3	43.68	1.21	4.4	18	29	0.75	----	3.57	Silty CLAY to CLAY	"
8.03	26.1	41.76	1.24	4.8	26	42	0.79	----	3.41	CLAY	"
8.58	36.6	57.59	1.51	4.1	24	38	0.83	----	4.80	Silty CLAY to CLAY	"
9.05	17.6	27.10	1.00	5.7	18	27	0.86	----	2.27	CLAY	"
9.50	15.3	23.12	0.86	5.6	15	23	0.89	----	1.96	"	120-130
10.04	20.7	30.47	1.24	6.0	21	30	0.93	----	2.67	"	130-140
10.57	58.7	84.15	1.07	1.8	20	28	0.97	37	----	Silty SAND to Sandy SILT	"
11.02	21.4	29.97	0.93	4.3	14	20	1.00	----	2.76	Silty CLAY to CLAY	"
11.57	8.5	11.75	0.67	7.9	9	12	1.03	----	1.55	CLAY	120-130
12.04	13.7	18.70	1.64	12.0	14	19	1.07	----	1.72	Organic Material	130-140
12.57	46.1	61.99	2.59	5.6	46	62	1.11	----	6.04	CLAY	"
13.02	31.4	41.69	1.85	5.9	31	42	1.14	----	4.07	"	"
13.55	32.0	41.84	2.10	6.6	32	42	1.18	----	4.15	"	"
14.08	26.7	34.38	1.88	7.0	27	34	1.22	----	3.44	"	"
14.52	24.7	31.40	1.77	7.2	25	31	1.25	----	3.16	"	"
15.05	28.4	35.58	1.62	5.7	28	36	1.29	----	3.65	"	"
15.54	31.0	38.30	2.04	6.6	31	38	1.32	----	4.00	"	"
16.08	22.0	26.77	1.57	7.1	22	27	1.36	----	2.79	"	"
16.52	22.9	27.51	1.69	7.4	23	28	1.39	----	2.91	"	"
17.06	23.0	27.20	1.54	6.7	23	27	1.43	----	2.92	"	"
17.51	33.4	38.98	1.79	5.4	33	39	1.46	----	4.30	"	"
18.04	35.0	40.21	2.21	6.3	35	40	1.50	----	4.51	"	"
18.53	32.6	37.03	2.07	6.3	33	37	1.54	----	4.18	"	"
19.07	28.4	31.86	1.70	6.0	28	32	1.58	----	3.62	"	"
19.50	29.8	33.10	1.74	5.8	30	33	1.61	----	3.80	"	"
20.03	26.0	28.52	1.48	5.7	26	29	1.65	----	3.29	"	"
20.56	31.7	34.33	1.73	5.5	32	34	1.69	----	4.04	"	"
21.09	32.3	34.53	1.74	5.4	32	35	1.72	----	4.12	"	"
21.50	26.9	28.48	1.48	5.5	27	28	1.75	----	3.40	"	"
22.04	28.0	29.39	1.60	5.7	28	29	1.79	----	3.54	"	"
22.57	23.6	24.55	1.82	7.7	24	25	1.83	----	2.95	"	"
23.01	13.9	14.35	1.14	8.2	14	14	1.86	----	1.65	"	"
23.54	9.7	9.94	0.97	10.0	10	10	1.90	----	1.35	"	120-130
24.06	12.7	12.91	0.86	6.8	13	13	1.93	----	1.48	"	"
24.50	15.3	15.46	0.87	5.7	15	15	1.96	----	1.82	"	"
25.04	15.5	15.53	0.81	5.2	16	16	1.99	----	1.84	"	"
25.57	20.1	20.09	1.31	6.5	20	20	2.03	----	2.45	"	130-140
26.01	26.5	26.47	1.63	6.2	27	26	2.06	----	3.30	"	"
26.54	26.1	26.05	1.22	4.7	26	26	2.10	----	3.24	"	"
27.07	56.5	56.34	3.14	5.6	57	56	2.14	----	7.29	"	"
27.57	59.5	59.29	3.72	6.3	60	59	2.17	----	7.69	Very Stiff Fine Grained *	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 40.0 feet

CPT NO.: CPT-B-13
DATE : 07-03-2008
TIME : 13:18:32
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.06	68.8	68.51	3.52	5.1	69	69	2.21	----	8.92	Very Stiff Fine Grained *	130-140
28.57	63.8	63.48	3.00	4.7	43	42	2.25	----	8.25	Silty CLAY to CLAY	"
29.07	69.4	69.01	3.13	4.5	35	35	2.28	----	9.00	Clayey SILT to Silty CLAY	"
29.55	115.6	114.86	3.22	2.8	39	38	2.32	39	----	Silty SAND to Sandy SILT	"
30.05	101.5	100.78	2.69	2.7	34	34	2.36	38	----	"	"
30.54	111.2	110.33	4.01	3.6	44	44	2.39	----	14.56	Sandy SILT to Clayey SILT	"
31.03	23.1	22.90	1.69	7.3	23	23	2.43	----	2.80	CLAY	"
31.58	13.4	13.28	0.72	5.4	13	13	2.46	----	1.51	"	120-130
32.08	16.8	16.63	0.76	4.5	17	17	2.49	----	1.96	"	"
32.59	26.0	25.49	1.10	4.2	17	17	2.53	----	3.18	Silty CLAY to CLAY	130-140
33.02	31.2	30.27	1.44	4.6	21	20	2.56	----	3.87	"	"
33.56	34.7	33.22	1.85	5.3	35	33	2.60	----	4.33	CLAY	"
34.00	43.0	40.70	2.27	5.3	43	41	2.63	----	5.43	"	"
34.52	52.9	49.41	3.50	6.6	53	49	2.67	----	6.75	"	"
35.07	44.1	40.62	2.98	6.8	44	41	2.71	----	5.57	"	"
35.51	34.9	31.77	2.12	6.1	35	32	2.74	----	4.34	"	"
36.05	34.5	30.96	2.03	5.9	35	31	2.78	----	4.28	"	"
36.59	28.9	25.56	1.57	5.4	29	26	2.82	----	3.53	"	"
37.04	21.2	18.52	1.38	6.5	21	19	2.85	----	2.50	"	"
37.58	20.9	17.99	1.46	7.0	21	18	2.89	----	2.45	"	"
38.03	17.1	14.53	1.31	7.7	17	15	2.92	----	1.94	"	"
38.58	23.9	20.00	1.67	7.0	24	20	2.96	----	2.84	"	"
39.03	30.0	24.78	2.12	7.1	30	25	3.00	----	3.65	"	"
39.56	51.0	41.87	3.26	6.4	51	42	3.04	----	6.45	"	"
40.01	68.2	55.73	4.12	6.0	68	56	3.07	----	8.74	Very Stiff Fine Grained *	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-15
DATE : 07-03-2008
TIME : 14:02:39
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.53	56.1	89.76	2.27	4.0	28	45	0.06	----	7.48	Clayey SILT to Silty CLAY	130-140
1.00	79.7	127.52	5.21	6.5	80	128	0.13	----	10.62	Very Stiff Fine Grained *	>140
1.55	77.8	124.48	4.67	6.0	78	124	0.20	----	10.36	"	130-140
2.01	68.1	108.96	4.88	7.2	68	109	0.26	----	9.06	"	"
2.56	55.4	88.64	5.00	9.0	55	89	0.34	----	7.36	CLAY	"
3.02	44.9	71.84	4.76	10.6	45	72	0.40	----	5.96	"	"
3.55	22.5	36.00	2.57	11.4	23	36	0.47	----	2.97	"	"
4.08	30.4	48.64	2.95	9.7	30	49	0.54	----	4.02	"	"
4.52	49.4	79.04	4.25	8.6	49	79	0.58	----	6.55	"	"
5.06	22.9	36.64	1.79	7.8	23	37	0.61	----	3.01	"	"
5.52	38.8	62.08	3.01	7.8	39	62	0.65	----	5.12	"	"
6.07	39.9	63.84	3.21	8.0	40	64	0.69	----	5.27	"	"
6.52	50.1	80.16	2.91	5.8	50	80	0.72	----	6.62	"	"
7.08	36.5	58.40	2.41	6.6	37	58	0.76	----	4.80	"	"
7.54	37.1	59.36	0.76	2.0	15	24	0.79	----	4.88	Sandy SILT to Clayey SILT	"
8.01	35.8	56.26	0.94	2.6	14	23	0.83	----	4.70	"	"
8.58	55.4	84.79	1.40	2.5	22	34	0.87	----	7.31	"	"
9.08	87.9	131.31	1.81	2.1	29	44	0.91	40	----	Silty SAND to Sandy SILT	"
9.55	67.9	99.09	1.36	2.0	23	33	0.94	38	----	"	"
10.03	53.5	76.47	0.66	1.2	18	25	0.97	36	----	"	120-130
10.51	37.0	51.71	0.77	2.1	15	21	1.00	----	4.84	Sandy SILT to Clayey SILT	130-140
11.07	64.2	88.36	1.96	3.1	26	35	1.05	----	8.46	"	"
11.54	31.5	42.78	1.99	6.3	32	43	1.08	----	4.10	CLAY	"
12.09	25.7	34.38	1.32	5.1	26	34	1.12	----	3.32	"	"
12.57	27.7	36.55	1.59	5.7	28	37	1.15	----	3.58	"	"
13.04	26.3	34.23	1.61	6.1	26	34	1.19	----	3.39	"	"
13.52	27.0	34.66	1.66	6.1	27	35	1.22	----	3.48	"	"
14.10	17.5	22.09	1.15	6.6	18	22	1.27	----	2.21	"	"
14.58	21.8	27.16	1.15	5.3	22	27	1.30	----	2.78	"	"
15.06	22.8	28.02	1.31	5.7	23	28	1.34	----	2.91	"	"
15.59	36.6	44.30	1.68	4.6	24	30	1.37	----	4.74	Silty CLAY to CLAY	"
16.06	35.6	42.51	2.02	5.7	36	43	1.41	----	4.60	CLAY	"
16.53	37.5	44.16	2.00	5.3	38	44	1.44	----	4.85	"	"
17.01	37.6	43.65	1.93	5.1	38	44	1.48	----	4.86	"	"
17.57	43.3	49.52	2.32	5.4	43	50	1.52	----	5.62	"	"
18.03	43.7	49.45	2.52	5.8	44	49	1.55	----	5.67	"	"
18.53	33.2	37.13	1.94	5.8	33	37	1.59	----	4.26	"	"
19.01	33.3	36.83	1.81	5.4	33	37	1.62	----	4.27	"	"
19.58	31.2	34.04	1.75	5.6	31	34	1.66	----	3.98	"	"
20.04	34.1	36.79	2.01	5.9	34	37	1.70	----	4.37	"	"
20.50	24.7	26.35	1.57	6.4	25	26	1.73	----	3.11	"	"
21.07	27.7	29.22	1.41	5.1	28	29	1.77	----	3.50	"	"
21.54	33.9	35.48	2.12	6.3	34	35	1.81	----	4.33	"	"
22.01	29.2	30.32	1.76	6.0	29	30	1.84	----	3.70	"	"
22.57	27.9	28.70	1.61	5.8	28	29	1.88	----	3.52	"	"
23.03	24.2	24.70	1.32	5.5	24	25	1.91	----	3.02	"	"
23.50	22.9	23.18	1.36	5.9	23	23	1.95	----	2.84	"	"
24.04	17.9	17.95	1.06	5.9	18	18	1.99	----	2.17	"	"
24.51	17.8	17.79	0.91	5.1	18	18	2.02	----	2.15	"	120-130
25.06	24.5	24.47	1.21	4.9	25	24	2.06	----	3.04	"	130-140
25.53	20.5	20.46	0.99	4.8	21	20	2.09	----	2.50	"	"
26.09	20.2	20.15	1.05	5.2	20	20	2.13	----	2.46	"	"
26.54	17.1	17.05	0.93	5.4	17	17	2.16	----	2.04	"	120-130
27.01	16.1	16.04	0.85	5.3	16	16	2.19	----	1.91	"	"
27.55	26.3	26.18	1.66	6.3	26	26	2.23	----	3.26	"	130-140

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-15
DATE : 07-03-2008
TIME : 14:02:39
Groundwater measured at 4.2 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.05	43.1	42.87	2.98	6.9	43	43	2.26	----	5.50	CLAY	130-140
28.51	19.5	19.38	1.69	8.7	20	19	2.30	----	2.35	"	"
29.05	21.2	21.06	1.68	7.9	21	21	2.34	----	2.57	"	"
29.58	20.3	20.15	1.68	8.3	20	20	2.38	----	2.44	"	"
30.02	47.6	47.21	3.17	6.7	48	47	2.41	----	6.08	"	"

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-17
DATE : 07-03-2008
TIME : 14:22:57
Groundwater measured at 4.1 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.56	23.8	38.08	0.96	4.0	16	25	0.07	----	3.17	Silty CLAY to CLAY	130-140
1.01	16.5	26.40	2.42	12.0	17	26	0.13	----	2.19	Organic Material	"
1.53	41.2	65.92	2.95	7.2	41	66	0.20	----	5.48	CLAY	"
2.04	44.9	71.84	3.90	8.7	45	72	0.27	----	5.97	"	"
2.57	41.1	65.76	3.53	8.6	41	66	0.34	----	5.46	"	"
3.07	24.3	38.88	2.04	8.4	24	39	0.40	----	3.21	"	"
3.56	37.6	60.16	2.36	6.3	38	60	0.47	----	4.98	"	"
4.06	51.5	82.40	4.11	8.0	52	82	0.54	----	6.83	"	"
4.55	32.4	51.84	2.90	9.0	32	52	0.57	----	4.28	"	"
5.04	28.0	44.80	2.24	8.0	28	45	0.61	----	3.69	"	"
5.50	20.7	33.12	1.48	7.1	21	33	0.64	----	2.71	"	"
6.02	21.5	34.40	1.45	6.7	22	34	0.68	----	2.81	"	"
6.56	16.3	26.08	1.11	6.8	16	26	0.72	----	2.11	"	"
7.01	17.2	27.52	0.99	5.8	17	28	0.75	----	2.23	"	"
7.55	16.7	26.72	0.76	4.6	17	27	0.79	----	2.16	"	120-130
8.01	20.9	33.05	1.20	5.7	21	33	0.82	----	2.72	"	130-140
8.56	23.0	35.44	1.36	5.9	23	35	0.86	----	2.99	"	"
9.03	24.9	37.52	1.24	5.0	25	38	0.89	----	3.24	"	"
9.58	27.6	40.48	1.35	4.9	28	40	0.93	----	3.59	"	"
10.03	77.1	110.59	2.52	3.3	31	44	0.97	----	10.19	Sandy SILT to Clayey SILT	"
10.55	81.4	113.81	1.70	2.1	27	38	1.00	39	----	Silty SAND to Sandy SILT	"
11.08	48.4	66.69	2.95	6.1	48	67	1.04	----	6.35	CLAY	"
11.52	77.6	105.67	2.05	2.6	31	42	1.07	----	10.24	Sandy SILT to Clayey SILT	"
12.06	35.8	48.01	1.70	4.7	24	32	1.11	----	4.67	Silty CLAY to CLAY	"
12.58	30.3	40.04	1.54	5.1	30	40	1.15	----	3.93	CLAY	"
13.02	26.4	34.45	1.20	4.5	18	23	1.18	----	3.40	Silty CLAY to CLAY	"
13.54	18.7	24.03	0.99	5.3	19	24	1.22	----	2.37	CLAY	"
14.07	20.2	25.56	0.98	4.9	20	26	1.26	----	2.57	"	"
14.53	21.9	27.37	0.98	4.5	22	27	1.29	----	2.79	"	"
15.07	21.2	26.10	1.01	4.8	21	26	1.33	----	2.69	"	"
15.53	26.8	32.56	1.50	5.6	27	33	1.36	----	3.43	"	"
16.06	24.6	29.43	1.51	6.1	25	29	1.40	----	3.14	"	"
16.51	30.1	35.54	1.71	5.7	30	36	1.44	----	3.87	"	"
17.04	38.7	44.97	1.65	4.3	26	30	1.47	----	5.01	Silty CLAY to CLAY	"
17.56	41.8	47.88	1.99	4.8	28	32	1.51	----	5.42	"	"
18.01	45.3	51.36	2.24	4.9	30	34	1.54	----	5.88	"	"
18.59	46.4	51.91	1.92	4.1	23	26	1.59	----	6.02	Clayey SILT to Silty CLAY	"
19.03	51.3	56.79	2.08	4.1	26	28	1.62	----	6.67	"	"
19.56	58.2	63.62	2.73	4.7	39	42	1.66	----	7.58	Silty CLAY to CLAY	"
20.01	66.0	71.38	2.58	3.9	33	36	1.69	----	8.62	Clayey SILT to Silty CLAY	"
20.54	66.1	70.57	3.78	5.7	66	71	1.73	----	8.63	Very Stiff Fine Grained *	"
21.07	54.5	57.55	2.99	5.5	55	58	1.77	----	7.08	CLAY	"
21.55	49.5	51.85	2.58	5.2	50	52	1.80	----	6.41	"	"
22.07	44.7	46.42	2.63	5.9	45	46	1.84	----	5.76	"	"
22.50	42.8	44.12	2.22	5.2	43	44	1.87	----	5.51	"	"
23.02	39.6	40.46	2.18	5.5	40	40	1.91	----	5.07	"	"
23.54	34.7	35.14	2.09	6.0	35	35	1.95	----	4.42	"	"
24.05	32.9	33.03	2.01	6.1	33	33	1.98	----	4.17	"	"
24.57	33.6	33.59	1.80	5.4	34	34	2.02	----	4.26	"	"
25.07	37.1	37.06	1.95	5.3	37	37	2.06	----	4.72	"	"
25.58	31.1	31.04	1.63	5.2	31	31	2.09	----	3.92	"	"
26.01	31.8	31.72	1.46	4.6	21	21	2.13	----	4.01	Silty CLAY to CLAY	"
26.51	29.6	29.50	1.46	4.9	30	30	2.16	----	3.71	CLAY	"
27.02	29.3	29.18	1.37	4.7	29	29	2.20	----	3.66	"	"
27.53	37.5	37.32	1.79	4.8	25	25	2.24	----	4.75	Silty CLAY to CLAY	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 30.0 feet

CPT NO.: CPT-B-17
DATE : 07-03-2008
TIME : 14:22:57
Groundwater measured at 4.1 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.07	23.6	23.47	1.32	5.6	24	23	2.28	----	2.90	CLAY	130-140
28.58	42.8	42.53	2.52	5.9	43	43	2.31	----	5.45	"	"
29.08	40.4	40.12	2.59	6.4	40	40	2.35	----	5.13	"	"
29.50	15.4	15.28	0.96	6.2	15	15	2.38	----	1.79	"	120-130
30.08	39.1	38.77	2.39	6.1	39	39	2.42	----	4.94	"	130-140

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 62.0 feet

CPT NO.: CPT-B-18
DATE : 07-03-2008
TIME : 14:54:23
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.58	53.8	86.08	3.98	7.4	54	86	0.07	----	7.17	Silty CLAY to CLAY	130-140
1.06	100.1	160.16	6.11	6.1	100	160	0.13	----	13.34	Very Stiff Fine Grained *	>140
1.50	72.3	115.68	5.43	7.5	72	116	0.20	----	9.63	"	"
2.05	45.3	72.48	3.52	7.8	45	72	0.27	----	6.02	CLAY	130-140
2.55	37.2	59.52	3.65	9.8	37	60	0.34	----	4.94	"	"
3.03	25.6	40.96	2.33	9.1	26	41	0.40	----	3.39	"	"
3.54	27.2	43.52	1.70	6.3	27	44	0.47	----	3.60	"	"
4.06	30.0	48.00	1.82	6.1	30	48	0.51	----	3.96	"	"
4.51	23.5	37.60	1.40	6.0	24	38	0.54	----	3.09	"	"
5.05	24.2	38.72	1.01	4.2	16	26	0.58	----	3.18	Silty CLAY to CLAY	"
5.51	21.7	34.72	1.03	4.7	22	35	0.62	----	2.84	CLAY	"
6.05	18.2	29.12	0.94	5.2	18	29	0.65	----	2.37	"	"
6.51	15.6	24.96	0.75	4.8	16	25	0.68	----	2.02	"	120-130
7.06	13.4	21.44	0.70	5.2	13	21	0.72	----	1.72	"	"
7.52	13.8	22.08	0.65	4.7	14	22	0.75	----	1.77	"	"
8.06	13.1	20.96	0.50	3.8	9	14	0.78	----	1.68	Silty CLAY to CLAY	"
8.58	15.4	24.44	0.53	3.4	10	16	0.81	----	1.98	"	"
9.03	17.5	27.28	0.54	3.1	9	14	0.84	----	2.25	Clayey SILT to Silty CLAY	"
9.57	30.3	46.03	1.48	4.9	30	46	0.88	----	3.96	CLAY	130-140
10.03	27.8	41.32	1.33	4.8	28	41	0.91	----	3.62	"	"
10.56	38.3	55.43	1.97	5.1	38	55	0.95	----	5.01	"	"
11.00	81.2	114.94	3.55	4.4	41	57	0.98	----	10.73	Clayey SILT to Silty CLAY	"
11.57	83.1	115.24	3.48	4.2	42	58	1.03	----	10.98	"	"
12.08	27.4	37.46	1.93	7.0	27	37	1.06	----	3.55	CLAY	"
12.51	28.1	37.97	1.65	5.9	28	38	1.09	----	3.64	"	"
13.03	49.2	65.52	2.58	5.2	49	66	1.13	----	6.45	"	"
13.55	33.8	44.34	1.95	5.8	34	44	1.17	----	4.39	"	"
14.08	29.4	37.99	1.77	6.0	29	38	1.21	----	3.80	"	"
14.53	27.5	35.06	1.82	6.6	28	35	1.24	----	3.54	"	"
15.06	23.5	29.52	1.83	7.8	24	30	1.28	----	3.00	"	"
15.58	77.7	96.18	4.50	5.8	78	96	1.32	----	10.22	Very Stiff Fine Grained *	"
16.01	36.3	44.39	2.55	7.0	36	44	1.35	----	4.70	CLAY	"
16.53	28.1	33.85	2.13	7.6	28	34	1.39	----	3.60	"	"
17.05	19.9	23.62	1.19	6.0	20	24	1.42	----	2.50	"	"
17.55	30.5	35.66	1.82	6.0	31	36	1.46	----	3.91	"	"
18.04	37.9	43.67	2.21	5.8	38	44	1.50	----	4.89	"	"
18.56	39.2	44.61	1.93	4.9	39	45	1.53	----	5.06	"	"
19.00	38.2	43.03	2.09	5.5	38	43	1.57	----	4.92	"	"
19.53	31.6	35.16	1.78	5.6	32	35	1.60	----	4.04	"	"
20.05	26.6	29.23	1.45	5.5	27	29	1.64	----	3.37	"	"
20.58	34.8	37.77	1.87	5.4	35	38	1.68	----	4.46	"	"
21.01	40.1	43.07	2.51	6.3	40	43	1.71	----	5.16	"	"
21.58	37.5	39.73	2.65	7.1	38	40	1.75	----	4.81	"	"
22.01	35.0	36.82	1.91	5.5	35	37	1.78	----	4.47	"	"
22.52	30.8	32.12	1.76	5.7	31	32	1.82	----	3.91	"	"
23.03	35.6	36.82	2.24	6.3	36	37	1.86	----	4.54	"	"
23.54	31.6	32.40	2.02	6.4	32	32	1.90	----	4.00	"	"
24.04	21.0	21.35	1.32	6.3	21	21	1.93	----	2.59	"	"
24.52	21.8	21.98	0.99	4.5	22	22	1.97	----	2.69	"	"
25.03	15.7	15.71	0.69	4.4	16	16	2.00	----	1.87	"	120-130
25.53	14.9	14.89	0.64	4.3	15	15	2.03	----	1.76	"	"
26.05	25.4	25.37	1.34	5.3	25	25	2.07	----	3.16	"	130-140
26.54	22.5	22.45	1.17	5.2	23	22	2.10	----	2.76	"	"
27.05	20.8	20.74	1.01	4.9	21	21	2.14	----	2.53	"	"
27.55	51.8	51.62	3.02	5.8	52	52	2.18	----	6.66	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 62.0 feet

CPT NO.: CPT-B-18
DATE : 07-03-2008
TIME : 14:54:23
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.03	34.1	33.96	2.88	8.4	34	34	2.21	----	4.30	CLAY	130-140
28.53	33.7	33.53	2.77	8.2	34	34	2.25	----	4.24	"	"
29.02	49.9	49.62	3.32	6.7	50	50	2.28	----	6.40	"	"
29.58	54.8	54.45	3.34	6.1	55	54	2.32	----	7.04	"	"
30.06	18.7	18.57	1.26	6.7	19	19	2.36	----	2.23	"	"
30.54	17.4	17.26	1.22	7.0	17	17	2.39	----	2.05	"	"
31.07	20.3	20.12	1.02	5.0	20	20	2.43	----	2.43	"	"
31.56	18.9	18.72	0.93	4.9	19	19	2.47	----	2.24	"	"
32.05	16.6	16.43	0.90	5.4	17	16	2.50	----	1.93	"	120-130
32.55	20.2	19.77	1.02	5.0	20	20	2.53	----	2.40	"	130-140
33.04	21.7	20.98	1.30	6.0	22	21	2.57	----	2.60	"	"
33.54	15.3	14.64	0.93	6.1	15	15	2.60	----	1.74	"	120-130
34.05	13.2	12.49	0.87	6.6	13	12	2.63	----	1.46	"	"
34.56	18.0	16.81	1.04	5.8	18	17	2.67	----	2.09	"	130-140
35.08	32.2	29.67	2.17	6.7	32	30	2.71	----	3.98	"	"
35.54	33.8	30.78	2.18	6.4	34	31	2.74	----	4.19	"	"
36.08	22.7	20.38	1.41	6.2	23	20	2.78	----	2.71	"	"
36.53	23.9	21.19	1.59	6.7	24	21	2.81	----	2.86	"	"
37.04	17.6	15.39	1.08	6.1	18	15	2.85	----	2.02	"	"
37.51	16.7	14.42	1.06	6.3	17	14	2.88	----	1.89	"	"
38.06	15.3	13.03	0.89	5.8	15	13	2.92	----	1.70	"	120-130
38.52	17.7	14.91	0.94	5.3	18	15	2.95	----	2.02	"	"
39.07	35.2	29.19	2.32	6.6	35	29	2.99	----	4.35	"	130-140
39.53	40.4	33.24	3.16	7.8	40	33	3.02	----	5.04	"	"
40.07	31.7	25.94	2.36	7.4	32	26	3.06	----	3.87	"	"
40.58	18.7	15.22	1.15	6.1	19	15	3.10	----	2.13	"	"
41.05	24.8	20.09	1.48	6.0	25	20	3.13	----	2.94	"	"
41.59	40.1	32.30	2.18	5.4	40	32	3.17	----	4.98	"	"
42.04	43.1	34.55	3.64	8.4	43	35	3.20	----	5.37	"	"
42.58	47.0	37.47	3.35	7.1	47	37	3.24	----	5.89	"	"
43.02	39.2	31.10	2.38	6.1	39	31	3.27	----	4.84	"	"
43.56	34.9	27.54	1.82	5.2	35	28	3.31	----	4.27	"	"
44.06	39.5	31.00	2.10	5.3	40	31	3.35	----	4.87	"	"
44.51	42.7	33.35	2.15	5.0	43	33	3.38	----	5.30	"	"
45.03	47.1	36.58	2.52	5.4	47	37	3.42	----	5.88	"	"
45.56	48.5	37.46	3.23	6.7	49	37	3.46	----	6.06	"	"
46.08	43.0	33.02	2.52	5.9	43	33	3.50	----	5.32	"	"
46.52	42.9	32.79	2.39	5.6	43	33	3.53	----	5.31	"	"
47.04	45.4	34.50	2.30	5.1	45	35	3.57	----	5.63	"	"
47.54	60.9	46.02	2.88	4.7	41	31	3.60	----	7.70	Silty CLAY to CLAY	"
48.07	50.6	38.02	3.06	6.0	51	38	3.64	----	6.32	CLAY	"
48.51	44.1	32.97	2.46	5.6	44	33	3.67	----	5.45	"	"
49.04	33.5	24.90	1.97	5.9	34	25	3.71	----	4.03	"	"
49.58	26.0	19.21	1.41	5.4	26	19	3.75	----	3.03	"	"
50.03	23.0	16.91	1.41	6.1	23	17	3.78	----	2.62	"	"
50.56	26.3	19.21	1.51	5.7	26	19	3.82	----	3.06	"	"
51.01	31.1	22.60	1.95	6.3	31	23	3.85	----	3.69	"	"
51.54	40.5	29.25	2.65	6.5	41	29	3.89	----	4.94	"	"
52.08	28.8	20.68	2.08	7.2	29	21	3.93	----	3.38	"	"
52.52	31.2	22.28	1.40	4.5	21	15	3.96	----	3.69	Silty CLAY to CLAY	"
53.06	37.5	26.62	2.33	6.2	38	27	4.00	----	4.53	CLAY	"
53.56	24.1	17.03	1.43	5.9	24	17	4.04	----	2.74	"	"
54.07	27.1	19.07	1.48	5.5	27	19	4.08	----	3.13	"	"
54.59	35.5	24.86	2.11	5.9	36	25	4.11	----	4.25	"	"
55.02	30.7	21.42	1.88	6.1	31	21	4.14	----	3.60	"	"

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 62.0 feet

CPT NO.: CPT-B-18
DATE : 07-03-2008
TIME : 14:54:23
Groundwater measured at 3.7 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
55.53	29.1	20.21	1.86	6.4	29	20	4.18	----	3.38	CLAY	130-140
56.04	34.2	23.65	1.91	5.6	34	24	4.22	----	4.06	"	"
56.53	45.8	31.53	2.73	6.0	46	32	4.25	----	5.60	"	"
57.04	32.9	22.54	2.14	6.5	33	23	4.29	----	3.88	"	"
57.53	24.4	16.64	1.52	6.2	24	17	4.33	----	2.74	"	"
58.01	24.3	16.50	1.40	5.8	24	17	4.36	----	2.72	"	"
58.58	25.3	17.10	1.47	5.8	25	17	4.40	----	2.85	"	"
59.05	32.2	21.67	2.17	6.7	32	22	4.44	----	3.77	"	"
59.54	42.1	28.20	4.55	10.8	42	28	4.47	----	5.08	"	"
60.03	27.3	18.20	1.97	7.2	27	18	4.51	----	3.10	"	"
60.50	87.0	57.75	4.32	5.0	87	58	4.54	----	11.06	Very Stiff Fine Grained *	"
61.05	100.7	66.49	6.03	6.0	101	66	4.59	----	12.88	"	>140
61.51	102.1	67.10	6.07	5.9	102	67	4.62	----	13.06	"	"
62.03	39.0	25.51	4.73	12.0	39	26	4.66	----	4.65	CLAY	130-140

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 40.0 feet

CPT NO.: CPT-B-22
DATE : 07-03-2008
TIME : 12:49:49
Groundwater measured at 4.0 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.52	36.6	58.56	1.49	4.1	18	29	0.06	----	4.88	Clayey SILT to Silty CLAY	130-140
1.05	46.3	74.08	2.85	6.2	46	74	0.13	----	6.16	CLAY	"
1.56	53.6	85.76	3.73	7.0	54	86	0.20	----	7.13	"	"
2.05	52.2	83.52	3.80	7.3	52	84	0.27	----	6.94	"	"
2.57	49.6	79.36	4.42	8.9	50	79	0.34	----	6.59	"	"
3.00	41.8	66.88	4.01	9.6	42	67	0.40	----	5.55	"	"
3.52	20.1	32.16	2.42	12.0	20	32	0.47	----	2.65	"	"
4.05	29.8	47.68	2.19	7.3	30	48	0.50	----	3.94	"	"
4.58	37.1	59.36	2.49	6.7	37	59	0.54	----	4.91	"	"
5.03	20.4	32.64	1.79	8.8	20	33	0.57	----	2.68	"	"
5.58	19.2	30.72	1.09	5.7	19	31	0.62	----	2.51	"	"
6.04	24.3	38.88	1.41	5.8	24	39	0.65	----	3.19	"	"
6.59	45.2	72.32	2.57	5.7	45	72	0.69	----	5.97	"	"
7.04	36.3	58.08	1.92	5.3	36	58	0.72	----	4.78	"	"
7.51	20.8	33.28	1.34	6.4	21	33	0.76	----	2.71	"	"
8.05	35.3	56.48	2.10	5.9	35	56	0.79	----	4.63	"	"
8.51	26.2	41.20	1.79	6.8	26	41	0.83	----	3.42	"	"
9.01	35.8	54.99	2.22	6.2	36	55	0.86	----	4.69	"	"
9.56	41.8	62.56	1.65	3.9	21	31	0.90	----	5.49	Clayey SILT to Silty CLAY	"
10.02	40.2	58.82	1.05	2.6	16	24	0.94	----	5.27	Sandy SILT to Clayey SILT	"
10.56	39.3	55.96	0.97	2.5	16	22	0.98	----	5.15	"	"
11.02	33.4	46.59	1.27	3.8	17	23	1.01	----	4.35	Clayey SILT to Silty CLAY	"
11.56	39.5	54.30	1.87	4.7	26	36	1.05	----	5.16	Silty CLAY to CLAY	"
12.02	33.6	45.61	2.12	6.3	34	46	1.08	----	4.37	CLAY	"
12.56	35.3	47.18	2.13	6.0	35	47	1.12	----	4.59	"	"
13.01	30.6	40.38	1.57	5.1	31	40	1.15	----	3.96	"	"
13.56	25.9	33.64	1.33	5.1	26	34	1.19	----	3.33	"	"
14.02	33.0	42.30	1.84	5.6	33	42	1.23	----	4.27	"	"
14.56	28.5	35.96	1.63	5.7	29	36	1.27	----	3.67	"	"
15.02	26.3	32.76	1.59	6.0	26	33	1.30	----	3.37	"	"
15.57	31.5	38.64	1.41	4.5	21	26	1.34	----	4.06	Silty CLAY to CLAY	"
16.03	50.3	60.90	2.75	5.5	50	61	1.37	----	6.56	CLAY	"
16.57	33.2	39.57	2.19	6.6	33	40	1.41	----	4.28	"	"
17.02	27.4	32.23	1.83	6.7	27	32	1.45	----	3.50	"	"
17.57	27.0	31.24	2.07	7.7	27	31	1.49	----	3.44	"	"
18.01	36.8	42.09	2.38	6.5	37	42	1.52	----	4.75	"	"
18.52	33.7	38.10	1.95	5.8	34	38	1.55	----	4.33	"	"
19.06	34.4	38.40	1.88	5.5	34	38	1.59	----	4.42	"	"
19.51	32.4	35.79	1.85	5.7	32	36	1.63	----	4.15	"	"
20.04	28.0	30.54	1.61	5.8	28	31	1.66	----	3.55	"	"
20.58	23.3	25.09	1.58	6.8	23	25	1.70	----	2.92	"	"
21.02	26.9	28.65	1.51	5.6	27	29	1.74	----	3.40	"	"
21.56	35.8	37.73	1.95	5.4	36	38	1.78	----	4.58	"	"
22.09	31.8	33.23	1.98	6.2	32	33	1.81	----	4.04	"	"
22.52	34.7	35.99	1.69	4.9	35	36	1.84	----	4.42	"	"
23.05	29.1	29.92	1.60	5.5	29	30	1.88	----	3.67	"	"
23.57	28.8	29.35	1.85	6.4	29	29	1.92	----	3.63	"	"
24.02	23.2	23.46	1.37	5.9	23	23	1.95	----	2.88	"	"
24.54	20.5	20.54	1.16	5.7	21	21	1.99	----	2.51	"	"
25.08	17.6	17.59	1.06	6.0	18	18	2.03	----	2.12	"	"
25.52	13.8	13.78	0.83	6.0	14	14	2.06	----	1.61	"	120-130
26.05	17.2	17.17	0.86	5.0	17	17	2.09	----	2.06	"	"
26.57	17.7	17.66	0.88	5.0	18	18	2.12	----	2.12	"	"
27.08	14.2	14.16	0.77	5.4	14	14	2.16	----	1.65	"	"
27.52	16.4	16.34	0.93	5.7	16	16	2.18	----	1.94	"	"

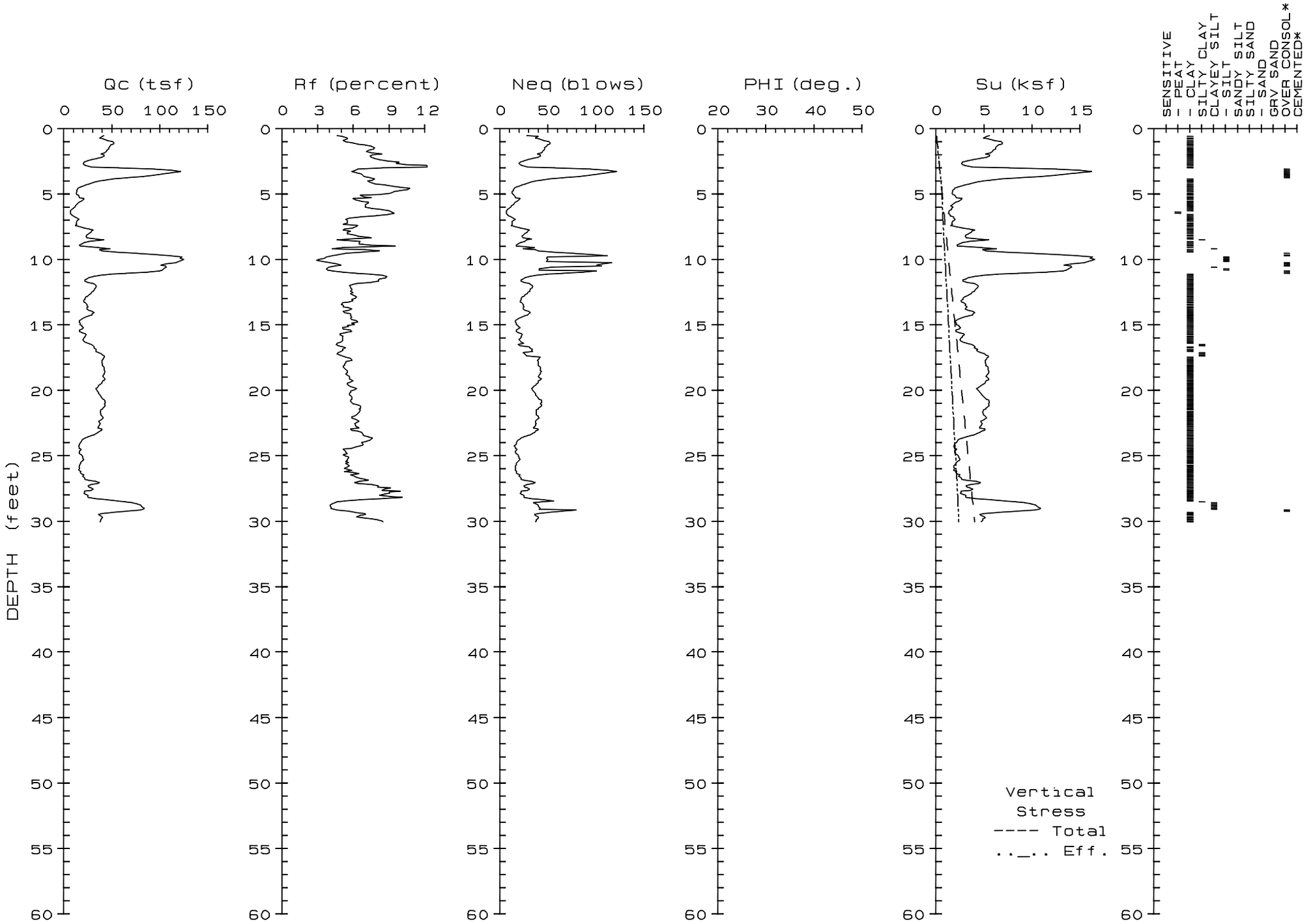
PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)
Terminated at 40.0 feet

CPT NO.: CPT-B-22
DATE : 07-03-2008
TIME : 12:49:49
Groundwater measured at 4.0 feet

KLEINFELDER, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qc (tsf)	Qc' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.04	43.0	42.81	2.82	6.6	43	43	2.22	----	5.48	CLAY	130-140
28.57	104.9	104.36	4.11	3.9	52	52	2.26	----	13.73	Clayey SILT to Silty CLAY	"
29.08	122.3	121.57	5.32	4.3	122	122	2.30	----	16.05	Very Stiff Fine Grained *	>140
29.57	110.2	109.46	5.09	4.6	110	109	2.34	----	14.43	"	"
30.05	92.5	91.81	4.45	4.8	93	92	2.37	----	12.06	"	130-140
30.54	79.0	78.36	2.98	3.8	40	39	2.41	----	10.26	Clayey SILT to Silty CLAY	"
31.02	19.0	18.83	1.16	6.1	19	19	2.44	----	2.26	CLAY	"
31.53	16.6	16.44	0.77	4.6	17	16	2.47	----	1.93	"	120-130
32.03	22.8	22.49	1.03	4.5	23	22	2.51	----	2.75	"	130-140
32.54	21.6	21.04	1.08	5.0	22	21	2.55	----	2.59	"	"
33.05	26.5	25.49	1.47	5.5	27	25	2.59	----	3.24	"	"
33.58	40.5	38.45	1.89	4.7	27	26	2.62	----	5.10	Silty CLAY to CLAY	"
34.01	33.9	31.83	1.57	4.6	23	21	2.65	----	4.22	"	"
34.53	46.0	42.63	2.25	4.9	31	28	2.69	----	5.82	"	"
35.04	40.8	37.31	2.00	4.9	27	25	2.73	----	5.13	"	"
35.55	39.6	35.72	2.07	5.2	40	36	2.77	----	4.96	CLAY	"
36.07	36.9	32.83	1.76	4.8	25	22	2.80	----	4.60	Silty CLAY to CLAY	"
36.57	37.8	33.17	1.82	4.8	25	22	2.84	----	4.71	"	"
37.08	42.1	36.43	2.07	4.9	28	24	2.88	----	5.28	"	"
37.51	82.9	70.89	4.79	5.8	83	71	2.91	----	10.72	Very Stiff Fine Grained *	"
38.05	85.6	71.07	4.87	5.7	86	71	2.98	----	11.07	"	"
38.55	85.6	71.07	4.87	5.7	86	71	2.98	----	11.07	"	"
39.04	74.7	61.44	5.14	6.9	75	61	3.02	----	9.61	"	>140
39.51	114.5	93.69	7.15	6.2	115	94	3.06	----	14.91	"	"
40.05	53.1	43.21	3.89	7.3	53	43	3.10	----	6.72	CLAY	130-140

DEPTH = Sampling interval (~.1 feet)
Qc = Tip bearing resistance TotStr = Total Stress using est. density**
Fs = Sleeve friction resistance Phi = Soil friction angle*
Rf = Tip/Sleeve ratio Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf)
SPT = Equivalent Standard Penetration Test* (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)
References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975



Terminated at 30.0 feet

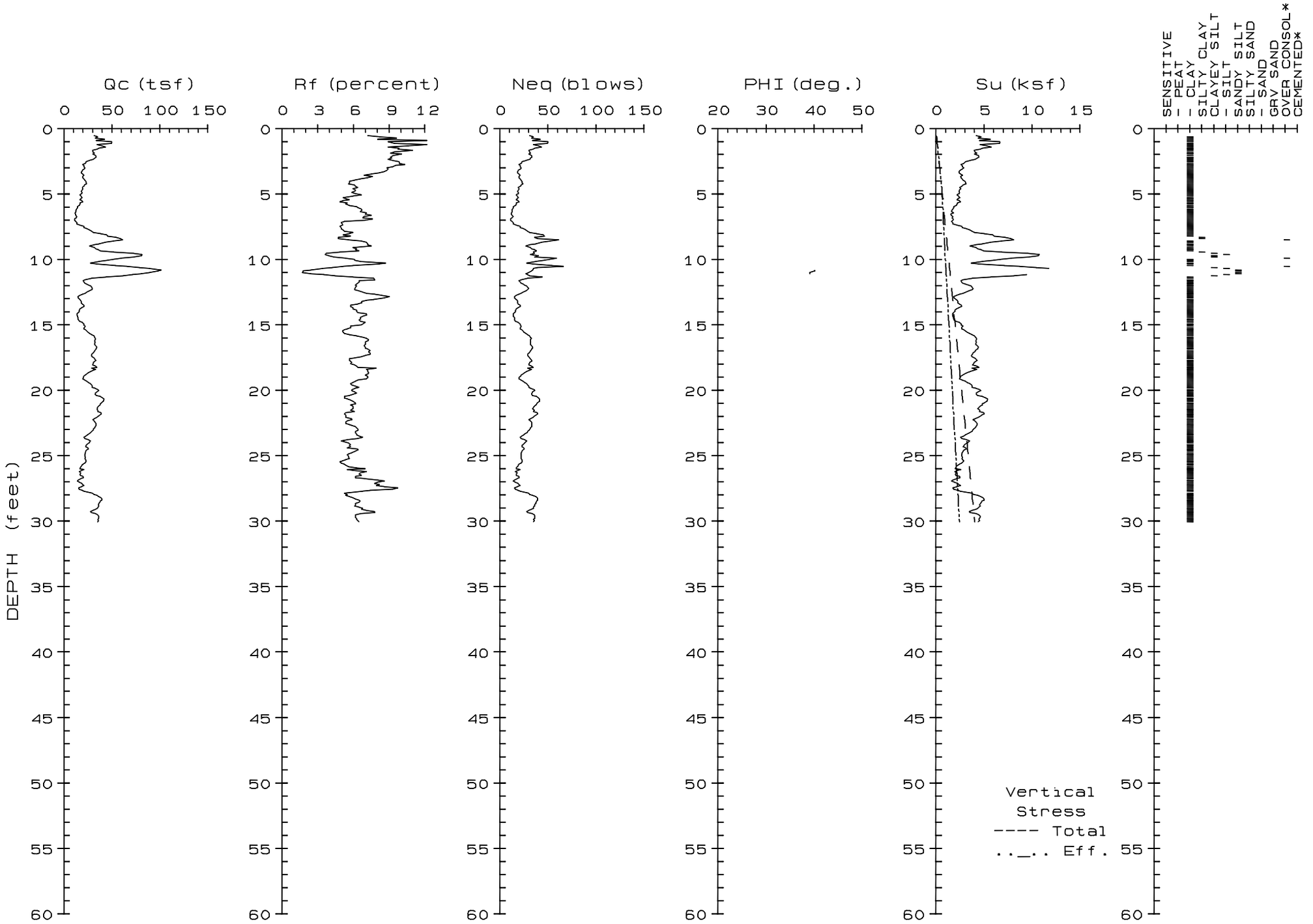
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-4
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

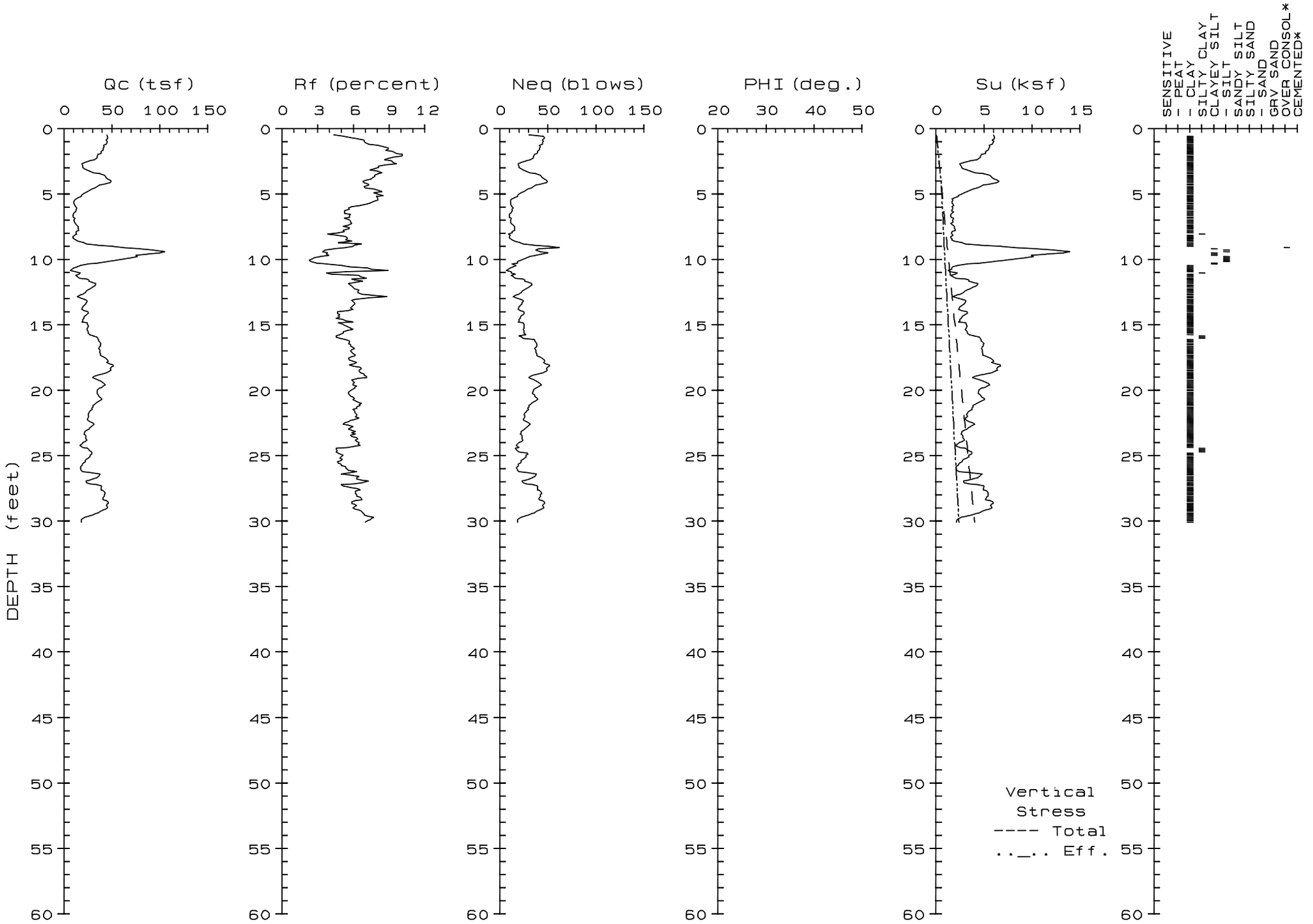
Groundwater measured at 4.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-5
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

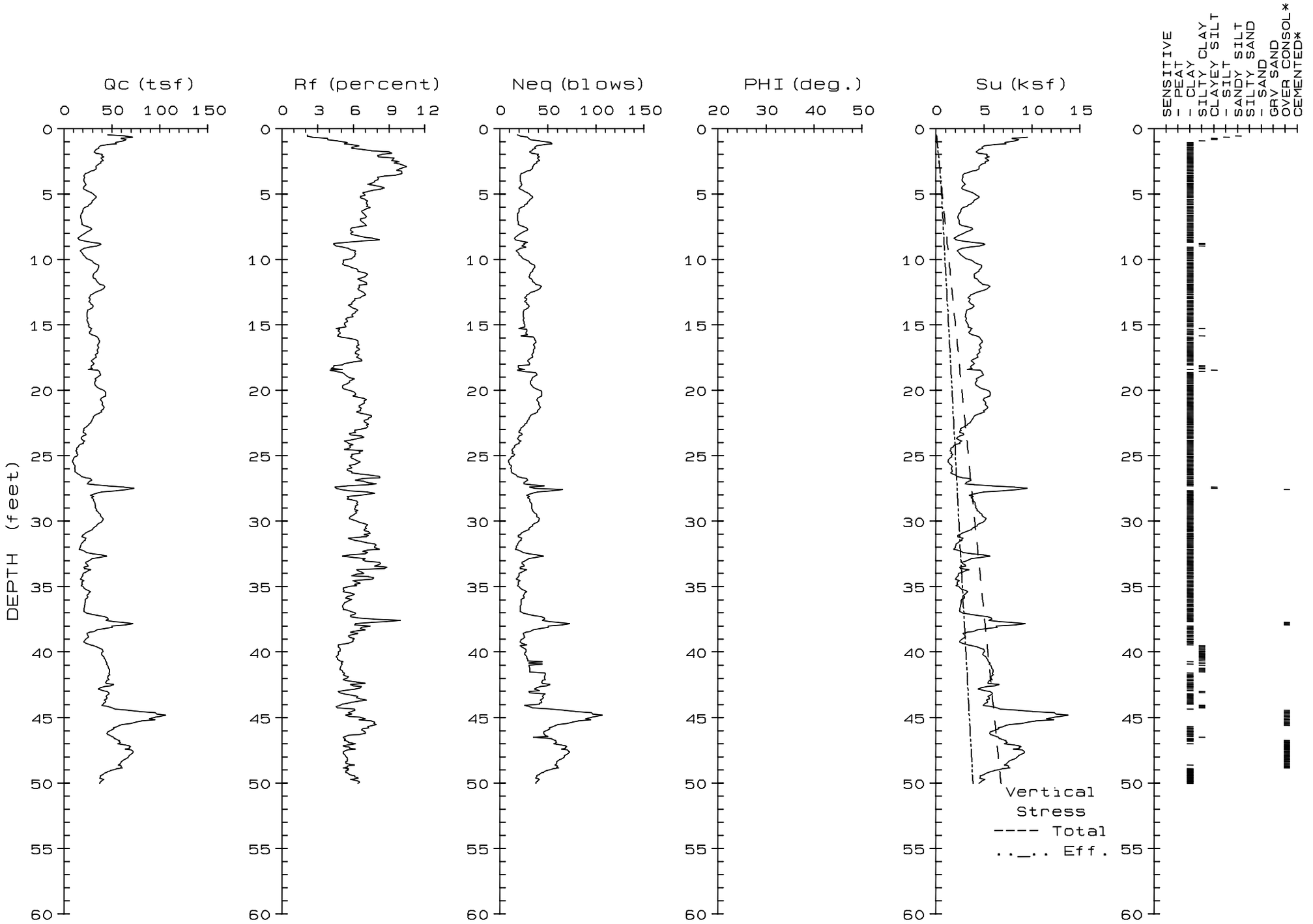
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-6
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

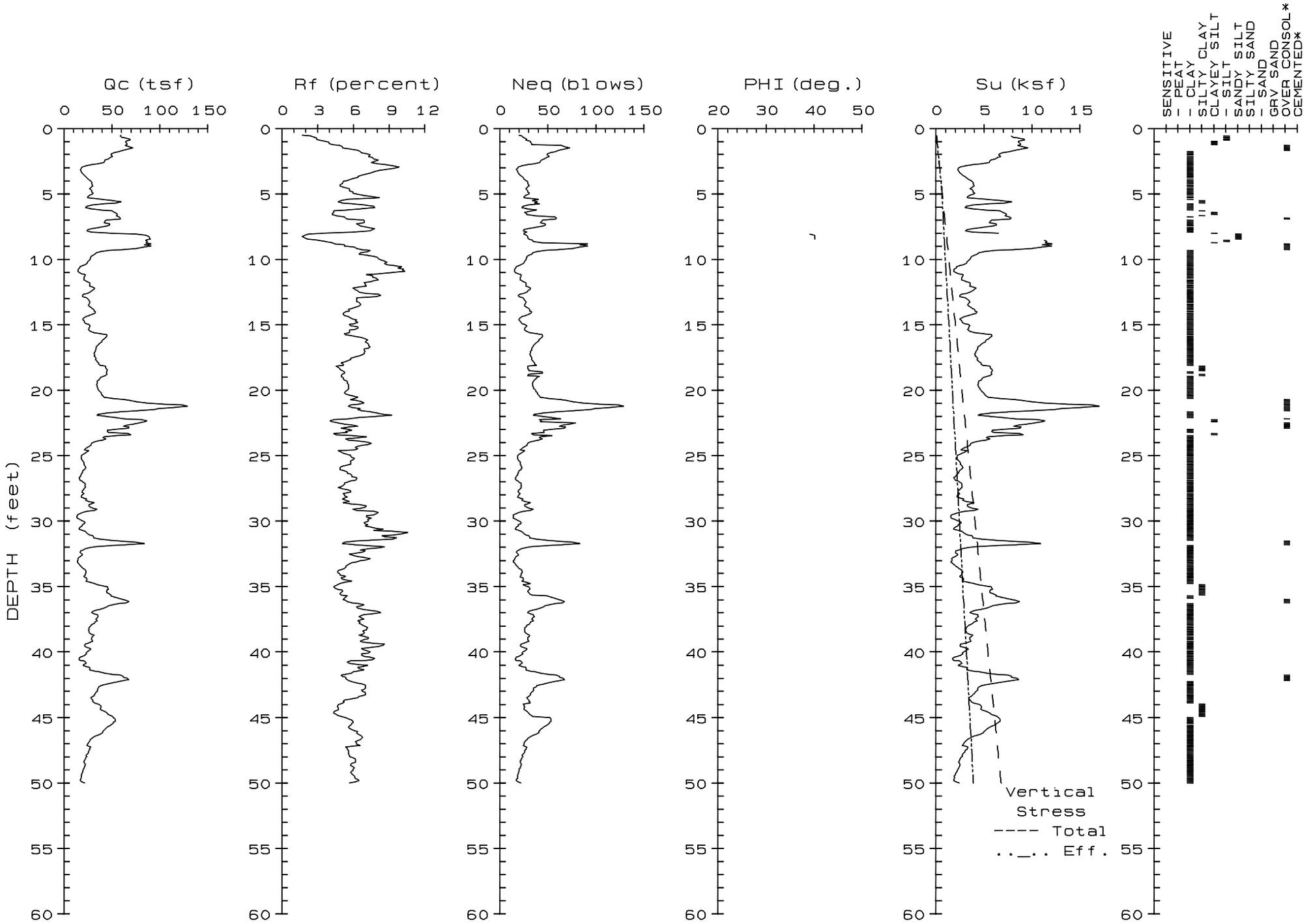
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-8
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

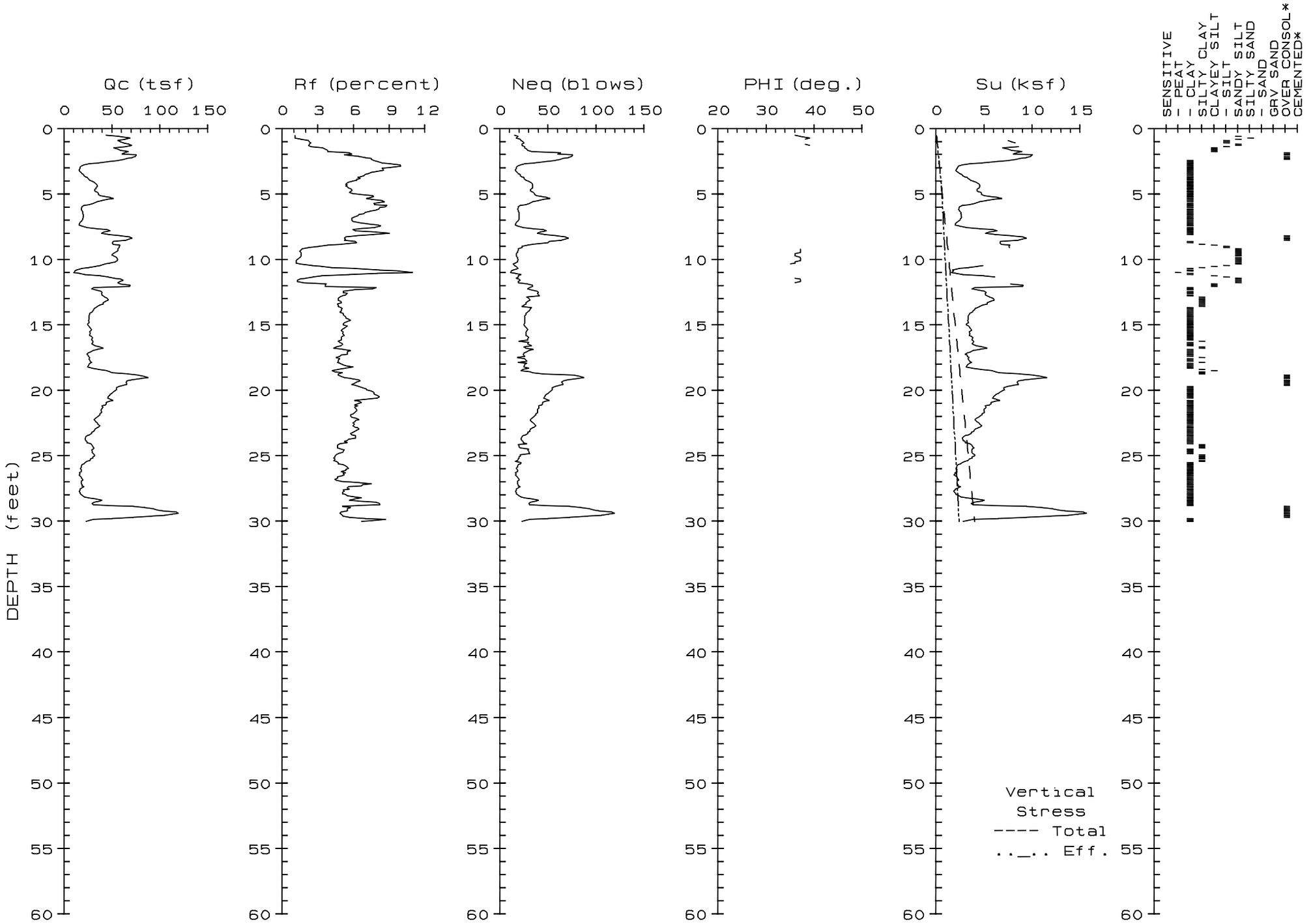
Groundwater measured at 4.3 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-10
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

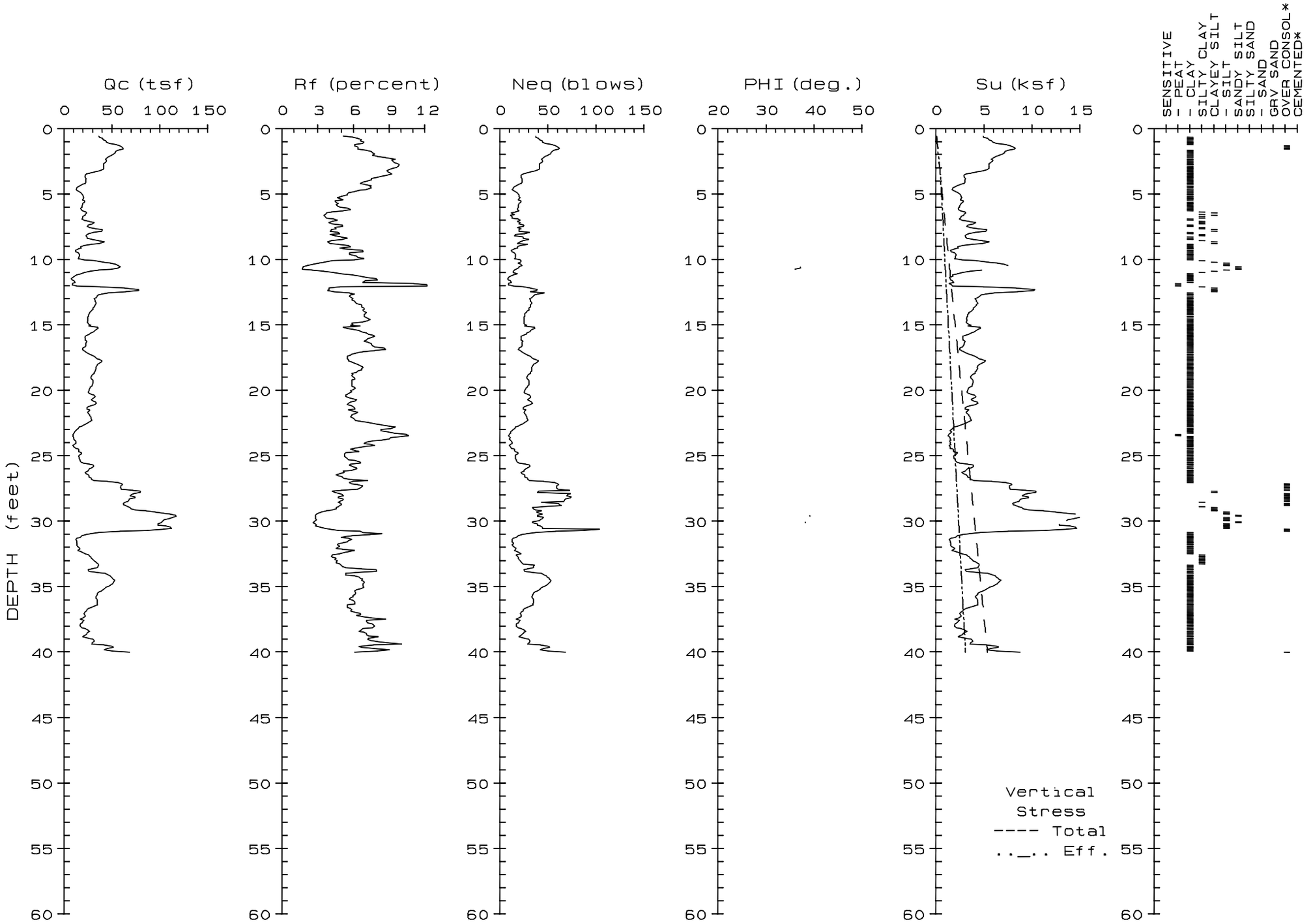
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-12
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

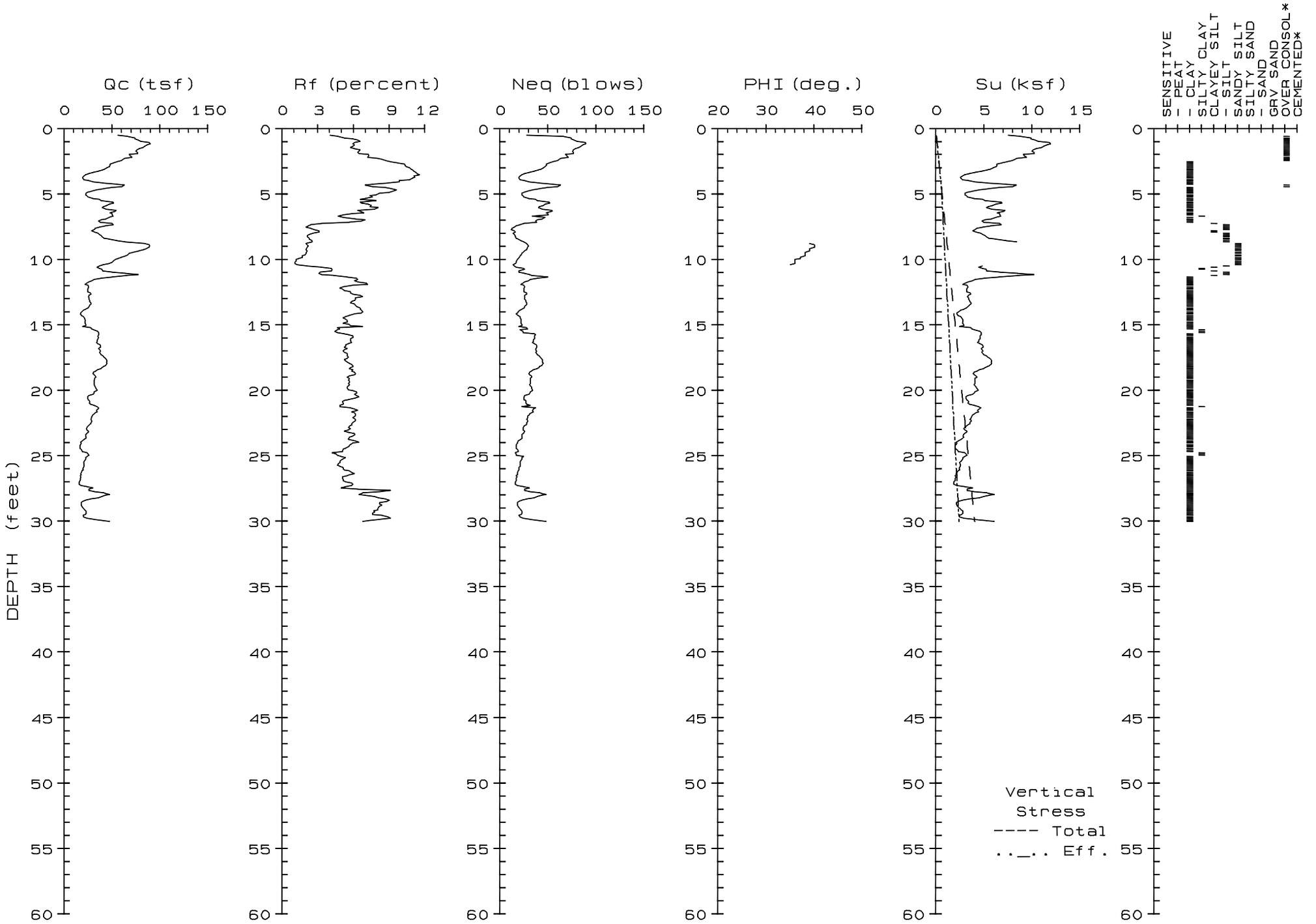
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-13
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

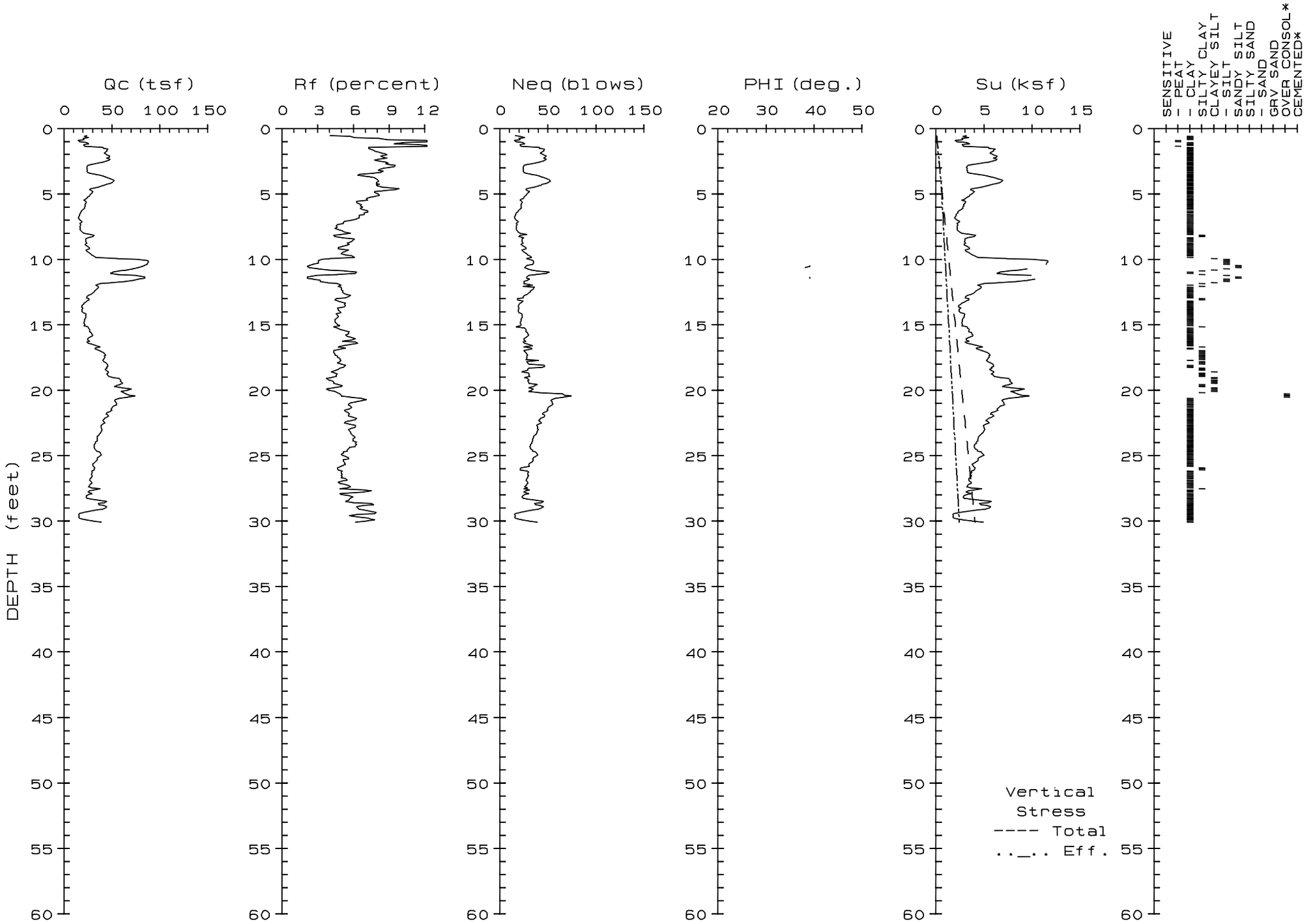
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-15
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

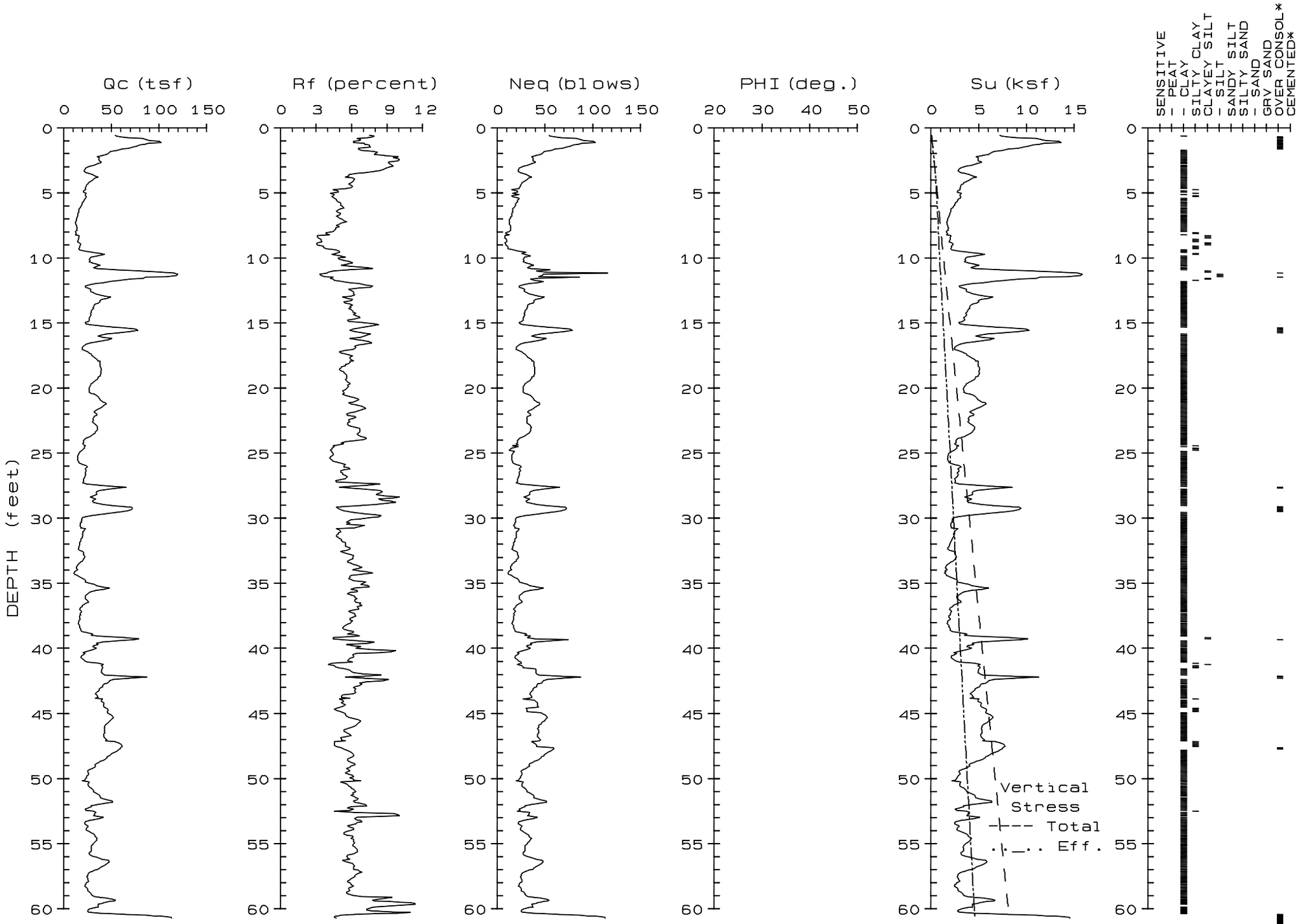
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-17
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 62.0 feet

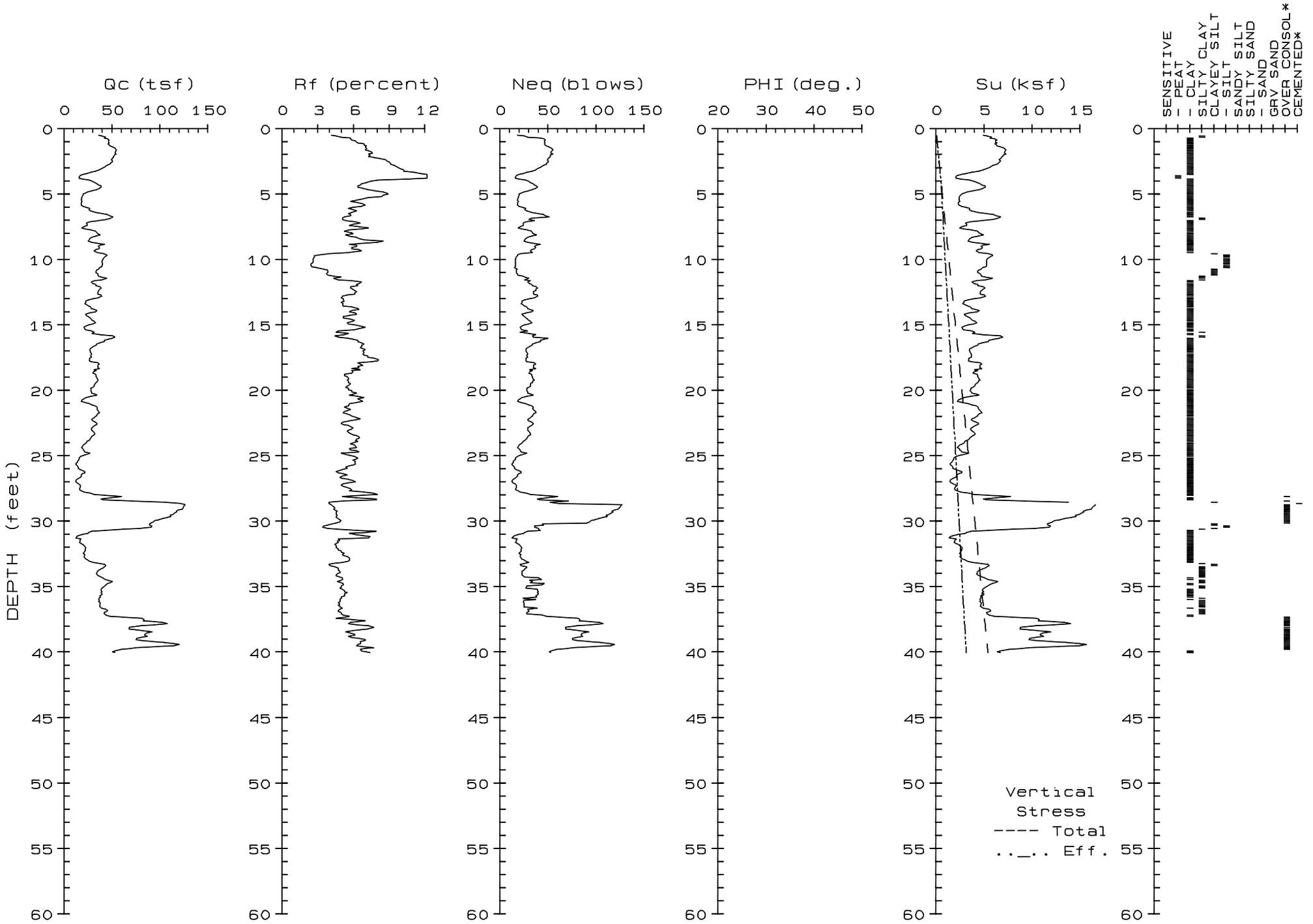
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-18
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

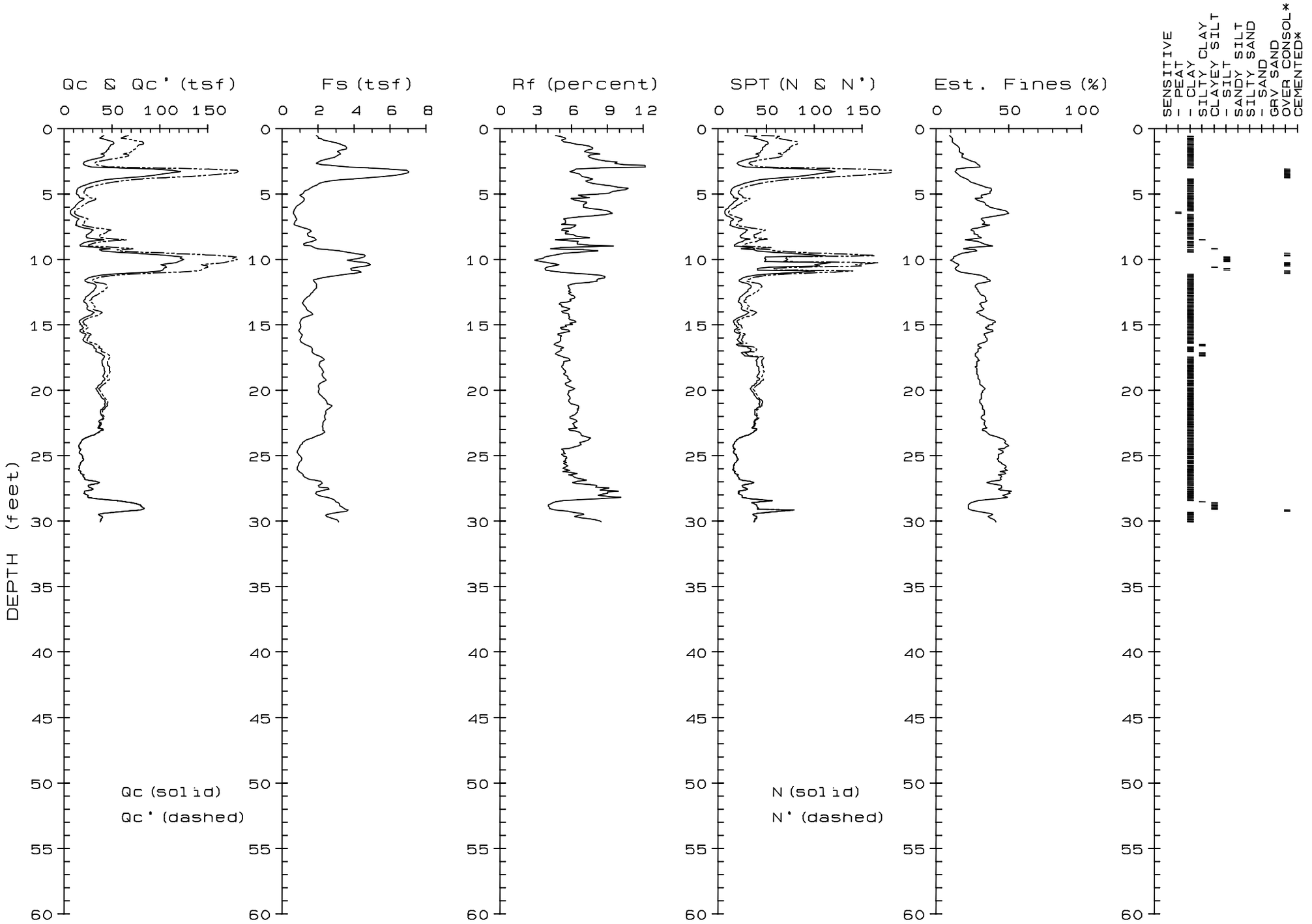
Groundwater measured at 4.0 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-22
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

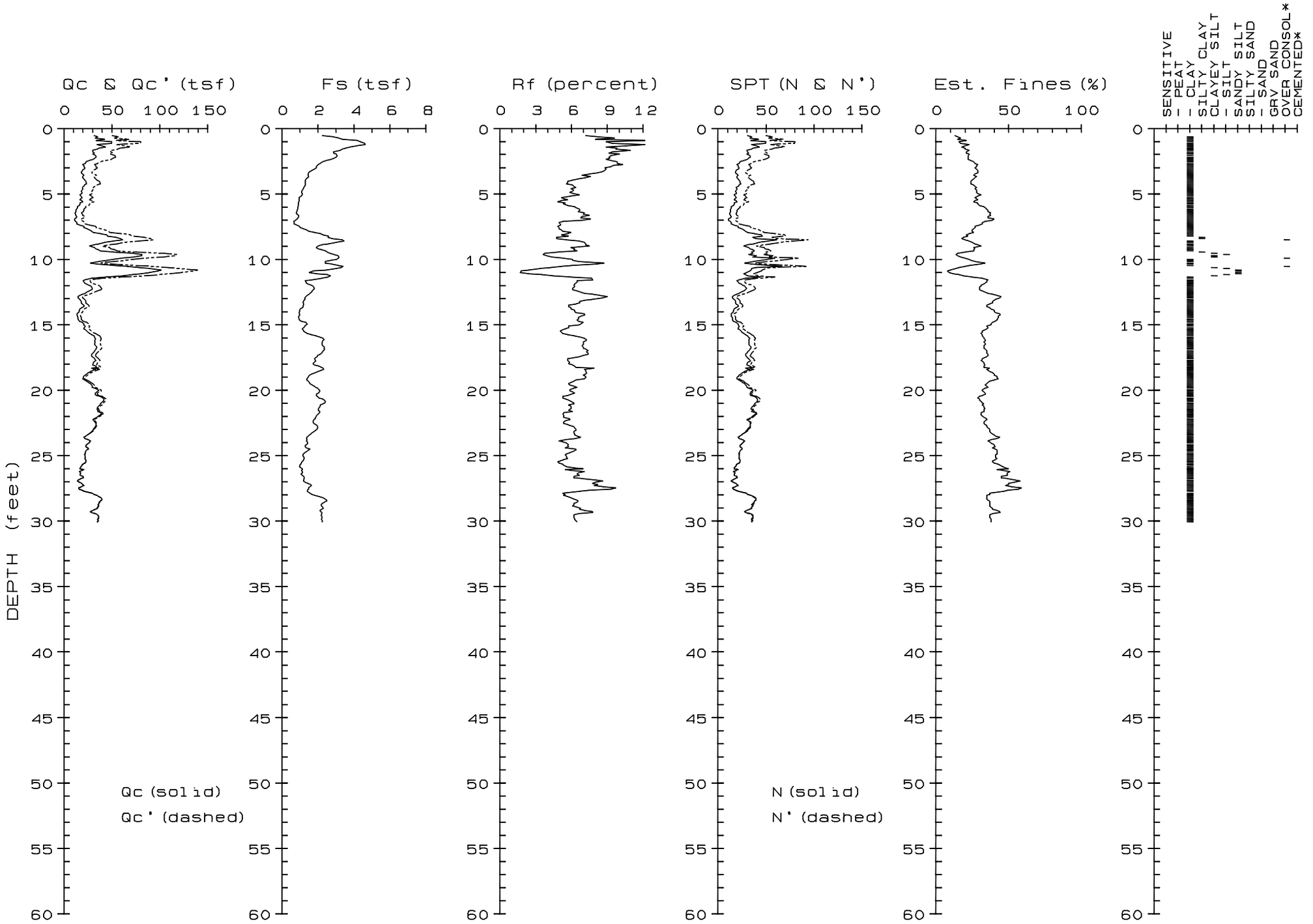
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-4
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

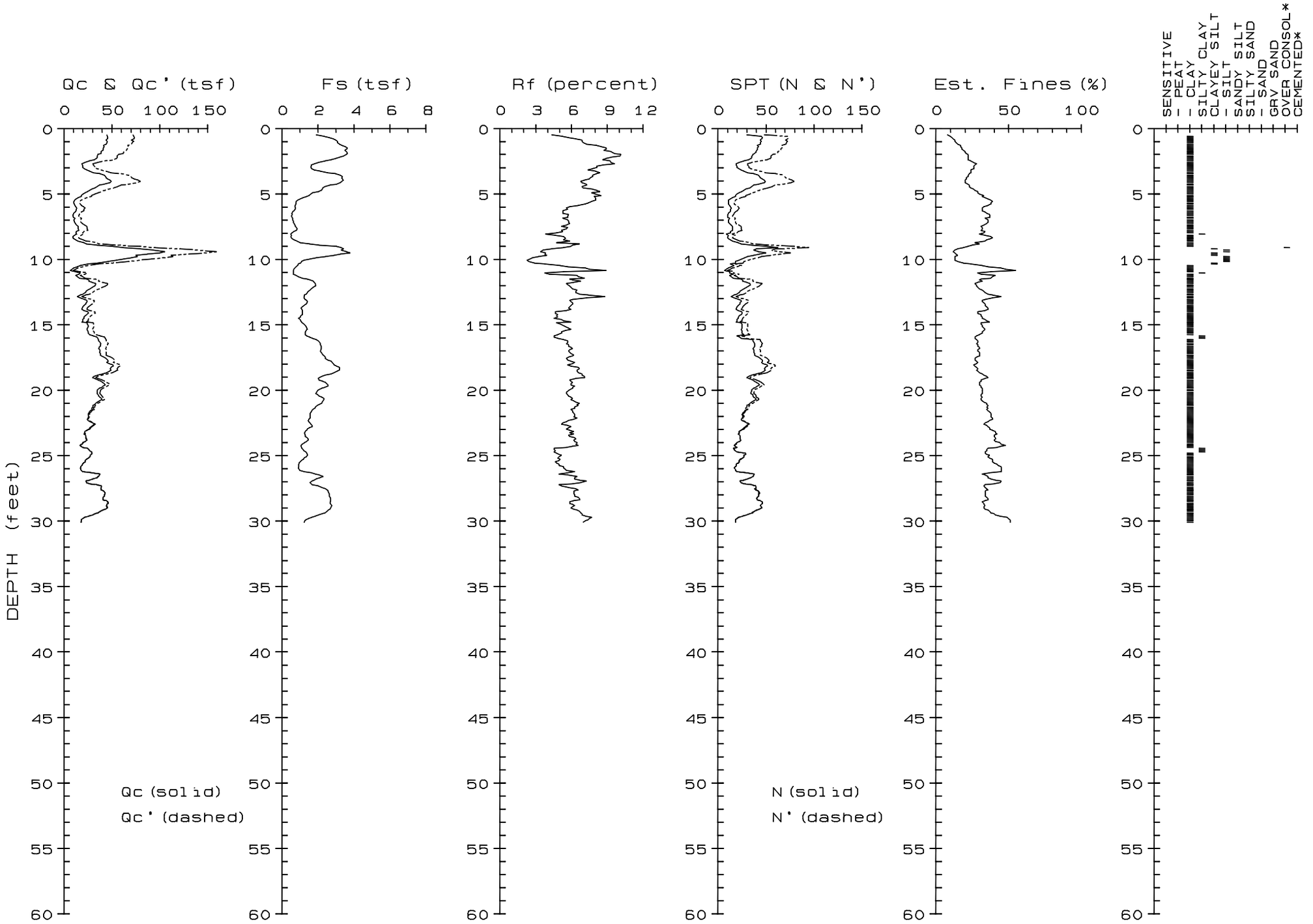
Groundwater measured at 4.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-5
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

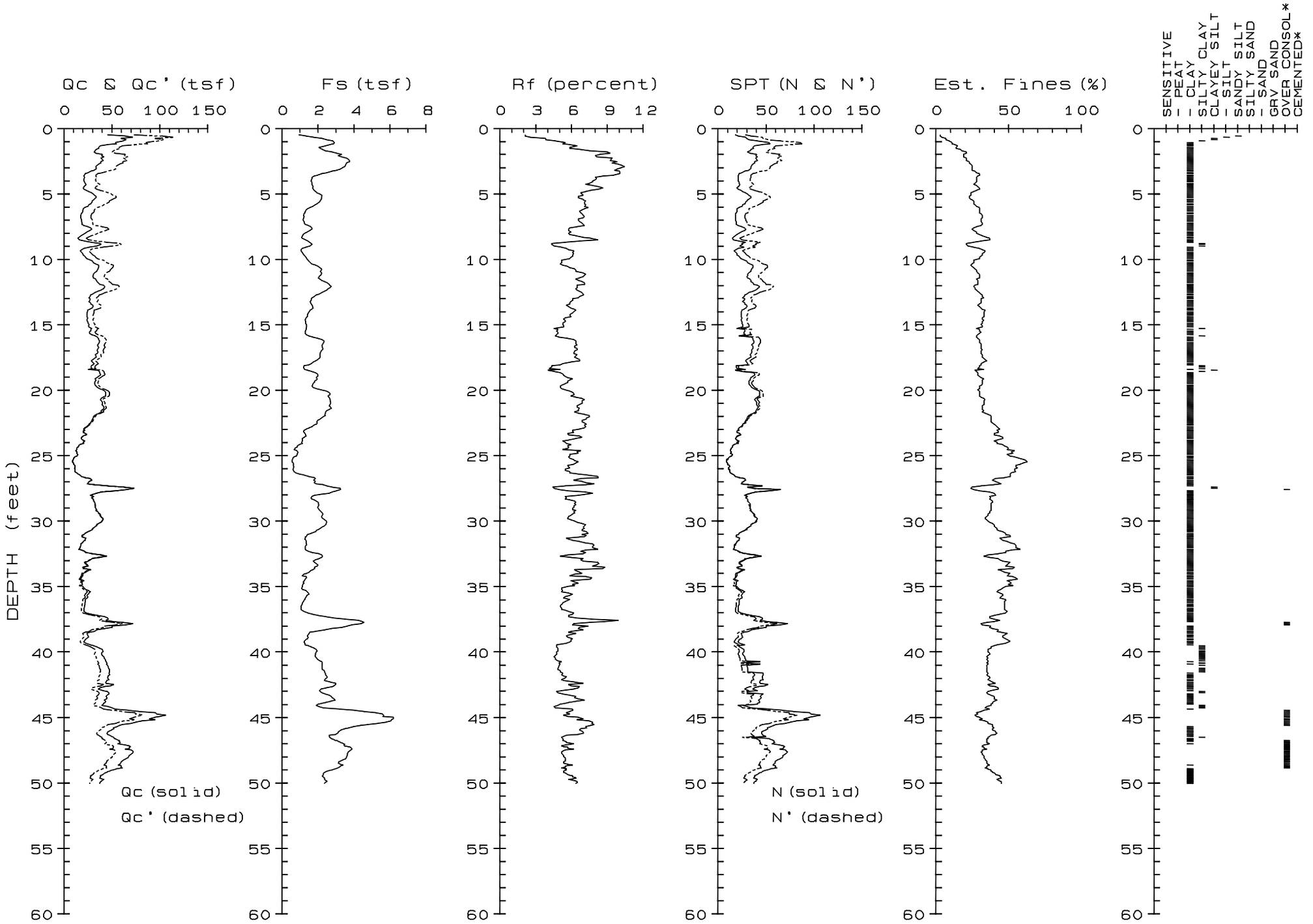
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-6
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

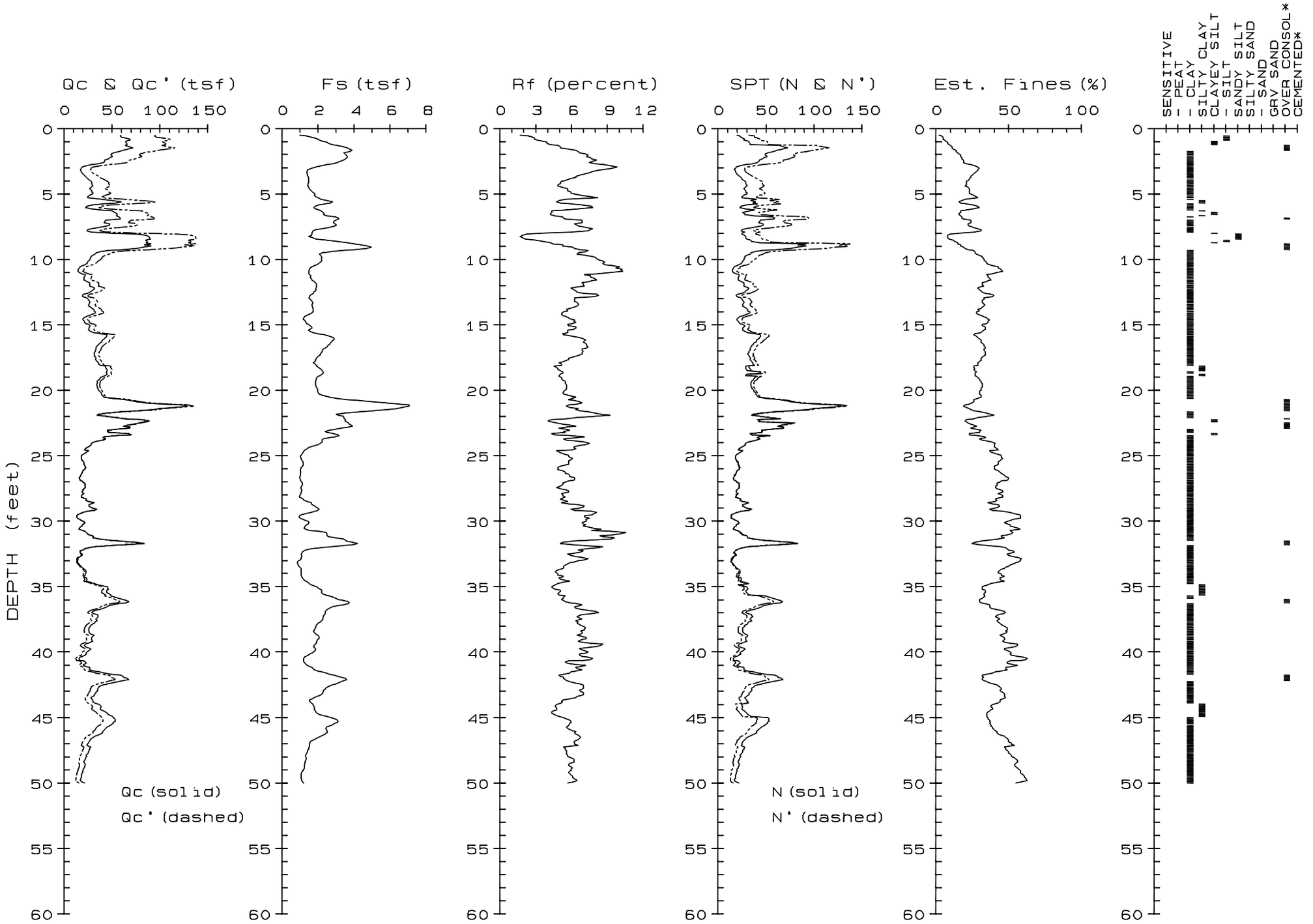
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-8
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

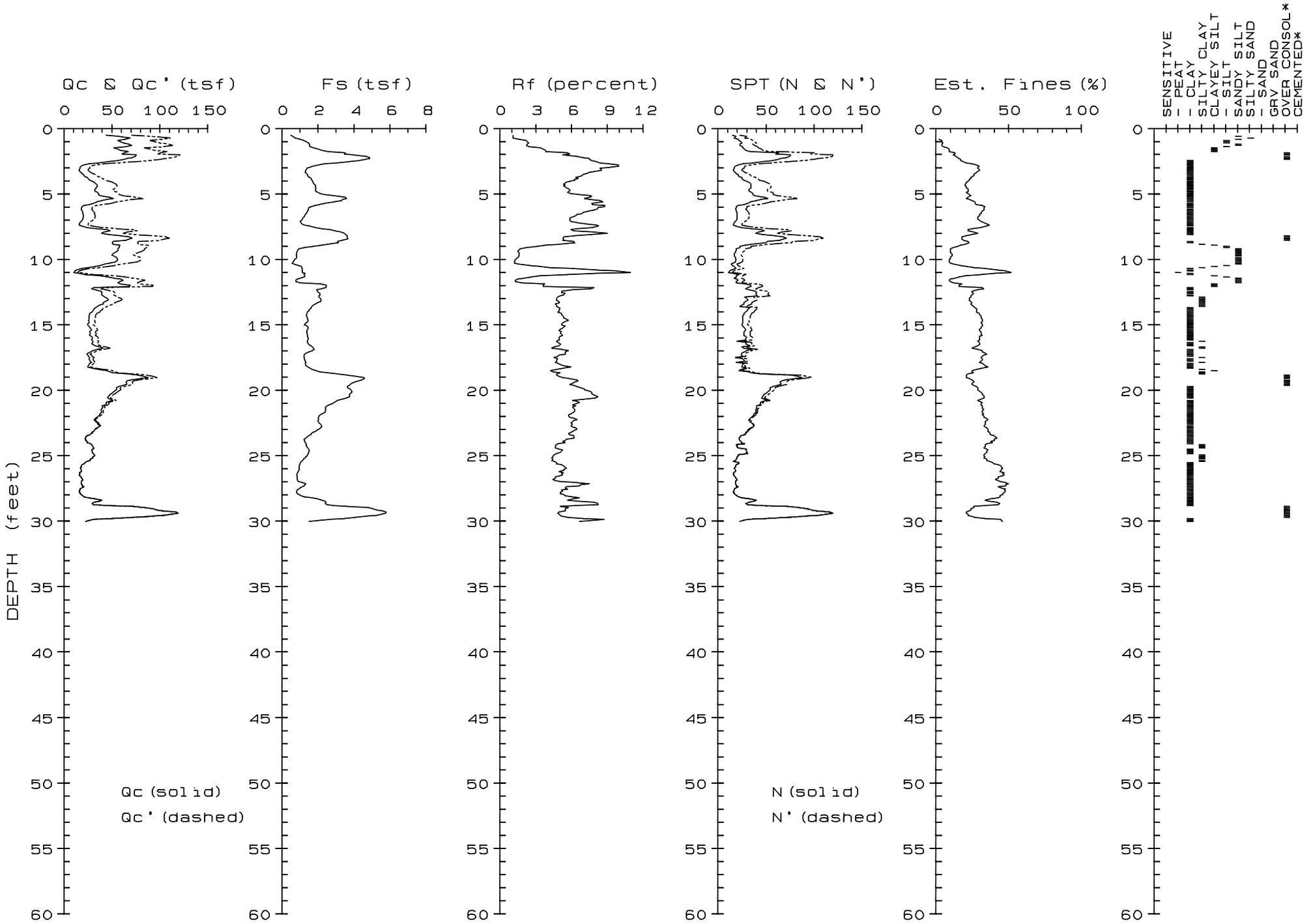
Groundwater measured at 4.3 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-10
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

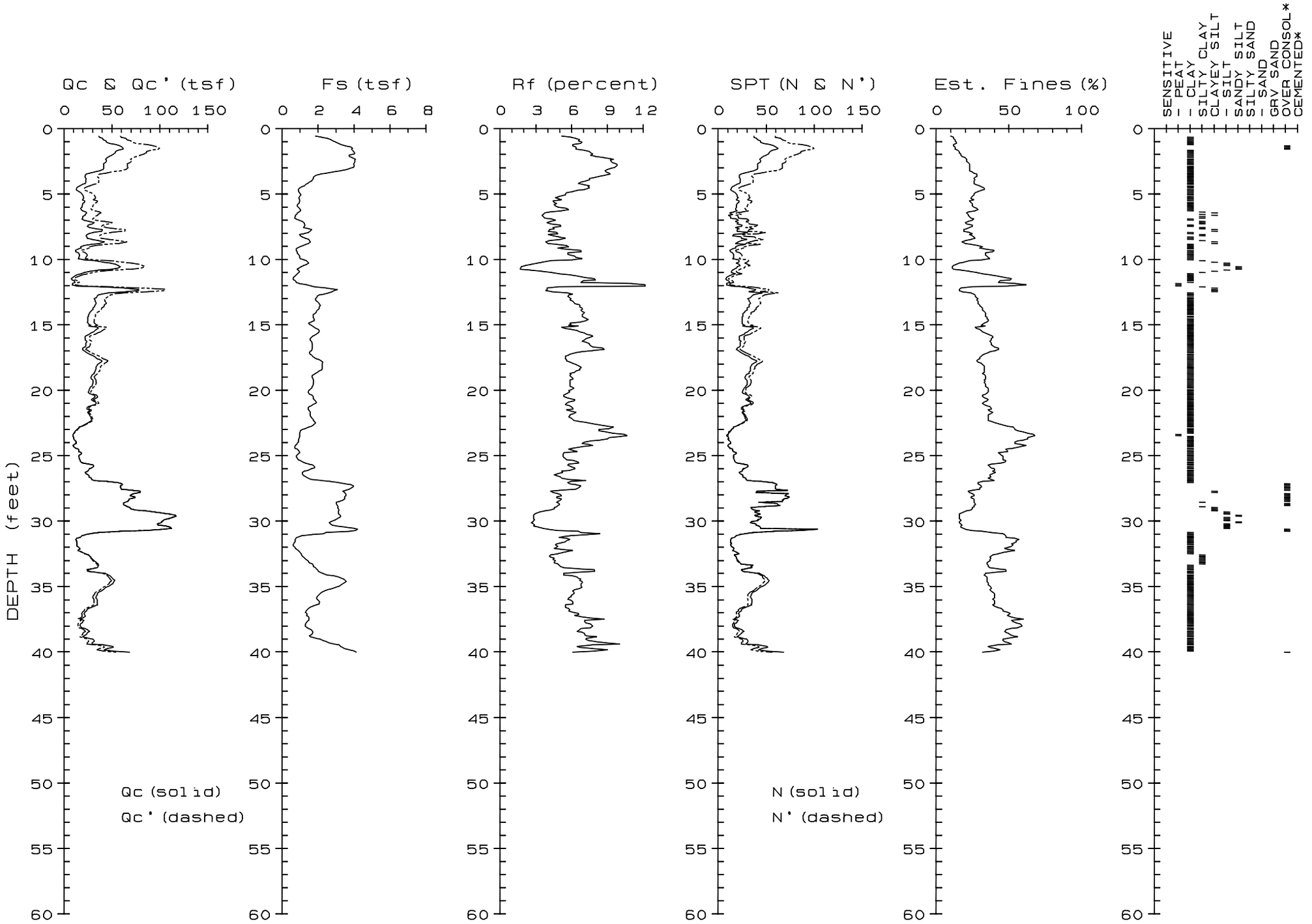
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-12
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

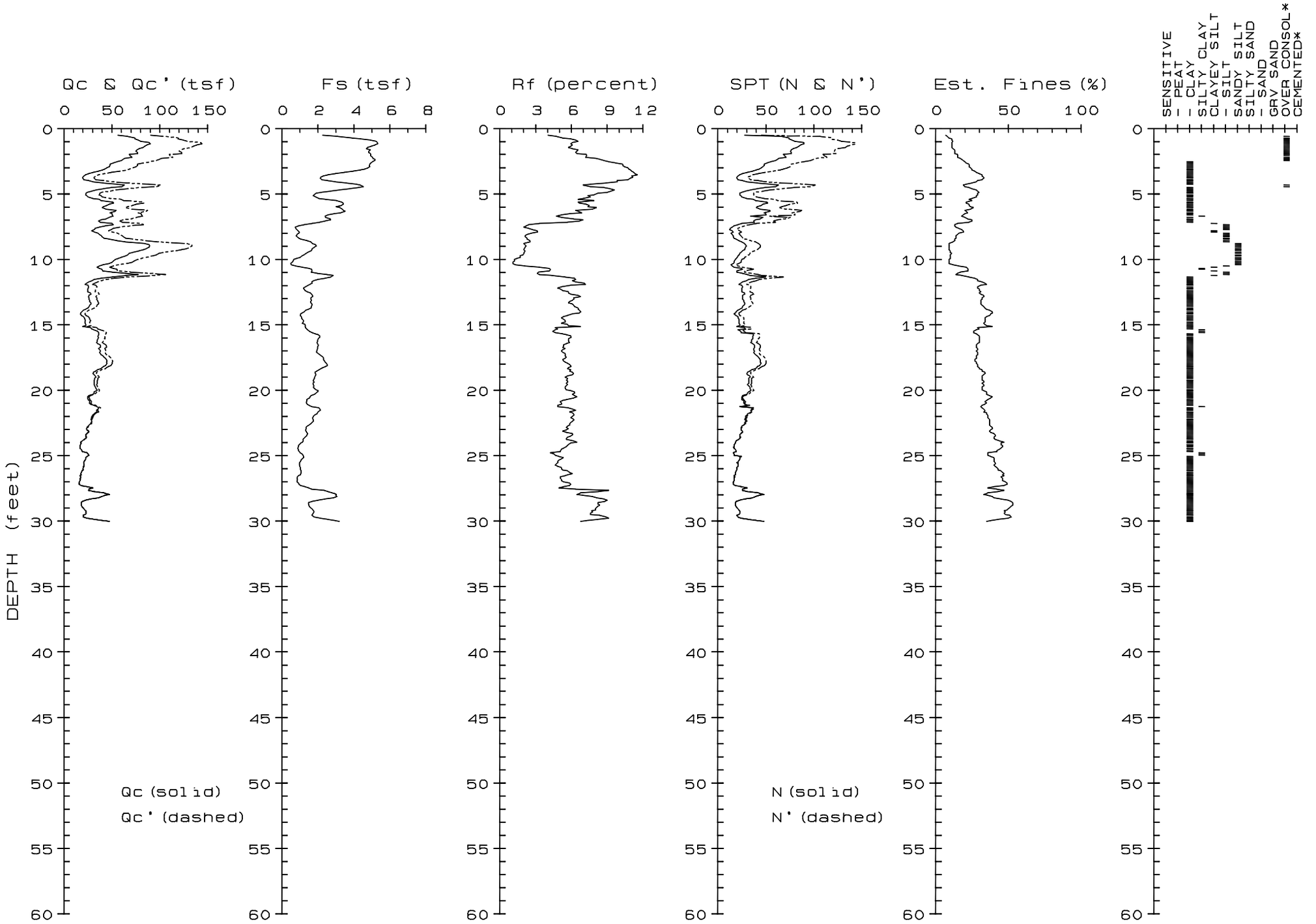
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-13
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

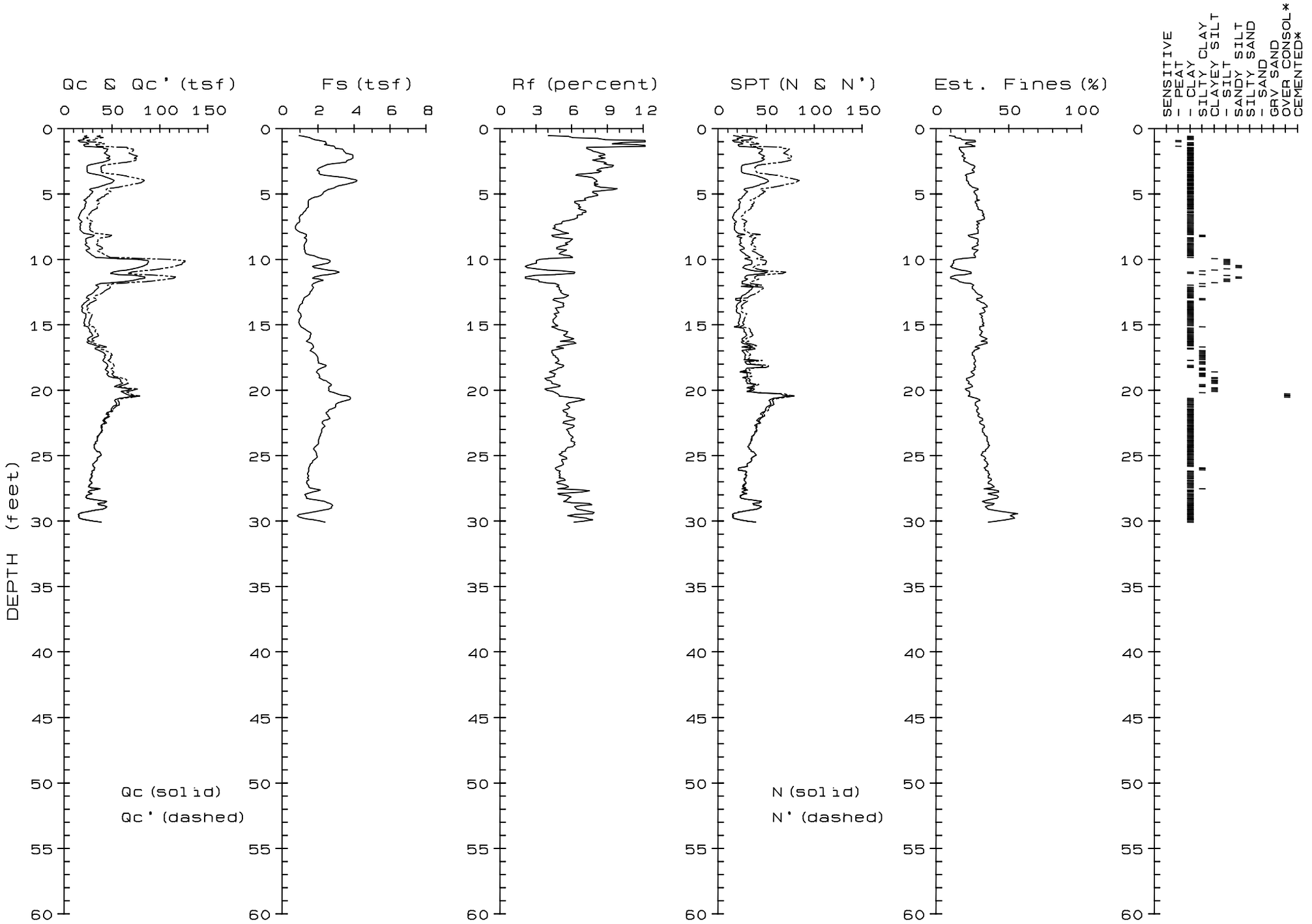
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-15
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

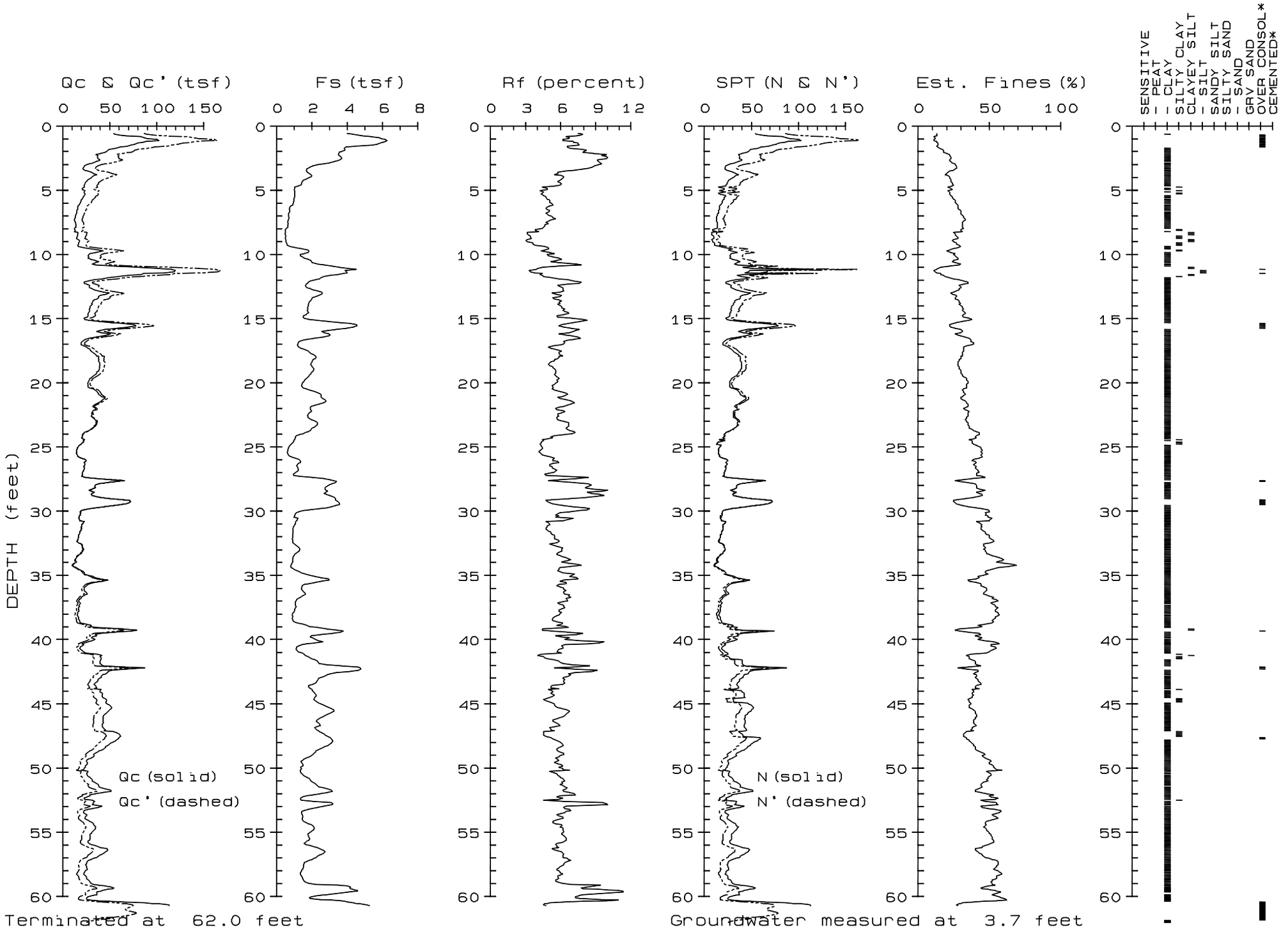
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-17
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates

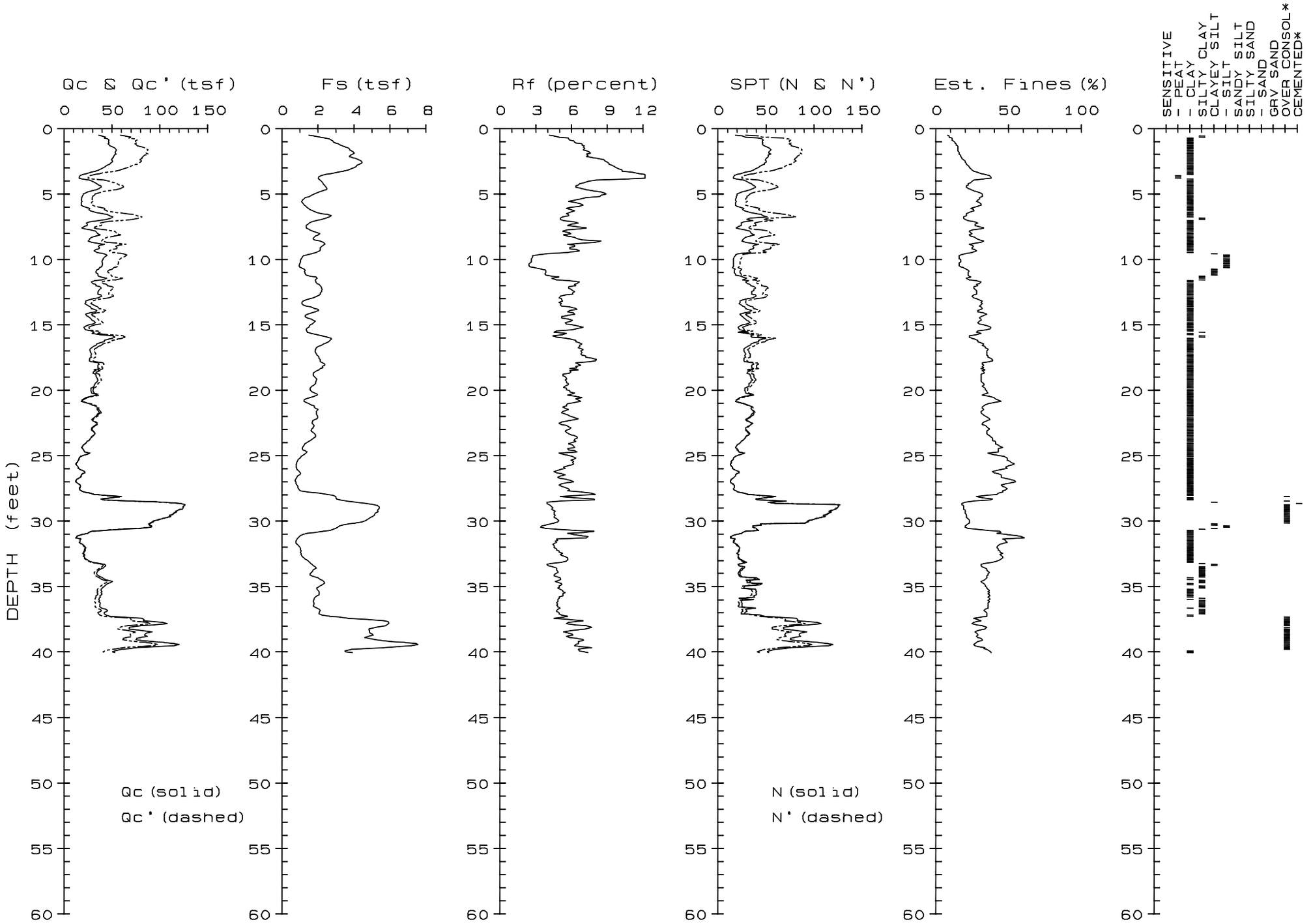


PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-18
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

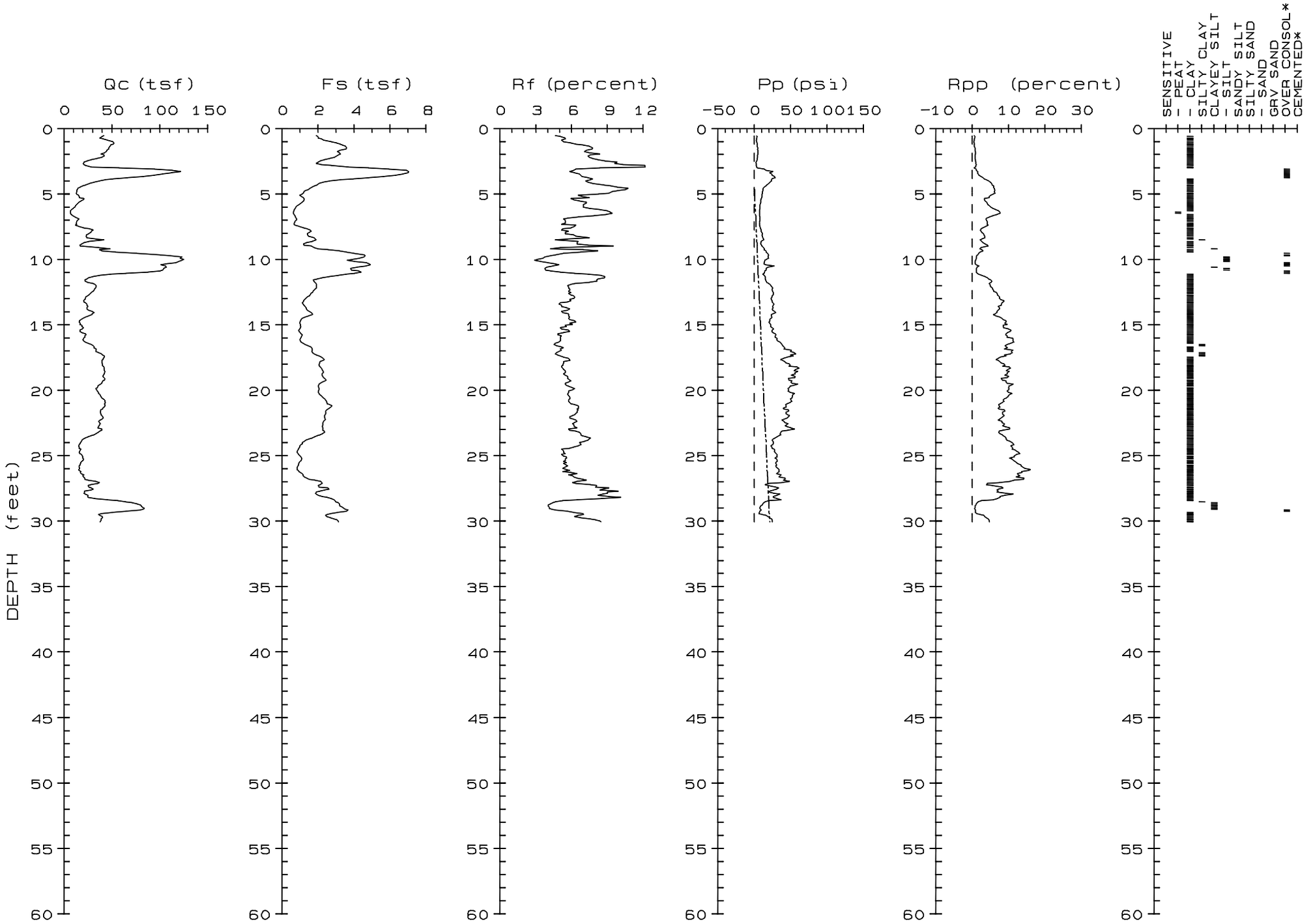
Groundwater measured at 4.0 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-22
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

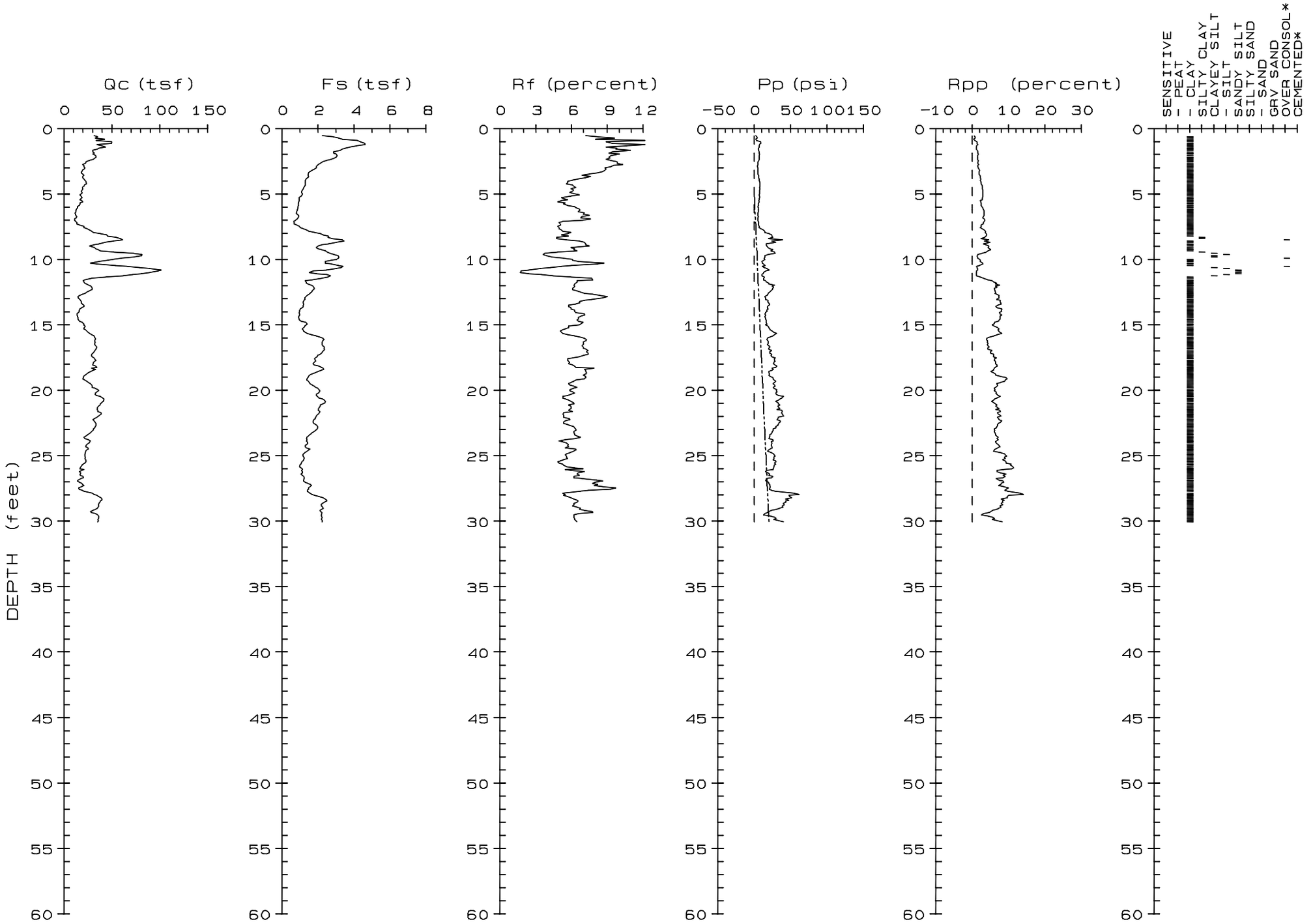
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-4
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

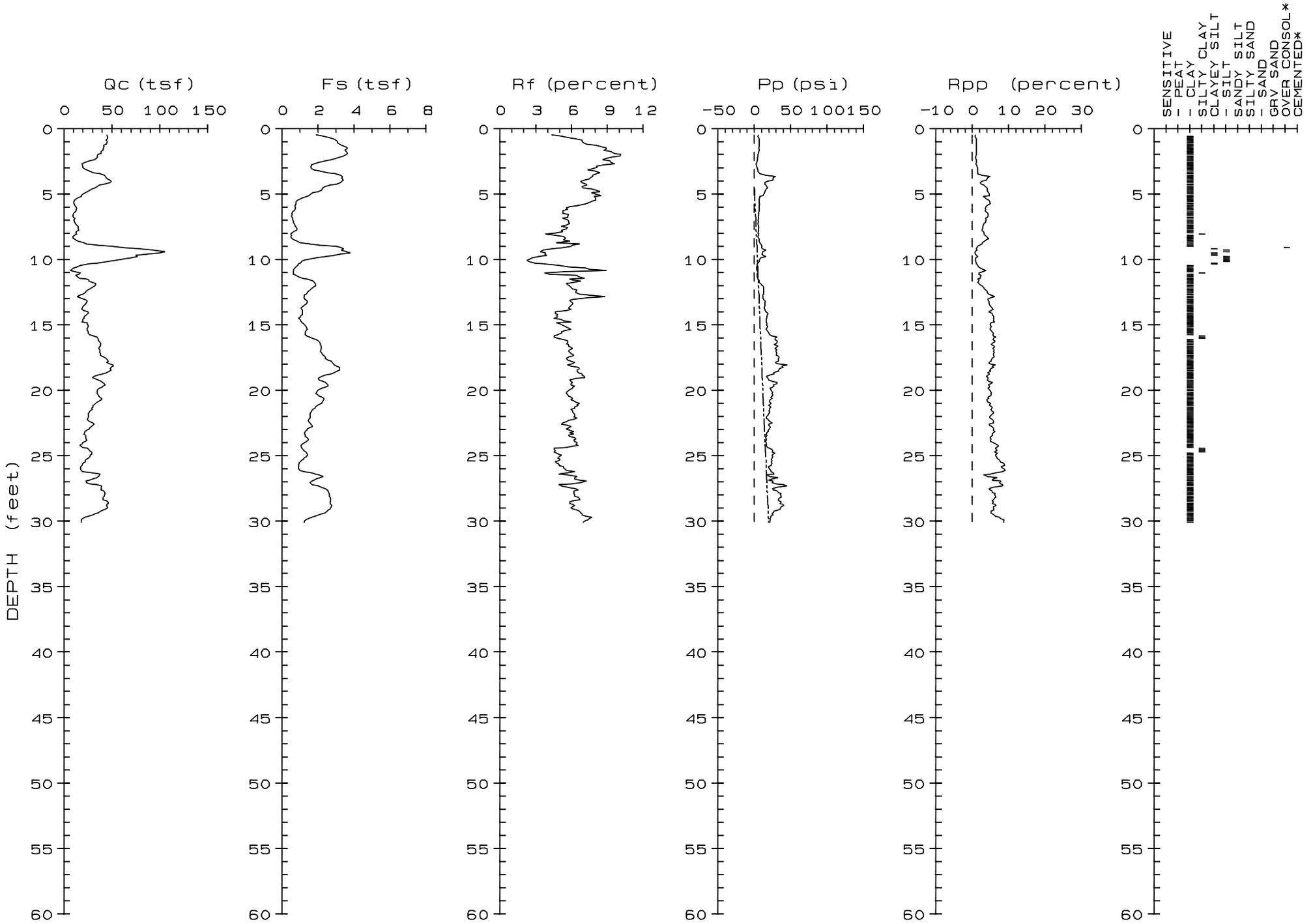
Groundwater measured at 4.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-5
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

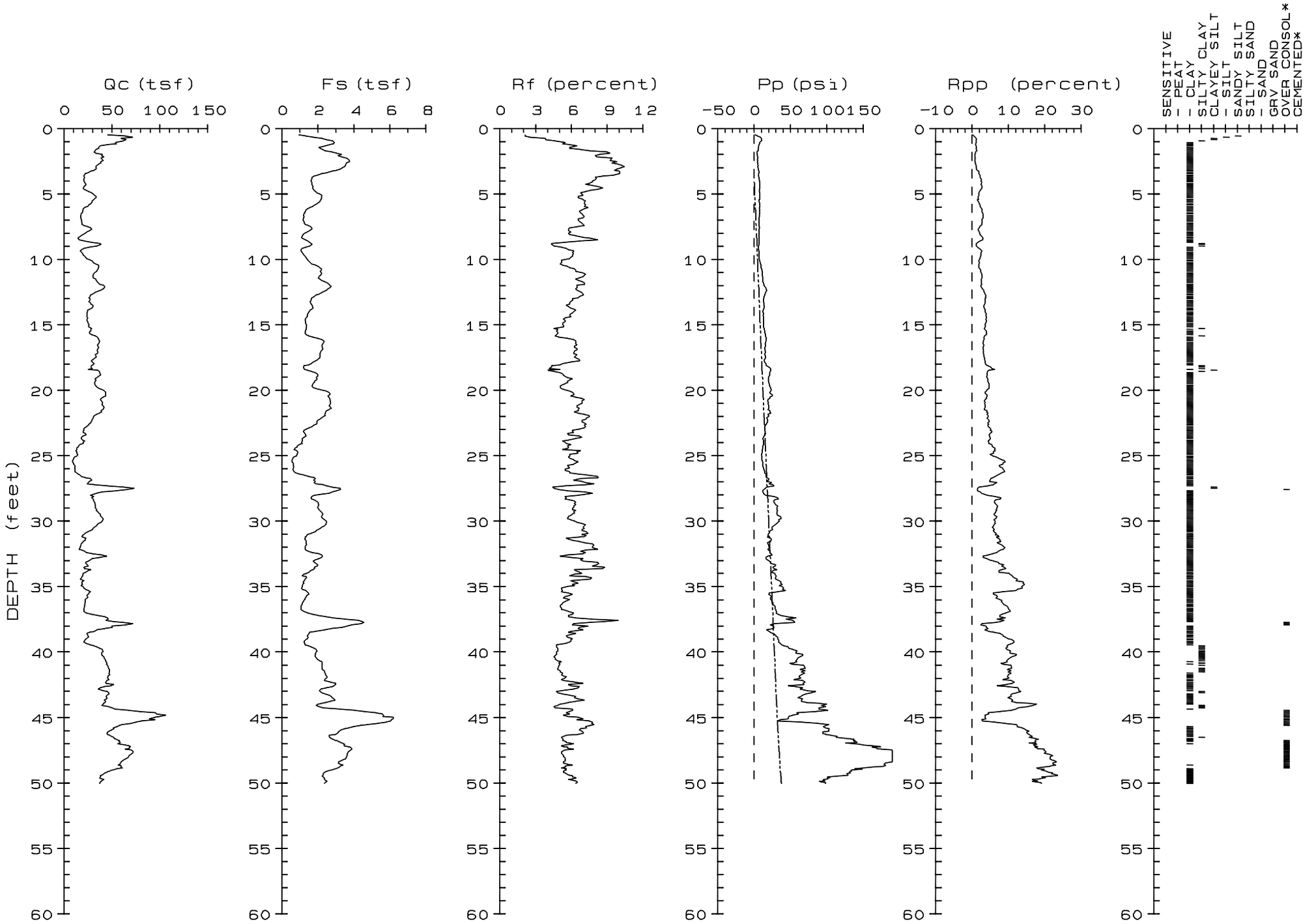
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-6
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

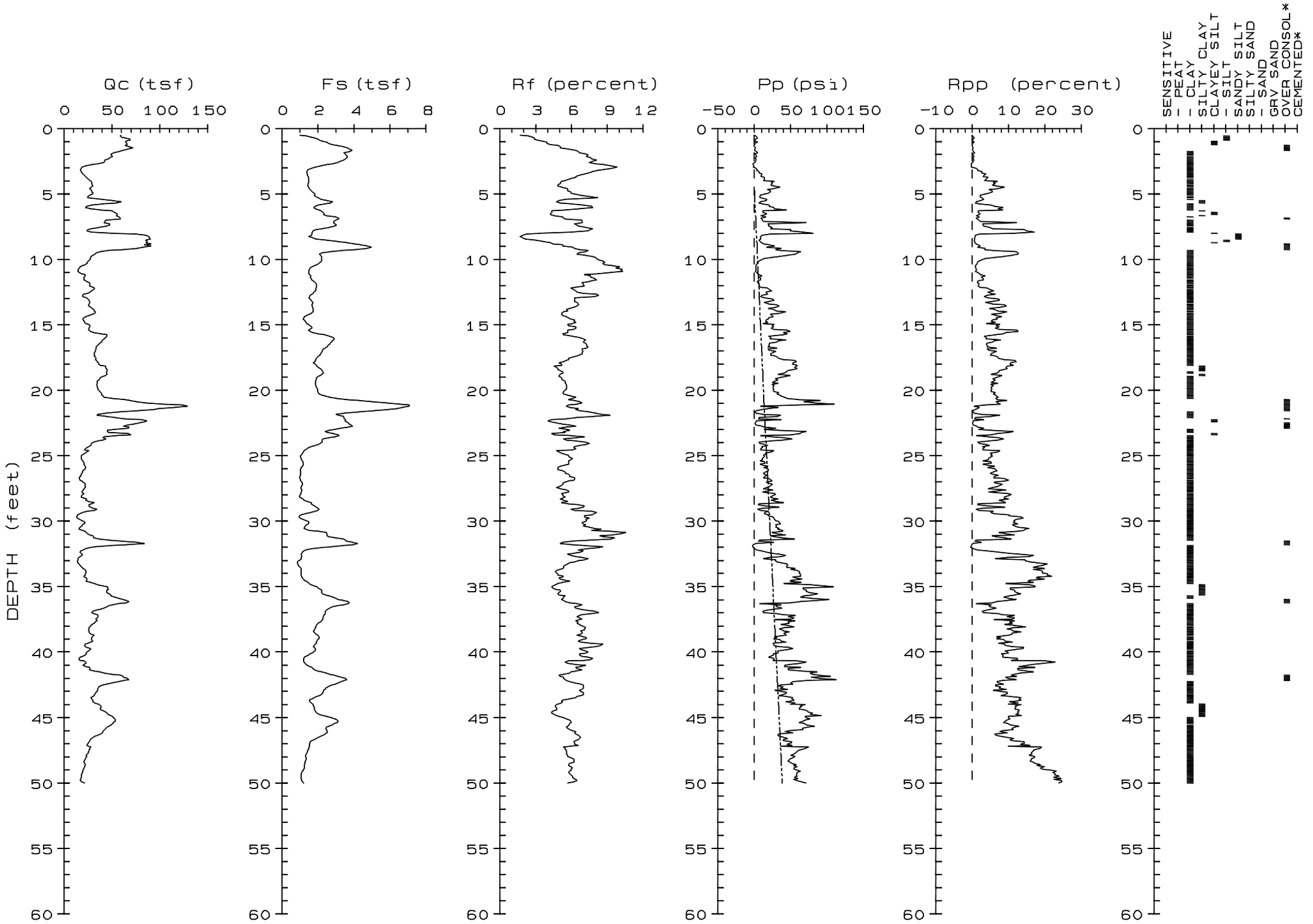
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-8
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 50.0 feet

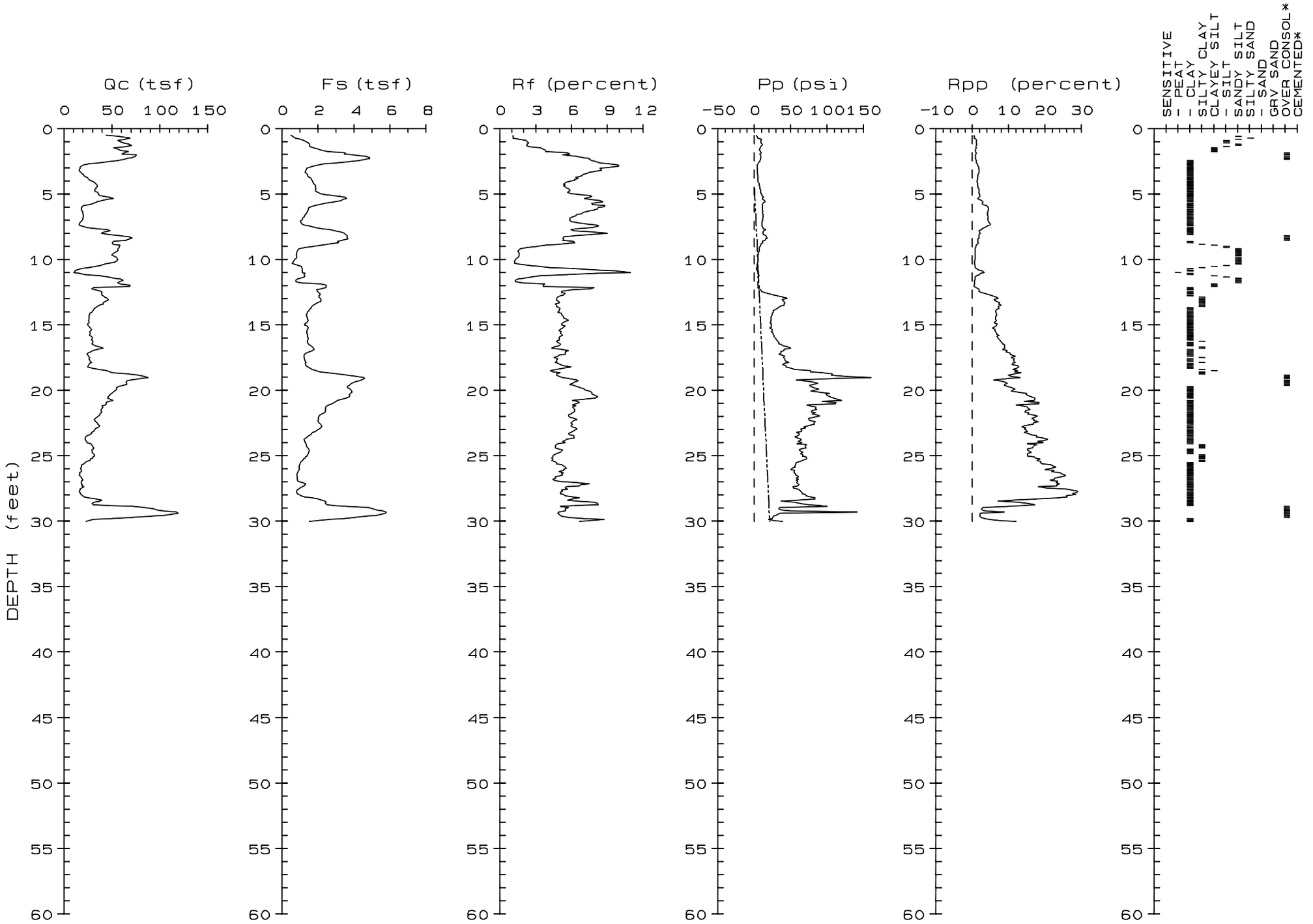
Groundwater measured at 4.3 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-10
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

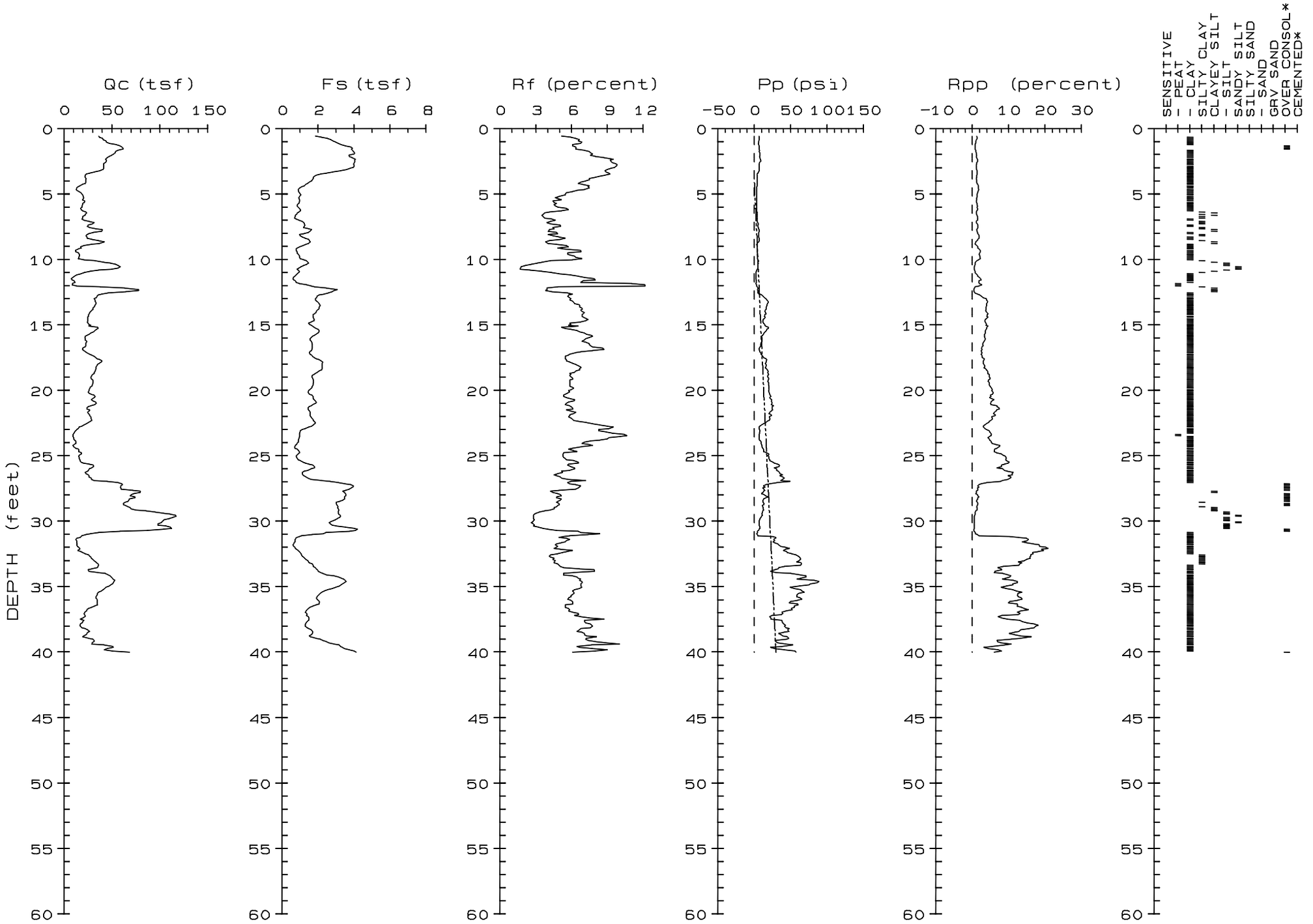
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-12
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

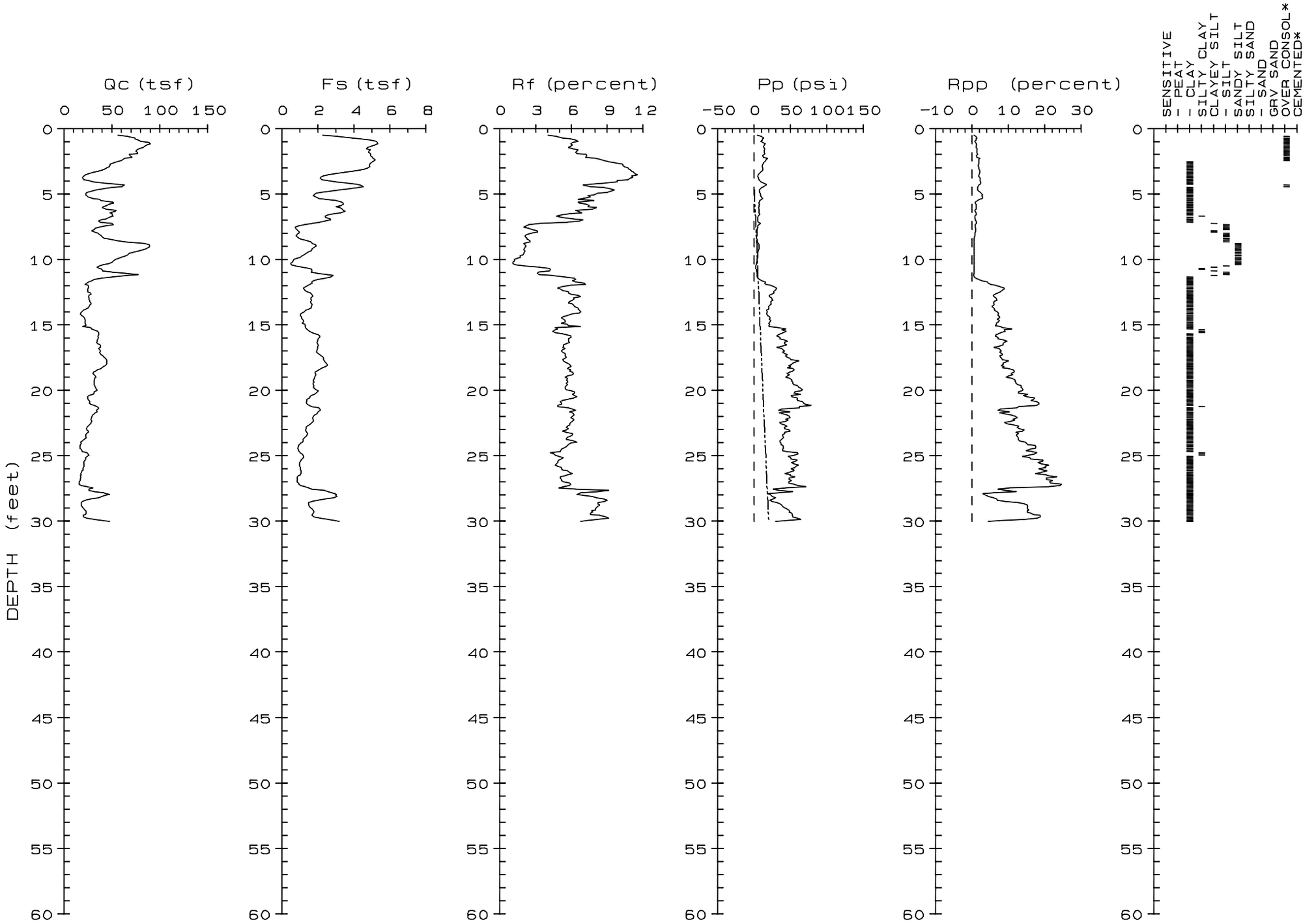
Groundwater measured at 3.7 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-13
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

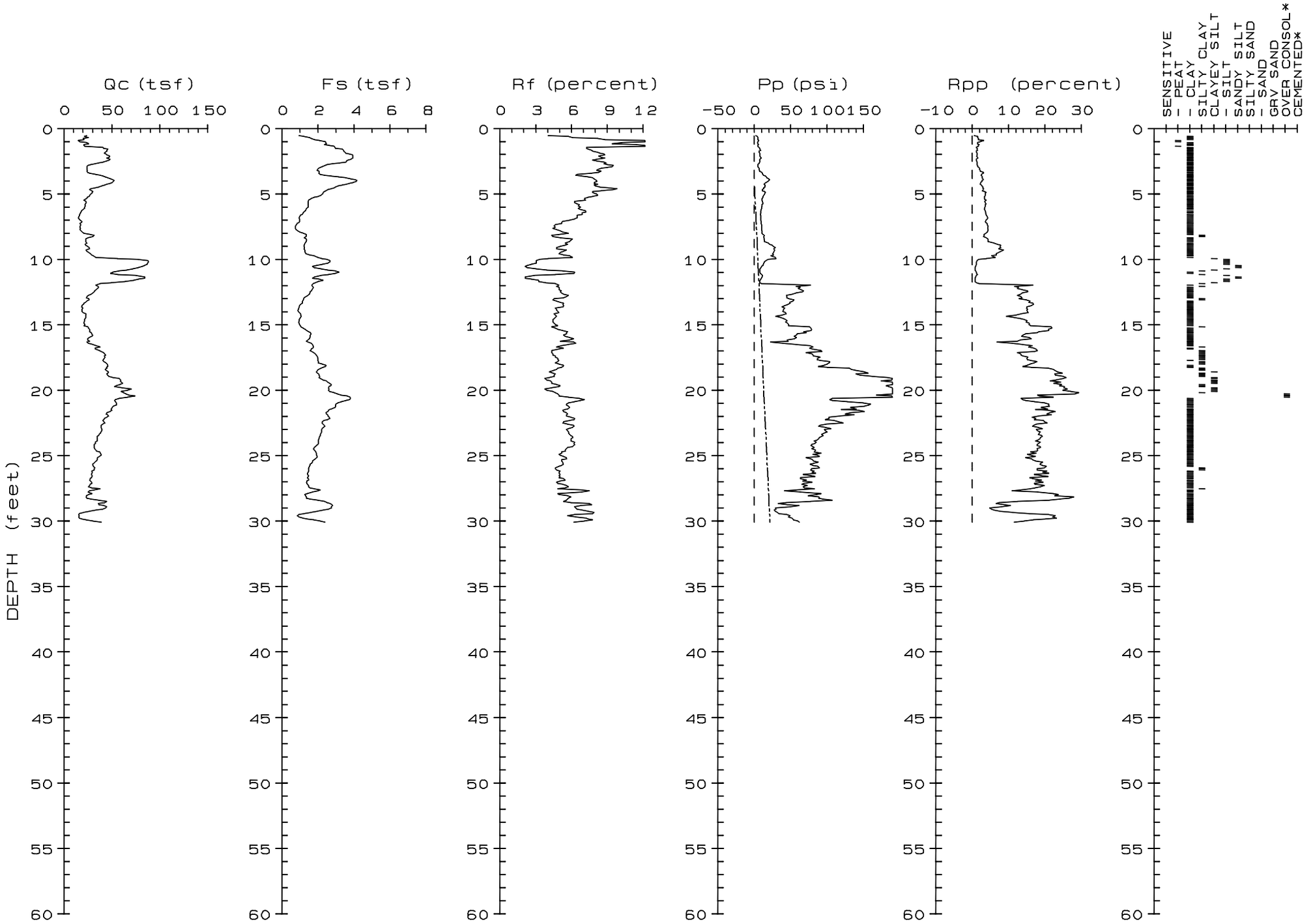
Groundwater measured at 4.2 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-15
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 30.0 feet

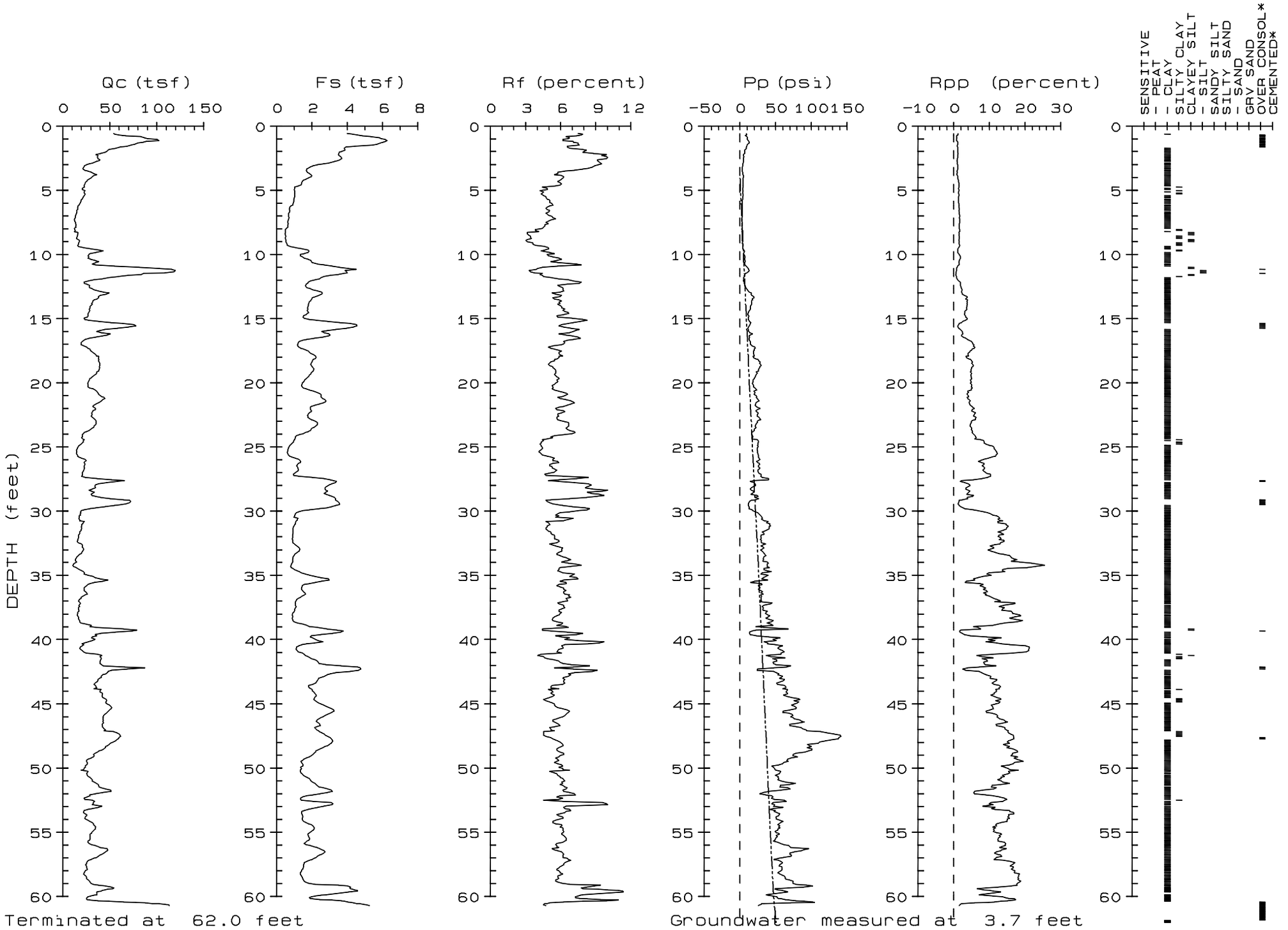
Groundwater measured at 4.1 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-17
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates

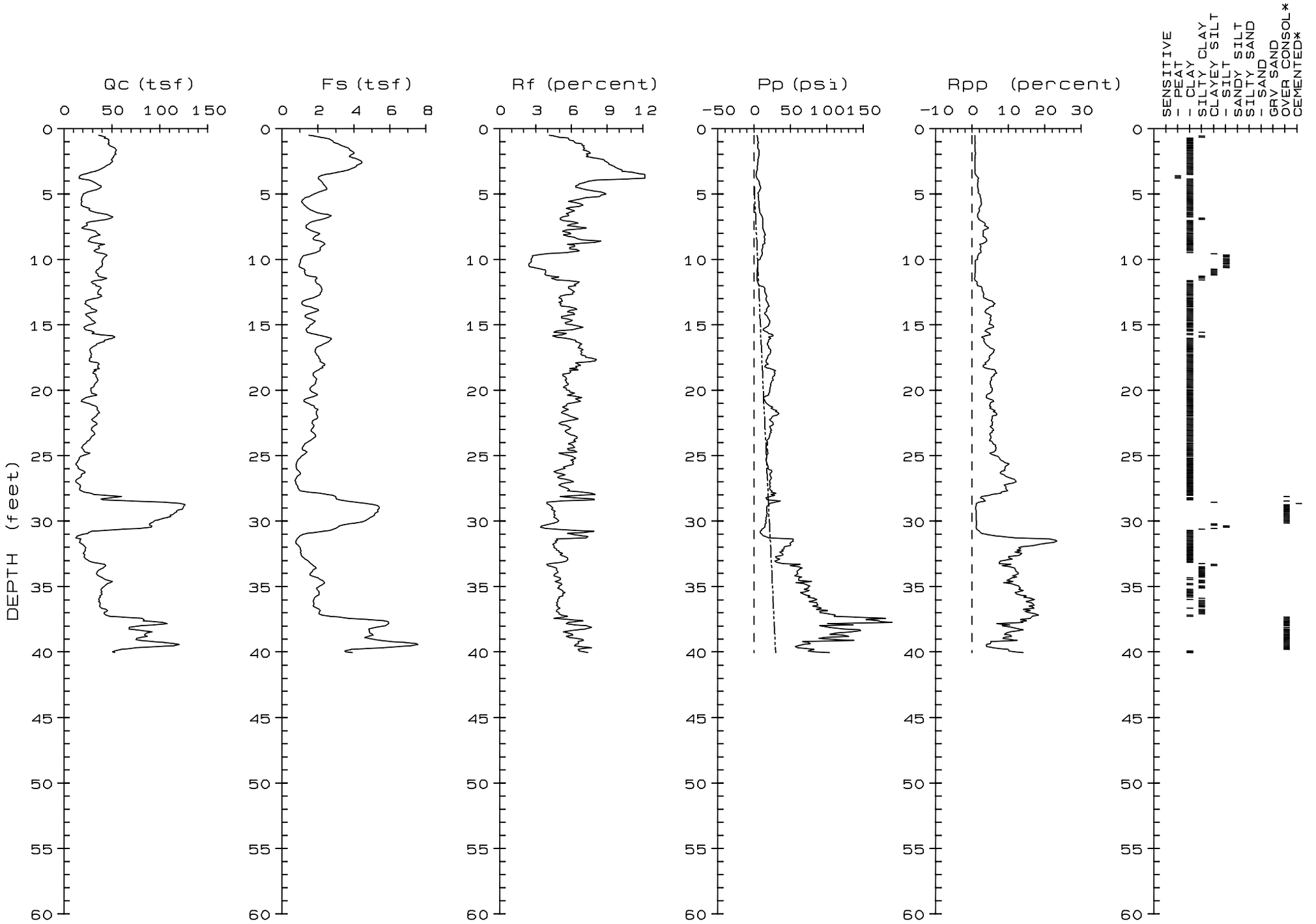


PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-18
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates



Terminated at 40.0 feet

Groundwater measured at 4.0 feet

PROJECT: VACAVILLE POWER STATION
LOCATION: Vacaville CA
PROJ. NO.: 94660.GEO(KLF-175)

CPT NO.: CPT-B-22
DATE : 07-03-2008

KLEINFELDER, INC.

cpts by John Sarmiento & Associates

R-1			R-2			R-3			R-4		
A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm
5	0.91	871	**5**	0.78	747	**5**	0.66	632	**5**	0.96	919
10	0.54	1034	**10**	3.41	6530	**10**	0.57	1092	**10**	0.28	536
15	0.38	1092	**15**	0.35	1005	**15**	0.43	1235	**15**	0.29	833
20	0.50	1915	**20**	0.27	1034	**20**	0.35	1341	**20**	0.17	651
25	0.21	1005	**25**	0.22	1053	**25**	0.25	1197	**25**	0.20	958
30	0.19	1092	**30**	0.18	1034	**30**	0.19	1092	**30**	0.05	287
35	0.16	1072	**35**	0.15	1005	**35**	0.29	1944	**35**	0.12	804
			40	0.35	2681	**40**	0.16	1226	**40**	0.18	1379
			45	0.11	948	**45**	0.09	776	**45**	0.11	948
			50	0.10	958	**50**	0.04	383	**50**	0.12	1149
			55	0.11	1159	**55**	2.50	26331	**55**	0.20	2107
			60	0.09	1034	**60**	0.01	115	**60**	0.08	919
			65	0.07	871	**65**	0.33	4108	**65**	0.14	1743
			70	0.06	804	**70**	0.50	6703	**70**	0.06	804
			75	0.05	718	**75**	0.05	718	**75**	0.05	718
			80	0.05	766	**80**	0.07	1072	**80**	0.07	1072
			85	0.06	977	**85**	0.06	977	**85**	0.12	1953
			90	0.01	172	**90**	0.10	1724	**90**	0.05	862
			95	0.04	728	**95**	0.04	728			
			100	0.03	575	**100**	0.07	1341			
			105	6.00	120645						
			110	0.04	843						
			115	0.08	1762						
			120	0.05	1149						
			125	0.03	718						
			130	0.37	9211						
			135	2.80	72387						
			140	1.20	32172						

Note: The average resistivity of a layer in ohm-cm is the average resistivity of soil to a depth equal to the pin spacing (i.e. a 10-foot spacing is a 10-foot thick layer).

KLEINFELDER
Bright People. Right Solutions.

Results of Field Resistivity Tests
CPV Vacaville Power Plant
NWC of Fry and Lewis Roads
Elmira, Solano County, California

Plate
D-1

R-5			R-6			R-7			R-8		
A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm
5	0.79	756	**5**	0.92	881	**5**	0.21	201	**5**	0.92	881
10	1.44	2758	**10**	0.03	57	**10**	0.56	1072	**10**	0.60	1149
15	0.37	1063	**15**	0.31	890	**15**	0.40	1149	**15**	0.42	1206
20	0.53	2030	**20**	0.33	1264	**20**	0.30	1149	**20**	0.32	1226
25	0.23	1101	**25**	0.22	1053	**25**	0.24	1149	**25**	0.25	1197
30	0.21	1206	**30**	0.21	1206	**30**	0.20	1149	**30**	0.21	1206
35	0.13	871	**35**	0.17	1139	**35**	0.17	1139	**35**	0.18	1206
40	2.30	17618	**40**	0.37	2834	**40**	0.14	1072	**40**	0.15	1149
45	0.10	862	**45**	0.15	1293	**45**	0.12	1034	**45**	0.14	1206
50	0.12	1149	**50**	1.71	16373	**50**	0.11	1053	**50**	0.11	1053
55	0.14	1475	**55**	0.11	1159	**55**	0.10	1053	**55**	0.10	1053
60	0.10	1149	**60**	0.14	1609	**60**	0.10	1149	**60**	0.09	1034
65	0.06	747	**65**	0.11	1369				**65**	0.08	996
70	0.02	268	**70**	0.10	1341				**70**	0.09	1206
75	0.34	4883	**75**	0.10	1436				**75**	0.07	1005
80	0.12	1838	**80**	0.07	1072				**80**	0.07	1072
85	0.08	1302	**85**	0.06	977				**85**	0.06	977
90	0.08	1379	**90**	0.54	9307				**90**	0.06	1034
95	0.06	1092	**95**	0.06	1092				**95**	0.07	1273
100	0.02	383							**100**	0.06	1149
									105	0.05	1005
									110	0.05	1053
									115	0.04	881

KLEINFELDER
Bright People. Right Solutions.

Results of Field Resistivity Tests
CPV Vacaville Power Plant
NWC of Fry and Lewis Roads
Elmira, Solano County, California

Plate
D-2

R-9			R-10		
A-Spacing (ft)	R	RESISTIVITY ohm-cm	A-Spacing (ft)	R	RESISTIVITY ohm-cm
5	0.87	833	**5**	0.66	632
10	0.18	345	**10**	0.34	651
15	0.40	1149	**15**	0.32	919
20	0.32	1226	**20**	0.20	766
25	0.23	1101	**25**	0.26	1245
30	0.26	1494	**30**	0.21	1206
35	0.17	1139	**35**	0.17	1139
40	0.17	1302	**40**	0.14	1072
45	0.13	1120	**45**	0.14	1206
50	0.11	1053	**50**	0.12	1149
55	0.13	1369	**55**	0.10	1053
60	0.12	1379	**60**	0.09	1034
			65	0.10	1245
			70	0.07	938
			75	0.13	1867
			80	0.07	1072
			85	0.08	1302
			90	1.60	27576
			95	0.05	910
			100	0.05	958
			105	0.04	804
			110	0.03	632
			115	0.04	881

KLEINFELDER
Bright People. Right Solutions.

Results of Field Resistivity Tests
CPV Vacaville Power Plant
NWC of Fry and Lewis Roads
Elmira, Solano County, California

Plate
D-3