APPENDIX A
EXPLORATORY BORINGS

The subsurface exploration program for the proposed project consisted of twelve subsurface explorations. Of these, three were drilled using a Failing Holemaster truck-mounted drill rig equipped with 6-inch-diameter hollow-stem augers as well as a 4⅞-inch-diameter mud-rotary drag bit. The borings varied in depth from approximately 20 to 100 feet below the existing asphalt, concrete, and/or baserock sections, or under landscaped areas in various locations near existing building footprints.

Nine explorations were performed using a truck-mounted electric Cone Penetrometer Test (CPT) rig. The CPTs extended to depths varying from approximately 45 to 100 feet below the existing asphalt, concrete, and/or baserock sections, or under landscaped areas in various locations near existing building footprints. Three of the explorations, CPT-2, CPT-5, and CPT-8, were completed using a Seismic Cone Penetrometer in order to obtain shear wave velocities representative of the soil profile.

As required by local ordinance, permits were obtained from both the City of Eureka Community Development Department and from the Humboldt County Department of Public Health prior to drilling. Upon completion, the borings were backfilled with cement grout and/or bentonite as required by the County and finished at surface grade with a concrete plug or cap (where applicable). Soil cuttings from the borings drilled were left on-site in landscaped or undeveloped areas of the site. Prior to the start of the field exploration work, Underground Services Alert (USA) was contacted to locate utilities at the exploration locations.

The Logs of Borings (KB-3, KB-4, and KB-10) are presented as Plates A-2 through A-4. An explanation to the logs is presented on Plate A-1. The Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the boring number, drilling date, drilling method, approximate boring elevation, and the name of the logger. The borings were logged by a Kleinfelder staff geologist utilizing

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the Unified Soil Classification System. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual.

Relatively undisturbed samples of the subsurface soils were recovered using a 2.43-inch (inside diameter) Modified California Sampler. Samples recovered from the drill rig were driven by a 140-pound hammer with a 30-inch fall. The number of blows required to drive the last 12 inches of an 18-inch drive is recorded as the Penetration Resistance (blows/foot) on the boring log. Sampling and testing was in general accordance with ASTM D-1586. Correction factors were applied to the blow count numbers on the logs in accordance with NCEER recommendations (1998). When the sampler was withdrawn from the boring, the brass liners containing the samples were removed, examined for logging purposes, sealed, and labeled.

Nine Cone Penetration Tests (CPT) were performed using an electric penetrometer in general accordance with ASTM D-3441. CPT consists of hydraulically pushing a steel sleeve and cone into the soil while measuring the tip resistance, side friction, and pore water pressure. This provides in situ data for pile design and seismic calculations. CPT logs are presented after the boring logs in this Appendix.

The locations of the explorations were either surveyed or estimated by a Wärtsilä representative based on measurements from existing buildings at the site. The elevations shown on the boring logs were roughly estimated using topographic data provided by PG&E in conjunction with survey data provided by Wärtsilä. As such, the elevations and locations of the borings will be considered approximate to the degree implied.

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APPENDIX B
LABORATORY TESTS AND PROCEDURES

GENERAL

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils, which may affect the geotechnical aspects of project design and construction. Testing was performed in general accordance with ASTM Standards for Soil Testing, latest revisions.

A description of the laboratory testing program is presented below.

MOISTURE CONTENT AND DRY UNIT WEIGHT TESTS

Moisture content was evaluated in general accordance with ASTM Test Method D 2216; dry unit weight was evaluated using procedures similar to ASTM Test Method D 2937. The results of these tests are presented on the Logs of Borings, Appendix A.

PARTICLE-SIZE ANALYSIS

Particle-size analysis was performed on two samples of the on-site soils to aid in soil classification and for use in liquefaction analyses. The tests were performed in general accordance with ASTM Standard Test Method D422. Test results are presented in Appendix B.

CONSOLIDATION TESTS

Consolidation tests were performed on five samples of the onsite soils in accordance with ASTM Standard Test Method D2435. Test results are used to estimate soil compressibility for use in settlement analyses. The test results are presented in Appendix B.

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PLASTICITY INDEX

Plasticity Index (Atterberg Limits) tests were performed on 14 samples of the on-site soils to measure the index properties of the soil. These tests were conducted in accordance with ASTM Standard Test Method D4318. Test results are used for correlation and classification purposes. The test results are presented in Appendix B.

CORROSIVITY TESTS

Two samples of the on-site soils were sent to Environmental Technical Services (ETS) of Petaluma, California for testing to screen for corrosivity potential. The samples were tested for redox, pH, resistivity, sulfate content and chloride content. The test results are presented in Appendix B.

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Appendix A

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				DESCRIPTIVE NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	**GRAVELS** MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	**GW**	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	**GM**	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	**SW**	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	**SM**	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	**SILTS AND CLAYS** LIQUID LIMIT LESS THAN 50		**ML**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			**Pt**	PEAT AND OTHER HIGHLY ORGANIC SOILS

FIELD SAMPLING

- MODIFIED CALIFORNIA SAMPLE
- DISTURBED, BAG OR BULK SAMPLE
- STANDARD PENETRATION TEST
- SHELBY TUBE SAMPLE
- 3-1/2" I.D. CONTINUOUS CORE SAMPLE
- UNRETAINED PORTION OF SAMPLE
- WATER LEVEL OBSERVED IN BORING (at given post-drilling time)
- WATER LEVEL OBSERVED IN BORING (at time of drilling)

LABORATORY TESTS

LL	LIQUID LIMIT
PI	PLASTICITY INDEX
SA	SIEVE ANALYSIS
#200	PERCENT PASSING #200 SIEVE
RV	RESISTANCE VALUE
EI	EXPANSION INDEX
DS	DIRECT SHEAR
Tx/UU	TRIAXIAL SHEAR-UNCONSOLIDATED UNDRAINED
UC	UNCONFINED COMPRESSION
SG	SPECIFIC GRAVITY
PP	POCKET PENETROMETER SHEAR STRENGTH (tsf)

NOTES: Blow counts represent the number of blows of a 140-pound hammer falling 30-inches required to drive a sampler the last 12-inches of an 18-inch penetration. The blow counts have been converted to standard N-value blow counts.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil strata and groundwater observed at the boring location on the date of drilling only.

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PROJECT NUMBER **68522-1** DATE **Oct 2006**

BORING LOG LEGEND

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-1**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
						1		GM	**SILTY SANDY GRAVEL, TRACE CLAY** light gray, dry, med. dense to dense, gravels are subrounded to subangular and up to 1.0" dia. (FILL).
						2		GC	**SANDY CLAYEY GRAVEL W/ SILT** mod. brown to grayish-brown, dry to damp, med. dense to dense, gravels are subrounded to subangular and up to 0.75" dia. occ. subrounded oblate cobbles up to 4" dia. (FILL).
						3			
						4		CL/CH	**CLAY W/ SILT** dark grayish-brown, damp, medium stiff, mod. to highly plastic, abundant vertically oriented rootlets, strong organic odor, (Qhb-Holocene bay deposits).
						5			
				5		6		CL	**SILTY SANDY CLAY** dark grayish-brown, saturated, soft to medium stiff, mod. plastic, strong organic odor, (Qhb-Holocene bay deposits).
						7			
	30.8		LL = 20 PI = 6	4		8		ML/CL	**SILTY CLAY** mottled grayish-green to orange-brown, damp to moist, soft to medium stiff w/ depth, mod. plastic, abundant rootlets, faint organic odor, (Qhb-Holocene bay deposits).
						9			
						10		CL/CH	**CLAY W/ SILT** tan-brown mottled w/ grayish-green, damp, stiff to very stiff, mod. to highly plastic, abundant rootlets, strong organic odor, (Qph-Upper Hookton Formation).
				12		11			
						12		ML	**CLAYEY SILT W/ VERY FINE GRAINED SAND** grayish-green mottled w/ tan brown, damp, very stiff to hard w/ depth, mod. to low plasticity, some Fe-ox/redox. pockets, grain size coarsens w/ depth.
						13			
						14			
						15			
				21		16			
						17			
						18		CL	**SILTY CLAY W/ VERY FINE GRAINED SAND** grayish-green mottled w/ orange-brown w/ dark reddish-brown concretions (worm burrows?), damp, hard to very hard, mod. plasticity, mild organic odor.
						19			
						20			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **9.5 ****
TOTAL DEPTH: **21.5 feet**
GROUND WATER DEPTH: ▽ **5.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

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PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-3

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-2**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				19		21		ML	**CLAYEY SILT W/ VERY FINE GRAINED SAND** grayish-green mottled w/ orange-brown w/ dark reddish-brown concretions (worm burrows?), damp, hard to very hard, low to mod. plasticity, mild organic odor.
						22			
						23			BOTTOM OF BORING KB-3 @ 21.5 FEET
						24			
						25			
						26			
						27			
						28			
						29			
						30			
						31			
						32			
						33			
						34			
						35			
						36			
						37			
						38			
						39			
						40			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **9.5 ****
TOTAL DEPTH: **21.5 feet**
GROUND WATER DEPTH: ▽ **5.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-3

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-2**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
									Asphalt
						1		GM	**SANDY GRAVEL W/ SILT** dark greenish brown, dry to damp, gravels are subrounded to subangular and up to 1.25" dia. (FILL).
								GC	
						2		CL/CH	**SANDY GRAVELLY CLAY W/ SILT** dark greenish gray, moist, mod. plastic, med. stiff, (FILL).
						3			**SILTY CLAY W/ SAND** tan brown w/ greenish-gray mottling, moist, mod. to highly plastic, soft to med. stiff, (FILL).
						4		CL/CH	**SILTY CLAY W/ SAND** greenish-gray w/ tan brown mottling, moist to saturated, mod. to highly plastic, (FILL).
						5			
			pp=1.0 tsf						**SILTY CLAY** dark greenish-gray to black, moist, medium stiff, mod. to highly plastic, abundant vertically oriented rootlets, strong organic odor, (Qhb-Holocene bay deposits).
70	45.2		LL=50, PI=19	12		6			
						7		ML/MH	
						8			
92	25.4		Consol LL=35, PI=20	3		9		CL	**CLAY W/ SILT** dark greenish-gray to black, moist to saturated, soft, highly plastic, less rootlets than previous interval, strong organic odor, some Fe-ox/redox. mottling, (Qhb-Holocene bay deposits).
						10		CL/CH	**SILTY CLAY, TRACE SAND** greenish-gray mottled w/ tan to reddish-brown, damp, stiff, mod. to highly plastic, grades sandier w/ depth, (Qph-Upper Hookton Formation).
			pp=1.0 tsf	13		11			
						12		SC	**CLAYEY SAND W/ SILT** tan brown mottled w/ reddish brown, damp, med. dense, f. to med. grained sand.
						13			**CLAYEY SILT W/ SAND** reddish-yellowish brown, damp, stiff to very stiff, mod. to low plasticity, occ. to rare carbonized wood frags., some Fe-ox/redox. mottling .
						14		ML	
						15			
	27.5		Minus #200=70%	16		16			**SANDY SILT** tan brown to yellowish-brown, damp, med. dense, f. grained sand.
						17		ML	
						18			**CLAYEY SILT W/ SAND** reddish-brown mottled w/ greenish-gray, damp, stiff, mod. plastic.
						19		ML	
						20			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
			pp= 2.5 tsf	15		21		CL	**SILTY CLAY, TRACE SAND** med. to dark gray, damp, stiff to very stiff, mod. plastic.
						22		SM	**SILTY SAND, TRACE CLAY** med. to dark gray, damp, med. dense, f. grained sand, occ. vertically oriented rootlets.
						23		CL/CH	**CLAY W/ SILT, TRACE VERY FINE GRAINED SAND** dark bluish-gray to greenish-gray, damp, hard, mod. to highly plastic, trace rootlets (Qph-Upper Hookton Formation-1st Bay Clay?)
						24			
						25			
			Consol	21		26			
						27			
						28		CH	**CLAY W/ SILT** bluish gray to dark bluish gray, damp, hard, highly plastic.
						29			
						30			
				19		31		SM	**SILTY SAND W/ CLAY** reddish-yellow mottled w/ light bluish-gray, damp, dense, very fine grained sand, Fe-ox concretions? (Qph-Upper Hookton Formation-Upper Sand Beds?).
						32			
						33		SP	**SAND, TRACE SILT** mod. brown to grayish tan-brown, damp to saturated, dense to very dense w/ depth, f. to med. grained sand.
						34			
						35			
				39		36			
						37			
						38			
						39			
						40			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				40		41		SP	**SAND, TRACE SILT** mod. brown to dark grayish-brown, saturated, dense to very dense, med. to coarse grained sand.
						42			
						43			
						44			
						45			
				43		46		SM	**SILTY SAND, TRACE CLAY** dark bluish-gray, damp to saturated, dense to very dense, f. grained sand, grades to GP at base?
						47		GP?	
						48			No sample recovery, drilling action indicates gravel
						49			
				42		50		GP/GC?	
						51			
						52			**SANDY CLAYEY GRAVEL W/ SILT** dark greenish-gray to gray-brown, saturated, very dense, gravels are sugangular to subrounded and up to 1" dia.
						53			
						54		GC	
				48		55			
						56			**GRAVELLY CLAYEY SAND, TRACE SILT** lt. gray w/ gray-brown mottling, very dense, moist, v. fine to med. grained sand.
						57		SC	
						58			**SAND, TRACE SILT** mod. brown to reddish brown and/or gray-brown, saturated, very dense, sand is f. to med. grained, Fe-ox staining increases with depth.
						59			
						60			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				77		61		SP	**SAND, TRACE SILT** mod. brown to reddish brown and/or gray-brown, saturated, very dense, sand is f. to med. grained, Fe-ox staining increases with depth.
						62			
						63			
						64			
				109		65			
						66			
						67			
						68			
						69			
				52		70			
						71			
						72			
						73			
						74		CL	**CLAY W/ SILT, TRACE SAND** dark grayish-brown to bluish-gray w/ depth, damp, hard, mod. plastic, slight organic odor, minor rootlets, (Qph-Upper Hookton Formation-2nd Bay Clay?)
				20		75			
						76			
						77			
						78			
						79			
						80			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				32		81		SC/ML	**CLAYEY SILTY F. GRAINED SAND** bluish-gray, damp, very dense, slight organic odor, inc. sand content w/ depth.
						82			
						83		CL	**SILTY CLAY** dark bluish-gray, damp, hard, mod. plastic, slight organic odor.
						84			
						85			
				25		86		ML	**CLAYEY SILT, TRACE FINE GRAINED SAND** bluish-gray w/ greenish-gray mottling, damp, hard, low to mod. plastic, slight organic odor.
						87			
						88		CL	**SILTY CLAY, TRACE FINE GRAINED SAND** dark bluish-gray, damp, hard, mod. plastic, very faint organic odor.
						89			
						90			
				26		91		ML	**CLAYEY SILT, TRACE FINE GRAINED SAND** dark bluish-gray to greenish-gray, damp, hard, low to mod. plastic, very faint organic odor, thin lens of clayey SAND w/ silt (SC)at base.
						92			
						93			
						94			
				37		95			
						96		SC	**CLAYEY SAND W/ SILT** bright reddish-brown (highly oxidized-paleosol?), damp, very dense, sand is med. to coarse grained. (Qph-Lower Hookton Formation?).
						97			
						98			
						99			
						100			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				35	■			SC	**CLAYEY SAND W/ SILT** mod. brown to grayish-brown, saturated, very dense, sand is f. to med. grained.
						101		ML	**CLAYEY SILT, TRACE FINE GRAINED SAND** grayish-brown w/ orange-brown oxidized mottling, damp, hard, low to mod. plastic.
								SC	**CLAYEY SAND W/ SILT** grayish-brown w/ dark reddish-brown to orange brown staining (high Fe-ox and Mn-ox staining on layers-paleosol?), damp to moist, very dense, sand is f. to med. grained.
						102			
						103			
						104			BOTTOM OF BORING KB-4 @ 101.75 FEET
						105			
						106			
						107			
						108			
						109			
						110			
						111			
						112			
						113			
						114			
						115			
						116			
						117			
						118			
						119			
						120			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **10.7 ****
TOTAL DEPTH: **101.8 feet**
GROUND WATER DEPTH: ▽ **5.5 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-26-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-4

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-3**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
						1			**SILTY CLAY W/ SAND** dark brown mottled w/ orange brown, damp, stiff to very stiff, gravels subrounded and up to 0.75" dia., (FILL).
						2			
			PP=2.0 tsf	26		3		CL	
90	26.1		LL = 30 PI = 15			4			
						5			
72	44.8		LL = 46 PI = 18	14		6			▽ **CLAY W/ SILT** dark grayish-brown, damp to moist, med. stiff to stiff w/ depth, highly plastic, strong organic odor, vertically aligned rootlets, (Qhb-Holocene bay deposits).
						7			
						8		ML/CL	
51	77.0			5		9			-same as above, except dark grayish-brown, stronger organic odor, occ. to rare carbonized wood frags., soft to med. stiff, (Qhb-Holocene bay deposits).
						10			
95	23.0		Consol LL=35, PI=14	4		11		CL	**SILTY CLAY W/ SAND** dark grayish-green to grayish-brown, damp to moist, soft to med. stiff, mod. plastic, strong organic odor, slight ox-redox. mottling, (Qhb-Holocene bay deposits).
						12			**CLAY W/ SILT** gray to grayish-brown, moist, soft, mod. to highly plastic, mild organic odor, (Qhb-Holocene bay deposits).
78	44.1		LL = 40 PI = 20	4		13		CL/CH	
						14			
						15			**SILTY CLAY** bluish-gray to grayish-brown,moist, soft, mod. plasticity, mild organic odor, (Qhb-Holocene bay deposits).
86	30.1		Consol LL=38, PI=18	4		16		CL	
						17			
88	37.6		LL = 30			18			**CLAYEY SANDY SILT** greenish-gray to bluish-gray, moist, soft to med. stiff, fine to med. grained sand lenses, occ. thin silty clay lenses, abund. shell frags. (clams?) w/ depth (Qhb-Holocene bay deposits).
83	36.9		PI = 14	4					
89	33.5		Gradation LL = 26 PI = 11			19		ML/CL	
						20			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **11.5 ****
TOTAL DEPTH: **91.5 feet**
GROUND WATER DEPTH: ▽ **6.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-10

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-4**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
103	25.6		LL = 22 PI = 9 Consol	11		21		SM	**SILTY SAND W/ CLAY** bluish-gray mottled w/ greenish-gray, moist, loose to med. dense, sand is f. to med. grained, rare shell (clams?) frags., (Qhb-Holocene bay deposits).
						22		CL/CH	**SILTY CLAY, TR. F. GRAINED SAND** bluish-gray mottled w/ greenish-gray, moist, stiff, mod. plasticity, very faint organic odor, (Qph-Upper Hookton Formation-1st Bay Clay?).
				13		23			
						24		CL	**SILTY CLAY W/ F. GRAINED SAND** bluish-gray, moist, stiff, mod. plasticity, faint organic odor.
						25			
				19		26			**SILTY SAND W/ CLAY** bluish-gray to greenish-grayish-brown, moist to saturated w/ depth, med. dense, odor less prevalent than w/ prev. interval, rare vertically oriented rootlets.
						27			
						28		SM	
						29			
						30			**CLAYEY SILT W/ F. GRAINED SAND** greenish-gray mottled w/ grayish-brown, damp, very stiff, low to mod. plastic.
				18		31			
						32			
						33		ML	
						34			
						35			**SAND W/ SILT** dark bluish-gray, damp to moist, dense to very dense, rare woody frags. aligned horiz. (Qph-Upper Hookton Formation-Upper Sand Beds?).
				37		36		SP	
						37			
						38			**SILTY SAND, TR. CLAY** mod. brown to greenish-gray brown, saturated, very dense, sand is f. to med. grained.
						39		SM	
						40			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **11.5 ****
TOTAL DEPTH: **91.5 feet**
GROUND WATER DEPTH: ▽ **6.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-10

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-4**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				56		41		SM	**SILTY SAND, TR. CLAY** yellowish-tan brown to orange brown, saturated, very dense, sand is f. to coarse grained.
						42			
						43			
						44			
						45			
				30		46		GC	**SANDY CLAYEY GRAVEL W/ SILT** grayish-brown mottled w/ bright orange brown, moist, dense, gravels are subrounded and up to 1.25" dia., well developed clay films/Fe-ox films on gravel faces.
						47			
						48		SC	**CLAYEY SAND W/ SILT** orange brown mottled with greenish-gray brown, moist, very dense, sand is f. to med. grained and grading to med. to coarse grained w/ depth.
						49			
						50			
				32		51			
						52			
						53		SP	**SILTY SAND, TR. CLAY** orange brown, moist to saturated, very dense, sand is f. to med. grained.
						54			
				48		55			
						56			
						57			
						58			
						59			
						60			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **11.5 ****
TOTAL DEPTH: **91.5 feet**
GROUND WATER DEPTH: ▽ **6.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-10

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-4**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				77		61			
						62		SP?	
						63			
						64			**SILTY CLAY** dark gray to dark bluish-gray, damp, hard, mod. plasticity, mild organic odor, (Qph-Upper Hookton Formation-2nd Bay Clay?).
				109		65			
						66			
						67		CL	
						68			
						69			
						70			
				30		71			**CLAYEY SILT, TR. V.F. GRAINED SAND** dark gray, damp, hard, low to mod. plastic, mild organic odor.
						72			
						73			
						74			
						75		ML	
				23		76			
						77			
						78			
						79			color changes to dark gray mottled w/ orange brown, damp, hard, low to mod. plastic, faint organic odor.
						80			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **11.5 ****
TOTAL DEPTH: **91.5 feet**
GROUND WATER DEPTH: ▽ **6.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-10

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-4**

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Shear Strength (ksf)	Other Tests	Blows/ft. *	Sample	Depth (feet)	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION
				40	■			SC	**CLAYEY SAND W/ SILT** yellowish-tan brown to orange brown, saturated, dense, sand is v.f. to f. grained. (Qph-Lower Hookton Formation?).
						81			
						82			
						83		SP	**SILTY SAND, TR. CLAY** dark reddish-brown w/ minor amounts of grayish-brown, moist to saturated, very dense, sand is f. to med. grained, minor Fe-ox/redox mottling.
						84			
				97	□	85			
						86			
						87			
						88			
						89			
				62	□	90			
						91			
						92			BOTTOM OF BORING KB-10 @ 91.5 FEET
						93			
						94			
						95			
						96			
						97			
						98			
						99			
						100			

* Converted to equivalent standard penetration blow counts.

** Existing ground surface at time of drilling.

SURFACE ELEVATION: **11.5 ****
TOTAL DEPTH: **91.5 feet**
GROUND WATER DEPTH: ▽ **6.0 feet at time of drilling**
▼ **feet**

LOGGED BY: **J. Wilen**
EQUIPMENT: **Hollow Stem Auger**
DIAMETER of BORING: **6 inches**
DATE DRILLED: **7-27-06**

KLEINFELDER

PROJECT NUMBER **68522-1** DATE **Oct 2006**

LOG OF EXPLORATION BORING KB-10

Humboldt Bay Power Plant
King Salmon (Eureka) - P.G.&E. HBPP

PLATE **A-4**

GREGG IN SITU, INC.

GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

August 10, 2006

Kleinfelder, Inc.
Attn: James Wilen
2240 N. Point Parkway
Santa Rosa, CA 95407

Subject: CPT Site Investigation
Eureka Power Plant
Eureka , California
GREGG Project Number: 06-254MA

Dear Mr. Wilen:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☐
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVIF Cone Penetration Tests	(UVIFCPTU)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden
Operations Manager

950 Howe Rd • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
OTHER OFFICES: LOS ANGELES • HOUSTON • SOUTH CAROLINA
www.greggdrilling.com

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (Feet)	Depth of Groundwater Samples (Feet)	Depth of Soil Samples (Feet)	Depth of Pore Pressure Dissipation Tests (Feet)
CPT-01	8/2/06	47.24			
SCPT-02	8/2/06	61.84	SEISMIC		
CPT-03	8/2/06	47.74			
SCPT-05	8/2/06	100.06			44.78
CPT-06	8/3/06	84.48			
SCPT-07	8/3/06	86.12	SEISMIC		
CPT-08	8/3/06	22.15			
CPT-08A	8/3/06	57.25	SEISMIC		
CPT-09	8/3/06	25.26			
CPT-12	8/3/06	83.17			51.35

Cone Penetration Test Data & Interpretation

Soil behavior type and stratigraphic interpretation is based on relationships between cone bearing (q_c), sleeve friction (f_s), and pore water pressure (u_2). The friction ratio (R_f) is a calculated parameter defined by $100 f_s/q_c$ and is used to infer soil behavior type. Generally:

Cohesive soils (clays)

- High friction ratio (R_f) due to small cone bearing (q_c)
- Generate large excess pore water pressures (u_2)

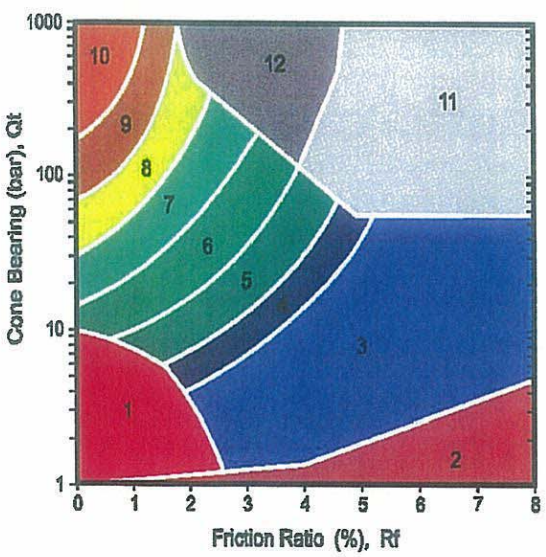
Cohesionless soils (sands)

- Low friction ratio (R_f) due to large cone bearing (q_c)
- Generate very little excess pore water pressures (u_2)

A complete set of baseline readings are taken prior to and at the completion of each sounding to determine temperature shifts and any zero load offsets. Corrections for temperature shifts and zero load offsets can be extremely important, especially when the recorded loads are relatively small. In sandy soils, however, these corrections are generally negligible.

The cone penetration test data collected from your site is presented in graphical form in Appendix CPT. The data includes CPT logs of measured soil parameters, computer calculations of interpreted soil behavior types (SBT), and additional geotechnical parameters. A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Soil interpretation for this project was conducted using recent correlations developed by Robertson, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on q_c, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.



ZONE	Qt/N	SBT
1	2	Sensitive, fine grained
2	1	Organic materials
3	1	Clay
4	1.5	Silty clay to clay
5	2	Clayey silt to silty clay
6	2.5	Sandy silt to clayey silt
7	3	Silty sand to sandy silt
8	4	Sand to silty sand
9	5	Sand
10	6	Gravely sand to sand
11	1	Very stiff fine grained*
12	2	Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2002) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT*. It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

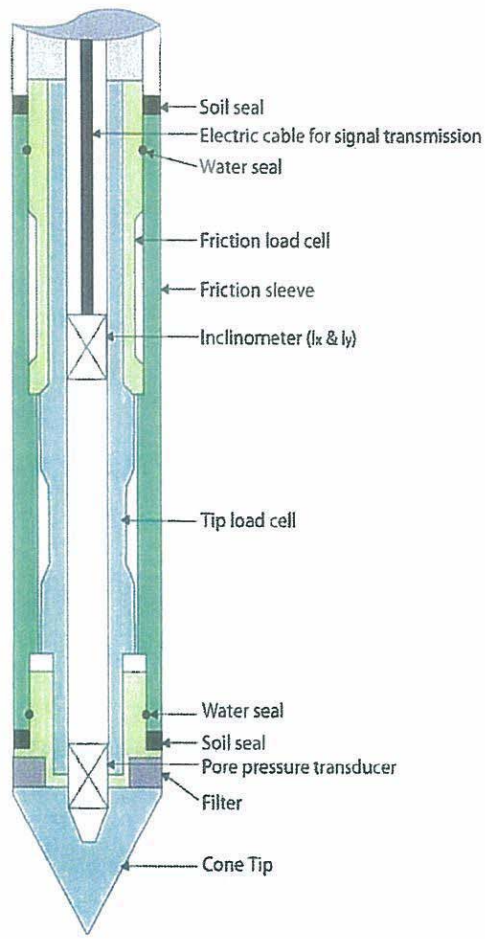


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedures generally consist of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

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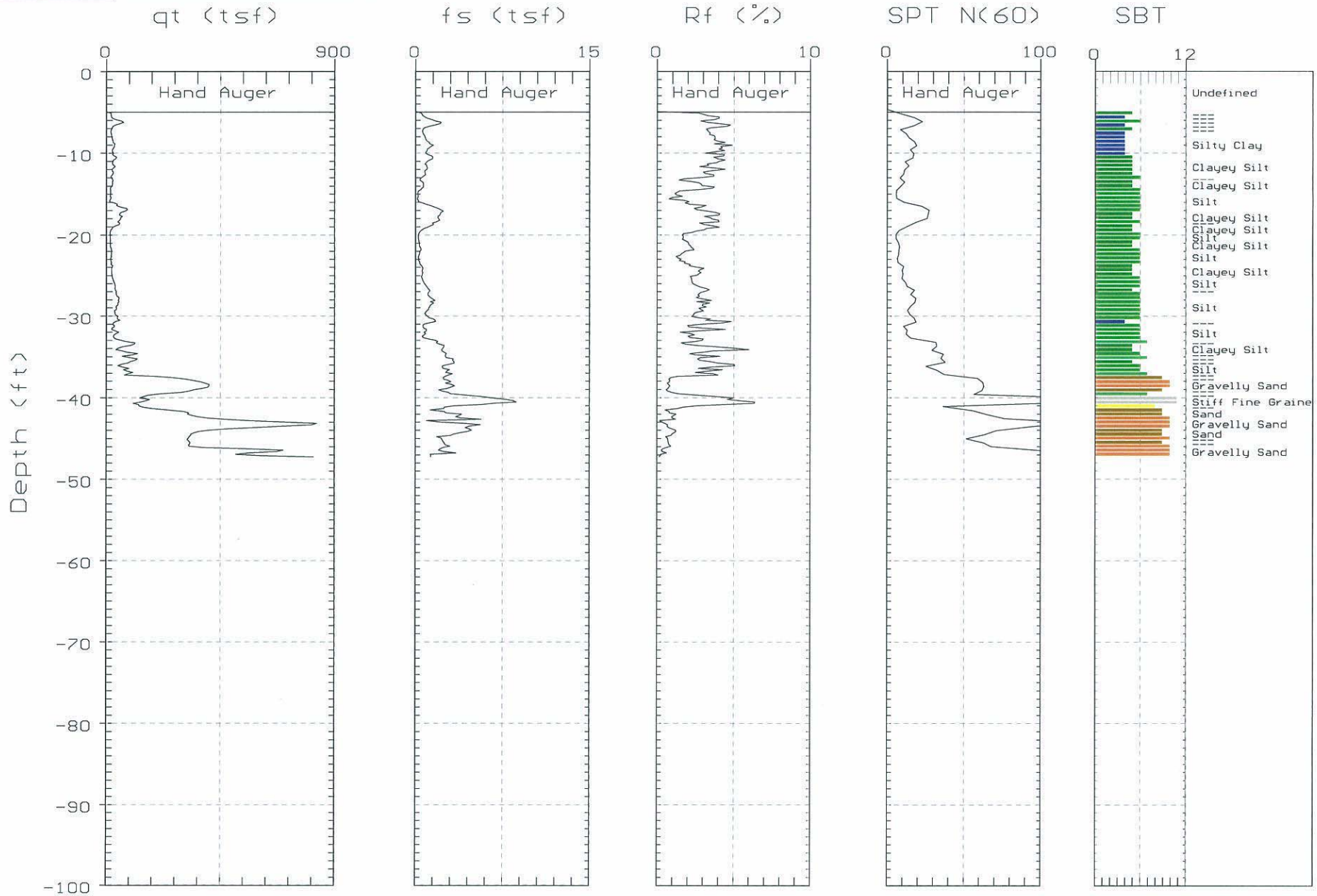
Copies of ASTM Standards are available through www.astm.org

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-01

Engineer: J. Wilen
Date: 08:02:06 13:40



Max. Depth: 47.24 (ft)
Depth Inc.: 0.164 (ft)

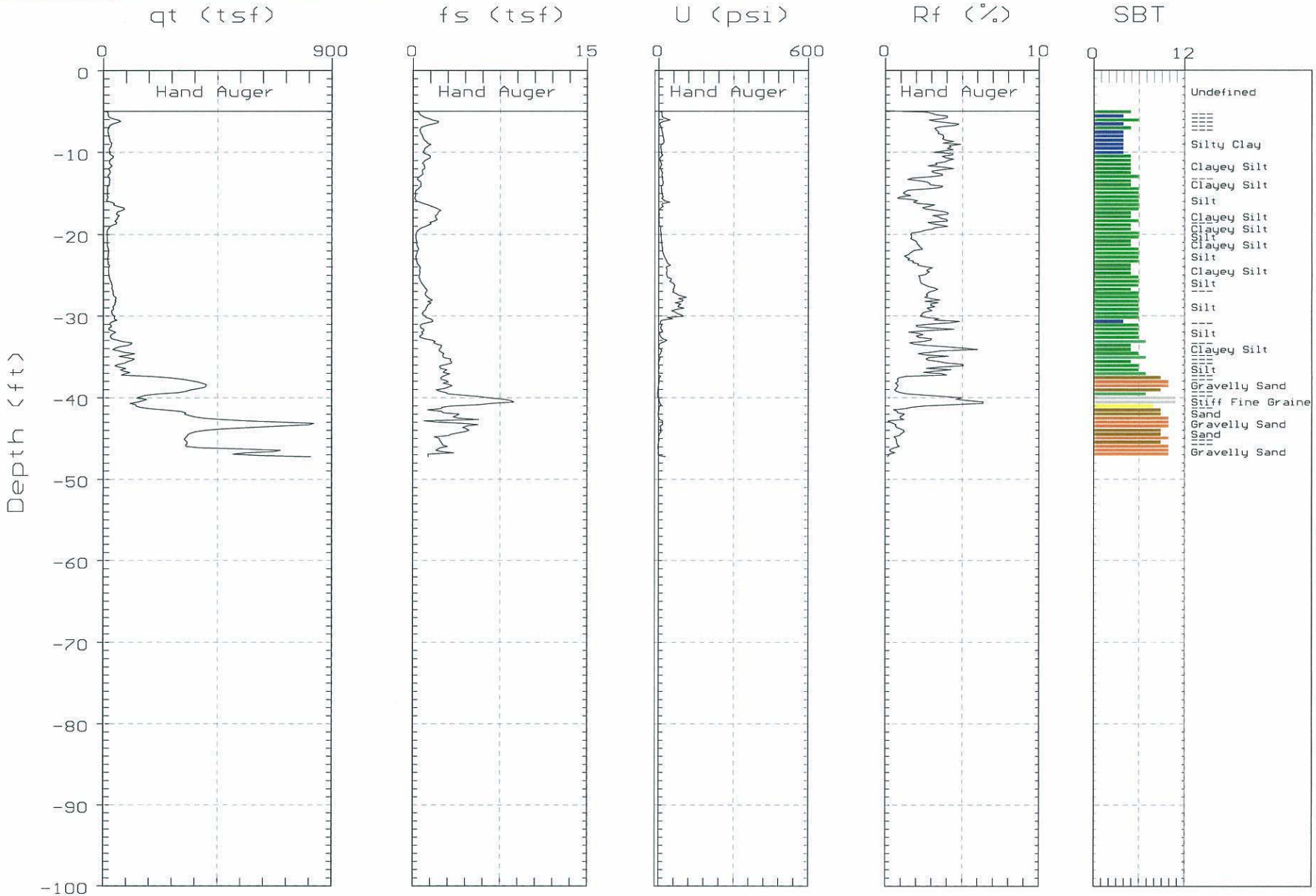
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-01

Engineer: J. Wilen
Date: 08:02:06 13:40



Max. Depth: 47.24 (ft)
Depth Inc.: 0.164 (ft)

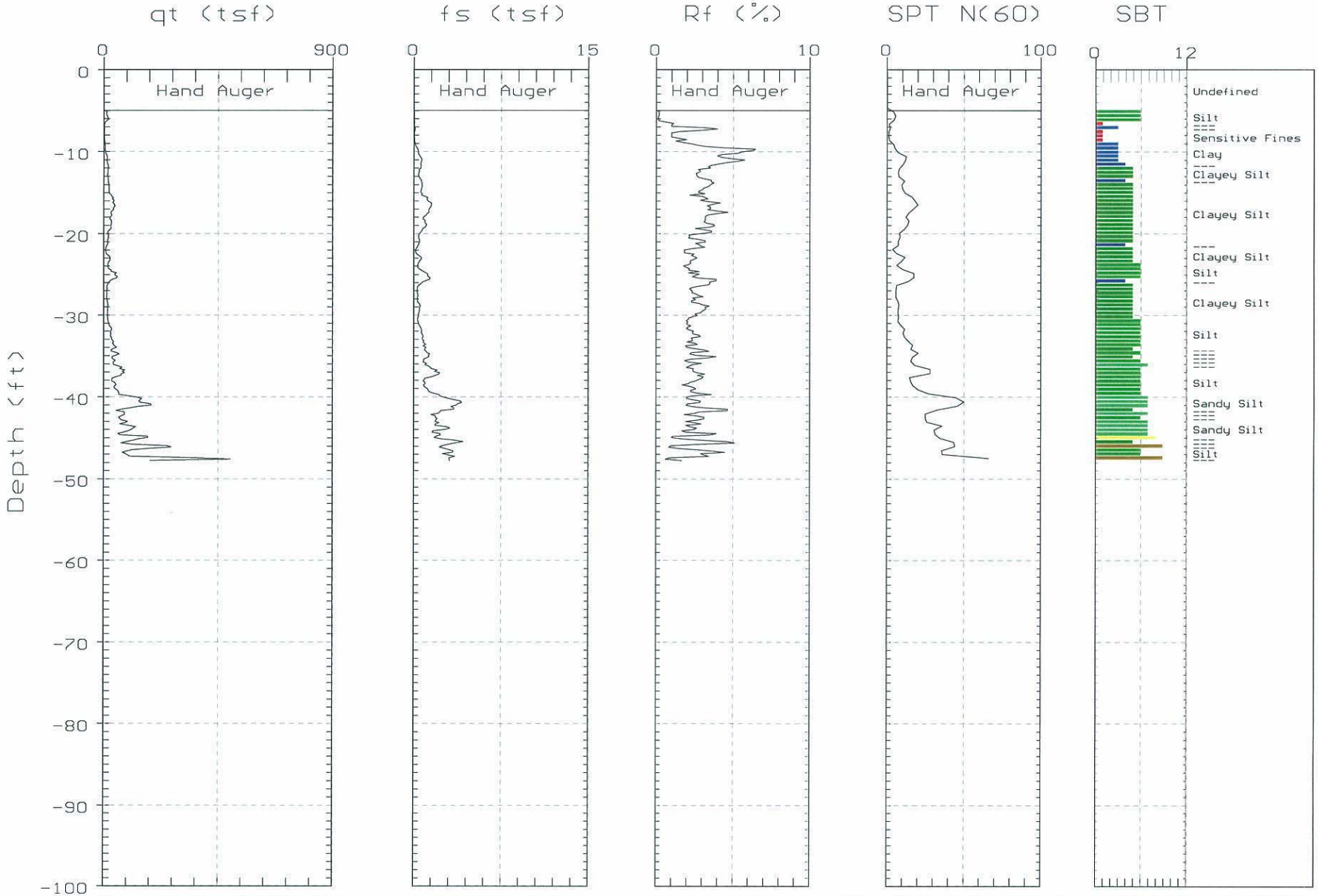
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-03

Engineer: J. Wilen
Date: 08:02:06 17:02



Max. Depth: 47.74 (ft)
Depth Inc.: 0.164 (ft)

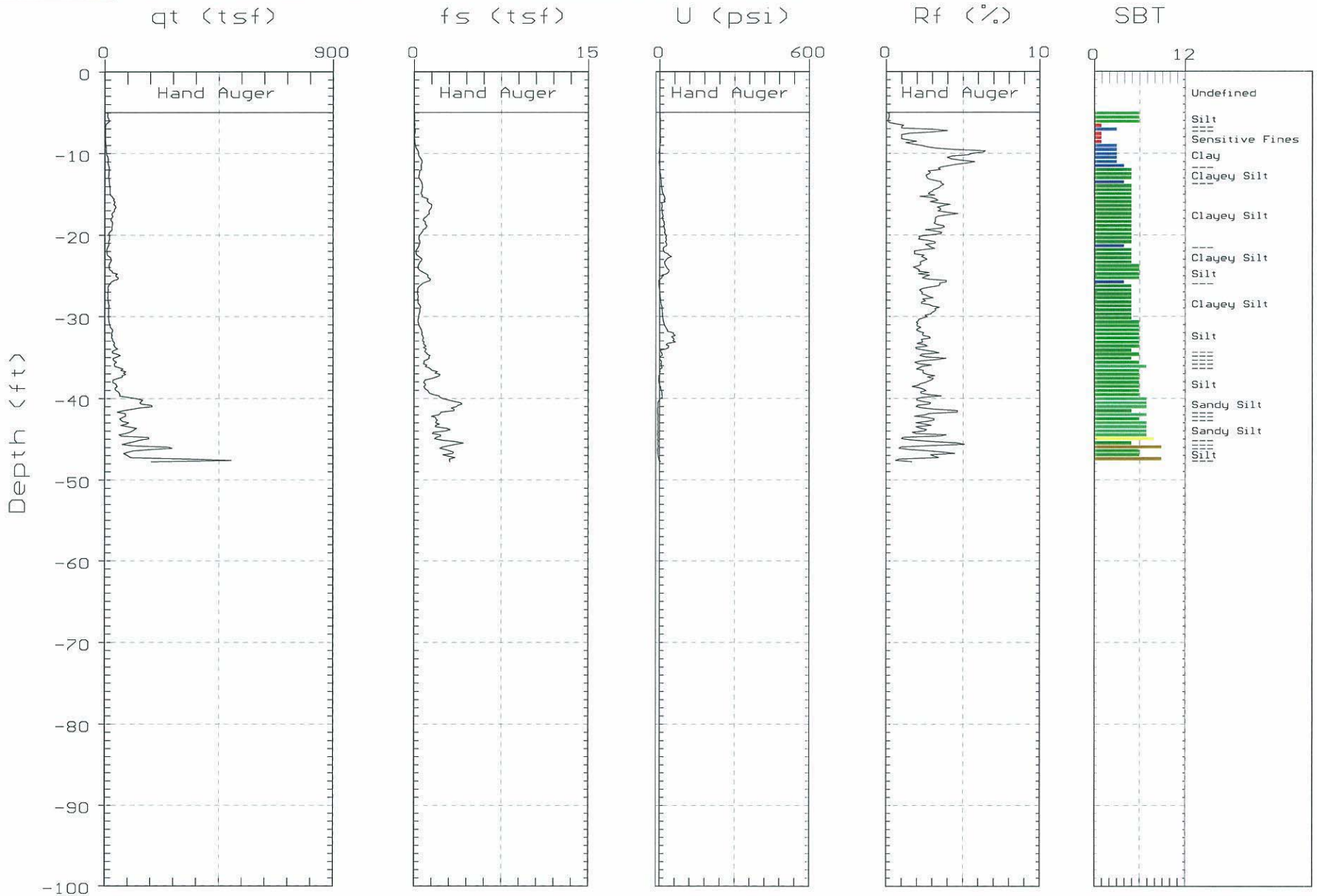
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-03

Engineer: J. Wilen
Date: 08:02:06 17:02



Max. Depth: 47.74 (ft)
Depth Inc.: 0.164 (ft)

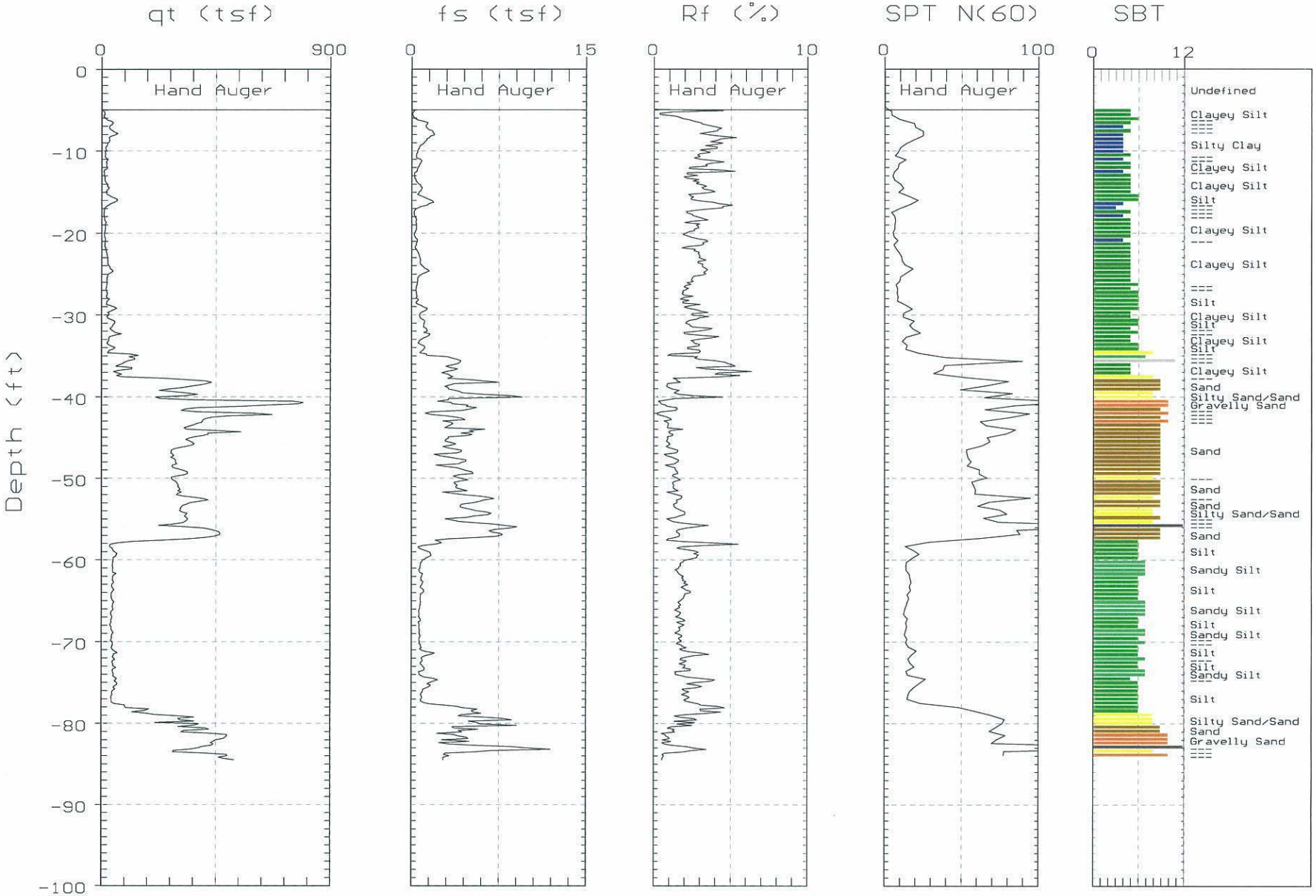
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-06

Engineer: J. Wilen
Date: 08:03:06 10:08



Max. Depth: 84.48 (ft)
Depth Inc.: 0.164 (ft)

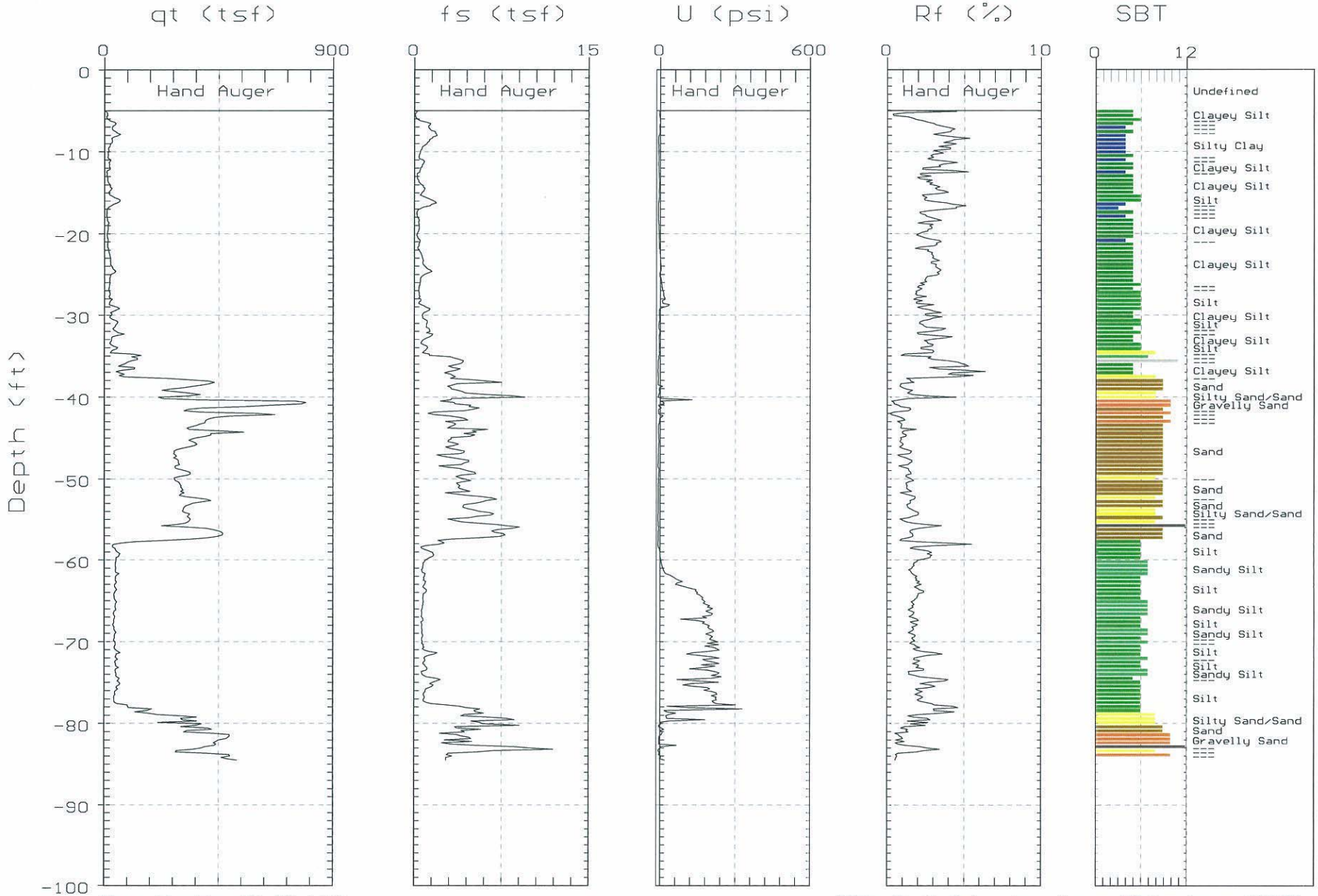
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-06

Engineer: J. Wilen
Date: 08:03:06 10:08



Max. Depth: 84.48 (ft)
Depth Inc.: 0.164 (ft)

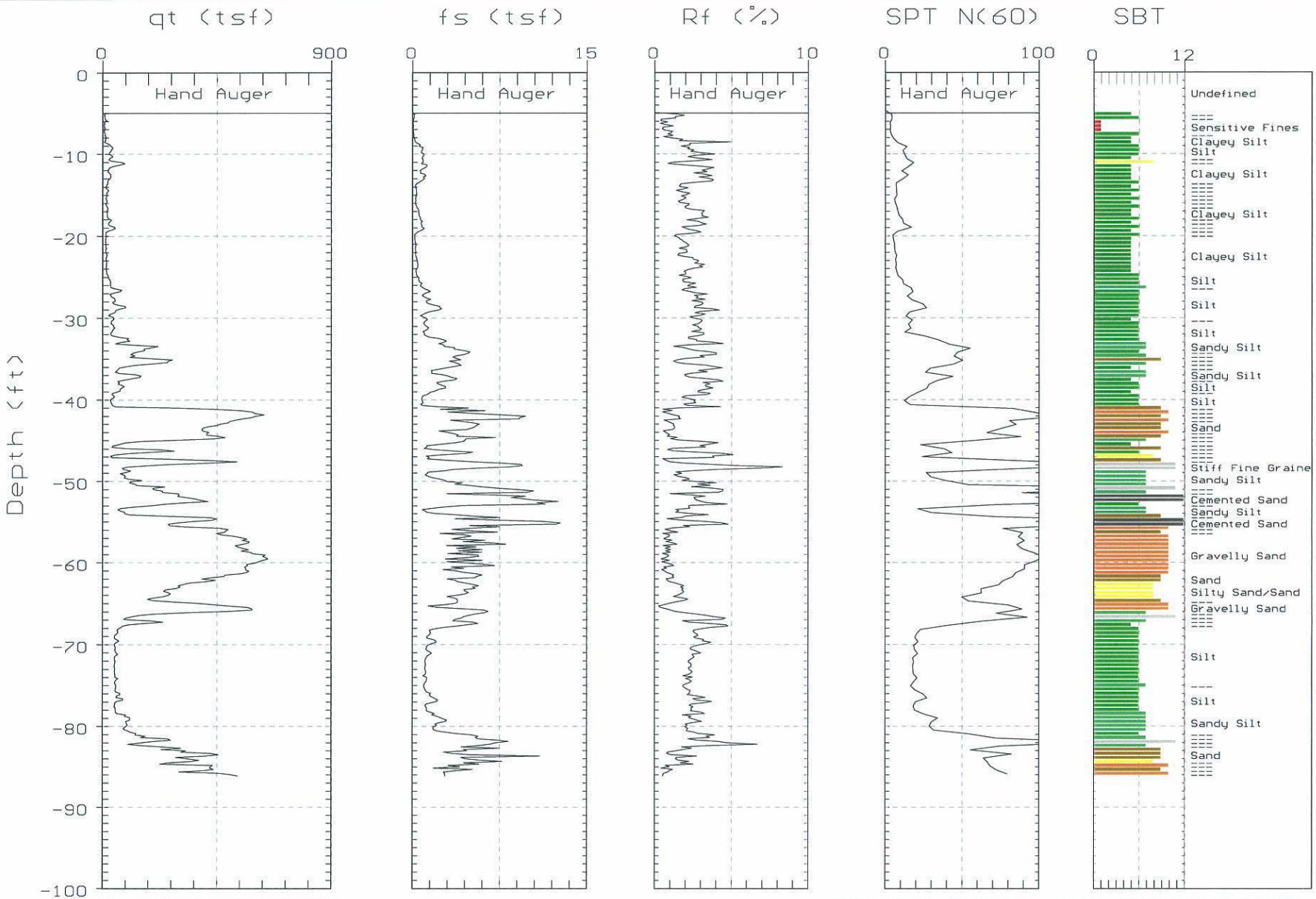
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-07

Engineer: J. Wilen
Date: 08:03:06 14:27



Max. Depth: 86.12 (ft)
Depth Inc.: 0.164 (ft)

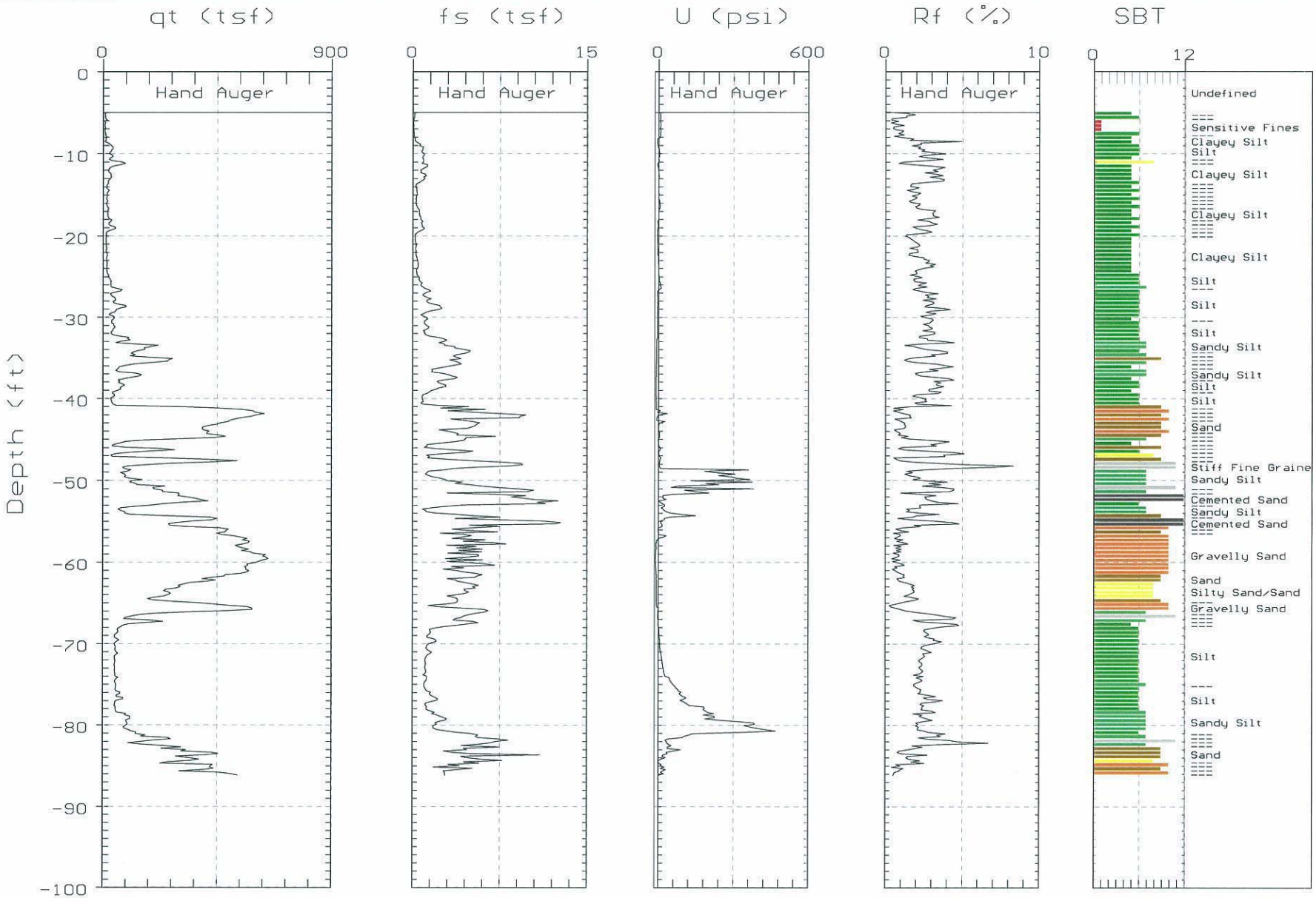
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-07

Engineer: J. Wilen
Date: 08:03:06 14:27



Max. Depth: 86.12 (ft)
Depth Inc.: 0.164 (ft)

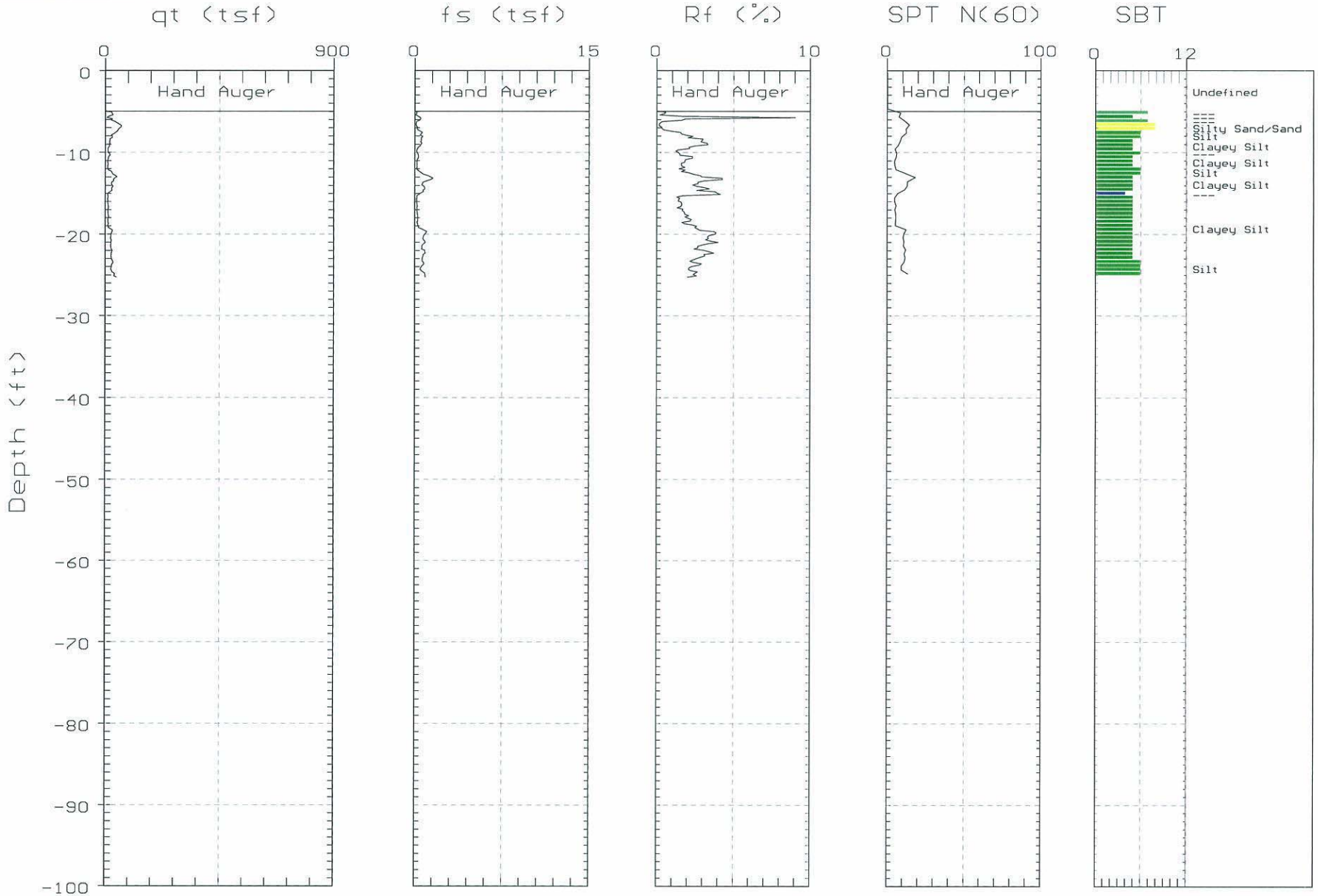
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-09

Engineer: J. Wilen
Date: 08:03:06 20:17



Max. Depth: 25.26 (ft)
Depth Inc.: 0.164 (ft)

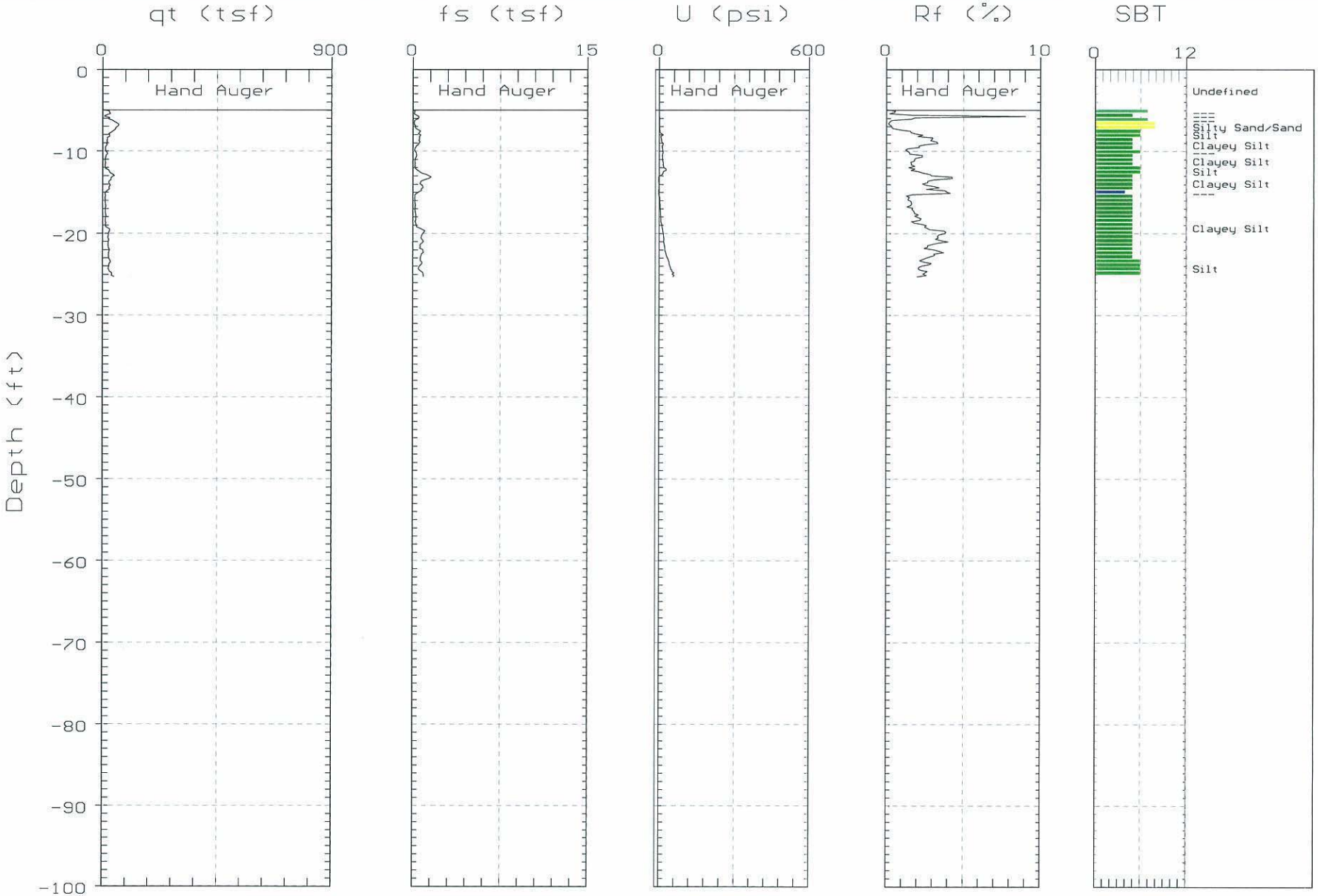
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-09

Engineer: J. Wilen
Date: 08:03:06 20:17



Max. Depth: 25.26 (ft)
Depth Inc.: 0.164 (ft)

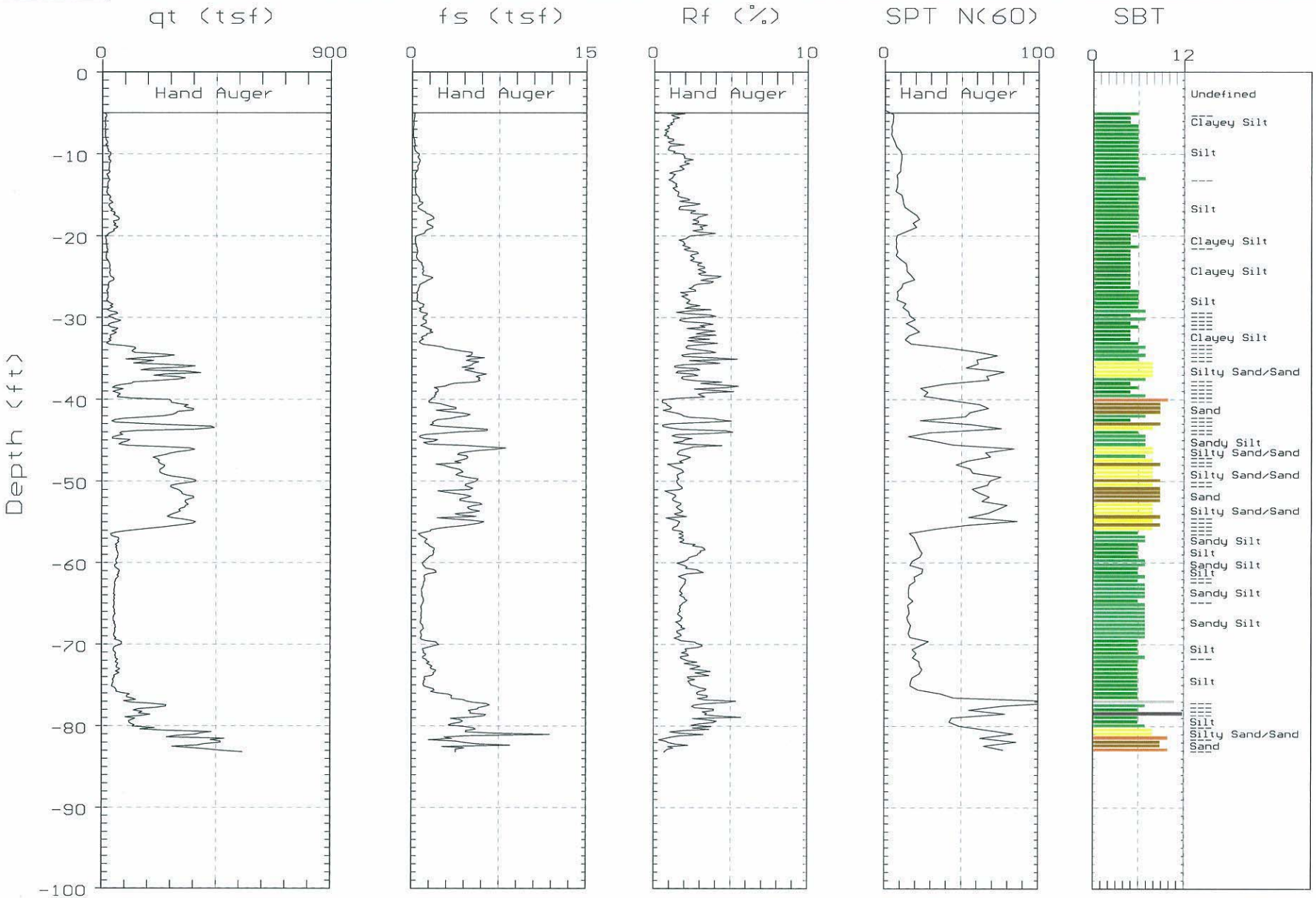
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-12

Engineer: J. Wilen
Date: 08:03:06 08:06



Max. Depth: 83.17 (ft)
Depth Inc.: 0.164 (ft)

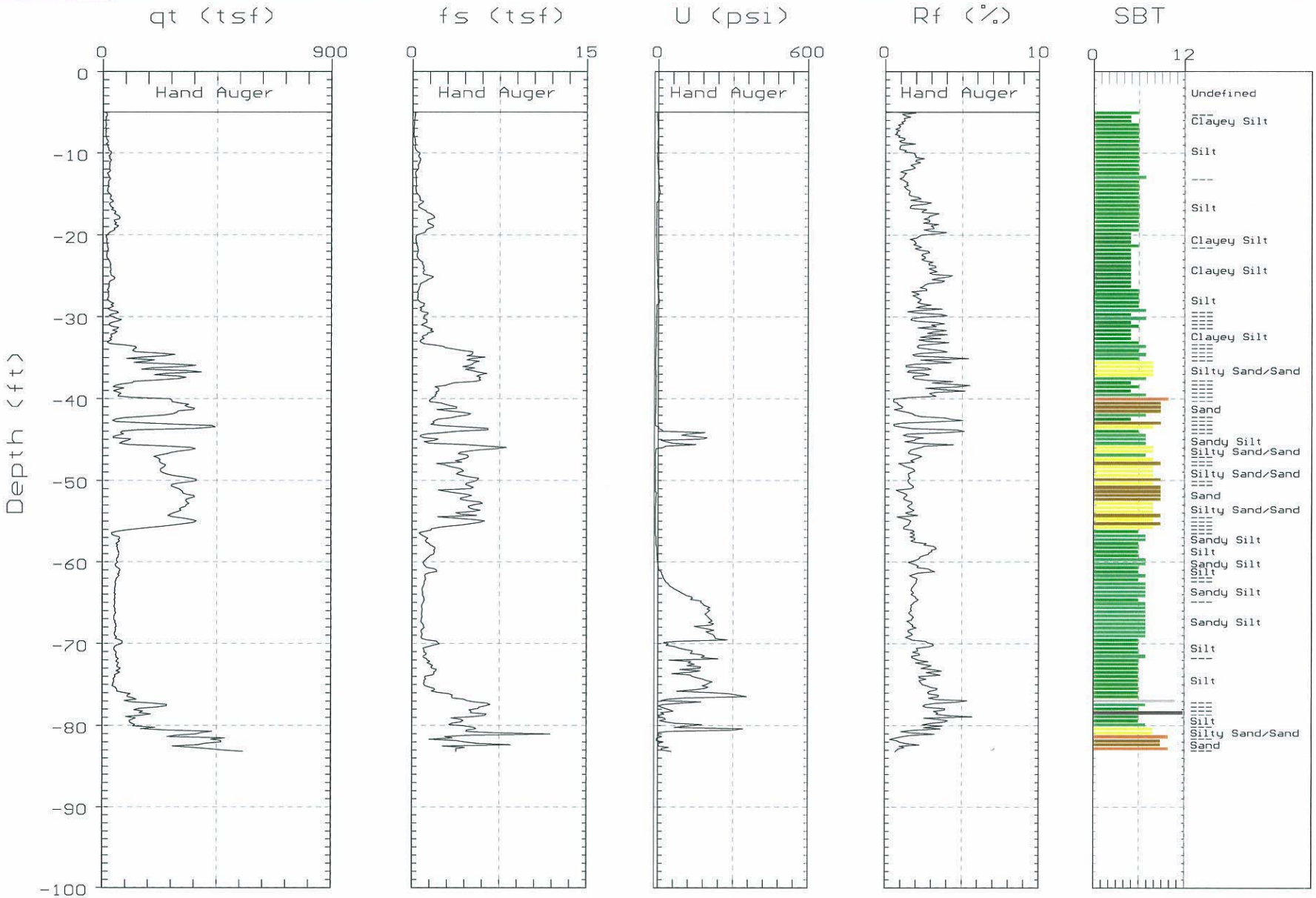
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: CPT-12

Engineer: J. Wilen
Date: 08:03:06 08:06



Max. Depth: 83.17 (ft)
Depth Inc.: 0.164 (ft)

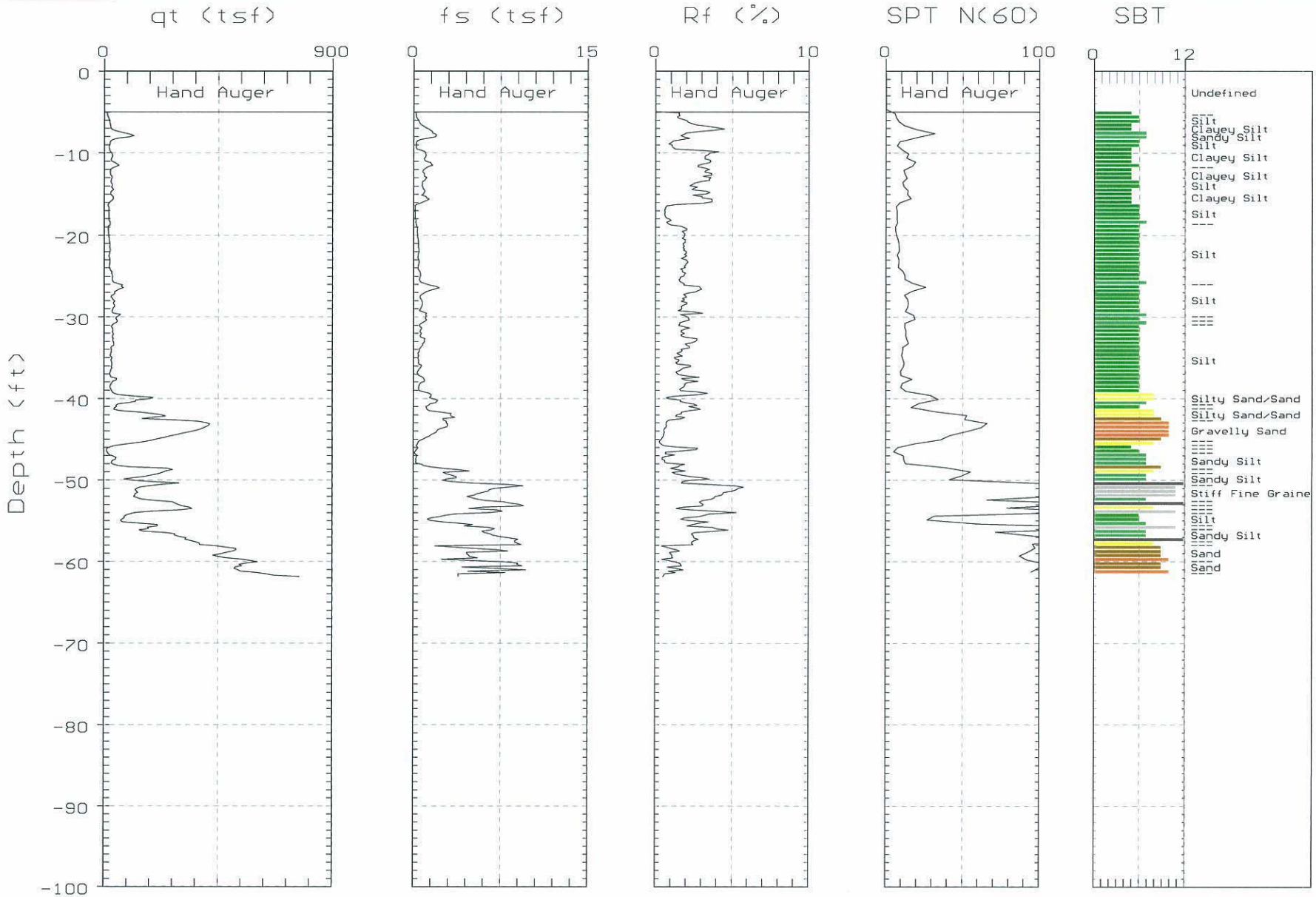
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-02

Engineer: J. Wilen
Date: 08:02:06 15:10



Max. Depth: 61.84 (ft)
Depth Inc.: 0.164 (ft)

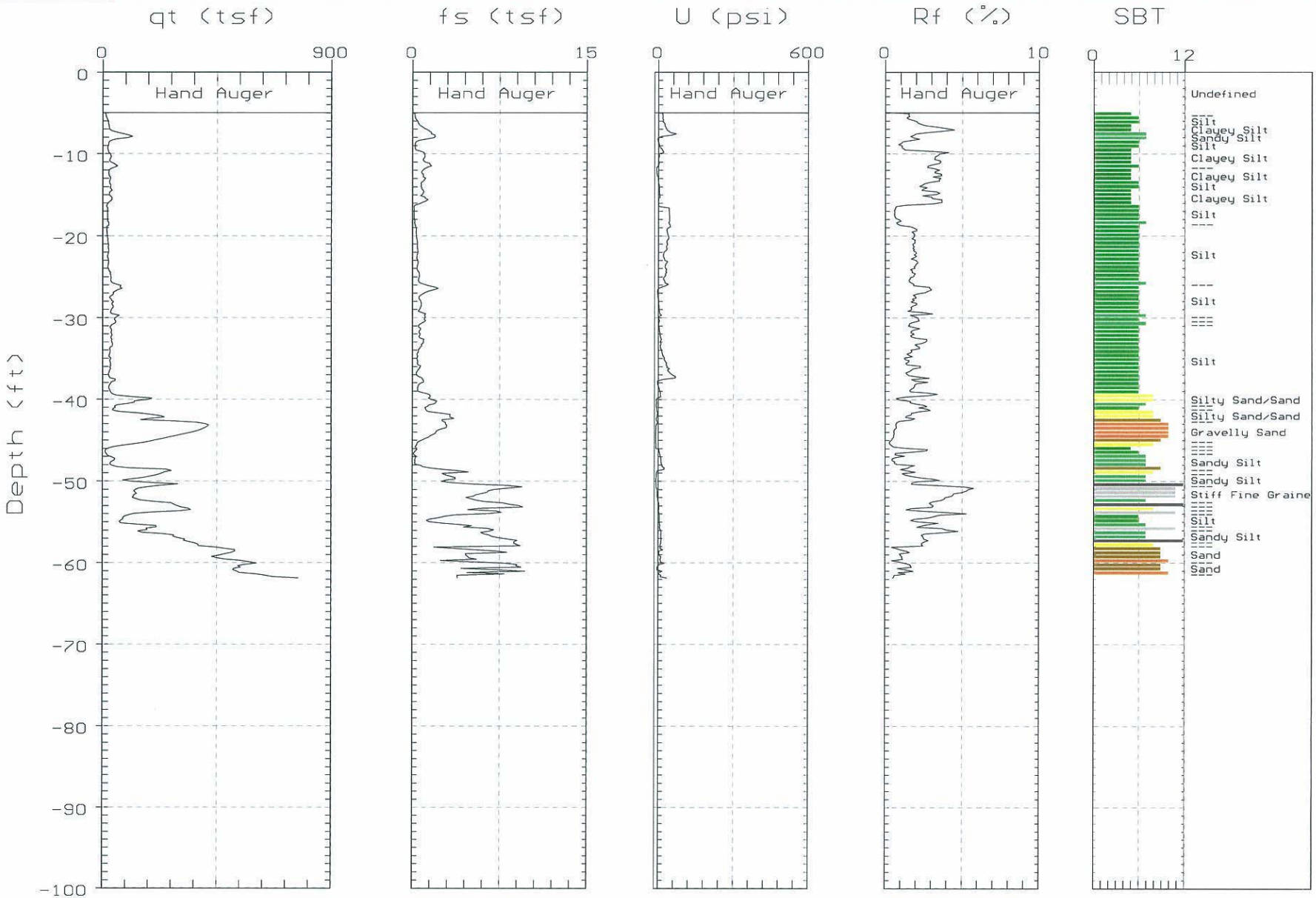
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-02

Engineer: J. Wilen
Date: 08:02:06 15:10



Max. Depth: 61.84 (ft)
Depth Inc.: 0.164 (ft)

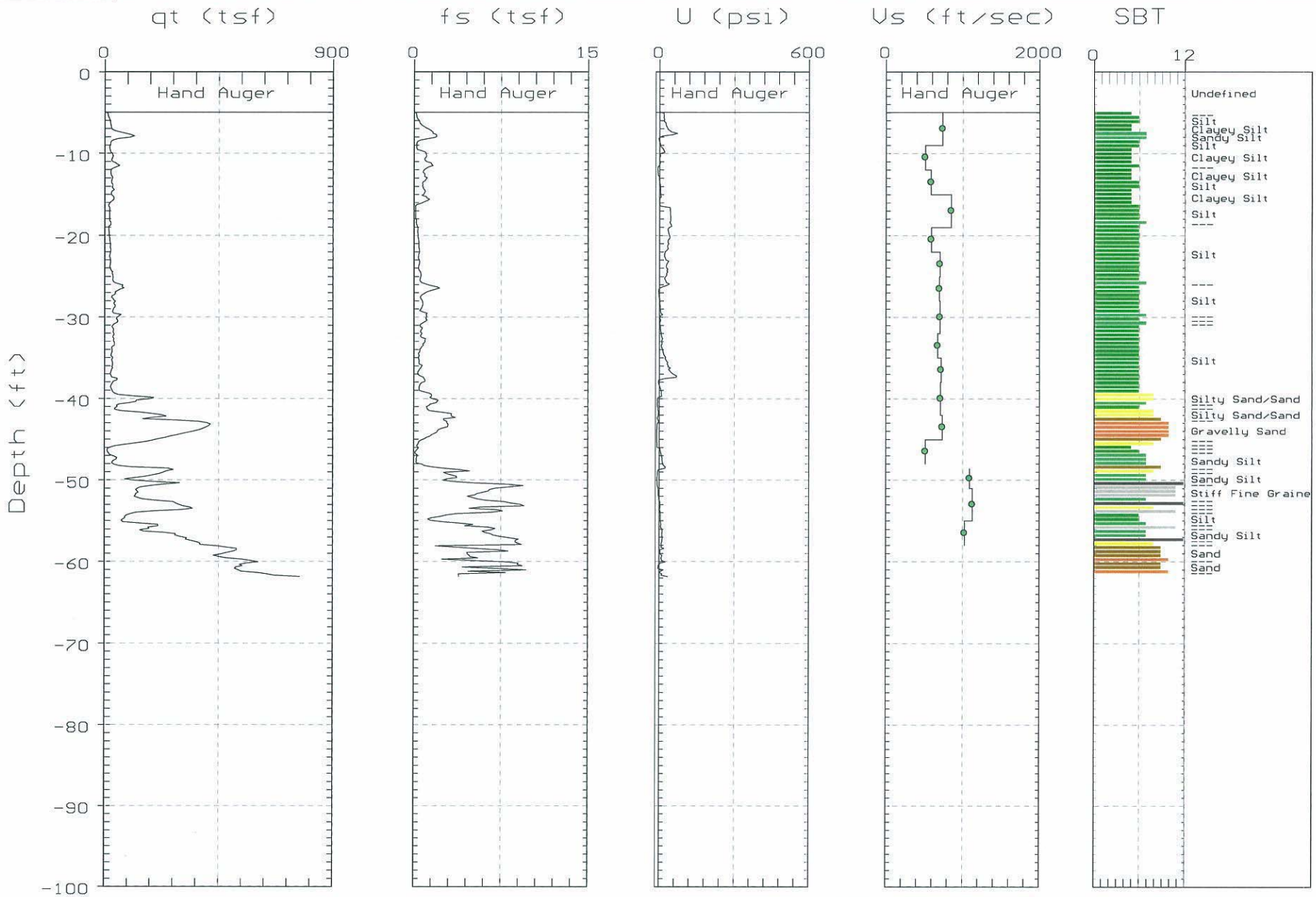
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-02

Engineer: J. Wilen
Date: 08:02:06 15:10



Max. Depth: 61.84 (ft)
Depth Inc.: 0.164 (ft)

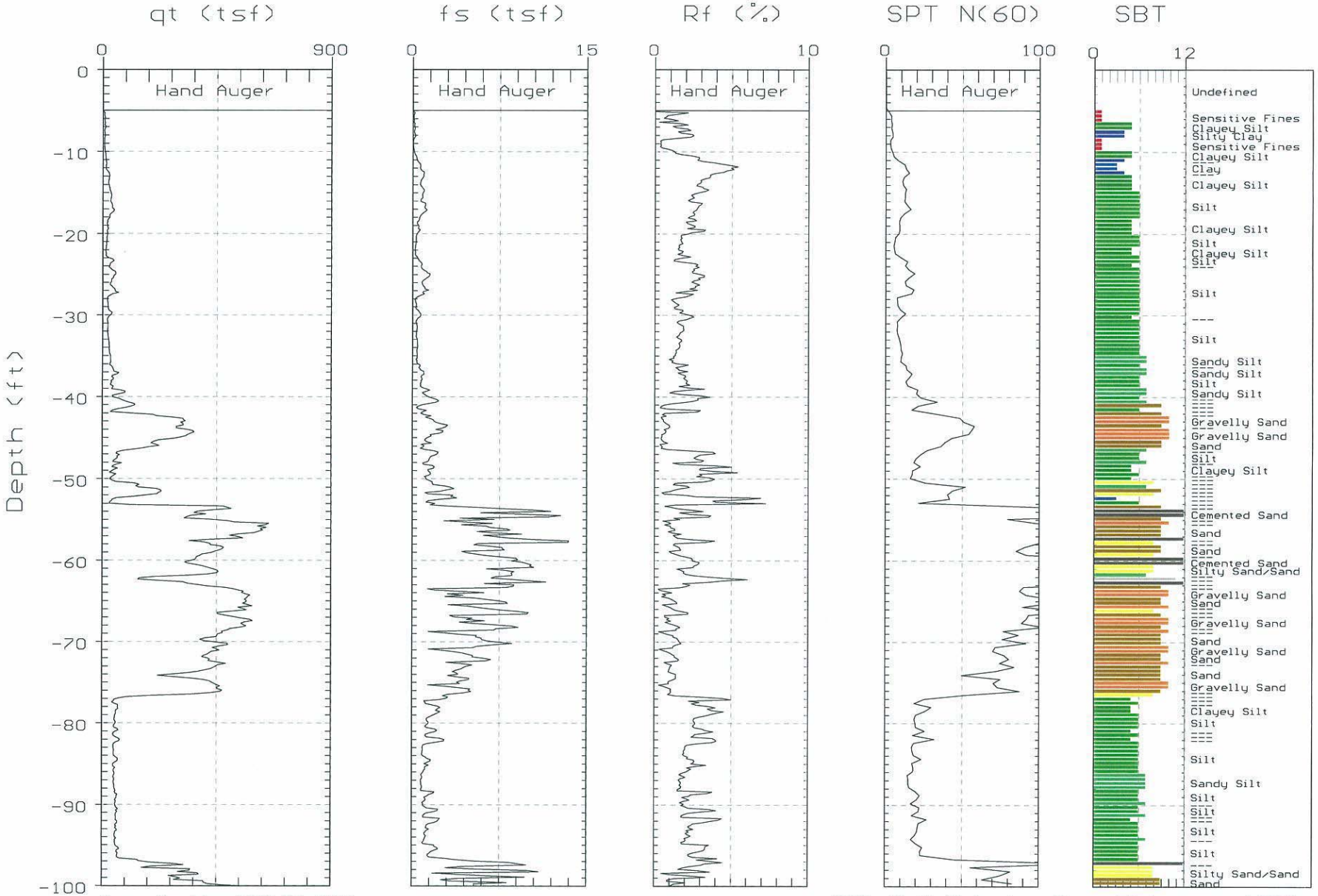
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-05

Engineer: J. Wilen
Date: 08:02:06 09:15



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

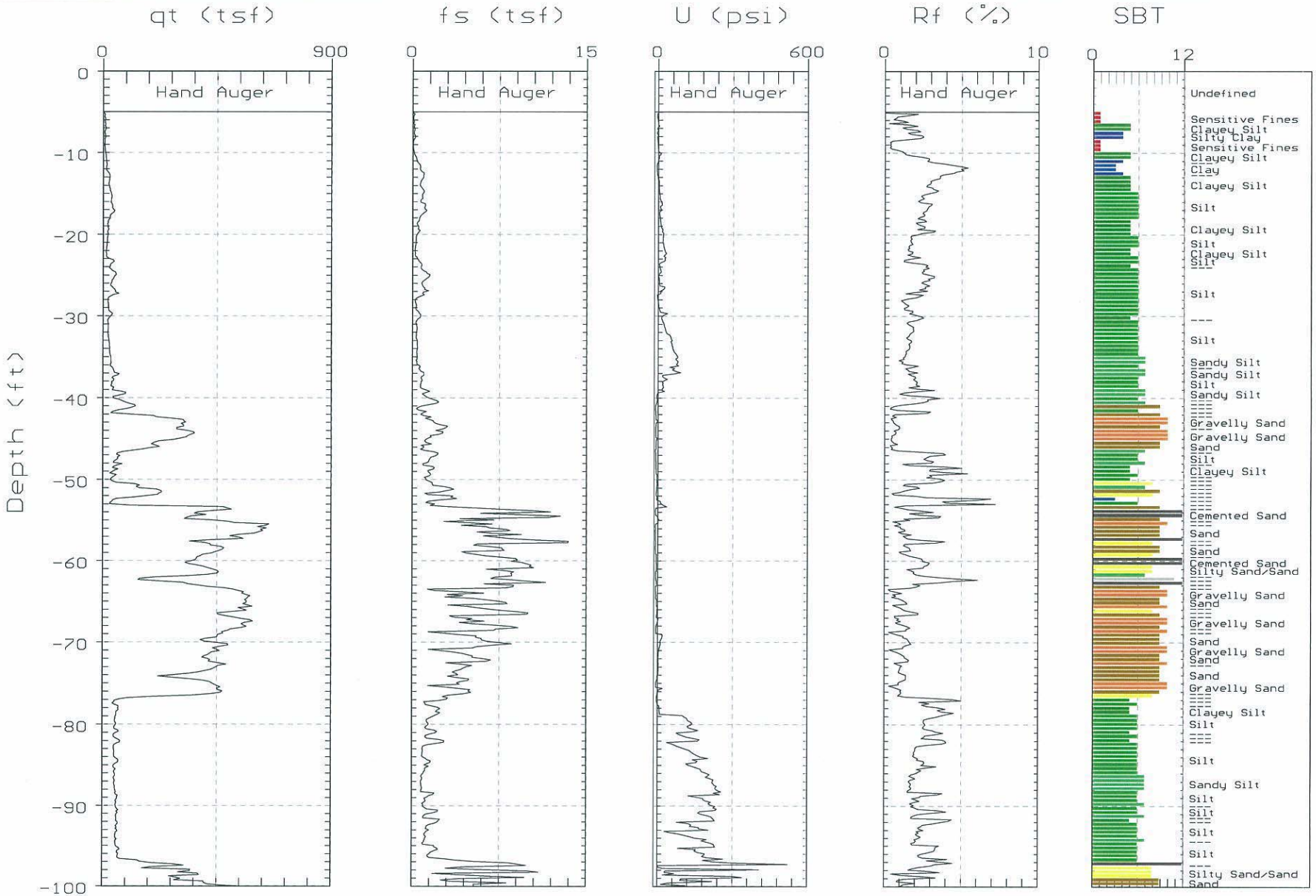
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-05

Engineer: J. Wilen
Date: 08:02:06 09:15



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

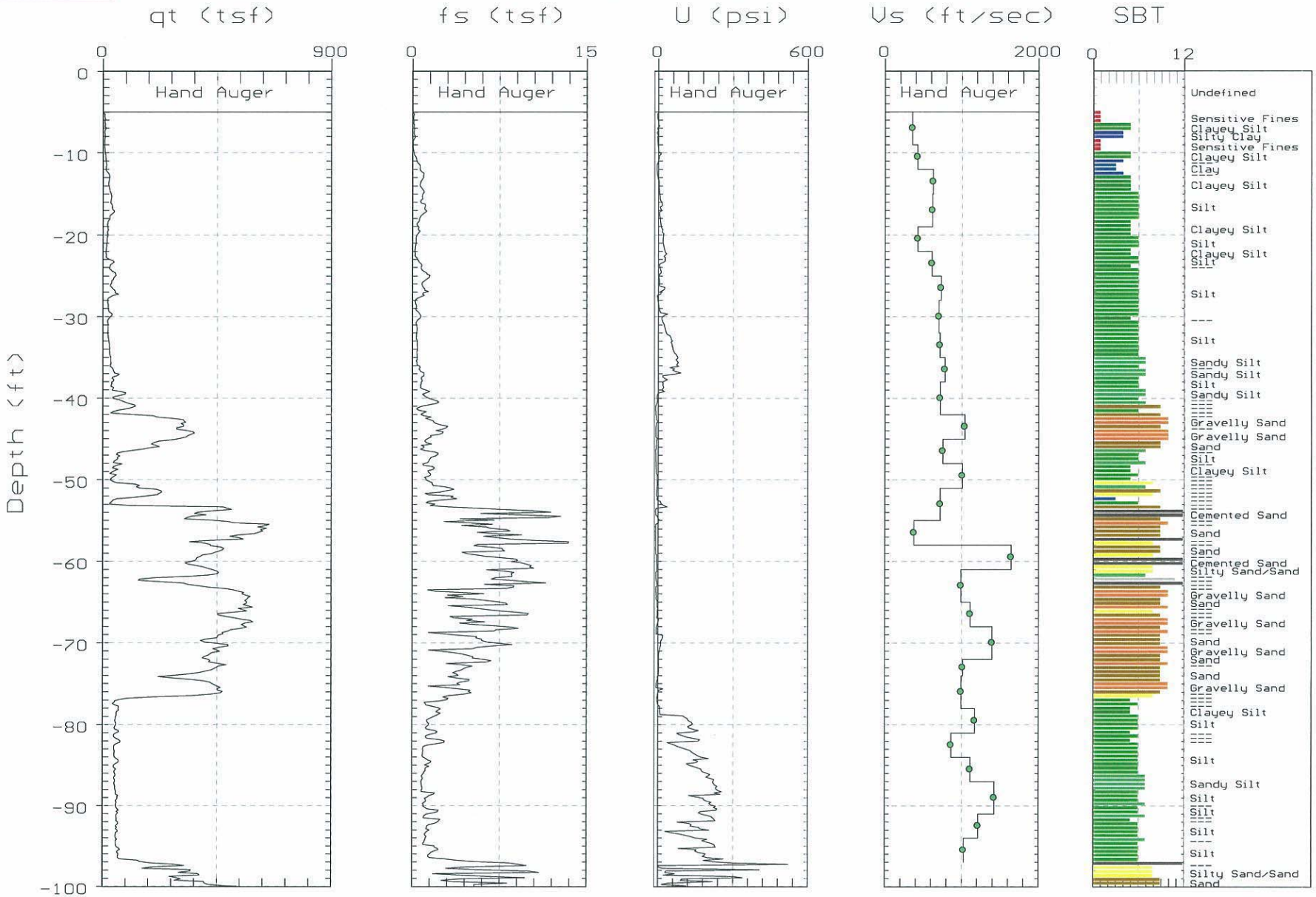
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-05

Engineer: J. Wilen
Date: 08:02:06 09:15



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

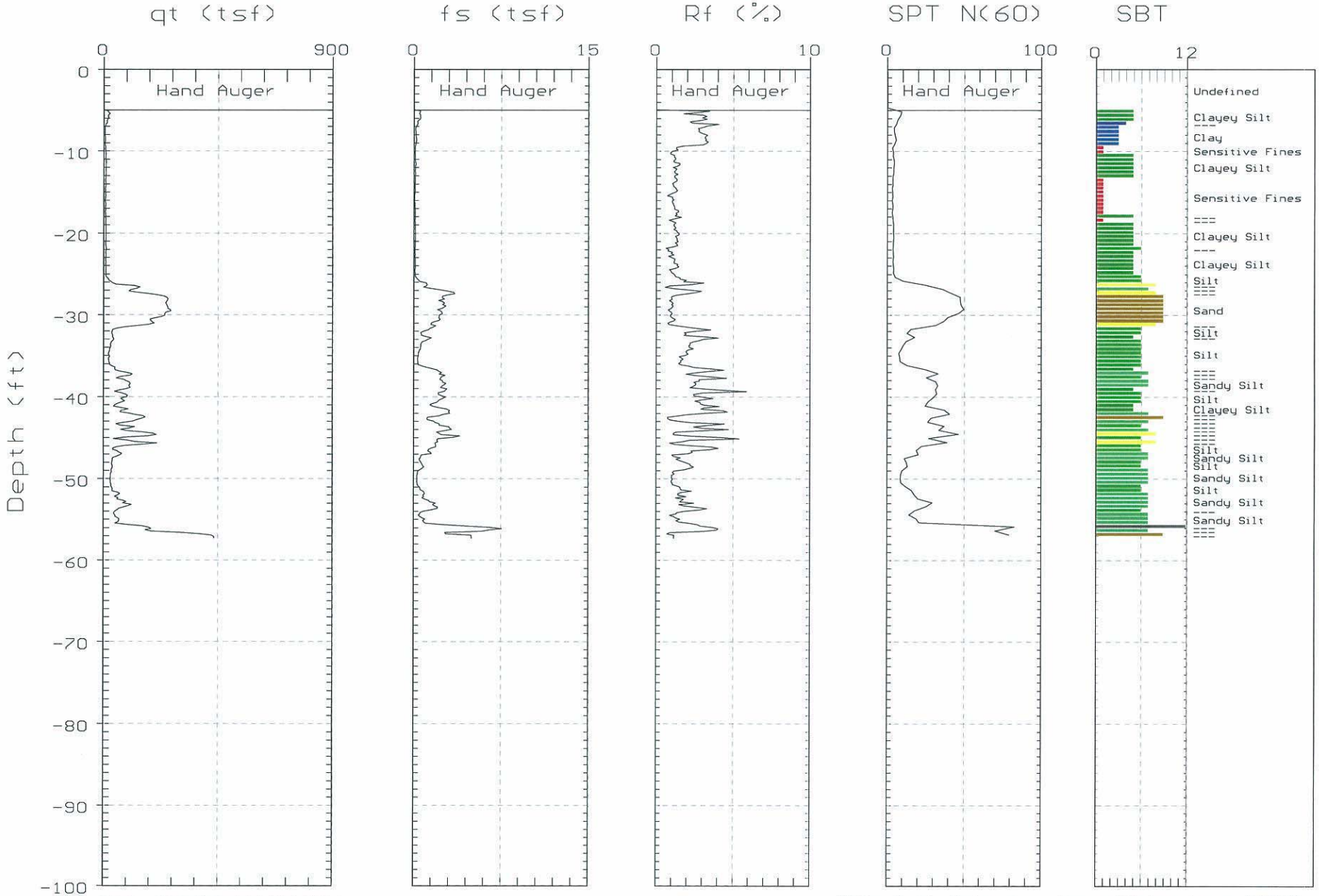
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-08a

Engineer: J. Wilen
Date: 08:03:06 17:55



Max. Depth: 57.25 (ft)
Depth Inc.: 0.164 (ft)

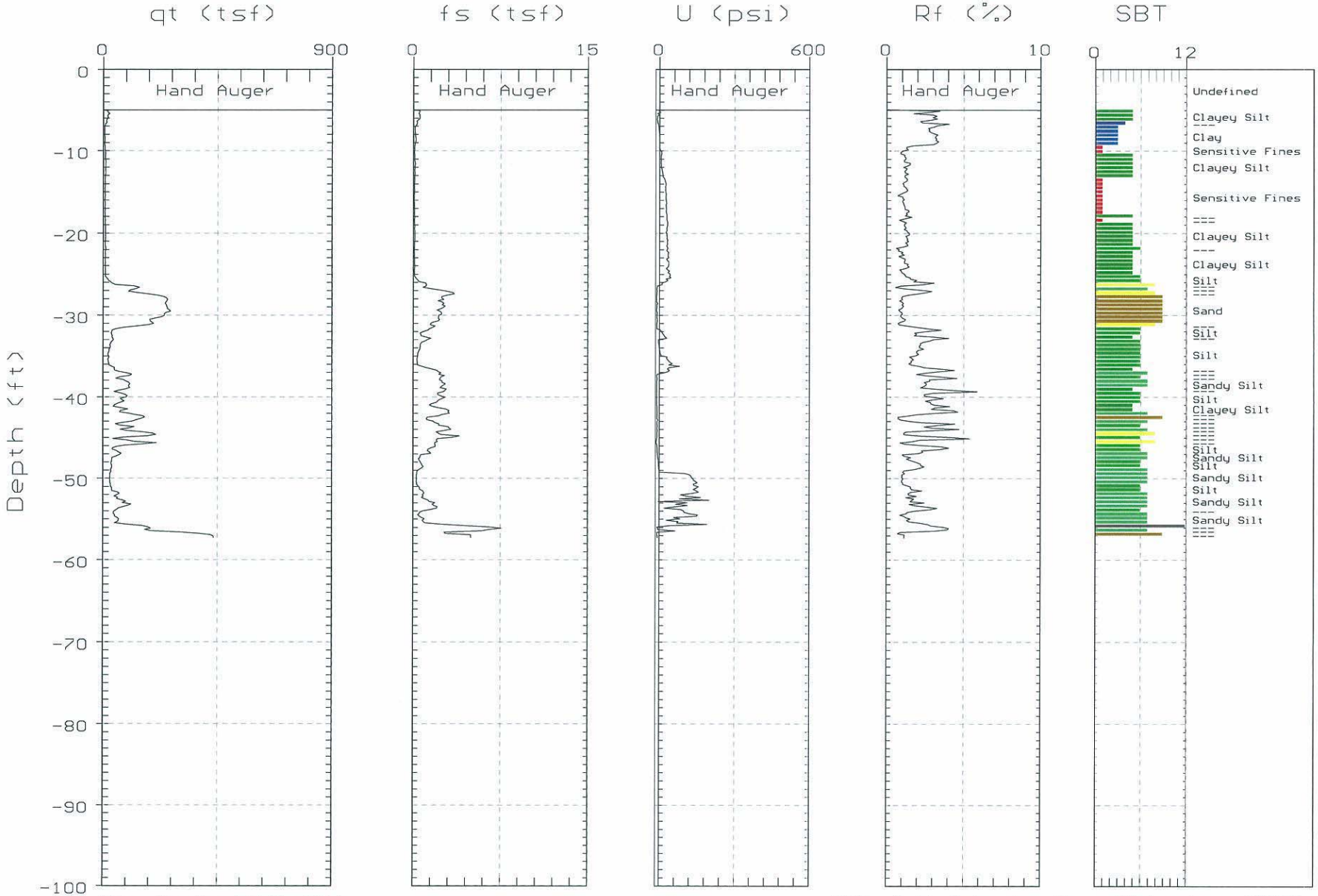
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-08a

Engineer: J. Wilen
Date: 08:03:06 17:55



Max. Depth: 57.25 (ft)
Depth Inc.: 0.164 (ft)

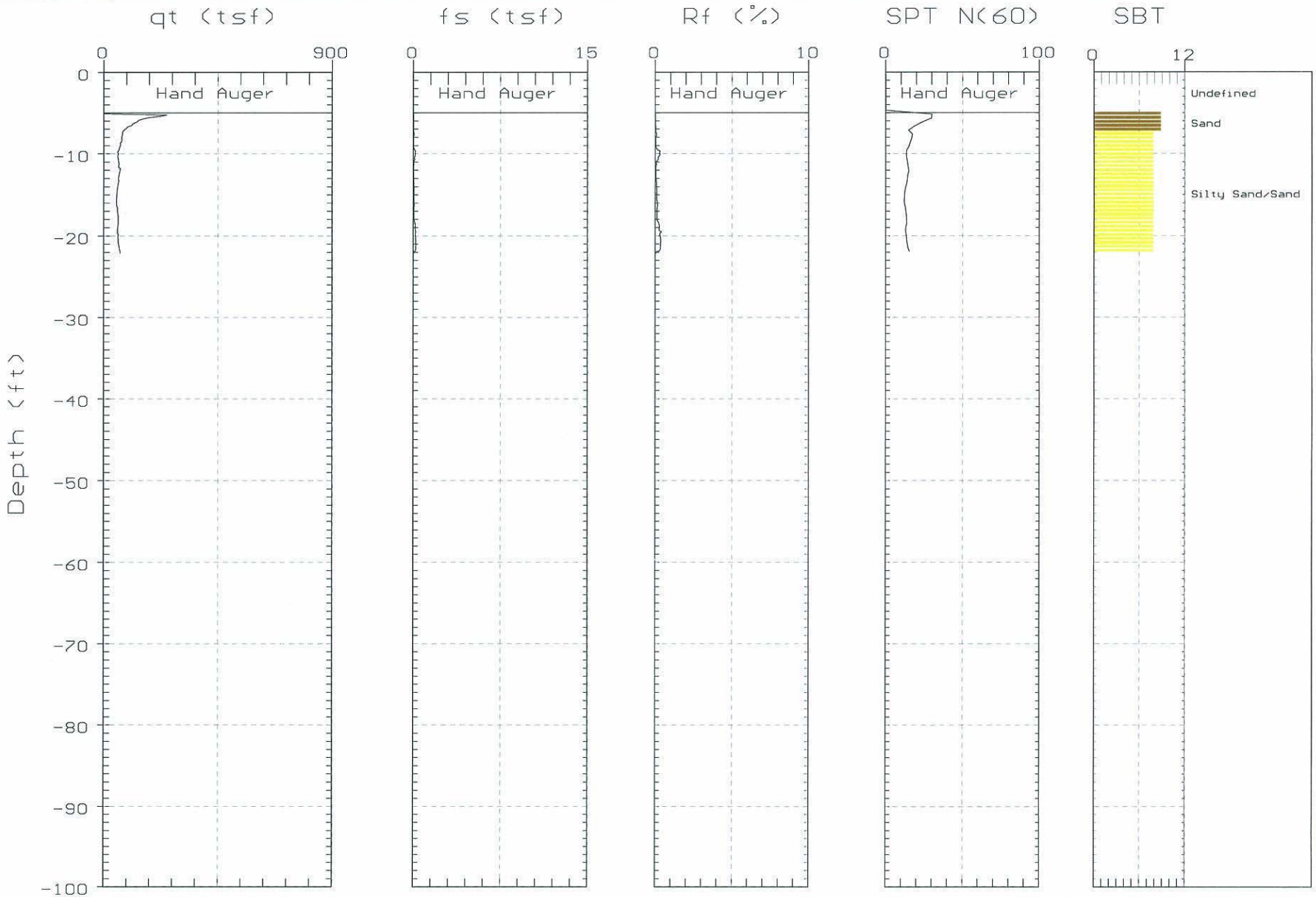
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-08

Engineer: J. Wilen
Date: 08:03:06 17:09



Max. Depth: 22.15 (ft)
Depth Inc.: 0.164 (ft)

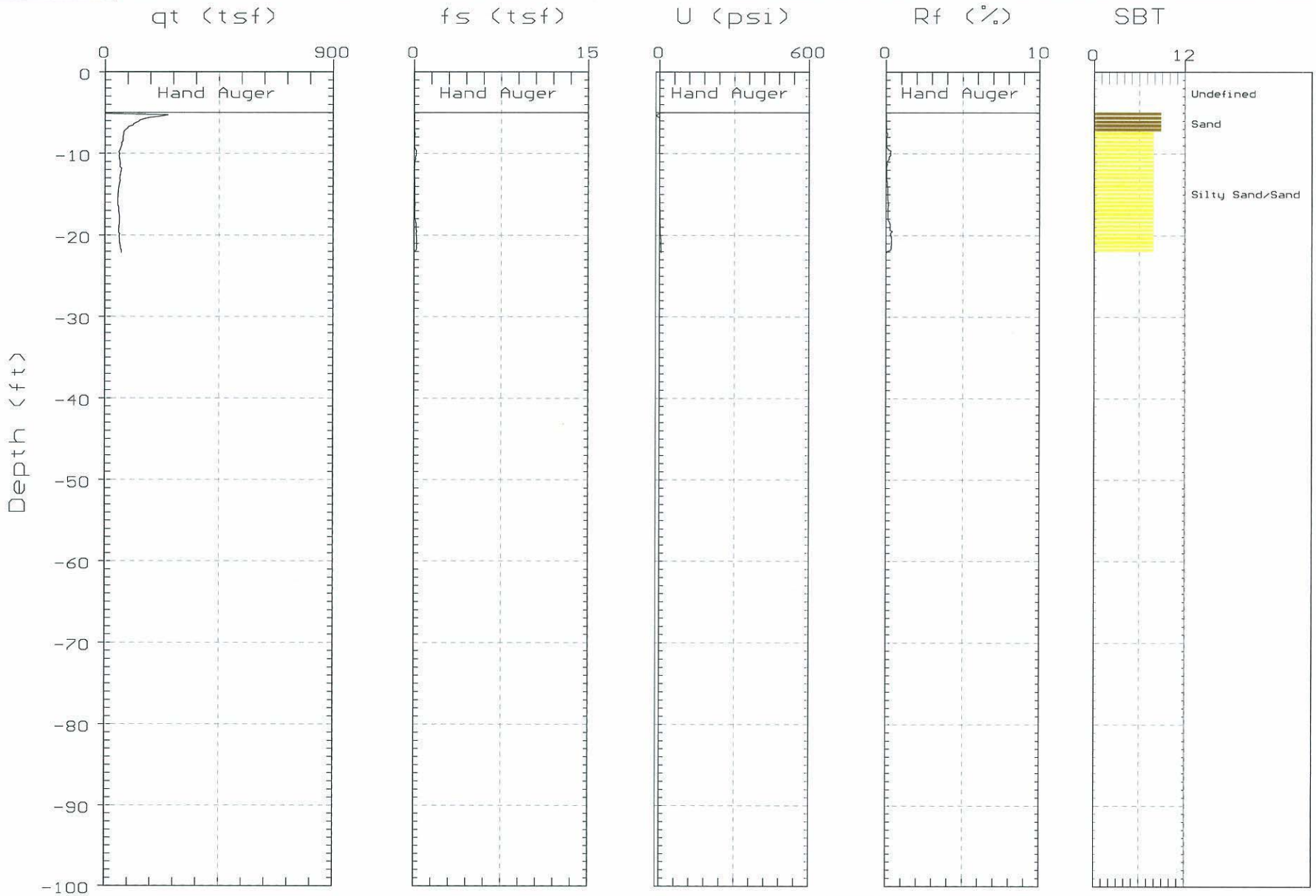
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-08

Engineer: J. Wilen
Date: 08:03:06 17:09



Max. Depth: 22.15 (ft)
Depth Inc.: 0.164 (ft)

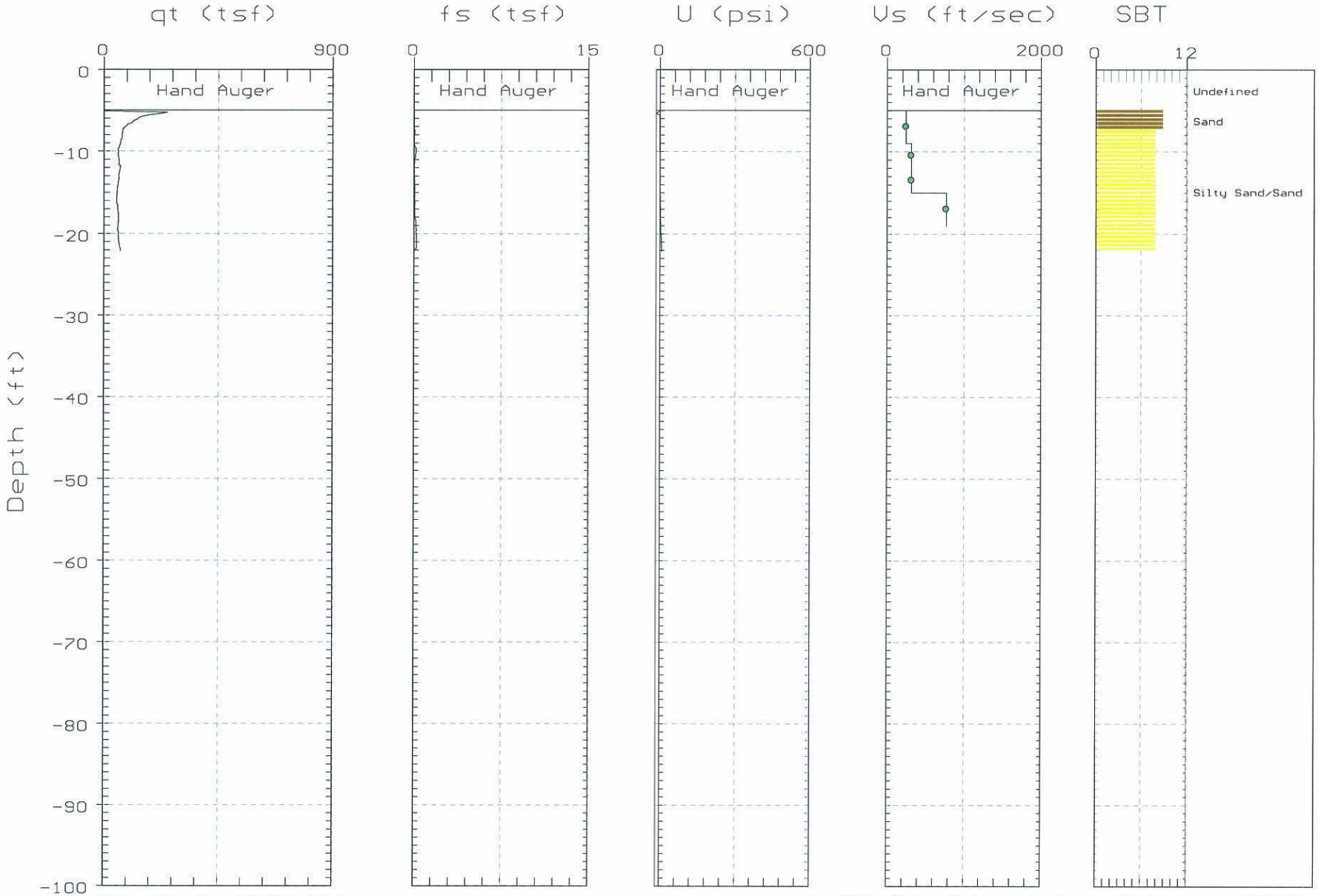
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: Eureka Power Plant
Location: SCPT-08

Engineer: J. Wilen
Date: 08:03:06 17:09



Max. Depth: 22.15 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)