State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Engineering

SHERMAN ISLAND
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT

State Water Facilities
Sacramento County
California

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ENGINEERING GEOLOGY CERTIFICATION

This report has been prepared under my direction as the professional geologist in direct responsible charge of the work, in accordance with the provisions of the Geologist Act of the State of California.

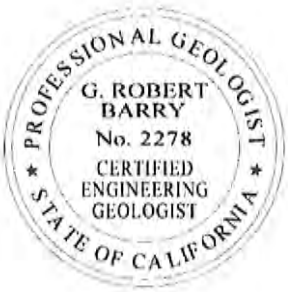

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TABLE OF CONTENTS

INTRODUCTION 1
Purpose and Scope 1
Project Location 1

GEOLOGY 2
Aerial Geology 2
Local Geology 2

GEOLOGIC INVESTIGATIONS 3
Exploration Drilling 3
Cone Penetrometer Test Contractor and Equipment 3
Land-Based Drilling 4
Drilling Contractor and Equipment 4
Drilling Methods 4
In Situ Testing and Sampling 5
Over-Water Drilling 8
Drilling Contractor and Equipment 8
Drilling Method 8
In Situ Geotechnical Testing and Sampling 8
Site Restoration 9

LABORATORY TESTING 9
Permits and Clearances 9
Utility Clearances 9
Land Drilling Permit and Access Requirements 10
Over-Water Drilling Permit and Access Requirements 10
Location Surveys 11

GEOTECHNICAL EXPLORATION 11
Manzo Ranch Results 11
Summary 11
Land-Based Drilling Results 11
Over-Water Drilling Results 12
Cone Penetrometer Testing Results 12
Foundation Conditions 14
Groundwater 14
Excavation Characteristics 14
Conclusions and Recommendations 15
Little Baja 16
Summary 16
Land-Based Drilling Results 16

Over-Water Drilling Results 16
Cone Penetrometer Testing Results 17
Foundation Conditions 18
Groundwater 18
Excavation Characteristics 19
Conclusions and Recommendations 19

FAULTING AND SEISMICITY 20
Faulting 20
The Coast Range-Central Valley Boundary Zone 20
Pittsburg-Kirby Hills Thrust Fault (GV05) 21
Mount Diablo Thrust Fault (Blind) 21
The Midland Fault 21
Other Faults 22
Seismicity 22
Manzo Ranch 22
Little Baja 25
Probabilistic Determination Using the USGS Website 27

REFERENCES 29

LIST OF TABLES

Table 1. Manzo Ranch Salvaged Fish Release Site CPT Summary 13
Table 2. Manzo Ranch Salvaged Fish Release Site Pore Pressure Dissipation Test Results 13
Table 3. Little Baja Salvaged Fish Release Site CPT Summary 17
Table 4. Little Baja Salvaged Fish Release Site Pore Pressure Dissipation Test Results 18
Table 5. Sherman Island Fish Release Site, Manzo Ranch, Significant Faults, Parameters, and PGA Used in NGA Calculations. 23
Table 6. Estimated Spectral Accelerations and Peak Ground Velocity, Geometric Mean Horizontal Component (5% Damping) of Ground Motion on Stiff Soil (Vs30=230 m/s) for an Mw 6.7 Earthquake on the GV05 Fault at the Sherman Island Fish Release Site, Manzo Ranch, Using NGA. 23
Table 7. Arias Intensity in Meters Per Second (m/s) and Duration of Ground Motion in Seconds from an Mw 6.7 Earthquake on the GV05 Fault at Sherman Island Fish Release Site, Manzo Ranch 24
Table 8. Estimated Fault Normal (FN) Directivity Effects on Spectral Accelerations

(SA) (5% Damping) of Ground Motion on Stiff Soil (Vs30=230 m/s) for an Mw 6.7 Earthquake on the GV05 Fault at the Sherman Island Fish Release Site, Manzo Ranch, Using NGA. 24
Table 9. Sherman Island Fish Release Site, Little Baja, Significant Faults, Parameters, and PGA Used in NGA Calculations. 25
Table 10. Estimated Spectral Accelerations and Peak Ground Velocity, Geometric Mean Horizontal Component (5% Damping) of Ground Motion on Very Dense Soil and Soft Rock (Vs30=371 m/s) for an Mw 6.7 Earthquake on the GV05 (Pittsburg Kirby Hills) Fault at the Sherman Island Fish Release Site (Little Baja) Using NGA. 26
Table 11. Arias Intensity in Meters Per Second (m/s) and Duration of Ground Motion in Seconds from an Mw 6.7 Earthquake on the GV05 Fault at Sherman Island Fish Release Site (Little Baja). 26
Table 12. Estimated Fault Normal (FN) Directivity Effects on Spectral Accelerations (SA) (5% Damping) of Ground Motion on Very Dense Soil and Soft Rock (Vs30=371 m/s) for an Mw 6.7 Earthquake on the Fault at the Sherman Island Fish Release Site (Little Baja) Using NGA. 27
Table 13. Summary of 2008 USGS Probabilistic Seismic Hazard Curve Parameters, Sherman Island Fish Release Site—Manzo Ranch. 27
Table 14. Summary of 2008 USGS Probabilistic Seismic Hazard Curve Parameters, Sherman Island Fish Release Site—Little Baja. 28

LIST OF APPENDICES

Appendix A Final Drill Hole Logs
Appendix B CPT Logs
Appendix C Lab Results
Appendix D Vane Shear Testing
Appendix E Hammer Energy Measurements

LIST OF PLATES

Plate 1 New Salvage Fish Release Sites Location Map
Plate 2 Manzo Ranch Geologic Exploration and Plan Map
Plate 3 Little Baja Geologic Exploration and Plan Map
Plate 4 Manzo Ranch Geologic Section A-A

Plate 5 Manzo Ranch Geologic Section B-B

Plate 6 Manzo Ranch Geologic Section C-C

Plate 7 Little Baja Geologic Section D-D

Plate 8 Little Baja Geologic Section E-E

Plate 9 Little Baja Geologic Section F-F

Plate 10 Explanation of Graphic Logs

Plate 11 Fault Location Map

INTRODUCTION

The Department of Water Resources (DWR) is planning two new fish release sites on Sherman Island in compliance with the 2009 National Marine Fisheries Service (NMFS) Biological Opinion. The two new fish release sites, are named the Manzo Ranch site and the Little Baja site. The new sites are necessary to reduce predation and improve survival of fish salvaged from DWR's Skinner Fish Protective Facility near Tracy and released from the fish release sites on Sherman Island. The site improvements include the following: intake with retrievable screen; release pipe and pile support structure; levee improvements; addition of reinforced concrete pad; electrical upgrades; and security and access improvements. DWR is coordinating the overall efforts on the Sherman Island new fish release sites with Reclamation District 341 (District), Sherman Island. The District is in agreement that the levee needs to be upgraded and raised to meet the U.S. Army Corps of Engineers (USACOE) PL 84-99 standard for levees. DWR and the District are coordinating construction schedules to construct the fish release sites and levee improvements during the same season, if possible. The proposed levee improvements will increase the strength of the levee section at the New Salvage Release sites. Surveys and studies will be required to gather information to complete the project design, prepare the appropriate environmental documents, and acquire the required permits.

Purpose and Scope

The purpose of this report is to provide geotechnical and geologic data for the design of the proposed facilities. This report summarizes geologic investigations performed by the Project Geology Section (Project Geology) in the Division of Engineering, Geotechnical Services Branch for the New Salvage Fish Release Sites. Note that the locations of the geologic sections on Plates 2 through 9 are for general reference only and may not be consistent with the actual structure locations which have not been finalized.

This report presents field and laboratory test data obtained during the Geotechnical Investigations conducted in July and August 2013, as well as the methods used for data acquisition.

Project Location

The New Salvage Fish Release Sites are located on the levee on the northwest side of Sherman Island in southwestern Sacramento County within the Sacramento-San Joaquin Delta (Delta). The projects are located on the crest of the levee and extend along the water side portion of the levee into the Sacramento River (Plate 1 through Plate 3). The Manzo Ranch site is located within Assessor Parcel Number (APN): 158-080-005-000 and the Little Baja site is located within APN: 158-0080-008-0000.

GEOLOGY

Aerial Geology

The New Salvaged Fish Release Sites are located on the north side of Sherman Island in the Sacramento San Joaquin Delta. Sherman Island is located on the western side of the Delta (See Plate 1). The Delta represents the arm of the San Francisco Bay estuary that extends into the Central Valley geomorphic province of California and the waters are all influenced by tidal actions. The Delta is bordered on the west by the Coast Ranges, on the north by the Sacramento River floodplain, on the south by the San Joaquin River floodplain, and transitions into California's Central Valley toward the east.

The Central Valley province is a sedimentary basin approximately 430 miles long and up to 65 miles wide, which lies between the primarily granitic mountain ranges of the Sierra Nevada province to the east and the primarily marine and volcanic Franciscan Complex rocks of the Coast Ranges province to the west. The Central Valley province is characterized by a large northwest-trending asymmetrical synclinal trough filled with a prism of upper Mesozoic-age (approximately 135 million years old) through recent sediments up to 30,000 feet thick (Bartow, 1991).

The geomorphology and surficial geology of the Delta have been shaped by the landward spread of tidal environments resulting from sea level rise since the last glacial period. During that period, approximately 15,000 years ago, the Pacific Coast was at least 6 miles west of its present position and the relative sea level was approximately 300 feet lower than present day sea level. During the last glacial period, the location of the present-day Delta formed part of the arid alluvial floodplain. As a consequence, alluvial and eolian sand deposits underlie most of the late Holocene Delta soils. Between 10,000 and 5,000 years ago, relative sea level rise was rapid, out-stripping the rate of deposition of flood-borne sediments supplied by the river systems (Byrne et al., 2001). This action resulted in the landward transgression of the ocean through the Carquinez Strait and into the Central Valley, forming the Suisun Bay and the Delta. This period saw the widespread deposition of organic silt and clay across the alluvial floodplain surface. Approximately 5,000 years ago, relative sea level rise slowed, halting landward transgression of the tidal wetlands. At this time, the Deltaic environment remained in approximately its present position, with slow relative sea level rise balanced by vertical marsh growth through biomass accumulation and sediment deposition (Atwater et al., 1979).

Local Geology

The Manzo Ranch and Little Baja sites are both sited on artificial fill (levee fill) and Quaternary alluvium. The Quaternary alluvium can be divided into an upper soft zone and a lower dense zone. The upper zone is comprised of soft soils dominated by organic fines, fines, sands, and peat in varying stages decomposition with a range of organic content. The lower zone is comprised of dense to very dense sand and

hard to very hard clays and silts. Organics were not encountered in the lower denser zone in the borings drilled for the Salvaged Fish Release projects.

GEOLOGIC INVESTIGATIONS

Exploration Drilling

Geologic exploration related to the proposed salvaged fish release sites included land-based cone penetrometer test (CPT), land-based and over-water soil borings, and laboratory testing. Initial exploration was conducted between July 8 and July 12, 2013, and consisted of 15 land-based CPT locations pushed through the existing levee and near the levee toe. The second phase of exploration took place between July 17 and July 31, 2013, and consisted of four land-based soil boring locations. The third phase of exploration took place between July 31 and August 7, 2013, and consisted of four soil borings used to install instruments. Two soil borings were drilled on the land-side hinge on the top of the levee and two soil borings were drilled on the land-side toe of the levee. All four borings were installed with inclinometer casing. In addition, the two levee borings had vane shear testing conducted within them. The fourth phase of exploration took place between August 12 and August 16, 2013, and consisted of two over-water soil borings within the Sacramento River. Exploration locations are depicted on Plates 2 and 3. The drill hole logs are located in Appendix A, and CPT logs are located in Appendix B of this report.

Cone Penetrometer Test Contractor and Equipment

CPT soundings were performed by Gregg Drilling and Testing, Inc. (Gregg Drilling) under the direction of an Engineering Geologist from Project Geology. CPT equipment was mobilized July 8, 2013. CPT operations included a truck-mounted CPT rig, a two-axle supply or water support truck with trailer, two personnel from Gregg Drilling, an Engineering Geologist from Project Geology, and a DWR environmental monitor.

A total of 15 CPT soundings were performed using a truck-mounted, 30-ton piezocone apparatus. Gregg Drilling uses a standard cone which includes a piezocone and a seismic cone. CPTs using the standard cone were performed in accordance with ASTM International (ASTM) D5778.

Downhole seismic shear wave velocity measurements were conducted in four CPT soundings using a seismic CPT system. Seismic shear wave velocities were measured every 5 feet downhole. A seismic cone assembly is similar to a conventional cone assembly, but it also includes a three-component array of geophones. The geophones are orthogonally mounted inside the assembly above the cone tip. The seismic CPT system includes the basic thrust system, seismic cone assembly, seismic wave source, and a digital recording seismograph. Seismic shear waves were generated by striking a seismic beam coupled to the ground surface by a hydraulic cylinder under the CPT rig.

Pore pressure dissipation tests were performed at selected depths in each CPT sounding. One to two tests were carried out per sounding.

The field engineering geologist obtained two copies of the field (uncorrected) CPT log from the CPT subcontractor immediately after completion of the sounding. One copy was submitted to the Bay Delta office and the other was given to the field investigation geologist, who was in charge of the adjacent soil boring, for reference in planning sampling intervals. Upon completion of testing, Gregg Drilling provided DWR with computer data files of the explorations.

The CPT locations are shown on Plate 2. Standard cone, seismic cone, and pore pressure dissipation CPT data are included in Appendix B.

Land-Based Drilling

Drilling Contractor and Equipment

Drilling equipment and services were provided by Gregg Drilling and Testing, Inc. (Gregg Drilling) and were carried out under the direction of an Engineering Geologist from Project Geology.

The land-based borings was drilled with a truck-mounted Mobile B-53 drill rig using hollow stem auger and mud rotary drilling methods. Drilling operations consisted of the truck-mounted drill rig, a two axle support truck with a water tank, two personnel from Gregg Drilling, an Engineering Geologist from Project Geology, and a DWR environmental monitor. The drill rig was mobilized for investigations performed on July 17, 2013. The locations of the land-based borings are shown in Plates 2 and 3.

Drilling Methods

Drilling and sampling methods were selected to provide the best method of obtaining useful geotechnical and geologic data in the sensitive soft sediments of the levee fill and Delta soils, and shallow groundwater conditions. A combination of hollow-stem auger and mud rotary drilling methods was used. Sampling included standard-penetration tests (SPTs), dry core sampling, punch core sampling, and Shelby tube sampling.

Hollow-Stem Auger Drilling

The use of hollow-stem auger drilling is required whenever a boring is being advanced through a levee prism. Hollow-stem augers (6-1/2-inch outside diameter) were used to start drilling within the levee prism. As a safety measure, the top 5 feet were hand-augered before drilling to assure that there were no shallow obstructions or buried utilities. The hollow-stem auger was then advanced from the ground surface to a depth of about 30 feet in each boring; about 5 to 10 feet below the levee foundation. Sampling proceeded through the hollow stem augers in advance of the auger. The augers were withdrawn and 6-5/8-inch outside diameter threaded casing was pushed into the previously drilled hole through the levee to a depth of about

30 feet. Drilling continued through the casing using mud rotary methods from a depth of 30 feet to the depth of the hole. The methods used to drill through the levees were in accordance with USACE Procedures for Drilling in Earth Embankments (ER 1110-1-1807, March 2006) (USACE, 2006).

Mud Rotary Drilling

The mud rotary drilling method was a direct circulation rotary wash with a surface conductor casing and a wireline sample retrieval system. The drilling set-up consisted of a 5.5-inch-diameter coring bit and 4.5-inch-diameter (HWT) flush jointed drill rods, which produced a nominal 6-inch-diameter borehole.

Drilling fluid consisted of a mixture of water and bentonite. The drilling fluid was discharged from a collar into a tub and then pumped into a shaker separator. The shaker separated the drill cuttings from the drilling fluid and discharged the cuttings into containers (55-gallon drums) for disposal. The drilling fluid was then recirculated down the borehole. Soil cuttings and waste were contained in 55-gallon drums. Soil was removed from the site and tested for hazardous components by the drilling contractor before disposal.

In Situ Testing and Sampling

In situ testing conducted during drilling activities consisted of SPTs, pocket penetrometer, torvane test, and vane shear testing. In addition to testing, soil samples were recovered using the standard 2-inch split tube SPT sampler, punch-core split barrels, and thin-walled (Shelby) tubes.

The sample numbering system included a letter designation for the type of sampler and the sampling depth interval. Sample numbers were noted on the field boring log as well as on each sample container. The sample number is linked to the boring number for cross-reference in the database. Chain-of-custody forms were used to track the samples from the field to their intermediate and final destinations.

Sampling attempts that resulted in no recovery were denoted with “NR” for “No Recovery” on the boring log and other documentation for that sample run. Equipment was checked and every attempt was made to understand why no sample was recovered. Field personnel troubleshot the problems and directed the drillers to drill to the bottom of the attempted sampling interval and remove all disturbed material followed by a fresh sampling attempt. For example, if the recovery problem appeared to be a matter of loose, clean sands or gravel falling out of the sampler, a sand catcher was added to the sampler.

Standard Penetration Test

SPTs were performed using an unlined 24-inch long, 2-inch outside diameter (OD), 1-3/8-inch constant inside diameter (ID) split tube sampler. SPTs were performed in general accordance with ASTM D1586. An SPT sampler was attached to NWJ (2-5/8-inch-diameter) drill rods and advanced using a 140-pound automatic hammer

with a 30-inch drop. The sampler was driven 18 inches and blow counts for each 6-inch increment were noted on the boring logs.

The recovered sample from each drive was logged, and placed in a re-sealable moisture-proof glass jar, and labeled with permanent ink. Obvious slough in the sampler was removed and placed in a 55-gallon California Department of Transportation (DOT) approved drum for subsequent disposal. SPTs were generally performed at 5-foot intervals.

Each of the automatic hammers was calibrated to determine the hammer energy for blow-count (N-value) corrections. Corrected (N_{60}) blow counts are included in drill logs in Appendix A along with uncorrected field blow counts. The hammer energy measurements are detailed in Appendix D.

SPT tests were halted for each 6-inch increment when the:

- Number of blows exceeded 50, or
- Sampler had not advanced as a result of 10 consecutive blows, as evidenced by the rebound of the rods when encountering very hard material.

Shelby Tube Samplers

A Shelby tube (thin-walled) sampler was used to obtain relatively undisturbed samples of cohesive soils for laboratory strength and consolidation testing. Thin walled sample tube collection was in accordance with ASTM D1587, and used different types of samplers depending on the soil conditions encountered. A fixed piston sampler was used primarily in soft soil deposits to minimize sample disturbance. An open-end type Shelby tube sampler was used in primarily stiff soil deposits, where sample recovery was limited using the piston sampler. When primarily hard soil deposits were encountered, the rotary Pitcher barrel sampler was used. Samples were collected using 3-inch OD Shelby tubes.

Samples were labeled and handled in accordance with ASTM D4220 and ASTM D1587. The following information was written on the top half of the tube and on the end cap:

- Project name
- Boring/sample number
- Depth interval
- Vertical (UP) direction

Samples were kept out of direct sunlight and placed in a custom Shelby tube carrier. The entire sample carrier was secured with rope or cable to the body of the transporting vehicle for delivery to a temperature-controlled area and the final testing laboratory.

Punch Core Sampling

Punch-core samplers consist of a wire-line coring system with a 5-foot-long, 134-millimeter (mm) OD (5.7-inch OD) core barrel for coring through soil. Most punch core sampling included redrilling through the SPT or Shelby tube sample interval and then recovery of the remaining 3 to 3.5 feet of a 5-foot drilling run.

Cored soil samples were retrieved and extruded onto a logging tray. After geologic logging according to ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Method), samples were retained from each distinct stratum within each core run. The samples were sealed in moisture-proof glass jars, labeled with a permanent marker and placed in boxes for storage. The remaining samples that were not retained for laboratory testing were placed in a 55-gallon DOT-approved drum for subsequent disposal.

Vane Shear Testing

Vane shear testing was conducted on soft soils identified within the drill holes. One vane shear boring was located on the levee at the Manzo Ranch location and one on the levee at the Little Baja location. Vane shear location depths are presented in the boring logs. The locations of the vane shear borings are shown on Plates 2 and 3. Results of the vane shear testing are presented in Appendix E.

Inclinometer Installation

Four inclinometer casings were installed between August 1 and August 7, 2013. Inclinometer depths are presented in the boring logs. The locations of the inclinometer casings (LB-S2inc, LB-S3inc, MR-S2inc, and MR-S3) are shown on Plates 2 and 3.

Site Restoration

At the completion of drilling, equipment and materials, tools, and unused materials were removed from the site. Trash was properly disposed off site. To restore the site, the borings were backfilled with a grout mix of approximately 95% cement and 5% bentonite pumped through a tremie pipe to within approximately 2 feet below ground surface (bgs). The remaining 2 feet was backfilled with soil cuttings compatible with the existing ground condition. Surface restoration consisted of moving soil and ground cover back over the grouted borehole and returning the site to approximately pre-investigation conditions. All remaining drill fluids and cuttings were stored in containers and transported off site for disposal at a state-licensed facility. Photos documenting the surficial conditions at the exploration areas were taken before and after drilling activities and are available in the Project Geology office.

Over-Water Drilling

Drilling Contractor and Equipment

Gregg Drilling was also contracted to provide the over-water drilling equipment and services. The *RV Quin Delta* drill ship was equipped with a Mobile B-80 drill rig. The ship is a self-propelled ocean-going vessel with a shallow draft of 5 feet. It was equipped with two 80-foot-long "spud" anchors, allowing the vessel to be safely anchored over the testing location. The *RV Quin Delta* has digital GPS positioning capabilities, twin Detroit 671 engines, and an on-board GPS coupled with an autopilot that guided the vessel accurately to and positioned over the selected location. The ship was manned full time by a captain and a first mate.

The drill crew included the driller and one helper, along with the first mate, who assisted with the drilling activities and manned the support boat. The support boat, *Aurora*, provided transport for personnel and equipment between the anchored ship and the marina. The marina used for the New Salvaged Fish Release Sites project was Outrigger Marina, located approximately 6 miles northeast of the drill locations. The *RV Quin Delta* drill ship mobilized on August 12, 2013, and demobilized on August 16, 2013. The ship-based over-water borings were drilled to a maximum depth of about 127 feet below deck.

Drilling Method

Mud rotary drilling was used for the over-water soil borings. The borings were advanced using a wire-line punch core system. Conductor casing made up of 8¾-inch diameter threaded steel casing was placed from the deck of the drilling vessel to a depth of 21 and 27 feet below mud line (MR-S1 and LB-S1 respectively). Drilling fluid (water with or without bentonite) was passed through the rotating drill rod and around the drill bit, flushing the cuttings from the borehole to a mud tub on the deck.

Bentonite was used in the drilling fluid mixture. The bentonite mixture reduces friction, cools the drill bit, and helps to prevent circulation loss into the surrounding material. The drilling fluid was discharged from a collar positioned around the conductor casing and into a deep mud tub, allowing the drill cuttings to settle out and separate from the drilling fluid. A rubber collar was used to direct cuttings and drilling fluid into the mud tub and prevent them from entering the river through the opening in the drill deck. The settled drill cuttings were constantly removed by shovel and carefully placed into 55-gallon drums or pumped through a de-sanding "shaker" system that emptied the cuttings into 55-gallon drums. The drilling fluid was then re-circulated down the borehole. Cuttings were monitored as they were discharged from the collar to assess changes in stratigraphy.

In Situ Geotechnical Testing and Sampling

In situ testing conducted during over-water drilling activities consisted of SPTs. In addition to testing and recovery of soil samples using the standard 2-inch split tube SPT sampler, soil samples were recovered using punch-cores, and thin-walled

(Shelby) tube samplers. The equipment used for sampling was essentially the same as that used for the land-based borings.

Site Restoration

Clear water with bentonite additives was used to advance the exploration boring and remove the drill cuttings from the borehole. These products are stable, non-toxic, non-hazardous materials manufactured for use as drilling mud. Drilling fluids and cuttings were containerized for off-site disposal at an appropriate facility.

During the drilling operations, spill control measures were applied in accordance with Best Management Practices requirements. A storm water pollution prevention plan was implemented for all site-disturbing activities to control spills of fluids from drilling activities.

At the completion of drilling, disposal containers and trash were transported off site for proper disposal or storage.

LABORATORY TESTING

Laboratory tests were performed on selected samples to aid in soil classification and to determine the physical characteristics of the soil underlying the planned Curtis Landing Fish Release site. Tests were performed by DWR's Bryte Laboratory in West Sacramento, California. Tests performed included:

- Grain size analysis (ASTM D422)
- Hydrometer analysis (ASTM D422)
- Moisture content (ASTM D2216)
- Atterberg limits (ASTM D4318)
- Organic content (ASTM D2974)
- Consolidation (ASTM D2435)
- Consolidated-Undrained Triaxial Compression with pore pressure measurements (ASTM D4767)

Geotechnical laboratory test data are presented in Appendix C.

Permits and Clearances

Utility Clearances

The presence of overhead and underground utilities was evaluated for proposed exploration locations in accordance with the pre-work safety plan. Underground Service Alert (USA) was contacted at least two full working days prior to performing subsurface explorations. Site visits with the utility representatives were performed at

proposed exploration locations where there was an uncertainty about the location of underground utilities or potential conflicts.

Land Drilling Permit and Access Requirements

A Notice of Exemption (NOE) was completed by the Division of Environmental Services (DES). Entry permits were not required because the properties are owned by the DWR. An encroachment permit was required from Sacramento County because our exploration was within the county's right-of-way for Sherman Island Road.

Over-Water Drilling Permit and Access Requirements

The waterways where drilling was planned are considered State Lands. The State Lands Commission (SLC) protects waterways in a public trust and has jurisdiction over rivers. Therefore, TEPs are not needed. However, pursuant to the 1979 Memorandum of Understanding between SLC and DWR, formal notification of the proposed work was provided by DWR to the SLC Public Lands Manager.

Multi-agency coordination and several permits were obtained before over-water drilling was performed. Permits were obtained from:

- California Fish and Wildlife Code Section 1600, Streambed Alteration Agreement;
- U. S. Army Corps of Engineers (USACE), Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act, Nationwide Permit 6;
- Regional Water Quality Control Board Clean Water Act Section 401;
- Letter of Concurrence from U.S. Fish and Wildlife Service for federal species under the Endangered Species Act under their jurisdiction;
- Letter of Concurrence from National Oceanic and Atmospheric Agency Fisheries Unit for federal species under the Endangered Species Act under their jurisdiction.
- Anchor Waiver issued by the Department of Homeland Security, United States Coast Guard.

The Central Valley Flood Protection Board (CVFPB) was contacted for encroachment permits for over-water borings proposed near Project levees. A permit was issued for both the overwater and landside drilling activities.

The various permits and NOE imposed the following restrictions on over-water drilling:

- Drilling is limited to the period starting August 15 through October 31 during daylight hours only;

- Presence of an environmental monitor is required at all times during drilling;
- Plans and mitigation to minimize or control spills during drilling activities are required;
- No drilling is permitted at known shipwreck sites.

Location Surveys

Location surveys were required during the planning and execution of the geotechnical exploration. The general locations of the drill holes and CPTs were determined in the office using the proposed locations of the new salvaged fish release sites. Pre-exploration field surveys were conducted in the field to determine the actual exploration location and to delineate and mark the locations for USA clearance. A DWR field surveyor recorded the actual locations of the land explorations to an accuracy of approximately 2.5 inches horizontal and vertical.

A handheld or shipboard GPS was used to locate over-water boring locations. The ship captain, geologist, and environmental monitor modified the location as necessary to ensure safe drilling that avoided levee slopes, environmentally sensitive areas, and utilities by staying in the area cleared by USA. When possible, the DWR survey crew surveyed the location of the borings during drilling. The surveyors were not able to board the ship and a Project Geology GPS device provided the location coordinates. The horizontal datum used for the project is NAD83 and the vertical datum used for the project is NAVD88.

GEOTECHNICAL EXPLORATION

The New Salvaged Fish Released sites consist of two separate proposed facilities to be constructed on the Sherman Island levee on the northwest Sacramento River side of the island. The Manzo Ranch site is located approximately one half mile northeast of the Little Baja site. The site locations are shown on Plate 1.

Manzo Ranch Results

Summary

Two land-based borings (MR-S2 and MR-S3), two inclinometer borings (MR-S2inc and MR-S3inc) and seven CPT soundings (MRC1 through MRC7) were completed on the crown and toe of the levee for the Manzo Ranch Fish Release Site Geotechnical Investigation. One over-water based boring (MR-S1) was drilled for the Manzo Ranch Fish Release Site Geotechnical Investigation.

Land-Based Drilling Results

Two land-based borings (MR-S2 and MR-S3) were drilled for the Manzo Ranch Fish Release Site Geotechnical Investigation. The drill logs and test data are included in Appendix A, and the graphical log is included on Plates 4 through 6, Geologic Sections A-A, B-B, and C-C. Boring MR-S2 was drilled on the crest portion of the

levee to a depth of approximately 99.0 feet bgs. Boring MR-S3 was drilled near the landside toe of the levee to a depth of approximately 79.0 feet bgs.

The borings encountered layers of medium dense silty sand (SM), and stiff sandy lean clay s(CL) within the levee prism to a depth of about 23.1 feet bgs (Elevation -9.7 feet). A layer of loose clayey sand (SC) was encountered from 15.8 feet to about 19.5 feet bgs within the levee prism. Below the levee from about 23.1 feet to about 99 feet bgs (Elevation -85.6 feet) materials consisted of layers of soft to very soft organic lean clay (OL), lean clay with organics (CL)o, peat (Pt) and elastic silt (MH) to a depth of about 57.0 feet bgs (Elevation -44 feet). The material became medium dense to dense silty sand (SM) from 57 feet bgs to 81.5 feet bgs (elevation -68.13 feet). From 81.5 feet bgs to the bottom to the hole the material consists of hard fat clay (CH).

Over-Water Drilling Results

One over-water based boring (MR-S1) was drilled for the Manzo Ranch Fish Release Site Geotechnical Investigation. The over-water drill log and test data are included in Appendix A and the graphical log is included on Plate 4, Geologic Section A-A.

The over-water boring was drilled within the Sacramento River, approximately 100 feet off of the north shore line of Sherman Island to a depth of approximately 113.5 feet (bsd) or 93.4 feet below the river mudline.

When over-water drilling was initiated for boring MR-S1 the deck of the ship was located approximately 20.1 feet above the bottom of the Sacramento River (mudline). From 20.0 feet below deck (Elevation -12 feet) to approximately 59.3 feet bsd (Elevation -51 feet), subsurface materials consisted of very soft organic lean clay with sand (OL)s and organic lean clay (OL), very soft sandy elastic silt s(MH), very soft sandy lean clay s(CL), loose clayey sand (SC/CL), and loose silty sand (SM). From 59.3 feet bsd to the bottom of the boring, materials consisted of layers of medium dense poorly graded sand (SP), hard fat clay and fat clay with sand (CH) (CH)s, dense clayey sand (SC), and dense silty sand (SM).

Cone Penetrometer Testing Results

Seven land-based CPT soundings were advanced for the Manzo Ranch Fish Release Site in general accordance with ASTM D5778. Table 1 presents the CPT locations, elevations, completed depths, performance date, and test information for the CPTs. CPT logs and test data are included in Appendix B and the graphical logs are included on Plates 4 through 6, Geologic Sections A-A, B-B, and C-C.

Pore Pressure Dissipation Test

A total of nine dissipation tests were performed on the seven CPT soundings for the Manzo Ranch Fish Release Site. Dissipation tests are performed by measuring pore pressure during a pause in cone advancement. The rate of pore pressure dissipation is related to the compressibility and permeability of the soil. Equilibrium

pore pressures can also be determined by a dissipation test. Data from the dissipation tests can be used to interpret static groundwater conditions at the depth where the dissipation test was performed. These test results are not based on direct observation of either groundwater elevation data or examination of subsurface material. Static groundwater conditions are predicted from inferences derived from secondary observations and reporting of transducer pressure data obtained from the cone penetrometer. A summary of the dissipation test results and the associated groundwater elevation calculations is presented in Table 2.

CPT Hole	Easting	Northing	EL (ft)	Depth (ft)	Date	Seismic	PPDT[1] Depths (ft)	Reason for Stopping
MR-C1	6627354.030	1786224.886	13.24	108	7/08/13	No	17.1, 60.2	Cone could not advance
MR-C2	6627417.661	1786159.666	-5.34	84	7/09/13	No	44.5	Cone could not advance
MR-C3	6627273.528	1786174.232	13.91	100	7/08/13	Yes	63.0	Cone could not advance
MR-C4	6627409.892	1786256.353	11.92	100	7/08/13	No	61.8	Cone could not advance
MR-C5	6627430.434	1786140.300	-8.54	80	7/09/13	Yes	41.1	Cone could not advance
MR-C6	6627469.798	1786196.631	-5.10	84	7/09/13	No	50.1	Cone could not advance
MR-C7	6627328.401	1786074.262	-9.46	77	7/10/13	No	49.6, 72.7	Cone could not advance
[1]Pore pressure dissipation test								

Table 1. Manzo Ranch Salvaged Fish Release Site CPT Summary

CPT Hole	Elevation	Date	Cone Depth (ft bgs)	Equilibrium Pore Pressure (U_e) in (psi)	Water Head ($H_{water)\ in\ (ft)}$	Depth to GW (ft bgs)
MR-C1	13.24	7/08/13	17.1	-0.22	-0.51	17.57
MR-C1	13.24	7/08/13	60.2	16.01	36.98	23.22
MR-C2	-5.34	7/09/13	44.5	21.54	49.75	0
MR-C3	13.91	7/08/13	63.0	19.21	44.37	18.63
MR-C4	11.92	7/08/13	61.8	23.11	53.38	8.42
MR-C5	-8.54	7/09/13	41.1	19.73	45.58	0
MR-C6	-5.10	7/09/13	50.1	27.75	64.10	0
MR-C7	-9.46	7/10/13	49.6	24.78	57.24	0
MR-C7	-9.46	7/10/13	72.7	144.42	333.61	0

Table 2. Manzo Ranch Salvaged Fish Release Site Pore Pressure Dissipation Test Results

Seismic Cone Tests

Seismic cone tests were performed in two CPT soundings (MR-C3 and MR-C5) to obtain shear wave velocity. These data are located in Appendix B. Sedimentary material throughout the Delta is typically heterogeneous and individual layers of uniform material are not laterally extensive. Thus, seismic cone tests were not expected to provide data that would identify large-scale subsurface discontinuities. Rather, the tests were performed to gather data on site-specific physical properties of the subsurface material.

Foundation Conditions

The subsurface exploration within the levee encountered Quaternary artificial fill (Qaf) from the surface to about 23.1 feet below ground surface (bgs) (Elevation -9.7 feet mean sea level (msl) (NAVD 88)). The Quaternary levee fill material was medium dense and stiff from the levee crown to a depth of 15.8 feet bgs, loose from 15.8 to 19.5 feet bgs, and medium stiff from 19.5 to 23.1 feet bgs. Quaternary Alluvium (Qal) was encountered adjacent to the levee and beneath the levee fill to a depth of approximately 99.0 feet bgs (Elevation -85 feet). The Qal was soft to very soft to a depth of approximately 58.5 feet bgs (Elevation -45.5 feet), becoming medium dense to dense and hard from about 58.5 feet bgs to the bottom of the hole at 99.0 feet bgs (Elevation -85.6). See Plates 4 through 6, Geologic Sections A-A, B-B, and C-C.

Over-water boring, MR-1, encountered Quaternary alluvium (Qal) from mud line (Elevation -12.0 feet msl) to the bottom of the boring at 113.5 feet below ship deck (bsd). The Qal was unconsolidated and very soft or loose to a depth of 59.3 feet bsd (Elevation -51 feet) becoming medium dense to dense or hard from 59.3 feet bsd to the bottom of the hole. See Plate 4, Geologic Section A-A.

Groundwater

Groundwater was encountered in all of the borings at about the elevation of the Sacramento Deep Water Ship Channel water surface elevation. The ship channel water surface water elevation fluctuates with the tides and it appears that the groundwater also fluctuates with the tides based on observation made while drilling. Ditches near the landside levee toe were observed to fill up with water during high tides.

Excavation Characteristics

Excavation can be accomplished by conventional methods. If Cast-In-Drilled-Hole (CIDH) piles are used for foundation support, steel shells will be necessary to an elevation of about -62 to -70 feet msl to prevent the soft soils and sand from sloughing or caving in. If allowed, driven piles would be the best option for this project. The Reclamation District or other governing body may require pre-drilling through the levee prism prior to driving piles.

Conclusions and Recommendations

The following is a list that summarizes this report and presents the major conclusions and recommendations that were made based on geologic investigations for the proposed Manzo Ranch New Salvage Fish Release Site:

- There are no known geologic “fatal flaws” at the Manzo Ranch New Salvage Fish Release Site.
- Geologic exploration consisted of on-land and over-water exploration drilling and CPT. Drilling consisted of two on-land borings. One boring was located on the crown of the levee and one near the land-side toe of the levee. The over-water boring was located approximately 100 feet west of the levee within the Sacramento River. Seven CPT explorations were performed. Three on the crown of the levee and four near the land-side toe of the levee.
- Based on the geologic exploration, subsurface materials within the levee consisted of layers of medium dense silty sand (SM), and stiff sandy lean clay s(CL) to a depth of about 23.1 feet bgs (Elevation -9.7 feet). A layer of loose clayey sand (SC) was encountered from 15.8 feet to about 19.5 feet bgs within the levee prism.
- Below the levee from about 23.1 feet to about 99 feet bgs (Elevation -85.6 feet) materials consisted of layers of soft to very soft organic lean clay (OL), lean clay with organics (CL)o, peat (Pt), and elastic silt (MH) to a depth of about 57.0 feet bgs (Elevation -44 feet). The material became medium dense to dense silty sand (SM) from 57 feet bgs to 81.5 feet bgs (elevation -68.13 feet). From 81.5 feet bgs to the bottom to the hole the material consists of hard fat clay (CH).
- Based on geologic exploration, subsurface materials below the Sacramento River mudline consisted of very soft organic lean clay with sand (OL)s and organic lean clay (OL), very soft sandy elastic silt s(MH), very soft sandy lean clay s(CL), loose clayey sand (SC/CL), and loose silty sand (SM) to about 59.3 feet bsd (Elevation -51 feet). Below approximately Elevation -59 feet to the bottom of the boring materials consisted of layers of medium dense poorly graded sand (SP), hard fat clay (CH) and fat clay with sand (CH)s, dense clayey sand (SC), and dense silty sand (SM).
- The Manzo Ranch New Fish Salvage Release Site will be constructed in levee fill and recent alluvium. Excavations can be completed using conventional methods, such as excavators, dozers, and scrapers.
- The loose fill and alluvium from Elevation -44 feet to the ground surface should be ignored for axial loading in the pile design calculations but can be considered in calculating the lateral loads. This material should be considered when determining the soil resistance to overcome during pile driving.

- Negative shaft resistance loads (downdrag) caused by the uncompacted fill and alluvium will need to be calculated over the embedded pile length.

Little Baja

Summary

Two land-based boring (LB-S2 and LB-S3), two inclinometer borings (LB-S2inc and LB-S3inc), and eight CPT soundings (LBC1 through LBC8) were completed on the crown and toe of the levee for the Little Baja Fish Release Site Geotechnical Investigation. One over-water based boring (LB-S1) was drilled for the Little Baja Fish Release Site Geotechnical Investigation.

Land-Based Drilling Results

Two land-based borings (LB-S2 and LB-S3) were drilled for the Little Baja Fish Release Site Geotechnical Investigation. The drill logs and test data are included in Appendix A, and the graphical logs are included on Plates 7 through 9, Geologic Sections D-D, E-E, and F-F. Boring LB-S2 was drilled on the crest portion of the levee to a depth of approximately 100.0 feet bgs. Boring LB-S3 was drilled near the landside toe of the levee to a depth of approximately 89.0 feet bgs.

Boring LB-S2 encountered loose silty sand (SM) within the levee prism to a depth of about 20.0 feet bgs (Elevation -6.37 feet). Thin layers of lean clay (CL) and organic lean clay (OL) were observed near the foundation of the levee. Below the levee from about 20.0 feet to about 72 feet bgs (Elevation -58 feet) materials consisted of layers organic lean clay (OL), lean clay with organics (CL)o, and sandy lean clay s(CL) to a depth of about 72.0 feet bgs (Elevation -58 feet). The material below approximately 75 feet to the bottom of the boring consisted of silt (ML), silt with sand(ML)s, silty sand (SM), poorly graded sand (SP).

Over-Water Drilling Results

One over-water based boring (LB-S1) was drilled for the Little Baja Fish Release Site Geotechnical Investigation. The over-water drill log and test data are included in Appendix A and the graphical log is included on Plate 5, Geologic Section A-A.

The over-water boring was drilled within the Sacramento River, approximately 100 feet off of the north shore line of Sherman Island to a depth of approximately 127.2 feet (bsd) or 100 feet below the river mudline.

When over-water drilling was initiated for boring LB-S1 the deck of the ship was located approximately 27.2 feet above the bottom of the Sacramento River (mudline). From 27.2 feet below deck (Elevation -18 feet) to approximately 51.3 feet bsd (Elevation -69 feet), subsurface materials consisted of very soft organic lean clay (OL) and peat (Pt), medium stiff lean clay (CL) and sandy lean clay s(CL), and very soft sandy lean clay s(CL). From 51.3 feet bsd to about 73.0 feet bsd subsurface materials consisted of medium dense silty sand(SM), and silt with sand (ML)s. Below approximately 73.0 feet to the bottom of the boring, materials consisted of

dense sandy silt s(ML), very stiff lean clay (CL) and slightly to well indurated silty sand (SM), and slightly indurated very stiff lean clay (CL).

Cone Penetrometer Testing Results

Eight land-based CPT soundings were advanced for the Little Baja Fish Release Site in general accordance with ASTM D5778. Table 3 presents the CPT locations, elevations, completed depths, performance date, and test information for the CPTs. CPT logs and test data are included in Appendix B and the graphical logs are included on Plates 7 through 9, Geologic Sections D-D, E-E, and F-F.

Pore Pressure Dissipation Test

A total of nine dissipation tests were performed on the eight CPT soundings for the Little Baja Fish Release Site. A summary of the dissipation test results and the associated groundwater elevation calculations is presented in Table 4. Pore Pressure Dissipation Tests are described in the Manzo Ranch Results.

Seismic Cone Tests

Seismic cone tests were performed in two CPT soundings (LB-C1 and LB-C5) to obtain shear wave velocity. These data are located in Appendix B. Sedimentary material throughout the Delta is typically heterogeneous and individual layers of uniform material are not laterally extensive. Thus, seismic cone tests were not expected to provide data that would identify large-scale subsurface discontinuities. Rather, the tests were performed to gather data on site-specific physical properties of the subsurface material.

CPT Hole	Easting	Northing	EL (ft)	Depth (ft)	Date	Seismic	PPDT[1] Depths (ft	Reason for Stopping
LB-C1	6625126.521	1784965.834	14.00	87	7/10/13	Yes	76.1	Cone could not advance
LB-C2	6625173.670	1784886.948	-6.65	59	7/12/13	No	56.8	Cone could not advance
LB-C3	6625062.054	1784927.026	12.18	85	7/11/13	No	75.8	Cone could not advance
LB-C4	6625214.032	1784998.747	12.72	83	7/10/13	No	77.9	Cone could not advance
LB-C5	6625201.431	1784831.314	-9.33	56	7/11/13	Yes	53.5	Cone could not advance
LB-C6	6625226.413	1784783.735	-9.40	55	7/11/13	No	54.1	Cone could not advance
LB-C7	6625249.970	1784920.985	-7.47	64	7/12/13	No	55.0, 63.7	Cone could not advance
LB-C8	6625087.655	1784855.935	-3.27	70	7/12/13	No	59.8	Cone could not advance

[1]Pore pressure dissipation test

Table 3. Little Baja Salvaged Fish Release Site CPT Summary

CPT Hole	Elevation	Date	Cone Depth (ft bgs)	Equilibrium Pore Pressure (U_e) in (psi)	Water Head ($H_{water)\ in\ (ft)}$	Depth to GW (ft bgs)
LB-C1	14.0	7/10/13	76.1	27.08	62.55	13.55
LB-C2	-6.65	7/12/13	56.8	25.75	59.48	0
LB-C3	12.18	7/11/13	75.78	23.07	53.29	22.49
LB-C4	12.72	7/10/13	77.92	32.51	75.10	2.82
LB-C5	-9.33	7/11/13	53.48	26.19	60.50	0
LB-C6	-9.40	7/11/13	54.05	27.86	64.36	0
LB-C7	-7.47	7/12/13	54.95	24.26	56.04	0
LB-C7	-7.47	7/12/13	63.73	25.60	59.14	4.59
LB-C8	-3.27	7/12/13	59.79	27.79	64.19	0

Table 4. Little Baja Salvaged Fish Release Site Pore Pressure Dissipation Test Results

Foundation Conditions

The subsurface exploration within the levee encountered Quaternary artificial fill (Qaf) from the surface to about 20.0 feet below ground surface (bgs) (Elevation -6.37 feet mean sea level (msl) (NAVD 88)). The Quaternary levee fill material was very loose to loose from the levee crown to a depth of 20.0 feet bgs. Quaternary alluvium (Qal) was encountered adjacent to the levee and beneath the levee fill to a depth of approximately 100.0 feet bgs (Elevation -86.37 feet), was encountered. The Qal was medium stiff to very stiff from 20.0 feet to a depth of approximately 32.3 feet bgs (Elevation -18.67 feet), becoming soft to very soft from 32.3 feet bgs to a depth of approximately 75 feet bgs (Elevation -61.37 feet). Below 75 feet to the bottom of the hole at 100 feet bgs to material is dense to very dense. See Plates 7 through 9, Geologic Sections D-D, E-E, and F-F.

The over-water boring encountered Quaternary alluvium (Qal) from mud line (Elevation -18 feet msl) to the bottom of the boring at 80 feet below ship deck (bsd). The Qal was unconsolidated and very soft or loose to a depth of 45.2 feet bsd (Elevation -63 feet) becoming medium stiff to stiff or medium dense to dense or hard to a depth of about 73.0 feet bsd (Elevation -91 feet). Quaternary Older Alluvium was encountered from about 73.0 feet bsd to the bottom of the hole. See Plate 7, Geologic Section D-D.

Groundwater

Groundwater was encountered in all of the borings at about the elevation of the Sacramento Deep Water Ship Channel water surface elevation. The ship channel water surface water elevation fluctuates with the tides and it appears that the groundwater also fluctuates with the tides based on observation made while drilling.

Ditches near the landside levee toe were observed to fill up with water during high tides.

Excavation Characteristics

Excavation can be accomplished by conventional methods. Based on the geology at this site, CIDH could be used but steel pipe casing would need to be used. Soft soils that may be prone to sloughing or caving to a depth of about -60 feet msl were encountered. The sand encountered below this elevation is very dense but they may be prone to caving or running. If allowed, driven piles would be the best option for this project. It may be required by the reclamation district or other governing body to pre-drill through the levee prism prior to driving piles.

Conclusions and Recommendations

The following is a list that summarizes this report and presents the major conclusions and recommendations that were made based on geologic investigations for the proposed Little Baja New Salvage Fish Release Site:

- There are no known geologic “fatal flaws” at the Little Baja New Salvage Fish Release Site.
- Geologic exploration consisted of on-land and over-water exploration drilling and CPT. Drilling consisted of two on-land borings. One boring was located on the crown of the levee and one near the land-side toe of the levee. The over-water boring was located approximately 100 feet west of the levee within the Sacramento River. Eight CPT explorations were performed. Three on the crown of the levee and five near the land-side toe of the levee.
- Based on the geologic exploration, subsurface materials within the levee consisted of loose silty sand (SM) to a depth of approximately 20.0 feet bgs (Elevation -8 feet).
- Below the levee from about 20.0 feet to about 72 feet bgs (Elevation -61 feet) materials consisted of layers organic lean clay (OL), lean clay with organics (CL)o, and sandy lean clay s(CL). The material below approximately 72 feet to the bottom of the boring consisted of silt (ML), silt with sand (ML)s, silty sand (SM), poorly graded sand (SP).
- Based on the geologic exploration, subsurface materials below the Sacramento River mudline from about 27 feet below deck (Elevation -19 feet) to approximately 69 feet bsd (Elevation -61 feet), subsurface materials consisted of very soft organic lean clay (OL) and peat (Pt), medium stiff lean clay (CL) and sandy lean clay s(CL), very soft sandy lean clay s(CL). From 51.3 feet bsd to about 73.0 feet bds subsurface materials consisted of medium dense silty sand(SM) and silt with sand (ML)s. Below approximately 73.0 feet to the bottom of the boring materials consisted of dense sandy silt s(ML), very stiff lean clay

(CL) and slightly to well indurated silty sand (SM) and slightly indurated very stiff lean clay (CL).

- The Little Baja New Salvage Fish Release Site will be constructed in levee fill and recent alluvium. Excavations can be completed using conventional methods, such as excavators, dozers, and scrapers.
- The loose fill and alluvium from Elevation -61 feet to the ground surface should be ignored for axial loading in the pile design calculations but should be considered in calculating the lateral loads. This material should be considered when determining the soil resistance to overcome during pile driving.
- Negative shaft resistance loads (downdrag) caused by the loose uncompacted fill and alluvium will need to be calculated over the embedded pile length.

FAULTING AND SEISMICITY

Faulting

The new salvaged fish release sites are located at the western edge of the Sacramento-San Joaquin Delta, bounding the eastern flank of the Coast Range geomorphic province. Known faults (Plate 11) that have the capability to affect the fish release sites are generally located to the west with the exception of the Midland fault which is located to the east of the two sites. The following describes a few of the nearby faults.

The Coast Range-Central Valley Boundary Zone

The Coast Range-Central Valley Boundary Zone is an approximately 300-mile-long (500 km), multi-segmented, active, blind fold and thrust belt that underlies the Coast Range-Central Valley geomorphic boundary. The CRCV is thought to accommodate most of the crustal shortening normal to the San Andreas fault at the Pacific-North American plate boundary.

Several earthquakes greater than magnitude 6 have occurred along the CRCV to the north and to the south of the Delta region. However, there have been no known CRCV events of $M \geq 6$ in or near the Delta. Blind thrust faults in the CRCV were responsible for the 1983 Coalinga earthquake (M=6.4), the 1985 Kettleman Hills earthquake (M=6.1), and possibly several moderate to large historical earthquakes. These may include the 1892 Winters-Vacaville sequence, albeit whose location is poorly constrained. There has been no historical seismicity along the proposed trace of the CRCV in the delta. Two segments are evaluated in this report, the GV04b, Gordon Valley segment and the GV05, Pittsburg-Kirby Hills segment. The Pittsburg-Kirby Hills segment is further discussed below.

Pittsburg-Kirby Hills Thrust Fault (GV05)

The NNE-SSW-striking Pittsburg-Kirby Hills thrust fault can be traced from the town of Pittsburg northward through the Kirby Hills to the eastern end of the Potrero Hills anticline. Minimum fault length is about 12.5 miles (20 km). The 1999 Working Group favors the scenario of the PKHF as a subvertical strike-slip fault that accommodates differential NNE-SSW crustal shortening and distributed dextral shear across the Delta region (Hector and Unruh, 1992; McCarthy et al., 1994; Unruh and Hector, 1999). They also consider that the M 6 1889 Antioch earthquake, estimated to have occurred in the vicinity of Pittsburg and Antioch (Toppozada et al., 1981), occurred on a discrete rupture segment of the PKHF representing only the southern 6.2 miles (10 km) or so of the fault.

Mount Diablo Thrust Fault (Blind)

The Mount Diablo thrust fault (blind) is interpreted to underlie the asymmetric, southwest vergent Mount Diablo and Tassajara anticlines (Crane, 1995; Unruh and Sawyer, 1997).

Based on estimates of potential rupture area and dimensional comparisons of the Mount Diablo Anticline to folds overlying sources of the 1983 Coalinga and 1994 Northridge earthquakes (Unruh and Sawyer, 1997), the 1999 Working Group adopted a weighted range of values for maximum magnitudes for the Mount Diablo thrust fault. The resulting median maximum earthquake magnitude is M_w=6.75.

Considering the range of values in horizontal shortening, fault dip, and timing of deformation, the 1999 Working Group adopted a weighted range of values for slip rate on the Mount Diablo thrust fault. The resulting median slip rate is 3 mm per year.

The Midland Fault

The Midland Fault was recognized in the Delta during the development of the Rio Vista gas field between 1936 and 1943 and was originally described as a major subsurface structural feature. The fault is a west-dipping fault along the eastern margin of the Montezuma Hills that is thought to have accommodated extension and subsidence in the early Tertiary Sacramento Valley Basin (Krug et al., 1992). No historical evidence for movement on the Midland fault or seismicity associated with this stretch of the fault has been recorded. However, the shallow stratigraphic record seen on the seismic profile in the vicinity of the Montezuma Hills, as evaluated by Weber-Band, indicates the Midland is a long-lived fault that has been reactivated in late Cenozoic time

Seismic reflection profiles across the fault indicate that its dip is relatively steep near the surface but shallows with increasing depth. Based on detailed analysis of seismic reflection data, Weber-Band (1998) proposed that the Midland fault reactivated in the late Cenozoic as a reverse fault in response to horizontal crustal shortening. Weber-Band (1998) estimates about 800 feet (243 m) of vertical

separation on the late Cenozoic unconformity across the Midland fault and attributes the uplift of the eastern Montezuma Hills to this movement.

The work of Weber-Band shows reverse movement on the Midland fault in the vicinity of the Montezuma Hills, where it is buried about one kilometer or less below the surface. Considering the range of fault dips for the Midland and the age range of the Cenozoic unconformity across the fault, the 1999 Working Group adopted a range of weighted values for the Midland's slip rate. The average slip rate is estimated to be 0.0006 inches/year (0.15 mm). Also, considering different subsurface rupture lengths for the Midland, the 1999 Working Group adopted a weighted range of earthquake magnitudes, with a average maximum earthquake magnitude of M_w=7.2 for the Midland.

Other Faults

Other faults in the region that affect the seismicity at Clifton Court Forebay include the main strike-slip faults in the San Francisco Bay Area, which are responsible for releasing most of the seismic moment in that region, and some minor faults. These are the San Andreas, Hayward-Rodgers Creek, Calaveras, Concord-Green Valley, Marsh Creek-Greenville, as well as the shorter Clayton and West Napa faults.

Seismicity

A site specific deterministic analysis was performed at both salvaged fish release sites. The deterministic results for the Manzo Ranch site can be found in Tables 5 through 8. The deterministic results for the Little Baja site can be found in Tables 9 through 12.

The Manzo Ranch Salvaged Fish Release Site was evaluated using a shear wave velocity of 230 m/s in the upper 30 meters (100 feet). The Little Baja Salvaged Fish Release Site was evaluated using a shear wave velocity of 371 m/s in the upper 30 meters (100 feet). The shear wave velocities for the upper 30 meters (100 feet) were developed from the measured shear wave velocities obtained from the CPT exploration.

Manzo Ranch

A moment magnitude (M_w) 6.7 earthquake on the Pittsburg-Kirby Hills fault would generate a 50th percentile **Peak Ground Acceleration (PGA) of 0.33g** and a Peak Ground Velocity (PGV) of 35.71 cm/s**.** Table 5 includes significant faults to the site, the parameters of the faults used in the calculations of the ground motions, and the 50th, 87th, and 84th percentile PGA. Table 6 lists the estimated spectral accelerations and PGV for a Mw 6.7 earthquake on the Pittsburg-Kirgy Hills fault (GV05) at the Manzo Ranch site. Table 7 lists the Arias Intensity and Duration of Ground Motion and Table 8 lists the estimated fault normal directivity effects on spectral accelerations.

Fault Name/ Activity	Moment Magnitude (Mw)	Slip Rate (mm/yr)	Distance (km)			Type	Dip Angle (degrees), Dip Direction	Rupture Rake (degrees)	Rupture Width (km)	Weighted Average of NGA Relationships Peak Ground Acceleration (g) (5% damping) Horizontal		
			Rrup	Rjb	Rx (+/-)					50th%ile	67th%ile	84th%ile
GV05, Pittsburg Kirby (A)	6.7	1.0	12.8	8.0	8.0	Blind, reverse	90, vertical	180	10.0	0.33	0.42	0.52
Midland (A)	7.2	0.6	11.5	4.8	12.0	Blind, reverse	70, west	?	21.3	0.30	0.39	0.48
West Tracy (A)	6.5	0.5	11.4	11.4	-6.0	Blind, reverse-oblique	80, southwest	?	16.4	0.24	0.32	0.40

Notes: 1. A=active fault, per DSOD criteria. Fault has ruptured within last 35,000 years.
2. CA = conditionally active fault, per DSOD criteria. Fault ruptured within the Quaternary period, but its displacement history during the last 35,000 years is unknown.

Table 5. Sherman Island Fish Release Site, Manzo Ranch, Significant Faults, Parameters, and PGA Used in NGA Calculations.

Ground Motion Parameter	Period T (s)	Ground Motion 50th%ile (g)	Ground Motion 67th%ile (g)	Ground Motion 84%ile (g)
Spectral Acceleration (g)	0.01	0.33	0.42	0.52
	0.02	0.33	0.43	0.53
	0.03	0.34	0.44	0.54
	0.05	0.36	0.47	0.58
	0.075	0.41	0.54	0.67
	0.1	0.48	0.63	0.78
	0.15	0.60	0.78	0.97
	0.2	0.66	0.87	1.07
	0.25	0.68	0.90	1.12
	0.3	0.69	0.92	1.14
	0.4	0.66	0.88	1.11
	0.5	0.60	0.82	1.04
	0.75	0.46	0.64	0.83
	1	0.36	0.51	0.65
	1.5	0.23	0.32	0.42
	2	0.16	0.23	0.30
	3	0.08	0.12	0.16
	4	0.06	0.08	0.11
	5	0.04	0.06	0.08
	7.5	0.02	0.03	0.04
	10	0.01	0.02	0.02
PGA (g)	0	0.33	0.42	0.52
PGV (cm/s)	-1	35.71	47.74	59.62

Note: To preserve space, “Percentile” is abbreviated as “%ile” on this table.

Table 6. Estimated Spectral Accelerations and Peak Ground Velocity, Geometric Mean Horizontal Component (5% Damping) of Ground Motion on Stiff Soil (Vs30=230 m/s) for an Mw 6.7 Earthquake on the GV05 Fault at the Sherman Island Fish Release Site, Manzo Ranch, Using NGA.

Fault	Arias Intensity (m/s)		Duration (s) (D_{5-95})	
Pittsburg-Kirby Hills (GV05)	50th%ile Ground Motion	84th%ile Ground Motion	50th%ile Ground Motion	84th%ile Ground Motion
	1.533	4.713	15	22

Note: To preserve space, "Percentile" is abbreviated as "%ile" on this table.

Table 7. Arias Intensity in Meters Per Second (m/s) and Duration of Ground Motion in Seconds from an Mw 6.7 Earthquake on the GV05 Fault at Sherman Island Fish Release Site, Manzo Ranch.

Period T(s)	SA 50th%ile (g)	FN Directivity (g)	FN-SA Decimal Increase (g)	Percent Increase (g)
0.000	0.330	0.330	0.000	0.0%
0.010	0.327	0.327	0.000	0.0%
0.020	0.329	0.329	0.000	0.0%
0.030	0.338	0.338	0.000	0.0%
0.050	0.358	0.358	0.000	0.0%
0.075	0.414	0.414	0.000	0.0%
0.100	0.482	0.482	0.000	0.0%
0.150	0.595	0.595	0.000	0.0%
0.200	0.657	0.657	0.000	0.0%
0.250	0.683	0.683	0.000	0.0%
0.300	0.688	0.688	0.000	0.0%
0.400	0.657	0.657	0.000	0.0%
0.500	0.601	0.601	0.000	0.0%
0.750	0.462	0.464	0.002	0.4%
1.000	0.358	0.360	0.002	0.6%
1.500	0.225	0.227	0.002	1.0%
2.000	0.156	0.158	0.002	1.2%
3.000	0.084	0.086	0.001	1.7%
4.000	0.055	0.056	0.001	2.0%
5.000	0.039	0.040	0.001	2.3%
7.500	0.018	0.018	0.000	2.3%
10.000	0.010	0.011	0.000	2.3%

To preserve space, "Percentile" is abbreviated as "%ile" on this table.
According to Somerville et. al., 1997, for dip-slip faults the significant factors influencing directivity are:

- The moment magnitude
- The rupture distance
- The style of faulting
- The fraction of fault along dip that ruptures toward the site (referred to as the length ratio 'X').
- The azimuth angle between fault plane epicenter and ray path to the site (referred to as theta 'θ'). The worst case is when X = 1 and θ = 0.

We use the following input parameters in directivity calculations:

- Moment magnitude = 6.7
- Rupture distance (Rrup) = 12.4 km
- Style of faulting = dip-slip
- Length ratio (Y) = 1.0
- Zenith angle (Φ) = 51 degrees

Table 8. Estimated Fault Normal (FN) Directivity Effects on Spectral Accelerations (SA) (5% Damping) of Ground Motion on Stiff Soil (Vs30=230 m/s) for an Mw 6.7 Earthquake on the GV05 Fault at the Sherman Island Fish Release Site, Manzo Ranch, Using NGA.

Little Baja

A moment magnitude (M_w) 6.7 earthquake on the Pittsburg-Kirby Hills fault would generate a **PGA of 0.36g** and a PGV of 32.30 cm/s**.**. Table 9 includes significant faults to the site, the parameters of the faults used in the calculations of the ground motions, and the 50th, 87th, and 84th percentile PGA. Table 10 lists the estimated spectral accelerations and PGV for a Mw 6.7 earthquake on the Pittsburg-Kirgy Hills fault (GV05) at the Little Baja Site. Table 11 lists the Arias Intensity and Duration of Ground Motion and Table 12 lists the estimated fault normal directivity effects on spectral accelerations.

Fault Name/ Activity	Moment Magnitude (Mw)	Slip Rate (mm/yr)	Distance (km)			Type	Dip Angle (degrees), Dip Direction	Rupture Rake (degrees)	Rupture Width (km)	Weighted Average of NGA Relationships Peak Ground Acceleration (g) (5% damping) Horizontal (%ile)		
			Rrup	Rjb	Rx (+/-)					50th%	67th%	84th%
GV05, Pittsburg Kirby (A)	6.7	1.0	12.4	7.3	7.3	Blind, reverse	90, vertical	180	10.0	0.36	0.48	0.59
Midland (A)	7.2	0.6	12.0	5.3	12.6	Blind, reverse	70, west	?	21.3	0.31	0.42	0.52
West Tracy (A)	6.5	0.5	11.2	11.2	-5.9	Blind, reverse-oblique	80, southwest	?	16.4	0.25	0.33	0.42
GV04b, Gordon Valley (A)	6.7	1.0	22.2	20.2	-2.12	Blind, reverse	30, west	90	14.6	0.23	0.30	0.38
Mt. Diablo Thrust Fault (A)	6.7	2.0	25.8	20.2	30.5	Blind, reverse	38, northeast	90	13.0	0.20	0.28	0.35
Greenville (A)	7.0	2.0	20.7	20.7	20.7	Strike-slip	90, vertical	180	17.0	0.17	0.23	0.29
Green Valley Connected (A)	6.7	5.0	27.4	27.4	27.4	Strike-slip, right-lateral	90, vertical	180	14.0	0.12	0.17	0.21

Notes:
1. A=active fault, per DSOD criteria. Fault has ruptured within last 35,000 years.
2. CA = conditionally active fault, per DSOD criteria. Fault ruptured within the Quaternary period, but its displacement history during the last 35,000 years is unknown.
3. To preserve space, "Percentile" is abbreviated as "%ile" on this table.
4. Slip rates listed are an approximation.

Table 9. Sherman Island Fish Release Site, Little Baja, Significant Faults, Parameters, and PGA Used in NGA Calculations.

Ground Motion Parameter	Period T (s)	Ground Motion 50th%ile (g)	Ground Motion 67th%ile (g)	Ground Motion 84%ile (g)
	0.01	0.36	0.48	0.60
	0.02	0.36	0.48	0.61
	0.03	0.38	0.51	0.64
	0.05	0.42	0.57	0.71
	0.075	0.51	0.68	0.86
	0.1	0.59	0.80	1.01

Spectral Acceleration (g)	0.15	0.72	0.98	1.24
	0.2	0.78	1.07	1.35
	0.25	0.79	1.08	1.38
	0.3	0.78	1.07	1.36
	0.4	0.71	0.99	1.26
	0.5	0.62	0.87	1.12
	0.75	0.43	0.62	0.81
	1	0.32	0.45	0.59
	1.5	0.18	0.26	0.34
	2	0.11	0.17	0.22
	3	0.06	0.09	0.12
	4	0.04	0.06	0.08
	5	0.03	0.04	0.05
	7.5	0.01	0.02	0.03
	10	0.01	0.01	0.02
PGA (g)	0	0.36	0.48	0.59
PGV (cm/s)	-1	32.30	44.01	55.63

Table 10. Estimated Spectral Accelerations and Peak Ground Velocity, Geometric Mean Horizontal Component (5% Damping) of Ground Motion on Very Dense Soil and Soft Rock (Vs30=371 m/s) for an Mw 6.7 Earthquake on the GV05 (Pittsburg Kirby Hills) Fault at the Sherman Island Fish Release Site (Little Baja) Using NGA.

Fault	**Arias Intensity (m/s)**		**Duration (s) (D_{5-95})**	
GV05 Fault	50th%ile Ground Motion	84th%ile Ground Motion	50th%ile Ground Motion	84th%ile Ground Motion
	1.396	4.546	13	20

Table 11. Arias Intensity in Meters Per Second (m/s) and Duration of Ground Motion in Seconds from an Mw 6.7 Earthquake on the GV05 Fault at Sherman Island Fish Release Site (Little Baja).

Period T(s)	**SA 50th%ile (g)**	**FN Directivity (g)**	**FN-SA Decimal Increase (g)**	**Percent Increase (g)**
0.000	0.358	0.358	0.000	0.0%
0.010	0.358	0.358	0.000	0.0%
0.020	0.364	0.364	0.000	0.0%
0.030	0.380	0.380	0.000	0.0%
0.050	0.421	0.421	0.000	0.0%
0.075	0.505	0.505	0.000	0.0%
0.100	0.592	0.592	0.000	0.0%
0.150	0.724	0.724	0.000	0.0%
0.200	0.784	0.784	0.000	0.0%
0.250	0.792	0.792	0.000	0.0%

0.300	0.776	0.776	0.000	0.0%
0.400	0.709	0.709	0.000	0.0%
0.500	0.617	0.617	0.000	0.0%
0.750	0.434	0.436	0.002	0.5%
1.000	0.315	0.318	0.003	0.8%
1.500	0.180	0.182	0.003	1.4%
2.000	0.115	0.117	0.002	1.8%
3.000	0.060	0.061	0.001	2.5%
4.000	0.038	0.039	0.001	2.9%
5.000	0.027	0.028	0.001	3.3%
7.500	0.012	0.013	0.000	3.3%
10.000	0.007	0.007	0.000	3.3%

To preserve space, “Percentile” is abbreviated as “%ile” on this table.
According to Somerville et. al., 1997, for dip-slip faults the significant factors influencing directivity are:

- The moment magnitude
- The rupture distance
- The style of faulting
- The fraction of fault along dip that ruptures toward the site (referred to as the length ratio ‘X’).
- The azimuth angle between fault plane epicenter and ray path to the site (referred to as theta ‘θ’). The worst case is when X = 1 and θ = 0.

We use the following input parameters in directivity calculations:

- Moment magnitude = 6.7
- Rupture distance (Rrup) = 12.4 km
- Style of faulting = dip-slip
- Length ratio (Y) = 1.0
- Zenith angle (Φ) = 51 degrees

Table 12. Estimated Fault Normal (FN) Directivity Effects on Spectral Accelerations (SA) (5% Damping) of Ground Motion on Very Dense Soil and Soft Rock (Vs30=371 m/s) for an Mw 6.7 Earthquake on the Fault at the Sherman Island Fish Release Site (Little Baja) Using NGA.

Probabilistic Determination Using the USGS Website

The design earthquake loading was calculated probabilistically using the USGS National Seismic Hazard Mapping Project Website (USGS 2008). The calculations assume a firm-rock site. The peak accelerations are presented below in Table 13 for the Manzo Ranch site and Table 14 for the Little Baja site.

2008 USGS Hazard Curve Parameters	
Return Periods	**Corresponding PGA (g)**
108 years ≈ (50% chance in 75 years)	0.22
224 years ≈ (20% chance in 50 years)	0.28
475 years ≈ (10% chance in 50 years)	0.36
975 years ≈ (5% chance in 50 years)	0.44
2475 years ≈ (2% chance in 50 years)	0.56
4975 years ≈ (1% chance in 50 years)	0.65

Table 13. Summary of 2008 USGS Probabilistic Seismic Hazard Curve Parameters, Sherman Island Fish Release Site—Manzo Ranch.

2008 USGS Hazard Curve Parameters	
Return Periods	**Corresponding PGA (g)**
108 years ≈ (50% chance in 75 years)	0.19
224 years ≈ (20% chance in 50 years)	0.26
475 years ≈ (10% chance in 50 years)	0.34
975 years ≈ (5% chance in 50 years)	0.43
2475 years ≈ (2% chance in 50 years)	0.56
4975 years ≈ (1% chance in 50 years)	0.67

Table 14. Summary of 2008 USGS Probabilistic Seismic Hazard Curve Parameters, Sherman Island Fish Release Site—Little Baja.

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APPENDICES

Appendix A

Drill Hole Logs

Manzo Ranch Salvaged Fish Release Site

Drill Hole Logs

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sacramento River
Coordinates: North 2,213,514.06 East 6,195,485.69
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **8/12/13**	DATE COMPLETED **8/14/13**	GROUND ELEVATION **8.00 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **113.5 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Chris St. Pierre**	HELPER'S NAME **Jose Sagrero**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 113.5 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-80**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **5 3/4" drag bit**		DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**		FIELD LOGGER **Hightower**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH **8.625" O.D. threaded steel to 45'**		FIELD LOG REVIEWER
SAMPLER TYPE(S) **2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher**		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP **Marl, automatic, 140 lbs / 30-inch drop**		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with 95% cement, 5% bentonite by wt.**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0		0.0 to 1.5' Deck of Quin Delta.														
	1																
	2		1.5 to 20.1' Water-Sacramento River.														
5	3																
	4																
	5																
	6																
	7																
0	8																
	9																
	10			RD													
	11																
	12																
-5	13																
	14																
	15																
	16																
	17																
-10	18																
	19																
	20																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,514.06 East 6,195,485.69
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

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Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20		Quaternary, (Qal) 20.1 to 113.5'														
	21																
	22		20.1 to 30.0' ORGANIC SILT with Sand, o(ML)s: About 50% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 35% organics, non-decomposed organic fibers, thick root-like fibers and large wood chunks > 1.5" diameter and +3" length; about 15% fine sand; very soft, very dark gray, wet; organic odor; no reaction with HCl.													
-15	23																
	24																
	25	o(ML)s															
	26																
	27				SPT	100	0 0 0	0	0				41	28	47	OC	S01A-027.0-028.5
-20	28																
	29																
	30		30.0 to 42.5' ORGANIC LEAN CLAY, (OL): About 60% medium plasticity, medium dry strength, no dilatancy, low toughness fines; about 40% organics, slightly decomposed organics, leaf and root-like material; very soft, very dark brown, wet; organic odor; no reaction with HCl; organic content varies, could be peat.													
	31																
	32			RD,	SPT	100	0 1 1	2	3	<0.25P 0.2T		7					S02A-032.0-033.5
-25	33																
	34																
	35																
	36	OL															
	37				SHELBY	82											T01A-037.0-038.8
-30	38																
	39									<0.25P							
	40		At 39.2' 0.3' thick spongy peat layer, non-altered leaf material. From 39.5' alternating layers of dark gray clay and slightly decomposed organic material, spongy feel. At 41.2' 0.3' peat layer, black slightly altered organic leaf and root material.		SPT	100	0 1 0	1	1								Shelby pushed with less than 50 psi downpressure S03A-039.5-041.0
	41																
	42				PCORE	37				<0.25P							P01A-041.5-042.0
-35	43		42.5 to 48.2' SANDY ELASTIC SILT, s(MH): About 70% low plasticity, medium dry strength, slow dilatancy, low toughness fines; about 30% fine sand; very soft, dark greenish gray, wet; no reaction with HCl; trace organic fibers.														
	44	s(MH)			SPT	93	0 1	3	4								S04A-044.0-045.4
	45																

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,514.06 East 6,195,485.69
Survey Method: Ground Survey Datum: NAD83
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County: Sacramento

DRILL HOLE LOG
MR-S1

State of California
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Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45	s(MH)	42.5 to 48.2' SANDY ELASTIC SILT, s(MH): About 70% low plasticity, medium dry strength, slow dilatancy, low toughness fines; about 30% fine sand; very soft, dark greenish gray, wet; no reaction with HCl; trace organic fibers. *(Continued)*		SPT	93	2	3	4	<0.25P							
	46				PCORE	0											
	47		From 47.0' About 60% low plasticity fines; about 40% fine sand.		SPT	100	0 0 0	0	0								S05A-047.0-048.5
-40	48		48.2 to 53.0' SANDY LEAN CLAY, s(CL): About 70% medium plasticity, high dry strength, no dilatancy, medium toughness fines; about 30% fine sand; very soft, dark greenish gray, wet; no reaction with HCl.							<0.25P							
	49									<0.25P							
	50	s(CL)			PCORE	9											
	51																
	52				SHELBY	0											
-45	53		53.0 to 56.8' CLAYEY SAND, (SC/CL): About 50% fine to medium sand; about 50% low to medium plasticity, slow dilatancy, low to medium toughness fines; loose, dark greenish gray, moist; no reaction with HCl.														
	54																
	55	SC/CL			SPT	0	3 4 2	6	8								Shelby pushed with 50 psi downpressure
	56					100											P04A-056.0-056.5
	57	SM	56.8 to 59.3' SILTY SAND, (SM): About 80% fine to medium sand; about 20% nonplastic fines; loose, dark greenish gray, wet; no reaction with HCl; trace mica.	RD	SPT	100	1 3 5	8	10								S07A-057.0-058.5
-50	58																
	59																P05A-058.5-059.0
	60		59.3 to 69.2' Poorly Graded SAND with Silt, (SP-SM): About 90% fine to medium sand; about 10% nonplastic fines; medium dense, dark gray, wet; no reaction with HCl; abundant mica.		PCORE	80											P05B-060.0-060.5
	61																
	62				SPT	87	5 7 10	17	22						13		S08A-062.0-063.2 Lab. Classification: SILTY SAND (SM)
-55	63																
	64	SP-SM															
	65		From 65.0' trace coarse sand, trace fine subrounded gravel. Max sieve size is about 3/8".		PCORE	74											P06A-065.0-065.5
	66																
	67				SPT	73	3 10 19	29	38								S09A-067.0-068.1
-60	68																
	69	(CH)s	*Description on next page.*		PCORE	100											
	70																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,514.06 East 6,195,485.69
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70		69.2 to 72.8' FAT CLAY with Sand, (CH)s: About 80% high plasticity, very high dry strength, no dilatancy, high toughness fines; about 20% fine sand; hard, greenish gray, moist; strong reaction with HCl; calcium carbonate nodules. *(Continued)*														
	71	(CH)s			PCORE	100				2.0T >4.5P							P07A-070.5-071.0
	72		At 72.2' 0.2' layere of cemented carbonate with a strong HCL reaction.														
-65	73		72.8 to 74.2' CLAYEY SAND, (SC): About 70% fine sand; about 30% medium plasticity fines; dense, greenish gray, moist; no reaction with HCl.		SPT	100	5 11 15	26	34								S10A-072.0-072.8
		SC															S10B-072.8-073.5
	74		From 73.8' About 60% fine sand; about 40% medium plasticity fines.														
	75		74.2 to 88.9' FAT CLAY, (CH): About 90% high plasticity, very high dry strength, no dilatancy, high toughness fines; about 10% fine sand; hard, greenish gray, moist; strong reaction with HCl; abundant calcium carbonate nodules, slightly indurated.		PCORE	74											P08A-074.5-075.0
	76																P08B-075.5-076.0
	77																
			From 74.4' olive brown.														T03A-077.0-078.1
-70	78		From 77.0' About 95% high plasticity fines; about 5% fine sand.		PITCHER	44				>4.5P 1.8T							
	79																
	80		From 79.6' yellowish brown.		SPT	100	7 12 15	27	35								S11A-079.5-078.1
	81																
		CH				80				>4.5P							P09A-081.0-081.5
	82			RD													T04A-082.0-083.0
-75	83				PITCHER	40				>4.5P							
	84																
	85				SPT	93	5 10 12	22	28								S12A-084.5-085.9
	86					100											P10A-086.0-086.5
	87				SPT	100	4 8 10	18	23	3.0P 3.75P							S13A-087.0-088.5
-80	88																
	89		88.9 to 106.0' FAT CLAY with Sand, (CH)s: About 85% high plasticity, very high dry strength, no dilatancy, high toughness fines; about 15% sand; hard, reddish brown, moist; strong reaction with HCl; trace fine to coarse rounded gravel, max size about 1"; slightly indurated.							>4.5P							
	90				PCORE	100				1.8T							P11A-090.0-090.5
	91									>4.5P							
	92	(CH)s															
-85	93				SPT	100	6 10 14	24	31								S14A-092.0-093.5
	94		From 94.0' strong reaction with HCl; no gravel; abundant calcium carbonate stringers.			100				>4.5P							P12A-094.5-095.0
	95					56											

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,514.06 East 6,195,485.69
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	95		88.9 to 106.0' FAT CLAY with Sand, (CH)s: About 85% high plasticity, very high dry strength, no dilatancy, high toughness fines; about 15% sand; hard, reddish brown, moist; strong reaction with HCl; trace fine to coarse rounded gravel, max size about 1"; slightly indurated. *(Continued)*														T05A-094.5-095.9
	96				PITCHER	56											
	97																
-90	98		From 97.8' moderately indurated. From 97.9' greenish gray mottling to 99.5'.		SPT	67	12 15 19	34	44								S15A-097.0-098.0
	99																P13A-098.5-099.0
	100		At 99.3' 0.2' layer with about 5% fine rounded gravel up to 1/2" diameter.		PCORE	91											
		(CH)s															P13B-100.0-100.5
	101		101.0' sandy fat clay layer 0.1' thick.							>4.5P							
	102		From 102.0' fine sand sized green nodules, same bright green as mottling above.														
-95	103				SPT	100	10 16 22	38	49								S16A-102.0-103.5
	104		At 104.0' 1.4' thick layer of 25% fine sand, trace fine rounded grave up to 3/8 ", abundant calcium carbonate masses and nodules.	RD													P14A-104.0-104.5
	105				PCORE	77											
	106		From 105.6' greenish gray, strong reaction with HCl; mottled with dark greenish gray,; about 20 fine sand, no gravel, abundant calcium carbonate nodules.														
	107		106.0 to 113.5' SILTY SAND, (SM/ML): About 50% fine to medium sand; about 50% low plasticity, rapid dilatancy fines; dense, dark greenish gray, moist; strong reaction with HCl; abundant calcium carbonate stringers.														
-100	108				SPT	100	9 16 40	56	73								S17A-107.0-108.5
	109																
	110	SM/ML	At 108.1' strong reaction with HCl; 0.2' layer cemented with calcium carbonate. At 109.5' 0.5' gravel layer with 1-1/4" rounded gravel.		PCORE	11											
	111																
	112																
-105	113				SPT	100	9 14 23	37	48								S18A-1120.-113.5
	114		Boring terminated at 113.5' below ship deck.														
	115																
	116																
	117																
-110	118																
	119																
	120																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,213,388.55 East 6,195,520.24
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **7/17/13** DATE COMPLETED **7/19/13**	GROUND ELEVATION **13.37 ft** ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **99.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**	DRILLER'S NAME **Luis Torres** HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL **23.1 ft**
DRILLING METHOD **0 - 5 ft: HA, 5 - 32 ft: HSA, 32 - 99 ft: RD**	DRILL RIG MAKE AND MODEL **Mobile B-53**	DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4" O.D. punch core bit**	DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**	FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED	CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**	FIELD LOG REVIEWER
SAMPLER TYPE(S) **2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher**	HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP **Marl, automatic, 140 lbs / 30-inch drop**	HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with 95% cement, 5% bentonite by wt.**	GROUNDWATER READING: DURING DRILLING AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0	(GP)s	LEVEE FILL, (Qaf) 0.0 to 23.1'	Hand Auger													
	1		0.0 to 0.5' Poorly Graded GRAVEL with Sand, (GP)s: About 85% fine, angular to subangular gravel, maximum size 3/4" in.; about 15% fine sand; greenish gray, dry; road base.														B01A-000.0-005.0
	2	s(ML)															
10	3		0.5 to 4.5' SANDY SILT, s(ML): About 60% nonplastic, slow dilatancy fines; about 40% fine sand; light reddish brown, moist; no reaction with HCl.														
	4																
	5		4.5 to 10.7' SILTY SAND, (SM): About 60% fine to medium sand; about 40% nonplastic fines; medium dense, light reddish brown, moist; no reaction with HCl.		SPT	67	5 12 17	29	38			1			12		S01A-005.0-006.0 Lab. Classification: WELL-GRADED SAND with SILT (SW-SM)
	6																
	7	SM															
5	8																
	9																
	10																
	11		10.7 to 15.8' SANDY LEAN CLAY, s(CL): About 70% medium plasticity, low dry strength, slow dilatancy, low toughness fines; about 30% fine sand; stiff, black, wet; organic odor; no reaction with HCl.	Auger	SPT	60	6 5 6	11	14								S02A-010.0-010.7
	12																
	13	s(CL)															
0	14				SHELBY	70				1.5P							T01A-013.5-014.9
	15																
	16		15.8 to 19.5' CLAYEY SAND, (SC): About 55% fine sand; about 45% low plasticity fines; loose, dark gray, wet; no reaction with HCl.														Shelby pushed with 250 psi downpressure
	17	SC			SPT	47	0 0 2	2	3						28		S03A-016.0-016.7
-5	18																
	19																
	20	s(CL)	*Description on next page.*														

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,388.55 East 6,195,520.24
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S2
Sheet 2 of 5

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20	s(CL)	19.5 to 23.1' SANDY LEAN CLAY, s(CL): About 75% low plasticity, low dry strength, no dilatancy, low toughness fines; about 25% fine sand; medium stiff, black, wet; organic odor; no reaction with HCl. *(Continued)*														
	21				SHELBY	85											T02A-020.0-021.7
	22									.5P .7T							Shelby pushed with 250 psi downpressure
	23																
-10			QUATERNARY, (Qal) 23.1 to 99.0'														
	24				SPT	87	1 3 3	6	8	<.25P							S04A-023.0-024.3
	25		23.1 to 40.0' ELASTIC SILT with Organics, (MH)o: About 85% medium plasticity, medium dry strength, slow dilatancy, low toughness fines; about 15% organics, small visable organic fibers; very soft, dark gray black, wet; organic odor; no reaction with HCl; trace fine sand.							.25P							
	26			Auger	SHELBY	90						97 45	21 16	50 96	17	HD OC HD OC HD OC	T03A-025.0-026.8 Lab. Classification: SILTY SAND (SM)
	27																Lab. Classification: SANDY ELASTIC SILT (MH)
-15	28																
	29				SPT	87	2 2 4	6	8								Lab. Classification: SILT (ML) Shelby pushed with 250 psi downpressure
	30																S05A-028.0-029.3
	31	(MH)o			SHELBY	100											T04A-030.0-032.0
	32		At 32.0' 0.1' thick layer of leaf like organic material. From 32.7' color change to light gray.		SPT	67	1 1 1	2	3								Shelby pushed with 200 psi downpressure S05.2A-032.0-033.0
-20	33																
	34																
	35				PCORE	0											
	36																
	37		From 37.0' color change to black.														
	38			RD	SHELBY	65											
-25	39																
	40		40.0 to 44.5' ORGANIC LEAN CLAY, (OL): About 70% low plasticity, medium dry strength, slow dilatancy, low toughness fines; about 30% organics, intermixed layers of leaf mateial and decomposed organics; black, wet; organic odor; no reaction with HCl.														
	41				PCORE	0											
	42	OL															
	43				SPT	100	1 1 4	5	6								S06A-042.0-043.5
-30	44				PCORE	0											P03A-043.5-047.0
	45	PT	*Description on next page.*														

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Final Report Version 8/20/2013

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,388.55 East 6,195,520.24
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45	PT	44.5 to 46.5' PEAT, (PT): About 80% hemic organics, fiberous, leafs and twigs. Slightly decomposed; about 20% no to low plasticity fines; black, wet; organic odor; no reaction with HCl. *(Continued)*	PCORE		0											
	46																
	47	OL	46.5 to 52.0' ORGANIC SILT with Sand, (OL): About 50% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 35% organics, leaf material and decomposed organics, very spongy; about 15% sand; stiff, black, wet; organic odor; no reaction with HCl.	SHELBY		100						77	26	47	HD OC	T06A-047.0-049.0 Lab. Classification: SILTY SAND (SM)
-35	48																
	49					100											Shelby pushed with 50 psi downpressure
	50		From 50.0' alternating layers of gray and black silt and organics.	SPT		47	0 0 0	0	0								S07A-050.0-050.7
	51																
	52	CL	52.0 to 57.0' LEAN CLAY, (CL): About 90% medium plasticity, low dry strength, slow dilatancy, low toughness fines; about 10% fine sand; very soft, gray, wet; no reaction with HCl.			0											
	53			SHELBY		100						37	15	96	HD OC	T07A-052.5-054.5 Lab. Classification: LEAN CLAY (CL)	
-40	54											36	15	89	HD OC		
												34	12	85	HD OC		
	55																Lab. Classification: LEAN CLAY (CL)
	56			PCORE		92				<.25P <.1T							Lab. Classification: LEAN CLAY with SAND (CL) Shelby pushed with 100 psi downpressure
	57		57.0 to 81.5' SILTY SAND, (SM): About 85% fine to medium sand; about 15% nonplastic fines; medium dense, dark gray, wet; no reaction with HCl.	RD, SPT		100	5 9 15	24	31								P06A-055.0-055.5
-45	58																S08A-057.0-058.5
	59			PCORE		57											
	60																
	61																
	62			SPT		73	11 15 17	32	41						11		S09A-062.0-063.1 Lab. Classification: POORLY GRADED SAND with SILT (SP-SM)
	63	SM															
-50	64																P08A-064.0-064.5
	65																
	66																
	67		From 67.0' dense.														S10A-067.0-068.0
	68																
-55	69																P09A-069.0-069.5
	70																

LABORATORY DATA

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Final Report Version 8/20/2013

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,388.55 East 6,195,520.24
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70	SM	57.0 to 81.5' SILTY SAND, (SM): About 85% fine to medium sand; about 15% nonplastic fines; medium dense, dark gray, wet; no reaction with HCl. *(Continued)*														
	71																
	72																S11A-072.0-073.0
-60	73																
	74																
	75																
	76																
	77																S12A-077.0-077.9
-65	78																
	79																
	80																
	81									>4.5P							
	82	CH	81.5 to 99.0' FAT CLAY, (CH): About 90% high plasticity, high dry strength, no dilatancy, high toughness fines; about 10% fine sand; hard, light greenish gray, moist; weak reaction with HCl.	RD						4.7T							P11A-081.5-082.0
	83																S13A-082.0-082.5
-70	84		From 83.5' light brown, greenish gray mottling. calcite stringers react strong to HCL.							4.0P							
	85																P12A-085.0-085.5
	86																
	87																S14A-087.0-087.6
-75	88									>4.5P							
	89																
	90																
	91																
	92																
	93		At 92.7' .04' thick layer of greenish gray clay.														S15A-092.5-093.5
-80	94																
	95																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,388.55 East 6,195,520.24
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	95	CH	81.5 to 99.0' FAT CLAY, (CH): About 90% high plasticity, high dry strength, no dilatancy, high toughness fines; about 10% fine sand; hard, light greenish gray, moist; weak reaction with HCl. *(Continued)*	RD						4.0P							P14A-094.5-095.0
-85	96																
	97																
	98																
	99		Boring terminated 99' below levee crown.														
	100																
	101																
	102																
-90	103																
	104																
	105																
	106																
	107																
-95	108																
	109																
	110																
	111																
	112																
-100	113																
	114																
	115																
	116																
	117																
-105	118																
	119																
	120																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,213,393.00 East 6,195,534.45
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County:

DRILL HOLE LOG
MR-S2inc
Sheet 1 of 1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **8/6/13**	DATE COMPLETED **8/5/13**	GROUND ELEVATION **13.10 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **70.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Vince Pokrywka**	HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 5 ft: HA, 5 - 70 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-53**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4"**		DRILLING ROD TYPE AND DIAMETER		FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**		FIELD LOG REVIEWER
SAMPLER TYPE(S) **Vane shear testing**		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with a lean cement mix**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	Inclinometer Installation Schematic	REMARKS
10	0			Hand Auger													Flush Monument	0' to 70' Lean Cement 0' to 70' Inclinometer Casing 0' to 2' Flush Monument
5																		
0					VSHEAR													
-5	20																	
-10					VSHEAR													
-15																		
-20				Rotary													Lean Cement / Inclinometer Casing	
-25	40																	
-30																		
-35					VSHEAR													
-40																		
-45	60																	
-50																		
-55																		

9/11/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,213,310.45 East 6,195,567.80
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **7/23/13** DATE COMPLETED **7/22/13**	GROUND ELEVATION **-5.56 ft** ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **79.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**	DRILLER'S NAME **Vince Pokrywka** HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 5 ft: HA, 5 - 31.5 ft: HSA, 31.5 - 79 ft: RD**	DRILL RIG MAKE AND MODEL **Mobile B-53**	DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4" O.D. punch core bit**	DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**	FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED	CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**	FIELD LOG REVIEWER
SAMPLER TYPE(S) **2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher**	HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP **Marl, automatic, 140 lbs / 30-inch drop**	HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with 95% cement, 5% bentonite by wt.**	GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0	s(ML)	QUATERNARY ALLUVIUM, (Qal) 0.0 to 79.0'	Hand Auger	BULK	100											B01A-000.0-005.0
	1		0.0 to 4.5' SANDY SILT, s(ML): About 70% no to low plasticity fines; about 30% fine sand; light brown, moist; no reaction with HCl.														
	2																
	3																
	4																
-10	5	s(CL)	4.5 to 6.0' SANDY LEAN CLAY, s(CL): About 70% low plasticity, low toughness fines; about 30% fine sand; dark gray to black, moist; no reaction with HCl.	Auger													T01A-005.0-007.0
	6	(CL)o	6.0 to 9.5' LEAN CLAY with Organics, (CL)o: About 85% low plasticity, medium dry strength, slow dilatancy, low toughness fines; about 10% organics; about 5% fine sand; soft, black, moist; organic odor; no reaction with HCl.														
	7									.5P							Shelby pushed with 100 psi downpressure
	8				SPT	53	1 1 2	3	4								S01A-007.5-008.3
	9																
-15	10	PT	9.5 to 34.0' PEAT, (PT): About 50% low to medium plasticity, low dry strength, slow dilatancy, low toughness fines; about 50% organics, fibers and decomposed material; very soft, moist; organic odor; no reaction with HCl.		SHELBY	100									9 14 20	HD OC HD OC HD OC	T02A-010.0-012.0 Lab. Classification: WELL-GRADED SAND with SILT (SW-SM)
	11																
	12									.5P							
	13				SPT	100	0 0 0	0	0			9					Lab. Classification: SILTY SAND (SM)
	14																Lab. Classification: SILTY SAND (SM) Shelby pushed with 50 psi downpressure
-20	15																
	16				SPT	100	0 0 0	0	0			11			47		S02A-012.5-014.0 S03A-015.0-016.5
	17																
	18				SPT	53	0 0 0	0	0								S04A-017.5-018.3
	19																
-25	20																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,310.45 East 6,195,567.80
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
MR-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20		9.5 to 34.0' PEAT, (PT): About 50% low to medium plasticity, low dry strength, slow dilatancy, low toughness fines; about 50% organics, fibers and decomposed material; very soft, moist; organic odor; no reaction with HCl. *(Continued)*														
	21				SHELBY	100											Shelby pushed with 0 psi downpressure T03A-020.0-022.0
	22									.2P							
	23																
	24				SPT	100	0 0 0	0	0								S05A-023.5-025.0
-30	25			Auger													
	26																
	27	PT			SHELBY	100											T04A-026.0-028.0
	28									.2P							Shelby pushed with 0 psi downpressure
	29				SPT	100	0 0 0	0	0								S06A-028.5-030.0
-35	30																
	31				SPT	100	0 0 0	0	0								S07A-030.0-031.5
	32					0				<.2P <.1T							P01A-031.5-032.5
	33				SHELBY	100											T05A-032.5-034.5
	34		34.0 to 37.0' LEAN CLAY, (CL): About 90% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 10% fine sand; soft, light gray, no to weak reaction with HCl.							.5P							
-40	35	CL															Shelby pushed with 50 psi downpressure
	36				PCORE	67				.5P							P02A-035.0-035.5
	37		37.0 to 41.5' SANDY FAT CLAY, s(CL): About 65% low plasticity, slow dilatancy, low toughness fines; about 35% fine sand; moist; no reaction with HCl.														
	38			(RD)	SPT	100	0 0 1	1	1								
	39	s(CL)															
-45	40																Driller did not insert punch core for run P03
	41				PCORE	0											
	42		41.5 to 46.5' SILTY SAND, (SM): About 85% fine to medium sand; about 15% nonplastic fines; medium dense, light gray, moist; no reaction with HCl.														
	43	SM			SPT	100	6 9 11	20	26								S09A-042.5-044.0
	44																
-50					PCORE	86											
	45																

Final Report Version 8/20/2013

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DRILL HOLE LOG
MR-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45	SM	41.5 to 46.5' SILTY SAND, (SM): About 85% fine to medium sand; about 15% nonplastic fines; medium dense, light gray, moist; no reaction with HCl. *(Continued)*		PCORE	86											P04A-044.5-045.0
	46																
	47	SW-SM	46.5 to 47.5' Poorly Graded SAND with Silt, (SW-SM): About 90% fine sand; about 10% nonplastic fines; light gray, moist; no reaction with HCl.														
	48				SPT	67	10 21 28	49	63								S10A-047.5-078.5
	49		47.5 to 60.2' SILTY SAND, (SM): About 85% fine sand; about 15% nonplastic fines; dense, gray, moist; no reaction with HCl; Fine to medium sand below 49ft.														
-55	50				PCORE	0											
	51																
	52																
	53				SPT	100	12 18 33	51	66								S11A-052.5-054.0
	54	SM															
-60	55				PCORE	100											
	56																
	57			RD													
	58				SPT	100	10 21 30	51	66								S12A-057.5-059.0
	59																
-65	60		60.2 to 79.0' FAT CLAY, (CH): About 95% high plasticity, high dry strength, no dilatancy, high toughness fines; about 5% fine sand; light brown with bluish grey mottling, moist; strong reaction with HCl; Calcite inclusions throughout, possible pumice inclusions below 70.5ft.		PCORE	63											
	61																
	62																
	63				SPT	67	7 11 12	23	30								S13A-062.5-064.0
	64																
-70	65	CH			PCORE	0											
	66																
	67																
	68				SPT	100	5 11 15	26	34								S14A-067.5-069.0
	69																
-75	70				PCORE	60											P09A-069.0-069.5

Final Report Version 8/20/2013

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Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,213,310.45 East 6,195,567.80
Survey Method: Ground Survey Datum: NAD83
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County: Sacramento

DRILL HOLE LOG
MR-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70	CH	60.2 to 79.0' FAT CLAY, (CH): About 95% high plasticity, high dry strength, no dilatancy, high toughness fines; about 5% fine sand; light brown with bluish grey mottling, moist; strong reaction with HCl; Calcite inclusions throughout, possible pumice inclusions below 70.5ft. *(Continued)*														BOX1-069.5-071.1
	71				PCORE	60				1.25P .5T							
	72																
	73				SPT	100	6 8 12	20	26								S15A-072.5-074.0
	74																
-80				RD													BOX1-074.0-077.3
	75																
	76				PCORE	94											
	77																
	78				SPT	100	8 10 13	23	30								S16A-077.5-079.0
	79		Boring terminated 79' below ground.														
-85	80																
	81																
	82																
	83																
	84																
-90	85																
	86																
	87																
	88																
	89																
-95	90																
	91																
	92																
	93																
	94																
-100	95																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,213,304.58 East 6,195,562.60
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County:

DRILL HOLE LOG
MR-S3inc

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **8/2/13**	DATE COMPLETED **8/1/13**	GROUND ELEVATION **-5.27 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **50.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Vince Pokrywka**	HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 5 ft: HA, 5 - 50 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-53**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4"**		DRILLING ROD TYPE AND DIAMETER		FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**		FIELD LOG REVIEWER
SAMPLER TYPE(S)		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with a lean cement mix**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	Inclinometer Installation Schematic	REMARKS
	0			Hand Auger													Monument	0' to 60' Lean Cement 0' to 60' Inclinometer Casing 0' to 3' Monument Monument starts 2.5' above ground surface. Inclinometer Starts 2.0' above ground surface.
-10																		
-15																		
-20																		
-25	20																	
-30				Rotary														
-35																	Lean Cement Inclinometer Casing	
-40																		
-45	40																	
-50																		
-55																		
-60																		
-65	60																	

9/11/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Little Baja Salvaged Fish Release Site

Drill Hole Logs

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sacramento River
Coordinates: North 2,212,304.62 East 6,193,252.41
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S1

State of California
California Natural Resources Agency
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DATE STARTED **8/14/13**	DATE COMPLETED **8/16/13**	GROUND ELEVATION **9.00 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **127.2 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Chris St. Pierre**	HELPER'S NAME **Jose Sagrero**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 113.5 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-80**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **5 3/4" drag bit**		DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**		FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH **8.625" O.D. threaded steel to 45'**		FIELD LOG REVIEWER
SAMPLER TYPE(S) **2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher**		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP **Marl, automatic, 140 lbs / 30-inch drop**		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with 95% cement, 5% bentonite by wt.**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0		0.0 to 1.5' Deck of Quin Delta.														
	1																
	2		1.5 to 27.0' Water-Sacramento River.														
	3																
5	4																
	5																
	6																
	7																
	8																
0	9																
	10			(RD)													
	11																
	12																
	13																
-5	14																
	15																
	16																
	17																
	18																
-10	19																
	20																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,304.62 East 6,193,252.41
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20		1.5 to 27.0' Water-Sacramento River. *(Continued)*														
	21																
	22																
	23																
-15	24																
	25																
	26																
	27		Quaternary, (Qal) 27.0 to 127.2'														
	28																
-20	29		27.0 to 38.5' ORGANIC LEAN CLAY, (OL): About 65% low plasticity, no to low dry strength, no dilatancy, low toughness fines; about 35% organics, highly decomposed organic muck, some reddish brown leaf material; very soft, dark brown to black, wet; organic odor; no reaction with HCl.														
	30																
	31																
	32																
	33	OL		RD													
-25	34																
	35																
	36																
	37				SPT	100	0 0 1	1	1			7					S01A-036.5-038.0
	38									<0.2P							
-30	39		38.5 to 41.7' PEAT, (PT): About 65% organics, leaf and decomposed material; about 35% low plasticity, medium dry strength fines; black mottled with reddish brown, wet; no reaction with HCl.														
	40	PT			PCORE	100											P01A-039.0-039.5
	41																
	42		41.7 to 45.2' ORGANIC LEAN CLAY, o(CL): About 70% medium plasticity, low dry strength, no dilatancy, medium toughness fines; about 30% organics, leaf material; very soft, light gray, wet; no reaction with HCl.							<.2P							
	43	o(CL)			SPT	100	0 0 0	0	0								S02A-042.0-043.5
-35	44				PCORE	100											
	45																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

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DRILL HOLE LOG
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State of California
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Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45																
	46	CL	45.2 to 49.2' LEAN CLAY, (CL): About 90% medium to high plasticity, low dry strength, no dilatancy, low toughness fines; about 10% fine sand; medium stiff, gray, moist; no reaction with HCl.	PCORE		100				.5P							P02A-046.0-046.5
	47																
	48			SHELBY		88											T01A-047.0-049.2
-40	49									<.2P							
	50	s(CL)	49.2 to 51.3' SANDY LEAN CLAY, s(CL): About 65% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 35% fine sand; medium stiff, light gray, moist; no reaction with HCl.														Shelby tube pushed with 50 psi downpressure
	51			PCORE		100				.5P							
	52		51.3 to 54.8' SILTY SAND, (SM): About 80% fine sand; about 20% nonplastic fines; medium dense, gray, wet; no reaction with HCl.														
	53	SM		SPT		100	3 4 7	11	14								S03A-052.0-053.5
-45	54																
	55		54.8 to 57.5' LEAN CLAY with Sand, (CL)s: About 75% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 25% fine sand; stiff, gray, moist; no reaction with HCl.	PCORE		71				1.0P							P04A-055.0-055.5
	56	(CL)s															
	57																
	58		57.5 to 69.9' SILTY SAND, (SM): About 85% fine sand; about 15% no plasticity fines; gray, moist; no reaction with HCl.	RD													P05A-058.0-058.5
-50	59			PCORE		54											
	60																
	61																
	62			SPT		0	3 6 8	14	18								
	63	SM															
-55	64																
	65			PCORE		0											
	66																
	67		From 67.0' About 65% fine sand; about 35% nonplastic fines.	SPT		80	4 6 7	13	17						29		S05A-067.0-068.2 Lab. Classification: SILTY SAND (SM)
	68		From 68.0' strong reaction with HCl; calcite concretions.														
-60	69			PCORE		86											
	70																

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DRILL HOLE LOG
LB-S1

State of California
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Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70	(ML)s	69.9 to 73.0' SILT with Sand, (ML)s: About 75% no plasticity, low dry strength, rapid dilatancy fines; about 25% fine sand; greenish gray, moist; no reaction with HCl. *(Continued)*	PCORE		86											
	71																P07A-071.0-071.5
	72					60											T02A-072.0-072.6
	73		73.0 to 75.0' SANDY SILT, s(ML): About 65% no plasticity, rapid dilatancy fines; about 35% fine sand; dense, greenish gray, moist; no reaction with HCl.			100											
-65	74	s(ML)		SPT		100	9 18 30	48	62								S06A-073.5-075.0
	75	CL	75.0 to 76.5' LEAN CLAY, (CL): About 90% low plasticity, low to medium dry strength, no dilatancy, medium toughness fines; about 10% fine sand; very stiff, greenish gray, moist; no reaction with HCl.	PCORE		60				2.5P							
	76																
	77	SM	76.5 to 80.2' SILTY SAND, (SM): About 55% fine sand; about 45% low plasticity fines; dense, dark greenish gray, moist; weak cementation; no reaction with HCl.	SPT		100	9 17 31	48	62								S09A-077.0-078.5
	78																
-70	79																
	80	CL	80.2 to 86.3' LEAN CLAY, (CL): About 90% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 10% fine sand; very stiff, greenish gray, moist; weak cementation; no reaction with HCl; Borderline ML.	PCORE		83				3.5P							
	81																P10A-080.5-081.0
	82			RD													T03A-082.0-083.1
	83			PITCHER		44				>4.5P							
-75	84																
	85			PCORE		80											
	86	SM	86.3 to 109.1' SILTY SAND, (SM): About 60% fine sand; about 40% no plasticity fines; greenish gray, moist; weak cementation; no reaction with HCl.														
	87					0	17 50										S08A-087.0-087.75
	88		From 88.0' strong reaction with HCl; calcite inclusions.														
-80	89			PCORE		29											
	90																
	91																
	92		From 92.0' no reaction with HCl.	SPT		93	14 28 41	69	89								S09A-092.0-093.4
	93																
-85	94			PCORE		86											
	95																

Final Report Version 8/20/2013

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Feature:
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Survey Method: Ground Survey Datum: NAD83
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County: Sacramento

DRILL HOLE LOG
LB-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	95		86.3 to 109.1' SILTY SAND, (SM): About 60% fine sand; about 40% no plasticity fines; greenish gray, moist; weak cementation; no reaction with HCl. *(Continued)*		PCORE	86											P13A-095.0-095.5
	96																
	97		From 97.0' About 85% fine sand; about 15% nonplastic fines; dark greenish gray.		SPT	100	19 25 34	59	76								S10A-097.0-098.5
	98																
-90	99		From 99.0' well indurated.		PCORE	100											
	100																
	101																
	102	SM			SPT	100	36 27 37	64	83								S11A-102.0-103.5
	103																
-95	104			RD	PCORE	100											
	105																
	106																P15A-106.0-106.5
	107					100	33 50										S12A-107.0-107.5
	108																
-100	109		109.1 to 111.0' Well-Graded SAND with Gravel, (SW)g: About 80% fine to coarse sand; about 15% fine, rounded gravel; about 5% no plasticity fines; very dense, dark greenish gray, wet; weak cementation; no reaction with HCl.		PCORE	88											
	110	(SW)g															P16A-109.5-110.0
	111		111.0 to 127.2' SILTY SAND, (SM): About 85% fine sand; about 15% nonplastic fines; greenish gray, moist; weak cementation; no reaction with HCl.														
	112					100	31 50										S13A-112.0-112.9
	113		From 113.0' well indurated.														
-105	114				PCORE	100											
	115	SM															
	116																
	117				SPT	80	32 32 50	82	106								S14A-117.0-118.0
	118		From 118.0' fine to medium sand; no reaction with HCl; well indurated.														
-110	119				PCORE	100											
	120																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,304.62 East 6,193,252.41
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	120	SM	111.0 to 127.2' SILTY SAND, (SM): About 85% fine sand; about 15% nonplastic fines; greenish gray, moist; weak cementation; no reaction with HCI. *(Continued)*														P18A-119.5-120.0
	121				POORE	100											S15A-120.0-120.25
	122					100	50										
	123																
-115	124																
	125				POORE	100											P19A-124.0-124.5
	126																
	127					100	50										
			Boring terminated at 127.2' below ship deck.														S16A-127.0-127.5
	128																
-120	129																
	130																
	131																
	132																
	133																
-125	134																
	135																
	136																
	137																
	138																
-130	139																
	140																
	141																
	142																
	143																
-135	144																
	145																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,212,168.63 East 6,193,282.63
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED 7/23/13	DATE COMPLETED 7/26/13	GROUND ELEVATION 13.63 ft	ELEVATION BASIS Ground Survey	TOTAL DEPTH OF BORING 100.0 ft
DRILLING CONTRACTOR Gregg Drilling & Testing, Inc.		DRILLER'S NAME Vince Pokrywka	HELPER'S NAME James McIntyre	TOTAL DEPTH OF FILL 20 ft
DRILLING METHOD 0 - 5 ft: HA, 5 - 31.5 ft: HSA, 31.5 - 100 ft: RD		DRILL RIG MAKE AND MODEL Mobile B-53		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 6.5" O.D. HSA bit/ 5-3/4" O.D. punch core bit		DRILLING ROD TYPE AND DIAMETER 4.5" O.D. HWT		FIELD LOGGER Perry
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH 6.625" O.D. threaded steel to 30'		FIELD LOG REVIEWER
SAMPLER TYPE(S) 2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP Marl, automatic, 140 lbs / 30-inch drop		HAMMER EFFICIENCY 77.7%
BOREHOLE BACKFILL OR COMPLETION Tremie backfilled with 95% cement, 5% bentonite by wt.		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0	(GP)s	LEVEE FILL, (Qaf) 0.0 to 20.0'	Hand Auger													B01A-001.0-005.0
	1		0.0 to 0.5' Poorly Graded GRAVEL with Sand, (GP)s: About 85% fine, angular to subangular gravel, maximum size 3/4" in.; about 15% fine sand; greenish gray, dry; road base.														
	2																
	3		0.5 to 14.5' SILTY SAND, (SM): About 70% fine to medium sand; about 30% nonplastic fines; very loose, brown, dry; no reaction with HCl.														
10	4																
	5		At 5.2' 0.2 foot thick layer of organic silt.	Auger	SPT	53	0 1 1	2	3								
	6																
	7	SM															
	8				SPT	80	0 1 2	3	4			1			8		S02A-007.5-008.7 Lab. Classification: POORLY GRADED SAND with SILT (SP-SM)
5	9																
	10		From 10.0' loose.		SPT	80	1 3 4	7	9								
	11																
	12																
	13		At 12.6' About 70% low plasticity, low toughness fines; about 30% fine sand; 0.7 foot thick layer.		SPT	93	0 2 2	4	5								S04A-012.6-013.3
0	14																
	15	CL	14.5 to 15.2' SANDY LEAN CLAY, (CL): About 95% low plasticity, low toughness fines; about 5% fine sand; black, moist.														
	16	SM	15.2 to 16.2' SILTY SAND, (SM): About 70% fine to medium sand; about 30% nonplastic fines; very loose, brown, dry; no reaction with HCl.		SPT	100	2 2 2	4	5								
	17	(CL)o	16.2 to 17.2' LEAN CLAY with Organics, (CL)o: About 90% low plasticity, slow dilatancy, low toughness fines; about 10% organics, highly decomposed; black, moist; organic odor; no reaction with HCl.														S05A-016.2-016.5
	18				SHELBY	50											T01A-017.5-018.5
-5	19	SM	17.2 to 20.0' SILTY SAND, (SM): About 70% fine to medium sand; about 30% nonplastic fines.														Shelby pushed with 250 psi
	20																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,168.63 East 6,193,282.63
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S2
Sheet 2 of 5

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20		QUATERNARY, (Qal) 20.0 to 100.0'														downpressure
	21		20.0 to 32.3' ORGANIC ELASTIC SILT with Sand, o(MH)s: About 60% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 25% organics, leaf material; about 15% fine sand; black, moist; organic odor; no reaction with HCl.		SPT	100	0 0 0	0	0								S03A-020.5-022.0
	22																
	23				SHELBY	95							70	31	72	HD OC	T02A-022.5-024.4
-10	24		From 24.0' medium stiff.							.75P			75 108	23 39	57 59	HD OC HD OC	Lab. Classification: ELASTIC SILT with SAND (MH)
	25																Lab. Classification: SANDY ELASTIC SILT (MH)
	26	o(MH)s		Auger	SPT	100	0 1 3	4	5								Lab. Classification: SANDY ELASTIC SILT (MH)
	27																Shelby pushed with 0 psi downpressure
	28				SHELBY	85											S04A-025.0-026.5
-15	29		From 29.0' very stiff.							3.5P							T03A-027.5-029.2
	30		At 30.2' 0.6 foot thick layer of gray with no leafy organics just sticks.		SPT	100	0 0 0	0	0	1.5P							Shelby pushed with 0 psi downpressure from 29.5' to 29.0' and 150 psi downpressure from 29.0' to 29.5'
	31																
	32					100											S05A-030.0-031.5
	33		32.3 to 42.2' SANDY ORGANIC ELASTIC SILT, s(MH): About 40% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 30% fine sand; about 30% organics, sticks, leaves and decomposed material; very soft, gray, wet; organic odor; no reaction with HCl.		SPT	67	0 1 1	2	3								S06A-032.5-033.5
-20	34																
	35				PCORE	86				<.2P							BOX1-035.0-037.5
	36																
	37	s(MH)															
	38			(RD)	SHELBY	85							86 140	37 55	68 28	HD OC HD OC	T04A-037.5-039.3 Lab. Classification: SANDY ELASTIC SILT (MH)
-25	39												138	56	21	HD OC	
	40																Lab. Classification: SILTY SAND (SM)
	41				PCORE	57				1.5P .5T							Lab. Classification: SILTY SAND (SM) Shelby pushed with 0 psi downpressure BOX1-039.5-041.2
	42																
	43		42.2 to 54.5' ORGANIC LEAN CLAY, o(CL): About 70% low plasticity, slow dilatancy, low toughness fines; about 25% organics, horizontal layers of leaf material; about 5% fine sand; dark gray to black, wet; organic odor; no reaction with HCl.		SPT	100	0 0 0	0	0								S07A-042.5-044.0
-30	44	o(CL)			PCORE	100											BOX1-044.0-046.0
	45																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,168.63 East 6,193,282.63
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45		42.2 to 54.5' ORGANIC LEAN CLAY, o(CL): About 70% low plasticity, slow dilatancy, low toughness fines; about 25% organics, horizontal layers of leaf material; about 5% fine sand; dark gray to black, wet; organic odor; no reaction with HCl. *(Continued)*		PCORE	100				.5P							
	46																
	47																
	48				SPT	100	0 0 0	0	0								S08A-047.5-049.0
-35	49		From 49.0' About 55% low plasticity, low toughness fines; about 40% organics; about 5% fine sand.														
	50	o(CL)															P05A-049.0-049.5 BOX1-049.5-051.5
	51				PCORE	91				.5P							
	52																
	53				SPT	100	0 0 0	0	0								S09A-052.5-054.0
-40	54																
	55		54.5 to 58.7' LEAN CLAY, (CL): About 90% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 10% fine sand; very soft, gray, moist; no reaction with HCl.														
	56				SHELBY	100											T05A-055.0-057.0
	57	CL		RD						<.2P							Shelby pushed with 50 psi downpressure
	58																
-45	59		58.7 to 60.7' SANDY LEAN CLAY, s(CL): About 60% low plasticity fines; about 40% fine sand; gray, moist.		PCORE	100											
	60	s(CL)															
	61		60.7 to 62.8' CLAYEY SAND, (SC): About 70% fine sand; about 30% low plasticity fines; very loose, gray, wet; no reaction with HCl.														
	62	SC															P06A-062.0-062.5
	63		62.8 to 64.5' SANDY LEAN CLAY, s(CL): About 60% low plasticity fines; about 40% fine sand; gray, moist.		SPT	100	0 0 0	0	0								S10A-062.5-064.0
-50	64	s(CL)															
	65		64.5 to 67.0' CLAYEY SAND, (SC): About 70% fine sand; about 30% low plasticity fines; gray, wet; no reaction with HCl.		PCORE	100											
	66	SC															
	67		67.0 to 72.2' LEAN CLAY with Sand, (CL)s: About 85% high plasticity, slow dilatancy, low to medium toughness fines; about 15% fine sand; very soft, gray, wet; no reaction with HCl.														
	68				SPT	100	0 0 0	0	0			3	35	12			S11A-067.5-069.0
-55	69	(CL)s			PCORE	60				<.2P							
	70																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Final Report Version 8/20/2013

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,168.63 East 6,193,282.63
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70																
	71	(CL)s	67.0 to 72.2' LEAN CLAY with Sand, (CL)s: About 85% high plasticity, slow dilatancy, low to medium toughness fines; about 15% fine sand; very soft, gray, wet; no reaction with HCl. *(Continued)* From 71.0' stiff.		PCORE	60				1.5P							
	72																
	73	s(CL)	72.2 to 75.3' SANDY LEAN CLAY, s(CL): About 55% low plasticity, slow dilatancy, low toughness fines; about 45% fine sand; gray, wet; no reaction with HCl.		SPT	100	0 1 7	8	10								S12A-072.5-074.0
-60	74																
	75																
	76	ML	75.3 to 76.4' SILT, (ML): About 90% no to low plasticity, slow dilatancy, low toughness fines; about 10% fine sand; weak cementation; strong reaction with HCl.		PCORE	80											
	77	SM	76.4 to 77.4' SILTY SAND, (SM): About 75% fine sand; about 25% nonplastic fines; gray, wet; no reaction with HCl.														
	78	SP	77.4 to 80.3' Poorly Graded SAND, (SP): About 95% fine to medium sand; about 5% nonplastic fines; dense, gray to dark gray, wet; no reaction with HCl.		SPT	87	9 16 20	36	47								S13A-077.5-078.8
-65	79																
	80																
	81	s(CL)	80.3 to 81.6' SANDY LEAN CLAY, s(CL): About 65% low plasticity, low toughness fines; about 35% fine sand; light greenish gray.		PCORE	100											
	82	SM	81.6 to 83.8' SILTY SAND, (SM): About 95% fine sand; about 5% nonplastic fines; dark greenish gray, wet; no reaction with HCl.	RD													
	83				SPT	100	8 18 18	36	47								S14A-082.5-083.8
-70	84	(ML)s	83.8 to 88.2' SILT with Sand, (ML)s: About 85% no to low plasticity, rapid dilatancy, low toughness fines; about 15% fine sand; very dense, light greenish gray, moist; weak cementation; weak reaction with HCl.		PCORE	86											
	85																P11A-085.0-085.5
	86																
	87																
	88				SPT	100	13 43 60	103	133								
-75	89	SM	88.2 to 95.1' SILTY SAND, (SM): About 75% fine sand; about 25% nonplastic fines; very dense, light greenish gray, moist; no reaction with HCl.														S15A-088.2-089.0
	90				PCORE	94											
	91		From 91.0' About 85% fine sand; about 15% nonplastic fines.														
	92																
	93		From 93.2' About 55% fine sand; about 45% nonplastic fines.		SPT	100	10 31 50	81	105								S16A-092.5-093.2
-80	94																S16B-093.2-093.9
	95				PCORE	89											

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,168.63 East 6,193,282.63
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S2

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	95	(ML)s	95.1 to 98.7' SILT with Sand, (ML)s: About 80% nonplastic, rapid dilatancy, low toughness fines; about 20% fine sand; moist; no reaction with HCl.														
	96				PCORE	89											P13A-095.5-096.0
	97																
	98			(RD)		90	12 50										S17A-097.5-098.4
-85	99	SM	98.7 to 100.0' SILTY SAND, (SM): About 75% fine sand; about 25% nonplastic fines; light greenish gray, moist; weak reaction with HCl.		PCORE	100											P14A-099.0-100.0
	100		Boring terminated at 100' levee crown.														
	101																
	102																
	103																
-90	104																
	105																
	106																
	107																
	108																
-95	109																
	110																
	111																
	112																
	113																
-100	114																
	115																
	116																
	117																
	118																
-105	119																
	120																

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,212,160.43 East 6,193,288.08
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County:

DRILL HOLE LOG
LB-S2inc
Sheet 1 of 1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **8/6/13**	DATE COMPLETED **8/6/13**	GROUND ELEVATION **13.05 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **51.5 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Vince Pokrywka**	HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL **20 ft**
DRILLING METHOD **0 - 5 ft: HA, 5 - 50 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-53**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4"**		DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**		FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**		FIELD LOG REVIEWER
SAMPLER TYPE(S) **Vane shear testing**		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with a lean cement mix**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	Inclinometer Installation Schematic	REMARKS
10	0			Hand Auger													Flush Monument	0' to 51.5' Lean Cement 0' to 51.5' Inclinometer Casing 0' to 2' Flush Monument
5																		
0					VSHEAR													
-5	20																	
-10					VSHEAR												Lean Cement, Inclinometer Casing	
-15				Rotary														
-20																		
-25	40																	
-30																		
-35					VSHEAR													
-40																		
-45	60																	

9/11/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,212,094.40 East 6,193,325.28
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **7/29/13** DATE COMPLETED **7/31/13**	GROUND ELEVATION **-6.49 ft** ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **89.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**	DRILLER'S NAME **Vince Pokrywka** HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 5 ft: HA, 5 - 30 ft: HSA, 30 - 89 ft: RD**	DRILL RIG MAKE AND MODEL **Mobile B-53**	DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4" O.D. punch core bit**	DRILLING ROD TYPE AND DIAMETER **4.5" O.D. HWT**	FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED	CASING TYPE, DIAMETER, INSTALLATION DEPTH **6.625" O.D. threaded steel to 30'**	FIELD LOG REVIEWER
SAMPLER TYPE(S) **2" SPT, 3" Shelby Tube, 134 mm Punch Core, 3" Pitcher**	HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP **Marl, automatic, 140 lbs / 30-inch drop**	HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with 95% cement, 5% bentonite by wt.**	GROUNDWATER READING: DURING DRILLING AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	0	SM	0.0 to 4.5' SILTY SAND, (SM): About 80% fine sand; about 20% nonplastic fines; light brown, dry; no reaction with HCl.	Hand Auger	BULK	100											B01A-000.0-003.0
-10	5	o(CL)	4.5 to 12.0' ORGANIC LEAN CLAY, o(CL): About 55% low plasticity, slow dilatancy, low toughness fines; about 45% organics, leafy and decomposed material; medium stiff, dark brown to black, moist; organic odor; no reaction with HCl.		SPT	100	0 4 4	8	10								S01A-005.0-006.5
-15	8				SHELBY	65				.7P							T01A-007.5-008.8
	10				SPT	20	0 0 0	0	0						10		Lab. Classification: WELL-GRADED SAND with SILT (SW-SM)
-20	12	s(OL)	12.0 to 33.3' SANDY ORGANIC SILT, s(OL): About 35% nonplastic, low dry strength, no dilatancy, low toughness fines; about 35% organics, leafy decomposed material; about 30% fine sand; dark brown, moist.	Auger	SHELBY	110				.2P			134 127 122	30 50 47	18 31 41	HD OC HD OC HD OC	T02A-012.5-014.5 Lab. Classification: SILTY SAND (SM)
	14.5		From 14.5' very soft.														Lab. Classification: SILTY SAND (SM)
	15				SPT	100	0 0 0	0	0								Lab. Classification: SILTY SAND (SM)
	17																S03A-015.0-016.5
-25	18				SPT	100	0 0 0	0	0						21		S04A-017.5-019.0 Lab. Classification: SILTY SAND (SM)
	20																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ: DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,094.40 East 6,193,325.28
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	20	s(OL)	12.0 to 33.3' SANDY ORGANIC SILT, s(OL): About 35% nonplastic, low dry strength, no dilatancy, low toughness fines; about 35% organics, leafy decomposed material; about 30% fine sand; dark brown, moist. *(Continued)*	Auger													
	21				SPT	100	0 0 0	0	0								
	22																
-30	23				SPT	100	0 0 0	0	0								S06A-022.5-024.0
	24																
	25				SHELBY	85				<.2P							T03A-025.0-026.7
	26																
	27																
-35	28				SPT	100	0 0 0	0	0			7					S07A-028.0-029.5
	29																
	30				SPT	100	0 0 0	0	0						68		S08A-030.0-030.5 Lab. Classification: SANDY SILT (ML)
	31																
	32				PCORE	100											
	33																
-40	34	(MH)o	33.3 to 37.0' ELASTIC SILT with Organics, (MH)o: About 80% medium plasticity, low dry strength, slow dilatancy, low toughness fines; about 15% organics, leaves and decomposed material; about 5% fine sand; very soft, gray, moist; no reaction with HCl.														P01A-033.5-034.0
	35									<.2P							
	36				SHELBY	85				<.2P							T04A-035.0-036.7
	37	CL	37.0 to 44.3' LEAN CLAY, (CL): About 95% low plasticity, low dry strength, slow dilatancy, low toughness fines; about 5% fine sand; medium dense, gray, moist; no reaction with HCl.	RD		100											
-45	38				SPT	100	0 0 0	0	0								S09A-037.5-039.0
	39																
	40									.5P							
	41				PCORE	86				.75P		3	31	10			P03A-040.0-040.5
	42																
-50	43				SHELBY	100											T05A-042.5-044.5
	44																
	45	s(CL)	*Description on next page.*			100											

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Final Report Version 8/20/2013

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,094.40 East 6,193,325.28
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	45		44.3 to 56.2' SANDY LEAN CLAY, s(CL): About 65% low plasticity, slow dilatancy, low toughness fines; about 35% fine sand; medium stiff, gray, moist; no reaction with HCl. *(Continued)*														
	46				PCORE	100				.7P							
	47																
	48				SPT	100	0 0 0	0	0								S10A-047.5-049.5
-55	49		From 49.0' About 25% fine sand.														
	50																
	51	s(CL)			PCORE	100											
	52		From 52.0' About 40% fine sand.														
	53				SPT	100	0 4 5	9	12								S11A-052.5-054.0
-60	54																
	55																
	56				PCORE	77											
	57		56.2 to 83.0' SILTY SAND, (SM): About 85% fine sand; about 15% nonplastic fines; dense, dark gray, moist; no reaction with HCl.														P06A-056.0-056.5
	58			RD	SPT	100	10 15 20	35	45						8		S12A-057.5-059.0 Lab. Classification: POORLY GRADED SAND with SILT (SP-SM)
-65	59																
	60				PCORE	100											
	61																
	62		At 61.5' 1 foot thick layer with trace subrounded fine gravel. No gravel below 62.5 feet.														P07A-061.5-062.0
	63	SM	From 62.5' weak reaction with HCl; thin 0.01 foot layers of greeninsh gray silty sand cemented wtin calcite.		SPT	38	12 28 50	78	101								S13A-062.5-063.8
-70	64																
	65				PCORE	84											
	66																
	67																
	68				SPT	40	13 30 50	80	104								S14A-067.5-068.1
-75	69																
	70				PCORE	66											

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature:
Coordinates: North 2,212,094.40 East 6,193,325.28
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County: Sacramento

DRILL HOLE LOG
LB-S3

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	REMARKS
	70		56.2 to 83.0' SILTY SAND, (SM): About 85% fine sand; about 15% nonplastic fines; dense, dark gray, moist; no reaction with HCl. *(Continued)*														
	71				PCORE	66											P09A-071.0-071.5
	72																
	73					100	70										S15A-072.5-073.0
-80	74																
	75				PCORE	91											
	76		At 75.5' 0.2 foot layer of greenish gray hard clay.														
	77	SM															P10A-076.5-077.0
	78					67	46 50										S16A-077.5-078.0
-85	79			RD													
	80				PCORE	0											
	81																
	82																
	83					100	50										
-90			83.0 to 89.0' LEAN CLAY, (CL): About 90% low plasticity, low toughness fines; about 10% fine sand; very stiff, light greenish gray, moist; weak cementation; no reaction with HCl.							4P							P12A-083.0-083.5
	84																
	85				PCORE	11											
	86	CL															
	87																
	88		From 88.0' several thin (0.1') sand layers.		SPT	100	15 29 50	79	102								S18A-087.5-089.0
-95	89		Boring terminated at 89' below ground.														
	90																
	91																
	92																
	93																
-100	94																
	95																

Final Report Version 8/20/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Project: NEW SALVAGED FISH RELEASE SITES
Feature: / Sherman Island
Coordinates: North 2,212,091.37 East 6,193,318.87
Survey Method: Ground Survey Datum: NAD83
GPS: Latitude Longitude
County:

DRILL HOLE LOG
LB-S3inc
Sheet 1 of 1

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

DATE STARTED **8/1/13**	DATE COMPLETED **7/31/13**	GROUND ELEVATION **-6.48 ft**	ELEVATION BASIS **Ground Survey**	TOTAL DEPTH OF BORING **60.0 ft**
DRILLING CONTRACTOR **Gregg Drilling & Testing, Inc.**		DRILLER'S NAME **Vince Pokrywka**	HELPER'S NAME **James McIntyre**	TOTAL DEPTH OF FILL
DRILLING METHOD **0 - 5 ft: HA, 5 - 60 ft: RD**		DRILL RIG MAKE AND MODEL **Mobile B-53**		DWR/CONSULTANT COMPANY
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) **6.5" O.D. HSA bit/ 5-3/4"**		DRILLING ROD TYPE AND DIAMETER		FIELD LOGGER **Perry**
☒ VERTICAL ☐ INCLINED		CASING TYPE, DIAMETER, INSTALLATION DEPTH		FIELD LOG REVIEWER
SAMPLER TYPE(S)		HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP		HAMMER EFFICIENCY **77.7%**
BOREHOLE BACKFILL OR COMPLETION **Tremie backfilled with a lean cement mix**		GROUNDWATER READING: DURING DRILLING	AFTER DRILLING (DATE-TIME)	

Elevation, feet	Depth, feet	Graphic Log	FIELD CLASSIFICATION AND DESCRIPTION	Drilling Method	Sampled Interval	Recovery %	Blows per 6 in.	SPT N Value	N_{60}(ASTM)	PP or TV, tsf	Retained Sample	LABORATORY DATA: Water Content %	Liquid Limit	Plasticity Index	Fines% < #200	Other Lab Tests	Inclinometer Installation Schematic	REMARKS
	0			Hand Auger													Monument	0' to 60' Lean Cement 0' to 3' Monument 0' to 60' Inclinometer Casing Monument starts 2.5' above ground surface. Inclinometer Starts 2.0' above ground surface.
-10																		
-15																		
-20																		
-25	20																	
-30																		
-35																	Lean Cement	
-40				(Rotary)													Inclinometer Casing	
-45	40																	
-50																		
-55																		
-60																		
-65	60																	

9/11/2013

PROJECT GEOLOGY DRILL HOLE LOG: NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

Appendix B

CPT Logs

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

July 15, 2013

DWR
Attn: David Perry

Subject: CPT Site Investigation
Sherman Island New Fish Release Sites
Sherman Island, California
GREGG Project Number: 13-124MA

Dear Mr. Perry:

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	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☐
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Pressuremeter Testing	(PMT)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

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
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)
LBC1	7/10/13	87	-	-	76.1
LBC2	7/12/13	59	-	-	56.8
LBC3	7/11/13	85	-	-	75.8
LBC4	7/10/13	83	-	-	77.9
LBC5	7/11/13	56	-	-	53.5
LBC6	7/11/13	55	-	-	54.1
LBC7	7/12/13	63	-	-	55.0, 63.7
LBC8	7/12/13	70	-	-	59.8
MRC1	7/08/13	108	-	-	17.1, 60.2
MRC2	7/09/13	84	-	-	44.5
MRC3	7/08/13	100	-	-	63.0
MRC4	7/08/13	100	-	-	61.8
MRC5	7/09/13	80	-	-	41.1
MRC6	7/09/13	84	-	-	50.1
MRC7	7/10/13	77	-	-	49.6, 72.7

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

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Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986 pp. 791-803.

Robertson, P.K., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

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Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

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

Manzo Ranch Salvaged Fish Release Site

CPT Logs

GREGG

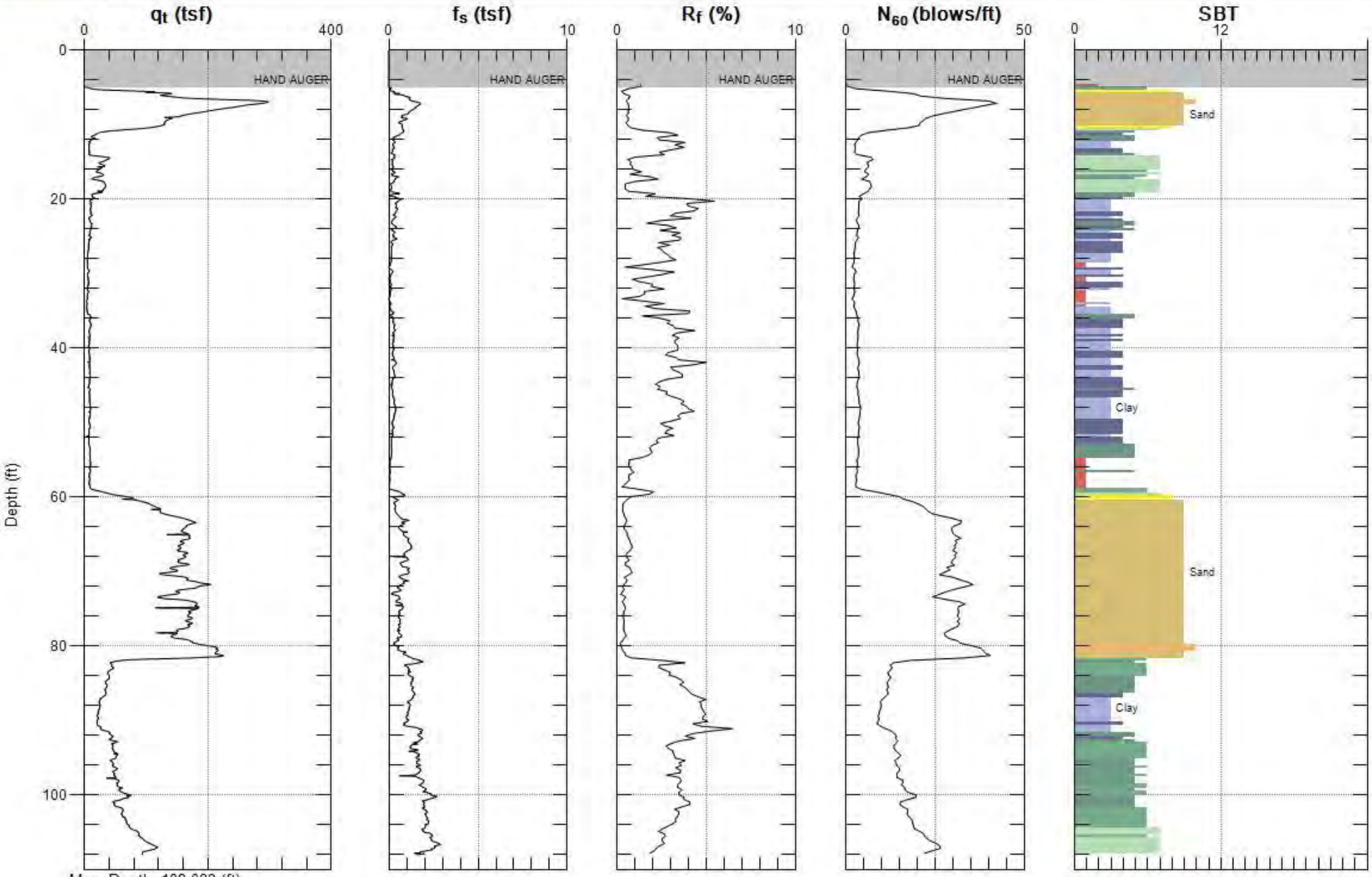
DWR

Site: SHERMAN ISLAND

Sounding: MRC1

Engineer: D.PERRY

Date: 7/8/2013 08:30



Max. Depth: 108.022 (ft)
Avg. Interval: 0.328 (ft)

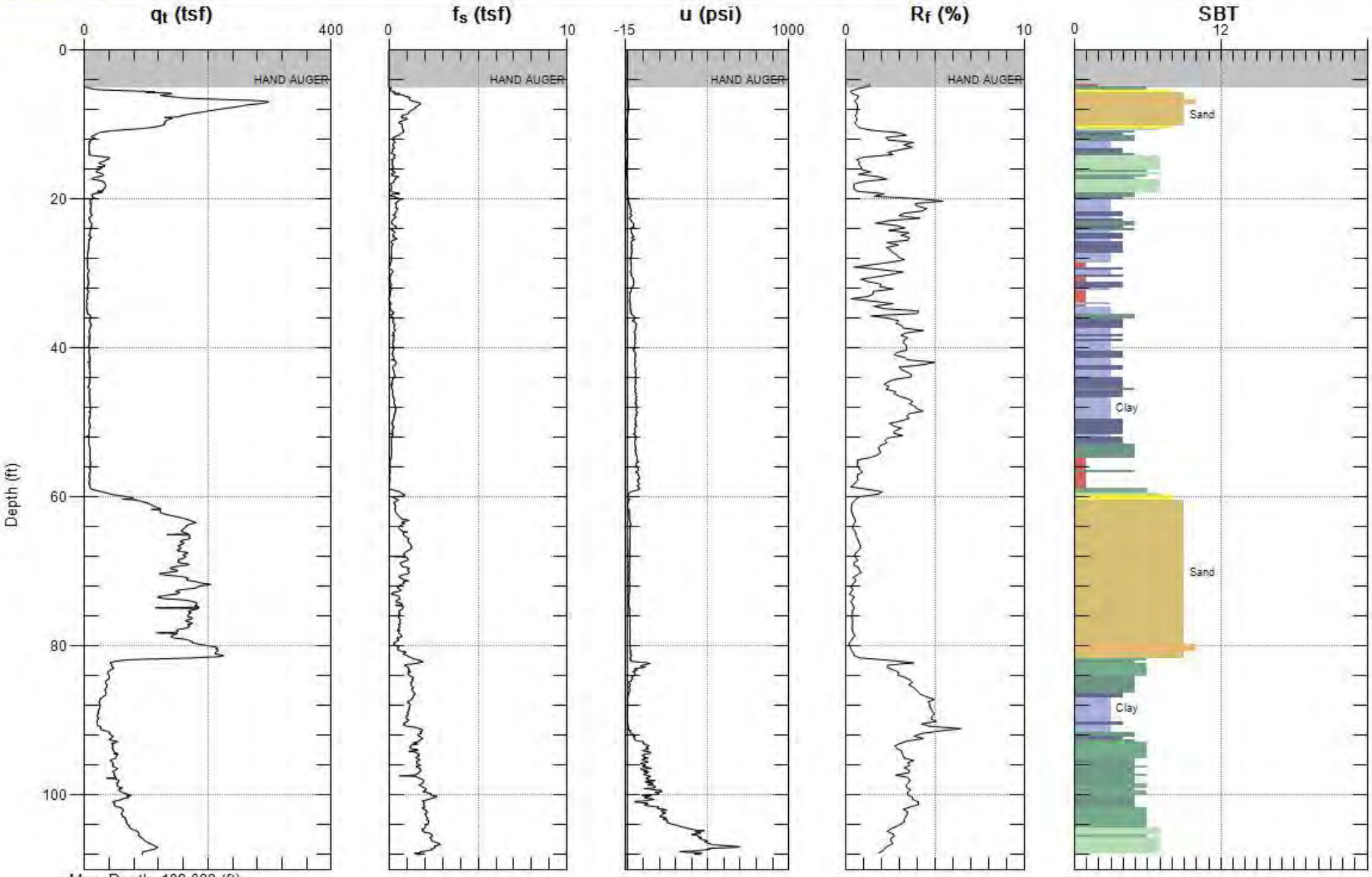
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: MRC1

Engineer: D.PERRY
Date: 7/8/2013 08:30



Max. Depth: 108.022 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

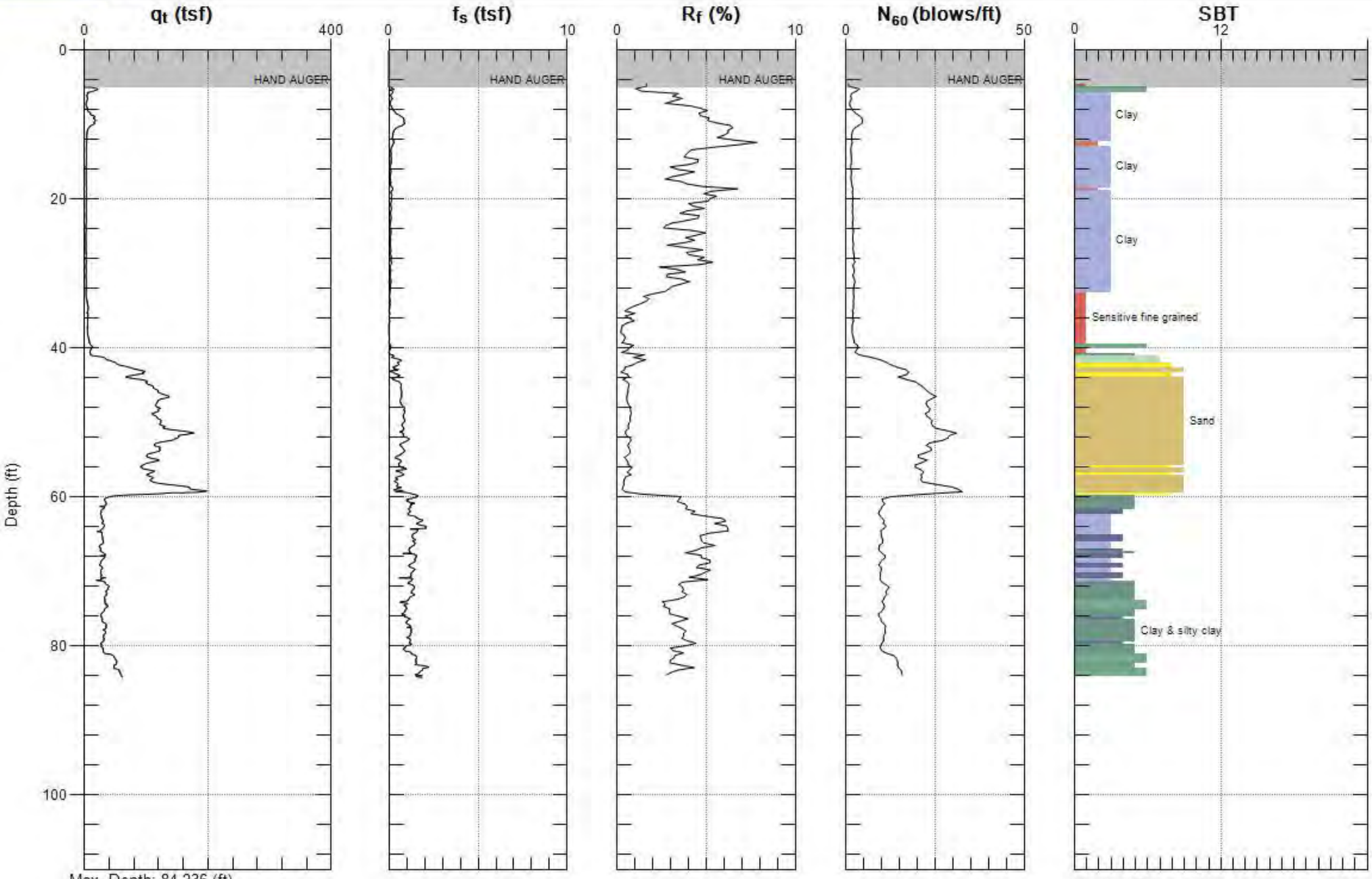
DWR

Site: SHERMAN ISLAND

Sounding: MRC2

Engineer: D.PERRY

Date: 7/9/2013 10:19



Max. Depth: 84.236 (ft)
Avg. Interval: 0.328 (ft)

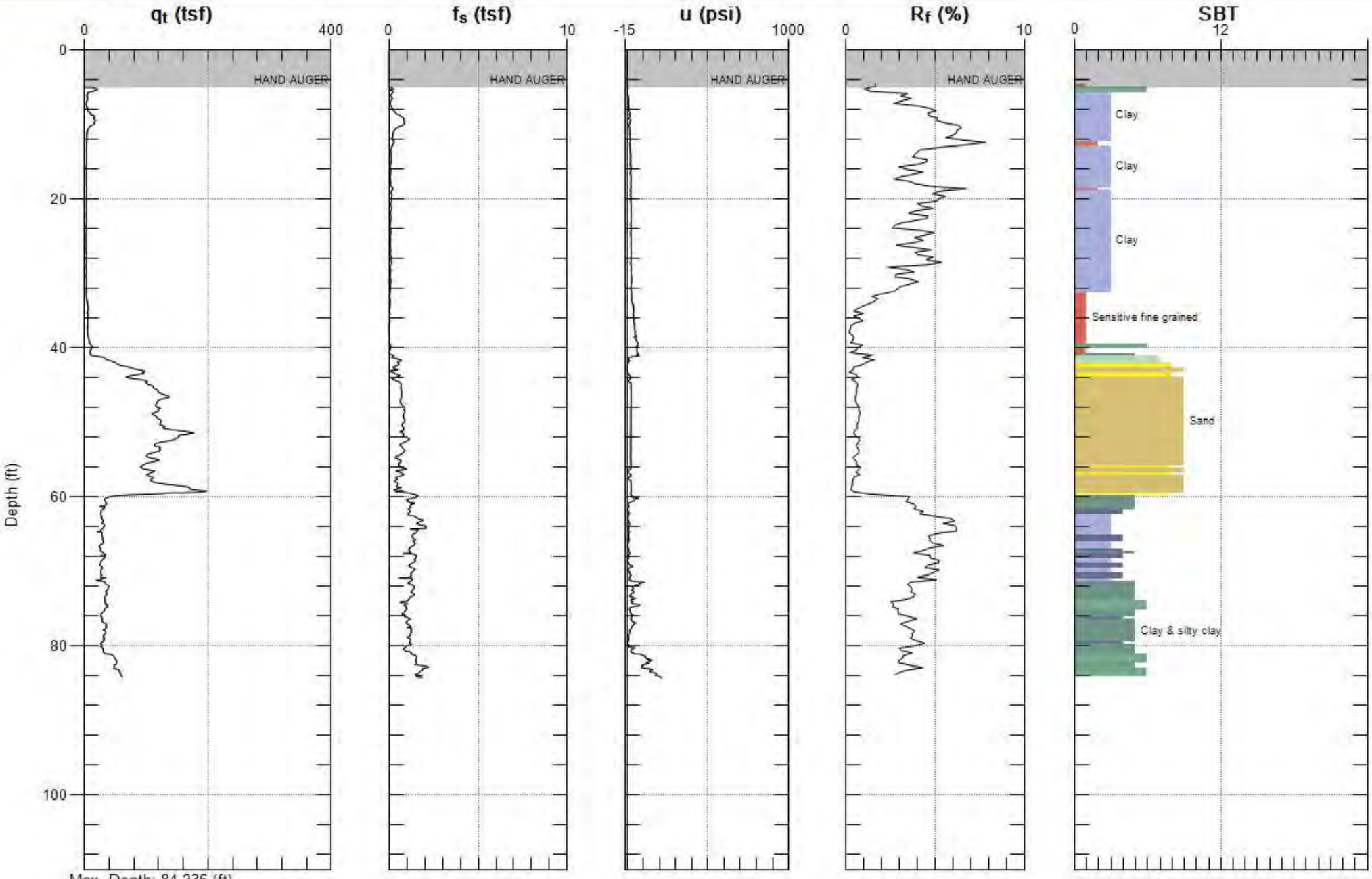
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC2 **Date: 7/9/2013 10:19**



Max. Depth: 84.236 (ft)
Avg. Interval: 0.328 (ft)

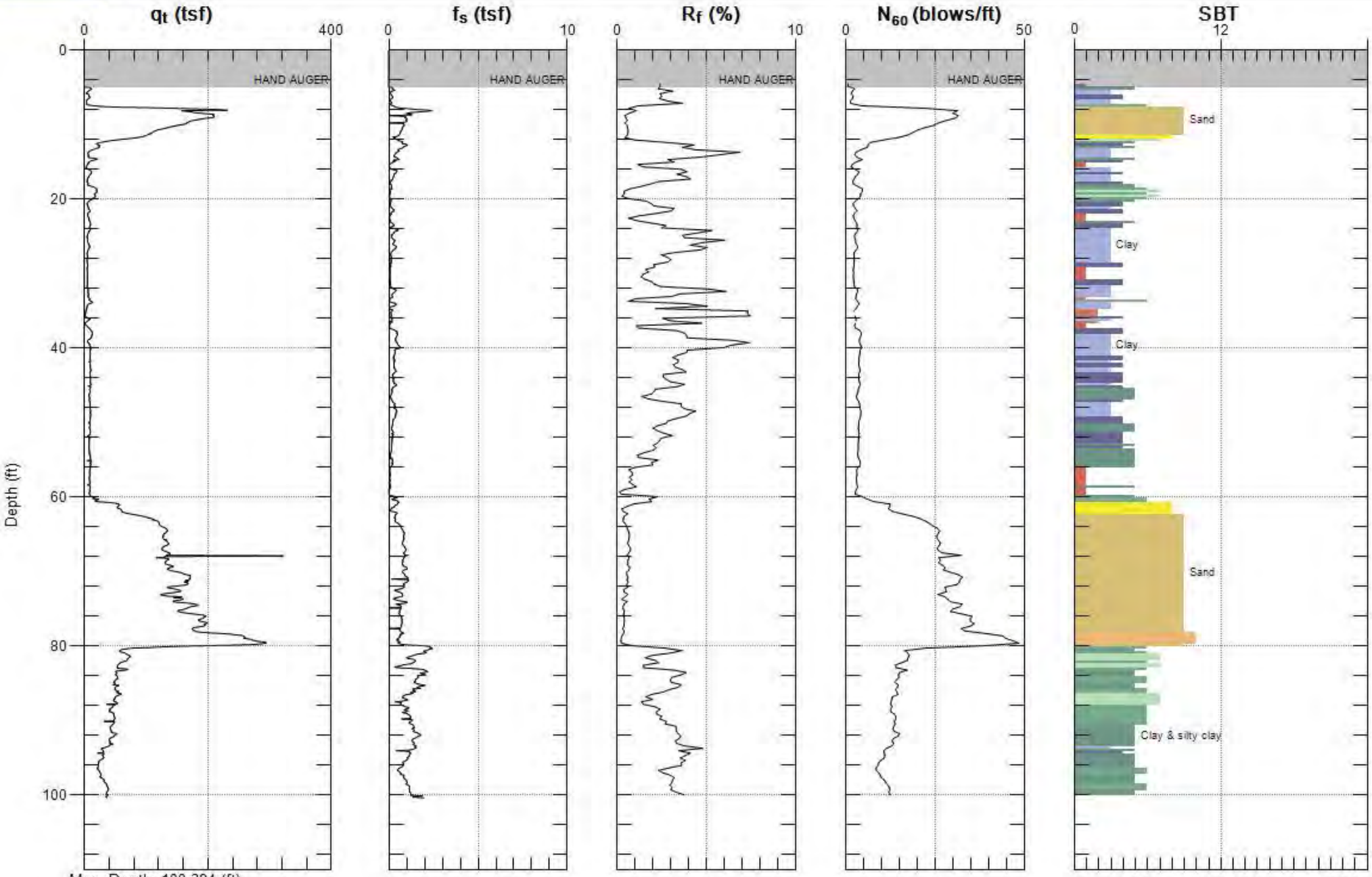
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: MRC3

Engineer: D.PERRY
Date: 7/8/2013 11:20



Max. Depth: 100.394 (ft)
Avg. Interval: 0.328 (ft)

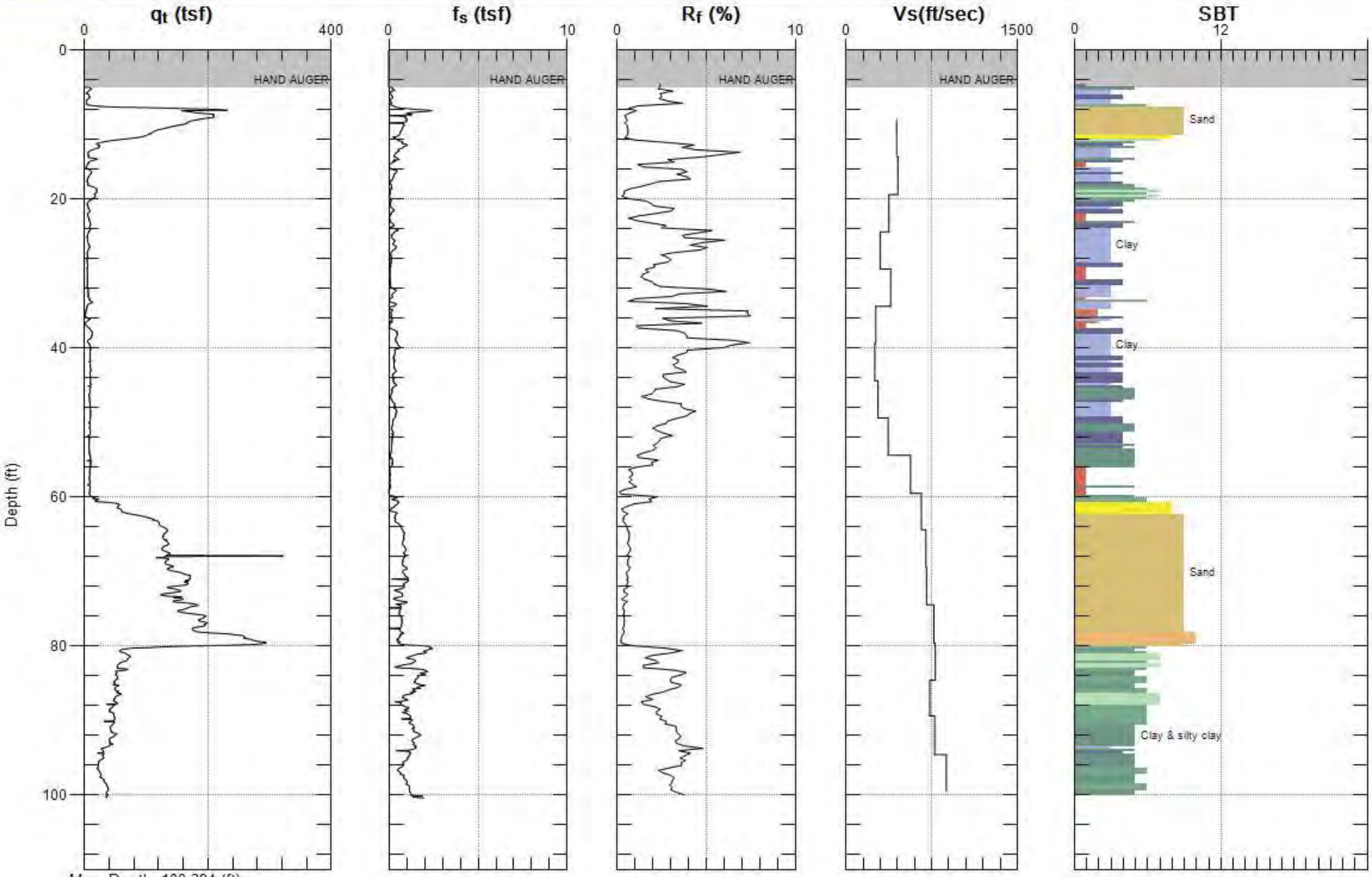
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: MRC3

Engineer: D.PERRY
Date: 7/8/2013 11:20



Max. Depth: 100.394 (ft)
Avg. Interval: 0.328 (ft)

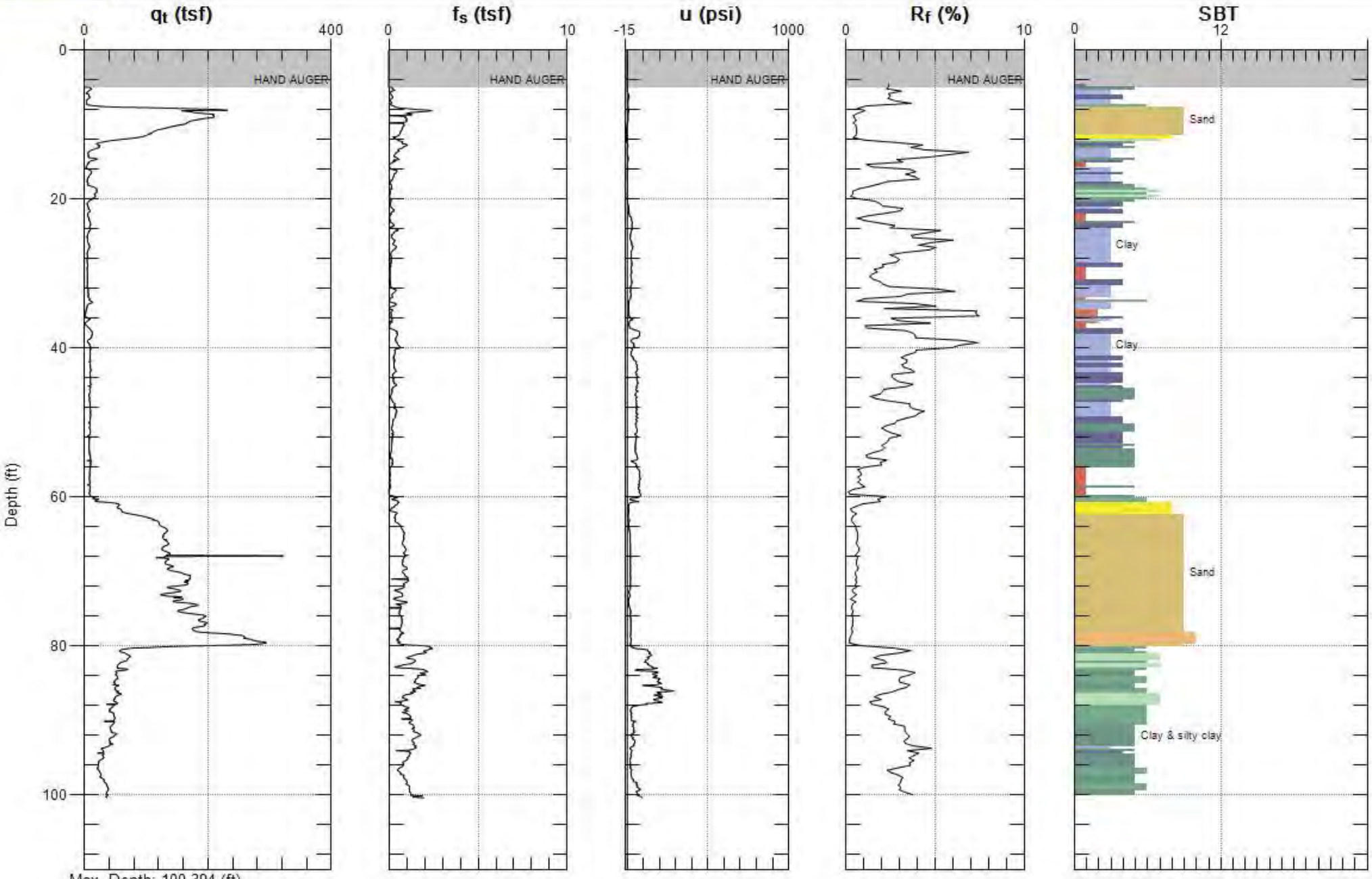
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC3 **Date: 7/8/2013 11:20**



Max. Depth: 100.394 (ft)
Avg. Interval: 0.328 (ft)

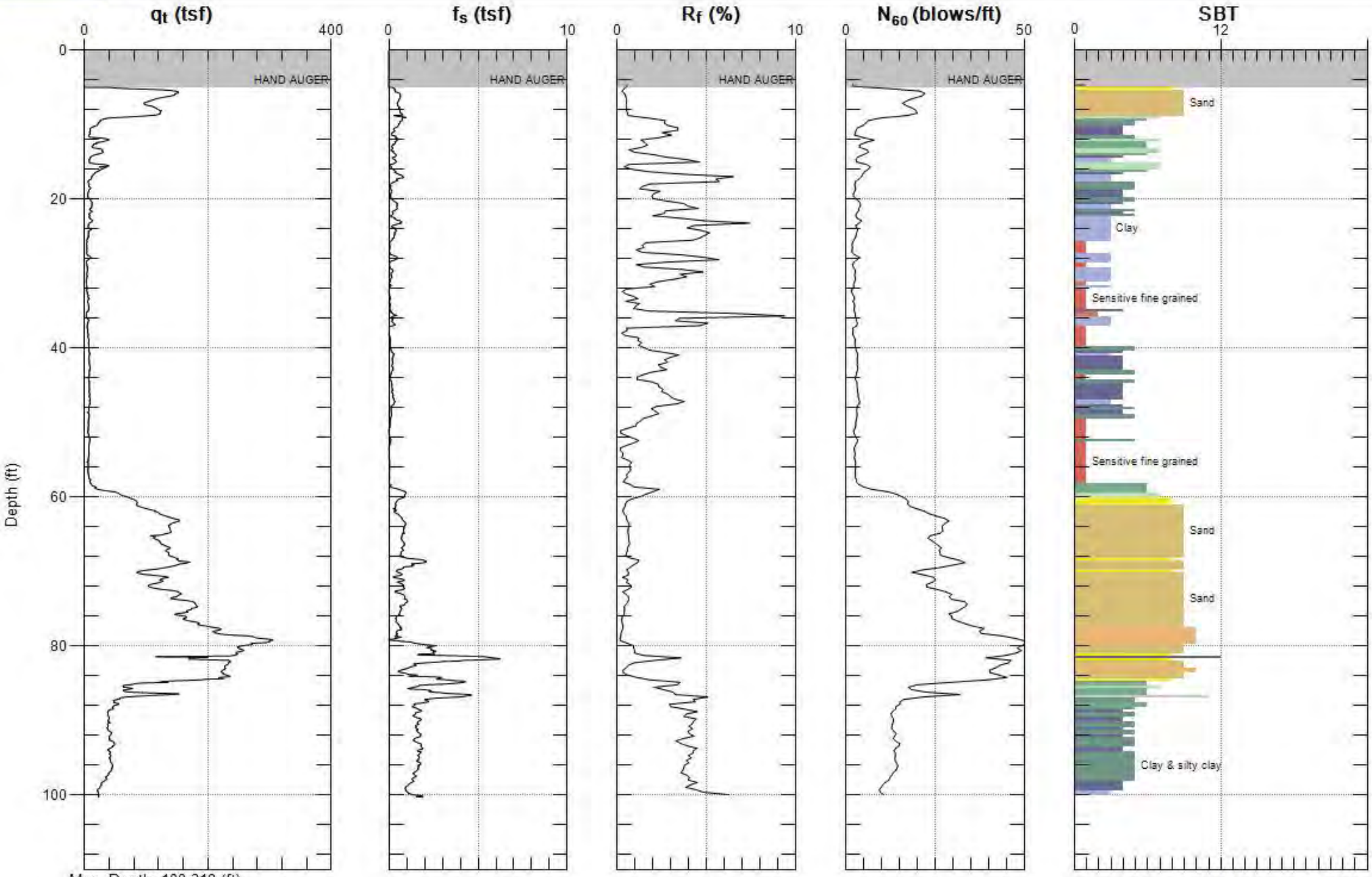
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: MRC4

Engineer: D.PERRY
Date: 7/8/2013 02:33



Max. Depth: 100.312 (ft)
Avg. Interval: 0.328 (ft)

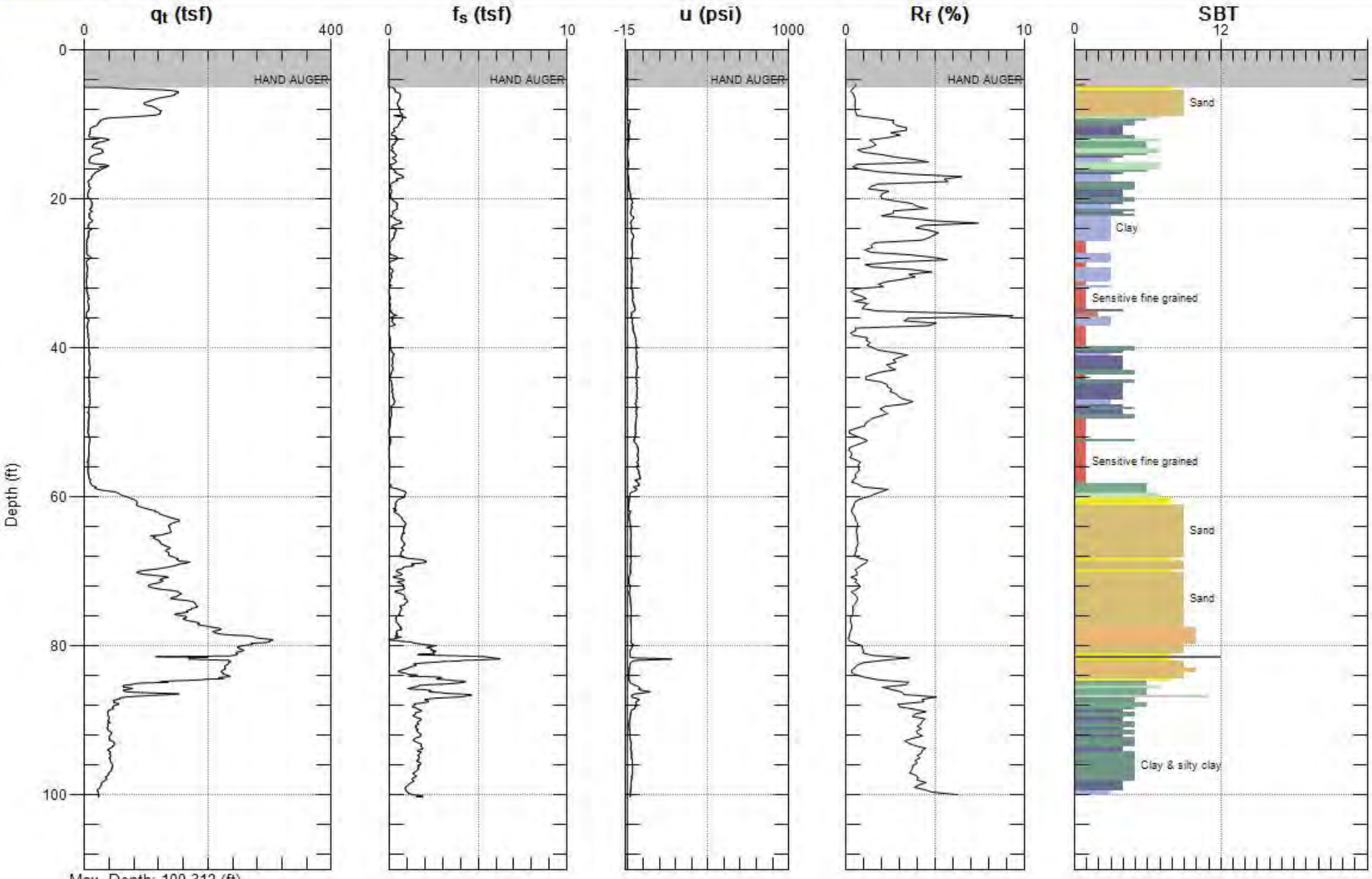
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC4 **Date: 7/8/2013 02:33**



Max. Depth: 100.312 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

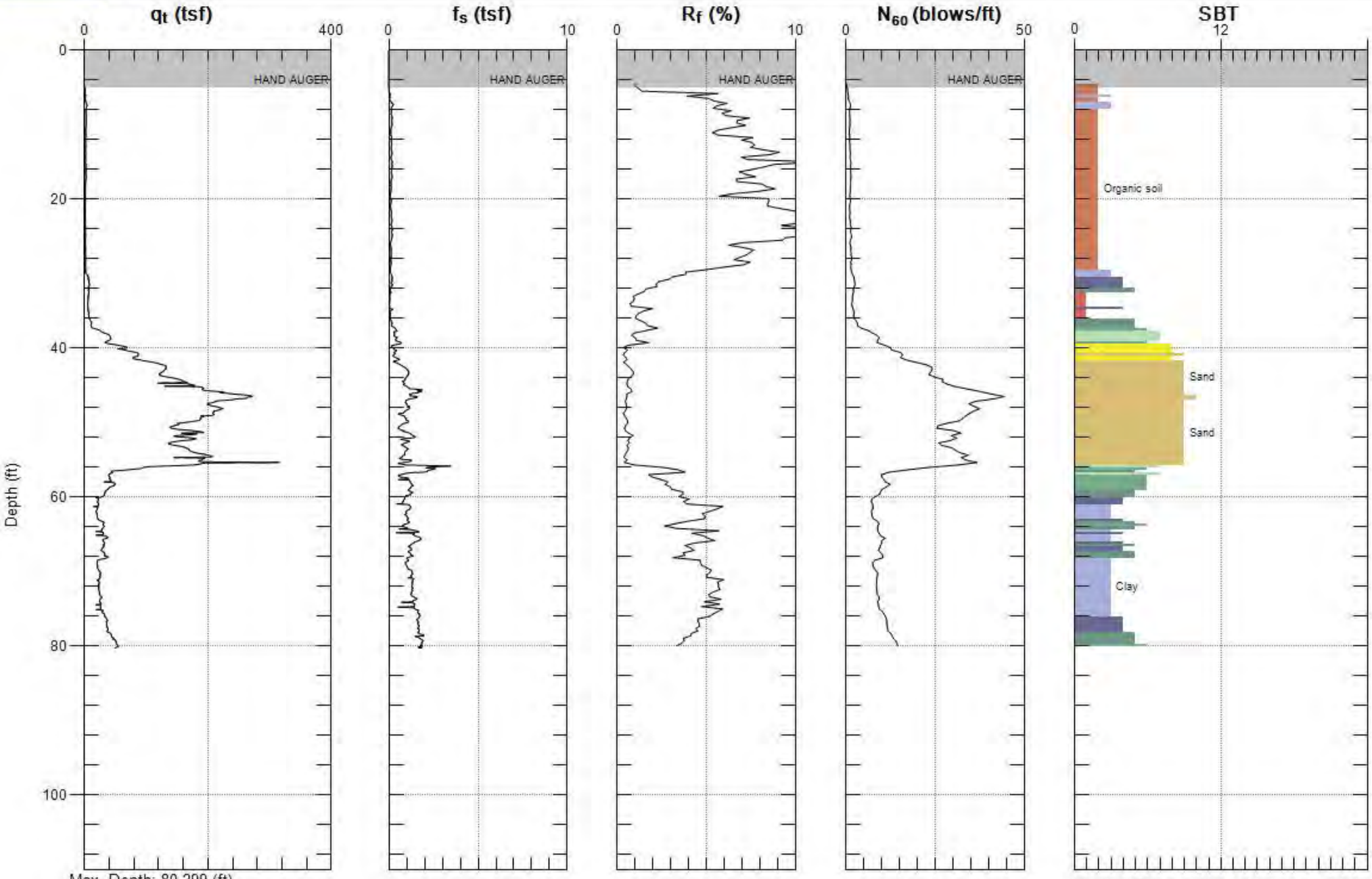
DWR

Site: SHERMAN ISLAND

Sounding: MRC5

Engineer: D.PERRY

Date: 7/9/2013 07:04



Max. Depth: 80.299 (ft)
Avg. Interval: 0.328 (ft)

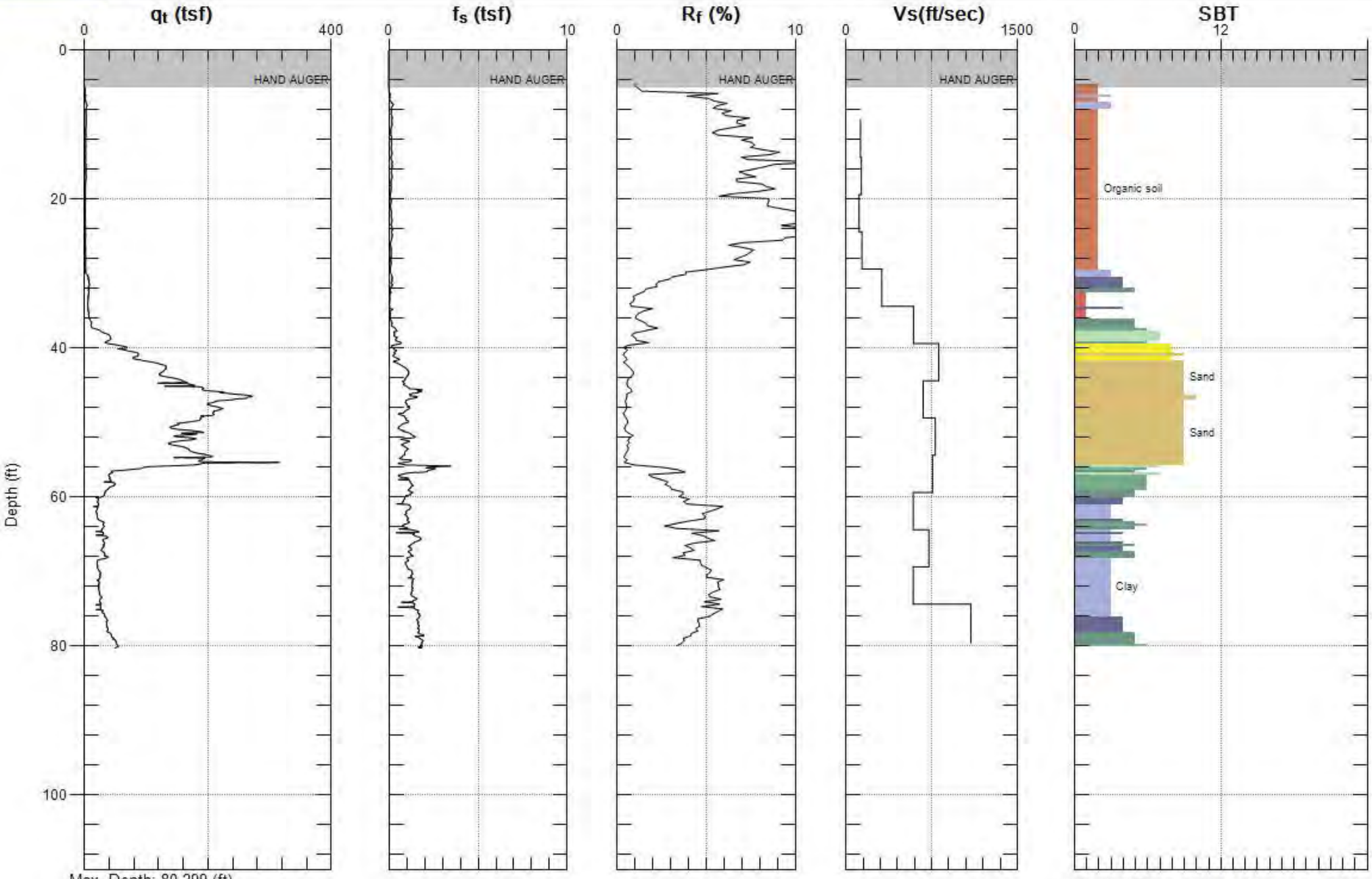
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC5 **Date: 7/9/2013 07:04**



Max. Depth: 80.299 (ft)
Avg. Interval: 0.328 (ft)

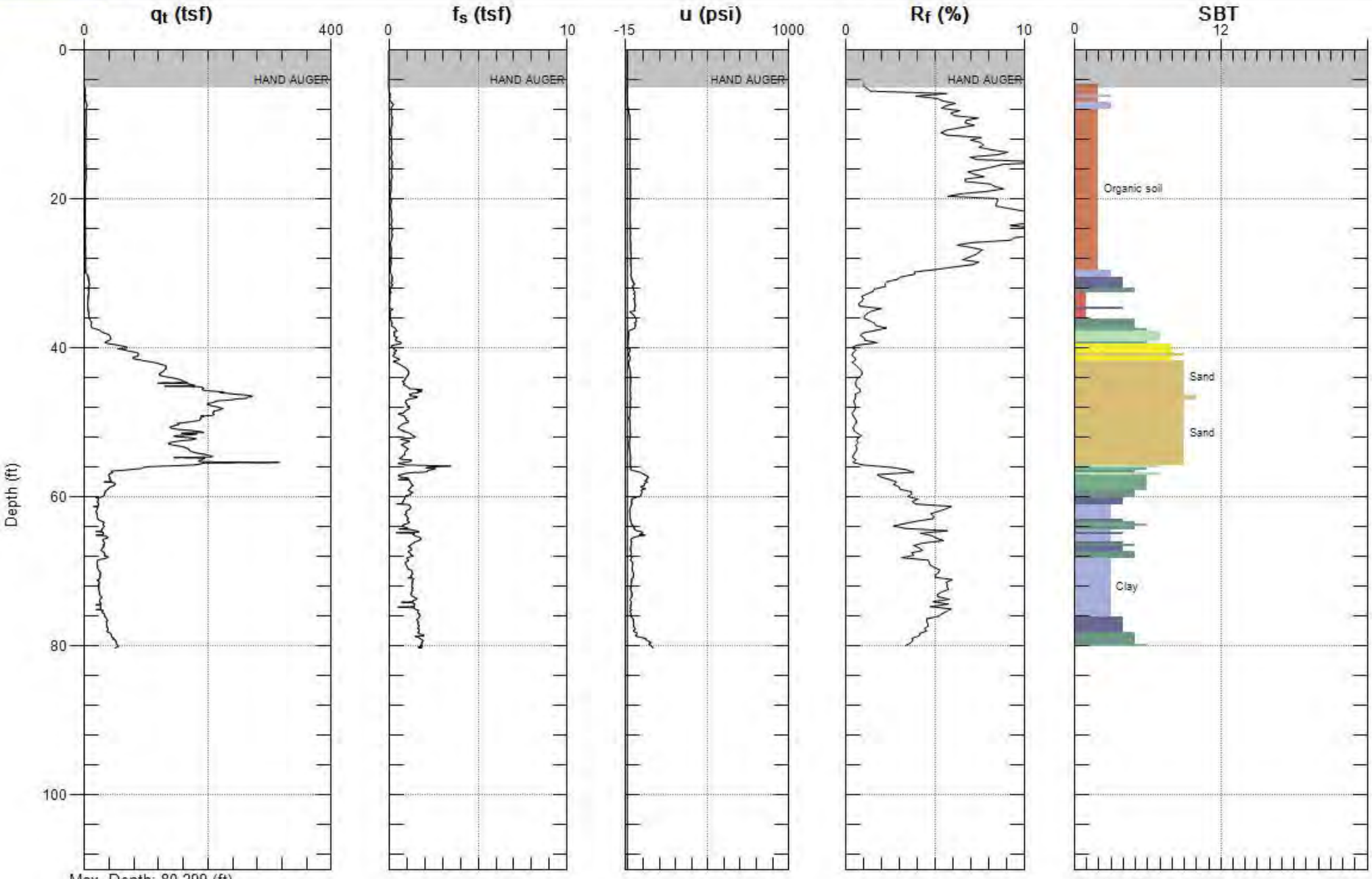
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC5 **Date: 7/9/2013 07:04**



Max. Depth: 80.299 (ft)
Avg. Interval: 0.328 (ft)

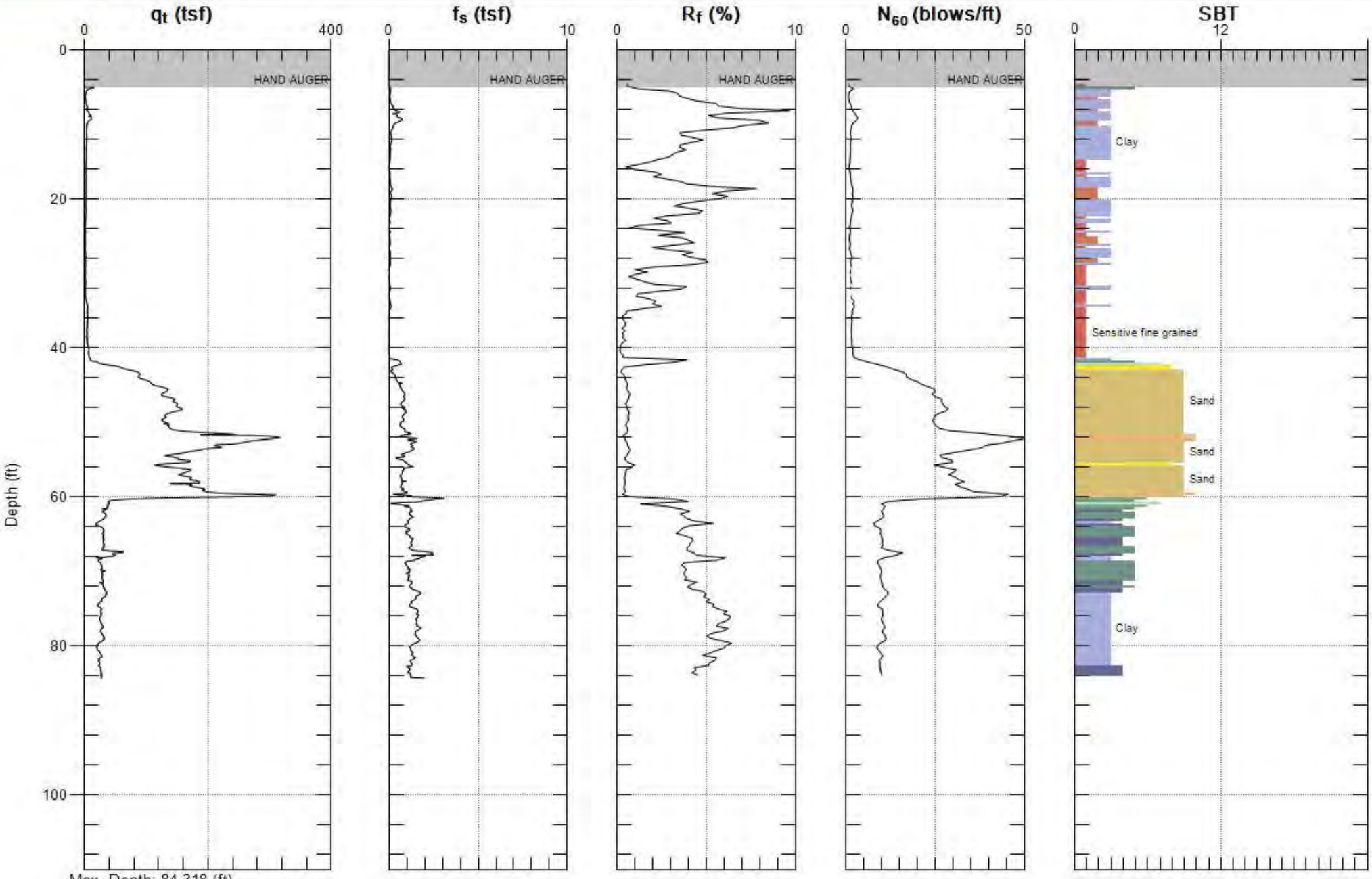
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC6 **Date: 7/9/2013 01:11**



Max. Depth: 84.318 (ft)
Avg. Interval: 0.328 (ft)

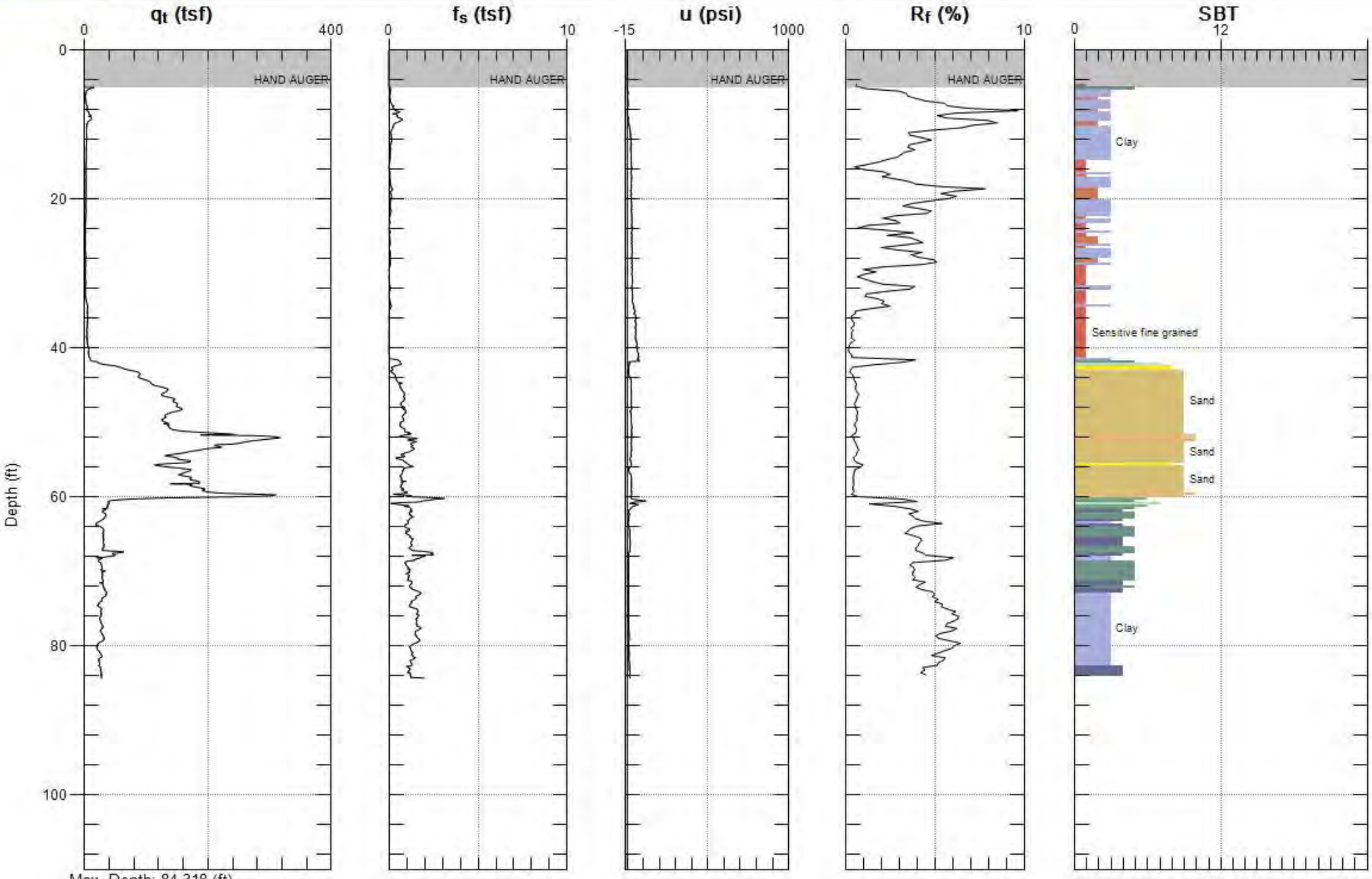
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC6 **Date: 7/9/2013 01:11**



Max. Depth: 84.318 (ft)
Avg. Interval: 0.328 (ft)

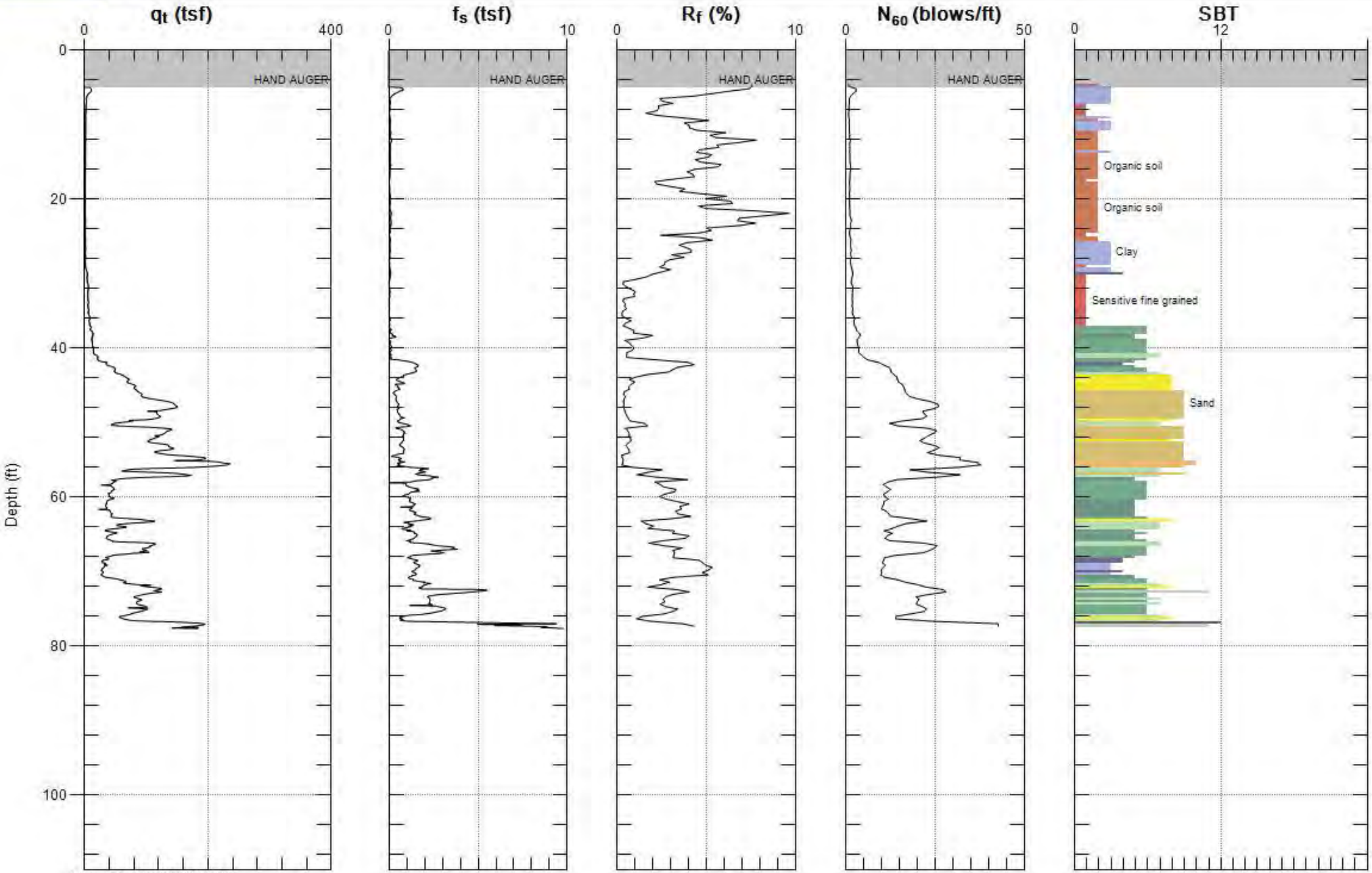
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: MRC7

Engineer: D.PERRY
Date: 7/10/2013 07:43



Max. Depth: 77.674 (ft)
Avg. Interval: 0.328 (ft)

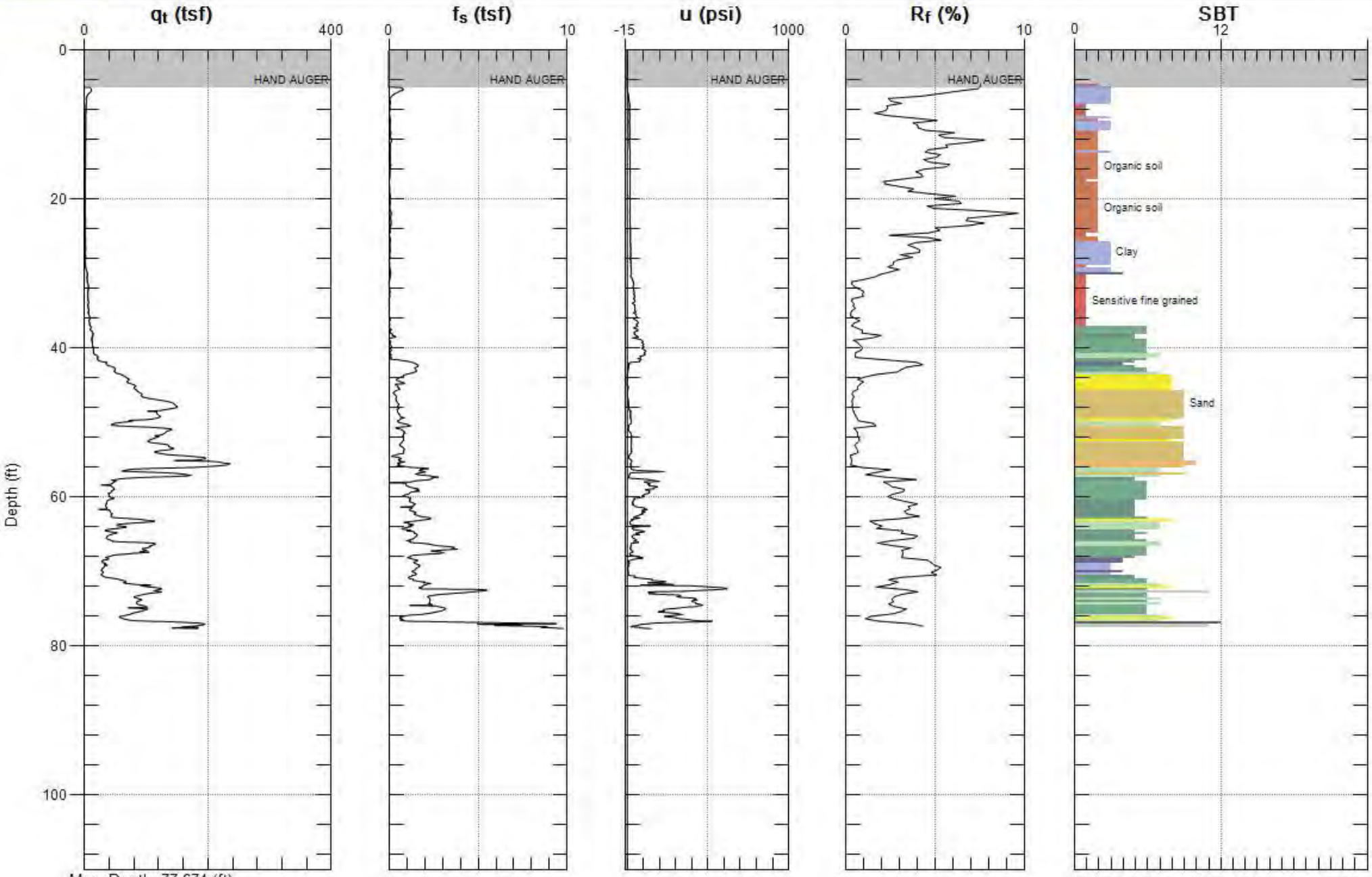
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: MRC7 **Date: 7/10/2013 07:43**



Max. Depth: 77.674 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Little Baja Salvaged Fish Release Site

CPT Logs

GREGG

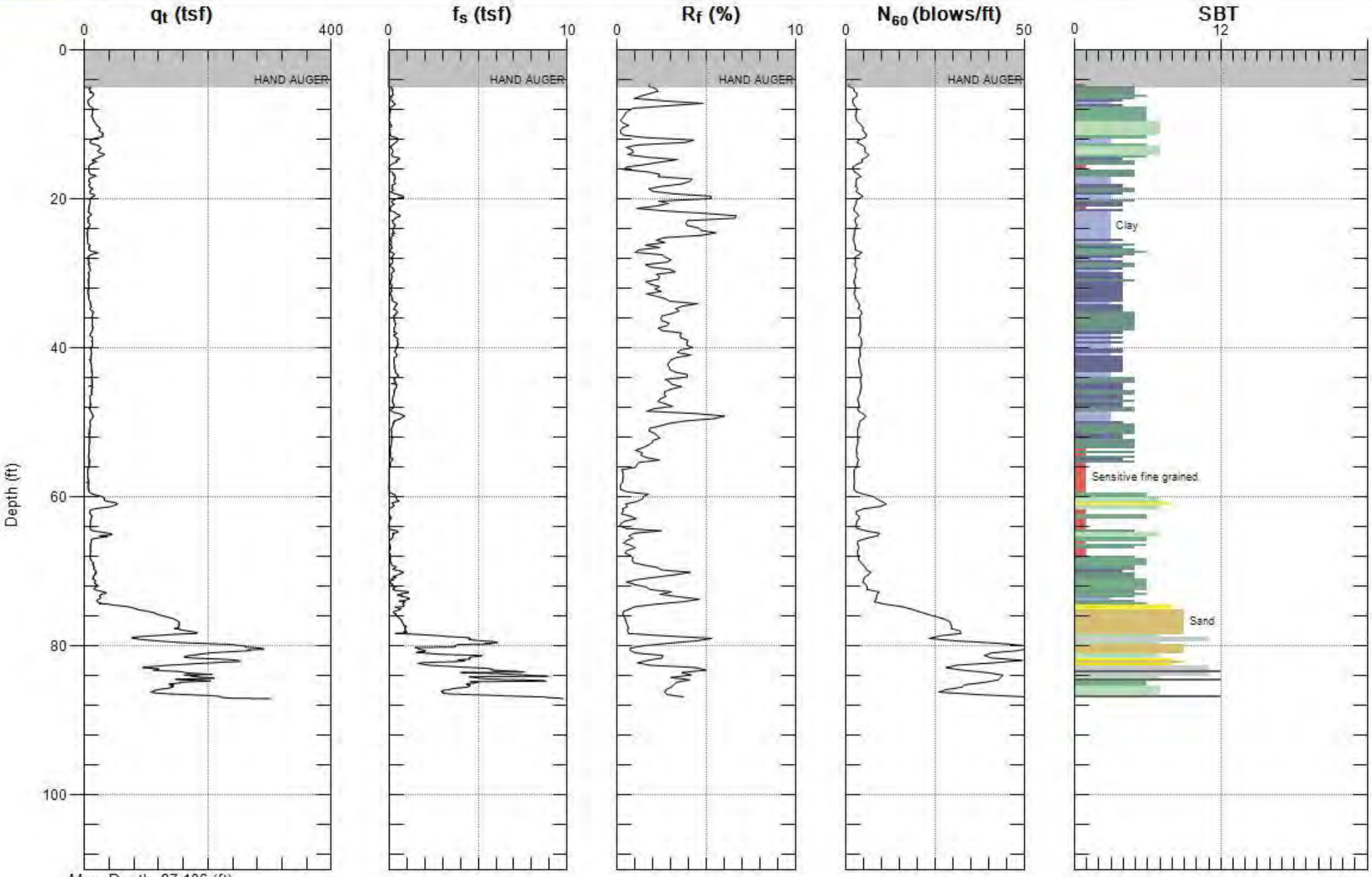
DWR

Site: SHERMAN ISLAND

Sounding: LBC1

Engineer: D.PERRY

Date: 7/10/2013 10:31



Max. Depth: 87.106 (ft)
Avg. Interval: 0.328 (ft)

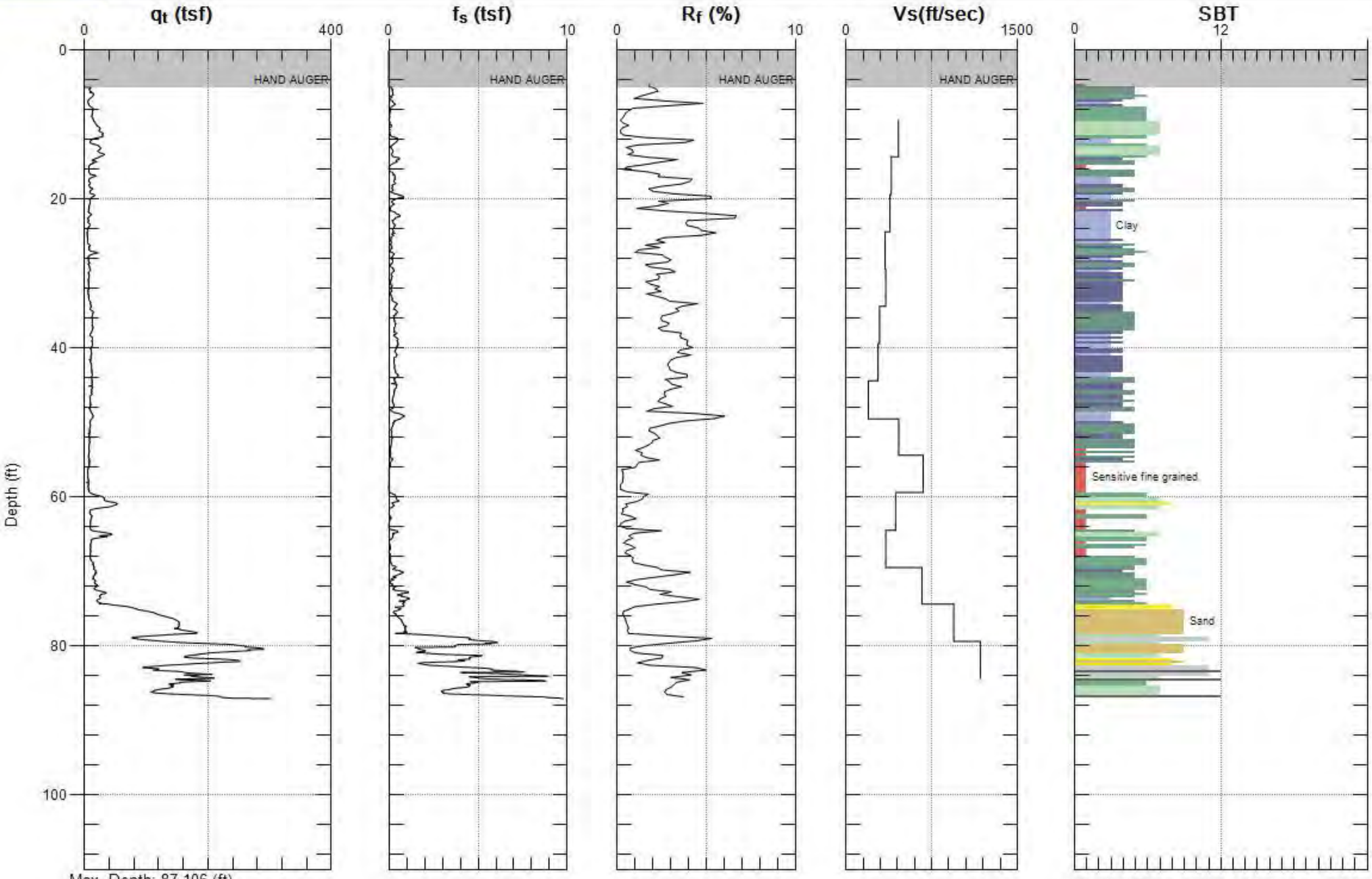
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: LBC1

Engineer: D.PERRY
Date: 7/10/2013 10:31



Max. Depth: 87.106 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

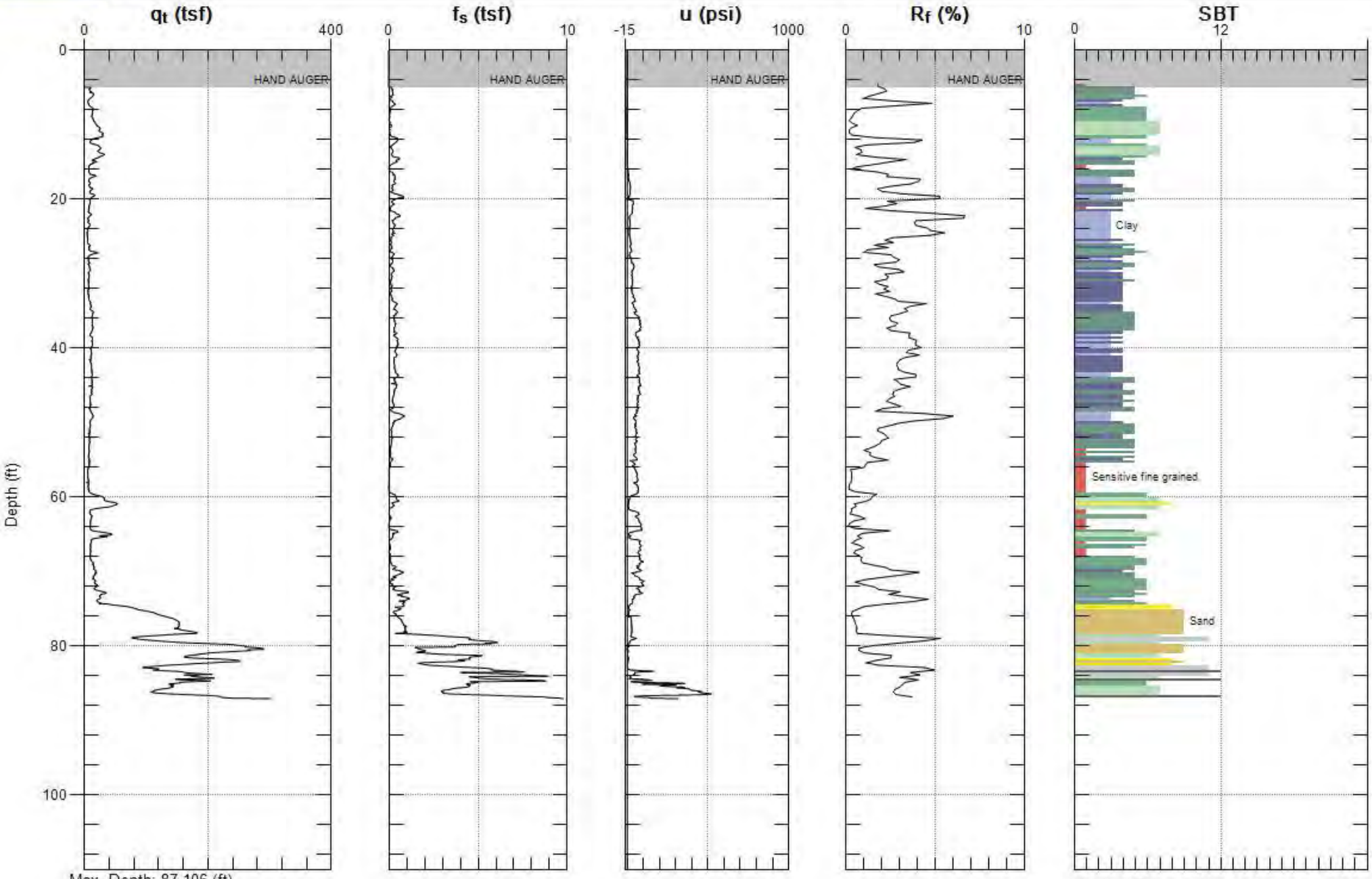
DWR

Site: SHERMAN ISLAND

Sounding: LBC1

Engineer: D.PERRY

Date: 7/10/2013 10:31



Max. Depth: 87.106 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

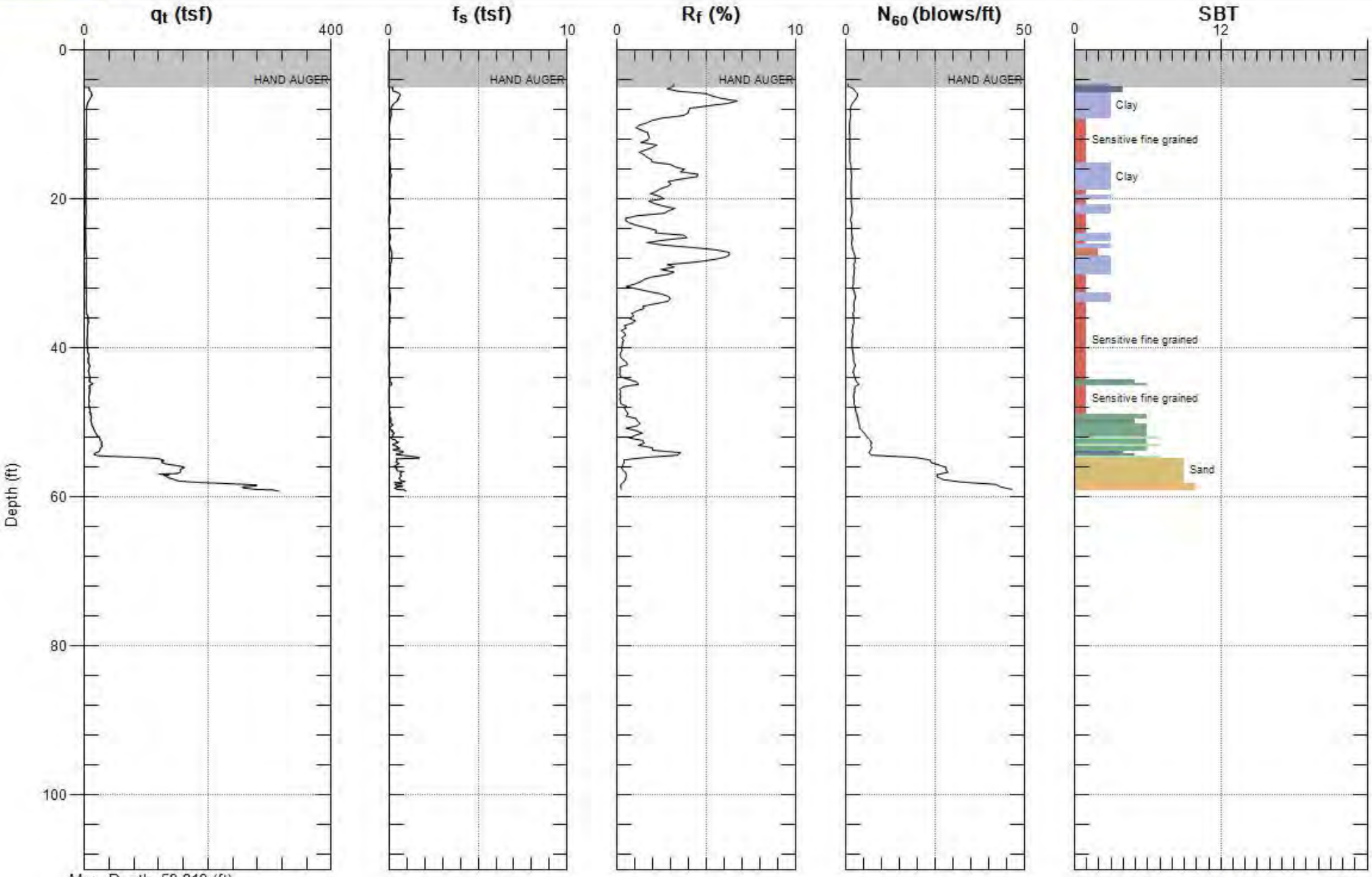
DWR

Site: SHERMAN ISLAND

Sounding: LBC2

Engineer: D.PERRY

Date: 7/12/2013 09:20



Max. Depth: 59.219 (ft)
Avg. Interval: 0.328 (ft)

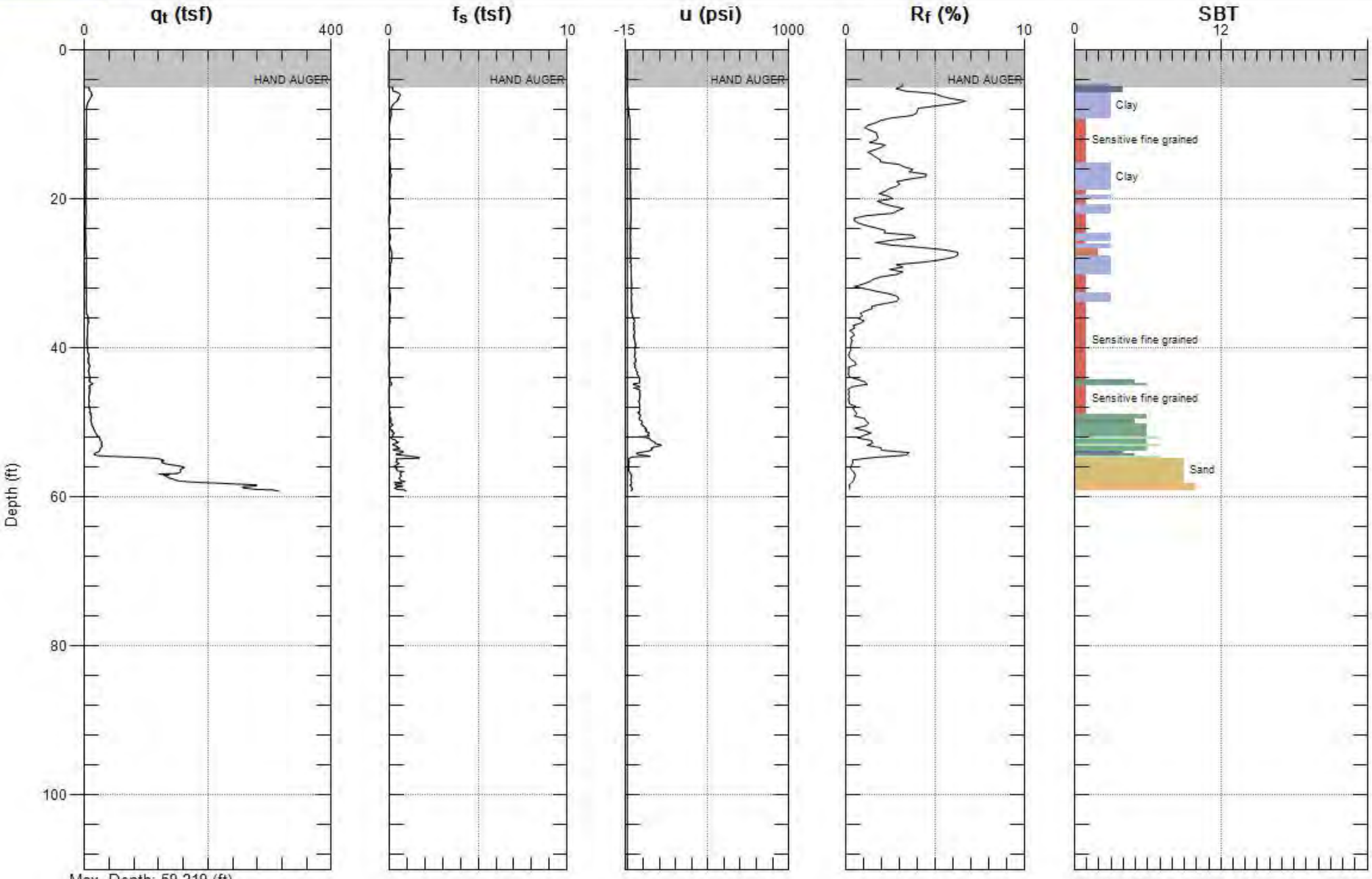
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC2 **Date: 7/12/2013 09:20**



Max. Depth: 59.219 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

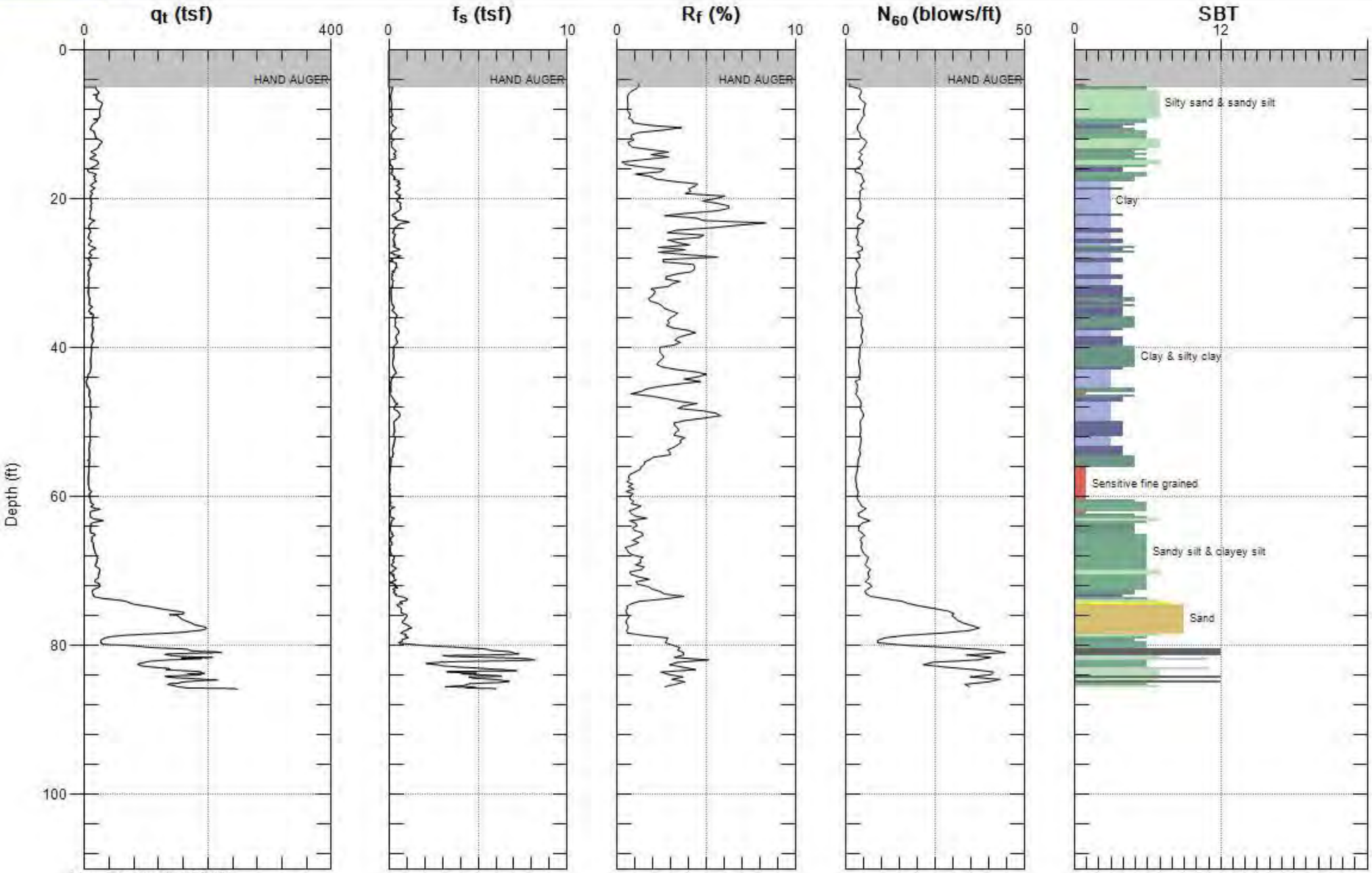
DWR

Site: SHERMAN ISLAND

Sounding: LBC3

Engineer: D.PERRY

Date: 7/11/2013 07:09



Max. Depth: 85.876 (ft)
Avg. Interval: 0.328 (ft)

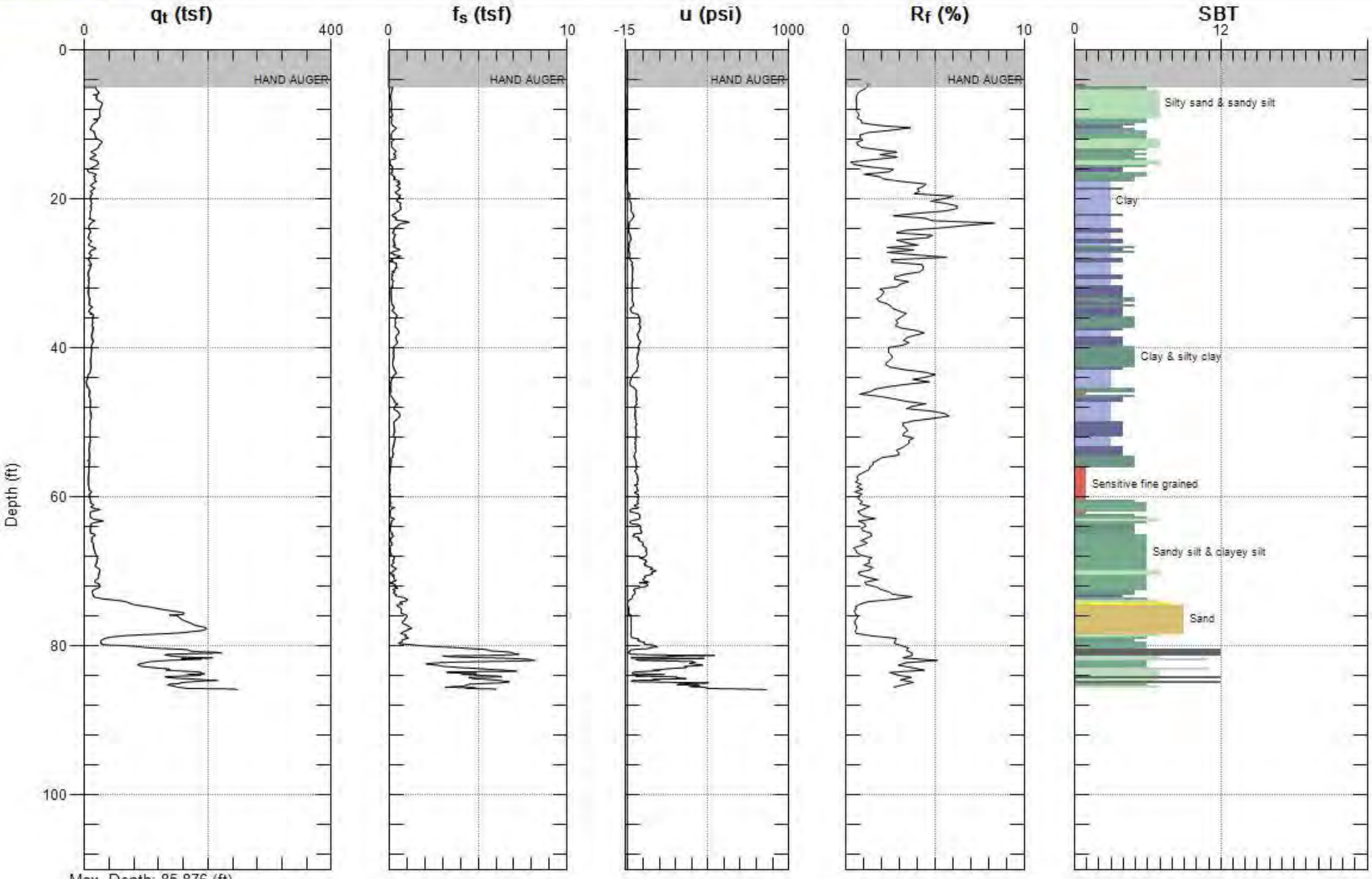
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC3 **Date: 7/11/2013 07:09**



Max. Depth: 85.876 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

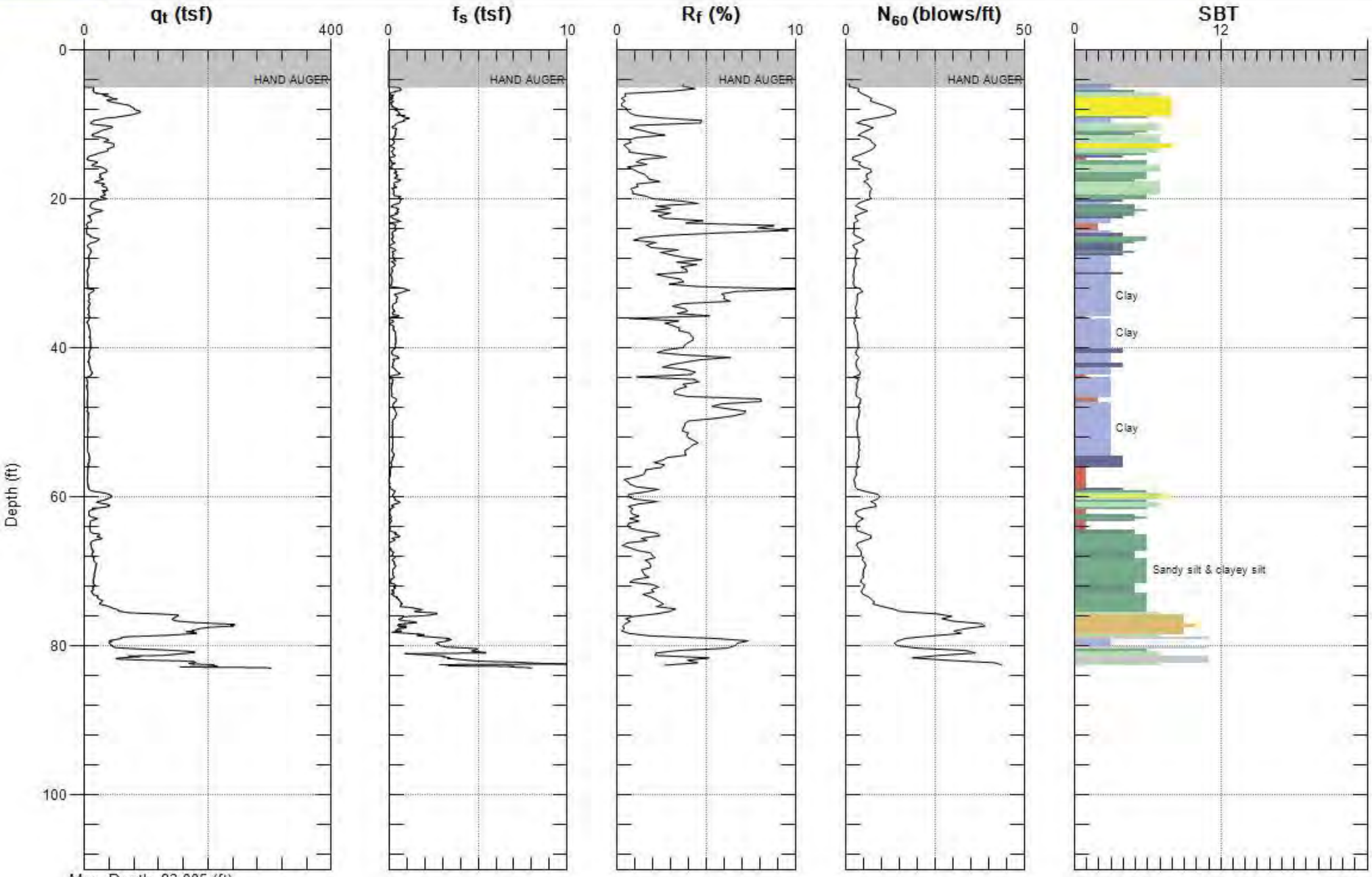
DWR

Site: SHERMAN ISLAND

Sounding: LBC4

Engineer: D.PERRY

Date: 7/10/2013 01:30



Max. Depth: 83.005 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

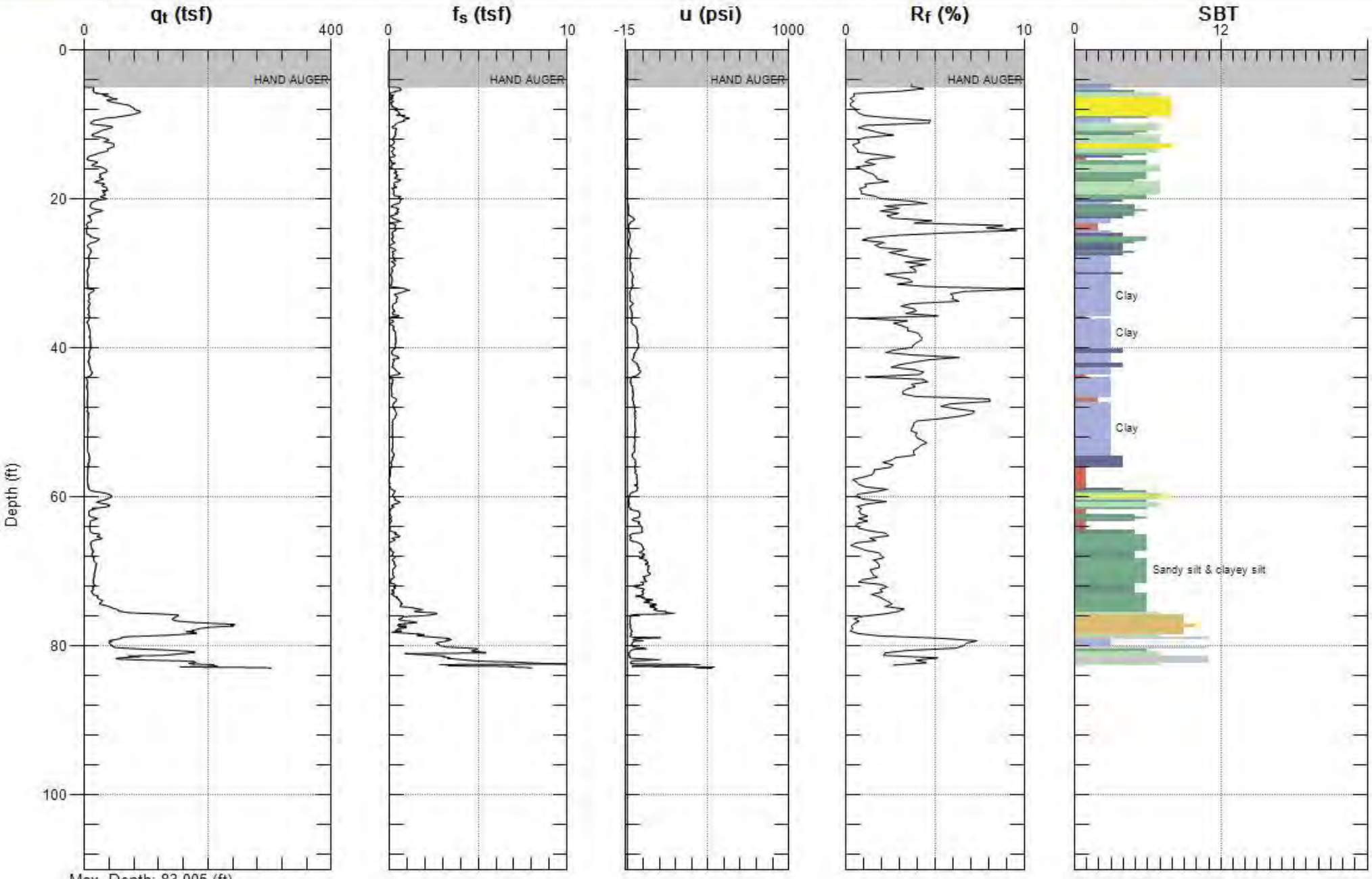
DWR

Site: SHERMAN ISLAND

Sounding: LBC4

Engineer: D.PERRY

Date: 7/10/2013 01:30



Max. Depth: 83.005 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

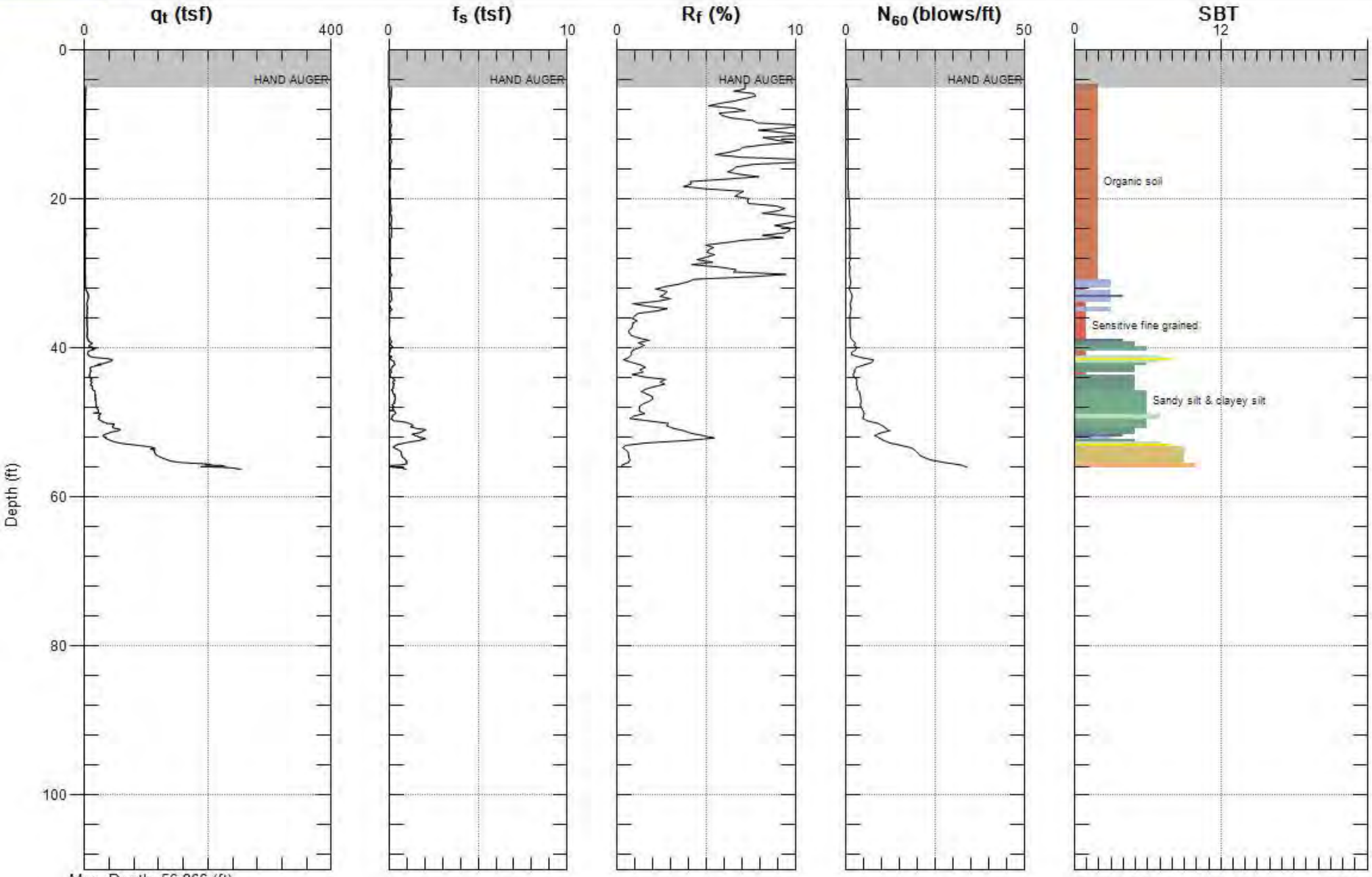
DWR

Site: SHERMAN ISLAND

Sounding: LBC5

Engineer: D.PERRY

Date: 7/11/2013 10:05



Max. Depth: 56.266 (ft)
Avg. Interval: 0.328 (ft)

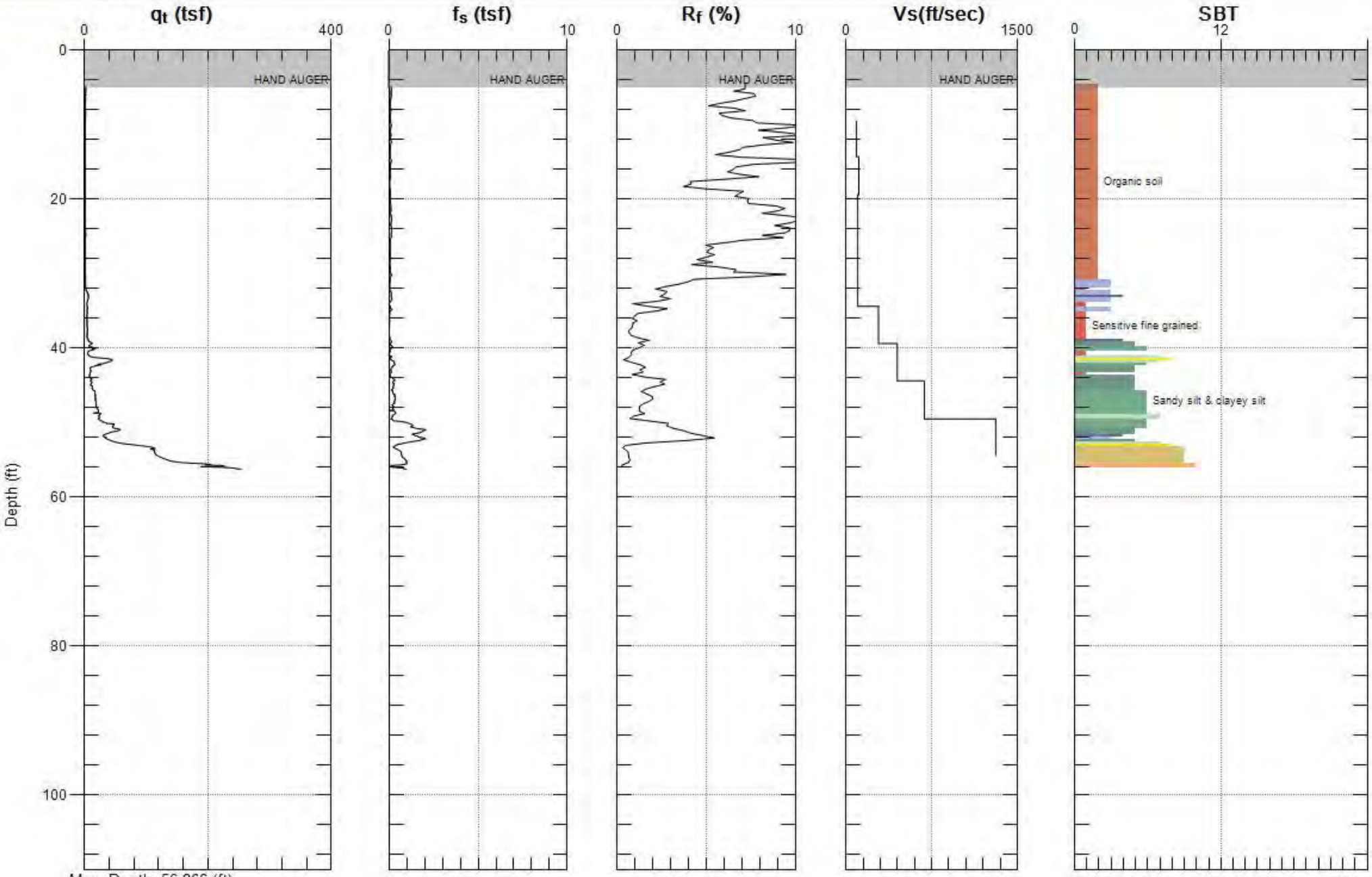
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC5 **Date: 7/11/2013 10:05**



Max. Depth: 56.266 (ft)
Avg. Interval: 0.328 (ft)

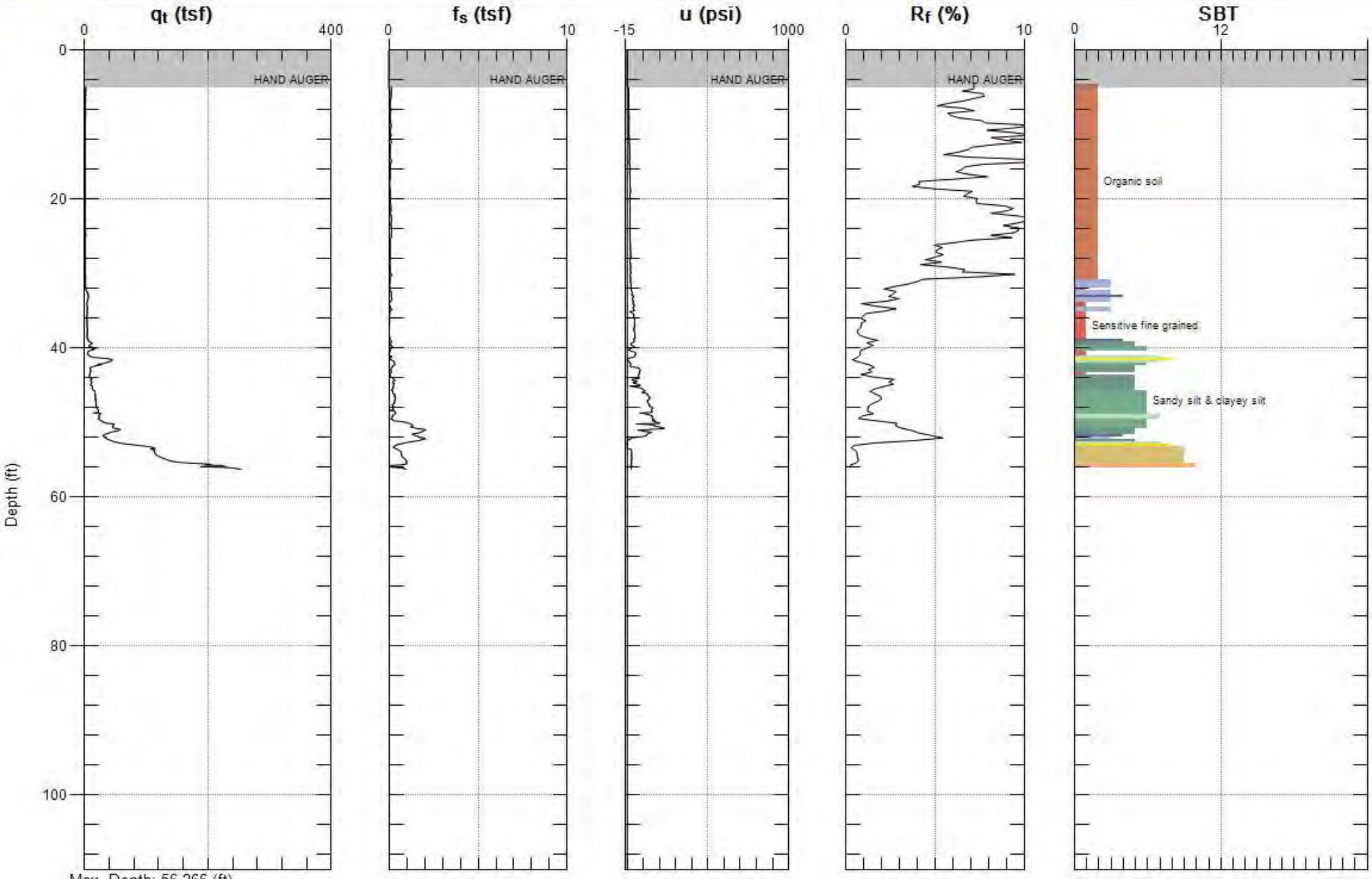
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: LBC5

Engineer: D.PERRY
Date: 7/11/2013 10:05



Max. Depth: 56.266 (ft)
Avg. Interval: 0.328 (ft)

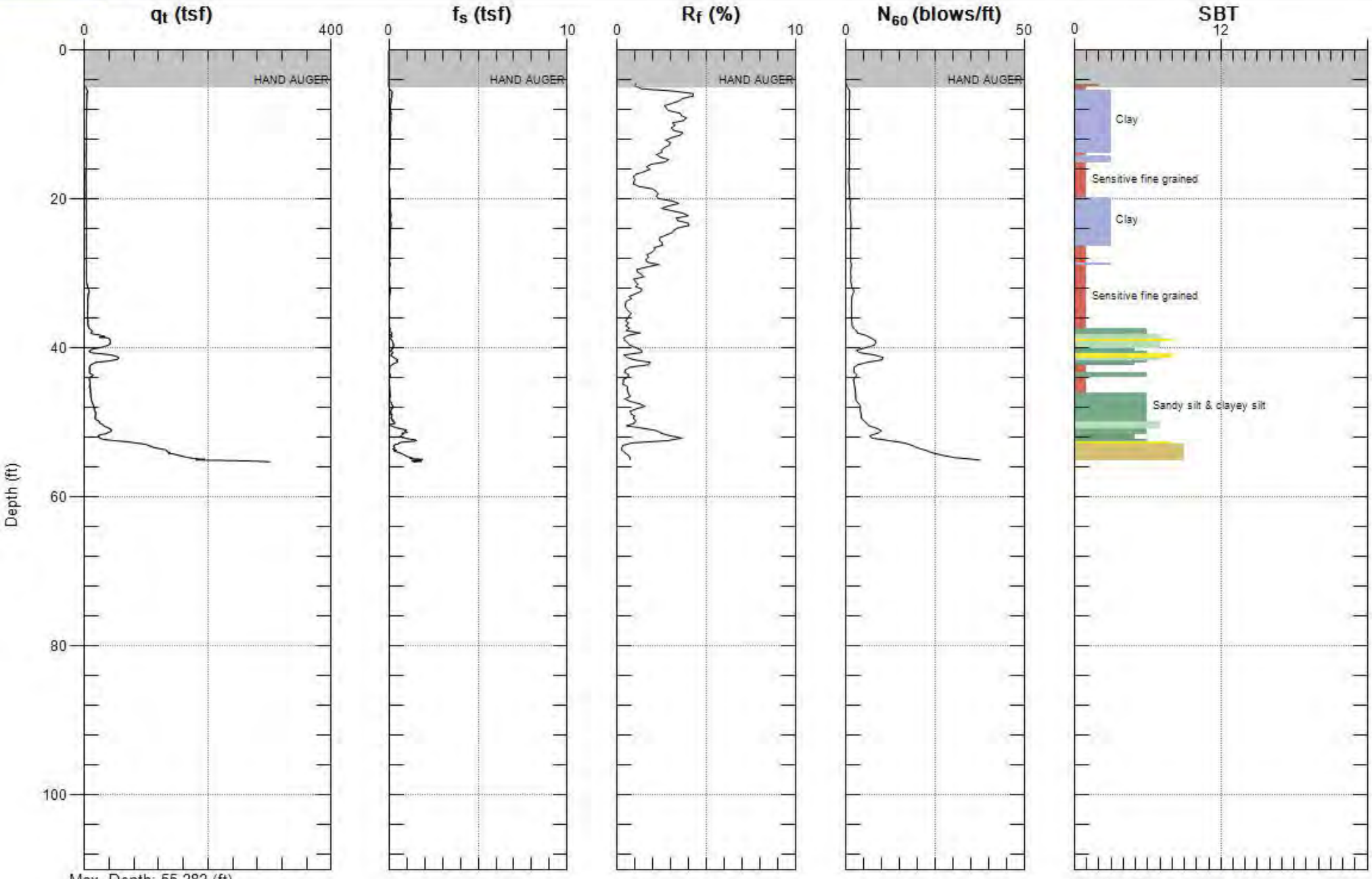
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC6 **Date: 7/11/2013 12:53**



Max. Depth: 55.282 (ft)
Avg. Interval: 0.328 (ft)

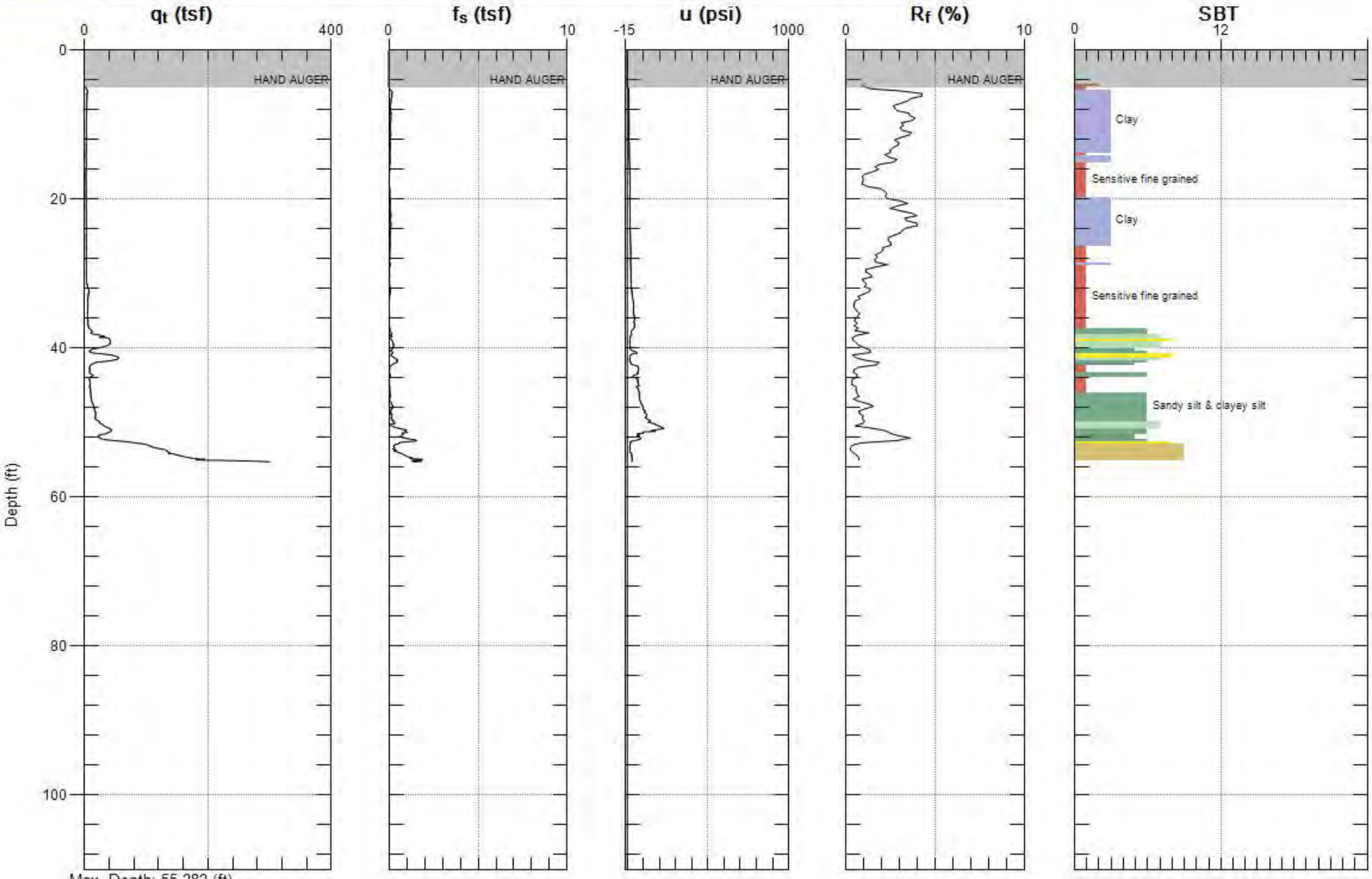
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC6 **Date: 7/11/2013 12:53**



Max. Depth: 55.282 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

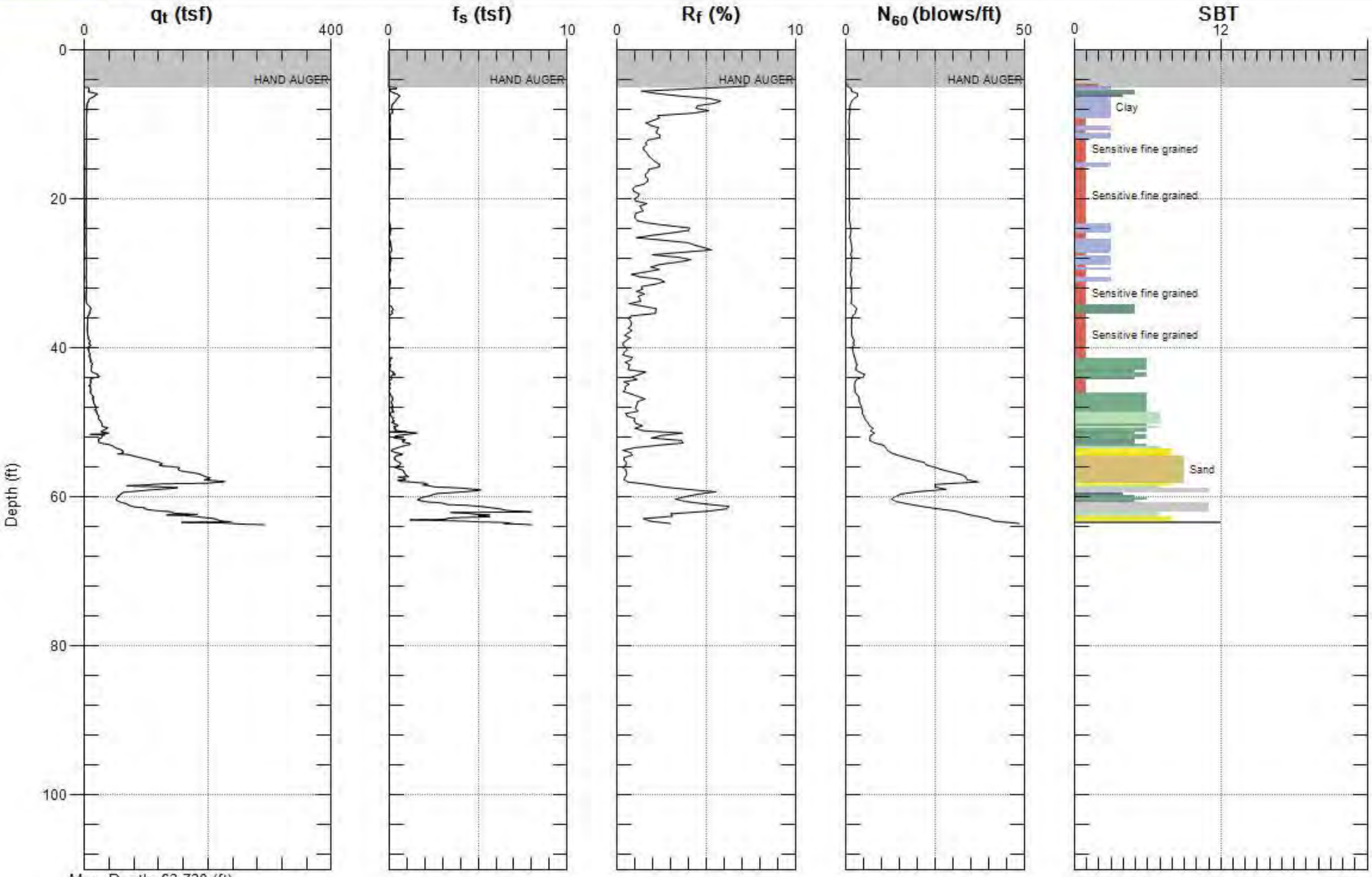
DWR

Site: SHERMAN ISLAND

Sounding: LBC7

Engineer: D.PERRY

Date: 7/12/2013 07:15



Max. Depth: 63.730 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

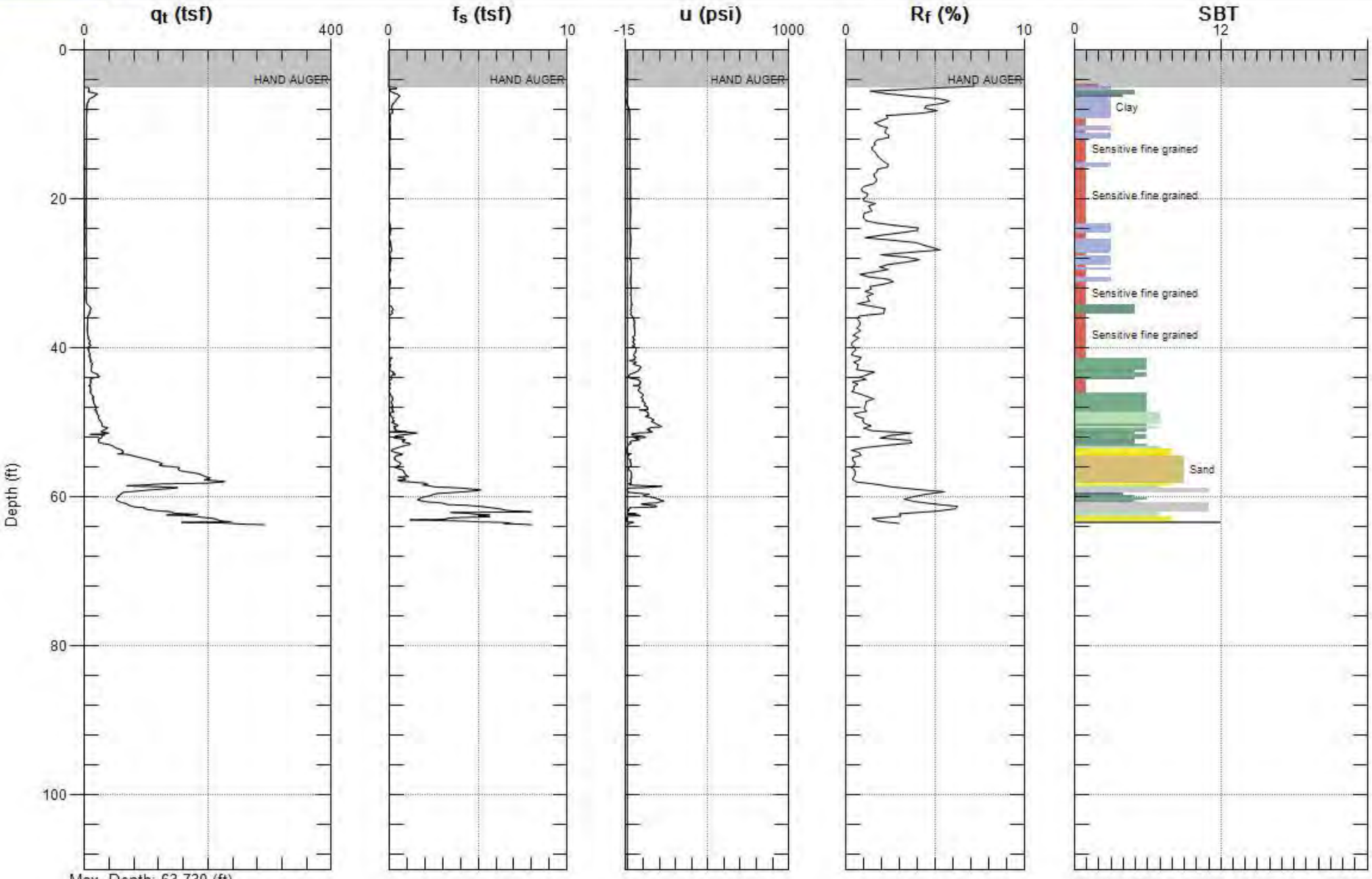
DWR

Site: SHERMAN ISLAND

Sounding: LBC7

Engineer: D.PERRY

Date: 7/12/2013 07:15



Max. Depth: 63.730 (ft)
Avg. Interval: 0.328 (ft)

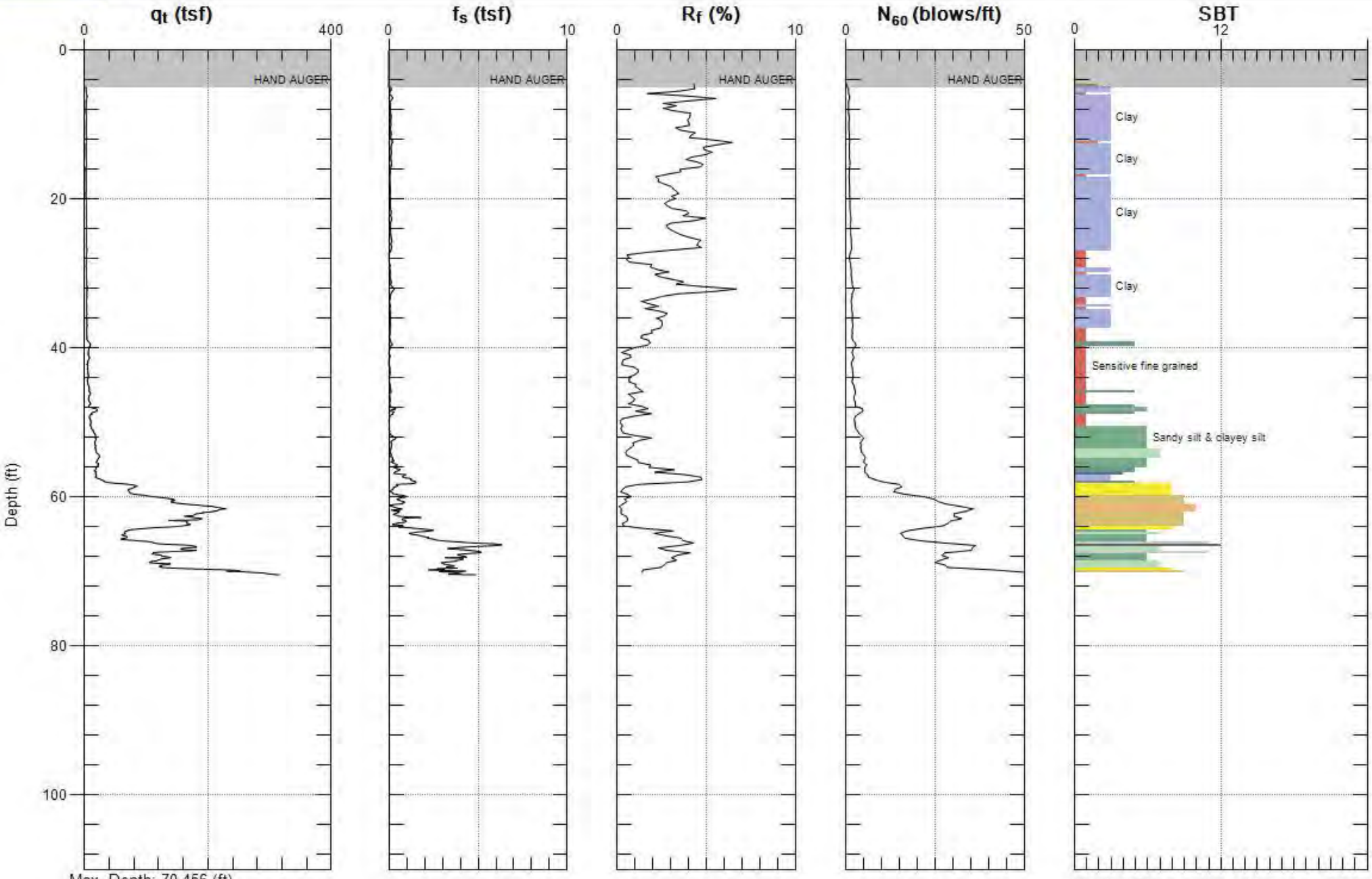
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND
Sounding: LBC8

Engineer: D.PERRY
Date: 7/12/2013 10:47



Max. Depth: 70.456 (ft)
Avg. Interval: 0.328 (ft)

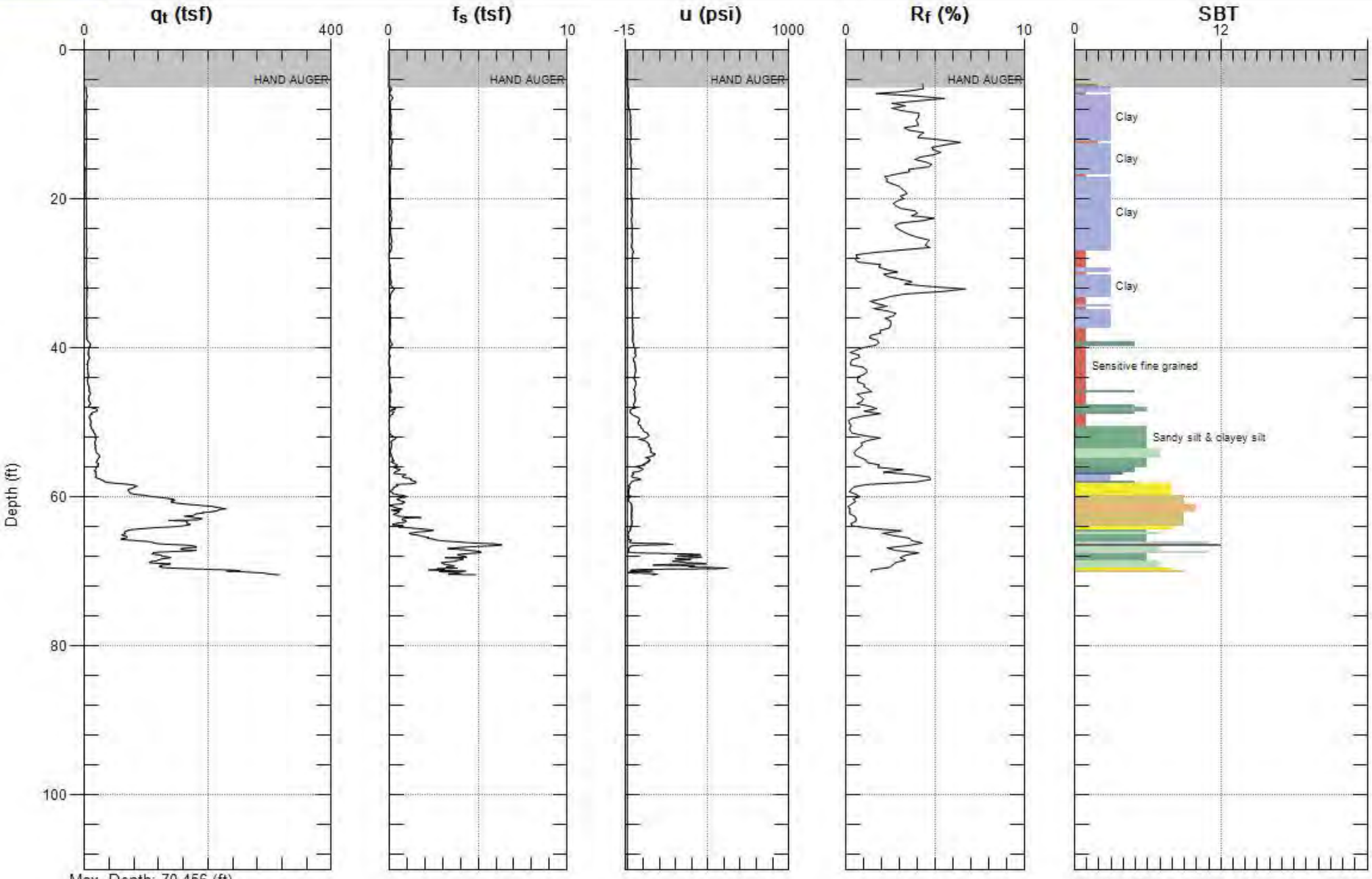
SBT: Soil Behavior Type (Robertson 1990)

GREGG

DWR

Site: SHERMAN ISLAND **Engineer: D.PERRY**

Sounding: LBC8 **Date: 7/12/2013 10:47**

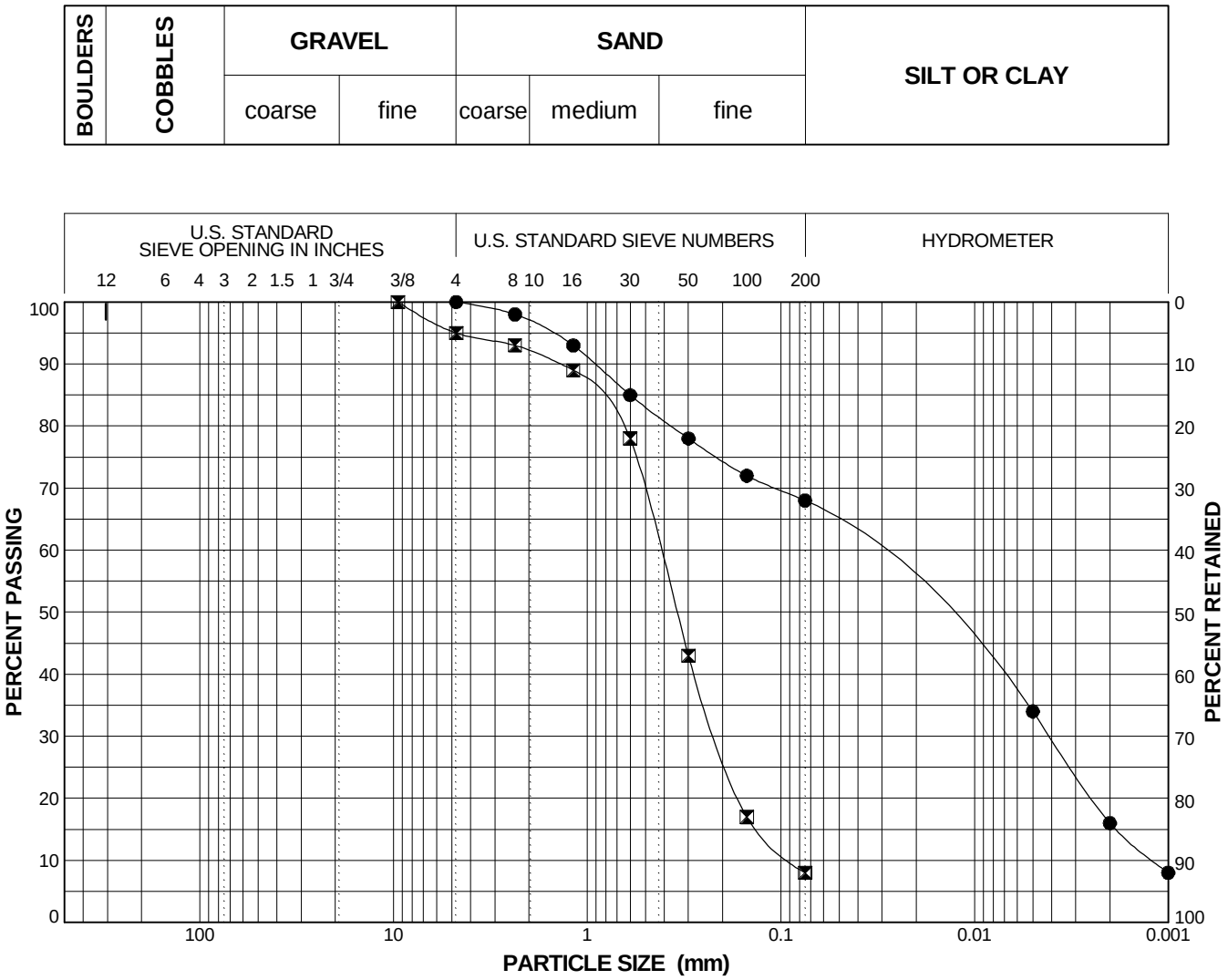


Max. Depth: 70.456 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Appendix C

Laboratory Results



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
LB-S3	S08A	30	●	0.0	32.0	68.0	
LB-S3	S12A	57.5	⧗	5.0	87.0	8.0	

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NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
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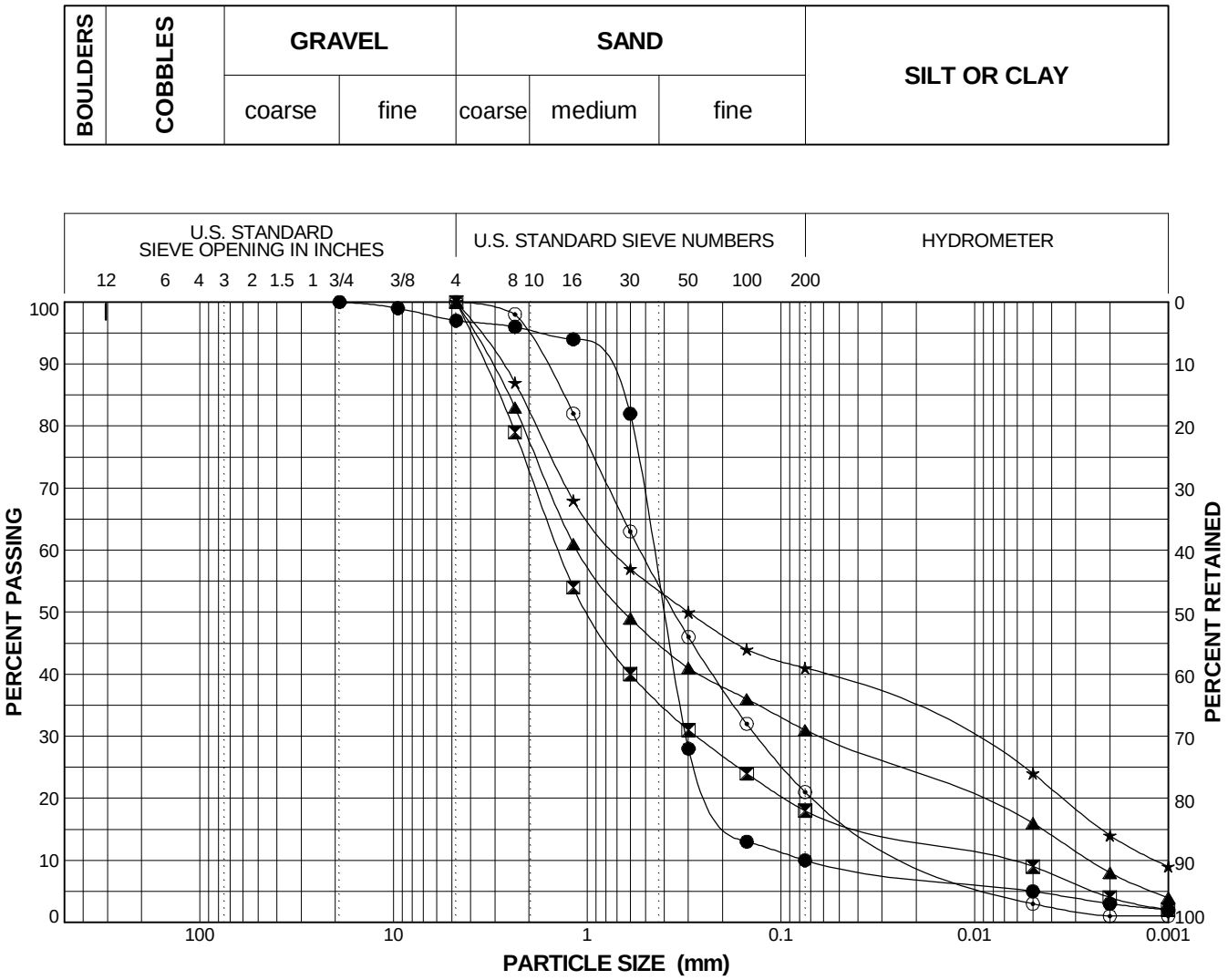
FIGURE
6

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
LB-S3	S02A	10	●	3.0	87.0	10.0	
LB-S3	T02A	12.5	⧗	0.0	82.0	18.0	SILTY SAND (SM)
LB-S3	T02A	13.1	▲	0.0	69.0	31.0	SILTY SAND (SM)
LB-S3	T02A	13.7	★	0.0	59.0	41.0	SILTY SAND (SM)
LB-S3	S04A	17.5	⊙	0.0	79.0	21.0	

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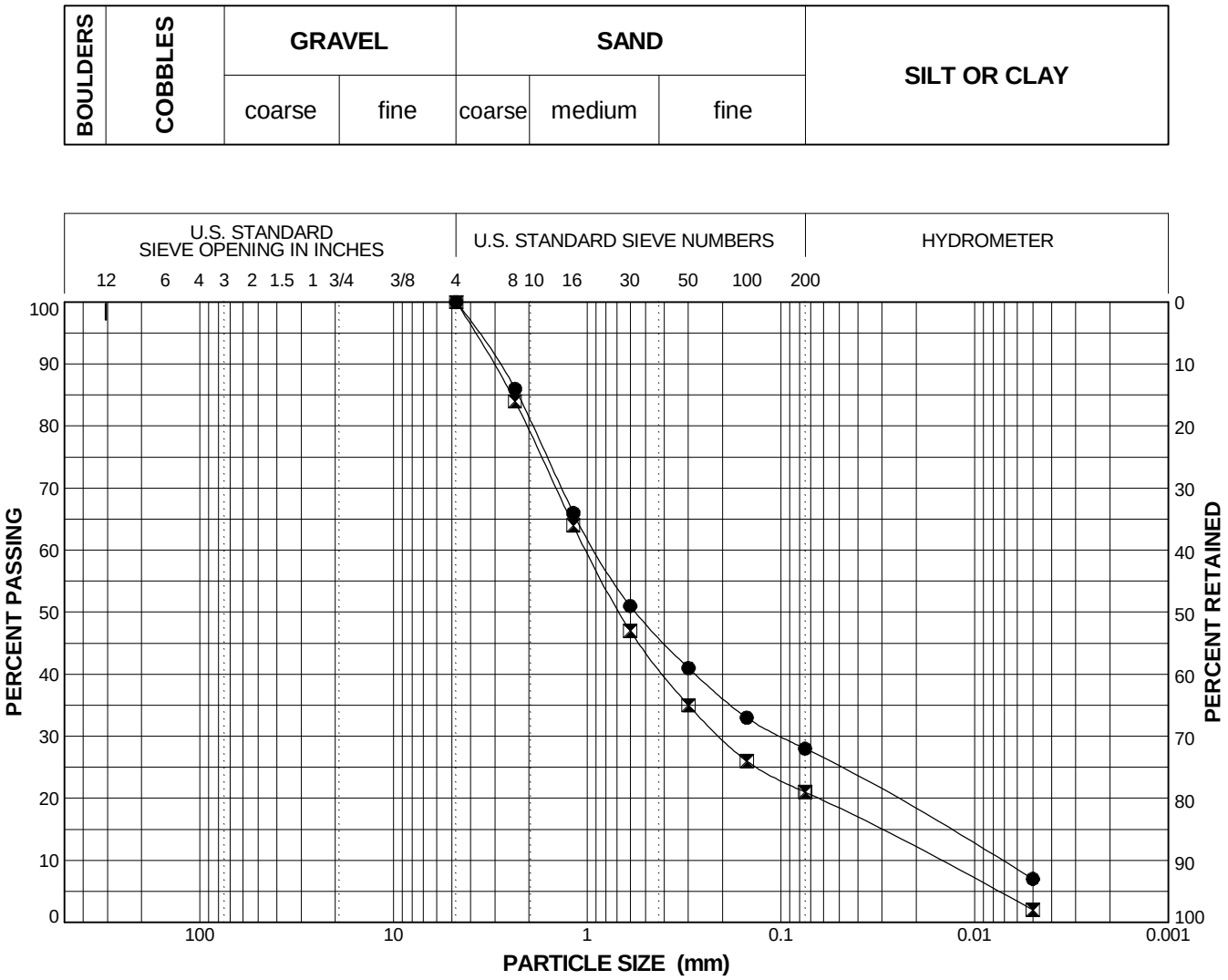
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
6

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
LB-S2	T04A	38.1	●	0.0	72.0	28.0	SILTY SAND (SM)
LB-S2	T04A	38.7	⧗	0.0	79.0	21.0	SILTY SAND (SM)

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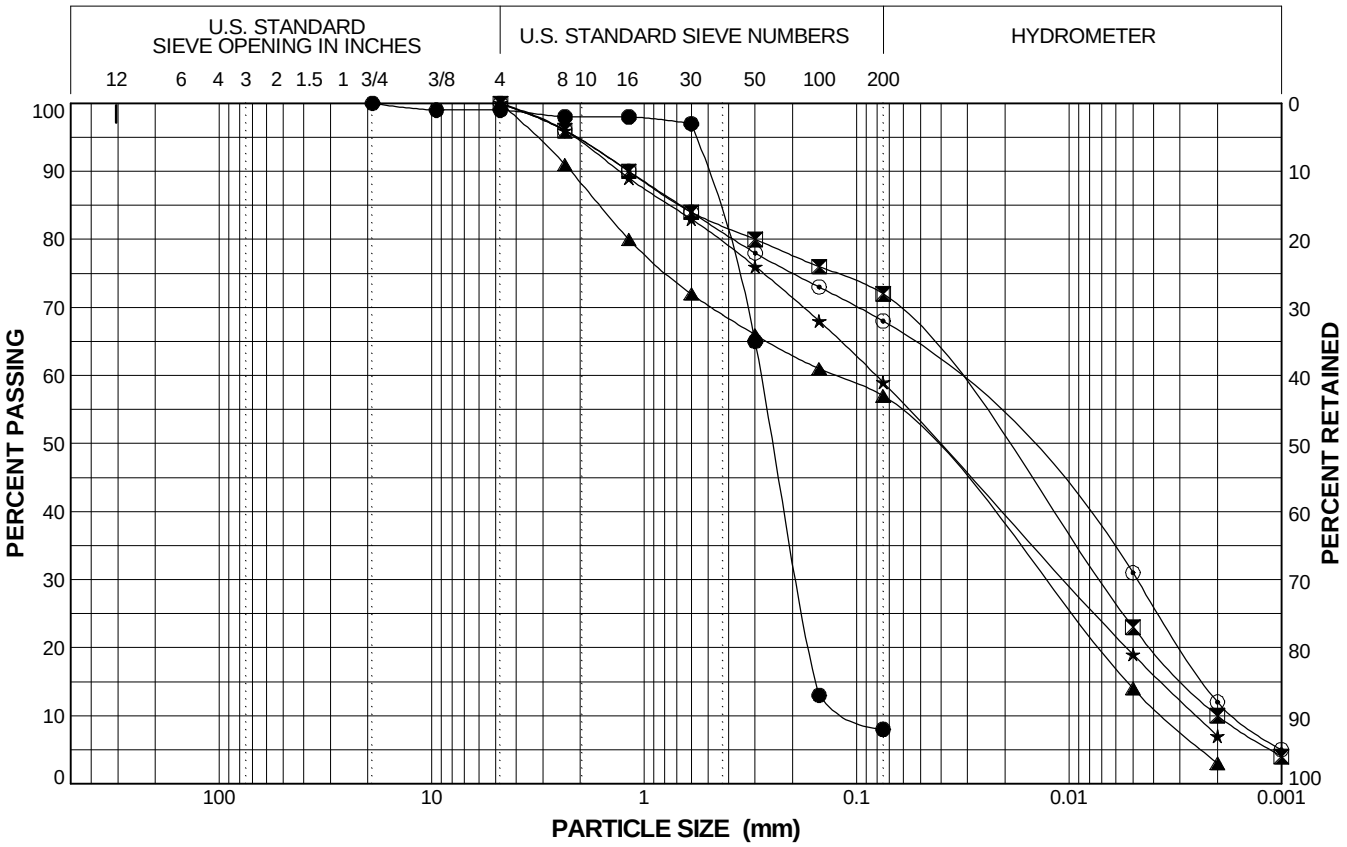
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
5

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
LB-S2	S02A	7.5	●	1.0	91.0	8.0	
LB-S2	T02A	22.5	⧗	0.0	28.0	72.0	ELASTIC SILT with SAND (MH)
LB-S2	T02A	23.2	▲	0.0	43.0	57.0	SANDY ELASTIC SILT (MH)
LB-S2	T02A	23.8	★	0.0	41.0	59.0	SANDY ELASTIC SILT (MH)
LB-S2	T04A	37.5	⊙	0.0	32.0	68.0	SANDY ELASTIC SILT (MH)

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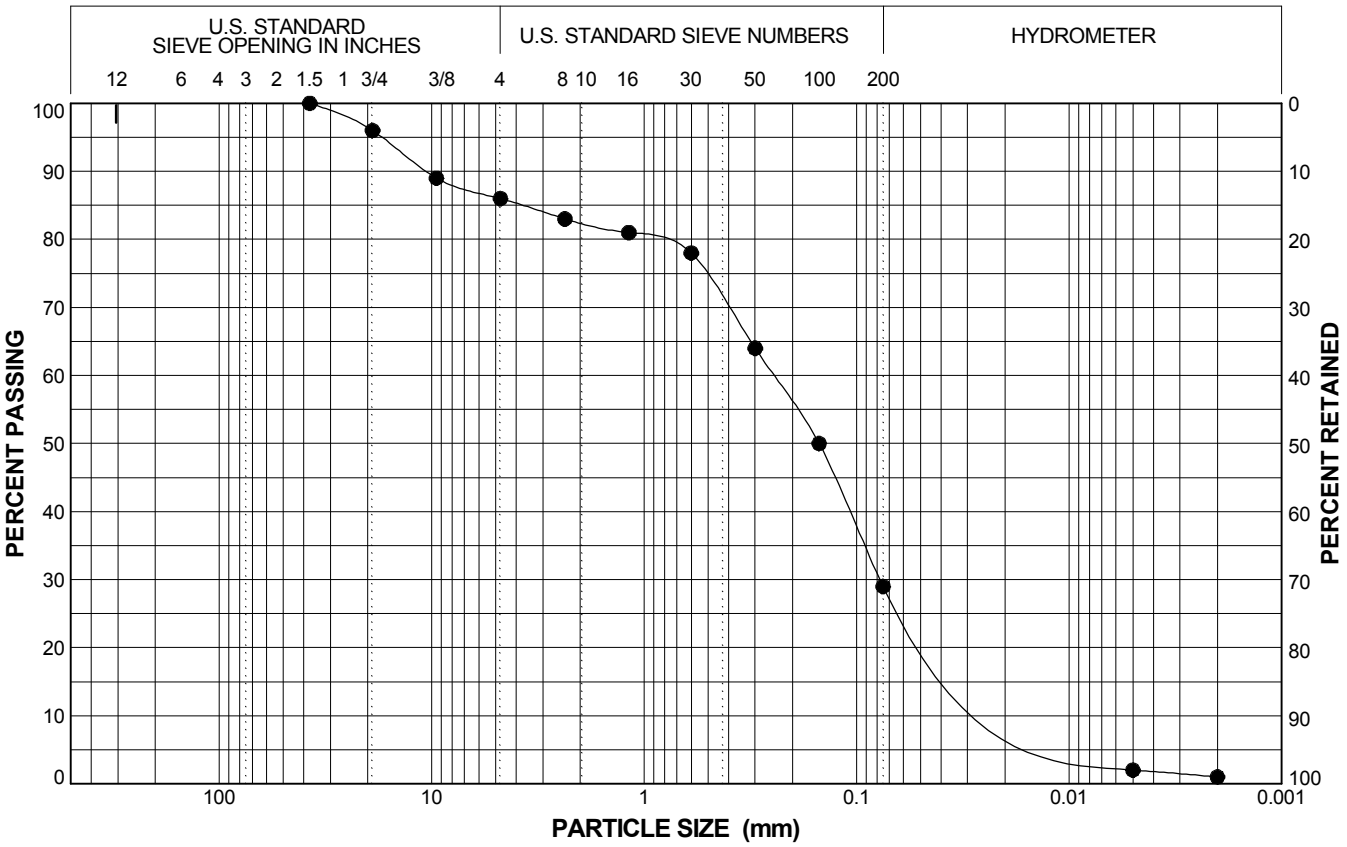
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
5

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
LB-S1	S05A	67	●	14.0	57.0	29.0	

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

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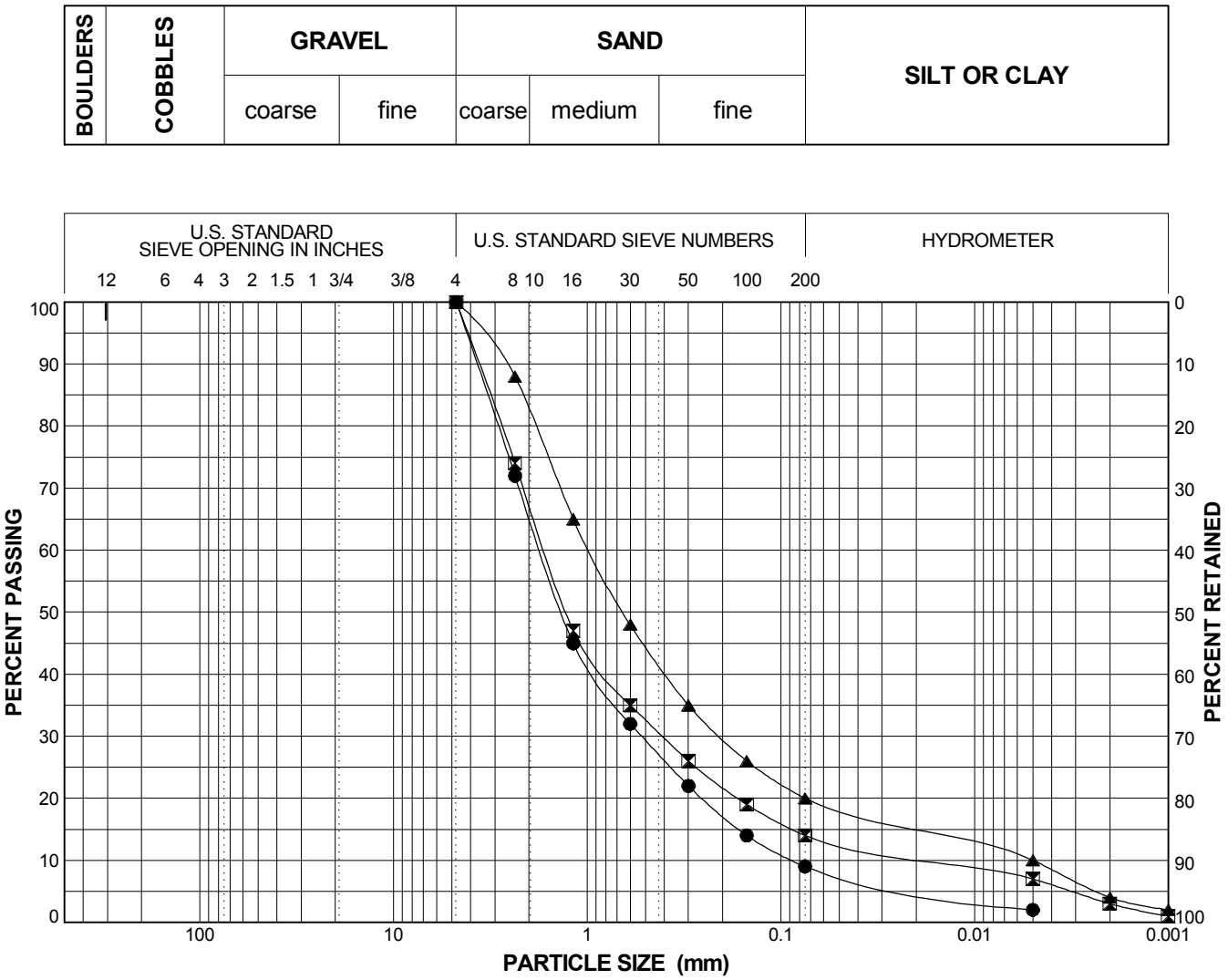
STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
4



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
MR-S3	T02A	10	●	0.0	91.0	9.0	
MR-S3	T02A	10.7	⧗	0.0	86.0	14.0	
MR-S3	T02A	11.4	▲	0.0	80.0	20.0	

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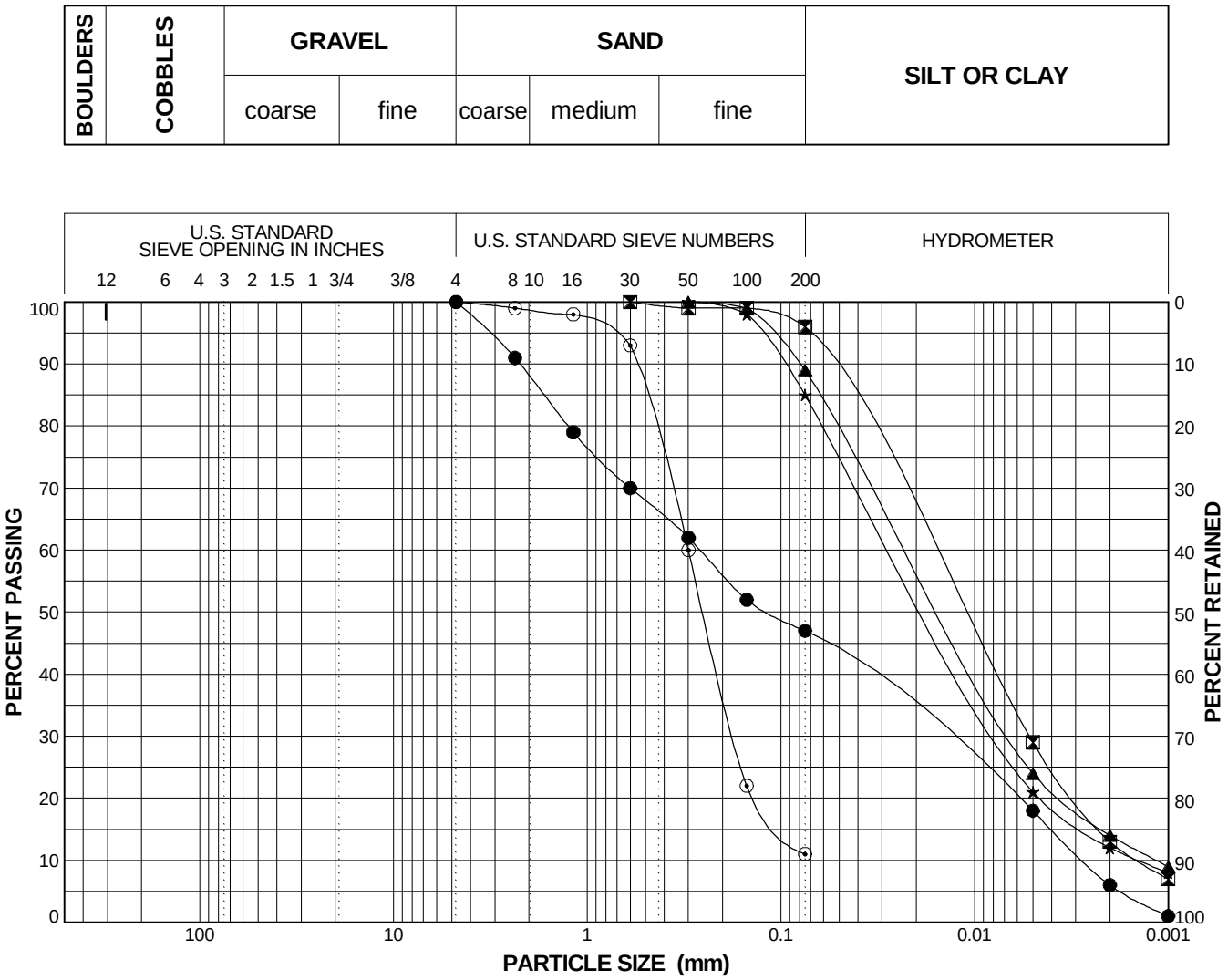
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
3

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
MR-S2	T06A	47	●	0.0	53.0	47.0	SILTY SAND (SM)
MR-S2	T07A	52.5	⧗	0.0	4.0	96.0	LEAN CLAY (CL)
MR-S2	T07A	53.2	▲	0.0	11.0	89.0	LEAN CLAY (CL)
MR-S2	T07A	53.9	★	0.0	15.0	85.0	LEAN CLAY with SAND (CL)
MR-S2	S09A	62	⊙	0.0	89.0	11.0	

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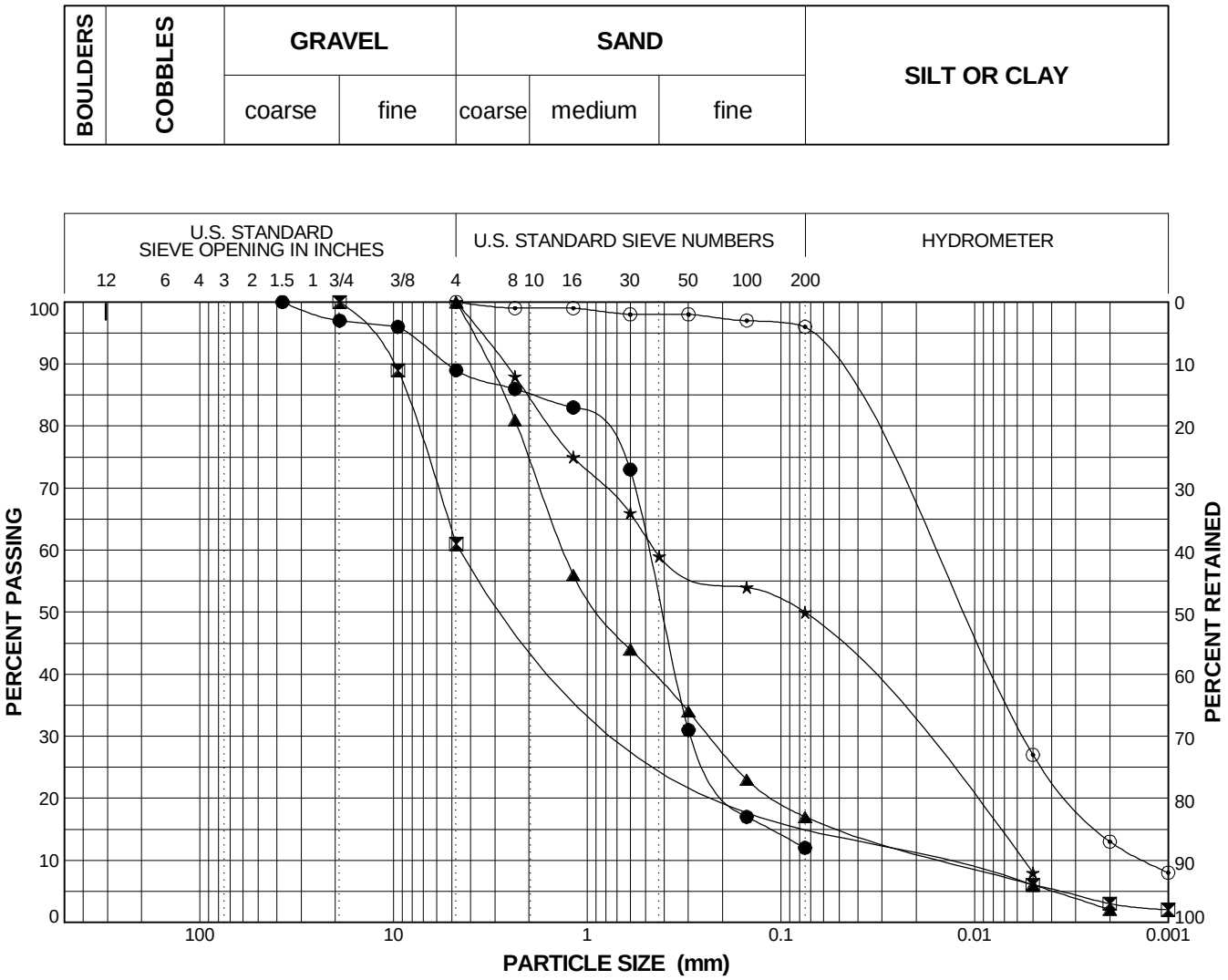
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
2

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
MR-S2	S01A	5	●	11.0	77.0	12.0	
MR-S2	S03A	16	⧗	39.0			
MR-S2	T03A	25	▲	0.0	83.0	17.0	
MR-S2	T03A	25.6	★	0.0	50.0	50.0	SANDY ELASTIC SILT (MH)
MR-S2	T03A	26.2	⊙	0.0	4.0	96.0	SILT (ML)

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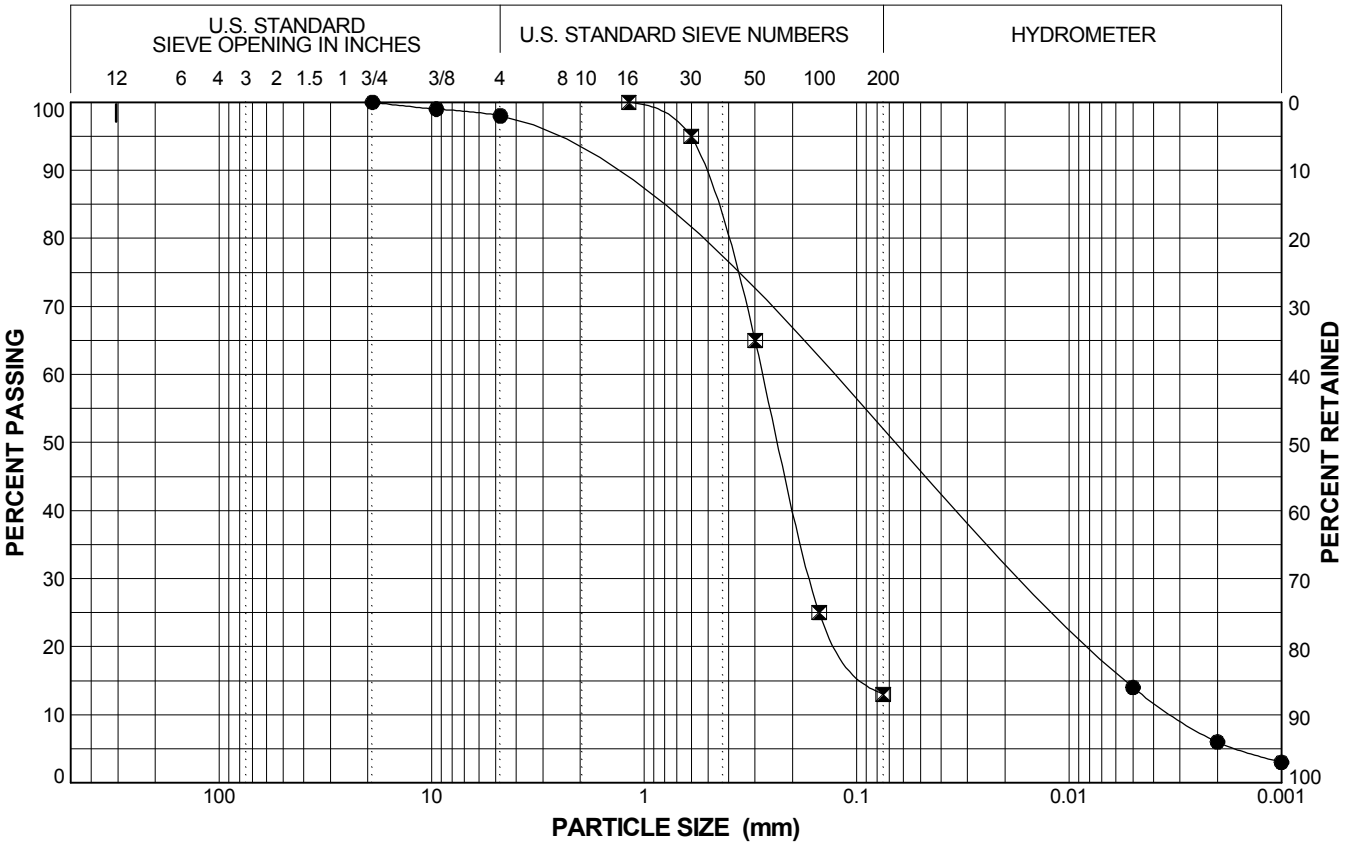
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
2

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
MR-S1	S01A	27	●	2.0			
MR-S1	S08A	62	⧗	0.0	87.0	13.0	

PG SIEVE CURVES; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

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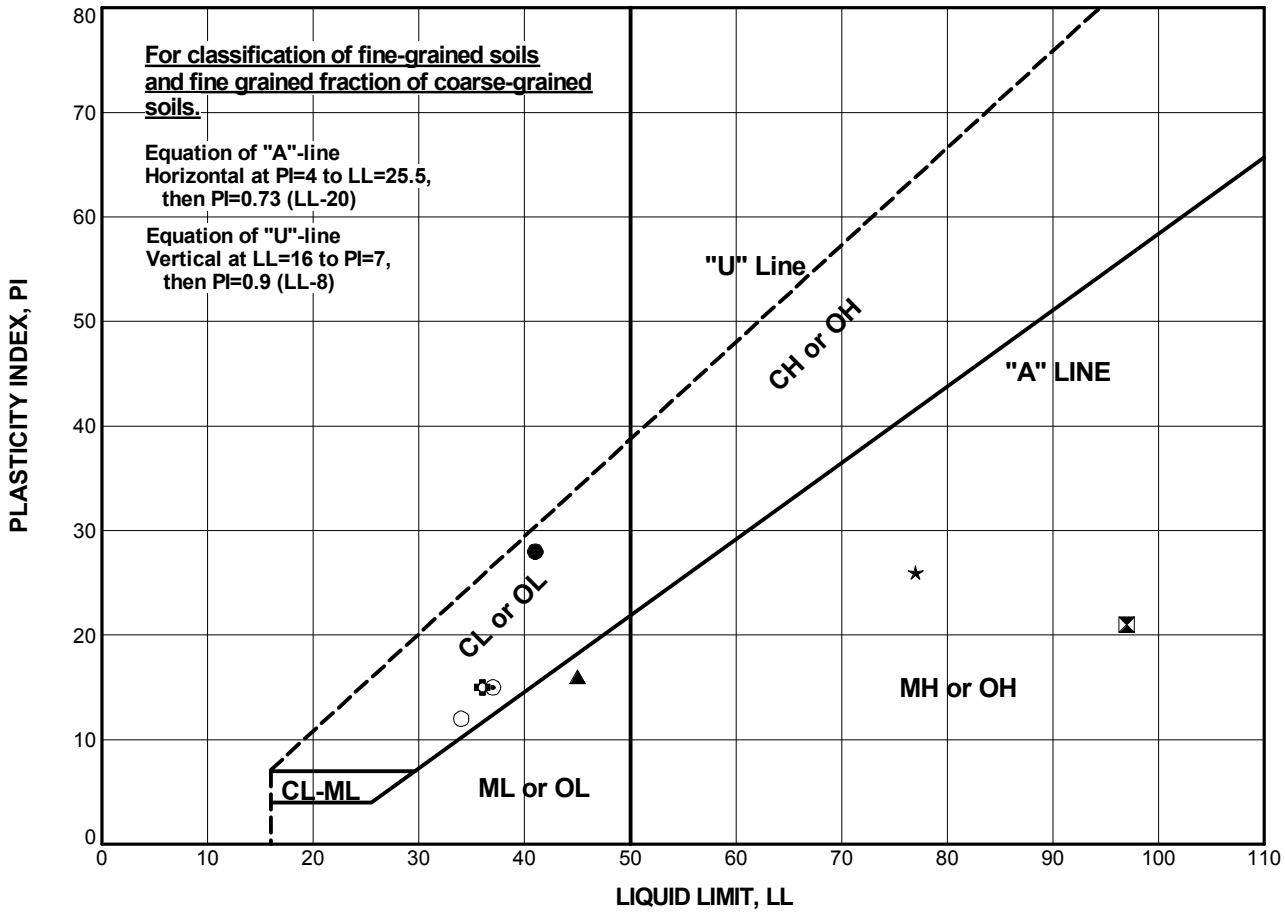
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PARTICAL SIZE DISTRIBUTION CURVES

FIGURE
1



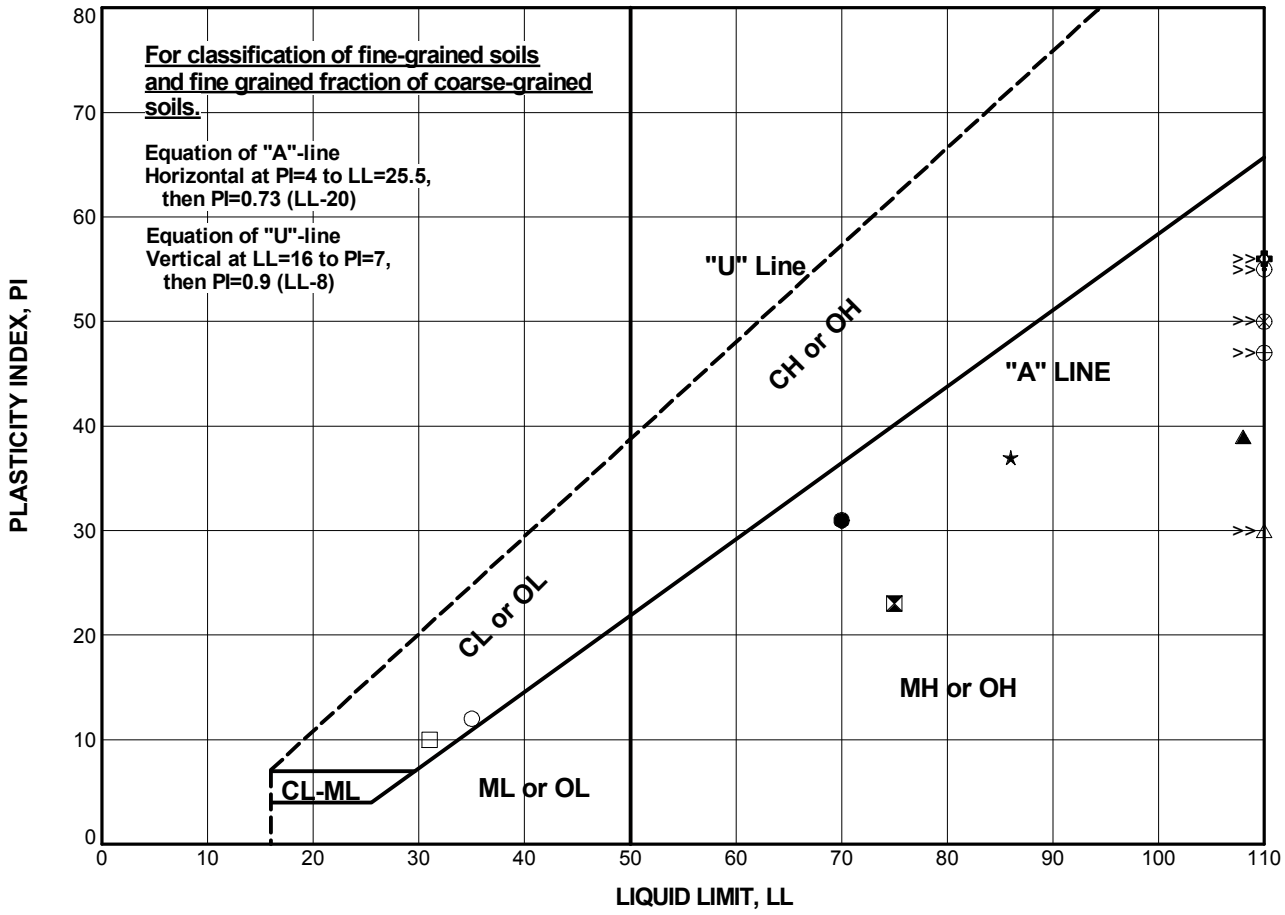
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
MR-S1	S01A	27	●	0.0	41	13	28	
MR-S2	T03A	25.6	⧗		97	76	21	SANDY ELASTIC SILT (MH)
MR-S2	T03A	26.2	▲		45	29	16	SILT (ML)
MR-S2	T06A	47	★		77	51	26	SILTY SAND (SM)
MR-S2	T07A	52.5	⊙		37	22	15	LEAN CLAY (CL)
MR-S2	T07A	53.2	✪		36	21	15	LEAN CLAY (CL)
MR-S2	T07A	53.9	○		34	22	12	LEAN CLAY with SAND (CL)

DWR ATT. PLOT (U LINE) 12202012; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PLASTICITY CHART

FIGURE
7



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
LB-S2	T02A	22.5	●		70	39	31	ELASTIC SILT with SAND (MH)
LB-S2	T02A	23.2	⧗		75	52	23	SANDY ELASTIC SILT (MH)
LB-S2	T02A	23.8	▲		108	69	39	SANDY ELASTIC SILT (MH)
LB-S2	T04A	37.5	★		86	49	37	SANDY ELASTIC SILT (MH)
LB-S2	T04A	38.1	⊙		140	85	55	SILTY SAND (SM)
LB-S2	T04A	38.7	✿		138	82	56	SILTY SAND (SM)
LB-S2	S11A	67.5	○	2.5	35	23	12	
LB-S3	T02A	12.5	△		134	104	30	SILTY SAND (SM)
LB-S3	T02A	13.1	⊗		127	77	50	SILTY SAND (SM)
LB-S3	T02A	13.7	⊕		122	75	47	SILTY SAND (SM)
LB-S3	P03A	40.5	□	2.9	31	21	10	

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLORATION GEOLOGY REPORT
PLASTICITY CHART

FIGURE
8

DWR ATT. PLOT (U LINE) 12202012; NEW FISH RELEASE SITES 12062013.GPJ; DWR PROJECT GEOLOGY LIBRARY 10292013.GLB; 01/07/14

OFFICE MEMO

TO: Mark Pagenkopp	**DATE:** January 13, 2014
FROM: Mark Strahm	**SUBJECT:** Test Request No 2013-29: Sherman Island Fish Release Site

Description

Attached are the results of the testing performed under Test Request No. 2013-29: Sherman Island Fish Release Site. Testing was performed on 40 samples delivered to our laboratory by David Perry on August 28, 2013.

Sampling

Samples were collected and transported by non-Bryte Lab employees.

Tests

Tests Performed:

-
- ASTM D2487: Classification of Soils
- ASTM D4318: Atterberg Limits
- ASTM D2974: Organic Content of Soils
- ASTM D422: Particle Size
- ASTM D854: Specific Gravity of Soils
- ASTM D2216: Water Content of Soils
- ASTM D2435: One-Dimensional Consolidation Properties of Soil
- ASTM D4767: Consolidated Undrained Triaxial Compression Test

Results

Classification Testing:

The majority of the samples tested may be considered to be organic to highly organic materials, per gradation (ASTM D422), Atterberg Limits (ASTM D4318), and Organic Content (ASTM D4318) testing performed at our laboratory. Classifications were performed ASTM D2487 except for the determination of organic content. Organic soils were classified based on laboratory determined organic contents (per ASTM D2974) in lieu of comparative Liquid Limit testing as specified in ASTM D2487. Soils found to have organic contents in excess of 5% were classified as organic soils based upon NAVFAC DM-7.1. Our laboratory testing indicated that 16 of the 21 samples selected for organic content exceeded 5% organic content and may be considered to be organic soils. Of these 16 organic samples, two were found to have organic contents in excess of 50% and may be considered Highly Organic Soils (PT).

Particle Size Analysis

Particle Size Analysis per ASTM D422 was performed on 37 of the received samples. This testing consisted of sieve analysis, hydrometer testing, and a combination of both, as requested. Particle size analysis was performed on as-received samples, some of which contained significant portions of organic materials. The weight of this organic material is reported as a portion of the weight retained on each sieve of the particle size analysis.

Hydrometer testing was performed on 29 of the samples in order to estimate the gradations of the fine grained portion of the materials. Hydrometer testing was performed in accordance with ASTM D422. The results of this testing are included on the attached classification summary analysis. It should be noted that the hydrometer analysis was performed on the as-received sample, including any organic materials. Due to the buoyant properties of organic material, the hydrometer results of some of the more organic soils may not represent the actual particle sizes of the tested material.

Specific Gravity:
Specific Gravity testing per ASTM D854 was performed on 17 of the received samples. Based upon our laboratory testing, observed specific gravities ranged from 1.80 to 2.64. The very low specific gravity measurements appear to be related to the high organic contents of the soils. It should be noted that ASTM D854 is not intended for measurement of highly organic materials which float in water. Therefore, the results of testing performed on organic materials may not be representative of the samples.

Water Content:
Water content determinations were requested on 13 of the received samples. Laboratory determination of moisture content was performed per ASTM D2216, Method B. Water contents of the samples tested was observed to range from 28.5% to 341.3%.

Consolidation Testing:
Consolidation testing per ASTM D2435 was per formed on Sample 2013-731. Results of the consolidation testing are presented in the attached charts.

Triaxial Compression Testing:
Triaxial compression testing was performed on seven of the received samples. The majority of these tests were performed on organic soils (Classifications OL, OH, or PT). Effective confining pressures requested for these samples ranged from 2.8 psi to 40.3 psi. Results of Consolidated Undrained testing (Per ASTM D4767) on the organic soils samples indicated very low angles of friction ranging from 8 to 12 degrees. Results of Sample 2013-740 indicated erratic and erroneous data for the lowest confining pressure (2013-740A). Results for this point were removed for clarity.

Testing was also performed on one sample (2013-1071) that was not classified as an organic material. Consolidated Undrained testing (Per ASTM D4767) was performed on this material at confining stresses of 13.2 psi, 25.7 psi, and 48.6 psi. Results of this testing is attached.

Please feel free to contact me at Bryte Lab (916-375-6012) if you have any questions or need any additional information.

State of California
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

CLASSIFICATION SUMMARY ANALYSIS

DIV. OF ENGINEERING
GEOTECH. SERVICES BRANCH
BRYTE SOILS AND CONCRETE LAB.

PROJECT: Sherman Island Fish Release Site **FEATURE:**

Lab No.	Borehole No.	Field Sample No.	Depth (ft)	PERCENT FINER														ATTERBERG LIMITS		SPECIFIC GRAVITY	ORGANIC CONTENT %	GROUP SYMBOL	ASTM D2487 CLASSIFICATION GROUP NAME
				MECHANICAL ANALYSIS											HYDROMETER								
				GRAVEL					SAND						SILT & CLAY								
				3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5M	2M	1M						
				75	37.5	19	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075	0.005	0.002	0.001						
				mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	LL	PI				
13-725						100	99	98	98	97	95	91	65	52	18	9	5	41	13	2.50	35.0%	OL	Sandy Organic Clay
13-726	MR-S1	S02A	32.0																	2.22			
13-727	MR-S1	S08A	62.0							100	95	65	25	13				NP	NP			SM	Silty sand
13-728	MR-S2	S01A	5.0	100	100	97	96	89	86	83	73	31	17	12						2.49			
13-730A	MR-S2	T03A	25	100	100	100	100	100	99	99	98	98	97	96	27	13	8	45	16	2.62	4.3%	ML	Silt
13-730B	MR-S2	T03A	25					100	88	75	66	59	54	50	8	0		97	21	2.20	21.4%	OH	Sandy Organic Silt
13-730C	MR-S2	T03A	25	100	100	100	100	100	81	56	44	34	23	17	6	2		NP	NP	1.80	33.1%	OL	Sandy Organic Silt
13-732	MR-S2	S09A	62.0					100	99	98	93	60	22	11									
13-733	MR-S3	S02A	12.5																	1.96			
13-735	LB-S1	S01A	36.5																	1.93			
13-737	LB-S1	S05A	67.0		100	96	89	86	83	81	78	64	50	29	2	1	0						
13-738	LB-S2	S02A	7.5	100	100	100	99	99	98	98	97	65	13	8									
13-739A	LB-S2	T02A	22.5					100	96	89	83	76	68	59	19	7	3	108	39	2.14	25.5%	MH	Sandy Elastic Silt
13-739B	LB-S2	T02A	22.5	100	100	100	100	100	91	80	72	66	61	57	14	3		75	23	2.17	20.1%	OH	Sandy Organic Silt
13-739C	LB-S2	T02A	22.5					100	96	90	84	80	76	72	23	10	4	70	31	2.42	12.0%	MH	Elastic Silt with sand
13-739UU	LB-S2	T02A	22.5	100	100	100	100	100	100	100	100	99	92	74	23	14	10	31	10	2.64	3.0%	CL	Lean Clay with sand
13-740A	LB-S2	T04A	37.5					100	84	64	47	35	26	21	2			138	56	2.02	37.6%	OH	Sandy Organic Silt
13-740B	LB-S2	T04A	37.5	100	100	100	100	100	86	66	51	41	33	28	7	0		140	55	2.14	30.2%	SM	Silty sand
13-740C	LB-S2	T04A	37.5					100	96	90	84	78	73	68	31	12	5	86	37	2.29	16.7%	OH	Sandy Organic Silt
13-741	LB-S2	S11A	67.5						100	98	94	89	87	82	24	10	5	35	12			CL	Lean Clay

Notes: 1. Macros must me enabled for cell formulas to work correctly (Excel Options>Trust Center>Trust Center Settings>Macro Settings>enable all macros)
2. Values may be entered directly into cells or imported from other spreadsheets with Import_Gradations and Import_Atterberg macros

DATE: Revised:1/13/14
INITIAL: 13-29
REQUEST NO.: 13-29

REMARKS:

IM - INSUFFICIENT MATERIAL
NP - NON-PLASTIC
NG - NO GOOD

State of California
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

CLASSIFICATION SUMMARY ANALYSIS

DIV. OF ENGINEERING
GEOTECH. SERVICES BRANCH
BRYTE SOILS AND CONCRETE LAB.

PROJECT: Sherman Island Fish Release Site **FEATURE:**

Lab No.	Borehole No.	Field Sample No.	Depth (ft)	PERCENT FINER														ATTERBERG LIMITS		SPECIFIC GRAVITY	ORGANIC CONTENT	GROUP SYMBOL	ASTM D2487 CLASSIFICATION GROUP NAME
				MECHANICAL ANALYSIS											HYDROMETER								
				GRAVEL					SAND						SILT & CLAY								
				3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5M	2M	1M						
				75	37.5	19	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075	0.005	0.002	0.001						
				mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	LL	PI				
13-743A	LBS3	T02A	12.5					100	87	68	57	50	44	41	24	14	9	122	47		27.0%	OH	Sandy Organic Silt
13-743B	LBS3	T02A	12.5	100	100	100	100	100	83	61	49	41	36	31	16	8	4	127	50		31.2%	OH	Sandy Organic Silt
13-743C	LBS3	T02A	12.5					100	79	54	40	31	24	18	9	4	2	134	30		38.0%	OH	Sandy Organic Silt
13-745	LBS3	P03A	40.5	100	100	100	100	100	100	100	99	99	94	83	25	13	8	31	10			CL	Lean Clay with sand
13-746	LB-S3	S12A	57.0				100	95	93	89	78	43	17	8									
13-950		S02A	10	100	100	100	99	97	96	94	82	28	13	10	5	3	2						
13-951	LB-S3	S04A	17.5					100	98	82	63	46	32	21	3	1	1						
13-952	LB-S3	S08A	30	100	100	100	100	100	98	93	85	78	72	68	34	16	8	NP	NP			ML	Sandy Silt
13-953		P13A	95								100	93	63	10	2	1	0						
13-954A	MR-S2	T06A	47.0-49.0	100	100	100	100	100	91	79	70	62	52	47	18	6	1	77	26	2.10	24.2%	OH	Sandy Organic Silt
13-955A	MR-S3	T02A	10.0 - 12.0					100	88	65	48	35	26	20	10	4	2	NP	NP	1.90	47.8%	OL	Sandy Organic Silt
13-955B	MR-S3	T02A	10.0-12.0	100	100	100	100	100	74	47	35	26	19	14	7	3	1	NP	NP		53.3%	PT	Highly Organic Soil
13-955C	MR-S3	T02A	10.0-12.0					100	72	45	32	22	14	9	2			NP	NP		54.5%	PT	Highly Organic Soil
13-1071A	MR-S2	T07A	52.5-54.5	100	100	100	100	100	100	100	100	100	98	85	21	12	8	34	12		3.2%	CL	Lean Clay
13-1071B	MR-S2	T07A	52.5-54.5									100	99	89	24	14	9	36	15		3.6%	CL	Lean Clay
13-1071C	MR-S2	T07A	52.5-54.5	100	100	100	100	100	100	100	100	99	99	96	29	13	7	37	15		4.1%	CL	Lean Clay

Notes: 1. Macros must me enabled for cell formulas to work correctly (Excel Options>Trust Center>Trust Center Settings>Macro Settings>enable all macros)
2. Values may be entered directly into cells or imported from other spreadsheets with Import_Gradations and Import_Atterberg macros

DATE: 12/10/2013
INITIAL: CG/JS/SC
REQUEST NO.: 13-29

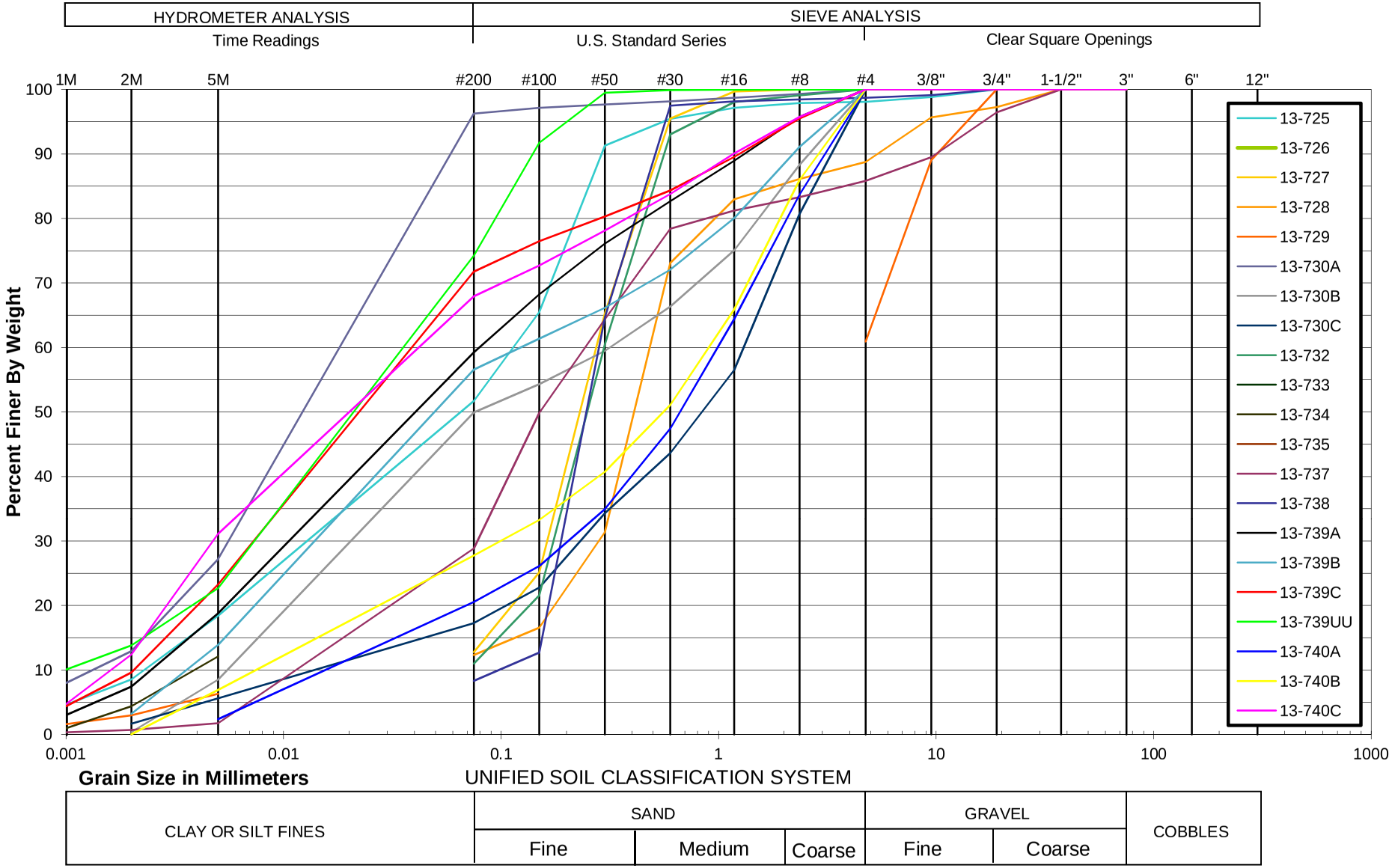
REMARKS:

IM - INSUFFICIENT MATERIAL
NP - NON-PLASTIC
NG - NO GOOD

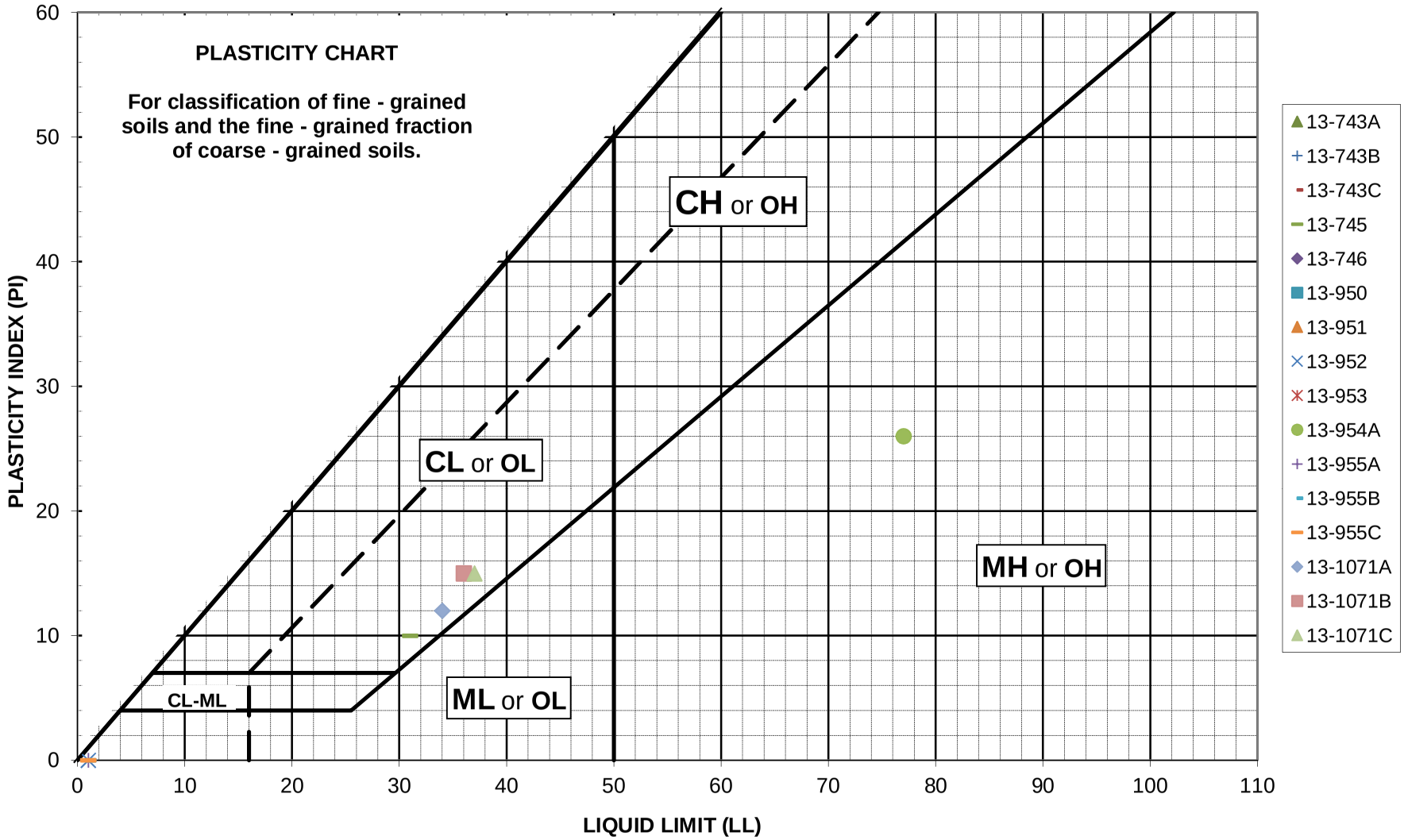
State of California
The Resources Agency
Department of Water Resources

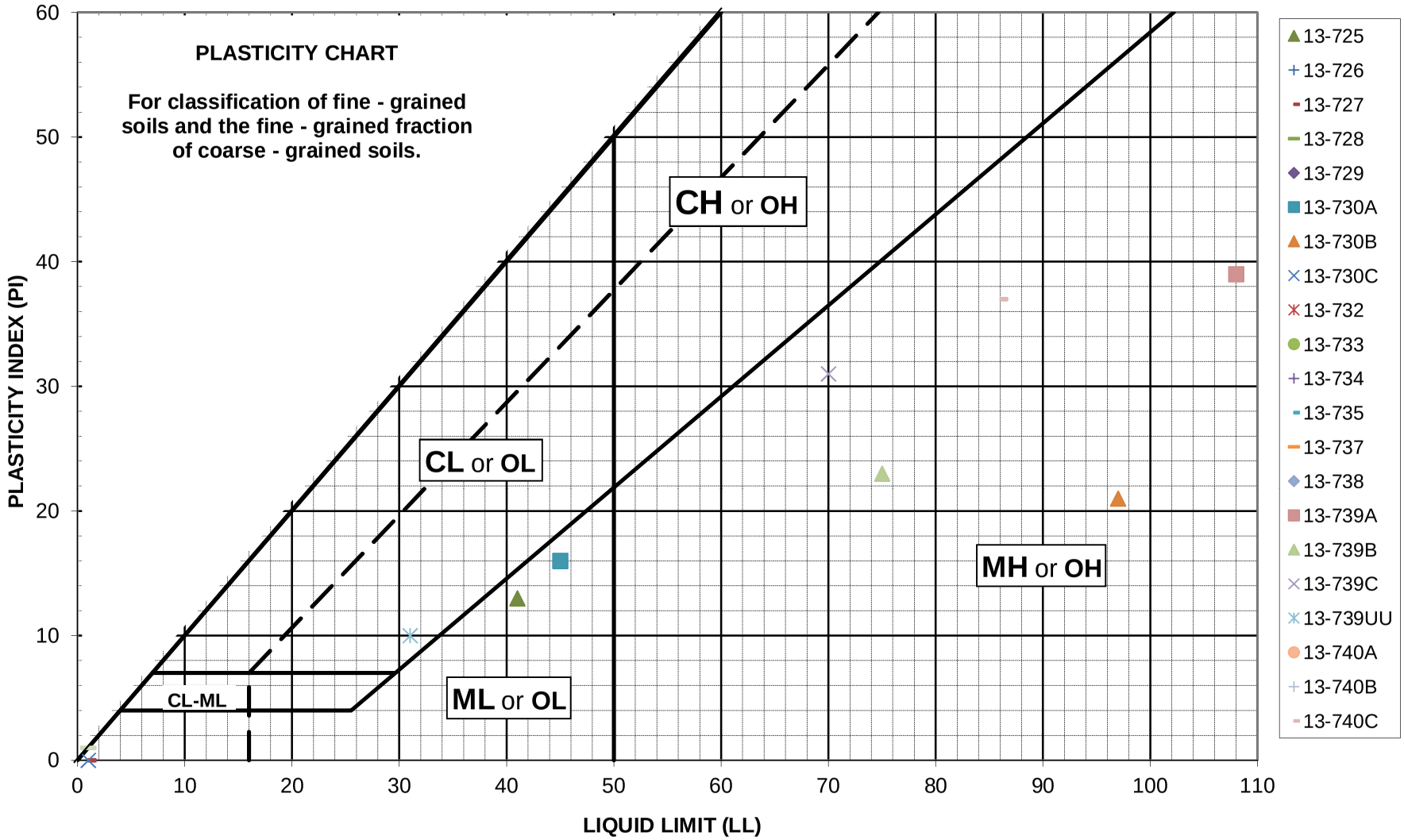
Particle Size Analysis Graph

Division of Engineering
Civil Engineering
Dams and Canals Section



1/13/2014


PLASTICITY CHART
For classification of fine - grained soils and the fine - grained fraction of coarse - grained soils.
CH or OH
CL or OL
MH or OH
ML or OL
CL-ML
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
0
10
20
30
40
50
60
70
80
90
100
110
13-743A
13-743B
13-743C
13-745
13-746
13-950
13-951
13-952
13-953
13-954A
13-955A
13-955B
13-955C
13-1071A
13-1071B
13-1071C


PLASTICITY CHART
For classification of fine - grained soils and the fine - grained fraction of coarse - grained soils.
CH or OH
CL or OL
MH or OH
ML or OL
CL-ML
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
0
10
20
30
40
50
60
70
80
90
100
110
13-725
13-726
13-727
13-728
13-729
13-730A
13-730B
13-730C
13-732
13-733
13-734
13-735
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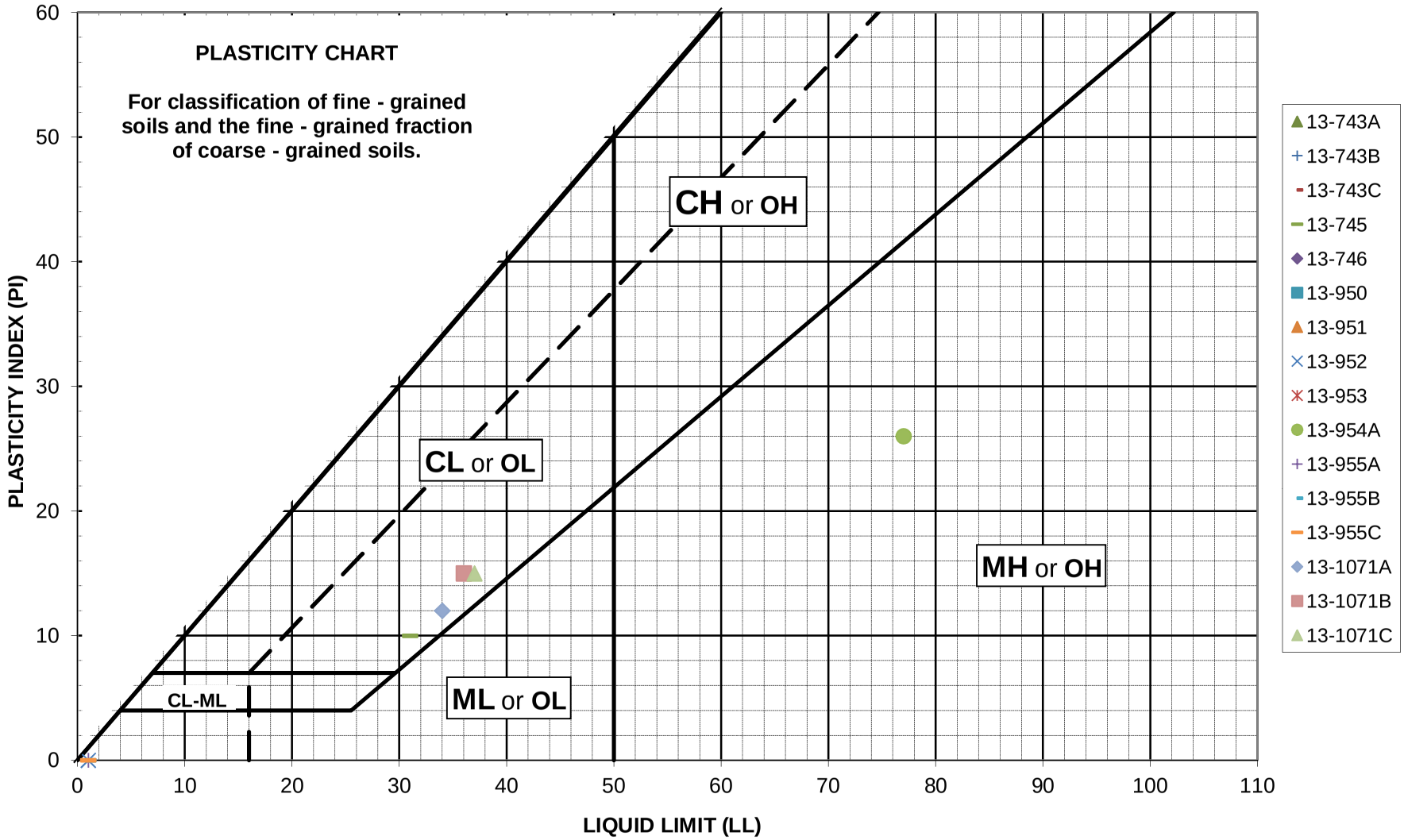
13-740A
13-740B
13-740C


PLASTICITY CHART
For classification of fine - grained soils and the fine - grained fraction of coarse - grained soils.
CH or OH
CL or OL
MH or OH
ML or OL
CL-ML
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
0
10
20
30
40
50
60
70
80
90
100
110
13-743A
13-743B
13-743C
13-745
13-746
13-950
13-951
13-952
13-953
13-954A
13-955A
13-955B
13-955C
13-1071A
13-1071B
13-1071C

State of California
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

MOISTURE CONTENT TEST SUMMARY
ASTM D2216 - 10

DIV. OF ENGINEERING
GEOTECH. SERVICES BRANCH
BRYTE SOILS AND CONCRETE LAB.

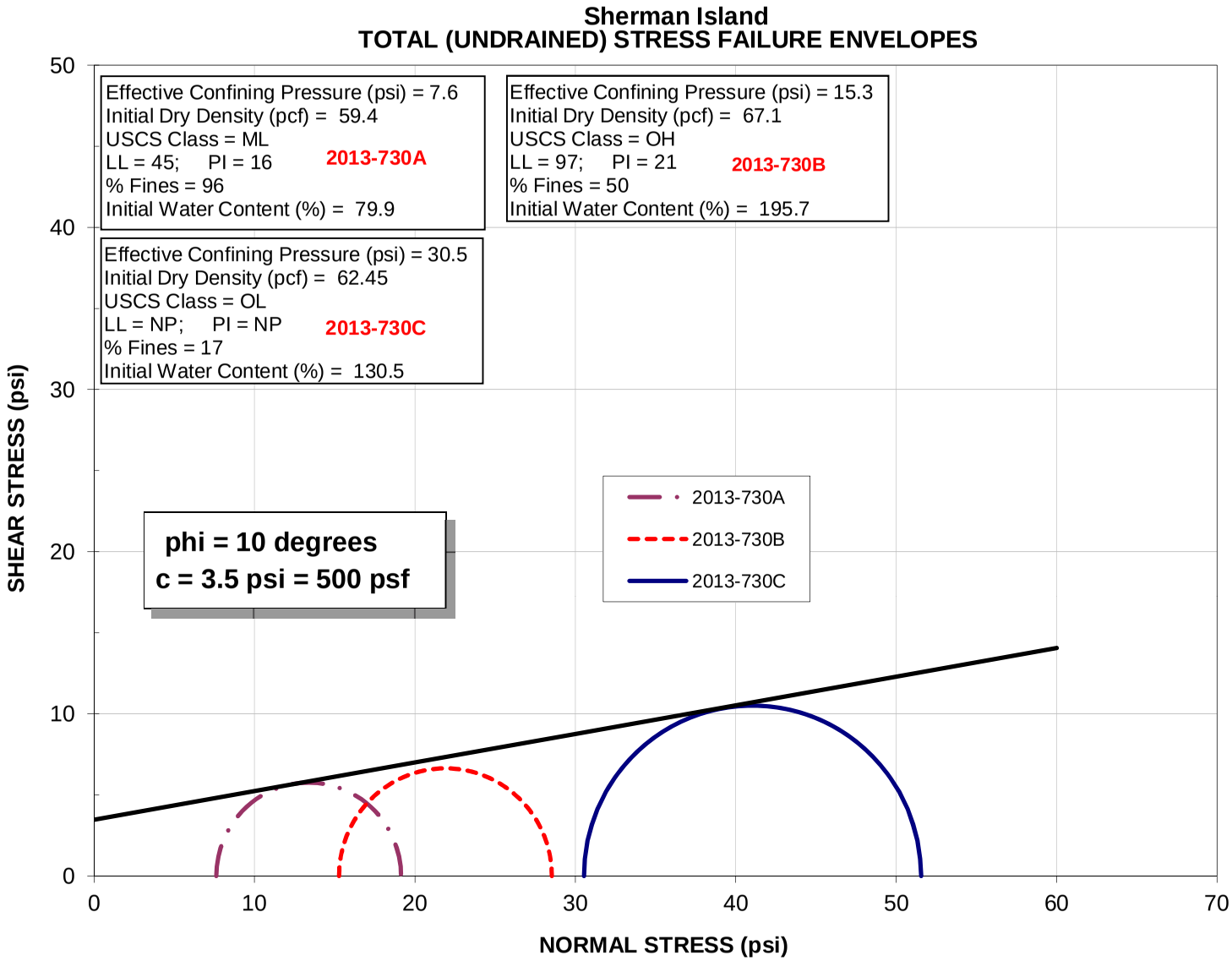
PROJECT: Sherman Island Fish Release Site

FEATURE: Shelby tube samples

LAB NUMBER	BORING NUMBER	FIELD NUMBER	DEPTH	CONTAINER/LID NUMBER	METHOD USED (A or B)	NUMBER OF MATERIALS	EXCLUDED MATERIAL	OVEN TEMP	CONTAINER MASS (g) $\{M_c\}$	CONTAINER + MOIST MASS (g) $\{M_{cms}\}$	DATE IN	TIME IN OVEN	CONTAINER + DRY MASS (g) $\{M_{cds}\}$	DATE OUT	TIME OUT	MASS OF WATER (g) $\{M_w = M_{cms} - M_{cds}\}$	MASS OF SOLIDS (g) $\{M_s = M_{cds} - M_c\}$	WATER CONTENT (%) $\{w = (M_w/M_s) * 100\}$	VISUAL CLASSIFICATION	MAX GRAIN SIZE (VISUAL)
2013-730C	MR-S2	T03A	25	AU	B				143.2	455.7		12:00	266.8		12:00	188.90	123.60	**152.8**		
2013-739A	LB-S2	T02A	22.5	9	B				140.2	603.6		12:00	347.47		12:00	256.13	207.27	**123.6**		
2013-739UU	LB-S2	T02A	22.5	V5	B				143.8	691.5		12:00	561.11		12:00	130.39	417.31	**31.2**		
2013-740A	LB-S2	T04A	37.5	GREEK	B				142	514.4		12:00	292.95		12:00	221.45	150.95	**146.7**		
2013-740B	LB-S2	T04A	37.5	KN	B				142.6	541		12:00	305.38		12:00	235.62	162.78	**144.7**		
2013-740C	LB-S2	T04A	37.5	PO	B				142.6	588.2		12:00	389.84		12:00	198.36	247.24	**80.2**		
2013-743A	LB-S3	T02A	12.5	A-34	B				135.3	460.8		12:00	246.21		12:00	214.59	110.91	**193.5**		
2013-743B	LB-S3	T02A	12.5	SOS	B				142.6	457		12:00	250.89		12:00	206.11	108.29	**190.3**		
2013-743C	LB-S3	T02A	12.5	O	B				135.9	425.2		12:00	228.19		12:00	197.01	92.29	**213.5**		
2013-955A	MR-S3	T02A	10.0-12.0	330	B				144.7	499.1		12:00	236.18		12:00	262.92	91.48	**287.4**		
2013-955B	MR-S3	T02A	10.0-12.0	18	B				141.9	453.5		12:00	212.51		12:00	240.99	70.61	**341.3**		
2013-955C	MR-S3	T02A	10.0-12.0	H-6					140.5	410.3		12:00	208.38		12:00	201.92	67.88	**297.5**		
2013-1071C	MR-S2	T07A	52.5-54.5	311	B				144.9	814.5		12:00	665.99		12:00	148.51	521.09	**28.5**		

REQUEST NO.: 2013-29
INITIALS: CG/SC
DATE: 12/11/2013

NOTES:


Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 7.6
Initial Dry Density (pcf) = 59.4
USCS Class = ML
LL = 45; PI = 16
2013-730A
% Fines = 96
Initial Water Content (%) = 79.9
Effective Confining Pressure (psi) = 15.3
Initial Dry Density (pcf) = 67.1
USCS Class = OH
LL = 97; PI = 21
2013-730B
% Fines = 50
Initial Water Content (%) = 195.7
Effective Confining Pressure (psi) = 30.5
Initial Dry Density (pcf) = 62.45
USCS Class = OL
LL = NP; PI = NP
2013-730C
% Fines = 17
Initial Water Content (%) = 130.5
phi = 10 degrees
c = 3.5 psi = 500 psf
2013-730A
2013-730B
2013-730C
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
10
20
30
40
50
60
70

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS
CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 9/27/2013

2013-730A	
Effective Confining Pressure (psi) = 7.6	
Initial Dry Density (pcf) = 59.4	
USCS Class = ML	
LL = 45; PI = 16	
% Fines = 96	
Initial Water Content (%) = 79.9	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	10.5
Excess Pore Pressure @ Failure (psi)	3.8
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	11.5

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**7.63**	1.046	-0.34
0.1	1.18	6.45	1.254	1.64
0.2	1.89	5.74	1.468	2.68
0.5	2.90	4.73	1.892	4.22
1	3.63	4.00	2.442	5.77
1.5	3.91	3.72	2.865	6.93
2	4.03	3.60	3.180	7.85
3	4.03	3.59	3.512	9.03
4	3.91	3.72	3.661	9.88
5	3.76	3.87	3.709	10.48
6	3.62	4.01	3.717	10.89
7	3.47	4.16	3.682	11.16
8	3.34	4.29	3.643	11.34
9	3.22	4.41	3.605	11.48
10	3.11	4.53	3.543	11.51
11	3.00	4.63	3.486	11.52
12	2.91	4.71	3.449	11.54
13	2.83	4.80	3.390	11.48
14	2.75	4.88	3.333	11.38
15	2.69	4.94	3.299	11.36
16	2.64	4.99	3.247	11.21
17	2.60	5.03	3.218	11.16
18	2.55	5.08	3.165	11.00
19	2.52	5.11	3.118	10.83
20	2.50	5.14	3.093	10.75
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Test Date - 9/29/2013

2013-730B	
Effective Confining Pressure (psi) = 15.3	
Initial Dry Density (pcf) = 67.1	
USCS Class = OH	
LL = 97; PI = 21	
% Fines = 50	
Initial Water Content (%) = 195.7	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	12.0
Excess Pore Pressure @ Failure (psi)	10.8
Total	
Failure Criteria (Strain @ PDS or 10%)	9.17
Dev. Stress @ Failure (psi)	13.3

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**15.27**	1.042	-0.62
0.1	0.37	14.90	1.027	-0.39
0.2	0.92	14.36	1.036	0.52
0.5	2.77	12.51	1.266	3.33
1	4.81	10.46	1.550	5.76
1.5	6.10	9.17	1.804	7.37
2	7.28	7.99	2.078	8.62
3	8.81	6.47	2.582	10.23
4	9.94	5.34	3.124	11.34
5	10.76	4.51	3.663	12.01
6	11.39	3.89	4.239	12.61
7	11.82	3.46	4.763	13.00
8	12.14	3.13	5.213	13.19
9	12.40	2.88	5.593	13.22
9.17	12.44	2.85	5.658	13.26
10	12.58	2.69	5.905	13.21
11	12.74	2.54	6.174	13.13
12	12.85	2.42	6.329	12.92
13	12.98	2.29	6.632	12.92
14	13.10	2.17	6.865	12.74
15	13.17	2.10	6.959	12.51
16	13.26	2.01	7.151	12.37
17	13.35	1.92	7.424	12.34
18	13.43	1.85	7.551	12.11
19	13.48	1.79	7.596	11.81
20	13.52	1.76	7.671	11.73
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Test Date - 9/29/2013

2013-730C	
Effective Confining Pressure (psi) = 30.5	
Initial Dry Density (pcf) = 62.45	
USCS Class = OL	
LL = NP; PI = NP	
% Fines = 17	
Initial Water Content (%) = 130.5	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	18.5
Excess Pore Pressure @ Failure (psi)	19.5
Total	
Failure Criteria (Strain @ PDS or 10%)	9.52
Dev. Stress @ Failure (psi)	21.0

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**30.54**	1.021	-0.62
0.1	1.55	29.00	1.047	1.35
0.2	2.65	27.90	1.101	2.81
0.5	5.44	25.11	1.235	5.90
1	8.65	21.90	1.424	9.29
1.5	10.16	20.39	1.569	11.60
2	12.44	18.11	1.735	13.31
3	15.66	14.89	2.044	15.54
4	17.79	12.76	2.344	17.15
5	19.47	11.08	2.668	18.48
6	20.84	9.71	3.019	19.60
7	21.89	8.65	3.294	19.84
8	22.74	7.81	3.601	20.32
9	23.51	7.04	3.952	20.79
9.52	23.86	6.69	4.137	21.00
10	24.21	6.34	4.295	20.90
11	24.76	5.79	4.537	20.48
12	25.43	5.12	5.038	20.67
13	25.89	4.66	5.478	20.88
14	26.30	4.25	5.789	20.35
15	26.63	3.92	6.136	20.16
16	26.88	3.66	6.511	20.20
17	27.11	3.44	6.771	19.84
18	27.32	3.22	6.995	19.29
19	27.47	3.08	7.169	19.00
20	27.61	2.94	7.433	18.93
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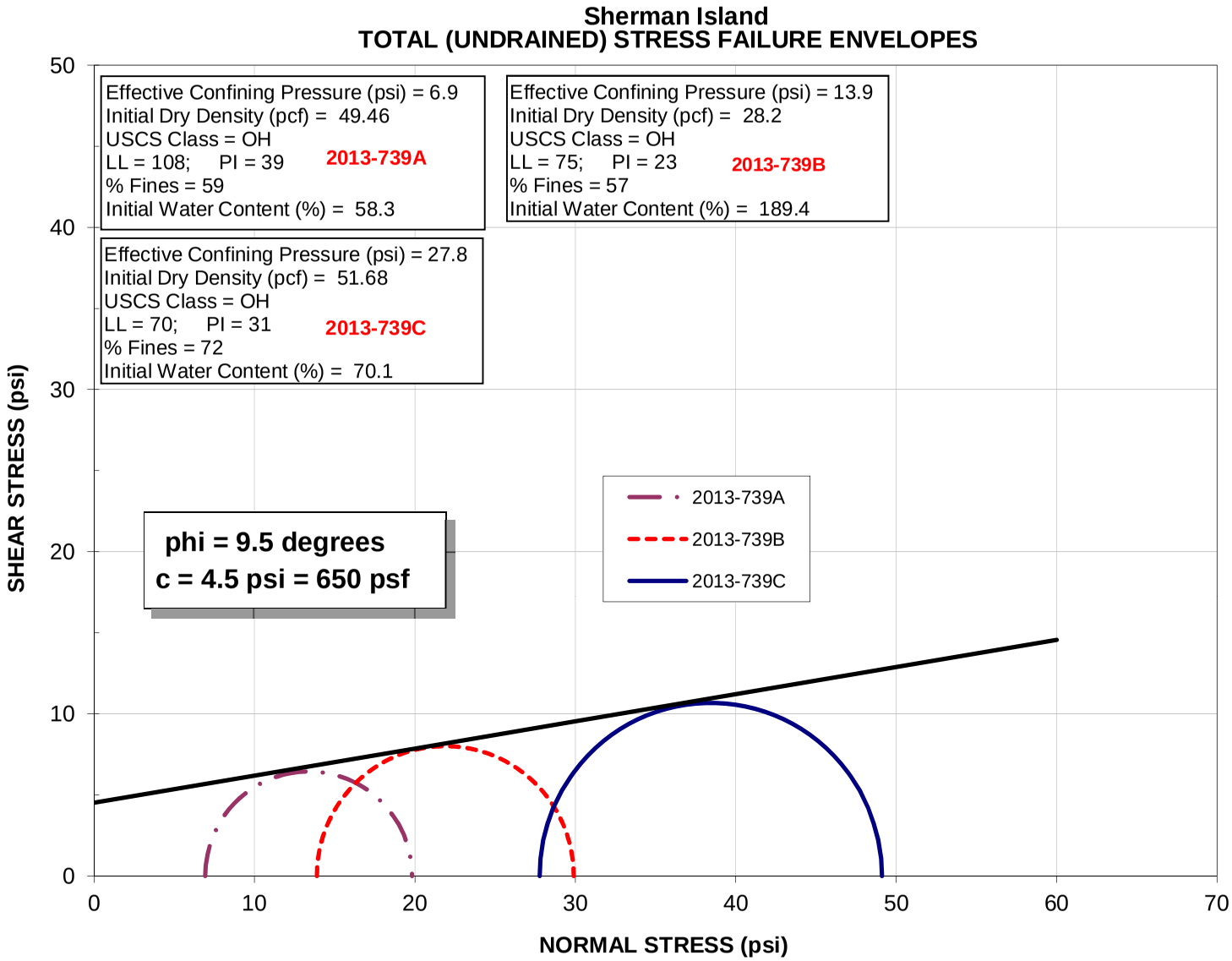
Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 6.9
Initial Dry Density (pcf) = 49.46
USCS Class = OH
LL = 108; PI = 39
2013-739A
% Fines = 59
Initial Water Content (%) = 58.3
Effective Confining Pressure (psi) = 13.9
Initial Dry Density (pcf) = 28.2
USCS Class = OH
LL = 75; PI = 23
2013-739B
% Fines = 57
Initial Water Content (%) = 189.4
Effective Confining Pressure (psi) = 27.8
Initial Dry Density (pcf) = 51.68
USCS Class = OH
LL = 70; PI = 31
2013-739C
% Fines = 72
Initial Water Content (%) = 70.1
phi = 9.5 degrees
c = 4.5 psi = 650 psf
2013-739A
2013-739B
2013-739C
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
10
20
30
40
50
60
70

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS
CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 9/24/2013

2013-739A	
Effective Confining Pressure (psi) = 6.9	
Initial Dry Density (pcf) = 49.46	
USCS Class = OH	
LL = 108; PI = 39	
% Fines = 59	
Initial Water Content (%) = 58.3	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	11.9
Excess Pore Pressure @ Failure (psi)	6.3
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	12.9

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**6.93**	1.068	-0.44
0.1	0.78	6.14	1.138	0.85
0.2	1.32	5.61	1.303	1.70
0.5	2.57	4.37	1.817	3.57
1	3.90	3.03	2.903	5.77
1.5	4.76	2.17	4.349	7.27
2	5.36	1.58	6.336	8.42
3	5.99	0.94	12.005	10.39
4	6.26	0.68	18.193	11.63
5	6.34	0.60	21.046	11.93
6	6.40	0.54	23.622	12.18
7	6.44	0.50	26.279	12.58
8	6.49	0.45	29.179	12.65
9	6.53	0.40	32.883	12.77
10	6.58	0.34	39.438	12.89
11	6.63	0.31	43.166	13.12
12	6.66	0.27	49.259	13.05
13	6.70	0.24	55.990	13.09
14	6.73	0.21	65.219	13.20
15	6.75	0.19	69.812	13.03
16	6.75	0.19	69.186	12.91
17	6.75	0.18	73.239	13.09
18	6.77	0.16	79.470	12.94
19	6.78	0.16	82.476	12.78
20	6.79	0.14	91.013	12.66
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Test Date - 9/24/2013

2013-739B	
Effective Confining Pressure (psi) = 13.9	
Initial Dry Density (pcf) = 28.2	
USCS Class = OH	
LL = 75; PI = 23	
% Fines = 57	
Initial Water Content (%) = 189.4	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	16.0
Excess Pore Pressure @ Failure (psi)	12.3
Total	
Failure Criteria (Strain @ PDS or 10%)	5.87
Dev. Stress @ Failure (psi)	16.0

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**13.89**	1.045	-0.60
0.1	1.20	12.69	1.097	1.23
0.2	1.99	11.89	1.206	2.45
0.5	3.93	9.96	1.545	5.43
1	6.14	7.74	2.125	8.70
1.5	7.75	6.13	2.794	11.00
2	8.97	4.91	3.610	12.82
3	10.79	3.10	5.785	14.83
4	11.82	2.08	8.570	15.73
5	12.28	1.60	10.952	15.96
5.87	12.49	1.40	12.442	16.02
6	12.50	1.39	12.488	15.99
7	12.58	1.31	12.790	15.45
8	12.57	1.32	12.398	15.02
9	12.56	1.33	12.005	14.69
10	12.52	1.38	11.420	14.33
11	12.45	1.43	10.671	13.85
12	12.36	1.53	9.804	13.48
13	12.28	1.61	9.201	13.22
14	12.22	1.67	8.751	12.94
15	12.14	1.75	8.207	12.62
16	12.10	1.79	7.967	12.49
17	12.08	1.81	7.811	12.32
18	12.07	1.82	7.573	11.99
19	12.06	1.82	7.496	11.85
20	12.07	1.82	7.475	11.76
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Test Date - 9/26/2013

2013-739C	
Effective Confining Pressure (psi) = 27.8	
Initial Dry Density (pcf) = 51.68	
USCS Class = OH	
LL = 70; PI = 31	
% Fines = 72	
Initial Water Content (%) = 70.1	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	20.8
Excess Pore Pressure @ Failure (psi)	20.6
Total	
Failure Criteria (Strain @ PDS or 10%)	7.76
Dev. Stress @ Failure (psi)	21.3

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**27.77**	1.022	-0.60
0.1	2.19	25.58	1.103	2.64
0.2	3.73	24.04	1.195	4.69
0.5	7.17	20.61	1.427	8.80
1	10.68	17.09	1.734	12.54
1.5	13.28	14.50	2.034	15.00
2	15.07	12.71	2.295	16.46
3	17.60	10.18	2.812	18.44
4	19.27	8.51	3.333	19.86
5	20.56	7.23	3.875	20.78
6	21.51	6.27	4.328	20.87
7	22.18	5.60	4.763	21.08
7.76	22.59	5.20	5.105	21.35
8	22.69	5.09	5.185	21.32
9	23.08	4.69	5.477	21.02
10	23.31	4.47	5.590	20.53
11	23.51	4.27	5.711	20.11
12	23.71	4.08	5.808	19.62
13	23.89	3.89	5.903	19.09
14	24.04	3.74	6.042	18.85
15	24.16	3.62	6.064	18.35
16	24.18	3.60	5.984	17.94
17	24.21	3.57	5.882	17.41
18	24.20	3.58	5.618	16.54
19	24.15	3.62	5.391	15.91
20	24.06	3.72	5.204	15.64
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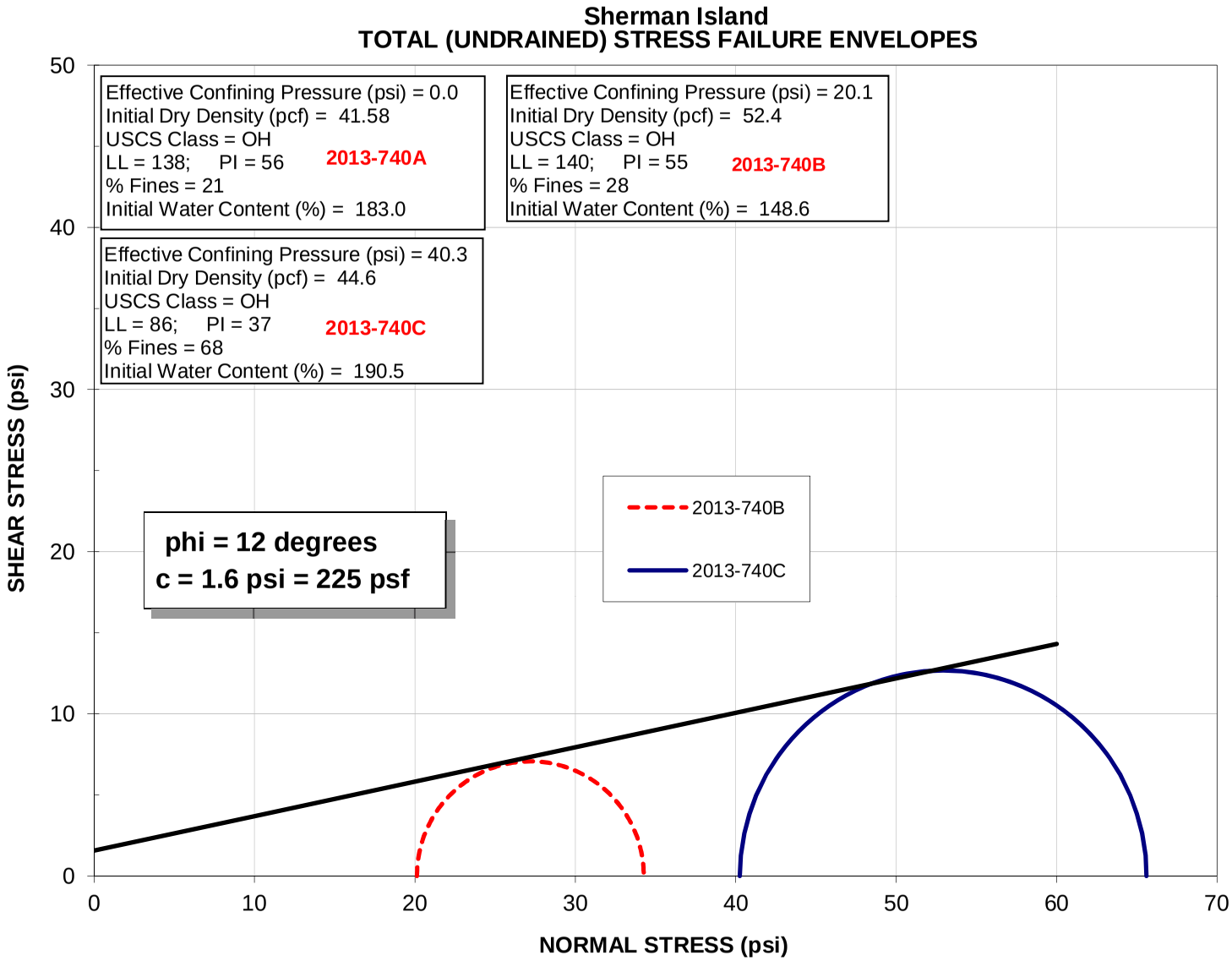
Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 0.0
Initial Dry Density (pcf) = 41.58
USCS Class = OH
LL = 138; PI = 56
2013-740A
% Fines = 21
Initial Water Content (%) = 183.0
Effective Confining Pressure (psi) = 20.1
Initial Dry Density (pcf) = 52.4
USCS Class = OH
LL = 140; PI = 55
2013-740B
% Fines = 28
Initial Water Content (%) = 148.6
Effective Confining Pressure (psi) = 40.3
Initial Dry Density (pcf) = 44.6
USCS Class = OH
LL = 86; PI = 37
2013-740C
% Fines = 68
Initial Water Content (%) = 190.5
phi = 12 degrees
c = 1.6 psi = 225 psf
2013-740B
2013-740C
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
10
20
30
40
50
60
70

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS
CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 10/7/2013

2013-740A	
Effective Confining Pressure (psi) = 0.0	
Initial Dry Density (pcf) = 41.58	
USCS Class = OH	
LL = 138; PI = 56	
% Fines = 21	
Initial Water Content (%) = 183.0	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	4.967
Dev. Stress @ Failure (psi)	19.4
Excess Pore Pressure @ Failure (psi)	10.1
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	23.1

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)

Test Date - 10/10/2013

2013-740B	
Effective Confining Pressure (psi) = 20.1	
Initial Dry Density (pcf) = 52.4	
USCS Class = OH	
LL = 140; PI = 55	
% Fines = 28	
Initial Water Content (%) = 148.6	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	14.1
Excess Pore Pressure @ Failure (psi)	15.8
Total	
Failure Criteria (Strain @ PDS or 10%)	4.83
Dev. Stress @ Failure (psi)	14.1

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**20.12**	1.031	-0.60
0.1	1.91	18.23	1.073	1.33
0.2	3.03	17.11	1.152	2.59
0.5	5.33	14.81	1.340	5.03
1	7.93	12.20	1.621	7.57
1.5	9.85	10.29	1.907	9.33
2	11.31	8.82	2.200	10.59
3	13.52	6.61	2.883	12.44
4	15.04	5.10	3.695	13.73
4.83	15.71	4.42	4.202	14.14
5	15.79	4.34	4.253	14.13
6	15.89	4.25	4.191	13.57
7	15.80	4.34	4.007	13.04
8	15.78	4.36	3.924	12.75
9	15.77	4.37	3.836	12.39
10	15.74	4.40	3.713	11.94
11	15.82	4.32	3.760	11.92
12	15.91	4.22	3.797	11.80
13	15.98	4.16	3.797	11.62
14	16.05	4.08	3.821	11.51
15	16.14	3.99	3.905	11.60
16	16.25	3.88	3.984	11.57
17	16.38	3.76	4.065	11.51
18	16.47	3.67	4.136	11.50
19	16.56	3.58	4.220	11.54
20	16.58	3.56	4.204	11.40
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Test Date - 10/13/2013

2013-740C	
Effective Confining Pressure (psi) = 40.3	
Initial Dry Density (pcf) = 44.6	
USCS Class = OH	
LL = 86; PI = 37	
% Fines = 68	
Initial Water Content (%) = 190.5	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	24.2
Excess Pore Pressure @ Failure (psi)	27.3
Total	
Failure Criteria (Strain @ PDS or 10%)	7.85
Dev. Stress @ Failure (psi)	25.3

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**40.26**	1.015	-0.60
0.1	3.13	37.14	1.096	3.56
0.2	5.34	34.93	1.178	6.20
0.5	9.56	30.70	1.346	10.62
1	14.13	26.14	1.567	14.82
1.5	17.27	23.00	1.753	17.32
2	19.61	20.66	1.919	18.98
3	23.18	17.09	2.255	21.45
4	25.53	14.74	2.576	23.22
5	27.26	13.01	2.858	24.19
6	28.51	11.76	3.103	24.73
7	29.53	10.74	3.336	25.10
7.85	30.13	10.14	3.499	25.33
8	30.23	10.04	3.522	25.32
9	30.64	9.62	3.595	24.97
10	31.01	9.25	3.655	24.57
11	31.29	8.98	3.666	23.96
12	31.56	8.71	3.701	23.52
13	31.77	8.50	3.722	23.15
14	31.93	8.34	3.701	22.52
15	32.11	8.16	3.698	22.02
16	32.26	8.01	3.698	21.62
17	32.40	7.87	3.699	21.23
18	32.57	7.69	3.701	20.78
19	32.70	7.56	3.684	20.30
20	32.82	7.45	3.683	19.98
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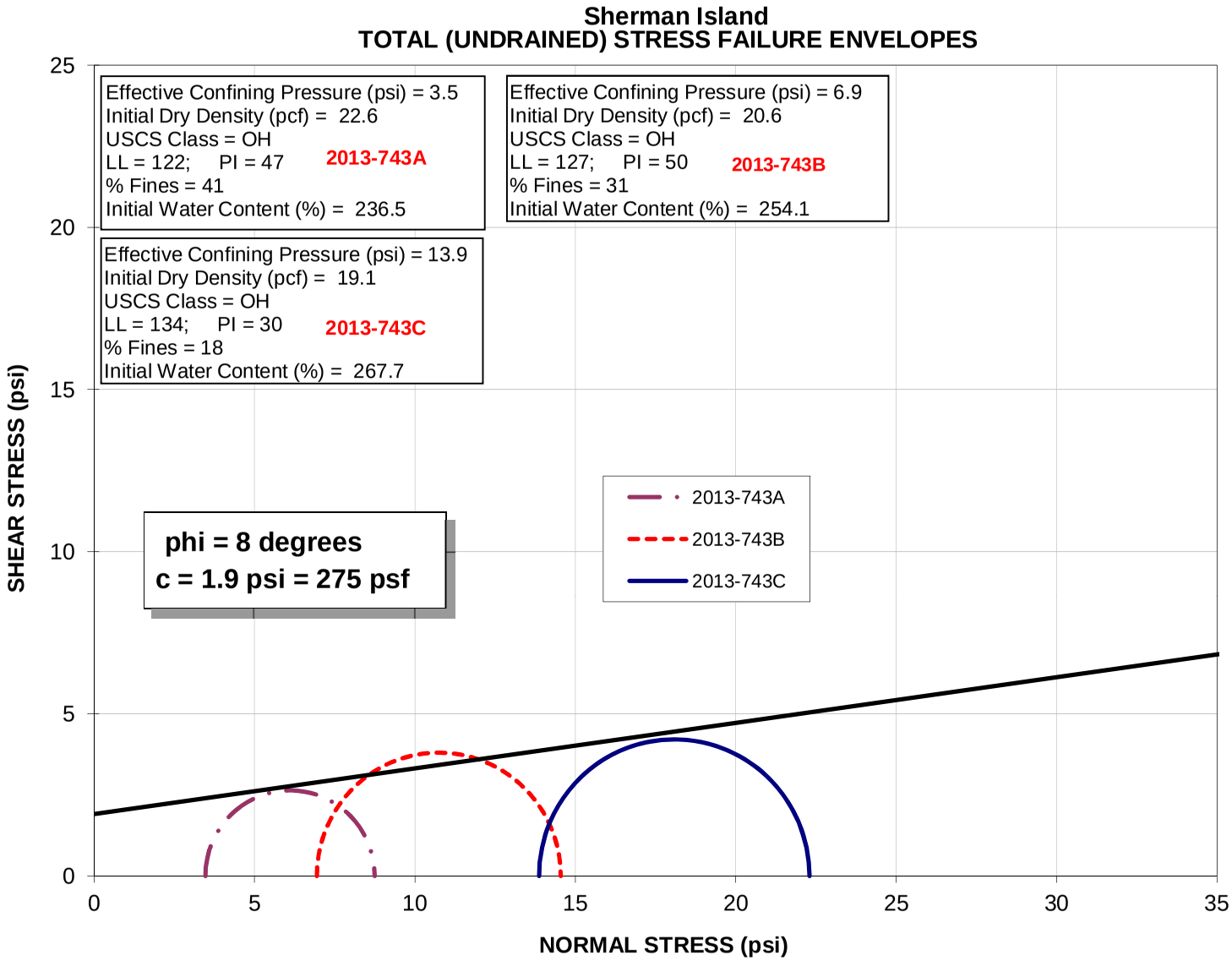
Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 3.5
Initial Dry Density (pcf) = 22.6
USCS Class = OH
LL = 122; PI = 47
% Fines = 41
Initial Water Content (%) = 236.5
2013-743A
Effective Confining Pressure (psi) = 6.9
Initial Dry Density (pcf) = 20.6
USCS Class = OH
LL = 127; PI = 50
% Fines = 31
Initial Water Content (%) = 254.1
2013-743B
Effective Confining Pressure (psi) = 13.9
Initial Dry Density (pcf) = 19.1
USCS Class = OH
LL = 134; PI = 30
% Fines = 18
Initial Water Content (%) = 267.7
2013-743C
phi = 8 degrees
c = 1.9 psi = 275 psf
2013-743A
2013-743B
2013-743C
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
5
10
15
20
25
30
35

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS
CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 10/13/2013

2013-743A	
Effective Confining Pressure (psi) = 3.5	
Initial Dry Density (pcf) = 22.6	
USCS Class = OH	
LL = 122; PI = 47	
% Fines = 41	
Initial Water Content (%) = 236.5	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	4.5
Excess Pore Pressure @ Failure (psi)	3.2
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	5.3

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**3.47**	1.149	-0.45
0.1	0.25	3.20	1.005	0.01
0.2	0.55	2.93	1.109	0.32
0.5	1.05	2.42	1.425	1.03
1	1.67	1.80	2.078	1.94
1.5	2.13	1.34	2.970	2.65
2	2.48	1.00	4.219	3.23
3	2.89	0.58	7.567	3.82
4	3.09	0.39	12.097	4.30
5	3.17	0.31	15.205	4.46
6	3.22	0.25	19.962	4.72
7	3.31	0.16	31.247	4.83
8	3.38	0.09	53.930	5.02
9	3.43	0.04	136.390	5.14
10	3.47	0.01	955.726	5.28
11	3.50	-0.03	0.000	5.37
12	3.52	-0.04	0.000	5.40
13	3.55	-0.08	0.000	5.55
14	3.56	-0.08	0.000	5.59
15	3.57	-0.10	0.000	5.79
16	3.59	-0.12	0.000	5.82
17	3.60	-0.13	0.000	6.01
18	3.62	-0.14	0.000	6.11
19	3.62	-0.15	0.000	6.13
20	3.64	-0.16	0.000	6.30
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Test Date - 10/14/2013

2013-743B	
Effective Confining Pressure (psi) = 6.9	
Initial Dry Density (pcf) = 20.6	
USCS Class = OH	
LL = 127; PI = 50	
% Fines = 31	
Initial Water Content (%) = 254.1	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	6.4
Excess Pore Pressure @ Failure (psi)	5.4
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	7.6

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**6.95**	1.029	0.20
0.1	0.60	6.35	1.155	0.98
0.2	0.99	5.96	1.249	1.49
0.5	1.84	5.11	1.517	2.64
1	2.76	4.20	1.894	3.76
1.5	3.40	3.56	2.279	4.56
2	3.92	3.03	2.665	5.05
3	4.59	2.37	3.393	5.67
4	5.05	1.91	4.247	6.19
5	5.37	1.58	5.078	6.45
6	5.71	1.25	6.334	6.66
7	5.97	0.99	8.078	7.00
8	6.19	0.77	10.219	7.10
9	6.37	0.58	13.584	7.34
10	6.52	0.44	18.382	7.60
11	6.62	0.34	23.842	7.76
12	6.70	0.26	31.467	7.87
13	6.76	0.20	41.263	8.12
14	6.81	0.14	58.528	8.33
15	6.85	0.10	80.516	8.28
16	6.88	0.07	119.684	8.51
17	6.91	0.05	186.019	8.76
18	6.93	0.02	389.000	8.91
19	6.96	-0.01	0.000	9.06
20	7.00	-0.03	0.000	9.36
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Test Date - 10/14/2013

2013-743C	
Effective Confining Pressure (psi) = 13.9	
Initial Dry Density (pcf) = 19.1	
USCS Class = OH	
LL = 134; PI = 30	
% Fines = 18	
Initial Water Content (%) = 267.7	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	7.8
Excess Pore Pressure @ Failure (psi)	9.9
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	8.4

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**13.87**	1.046	-0.61
0.1	1.14	12.74	1.022	0.28
0.2	1.81	12.07	1.080	0.97
0.5	3.15	10.73	1.226	2.42
1	4.80	9.07	1.469	4.26
1.5	5.97	7.91	1.643	5.09
2	6.91	6.97	1.824	5.75
3	8.29	5.60	2.212	6.79
4	9.17	4.71	2.573	7.41
5	9.94	3.93	2.986	7.82
6	10.57	3.31	3.364	7.83
7	11.22	2.66	4.026	8.05
8	11.69	2.19	4.727	8.15
9	12.17	1.72	5.907	8.44
10	12.54	1.34	7.268	8.43
11	12.85	1.03	9.264	8.54
12	13.11	0.77	12.124	8.59
13	13.33	0.55	16.783	8.70
14	13.51	0.37	24.612	8.78
15	13.65	0.23	39.541	8.97
16	13.78	0.10	89.282	9.02
17	13.88	0.00	0.000	9.02
18	13.98	-0.10	0.000	9.16
19	14.06	-0.17	0.000	9.31
20	14.10	-0.22	0.000	9.33
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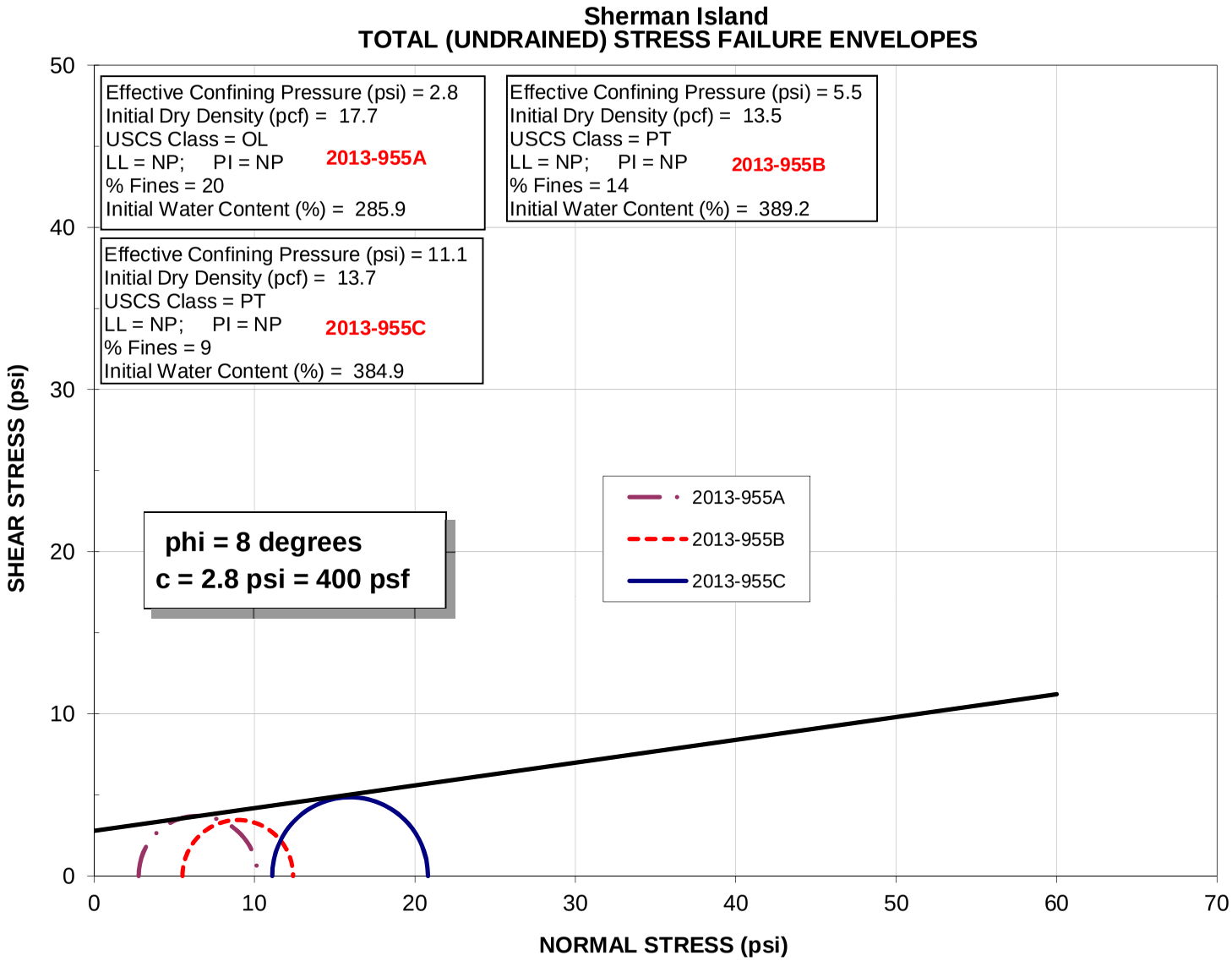
Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 2.8
Initial Dry Density (pcf) = 17.7
USCS Class = OL
LL = NP; PI = NP
2013-955A
% Fines = 20
Initial Water Content (%) = 285.9
Effective Confining Pressure (psi) = 5.5
Initial Dry Density (pcf) = 13.5
USCS Class = PT
LL = NP; PI = NP
2013-955B
% Fines = 14
Initial Water Content (%) = 389.2
Effective Confining Pressure (psi) = 11.1
Initial Dry Density (pcf) = 13.7
USCS Class = PT
LL = NP; PI = NP
2013-955C
% Fines = 9
Initial Water Content (%) = 384.9
phi = 8 degrees
c = 2.8 psi = 400 psf
2013-955A
2013-955B
2013-955C
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
10
20
30
40
50
60
70

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS
CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 10/18/2013

2013-955A	
Effective Confining Pressure (psi) = 2.8	
Initial Dry Density (pcf) = 17.7	
USCS Class = OL	
LL = NP; PI = NP	
% Fines = 20	
Initial Water Content (%) = 285.9	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	6.0
Excess Pore Pressure @ Failure (psi)	2.7
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	7.4

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**2.78**	1.004	-0.01
0.1	0.26	2.52	1.178	0.45
0.2	0.49	2.29	1.377	0.87
0.5	1.01	1.77	2.028	1.82
1	1.62	1.16	3.472	2.88
1.5	2.01	0.78	5.648	3.63
2	2.26	0.52	8.895	4.12
3	2.52	0.25	21.617	5.24
4	2.61	0.16	36.085	5.79
5	2.66	0.12	52.702	6.01
6	2.69	0.08	77.670	6.42
7	2.74	0.04	195.481	6.81
8	2.78	0.00	2685.277	6.87
9	2.81	-0.03	0.000	7.03
10	2.84	-0.06	0.000	7.41
11	2.87	-0.09	0.000	7.48
12	2.88	-0.10	0.000	7.48
13	2.90	-0.12	0.000	7.74
14	2.91	-0.14	0.000	7.96
15	2.93	-0.15	0.000	7.89
16	2.95	-0.17	0.000	8.02
17	2.96	-0.18	0.000	8.30
18	2.97	-0.19	0.000	8.31
19	2.99	-0.21	0.000	8.28
20	3.00	-0.22	0.000	8.47
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Test Date - 10/18/2013

2013-955B	
Effective Confining Pressure (psi) = 5.5	
Initial Dry Density (pcf) = 13.5	
USCS Class = PT	
LL = NP; PI = NP	
% Fines = 14	
Initial Water Content (%) = 389.2	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	6.1
Excess Pore Pressure @ Failure (psi)	5.3
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	6.9

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**5.52**	1.087	-0.44
0.1	0.37	5.16	1.011	0.06
0.2	0.66	4.87	1.110	0.53
0.5	1.41	4.12	1.393	1.62
1	2.39	3.14	1.941	2.96
1.5	3.16	2.38	2.558	3.70
2	3.76	1.78	3.432	4.33
3	4.65	0.89	6.954	5.29
4	5.12	0.41	15.670	5.95
5	5.30	0.23	27.208	6.14
6	5.41	0.12	53.338	6.27
7	5.52	0.01	470.614	6.40
8	5.61	-0.07	0.000	6.60
9	5.69	-0.16	0.000	6.66
10	5.75	-0.22	0.000	6.89
11	5.81	-0.28	0.000	6.87
12	5.85	-0.32	0.000	6.92
13	5.88	-0.35	0.000	7.09
14	5.92	-0.38	0.000	7.28
15	5.94	-0.41	0.000	7.19
16	5.95	-0.42	0.000	7.28
17	5.97	-0.44	0.000	7.55
18	5.99	-0.46	0.000	7.58
19	6.01	-0.48	0.000	7.40
20	6.03	-0.50	0.000	7.67
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Test Date - 10/20/2013

2013-955C	
Effective Confining Pressure (psi) = 11.1	
Initial Dry Density (pcf) = 13.7	
USCS Class = PT	
LL = NP; PI = NP	
% Fines = 9	
Initial Water Content (%) = 384.9	
FAILURE CRITERIA SELECTION	
Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	8.6
Excess Pore Pressure @ Failure (psi)	8.2
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	9.7

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**11.10**	1.061	-0.63
0.1	0.63	10.48	1.021	0.22
0.2	1.06	10.05	1.081	0.81
0.5	2.10	9.01	1.255	2.30
1	3.24	7.86	1.495	3.90
1.5	4.39	6.72	1.748	5.03
2	5.18	5.93	1.995	5.90
3	6.44	4.67	2.526	7.13
4	7.42	3.69	3.202	8.12
5	8.17	2.94	3.925	8.61
6	8.68	2.44	4.687	9.00
7	9.06	2.05	5.504	9.23
8	9.43	1.68	6.598	9.39
9	9.80	1.31	8.247	9.51
10	10.11	0.99	10.761	9.71
11	10.37	0.74	14.667	10.05
12	10.56	0.55	19.360	10.07
13	10.70	0.41	25.905	10.23
14	10.80	0.31	34.033	10.34
15	10.88	0.23	45.775	10.39
16	10.95	0.16	66.527	10.41
17	11.01	0.10	104.112	10.53
18	11.03	0.08	138.695	10.70
19	11.07	0.04	287.769	10.65
20	11.11	0.00	0.000	10.79
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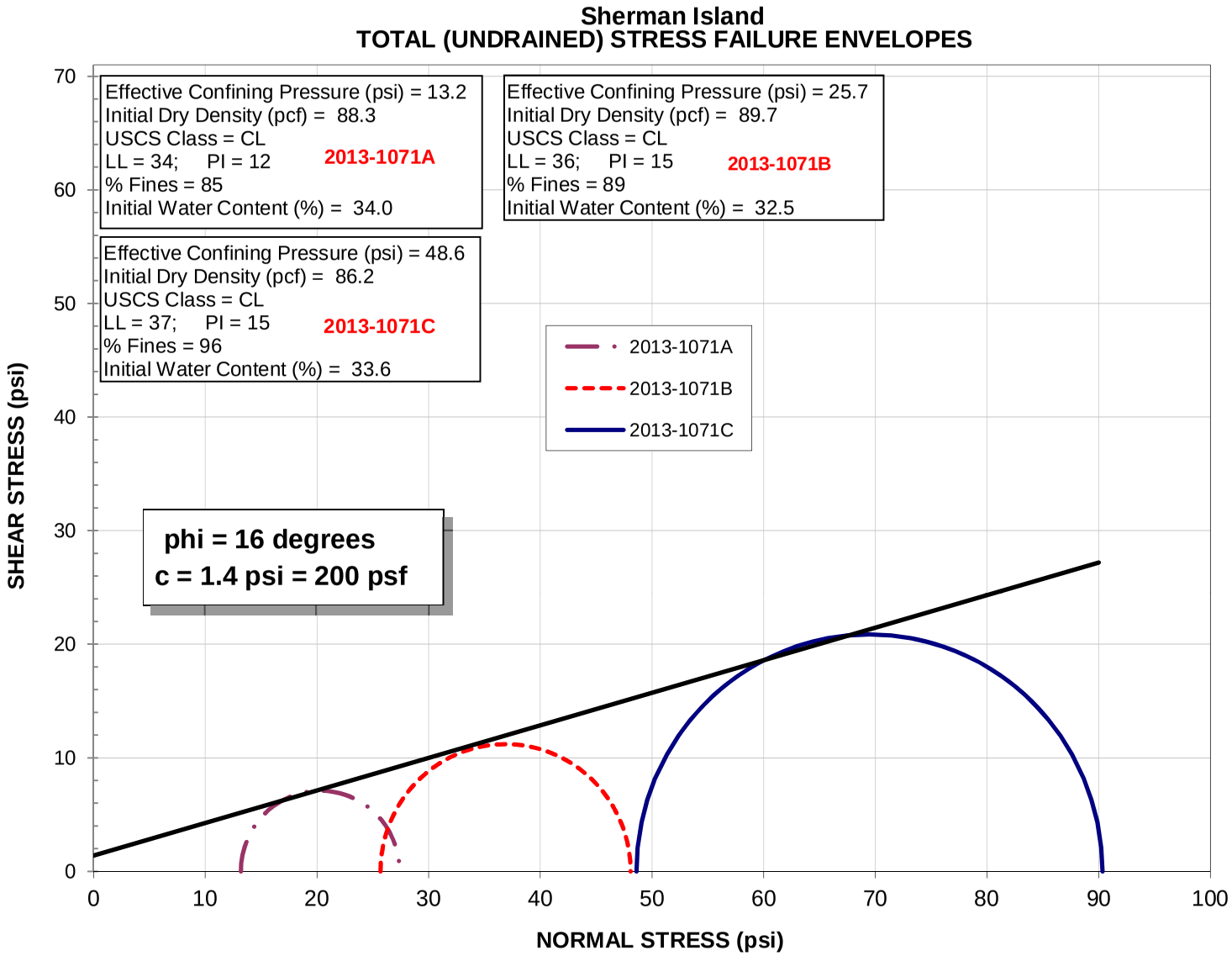
Sherman Island
TOTAL (UNDRAINED) STRESS FAILURE ENVELOPES
Effective Confining Pressure (psi) = 13.2
Initial Dry Density (pcf) = 88.3
USCS Class = CL
LL = 34; PI = 12
% Fines = 85
Initial Water Content (%) = 34.0
2013-1071A
Effective Confining Pressure (psi) = 25.7
Initial Dry Density (pcf) = 89.7
USCS Class = CL
LL = 36; PI = 15
% Fines = 89
Initial Water Content (%) = 32.5
2013-1071B
Effective Confining Pressure (psi) = 48.6
Initial Dry Density (pcf) = 86.2
USCS Class = CL
LL = 37; PI = 15
% Fines = 96
Initial Water Content (%) = 33.6
2013-1071C
2013-1071A
2013-1071B
2013-1071C
phi = 16 degrees
c = 1.4 psi = 200 psf
SHEAR STRESS (psi)
NORMAL STRESS (psi)
0
10
20
30
40
50
60
70
80
90
100

Sherman Island
Location:

ASTM 4767: TRIAXIAL COMPRESSION TEST RESULTS

CONSOLIDATED UNDRAINED WITH PORE PRESSURE MEASUREMENTS

Test Date - 10/4/2013

2013-1071A

Effective Confining Pressure (psi) = 13.2
Initial Dry Density (pcf) = 88.3
USCS Class = CL
LL = 34; PI = 12
% Fines = 85
Initial Water Content (%) = 34.0

FAILURE CRITERIA SELECTION

Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	13.8
Excess Pore Pressure @ Failure (psi)	7.7
Total	
Failure Criteria (Strain @ PDS or 10%)	5.9
Dev. Stress @ Failure (psi)	14.2

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**13.20**	1.040	-0.51
0.1	1.73	11.47	1.232	2.66
0.2	2.90	10.30	1.412	4.24
0.5	4.83	8.37	1.806	6.75
1	6.35	6.85	2.351	9.26
1.5	7.10	6.11	2.800	11.00
2	7.48	5.72	3.146	12.27
3	7.74	5.47	3.457	13.45
4	7.78	5.43	3.531	13.75
5	7.75	5.46	3.528	13.81
5.9	7.70	5.51	3.575	14.20
6	7.69	5.51	3.573	14.19
7	7.65	5.55	3.534	14.08
8	7.62	5.59	3.457	13.73
9	7.57	5.63	3.448	13.78
10	7.53	5.68	3.452	13.92
11	7.50	5.70	3.384	13.59
12	7.47	5.73	3.296	13.17
13	7.44	5.78	3.300	13.28
14	7.41	5.79	3.279	13.20
15	7.40	5.80	3.196	12.74
16	7.39	5.82	3.126	12.37
17	7.37	5.84	3.142	12.51
18	7.36	5.84	3.097	12.25
19	7.35	5.85	3.021	11.82
20	7.35	5.86	2.996	11.69
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Test Date - 10/4/2013

2013-1071B

Effective Confining Pressure (psi) = 25.7
Initial Dry Density (pcf) = 89.7
USCS Class = CL
LL = 36; PI = 15
% Fines = 89
Initial Water Content (%) = 32.5

FAILURE CRITERIA SELECTION

Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	22.3
Excess Pore Pressure @ Failure (psi)	16.5
Total	
Failure Criteria (Strain @ PDS or 10%)	6.24
Dev. Stress @ Failure (psi)	22.4

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**25.70**	1.020	-0.51
0.1	2.74	22.96	1.225	5.18
0.2	4.84	20.86	1.400	8.34
0.5	8.67	17.03	1.794	13.52
1	12.00	13.70	2.298	17.79
1.5	13.74	11.96	2.665	19.92
2	14.77	10.93	2.928	21.08
3	15.79	9.92	3.233	22.15
4	16.25	9.46	3.362	22.33
5	16.46	9.24	3.410	22.26
6	16.57	9.14	3.444	22.34
6.24	16.58	9.12	3.456	22.38
7	16.61	9.09	3.454	22.31
8	16.62	9.08	3.432	22.09
9	16.60	9.10	3.415	21.98
10	16.56	9.15	3.409	22.04
11	16.51	9.19	3.380	21.87
12	16.45	9.25	3.333	21.56
13	16.39	9.31	3.316	21.56
14	16.33	9.37	3.285	21.40
15	16.26	9.44	3.230	21.05
16	16.18	9.53	3.189	20.86
17	16.11	9.60	3.164	20.78
18	16.02	9.68	3.108	20.42
19	15.94	9.76	3.058	20.08
20	15.89	9.81	3.023	19.85
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Test Date - 10/7/2013

2013-1071C

Effective Confining Pressure (psi) = 48.6
Initial Dry Density (pcf) = 86.2
USCS Class = CL
LL = 37; PI = 15
% Fines = 96
Initial Water Content (%) = 33.6

FAILURE CRITERIA SELECTION

Effective	
Failure Criteria (Strain @ PSR or 5%)	5.0
Dev. Stress @ Failure (psi)	38.5
Excess Pore Pressure @ Failure (psi)	29.7
Total	
Failure Criteria (Strain @ PDS or 10%)	10
Dev. Stress @ Failure (psi)	41.7

Axial Strain ε (%)	Excess Pore Pressure Δu (psi)	Effective Confining Stress σ_3' (psi)	Stress Ratio σ_1'/σ_3'	Deviator Stress $(\sigma_1 - \sigma_3)$ (psi)
0	0.00	**48.62**	1.005	-0.25
0.1	4.69	43.93	1.205	8.98
0.2	8.58	40.05	1.353	14.14
0.5	15.80	32.83	1.682	22.38
1	21.75	26.87	2.062	28.52
1.5	24.82	23.80	2.322	31.46
2	26.57	22.06	2.509	33.29
3	28.50	20.13	2.764	35.49
4	29.32	19.31	2.926	37.17
5	29.65	18.97	3.027	38.45
6	29.72	18.90	3.078	39.26
7	29.63	19.00	3.125	40.38
8	29.45	19.18	3.139	41.02
9	29.21	19.39	3.126	41.23
10	28.95	19.67	3.121	41.72
11	28.70	19.93	3.106	41.98
12	28.44	20.19	3.074	41.88
13	28.17	20.46	3.047	41.87
14	27.91	20.72	3.020	41.85
15	27.65	20.98	2.984	41.62
16	27.39	21.25	2.937	41.15
17	27.13	21.50	2.911	41.08
18	26.91	21.72	2.874	40.69
19	26.68	21.95	2.825	40.07
20	26.46	22.15	2.788	39.62
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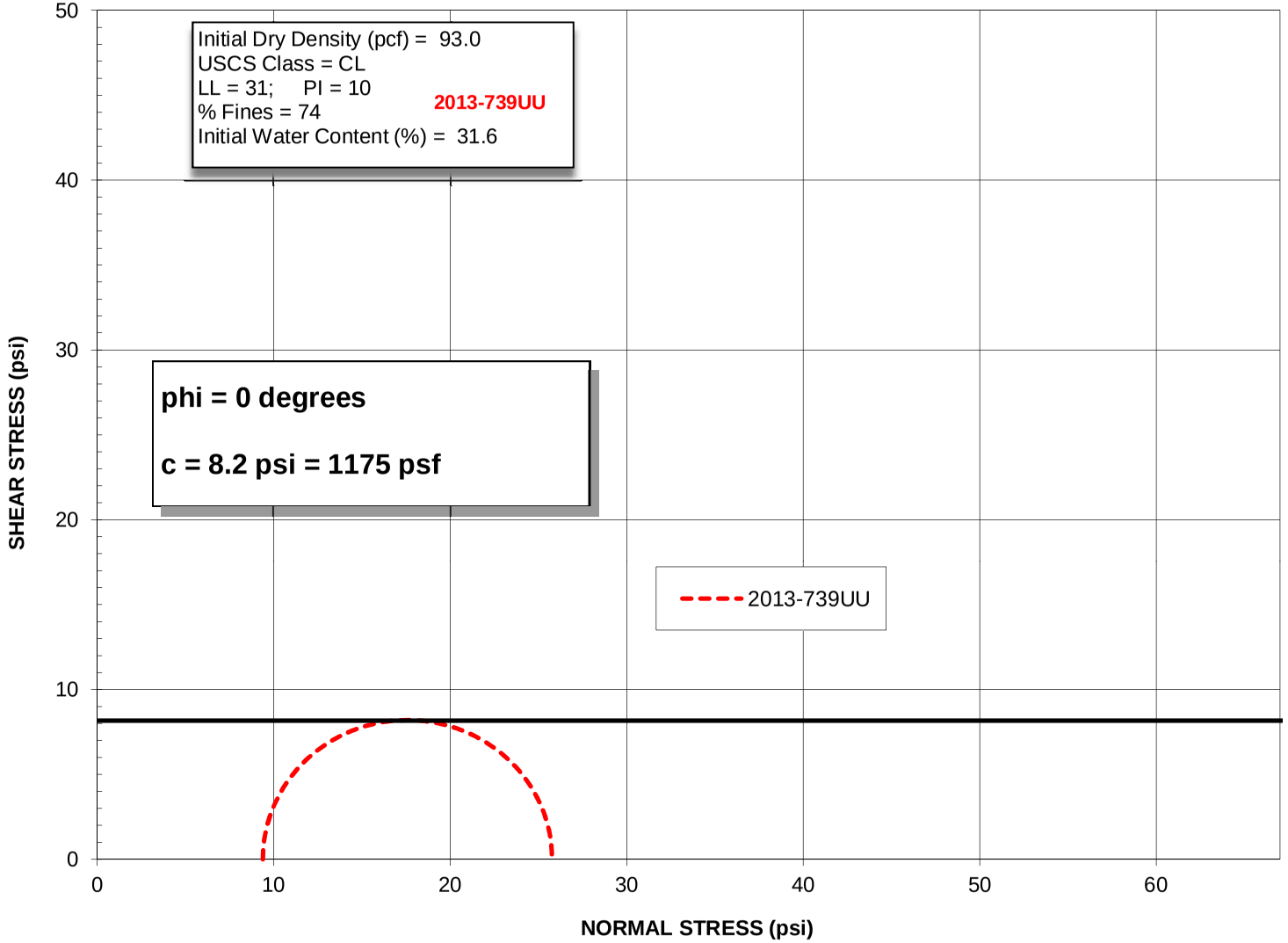
UNCONSOLIDATED UNDRAINED (UU) AXIAL COMPRESSION TEST

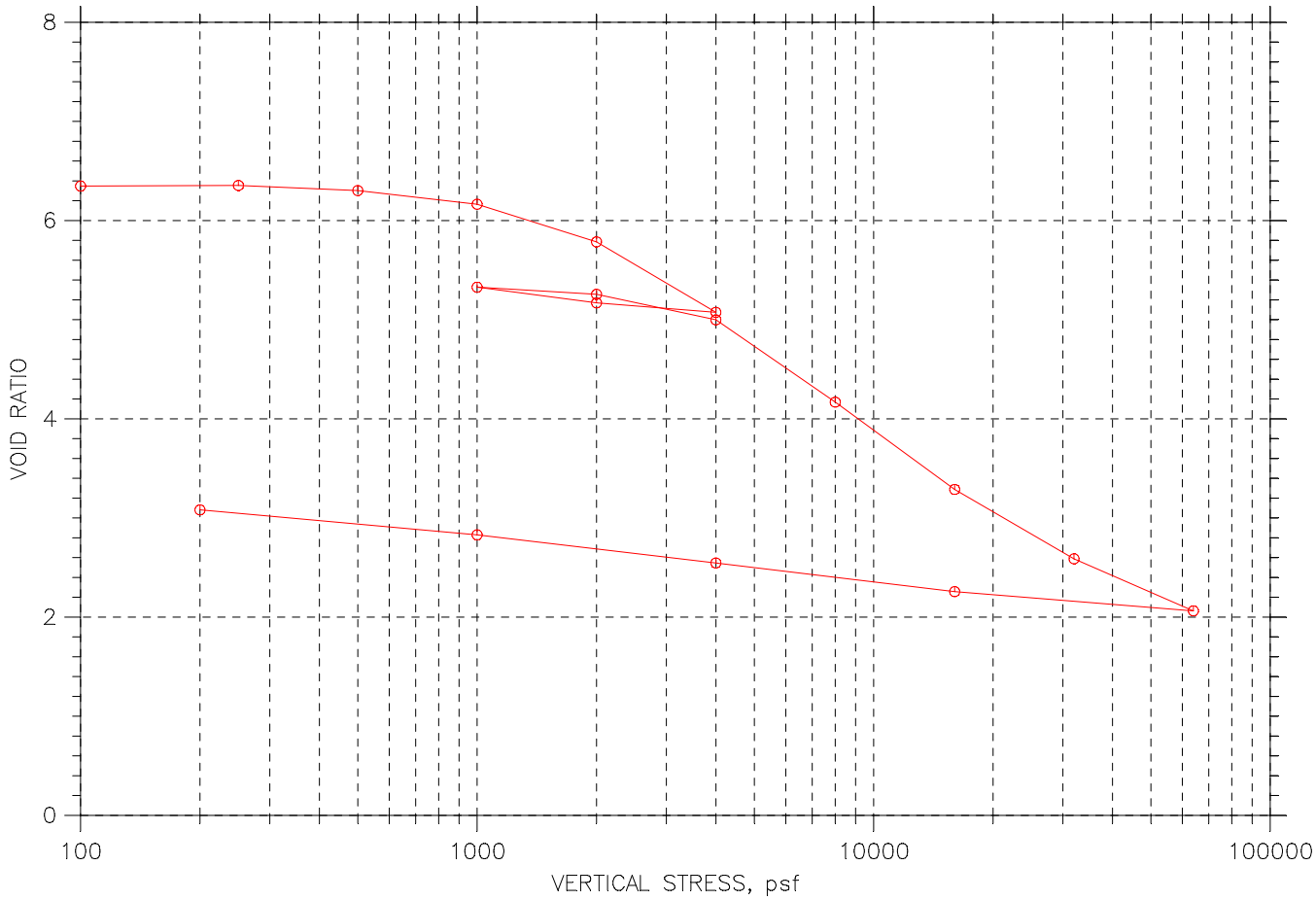
Boring: LB-S1, Sample T01@47.5

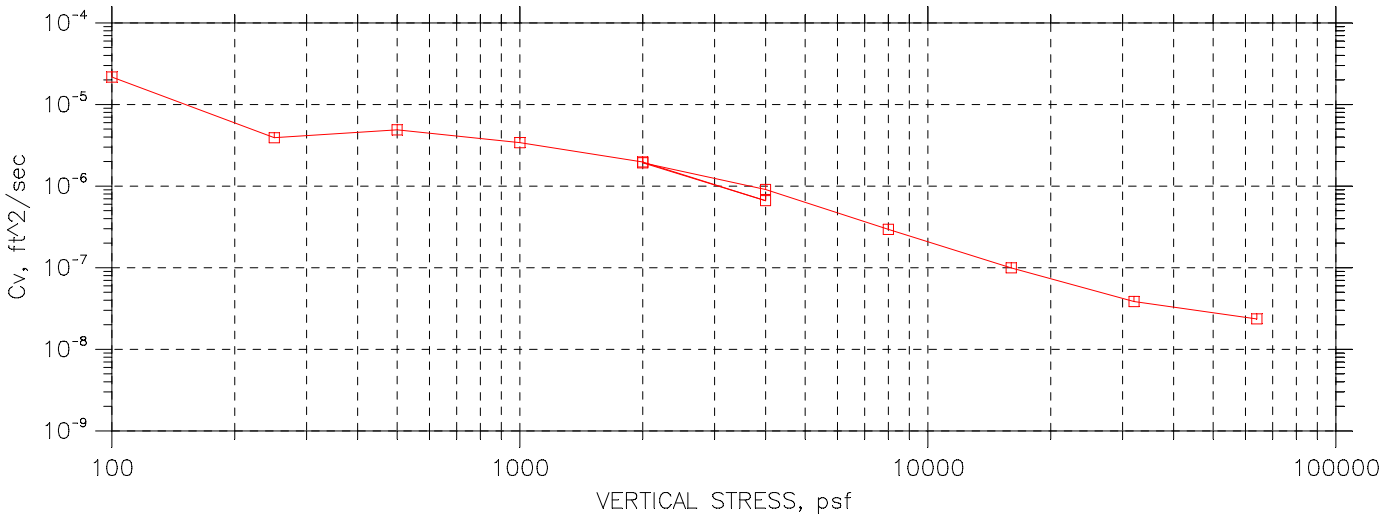


Note: Silty Clay,Brown,Firm

CONSOLIDATION TEST DATA

SUMMARY REPORT



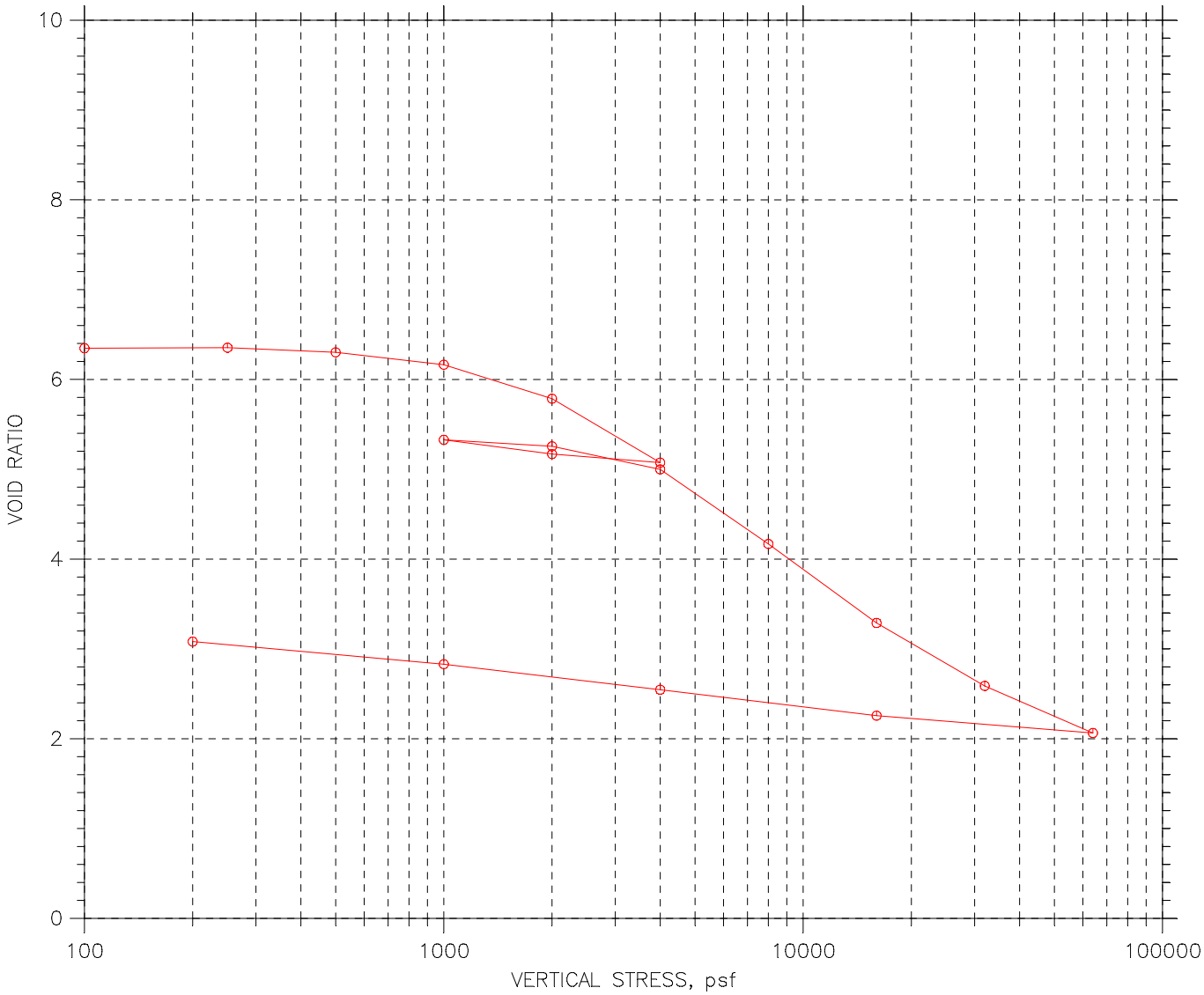


	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
DEPARTMENT OF WATER RESOURCES	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

Wed, 18-DEC-2013 15:09:53

CONSOLIDATION TEST DATA

SUMMARY REPORT



				Before Test	After Test
Overburden Pressure: 0 psf				Water Content, %	215.86	95.66
Preconsolidation Pressure: 0 psf				Dry Unit Weight, pcf	23.28	42.06
Compression Index: 3.81959e-313				Saturation, %	93.10	85.37
Diameter: 2.5 in		Height: 1 in		Void Ratio	6.38	3.08
LL: ---	PL: ---	PI: ---	GS: 2.75			

	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

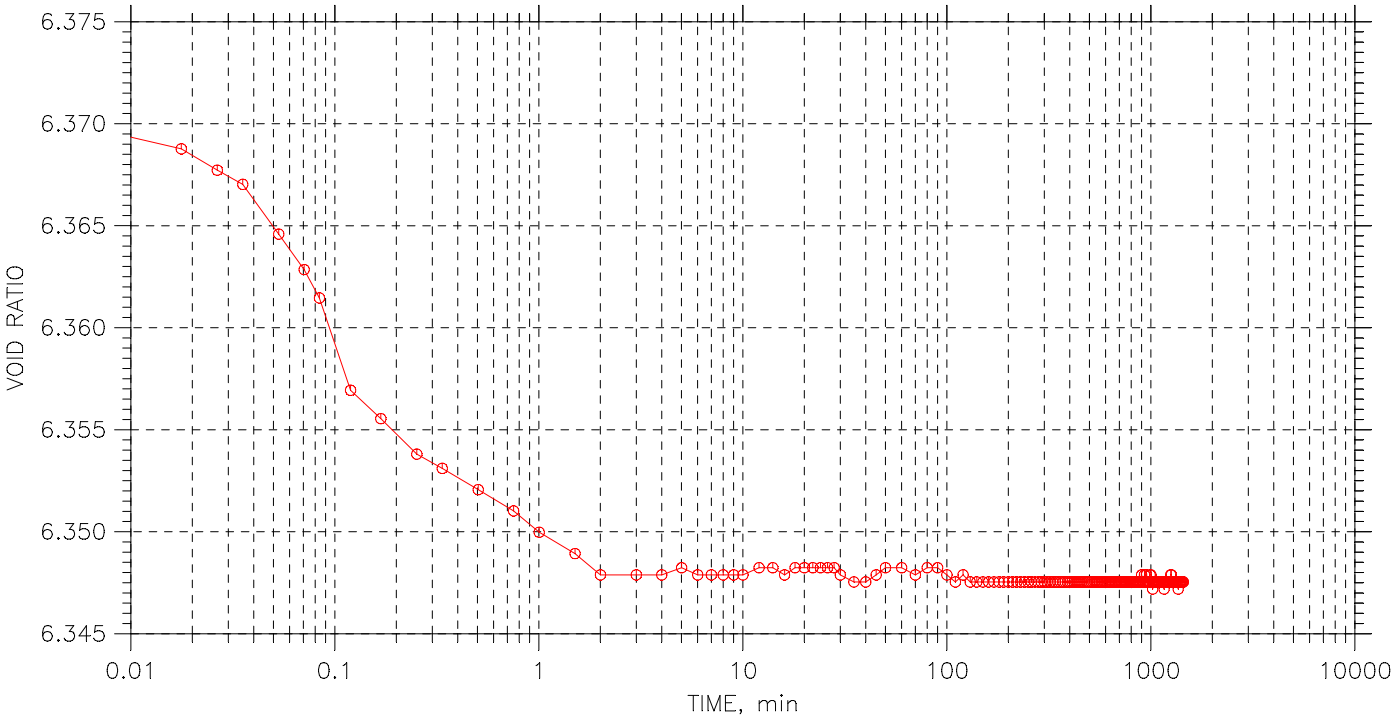
Wed, 18-DEC-2013 15:09:53

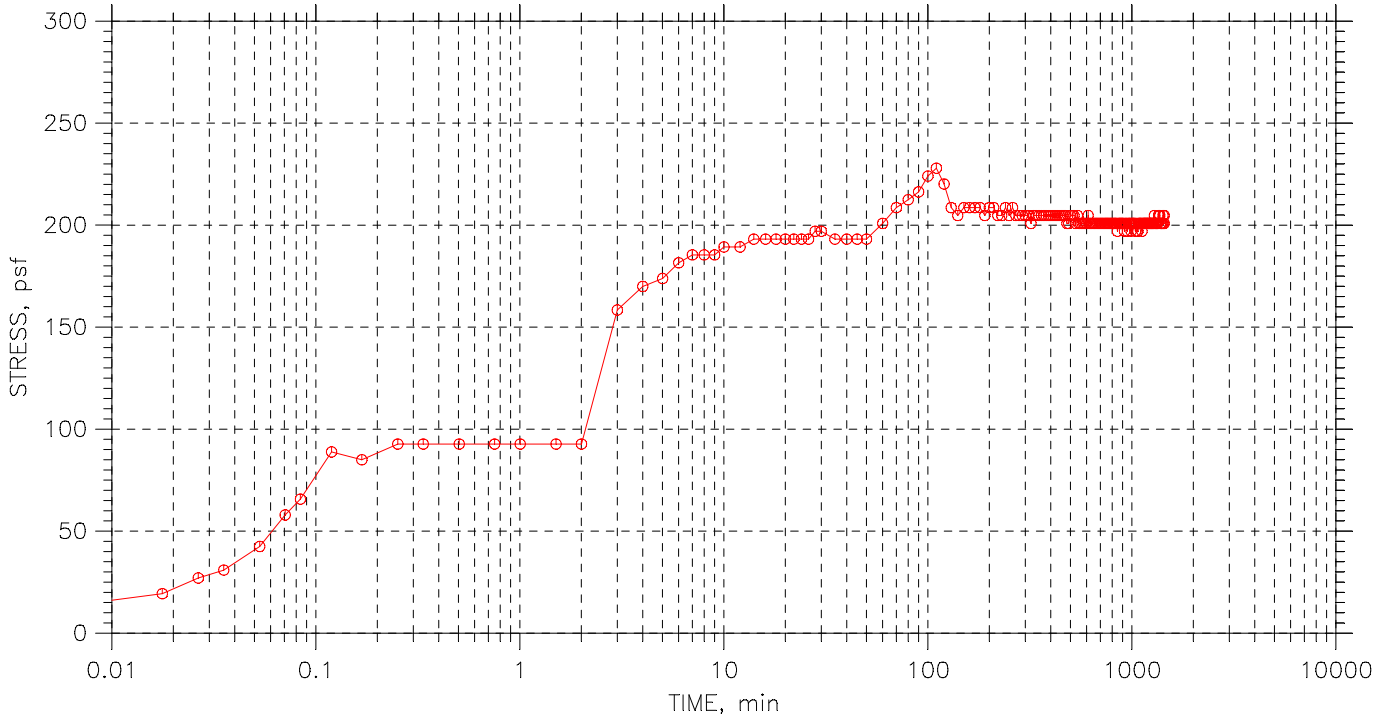
CONSOLIDATION TEST DATA

TIME CURVES

Constant Volume Step: 1 of 18

Stress: 100. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

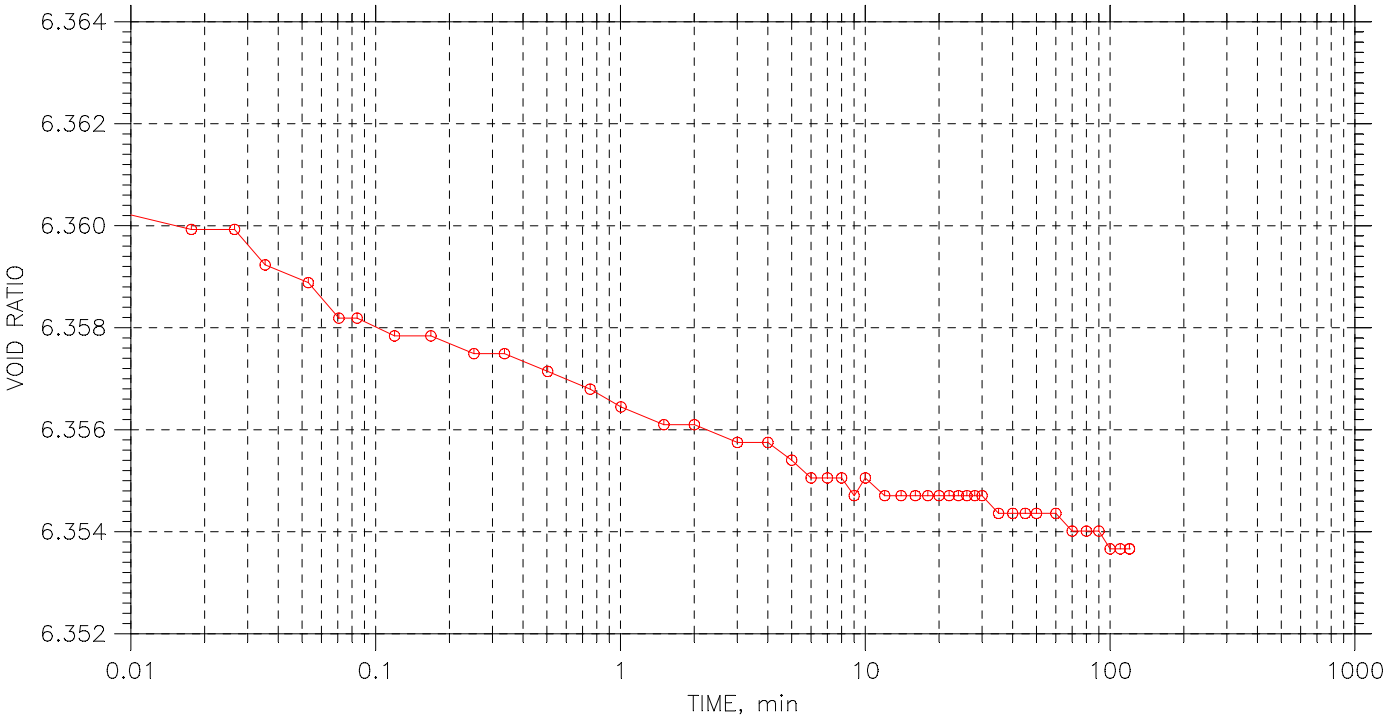
Wed, 18-DEC-2013 15:09:53

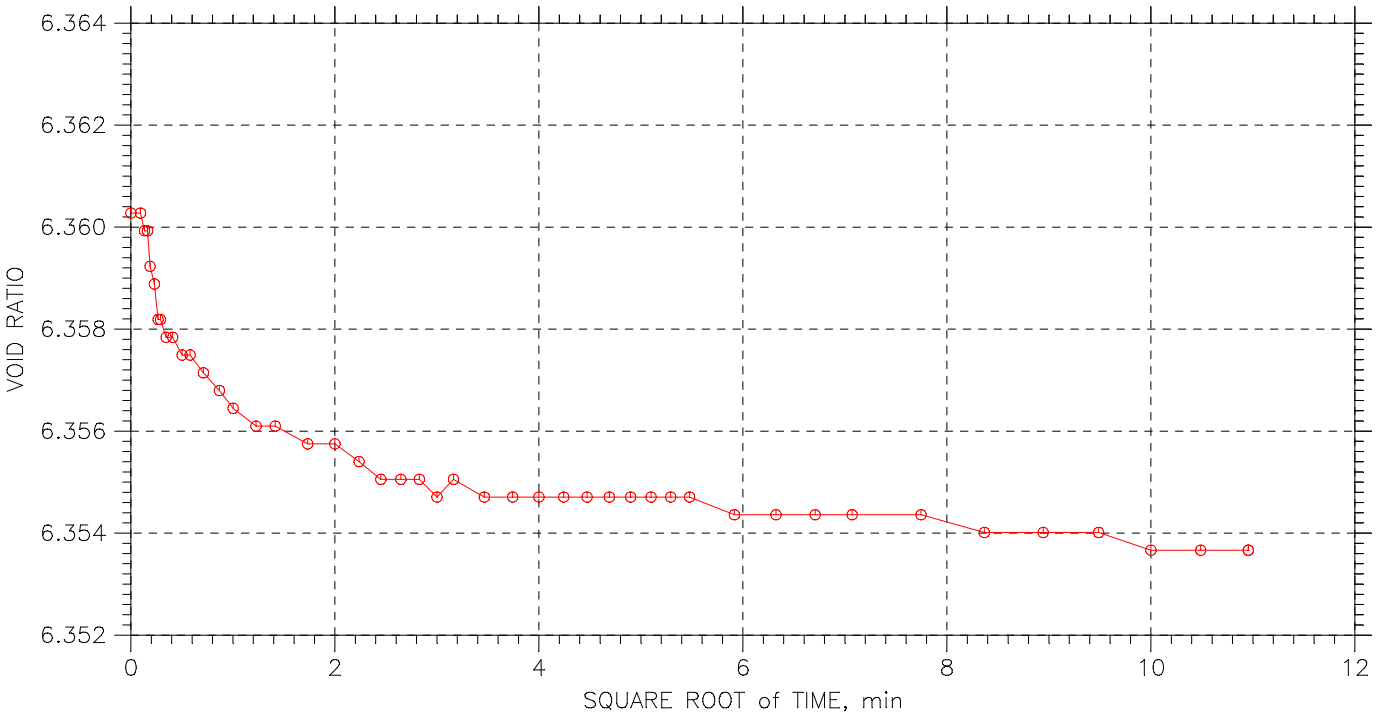
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 18

Stress: 250. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

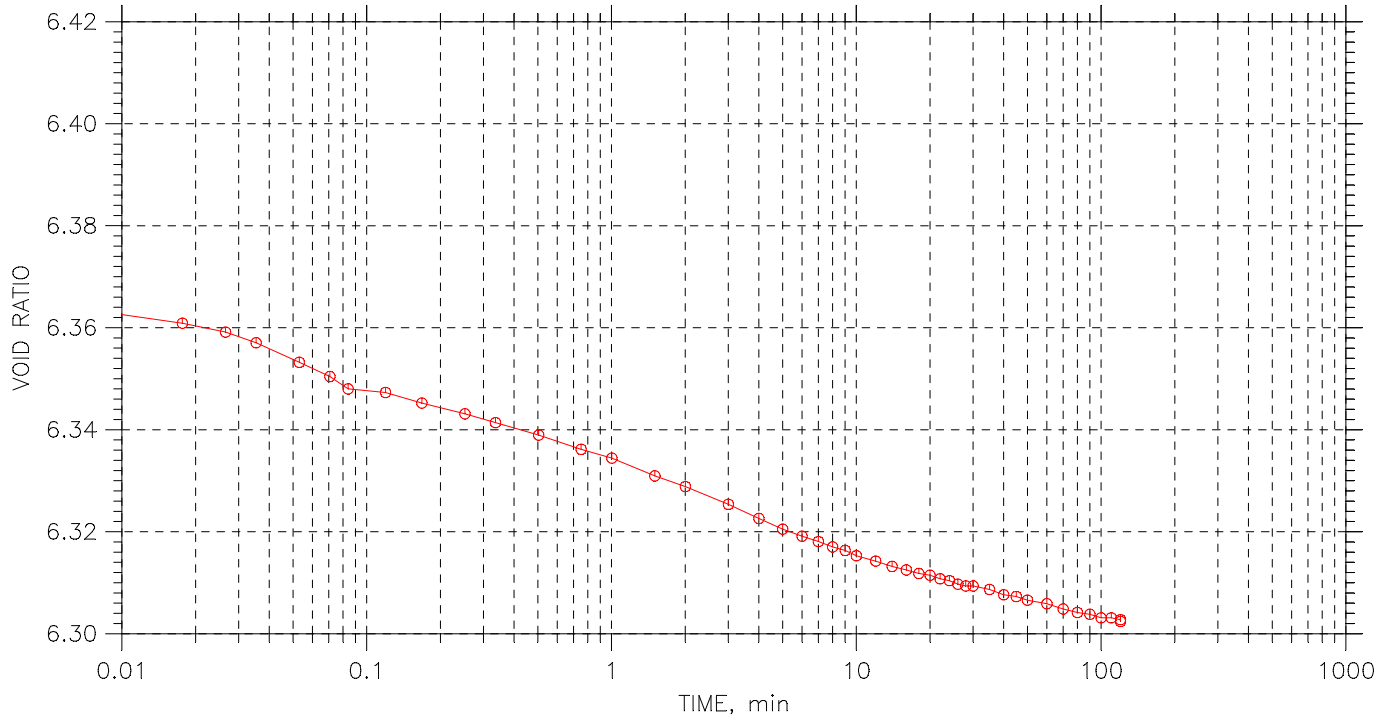
Wed, 18-DEC-2013 15:09:54

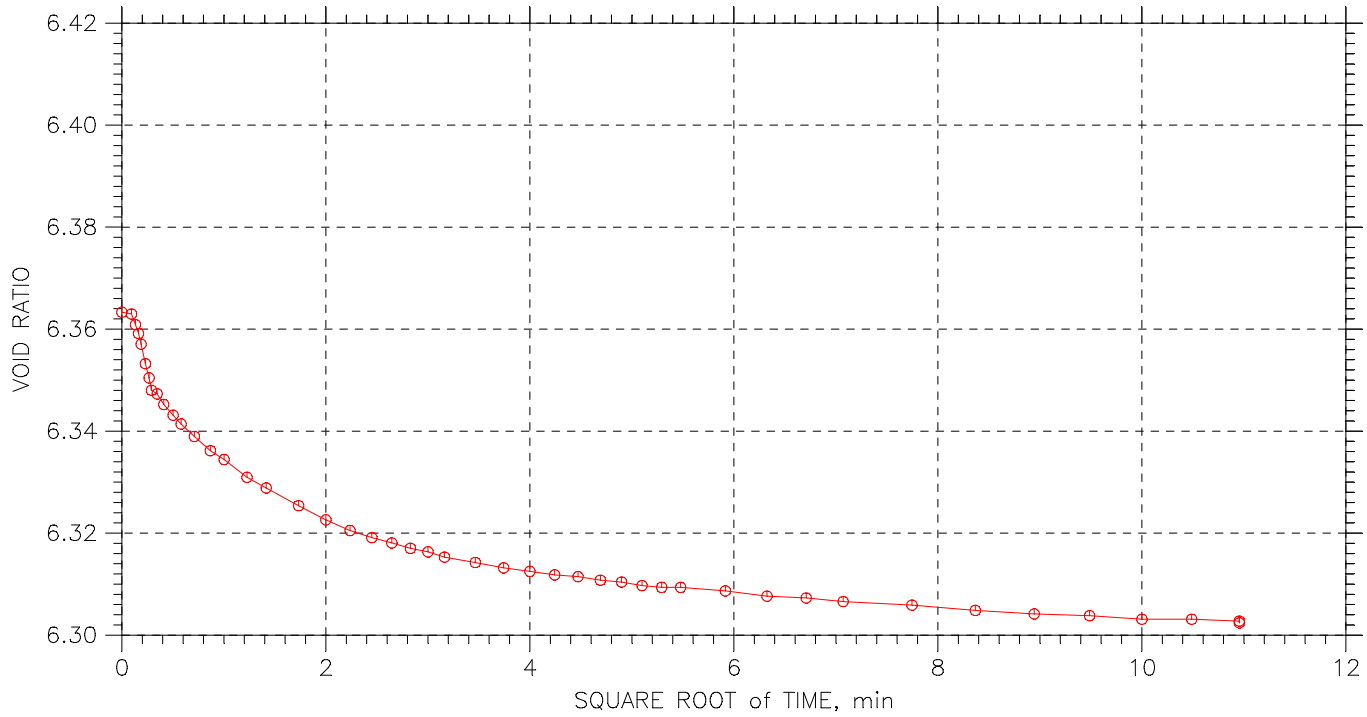
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 18

Stress: 500. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

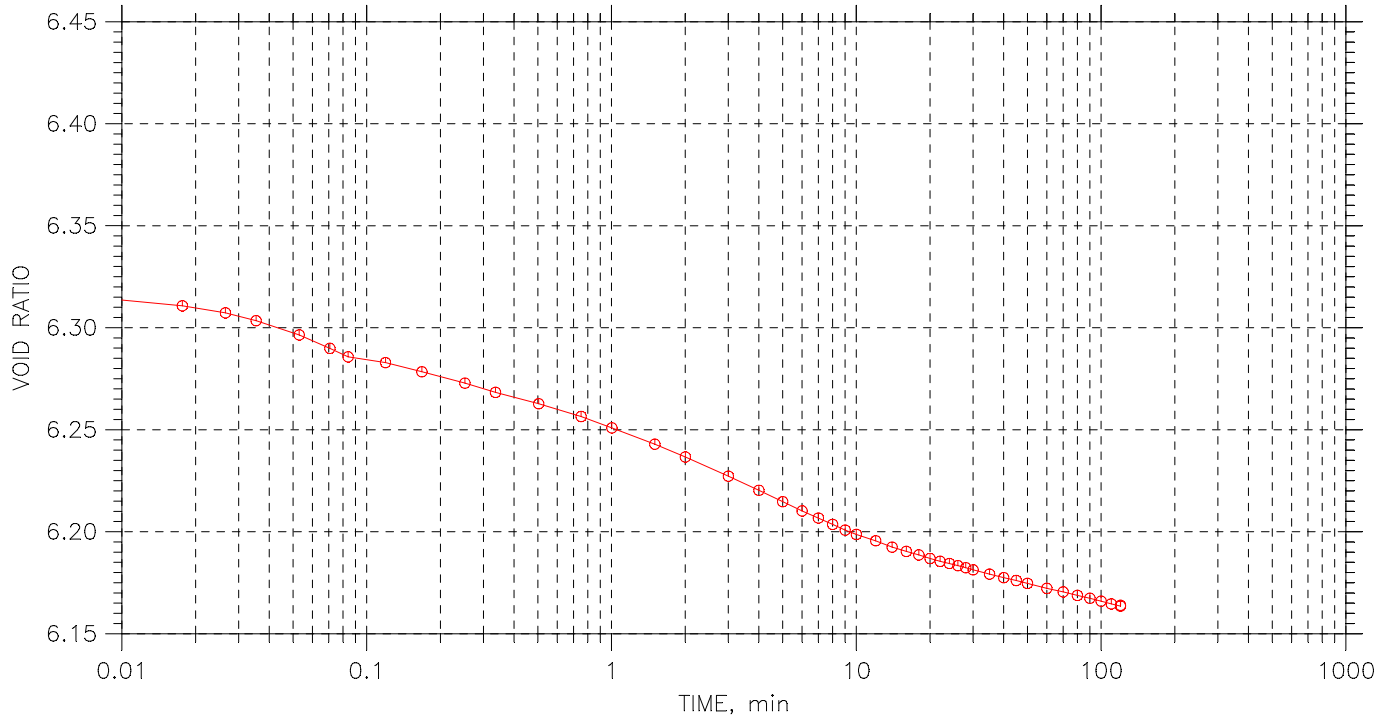
Wed, 18-DEC-2013 15:09:54

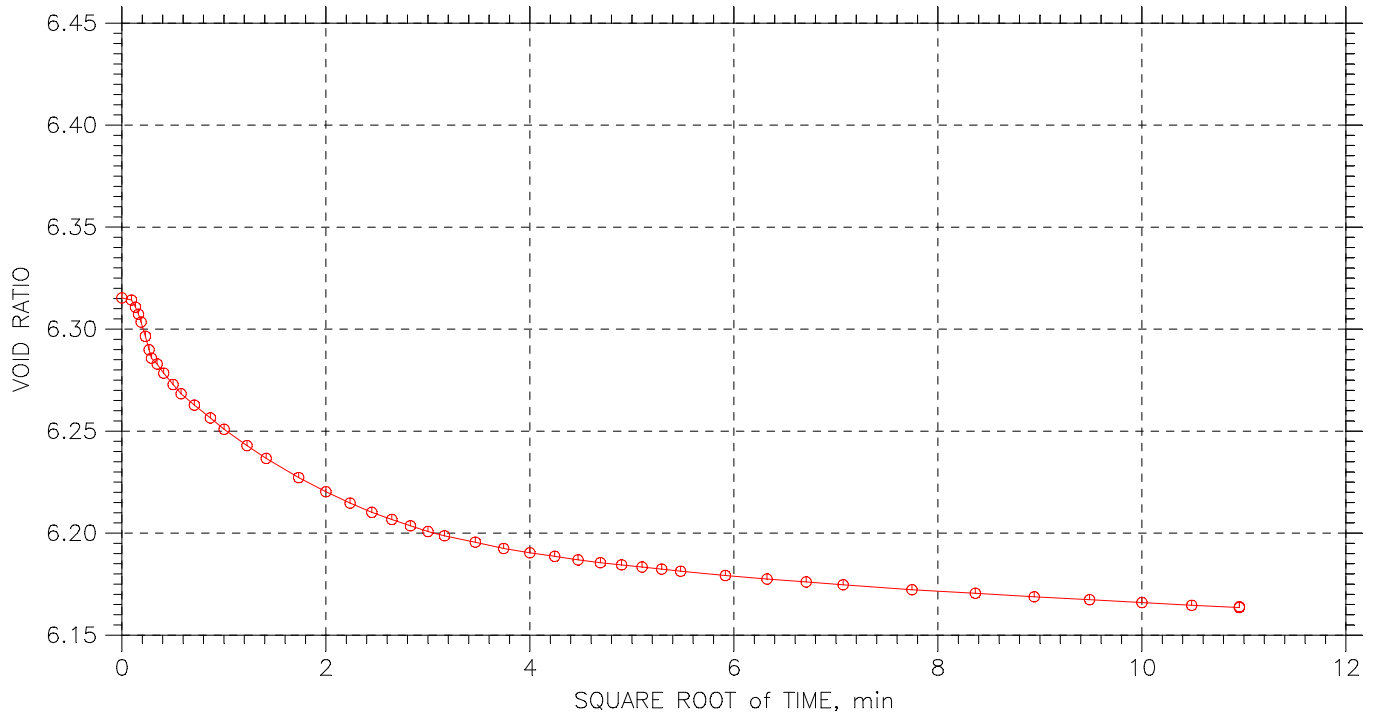
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 18

Stress: 1000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

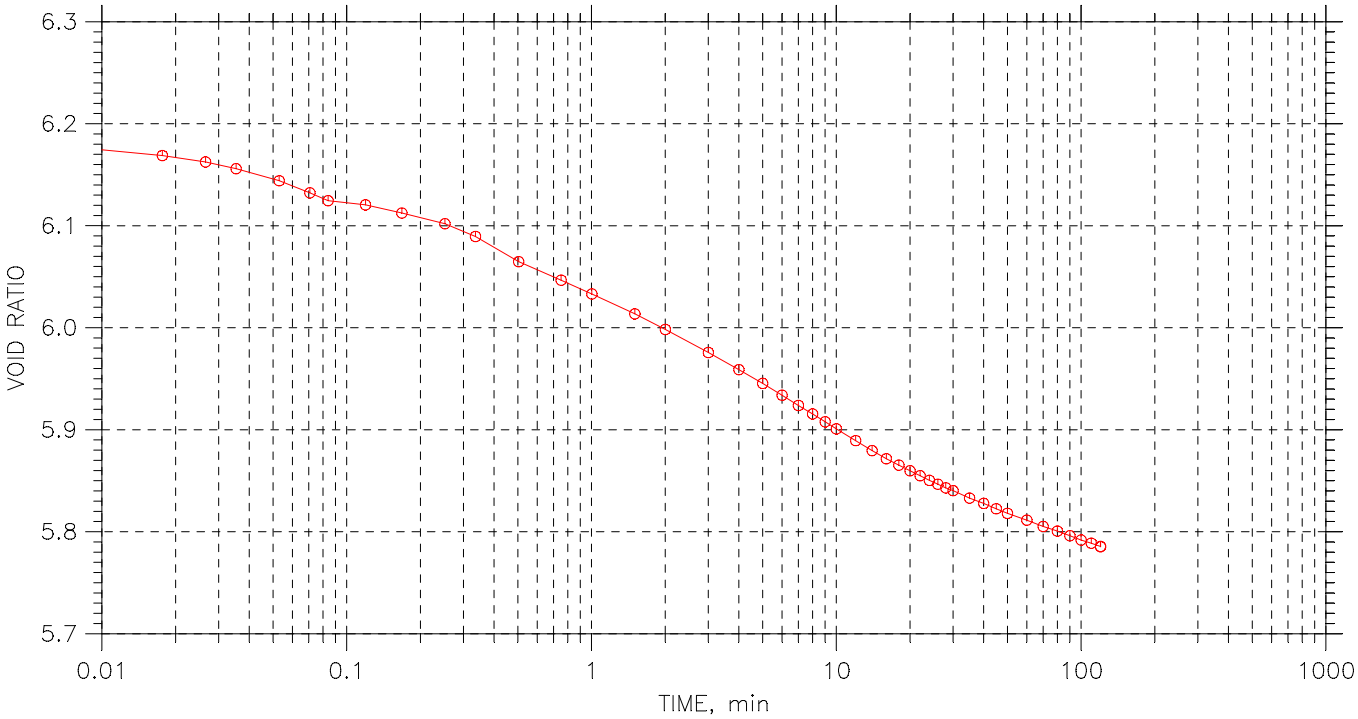
Wed, 18-DEC-2013 15:09:55

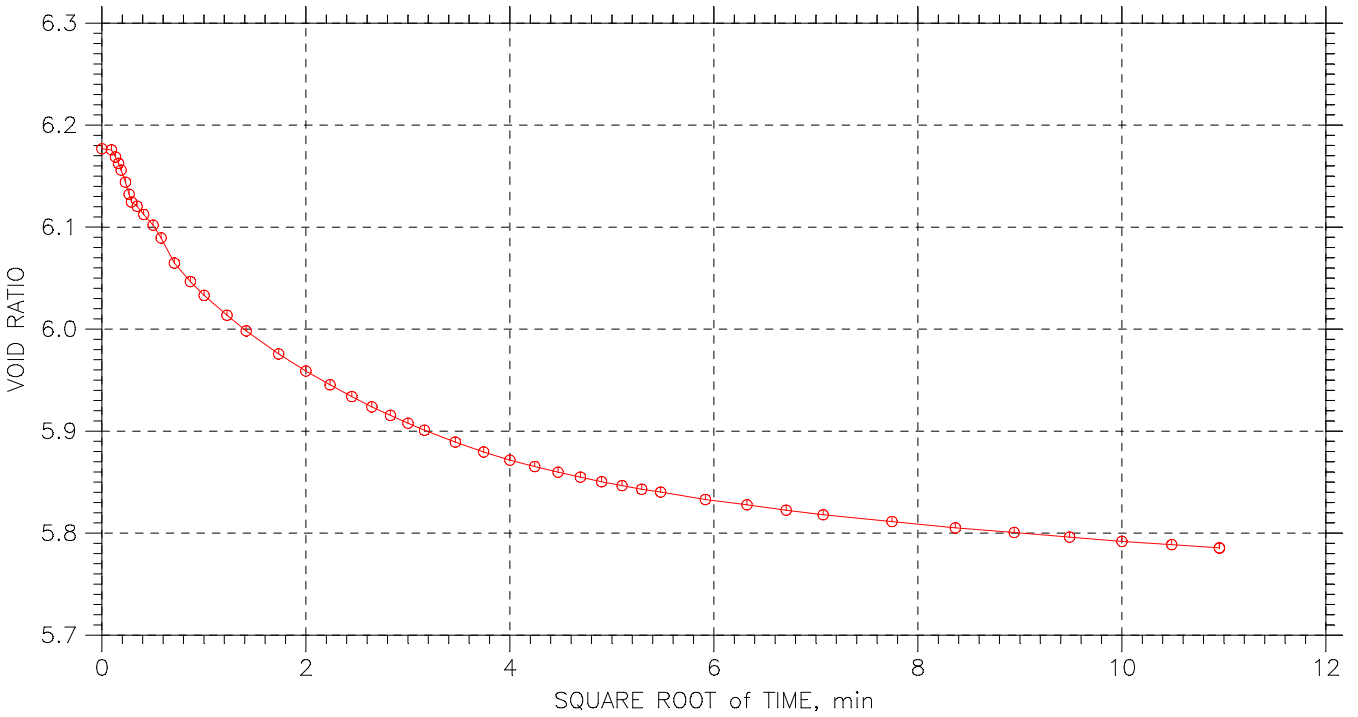
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 18

Stress: 2000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
DEPARTMENT OF WATER RESOURCES	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

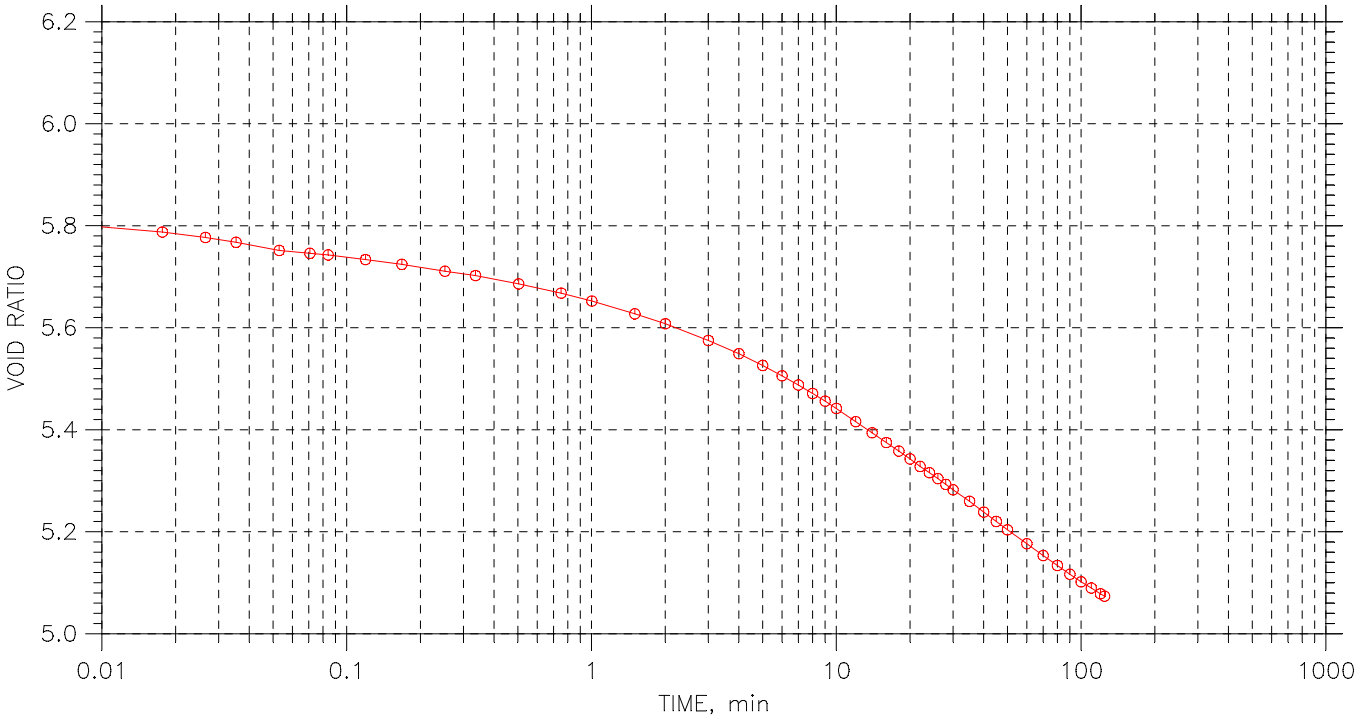
Wed, 18-DEC-2013 15:09:55

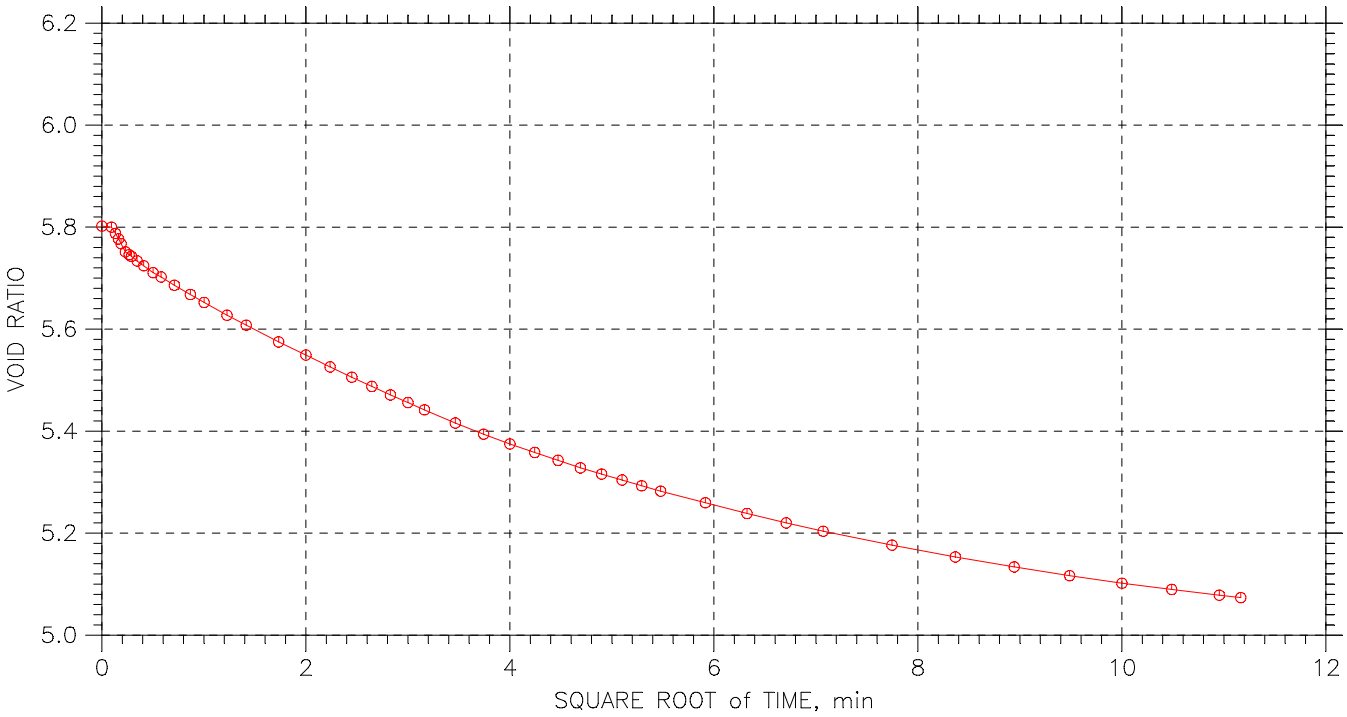
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 18

Stress: 4000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

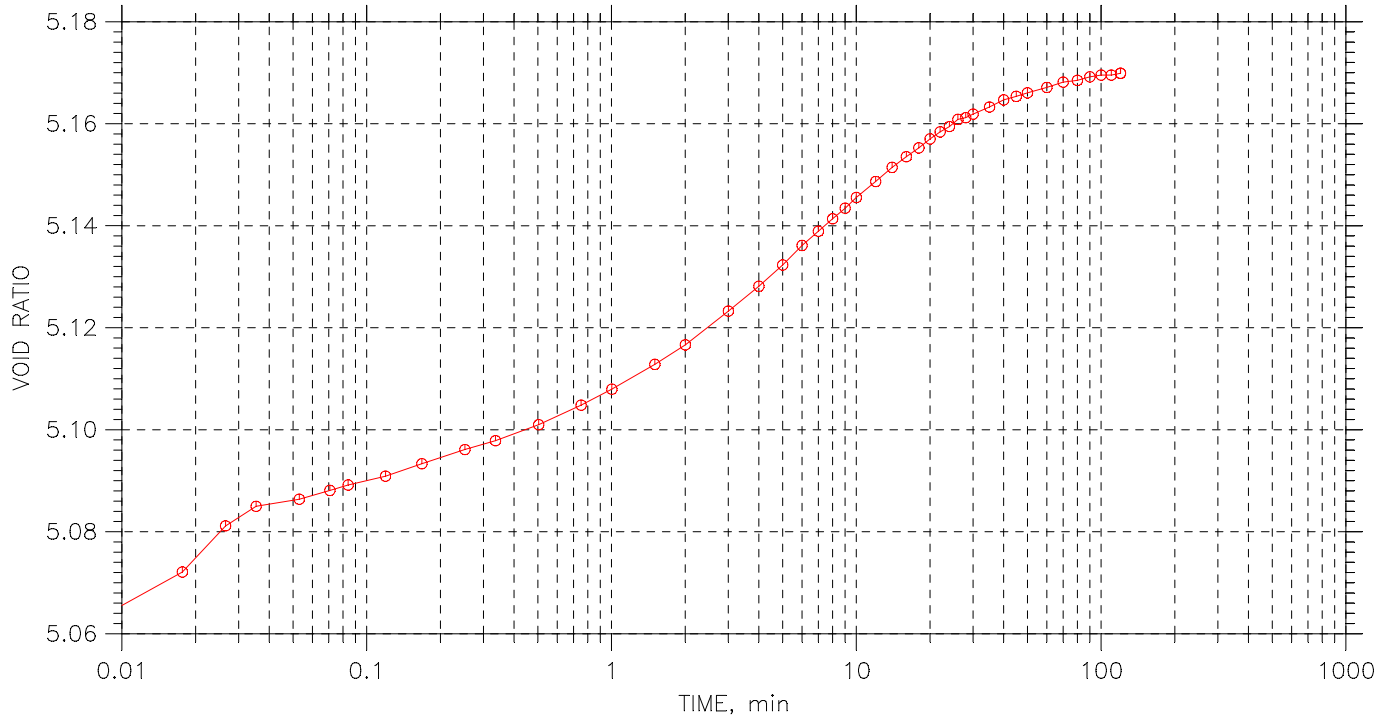
Wed, 18-DEC-2013 15:09:56

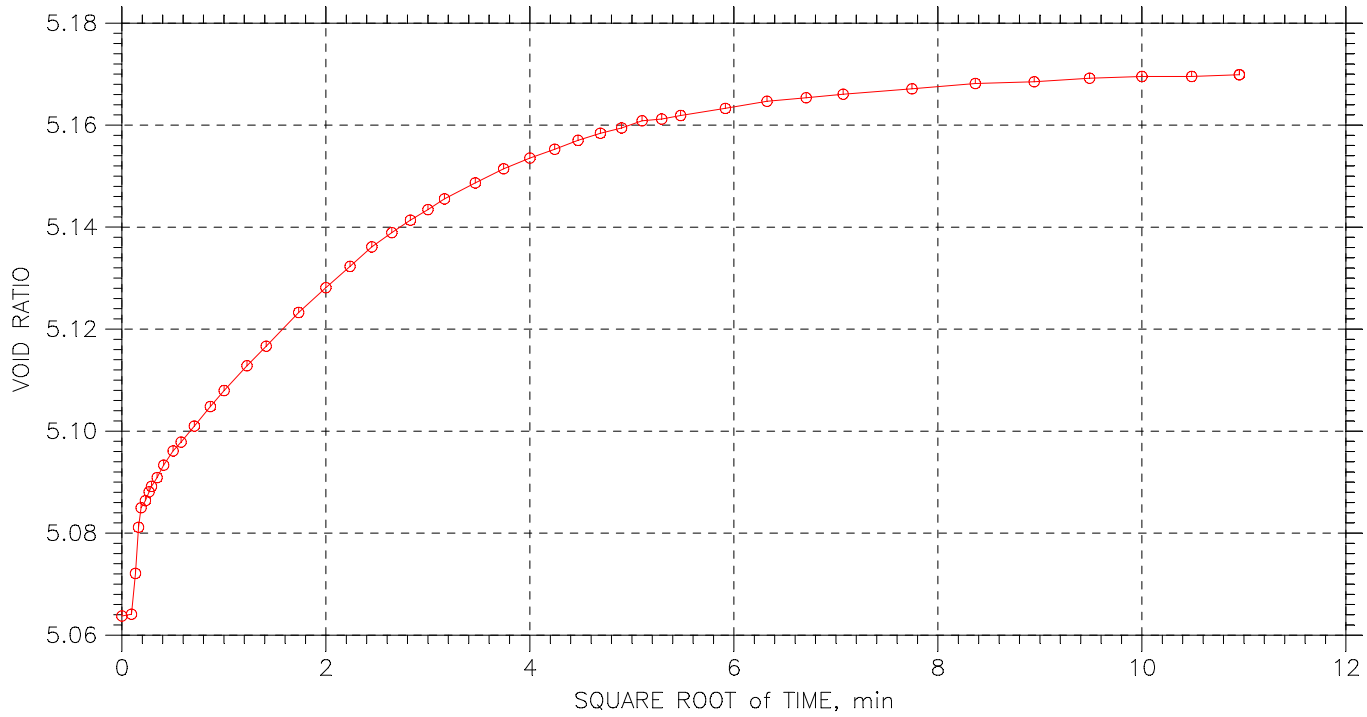
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 18

Stress: 2000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

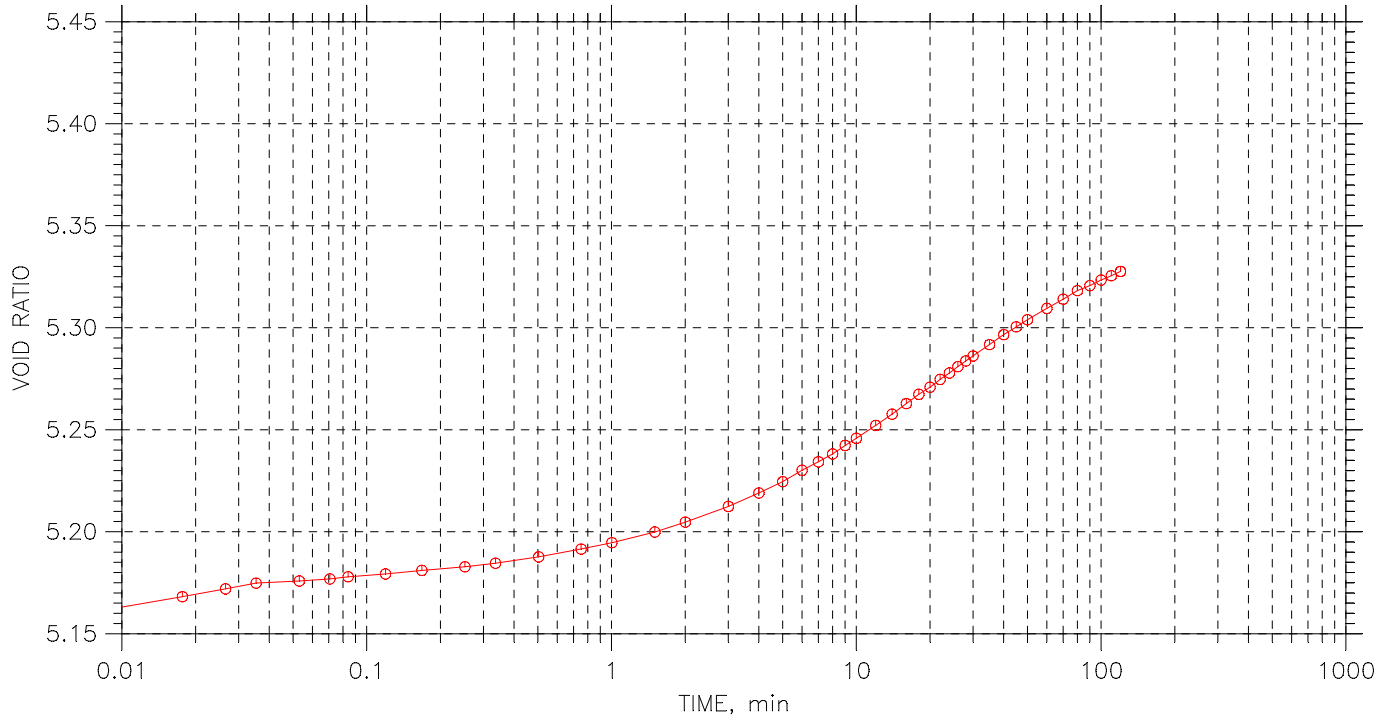
Wed, 18-DEC-2013 15:09:56

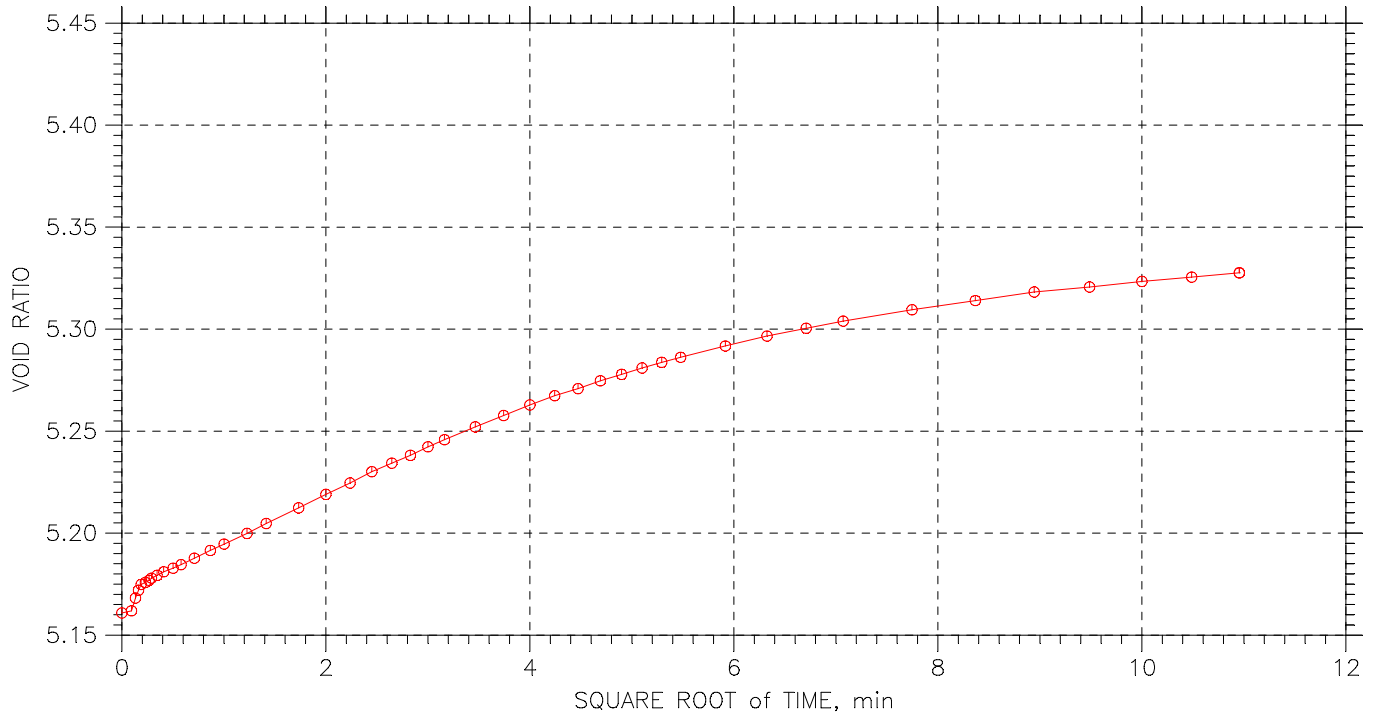
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 18

Stress: 1000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

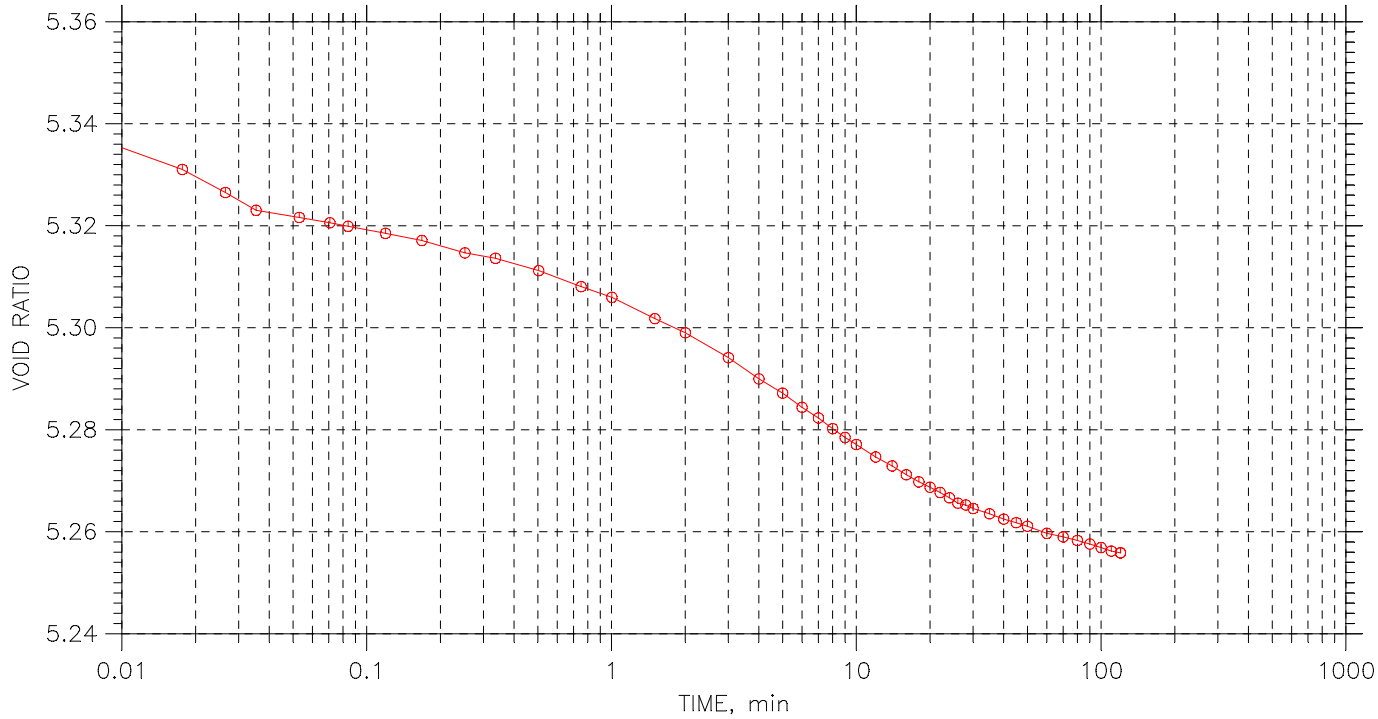
Wed, 18-DEC-2013 15:09:57

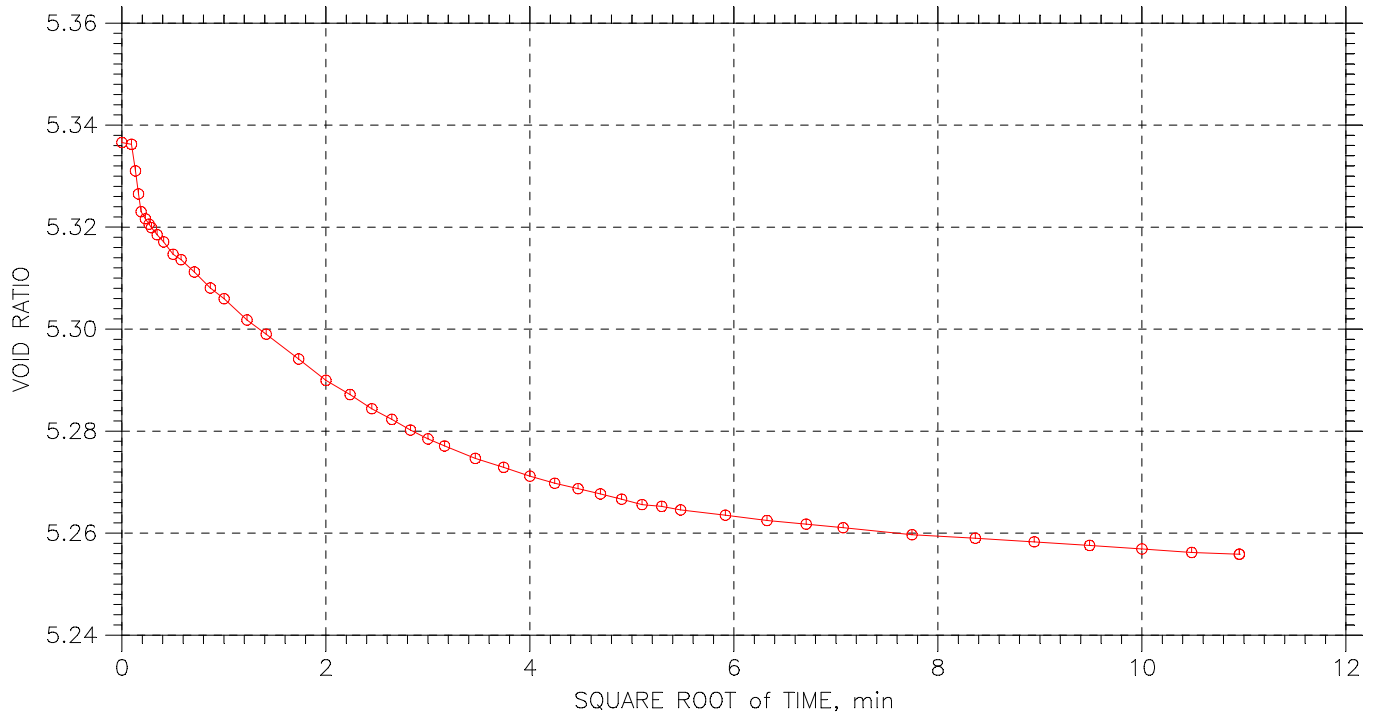
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 18

Stress: 2000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

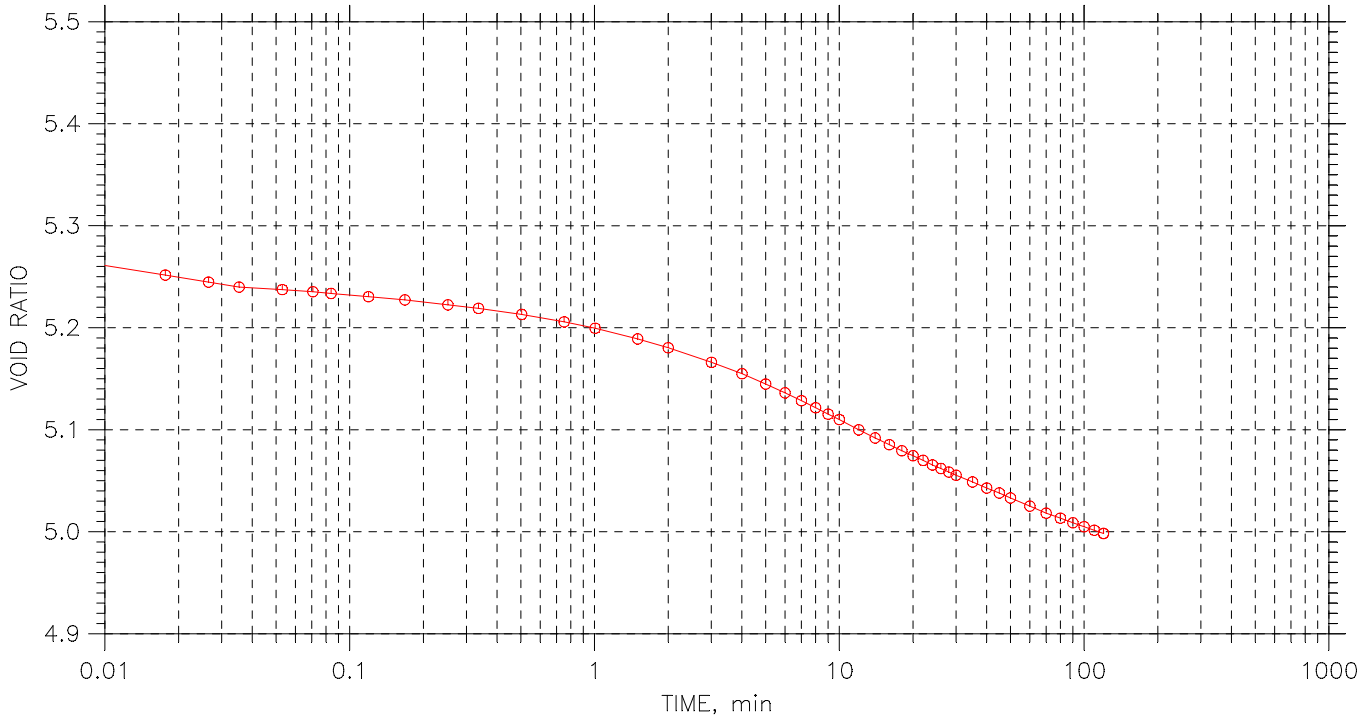
Wed, 18-DEC-2013 15:09:57

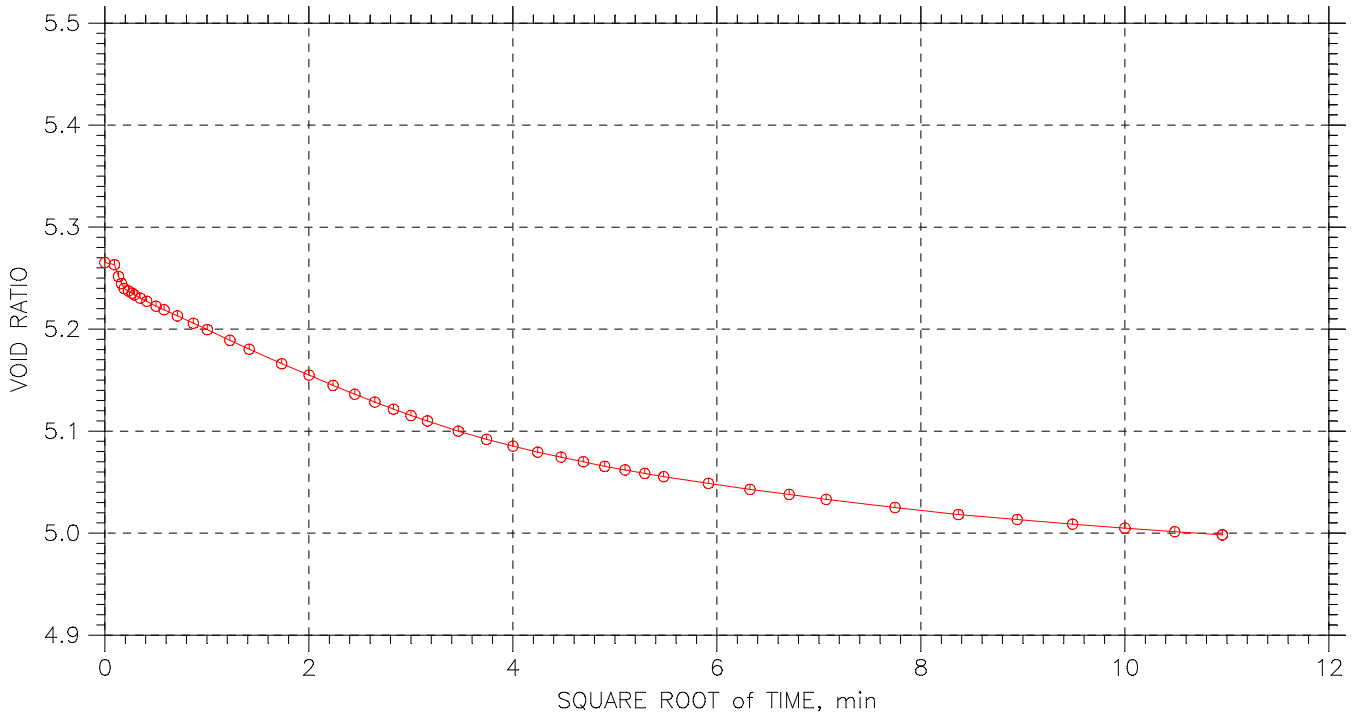
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 18

Stress: 4000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

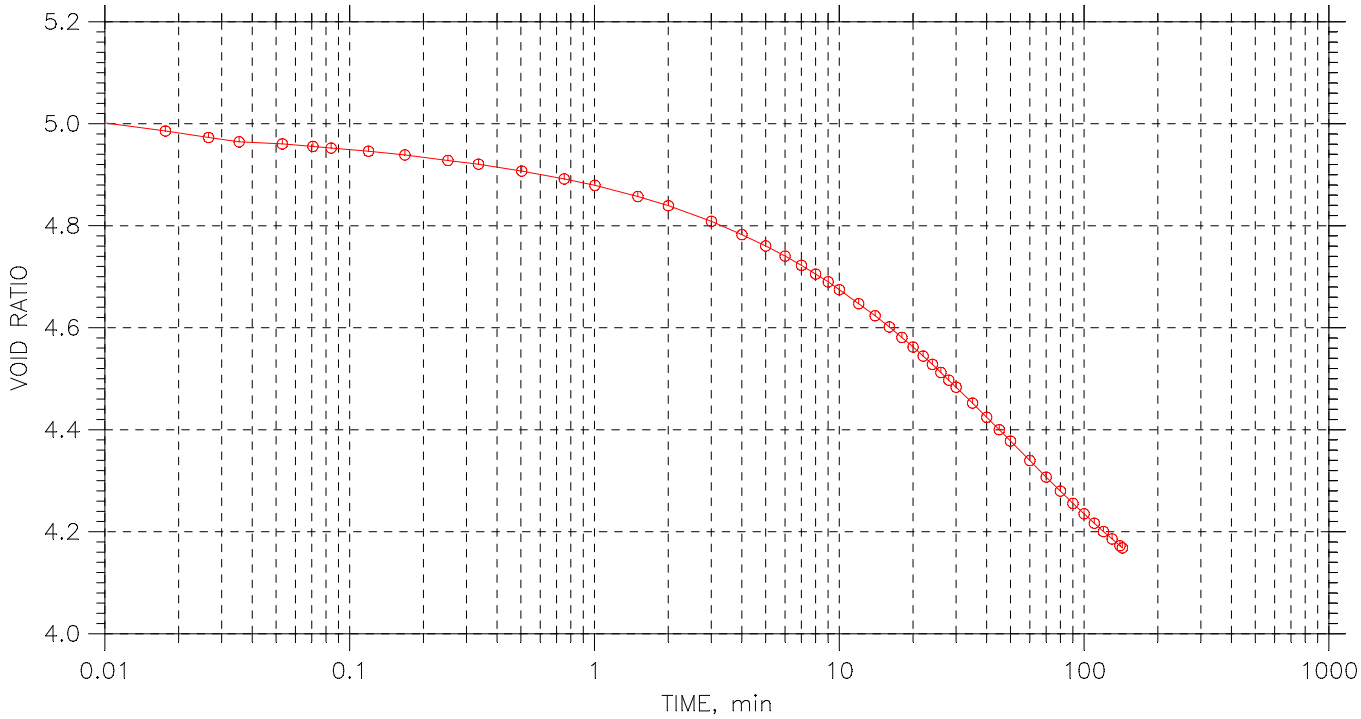
Wed, 18-DEC-2013 15:09:57

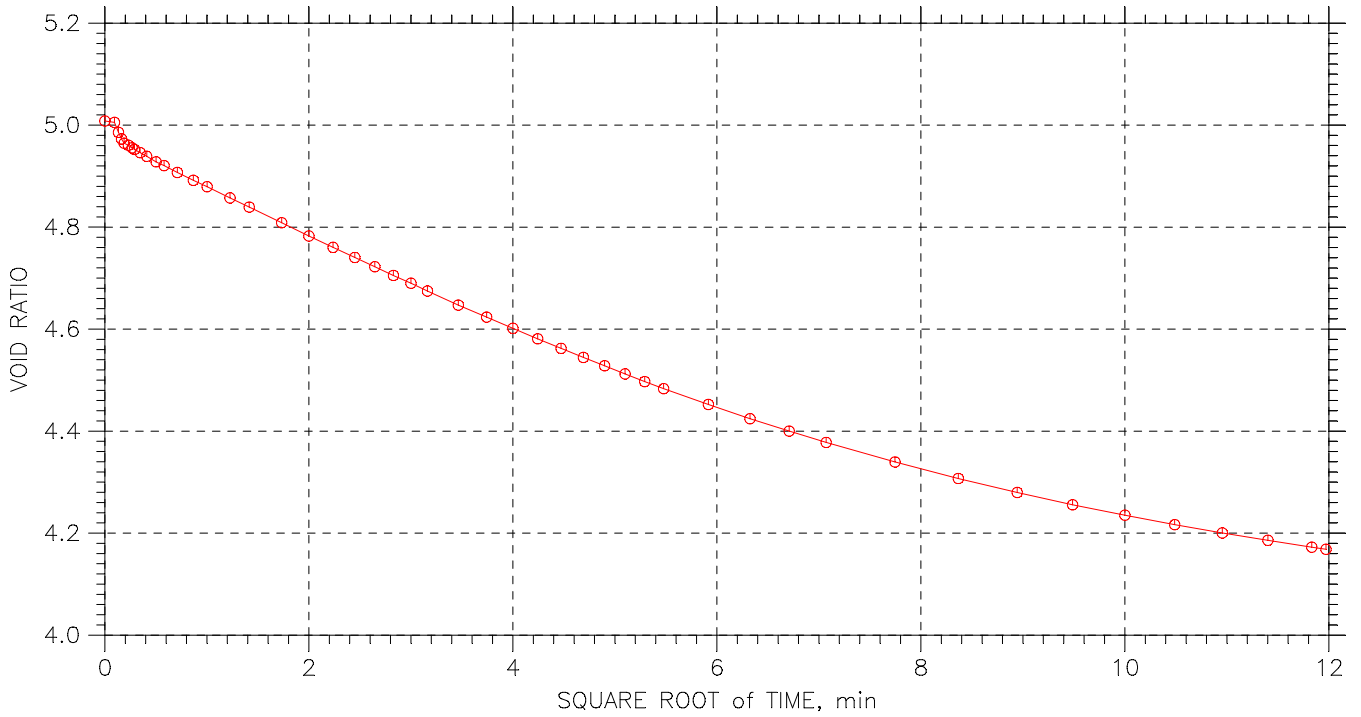
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 18

Stress: 8000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

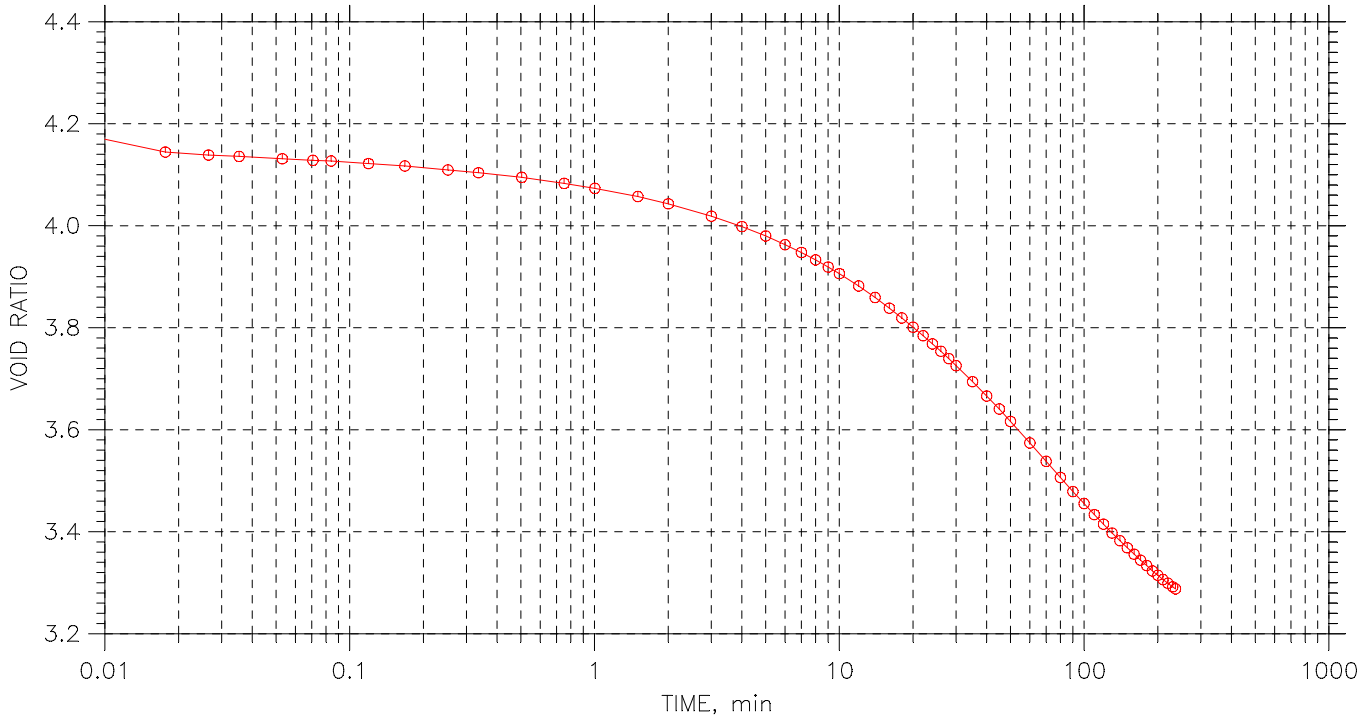
Wed, 18-DEC-2013 15:09:58

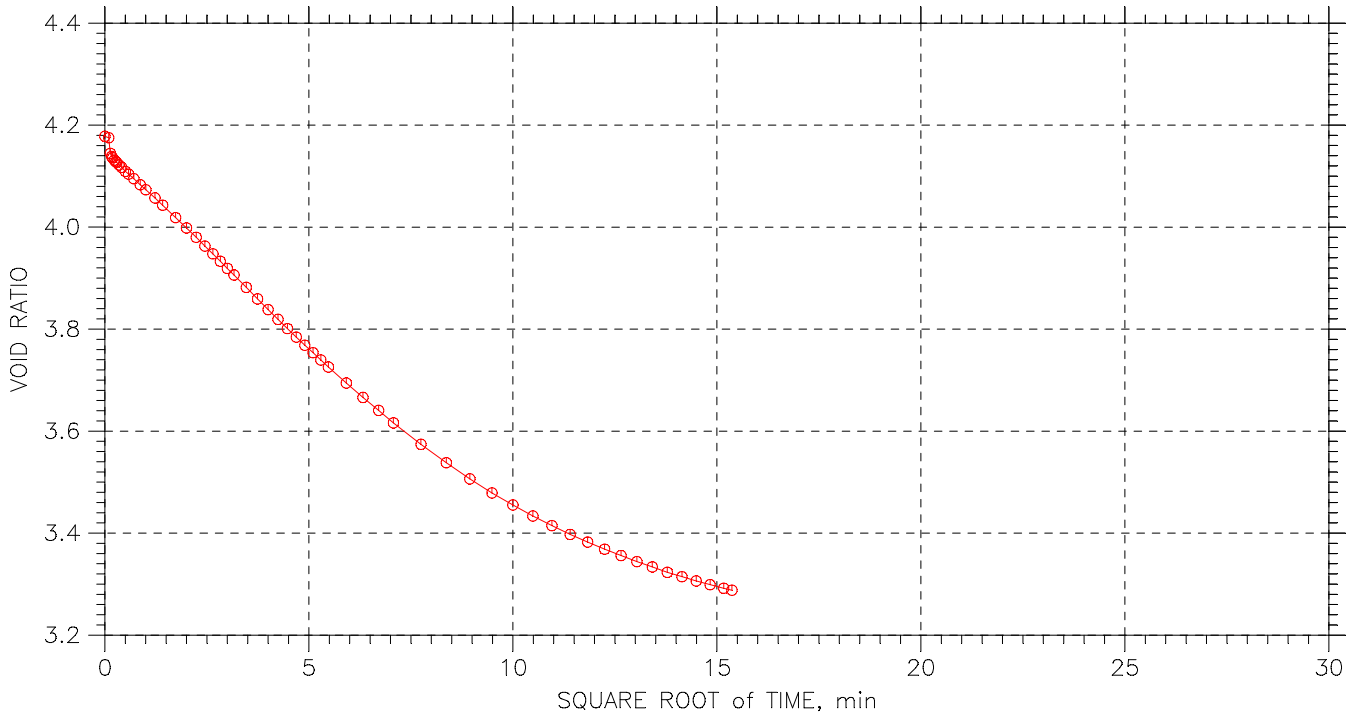
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 18

Stress: 16000 psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

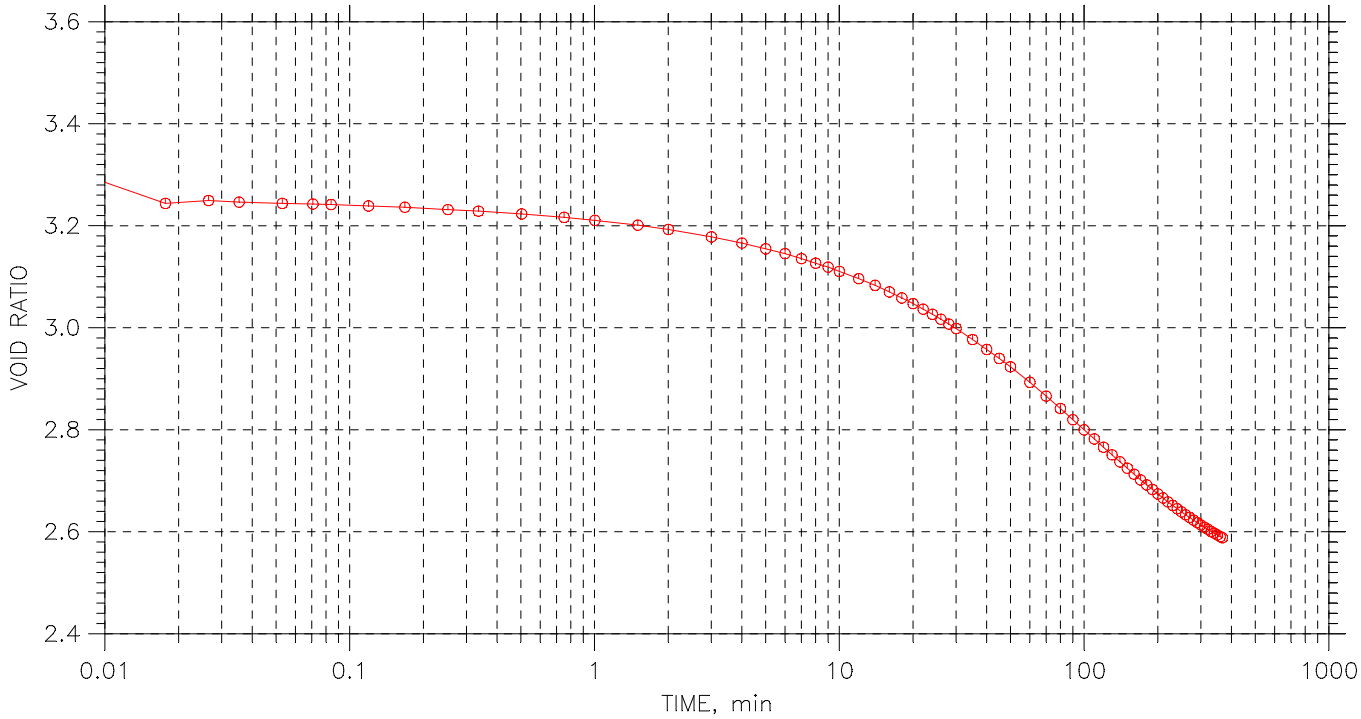
Wed, 18-DEC-2013 15:09:58

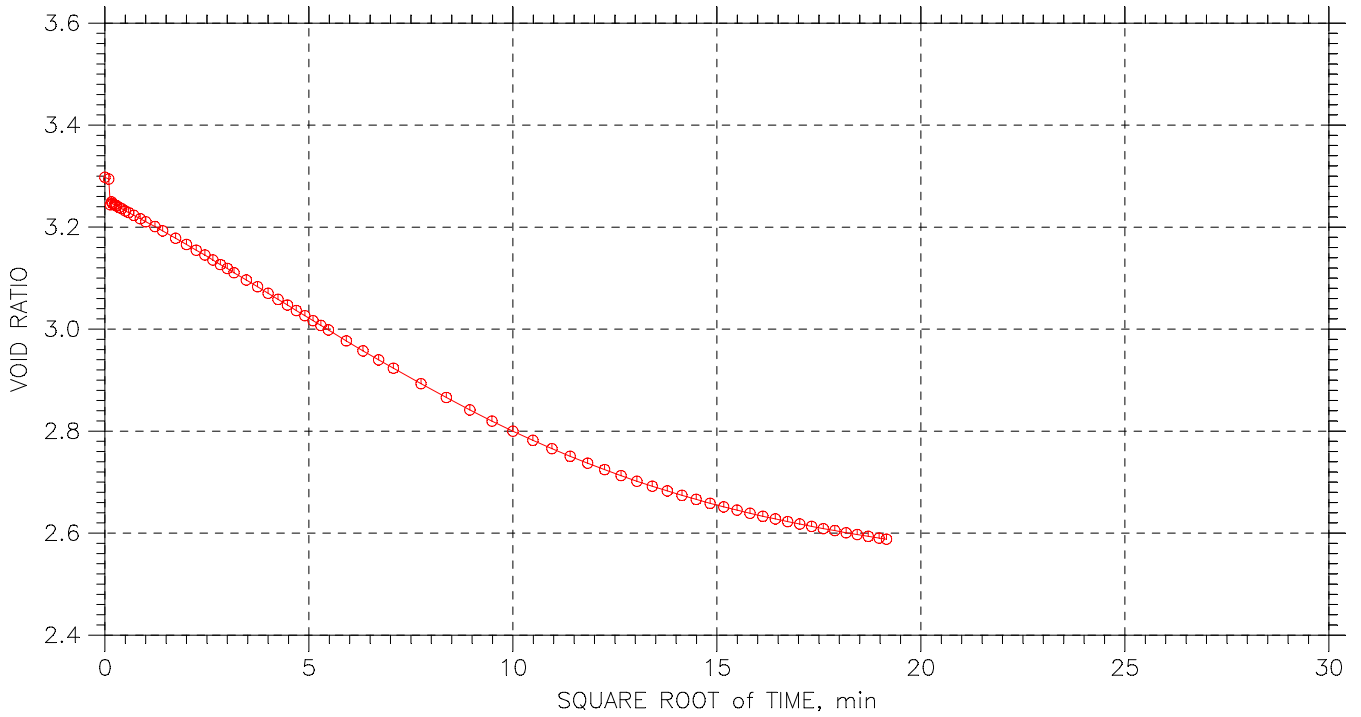
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 18

Stress: 32000 psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

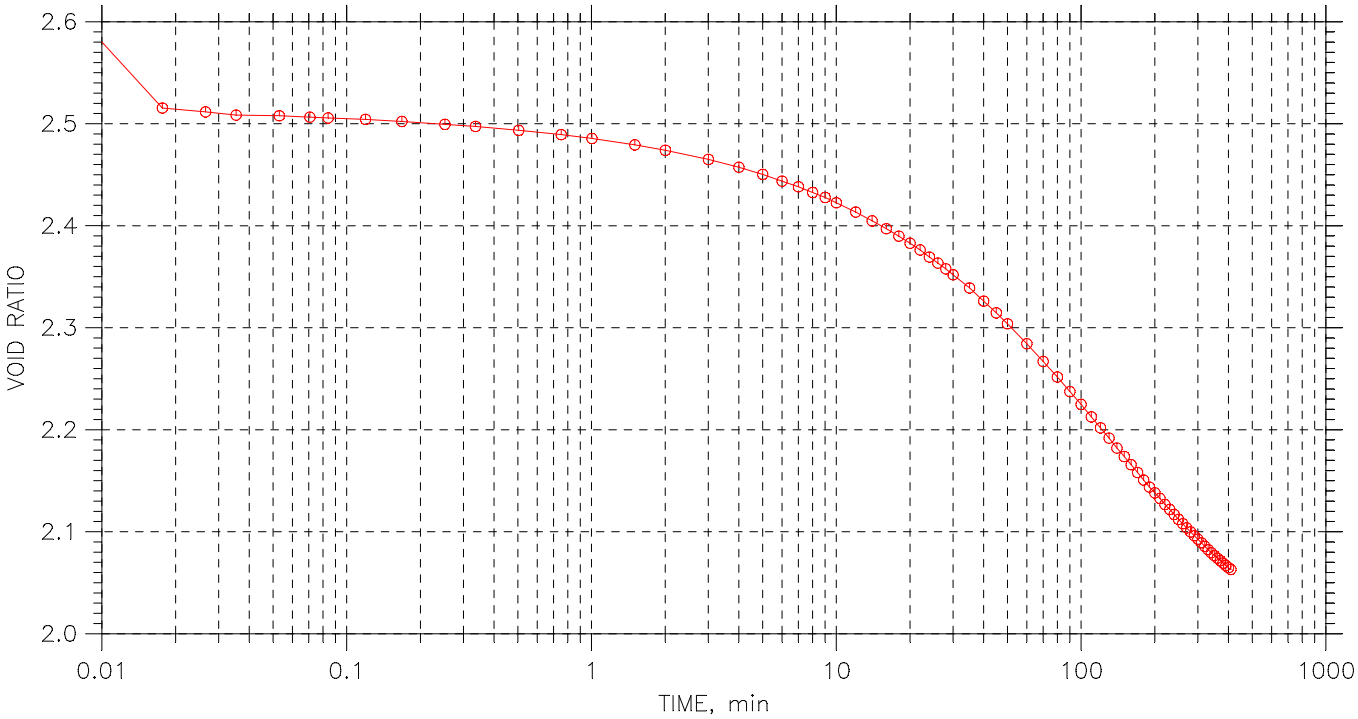
Wed, 18-DEC-2013 15:09:59

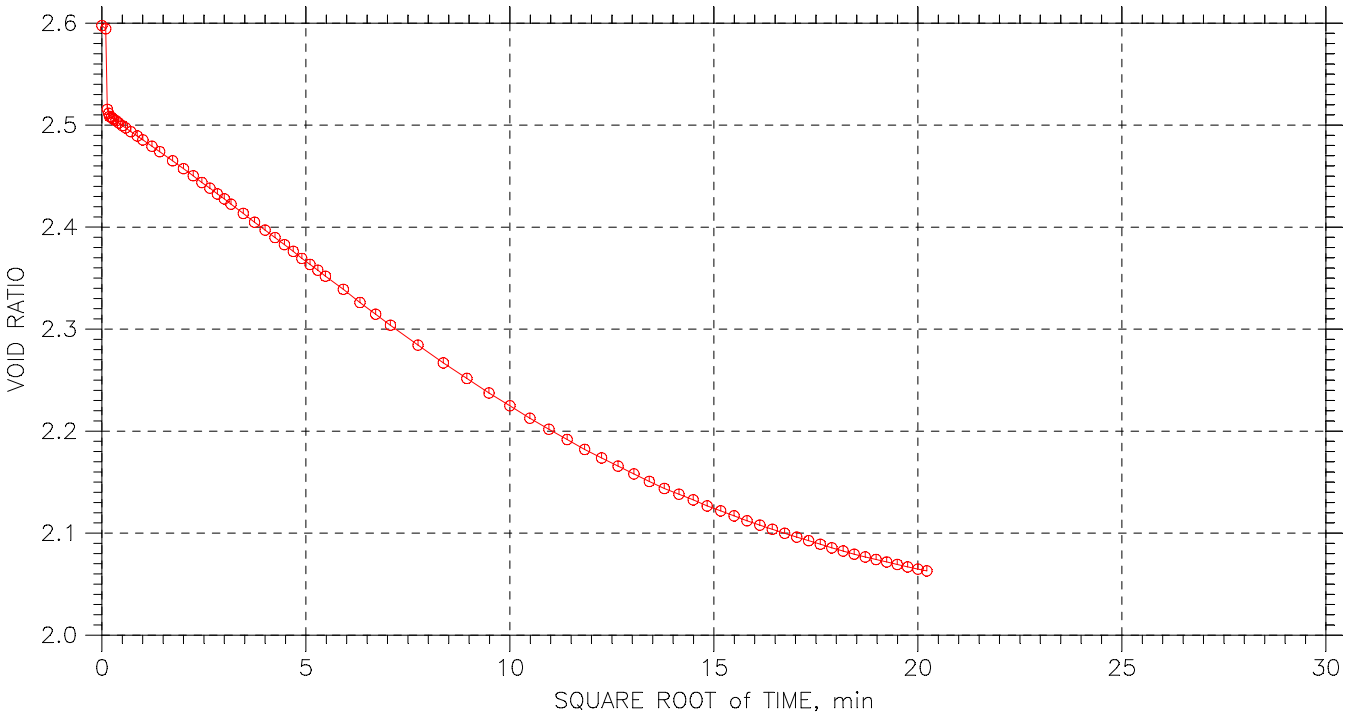
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 18

Stress: 64000 psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
DEPARTMENT OF WATER RESOURCES	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

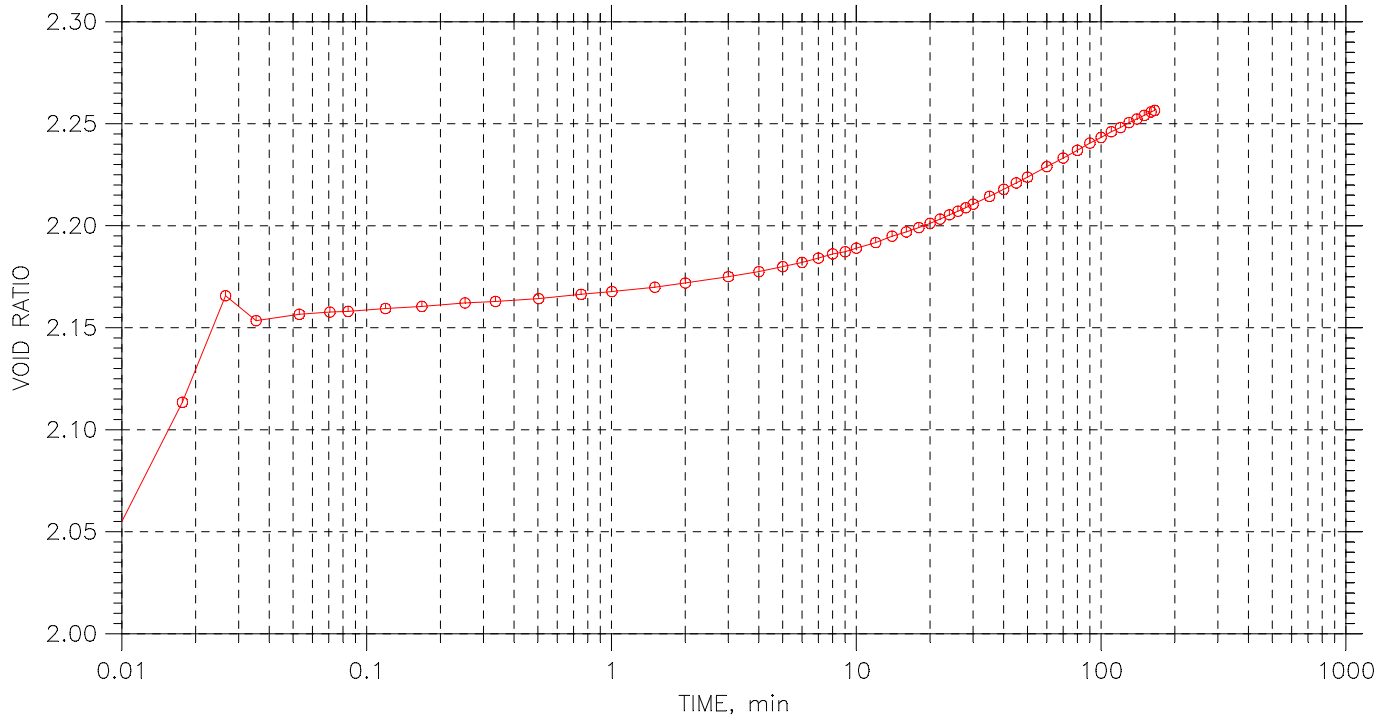
Wed, 18-DEC-2013 15:09:59

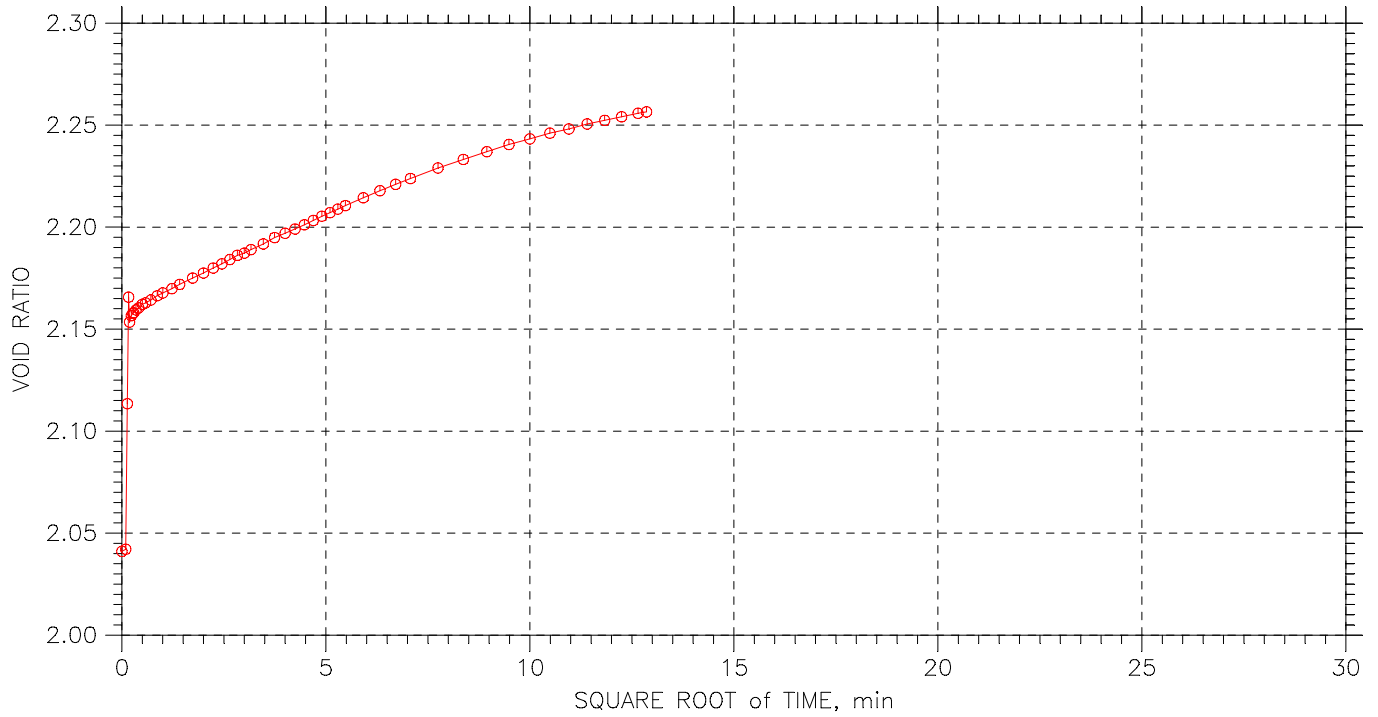
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 18

Stress: 16000 psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

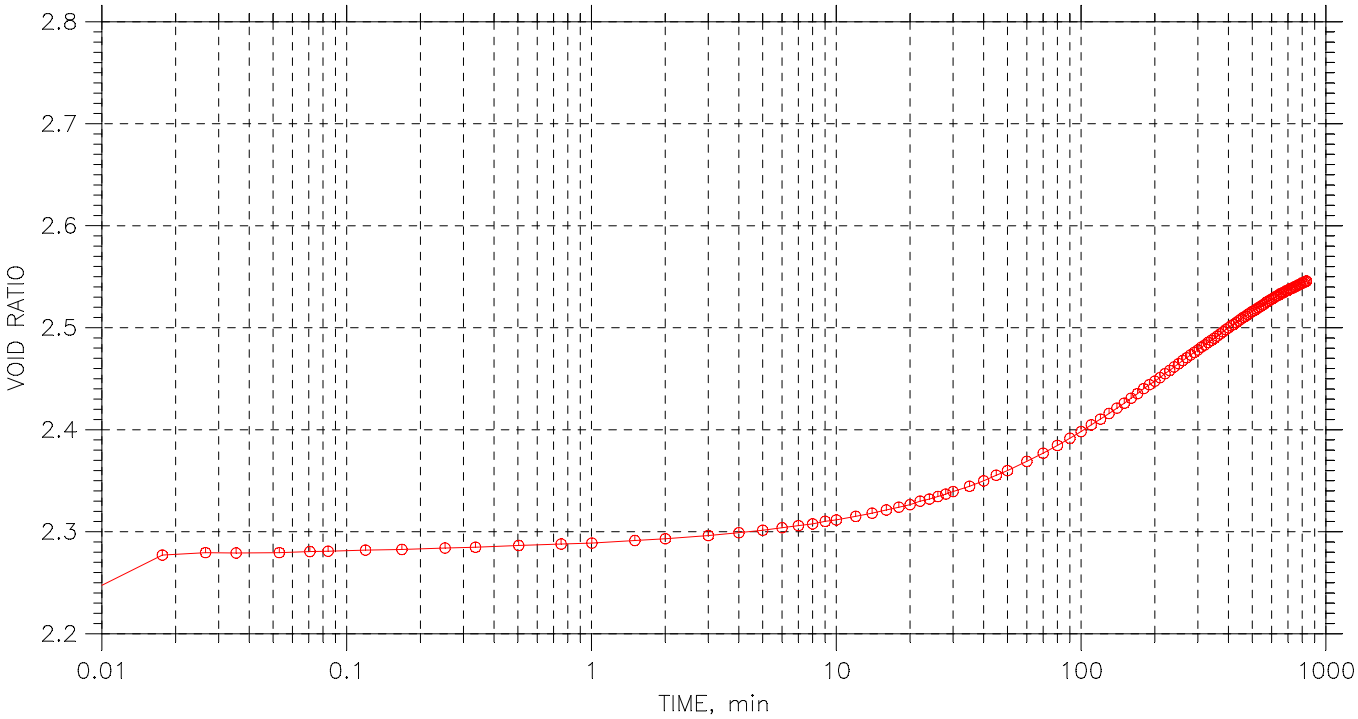
Wed, 18-DEC-2013 15:10:00

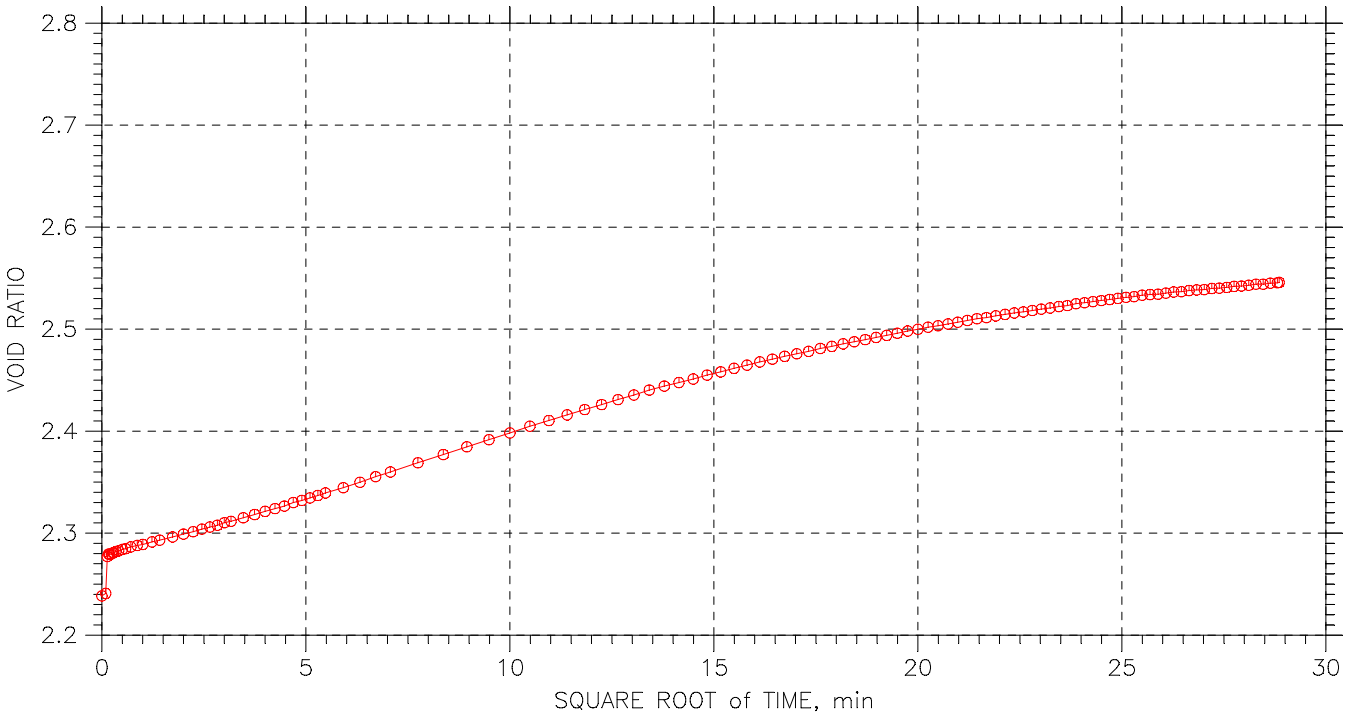
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 18

Stress: 4000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
DEPARTMENT OF WATER RESOURCES	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

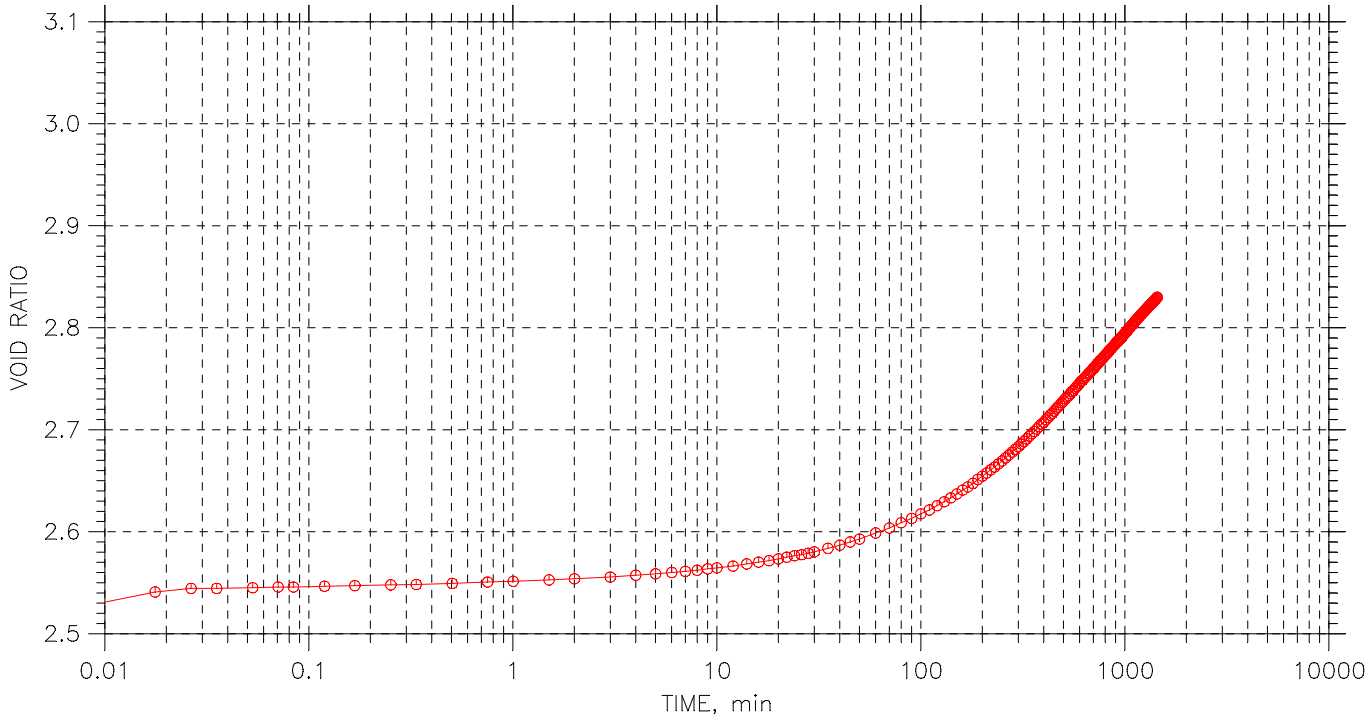
Wed, 18-DEC-2013 15:10:00

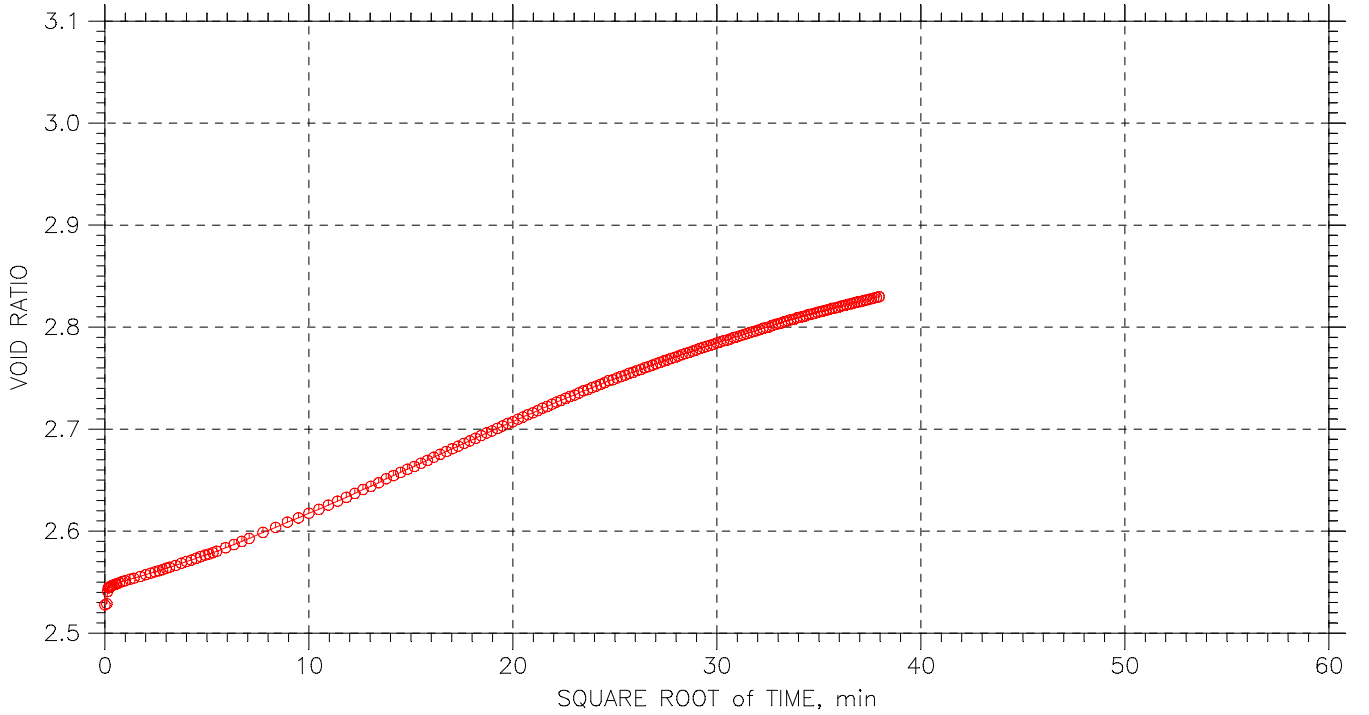
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 18

Stress: 1000. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

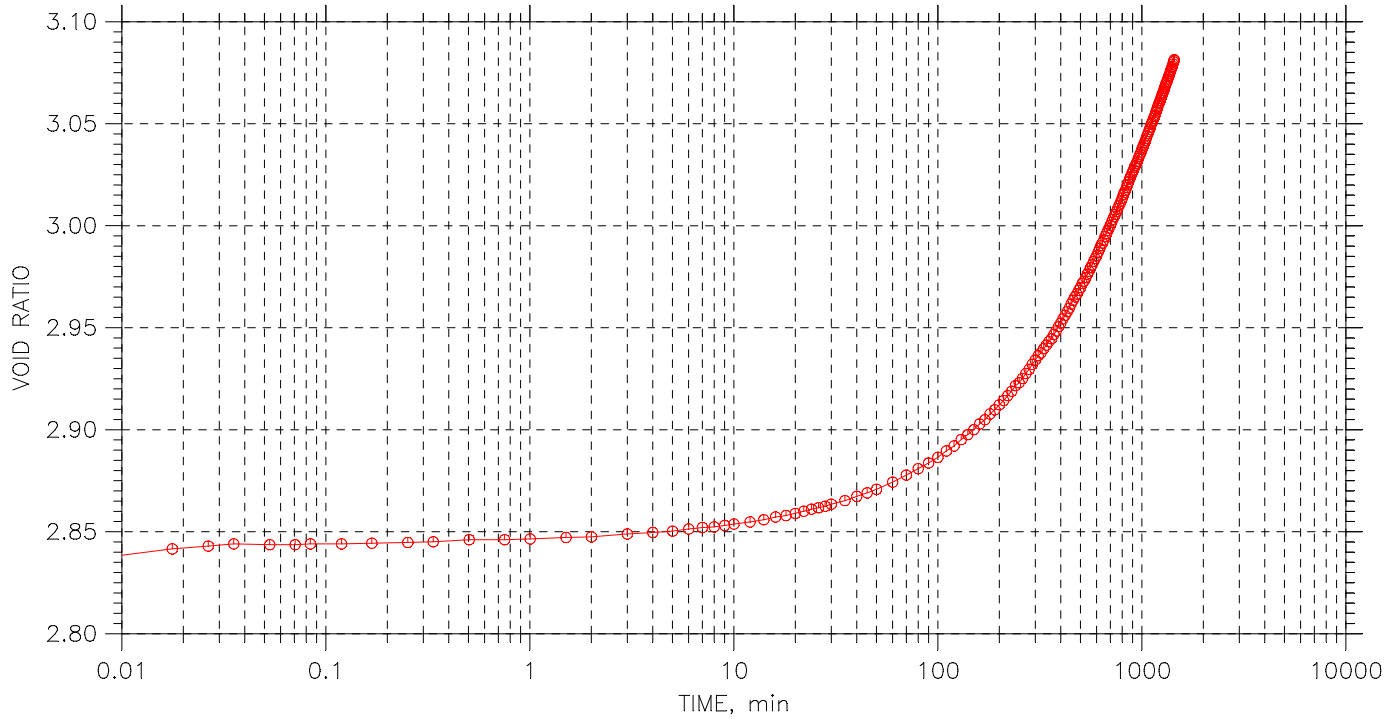
Wed, 18-DEC-2013 15:10:01

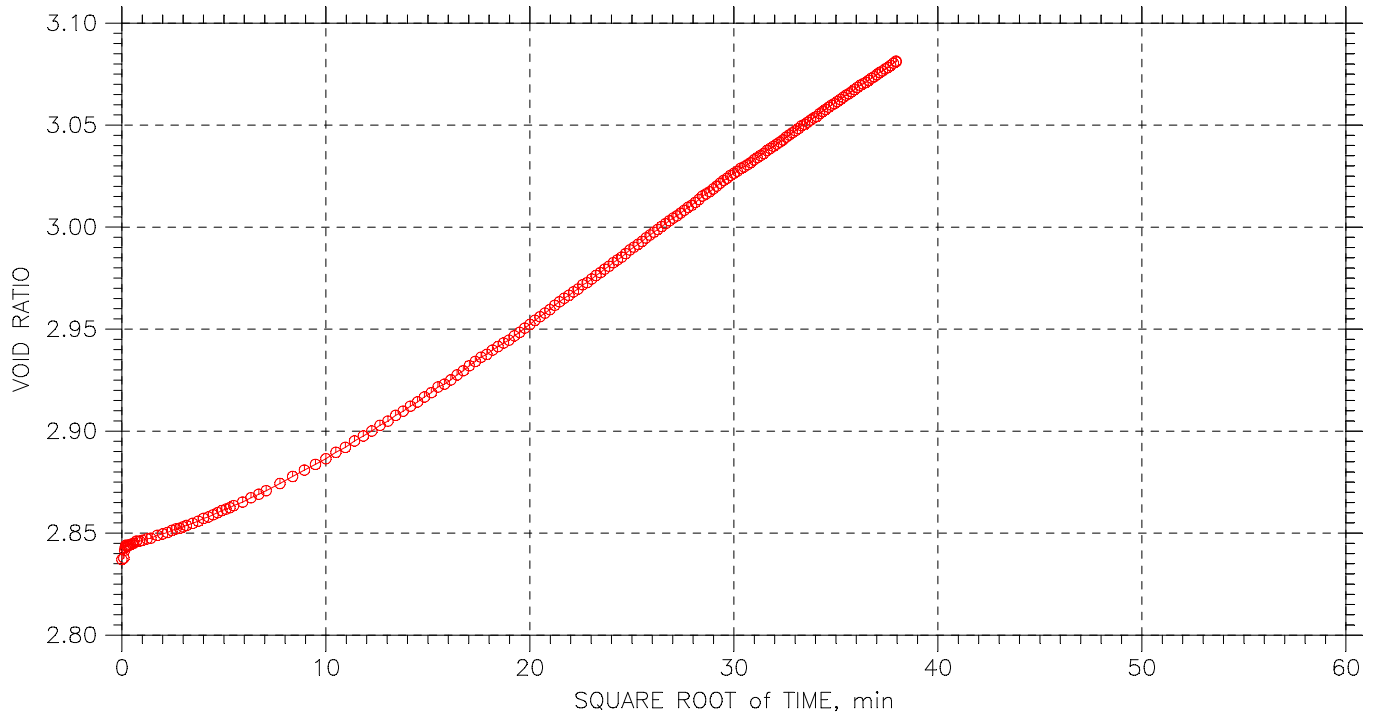
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 18

Stress: 200. psf





	Project: Sherman Island	Location: Bryte Lab	Project No.: 2013-29
	Boring No.: MR-S2	Tested By: CDG III	Checked By: CDG III
	Sample No.: 13-731CONS	Test Date: 12/10/2013	Depth: 37.5'
DEPARTMENT OF WATER RESOURCES	Test No.: T05A	Sample Type: 2.5" ring	Elevation: -
	Description:		
	Remarks: CHAMBER #2		

Wed, 18-DEC-2013 15:10:01

Appendix D

Vane Shear Testing

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

August 14, 2013, 2013

DWR
Attn: Robert Barry

Subject: Field Vane Shear Test Site Investigation
Sherman Island New Fish Release Site
Sherman Island, California
GREGG Project Number: D2120444

Dear Mr. Barry:

The following report presents the results of GREGG Drilling & Testing's Field Vane Shear 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	UVOST Laser Induced Fluorescence	(UVOST)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☒
10	SPT Energy Calibration	(SPTE)	☐

The field vane shear tests were carried out in accordance with ASTM 2573-08. 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 (562) 427-6899.

Sincerely,
GREGG Drilling & Testing, Inc.

Peter Robertson
Technical Operations

2726 Walnut Ave • Signal Hill, California 90755 • (562) 427-6899 • FAX (562) 427-3314
OTHER OFFICES: SAN FRANCISCO • HOUSTON • SOUTH CAROLINA
www.greggdrilling.com

Field Vane Shear Test Summary

-Table 1-

FVST Identification	Date	Test Depths (Feet)	Comments
MRS2INC	8/5/13	14, 14R, 26.5*, 51.5, 51.5R	R = Remolded Test Preformed M = Maximum Torque Applied (No Shear)
LBS2INC	8/6/13	16.5, 16.5R, 26.5M, 51.5M	

* Maximum shear strength obtained as a result of equipment failure

Bibliography

Greig, J.W., R.G. Campanella and P.K. Robertson, "Comparison of Field Vane Results With Other In-Situ Test Results", International Symposium on Laboratory and Field Vane Shear Strength Testing, ASTM, Tampa FL, Proceedings, 1987

Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp.107=112.

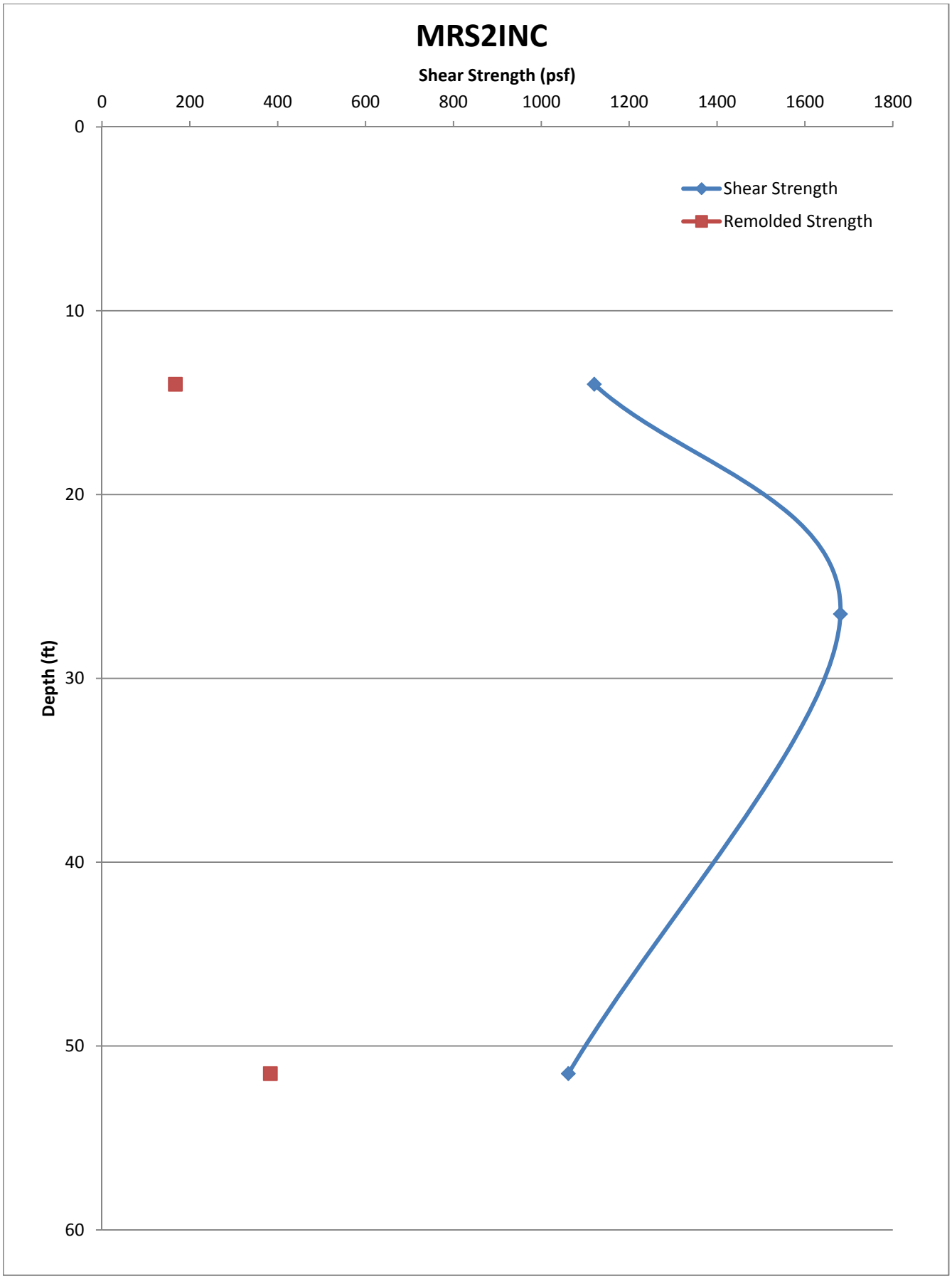
Richards, Adrian F. (Editor), "Vane Shear Testing in Soils", The International Symposium on Laboratory and Field Vane Shear Strength Testing, January 1987.

Chandler, R.J., "The In-Situ Measurement of the Undrained Shear Strength of Clays Using the Field Vane," Vane Shear Testing in Soils: Field and Laboratory Studies, ASTM STP 1014, A.F. Richards, Ed., American Society for Testing and Materials, Philadelphia, 1988, pp. 13-44.

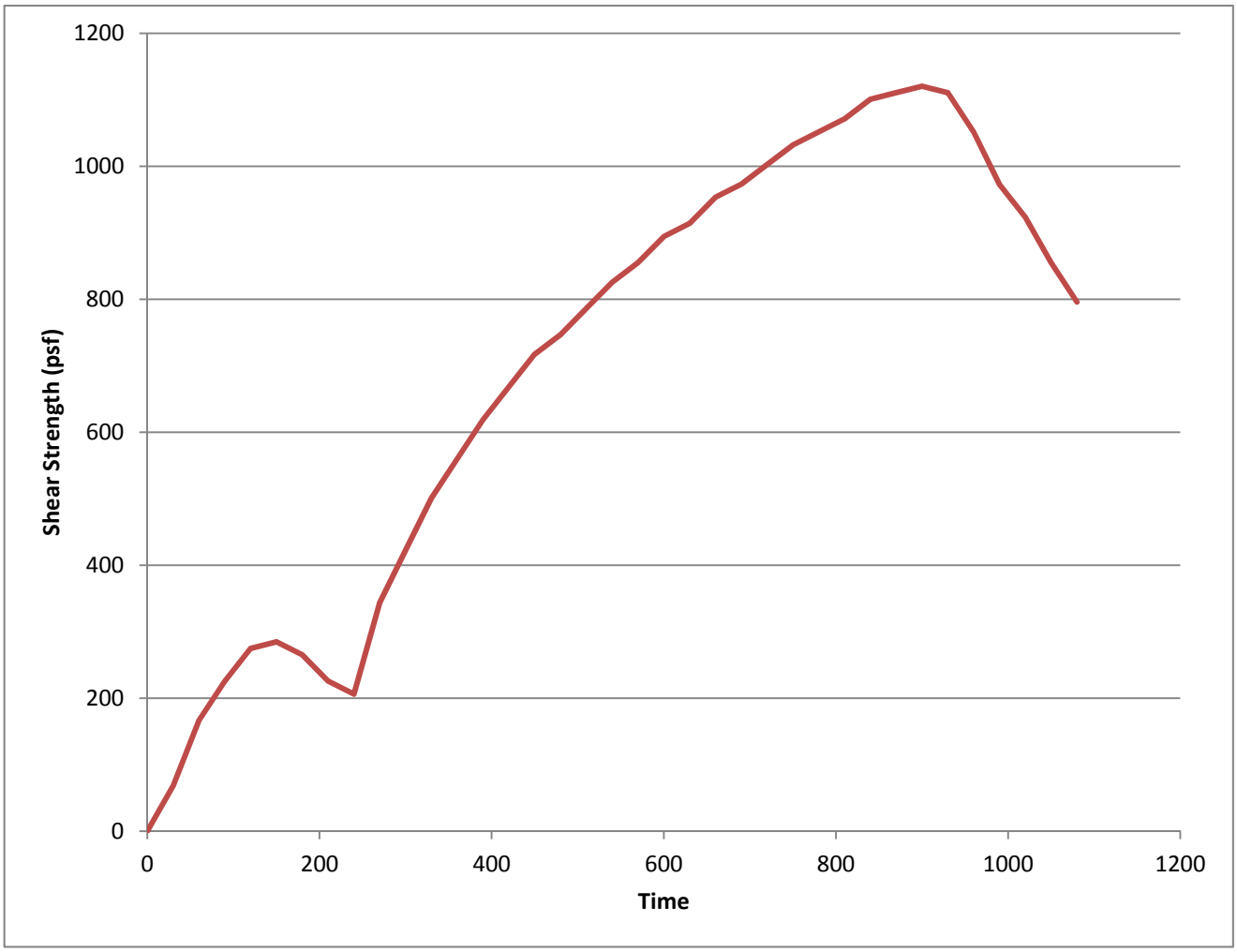
Copies of ASTM Standards are available through www.astm.org

CLIENT	DWR
SITE	Sherman Island
LOCATION	MRS2INC
VANE TYPE	Geonor H-10
VANE DIAMETER, d (mm)	55
VANE LENGTH, l (mm)	110

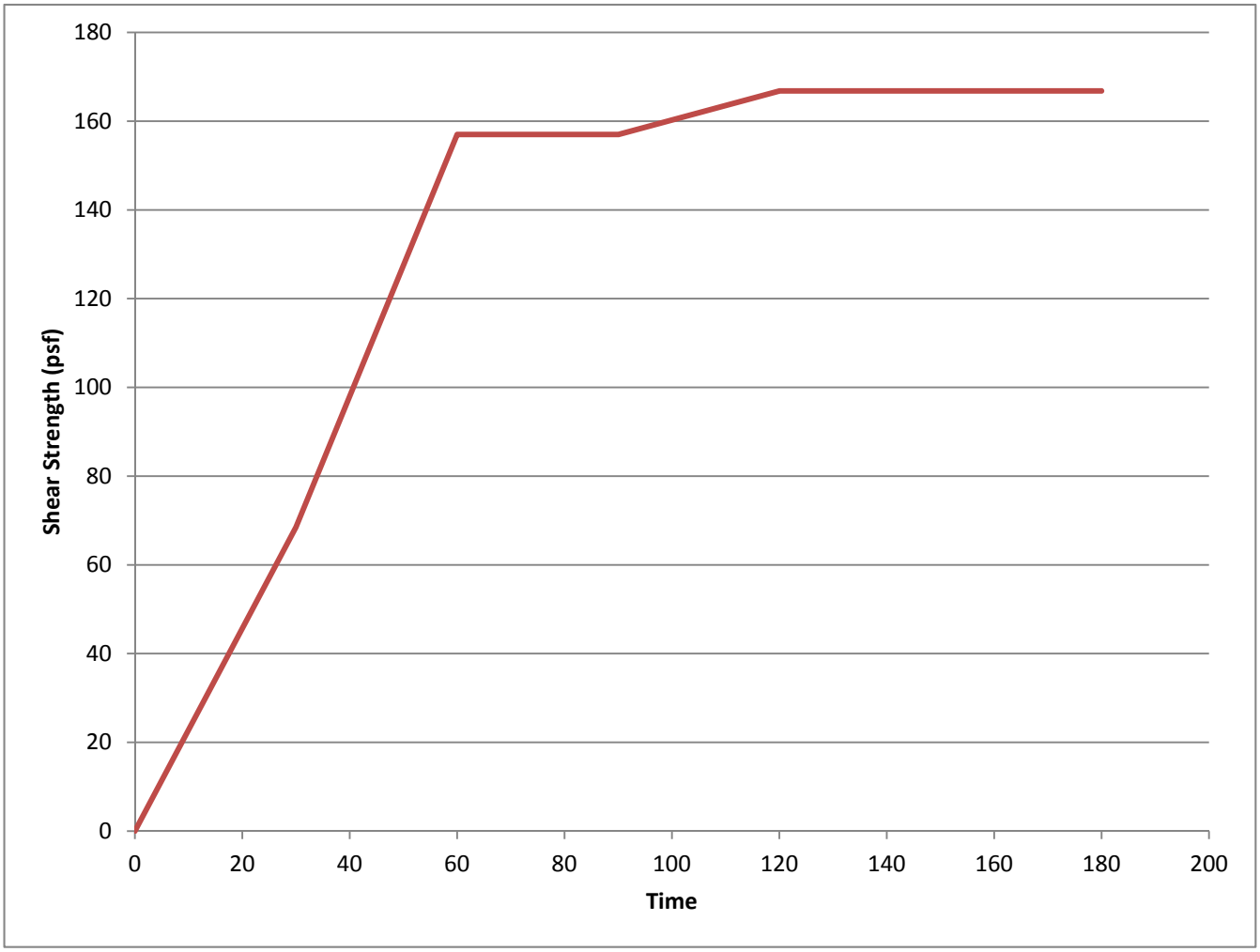
DEPTH (m)	DEPTH (ft)	PEAK LOAD READING (N)	SHEAR STRENGTH (KPa)	SHEAR STRENGTH (psf)	REMOLDED PEAK LOAD READING (N)	REMOLDED SHEAR STRENGTH (KPa)	REMOLDED SHEAR STRENGTH (psf)	SENSITIVITY
4.27	14.00	186.79	53.64	1120.48	27.81	7.98	166.80	6.72
8.08	26.50	280.21	80.46	1680.89	MAX RESULTING FROM EQUIP FAILURE			
15.70	51.50	176.96	50.81	1061.49	63.87	18.34	383.10	2.77


MRS2INC
Shear Strength (psf)
0
200
400
600
800
1000
1200
1400
1600
1800
Depth (ft)
0
10
20
30
40
50
60
Shear Strength
Remolded Strength

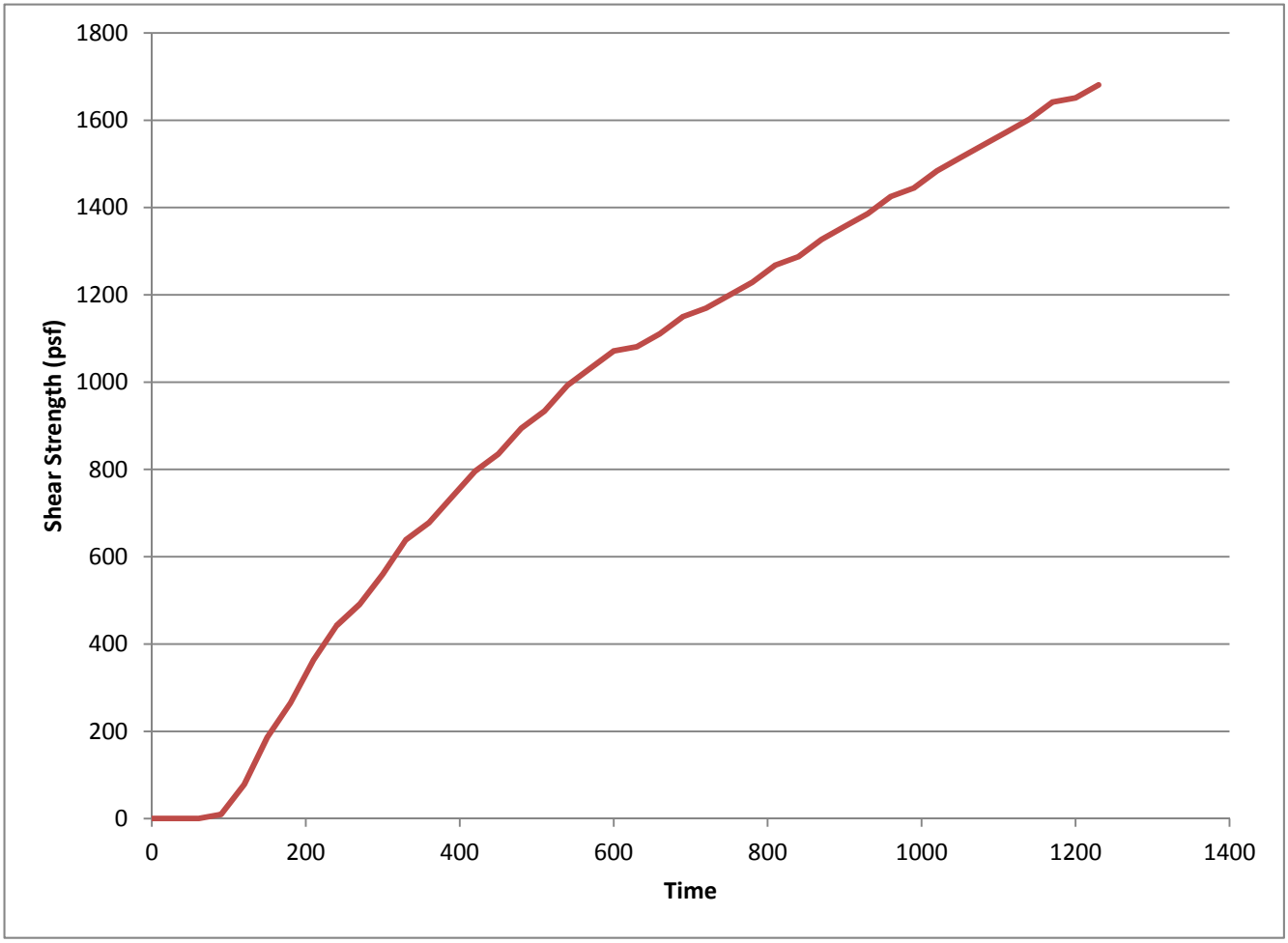
Location:	MRS2INC	**Max Shear**	53.64	KPa
Depth:	14	**Strength:**	1120.48	psf



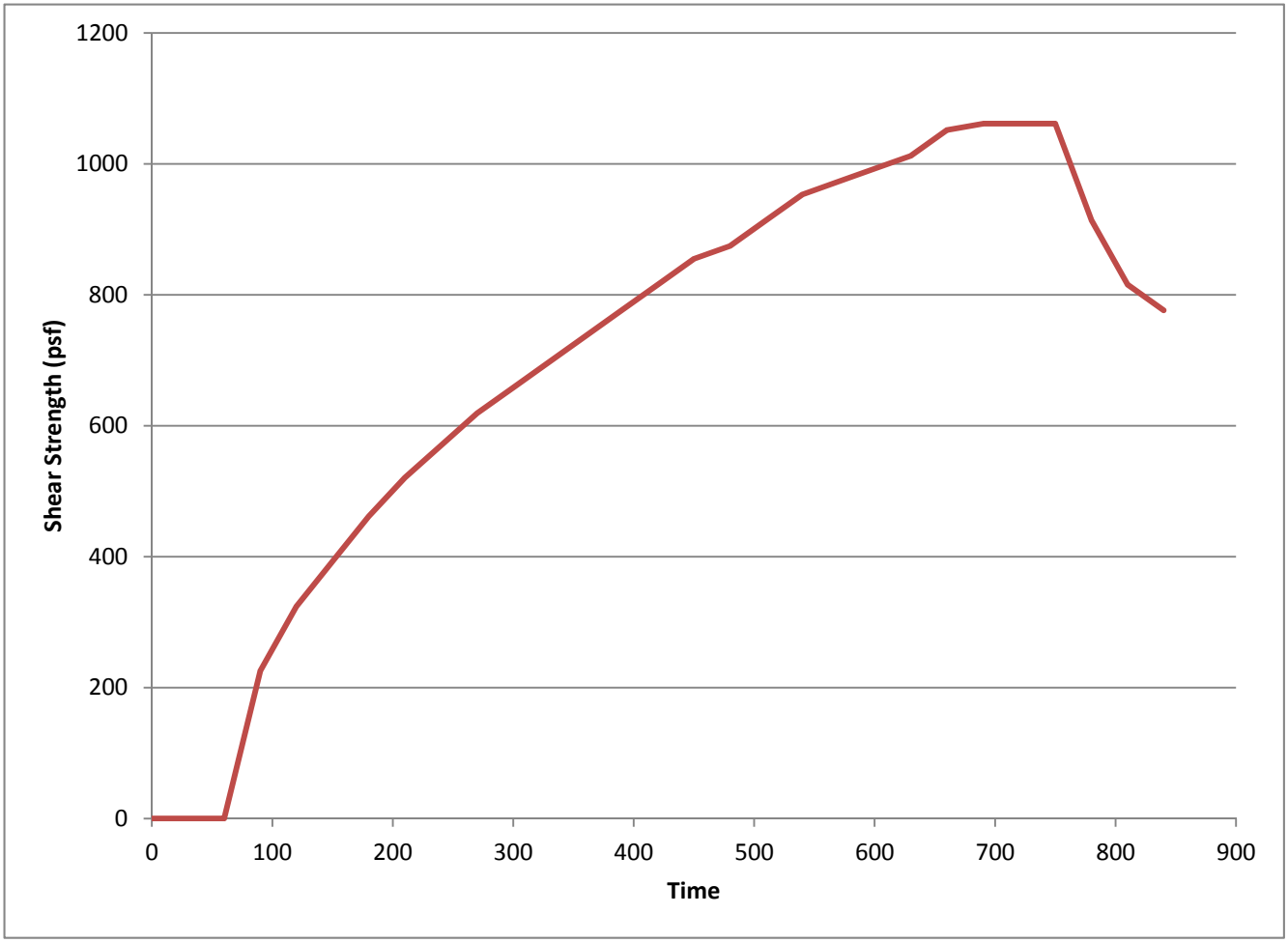
Location: MRS2INC **Max Shear** 7.98 KPa
Depth: 14 Remolded **Strength:** 166.80 psf



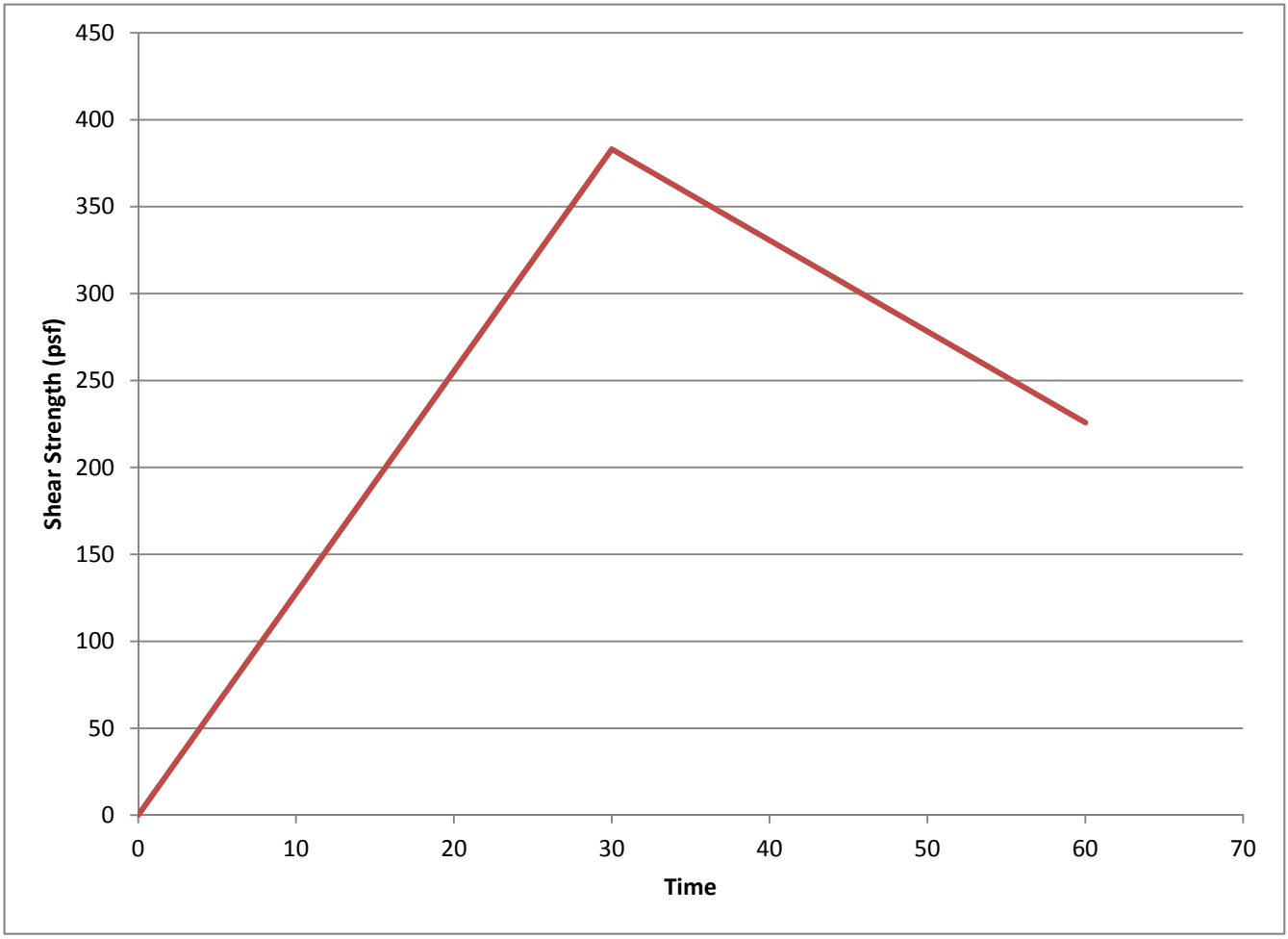
Location: MRS2INC **Max Shear** 80.46 KPa
Depth: 26.5 **Strength:** 1680.89 psf



Location: MRS2INC **Max Shear** 50.81 KPa
Depth: 51.5 **Strength:** 1061.49 psf

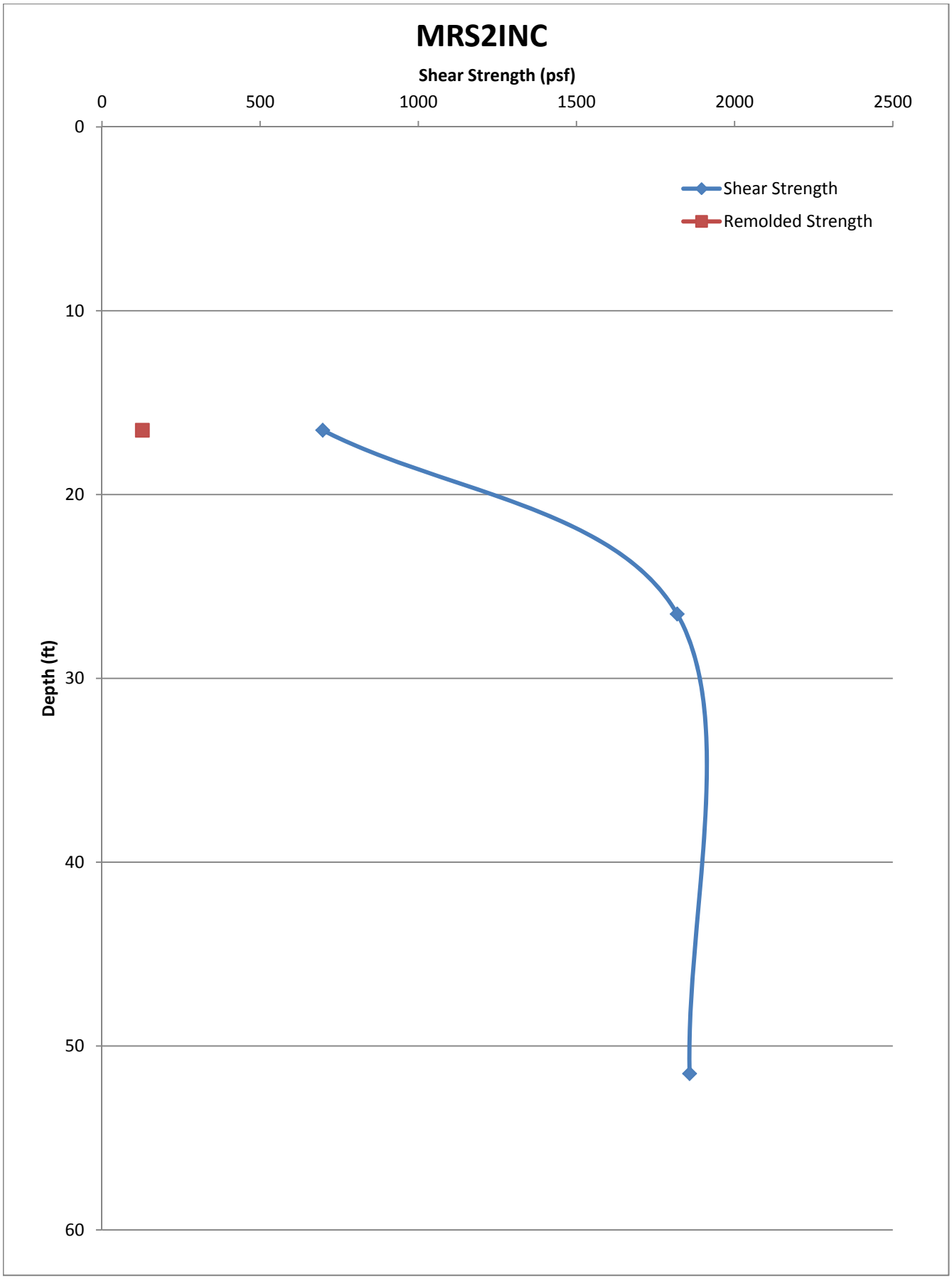


Location: MRS2INC **Max Shear** 18.34 KPa
Depth: 51.5 Remolded **Strength:** 383.10 psf

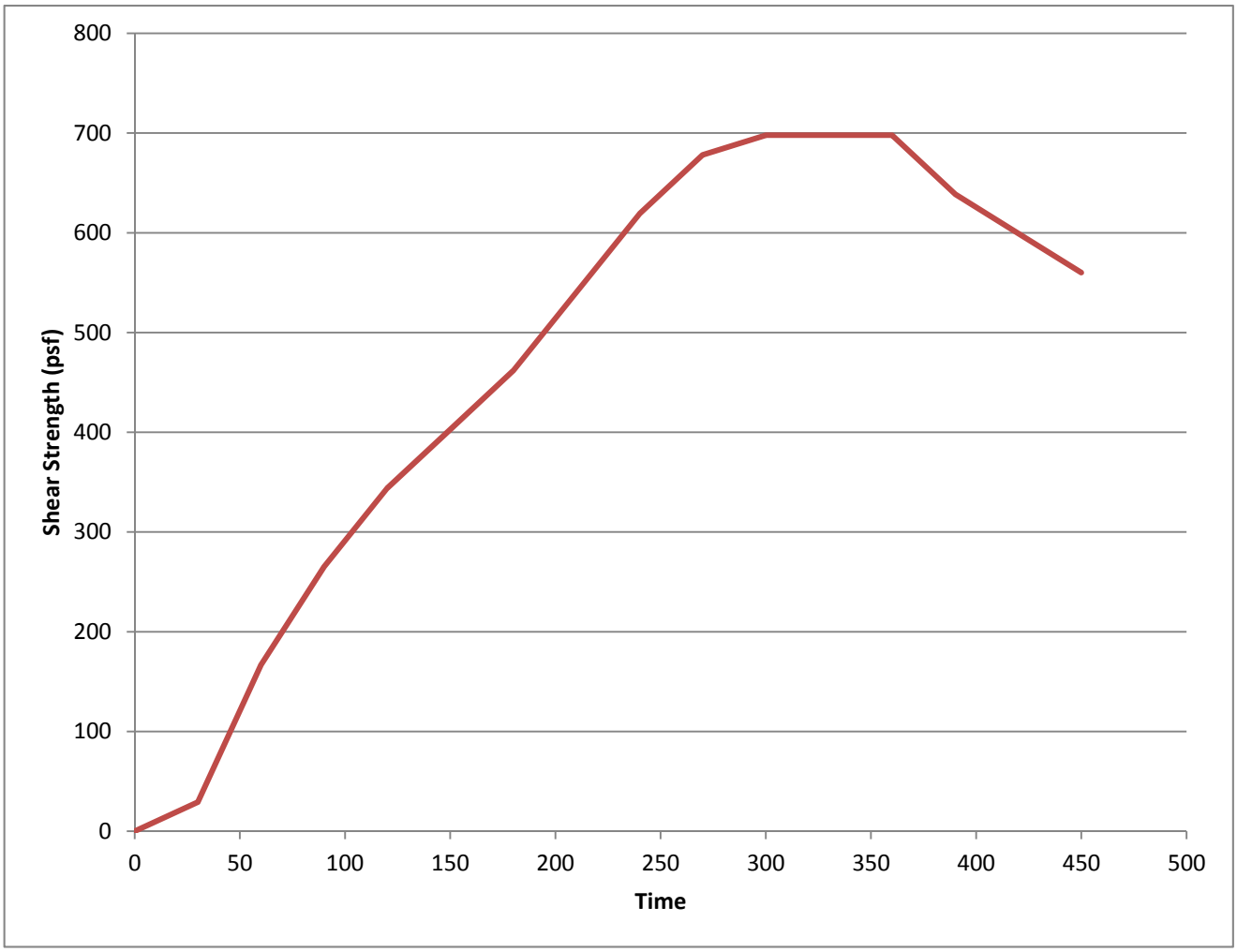


CLIENT	DWR
SITE	Little Baja
LOCATION	LBS2INC
VANE TYPE	Geonor H-10
VANE DIAMETER, d (mm)	55
VANE LENGTH, l (mm)	110

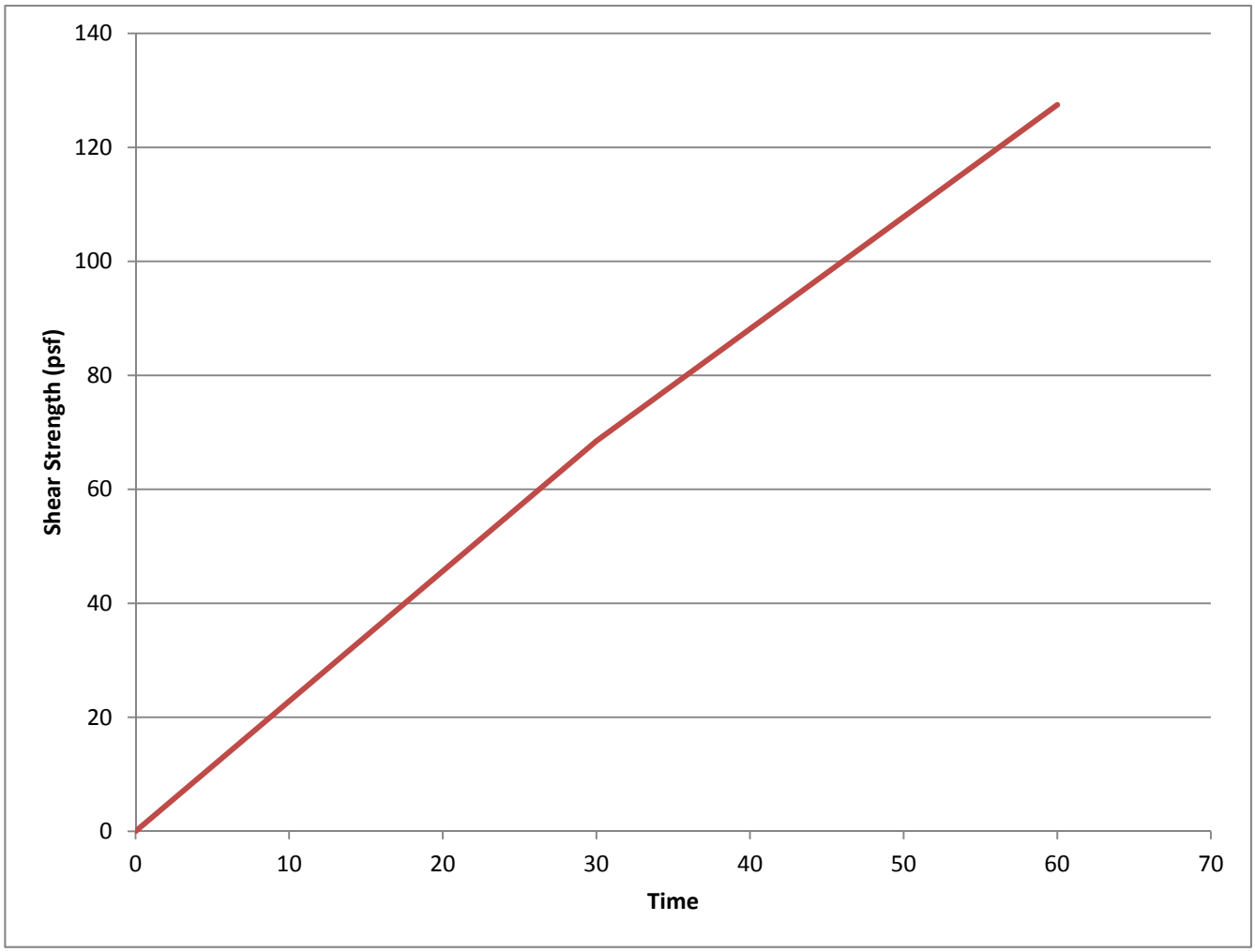
DEPTH (m)	DEPTH (ft)	PEAK LOAD READING (N)	SHEAR STRENGTH (KPa)	SHEAR STRENGTH (psf)	REMOLDED PEAK LOAD READING (N)	REMOLDED SHEAR STRENGTH (KPa)	REMOLDED SHEAR STRENGTH (psf)	SENSITIVITY
5.03	16.50	116.31	33.40	697.72	21.25	6.10	127.48	5.47
8.08	26.50	303.16	87.05	1818.54	MAX TORQUE APPLIED / NO SHEAR			
15.70	51.50	309.72	88.94	1857.86	MAX TORQUE APPLIED / NO SHEAR			


MRS2INC
Shear Strength (psf)
0
500
1000
1500
2000
2500
0
10
20
30
40
50
60
Depth (ft)
Shear Strength
Remolded Strength

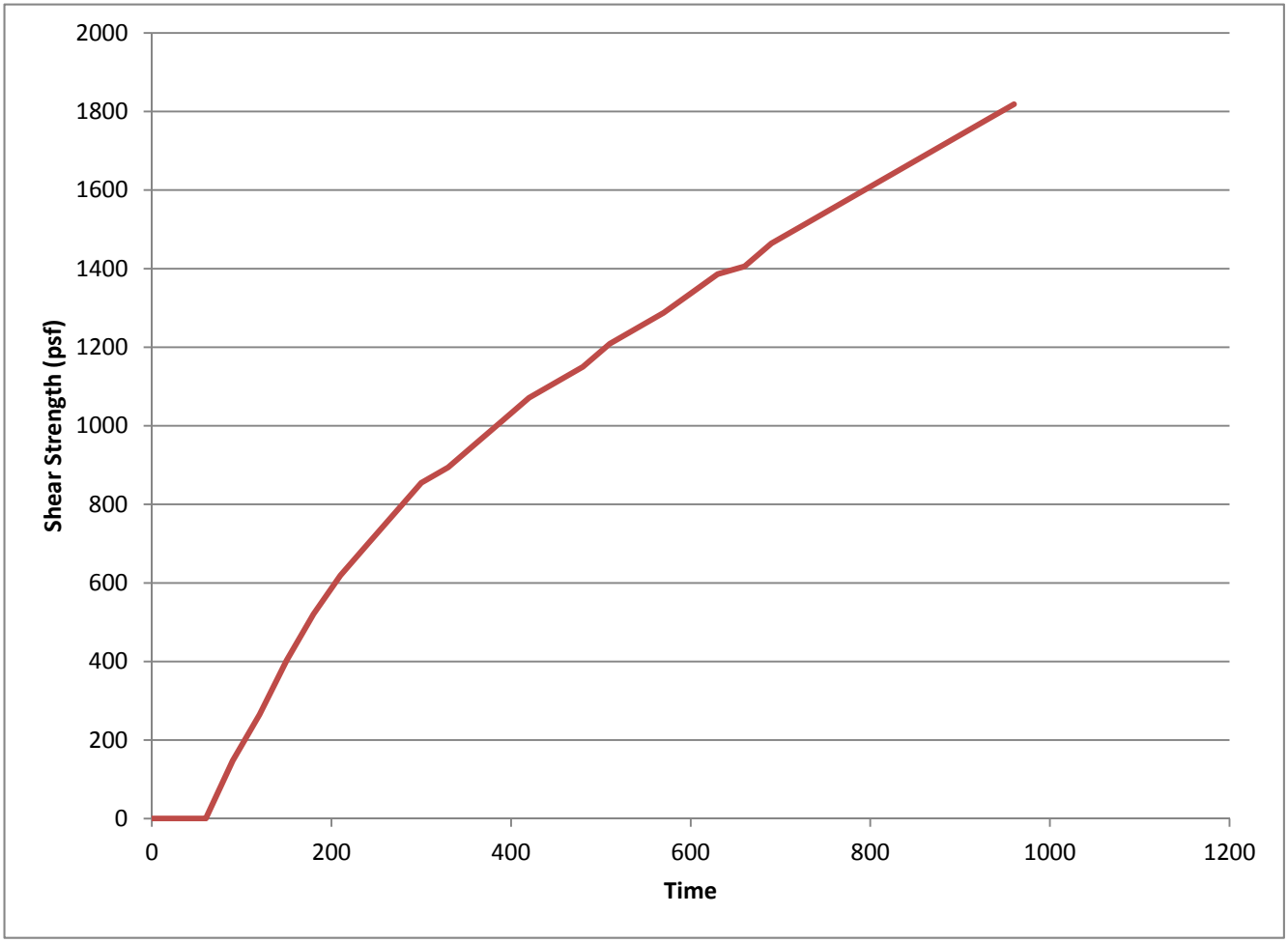
Location: LBS2INC **Max Shear** 33.40 KPa
Depth: 16.5 **Strength:** 697.72 psf



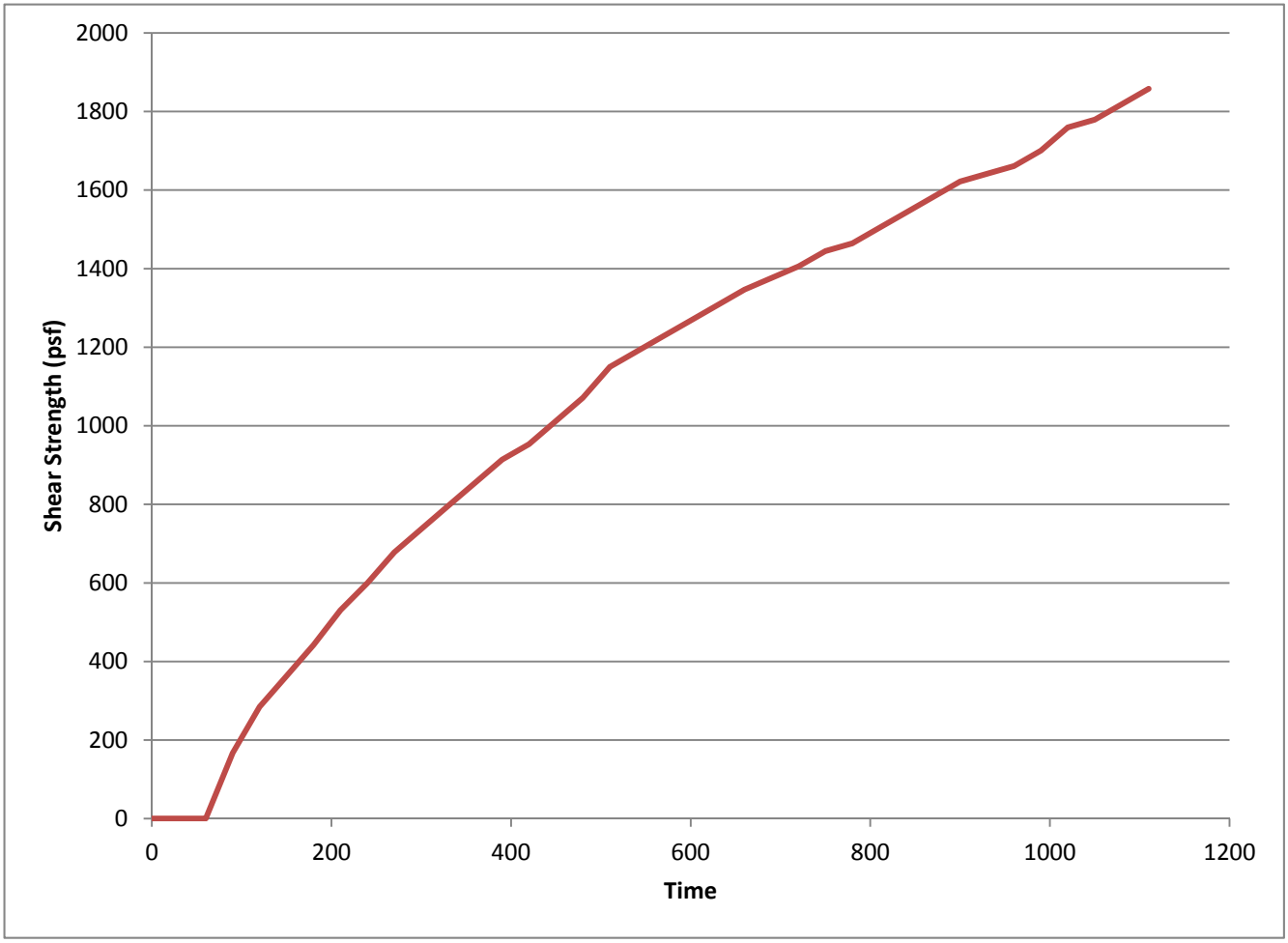
Location: LBS2INC **Max Shear** 6.10 KPa
Depth: 16.5 Remolded **Strength:** 127.48 psf



Location: LBS2INC **Max Shear** 87.05 KPa
Depth: 26.5 **Strength:** 1818.54 psf



Location: LBS2INC **Max Shear** 88.94 KPa
Depth: 51.5 **Strength:** 1857.86 psf



Appendix E

Hammer Energy Measurements

August 8, 2013

Department of Water Resources
Division of Engineering
Project Geology Section
3500 Industrial Blvd.
West Sacramento, CA 95691

Re: Standard Penetration Energy Measurements
Automatic Hammer on Mud Rotary Drill Rig, D-3
Sherman Island New Fish Release Site

Dear Sir,

This report offers results of energy measurements and related calculations made on July 25, 2013 during Standard Penetration Testing (SPT) on Gregg Drilling's mud rotary drill rig. Dynamic tests were performed on an instrumented section of NWJ drill rod attached to the sampler rod string. All dynamic measurements were obtained and recorded using a Pile Driving Analyzer®.

Equipment:

SPT energy measurements were made on SPT samplers driven by the hammer/anvil system on the Gregg Drilling drill rig on July 25, 2013. The rig was tested on the Sherman Island New Fish Release Site area, Call-Up #9 boring LBS2. In total, 6 energy measurements were collected corresponding to 6 different samples at increasing depth.

Gregg used a Model PAK Pile Driving Analyzer (PDA) to acquire and process measurements of force and velocity with every impact of the automatic hammer on the sample rods. Gregg follows the procedure outlined in ASTM D4633. Two strain gauges mounted on a two foot section of NWJ rod measured force, while two piezoresistive accelerometers bolted on the same rod measured acceleration. The gauges were mounted approximately 6" from the top of the rod.
Analog signals from the gauges and accelerometers were collected, digitized, displayed in real-time, and stored by the PDA. Selected output from the PDA for each recorded impact of the hammer included:

- Maximum force in the rod (FMX)
- Maximum velocity in the rod (VMX)
- Maximum calculated transferred energy (EMX)
- Blows per minute (BPM)
- Energy transferred to the rods (ETR)

Data and Calculations:

The purpose of testing was to measure the energy transferred from the hammer to the drill rod and to calculate the energy efficiency of the hammer. The PDA measurements of force and velocity were reviewed after field testing and analyzed to calculate the transferred energy (EMX).

The maximum energy transferred past the gauge location, EMX, is computed by the PDA using force (F) and velocity (V) records as follows:

$$EMX = \int_a^b F(t)\, V(t)\, dt$$

The time "a" corresponds to the start of the record when the energy transfer begins and "b" is the time at which energy transferred to the rod reaches a maximum value. The energy transferred is defined as ETR, and is usually used to define the efficiency of the hammer/anvil system.

Results:

Table 1 summarizes the average calculated energies for each sample tested as well as the type of sample and depth. It is shown that the overall average (ETR) energy for this system is 78%. Appendix A provides plots and tables of PDA results for all hammer blows at each sampling depth. The plots and tables present selected measured and calculated results as a function of blow number. The results include:

- the blow number
- depth
- BLC (blow count in blows per foot)
- FMX (maximum rod force)
- VMX (maximum rod velocity)
- EMX (maximum transferred energy)
- BPM (blows per minute)
- ETR (energy transferred in percent of maximum)

At the end of each table is a statistical evaluation of the results for each variable including the average, standard deviation, maximum, and what blow number this maximum occurred.

If you have any questions or comments on this report, please do not hesitate to call our office at (562) 427-6899.

Sincerely,

Peter Robertson
Technical Advisor
Gregg Drilling & Testing

GREGG DRILLING

SPT ENERGY ANALYSIS

Client:	DWR
Project:	Sherman Island New Fish Rel.
Date:	7/25/2013
Boring:	Call-Up #9, LBS2
Rig:	D3

Table 1 - SPT Sample Summary

Sample #	Sampler	Length of Sample Rod (ft)	Sampler Length (ft)	Total Rod Length* (ft)	Depth of Sample (below Mudline) (ft)	Total Blows Analyzed by PDA	Average Energy Transferred to Rods (% of Theoretical Max.)	Maximum Efficiency Recorded (%)	Standard Deviation
1	SPT	75	4.63	79.6	72.5	6	76.5	81.4	3
2	SPT	80	4.63	84.6	77.5	9	73.5	75.9	2
3	SPT	85	4.63	89.6	82.5	43	84.9	90.4	3
4	SPT	90	4.63	94.6	87.5	81	74.8	79.5	2
5	SPT	95	4.63	99.6	92.5	92	77.0	80.2	2
6	SPT	100	4.63	104.6	97.5	67	79.3	86.7	2
						Average	77.7		

* Total rod length includes, sampler, rod, adaptors, and instrumented section below gauges

Appendix A

Gregg Drilling & Testing
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

D3 - LBS2 @ 72.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 79.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
8	0.00	0.3	0.0	0.3	9.7	72.0
9	0.00	0.3	38.9	0.3	11.5	76.2
10	0.00	0.3	42.1	0.3	11.4	75.4
11	0.00	0.3	45.1	0.3	11.8	81.4
12	0.00	0.3	42.9	0.3	11.9	76.4
13	0.00	0.3	41.6	0.3	11.1	77.8
	Average	0.3	42.1	0.3	11.2	76.5
	Std. Dev.	0.0	2.0	0.0	0.7	2.8
	Maximum	0.3	45.1	0.3	11.9	81.4
	@ Blow#	11	11	11	12	11

Total number of blows analyzed: 6

Time Summary

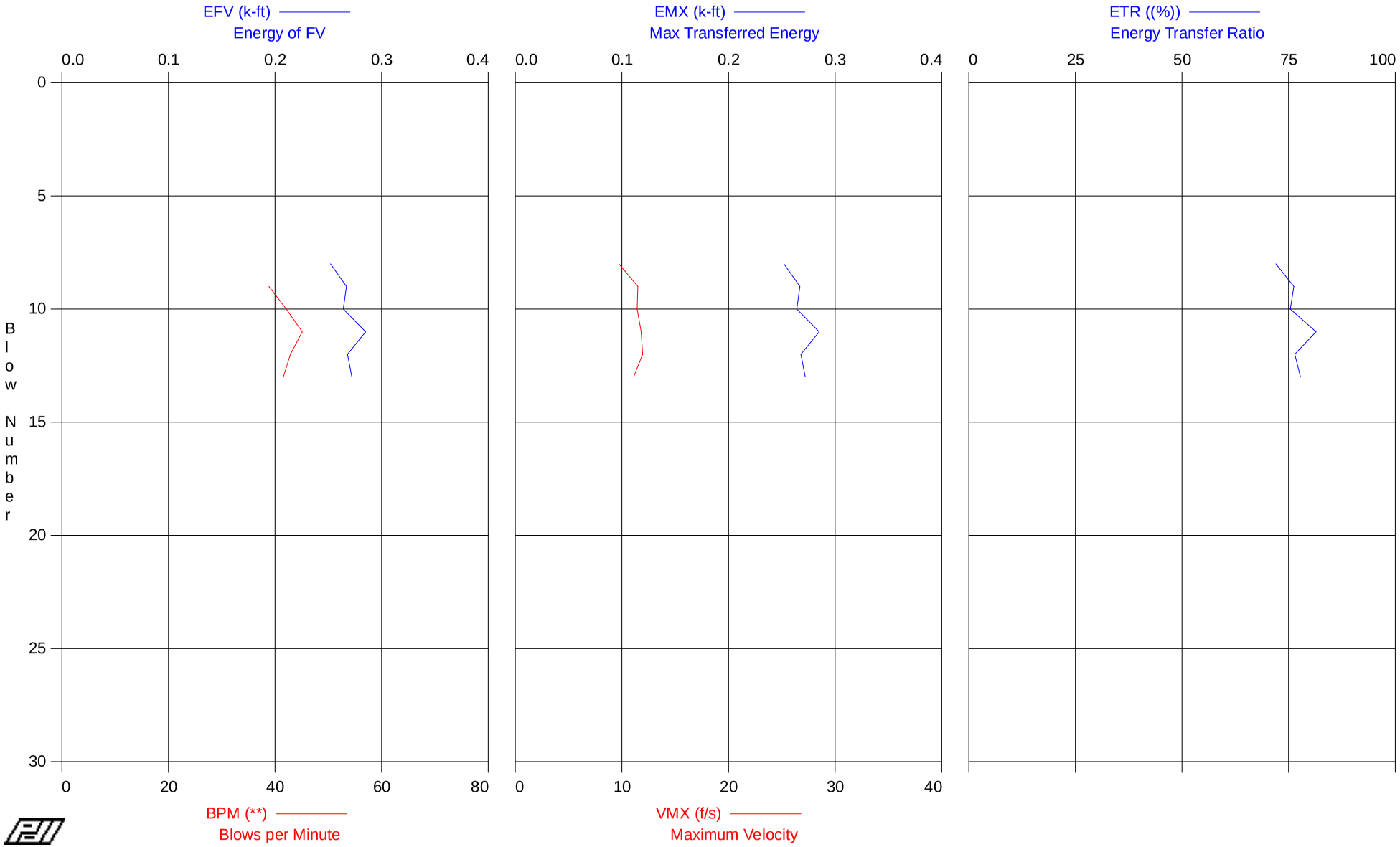
Drive 7 seconds 1:02:24 PM - 1:02:31 PM (7/23/2013) BN 8 - 13

Gregg Drilling & Testing - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 72.5ft



D3 - LBS2 @ 77.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 84.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
1	0.00	0.3	0.0	0.3	12.2	73.8
2	0.00	0.3	33.1	0.3	12.6	75.9
3	0.00	0.3	36.7	0.3	12.4	74.6
4	0.00	0.3	34.7	0.3	12.5	74.2
5	0.00	0.3	36.9	0.3	12.3	73.0
6	0.00	0.3	38.9	0.3	12.8	74.2
7	0.00	0.2	37.5	0.2	12.5	70.0
8	0.00	0.3	36.4	0.3	11.9	74.2
9	0.00	0.3	38.9	0.3	11.3	71.7
	Average	0.3	36.6	0.3	12.3	73.5
	Std. Dev.	0.0	1.8	0.0	0.4	1.6
	Maximum	0.3	38.9	0.3	12.8	75.9
	@ Blow#	2	6	2	6	2

Total number of blows analyzed: 9

Time Summary

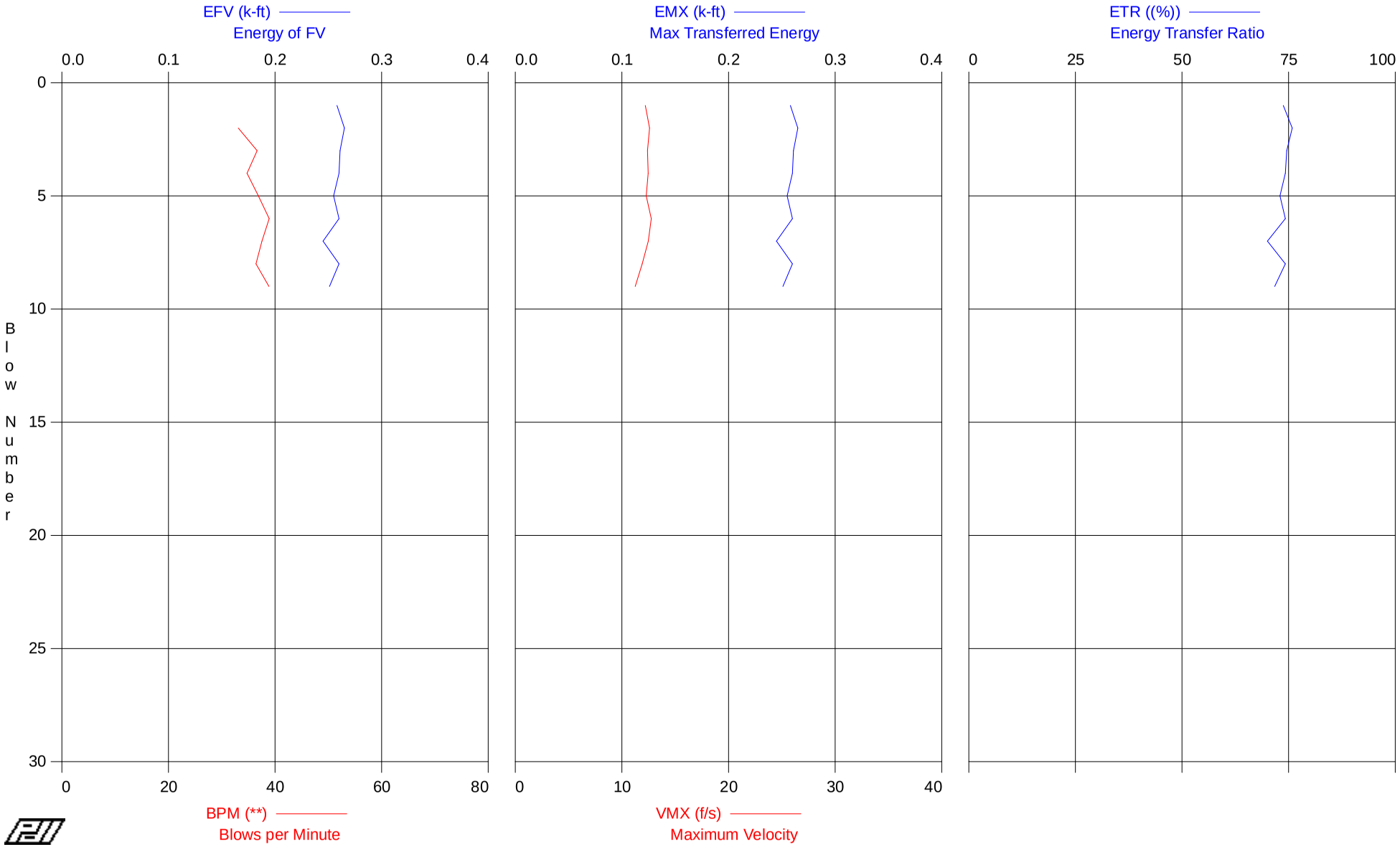
Drive 14 seconds 1:34:46 PM - 1:35:00 PM (7/23/2013) BN 1 - 9

Gregg Drilling & Testing - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 77.5ft



D3 - LBS2 @ 82.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 89.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
2	0.00	0.3	0.0	0.3	12.1	74.3
3	0.00	0.3	31.2	0.3	12.2	78.9
5	0.00	0.3	31.6	0.3	14.0	79.0
6	0.00	0.3	42.1	0.3	13.8	83.6
7	0.00	0.3	41.7	0.3	14.0	81.1
8	0.00	0.3	42.3	0.3	12.9	80.6
9	0.00	0.3	42.8	0.3	15.2	89.7
10	0.00	0.3	42.9	0.3	12.6	85.1
11	0.00	0.3	41.9	0.3	12.2	84.8
12	0.00	0.3	42.3	0.3	12.5	90.4
13	0.00	0.3	43.8	0.3	14.7	84.8
14	0.00	0.3	43.8	0.3	14.7	83.9
15	0.00	0.3	42.9	0.3	14.0	85.3
16	0.00	0.3	42.3	0.3	13.4	87.7
17	0.00	0.3	42.2	0.3	13.0	84.5
18	0.00	0.3	42.9	0.3	13.9	88.1
19	0.00	0.3	42.7	0.3	12.4	84.4
20	0.00	0.3	42.2	0.3	12.6	83.4
21	0.00	0.3	41.9	0.3	12.2	83.4
22	0.00	0.3	42.5	0.3	12.6	88.6
23	0.00	0.3	43.0	0.3	13.5	87.1
24	0.00	0.3	42.6	0.3	12.4	83.7
25	0.00	0.3	42.3	0.3	12.4	86.7
26	0.00	0.3	42.1	0.3	13.9	87.4
27	0.00	0.3	42.9	0.3	13.7	85.5
28	0.00	0.3	43.2	0.3	12.6	85.5
29	0.00	0.3	42.5	0.3	13.3	84.3
30	0.00	0.3	39.7	0.3	14.6	88.9
31	0.00	0.3	43.0	0.3	14.7	84.9
32	0.00	0.3	42.5	0.3	14.1	86.9
33	0.00	0.3	41.7	0.3	13.1	87.8
34	0.00	0.3	40.3	0.3	14.3	82.6
35	0.00	0.3	41.4	0.3	13.6	86.7
36	0.00	0.3	41.4	0.3	14.4	83.3
37	0.00	0.3	41.2	0.3	14.2	85.2
38	0.00	0.3	40.7	0.3	12.5	85.4
39	0.00	0.3	41.0	0.3	13.8	86.4
40	0.00	0.3	41.5	0.3	12.9	85.7
41	0.00	0.3	41.4	0.3	13.3	84.5
42	0.00	0.3	41.1	0.3	13.9	84.3
43	0.00	0.3	41.2	0.3	13.5	88.4
44	0.00	0.3	41.4	0.3	12.6	81.5
45	0.00	0.3	41.3	0.3	14.4	85.5
	Average	0.3	41.5	0.3	13.4	84.9
	Std. Dev.	0.0	2.4	0.0	0.8	3.0
	Maximum	0.3	43.8	0.3	15.2	90.4
	@ Blow#	12	14	12	9	12

Total number of blows analyzed: 43

Time Summary

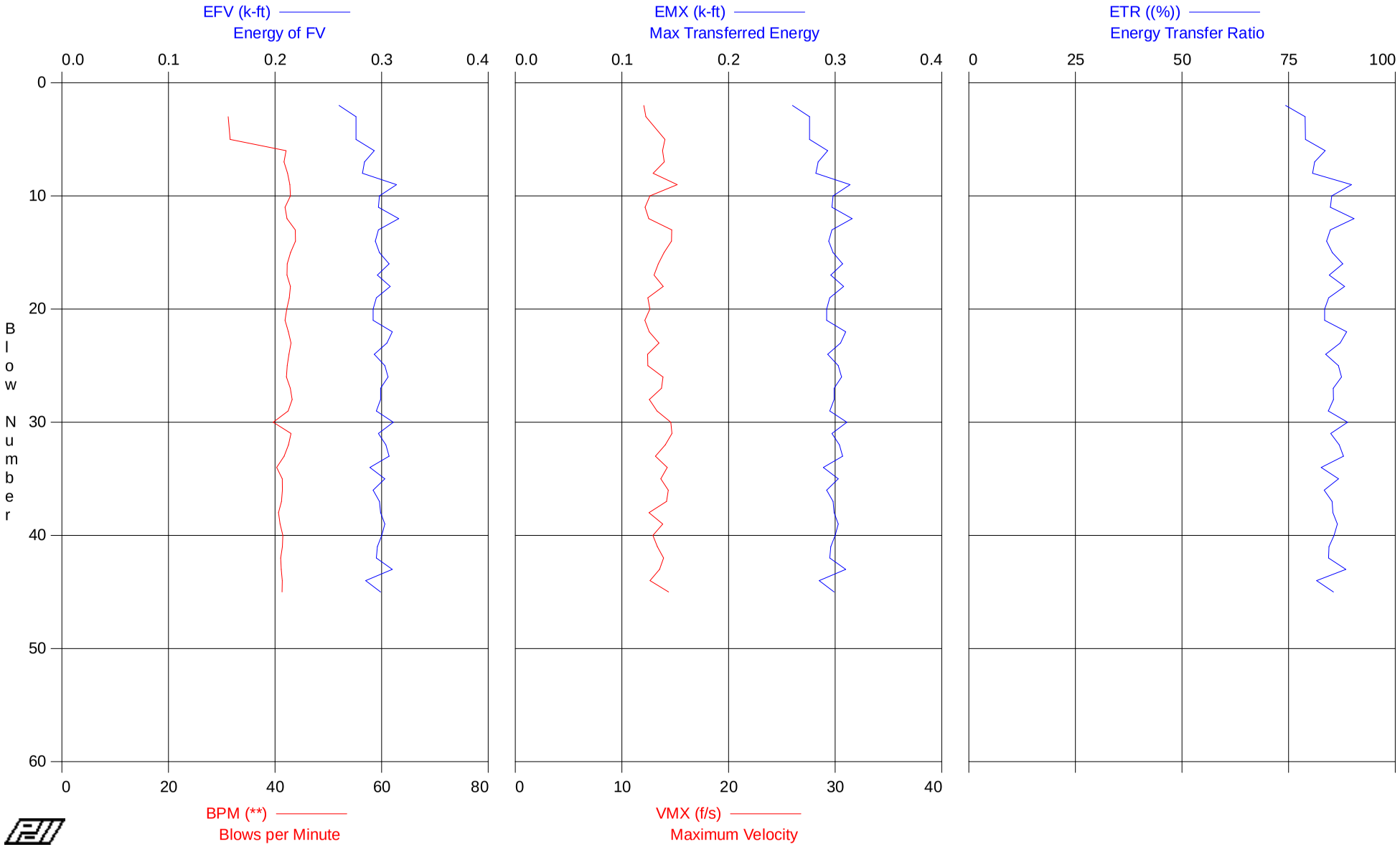
Drive 1 minute 2 seconds 2:22:57 PM - 2:23:59 PM (7/23/2013) BN 2 - 45

Gregg Drilling & Testing - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 82.5ft



D3 - LBS2 @ 87.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 94.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
1	0.00	0.3	38.7	0.3	13.3	79.5
2	0.00	0.3	40.1	0.3	13.1	79.2
3	0.00	0.3	39.2	0.3	12.2	76.5
4	0.00	0.3	38.0	0.3	13.5	77.2
5	0.00	0.3	38.0	0.3	12.6	76.4
6	0.00	0.3	39.2	0.3	12.4	78.5
7	0.00	0.3	38.6	0.3	12.8	74.3
8	0.00	0.3	35.9	0.3	12.0	76.4
9	0.00	0.3	37.0	0.3	12.0	76.5
10	0.00	0.3	38.6	0.3	12.0	76.9
11	0.00	0.3	33.7	0.3	13.2	78.7
12	0.00	0.3	39.1	0.3	12.1	77.2
13	0.00	0.3	40.0	0.3	12.4	76.5
14	0.00	0.3	40.1	0.3	13.2	77.7
15	0.00	0.3	39.4	0.3	12.4	77.9
16	0.00	0.3	38.8	0.3	11.9	75.6
17	0.00	0.3	36.2	0.3	12.4	76.2
18	0.00	0.3	38.9	0.3	12.2	79.1
19	0.00	0.3	42.8	0.3	12.2	79.1
20	0.00	0.3	41.4	0.3	11.9	76.8
21	0.00	0.3	39.0	0.3	13.7	77.0
22	0.00	0.3	39.4	0.3	12.3	78.2
23	0.00	0.3	40.6	0.3	12.7	77.0
24	0.00	0.3	35.4	0.3	12.6	74.2
25	0.00	0.3	38.7	0.3	12.0	76.5
26	0.00	0.3	38.3	0.3	12.9	74.1
27	0.00	0.3	39.1	0.3	12.2	76.9
28	0.00	0.3	39.3	0.3	12.6	76.8
29	0.00	0.3	29.8	0.3	12.1	75.8
30	0.00	0.3	36.0	0.3	12.6	75.8
31	0.00	0.3	36.7	0.3	11.8	74.8
32	0.00	0.3	36.5	0.3	12.5	77.2
33	0.00	0.3	36.9	0.3	12.2	75.8
34	0.00	0.3	36.2	0.3	12.9	73.1
35	0.00	0.3	37.8	0.3	11.8	75.5
36	0.00	0.3	37.6	0.3	12.9	73.9
37	0.00	0.3	37.0	0.3	13.0	74.4
38	0.00	0.3	36.3	0.3	13.1	74.2
39	0.00	0.3	37.3	0.3	12.8	73.2
40	0.00	0.3	37.3	0.3	11.7	73.9
41	0.00	0.3	37.0	0.3	11.9	72.8
42	0.00	0.3	36.4	0.3	13.1	74.6
43	0.00	0.3	37.0	0.3	12.5	73.3
44	0.00	0.3	37.0	0.3	11.9	72.8
45	0.00	0.3	36.3	0.3	12.6	72.5
46	0.00	0.3	36.1	0.3	12.0	73.2
47	0.00	0.3	37.4	0.3	12.6	74.3
48	0.00	0.3	37.2	0.3	11.8	74.8
49	0.00	0.3	36.7	0.3	12.4	73.7
50	0.00	0.3	36.1	0.3	11.8	73.6
51	0.00	0.3	37.5	0.3	13.2	73.6
52	0.00	0.3	37.1	0.3	12.1	74.1
53	0.00	0.3	36.5	0.3	12.2	73.3
54	0.00	0.3	36.3	0.3	12.5	73.2
55	0.00	0.3	36.1	0.3	12.3	72.9
56	0.00	0.3	35.1	0.3	12.0	72.0
57	0.00	0.3	34.4	0.3	12.2	72.1
58	0.00	0.2	34.7	0.2	12.7	71.2
59	0.00	0.3	34.7	0.3	12.0	72.8
60	0.00	0.3	34.8	0.3	11.3	71.7
61	0.00	0.3	34.2	0.3	11.5	73.9
62	0.00	0.3	37.4	0.3	12.2	73.5
63	0.00	0.3	35.6	0.3	12.1	73.0
64	0.00	0.3	34.5	0.3	11.8	73.8
65	0.00	0.3	34.0	0.3	12.8	73.6
66	0.00	0.3	35.5	0.3	11.7	73.8
67	0.00	0.3	35.3	0.3	12.1	72.7

D3 - LBS2 @ 87.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
68	0.00	0.3	34.6	0.3	11.6	72.6
69	0.00	0.3	34.6	0.3	11.8	73.4
70	0.00	0.3	35.0	0.3	11.9	71.5
71	0.00	0.3	34.7	0.3	11.4	72.8
72	0.00	0.3	34.4	0.3	11.6	74.1
73	0.00	0.3	35.0	0.3	11.7	73.3
74	0.00	0.3	35.4	0.3	12.7	73.6
75	0.00	0.3	36.4	0.3	12.6	72.8
76	0.00	0.3	36.1	0.3	11.8	73.5
77	0.00	0.3	36.0	0.3	12.4	73.2
78	0.00	0.3	37.5	0.3	11.7	73.5
79	0.00	0.3	36.8	0.3	12.0	74.8
80	0.00	0.3	36.0	0.3	12.3	74.2
81	0.00	0.3	35.9	0.3	13.0	75.5
	Average	0.3	36.9	0.3	12.3	74.8
	Std. Dev.	0.0	2.0	0.0	0.5	2.0
	Maximum	0.3	42.8	0.3	13.7	79.5
	@ Blow#	1	19	1	21	1

Total number of blows analyzed: 81

Time Summary

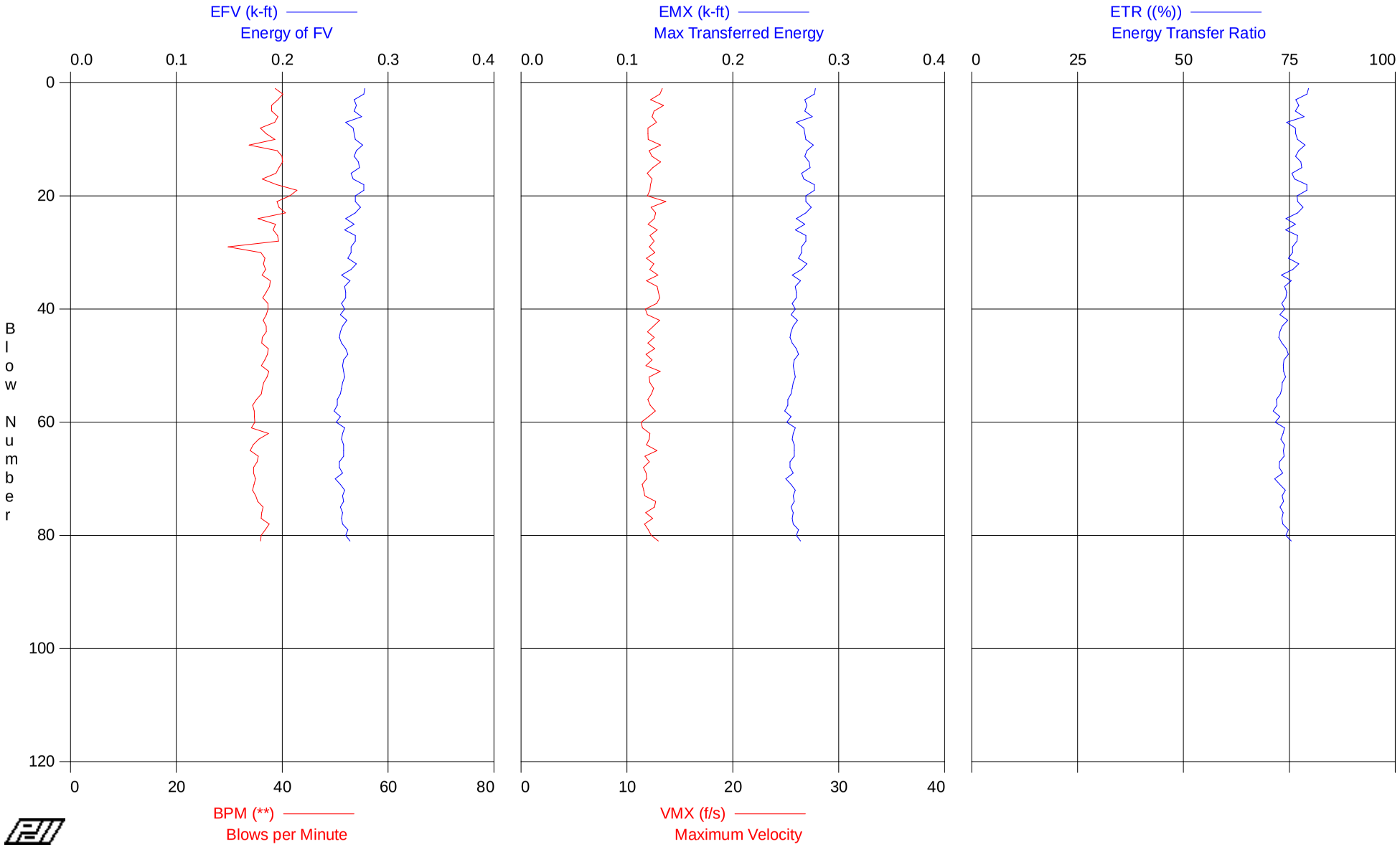
Drive 2 minutes 10 seconds 3:02:43 PM - 3:04:53 PM (7/23/2013) BN 1 - 81

Gregg Drilling & Testing - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 87.5ft



D3 - LBS2 @ 92.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 99.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
1	0.00	0.2	0.0	0.2	12.1	70.8
2	0.00	0.3	34.5	0.3	12.6	72.9
3	0.00	0.3	34.8	0.3	12.2	73.5
4	0.00	0.3	34.7	0.3	12.1	74.8
5	0.00	0.3	33.1	0.3	13.3	75.4
6	0.00	0.3	37.8	0.3	12.8	74.9
7	0.00	0.3	37.5	0.3	13.7	76.6
8	0.00	0.3	37.4	0.3	14.0	76.9
9	0.00	0.3	36.4	0.3	13.6	78.3
10	0.00	0.3	36.4	0.3	13.3	75.7
11	0.00	0.3	36.4	0.3	13.6	76.1
12	0.00	0.3	35.3	0.3	13.8	74.4
13	0.00	0.3	35.4	0.3	13.5	77.7
14	0.00	0.3	36.0	0.3	13.4	75.2
15	0.00	0.3	36.1	0.3	13.5	76.3
16	0.00	0.3	36.0	0.3	12.7	78.0
17	0.00	0.3	35.9	0.3	13.7	75.1
18	0.00	0.3	35.4	0.3	13.1	74.5
19	0.00	0.3	35.3	0.3	13.4	74.5
20	0.00	0.3	35.1	0.3	13.3	75.5
21	0.00	0.3	34.8	0.3	12.3	77.0
22	0.00	0.3	35.6	0.3	13.6	79.8
23	0.00	0.3	37.2	0.3	14.0	77.5
24	0.00	0.3	36.3	0.3	12.8	79.2
25	0.00	0.3	36.8	0.3	13.2	78.2
26	0.00	0.3	36.8	0.3	13.1	78.4
27	0.00	0.3	36.5	0.3	13.5	78.2
28	0.00	0.3	36.2	0.3	13.6	79.1
29	0.00	0.3	37.9	0.3	13.0	76.6
30	0.00	0.3	37.8	0.3	13.3	76.2
31	0.00	0.3	37.5	0.3	12.4	78.0
32	0.00	0.3	37.2	0.3	12.9	76.8
33	0.00	0.3	36.5	0.3	13.1	80.2
34	0.00	0.3	36.4	0.3	13.5	77.5
35	0.00	0.3	36.5	0.3	13.1	78.8
36	0.00	0.3	37.2	0.3	12.4	76.4
37	0.00	0.3	37.1	0.3	13.5	76.8
38	0.00	0.3	37.1	0.3	13.6	77.4
39	0.00	0.3	36.8	0.3	12.5	76.0
40	0.00	0.3	36.8	0.3	13.7	77.9
41	0.00	0.3	36.8	0.3	13.4	77.5
42	0.00	0.3	36.7	0.3	13.4	78.5
43	0.00	0.3	36.7	0.3	13.4	77.8
44	0.00	0.3	37.1	0.3	13.7	77.6
45	0.00	0.3	33.5	0.3	13.3	74.1
46	0.00	0.3	32.0	0.3	13.7	77.6
47	0.00	0.3	38.9	0.3	12.5	80.2
48	0.00	0.3	38.9	0.3	12.5	77.5
49	0.00	0.3	39.6	0.3	12.7	79.0
50	0.00	0.3	41.0	0.3	12.4	78.4
51	0.00	0.3	38.5	0.3	12.9	76.7
52	0.00	0.3	37.3	0.3	12.6	77.1
53	0.00	0.3	38.4	0.3	13.2	77.6
54	0.00	0.3	38.4	0.3	12.9	77.3
55	0.00	0.3	38.2	0.3	13.5	76.4
56	0.00	0.3	38.0	0.3	13.2	76.5
57	0.00	0.3	36.5	0.3	13.2	76.6
58	0.00	0.3	35.9	0.3	12.2	77.3
59	0.00	0.3	37.2	0.3	12.8	77.4
60	0.00	0.3	37.3	0.3	12.3	77.3
61	0.00	0.3	37.4	0.3	12.3	80.1
62	0.00	0.3	37.4	0.3	12.3	78.0
63	0.00	0.3	37.3	0.3	13.0	78.8
64	0.00	0.3	37.4	0.3	13.1	77.9
65	0.00	0.3	38.2	0.3	12.9	79.3
66	0.00	0.3	38.6	0.3	13.7	78.6
67	0.00	0.3	38.8	0.3	12.4	79.2

D3 - LBS2 @ 92.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
68	0.00	0.3	38.2	0.3	12.2	79.2
69	0.00	0.3	36.9	0.3	13.2	77.6
70	0.00	0.3	36.2	0.3	13.3	77.1
71	0.00	0.3	36.3	0.3	12.8	78.6
72	0.00	0.3	36.4	0.3	13.1	78.1
73	0.00	0.3	37.0	0.3	13.6	76.9
74	0.00	0.3	37.1	0.3	12.7	77.7
75	0.00	0.3	36.9	0.3	13.0	76.6
76	0.00	0.3	37.0	0.3	12.1	77.5
77	0.00	0.3	36.5	0.3	12.4	76.2
78	0.00	0.3	36.8	0.3	13.6	76.5
79	0.00	0.3	36.7	0.3	13.1	76.8
80	0.00	0.3	36.6	0.3	13.8	76.7
81	0.00	0.3	34.8	0.3	12.7	75.2
82	0.00	0.3	35.4	0.3	13.2	75.2
83	0.00	0.3	35.0	0.3	12.8	76.3
84	0.00	0.3	34.0	0.3	12.2	75.1
85	0.00	0.3	34.1	0.3	13.2	74.9
86	0.00	0.3	34.9	0.3	13.4	76.3
87	0.00	0.3	37.3	0.3	13.0	76.3
88	0.00	0.3	37.2	0.3	12.4	75.7
89	0.00	0.3	36.9	0.3	13.6	75.8
90	0.00	0.3	36.8	0.3	13.3	76.7
91	0.00	0.3	36.9	0.3	13.0	76.6
92	0.00	0.3	36.4	0.3	13.5	78.2
	Average	0.3	36.6	0.3	13.1	77.0
	Std. Dev.	0.0	1.4	0.0	0.5	1.6
	Maximum	0.3	41.0	0.3	14.0	80.2
	@ Blow#	33	50	33	8	47

Total number of blows analyzed: 92

Time Summary

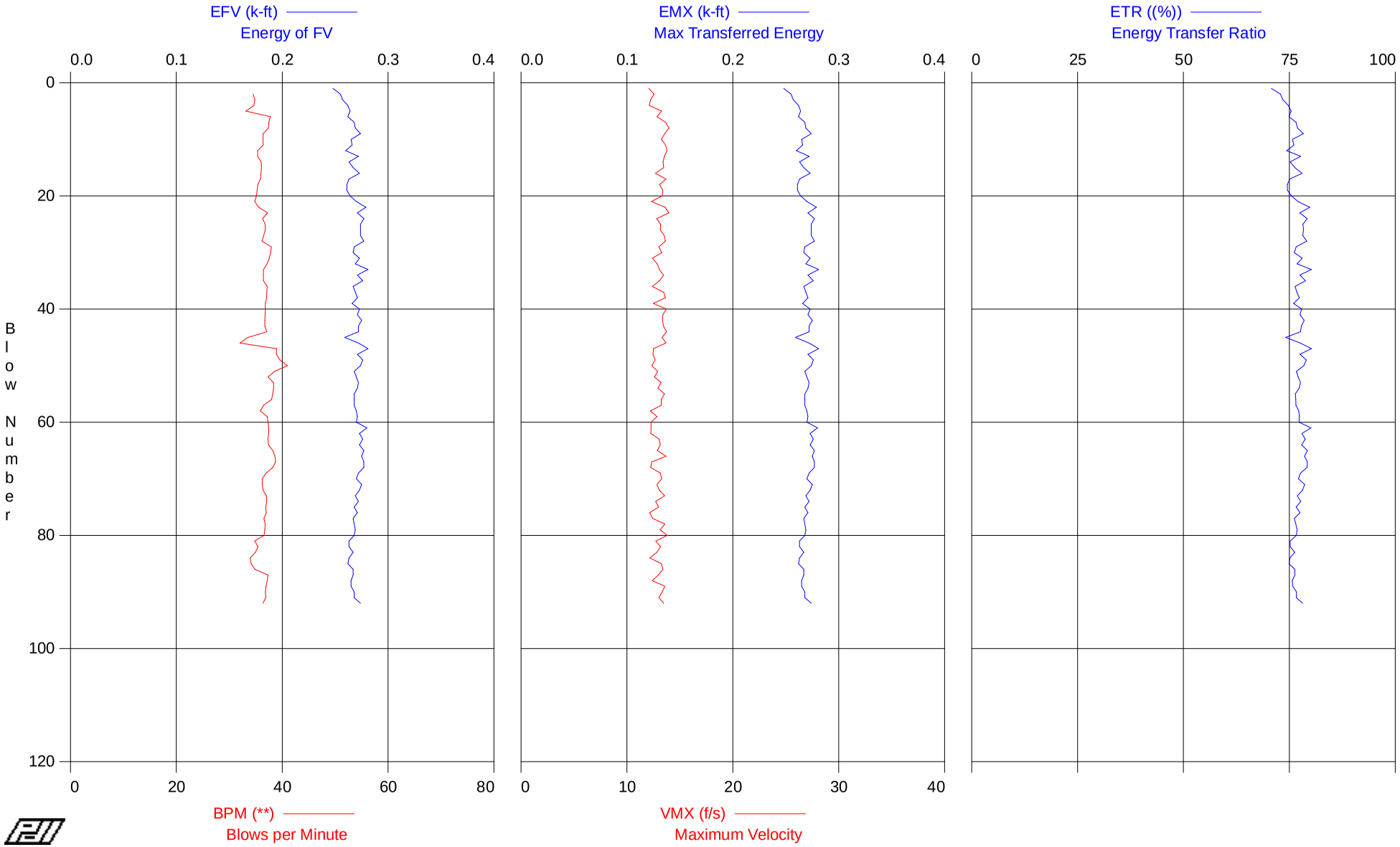
Drive	2 minutes 29 seconds	4:59:21 PM - 5:01:50 PM (7/23/2013) BN 1 - 92

Gregg Drilling & Testing - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 92.5ft



D3 - LBS2 @ 97.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

AR: 1.45 in^2
LE: 104.63 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.35

EFV: Energy of FV
BPM: Blows per Minute
EMX: Max Transferred Energy

VMX: Maximum Velocity
ETR: Energy Transfer Ratio

BL#	depth	EFV	BPM	EMX	VMX	ETR
	ft	k-ft	**	k-ft	f/s	(%)
3	0.00	0.3	24.6	0.3	13.2	76.9
4	0.00	0.3	30.7	0.3	13.1	76.6
5	0.00	0.3	30.8	0.3	12.1	76.4
6	0.00	0.3	31.2	0.3	12.2	76.9
7	0.00	0.3	31.1	0.3	12.6	76.2
8	0.00	0.3	31.5	0.3	13.7	81.0
9	0.00	0.3	35.9	0.3	12.7	83.5
10	0.00	0.3	38.1	0.3	12.4	81.1
11	0.00	0.3	38.4	0.3	12.6	83.1
12	0.00	0.3	38.4	0.3	13.0	83.1
13	0.00	0.3	38.6	0.3	12.9	79.6
14	0.00	0.3	39.2	0.3	12.7	80.3
15	0.00	0.3	39.2	0.3	12.3	79.9
16	0.00	0.3	39.3	0.3	12.6	86.7
17	0.00	0.3	39.3	0.3	12.6	80.0
18	0.00	0.3	38.8	0.3	12.9	82.3
19	0.00	0.3	40.5	0.3	13.1	81.6
20	0.00	0.3	41.5	0.3	13.8	83.4
21	0.00	0.3	42.3	0.3	12.7	81.1
22	0.00	0.3	42.2	0.3	12.7	81.0
23	0.00	0.3	42.2	0.3	13.6	81.5
24	0.00	0.3	42.1	0.3	13.9	81.4
25	0.00	0.3	42.1	0.3	13.3	81.5
26	0.00	0.3	42.1	0.3	14.0	80.5
27	0.00	0.3	42.0	0.3	13.1	80.0
28	0.00	0.3	41.8	0.3	13.2	84.0
29	0.00	0.3	41.4	0.3	12.7	78.7
30	0.00	0.3	41.5	0.3	13.3	79.6
31	0.00	0.3	41.8	0.3	13.6	79.4
32	0.00	0.3	41.8	0.3	13.7	78.7
33	0.00	0.3	41.9	0.3	13.5	79.3
34	0.00	0.3	41.6	0.3	13.5	79.2
35	0.00	0.3	41.7	0.3	13.2	79.6
36	0.00	0.3	41.7	0.3	13.4	78.5
37	0.00	0.3	41.4	0.3	12.8	80.1
38	0.00	0.3	41.4	0.3	13.0	80.4
39	0.00	0.3	41.5	0.3	13.2	79.9
40	0.00	0.3	41.6	0.3	12.7	81.4
41	0.00	0.3	41.5	0.3	13.5	80.3
42	0.00	0.3	41.5	0.3	13.0	79.7
43	0.00	0.3	41.2	0.3	13.0	80.3
44	0.00	0.3	41.3	0.3	12.5	79.5
45	0.00	0.3	41.1	0.3	13.0	79.5
46	0.00	0.3	41.2	0.3	13.1	78.9
47	0.00	0.3	41.4	0.3	12.6	79.6
48	0.00	0.3	41.3	0.3	12.7	79.9
49	0.00	0.3	41.5	0.3	12.8	80.2
50	0.00	0.3	40.2	0.3	12.9	78.9
51	0.00	0.3	40.6	0.3	12.4	77.7
52	0.00	0.3	39.8	0.3	12.7	80.1
53	0.00	0.3	39.5	0.3	12.8	75.7
54	0.00	0.3	39.0	0.3	13.5	75.4
55	0.00	0.3	38.8	0.3	13.2	75.5
56	0.00	0.3	39.0	0.3	12.6	77.6
57	0.00	0.3	39.5	0.3	12.9	77.1
58	0.00	0.3	39.5	0.3	13.0	76.5
59	0.00	0.3	39.4	0.3	13.6	77.6
60	0.00	0.3	39.3	0.3	12.5	77.2
61	0.00	0.3	39.4	0.3	13.4	78.5
62	0.00	0.3	39.2	0.3	12.5	77.7
63	0.00	0.3	39.2	0.3	12.5	75.6
64	0.00	0.3	39.3	0.3	13.0	77.5
65	0.00	0.3	39.3	0.3	12.6	76.7
66	0.00	0.3	39.3	0.3	13.3	77.6
67	0.00	0.3	39.3	0.3	13.0	75.3
68	0.00	0.3	39.2	0.3	13.5	76.4
69	0.00	0.3	39.3	0.3	13.7	77.4

D3 - LBS2 @ 97.5ft
OP: MSULLIVAN

140LB AUTO HAMMER
Test date: 23-Jul-2013

	EFV	BPM	EMX	VMX	ETR
	k-ft	**	k-ft	f/s	(%)
Average	0.3	39.5	0.3	13.0	79.3
Std. Dev.	0.0	3.3	0.0	0.4	2.3
Maximum	0.3	42.3	0.3	14.0	86.7
@ Blow#	16	21	16	26	16

Total number of blows analyzed: 67

Time Summary

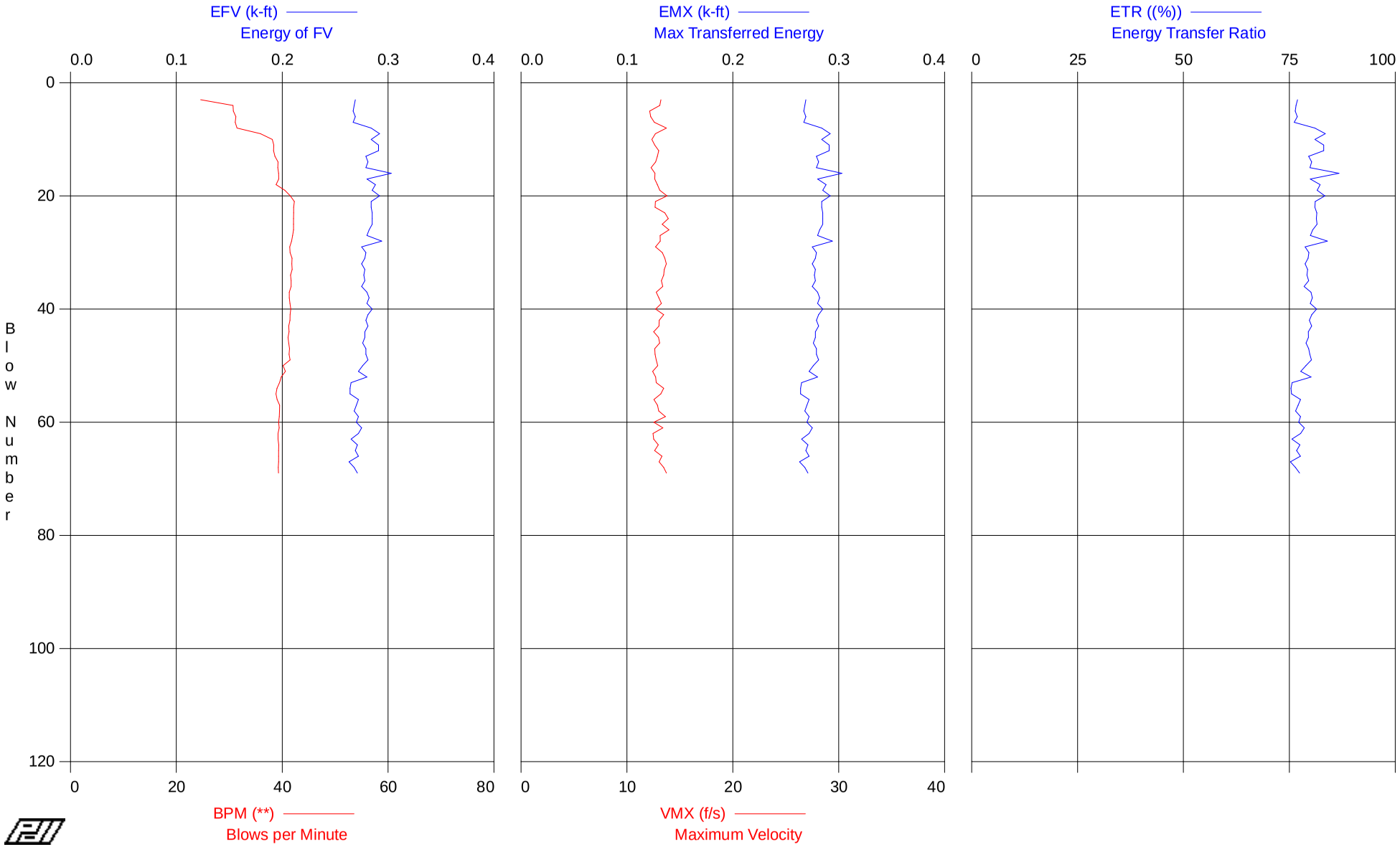
Drive	1 minute 41 seconds	5:42:44 PM - 5:44:25 PM (7/23/2013) BN 3 - 69

Gregg Drilling & Testing - Case Method & iCAP® Results

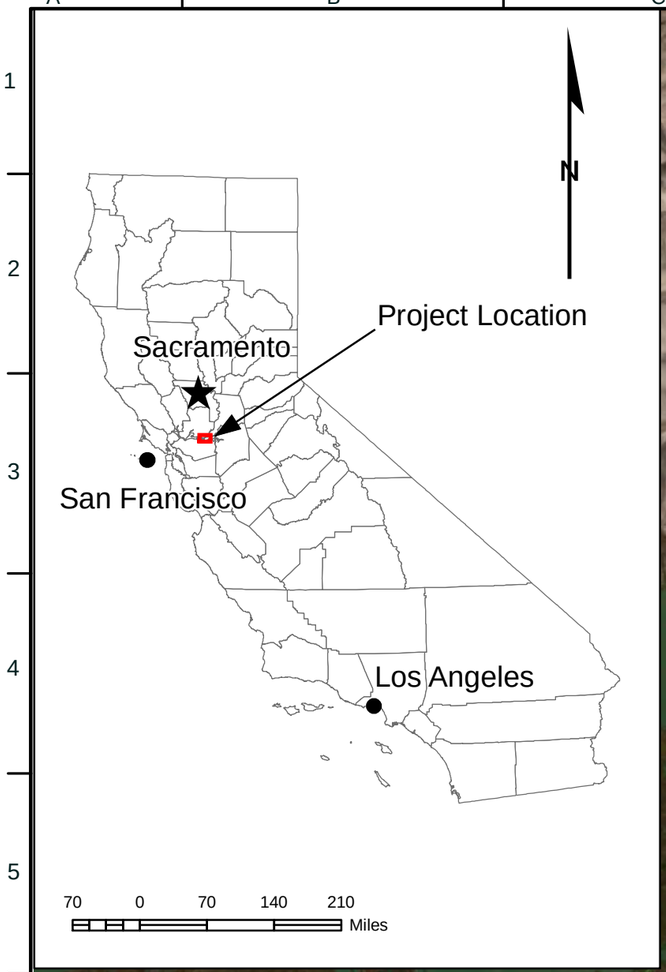
PDIPLOT Ver. 2012.2 - Printed: 8-Aug-2013

Test date: 23-Jul-2013

D3 - LBS2 @ 97.5ft



PLATES



THINK SAFETY - ACT SAFELY

REV.	DATE	DESCRIPTION

DRAWING SCALES

0.5 0 0.5 1 1.5 Miles

GEOLOGY REPORT No. 80-10-39

CONSTRUCTION SPEC. No.

GEOLOGY DRAWING No. PG-D10-005

GEOLOGIC MAPPING AND/OR LOGGING BY: 1 _____ 2 _____

DRAWING PREPARED BY: M. Pagenkopp DATE: 12/02/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH AND LITTLE BAJA
LOCATION MAP

RELEASE DATE: 01/21/2014

SHEET No. 1 of 1

PLATE 1

$$$DATE$$$
$$$DESIGNFILESPECIFICA$$$

THINK SAFETY - ACT SAFELY

REV.	DATE	DESCRIPTION

DRAWING SCALES

40 0 40 80 120

Feet

GEOLOGY REPORT No. 80-10-39

CONSTRUCTION SPEC. No.

GEOLOGY DRAWING No. PG-D10-006

GEOLOGIC MAPPING AND/OR LOGGING BY:

1

2

DRAWING PREPARED BY: M. Pagenkopp DATE: 12/02/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH FISH RELEASE SITE
GEOLOGIC EXPLORATION AND PLAN MAP

RELEASE DATE : 01/21/2014

SHEET No. 1 of 1

PLATE 2

$$$DATES$$$
$$$DESIGNFILESPECIFICAS$$$

$$$$$$$$$$$$$$$$$$$$DESIGNFILESPECIFICATION$$$$$$$$$$$$$$$$$$$$

THINK SAFETY - ACT SAFELY

REV.	DATE	DESCRIPTION

DRAWING SCALES

40 0 40 80 120 Feet

GEOLOGY REPORT No. 80-10-39

CONSTRUCTION SPEC. No.

GEOLOGY DRAWING No. PG-D10-007

GEOLOGIC MAPPING AND/OR LOGGING BY: 1 2

DRAWING PREPARED BY: M. Pagenkopp DATE: 12/02/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
LITTLE BAJA FISH RELEASE SITE
GEOLOGIC EXPLORATION AND PLAN MAP

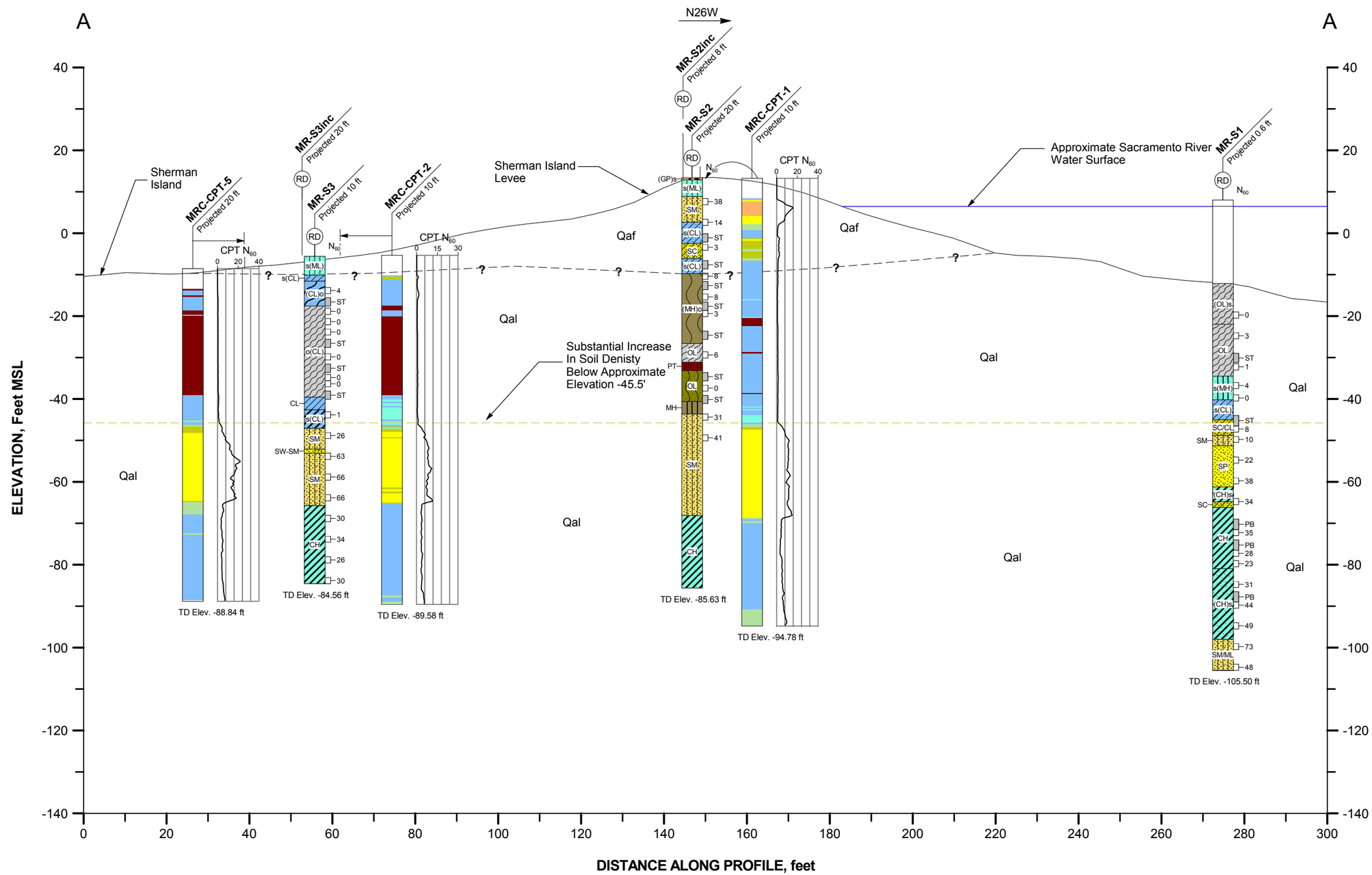
RELEASE DATE : 01/21/2014

SHEET No. 1 of 1

PLATE 3

$$DATE$$$$
$$$DESIGNFILESPECIFICA$$$$

$$$$$$$$$$$$$$$$$$$$DESIGNFILESPECIFICATION$$$$$$$$$$$$$$$$$$$$



Notes:
1) See Plate 2 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

REV.	DATE	DESCRIPTION

DRAWING SCALES
0 12.5 25 37.5 50 62.5 Vertical Scale 25.00 ft/in.
0 12.5 25 37.5 50 62.5 Horizontal Scale 25.00 ft/in.

GEOLOGY REPORT No. 80-10-39
CONSTRUCTION SPEC. No.
GEOLOGY DRAWING No. PG-D10-008

GEOLOGIC MAPPING AND/OR LOGGING BY:
1 D. Perry
2 N. Hightower
DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013

STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

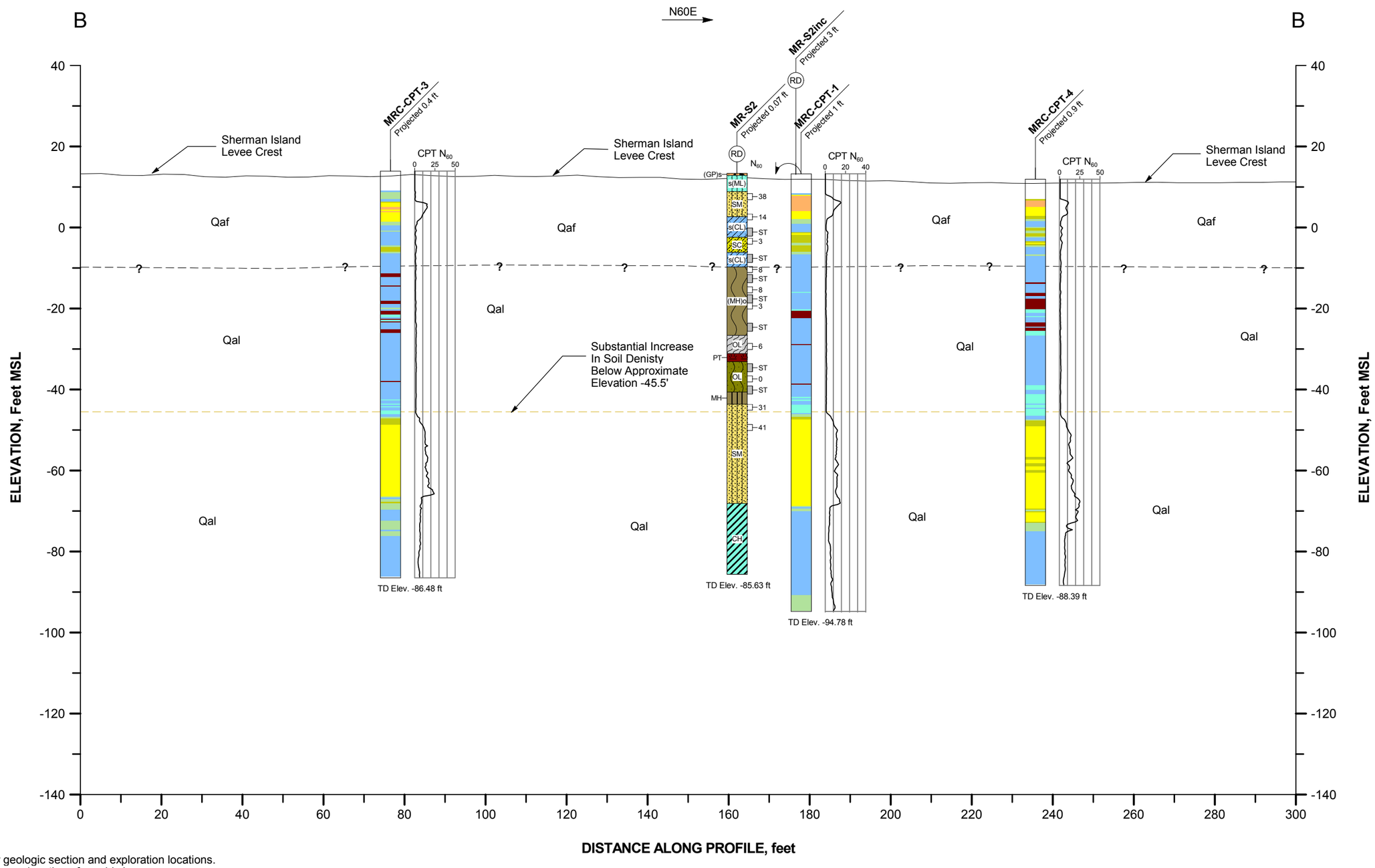
THINK SAFETY - ACT SAFELY

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH FISH RELEASE SITE
GEOLOGIC SECTION A - A

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 4

$$$DATE$$$$
$$$DESIGNFILESPECIFICA$$$$

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES



Notes:
1) See Plate 2 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

REV.	DATE	DESCRIPTION

DRAWING SCALES
0 12.5 25 37.5 50 62.5 Vertical Scale 25.00 ft/in.
0 12.5 25 37.5 50 62.5 Horizontal Scale 25.00 ft/in.

GEOLOGY REPORT No. 80-10-39
CONSTRUCTION SPEC. No.
GEOLOGY DRAWING No. PG-D10-009

GEOLOGIC MAPPING AND/OR LOGGING BY:
1 D. Perry
2 N. Hightower
DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

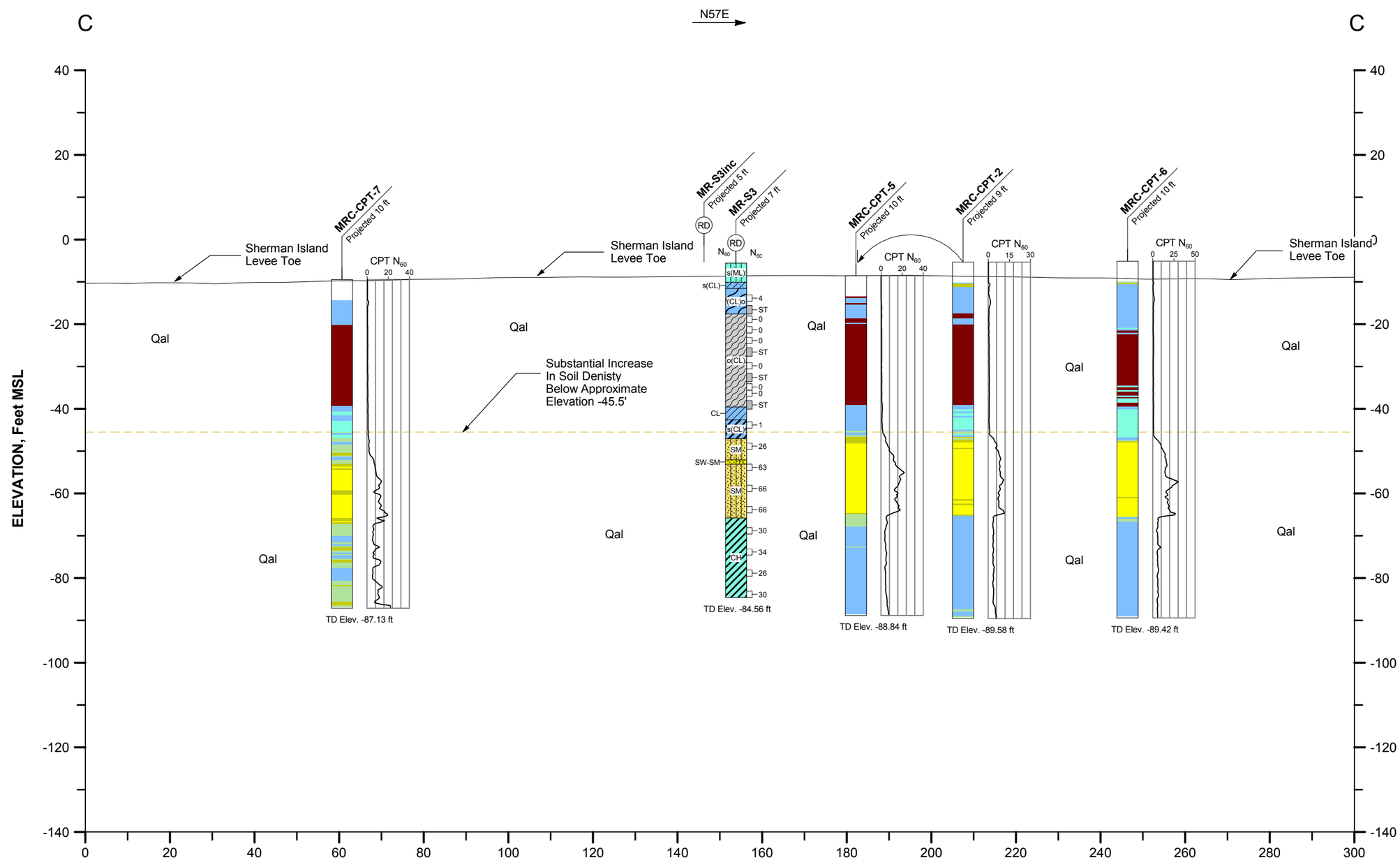
THINK SAFETY - ACT SAFELY

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH FISH RELEASE SITE
GEOLOGIC SECTION B - B

RELEASE DATE: 01/21/2012
SHEET No. 1 of 1
PLATE 5

$$$DATE$$$$
$$$DESIGNFILESPECIFICA$$$$

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES



Notes:
1) See Plate 2 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

THINK SAFETY - ACT SAFELY

DRAWING SCALES: Vertical Scale 25.00 ft/in.; Horizontal Scale 25.00 ft/in.	GEOLOGY REPORT No. 80-10-39	GEOLOGIC MAPPING AND/OR LOGGING BY: 1 D. Perry; 2 N. Hightower
	CONSTRUCTION SPEC. No.	DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013
	GEOLOGY DRAWING No. PG-D10-010	

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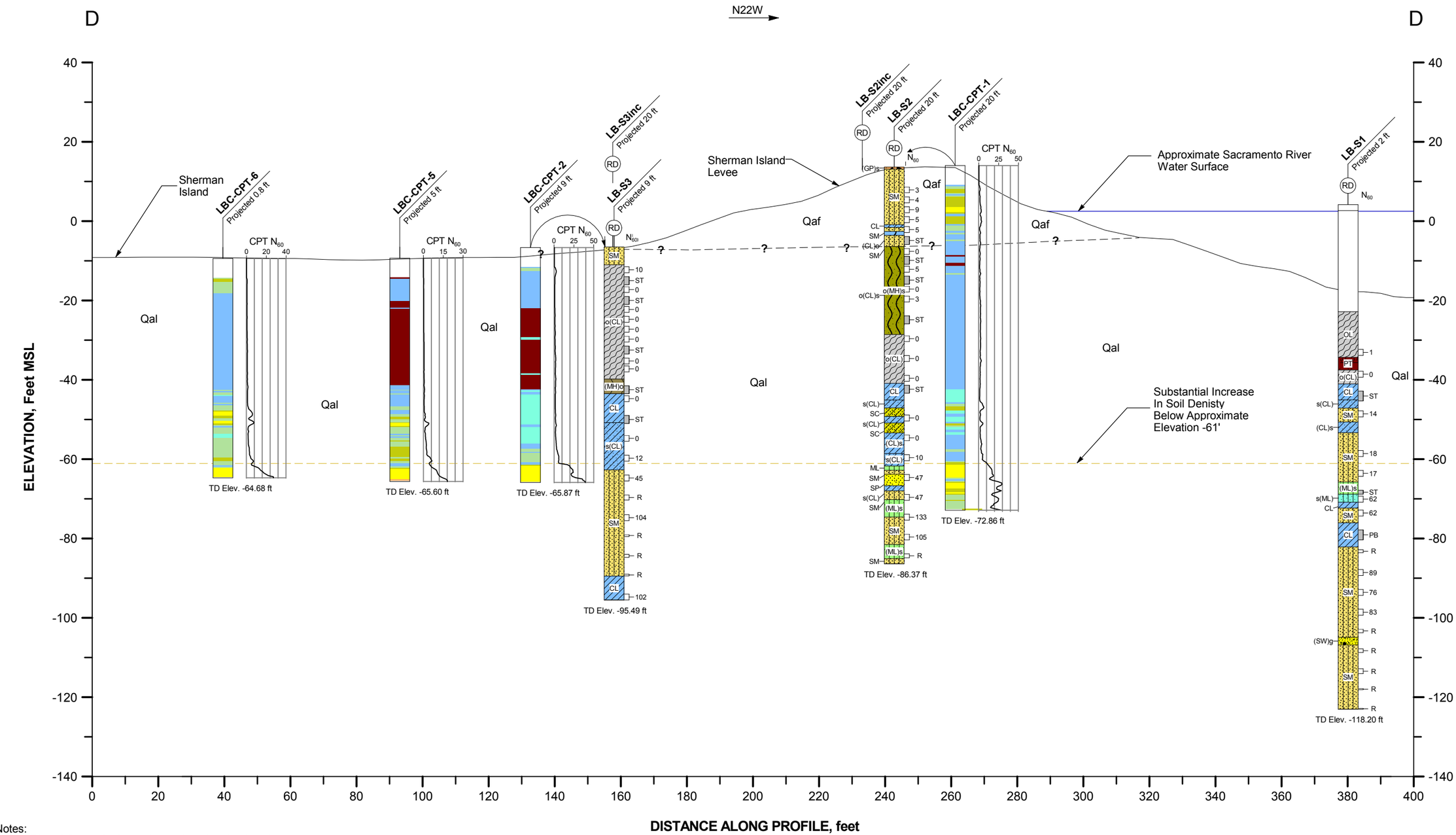
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH FISH RELEASE SITE
GEOLOGIC SECTION C - C

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 6

REV. | DATE | DESCRIPTION

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES



Notes:
1) See Plate 3 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

REV.	DATE	DESCRIPTION

DRAWING SCALES

Vertical Scale 25.00 ft/in.

Horizontal Scale 30.00 ft/in.

GEOLOGY REPORT No. 80-10-39

CONSTRUCTION SPEC. No.

GEOLOGY DRAWING No. PG-D10-011

GEOLOGIC MAPPING AND/OR LOGGING BY:
1 D. Perry
2 N. Hightower

DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

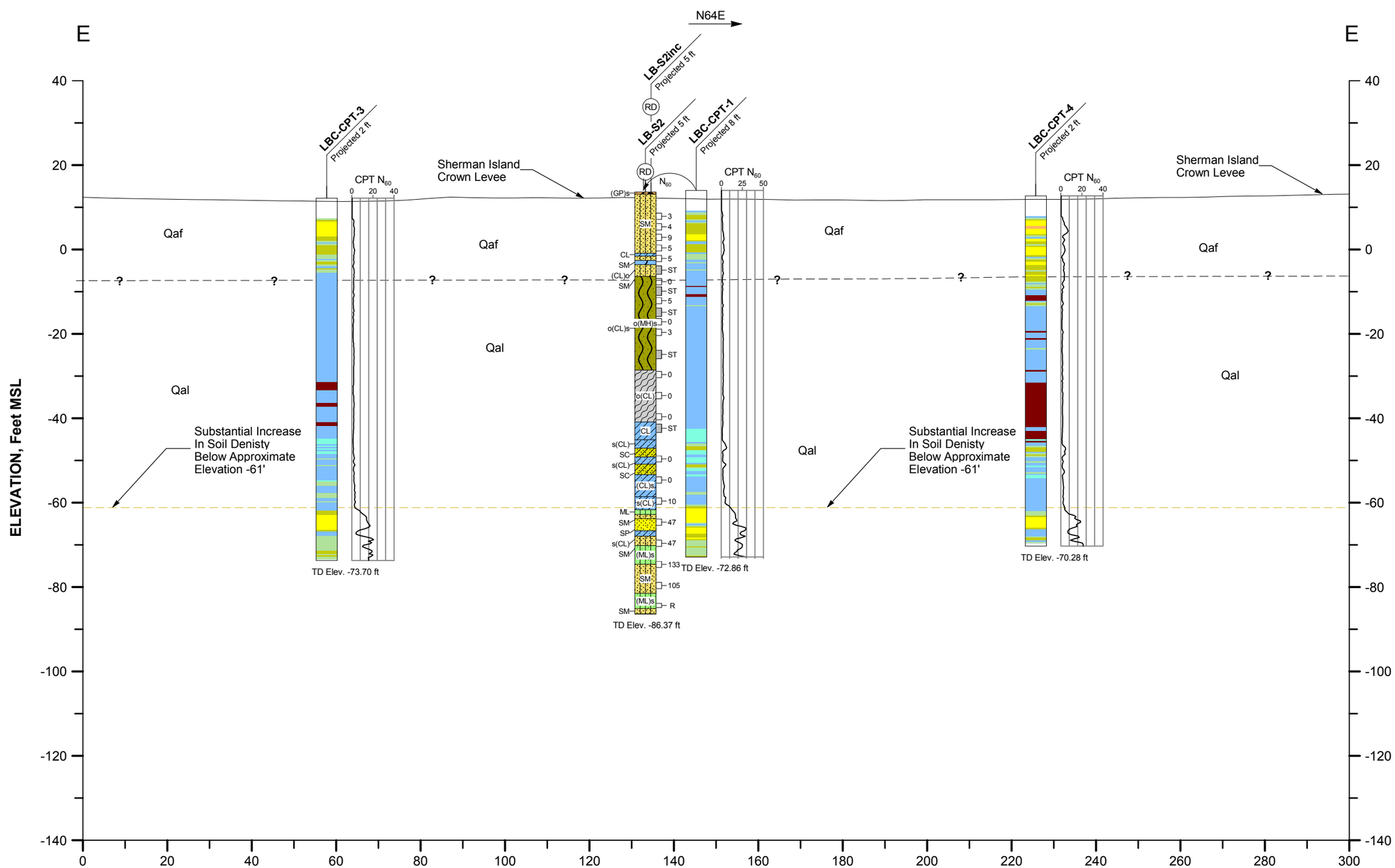
THINK SAFETY - ACT SAFELY

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
LITTLE BAJA FISH RELEASE SITE
GEOLOGIC SECTION D - D

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 7

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES

$$$DATE$$$$
$$$DESIGNFILESPECIFICA$$$$



Notes:
1) See Plate 3 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

THINK SAFETY - ACT SAFELY

DRAWING SCALES
Vertical Scale 25.00 ft/in.
Horizontal Scale 25.00 ft/in.

REV.	DATE	DESCRIPTION

GEOLOGY REPORT No. 80-10-39
CONSTRUCTION SPEC. No.
GEOLOGY DRAWING No. PG-D10-012

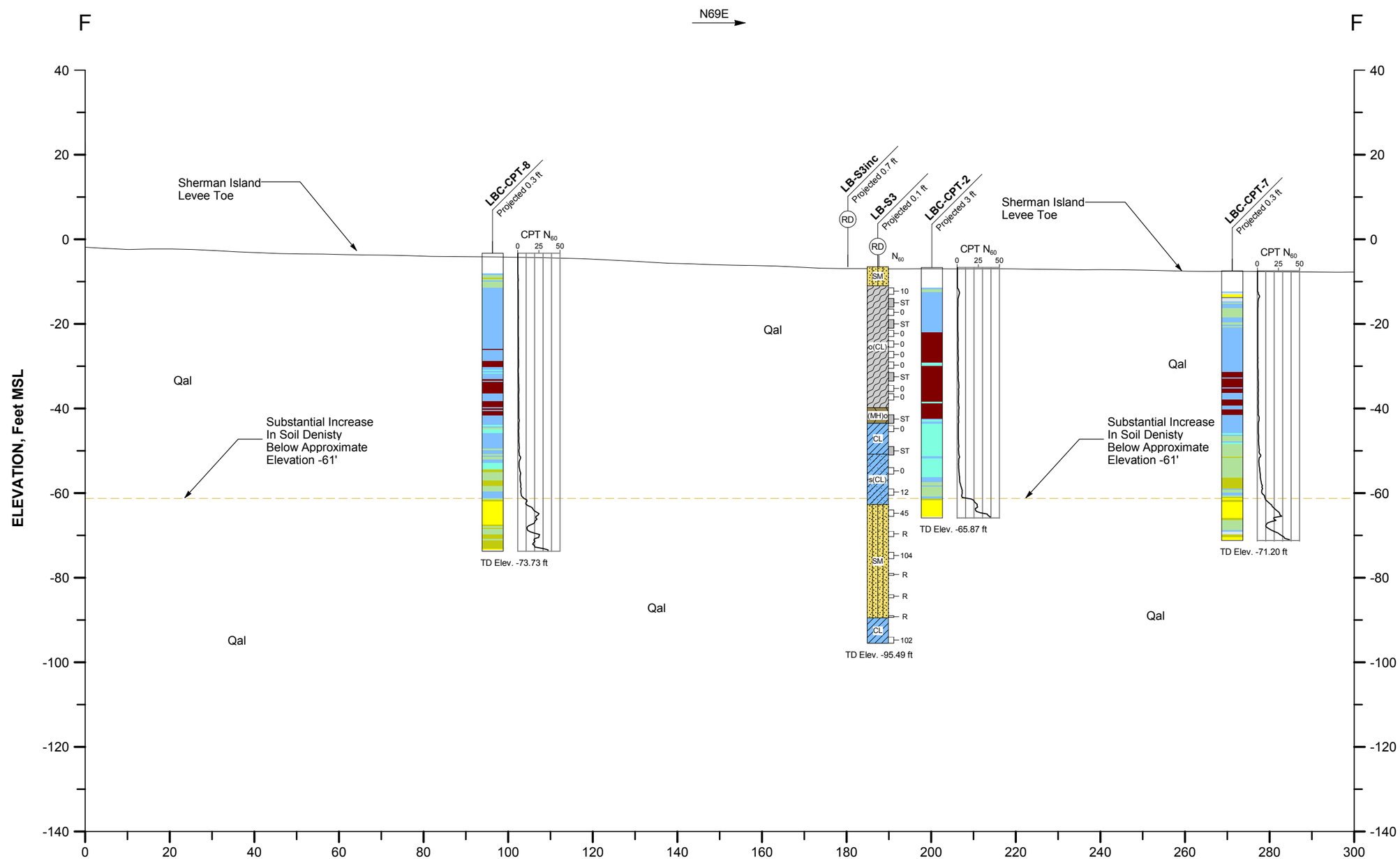
GEOLOGIC MAPPING AND/OR LOGGING BY:
1 D. Perry
2 N. Hightower
DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
LITTLE BAJA FISH RELEASE SITE
GEOLOGIC SECTION E - E

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 8

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES



Notes:
1) See Plate 3 for geologic section and exploration locations.
2) See Plate 10 for explanation of graphic logs.

THINK SAFETY - ACT SAFELY

REV.	DATE	DESCRIPTION

DRAWING SCALES
0 12.5 25 37.5 50 62.5 Vertical Scale 25.00 ft/in.
0 12.5 25 37.5 50 62.5 Horizontal Scale 25.00 ft/in.

GEOLOGY REPORT No. 80-10-39
CONSTRUCTION SPEC. No.
GEOLOGY DRAWING No. PG-D10-013

GEOLOGIC MAPPING AND/OR LOGGING BY:
1 D. Perry
2 N. Hightower
DRAWING PREPARED BY: M. Pagenkopp DATE: 12/05/2013

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
LITTLE BAJA FISH RELEASE SITE
GEOLOGIC SECTION F - F

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 9

$$$DATE$$$
$$$DESIGNFILESPECIFICA$$$

12/5/13 PG 11X17 SPT CPT (SBT N60) NEW FISH RELEASE SITES.GPJ NEW SALVAGED FISH RELEASE SITES

GROUP SYMBOLS AND NAMES

Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names
	Lean Clay (CL)		Lean Clay with Sand (CL)s		Sandy Lean Clay s(CL)		Sandy Lean Clay with Gravel s(CL)g		Fat Clay (CH)		Fat Clay with Sand (CH)s
	Sandy Fat Clay s(CH)		Lean to Fat Clay (CL/CH)		Silty Clay with Sand (CL-ML)s		Clayey Silt (ML/CL)		Silt (ML)		Silt with Sand (ML)s
	Sandy Silt s(ML)		Elastic Silt (MH)		Elastic Silt with Sand (MH)s		Sandy Elastic Silt s(MH)		Organic Lean Clay (CL)		Organic Lean Clay with Sand (OL)
	Sandy Organic Lean Clay (OL)		Organic Fat Clay (OH)		Organic Fat Clay with Sand (OH)		Organic Silt (OL)		Organic Silt with Sand (OL)		Sandy Organic Silt (OL)
	Organic Elastic Silt (OH)		Peat (PT)		Poorly Graded Sand (SP)		Poorly Graded Sand with Gravel (SP)g		Poorly Graded Sand with Clay (SP-SC)		Poorly Graded Sand with Silt (SP-SM)
	Poorly Graded Sand with Silt and Gravel (SP-SM)g		Well-Graded Sand (SW)		Well-Graded Sand with Gravel (SW)g		Well-Graded Sand with Clay (SW-SC)		Well-Graded Sand with Silt (SW-SM)		Well-Graded Sand with Silt and Gravel (SW-SM)g
	Clayey Sand (SC)		Clayey Sand with Gravel (SC)g		Silty Clayey Sand (SC-SM)		Silty Sand (SM)		Silty Sand with Gravel (SM)g		Poorly Graded Gravel (GP)
	Poorly Graded Gravel with Sand (GP)s		Poorly Graded Gravel with Silt and Sand (GP-GM)		Well-Graded Gravel (GW)		Well-Graded Gravel with Sand (GW)s		Well-Graded Gravel with Silt and Sand (GW-GM)		Clayey Gravel (GC)
	Clayey Gravel with Sand (GC)s		Silty Gravel (GM)		Silty Gravel with Sand (GM)s		Tephra (VP)				

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (1.4 in. ID)
- Bag Sample
- Piston
- Hydropunch
- Modified California (2.0 in. ID)
- Bulk Sample
- Pitcher Barrel
- Punch Core
- Shelby Tube (2.87 in. ID)
- Jar Sample
- No Sample Drilling
- Dry Core

NORMALIZED SOIL BEHAVIOR TYPE (CPT)

- 1: Sensitive Fine-grained
- 4: Clayey Silt to Silty Clay
- 7: Gravelly Sand to Sand
- 2: Organic Material
- 5: Silty Sand to Sandy Silt
- 8: Very stiff Sand to Clayey sand
- 3: Clay to Silty Clay
- 6: Clean Sand to Silty Sand
- 9: Very Stiff Fine-grained

FIELD AND LABORATORY TESTS

- **AL** Atterberg Limits - Liquid Limit, Plastic Limit, Plasticity Index (ASTM D4318)
- **CN** Consolidation (ASTM D2435)
- **CR** Corrosion, Sulfates, Chlorides (CTM 643; CTM 417; CTM 422)
- **CU** Consolidated Undrained Triaxial (ASTM D4767)
- **DS** Direct Shear (ASTM D3080)
- **EI** Expansion Index (ASTM D4829)
- **HD** Hydrometer (ASTM D422)
- **OC** Organic Content (ASTM D2974)
- **PA** Particle Size Analysis (ASTM D422)
- **PM** Pressure Meter (ASTM D4719)
- **PP** Pocket Penetrometer
- **SG** Specific Gravity (ASTM D854)
- **SW** Swell Potential (ASTM D4546)
- **TV** Pocket Torvane
- **UC** Unconfined Compression (ASTM D2166)
- **UU** Unconsolidated Undrained Triaxial (ASTM D2850)
- **UW** Unit Weight (ASTM D2937)
- **WC** Water Content (ASTM D 2216)

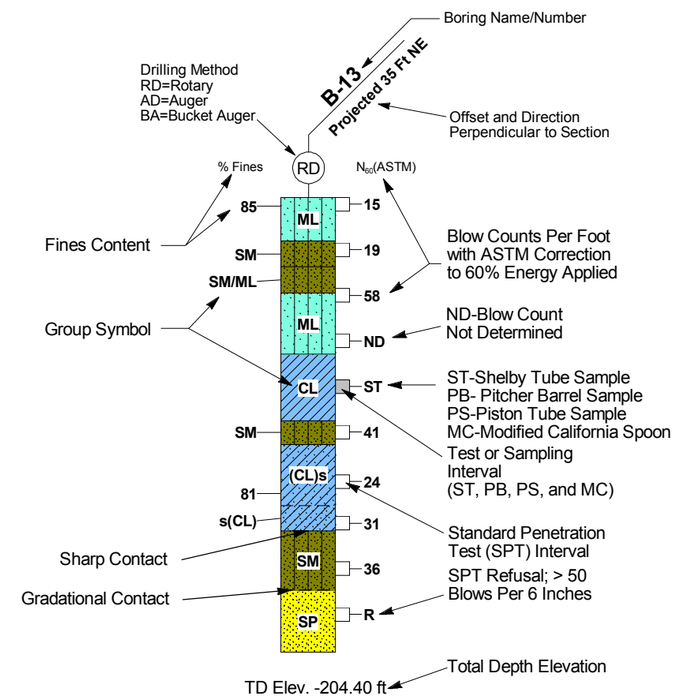
WELL GRAPHIC SYMBOLS

- Blank casing in cement grout
- Blank casing in filter sand
- Native backfill or slough
- Blank casing in bentonite seal
- Slotted casing in filter sand
- Vibrating wire piezometer

WATER LEVEL SYMBOLS

- First water encountered during drilling
- Water level measured at end of drilling
- Static water level reading (short-term)
- Static water leavel reading (long-term)

BORING EXPLANATION



- Approximate or Uncertain Geologic Contact
- Approximate or Gradational Soil Density or Consistancy Change
- Geologic Section (A — A)

Notes:

1) Soils were classified in the field in general accordance with ASTM D2488-06, Standard Practice for Description and Identification of Soils (Visual Manual Procedure). Where laboratory testing was performed, classifications are presented in the remarks column of the log in general accordance with ASTM D2487-06, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

2) Borderline symbols, two group symbols separated by a slash, are used in field visual classification when (A) percentage of fines is estimated to be between 45% and 55%, (B) percentages of sand and gravel are estimated to be about the same, (C) soil could be either well graded or poorly graded, (D) soil could be either a silt or a clay, or (E) fine-grained soil has properties indicating that it is at the boundary between low and high plasticity.

3) Horizontal Datum NAD 83 State Plane Zone III and Vertical Datum NAVD 88.

REV.	DATE	DESCRIPTION

DRAWING SCALES

GEOLOGY REPORT No. 80-10-39
CONSTRUCTION SPEC. No.
GEOLOGY DRAWING No. PG-D10-014

GEOLOGIC MAPPING AND/OR LOGGING BY: 1 2
DRAWING PREPARED BY: M. Pagenkopp DATE: 01/07/2014

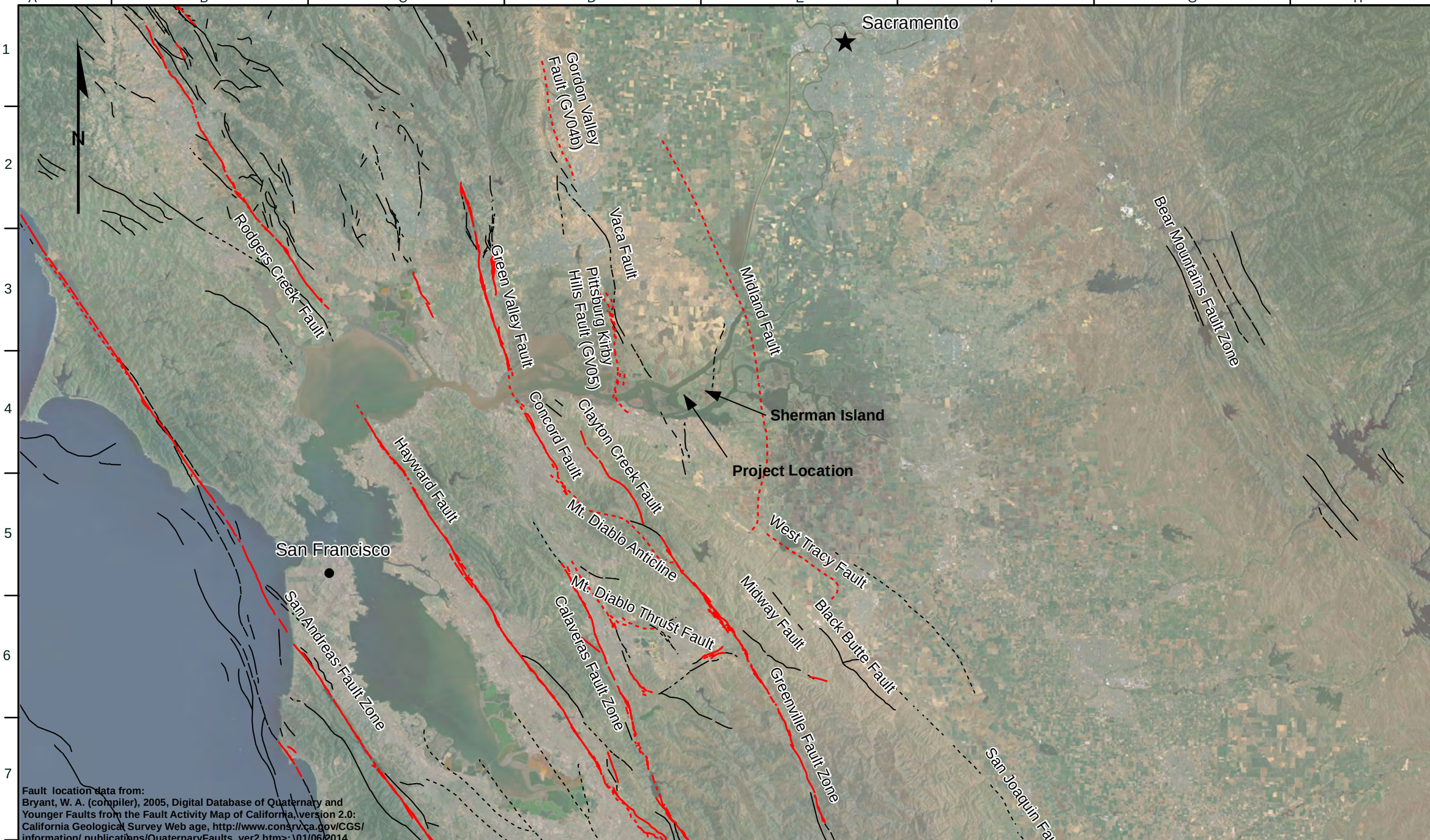
STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

THINK SAFETY - ACT SAFELY

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
EXPLANATION OF GRAPHIC LOGS

RELEASE DATE: 01/21/2014
SHEET No. 1 of 1
PLATE 10

$$$DATE$$$$
$$$DESIGNFILESPECIFICA$$$$



Fault location data from:
Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web age, http://www.consrv.ca.gov/CGS/information/ publications/QuaternaryFaults_ver2.htm>; \01/06/2014

THINK SAFETY - ACT SAFELY

REV.	DATE	DESCRIPTION

DRAWING SCALES

6 0 6 12 18 Miles

GEOLOGY REPORT No. 80-10-89

CONSTRUCTION SPEC. No.

GEOLOGY DRAWING No. PG-D10-015

GEOLOGIC MAPPING AND/OR LOGGING BY:
1
2

DRAWING PREPARED BY: M. Pagenkopp DATE: 01/06/2014

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
PROJECT GEOLOGY SECTION
STATE WATER FACILITIES

STATE WATER PROJECT
DELTA FIELD DIVISION
NEW SALVAGED FISH RELEASE SITES
MANZO RANCH AND LITTLE BAJA
FAULT LOCATION MAP

RELEASE DATE: 01/21/2014

SHEET No. 1 of 1

PLATE 11

$$$DATE$$$
$$$DESIGNFILESPECIFICA$$$

$$$$$$$$$$$$$$$$$$$$DESIGNFILESPECIFICATION$$$$$$$$$$$$$$$$$$$$