# City of Pinole
# Pinole-Hercules Water Pollution Control Plant Upgrades
# October 30, 2015

**DESIGNER**

HDR Engineering, Inc.
2365 Iron Point Road, Suite 300
Folsom, CA 95630
(916) 817-4700

**OWNER**

City of Pinole
2131 Pear Street
Pinole, CA 94564

REGISTERED PROFESSIONAL ENGINEER
Craig Olsen
No. 39819
Exp.
12/31/2015
STATE OF CALIFORNIA

## GENERAL

### *Scope*

A. This Addendum forms a part of the Bidding and Contract Documents and modifies the Project Specifications and Drawings described below.

B. This Addendum consists of 7 pages and the following attachments:
1. Section 02072 – Demolition Cutting and Patching, Attachment "Lead/Asbestos Pre-Demolition Inspection Report" (10 pages)
2. Section 02200 – Earthwork, Attachment "Boring Logs" (44 pages).
3. Section 02361 – Driven Steel Sheet Piling (New) (3 pages).
4. Section 15060 – Pipe and Pipe Fittings: Basic Requirements, Article 3.12 Schedules (Reissued) (12 pages).
5. Reissued Drawing 02C107.
6. Missing Drawing 63P101.

### *Acknowledgment*

A. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

# REVISIONS TO SPECIFICATIONS

## *Part 1 – Contract Requirements*

## *Section 001000 – Invitation to Bid*

### Article 1.01

**CHANGE TO READ**

"1.01 Bids will be received at the City of Pinole Office of the Director of Public Works, City Hall, 2131 Pear Street, Pinole, California, and shall be date and time stamped before **2:00 p.m.**, December 10, 2015, local time, at which time they will be opened and read aloud."

## *Section 002000 – Instructions to Bidders*

### Article 7.01

**CHANGE TO READ**

"7.01 All questions about the meaning or intent of the bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. **Questions received after close of business (5:00 p.m. PST) on Wednesday, November 25, 2015 will not be answered.** Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect."

## *Section 004360 – List of Equipment Manufacturers*

### Article 3.07

**TABLE**

Table will be completed in next Addendum.

## *Part 2 – Technical Specifications*

## *Section 02072 – Demolition, Cutting and Patching*

### Article 1.4

**ADD**

"B. Lead/Asbestos Pre-Demolition Inspection Report:

1. Remove and properly dispose of components with lead based paint and asbestos containing materials in accordance with EPA NESHAP regulations, OSHA, California Health Code, BAAQMD, Proposition 65 and any other applicable Federal, State, or local regulations. A lead/Asbestos Pre-Demolition Inspection Report was completed and identified Asbestos containing materials and components containing lead based paint. This report is included at the end of this section."

## Section 11068 – Pumping Equipment: Vortex (Torque-Flow)

**Article 2.3 A.2.a.**
**CHANGE TO READ**
"a. Design condition: 175 gpm at 65 FT TDH, 63 percent pump efficiency."

**Article 2.3 A.2.b.**
**CHANGE TO READ**
"b. Shutoff condition: 100 gpm at 80 FT TDH."

**Article 2.3 A.2.g.**
**CHANGE TO READ**
"g. Drive configuration: Belt drive."

## Section 11142 – Rotary Drum Thickening System

**Article 2.3 B.3.a.**
**CHANGE TO READ**
"a. 1.5 HP minimum, TEFC, 1800 rpm, 480 VAC, 3 Phase, 60 Hertz, 1.15 service factor."

**Article 2.3 C.**
**ADD**
"C. Basis of Design:

1. The permanent installation of the washer/compactor has been designed based on the first named manufacturer Fokoku Koyogo Company.
2. The Drawings show the general location of the equipment and the orientation, service connections and relationship between the components.
3. These items may vary depending on the equipment provided.
4. Any changes shall be coordinated and provided by the manufacturer and Contractor to ensure a complete and functional system.
5. Contractor shall pay the costs for all modifications and/or redesign of the system illustrated on contract plans and any modifications to structural, mechanical, or electrical/instrumentation control areas of work, including the cost for the Engineer to verify the layout, sizing and any re-design to accommodate the proposed equipment."

## Section 11364 – Dewatering Centrifuge

**Article 2.2 B.**
**ADD**
"B. Basis of Design:

1. The permanent installation of the washer/compactor has been designed based on the first named manufacturer Alfa Laval.
2. The Drawings show the general location of the equipment and the orientation, service connections and relationship between the components.
3. These items may vary depending on the equipment provided.
4. Any changes shall be coordinated and provided by the manufacturer and Contractor to ensure a complete and functional system.

5. Contractor shall pay the costs for all modifications and/or redesign of the system illustrated on contract plans and any modifications to structural, mechanical, or electrical/instrumentation control areas of work, including the cost for the Engineer to verify the layout, sizing and any re-design to accommodate the proposed equipment."

## *Section 11923 – Liquid Polymer Batching System*

**Article 2.1 A.1.**
**DELETE**
"1. Acrison."

**Article 2.2 E.**
**CHANGE TO READ**
"E. Mixing Chamber: PVC or 304 stainless steel."

**Article 2.2 F.1.**
**CHANGE TO READ**
"1. Skid: 56 IN wide x 54 IN deep x 68 IN high."

**Article 2.3A. 2.**
**CHANGE TO READ**
"2. Mixing chamber shall be transparent to allow viewing of mixing intensity. For stainless steel mixing chambers provide section of clear pipe at mixing chamber outlet."

**Article 2.3 A.5.**
**ADD**
"5. For systems using water pressure and flow for mixing energy, provide, stainless steel multistage dilution water pump with pressure regulating valve. Pump sized to boost water pressure 50 psi over incoming pressure."

**Article 2.3 B.1.**
**CHANGE TO READ**
"1. Polymer mixing unit shall have a signal generating flow meter and an on/off motor operated ball valve for on/off control of dilution water. Valve shall be capable of supplying water from 0.5 to 40 gpm."

**Article 2.3 C.2.**
**CHANGE TO READ**
"2. Capacity Range: 0.05 to 10 gph."

## *Section 13420 – Chemical Storage Tanks*

**Article 1.2 A. 1.i.**
**ADD**
"i. NSF 61."

**Article 1.2 B.2.**

**CHANGE TO READ**

"2. Tanks shall be manufactured by a firm with a nationally accepted quality standard (i.e., ISO 9001 – 2008 or equal)."

**Article 2.1 A. 2.a.**

**CHANGE TO READ**

"a. Model ICT with full drain outlet."

**Article 2.2 A. and B.**

**CHANGE TO READ**

"A. Plastic – The tanks shall be molded from Metallocene High Density Cross-linked Polyethylene (HDXLPE). The resin used shall be Paxon 7004 or Escorene 8460 as manufactured by Exxon/Mobil Chemical, Schulink XL 350, or of resin of equal physical and chemical properties. The interior of the tank shall have an anti-oxidant resistant medium density polyethylene liner.

B. Filler and Pigments – the plastic shall not contain any fillers. All plastic shall contain a minimum of 0.25 percent U.V. stabilizer and a maximum of 0.60 percent. Stabilizer shall be compounded into the polyethylene."

**Article 2.5 B.1.**

**CHANGE TO READ**

"1. Tank manufacturer shall supply one Ultra high molecular weight (UHMW) polyethylene or HDXLPE full drain outlet assembly. Connection shall be built without use of rotational mold parting line thus utilizing one piece construction. Full drain outlet shall be molded into High Density Cross-linked polyethylene tank. Assembly shall consist of molded in UHMW or metallic insert with welded polyethylene flange end connection. Metallic inserts shall be 316 stainless steel, titanium or Hastelloy C-276 based on chemical compatibility. Molded in UHMW or HDXLPE assembly shall provide full drain of tank contents. Full drain outlet must be connected to a flexible expansion joint allowing for minimum of 1/2 IN lateral movement and 3/8 IN of elongation."

## *Section 15060 – Pipe and Pipe Fittings: Basic Requirements*

**Article 3.12 Schedules**

**REISSUED**

Attached

## *Section 15062 – Pipe: Ductile*

**Article 2.1 A.9.**

**CHANGE TO READ**

"9. Restrained joints:

a. American (Lock Fast) – 12 IN and below.
b. U.S. Pipe (TR-Flex) – 4 IN to 54 IN (Field-Lok gaskets not allowed).
c. American (Lock Fast) – Above 12 IN.
d. EBAA Iron Inc. (MEGALUG Series 1100) – for stuffing box joints."

### *Section 15885 – Odor Control System*

**Article 2.1 A.4.**
**CHANGE TO READ**
"4. BioRem.
5. Or approved equal."

**Article 2.4 B.2.**
**CHANGE TO READ**
"2. Height of scrubber shall be maximum 17 FT to top of discharge flanges."

**Article 2.4 E.1.**
**CHANGE TO READ**
"1. The bioscrubber reactor shall be configured with a single fluid injection spray nozzle located above the media for proper irrigation. Each spray nozzle shall be inspected and tested by the manufacturer to ensure even dispersion of irrigation water, and certified to be operating properly after installation and prior to the mechanical commissioning."

# REVISIONS TO DRAWINGS

### *Drawing 00G011*

**General Design Criteria**
**CHANGE TO READ**

| **Primary Scum Pumps (PC 3)** | |
|---|---|
| No. | 1 |
| Type | SUBMERSIBLE, CHOPPER |
| Capacity per Pump, gpm | 150 |
| TDH | 65 |
| Motor Size, hp | 10 |
| Motor Control | CONSTANT |

**ADD TO TABLE**

| **Gravity Sludge Thickener Scum Pump** | |
|---|---|
| No. | 1 |
| Type | SUBMERSIBLE, CHOPPER |
| Capacity per Pump, gpm | 150 |
| TDH | 40 |
| Motor Size, hp | 5 |
| Motor Control | CONSTANT |

### *Drawing 51D102*

GENERAL NOTES:

**CHANGE TO READ**

"2. DEMOLISH AIR FILTER, CONCRETE SUPPORTS, AND ASSOCIATED CONDUITS AND WIRES. DEMO PORTION OF SHEET METAL 12" ABOVE ELECTRICAL PANEL. BEND TOP OF SHEET METAL TO PREVENT SHARP EDGES. EXIST ELECTRICAL PANEL ON SHEET METAL WALL TO REMAIN. RE-ROUTE CONDUIT AND SUPPORTS TO LOWER PORTION OF WALL."

### *Drawing 64P101*

**CHANGE**

"61M103"

**TO READ**

"63P101"

### *Drawing 00E012*

**23PMP002**

**CHANGE**

"5 HP"

**TO READ**

"10 HP"

### *Drawing 41E103*

**Delete in its entirety.**

## End of Addendum

**Attachment for Section 02072 – Demolition Cutting and Patching**

**“Lead/Asbestos Pre-Demolition Inspection Report”**

*NorBay Consulting*

*LOGICAL* *ENVIRONMENTAL* *SOLUTIONS*

*(415) 507-9786 Phone*
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*2400 Las Gallinas Avenue, Suite 110*
*San Rafael, California 94903*

October 15, 2014

Mr. Dean Allison
City of Pinole
Development Services Director
2131 Pear Street
Pinole, CA 94564

**SUBJECT: ASBESTOS AND LEAD PRE-DEMOLITION INSPECTION AND BULK SAMPLING LIMITED NUMBER OF STRUCTURES PINOLE/HERCULES W.P.C, PINOLE, CA**

Dear Mr. Allison:

NorBay Consulting is pleased to provide the analytical results from the asbestos and lead pre-demolition inspection of a limited number of structures located at the Pinole/Hercules W.P.C in Pinole, California.

The structures inspected included (1) Headworks/Maintenance Building, (2) Public Works Storage, (3) Primary Clarifier #3, (4) Secondary Clarifier #1, (5) Secondary Clarifier #2, (6) Solids Handling Structure and associated tank, (7) Secondary Clarifier Distribution Box and (8) Caustic storage tank.

Our inspection included the visual observation of suspect asbestos containing building materials, the collection of suspect building materials to determine asbestos content, if any, laboratory analysis, the collection of lead in paint readings utilizing a RMD direct reading instrument, visual inspection for other hazardous materials and generation of a final report.

NorBay Consulting appreciates the opportunity to provide you with these services. If you have any questions regarding this report or if you require additional information please do not hesitate to contact me at (415) 507-9786.

Respectfully,
NORBAY CONSULTING

Bob Gerhold

Bob Gerhold
Certified Asbestos Consultant # 92-0157
CDPH Lead Inspector/Assessor I2108

Asbestos & Lead Pre-Demolition Inspection
Various Structures Located at the
Pinole/Hercules W.P.C, Pinole, CA

## EXECUTIVE SUMMARY

NorBay Consulting performed a pre-demolition asbestos and lead inspection of various structures located at the Pinole/Hercules W.P.C. in Pinole, California. It is our understanding that the structures inspected are scheduled to be demolished thus the need for this inspection as per Bay Area Air Quality Management District (BAAQMD) and Cal-OSHA regulations. Mr. Bob Gerhold, Cal-OSHA Certified Asbestos Consultant #92-0157 and Certified Lead Inspector # 2108 and Mr. Greg Marszal, Cal-OSHA Certified Site Surveillance Technician #96-0175 performed the inspection on October 8, 2014.

The structures inspected included (1) Headworks/Maintenance Building, (2) Public Works Storage, (3) Primary Clarifier #3, (4) Secondary Clarifier #1, (5) Secondary Clarifier #2, (6) Solids Handling Structure and associated tank, (7) Secondary Clarifier Distribution Box and (8) Caustic storage tank.

**This Executive Summary is provided solely for the purpose of overview. Any party who relies on this report must read the entire report. The Executive Summary may have omitted important details, anyone of which could be crucial to the proper understanding and risk assessment of the subject matter.**

A total of thirty-eight (38) samples of suspect asbestos containing materials were collected during the inspection. Upon analysis by Polarized Light Microscopy (PLM) the following material(s) were found to contain varying percentages of asbestiform minerals or are materials known to contain asbestos.

- Composition rolled roofing on the Headworks/Maintenance Building;
- Grey roofing mastics on various locations of the Headworks/Maintenance Building;
- Sealant on the exterior of the northeast room door of the Headworks/Maintenance Building;
- Drywall/taping mud throughout the Headworks/Maintenance Building.

A total of one hundred and twenty-four (124) readings were collected of exterior and interior painted/coated surfaces during the inspection. In addition, six (6) calibration readings were also collected. For this report lead based paint includes readings $\geq$ 1.0 mg/cm2, lead-containing paint includes readings $\geq$ 0.1 to $\leq$ 1.0 mg/cm2 and no lead detected includes readings of 0.0 mg/cm2. It is extremely important to understand that XRF readings, which have a value of 0.0 mg/cm2, do not necessarily mean there is "no lead present" but rather the level is below what the instrument can read.

The following components were found to contain lead in paint/coatings > 1.0 mg/cm2.

- Brown metal doorframes on the west side of the Headworks/Maintenance Building;
- Gray metal hoist supports in the shop portion of the Headworks/Maintenance Building;
- Black metal piping under the platform, north side of the structure and in the mechanical pit of the Primary Clarifier #3;
- Black metal piping in the mechanical pit of the Secondary Clarifier #1;
- Orange metal hoist in the Public Works Storage Building.

A more detailed presentation of procedures and findings is presented in the body of this report. Also included is a discussion of recommendations and regulatory considerations.

## ASBESTOS SURVEY PROCEDURES

NorBay Consulting identified homogeneous areas of materials, which were suspected of containing asbestos. A homogeneous area, for bulk sampling purposes, is one that seems by texture, color and wear to be uniform and applied during the same general time period. After the homogeneous areas had been identified, representative bulk sample(s) are collected for laboratory analysis. Because asbestos-containing building materials have compositional variability, it is possible to obtain different laboratory results for samples from the same homogeneous area. Therefore, a homogeneous area with at least one positive sample for will result in the entire homogeneous area being designated as an asbestos containing material.

The sampling strategy employed by NorBay Consulting was partially based on guidelines established by the Environmental Protection Agency (EPA) for school buildings (40 CFR Part 763, AHERA) which require that samples be collected from each homogeneous area of suspected ACM. Upon completion of the inspection and bulk sampling, the samples were delivered under chain of custody protocol to Forensic Analytical of Hayward, California for analysis by Polarized Light Microscopy (PLM).

## SAMPLE ANALYSIS

Bulk samples were examined by Polarized Light Microscopy (PLM) in accordance with EPA Test Method 600/R-93/116, “Method for the Determination of Asbestos in Bulk Building Materials”.

The percentage of asbestos is determined by visual estimation. Laboratory results are reported based on the percentage of asbestiform minerals identified within each sample layer. The lower limit of reliable detection by PLM is 1% by volume. When asbestos or other minerals are observed in concentrations believed to be less than the reliable detection limit (less than 1%) the results are usually indicated as TRACE. Samples found to contain < 1% asbestos were further analyzed by the NESHAP point counting method to verify that the material truly contained < 1% asbestos.

Upon analysis the analytical results are compared to government agency standards. Currently, both the California Occupational Safety and Health Administration (Cal-OSHA) and the Environmental Protection Agency (EPA) define material with contains more than one percent asbestos to be an asbestos containing material (ACM). In addition, Cal-OSHA defines any manufactured construction material containing more than 0.1% by weight as asbestos containing construction materials (ACCM).

Cal-OSHA also requires notification and registration of the contractor when disturbing materials with more than one-tenth of one percent and regulates worker protection whenever materials containing any detectable levels of asbestos are to be disturbed.

## RESULTS

Analytical results from the asbestos bulk sampling can be found in the following table:

| Sample ID | Material | Location | Results |
|---|---|---|---|
| 5330-PLM-1 & 2 | Composition rolled roofing | Headworks/Maintenance Building (roof) | 70% asbestos in bottom layer of felt |
| 5330-PLM-3 & 4 | Parapet wall flashing | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-5 | Paint and sealant on roof cap stones | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-6 | White and black sealant on roof divider | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-7 | Lightweight concrete under parapet wall flashing | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-8 | Black roofing mastic with silver paint | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-9 | Gray roofing mastics | Headworks/Maintenance Building (roof) | 5% asbestos |
| 5330-PLM-10 | Caulking between cinderblock parapet | Headworks/Maintenance Building (roof) | No Asbestos Detected |
| 5330-PLM-11 | Exterior window glazing | Headworks/Maintenance Building, south side | No Asbestos Detected |
| 5330-PLM-12 | Exterior door sealant | Headworks/Maintenance Building, northeast room | 15% asbestos |
| 5330-PLM-13-15 | Interior drywall/taping mud | Headworks/Maintenance Building | < 1% asbestos |
| 5330-PLM-16-18 | Interior textured paint | Headworks/Maintenance Building | No Asbestos Detected |
| 5330-PLM-19-21 | Textured paint | Primary Clarifier #3 and mechanical pit | No Asbestos Detected |
| 5330-PLM-22 | Sealant at base of clarifier | Primary Clarifier #3 | No Asbestos Detected |
| 5330-PLM-23 | Insulation on piping | Primary Clarifier #3, south side | No Asbestos Detected |
| 5330-PLM-24 | Patch on insulation around piping | Primary Clarifier #3, south side | No Asbestos Detected |
| 5330-PLM-25 & 26 | Textured paint and white concrete under paint | Secondary Clarifier #2 | No Asbestos Detected |
| 5330-PLM-27 | Sealant at base of clarifier | Secondary Clarifier #2 | No Asbestos Detected |
| 5330-PLM-28-32 | Textured paint and white concrete under paint | Secondary Clarifier #1 and mechanical pit | No Asbestos Detected |
| 5330-PLM-33-36 | Textured paint and white concrete under paint | Solids Handling Structure and associated tank | No Asbestos Detected |
| 5330-PLM-37 | Textured paint | Secondary Clarifier Distribution Box | No Asbestos Detected |
| 5330-PLM-38 | Exterior coating | Caustic Storage Tank | No Asbestos Detected |

## REGULATORY CONSIDERATIONS

Current EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations require that most ACM be removed prior to demolition or renovation activities. Other regulations apply to construction activities and notification requirements for projects involving ACM/ACCM. At both the federal and state levels, these include, but are not limited to Federal OSHA regulation 29 CFR 1910 and 1926, the California Health Code, California OSHA 8 CCR 1529 and Proposition 65 which requires the posting of notifications when a facility is known to contain toxic substances found on the governors list.

As previously mentioned in this report both the California Occupational Safety and Health Administration (Cal-OSHA) and the Environmental Protection Agency (EPA) define material with contains more than one percent asbestos to be an asbestos containing material (ACM). In addition, Cal-OSHA defines any manufactured construction material containing more than 0.1% by weight as asbestos containing construction materials (ACCM). Cal-OSHA also requires notification and registration of the contractor when disturbing materials with more than one-tenth of one percent and regulates worker protection whenever materials containing any detectable levels of asbestos are to be disturbed.

## RECOMMENDATIONS

Bay Area Air Quality Management District (BAAQMD) Regulation 11-2-401.3 requires that for every demolition or renovation involving the removal of 100 square/linear feet or greater of Regulated Asbestos Containing material (RACM), a notification must be made to the BAAQMD at least ten working days prior to commencement of demolition/renovation activities. In addition, BAAQMD requires removal, prior to renovation and/or demolition of regulated asbestos-containing materials (RACM), i.e; materials with asbestos content of greater than 1% that are friable (can be crumbled, pulverized or reduced to powder by hand pressure) or may become friable during renovation or demolition. Non-friable asbestos containing materials containing greater than 1% asbestos are also considered to be RACM if they are subjected to sanding, drilling, grinding, cutting, abrading or may become friable during demolition/renovation activities.

NorBay Consulting recommends that the asbestos containing materials discovered as part of our inspection be removed by a licensed asbestos abatement contractor prior to be impacted by demolition activities. The contractor selected must be familiar with and abide by the rules and regulations regarding the removal, packaging and disposal of asbestos containing materials and materials containing detectable levels of asbestos.

## LEAD IN PAINT XRF SURVEY PROCEDURES

The sampling strategy employed by NorBay Consulting was performed as outlined in Title 17, California Code of Regulations, Division 1, Chapter 8 and in accordance with those survey procedures listed in the “Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing”, June 1995 by the U.S. Department of Housing and Urban Development (HUD). Our investigation included the collection of readings on similar painted surfaces (not every component in every room as dictated by HUD guidelines.)

Prior to data collection painted/coated surfaces were categorized into distinct areas of homogeneity, substrate material, building material and/or distinct paint type. After the items have been identified, a representative reading of the painted/coated surface is collected. Because painted/coated have compositional variability due to one or more paint layers, it is possible to obtain different readings for samples from the same homogeneous area. Therefore, a homogeneous area with at least one XRF reading of 1.0 mg/cm2 or greater will result in the entire homogenous material, substrate and/or distinct paint type being designated as lead based paint. Each XRF reading along with the location, component, substrate, color and condition of the painted/coated surface are included in the XRF readings table located at the end of this report.

## SAMPLE ANALYSIS

The XRF testing was performed in accordance with the aforementioned criteria, using an RMD-LPA-1 XRF Analyzer. Exposure times are internally determined by the instrument and are based on a number of factors including lead content, substrate and source strength. The instrument is calibrated to the manufacturer's specifications and was periodically verified against known lead standards produced by the National Institute of Standards and Testing.

HUD defines action level as the hazard level for which a corrective response action will be required. Currently, the most widely used action level for lead-based paint (LBP) is 1.0 mg/cm2 (as measured by an XRF) established by HUD and adopted by the U.S. Environmental Protection Agency. The action level is 5000 parts per million (ppm) or 0.5% by weight when collected paint chip samples are analyzed using atomic absorption spectroscopy (AAS).

HUD guidelines consider XRF findings of 1.0 mg/cm2 or greater, as lead based paint, which may be a potential hazard. It is extremely important to understand that XRF readings, which have a value of 0.0 mg/cm2, do not necessarily mean there is "no lead present".

## RESULTS

During our investigation a total of one hundred and twenty four (124) XRF readings were collected of various interior and exterior building/structure components.

Of these readings, nine (9) resulted in levels considered to be lead based paint or glazing. The components included the following;

- Brown metal doorframes on the west side of the Headworks/Maintenance Building;
- Gray metal hoist supports in the shop portion of the Headworks/Maintenance Building;
- Black metal piping under the platform, north side of the structure and in the mechanical pit of the Primary Clarifier #3;
- Black metal piping in the mechanical pit of the Secondary Clarifier #1;
- Orange metal hoist in the Public Works Storage Building.

In addition, certain components contained detectable levels of lead (not lead based) which would also subject the disturbance of these materials to Cal-OSHA regulations. (See Construction Work Standards Section.)

For a complete listing of readings see the attached XRF Readings sheet.

## REGULATORY CONSIDERATIONS / RECOMMENDATIONS

Current EPA and HUD guidelines recommend that surfaces containing lead based paint in damaged condition to be considered “lead-based paint hazards” and should be addressed through abatement (permanent removal) or interim controls (temporary). Surfaces containing lead based paints in intact condition should be monitored, but are not considered to be “lead based paint hazards”.

The following structures/components contained damaged lead based paint:

- None

**Construction Work Standards**

At present, there are no state or federal laws dealing with mandatory abatement following the identification of lead containing or lead based paints prior to disturbance. However, in 1993 the Occupational Safety and Health Administration promulgated legislation (29 CFR 1926.62 and 8 CCR 1532.1) entitled "Lead Exposure in the Construction Industry" which deals with worker exposure to lead.

It should be noted that aside from the HUD definition of lead-based paint (1.0 $mg/cm^2$), OSHA regulates worker protection and work practices on building components containing any detectable amounts of lead. Therefore, components determined to contain less than 1.0 $mg/cm^2$ may still be subject to OSHA regulations, if these materials are to be disturbed. This standard essentially states that work, involving components containing any amount of lead must follow certain guidelines. These guidelines include but are not limited to training, personal protective equipment and specific work practices whenever workers disturb lead in any concentration because the disturbance may result in airborne exposures over action or permissible exposure limits.

This legislation requires that any task that may potentially expose workers to any concentration of lead be monitored to determine workers eight-hour time weighted average (TWA) exposure to lead. Prior to conduction of activities that may generate a lead exposure, such workers must be properly fitted with respiratory protection and protective clothing until personal eight-hour TWA results reveal exposures within acceptable levels.

Any proposed renovation/demolition, which may involve the removal of building materials with lead based and/or lead containing painted surfaces, should include provisions to minimize the potential for airborne release of lead contaminated dust. It is recommended, as a minimum, that demolition of building materials which have lead-based and/or lead-containing paints be conducted with the materials kept in a wetted state and removed in sections, as feasible, to reduce the potential for airborne lead emissions.

## LIMITATIONS

NorBay Consulting conducted this inspection and prepared this report for the sole and exclusive use of The City of Pinole, the only intended beneficiaries of our work. NorBay Consulting has performed this inspection in a substantial and workmanlike manner, in accordance with generally accepted methods and practices of the profession, and consistent with that level of care and skill

ordinarily exercised by reputable environmental consultants under similar conditions and circumstances.

Please note that no subsurface investigation was conducted to determine if asbestos cement "transite" electrical or water utilities were present.

Enclosed you will find the laboratory reports and chain of custody form for all asbestos bulk samples collected. In addition, a spread sheet of all XRF readings is also included.

If you have any questions regarding this report or if you require additional information please do not hesitate to contact me at (415) 507-9786.

Sincerely,
NORBAY CONSULTING

*Bob Gerhold*

Bob Gerhold
Certified Asbestos Consultant #92-0157
CDPH Certified Lead Inspector/Assessor I2108

# LABORATORY REPORTS AND CHAIN OF CUSTODY FORMS

# POLARIZED LIGHT MICROSCOPY (PLM)

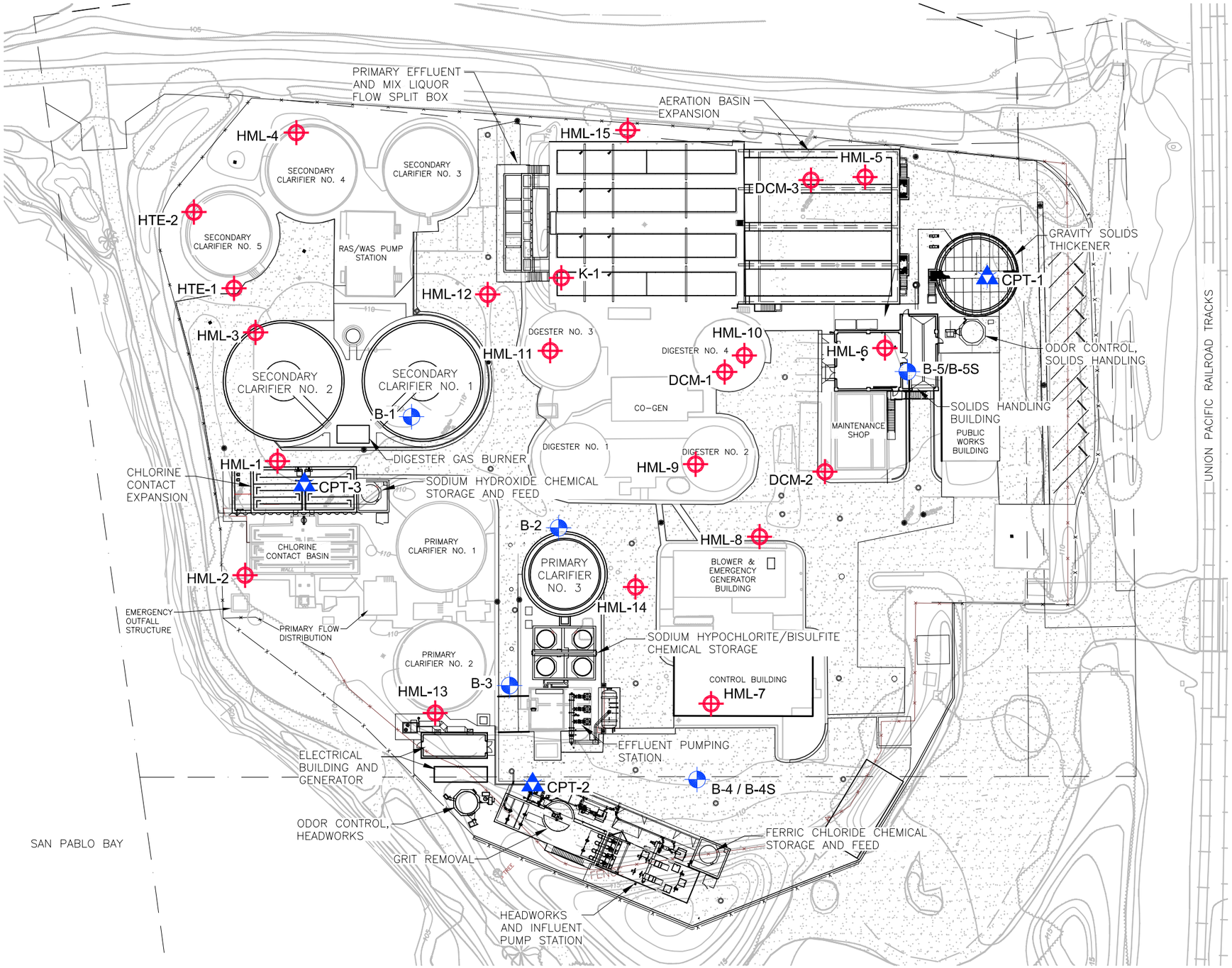
# XRF READINGS

**Readings shaded in gray indicate lead based paint**

**Readings shaded in green indicate lead containing paint**

# Attachment for Section 02200 – Earthwork

# “Boring Logs”




LEGEND

| | |
|---|---|
| B-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HDR (CURRENT STUDY) |
| CPT-1 | APPROXIMATE LOCATION OF CONE PENETRATION TEST BY HDR (CURRENT STUDY) |
| DCM-3 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY DCM ENGINEERING (2005) |
| HTE-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HULTGREN-TILLIS ENGINEERS (2001) |
| K-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY KOELZER ENGINEERING SERVICES (1995) |
| HML-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HARDING, MILLER, LAWSON, & ASSOCIATES (1971) |

SCALE: 1"=60'

60 0 60 120

SCALE IN FEET

BASE MAP: GENERAL OVERALL SITE KEY PLAN, 90% SUBMITTAL, DATED MARCH 31, 2015

HDR

ONE COMPANY | Many Solutions

**SITE PLAN**

Pinole/Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Figure
2

RF11

# LOG OF BORING 1

Equipment 9" Hollow Stem Auger

Elevation 6.3* Date 12/11/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with occasional rock fragments (FILL) |
| | 29.5 | 84 | | | water level 12/11/70 |
| | | | 5 | | GRAY CLAYEY SILT (MH) soft, saturated, with organic matter |
| | | | | | GRAY SILTY SAND (SM) loose, saturated, with occasional gravel |
| | | | 10 | | medium dense at 9.0' |
| | | | | | LIGHT BROWN SILT (ML) stiff, saturated |
| Consolidation Test $e_o = 0.92$ $C_c = 0.27$ | 34.2 | 86 | 15 | | |
| | | | 20 | | |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

*Datum: USC&GS, Bench Mark A-130, 1932, Elevation 20.81 per Plan by Edward Coleman & Associates, Redding, California, undated

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 1

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 6

RF11

## LOG OF BORING 2

Equipment 9" Hollow Stem Auger

Elevation 6.5 Date 12/14/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | BROWN SANDY CLAY (CL) medium stiff, wet, with occasional rock fragments (FILL) |
| | 53.4 | 63 | | | GRAY SANDY SILT (MH) soft, saturated, with wood debris and decayed vegetation |
| | 51.1 | 64 | | | |
| | | | 5 | | GRAY SILTY SAND (SM) loose, saturated, with occasional shell fragments medium dense at 9.5' |
| | | | 10 | | |
| | 30.8 | 91 | | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | | | 15 | | |
| | 30.7 | 87 | | | |
| | | | 20 | | with occasional rock fragments |
| | | | 25 | | LIGHT BROWN SILTY SAND (SM) dense, saturated, slightly cemented |
| | | | 30 | | GRAY SANDY CLAY (CH) very stiff, saturated |
| | | | 35 | | BROWN SILTY SAND (SM) dense, saturated (boring backfilled prior to water level stabilization) |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible] Date 12/31/70

LOG OF BORING 2

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 7

RF11

## LOG OF BORING 3

Equipment 9" Hollow Stem Auger

Elevation 5.8 Date 12/14/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | |
|---|---|---|---|---|---|
| | 28.3 | 86 | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet (FILL) |
| | | | 5 | | BLACK SANDY SILT (MH) soft, saturated, with organic debris |
| | | | | | GRAY SILTY SAND (SM) loose, saturated medium dense at 9.0' |
| | | | 10 | | |
| | 34.0 | 88 | 15 | | LIGHT BROWN SANDY SILT (ML) stiff, saturated |
| | | | 20 | | (boring backfilled prior to water level stabilization) |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 3

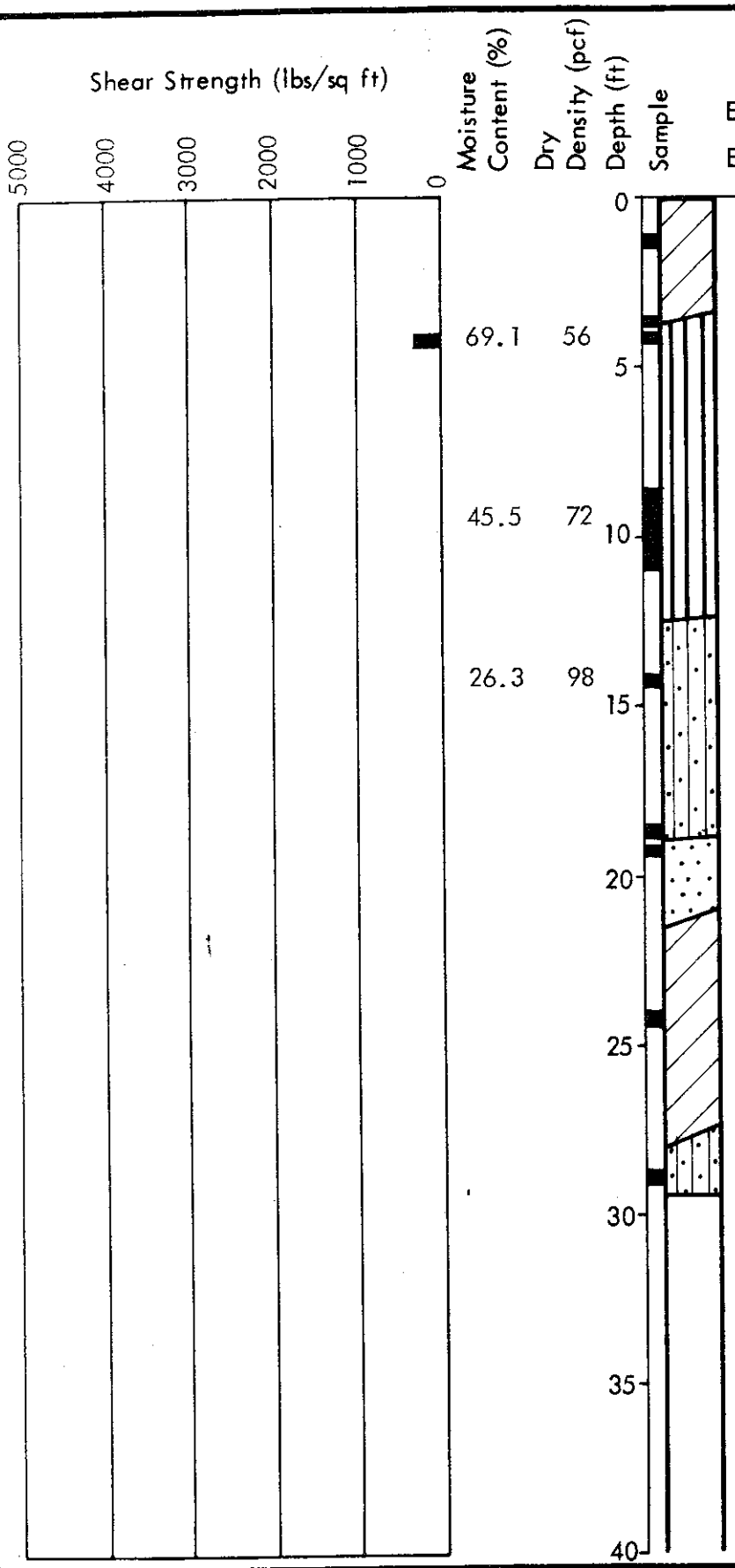
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 8

## LOG OF BORING 4

Equipment: 9" Hollow Stem Auger

Elevation: 6.7 Date: 12/14/70




DARK BROWN SANDY CLAY (CL)
medium stiff, wet, with rock fragments and wood debris

FILL

GRAY SANDY SILT (MH)
soft, saturated, with vegetation

LIGHT BROWN SILTY SAND (SM)
dense, saturated

lens of sandy clay, with rock fragments from 18 to 19'

BROWN SAND (SP)
dense, saturated

LIGHT BROWN SANDY CLAY (CL)
very stiff, saturated

BROWN SILTY SAND (SM)
dense, saturated, with rock fragments

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORING 4

Sewage Treatment Plant Additions
City of Pinole, California

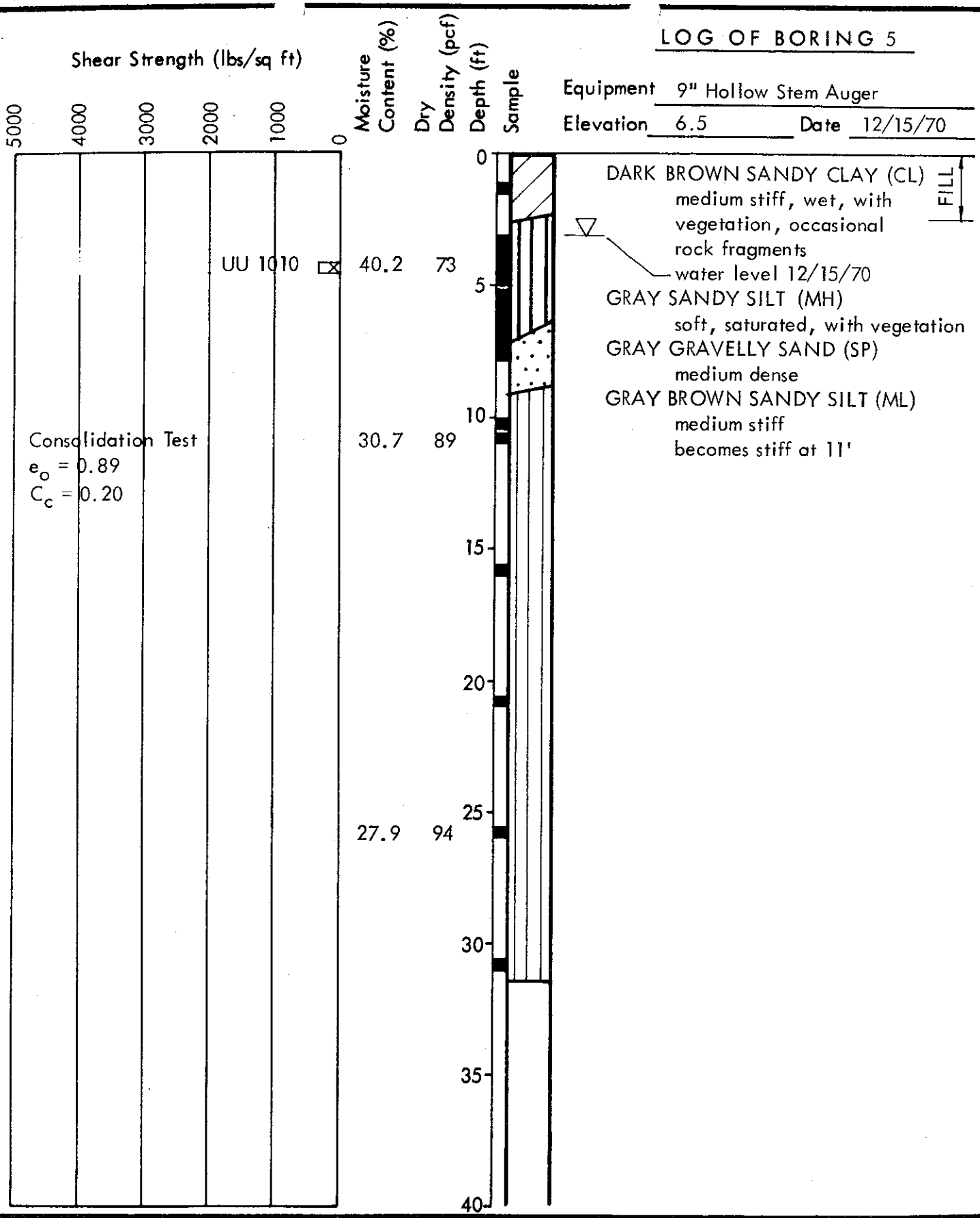
PLATE 9

RF11

## LOG OF BORING 5

Equipment 9" Hollow Stem Auger

Elevation 6.5 Date 12/15/70




**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORING 5

Sewage Treatment Plant Additions
City of Pinole, California

PLATE **10**

RF11

# LOG OF BORING 6

Equipment 9" Hollow Stem Auger

Elevation 7.4 Date 12/15/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with rock fragments wood debris from 4.0 to 4.7' (FILL) |
| | 31.1 | 79 | | | |
| | | | 5 | | GRAY SANDY SILT (ML) soft, saturated |
| | 59.8 | 64 | | | GRAY SILTY SAND (SM) loose, saturated |
| UU 1440 | 30.5 | 90 | 10 | | GRAY SANDY CLAY (CH) medium stiff, saturated |
| | | | | | LIGHT BROWN CLAYEY SILT (ML) stiff, saturated, with occasional gravel |
| | | | 15 | | |
| | | | 20 | | (boring backfilled prior to water level stabilization) |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

Shear Strength scale: 5000, 4000, 3000, 2000, 1000, 0

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 6
Sewage Treatment Plant Additions
City of Pinole, California

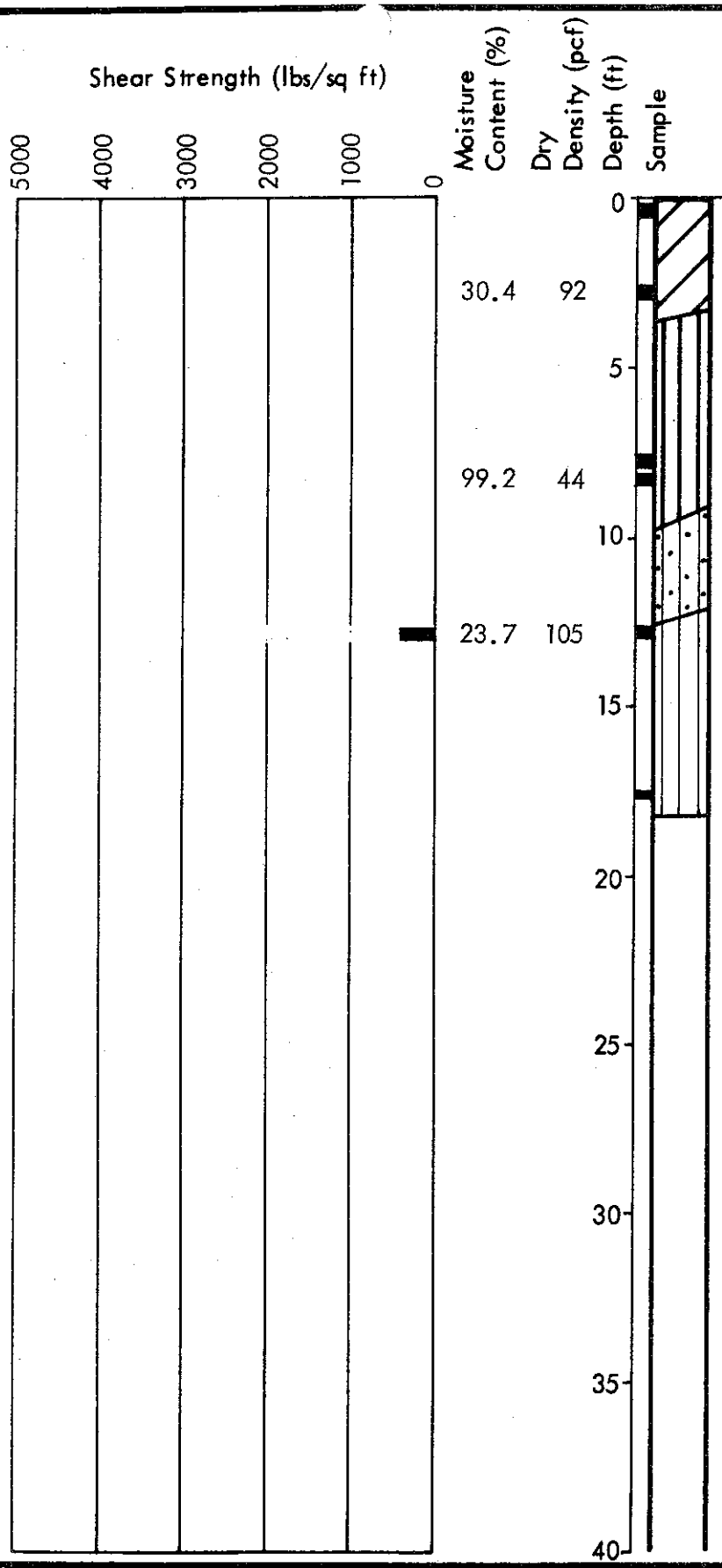
PLATE 11

RF11

## LOG OF BORING 7

Equipment 6" Flight Auger

Elevation 8.0 Date 12/15/70




DARK BROWN SANDY CLAY (CH)
medium stiff, wet, with occasional rock and asphalt fragments

FILL

GRAY SANDY SILT (MH)
soft, saturated, with occasional gravel

GRAY SILTY SAND (SM)
loose, saturated

LIGHT BROWN CLAYEY SILT (ML)
medium stiff, saturated

stiff

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: Bu/jd Date 12/31/70

LOG OF BORING 7

Sewage Treatment Plant Additions
City of Pinole, California

PLATE **12**

RF11

# LOG OF BORING 8

Equipment 9" Hollow Stem Auger

Elevation 7.7 Date 12/16/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | 1-1/2" ASPHALT CONCRETE<br>6" BASE ROCK<br>DARK BROWN SANDY CLAY (CL) FILL<br>stiff, wet, with rock fragments |
| | 86.2 | 47 | 5 | | GRAY SANDY SILT (MH)<br>medium stiff, wet<br>soft at 2.5'<br>with decayed vegetation<br>with occasional shell and rock fragments |
| | | | 10 | | |
| | | | 15 | | LIGHT BROWN SILTY SAND (SM)<br>dense, saturated, with gravel<br>LIGHT BROWN SILT (ML)<br>very stiff, saturated, slightly cemented |
| | 20.0 | 107 | 20 | | |
| | | | 25 | | with occasional gravel and sand lenses |
| | | | 30 | | (boring backfilled prior to water level stabilization) |
| | | | 35 | | |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: /jd Date 12/31/70

LOG OF BORING 8

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 13

RF12

Shear Strength (lbs/sq ft,

Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample

## LOG OF BORING 9

Equipment 9" Hollow Stem Auger

Elevation 7.8 Date 12/16/70

| Moisture Content (%) | Dry Density (pcf) |
|---|---|
| 26.3 | 95 |
| 54.2 | 74 |

0, 5, 10, 15

DARK BROWN SANDY CLAY (CL)
stiff, wet, with occasional rock fragments

FILL

GRAY SANDY SILT (MH)
soft, saturated, with occasional gravel
water level 12/16/70
medium stiff, sandy at 8.5'

LIGHT BROWN SILTY SAND (SM)
dense, saturated, with occasional gravel

## LOG OF BORING 10

Equipment 9" Hollow Stem Auger

Elevation 7.3 Date 12/16/70

| Moisture Content (%) | Dry Density (pcf) |
|---|---|
| 92.5 | 46 |
| 28.3 | 92 |

0, 5, 10, 15

1-1/2" ASPHALT CONCRETE
6" BASE ROCK
DARK BROWN SANDY CLAY (CL)
stiff, wet, with occasional rock fragments

FILL

GRAY SANDY SILT (MH)
medium stiff, saturated, with vegetation

GRAY SILTY SAND (SM)
medium dense, saturated

LIGHT BROWN SANDY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: CBJ/jd Date 12/31/70

LOG OF BORINGS 9 & 10

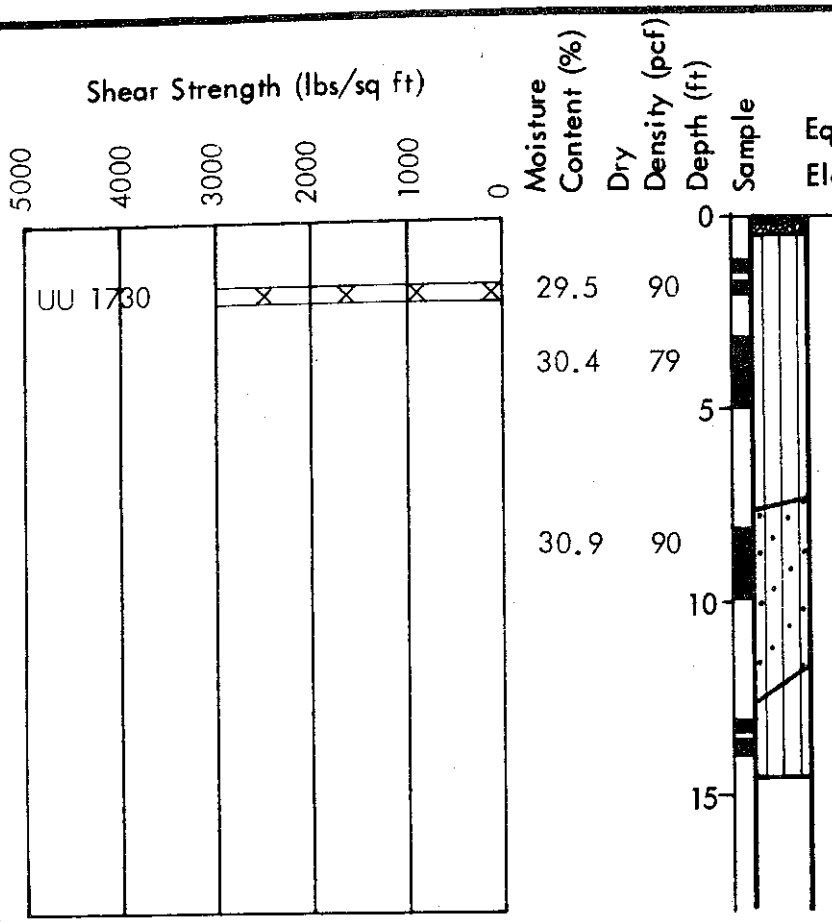
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 14

## LOG OF BORING 11

Equipment 9" Hollow Stem Auger

Elevation 7.5 Date 12/17/70




1-1/2" ASPHALT CONCRETE
6" BASE ROCK
LIGHT BROWN SANDY SILT (ML)
stiff, wet, with rock fragments
soft, saturated at 3.0'

FILL

GRAY SILTY SAND (SM)
medium dense, saturated

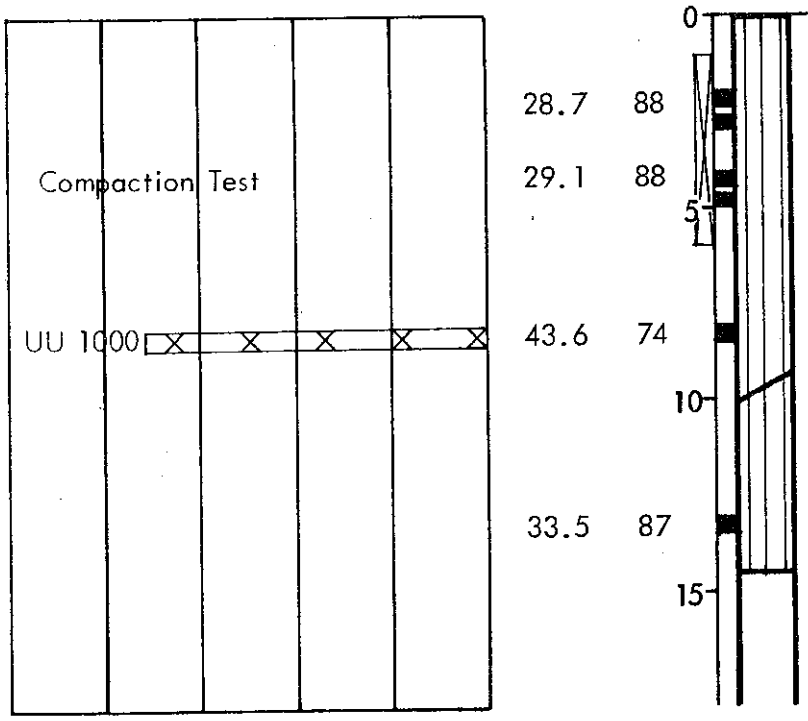
LIGHT BROWN CLAYEY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

## LOG OF BORING 12

Equipment 6" Flight Auger

Elevation 7.3 Date 12/17/70




LIGHT BROWN SANDY SILT (ML)
stiff, wet, with rock fragments
medium stiff, saturated at 3'

FILL

LIGHT BROWN CLAYEY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORINGS 11&12
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 15

RF12

## LOG OF BORING 13

Equipment 6" Flight Auger
Elevation 7.8 Date 12/17/70

Shear Strength (lbs/sq ft): 5000, 4000, 3000, 2000, 1000, 0

| Depth (ft) | Sample | Moisture Content (%) | Dry Density (pcf) | Description |
|---|---|---|---|---|
| 0 | UU 4010 | 36.1 | 83 | LIGHT BROWN SANDY SILT (ML) stiff, wet, with rock fragments |
| | | 30.3 | 86 | medium stiff, saturated at 5.0' |
| 5 | | | | FILL |
| 10 | | | | GRAY BROWN CLAYEY SILT (ML) medium stiff, saturated becomes stiff at 13' |
| 15 | | | | (boring backfilled prior to water level stabilization) |

## LOG OF BORING 14

Equipment 6" Flight Auger
Elevation 8.2 Date 12/17/70

| Depth (ft) | Sample | Moisture Content (%) | Dry Density (pcf) | Description |
|---|---|---|---|---|
| 0 | Compaction Test | 26.5 | 93 | 1-1/2" ASPHALT CONCRETE 6" BASE ROCK LIGHT BROWN SANDY SILT (ML) stiff, wet, with rock fragments |
| 5 | | 29.2 | 91 | medium stiff, saturated at 5.0' |
| | | | | FILL |
| 10 | | 18.6 | 104 | GRAY SILTY SAND (SM) medium dense, saturated |
| | | | | LIGHT BROWN CLAYEY SANDY SILT (ML) - stiff, saturated |
| 15 | | | | (boring backfilled prior to water level stabilization) |

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: BW/jd Date 12/31/70

LOG OF BORINGS 13 & 14
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 16

RF11

## LOG OF BORING 15

Equipment 9" Hollow Stem Auger

Elevation 6.6 Date 1/14/71

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | 25.5 | 92 | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with abundant rock fragments (FILL) |
| | 23.3 | 92 | | | DARK GRAY SANDY SILT (MH) medium stiff, wet saturated at 3' |
| | | | 5 | | |
| | | | 10 | | GRAY SILTY SAND (SM) medium dense, saturated |
| | | | | | GRAY SILT (ML) stiff, saturated |
| | | | 15 | | GRAY SILTY SAND (SM) dense, saturated, with some gravel |
| | 30.5 | 91 | | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | 37.1 | 83 | 20 | | BLUE GRAY SILTY CLAY (CL) stiff, saturated |
| | | | 25 | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | | | 30 | | |
| | | | 35 | | (boring backfilled before water level stabilized) |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: hr/jd Date 1/18/71

LOG OF BORING 15

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 17

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61 with 8" Hollow Stem Auger | Ground Water | Free water observed at 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 0–4 | 91 | 24.0 | 11 | 3.0–3.5 | CL | **MEDIUM BROWN SILTY CLAY** moderately stiff, moderately moist, sticky, trace sand<br>trace of small gravel |
| 5–11 | 82 | 33.2 | 3.5 | 6.5–7.0 | CH | **BLACK TO DARK BROWN CLAY** very moist, fat, trace fine sand, soft to very soft<br>increasing trace of fine gravel<br>▽ moderate water entry encountered at 11.0 feet while drilling |
| 11–16 | 95 | 27.2 | 6 | 11.5–12.0 | SC | **MEDIUM GREY GREEN SILTY SAND** loose, water saturated, trace clay |
| 16–17 | 88 | 32.6 | 19 | 16.0–16.5 | ML | **MEDIUM TAN GREEN SILT** moist, medium dense, sandy |

KOELZER ENGINEERING SERVICES

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1**
Waste Water Treatment Plant
Pinole, California

PLATE: 4

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61B with 8" Hollow Stem Auger | Ground Water | Free water observed @ 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 17–22 | | | | | ML | **MEDIUM TAN GREEN SILT (CON'T)** moist, medium dense, sandy<br>▽ water rapidly entering borehole @ approx. 19' below ground surface<br>grading to medium brown clayey silt w/a slightly waxy appearance |
| 22 | 74 | 41.8 | 30 | 21.5–22.0 | | |
| 23–27 | | | | | ML | **ORANGE TAN SANDY SILT** moist, massive, medium dense |
| 27 | 93 | 26.5 | 31 | 26.5–27.0 | | |
| 28–29 | | | | | MH | **MEDIUM TAN CLAYEY SILT** moist, fine sand, plastic, stiff |
| 30–34 | | | | | CL | **MEDIUM TAN SILTY CLAY** very moist, stiff, massive, waxy |
| 31 | 87 | 31.3 | 30 | 31.0–31.5 | | |

KOELZER ENGINEERING SERVICES

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1(cont'd)**
Waste Water Treatment Plant
Pinole, California

PLATE: 5

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1
(2 of 3)

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61 with 8" Hollow Stem Auger | Ground Water | Free water observed at 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 34 | | | | | | |
| 35 | | | | | | |
| 36 | 88 | 31.5 | 32 | 36.5-37.0 | | water level at 36.0 feet, 15 minutes after drilling (not a static water level) |
| 37 | | | | | | |
| 38 | | | | | | |
| 39 | | | | | ML | **MEDIUM TO LIGHT TAN SANDY SILT** moderately moist, medium dense trace white kaolinite & organic flakes |
| 40 | | | | | | |
| 41 | 101 | 24.3 | 45 | 41.5-42.0 | | |
| 42 | | | | | | |
| 43 | | | | | | |
| 44 | | | | | GC | **BROWN TAN CLAYEY GRAVEL** |
| 45 | 85 | 33.6 | 35 | 45.5-46.0 | ML | **MEDIUM TAN CLAYEY SILT** moist, very stiff, trace gravel |
| 46 | | | | | | |
| 47 | | | | | | boring terminated at 46.5' |
| 48 | | | | | | |
| 49 | | | | | | |
| 50 | | | | | | |
| 51 | | | | | | |

**KOELZER ENGINEERING SERVICES**

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1 (CON'T)**
Waste Water Treatment Plant
Pinole, California

PLATE: 6

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1

Drilling Method: Rotary Wash
Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | 3-inches Asphalt Concrete over 6-inches Aggregate Base | | | |
| | | | | | | CL | Gray Sandy Lean Clay (CL) with gravel, medium stiff to stiff, moist (Fill) | | | |
| 1.3<br>0.7 | | 9 | | | | | | 22 | | LL=41<br>PI=18 |
| | | | | 5 | | | | | | |
| | | | | | | | becoming very stiff | | | |
| 3.5<br>0.5 | | Push | | | | CL | Gray and Tan Sandy Lean Clay (CL) with gravel, medium stiff, wet | 27 | 92 | 900psf (TxUU)<br>(see Plate 6) |
| | | | | 10 | | | | | | |
| | | | | | | | becoming soft | | | |
| - | 0.13 | Push | | | | | | 26 | 96 | Sieve |
| 2.0 | 1.1 | | | | | CL | Brown Sandy Lean Clay (CL), stiff to very stiff, moist | | | (see Plate 7) |
| | | | | 15 | | | | | | |
| 2.7<br>2.3 | | 11 | | | | | | | | |
| | | | | 20 | | | | | | |
| | | | | | | CL | Gray Lean Clay (CL), very stiff, moist | | | |
| 3.7<br>4.0 | | 23 | | | | | | 39 | 82 | |
| | | | | | | | Bottom of boring at 23.5 feet | | | |
| | | | | 25 | | | | | | |
| | | | | 30 | | | | | | |
| | | | | 35 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 1**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 3** |

Drilling Method: Rotary Wash

Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | CL | Brown Sandy Lean Clay (CL) with gravel, very stiff, moist (Fill) | | | |
| 2.7 | | 23 | | | | | | 20 | 98 | |
| | | | | 5 | | | | | | |
| 0.7 | 0.30 | 5 | | | | CH | Black Fat Clay (CH) with gravel and organics, medium stiff, moist | 160<br>101 | 27<br>44 | 575psf (TxUU) (see Plate 6) |
| | | 8 | | | | SM<br>SC | Gray Silty Sand (SM) to Clayey Sand (SC), loose, wet | | | |
| | | Push | | 10 | | | | 34 | 86 | 740psf (TxUU)<br>LL=42<br>PI=15<br>Sieve Analysis (see Plate 7) |
| | 0.14<br>0.20 | | | | | | | | | |
| | | 10 | | | | CL | Light Brown Sandy Lean Clay (CL), medium stiff to stiff, moist | | | |
| | | | | 15 | | | | | | |
| 1.0 | | 9 | | | | | | | | |
| | | | | 20 | | | becoming stiff to very stiff | | | Consolidation Test (see Plate 6) |
| 1.5<br>2.0 | | 19 | | | | | | | | |
| | | | | 25 | | SM | Light Brown Silty Sand (SM) with gravel, medium dense, moist | | | |
| | | 22 | | | | | | 27 | 93 | |
| | | | | 30 | | CL | Light Brown Sandy Lean Clay (CL), stiff, moist | | | |
| | | | | 35 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 2**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 4** |

Drilling Method: Rotary Wash
Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 35 | | CL | | | | |
| 1.5 | | 12 | | | | | | | | |
| | | | | | | | Bottom of boring at 37.5 feet | | | |
| | | | | 40 | | | | | | |
| | | | | 45 | | | | | | |
| | | | | 50 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 70 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 2**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 5** |

# LOG OF BORING B-1

LOCATION: See Plate 2
GROUND SURFACE: Grass lawn

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **FILL - MIXED LEAN TO FAT CLAY WITH GRAVEL**<br>- dark grayish brown<br>- up to 2" gravel<br>- medium to high plasticity | | | | | | | | | | |
| 5 | 1 | | 10 | | **FILL - MIXED SANDY LEAN CLAY**<br>- olive brown<br>- trace gravel<br>- moist<br>- medium plasticity<br>- medium stiff<br>**CORROSION TEST** See Plate C-6 | 29 | 94 | | | 5 | 38 | 57 | 0.6 | | |
| 10 | 2 | | 17 | | **LEAN CLAY (CL)**<br>- dark greenish gray<br>- few sand, little silt<br>- moist to wet<br>- medium plasticity<br>- stiff | 25 | 98 | 44 | 20 | | | | 1.9 | | |
| | 3 | | 24 | | **CORROSION TEST** See Plate C-6 | | | | | | | | | | |
| 15 | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- thin (<12") interlayers of wet clayey sand<br>- moist to wet<br>- high plasticity<br>- very stiff | 57 | 81 | | | | | | | | |
| 20 | 4 | | 25 | ② | | 34 | 86 | | | 0 | 6 | 94 | 3.4 | | |
| 25 | 5 | | 27 | | **CONSOLIDATION TEST**<br>**SAMPLE 5**<br>$C_C = 0.22$<br>$e_O = 0.7405$ | 28 | 97 | 55 | 31 | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 24' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-1

PLATE NO.
B-1
(1 of 2)

## LOG OF BORING B-1 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Grass lawn

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 OF 2** | | | | | | | | | | |
| 25 | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- thin (<12") interlayers of wet clayey sand<br>- moist to wet<br>- high plasticity<br>- very stiff | | | | | | | | | | |
| | 6 | | 33 | | **CLAYEY SAND (SC)**<br>- olive brown<br>- fine sand<br>- wet<br>- medium plasticity clay<br>- medium dense | 27 | 97 | | | | | | | | |
| 30 | | | | | **LEAN CLAY (CL)**<br>- olive brown<br>- few sand<br>- moist to wet<br>- medium plasticity<br>- very stiff | | | | | | | | | | |
| | 7 | | 33 | | | 29 | 93 | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| | 8 | | 37 | | | 30 | 92 | | | | | | | | |
| 40 | | | | | **BOTTOM OF BORING AT 40 FEET** | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 24' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-1

PLATE NO.
B-1
(2 of 2)

## LOG OF BORING B-2

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approx. 8" asphalt concrete over 6" aggregate base)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **FILL - MIXED LEAN TO FAT CLAY WITH GRAVEL**<br>- dark grayish brown<br>- up to 2" gravel<br>- moist<br>- medium to high plasticity | | | | | | | | | | |
| 5 | 1 | | 18 | ② | **FILL - MIXED SANDY LEAN CLAY**<br>- dark greenish gray<br>- moist<br>- medium plasticity<br>- stiff | 29 | 89 | | | | | | 1.3 | | |
| | 2 | | 10 | | **BAY MUD - LEAN CLAY (CL)**<br>- dark greenish gray - medium plasticity<br>- moist to wet - soft | | | 39 | 16 | | | | | | |
| 10 | | | | | **BAY MUD - SILTY SAND (SM) TO CLAYEY SAND (SC)**<br>- dark greenish gray - wet<br>- trace fine gravel - loose<br>- trace shells | 32 | 87 | | | 3 | 70 | 17 | | | |
| 15 | 3 | | 28 | | **FAT CLAY (CH)**<br>- grayish brown<br>- trace sand<br>- moist to wet<br>- high plasticity<br>- very stiff to hard | 28 | 95 | | | | | | | | |
| 20 | 4 | | 58 | | | 17 | 116 | | | | | | | | |
| 25 | 5 | | 35 | | | 20 | | | | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 8' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-2

PLATE NO.
B-2
(1 of 2)

## LOG OF BORING B-2 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approx. 8" asphalt concrete over 6" aggregate base)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 of 2** | | | | | | | | | | |
| | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- trace sand<br>- moist to wet<br>- high plasticity<br>- very stiff to hard | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | |
| | | | | | **CLAYEY SAND (SC)**<br>- olive brown - dense<br>- wet | | | | | | | | | | |
| | 6 | ◣ | 44 | | | 19 | | | | | | | | | |
| 30 | | | | | **POORLY GRADED SAND (SP)**<br>- olive brown - wet<br>- with gravel - dense | | | | | | | | | | |
| | | | | | **BOTTOM OF BORING AT 30 FEET** | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 8' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-2

PLATE NO.
B-2
(2 of 2)

# LOG OF BORING B-3

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approximately 8" asphalt concrete)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | **FILL - MIXED LEAN CLAY WITH SAND AND GRAVEL**<br>- grayish brown to greenish brown<br>- up to 2" gravel<br>- moist to wet | | | | | | | | | | |
| 5 | 1 | | 26 | | **FILL - MIXED LEAN CLAY WITH SAND**<br>- dark greenish gray<br>- few ½" gravel<br>- wet<br>- medium plasticity<br>- stiff to very stiff | 25 | 93 | | | | | | | 560 | 28° |
| 10 | 2 | | 20 | | **FILL - MIXED CLAYEY SAND AND SANDY LEAN CLAY**<br>- olive brown to dark greenish gray<br>- up to 2" gravel<br>- wet<br>- medium plasticity clay<br>- stiff (clay)<br>- medium dense (sand)<br>**CONSOLIDATION TEST**<br>**SAMPLE 2**<br>$C_C = 0.19$<br>$e_O = 1.1034$ | 26 | 80 | | | 9 | 43 | 48 | | | |
| 15 | 3 | | 29 | | **FAT CLAY (CH)**<br>- dark grayish brown<br>- locally contains fine sand interlayers<br>- moist to wet<br>- high plasticity<br>- very stiff | 42 | 78 | 87 | 51 | | | | 5.9 | | |
| 20 | 4 | | 39 | | | 28 | 90 | | | 0 | 23 | 77 | | | |
| 25 | 5 | | 15 | | | 29 | | | | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-3

PLATE NO.
B-3
(1 of 2)

## LOG OF BORING B-3 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approximately 8" asphalt concrete)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| 25 | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 of 2** | | | | | | | | | | |
| | | | | | **FAT CLAY (CH)**<br>- dark grayish brown<br>- locally contains fine sand interlayers<br>- moist to wet<br>- high plasticity<br>- very stiff | | | | | | | | | | |
| | 6 | ◣ | 32 | | | 26 | | | | | | | | | |
| 30 | | | | | **BOTTOM OF BORING AT 30 FEET** | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-3

PLATE NO.
B-3
(2 of 2)

# UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

| MATERIAL TYPES | CRITERIA FOR ASSIGNING SOIL GROUP NAMES | | | GROUP SYMBOL | SOIL GROUP NAMES & LEGEND |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE | GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE | CLEAN GRAVELS <5% FINES | $C_u \geq 4$ AND $1 \leq C_c \leq 3$ | GW | WELL-GRADED GRAVEL |
| | | | $C_u < 4$ AND/OR $1 > C_c > 3$ | GP | POORLY-GRADED GRAVEL |
| | | GRAVELS WITH FINES >12% FINES | FINES CLASSIFY AS ML OR MH | GM | SILTY GRAVEL |
| | | | FINES CLASSIFY AS CL OR CH | GC | CLAYEY GRAVEL |
| | SANDS >50% OF COARSE FRACTION PASSES NO 4. SIEVE | CLEAN SANDS <5% FINES | $C_u \geq 6$ AND $1 \leq C_c \leq 3$ | SW | WELL-GRADED SAND |
| | | | $C_u < 6$ AND/OR $1 > C_c > 3$ | SP | POORLY-GRADED SAND |
| | | SANDS AND FINES >12% FINES | FINES CLASSIFY AS ML OR MH | SM | SILTY SAND |
| | | | FINES CLASSIFY AS CL OR CH | SC | CLAYEY SAND |
| FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT<50 | INORGANIC | PI>7 AND PLOTS>"A" LINE | CL | LEAN CLAY |
| | | | PI>4 AND PLOTS<"A" LINE | ML | SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OL | ORGANIC CLAY OR SILT |
| | SILTS AND CLAYS LIQUID LIMIT>50 | INORGANIC | PI PLOTS >"A" LINE | CH | FAT CLAY |
| | | | PI PLOTS <"A" LINE | MH | ELASTIC SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OH | ORGANIC CLAY OR SILT |
| HIGHLY ORGANIC SOILS | | PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR | | PT | PEAT |

## OTHER SYMBOLS

MATERIALS

- Asphalt
- Aggregate Base
- Boulders & Cobbles
- Fill
- Topsoil

SAMPLERS

- SPT (2" OD)
- Modified California (3" OD)
- California (2.5" OD)
- Shelby Tube
- Pitcher Barrel
- HQ Core
- Grab/Bulk

PIEZOMETER

- Concrete Grout/Fill
- Bentonite/Grout Seal
- Sand Pack + Solid Pipe
- Sand Pack + Slotted Pipe

- INITIAL WATER LEVEL MEASUREMENT(WITH DATE)
- STABILIZED WATER LEVEL MEASUREMENT(WITH DATE)

## GRAIN SIZES

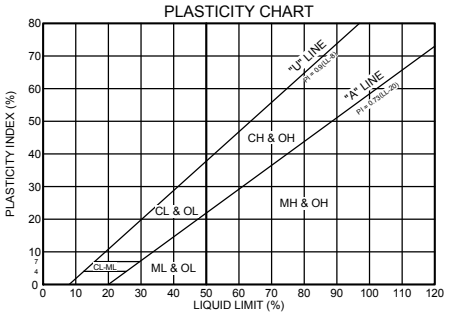
| U.S. STANDARD SIEVE | 200 | 40 | 10 | 4 | 3/4" | 3" | 12" |
|---|---|---|---|---|---|---|---|
| SILTS AND CLAYS | SAND | | | GRAVEL | | COBBLES | BOULDERS |
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

## PENETRATION RESISTANCE

| SAND & GRAVEL | | SILT & CLAY | | |
|---|---|---|---|---|
| RELATIVE DENSITY | BLOWS/FOOT* | CONSISTENCY | BLOWS/FOOT* | UNC. COMP. STRENGTH (KSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 1 | 0 - 1/2 |
| LOOSE | 5 - 10 | SOFT | 2 - 4 | 1/2 - 1 |
| MEDIUM DENSE | 11 - 30 | FIRM | 5 - 8 | 1 - 2 |
| DENSE | 31 - 50 | STIFF | 9 - 15 | 2 - 4 |
| VERY DENSE | OVER 50 | VERY STIFF | 16 - 30 | 4 - 8 |
| | | HARD | OVER 30 | OVER 8 |

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

PLASTICITY CHART




## NOTES

| | |
|---|---|
| AT | ATTERBERG LIMITS |
| BGS | BELOW GROUND SURFACE |
| c | COHESION |
| CD | CONSOLIDATED DRAINED TRIAXIAL |
| CN | CONSOLIDATION |
| CR | CORROSIVITY |
| CU | CONSOLIDATED UNDRAINED TRIAXIAL |
| DS | DIRECT SHEAR |
| EI | EXPANSION INDEX |
| HY | HYDROMETER |
| LL | LIQUID LIMIT |
| $N_{60}$ | BLOW COUNT, Corrected for Hammer Energy Only |
| PI | PLASTICITY INDEX |
| PR | PERMEABILITY |
| RV | R-VALUE |
| SA | SIEVE ANALYSIS |
| -200 | % PASSING NO. 200 SIEVE |
| TC | CYCLIC TRIAXIAL |
| UC | UNCONFINED COMPRESSION |
| UU | UNCONSOLIDATED UNDRAINED TRIAXIAL |

INCREASING VISUAL MOISTURE CONTENT

SATURATED
WET
MOIST
DAMP
DRY

COMPONENT PERCENTAGE

| | |
|---|---|
| PRIMARY | >50% |
| SECONDARY (-y) | 30 - 50% |
| WITH | 15 - 30% |
| TRACE | 0 - 15% |

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**Boring Legend**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Figure
Boring Legend

LEGEND 215786_PINOLE_HERCULES_WWTP_R3.GPJ FOLSOM 12-30-13.GDT 3/31/15

LOGGED BY: Brett Bourgeois | DATE: START 11/21/13 END 11/21/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 10.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 12.0 ft DEPTH: 8.8 ft

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0830 hrs TIME: 0930 hrs

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/21/13 DATE: 1/21/14

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Landscape Gravel at ground surface<br>Dark brown Silty SAND (SM), fine grained, moist (Fill) | Elevation Datum: NGVD29<br>Cement Grout<br>Hand auger from 0 to 5'<br>Bentonite Chips | |
| 5.0<br>6.5 | | S-1 | 7 17 16 (25) | | | | 21 | | 5 | 5 | | Yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, damp (Fill) | 2" PVC (Solid)<br>Begin solid flight auger | 5 |
| | | | | | | | | ▼ | | | | Dark gray mottled black, medium plasticity, with fine gravel, trace fine- to medium-grained sand, firm, moist | | |
| 10.0<br>11.5 | | S-2 | 4 5 7 (10) | | | | | ▽ | 10 | 0 | | | 2" PVC (0.02" Slots) | 10 |
| | | | | | | | | | | | | Yellowish-brown Fat CLAY (CH), high plasticity, trace fine-grained sand, stiff, damp | | |
| 15.0<br>16.5 | | S-3 | 4 8 9 (15) | 1.8 | 2.3 | | | | 15 | -5 | | | Begin mud rotary | 15 |
| 17.5<br>19.0 | | S-4 | 4 8 10 (15) | | | 86 | 36 | AT | | | | Decreased sand | LL=77, PL=27, PI=50 | |
| 20.0<br>21.5 | | S-5 | 5 6 9 (14) | 3.0 | 2.8 | 82 | 39 | UU | 20 | -10 | | Dark olive brown mottled black Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff, damp | | 20 |
| 22.5<br>24.0 | | S-6 | 3 8 11 (18) | 3.0 | 2.3 | | | | | | | | | |
| 25.0<br>26.5 | | S-7 | 6 11 16 (26) | 3.3 | 1.5 | 96 | 28 | AT UU | 25 | -15 | | Dark olive gray, very stiff, moist | LL=45, PL=21, PI=24 | 25 |
| 27.5<br>29.0 | | S-8 | 6 9 13 (21) | 3.0 | 2.5 | | | | 30 | -20 | | | | 30 |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-1

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 – 31.5 | X | S-9 | 8 12 15 (26) | (Su) 3.8 | (Su) 1.3 | | | | | | | Dark olive gray Lean CLAY (CL), medium plasticity, trace fine-grained sand, very stiff, moist | | |
| | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 35.0 – 36.5 | X | S-10 | 9 19 27 (46) | | | | | | 35 | -25 | | Olive Gray Brown Silty SAND (SM), fine- to medium-grained, dense, damp | 35 | |
| 40.0 – 41.5 | X | S-11 | 8 14 20 (34) | 4.5 | | | | | 40 | -30 | | Light olive gray Lean CLAY (CL), low to medium plasticity. trace fine- to medium-grained sand, very stiff to hard, dry to damp | 40 | |
| 45.0 – 46.5 | X | S-12 | 11 20 22 (42) | | | | | | 45 | -35 | | | 45 No recovery, recovered sample using SPT with sand catcher | |
| 50.0 – 51.5 | X | S-13 | 9 14 19 (33) | 3.8 | 3.3 | | | | 50 | -40 | | Decreased sand | 50 | |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-1

LOGGED BY: Brett Bourgeois | DATE: START 11/20/13 END 11/20/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 8.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 10.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0900 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/20/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Asphalt Concrete | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Yellowish-brown Sandy SILT (ML), fine-grained sand, trace fine to coarse gravel (subangular), damp (Fill) | Hand auger from 0 to 5' |
| | | | | | | | | | | 5 | | Yellowish-brown Clayey SAND (SC), low plasticity, with Gravel, medium dense, damp, sand/gravel in clay matrix (Fill) | |
| 5.0 | | | | | | | | | 5 | | | | Begin solid flight auger 5 |
| 6.5 | | S-1 | 8 8 7 (11) | | | 89 | 30 | SA UU | | | | Grayish-brown | Sample exhibits clay-like behavior due to clay matrix |
| 7.5 | | | | | | 95 | 22 | | | | | | |
| 9.0 | | S-2 | 9 10 13 (17) | | | | | | | 0 | | Gray | |
| 10.0 | | | | | | | | ▽ | 10 | | | Gray Sandy SILT (ML), fine-grained sand, firm to stiff, moist to wet | 10 |
| 11.5 | | S-3 | 6 5 6 (9) | | | 95 | 29 | SA | | | | | |
| | | | | | | | | | | | | | Begin mud rotary |
| 12.5 | | | | | | | | | | | | Gray Silty Sand (SM), fine-grained sand, medium dense, moist to wet | |
| 14.0 | | S-4 | 8 8 7 (13) | | | 92 | 32 | HY | | -5 | | | |
| 15.0 | | | | | | | | | 15 | | | Brown mottled gray Lean CLAY (CL), medium plasticity, with silt, trace fine-grained sand, stiff, damp | 15 |
| 16.5 | | S-5 | 5 8 9 (15) | 3.5 | | 93 | 30 | AT | | | | | LL=45, PL=22, PI=23 |
| | | | | | | | | | | -10 | | Grayish-brown, stiff to very stiff | |
| 20.0 | | | | | | | | | 20 | | | | 20 |
| 21.5 | | S-6 | 5 8 11 (18) | 3.0 | 1.8 | 92 | 31 | AT | | | | | LL=45, PL=21, PI=24 |
| | | | | | | | | | | -15 | | | |
| 25.0 | | | | | | | | | 25 | | | | 25 |
| 26.5 | | S-7 | 6 10 13 (22) | 3.0 | 1.8 | | | | | | | | |
| | | | | | | | | | | -20 | | Light grayish-brown Poorly-graded SAND (SP), fine- to medium-grained, trace silt, with fine to coarse gravel (angular), dense, damp | |
| | | | | | | | | | 30 | | | | 30 |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-2

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 | | | | | | | | | | | | | |
| | | S-8 | 19 18 39 (55) | (Su) | (Su) | | | | | | | Light grayish-brown Poorly-graded SAND (SP), fine- to medium-grained, trace silt, with fine to coarse gravel (angular), dense, damp | |
| 31.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -25 | | Light brown Lean CLAY (CL), low plasticity, damp, trace fine-grained sand, very stiff to hard, damp | |
| 35.0 | | | | | | | | | 35 | | | | 35 |
| | | S-9 | 6 7 13 | | | | | | | | | | |
| 36.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -30 | | | |
| 40.0 | | | | | | | | | 40 | | | | 40 |
| | | S-10 | 10 15 21 | | | | | | | | | | |
| 41.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -35 | | | |
| 45.0 | | | | | | | | | 45 | | | | 45 |
| | | S-11 | 5 11 15 | | | | | | | | | | |
| 46.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -40 | | | |
| 50.0 | | | | | | | | | 50 | | | Grayish brown | 50 |
| | | S-12 | 12 18 19 (37) | 2.3 | 3.8 | | | | | | | | |
| 51.5 | | | | | | | | | | | | | |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-2

LOGGED BY: Brett Bourgeois | DATE: START 11/21/13 END 11/21/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 8.2 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 9.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 1230 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/21/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Asphalt Concrete | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Yellowish-brown Sandy Lean CLAY (CL), low to medium plasticity, fine-grained SAND, damp (Fill) | Hand auger from 0 to 5' |
| | | | | | | | | | | 5 | | | |
| 5.0 | | | | | | | | | 5 | | | | Begin solid flight auger |
| 6.5 | | S-1 | 7 12 12 (18) | | | 89 | 30 | | | | | Gray mottled brown, very stiff | |
| | | | | | | | | | | 0 | | Dark gray Sandy SILT (ML), fine-grained sand, firm, moist | |
| | | | | | | | | ▽ | | | | | |
| 10.0 | | | | | | | | | 10 | | | | |
| 11.5 | | S-2 | 3 3 5 (6) | | | 89 | 34 | HY | | | | | |
| 12.5 | | | | | | | | | | | | Dark bluish-gray Sandy Lean CLAY (CL), medium plasticity, fine-grained sand, stiff to very stiff, moist to wet | Begin mud rotary |
| 14.0 | | S-3 | 5 9 13 (19) | 1.0 | 1.0 | 98 | 27 | SA AT | | -5 | | | LL=40, PL=22, PI=18 |
| 15.0 | | | | | | | | | 15 | | | | |
| 16.5 | | S-4 | 7 11 15 (22) | 4.3 | | | | | | | | Gray, decreased sand | |
| 17.5 | | | | | | | | | | -10 | | | Cobble in shoe. light brown sandy clay cuttings |
| 19.0 | | | 8 18 14 (27) | | | | | | | | | | |
| 20.0 | | | | | | | | | 20 | | | | |
| 21.5 | | S-5 | 5 5 9 (13) | 4.3 | 2.0 | 99 | 26 | UU | | | | Light grayish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, very stiff, damp | |
| | | | | | | | | | | -15 | | Light grayish-brown SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| 25.0 | | | | | | | | | 25 | | | | |
| 26.5 | | S-6 | 14 19 31 (48) | 4.5 | 1.3 | | | | | | | | |
| | | | | | | | | | | -20 | | | |
| | | | | | | | | | 30 | | | | 30 |

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## Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-3

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 – 31.5 | X | S-7 | 11 36 50/6" | (Su) 1.5 | (Su) | | | | | | | Light grayish-brown SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| | | | | | | | | | | -25 | | Light grayish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, dry to damp | |
| 35.0 – 36.5 | X | S-8 | 10 16 22 (38) | 2.3 | 1.5 | | | | 35 | | | | 35 |
| | | | | | | | | | | -30 | | Bluish-gray | |
| 40.0 – 41.5 | X | S-9 | 9 16 26 (42) | 4.5 | | | | | 40 | | | | 40 |
| | | | | | | | | | | -35 | | Bluish-gray SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| 45.0 – 46.5 | X | S-10 | 15 27 32 (59) | 4.5 | 1.0 | | | | 45 | | | | 45 |
| | | | | | | | | | | -40 | | | |
| 50.0 – 51.5 | X | S-11 | 14 30 46 (77) | 4.5 | 1.8 | | | | 50 | | | | 50 |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-3

LOGGED BY: Brett Bourgeois | DATE: START 11/22/13 END 11/22/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 8.0 ft DEPTH: 8.0 ft

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0800 hrs TIME: 0900 hrs

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/22/13 DATE: 1/21/14

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 | |
| | | | | | | | | | | | | Dark gray Lean CLAY (CL), medium plasticity, with fine sand, moist (Fill) | Cement Grout | |
| | | | | | | | | | | | | | Hand auger from 0 to 5' | |
| | | | | | | | | | | | | | Bentonite Chips | |
| | | | | | | | | | | 5 | | | 2" PVC (Solid) | |
| 5.0 | | | | | | | | | 5 | | | | | 5 |
| 6.5 | | S-1 | 2 3 4 (5) | 2.5 | 1.3 | 52 | 76 | UU | | | | Black Fat CLAY (CH), high plasticity, trace fine sand, soft, moist | Begin solid flight auger | |
| | | | | | | | | ▼ | | | | See Boring B-4S Log for Description | | |
| 9.5 | | | | | | | | | | 0 | | | | |
| 11.0 | | | 2 2 2 (3) | | | | | | 10 | | | | No sample recovery | 10 |
| | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 14.5 | | | | | | | | | | -5 | | | | |
| 16.0 | | S-2 | 1 2 1 (3) | | | | | | 15 | | | | No sample recovery | 15 |
| 17.0 | | | | | | | | | | | | Light grayish-brown Fat CLAY (CH), high plasticity, trace fine sand, stiff to very stiff, damp | Begin mud rotary | |
| 18.5 | | S-3 | 2 9 14 (20) | 4.0 | 1.5 | 96 | 28 | SA AT UU | | | | | LL=65, PL=25, PI=40 | |
| 19.5 | | | | | | | | | | -10 | | | | |
| 21.0 | | S-4 | 9 15 18 (32) | 4.5 | 2.0 | | | | 20 | | | | | 20 |
| 22.0 | | | | | | | | | | | | | | |
| 23.5 | | S-5 | 9 14 22 (34) | 3.3 | 1.0 | 103 | 24 | | | | | Increased sand | | |
| 24.5 | | | | | | | | | | -15 | | Light grayish-brown Poorly-graded SAND with SILT (SP-SM), medium- to coarse-grained, very dense, damp | | |
| 26.0 | | S-6 | 8 29 46 (72) | | | | | | 25 | | | | | 25 |
| 27.0 | | | | | | | | | | | | | | |
| 28.4 | | S-7 | 39 50/3" | | | | | | | | | with fine gravel (subangular) | | |
| 29.5 | | | | | | | | | | -20 | | | | |
| | | | | | | | | | 30 | | | | | 30 |

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# Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-4

HDR FOLSOM BORING LOG 215786_PINOLE_HERCULES_WWTP_R3.GPJ FOLSOM 12-30-13.GDT 3/31/15

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31.0 | | S-8 | 40 50/3 (16) | (Su) | (Su) | | | | | | | Light grayish-brown Poorly-graded GRAVEL with SILT (GP-GM), fine to coarse, subangular to subrounded, with medium-grained sand, very dense, moist *(continued)* | | |
| | | | | | | | | | | | | Light grayish-brown SILT (SM), low plasticity, trace fine-grained sand, hard, moist | | |
| 34.5 | | | | | | | | | | -25 | | | | |
| | | S-9 | 8 22 30 | | | | | | 35 | | | | 35 | |
| 36.0 | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 39.5 | | | | | | | | | | -30 | | | | |
| | | S-10 | 22 28 48 (77) | 4.5 | | | | | 40 | | | | 40 | |
| 41.0 | | | | | | | | | | | | | | |
| 44.5 | | | | | | | | | | -35 | | | | |
| | | S-11 | 10 19 32 (51) | | | | | | 45 | | | | 45 | |
| 46.0 | | | | | | | | | | | | | | |
| 49.5 | | | | | | | | | | -40 | | | | |
| | | S-12 | 8 13 27 (40) | | | | | | 50 | | | | 50 | |
| 51.0 | | | | | | | | | | | | | | |

End Boring at 51 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-4

LOGGED BY: Brett Bourgeois | DATE: START 1/21/14 END 1/21/14

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SSA | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: 18.0 ft | BIT DIAMETER: 7 1/4" | GROUNDWATER DATA: DEPTH: DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☒ DATE: DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | ☒ | S-1 | 10 15 17 (24) | 3.8 | | | | | | | | Dark gray Lean CLAY (CL), medium plasticity, with fine sand, very stiff, damp (Fill) | Begin hollow stem auger |
| 2.0 | | | | | | | | | | | | | |
| 2.5 | ☒ | S-2 | 7 10 10 (15) | 1.0 | | | | | | | | Dark gray to black | |
| 4.0 | | | | | | | | | | 5 | | | |
| 5.0 | ☒ | S-3 | 3 3 4 (5) | 1.0 | | | | | 5 | | | Black Fat CLAY (CH), high plasticity, trace fine sand, soft, moist, trace organics (Young Bay Mud) | 5 |
| 6.5 | | | | | | | | | | | | | |
| 7.5 | | S-4 | 0 0 0 | | | | | | | | | Decreased sand, wet, very soft, increased organics | |
| 9.0 | | | | | | | | | | | | | |
| 9.5 | ☒ | S-5 | 3 1 2 (2) | | | | | | 10 | 0 | | | 10 |
| 11.0 | | | | | | | | | | | | Black Silty SAND (SM), fine-grained, medium plasticity fines, very loose, wet | |
| 12.0 | | S-6 | 1 3 12 | | | | | | | | | | |
| 13.5 | | | | | | | | | | | | Dark gray Poorly-graded SAND (SP), medium- to coarse-grained, medium dense | |
| 14.0 | | S-7 | 5 3 5 (11) | | | | | | 15 | -5 | | | 15 |
| 15.5 | | | | | | | | | | | | | |
| 16.0 | | S-8 | 5 8 18 | | | | | | | | | Trace clay lenses | |
| 17.5 | | | | | | | | | | | | | |
| 18.0 | ☒ | S-9 | 5 8 9 (15) | | | | | | | | | Light grayish-brown Fat CLAY (CH), high plasticity, trace fine sand, stiff to very stiff, damp | |
| 19.5 | | | | | | | | | | -10 | | End Boring at 19.5 feet depth | |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-4S

LOGGED BY: Brett Bourgeois | DATE: START 11/20/13 END 11/20/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 5.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 1430 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/20/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Gray Poorly-graded SAND (SP), fine- to medium-grained, trace silt, moist (Fill) | Hand auger from 0 to 5' |
| 5.0 | | | | | | | | | 5 | 5 | | | |
| 6.5 | | S-1 | 2 3 3 (5) | | | | | | | | | | Begin solid flight auger |
| | | | | | | | | | | | | Reddish-yellowish-brown Sandy SILT (ML), fine-grained sand, dry, cemented (Fill) | |
| 7.5 | | | | | | | | | | | | Dark gray to black Lean CLAY (CL), medium plasticity, soft, moist | |
| 9.0 | | S-2 | 2 2 2 (3) | | 0.3 | | | AT UU | | 0 | | | LL=39, PL=24, PI=15 |
| 10.0 | | | | | | | | | 10 | | | See Boring B-5S Log for Description | |
| 11.5 | | | 2 3 5 (6) | | | | | | | | | | No sample recovery, start mud rotary |
| 12.5 | | | | | | | | | | | | | |
| 14.0 | | | 5 8 10 (15) | | | | | | | -5 | | | No sample recovery |
| 15.0 | | | | | | | | | 15 | | | Grayish-yellowish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff to very stiff, damp | |
| 16.5 | | S-3 | 5 8 12 (17) | 4.3 | | 93 | 30 | UU | | | | | |
| | | | | | | | | | | -10 | | | |
| 20.0 | | | | | | | | | 20 | | | | |
| 21.5 | | S-4 | 8 11 15 (25) | 4.3 | 2.0 | | | | | | | | |
| | | | | | | | | | | -15 | | Grayish-yellowish-brown Silt (ML), low plasticity, trace fine-grained sand, very stiff, damp to moist | |
| 25.0 | | | | | | | | | 25 | | | | |
| 26.5 | | S-5 | 6 8 14 (21) | 3.8 | | | | | | | | | |
| | | | | | | | | | | -20 | | Grayish-yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, moist | |
| | | | | | | | | | 30 | | | | 30 |

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## Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-5

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 | | | | | | | | | | | | Grayish-yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, moist | |
| | | S-6 | 6 10 12 (21) | (Su) 3.8 | (Su) 1.5 | | | | | | | | |
| 31.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -25 | | | |
| 35.0 | | | | | | | | | 35 | | | | 35 |
| | | S-7 | 10 11 14 (25) | 2.3 | | | | | | | | | |
| 36.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -30 | | | |
| 40.0 | | | | | | | | | 40 | | | | 40 |
| | | S-8 | 6 10 11 (21) | 2.3 | 2.0 | | | | | | | | |
| 41.5 | | | | | | | | | | | | | |

End Boring at 41.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-5

LOGGED BY: Brett Bourgeois | DATE: START 1/21/14 END 1/21/14

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SSA | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: 15.0 ft | BIT DIAMETER: 7 1/4" | GROUNDWATER DATA: DEPTH: DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☒ DATE: DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | | S-1 | 2 2 3 (4) | | | | | | | | | Brown Lean Clay (CL), medium plasticity, with medium-grained sand, trace fine gravel (subangular), firm, damp (Fill) | Begin hollow stem auger |
| 2.0 | | | | | | | | | | | | | |
| 2.5 | | | | | | | | | | | | | |
| | | S-2 | 3 3 5 (6) | | | | | | | | | | |
| 4.0 | | | | | | | | | | 5 | | | |
| 5.0 | | | | | | | | | 5 | | | Reddish-yellowish-brown Sandy SILT (ML), fine-grained sand, dry, cemented (Fill) | 5 |
| | | S-3 | 3 4 4 (6) | | | | | | | | | | |
| 6.5 | | | | | | | | | | | | | |
| 7.5 | | | | | | | | | | | | Dark gray to black Lean CLAY (CL), medium plasticity, soft, moist | |
| | | S-4 | | | | | | | | | | | |
| | | | | | | | | | | 0 | | | |
| 9.5 | | | | | | | | | | | | Dark gray to black Sandy SILT (ML), non plastic, fine-grained sand, soft, moist | |
| 10.0 | | | | | | | | | 10 | | | | 10 |
| | | | 100 psi 400 psi | | | | | | | | | Wet | No sample recovery, recovered sample using SPT with sand catcher |
| 12.0 | | | | | | | | | | | | | |
| 12.5 | | | 2 4 5 | | | | | | | | | Dark gray to black Lean to Fat CLAY (CL/CH), medium to high plasticity, trace fine-grained sand, stiff, wet | |
| 14.0 | | | | | | | | | | -5 | | | |
| 15.0 | | | 5 10 15 (21) | | | | | | 15 | | | Grayish-yellowish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff to very stiff, damp | 15 |
| 16.5 | | | | | | | | | | | | | |

End Boring at 16.5 feet depth

HDR

ONE COMPANY | *Many Solutions*

**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

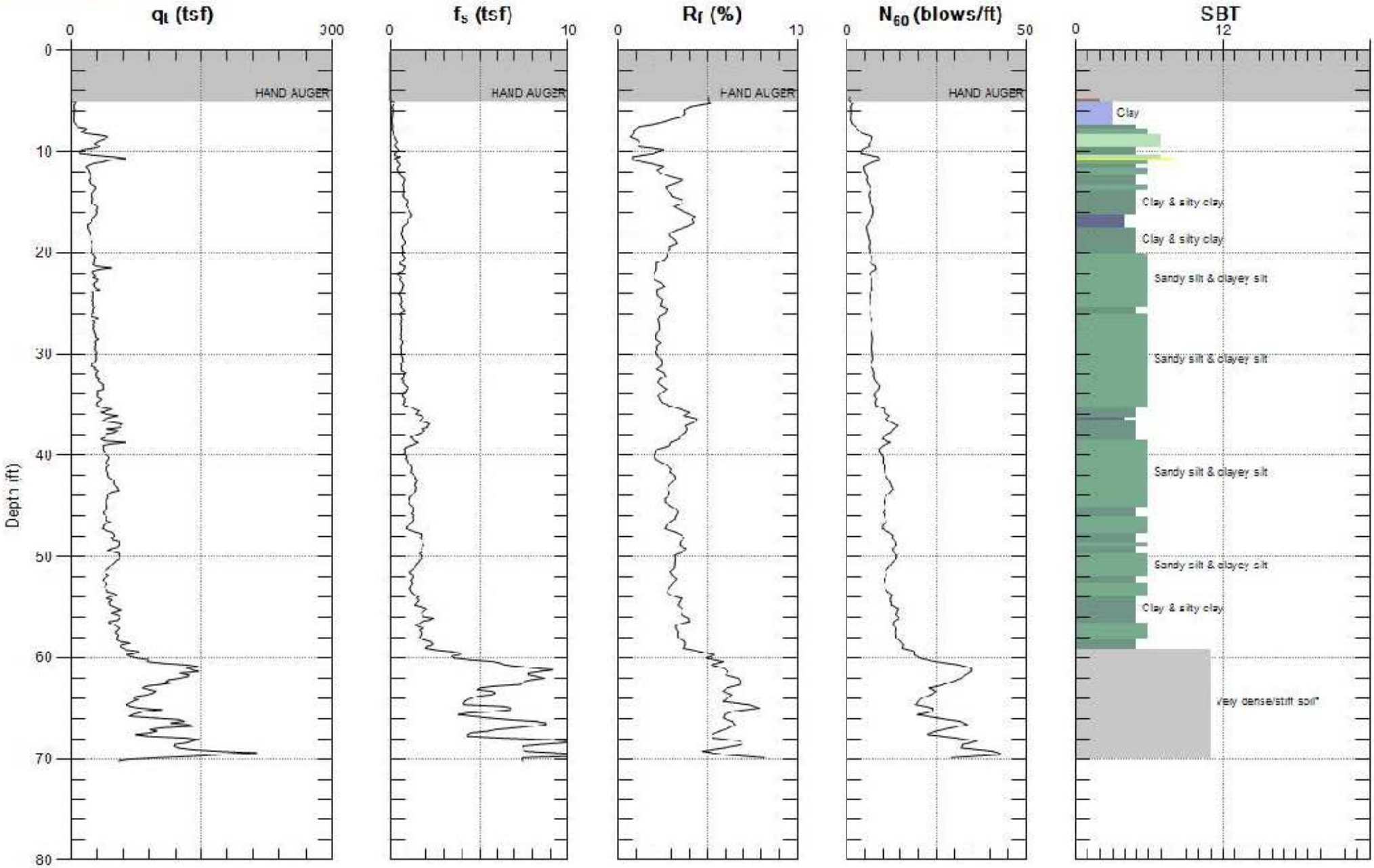
Date: APR 2015

Boring: B-5S

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-1

Engineer: V.CROSARIOL
Date: 1/5/2015 12:31



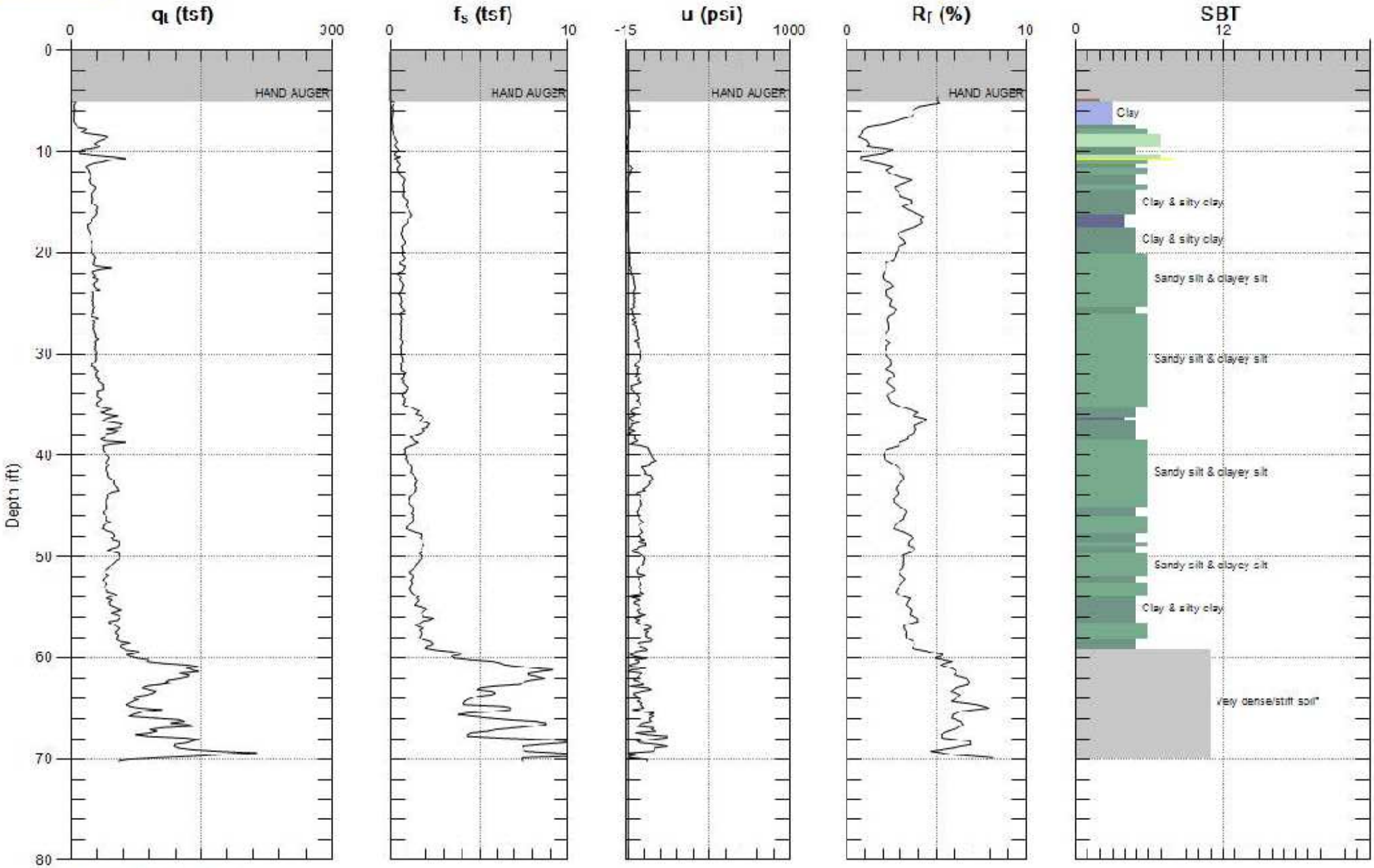

Max. Depth: 70.210 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-1

Engineer: V.CROSARIOL
Date: 1/5/2015 12:31



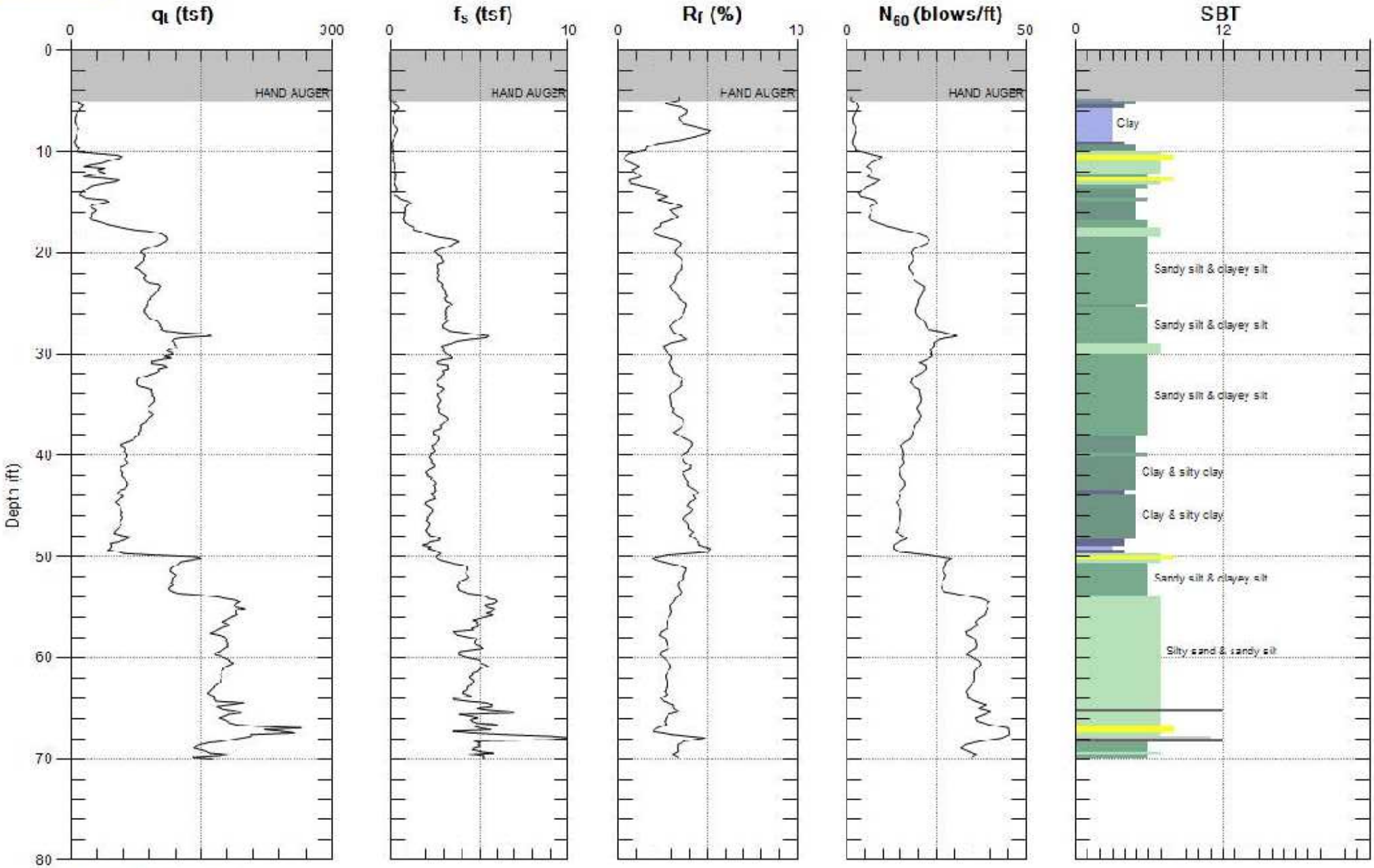

Max. Depth: 70.210 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-2

Engineer: V.CROSARIOL
Date: 1/5/2015 07:36



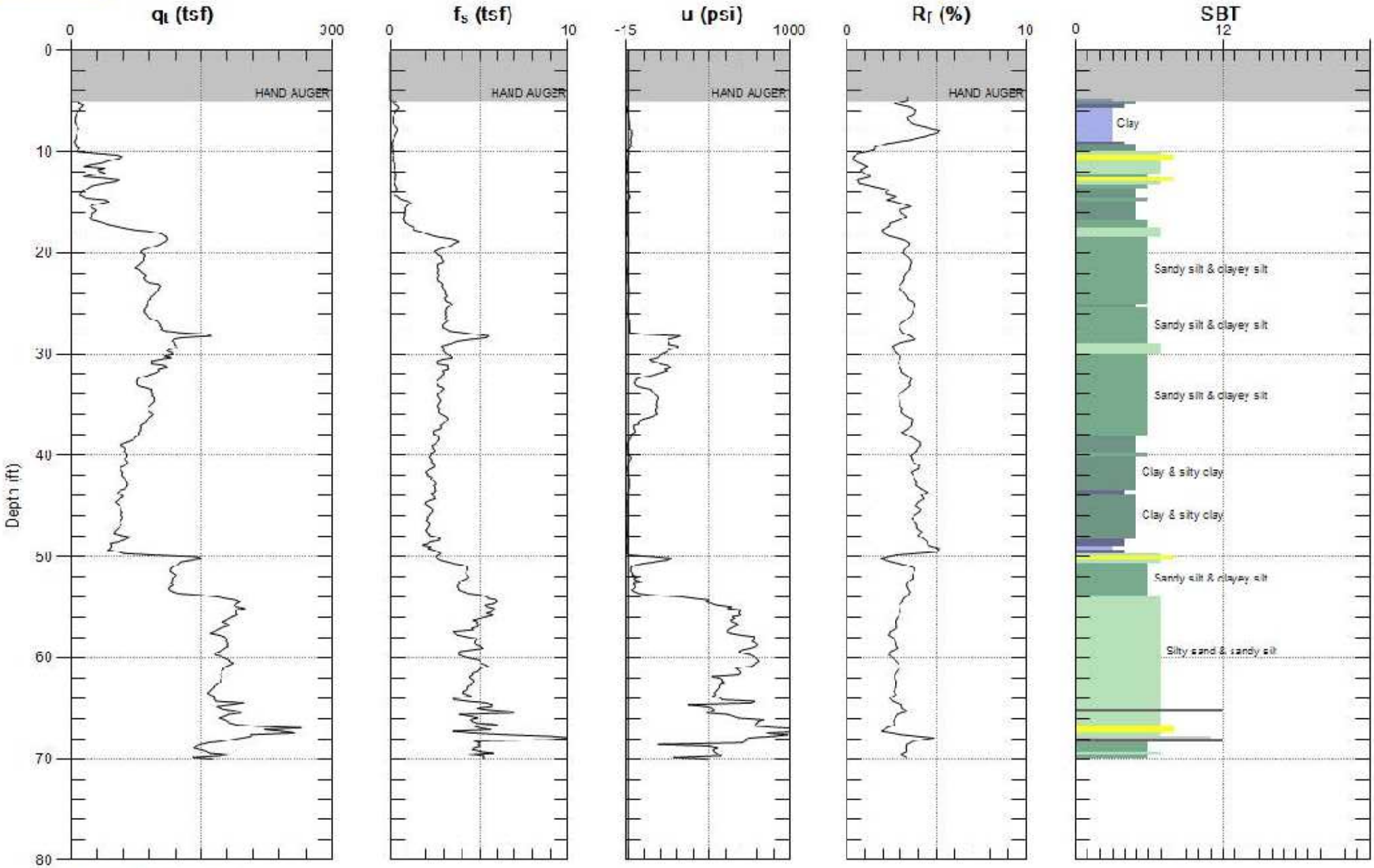

Max. Depth: 70.046 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-2

Engineer: V.CROSARIOL
Date: 1/5/2015 07:36



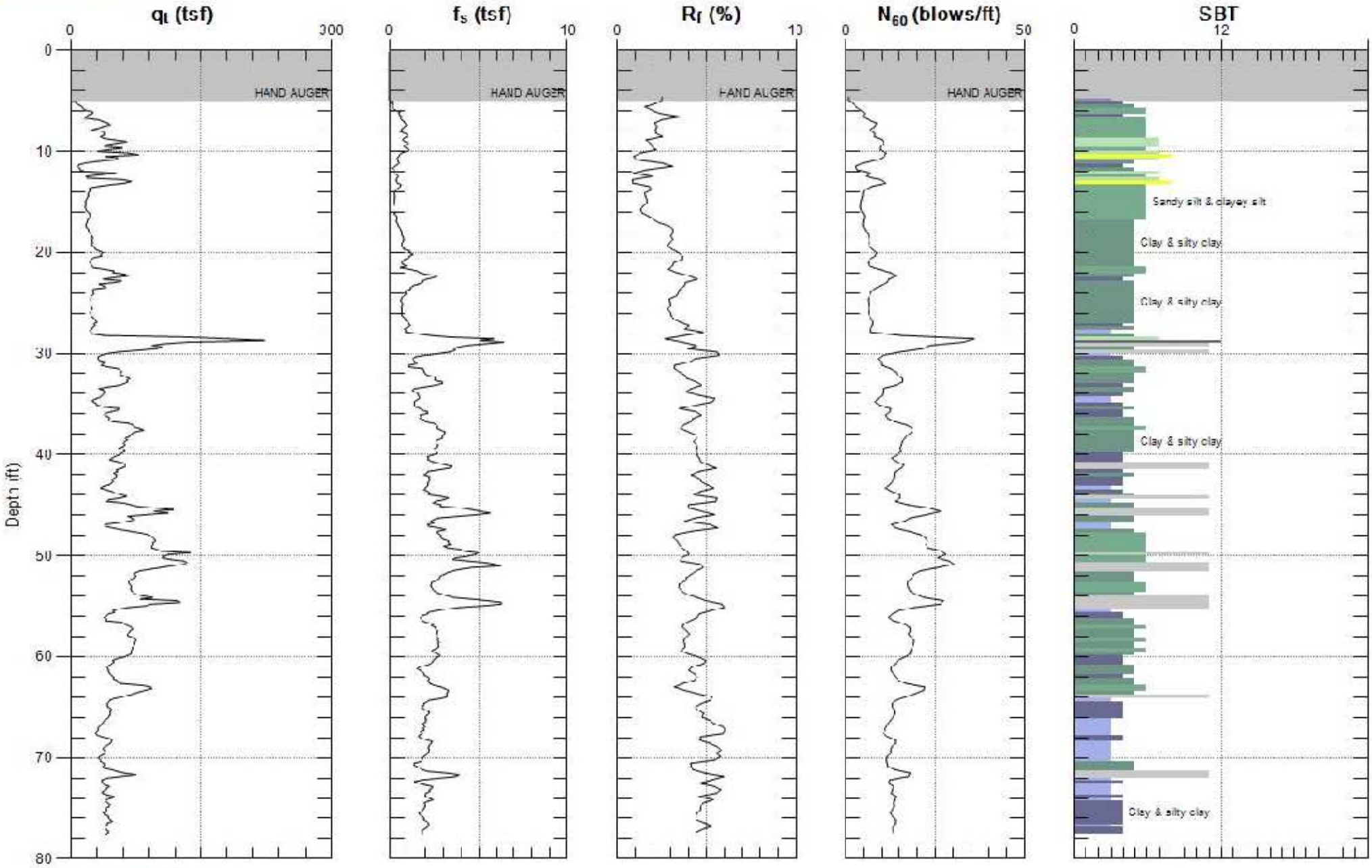

Max. Depth: 70.046 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-3

Engineer: V.CROSARIOL
Date: 1/5/2015 09:20



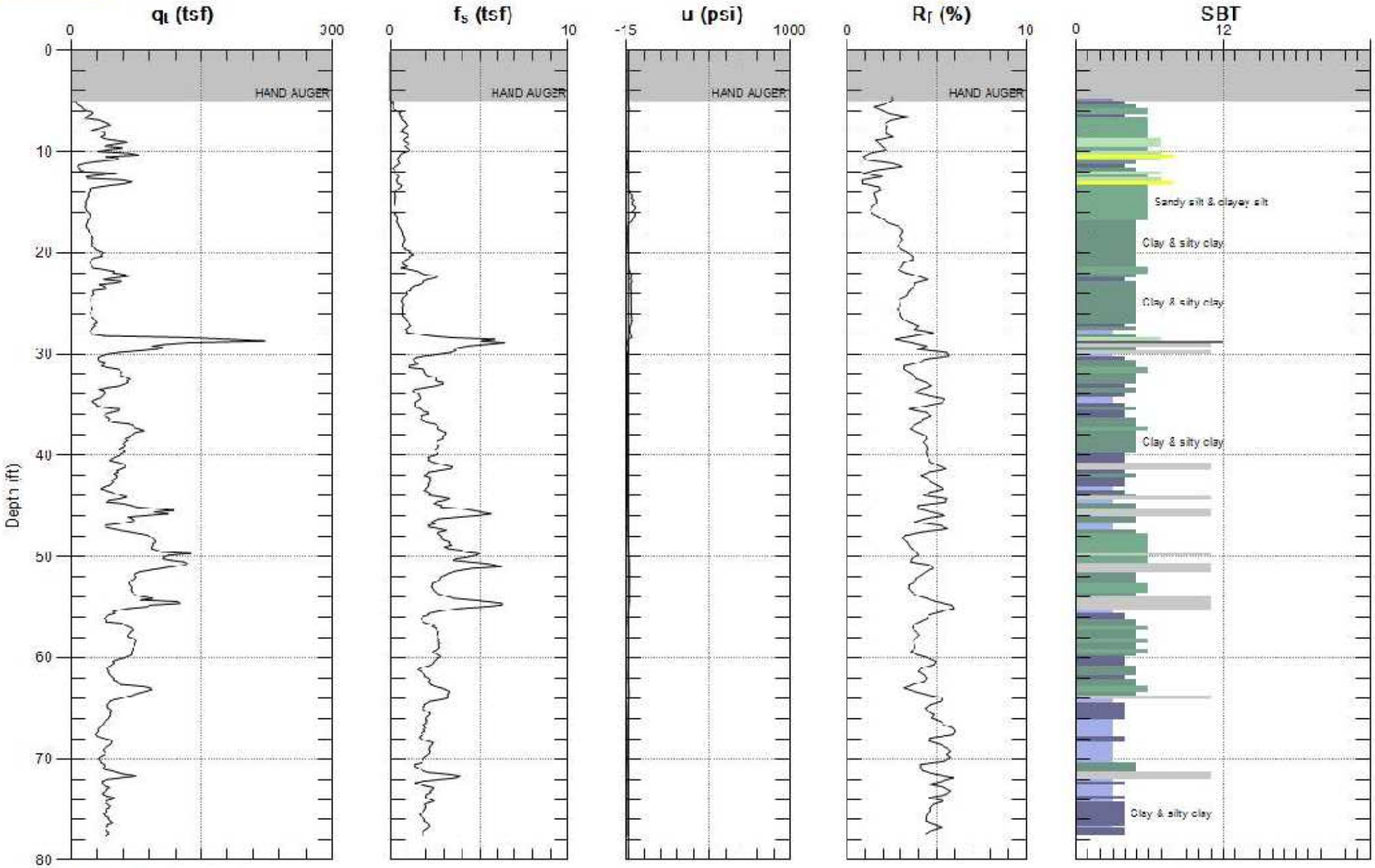

Max. Depth: 77.592 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

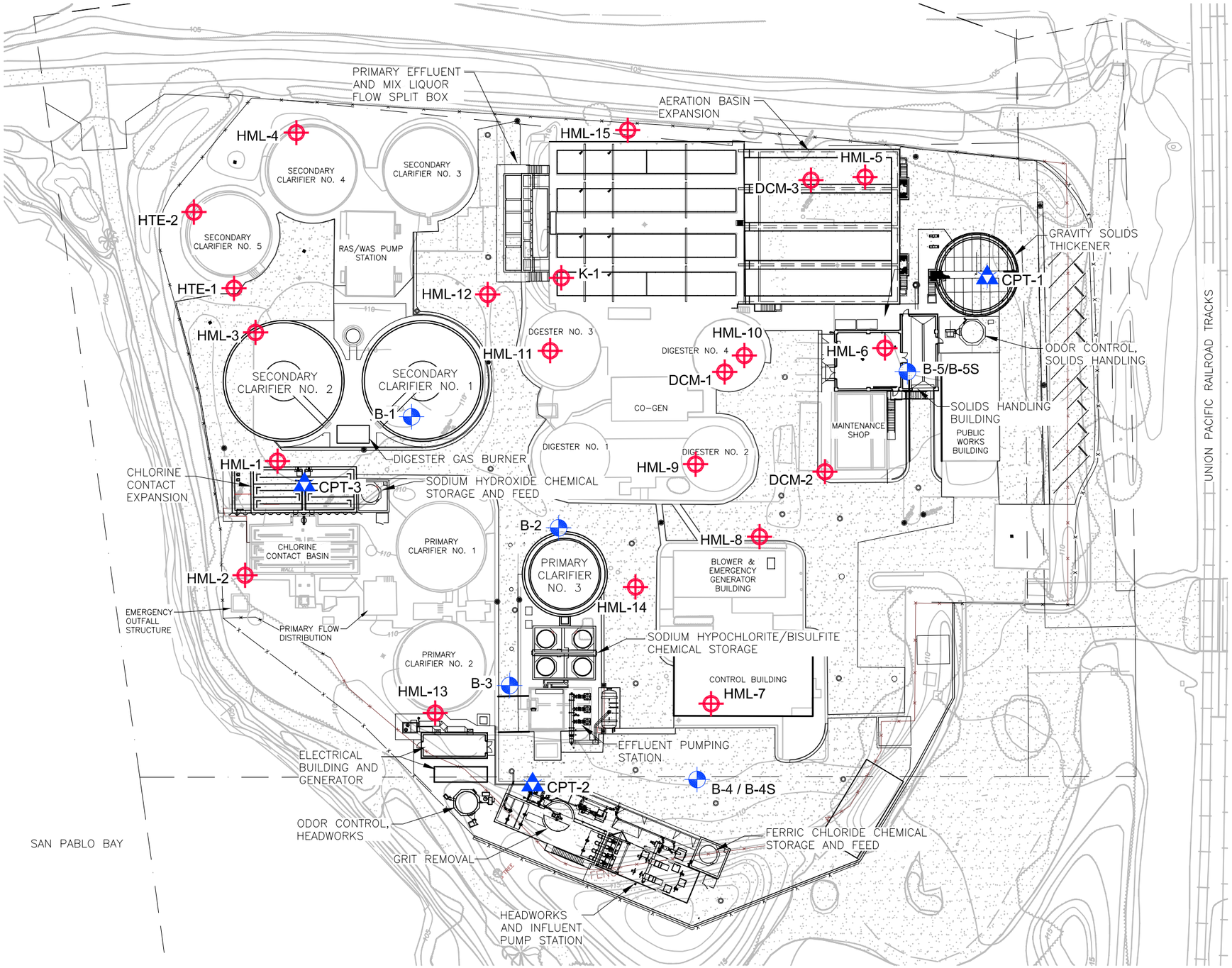
Site: PINOLE WPCP
Sounding: CPT-3

Engineer: V.CROSARIOL
Date: 1/5/2015 09:20




Max. Depth: 77.592 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)




LEGEND

| | |
|---|---|
| B-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HDR (CURRENT STUDY) |
| CPT-1 | APPROXIMATE LOCATION OF CONE PENETRATION TEST BY HDR (CURRENT STUDY) |
| DCM-3 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY DCM ENGINEERING (2005) |
| HTE-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HULTGREN-TILLIS ENGINEERS (2001) |
| K-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY KOELZER ENGINEERING SERVICES (1995) |
| HML-1 | APPROXIMATE LOCATION OF EXPLORATORY BORING BY HARDING, MILLER, LAWSON, & ASSOCIATES (1971) |

SCALE: 1"=60'

60 0 60 120

SCALE IN FEET

BASE MAP: GENERAL OVERALL SITE KEY PLAN, 90% SUBMITTAL, DATED MARCH 31, 2015

HDR

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**SITE PLAN**

Pinole/Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Figure
2

RF11

# LOG OF BORING 1

Equipment 9" Hollow Stem Auger

Elevation 6.3* Date 12/11/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with occasional rock fragments (FILL) |
| | 29.5 | 84 | | | water level 12/11/70 |
| | | | 5 | | GRAY CLAYEY SILT (MH) soft, saturated, with organic matter |
| | | | | | GRAY SILTY SAND (SM) loose, saturated, with occasional gravel |
| | | | 10 | | medium dense at 9.0' |
| | | | | | LIGHT BROWN SILT (ML) stiff, saturated |
| Consolidation Test $e_o = 0.92$ $C_c = 0.27$ | 34.2 | 86 | 15 | | |
| | | | 20 | | |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

*Datum: USC&GS, Bench Mark A-130, 1932, Elevation 20.81 per Plan by Edward Coleman & Associates, Redding, California, undated

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 1

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 6

RF11

## LOG OF BORING 2

Equipment 9" Hollow Stem Auger

Elevation 6.5 Date 12/14/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | BROWN SANDY CLAY (CL) medium stiff, wet, with occasional rock fragments (FILL) |
| | 53.4 | 63 | | | GRAY SANDY SILT (MH) soft, saturated, with wood debris and decayed vegetation |
| | 51.1 | 64 | | | |
| | | | 5 | | GRAY SILTY SAND (SM) loose, saturated, with occasional shell fragments medium dense at 9.5' |
| | | | 10 | | |
| | 30.8 | 91 | | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | | | 15 | | |
| | 30.7 | 87 | | | |
| | | | 20 | | with occasional rock fragments |
| | | | 25 | | LIGHT BROWN SILTY SAND (SM) dense, saturated, slightly cemented |
| | | | 30 | | GRAY SANDY CLAY (CH) very stiff, saturated |
| | | | 35 | | BROWN SILTY SAND (SM) dense, saturated (boring backfilled prior to water level stabilization) |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible] Date 12/31/70

LOG OF BORING 2

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 7

RF11

## LOG OF BORING 3

Equipment 9" Hollow Stem Auger

Elevation 5.8 Date 12/14/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | |
|---|---|---|---|---|---|
| | 28.3 | 86 | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet (FILL) |
| | | | 5 | | BLACK SANDY SILT (MH) soft, saturated, with organic debris |
| | | | | | GRAY SILTY SAND (SM) loose, saturated medium dense at 9.0' |
| | | | 10 | | |
| | 34.0 | 88 | 15 | | LIGHT BROWN SANDY SILT (ML) stiff, saturated |
| | | | 20 | | (boring backfilled prior to water level stabilization) |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 3

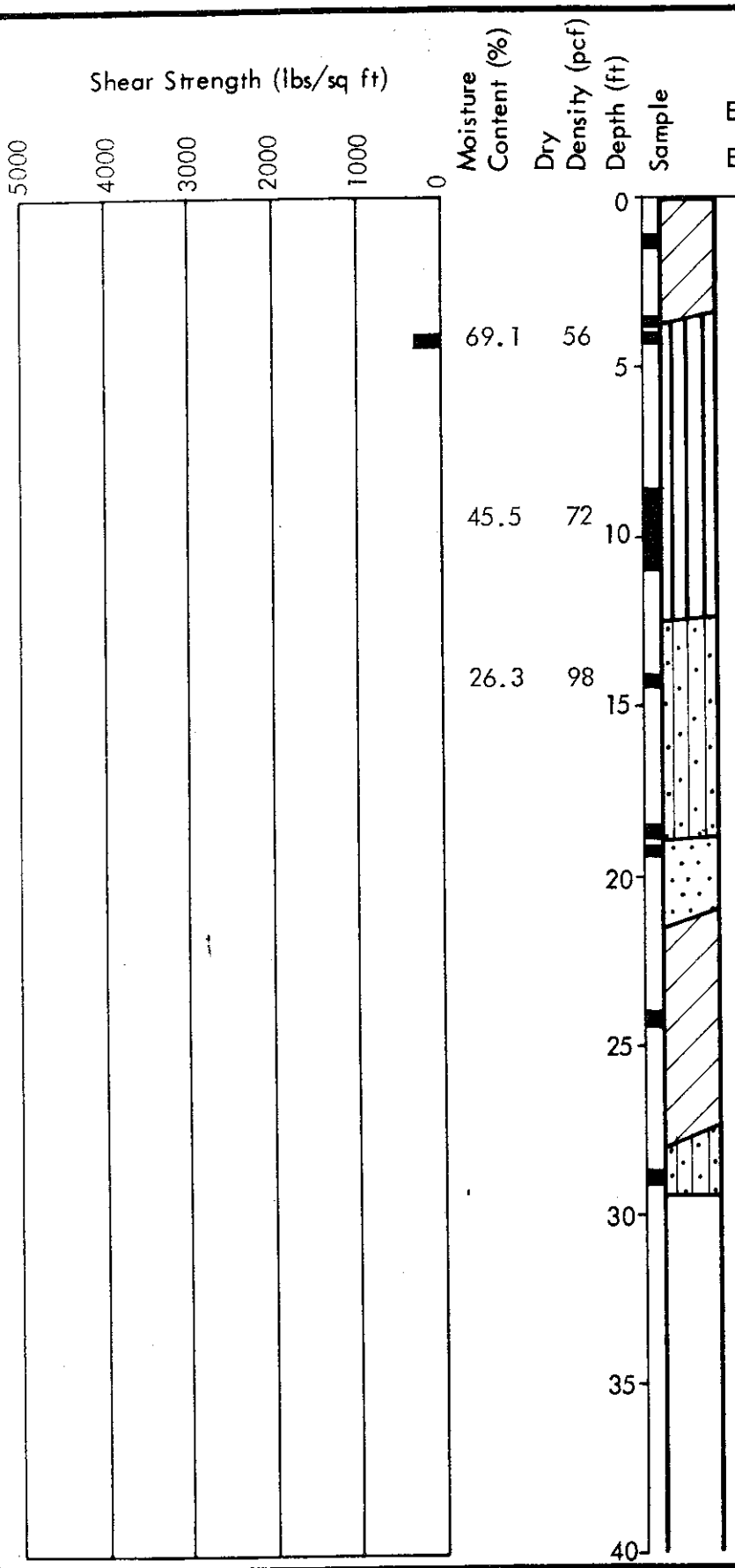
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 8

## LOG OF BORING 4

Equipment: 9" Hollow Stem Auger

Elevation: 6.7 Date: 12/14/70




DARK BROWN SANDY CLAY (CL)
medium stiff, wet, with rock fragments and wood debris

FILL

GRAY SANDY SILT (MH)
soft, saturated, with vegetation

LIGHT BROWN SILTY SAND (SM)
dense, saturated

lens of sandy clay, with rock fragments from 18 to 19'

BROWN SAND (SP)
dense, saturated

LIGHT BROWN SANDY CLAY (CL)
very stiff, saturated

BROWN SILTY SAND (SM)
dense, saturated, with rock fragments

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORING 4

Sewage Treatment Plant Additions
City of Pinole, California

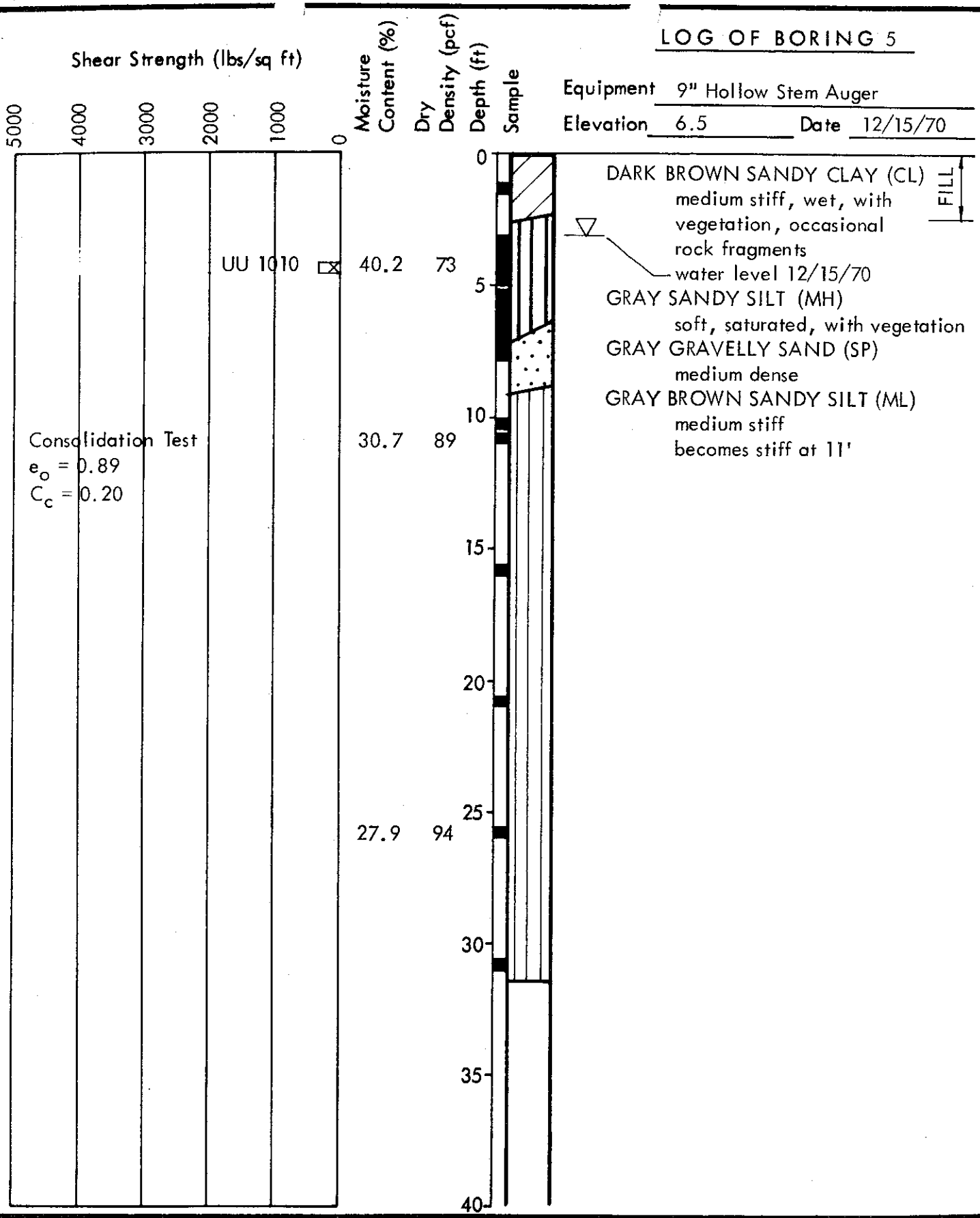
PLATE 9

RF11

## LOG OF BORING 5

Equipment 9" Hollow Stem Auger

Elevation 6.5 Date 12/15/70




**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORING 5

Sewage Treatment Plant Additions
City of Pinole, California

PLATE **10**

RF11

# LOG OF BORING 6

Equipment 9" Hollow Stem Auger

Elevation 7.4 Date 12/15/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with rock fragments wood debris from 4.0 to 4.7' (FILL) |
| | 31.1 | 79 | | | |
| | | | 5 | | GRAY SANDY SILT (ML) soft, saturated |
| | 59.8 | 64 | | | GRAY SILTY SAND (SM) loose, saturated |
| UU 1440 | 30.5 | 90 | 10 | | GRAY SANDY CLAY (CH) medium stiff, saturated |
| | | | | | LIGHT BROWN CLAYEY SILT (ML) stiff, saturated, with occasional gravel |
| | | | 15 | | |
| | | | 20 | | (boring backfilled prior to water level stabilization) |
| | | | 25 | | |
| | | | 30 | | |
| | | | 35 | | |
| | | | 40 | | |

Shear Strength scale: 5000, 4000, 3000, 2000, 1000, 0

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: [illegible]/jd Date 12/31/70

LOG OF BORING 6
Sewage Treatment Plant Additions
City of Pinole, California

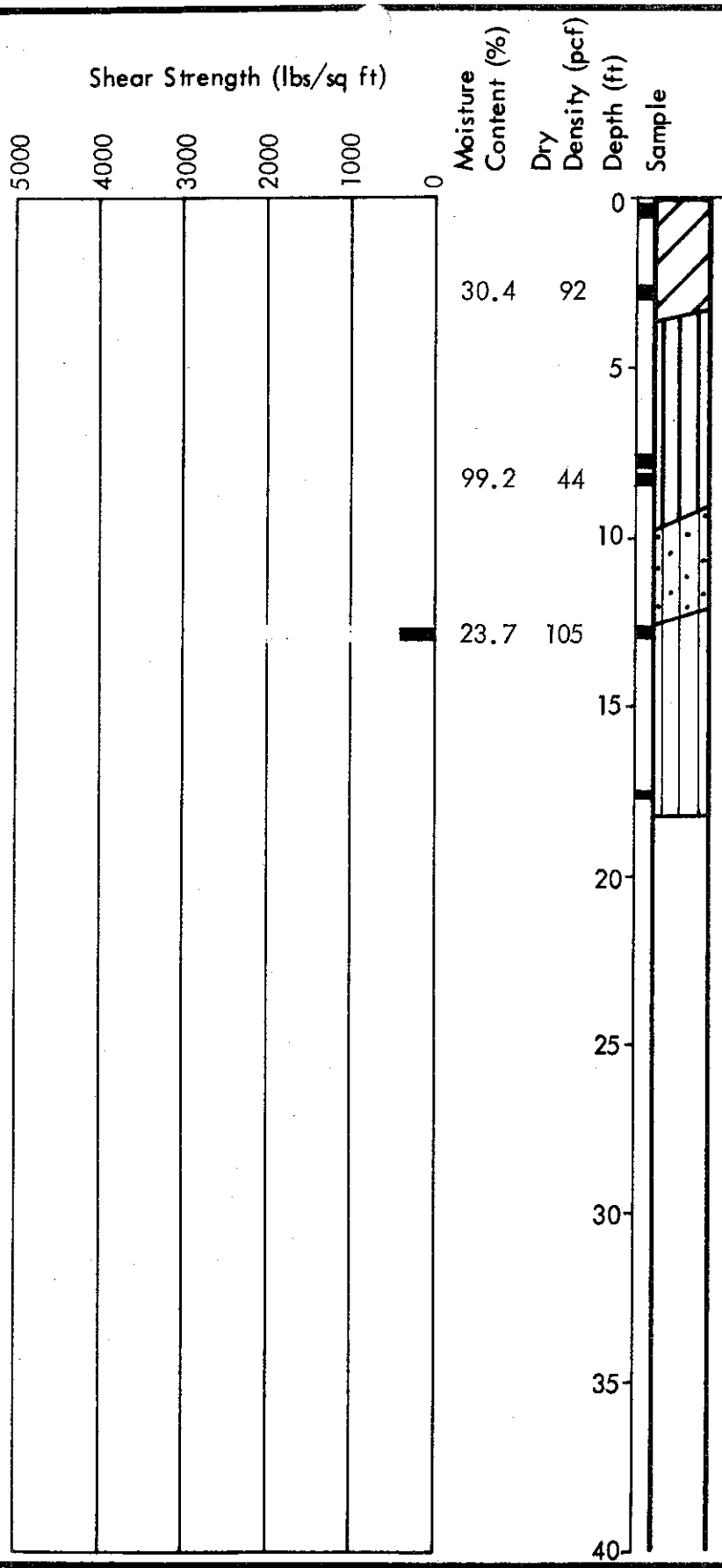
PLATE 11

RF11

## LOG OF BORING 7

Equipment 6" Flight Auger

Elevation 8.0 Date 12/15/70




DARK BROWN SANDY CLAY (CH)
medium stiff, wet, with occasional rock and asphalt fragments

FILL

GRAY SANDY SILT (MH)
soft, saturated, with occasional gravel

GRAY SILTY SAND (SM)
loose, saturated

LIGHT BROWN CLAYEY SILT (ML)
medium stiff, saturated

stiff

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: Bu/jd Date 12/31/70

LOG OF BORING 7

Sewage Treatment Plant Additions
City of Pinole, California

PLATE **12**

RF11

# LOG OF BORING 8

Equipment 9" Hollow Stem Auger

Elevation 7.7 Date 12/16/70

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | | | 0 | | 1-1/2" ASPHALT CONCRETE<br>6" BASE ROCK<br>DARK BROWN SANDY CLAY (CL) FILL<br>stiff, wet, with rock fragments |
| | 86.2 | 47 | 5 | | GRAY SANDY SILT (MH)<br>medium stiff, wet<br>soft at 2.5'<br>with decayed vegetation<br>with occasional shell and rock fragments |
| | | | 10 | | |
| | | | 15 | | LIGHT BROWN SILTY SAND (SM)<br>dense, saturated, with gravel<br>LIGHT BROWN SILT (ML)<br>very stiff, saturated, slightly cemented |
| | 20.0 | 107 | 20 | | |
| | | | 25 | | with occasional gravel and sand lenses |
| | | | 30 | | (boring backfilled prior to water level stabilization) |
| | | | 35 | | |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: /jd Date 12/31/70

LOG OF BORING 8

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 13

RF12

Shear Strength (lbs/sq ft,

Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample

## LOG OF BORING 9

Equipment 9" Hollow Stem Auger

Elevation 7.8 Date 12/16/70

| Moisture Content (%) | Dry Density (pcf) |
|---|---|
| 26.3 | 95 |
| 54.2 | 74 |

0, 5, 10, 15

DARK BROWN SANDY CLAY (CL)
stiff, wet, with occasional rock fragments

FILL

GRAY SANDY SILT (MH)
soft, saturated, with occasional gravel
water level 12/16/70
medium stiff, sandy at 8.5'

LIGHT BROWN SILTY SAND (SM)
dense, saturated, with occasional gravel

## LOG OF BORING 10

Equipment 9" Hollow Stem Auger

Elevation 7.3 Date 12/16/70

| Moisture Content (%) | Dry Density (pcf) |
|---|---|
| 92.5 | 46 |
| 28.3 | 92 |

0, 5, 10, 15

1-1/2" ASPHALT CONCRETE
6" BASE ROCK
DARK BROWN SANDY CLAY (CL)
stiff, wet, with occasional rock fragments

FILL

GRAY SANDY SILT (MH)
medium stiff, saturated, with vegetation

GRAY SILTY SAND (SM)
medium dense, saturated

LIGHT BROWN SANDY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: CBJ/jd Date 12/31/70

LOG OF BORINGS 9 & 10

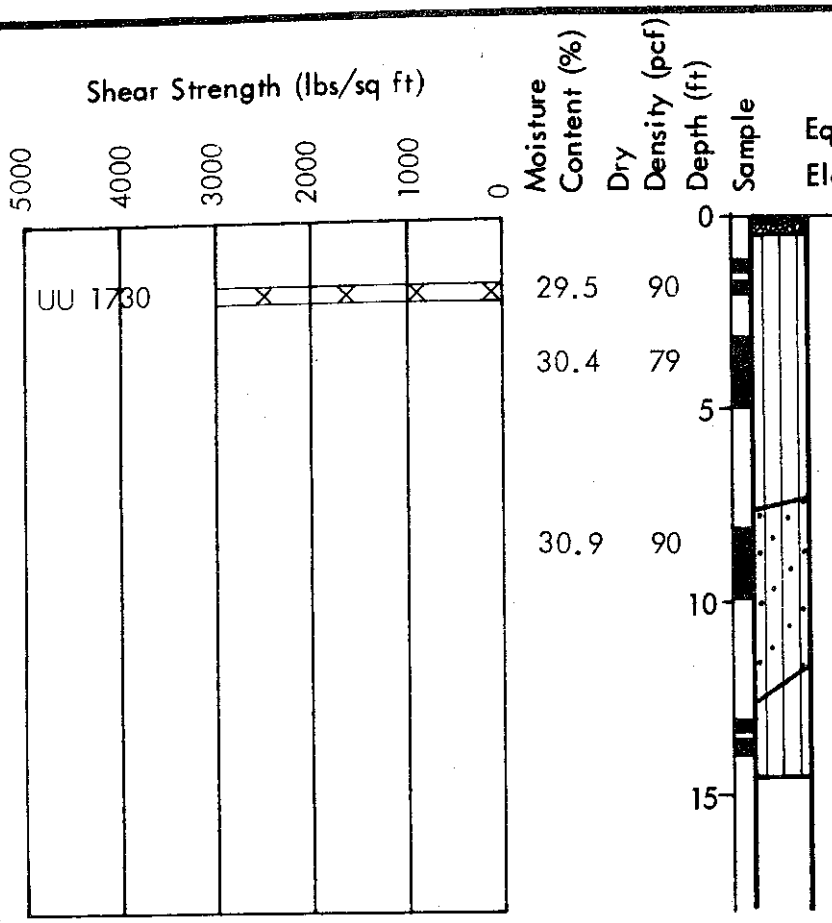
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 14

## LOG OF BORING 11

Equipment 9" Hollow Stem Auger

Elevation 7.5 Date 12/17/70




1-1/2" ASPHALT CONCRETE
6" BASE ROCK
LIGHT BROWN SANDY SILT (ML)
stiff, wet, with rock fragments
soft, saturated at 3.0'

FILL

GRAY SILTY SAND (SM)
medium dense, saturated

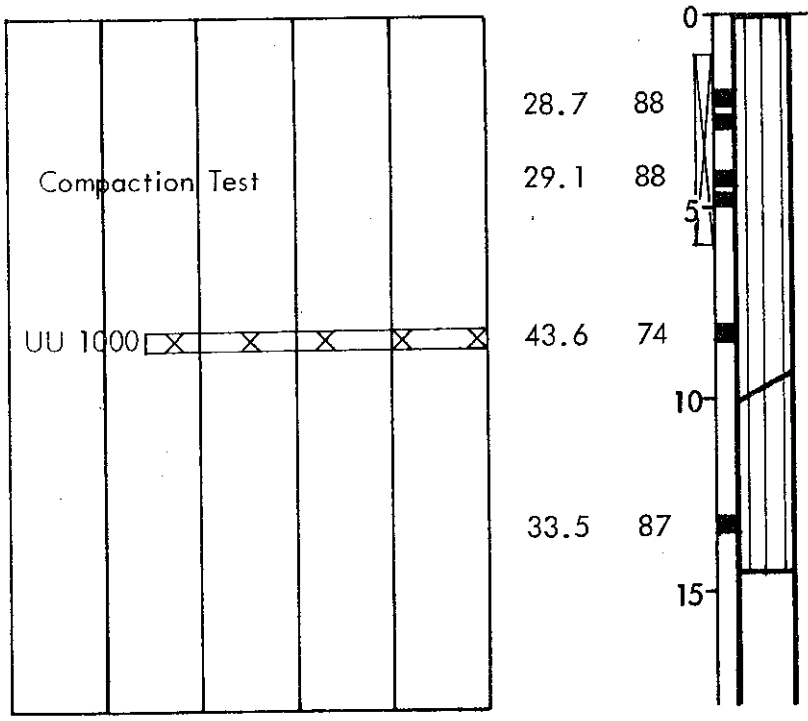
LIGHT BROWN CLAYEY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

## LOG OF BORING 12

Equipment 6" Flight Auger

Elevation 7.3 Date 12/17/70




LIGHT BROWN SANDY SILT (ML)
stiff, wet, with rock fragments
medium stiff, saturated at 3'

FILL

LIGHT BROWN CLAYEY SILT (ML)
stiff, saturated

(boring backfilled prior to water level stabilization)

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: jd Date 12/31/70

LOG OF BORINGS 11&12
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 15

RF12

## LOG OF BORING 13

Equipment 6" Flight Auger
Elevation 7.8 Date 12/17/70

Shear Strength (lbs/sq ft): 5000, 4000, 3000, 2000, 1000, 0

| Depth (ft) | Sample | Moisture Content (%) | Dry Density (pcf) | Description |
|---|---|---|---|---|
| 0 | UU 4010 | 36.1 | 83 | LIGHT BROWN SANDY SILT (ML) stiff, wet, with rock fragments |
| | | 30.3 | 86 | medium stiff, saturated at 5.0' |
| 5 | | | | FILL |
| 10 | | | | GRAY BROWN CLAYEY SILT (ML) medium stiff, saturated becomes stiff at 13' |
| 15 | | | | (boring backfilled prior to water level stabilization) |

## LOG OF BORING 14

Equipment 6" Flight Auger
Elevation 8.2 Date 12/17/70

| Depth (ft) | Sample | Moisture Content (%) | Dry Density (pcf) | Description |
|---|---|---|---|---|
| 0 | Compaction Test | 26.5 | 93 | 1-1/2" ASPHALT CONCRETE 6" BASE ROCK LIGHT BROWN SANDY SILT (ML) stiff, wet, with rock fragments |
| 5 | | 29.2 | 91 | medium stiff, saturated at 5.0' |
| | | | | FILL |
| 10 | | 18.6 | 104 | GRAY SILTY SAND (SM) medium dense, saturated |
| | | | | LIGHT BROWN CLAYEY SANDY SILT (ML) - stiff, saturated |
| 15 | | | | (boring backfilled prior to water level stabilization) |

**HARDING, MILLER, LAWSON & ASSOCIATES**
*Consulting Engineers*

Job No: 4229,002.03 Appr: BW/jd Date 12/31/70

LOG OF BORINGS 13 & 14
Sewage Treatment Plant Additions
City of Pinole, California

PLATE 16

RF11

## LOG OF BORING 15

Equipment 9" Hollow Stem Auger

Elevation 6.6 Date 1/14/71

| Shear Strength (lbs/sq ft) | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | Description |
|---|---|---|---|---|---|
| | 25.5 | 92 | 0 | | DARK BROWN SANDY CLAY (CL) medium stiff, wet, with abundant rock fragments (FILL) |
| | 23.3 | 92 | | | DARK GRAY SANDY SILT (MH) medium stiff, wet saturated at 3' |
| | | | 5 | | |
| | | | 10 | | GRAY SILTY SAND (SM) medium dense, saturated |
| | | | | | GRAY SILT (ML) stiff, saturated |
| | | | 15 | | GRAY SILTY SAND (SM) dense, saturated, with some gravel |
| | 30.5 | 91 | | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | 37.1 | 83 | 20 | | BLUE GRAY SILTY CLAY (CL) stiff, saturated |
| | | | 25 | | GRAY BROWN SANDY SILT (ML) stiff, saturated |
| | | | 30 | | |
| | | | 35 | | (boring backfilled before water level stabilized) |
| | | | 40 | | |

**HARDING, MILLER, LAWSON & ASSOCIATES**

*Consulting Engineers*

Job No: 4229,002.03 Appr: hr/jd Date 1/18/71

LOG OF BORING 15

Sewage Treatment Plant Additions
City of Pinole, California

PLATE 17

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61 with 8" Hollow Stem Auger | Ground Water | Free water observed at 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 0–4 | 91 | 24.0 | 11 | 3.0–3.5 | CL | **MEDIUM BROWN SILTY CLAY** moderately stiff, moderately moist, sticky, trace sand<br>trace of small gravel |
| 5–11 | 82 | 33.2 | 3.5 | 6.5–7.0 | CH | **BLACK TO DARK BROWN CLAY** very moist, fat, trace fine sand, soft to very soft<br>increasing trace of fine gravel<br>▽ moderate water entry encountered at 11.0 feet while drilling |
| 11–16 | 95 | 27.2 | 6 | 11.5–12.0 | SC | **MEDIUM GREY GREEN SILTY SAND** loose, water saturated, trace clay |
| 16–17 | 88 | 32.6 | 19 | 16.0–16.5 | ML | **MEDIUM TAN GREEN SILT** moist, medium dense, sandy |

KOELZER ENGINEERING SERVICES

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1**
Waste Water Treatment Plant
Pinole, California

PLATE: 4

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61B with 8" Hollow Stem Auger | Ground Water | Free water observed @ 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 17–22 | | | | | ML | **MEDIUM TAN GREEN SILT (CON'T)** moist, medium dense, sandy<br>▽ water rapidly entering borehole @ approx. 19' below ground surface<br>grading to medium brown clayey silt w/a slightly waxy appearance |
| 22 | 74 | 41.8 | 30 | 21.5–22.0 | | |
| 23–27 | | | | | ML | **ORANGE TAN SANDY SILT** moist, massive, medium dense |
| 27 | 93 | 26.5 | 31 | 26.5–27.0 | | |
| 28–29 | | | | | MH | **MEDIUM TAN CLAYEY SILT** moist, fine sand, plastic, stiff |
| 30–34 | | | | | CL | **MEDIUM TAN SILTY CLAY** very moist, stiff, massive, waxy |
| 31 | 87 | 31.3 | 30 | 31.0–31.5 | | |

KOELZER ENGINEERING SERVICES

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1(cont'd)**
Waste Water Treatment Plant
Pinole, California

PLATE: 5

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1
(2 of 3)

| Completion Date | 3-31-95 | Surface Elevation | 10' MSL (See Note 3) |
|---|---|---|---|
| Equipment | MOBILE B-61 with 8" Hollow Stem Auger | Ground Water | Free water observed at 11' |

| Depth (feet) | Dry Density (pcf) | Moisture Content (%) | Blow/ft | Sample | | Description |
|---|---|---|---|---|---|---|
| 34 | | | | | | |
| 35 | | | | | | |
| 36 | 88 | 31.5 | 32 | 36.5-37.0 | | water level at 36.0 feet, 15 minutes after drilling (not a static water level) |
| 37 | | | | | | |
| 38 | | | | | | |
| 39 | | | | | ML | **MEDIUM TO LIGHT TAN SANDY SILT** moderately moist, medium dense trace white kaolinite & organic flakes |
| 40 | | | | | | |
| 41 | 101 | 24.3 | 45 | 41.5-42.0 | | |
| 42 | | | | | | |
| 43 | | | | | | |
| 44 | | | | | GC | **BROWN TAN CLAYEY GRAVEL** |
| 45 | 85 | 33.6 | 35 | 45.5-46.0 | ML | **MEDIUM TAN CLAYEY SILT** moist, very stiff, trace gravel |
| 46 | | | | | | |
| 47 | | | | | | boring terminated at 46.5' |
| 48 | | | | | | |
| 49 | | | | | | |
| 50 | | | | | | |
| 51 | | | | | | |

**KOELZER ENGINEERING SERVICES**

FILE NUMBER: 1185.02 4-6-95

**LOG OF BORING 1 (CON'T)**
Waste Water Treatment Plant
Pinole, California

PLATE: 6

**Reference:** Koelzer Engineering Services (1995).

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
REFERENCE BORING RB-1

PLATE NO. D-1

Drilling Method: Rotary Wash
Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | 3-inches Asphalt Concrete over 6-inches Aggregate Base | | | |
| | | | | | | CL | Gray Sandy Lean Clay (CL) with gravel, medium stiff to stiff, moist (Fill) | | | |
| 1.3<br>0.7 | | 9 | | | | | | 22 | | LL=41<br>PI=18 |
| | | | | 5 | | | | | | |
| | | | | | | | becoming very stiff | | | |
| 3.5<br>0.5 | | Push | | | | CL | Gray and Tan Sandy Lean Clay (CL) with gravel, medium stiff, wet | 27 | 92 | 900psf (TxUU)<br>(see Plate 6) |
| | | | | 10 | | | | | | |
| | | | | | | | becoming soft | | | |
| - | 0.13 | Push | | | | | | 26 | 96 | Sieve |
| 2.0 | 1.1 | | | | | CL | Brown Sandy Lean Clay (CL), stiff to very stiff, moist | | | (see Plate 7) |
| | | | | 15 | | | | | | |
| 2.7<br>2.3 | | 11 | | | | | | | | |
| | | | | 20 | | | | | | |
| | | | | | | CL | Gray Lean Clay (CL), very stiff, moist | | | |
| 3.7<br>4.0 | | 23 | | | | | | 39 | 82 | |
| | | | | | | | Bottom of boring at 23.5 feet | | | |
| | | | | 25 | | | | | | |
| | | | | 30 | | | | | | |
| | | | | 35 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 1**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 3** |

Drilling Method: Rotary Wash

Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | CL | Brown Sandy Lean Clay (CL) with gravel, very stiff, moist (Fill) | | | |
| 2.7 | | 23 | | | | | | 20 | 98 | |
| | | | | 5 | | | | | | |
| 0.7 | 0.30 | 5 | | | | CH | Black Fat Clay (CH) with gravel and organics, medium stiff, moist | 160<br>101 | 27<br>44 | 575psf (TxUU) (see Plate 6) |
| | | 8 | | | | SM<br>SC | Gray Silty Sand (SM) to Clayey Sand (SC), loose, wet | | | |
| | | Push | | 10 | | | | 34 | 86 | 740psf (TxUU)<br>LL=42<br>PI=15<br>Sieve Analysis (see Plate 7) |
| | 0.14<br>0.20 | | | | | | | | | |
| | | 10 | | | | CL | Light Brown Sandy Lean Clay (CL), medium stiff to stiff, moist | | | |
| | | | | 15 | | | | | | |
| 1.0 | | 9 | | | | | | | | |
| | | | | 20 | | | becoming stiff to very stiff | | | Consolidation Test (see Plate 6) |
| 1.5<br>2.0 | | 19 | | | | | | | | |
| | | | | 25 | | SM | Light Brown Silty Sand (SM) with gravel, medium dense, moist | | | |
| | | 22 | | | | | | 27 | 93 | |
| | | | | 30 | | CL | Light Brown Sandy Lean Clay (CL), stiff, moist | | | |
| | | | | 35 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 2**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 4** |

Drilling Method: Rotary Wash
Date: April 4, 2001

| Pocket Penetrometer (TSF) | Torvane (TSF) | N (blows/ft.) | Samples | Depth (feet) | Graphic Log | USCS | Material Description | Moisture Content (%) | Dry Density (pcf) | Other Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 35 | | CL | | | | |
| 1.5 | | 12 | | | | | | | | |
| | | | | | | | Bottom of boring at 37.5 feet | | | |
| | | | | 40 | | | | | | |
| | | | | 45 | | | | | | |
| | | | | 50 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 70 | | | | | | |

*Secondary Clarifier Expansion*
*Pinole Wastewater Treatment Plant*
*Pinole, California*

**Log of Boring 2**

| | | |
|---|---|---|
| **Hultgren – Tillis Engineers** | **Project No. 462.01** | **Plate No. 5** |

# LOG OF BORING B-1

LOCATION: See Plate 2
GROUND SURFACE: Grass lawn

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **FILL - MIXED LEAN TO FAT CLAY WITH GRAVEL**<br>- dark grayish brown<br>- up to 2" gravel<br>- medium to high plasticity | | | | | | | | | | |
| 5 | 1 | | 10 | | **FILL - MIXED SANDY LEAN CLAY**<br>- olive brown<br>- trace gravel<br>- moist<br>- medium plasticity<br>- medium stiff<br>**CORROSION TEST** See Plate C-6 | 29 | 94 | | | 5 | 38 | 57 | 0.6 | | |
| 10 | 2 | | 17 | | **LEAN CLAY (CL)**<br>- dark greenish gray<br>- few sand, little silt<br>- moist to wet<br>- medium plasticity<br>- stiff | 25 | 98 | 44 | 20 | | | | 1.9 | | |
| | 3 | | 24 | | **CORROSION TEST** See Plate C-6 | | | | | | | | | | |
| 15 | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- thin (<12") interlayers of wet clayey sand<br>- moist to wet<br>- high plasticity<br>- very stiff | 57 | 81 | | | | | | | | |
| 20 | 4 | | 25 | ② | | 34 | 86 | | | 0 | 6 | 94 | 3.4 | | |
| 25 | 5 | | 27 | | **CONSOLIDATION TEST**<br>**SAMPLE 5**<br>$C_C = 0.22$<br>$e_O = 0.7405$ | 28 | 97 | 55 | 31 | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 24' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-1

PLATE NO.
B-1
(1 of 2)

## LOG OF BORING B-1 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Grass lawn

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 OF 2** | | | | | | | | | | |
| 25 | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- thin (<12") interlayers of wet clayey sand<br>- moist to wet<br>- high plasticity<br>- very stiff | | | | | | | | | | |
| | 6 | | 33 | | **CLAYEY SAND (SC)**<br>- olive brown<br>- fine sand<br>- wet<br>- medium plasticity clay<br>- medium dense | 27 | 97 | | | | | | | | |
| 30 | | | | | **LEAN CLAY (CL)**<br>- olive brown<br>- few sand<br>- moist to wet<br>- medium plasticity<br>- very stiff | | | | | | | | | | |
| | 7 | | 33 | | | 29 | 93 | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| | 8 | | 37 | | | 30 | 92 | | | | | | | | |
| 40 | | | | | **BOTTOM OF BORING AT 40 FEET** | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 24' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-1

PLATE NO.
B-1
(2 of 2)

## LOG OF BORING B-2

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approx. 8" asphalt concrete over 6" aggregate base)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **FILL - MIXED LEAN TO FAT CLAY WITH GRAVEL**<br>- dark grayish brown<br>- up to 2" gravel<br>- moist<br>- medium to high plasticity | | | | | | | | | | |
| 5 | 1 | | 18 | ② | **FILL - MIXED SANDY LEAN CLAY**<br>- dark greenish gray<br>- moist<br>- medium plasticity<br>- stiff | 29 | 89 | | | | | | 1.3 | | |
| | 2 | | 10 | | **BAY MUD - LEAN CLAY (CL)**<br>- dark greenish gray - medium plasticity<br>- moist to wet - soft | | | 39 | 16 | | | | | | |
| 10 | | | | | **BAY MUD - SILTY SAND (SM) TO CLAYEY SAND (SC)**<br>- dark greenish gray - wet<br>- trace fine gravel - loose<br>- trace shells | 32 | 87 | | | 3 | 70 | 17 | | | |
| 15 | 3 | | 28 | | **FAT CLAY (CH)**<br>- grayish brown<br>- trace sand<br>- moist to wet<br>- high plasticity<br>- very stiff to hard | 28 | 95 | | | | | | | | |
| 20 | 4 | | 58 | | | 17 | 116 | | | | | | | | |
| 25 | 5 | | 35 | | | 20 | | | | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 8' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-2

PLATE NO.
B-2
(1 of 2)

## LOG OF BORING B-2 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approx. 8" asphalt concrete over 6" aggregate base)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 of 2** | | | | | | | | | | |
| | | | | | **FAT CLAY (CH)**<br>- grayish brown<br>- trace sand<br>- moist to wet<br>- high plasticity<br>- very stiff to hard | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | |
| | | | | | **CLAYEY SAND (SC)**<br>- olive brown - dense<br>- wet | | | | | | | | | | |
| | 6 | ◣ | 44 | | | 19 | | | | | | | | | |
| 30 | | | | | **POORLY GRADED SAND (SP)**<br>- olive brown - wet<br>- with gravel - dense | | | | | | | | | | |
| | | | | | **BOTTOM OF BORING AT 30 FEET** | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Seepage at 8' during drilling. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-2

PLATE NO.
B-2
(2 of 2)

# LOG OF BORING B-3

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approximately 8" asphalt concrete)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | % MOISTURE | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (> #4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (< #200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | **FILL - MIXED LEAN CLAY WITH SAND AND GRAVEL**<br>- grayish brown to greenish brown<br>- up to 2" gravel<br>- moist to wet | | | | | | | | | | |
| 5 | 1 | | 26 | | **FILL - MIXED LEAN CLAY WITH SAND**<br>- dark greenish gray<br>- few ½" gravel<br>- wet<br>- medium plasticity<br>- stiff to very stiff | 25 | 93 | | | | | | | 560 | 28° |
| 10 | 2 | | 20 | | **FILL - MIXED CLAYEY SAND AND SANDY LEAN CLAY**<br>- olive brown to dark greenish gray<br>- up to 2" gravel<br>- wet<br>- medium plasticity clay<br>- stiff (clay)<br>- medium dense (sand)<br>**CONSOLIDATION TEST**<br>**SAMPLE 2**<br>$C_C = 0.19$<br>$e_O = 1.1034$ | 26 | 80 | | | 9 | 43 | 48 | | | |
| 15 | 3 | | 29 | | **FAT CLAY (CH)**<br>- dark grayish brown<br>- locally contains fine sand interlayers<br>- moist to wet<br>- high plasticity<br>- very stiff | 42 | 78 | 87 | 51 | | | | 5.9 | | |
| 20 | 4 | | 39 | | | 28 | 90 | | | 0 | 23 | 77 | | | |
| 25 | 5 | | 15 | | | 29 | | | | | | | | | |

**CONTINUED AT 25 FEET ON PAGE 2 OF 2**

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-3

PLATE NO.
B-3
(1 of 2)

## LOG OF BORING B-3 (CONT'D)

LOCATION: See Plate 2
GROUND SURFACE: Asphalt parking area
(approximately 8" asphalt concrete)

| DEPTH feet | SAMPLE NO. | TYPE | PENETRATION RESISTANCE blows/ft. | GROUNDWATER | DESCRIPTION ① | MOISTURE % | DRY DENSITY lbs./ft.³ | LIQUID LIMIT | PLASTICITY INDEX | GRAIN SIZE Gravel (>#4 sieve) % | GRAIN SIZE Sand (#4 to #200 sieve) % | GRAIN SIZE Fines (<#200 sieve) % | UNCONFINED COMPRESSIVE STRENGTH kips/ft.² | DIRECT SHEAR Cohesion p.s.f. | DIRECT SHEAR Internal Friction Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ② | | | | | | | | | | | |
| 25 | | | | | **CONTINUED FROM 25 FEET ON PAGE 1 of 2** | | | | | | | | | | |
| | | | | | **FAT CLAY (CH)**<br>- dark grayish brown<br>- locally contains fine sand interlayers<br>- moist to wet<br>- high plasticity<br>- very stiff | | | | | | | | | | |
| | 6 | ◣ | 32 | | | 26 | | | | | | | | | |
| 30 | | | | | **BOTTOM OF BORING AT 30 FEET** | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | |

REMARKS: ① Boring drilled on April 13, 2005. See Plates in Appendix A for definitions of terms.
② Equilibrium groundwater depth unknown. Hollow stem augers sealed off groundwater in borehole.

**DCM Engineering**

FILE NO. J-4922-1 | JULY 2005

BROWN AND CALDWELL
Pinole/Hercules WPCP
Anaerobic Digester Improvements
Pinole, California
LOG OF BORING B-3

PLATE NO.
B-3
(2 of 2)

# UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

| MATERIAL TYPES | CRITERIA FOR ASSIGNING SOIL GROUP NAMES | | | GROUP SYMBOL | SOIL GROUP NAMES & LEGEND |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE | GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE | CLEAN GRAVELS <5% FINES | $C_u \geq 4$ AND $1 \leq C_c \leq 3$ | GW | WELL-GRADED GRAVEL |
| | | | $C_u < 4$ AND/OR $1 > C_c > 3$ | GP | POORLY-GRADED GRAVEL |
| | | GRAVELS WITH FINES >12% FINES | FINES CLASSIFY AS ML OR MH | GM | SILTY GRAVEL |
| | | | FINES CLASSIFY AS CL OR CH | GC | CLAYEY GRAVEL |
| | SANDS >50% OF COARSE FRACTION PASSES NO 4. SIEVE | CLEAN SANDS <5% FINES | $C_u \geq 6$ AND $1 \leq C_c \leq 3$ | SW | WELL-GRADED SAND |
| | | | $C_u < 6$ AND/OR $1 > C_c > 3$ | SP | POORLY-GRADED SAND |
| | | SANDS AND FINES >12% FINES | FINES CLASSIFY AS ML OR MH | SM | SILTY SAND |
| | | | FINES CLASSIFY AS CL OR CH | SC | CLAYEY SAND |
| FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT<50 | INORGANIC | PI>7 AND PLOTS>"A" LINE | CL | LEAN CLAY |
| | | | PI>4 AND PLOTS<"A" LINE | ML | SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OL | ORGANIC CLAY OR SILT |
| | SILTS AND CLAYS LIQUID LIMIT>50 | INORGANIC | PI PLOTS >"A" LINE | CH | FAT CLAY |
| | | | PI PLOTS <"A" LINE | MH | ELASTIC SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OH | ORGANIC CLAY OR SILT |
| HIGHLY ORGANIC SOILS | | PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR | | PT | PEAT |

## OTHER SYMBOLS

MATERIALS

- Asphalt
- Aggregate Base
- Boulders & Cobbles
- Fill
- Topsoil

SAMPLERS

- SPT (2" OD)
- Modified California (3" OD)
- California (2.5" OD)
- Shelby Tube
- Pitcher Barrel
- HQ Core
- Grab/Bulk

PIEZOMETER

- Concrete Grout/Fill
- Bentonite/Grout Seal
- Sand Pack + Solid Pipe
- Sand Pack + Slotted Pipe

- INITIAL WATER LEVEL MEASUREMENT(WITH DATE)
- STABILIZED WATER LEVEL MEASUREMENT(WITH DATE)

## GRAIN SIZES

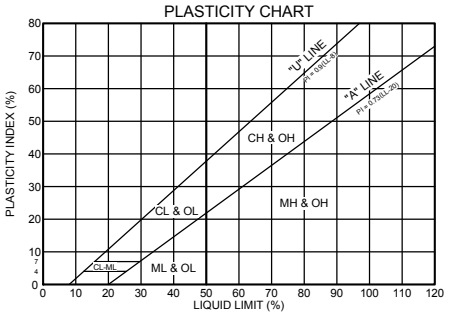
| U.S. STANDARD SIEVE | 200 | 40 | 10 | 4 | 3/4" | 3" | 12" |
|---|---|---|---|---|---|---|---|
| SILTS AND CLAYS | SAND | | | GRAVEL | | COBBLES | BOULDERS |
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

## PENETRATION RESISTANCE

| SAND & GRAVEL | | SILT & CLAY | | |
|---|---|---|---|---|
| RELATIVE DENSITY | BLOWS/FOOT* | CONSISTENCY | BLOWS/FOOT* | UNC. COMP. STRENGTH (KSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 1 | 0 - 1/2 |
| LOOSE | 5 - 10 | SOFT | 2 - 4 | 1/2 - 1 |
| MEDIUM DENSE | 11 - 30 | FIRM | 5 - 8 | 1 - 2 |
| DENSE | 31 - 50 | STIFF | 9 - 15 | 2 - 4 |
| VERY DENSE | OVER 50 | VERY STIFF | 16 - 30 | 4 - 8 |
| | | HARD | OVER 30 | OVER 8 |

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

PLASTICITY CHART




## NOTES

| | |
|---|---|
| AT | ATTERBERG LIMITS |
| BGS | BELOW GROUND SURFACE |
| c | COHESION |
| CD | CONSOLIDATED DRAINED TRIAXIAL |
| CN | CONSOLIDATION |
| CR | CORROSIVITY |
| CU | CONSOLIDATED UNDRAINED TRIAXIAL |
| DS | DIRECT SHEAR |
| EI | EXPANSION INDEX |
| HY | HYDROMETER |
| LL | LIQUID LIMIT |
| $N_{60}$ | BLOW COUNT, Corrected for Hammer Energy Only |
| PI | PLASTICITY INDEX |
| PR | PERMEABILITY |
| RV | R-VALUE |
| SA | SIEVE ANALYSIS |
| -200 | % PASSING NO. 200 SIEVE |
| TC | CYCLIC TRIAXIAL |
| UC | UNCONFINED COMPRESSION |
| UU | UNCONSOLIDATED UNDRAINED TRIAXIAL |

INCREASING VISUAL MOISTURE CONTENT

SATURATED
WET
MOIST
DAMP
DRY

COMPONENT PERCENTAGE

| | |
|---|---|
| PRIMARY | >50% |
| SECONDARY (-y) | 30 - 50% |
| WITH | 15 - 30% |
| TRACE | 0 - 15% |

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**Boring Legend**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Figure
Boring Legend

LEGEND 215786_PINOLE_HERCULES_WWTP_R3.GPJ FOLSOM 12-30-13.GDT 3/31/15

LOGGED BY: Brett Bourgeois | DATE: START 11/21/13 END 11/21/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 10.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 12.0 ft DEPTH: 8.8 ft

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0830 hrs TIME: 0930 hrs

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/21/13 DATE: 1/21/14

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Landscape Gravel at ground surface<br>Dark brown Silty SAND (SM), fine grained, moist (Fill) | Elevation Datum: NGVD29<br>Cement Grout<br>Hand auger from 0 to 5'<br>Bentonite Chips | |
| 5.0<br>6.5 | | S-1 | 7 17 16 (25) | | | | 21 | | 5 | 5 | | Yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, damp (Fill) | 2" PVC (Solid)<br>Begin solid flight auger | 5 |
| | | | | | | | | ▼ | | | | Dark gray mottled black, medium plasticity, with fine gravel, trace fine- to medium-grained sand, firm, moist | | |
| 10.0<br>11.5 | | S-2 | 4 5 7 (10) | | | | | ▽ | 10 | 0 | | | 2" PVC (0.02" Slots) | 10 |
| | | | | | | | | | | | | Yellowish-brown Fat CLAY (CH), high plasticity, trace fine-grained sand, stiff, damp | | |
| 15.0<br>16.5 | | S-3 | 4 8 9 (15) | 1.8 | 2.3 | | | | 15 | -5 | | | Begin mud rotary | 15 |
| 17.5<br>19.0 | | S-4 | 4 8 10 (15) | | | 86 | 36 | AT | | | | Decreased sand | LL=77, PL=27, PI=50 | |
| 20.0<br>21.5 | | S-5 | 5 6 9 (14) | 3.0 | 2.8 | 82 | 39 | UU | 20 | -10 | | Dark olive brown mottled black Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff, damp | | 20 |
| 22.5<br>24.0 | | S-6 | 3 8 11 (18) | 3.0 | 2.3 | | | | | | | | | |
| 25.0<br>26.5 | | S-7 | 6 11 16 (26) | 3.3 | 1.5 | 96 | 28 | AT UU | 25 | -15 | | Dark olive gray, very stiff, moist | LL=45, PL=21, PI=24 | 25 |
| 27.5<br>29.0 | | S-8 | 6 9 13 (21) | 3.0 | 2.5 | | | | 30 | -20 | | | | 30 |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-1

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 – 31.5 | X | S-9 | 8 12 15 (26) | (Su) 3.8 | (Su) 1.3 | | | | | | | Dark olive gray Lean CLAY (CL), medium plasticity, trace fine-grained sand, very stiff, moist | | |
| | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 35.0 – 36.5 | X | S-10 | 9 19 27 (46) | | | | | | 35 | -25 | | Olive Gray Brown Silty SAND (SM), fine- to medium-grained, dense, damp | 35 | |
| 40.0 – 41.5 | X | S-11 | 8 14 20 (34) | 4.5 | | | | | 40 | -30 | | Light olive gray Lean CLAY (CL), low to medium plasticity. trace fine- to medium-grained sand, very stiff to hard, dry to damp | 40 | |
| 45.0 – 46.5 | X | S-12 | 11 20 22 (42) | | | | | | 45 | -35 | | | 45 No recovery, recovered sample using SPT with sand catcher | |
| 50.0 – 51.5 | X | S-13 | 9 14 19 (33) | 3.8 | 3.3 | | | | 50 | -40 | | Decreased sand | 50 | |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-1

LOGGED BY: Brett Bourgeois | DATE: START 11/20/13 END 11/20/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 8.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 10.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0900 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/20/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Asphalt Concrete | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Yellowish-brown Sandy SILT (ML), fine-grained sand, trace fine to coarse gravel (subangular), damp (Fill) | Hand auger from 0 to 5' |
| | | | | | | | | | | 5 | | Yellowish-brown Clayey SAND (SC), low plasticity, with Gravel, medium dense, damp, sand/gravel in clay matrix (Fill) | |
| 5.0 | | | | | | | | | 5 | | | | Begin solid flight auger 5 |
| 6.5 | | S-1 | 8 8 7 (11) | | | 89 | 30 | SA UU | | | | Grayish-brown | Sample exhibits clay-like behavior due to clay matrix |
| 7.5 | | | | | | 95 | 22 | | | | | | |
| 9.0 | | S-2 | 9 10 13 (17) | | | | | | | 0 | | Gray | |
| 10.0 | | | | | | | | ▽ | 10 | | | Gray Sandy SILT (ML), fine-grained sand, firm to stiff, moist to wet | 10 |
| 11.5 | | S-3 | 6 5 6 (9) | | | 95 | 29 | SA | | | | | |
| | | | | | | | | | | | | | Begin mud rotary |
| 12.5 | | | | | | | | | | | | Gray Silty Sand (SM), fine-grained sand, medium dense, moist to wet | |
| 14.0 | | S-4 | 8 8 7 (13) | | | 92 | 32 | HY | | -5 | | | |
| 15.0 | | | | | | | | | 15 | | | Brown mottled gray Lean CLAY (CL), medium plasticity, with silt, trace fine-grained sand, stiff, damp | 15 |
| 16.5 | | S-5 | 5 8 9 (15) | 3.5 | | 93 | 30 | AT | | | | | LL=45, PL=22, PI=23 |
| | | | | | | | | | | -10 | | Grayish-brown, stiff to very stiff | |
| 20.0 | | | | | | | | | 20 | | | | 20 |
| 21.5 | | S-6 | 5 8 11 (18) | 3.0 | 1.8 | 92 | 31 | AT | | | | | LL=45, PL=21, PI=24 |
| | | | | | | | | | | -15 | | | |
| 25.0 | | | | | | | | | 25 | | | | 25 |
| 26.5 | | S-7 | 6 10 13 (22) | 3.0 | 1.8 | | | | | | | | |
| | | | | | | | | | | -20 | | Light grayish-brown Poorly-graded SAND (SP), fine- to medium-grained, trace silt, with fine to coarse gravel (angular), dense, damp | |
| | | | | | | | | | 30 | | | | 30 |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-2

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 | | | | | | | | | | | | | |
| | | S-8 | 19 18 39 (55) | (Su) | (Su) | | | | | | | Light grayish-brown Poorly-graded SAND (SP), fine- to medium-grained, trace silt, with fine to coarse gravel (angular), dense, damp | |
| 31.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -25 | | Light brown Lean CLAY (CL), low plasticity, damp, trace fine-grained sand, very stiff to hard, damp | |
| 35.0 | | | | | | | | | 35 | | | | 35 |
| | | S-9 | 6 7 13 | | | | | | | | | | |
| 36.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -30 | | | |
| 40.0 | | | | | | | | | 40 | | | | 40 |
| | | S-10 | 10 15 21 | | | | | | | | | | |
| 41.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -35 | | | |
| 45.0 | | | | | | | | | 45 | | | | 45 |
| | | S-11 | 5 11 15 | | | | | | | | | | |
| 46.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -40 | | | |
| 50.0 | | | | | | | | | 50 | | | Grayish brown | 50 |
| | | S-12 | 12 18 19 (37) | 2.3 | 3.8 | | | | | | | | |
| 51.5 | | | | | | | | | | | | | |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-2

LOGGED BY: Brett Bourgeois | DATE: START 11/21/13 END 11/21/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 8.2 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 9.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 1230 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/21/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | Asphalt Concrete | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Yellowish-brown Sandy Lean CLAY (CL), low to medium plasticity, fine-grained SAND, damp (Fill) | Hand auger from 0 to 5' |
| | | | | | | | | | | 5 | | | |
| 5.0 | | | | | | | | | 5 | | | | Begin solid flight auger |
| 6.5 | | S-1 | 7 12 12 (18) | | | 89 | 30 | | | | | Gray mottled brown, very stiff | |
| | | | | | | | | | | 0 | | Dark gray Sandy SILT (ML), fine-grained sand, firm, moist | |
| | | | | | | | | ▽ | | | | | |
| 10.0 | | | | | | | | | 10 | | | | |
| 11.5 | | S-2 | 3 3 5 (6) | | | 89 | 34 | HY | | | | | |
| 12.5 | | | | | | | | | | | | Dark bluish-gray Sandy Lean CLAY (CL), medium plasticity, fine-grained sand, stiff to very stiff, moist to wet | Begin mud rotary |
| 14.0 | | S-3 | 5 9 13 (19) | 1.0 | 1.0 | 98 | 27 | SA AT | | -5 | | | LL=40, PL=22, PI=18 |
| 15.0 | | | | | | | | | 15 | | | | |
| 16.5 | | S-4 | 7 11 15 (22) | 4.3 | | | | | | | | Gray, decreased sand | |
| 17.5 | | | | | | | | | | -10 | | | Cobble in shoe. light brown sandy clay cuttings |
| 19.0 | | | 8 18 14 (27) | | | | | | | | | | |
| 20.0 | | | | | | | | | 20 | | | | |
| 21.5 | | S-5 | 5 5 9 (13) | 4.3 | 2.0 | 99 | 26 | UU | | | | Light grayish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, very stiff, damp | |
| | | | | | | | | | | -15 | | Light grayish-brown SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| 25.0 | | | | | | | | | 25 | | | | |
| 26.5 | | S-6 | 14 19 31 (48) | 4.5 | 1.3 | | | | | | | | |
| | | | | | | | | | | -20 | | | |
| | | | | | | | | | 30 | | | | 30 |

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## Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-3

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 – 31.5 | X | S-7 | 11 36 50/6" | (Su) 1.5 | (Su) | | | | | | | Light grayish-brown SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| | | | | | | | | | | -25 | | Light grayish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, dry to damp | |
| 35.0 – 36.5 | X | S-8 | 10 16 22 (38) | 2.3 | 1.5 | | | | 35 | | | | 35 |
| | | | | | | | | | | -30 | | Bluish-gray | |
| 40.0 – 41.5 | X | S-9 | 9 16 26 (42) | 4.5 | | | | | 40 | | | | 40 |
| | | | | | | | | | | -35 | | Bluish-gray SILT (ML), low plasticity, trace fine-grained sand, hard, dry to damp | |
| 45.0 – 46.5 | X | S-10 | 15 27 32 (59) | 4.5 | 1.0 | | | | 45 | | | | 45 |
| | | | | | | | | | | -40 | | | |
| 50.0 – 51.5 | X | S-11 | 14 30 46 (77) | 4.5 | 1.8 | | | | 50 | | | | 50 |

End Boring at 51.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-3

LOGGED BY: Brett Bourgeois | DATE: START 11/22/13 END 11/22/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 8.0 ft DEPTH: 8.0 ft

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 0800 hrs TIME: 0900 hrs

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/22/13 DATE: 1/21/14

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 | |
| | | | | | | | | | | | | Dark gray Lean CLAY (CL), medium plasticity, with fine sand, moist (Fill) | Cement Grout | |
| | | | | | | | | | | | | | Hand auger from 0 to 5' | |
| | | | | | | | | | | | | | Bentonite Chips | |
| | | | | | | | | | | 5 | | | 2" PVC (Solid) | |
| 5.0 | | | | | | | | | 5 | | | | | 5 |
| 6.5 | | S-1 | 2 3 4 (5) | 2.5 | 1.3 | 52 | 76 | UU | | | | Black Fat CLAY (CH), high plasticity, trace fine sand, soft, moist | Begin solid flight auger | |
| | | | | | | | | ▼ | | | | See Boring B-4S Log for Description | | |
| 9.5 | | | | | | | | | | 0 | | | | |
| 11.0 | | | 2 2 2 (3) | | | | | | 10 | | | | No sample recovery | 10 |
| | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 14.5 | | | | | | | | | | -5 | | | | |
| 16.0 | | S-2 | 1 2 1 (3) | | | | | | 15 | | | | No sample recovery | 15 |
| 17.0 | | | | | | | | | | | | Light grayish-brown Fat CLAY (CH), high plasticity, trace fine sand, stiff to very stiff, damp | Begin mud rotary | |
| 18.5 | | S-3 | 2 9 14 (20) | 4.0 | 1.5 | 96 | 28 | SA AT UU | | | | | LL=65, PL=25, PI=40 | |
| 19.5 | | | | | | | | | | -10 | | | | |
| 21.0 | | S-4 | 9 15 18 (32) | 4.5 | 2.0 | | | | 20 | | | | | 20 |
| 22.0 | | | | | | | | | | | | | | |
| 23.5 | | S-5 | 9 14 22 (34) | 3.3 | 1.0 | 103 | 24 | | | | | Increased sand | | |
| 24.5 | | | | | | | | | | -15 | | Light grayish-brown Poorly-graded SAND with SILT (SP-SM), medium- to coarse-grained, very dense, damp | | |
| 26.0 | | S-6 | 8 29 46 (72) | | | | | | 25 | | | | | 25 |
| 27.0 | | | | | | | | | | | | | | |
| 28.4 | | S-7 | 39 50/3" | | | | | | | | | with fine gravel (subangular) | | |
| 29.5 | | | | | | | | | | -20 | | | | |
| | | | | | | | | | 30 | | | | | 30 |

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# Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-4

HDR FOLSOM BORING LOG 215786_PINOLE_HERCULES_WWTP_R3.GPJ FOLSOM 12-30-13.GDT 3/31/15

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS | PIEZOMETER GRAPHIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31.0 | | S-8 | 40 50/3 (16) | (Su) | (Su) | | | | | | | Light grayish-brown Poorly-graded GRAVEL with SILT (GP-GM), fine to coarse, subangular to subrounded, with medium-grained sand, very dense, moist *(continued)* | | |
| | | | | | | | | | | | | Light grayish-brown SILT (SM), low plasticity, trace fine-grained sand, hard, moist | | |
| 34.5 | | | | | | | | | | -25 | | | | |
| | | S-9 | 8 22 30 | | | | | | 35 | | | | 35 | |
| 36.0 | | | | | | | | | | | | | 2" PVC (0.02" Slots) | |
| 39.5 | | | | | | | | | | -30 | | | | |
| | | S-10 | 22 28 48 (77) | 4.5 | | | | | 40 | | | | 40 | |
| 41.0 | | | | | | | | | | | | | | |
| 44.5 | | | | | | | | | | -35 | | | | |
| | | S-11 | 10 19 32 (51) | | | | | | 45 | | | | 45 | |
| 46.0 | | | | | | | | | | | | | | |
| 49.5 | | | | | | | | | | -40 | | | | |
| | | S-12 | 8 13 27 (40) | | | | | | 50 | | | | 50 | |
| 51.0 | | | | | | | | | | | | | | |

End Boring at 51 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-4

LOGGED BY: Brett Bourgeois | DATE: START 1/21/14 END 1/21/14

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.5 ft

DRILL RIG: CME-75 | DRILL METHOD: SSA | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: 18.0 ft | BIT DIAMETER: 7 1/4" | GROUNDWATER DATA: DEPTH: DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☒ DATE: DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | ☒ | S-1 | 10 15 17 (24) | 3.8 | | | | | | | | Dark gray Lean CLAY (CL), medium plasticity, with fine sand, very stiff, damp (Fill) | Begin hollow stem auger |
| 2.0 | | | | | | | | | | | | | |
| 2.5 | ☒ | S-2 | 7 10 10 (15) | 1.0 | | | | | | | | Dark gray to black | |
| 4.0 | | | | | | | | | | 5 | | | |
| 5.0 | ☒ | S-3 | 3 3 4 (5) | 1.0 | | | | | 5 | | | Black Fat CLAY (CH), high plasticity, trace fine sand, soft, moist, trace organics (Young Bay Mud) | 5 |
| 6.5 | | | | | | | | | | | | | |
| 7.5 | | S-4 | 0 0 0 | | | | | | | | | Decreased sand, wet, very soft, increased organics | |
| 9.0 | | | | | | | | | | | | | |
| 9.5 | ☒ | S-5 | 3 1 2 (2) | | | | | | 10 | 0 | | | 10 |
| 11.0 | | | | | | | | | | | | Black Silty SAND (SM), fine-grained, medium plasticity fines, very loose, wet | |
| 12.0 | | S-6 | 1 3 12 | | | | | | | | | | |
| 13.5 | | | | | | | | | | | | Dark gray Poorly-graded SAND (SP), medium- to coarse-grained, medium dense | |
| 14.0 | | S-7 | 5 3 5 (11) | | | | | | 15 | -5 | | | 15 |
| 15.5 | | | | | | | | | | | | | |
| 16.0 | | S-8 | 5 8 18 | | | | | | | | | Trace clay lenses | |
| 17.5 | | | | | | | | | | | | | |
| 18.0 | ☒ | S-9 | 5 8 9 (15) | | | | | | | | | Light grayish-brown Fat CLAY (CH), high plasticity, trace fine sand, stiff to very stiff, damp | |
| 19.5 | | | | | | | | | | -10 | | End Boring at 19.5 feet depth | |

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-4S

LOGGED BY: Brett Bourgeois | DATE: START 11/20/13 END 11/20/13

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SFA/Mud | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: NA | BIT DIAMETER: 6"/4" | GROUNDWATER DATA: DEPTH: 5.0 ft DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: 1430 hrs TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☐ DATE: 11/20/13 DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | | | | | | | | | | | | Gray Poorly-graded SAND (SP), fine- to medium-grained, trace silt, moist (Fill) | Hand auger from 0 to 5' |
| 5.0 | | | | | | | | | 5 | 5 | | | |
| 6.5 | | S-1 | 2 3 3 (5) | | | | | | | | | | Begin solid flight auger |
| | | | | | | | | | | | | Reddish-yellowish-brown Sandy SILT (ML), fine-grained sand, dry, cemented (Fill) | |
| 7.5 | | | | | | | | | | | | Dark gray to black Lean CLAY (CL), medium plasticity, soft, moist | |
| 9.0 | | S-2 | 2 2 2 (3) | | 0.3 | | | AT UU | | 0 | | | LL=39, PL=24, PI=15 |
| 10.0 | | | | | | | | | 10 | | | See Boring B-5S Log for Description | |
| 11.5 | | | 2 3 5 (6) | | | | | | | | | | No sample recovery, start mud rotary |
| 12.5 | | | | | | | | | | | | | |
| 14.0 | | | 5 8 10 (15) | | | | | | | -5 | | | No sample recovery |
| 15.0 | | | | | | | | | 15 | | | Grayish-yellowish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff to very stiff, damp | |
| 16.5 | | S-3 | 5 8 12 (17) | 4.3 | | 93 | 30 | UU | | | | | |
| | | | | | | | | | | -10 | | | |
| 20.0 | | | | | | | | | 20 | | | | |
| 21.5 | | S-4 | 8 11 15 (25) | 4.3 | 2.0 | | | | | | | | |
| | | | | | | | | | | -15 | | Grayish-yellowish-brown Silt (ML), low plasticity, trace fine-grained sand, very stiff, damp to moist | |
| 25.0 | | | | | | | | | 25 | | | | |
| 26.5 | | S-5 | 6 8 14 (21) | 3.8 | | | | | | | | | |
| | | | | | | | | | | -20 | | Grayish-yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, moist | |
| | | | | | | | | | 30 | | | | 30 |

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## Boring Log

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date: APR 2015

Boring: B-5

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.0 | | | | | | | | | | | | Grayish-yellowish-brown Lean CLAY (CL), low plasticity, trace fine-grained sand, very stiff, moist | |
| | | S-6 | 6 10 12 (21) | (Su) 3.8 | (Su) 1.5 | | | | | | | | |
| 31.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -25 | | | |
| 35.0 | | | | | | | | | 35 | | | | 35 |
| | | S-7 | 10 11 14 (25) | 2.3 | | | | | | | | | |
| 36.5 | | | | | | | | | | | | | |
| | | | | | | | | | | -30 | | | |
| 40.0 | | | | | | | | | 40 | | | | 40 |
| | | S-8 | 6 10 11 (21) | 2.3 | 2.0 | | | | | | | | |
| 41.5 | | | | | | | | | | | | | |

End Boring at 41.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

Date
APR 2015

Boring
B-5

LOGGED BY: Brett Bourgeois | DATE: START 1/21/14 END 1/21/14

STATION & OFFSET: NA, NA | LATITUDE: | LONGITUDE: | O.G. ELEV.: 9.0 ft

DRILL RIG: CME-75 | DRILL METHOD: SSA | DRILLING COMPANY: Taber Drilling

CASING TIP DEPTH: 15.0 ft | BIT DIAMETER: 7 1/4" | GROUNDWATER DATA: DEPTH: DEPTH:

HAMMER TYPE: Automatic | HAMMER EFFICIENCY: 80% | NOT ENCOUNTERED ☐ TIME: TIME:

CHECKED BY (DATE): Vic Crosariol | EFFICIENCY MEASURED ☐ | NOT ESTABLISHED ☒ DATE: DATE:

| SAMPLE DEPTH (ft) | SAMPLER | SAMPLE NO./ CORE RUN | FIELD BLOWS/6 in ($N_{60}$) | POCKET PEN (ksf) | TORVANE (ksf) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | OTHER TESTS | DEPTH (ft) | ELEVATION (ft) | MATERIAL GRAPHIC | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | | | (Su) | (Su) | | | | | | | 4" Asphalt Concrete over 2" Aggregate Base | Elevation Datum: NGVD29 |
| | | S-1 | 2 2 3 (4) | | | | | | | | | Brown Lean Clay (CL), medium plasticity, with medium-grained sand, trace fine gravel (subangular), firm, damp (Fill) | Begin hollow stem auger |
| 2.0 | | | | | | | | | | | | | |
| 2.5 | | | | | | | | | | | | | |
| | | S-2 | 3 3 5 (6) | | | | | | | | | | |
| 4.0 | | | | | | | | | | 5 | | | |
| 5.0 | | | | | | | | | 5 | | | Reddish-yellowish-brown Sandy SILT (ML), fine-grained sand, dry, cemented (Fill) | 5 |
| | | S-3 | 3 4 4 (6) | | | | | | | | | | |
| 6.5 | | | | | | | | | | | | | |
| 7.5 | | | | | | | | | | | | Dark gray to black Lean CLAY (CL), medium plasticity, soft, moist | |
| | | S-4 | | | | | | | | | | | |
| | | | | | | | | | | 0 | | | |
| 9.5 | | | | | | | | | | | | Dark gray to black Sandy SILT (ML), non plastic, fine-grained sand, soft, moist | |
| 10.0 | | | | | | | | | 10 | | | | 10 |
| | | | 100 psi 400 psi | | | | | | | | | Wet | No sample recovery, recovered sample using SPT with sand catcher |
| 12.0 | | | | | | | | | | | | | |
| 12.5 | | | 2 4 5 | | | | | | | | | Dark gray to black Lean to Fat CLAY (CL/CH), medium to high plasticity, trace fine-grained sand, stiff, wet | |
| 14.0 | | | | | | | | | | -5 | | | |
| 15.0 | | | 5 10 15 (21) | | | | | | 15 | | | Grayish-yellowish-brown Lean CLAY (CL), medium plasticity, trace fine-grained sand, stiff to very stiff, damp | 15 |
| 16.5 | | | | | | | | | | | | | |

End Boring at 16.5 feet depth

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**Boring Log**

Pinole / Hercules Water Pollution Control Plant Upgrades
Pinole, California

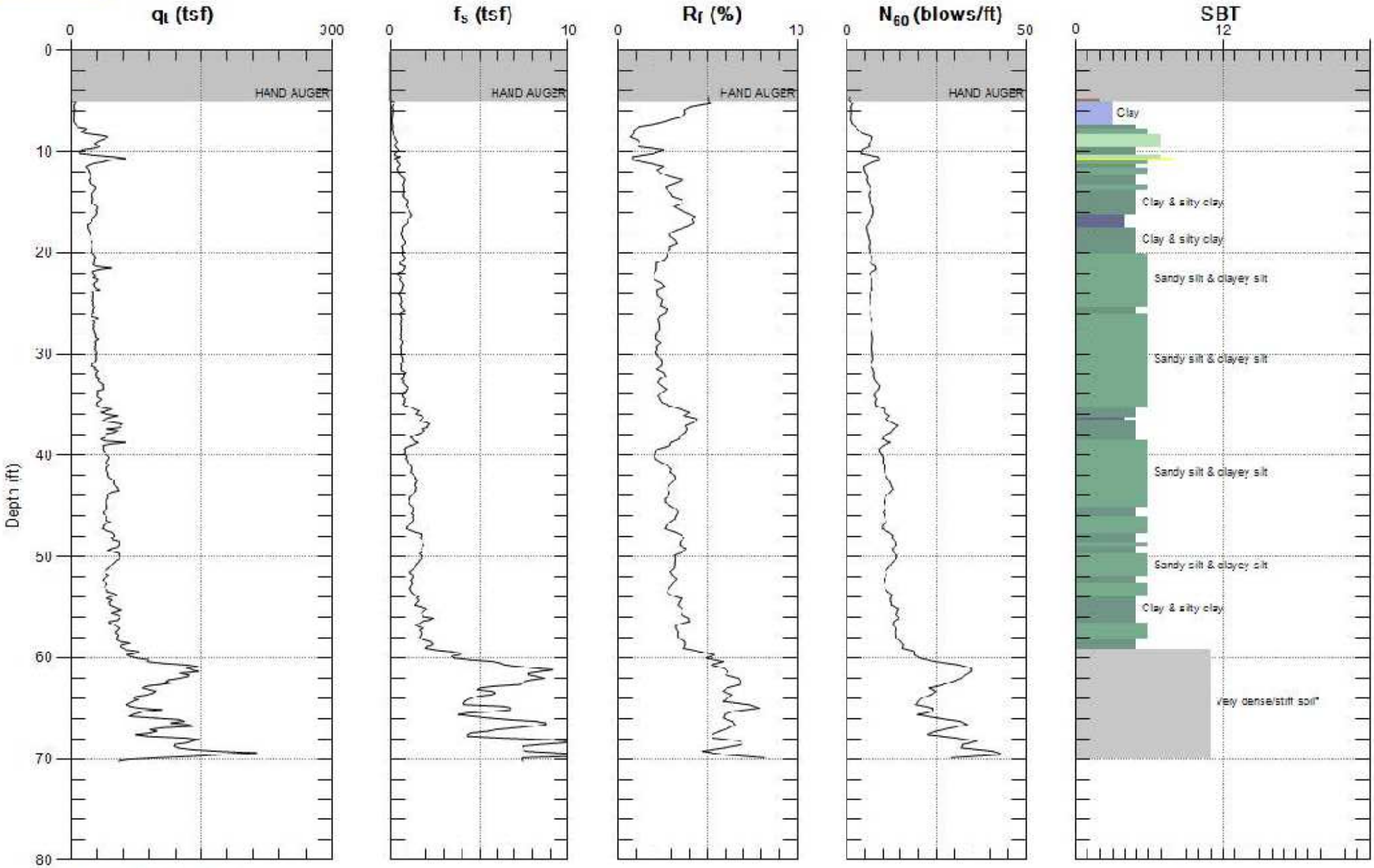
Date: APR 2015

Boring: B-5S

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-1

Engineer: V.CROSARIOL
Date: 1/5/2015 12:31



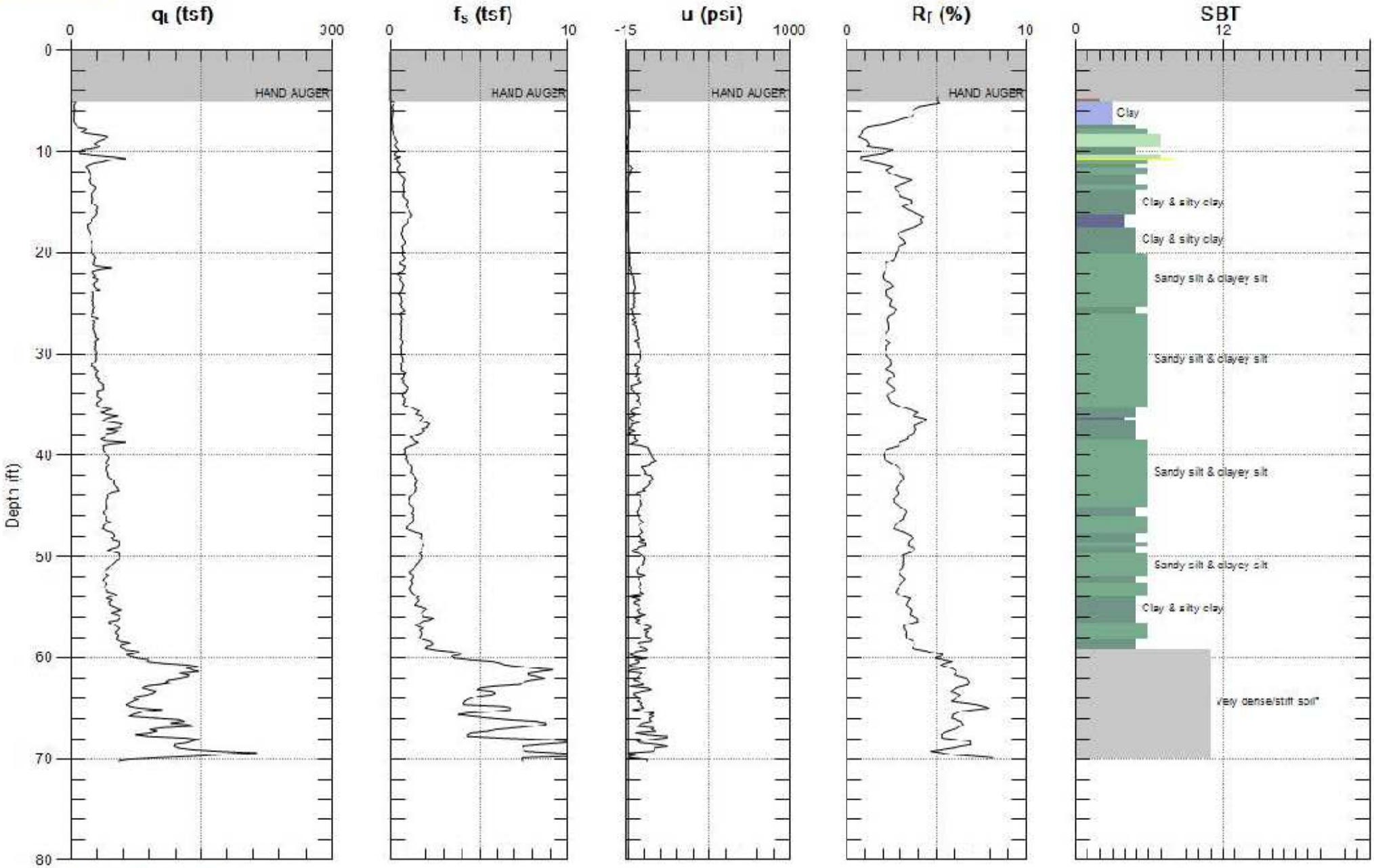

Max. Depth: 70.210 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-1

Engineer: V.CROSARIOL
Date: 1/5/2015 12:31



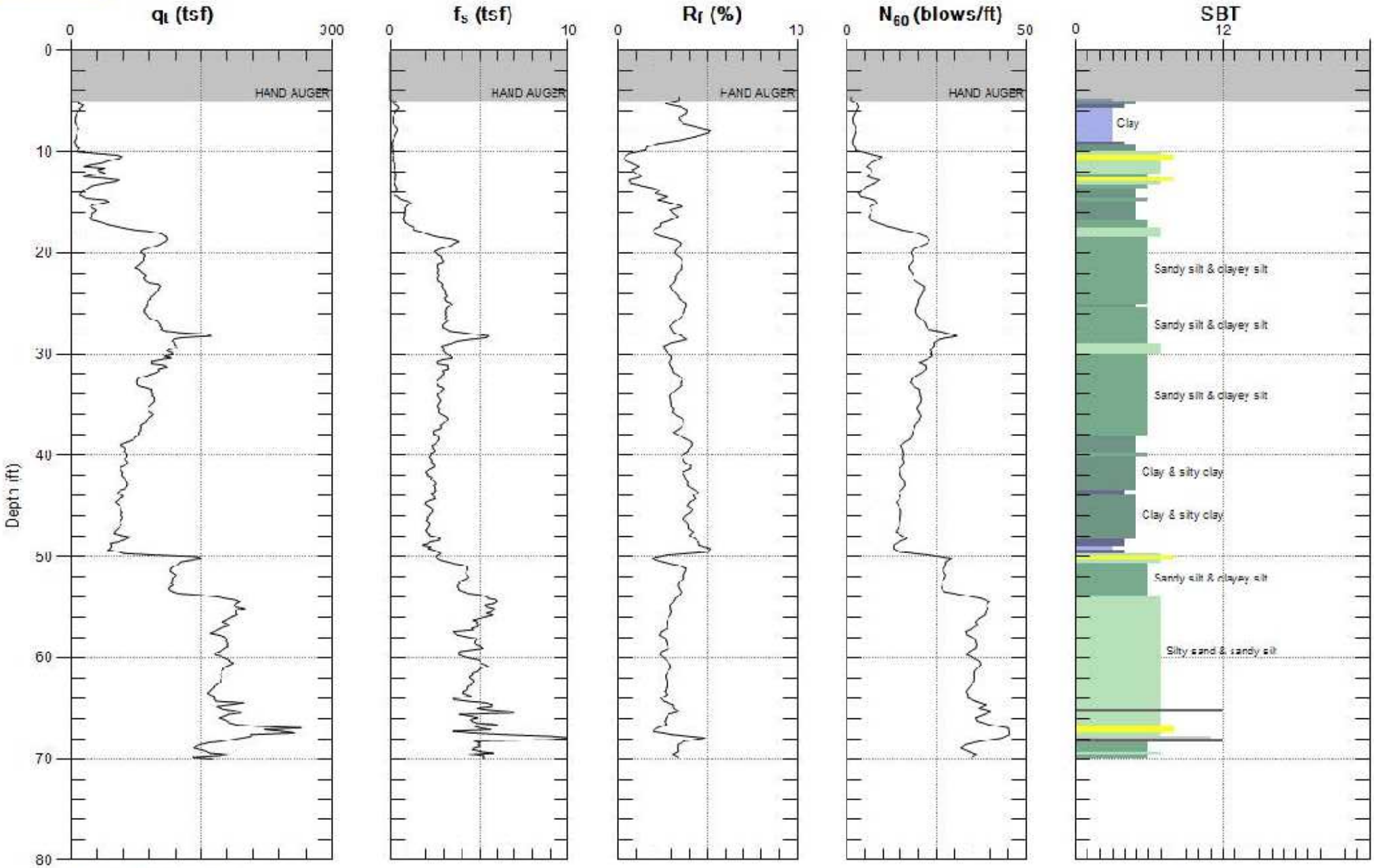

Max. Depth: 70.210 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-2

Engineer: V.CROSARIOL
Date: 1/5/2015 07:36



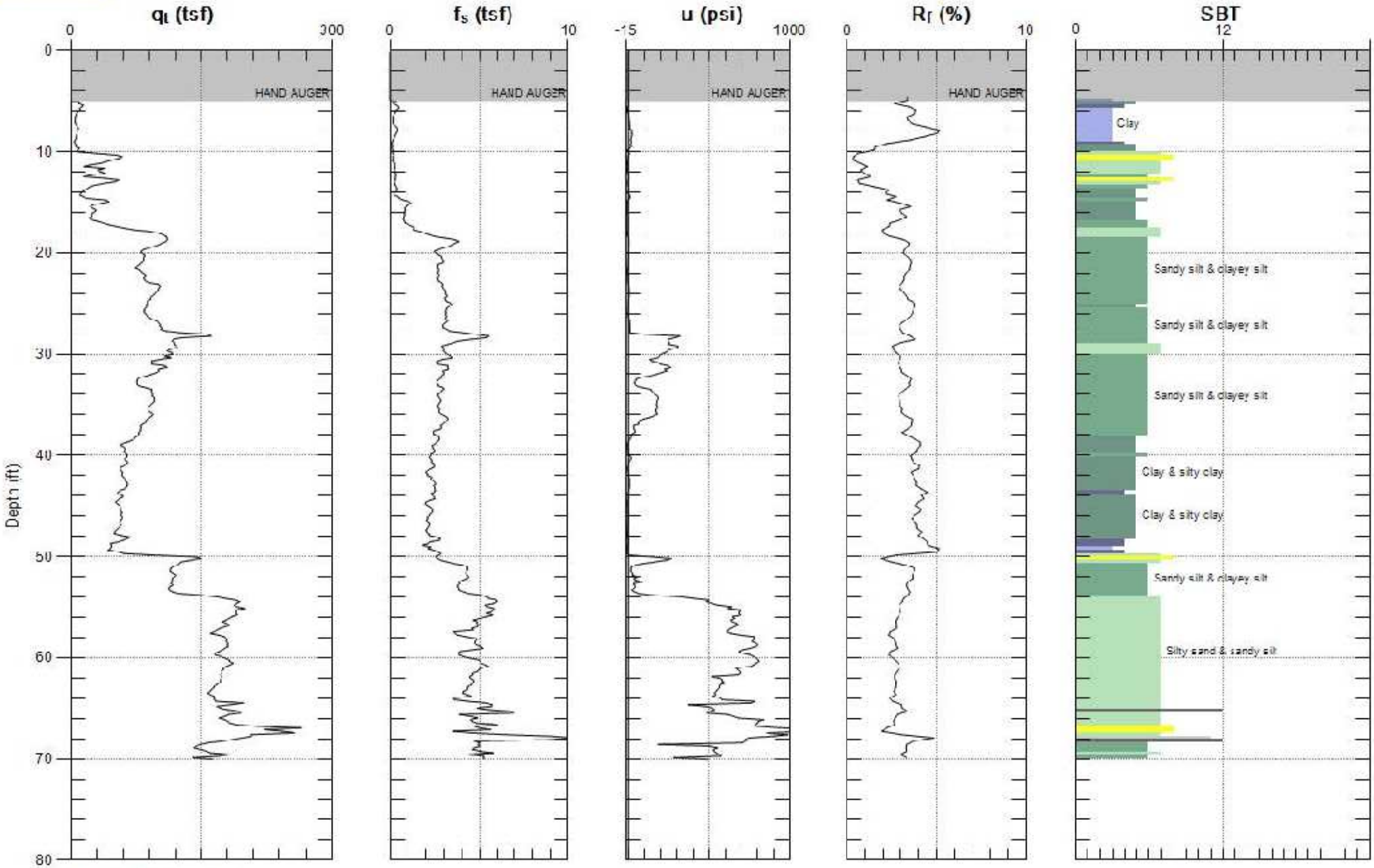

Max. Depth: 70.046 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-2

Engineer: V.CROSARIOL
Date: 1/5/2015 07:36



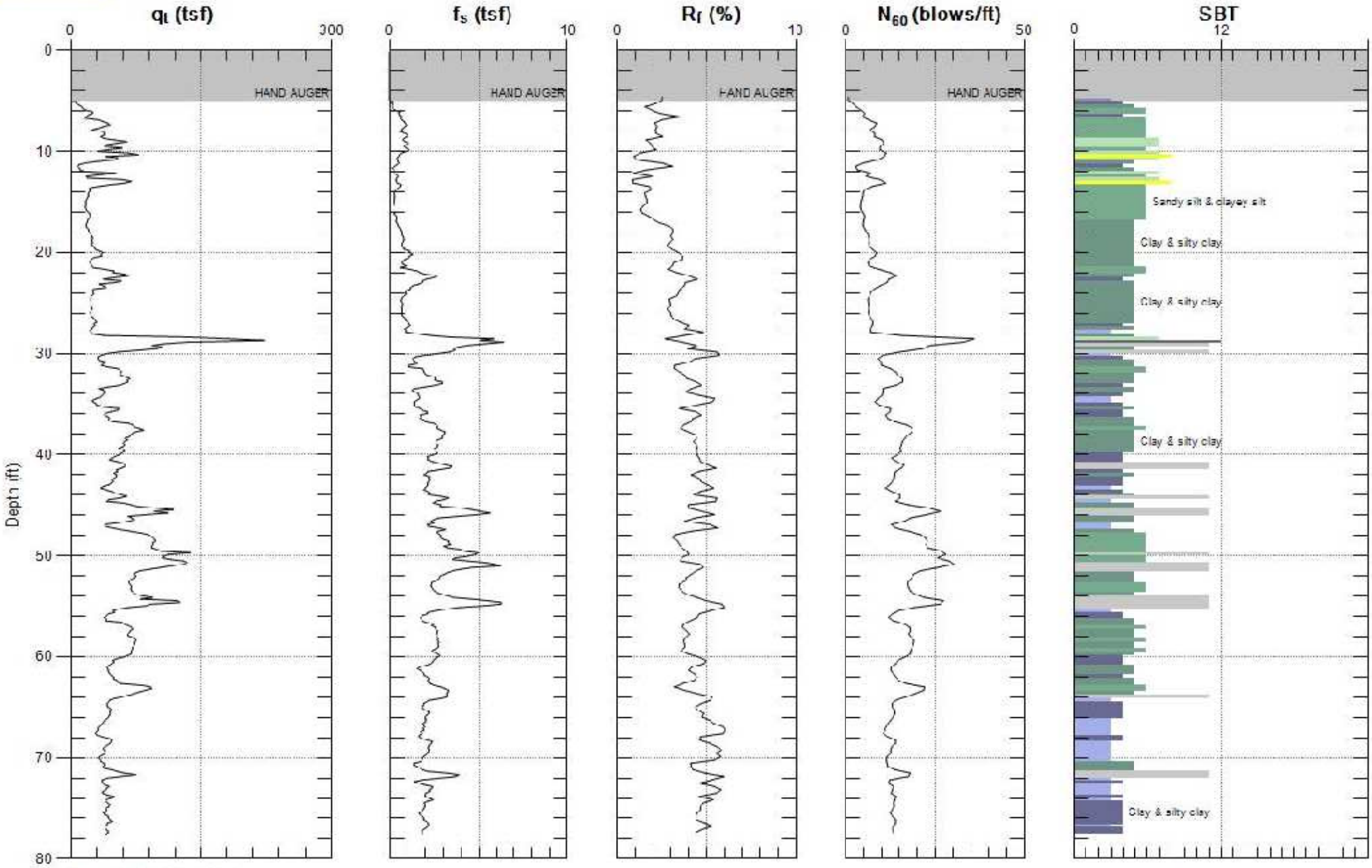

Max. Depth: 70.046 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-3

Engineer: V.CROSARIOL
Date: 1/5/2015 09:20



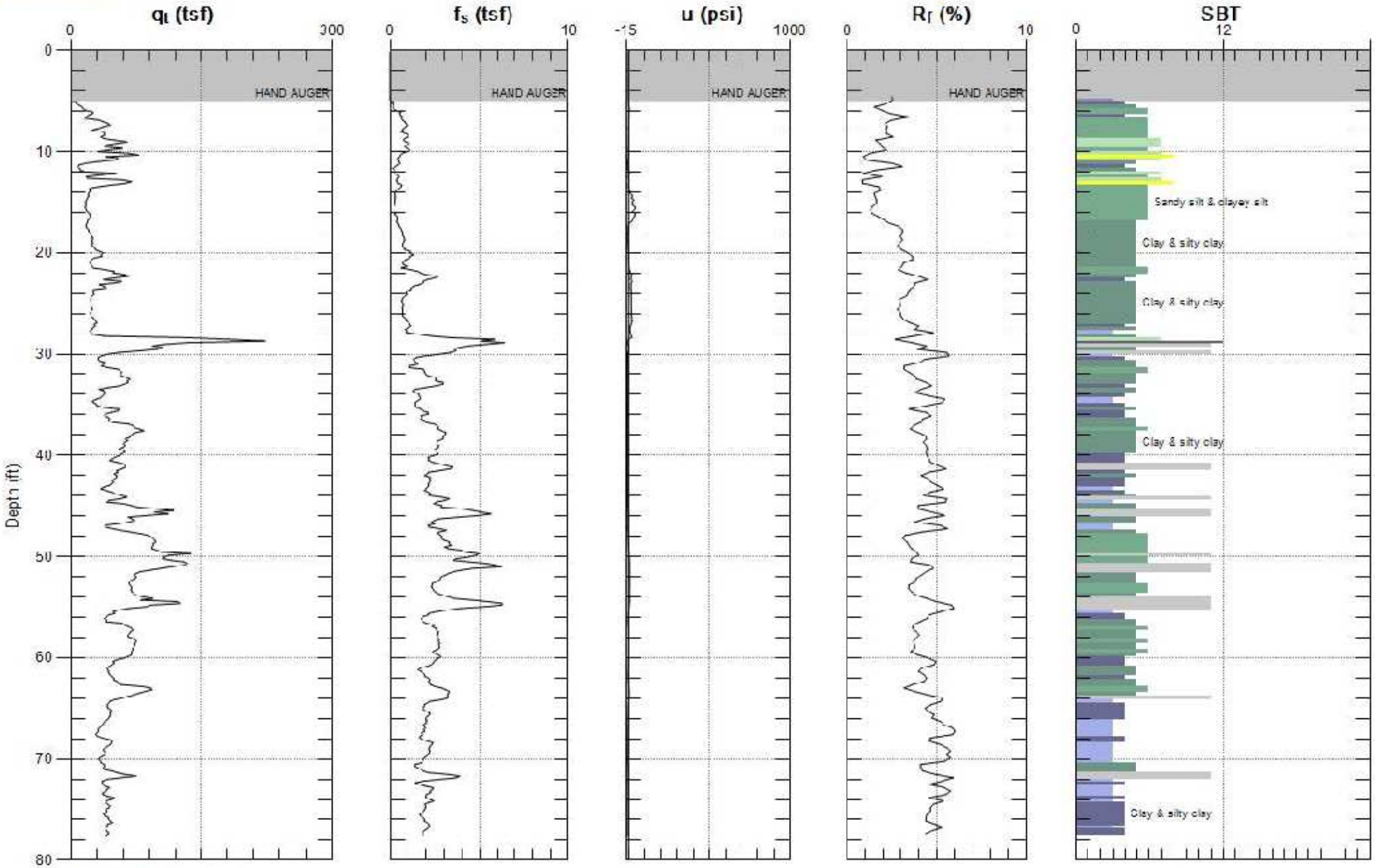

Max. Depth: 77.592 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG HDR

Site: PINOLE WPCP
Sounding: CPT-3

Engineer: V.CROSARIOL
Date: 1/5/2015 09:20




Max. Depth: 77.592 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

# SECTION 02361
## DRIVEN STEEL SHEET PILING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Steel sheet piling, steel sheet piling fittings including corners, tees, wyes, crosses, and points as applicable.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Institute of Steel Construction (AISC):
      a. 325, Manual of Steel Construction.
   2. ASTM International (ASTM):
      a. A36/A36M, Standard Specification for Carbon Structural Steel.
      b. A325/A325M, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
      c. A328/A328M, Standard Specification for Steel Sheet Piling.
   3. American Welding Society (AWS):
      a. D1.1, Structural Welding Code - Steel.
      b. D1.3, Structural Welding Code - Sheet Steel.

B. Qualifications:
   1. Sheeting installer must have, as a minimum, three (3) successful past installations of sheet piling of comparable overall heights and sections and comparable penetration into soils similar to these found on the Project.
   2. The Contractor shall be responsible for designing the sheet piling system to adequately support all loads, this incudes both permanent and temporary sheet pile installations.
      a. Design shall conform to the requirements of AISC 325.
      b. See contract Sheet 00S01 for requirements.

### 1.3 DEFINITIONS

A. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
   2. Installer and applicator are synonymous.

### 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
      c. Complete list and description of materials for all construction components.
   3. Documentation of qualifications required for sheeting installer.
   4. Detailed design calculations of sheet piling system.
      a. Submittal for informational purpose only and will not be checked.
      b. See contract Sheet 00S01 for requirements.
   5. Information on the type of driving equipment to be used; including manufacturer of equipment, model number and driving energy to be used.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Sheet piling:
      a. Skyline Steel Corporation.
      b. Gerdau Ameristeel.
      c. Or approved equal.
   2. Sheet piling points:
      a. Association Pile and Fitting Corporation.

B. Submit request for substitution in accordance with Specification Section 01640.

### 2.2 MATERIALS

A. Steel Sheet Piling:
   1. ASTM A328/A328M.
   2. Piling sections shall be continuously interlocking.
   3. Piling shall be reasonably free-sliding to grade when threaded.
   4. Provide standard handling hole approximately 4 IN from one end.

B. Corners, Tees and Wyes:
   1. As appropriate with ASTM A328/A328M piling.
   2. Fabricated from matching pieces of sheet piling, ASTM A36/A36M plates or angles, and ASTM A325/A325M high-strength bolts.
   3. Bolts shall be furnished with washers.

C. Welding Electrodes: AWS D1.1 and AWS D1.3, E70 electrode.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Do not begin sheet pile installation until the earthwork in the area where sheet piles are to be driven has been completed to the extent that grade elevation is at or no more than 2 FT below the top of piling elevation as indicated on the Drawings.

B. Furnish lines and levels as required to install sheet piles at their indicated locations.

### 3.2 INSTALLATION

A. Use method to drive sheet piles that will not cause damage to nearby buildings or structures.

B. Install sheet piles straight and plumb and to the dimensions shown on the Drawings.

C. Drive sheet piles vertical at locations shown on the Drawings.

D. Provide additional length of sheet piling sufficient to allow cutting off the top of the sheet piling that may be damaged during driving and construction operations.

E. Sheet piles shall be installed as one (1) continuous member unless splices are permitted by Engineer.
   1. Where splices are permitted, make splices by full penetration groove welding the entire cross sectional area of the piles at the splice location.
   2. Perform welding using operators who have passed welding qualification tests during previous 12 month period prior to commencement of required welding.
   3. Welding processes, procedures and welder qualification tests to be in accordance with AWS D1.1 welding code requirements.

F. Accurately locate and drive sheet piles by such methods and equipment so as not to impair the sheet pile strength or damage sheet piles in any way.

G. Pre-drilling or jetting of sheet piling is not permitted.

H. Adequately support and hold sheet piles in correct vertical position during driving by means of adequate driving equipment.

I. Provide suitable driving heads to prevent damage to sheet pile ends.

J. Drive sheet piles with equipment capable of driving sheet piles to required final depth or resistance, without damaging sheet piles.

K. Should any obstruction including but not limited to boulders, rocks, rubble, existing foundations or timbers be encountered which prevent driving of sheet pile to its required final depth, threaten sheet pile damage or cause sheet pile to drift from required location horizontally, cease driving and take corrective action as directed by Engineer.

L. Should any sheet pile as determined by Owner be damaged or otherwise not conform to this Specification Section, withdraw sheet pile and drive another sheet pile in its place.
   1. If it is impossible to withdraw damaged or rejected sheet pile, install additional sheet piles at locations indicated by Owner.
   2. Additional sheet piles shall be at Contractor's expense.

M. Damaged sheet piles include but are not necessarily limited to sheet piles bent, buckled, cracked, with fabrication tolerances beyond those indicated in ASTM A328/A328M, or with any other defect as determined by the Engineer would weaken the sheet pile.

N. Obtain cut off elevations from Drawings.

O. Drive sheet piling to piling elevation as determined by the Contractor’s sheet pile design engineer.

## 3.3 FIELD QUALITY CONTROL

A. Inspection:
   1. Allow each pile installation to be witnessed by the Owner who will determine that the required final driving resistance has been obtained and if necessary may revise the initially determined final driving resistance depending on driving conditions encountered.

**END OF SECTION**

**3.12 SCHEDULES**

A. SPECIFICATION SCHEDULE - SYSTEM 1
1. General:
a. Piping symbol and service:
1) IS – Influent Sewer.
2) PI – Primary Influent.
3) SS – Sanitary Sewer.
4) STD – Storm Drain.
**5) <u>PD – Plant Drain.</u>**
b. Test requirements:
1) Test medium: Low pressure air.
2) Pressure: See the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
3) Duration: See the FIELD QUALTIY CONTROL Article in PART 3 of this Specification Section.
c. Gaskets:
1) Push-on and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
2. System components:
a. Pipe size 3 IN through 48 IN:
1) Buried service:
a) Materials: Ductile iron, Class 53.
b) Reference: AWWA/ANSI C151/A21.51.
c) Lining: Cement.
d) Coating: Bituminous **<u>with polyethylene encasement</u>**.
e) Fittings:
(1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
(2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 IN to 16 IN.
f) Joints: Push-on joints with mechanical (stuffing box type) joints at fittings and valves.

B. SPECIFICATION SCHEDULE - SYSTEM 2
1. General:
a. Piping symbol and service:
1) ABI - Aeration Basin Influent.
2) CEN – Centrate.
3) D – Drain.
4) GRO – Grit Overflow.
5) GTO – Gravity thickener Overflow.
6) ML – Mixed Liquor.
7) OF – Overflow.
8) PB – Primary bypass.
9) PE – Primary Effluent.
10) RS – Raw Sewage.
11) SE – Secondary Effluent.
b. Test requirements:
1) Test medium: Water.
2) Pressure: 25 psig.
3) Duration: 6 HRS.
c. Gaskets:

1) Flanged, push-on, and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.

2. System components:
   a. Pipe size 3 IN through 48 IN:
      1) Exposed service:
         a) Material:
            (1) Flanged: Ductile iron, Class 53.
            (2) Grooved type joint system: Use pipe thickness per AWWA C606.
         b) Reference: AWWA/ANSI C115/A21.15.
         c) Lining: Cement.
         d) Coating: Paint.
         e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
         f) Joints: AWWA/ANSI C115/A21.15 flanged joints with flanges at valves and structure penetrations.
            **(1) <u>All joints to be restrained.</u>**
      2) Buried service:
         a) Materials: Ductile iron, Class 53.
         b) Reference: AWWA/ANSI C151/A21.51.
         c) Lining: Cement.
         d) Coating: Bituminous **<u>with polyethylene encasement</u>**.
         e) Fittings:
            (1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
            (2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 IN to 16 IN.
         f) Joints: Push-on joints with mechanical (stuffing box type) joints at fittings and valves.
            **(1) <u>All joints to be restrained.</u>**

C. SPECIFICATION SCHEDULE - SYSTEM 3
   1. General:
      a. Piping symbol and service:
         1) DS - Digested Sludge.
         2) GR – Grit.
         3) GTSL – Gravity Thickened Sludge.
         4) PSC - Primary Scum.
         5) PSL – Primary Sludge.
         6) RAS - Return Activated Sludge.
         7) TS – Thickened Sludge.
         8) WAS - Waste Activated Sludge.
      b. Test requirements:
         1) Test medium: Water.
         2) Pressure: 125 psig.
         3) Duration: 6 HRS.
      c. Gaskets:
         1) Flanged, push-on and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
         2) Grooved coupling joints (ductile and steel): Rubber, AWWA C606.
         3) Flanged joints (steel): AWWA C207.
   2. System components:
      a. Pipe size 3 IN through 24 IN:
         1) Exposed service:
            a) Material:
               (1) Flanged: Ductile iron, Class 53.
               (2) Grooved type joint system: Use pipe thickness per AWWA C606.
            b) Reference: AWWA/ANSI C115/A21.15.
            c) Lining: Glass.

d) Coating: Paint.
e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
f) Joints:
(1) Flanged or grooved type mechanical coupling (AWWA C606) joints.
(2) With both systems, provide screwed-on flanges at equipment, valves and structure penetrations.
**(3) <u>All joints to be restrained.</u>**

2) Buried service:
a) Materials: Ductile iron, Class 53.
b) Reference: AWWA/ANSI C151/A21.51.
c) Lining: Glass.
d) Coating: Bituminous **<u>with polyethylene encasement</u>**.
e) Fittings:
(1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
(2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 IN to 16 IN.
f) Joints: Push-on with mechanical (stuffing box type) joints at fittings and valves.
**(1) <u>All joints to be restrained.</u>**

b. Pipe size greater than 24 IN:
1) Exposed service:
a) Material: Steel, fabricated pipe.
b) Reference: AWWA C200.
c) Lining: Fusion bonded epoxy.
d) Coating: Fusion bonded epoxy.
e) Fittings: AWWA C208.
f) Joints: Butt-welded with rigid AWWA C207 flanges at equipment, valves, and structure penetrations.

2) Buried service:
a) Material: Steel, fabricated pipe.
b) Reference: AWWA C200.
c) Lining: Fusion bonded epoxy.
d) Coating: Fusion bonded epoxy.
e) Fittings: AWWA C208.
f) Joints: Butt welded.

D. SPECIFICATION SCHEDULE - SYSTEM 4 (NOT USED)

E. SPECIFICATION SCHEDULE - SYSTEM 5
1. General:
a. Piping symbol and service:
1) NG - Natural Gas.
b. Test requirements:
1) Test medium: Cylinder Nitrogen.
2) Pressure: 100 psig.
3) Duration: 6 HRS.
2. System components:
a. Pipe size through 26 IN:
1) Exposed service:
a) Material: Steel, Grade B, black, Schedule 40.
b) Reference: ASTM A53.
c) Lining: None.
d) Coating: Paint.
e) Fittings: Malleable iron meeting ASTM A197, ASME B16.3, Class 150.
f) Joints: Threaded, ASME B16.9 steel butt- or socket-welded joints.

2) Buried service:

a) Materials: Steel, Grade B, black, Schedule 40.
b) Reference: ASTM A53.
c) Linings: None.
d) Coatings: Factory coating-mill wrapped with 3-M "Scotchkote," or Energy Coating Company "Encoat" with fittings and uncoated portions fully wrapped after testing with 3-M "Scotchkote" tape.
e) Fittings: Malleable iron meeting ASTM A197, ASME B16.3, Class 150.
f) Joints: Threaded, ASME B16.9 steel butt- or socket-welded joints.

Natural Gas Piping Installation:

1. Install piping in accordance with NFPA, local gas company regulations, codes and local ordinances, complete with necessary appurtenances.
2. Install buried pipe at approximately 30 IN deep.
3. Gas cocks:
   a. Install before gas utilization equipment connected to system, at each branch main and at connection to meter.
   b. Design to operate safely under pressures indicated.
   c. Install ground joint unions at intervals to facilitate repairs.
   d. Cocks shall be of type and lubricant recommended by manufacturer for this class of service, and as approved by local gas company.
4. Pipe drainage:
   a. Drain horizontal piping to risers.
   b. Locate drains where required for system drainage.
   c. Install tee fitting with bottom outlet plugged or provide with threaded, capped nipple at bottom of risers or in accordance with applicable codes.
5. Make piping connections with shellacked joints or ground joint unions.
6. Provide vents from gas regulators, pressure reducing valves, and other vented devices to the outdoors and terminate in accordance with applicable codes.
7. Connect piping to pressure reducing valve outside each building as shown on drawings and schedule.
8. Provide flexible connections to vibration isolated equipment suitable for pressures, local and national codes and intended application.
9. Remove cutting and threading burrs.
10. Plug each gas outlet (including valves) with threaded plugs or caps immediately after installation and retain until the piping or equipment connections are completed.
11. Continuously ground gas piping electrically, bond tightly to the grounding connection.
12. Install piping parallel to other piping, but maintain a minimum 12 IN clearance between gas piping and any piping that could reach 200 DegF.
13. All gas piping in air plenums to be all-welded and encased in a Schedule 40 pipe sleeve.
    a. Ends of the sleeve open to atmosphere or sealed with the annullus vented (gas pipe size) to atmosphere.

F. SPECIFICATION SCHEDULE - SYSTEM 6 (NOT USED)

G. SPECIFICATION SCHEDULE - SYSTEM 7

1. General:
   a. Piping symbol and service:
      1) POLY - Polymer
      2) SBS – Sodium Bisulfite.
      3) SHC – Sodium Hypochlorite.
   b. Test requirements pressure lines:
      1) Test medium: Water.
      2) Pressure: 125 psig.
      3) Duration: 6 HRS.
   c. Test requirements vacuum lines:
      1) Test medium: Air.

2) Pressure: -27 IN HG.
3) Duration: 6 HRS.

d. Gaskets and O-rings:
1) Viton.

2. System components:
a. Pipe size 12 IN and smaller:
1) Exposed service:
a) Material: PVC, Type 1, Grade 1, Schedule 80.
b) Reference: ASTM D1785.
c) Lining: None.
d) Coating: Paint.
e) Fittings: Solvent welded socket type complying with ASTM D2467.
f) Joints: Solvent welded with unions at valves, penetrations through structures and equipment connections for pipe 2 IN and less and flanges at those locations for pipe above 2 IN.
g) For HCL service, provide pipe joint primer and solvent cement specifically formulated for use with this chemical: IPS-70 primer and IPS-724 solvent cement.
2) Buried service:
a) Material: PVC, Type 1, Grade 1, Schedule 40.
b) Reference: ASTM D1785.
c) Lining: None.
d) Coating: None.
e) Fittings: Solvent welded socket type complying with ASTM D2466.
f) Joints: Solvent welded.

H. SPECIFICATION SCHEDULE - SYSTEM 8
1. General:
a. Piping symbol and service:
1) FCL - Ferric Chloride.
2) SHD - Sodium Hydroxide.
b. Test requirements:
1) Test medium: Water.
2) Pressure: 125 psig.
3) Duration: 6 HRS.
c. Gaskets and O-rings: Polypropylene.
2. System components:
a. Pipe size 12 IN and smaller:
1) Exposed service:
a) Material: CPVC, Schedule 80.
b) Reference: ASTM F441.
c) Lining: None.
d) Coating: Paint.
e) Fittings: Solvent welded socket type complying with ASTM F439.
f) Joints:
(1) Solvent welded with unions at valves, penetrations through structures and equipment connections for pipe 2 IN and less and flanges at those locations for pipe above 2 IN.
(2) For sodium hydroxide, provide pipe joint primer IPS-70 and pipe joint solvent cement IPS-724.

I. SPECIFICATION SCHEDULE - SYSTEM 9
1. General:
a. Piping symbol and service:
1) 1W – No. 1 Water.
2) 2W – No. 2 Water.

3) 3W – No. 3 Water (Chlorinated Effluent).
4) 4W – No. 4 Water (Dechlorinated Effluent).
5) SW – Seal Water.
6) FE – Final Effluent.

b. Test requirements:
1) Test medium: Water.
2) Pressure: 125 psig.
3) Duration: 6 HRS.

c. Gaskets and O-rings:
1) O-rings: Neoprene or rubber.
2) Flanged, push-on and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
3) Flanged joints (steel): Rubber, AWWA C207.
4) Grooved coupling joints (ductile and steel): Rubber, AWWA C606.

2. System components:

a. Pipe size to 1 IN:
1) Exposed service:
a) Materials: Stainless steel tubing, TP-304L.
b) Reference: ASTM A269.
c) Lining: None.
d) Coating: None.
e) Fittings: Stainless steel 304L compression type tube fittings.
f) Joints: Compression type couplings, unions at equipment and valves.
g) Minimum wall thickness:
(1) 1/16 IN OD: 0.010 IN.
(2) 1/8 to 1/4 IN OD: 0.028 IN.
(3) 5/16 to 1/2 IN OD: 0.049 IN.
(4) 5/8 to 1 IN OD: 0.065 IN.

b. Pipe size 1 IN to 3 IN:
1) Exposed service:
a) Materials:
(1) Threaded: Steel, Grade B, black, Schedule 40.
(2) Grooved type joint system: Use pipe thickness per AWWA C606.
b) Reference: ASTM A53.
c) Lining: None.
d) Coating: Paint.
e) Fittings: Malleable iron or steel meeting ASME B16.3 and ASTM A234.
f) Joints:
(1) Threaded or grooved type mechanical coupling (AWWA C606) joints.
(2) With both systems, provide rigid flanges at equipment, valves and structure penetrations above 2 IN and unions at those locations 2 IN and below.
2) Buried service:
a) Materials: Steel, Schedule 40, Grade B.
b) Reference: ASTM A53.
c) Lining: None.
d) Coating: Bituminous.
e) Fittings: Malleable iron meeting ASME B16.3.
f) Joints: Threaded.

c. Pipe size 3 IN through 24 IN:
1) Exposed service:
a) Materials:
(1) Flanged: Ductile iron, Class 53.
(2) Grooved type mechanical joint system: Use pipe thickness per AWWA C606.
b) Reference: AWWA/ANSI C115/A21.15.

c) Lining: Cement.
d) Coating: Paint.
e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
f) Joints:
(1) Flanged or grooved type mechanical coupling (AWWA C606) joints.
(2) With both systems, provide screwed-on flanges at valves, equipment and structure penetration.
**(3) <u>All joints to be restrained.</u>**

2) Buried service:
a) Materials: Ductile iron, Class 53.
b) Reference: AWWA/ANSI C151/A21.51.
c) Lining: Cement.
d) Coating: Bituminous **<u>with polyethylene encasement</u>**.
e) Fittings:
(1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
(2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 IN to 16 IN.
f) Joints: Push-on with mechanical (stuffing box type) joint at fittings and valves.
**(1) <u>All joints to be restrained.</u>**

3) FE replacement pipe as shown on 06C101:
a) Buried service:
(1) Material: PVC, ASTM D1784.
(2) Reference: AWWA C900/C905 DR25.
(3) Lining: None.
(4) Coating: None.
(5) Fittings: ASTM D3139.
(6) Gasket: ASTM F477.

J. SPECIFICATION SCHEDULE - SYSTEM 10 (NOT USED)

K. SPECIFICATION SCHEDULE - SYSTEM 11
1. General:
a. Piping symbol and service:
1) HPA – High Pressure Air.
2) IA - Instrument Air.
b. Test requirements:
1) Test medium: See the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
2) Pressure: 150 psig.
3) Duration: 6 HRS.
c. Gaskets and O-rings:
1) O-ring and flanged joints: Rubber or neoprene, 250 DegF.
2) Grooved coupling joints (steel): AWWA C606, rubber, 250 DegF.
2. System components:
a. Pipe size to 1 IN for A, 3/8 IN to 1 IN for IA:
1) Exposed service:
a) Material: Stainless steel tubing, TP-304L.
b) Reference: ASTM A269.
c) Lining: None.
d) Coating: None.
e) Fittings: Stainless steel 304L, compression type tube fittings.
f) Joints: Compression type couplings, unions at equipment and valves.
b. Pipe size 1 IN to 4 IN:
1) Exposed service:
a) Materials:

(1) Threaded: Steel, Grade B, black, Schedule 40.
(2) Grooved type joint system: Use pipe thickness per AWWA C606.
b) Reference: ASTM A53.
c) Linings: None.
d) Coating: Paint.
e) Fittings: Malleable iron meeting ASME B16.3, ASTM A197 or steel meeting ASME B16.3, ASTM A234.
f) Joints:
(1) Threaded or grooved type mechanical coupling (AWWA C606) joints.
(2) With both systems, provide rigid flanges at equipment, valves and structure penetrations above 2 IN and unions at those locations 2 IN and below.
2) Buried service:
a) Materials: Steel, Schedule 40, Grade B, black.
b) Reference: ASTM A53.
c) Lining: None.
d) Coating: Bituminous.
e) Fittings: Malleable iron meeting ASME B16.3, ASTM A197 or steel meeting ASME B16.3, ASTM A234.
f) Joints: Threaded.
3. Slope all piping mains approximately 1:100 toward points of drainage.
4. Provide driplegs at low points:
a. Provide ball type isolation valve.
b. Route dripleg to nearest wall or column and terminate 4 FT above finished floor.

L. SPECIFICATION SCHEDULE - SYSTEM 12
1. General:
a. Piping symbol and service:
1) LPA - Low Pressure Process Air.
b. Test requirements:
1) Test medium: Air.
2) Pressure: 20 psig.
3) Duration: 6 HRS.
c. Gaskets and O-rings:
1) O-rings and flanged joints: Viton, 300 DegF.
d. Temperature:
1) Normal: 170 DegF.
2) Maximum: 250 DegF.
2. System components:
1) Pipe size through 2 IN:
a) Exposed service outside of channels and tankage:
(1) Material: Steel, Schedule 40, Grade B, black.
(2) Reference: ASTM A53.
(3) Lining: None.
(4) Coating: Paint.
(5) Fittings: Malleable iron meeting ASME B16.3, ASTM A197 or steel meeting ASTM A106, Grade B.
(6) Joints:
(a) Welded with flanges at equipment and valves.
(b) Harnessed compression sleeve couplings where indicated on Drawings.
b) Piping within channels and tankage:
(1) Material: Stainless steel 304L, Schedule 40.
(2) Reference: ASTM A778.
(3) Lining: None.
(4) Coating: None.

(5) Fittings: Seamless steel 304L meeting ASTM A774.
(6) Joints:
(a) Butt welded with unions at equipment and valves.
(b) Harnessed compression sleeve couplings where indicated on Drawings.

2) Pipe size above 2 IN:
a) Exposed service outside of channels and tankage:
(1) Material: Steel, Schedule 10, Grade B, black.
(2) Reference: ASTM A53.
(3) Lining: None.
(4) Coating: Paint.
(5) Fittings: Malleable iron meeting ASME B16.3, ASTM A197 or steel meeting ASTM A106, Grade B.
(6) Joints:
(a) Welded with flanges at equipment and valves.
(b) Harnessed compression sleeve couplings where indicated on Drawings.

b) Piping within channels and tankage:
(1) Material: Stainless steel 304L, Schedule 10.
(2) Reference: ASTM A778.
(3) Lining: None.
(4) Coating: None.
(5) Fittings: Seamless steel 304L meeting ASTM A774.
(6) Joints:
(a) Butt welded with flanges at equipment and valves.
(b) Harnessed compression sleeve couplings where indicated on Drawings.

3. Aeration equipment:
a. See elsewhere for limits of responsibility and materials specification.

M. SPECIFICATION SCHEDULE - SYSTEM 13
1. General:
a. Piping symbol and service:
1) LSG – Low Pressure Sludge Gas.
b. Test requirements:
1) Test medium: Air.
2) Pressure: 10 psig.
3) Duration: 6 HRS.
c. Gaskets:
1) Flanged joints: AISI 304 stainless steel, spiral wound, non-asbestos filler, 3/16 IN thick with compression ring to match required flange dimensions.
2. System components:
a. Pipe size 1 IN and greater:
1) Exposed service:
a) Material: Stainless steel, Schedule 10S, Grade TP316L.
b) References: ASTM A312, ASME B36.19.
c) Lining: None.
d) Coating: None.
e) Fittings: Butt welded stainless meeting ASTM A774.
f) Joints: Butt welded with ASTM A182 stainless steel flanges at equipment and valves.
2) Buried service:
a) Material: Stainless steel, Schedule 40S, Grade TP316L.
b) References: ASTM A312, ASME B36.19.
c) Lining: None.
d) Coating: None.

e) Fittings: Butt welded stainless meeting ASTM A774.
f) Joints: Butt welded.

N. SPECIFICATION SCHEDULE - SYSTEM 14 (NOT USED)

O. SPECIFICATION SCHEDULE - SYSTEM 15 (NOT USED)

P. SPECIFICATION SCHEDULE - SYSTEM 16 (NOT USED)

Q. SPECIFICATION SCHEDULE - SYSTEM 17 (NOT USED)

R. SPECIFICATION SCHEDULE - SYSTEM 18 (NOT USED)

S. SPECIFICATION SCHEDULE - SYSTEM 19 (NOT USED)

T. SPECIFICATION SCHEDULE - SYSTEM 20 (NOT USED)

U. SPECIFICATION SCHEDULE - SYSTEM 21
1. General:
a. Piping symbol and service:
1) VT - Vent.
2) VTR – Vent Through Roof.
b. Test requirements:
1) Test medium: Water.
2) Pressure: See the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
3) Duration: 6 HRS.
c. Gaskets: Rubber, ASTM C564.
2. System components:
a. Pipe size 1-1/4 IN and 1-1/2 IN:
1) Exposed service.
a) Material: Galvanized steel, Schedule 40.
b) Reference: ASTM A53.
c) Lining: Galvanized.
d) Coating: Paint.
e) Fittings: Cast iron drainage.
(1) ASTM A126, Class B.
f) Joints: Threaded.
b. Pipe size 2 IN and larger:
1) Exposed service.
a) Material: Cast iron soil pipe.
b) Reference: ASTM A74, CISPI 301.
c) Lining: None.
d) Coating: Paint.
e) Fittings: ASTM A74.
f) Joints: No-hub with elastomeric sealing sleeve and stainless steel clamp assembly conforming to CISPI 301.
2) Buried service (to 5 FT outside of structure):
a) Material: Cast-iron soil pipe.
b) Reference: ASTM A74.
c) Lining: None.
d) Coating: Bituminous.
e) Fittings: ASTM A74.
f) Joints: Hub and spigot.

Soil and Waste Piping Installation:
1. Install horizontal soil or waste lines less than 4 IN diameter with a slope of not less than 1/4 IN/FT or 2 percent toward the point of disposal.
2. Install 4 IN and larger piping at 1/8 IN per foot.

3. Install as close to construction as possible to maintain maximum head room.
4. Make changes of direction with 1/8 bends and junctions with wye fittings.
5. Use short wye fittings in vertical pipe only.
6. Install handhole test tee at base of each stack.
7. Install cleanouts at dead ends, at changes of direction and at 50 FT intervals on horizontal runs.
    a. Where cleanouts occur in concealed spaces, provide with extensions to floors above or to walls as required.
8. Install piping true to grade and alignment.
    a. Begin at the system low point.
9. Locate vertical extensions of underground piping below partition walls for concealment in wall.
    a. In locations where hubs are wider than partition, set hubs 1 IN below final floor.
10. Install concealed in finished structures such as administration and office facilities and at locations shown on Drawings.
11. For hub and spigot joints, install hub facing flow.

Vent Piping Installation:

1. Run vent stack parallel to each soil or waste stack to receive branch vents from fixtures.
2. Originate each vent stack from soil or waste pipe at its base.
3. Where possible, combine soil, waste or vent stacks before passing through roof so as to minimize roof openings.
4. Offset pipes running close to exterior walls away from such walls before passing through roof to permit proper flashing.
5. Provide pipes passing through roofs with cast iron increasers minimum of 12 IN below roof one size larger than pipe but in no case less than 4 IN.
6. Terminate each vent with approved frostproof jacket.
7. Carry vent stacks 4 IN and larger full size through roof.
    a. Extend vent stacks at least 12 IN above roofing.
8. Pipe vents from pressure regulating devices in compliance with local codes.
9. Install concealed in finished structures such as administration and office facilities and at locations shown on Drawings.

V. SPECIFICATION SCHEDULE - SYSTEM 22 (NOT USED)

W. SPECIFICATION SCHEDULE - SYSTEM 23 (NOT USED)

X. SPECIFICATION SCHEDULE - SYSTEM 24 (NOT USED)

Y. SPECIFICATION SCHEDULE - SYSTEM 25 (NOT USED)

Z. SPECIFICATION SCHEDULE - SYSTEM 26 (NOT USED)

AA. SPECIFICATION SCHEDULE - SYSTEM 27

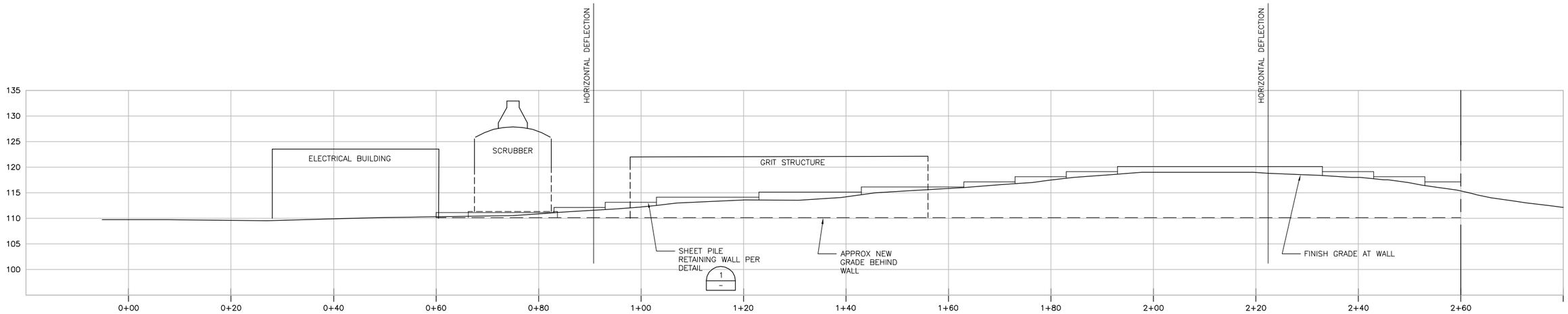
1. General:
    a. Piping symbol and service:
        1) SAM - Sample.
    b. Test requirements pressure lines:
        1) Test medium: Water.
        2) Pressure: 100 psig.
        3) Duration: 6 HRS.
    c. Gaskets and O-rings:
        1) O-rings and flanged joints: Neoprene or rubber.
2. System components:
    a. Pipe size 12 IN and smaller:
        1) Exposed service:
            a) Material: PVC, Type 1, Grade 1, Schedule 80.
            b) Reference: ASTM D1785.

c) Lining: None.
d) Coating: Paint.
e) Fittings: Solvent welded socket type complying with ASTM D2467.
f) Joints: Solvent welded with unions at valves, penetrations through structures and equipment connections for pipe 2 IN and less and flanges at those locations for pipe above 2 IN.

2) Buried service:
a) Material: PVC, Type 1, Grade 1, Schedule 40.
b) Reference: ASTM D1785.
c) Lining: None.
d) Coating: None.
e) Fittings: Solvent welded socket type complying with ASTM D2466.
f) Joints: Solvent welded.

BB. SPECIFICATION SCHEDULE - SYSTEM 28 (NOT USED)

**END OF SECTION**

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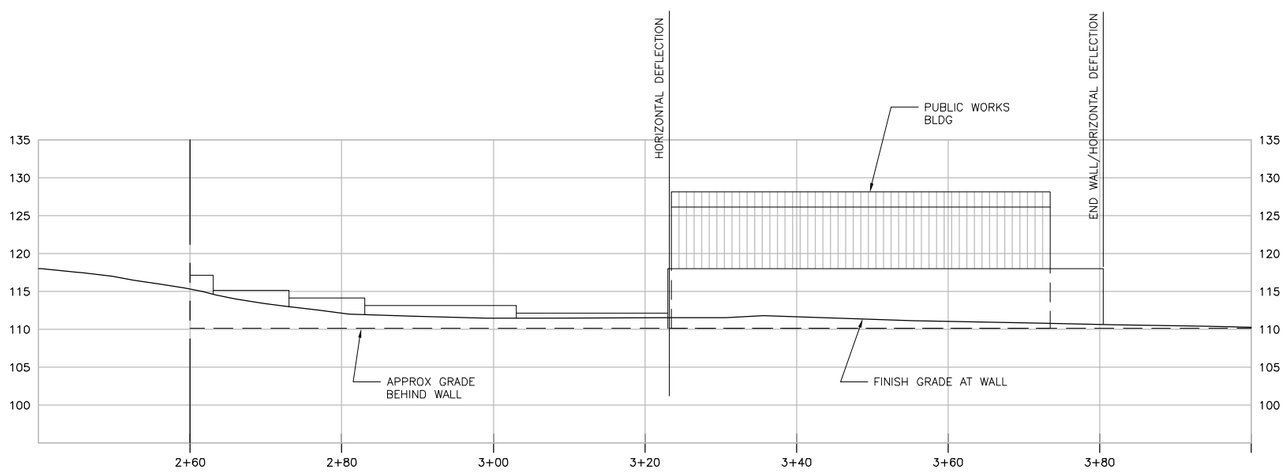


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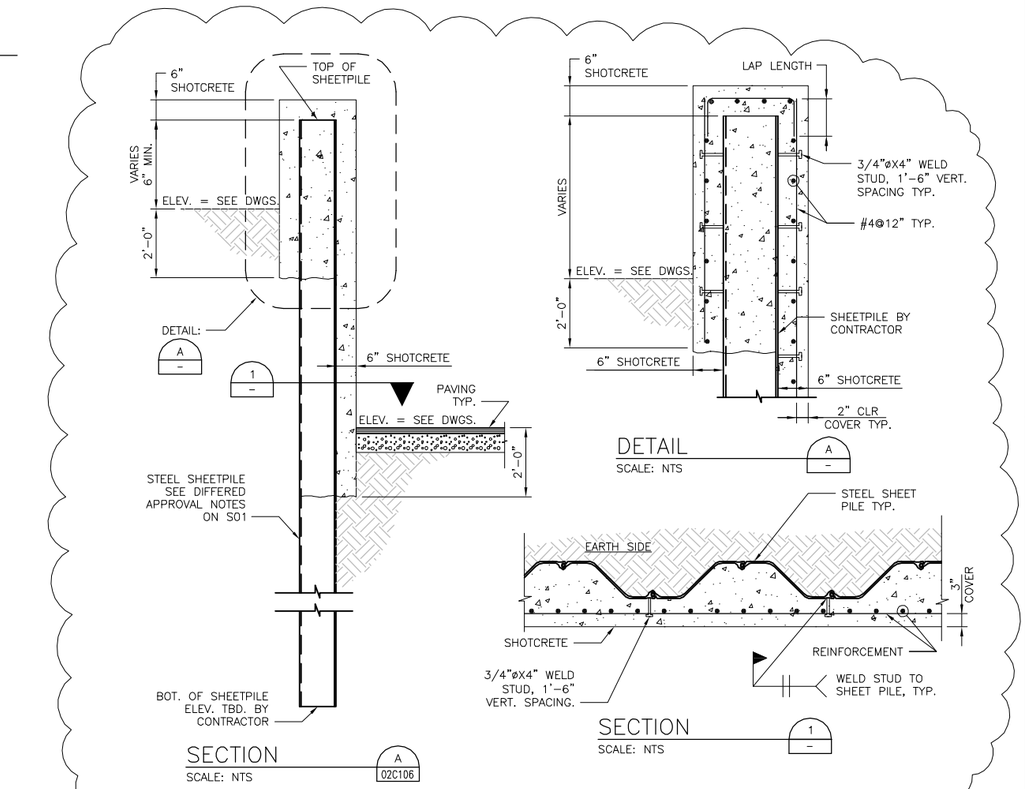


## TYPICAL SHEETPILE DETAILS

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HDR
HDR Engineering, Inc.

| ISSUE | DATE | DESCRIPTION |
|---|---|---|
| B | OCT. 2015 | ADDENDUM #1 |
| A | JUNE 2015 | ISSUED FOR BID |

| | |
|---|---|
| PROJECT MANAGER | C. OLSON |
| DESIGNED | M. PERINPAYANAGAM |
| DESIGNED | |
| CHECKED | C. OLSON |
| DRAWN | P. VAN MEURS/S.LARI |
| DATE | JUNE 30, 2015 |
| PROJECT NUMBER | 215786 |

REGISTERED PROFESSIONAL ENGINEER
CRAIG A. OLSON
NO. 39819
EXP. 12/31/15
CIVIL
STATE OF CALIFORNIA
06-30-15

CITY OF PINOLE CALIFORNIA 1903

PINOLE/HERCULES
WATER POLLUTION
CONTROL PLANT UPGRADE
CLIENT PN

**CIVIL**

**RETAINING WALL PROFILE AND DETAIL**

0 1" 2"

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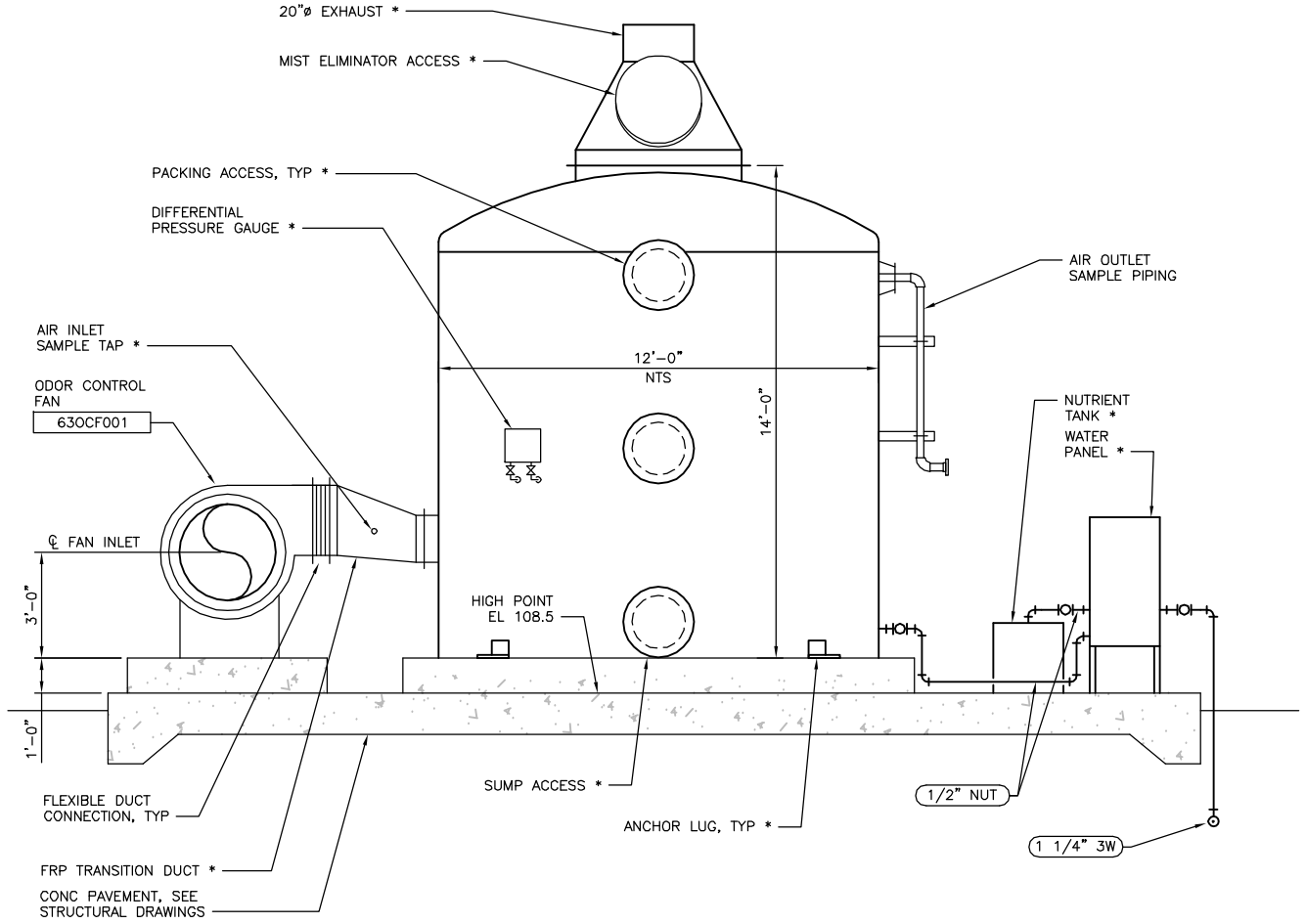
| SCALE | AS NOTED |

SHEET **02C107**




SECTION A
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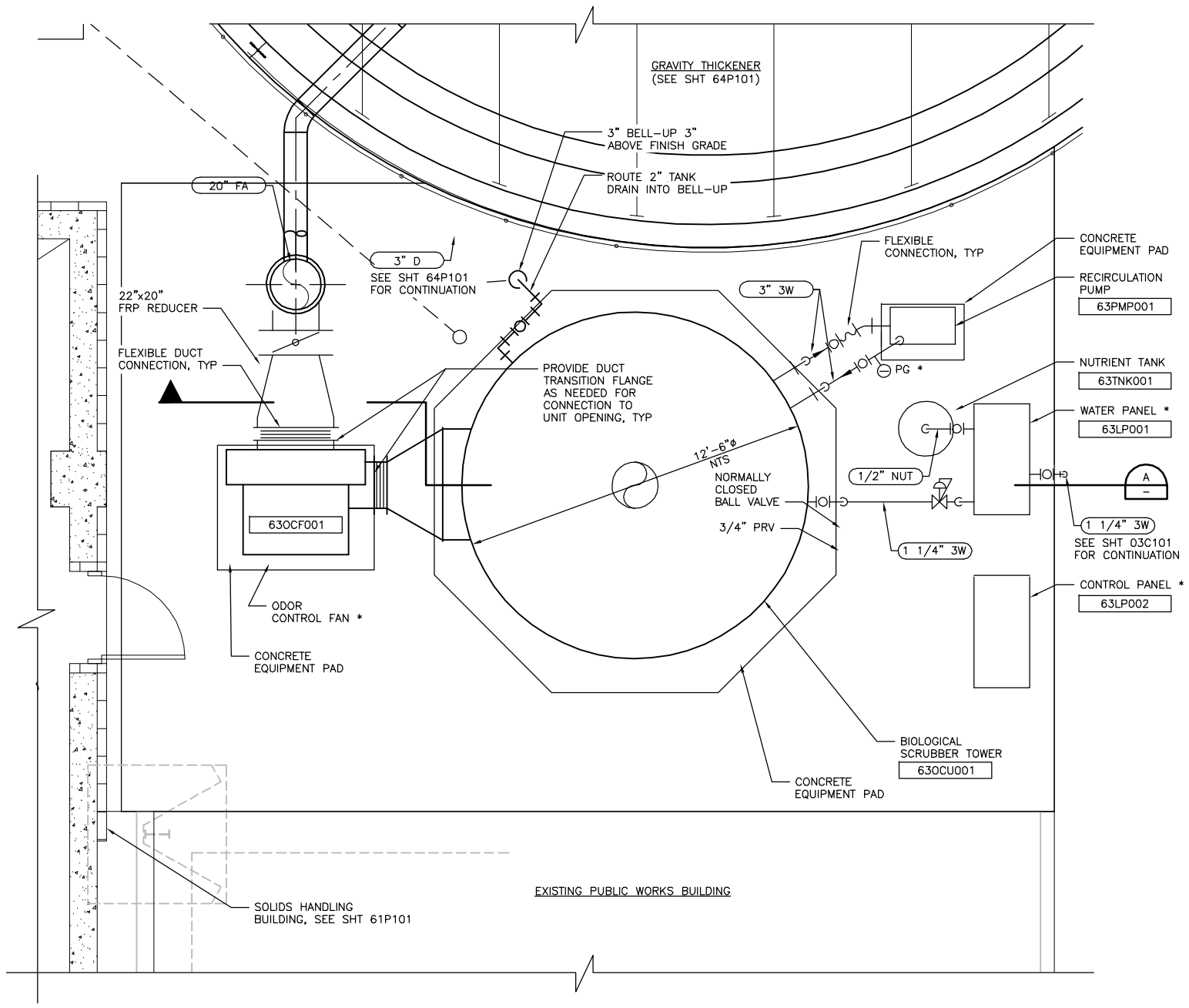


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HDR
HDR Engineering, Inc.

| ISSUE | DATE | DESCRIPTION |
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| | |
|---|---|
| PROJECT MANAGER | C. OLSON |
| DESIGNED | T. KONTONICKAS |
| DESIGNED | |
| CHECKED | C. OLSON |
| DRAWN | P. VAN MEURS |
| DATE | JUNE 30, 2015 |
| PROJECT NUMBER | 215786 |

REGISTERED PROFESSIONAL ENGINEER
THEODORE H. KONTONICKAS
NO. 29378
EXP. 06/30/17
MECHANICAL
STATE OF CALIFORNIA
06-30-15

CITY OF PINOLE CALIFORNIA 1903

PINOLE/HERCULES
WATER POLLUTION
CONTROL PLANT UPGRADE
CLIENT PN

**PROCESS**
**SOLIDS HANDLING**
**ODOR CONTROL FACILITY**
**PLAN AND SECTION**

0 1" 2"

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| FILENAME | 63P101 |
| SCALE | 1/4"=1'-0" |

SHEET
**63P101**