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| SRS Engineering Standards Manual | Manual: WSRC-TM-95-1 |
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| SAFETY • RESPONSIBILITY • SECURITY SRS SAVANNAH RIVER SITE | ENGINEERING STANDARD |
| Structural Design Criteria | STANDARD NO: 01060<br>DATE: 9/99<br>REVISION: 4<br>ESB TECH COMMITTEE: Civil/Structural |

## REVISION HISTORY

| REV | DATE | DESCRIPTION OF REVISION |
|---|---|---|
| 0 | 8/1/95 | INITIAL ISSUE |
| 1 | 10/1/96 | Included DOE Order 420.1, the SBC, requirements for concrete anchors and chipping, deleted unused acronyms and references, and editorials. |
| 2 | 07/28/97 | Included site specific design spectra for PC3 and PC4, UBC 1997 seismic loads and loading combinations and editorials. Revised basic wind speed from "fastest mile" to "three seconds gust". |
| 3 | 07/98 | Added UBC seismic ductility provisions and earthquake load factor of 1.2 for new PC-3 and PC-4 structures, increase PC-3 design basis tornado speed to 178 mph, added automobile in the PC-3 tornado missile criteria, took out dates of reference National Codes and Standards, and added notes to some loading combinations. |
| 4 | 09/99 | Added reference criteria for stacks, removed the SBC, added dynamic settlement load factor of 1.2 for new PC-3 and PC-4 structures, added correlation between Functional Classification and Performance Categories, revised PC1 and PC2 design wind speeds, and revised PC-3 design basis spectra. |
| | | |

## 1.0 PURPOSE AND SCOPE

**1.1** This document provides minimum structural design criteria for all new facilities and modifications to existing facilities, both permanent and temporary, at the Savannah River Site (SRS).

**1.2** The code year is established by the issue date of the project criteria documents. For modifications and additions to existing facilities, the Code of Record shall be established by the Design Authority. DOE Order 420.1 (Ref. 6.1.3) requires validation of existing designs, including designs with natural phenomena hazards assessment older than 10 years, against the current DOE natural phenomena hazard design criteria.

## 2.0 DOE ORDER AND STANDARDS APPLICABILITY

**2.1 DOE Orders as included in WSRC S/RID and DOE and Standards applicable for the evaluation, modification or addition to SRS facilities are listed in Section 6.1.**

**2.2** Conflict between the DOE Orders as included in WSRC S/RID and DOE Standards, National Codes and Standards, and this Engineering Standard shall be brought to the attention of Engineering Standards Board's Civil/Structural Committee Chairman for resolution.

## 3.0 NATIONAL CODES AND STANDARDS APPLICABILITY

**3.1** National Codes and Standards incorporated by reference in this document shall be the revision number and date at the time this document is invoked in the Design Output Documents, or as otherwise noted.

**3.2** The Design Output Document shall specify the applicable Codes and Standards utilized and their associated revision and date.

*3.3* The applicability of the codes and standards given in this section is limited to the extent of the references in the text.

## 4.0 ACRONYMS & DEFINITIONS

## 4.0 DEFINITIONS

### 4.1 Acronyms

The following is a list of acronyms and shortened titles used for the reference documents in this Engineering Standard. Load related symbols and factors are defined in Sections 5.2 and 5.3.

| | |
|---|---|
| ACI | American Concrete Institute |
| AASHTO | American Association of State Highway and Transportation Officials |
| ANSI | American National Standards Institute |
| APC | Atmospheric Pressure Change |
| API | American Petroleum Institute |
| AREMA | American Railway Engineering and Maintenance-of-Way Association |
| ASCE | American Society of Civil Engineers |
| ASD | Allowable Stress Design |
| AWWA | American Water Works Association |
| CFR | Code of Federal Regulation |
| CMAA | Crane Manufacturers Association of America |
| DBFL | Design Basis Flood |
| DOE | Department of Energy |
| DOE-STD | Department of Energy Standard |
| MBMA | Metal Building Manufacturers Association |
| NPH | Natural Phenomena Hazard |
| OSHA | Occupational Safety and Health Administration |
| PC | Performance Category |
| PGA | Peak Ground Acceleration |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SD | Strength Design |
| SDI | Steel Deck Institute |
| SGS | Site Geotechnical Services |
| S/RID | Standards/Requirements Identification Document |
| SRS | Savannah River Site |
| SSC | Structures, Systems, and Components |
| SQP | Structural Qualification Program for Savannah River Site Facilities |
| UBC | Uniform Building Code |
| WSRC | Westinghouse Savannah River Company |

## 4.2 Definitions

Key words and terms used in this document are defined as follows:

4.2.1 **Natural Phenomena Hazard (NPH)** - An act of nature (e.g., earthquake, wind, hurricane, tornado, flood, rain or snow precipitation, volcanic eruption, lightning strike, or extreme cold or heat) which threatens workers, the public, or the environment by potential damage to structures, systems, and components.

4.2.2 Performance Category (PC) - A classification based on a graded approach which is used to establish the NPH design and evaluation requirements for SSCs in accordance with DOE Standard 1021 (Ref. 6.1.2). Table 7.1.4 provides the methodology for assigning Performance categories for all SSCs.

**4.2.3 SQP - Structural Qualification Program for Savannah River Site Facilities, Revision 3, 1995** - The SQP provides

requirements to assess the structural design basis of SRS pre-operational and operating facilities to current DOE Orders and Standards, industry consensus codes and SRS standards and guidelines. DOE 420.1(Ref. 6.1.3) requires the contractor/operator to establish an implementation plan for evaluating and upgrading existing SSC for NPH mitigation. This program provides a plan for backfit evaluation for each facility, which will satisfy the requirements in DOE 420.1, Section 4.4.3. The methodologies used in this program are for the evaluation and upgrade of existing facilities.

## 5.0 REQUIREMENTS

### 5.1 Performance Categories

There are five Performance Categories, PC-0 through PC-4, associated with the SSC at the SRS (DOE Guide 420.1-Y, Ref. 6.1.4, andDOE-STD-1021, Ref.6.12) . The Performance Categories are based on the performance goals associated with these SSC and are expressed in terms of the annual probability of exceedance of the design basis natural phenomena hazards (See Table 7.1.1).

Interaction effects shall be considered in accordance with DOE-STD-1020 and DOE-STD-1021. See Ref. 6.2.14.7 for guidance.

### 5.2 Design Loads

SSC shall be designed for the loads prescribed in this standard and as supplemented by project specific criteria.

For additions or modifications to existing facilities, the effects of new loads transmitted to the existing SSC shall be considered. Modifications and additions shall not degrade the performance of existing SSC to the extent that they will not withstand NPH loads, provide confinement, or provide safe operation of essential facilities, protection of government property and the protection of life safety for occupants.

#### 5.2.1 Dead Load (D)

Dead loads are loads that remain permanently in place.

#### 5.2.2 Live Load (L & $L_r$)

**5.2.2.1** Live loads (L) are those loads produced by the use and occupancy of a building or other structure. Live loads on a roof ($L_r$) are those produced (1) during maintenance by workers, equipment, and materials and (2) during the life of the structure by movable objects such as temporary equipment. Also considered as live loads are the dynamic effects of operating equipment (such as cranes and pumps).

**5.2.2.2** Live loads on roofs shall be as stipulated in ASCE 7, (Ref. 6.2.6.2), AASHTO HB, (Ref. 6.2.1.1) or AREMA Manual (Ref. 6.2.5.1) as applicable.

**5.2.2.3** For modifications or analysis of existing structures, loading based on the actual use of the structure may be used. Loads identified as live loads in the original design, when known, may be counted as dead loads for the evaluation of existing structures.

**5.2.2.4** For yard structures exposed to wheel traffic, HS 20-44 (Ref. 6.2.1.1) truck loading shall be used, as a minimum, for wheel loading design. In areas subject to yard cranes, the crane wheel, track loading

or outrigger loads during lifts shall be considered.

### 5.2.3 Soil Load (H)

Structures and elements of structures retaining soil shall be designed for the lateral earth pressure and any surcharge plus any hydrostatic pressure corresponding to the maximum probable groundwater level.

### 5.2.4 Fluid Load (F)

The fluid load is the load resulting from the pressure of the fluid.

### 5.2.5 Rain Load (R)

Rain loads shall be obtained in accordance with ASCE 7. The minimum design shall be for a 25-year, 6 hour rainfall event at all performance categories. The curves provided in Engineering Standard 01110 (Ref. 6.2.14.2) shall be used to quantify the rainfall event.

### 5.2.6 Snow Load (S)

Snow loads shall be obtained in accordance with ASCE 7. Development of SRS specific snow hazard curves is not planned. The importance factor shall be 1.0 for PC-1 and PC-2 structures, and 1.2 for PC-3 and PC-4 structures.

5.2.7 Wind Load (W)

Wind load design for buildings and other structures shall be determined in accordance with the procedures in ASCE 7, using exposure "C", with the basic three-second gust wind speeds given in Table 7.1.1. The effect of the importance factor "I" is incorporated in the tabulated values for the basic wind speeds; "I" shall be taken as 1.0. The design wind speeds are derived from a DOE Memorandum (Ref. 6.1.5). For Probabilistic analysis wind hazard curve for SRS in three-second-gust speeds is available in Ref. 6.2.14.8.

For PC-3 and PC-4 structures, the design shall include consideration of wind driven missiles in accordance with DOE-STD-1020 (Ref. 6.1.1). The wind-driven missiles and the barrier thicknesses to preclude damage are provided in DOE-STD-1020. Barriers other than those given in DOE-STD-1020 may be analyzed or designed per the missile barrier criteria given in ASCE-58 (Ref. 6.2.6.3).

### 5.2.8 Tornado Load ($W_t$)

Tornado wind load design for buildings and other structures shall be also determined in accordance with the procedures in ASCE 7, using exposure "C", with the basic wind speed obtained from Table 7.1.1. The importance factor "I" shall be taken as 1.0. Tornado hazard curve for SRS in three-second -gust speeds is available in Ref. 6.2.14.10.

Tornado -driven missile criteria are given in Table 7.1.1. They are derived from requirements in DOE-STD-1020 and from recommendations in Ref. 6.2.14.10. The barrier thicknesses to preclude damage from tornado missiles are provided in DOE-STD-1020. Barriers other than those given in DOE-STD-1020 may be analyzed or designed per the missile barrier criteria given in ASCE-58.

APC shall apply for enclosed structures per provisions in DOE-STD-1020. Partially enclosed or open structures shall follow provisions in ASCE 7.

### 5.2.9 Earthquake Load (E)

#### 5.2.9.1 General

Earthquake load design for buildings and other structures shall be determined in accordance with DOE-STD-1020 and UBC (Ref. 6.2.9.1) for PC-1 and PC-2, and in accordance with DOE-STD-1020 and ASCE 4 (Ref. 6.2.6.1) dynamic analysis methods for PC-3 and PC-4.

#### 5.2.9.2 PC-1 and PC-2 Structures

For the purposes of earthquake load design for PC-1 and PC-2 structures using the UBC, the following modifications shall be made:

I = Importance factor,
= 1.0 for PC-1
= 1.25 for PC-2

The Soil Profile type at SRS may be taken as $S_D$. A review by a qualified Geotechnical Engineer of the subsurface conditions is recommended for the determination of the facility specific soil profile type.

For PC-1 and PC-2 structures regulated by SCDHEC (Ref. 6.2.15.1) UBC requirements for PC-2 shall be used for earthquake load.

#### 5.2.9.3 PC-3 and PC-4 Structures

Earthquake loads for PC-3 and PC-4 structures shall be determined in accordance with DOE-STD-1020. The site specific response spectra for PC-3 (Ref. 6.2.14.11) and PC-4 (Ref. 6.2.14.3) are given in Figure 7.2.1 and Table 7.1.3 for horizontal ground motion . The vertical site specific response spectra shall be taken as two-thirds of the horizontal spectra given in Figure 7.2.1and Table 7.1.3.

The spectra given in Table 7.1.3 and Figure 7.2.1 are considered "preliminary" in accordance with WSRC E7 Manual. To become "confirmed" SGS must review the facility specific soil conditions.

For structures with deep foundations, design response spectra appropriate for the depth shall be used.

For PC-3 and PC-4 structures regulated by Ref. 6.2.15.1, the earthquake loads given in this standard shall be considered to meet the seismic loading requirements of SCDHEC.

#### 5.2.9.4 Systems and Components

For systems and components, additional NPH evaluation requirements apply as described in Section 2.4 of DOE-STD-1020. PC-1 and PC-2 systems and components shall be designed for loads defined by the UBC. Seismic loads for PC-3 and PC-4 sub-structures or sub-systems shall be based on in-structure response spectra, or in-structure acceleration and displacement time histories. Where in-structure response spectra are needed, the methods given in Section 3.4.2 or ASCE 4 (Ref. 6.2.6.1) shall be used. Earthquake loads on new PC-3 and PC-4 systems and components shall be increased by twenty percent either through amplification of in-structure response spectra or in-structure time histories by a factor of

1.2, or through the use of the increased load factor for E in loading combinations given in Section 5.3.2.

### 5.2.10 Self Limiting Loads ($T\&T_a$)

Three types of self limiting loads (T, unless otherwise noted) shall be considered: thermal loads, creep and shrinkage, and settlement.

#### 5.2.10.1 Thermal Loads

The design of structures shall consider the effects of stresses and movements resulting from variations in temperature.

#### 5.2.10.2 Creep and Shrinkage

Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage.

#### 5.2.10.3 Settlement

Buildings and structures shall be designed for the total and differential foundation settlements, resulting from the combined static and dynamic loads. The dynamic settlement is due to dissipation of pore pressure and/or redistribution of soil stressesfrom the effects of a design basis earthquake. The dynamic portion of the settlement is to be factored by 1.2 for new facilities. The combined static and dynamic differential settlement is denoted as $T_a$ in the load combinations. The dynamic component of settlement is not taken concurrent with E.

For existing facilities, the dynamic settlement factor may be taken as 1.0.

### 5.2.11 Accident Load ($P_a$)

The consequences of a design basis accident resulting in internal pressurization shall be considered. Consequences of accidental explosions (internal or external to the facility) and generated missiles shall be considered in the design or evaluation of facilities. Consequences of potential heavy load drops shall be considered in the design or evaluation of structures.

Loads resulting from internal pressure, explosions, missile impact and heavy load drop shall be considered a $P_a$ loading.

### 5.2.12 Pipe Break Load (Y)

Effects of pipe breaks on structures, including reaction, jet, and movement, shall be considered.

### 5.2.13 Flood Load ($F_a$)

The structure shall be designed for the flooding and wave action consequences associated with flooding events with return periods of 500, 2000, 10,000, or 100,000 years for PC-1, PC-2, PC-3, or PC-4 respectively per DOE-STD-1020. Loads resulting from flooding and wave action shall be considered per Table7.1.1.

### 5.3 Load Combinations

Load combinations used for the design of an SSC are based on the SSC Performance Category and its structural material. For load combinations where a load reduces the effect of other loads, and at any time it may not be present, the load combinations shall be considered assuming the worst conditions for the load present or not.

Where loads may reverse, such as wind and seismic, both directions of loading shall be considered.

Floor live load shall be considered to vary from zero to its full value to determine the worst condition of loading for each element. Crane hook loads need not be combined with roof live load or with more than three fourths of the snow load or one half of the wind load.

#### 5.3.1 Performance Categories 0, 1, and 2

NPH loads need not be considered for PC-0 SSC.

For Allowable Stress Design (ASD), the PC-1 and PC-2 SSC shall be designed for the most critical condition resulting from the following load combinations as modified from the UBC:

ASD

1. $A = D$
2. $A = D + L + F + H + (L_r \text{ or } S \text{ or } R)$
3. $f_1 A = D + L + F + H + (W \text{ or } E/1.4)$
4. $f_1 A = D + L + F + H + W + 0.5S$
5. $f_1 A = D + L + F + H + S + 0.5W$
6. $f_1 A = D + L + F + H + S + E/1.4$
7. $f_2 A = D + L + F + H + (L_r + S + R) + (W \text{ or } E/1.4) + T$
8. $f_2 A = D + L + F + H + 0.5W + F_a$

Where:

- A is the required allowable stress capacity.

- $f_1 = 1.33$ for all stresses.
- $f_2 = 1.4$ for shear and 1.5 for all other stresses.
- For axial tension, the factored allowable stress (1.33A, or 1.5A) shall not exceed 0.7 times the ultimate tensile strength of the material.

When the design of the SSC is based on ultimate strength design (concrete) or load resistance factor design (steel), each element shall be designed to resist the most critical effects of the load factors and load combinations from the following load combinations as modified from the UBC:

<u>Concrete and Masonry (SD)</u>

1. $U = 1.4D + 1.7 L_T + 1.4F$

2. $U = 1.05D + 1.3L_T + 1.05F + 1.3H + 1.3W$
3. $U = 0.9D + 1.05F + 1.3H + 1.3W$
4. $U = 1.1\ (1.2D + 1.0\ L_T + 1.0F + 1.0H + 1.0E + 1.0T)$
5. $U = 1.1\ (0.9D + 1.0F + 1.0H + 1.0E + 1.0T)$
6. $U = 1.4D + 1.7L_T + 1.4F + 1.7H$
7. $U = 0.9D + 1.4F + 1.7H$
8. $U = 1.05\ D + 1.3L_T + 1.05F + 1.05T$
9. $U = 1.4D + 1.4T$
10. $U = 1.05D + 1.3\ L_T + 1.05F + 0.8W + 1.3H + 1.3F_a$
11. $U = 0.9D + 1.05F + 0.8W + 1.3H + 1.3F_a$

Where

- U is the required ultimate strength capacity.

- $L_T$ is the most critical value obtained from the following:

| | |
|---|---|
| $= L + 0.5\ L_r$, | $= 0.5L + L_r$, |
| $= L + 0.5S$, | $= 0.5L + S$, |
| $= L + 0.5R$, | $= 0.5L + R$ |

Steel (SD)
1. $U = 1.4D$
2. $U = 1.2D + 1.6L + 1.3F + 1.6H + 0.5\ (L_r \text{ or } S \text{ or } R)$
3. $U = 1.2D + (0.5L \text{ or } 0.8W) + 1.3F + 1.3H + 1.6\ (L_r \text{ or } S \text{ or } R)$
4. $U = 1.2D + 0.5L + 1.3F + 1.3H + 0.5\ (L_r \text{ or } S \text{ or } R) + 1.2T$
5. $U = 1.2D + 0.5L + 0.2S + 1.3F + 1.3H + 1.0E + 1.2T$
6. $U = 0.9D + 1.3F + 1.3H + (1.3W \text{ or } 1.0E) + 1.2T$
7. $U = 1.2D + 0.5L + 1.3F + 1.3H + 0.8W + 1.3F_a$
8. $U = 0.9D + 1.3F + 1.3H + 0.8W + 1.3F_a$

Where

- U is the required ultimate strength capacity.

### 5.3.2 Performance Categories 3 and 4

For Allowable Stress Design (ASD), the PC-3 and PC-4 SSC shall be designed for the most critical condition resulting from the following load combinations as modified from the UBC:

ASD
1. $A = D$
2. $A = D + L + F + H + (L_r \text{ or } S \text{ or } R)$
3. $f_1 A = D + L + F + H + (W \text{ or } 1.2E^*)$
4. $f_1 A = D + L + F + H + W + 0.5S$

5. $f_2A = D + L + F + H + S + 0.5W$
6. $f_4A = D + L + F + H + S + 1.2E^* + T + P_a + Y$
7. $f_3A = D + L + F + H + (L_r \text{ or } S \text{ or } R) + (W \text{ or } 1.2E^*) + T$
8. $f_3A = D + L + F + H + 0.5W + F_a$
9. $f_3A = D + F + H + W_t$
10. $f_3A = D + L + L_r + F + H + W_t$
11. $f_3A = D + L + L_r + F + H + W_t + T$
12. $f_4A = D + L + L_r + F + H + T_a$**
13. $f_4A = D + L + F + H + (L_r \text{ or } S \text{ or } R) + 1.2E^* + T + P_a + Y$

* For existing SSC the load factor for E may be taken as 1.0. For new systems and components the load factor for E may be taken as 1.0 if the in-structure response spectra has been amplified by a factor of 1.2 as stated in Section 5.2.9.4.

**For settlement, $T_a$, see Section 5.2.10.3

Where

- A is the required allowable stress capacity.

- $f_1$ = 1.33 for all stresses.
  - $f_2$ = 1.4 for shear and 1.5 for all other stresses.
- $f_3$ = 1.4 for shear and 1.6 for all other stresses.
  - $f_4$ = 1.4 for shear and 1.7 for all other stresses

For axial tension the factored allowable stress (1.33A, 1.5 A, 1.6A, or 1.7A) shall not exceed 0.7 times the ultimate tensile strength of the material.

When the design of the SSC is based on ultimate strength design (concrete) or load resistance factor design (steel), each element shall be designed to resist the most critical effects of the load factors and load combinations from the following load combinations as modified from the UBC:

Concrete and Masonry (SD)

1. $U = 1.4D + 1.7L_T + 1.4F$
2. $U = 1.0D + 1.15L_T + 1.0F + 1.15H + 1.15W$
3. $U = 0.9D + 1.0F + 1.15H + 1.15W$
4. $U = 1.1\ (1.2D + 1.0L_T + 1.0F + 1.0H + 1.2E^* + 1.0T)$
5. $U = 1.1\ (0.9D + 1.0F + 1.0H + 1.2E^* + 1.0T)$
6. $U = 1.4D + 1.7L_T + 1.4F + 1.7H$
7. $U = 0.9D + 1.4F + 1.7H$
8. $U = 1.05D + 1.3L_T + 1.05F + 1.05T$
9. $U = 1.4D + 1.4T$
10. $U = 1.05D + 1.3L_T + 1.05F + 1.3H + 0.8W + 1.0F_a$

11. $U = 0.9D + 1.05F + 1.3H + 0.8W + 1.0F_a$
12. $U = 1.0D_@ + 1.0F + 1.0H + 1.0W_t + 1.0T$
13. $U = 1.0D_@ + 1.0L_T + 1.0F + 1.0H + 1.0W_t + 1.0T$
14. $U = 1.1\ (1.2D + 1.0L_T + 1.0F + 1.0H + 1.2E^* + 1.0T_a^{**} + 1.0P_a + 1.0Y)$
15. $U = 1.0D_@ + 1.0T_a^{**} + 1.25P_a$

* For existing SSC the load factor for E may be taken as 1.0. For new systems and components the load factor for E may be taken as 1.0 if the in-structure response spectra has been amplified by a factor of 1.2 as stated in Section 5.2.9.4.

@ Combination with 0.9D, in place of 1.0D, shall also be considered.

**For settlement, $T_a$, see Section 5.2.10.3.

Where

- U is the required ultimate strength capacity.
- $L_T$ is the most critical value obtained from the following:

| | |
|---|---|
| $= L + 0.5\ L_r$, | $= 0.5L + L_r$, |
| $= L + 0.5S$, | $= 0.5L + S$, |
| $= L + 0.5R$, | $= 0.5L + R$ |

Steel (SD)

1. $U = 1.4D$
2. $U = 1.2D + 1.6L + 1.3F + 1.6H + 0.5\ (L_r \text{ or } S \text{ or } R)$
3. $U = 1.2D + (0.5L \text{ or } 0.8W) + 1.3F + 1.3H + 1.6\ (L_r \text{ or } S \text{ or } R)$
4. $U = 1.2D + 0.5L + 1.3F + 1.3H + 0.5\ (L_r \text{ or } S \text{ or } R) + 1.2T$
5. $U = 1.2D + 0.5L + 0.2S + 1.3F + 1.3H + 1.2E^* + 1.2T$
6. $U = 0.9D + 1.3F + 1.3H + (1.3W \text{ or } 1.2E^*) + 1.2T$
7. $U = 1.2D + 0.5L + 1.3F + 1.3H + 0.8W + 1.0F_a$
8. $U = 0.9D + 1.3F + 1.3H + 0.8W + 1.0F_a$
9. $U = 1.0D_@ + 1.3F + 1.3H + 1.0W_t + 1.0T$
10. $U = 1.0D_@ + 1.0L + 1.0L_r + 1.3F + 1.3H + 1.0W_t + 1.0T$
11. $U = 1.0D_@ + 1.0L + 1.0L_r + 1.0F + 1.0H + 1.2E^* + 1.0T_a^{**} + 1.0P_a + 1.0Y$
12. $U = 1.0D_@ + 1.0F + 1.0H + 1.0T_a^{**} + 1.25P_a$

* For existing SSC the load factor for E may be taken as 1.0. For new systems and components see also the load factor for E may be taken as 1.0 if the in-structure response spectra has been amplified by a factor of 1.2 as stated in Section 5.2.9.4.

@ Combination with 0.9D, in place of 1.0D, shall also be considered.

**For settlement, $T_a$, see Section 5.2.10.3.

Where

- U is the required ultimate strength capacity.

#### 5.3.3 Load Combinations for Highway and Railway Structures

Load combinations for highway structures shall be in accordance with AASHTO HB (Ref. 6.2.1.1). Load combinations for railway structures shall be in accordance with AREMA Manual (Ref. 6.2.5.1).

### 5.4 Materials

The UBC shall be followed consistent with the code used in conjunction with Sections 5.2 and 5.3 for allowable material strength capacities and detailing requirements for all structures except as noted below.

| | |
|---|---|
| Highway Structures: | AASHTO HB (Ref. 6.2.1.1) |
| Railway Structures; | AREMA Manual (Ref. 6.2.5.1) |
| Steel Decks: | SDI-28 and SDI DDM02 (Ref. 6.2.13.1 and 6.2.13.2) |
| Pre-engineered Buildings: | MBMA Metal Building System Manual (Ref. 6.2.10.1) |
| Austenitic Stainless Steel: | UBC ASD steel provisions with N690 (Ref. 6.2.3.1) allowables for axial compression |
| Cold Formed Stainless Steel | ANSI/ASCE 8 (Ref. 6.2.6.5) |
| PC-1 and PC-2 Atmospheric Steel Water Tanks: | AWWA D100 (Ref. 6.2.7.1) |
| PC-1 and PC-2 Atmospheric Steel Petroleum Storage Tanks | API 650 (Ref. 6.2.4.1) |
| Sanitary Concrete Structures: | ACI 350 (Ref. 6.2.2.5) |
| PC-3 and PC-4 Concrete Anchorage: | ACI 349, Appendix B (Ref. 6.2.2.4) |
| PC-1 and PC-2 Fiber Reinforced Plastic | ASCE Manual 63 (Ref. 6.2.6.4) |
| Concrete Chimneys | ACI 307 (Ref. 6.2.2.6) |
| Steel Stacks | ASME STS-1 (Ref. 6.2.12.1) |

#### 5.5 Miscellaneous Requirements

#### 5.5.1 Sliding, Overturning, and Buoyancy

Buildings and structures shall be designed to resist overturning, sliding and buoyancy due to earthquake, wind, tornado, lateral earth pressures, or fluid loads in accordance with Section 5.2 of this Engineering Standard with minimum safety factors provided in Table 7.1.2.

### 5.5.2 Foundation Design

Foundations shall be designed in accordance with the requirements of the UBC, except as noted below:

- Drilled piers shall comply with ACI 336.3R (Ref. 6.2.2 3).

- Design of piers, posts or poles per UBC is acceptable for depths less than 20 feet and provided that the ratio of length to relative stiffness factor is greater than 5 (see ACI 336.3R, Ref. 6.2.2.3).

- Ribbed-mat slabs shall comply with ACI 336.2R (Ref. 6.2.2.2).

#### 5.5.3 Shoring Design

Shoring design shall comply with requirements of UBC, and OSHA 29 CFR Part 1926 (Ref. 6.2.11.1).

#### 5.5.4 Craneway Design

Crane runway and supporting structure shall be designed per CMAA Specification #70 (Ref. 6.2.8.1) or #74 (Ref. 6.2.8.2) requirements as applicable.

#### 5.5.5 Fire Enclosure Evaluations of Concrete Elements

In the structural evaluation of concrete elements for fire events, where necessary, the provisions found in ACI 216 (Ref. 6.2.2.1) shall be followed.

#### 5.5.6 Concrete Anchors

PC-1 and PC-2 concrete anchors shall be designed per requirements of UBC (Ref. 6.2.9.1).

PC-3 and PC-4 concrete anchors shall be designed per requirements of ACI 349 Appendix B (Ref. 6.2.2.4).

Information useful for the design, selection and qualification of concrete expansion anchors, cast-in-place anchors and grouted anchor bolts is provided in 03251-G (Ref. 6.2.14.4). Information useful for installation and testing of concrete expansion anchors, cast-in-place anchors and grouted anchor bolts is provided in 03252-G (Ref. 6.2.14.5).

### 5.5.7 Coring, Chipping, and Drilling in Concrete

Coring, chipping and drilling in concrete elements or structures shall be per 03010-G (Ref. 6.2.14.6).

### 5.5.8 Concrete for Confinement

Concrete used for confinement shall consider liquid containment strategies given in Ref. 6.2.6.6.

### 5.5.9 Fragility Analysis

The existing SSC that do not meet the deterministic limits of this standard may be further evaluated using median failure limits and variabilities calculated for the given SSC.

### 5.5.10 Ductility Provisions

Seismic ductility provisions for UBC Seismic Zone 3 shall be used for new PC-3 and PC-4 structures.

## 6.0 REFERENCES

### 6.1 DOE Orders as included in WSRC S/RID, and DOE Orders and Standards and Memoranda

6.1.1 DOE-STD-1020-94 - NPH Design and Evaluation Criteria for DOE Facilities, Change Notice 1, January 1996.

6.1.2 DOE-STD-1021-93 - NPH Performance Categorization Criteria for Structures, Systems, and Components, Change Notice 1, January 1996.

6.1.3 DOE Order 420.1 - Facility Safety, Change 2 dated October 24, 1996.

6.1.4 DOE Guide 420.1-Y, Interim Guidelines for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Non-Nuclear Facilities.

6.1.5 A Memorandum of January 22, 1998 from DOE to the Office of Nuclear Safety Policy and Standards: H. Chander, Newsletter (Interim Advisory on Straight Winds and Tornados).

#### 6.2 Codes and Standards

### 6.2.1 American Association of State Highway and Transportation Officials (AASHTO)

6.2.1.1 Standard Specification for Highway Bridges (AASHTO HB)

### 6.2.2 American Concrete Institute (ACI)

6.2.2.1 ACI 216 Guide for Determining the Fire Endurance of Concrete Elements

6.2.2.2 ACI 336.2R Suggested Analysis and Design Procedures for Combined Footings and Mats

6.2.2.3 ACI 336.3R Design and Construction of Drilled Piers

6.2.2.4 ACI 349 Code Requirements for Nuclear Safety Related Concrete Structures

6.2.2.5 ACI 350 Environmental Engineering Concrete Structures

6.2.2.6 ACI 307 Standard Practice for the Design and Construction of Reinforced Concrete Chimneys

**6.2.3 American Institute of Steel Construction (AISC)**

6.2.3.1 ANSI/AISC N690 Nuclear Facilities: Steel Safety-Related Structures for Design, Fabrication and Erection

**6.2.4 American Petroleum Institute (API)**

6.2.4.1 API 650 Welded Steel Tanks for Oil Storage

**6.2.5 American Railway Engineering and Maintenance-of-Way Association (AREMA)**

6.2.5.1 *AREMA* Manual for Railway Engineering, Volume I and II

**6.2.6 American Society of Civil Engineers (ASCE)**

6.2.6.1 ASCE 4 Seismic Analysis of Safety Related Nuclear Structures

6.2.6.2 ANSI/ASCE 7 Minimum Design Loads for Buildings and Other Structures

6.2.6.3 ASCE 58 Structural Analysis and Design of Nuclear Plant Facilities

6.2.6.4 ASCE Manual 63 Structural Plastic Design Manual

6.2.6.5 ANSI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members

6.2.6.6 Concrete Watertight Structures and Hazardous Liquid Containment, Robert Hengst, ASCE

**6.2.7 American Water Works Association (AWWA)**

6.2.7.1 AWWA D100 Welded Steel Tanks for Water Storage

**6.2.8 Crane Manufactures Association of America (CMMA)**

6.2.8.1 CMMA Specification #70, Electrical Overhead Traveling Cranes

6.2.8.2 CMMA Specification #74, Specifications for Top Running and Under Running Types of Single Girder Electric Overhead Traveling Cranes

**6.2.9 International Conference of Building Officials (ICBO)**

6.2.9.1 Uniform Building Code (UBC)

**6.2.10 Metal Building Manufacturers Association (MBMA)**

6.2.10.1 *Low Rise* Building Systems Manual

**6.2.11 Occupational Safety and Health Administration (OSHA)**

6.2.11.1 29 CFR Part 1926 OSHA Safety and Health Standards

**6.2.12 American Society of Mechanical Engineers**

6.2.12.1 ASME STS-1 Steel Stacks

**6.2.13 Steel Deck Institute (SDI)**

6.2.13.1 SDI - Publ 28 Design Manual for Composite Decks from Decks and Cellular Metal Deck with Electrical Distribution

6.2.13.2 DDM02 Diaphragm Design Manual

**6.2.14 SRS Standards, Reports and Calculations**

6.2.14.1 SQP Seismic Qualification Program, Rev. 3, 1995

6.2.14.2 Engineering Standard 01110, Civil Site Design Criteria

6.2.14.3 SRS Seismic Response Analysis and Design Basis Guidelines, WSRC-TR-97-0085, Rev. 0, R. C. Lee, M. E. Maryak and M. D. McHood, March 1997

6.2.14.4 Concrete Expansion Anchors, Cast-in Place Anchors and Grouted Anchor Bolts Engineering Guide 03251-G

6.2.14.5 Installation and Testing of Concrete Anchors, Engineering Guide 03252-G

6.2.14.6 Coring, Chipping and Drilling in Concrete, Engineering Guide 03010-G

6.2.14.7 Evaluation of Seismic Spatial Interactions Between Facility Structures, Systems, and Components, Engineering Guide, 11520-G

6.2.14.8 Tornado, Maximum Wind Gust, and Extreme Rainfall Event Occurrence Frequencies at the Savannah River Site (U), WSRC-TR-98-00329, September 1998.

6.2.14.9 Engineering Standard 01060, Rev. 2, Data Letter, TCDL-037, Rev. 0, August 1997.

6.2.14.10 Tornado Hazard Assessment, Memo from McDonald-Mehta Engineers to Brent Gutierrez, November 9, 1997.

6.2.14.11 "Revised Envelope of the Site Specific PC3 Surface Ground Motion", Memo from Brent Gutierrez to Lawrence Salomone and Fred Loceff, September 9, 1999.

**6.2.15 State of South Carolina, Department of Health and Environmental Control (SCDHEC)**

6.2.15.1 Final Regulation, Department of Health and Environmental Control, Chapter 61, 61-104, Hazardous Waste Management Location Standards, Statutory Authority: 1976 Code Section 44-56-30, -35, et. seq.

### 6.2.16 U.S. Nuclear Regulatory Commission (USNRC)

6.2.16.1 NUREC-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, U.S. NRC

## 7.0 TABLES and FIGURES

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7.1.1 Natural Phenomena Hazards Criteria

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7.2.1 PC-3 and PC-4 Site Specific Spectra, Horizontal 5% Damping

**TABLE 7.1.1 - Natural Phenomena Hazards Criteria**

| | Performance Category | PC-0 | PC-1 | PC-2 | PC-3 | PC-4 |
|---|---|---|---|---|---|---|
| | Performance Goal Annual Probability of Exceedance | NA | $1x10^{-3}$ | $5x10^{-4}$ | $1x10^{-4}$ | $1x10^{-5}$ |
| S* E I S M I C | Required Minimum Annual Hazard Exceedance Probability | NA | $2x10^{-3}$ | $1x10^{-3}$ | $5x10^{-4}$ | $1x10^{-4}$ |
| | Peak Ground Acceleration(PGA)** | NA | ** | ** | ** | ** |
| W | Annual Hazard Exceedance Probability | NA | $2x10^{-2}$ | $1x10^{-2}$ | $1x10^{-3}$ | $1x10^{-4}$ |
| | Three Second Wind Speed, mph | NA | 100 | 107 | 133 | 160 |

| | | | | | | |
|---|---|---|---|---|---|---|
| IND | Missile Criteria | NA | NA | NA | 2x4 timber plank 15 lb. @ 50 mph (horiz); max height 30 ft. | 2x4 timber plank 15 lb. @ 50 mph (horiz); max height 50 ft. |
| TORNADO | Annual Hazard Exceedance Probability | NA | NA | NA | $2x10^{-5}$ | $2x10^{-6}$ |
| | Three Second Wind Speed, mph | NA | NA | NA | *178* | *TBD* |
| | Atmospheric Pressure Change (APC) | NA | NA | NA | *TBD* | *TBD* |
| | Missile Criteria | NA | NA | NA | 2x4 timber plank 15 lb. @ 100 mph (horiz); max height 150 ft; 70 mph (vert)<br><br>3 in dia std steel pipe, 75 lb @ 50 mph (horiz); max height 75 ft; 35 mph (vert)<br><br>*3000 lb automobile @ 19 mph rolls and tumbles* | 2x4 timber plank 15 lb. @ 150 mph (horiz); max height 200 ft; 100 mph (vert)<br><br>3 in dia std steel pipe, 75 lb @ 75 mph (horiz); max height 100 ft; 50 mph (vert)<br><br>3000 lb automobile @ 25 mph rolls and tumbles |
| FLOOD | Annual Hazard Exceedance Probability | NA | $2x10^{-3}$ | $5x10^{-4}$ | $1x10^{-4}$ | $1x10^{-5}$ |
| | Roof Design | NA | TBD | TBD | TBD | TBD |
| | DBFL | NA | TBD | TBD | TBD by Facility | TBD by Facility |

* The SCDHEC (Ref. 6.2.15.1) seismic provisions for Hazardous Waste Management locations of 10% probability of occurrence in 250 years is equivalent to a return period of about 2400 years. This corresponds to an annual exceedance probability of approximately 4.2E-4. The PGA determined for a PC-3 (annual hazard exceedance probability of 5E-4) is 0.16g. The typical PGA for PC-2 exceeds that required by the SCDHEC provisions.

** For PC-1 and PC-2 seismic provisions, see Section 5.2.9.2. For PC-3 and PC-4 seismic provisions, see Section 5.2.9.3.

**Table 7.1.2 - Factors of Safety**

| Performance Category | Analysis | DBE | DBT | DBFL | DBW |
|---|---|---|---|---|---|
| **PC-4[1]** | Overturning | 1.1[3] | 1.1[5] | | 1.5[4] |
| | Sliding | 1.1[3] | 1.1[5] | | 1.5[4] |
| | Buoyancy | | | 1.1[6] | |
| **PC-3[1]** | Overturning | 1.1[3] | 1.1[5] | | 1.5[4] |
| | Sliding | 1.1[3] | 1.1[5] | | 1.5[4] |
| | Buoyancy | | | 1.1[6] | |
| **PC-2[2]** | Overturning | 1.0[3] | | | 1.5[4] |
| | Sliding | 1.0[3] | | | 1.5[4] |
| | Buoyancy | | | 1.0[6] | |
| **PC-1[2]** | Overturning | 1.0[3] | | | 1.5[4] |
| | Sliding | 1.0[3] | | | 1.5[4] |
| | Buoyancy | | | 1.0[6] | |

Notes:
1. For PC-3 and PC-4 facility foundation design, these values are taken from the Standard Review Plan, NUREG 0800, Section 3.8.5 (Ref. 6.2.16.1). These factors of safety are *for* combinations provided in Notes 3, 4, 5, or 6, as applicable.
2. For PC-2 and PC-1, the factors of safety are consistent with the SBC and UBC for

earthquake loads and ASCE 7 for normal wind loads and are *for* combinations provided in Notes 3, 4, and 6, as applicable.

3. D + H + *( 1.2E*/1.4)*

4. D + H + W

5. D + H + *( $W_t$ /1.4)*

6. D + $F_a$

Where:
D = Dead Load
H = Lateral Earth Pressure
W = Wind Load
E = Earthquake Loads
$F_a$ = Buoyant Forces
$W_t$ = Tornado Loads

* For existing structures the 1.2 load factor for E may be taken as 1.0
For clarification on the unfactored earthquake load see the Data Letter (Ref. 6.2.14.9).

| **Table 7.1.3 — PC-3 and PC-4 Site Specific Spectra, Horizontal 5% Damping** | |
|---|---|
| **PC3 Reference 6.2.14.11** | |
| **Frequency (Hz)** | **Horizontal Spectral Acceleration (g)** |
| 0.10 | 0.0075 |
| 0.20 | 0.030 |
| 0.25 | 0.049 |
| 0.30 | 0.065 |
| 0.35 | 0.085 |
| 0.40 | 0.104 |
| 0.45 | 0.121 |
| 0.50 | 0.135 |
| 0.60 | 0.1677 |
| 2.00 | 0.375 |
| 9.00 | 0.375 |
| 33.0 | 0.160 |
| 100.0 | 0.160 |
| **PC4 Reference 6.2.14.3** | |
| **Frequency (Hz)** | **Horizontal Spectral Acceleration (g)** |
| 0.1 | 0.0067 |
| 0.2 | 0.0311 |
| 0.3 | 0.0632 |
| 0.4 | 0.1519 |
| 0.5 | 0.2411 |

| | |
|---|---|
| 0.5 | 0.5411 |
| 0.7 | 0.4813 |
| 1.5 | 0.760 |
| 7 | 0.655 |
| 18 | 0.350 |
| 33 | 0.227 |
| 100 | 0.227 |

**Table 7.1.4 Performance Categories**

Performance Categories are used as a means to ensure a graded level of protection for structures, systems, and components during Natural Phenomena Hazard (NPH) events. Functional Classifications are used to determine the minimum Performance Categories (PC) of SSCs in accordance with DOE Order 420.1 and DOE-STD-1021-93. Performance Categories PC-0 through PC-4 are assigned based on the function of the SSC as determined during the Functional Classification process. The table below provides the correlation between Functional Classification and Performance Categories. For replacement SSCs, Natural Phenomena Hazard (NPH) qualification, as a minimum, shall be the same as the original SSC through the provisions of DOE Order 420.1 Section 4.4.2. For all other conditions, SSCs shall be NPH qualified commensurate with the assigned Performance Category. This table provides the minimum requirements for compliance with DOE Order 420.1. Factors other than Functional Classification that are to be considered in determining the PC include programmatic mission, cost and replaceability of the SSC. It may be prudent based on other considerations such as mission importance or economic reasons to increase the performance category to provide a higher level of assurance.

| Functional Classification (Note 1) | Performance Category |
|---|---|
| Safety Class (Reactors) | PC-4 |
| Safety Class (Non-reactor) | PC-3 |
| Safety Significant | PC-2 |
| | |
| Production Support (Note 2) and General Services (Notes 2 and 5) except for the following: | PC-1 |
| Criterion 3 for Production Support in Attachment 8.5 to the Procedure 2.25, Note 1, (Emergency Plan) | PC-2 |
| Assembly of more than 300 people (Note 3) | PC-2 |
| Emergency Equipment (Note 4) | PC-2 |

Notes:

(1) Criteria for Functional Classifications are identified in Manual E7, Procedure 2.25.

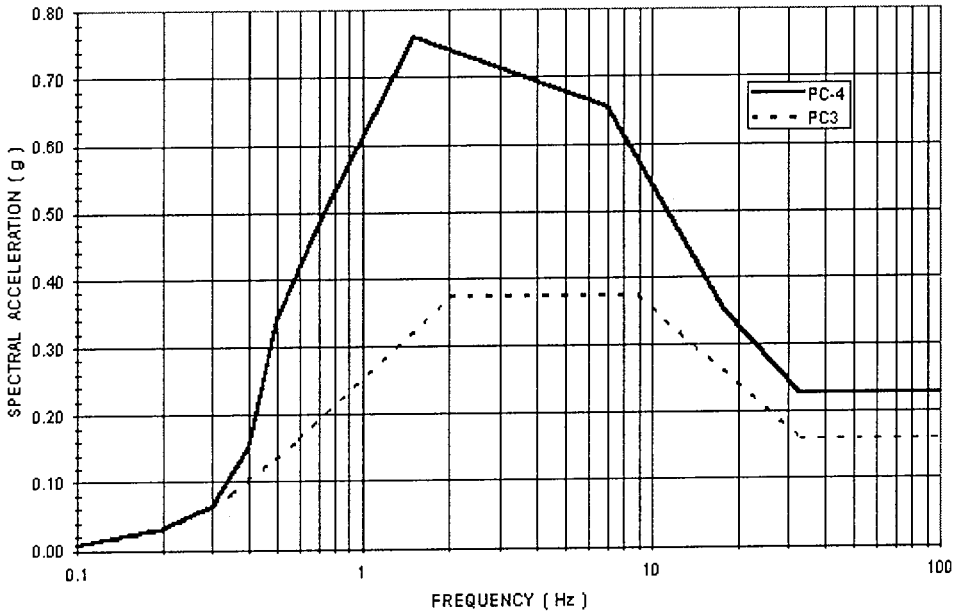
(2) In buildings that have routine human occupancy, the structure and any system or component whose failure could cause fatality or serious injury to in-facility workers shall be designed, as a minimum, to PC1.

(3) This Performance Category is defined in DOE Order 420.1 and DOE Standard 1021-93.

(4) Per DOE STD-1021-93, this includes SSCs such as emergency handling (fire station, medical facilities), hazard recovery, those related to emergency preparedness (emergency operations facilities) and communications that may be needed to preserve the health and safety of workers and visitors.

(5) Some General Services SSCs may be designed without consideration of NPH loads (PC0). This may be done when there is non human occupancy, no safety, and no mission considerations, and it is more cost effective to replace or repair the SSC than to design it to withstand NPH effects. Any SSC whose failure can affect the performance of a Performance Category 1,2,3 or 4 SSC, as determined by an interaction (two over one) evaluation, shall not be placed in PC-0.

**Figure 7.2.1**
**Site Specific Spectra, Horizontal 5% Damping**



K-TRT-F-00001
Rev. 0
May 1999

# F-Area Northeast Expansion Report (U)

Site Geotechnical Services Department

UNCLASSIFIED

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

Prepared for the U.S. Department of Energy Under Contract No. DE-AC09-89SR18035

UNCLASSIFIED

OSR 31-688 (Rev 11-20-97)
Stores: 26-8910.00

WESTINGHOUSE SAVANNAH RIVER COMPANY

# INTEROFFICE MEMORANDUM

Date: February 26, 2001 PEC-SGS-2001-00011

To: Distribution

From: Frank Syms, 730-2B/1084 FS.

**Subject: Revisions to K-TRT-F-00001, F-Area Northeast Expansion Report (U)**

Summary of revisions made to K-TRT-F-00001, Rev 1, dated January 2001 include:

1. Pages 12 and 13- Text revised on engineering stratigraphy.
2. Table 3.3-1- Stratigraphic picks revised on CPT soundings 176, 180 and 186.
3. Table 3.3-3- Soft zone thickness revised for SPT boring FB-20.

If you have questions, please contact me at (803) 952-6927.

c: Russ Beckmeyer, 730-2B/130
Mike Lewis, 730-2B/116
Larry Salomone, 730-B/304
Chester Reeves, 730-2B/1083
SGS Files, 730-2B/1102

Project:

F-Area Northeast Expansion

Document:

K-TRT-F-00001, Rev.0

Title:

F-Area Northeast Expansion Report (U)

Prepared by:

| | |
|---|---|
| F. H. Syms, Geotechnical Engineering, SGS Department | 5-28-99<br>Date |

Approvals:

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| M. R. Lewis | 5/28/99 |
| M.R. Lewis, Manager, Geotechnical Engineering, SGS Department | Date |
| L. A. Salomone | 6/1/99 |
| L. A. Salomone, Site Chief Geotechnical Engineer, SGS Department | Date |

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# 1. INTRODUCTION

A geotechnical program has been completed in F-Area at the Savannah River Site (SRS) in South Carolina. This program investigated the subsurface conditions for the area known as the "northeast expansion" located in the F-Area (Figure 1.0-1). The primary focus was to gather subsurface information within the expansion area and tie this information with the detailed studies completed for the Actinide Packaging and Storage Facility (APSF) located southwest and adjacent to the northeast expansion area (Figure 1.0-2) and the balance of F-Area.

Data acquired from the APSF investigation includes both field exploration and laboratory data, which are included within this report for summary and comparison purposes. Results of this investigation are intended to be used as baseline subsurface conditions for the siting of potential new mission facilities. Further, this data will augment specific foundation design investigations for the proposed new mission facilities to be constructed in this area. Specifically, the program consisted of a field exploration program consisting of Standard Penetration Test (SPT) borings and Seismic Piezocone Penetration Test (SCPTU) soundings; a laboratory testing program and an evaluation of subsurface conditions.

This geotechnical program was performed by SRS Projects Engineering and Construction Division (PE&CD), Site Geotechnical Services (SGS) Department, in conformance with DOE Order 420.1, Procedure Manual E7, (WSRC, 1996a), and SGS Procedure Manual E9 (WSRC, 1996b).

## 1.1 Purpose and Objectives

The purpose of the investigation was to obtain geotechnical information to characterize the subsurface conditions within the northeast expansion area and compare these conditions with the adjacent APSF area. Specific objectives included:

- define the engineering stratigraphy and compare the continuity, thickness and relative elevation of stratigraphic units across the study site respective to the APSF area;

- determine the index properties of each stratigraphic layer and make a direct comparison to properties determined for the APSF stratigraphy ;
- evaluate the presence, thickness and stratigraphic position of soft zones; and
- evaluate the subsurface conditions in terms of relative geotechnical and foundation capability.

## 1.2 Report Organization

The text of this report includes five sections. These sections are: Section 1, Introduction; Section 2, Subsurface Exploration; Section 3, Subsurface Conditions; Section 4, Geotechnical and Foundation Assessment, Section 5, Conclusions and Recommendations; and Section 6, References. These sections are followed in succession by tables and figures.

Appendices to this report include: Appendix A, Boring Logs; Appendix B, Laboratory Test Data; and Appendix C, Seismic Piezocone Penetrometer Test Soundings.

This report is divided into two volumes: Volume 1 contains the text, tables, and figures, Volume 2 contains appendices A , B and, C.

## 1.3 Quality Assurance

Quality related activities performed by WSRC/BSRI organizations during the Geotechnical Investigation were controlled in accordance with the WSRC QA Program as delineated in WSRC Procedure Manual 1Q. Activities were also controlled via compliance to the applicable administrative and technical procedures contained in WSRC Procedure Manual E9, "Site Geotechnical Services."

Cone Penetration Testing was conducted in accordance with the Quality Assurance Plan for WSRC Subcontract AA82276N, with Applied Research Associates, Inc. (ARA) and the ARA Quality Assurance Program for Cone Penetration Testing, Revision 3 (7/30/96). Subcontractor compliance with their implementing procedures and instructions (ARA-Q-101 through 107) also ensured the integrity of the CPT results and interpretations.

Soil testing performed by Law Engineering of Atlanta, Georgia (WSRC Subcontract No. AB80111N) was accomplished through compliance with the Law Engineering QA Program as delineated in the Law Engineering Quality Assurance Manual, Revision 1 (7/25/97), and applicable national/industry test standards (as specified in procurement specification K-SPC-G-00016, Revision 0).

SGS QA provided quality oversight over all quality related activities of the geotechnical investigation. SGS QA oversight activities included: the review and approval of all technical and quality procedures and instructions developed specifically for the investigation; monitoring field activities, sample handling, and soil testing laboratory activities; and providing direct QA oversight over seismic piezocone penetration testing activities.

QA/QC activities were also performed by Law Engineering and Applied Research & Associates personnel as prescribed in their respective QA plans, QA programs, and QA technical procedures.

## 2. SUBSURFACE EXPLORATION

Between August, 1995 and June, 1998, field exploration programs to support various design stages of the Actinide Packaging and Storage Facility (APSF) were completed. The information from both programs forms the basis for this report. The exploration program for the F-Area northeast expansion area was completed between February 1998 and April 1999. Within this time frame, the majority of the field investigation was completed between February 1998 and May 1998 after which work was suspended until the following fiscal year. Field work resumed in March of 1999 and was completed in April 1999.

The exploration programs consisted of a series of Standard Penetration Test (SPT) borings, Piezocone Penetration Test (CPTU) and Seismic Piezocone Penetration Test (SCPTU) soundings, both of which are referred to as CPT hereafter. Some SPT borings and CPT sounding locations were paired so that a site-specific comparison of results could be obtained. Figure 2.0-1 shows the locations of all borings and soundings.

The borings and soundings were advanced in a grid pattern, roughly 150 feet by 150 feet, covering the expansion area to the north and east of the APSF area. However, in heavily wooded areas, areas where site topography was too steep, or where access could not be obtained due to existing construction trailers, the exploration locations were not performed. This was limited to eight points in the northern and eastern most extent of the area (Figure 2.0-1). Exploration in these areas would be required as construction of new facilities is planned.

The SCPTU was used as the primary exploration technique. SPT borings were located adjacent to selected soundings to measure N-values and retrieve soil samples for laboratory classification testing. Test methods, equipment, and general field procedures, are summarized in the following sections. The following list summary field exploration completed for the northeast expansion investigation:

- 39 Seismic Piezocone Penetrometer Test (SCPTU) Soundings
- 4 Cone Penetrometer Samples
- 9 Standard Penetration Test (SPT) Borings (4 of which were continuous)

## 2.1 Field Test Location and Clearance

The selection of the boring locations, CPT soundings, and other field work was based primarily on the following criteria and factors:

- Existing Data;
- Data coverage;
- Site conditions (topography, wooded areas, etc.);
- Type of data required;
- Under-and-above ground interferences; and
- Presence of known soft zones.

Approval of the selected location for the field work was preceded by a series of work coordination steps as summarized below (the organization responsible for each step is noted in parentheses):

- Selection of general area based upon the factors listed above (SGS);
- Preliminary interference research (Construction Layout);
- Ground penetrating radar survey (Operations Department);
- Preparation of work package (SGS);
- Work Process Control (Operations Department); and
- Field survey (Construction Layout).

This detailed site clearance routine was essential for safe field operations. Any obstacles or restrictions encountered in any step during this process required the relocation of the proposed boring or sounding location, and therefore the re-initiation of the process.

## 2.2 Equipment and Field Test Methods

All equipment used in the field investigations met applicable ASTM standards and site standards and procedures as listed below:

- WSRC E9 SGS-GT-202 - Drilling Practices;
- WSRC E9 SGS-GT-203 - Sample Preparation, Handling and Storage;
- WSRC E9 SGS-GT-206 - Engineering Soil Descriptions;
- WSRC E9 SGS-GT-207 - Field Log Preparation;
- WSRC E9 SGS-GT-210 - Standard Penetration Test;

- WSRC E9 SGS-GT-211 - Cone Penetration Test Soundings;and
- WSRC 3Q5 Manual - Hydrogeologic Data Collection.

### *2.2.1 Exploration Contractor(s) and Equipment*

One drilling contractor was utilized for the borings, SPT testing and undisturbed soil sampling (Shelby tubes) and one contractor was used for all SCPT soundings. A description of the scope of each contractor and the equipment used is provided below.

*Graves Environmental, Inc.*

Graves Environmental, Inc., of Jackson, South Carolina performed the drilling and sampling for SPT and undisturbed borings. All Graves Environmental drillers involved with the drilling and sampling activities were experienced with geotechnical investigations and performed the drilling and sampling for the APSF investigation. The drilling equipment utilized is described below.

Failing 1500

The Failing 1500 drill rig is gas-driven with a 40-foot mast. The rig has a 23-foot Kelly assembly which allows for a 20-foot stroke and is capable of mud rotary, augering, and rotary coring techniques. The drill string is controlled by the Kelly arrangement, as well as, by a mechanical winch. This rig was used for all deeper borings requiring mud rotary.

*Applied Research Associates (ARA)*

Applied Research Associates (ARA) of Royalton, Vermont performed all CPT field and data processing activities including the CPT soundings completed for the APSF investigation. The CPT rig used for this investigation is described below.

Mac I

The Mac I CPT rig is a 22 ton rig capable of 30 ton mass push when fully ballasted. The push rod and piezocone utilized conformed with ASTM D5778 (ASTM 1995) consistent with WSRC E9 SGS-GT-211 - Cone Penetration Test Soundings. This rig was equipped with a hydraulic skid coupled to the surface beneath the rig for generating a shear wave source. Compressional waves were generated with a hydraulic vertical hammer located on the outside of the rig. All components were controlled by the operator.

### *2.2.2 Standard Penetration Test (SPT)*

Tests were performed in accordance with WSRC E9 SGS-GT-210 using a standard 24-inch long by 2-inch outside diameter (OD), split-spoon sampler with a 2-foot bleeder and check valve located above the sampler, NX drill stem, and a 140-lb safety hammer falling 30 inches. SPT N-values were determined by adding the number of blows required to drive the split-spoon sampler the last 12 inches of the standard 18-inch drive.

The general test procedure, as noted in sequence, is outlined below:

1. Split spoon is lowered into nominal 4-inch diameter borehole;
2. Depth is checked and any rod settlement noted;
3. Six-inch intervals, totaling 18 inches, are marked on the drill rod above the turntable;
4. Sampler is driven by blows applied using a 30-inch stroke with the rope wrapped twice over the cathead;
5. Sampler retrieved and recovery noted;
6. Sampled interval reamed and drilled out to next sample interval; and
7. Process repeated.

Prior to each SPT test, the Geotechnical Oversight professional verified that the spoon was properly assembled, making sure the bleeder and check valve were clean and the drive shoe was in good condition.

### *2.2.3 Undisturbed Sampling*

All undisturbed soil samples referenced within this report pertain to samples collected for the APSF investigation. No undisturbed samples were obtained specifically from the northeast expansion area.

Undisturbed (UD) soil samples were obtained for laboratory testing with direct push shelby tubes. The shelby tubes used were either brass or galvanized steel with a 3 inch OD, 0.065 inch wall thickness, and a length of 30 inches. Sampling was performed in accordance with ASTM D1587 (ASTM 1996).

The selection of the sampling interval was based on the results of previously pushed CPT soundings and/or SPT borings located within 10 to 15 feet from the UD boring. Prior to sampling, a sampling plan was developed for each UD boring. Generally, sampling was performed on the more cohesive soil layers encountered.

Drilling requirements for undisturbed sampling boreholes required that fluid pressures be kept as low as practical, while maintaining fluid return up the borehole. Drill bits with side discharge, or, in the case of tricone bits, with bottom deflectors, were required for reaming and advancing the borehole. Drilling was accomplished by mud rotary methods to the predetermined sampling depth. The drill stem was then tripped out and the bit removed. The Shelby tube head with a ball check valve was then attached and lowered to the bottom of the borehole. Borehole depth was checked against the drilled depth and noted. The maximum push length was marked on the drill stem and the rod hydraulically advanced a full 24 inches or until 600 psi hydraulic pressure was reached. Once the advance was made, the tube was allowed to sit for 5 minutes. When ready to retrieve the sample, the drill string was rotated about 90 degrees to shear the sample off the surrounding soil. When each sample was brought out of the borehole, the bottom and top were capped with plastic slip-on caps. If a gap was noted between the bottom tube edge and sample, a filler material was placed in the gap prior to placing the cap. Details of final sample preparation are provided in Section 2.3.

### *2.2.4 Piezocone Penetration Soundings*

CPTU, including seismic (SCPTU) soundings, were performed in accordance with ASTM D5778. The CPT was used because of the relatively quick and clean operation and its ability to provide a continuous soil profile for determining stratigraphy and defining the extent of soft and/or loose soil zones. In general, all CPT soundings included shear wave velocity surveys at 3-foot intervals. Target depths were based upon the estimated elevation of the top of the Congaree formation (approximately El. 130 feet MSL), a dense sandy layer (see section 3) that is considered incompressible. However, actual depths varied, depending upon ground surface elevations and subsurface conditions.

### *2.2.5 Borehole and Penetration Abandonment*

Abandonment of borings and soundings was performed per WSRC Manual 3Q5, Hydrogeologic Data Collection (WSRC, 1992). The standard grout mix consisted of the following:

- One sack Type 1 Portland Cement (94 lb sack);
- Two pounds of dry sodium bentonite; and
- 6.5 to 7.5 gallons of potable water.

All borings were abandoned immediately upon completion of testing. Grouting was accomplished via the tremie method. The grout pipe was lowered to the bottom of the boring and grout was injected until the boring fluid was displaced and grout returned to the surface. All borings were grouted to the surface and topped off until the column remained static.

Cone penetrometer soundings were abandoned by pressure grouting through a push rod which was re-pushed down to the bottom of the sounding. A grout tube extending to the bottom of the push rod was used to pump grout into the hole as the push rod was retracted. Holes were topped off until the column remained static.

## 2.3 Sample Preparation, Handling, Storage, Transportation, and Control

Samples were prepared and handled in accordance with WSRC E9 SGS-GT-203 - Sample Preparation, Handling and Storage. Shelby tubes were checked for conformance with ASTM D1587-83 (ASTM 1996).

The undisturbed samples were maintained in vertical tube boxes capable of holding four tubes as prescribed by ASTM D 4220 (ASTM 1996). Once the samples were obtained, the samples were trimmed, measured, and sealed. Plastic caps were placed over both ends of each tube, then taped and each tube labeled. For SPT borings, a sample was collected from the top and bottom of the sample spoon. If a material change occurred within the sample, additional samples were collected, as appropriate. Samples were placed in 8-ounce glass jars. The tops were closed tightly, wrapped, sealed with electrical tape, and samples were labeled on both the jar and the lid. Prior to sample turnover to Law Engineering, all samples were stored in accordance with WSRC E9 Procedure SGS-GT-203.

All soil samples selected for testing were turned over to Law Engineering for transporting to their laboratory in Atlanta. All tube samples tested by Law Engineering in Atlanta were transported in tube boxes and were maintained in a vertical position. Once in Atlanta, the samples were maintained in a controlled area according to the Law Engineering Quality Assurance Program.

## 3. SUBSURFACE CONDITIONS

Information obtained from the field exploration program has been used to characterize the subsurface (surface to about 180 feet in depth) conditions in the F-Area northeast expansion area. This included establishing the engineering stratigraphy and soil index properties and making a direct comparison with the adjacent APSF subsurface soils. Further, the presence of soft sediments defined as zones with measured tip resistances less than 15 tons per square foot (tsf) or SPT N-values of 5 or less, were evaluated. Groundwater conditions were determined from nearby monitoring well information. Eight subsurface cross-sections (Figures 3.0-1 through 3.0-8) were developed to show the engineering stratigraphy across the northeast expansion area, as well as, the APSF area. These subsurface sections are based on presently available information. Some variation from these conditions can be expected.

### 3.1 Engineering Stratigraphy

The subsurface engineering stratigraphy was determined from CPT measurements including tip resistance, sleeve resistance, friction ratio, and pore pressure signatures, shear wave velocity as well as correlations with adjacent soil boring data. The layering system is based on observed changes in the CPT measurements that are correlatable between soundings and nearby borings. The layer nomenclature was developed for mapping subsurface units across various parts of the SRS. For specific application to the APSF and F-Area northeast expansion area, it is only used to differentiate units based on similar engineering characteristics that can be mapped in the investigation area. Typical stratigraphic layering is shown on Figure 3.1-1.

The layer nomenclature follows an alphanumeric system with layer numbers increasing from top to bottom. Subdivided layers are identified with a letter designation (e.g., TR1A). Some layer boundaries correspond to geologic formations. Some upper portion of the layers TR1 and TR1A layers are most probably the Altamaha formation overlying the Tobacco Road formation, however, due to the similar material properties and an irregular erosional surface which separates these units, differentiating them is difficult. In some parts of the F-Area, the TR1 and TR2 layers have been subdivided to recognize sublayers with distinct soil properties (TR1A, TR2A, and TR2B). As described in the F-

Area Geotechnical Characterization Report (WSRC, 1996c), the TR3/4 layer was first correlated to the lower portion of the Tobacco Road formation but based on more recent geologic investigations in the area has been reassigned to the upper portion of the Dry Branch formation. Layers DB1 through DB3 were combined into a DB1/3 layer because of similar properties. Likewise, layers DB4 and DB5 were combined into a DB4/5 layer. The DB1/3 layer corresponds to the Dry Branch formation while the DB4/5 layer corresponds to the upper Santee/Tinker formation. The Santee/Tinker formation, is the most variable layer in the shallow subsurface. It has been further subdivided into the ST1 and ST2 layer where practical. The green clay, which is an informal stratigraphic interval at the SRS, is considered the basal unit for the shallow engineering stratigraphy and is labeled as GC. This geologic unit is locally continuous and provides a reliable marker bed. The Green Clay overlays the Congaree Formation which is predominantly dense silty sands and where applicable is labeled CG.

The following sections describe the physical attributes used to delineate each layer, as well as, depositional environment and lithologic variability with the exception of the CG layer.

### *3.1.1 TR1 and TR1A Layers*

The TR1 and TR1A layers are most probably the Altamaha formation consisting of red, purple and brown poorly sorted sands ranging from fine to gravel size with the dominant soil classification being clayey to silty sands (SC to SM). The depositional environment of these sediments is characterized as high energy fluvial such as river and stream channels. The base of the Altamaha is distinguished by an irregular erosional surface and can reach thicknesses of up to 70 feet at the SRS. This layer ranges in thickness from roughly 7 feet to nearly 36 feet thick. The TR1 layer is characterized by moderate SCPTU tip resistances and relatively high friction ratios while the underlying TR1A layer is generally less dense (lower tip resistances).

### *3.1.2 TR2A and TR2B Layers*

The TR2A and TR2B layers have been used to differentiate the Tobacco Road formation. Sediments of the Tobacco Road formation were deposited in low energy shallow marine transitional environments such as tidal flats. Much of the sediments are laminated or otherwise bioturbated (mixed by burrowing

organisms after deposition) red, purple and brown poorly sorted sands and clayey sands.

The TR2A, and TR2B layers are predominantly sands and clayey sands (SP-SM to SP-SC) as determined by laboratory classification tests. The TR2B layer is distinquished from the overlying TR1A layer by increased tip resistance and notably lower sleeve friction values resulting in a lower friction ratio. The TR2A ranges from about 20 feet to 40 feet thick while the TR2B layer ranges from about 10 to 27 feet thick.

### *3.1.3 TR3/4 and DB1/3 Layers*

The Dry Branch Formation consists of sands and clays deposited in a transitional sequence between near shore and bay or lagoon environments.The upper contact of the TR3/4 layer is defined by a marked decrease in CPT tip resistance and an increase in both the friction ratio and pore pressure measurements. As determined by laboratory classification tests, the TR3/4 layer is predominantly clays and sandy clays (SC). Thickness of this layer ranges from around 5 feet to around 10 feet thick over the balance of the area.

The DB1/3 layers correspond to the Irwinton Sands. On the CPT logs, the DB1/3 layer is a zone of variable, but generally high, CPT tip resistances and low friction ratios. In general, pore pressures are low or slightly above hydrostatic. The dominant unified soil classification for the DB1/3 is SP-SM with minor layers of CL material occurring as laminations. Thickness of this layer ranges from 25 to 35 feet thick.

### *3.1.4 DB4/5, ST1 and ST2 layers*

The Santee/Tinker Formations represent the most complex geologic unit in the shallow subsurface of F-Area. It is depositionally complex and highly variable in both its lithology and material properties. Soils in the Santee/Tinker range from sands to silty sands (SP-SM). The contact between the Santee/Tinker Formation and the overlying Dry Branch Formation is generally seen on the CPT logs as a sharp decrease in the pore pressure measurement. This layer is characterized by thin, alternating layers of low and high CPT tip resistances and friction ratios. Characteristically, CPT soundings in this layer show a pronounced sawtooth trace with large variations over relatively small vertical intervals. This

highly variable pattern suggests interfingering of alternating lenses of clayey and silty sands with more resistant, silica-cemented sediments and less resistant, calcareous sediments, and appears to be a result of rapid lateral and vertical changes in the nature of the materials originally deposited in this interval. The unit consists of complex sequences of limestones, carbonate muds, carbonate sands, and muddy sands.

The soils of the DB4/5 interval are much more plastic than the overlying Irwinton Sand (DB1/DB3) and the underlying ST1 layer. Soils of the DB4/5 typically classify as SM to CL materials. The DB4/5 layer has moderate to low tip resistances and moderate friction ratios. The DB4/5 layer has been subject to extensive characterization within the APSF area because of observed soft zones (tip resistances less than 15 tsf and N-values of 5 or less). The thickness of this layer ranges from about 6 to 10 feet thick. The ST1 layer is characterized by higher tip resistances than the overlying DB4/5 layer underlying ST2 layer. Although not all soundings penetrated this layer, the ST1 layer ranges in thickness from about 13 to 22 feet. Soils of the ST2 layer are generally characterized by lower tip resistances and sleeve resistances than the overlying ST1 layer. Soils of the ST1 and ST2 layers generally classify and SM to SP-SM materials. Based on the number of soundings that fully penetrated the ST2 layer, the thickness ranges from about 6 to 14 feet thick.

In F-Area and elsewhere at SRS, the Santee/Tinker formation has been a primary focus of foundation investigations. In fact, nearly all foundation remediation programs have targeted this unit because of drilling problems such as lost drill fluid circulation or rod drops.

### *3.1.5 GC Layer*

The "green clay" (GC) is an informal stratigraphic name at SRS for stiff, green to gray clays, silts, and clayey sands that are commonly found at the base of the Santee/Tinker Formation. In general, these soils classify as SM to ML with varying amounts of clay. This layer is locally continuous at F-Area and has been used to define the lower boundary of the shallow stratigraphy. Layer elevations and thicknesses have been determined from those borings and soundings that penetrate this layer. Most borings and CPT soundings do not reach or penetrate the GC layer. The top of the layer ranges from around El. 126 feet MSL in the

south and northwestern portions of the area to a high of around 140 feet MSL in the east-central part of the area. This is consistent with the correlating Gordon Confining Unit as mapped by Aadland (1995) which is correlatable to the "green clay" unit.

### 3.2 Groundwater Conditions

Groundwater data was derived from water table monitoring wells located in various locations around and within F-Area as well as from WSRC-TR-98-00045, The Regional Water Table of the Savannah River Site and Related Coverages. Monitoring well NBG-5 is the nearest to the F-Area northeast expansion area (see Figure 1.0-2). As shown on Figure 3.2-1, the water table elevation from May, 1986 to May, 1997, ranges from about El. 214 feet MSL to about El. 221 MSL. The dominant water table gradient in the F-Area expansion area is oriented to the north and is largely controlled by Upper Three Runs Creek located immediately north of the F-Area. Groundwater Table contours are shown on Figure 2.0-1.

### 3.3 Engineering Soil Characteristics

The engineering stratigraphy of the F-Area northeast expansion area was correlated with the APSF area and the engineering characteristics compared. This comparison was based on layer continuity and thickness, as well as, measured SPT N-values, CPT measurements and laboratory soil classification data. Layer continuity across the area is shown on eight subsurface cross-sections (Figures 3.0-1 through 3.0.8).

A summary of all CPT engineering layer picks for the F-Area northeast expansion area and APSF is given on Table 3.3-1, along with a generalized (average) stratigraphy for the area. Figures 3.3-1 through 3.3-3 show mean and standard deviations of shear wave velocities ($V_s$), CPT tip resistance ($q_t$) and CPT friction ratio ($R_f$) with the generalized average engineering stratigraphy. SPT N-values are plotted on Figure 3.3-4 to show the range of values versus elevation, as well as, the genralized engineering stratigraphy. Laboratory test results are included in Appendix C.

A comparison of engineering soil properties between the F-Area northeast expansion area, APSF and the balance of F-Area is summarized in Table 3.3-2. As can be seen, the tabulated properties are very similar for all three areas.

### *3.3.1 Soft Zone Characteristics*

Weight of rod and occasional rod drops have been described in numerous drilling reports for monitoring wells and geotechnical borings located in the central part of the SRS. Early subsurface investigations performed by the Unites States Army Corps of Engineers (COE) frequently described these zones as soft zones, or even voids, and numerous subsequent subsurface investigations have described these same conditions at the SRS. These soft zones typically occur in the carbonate-bearing sediments of the Santee Limestone, Utley Limestone, and the Griffins Landing Member of the lower Dry Branch Formation. The prevailing assumption about the origin of these soft zones is dissolutioning of carbonate-rich, clastic sediments, resulting in vugular porosity (open pore space). When drilling these zones, the drill rod meets little shear resistance and drops (COE, 1951). However, much of the time, recovery of soil in the sampler precludes the zone from being characterized as a void.

Soft zones are defined by SPT-N values $\leq$ 5 or CPT tip resistance $\leq$ 15 tsf. Also, thickness should be considered as well. These zones are generally restricted to the lower Dry Branch Formation and the Santee/Tinker Formation. However, soft zones can be found in other horizons at the SRS. The following sections discuss soft zones found in the northeast expansion and APSF areas.

Soft zones in two different horizons were identified on CPT sounding profiles. Two CPT soundings in the APSF area also had soft zone hits at about El. 240 feet MSL however these were considered to be isolated. Nineteen CPT soundings and five SPT borings had tip resistances and N-values meeting soft zone criteria however thirteen of these CPT soundings were pushed to delineate a soft zone within the APSF area (Figure 3.3-1). Four of the remaining six represented isolated hits in the APSF area and the other two were within the northeast expansion area. Of the five SPT borings, one was located in the APSF area while the other four were located in the northeast expansion area. Soft zone intervals noted on all CPT soundings and SPT borings are summarized on Table 3.3-3.

*3.3.1.1 Northeast Expansion Area Soft Zones*

Soft zone intervals were noted in only two of the soundings pushed for the F-Area northeast expansion investigation (soundings 103 and 157). Sounding 103 had a soft zone between El. 177.6 and El. 171.2 feet MSL with a cumulative soft zone thickness in this interval of about 2.9 feet thick. Revisions made to the boundary of the northeast expansion area placed sounding 103 outside of the investigation area, therefore this area was not investigated further (see Figure 2.0-1). SPT boring FB-19 had measured soft zones from El. 189.6 to about El. 186.6 feet MSL. CPT Sounding 114 was pushed adjacent to FB-19 (prior to FB-19 being drilled) with no measured soft zones.

Sounding 157 had two soft zone intervals. The upper most interval was between El. 215.1 and 211.2 feet MSL with a cumulative soft zone thickness of about 3.4 feet thick. The lower soft zone interval was between El. 179.8 and El. 173.5 feet MSL with a cumulative soft zone thickness of about 6.2 feet thick. SPT boring FB-17 was drilled about ten feet away from sounding 157. The upper soft zone interval between El. 215.1 and 211.2 feet MSL was not encountered in the SPT boring. In fact, N-values of about 10 were measured through this interval. The lower soft zone interval was encountered in FB-17. An interval of low blow counts, including weight of rod, corresponding to the lower interval measured in sounding 157 was encountered between El. 183.1 to El. 176.1 feet MSL. In SPT boring FB-17, a lower interval with low blow counts and weight of rods was also encountered from El. 157.6 to 151.6 feet MSL. This interval corresponds to a low tip resistance interval in CPT sounding 157 however tip resistances are higher than 15 tsf (about 20 tsf).

Additional indications of soft zones were noted in SPT boring FB-20 and FB-20A. FB-20 was drilled adjacent to sounding 179 for the purpose of obtaining a paired sounding and SPT boring. At about El. 179, a weight of rod over 37 inches was measured in boring FB-20. Drill fluid circulation was lost and the hole was abandoned. FB-20A was drilled adjacent to FB-20 and the interval from El. 194.9 to El. 181.4 was sampled with measured N-values greater than 20. At El. 181.4 however, circulation was lost in FB-20A and the hole was abandoned. These intervals in FB-20 and FB-20A correspond to a low tip resistance interval in sounding 179 which has thin layers of tip resistances measuring less than 15 tsf but have a cumulative thickness less than 2 feet.

*3.3.1.2 APSF Area Soft Zones*

The APSF area was extensively investigated for the extent and thickness of soft zones. Boring FB-1 located in the APSF area had low SPT N-values and weight of rod drop from El. 155.5 feet MSL to about El. 146.6 feet MSL. Soils from this interval were described as tan very fine silty and clayey sand with traces of shell fragments. Further investigation around this area with CPT soundings provided a reasonable mapped geometry of this soft zone. As shown on Figure 3.1-1, the soft zone actually occurred in two distinct horizons. The lowermost horizon within the Santee formation was delineated as shown on Figure 3.3-5. The upper Santee formation soft zone as shown on Figure 3.3-6 was not as continuous as the lower zone. Based on this investigative work it was reasonable to estimate the size, thickness and stratigraphic position of these soft zone intervals. SPT boring FB-4 in the APSF area also had a noted soft zone with low blow counts and weight of rod measurements from about El. 177.8 to 172.1 feet MSL.

*3.3.1.3 Soft Zone Samples and Analysis*

Four CPT tubes were taken from the soft zones identified in the APSF area. From these tubes the following laboratory tests were performed to identify soil parameters:

- 5 unit weight and moisture content tests
- 2 consolidation tests
- 5 Atterberg Limit tests
- 7 hydrometer suites including grain size analysis
- 1 unconfined compression test

Additional CPT samples were acquired from the lower soft zone interval in the vicinity of sounding 157 for the purpose of measuring the unit weight and moisture content for comparison with results from the APSF investigation. Results of the unit weights and moisture content were consistent with those made for the APSF area samples. The results of these tests are provided in Appendix B and are summarized on Table 3.3-5. It is important to note that the sample size for this type of sampler is smaller than that obtained from a shelby tube or other standard sampler. Arguments can be made that due to the smaller

diameter (1.75 inches compared to 3 inches for a shelby tube), disturbances will be greater. Additionally there is no precedent or standardized procedure for testing these smaller size samples. Therefore, the consolidation and strength results are solely for interpretation and engineering judgement and may not be representative of the in-situ properties of the soils tested.

## 4. GEOTECHNICAL AND FOUNDATION ASSESSMENT

The conditions encountered during this program are not unlike conditions found elsewhere at the SRS. In fact, they are very similar in terms of:

- Geology and soil classification;
- SPT N-values;
- CPT resistances;
- Shear wave velocity; and
- Presence of soft zones.

Figures 3.3-1 through 3.3-4 show the range of SPT N-values, the mean and and range of CPT corrected tip resistance ($q_t$), CPT friction ratio ($R_f$) and shear wave velocity ($V_s$) from this investigation. Based on these results, the soils encountered can support structure and foundation loads currently constructed at the SRS with no adverse consequences. Typical foundation loading for existing critical facilities at the SRS is in the range of 4 to 7 kips per square foot (ksf). Higher loads could be supported depending on the layout, geometry and foundation depths of the proposed facilities and the results of a structure specific geotechnical investigation program, which is required for the proposed new mission facilities.

The regional water table is approximately 60 to 70 feet below the ground surface, however, perched water should be expected. Construction cut slopes for the nearby APSF excavation have been stable since excavation in August and September of 1998, with slopes of one horizontal to one vertical. The slopes were benched and protected with a thin layer of emulsified asphalt. Heave markers placed within the excavation footprint measured heave between one-half to one inch for the 30 to 35 feet deep excavation. Thus, from a construction standpoint, there appears to be no apparent unusual issues.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The shallow stratigraphy and average engineering properties determined for the F-Area northeast expansion are directly comparable to those determined for the Actinide Packaging and Storage Facility (APSF) area as well as the balance of the F-Area. Geologic conditions are also directly comparable between these two areas.

Soft zone intervals detected in the F-Area northeast expansion area are consistent with soft zone sediments encountered at the APSF area. Siting and design of new facilities in this area should account for the presence of these soils either by avoiding the placement of critical facilities where these zones are known to exist, or determining the potential settlement and designing the facility to accommodate the estimated movement. A thorough review of the data included in this report is recommended for planning further investigations.

Design and construction of new PC-3 and higher facilities, heavily loaded structures or capital investment projects in the F-Area northeast expansion area should not require extensive geotechnical characterization. However, structure specific investigations for foundation design and construction, as well as, proper characterization of soft zone intervals are required. Foundation specific investigations should consider structure size, geometry, foundation type and depth, performance classification and functional classification, etc. A limited program of field testing to confirm dynamic soil properties may be required to obtain baseline subsurface information such that a site-specific comparison with results of this investigation can be made.

Heave monitoring is required for excavations greater than ten feet deep. Settlement monitoring is required for all major and/or critical new facilities throughout the construction phase until final turn-over or when operations commence. After operations commence, settlement monitoring is required on an established interval. Settlement results should be compiled and reviewed by competent geotechnical and structural engineers.

New critical facilities should consider seismic instrumentation in the structure design and facility operation. An SRS Engineering Standard for seismic

instrumentation is currently under development. This standard will provide specifications for seismic instrumentation installation and performance.

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| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-1 | CPT-2 | CPT-4 | CPT-5 | CPT-6 | CPT-7 | CPT-8 | CPT-9 | CPT-10 | CPT-11 | CPT-12 |
| SURFACE | 290.50 | 290.50 | 292.18 | 291.29 | 289.66 | 282.74 | 285.08 | 285.30 | 287.16 | 288.59 | 288.89 |
| TR1 | 290.50 | 290.50 | 292.18 | 291.29 | 289.66 | 282.74 | 285.08 | 285.30 | 287.16 | 288.59 | 288.89 |
| TR1A | 273.01 | 274.96 | 277.99 | 272.89 | 276.94 | 275.88 | 273.16 | 278.92 | 273.80 | 274.94 | 271.70 |
| TR2A | 258.98 | 255.83 | 260.97 | 259.95 | 262.96 | 262.94 | 260.97 | 261.90 | 261.21 | 253.89 | 254.91 |
| TR2B | 231.98 | 228.94 | 230.92 | 229.95 | 234.01 | 237.87 | 233.56 | 234.96 | 234.15 | 234.93 | 236.93 |
| TR3/TR4 | 209.01 | 203.45 | 210.00 | 209.93 | 210.99 | 213.87 | 209.04 | 211.89 | 209.94 | 211.90 | 215.29 |
| DB1/DB3 | 203.02 | 200.03 | 206.00 | 201.94 | 204.00 | 203.90 | 203.27 | 200.90 | 205.27 | 207.95 | 208.94 |
| DB4/DB5 | 172.02 | 176.62 | 178.00 | 175.98 | 175.96 | 176.93 | 173.37 | 172.90 | 172.98 | 176.90 | 177.22 |
| ST1 | 164.03 | 169.86 | 176.00 | 169.99 | 169.92 | 171.88 | 168.90 | 167.96 | 168.50 | 168.96 | 171.14 |
| ST2 | 151.96 | 152.01 | 151.99 | 152.93 | 151.99 | 152.88 | 149.90 | 149.90 | 151.88 | 151.89 | 149.00 |
| GC | 141.93 | 139.24 | ------ | 142.94 | 142.01 | 142.91 | 138.87 | 140.01 | 136.64 | 145.89 | 142.04 |
| CG | 132.99 | 133.11 | ------ | 136.00 | 133.93 | 133.88 | 132.72 | ------ | 132.22 | 141.90 | ------ |
| BASE | 130.50 | 132.50 | 148.17 | 134.29 | 132.66 | 132.74 | 129.08 | 139.30 | 130.16 | 138.59 | 137.89 |
| Layer Thickness (ft) | | | | | | | | | | | |
| | CPT-1 | CPT-2 | CPT-4 | CPT-5 | CPT-6 | CPT-7 | CPT-8 | CPT-9 | CPT-10 | CPT-11 | CPT-12 |
| TR1 | 17.49 | 15.54 | 14.19 | 18.40 | 12.72 | 6.86 | 11.92 | 6.38 | 13.36 | 13.65 | 17.19 |
| TR1A | 14.03 | 19.13 | 17.02 | 12.94 | 13.98 | 12.94 | 12.19 | 17.02 | 12.59 | 21.05 | 16.79 |
| TR2A | 27.00 | 26.89 | 30.05 | 30.00 | 28.95 | 25.07 | 27.41 | 26.94 | 27.06 | 18.96 | 17.98 |
| TR2B | 22.97 | 25.49 | 20.92 | 20.02 | 23.02 | 24.00 | 24.52 | 23.07 | 24.21 | 23.03 | 21.64 |
| TR3/TR4 | 5.99 | 3.42 | 4.00 | 7.99 | 6.99 | 9.97 | 5.77 | 10.99 | 4.67 | 3.95 | 6.35 |
| DB1/DB3 | 31.00 | 23.41 | 28.00 | 25.96 | 28.04 | 26.97 | 29.90 | 28.00 | 32.29 | 31.05 | 31.72 |
| DB4/DB5 | 7.99 | 6.76 | 2.00 | 5.99 | 6.04 | 5.05 | 4.47 | 4.94 | 4.48 | 7.94 | 6.08 |
| ST1 | 12.07 | 17.85 | 24.01 | 17.06 | 17.93 | 19.00 | 19.00 | 18.06 | 16.62 | 17.07 | 22.14 |
| ST2 | 10.03 | 12.77 | ------ | 9.99 | 9.98 | 9.97 | 11.03 | 9.89 | 15.24 | 6.00 | 6.96 |
| GC | 8.94 | 6.13 | ------ | 6.94 | 8.08 | 9.03 | 6.15 | ------ | 4.42 | 3.99 | ------ |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1A Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-13 | CPT-14 | CPT-15 | CPT-16 | CPT-17 | CPT-18 | CPT-19 | CPT-20 | CPT-21 | CPT-22 | CPT-22A |
| SURFACE | 289.79 | 289.70 | 295.13 | 283.80 | 287.10 | 293.00 | 293.10 | 291.20 | 291.70 | 290.60 | 291.40 |
| TR1 | 289.79 | 289.70 | 295.13 | 283.80 | 287.10 | 293.00 | 293.10 | 291.20 | 291.70 | 290.60 | 291.40 |
| TR1A | 280.02 | 271.70 | 277.94 | 270.65 | 271.95 | 278.03 | 278.00 | 279.99 | 279.08 | 276.70 | 274.98 |
| TR2A | 264.96 | 254.91 | 257.97 | 259.93 | 259.00 | 264.07 | 260.11 | 262.01 | 261.03 | 258.50 | 258.03 |
| TR2B | 238.91 | 236.93 | 222.93 | 232.86 | 230.99 | 236.99 | 233.04 | 234.00 | 235.03 | 230.02 | 227.96 |
| TR3/TR4 | 216.91 | 215.29 | 197.97 | 209.97 | 211.95 | 213.98 | 211.94 | 210.98 | 211.95 | 204.85 | 199.01 |
| DB1/DB3 | 208.98 | 208.94 | 195.02 | 203.15 | 202.90 | 208.00 | 204.04 | 204.96 | 205.00 | 200.90 | 196.02 |
| DB4/DB5 | 176.93 | 177.22 | 172.01 | 174.93 | 176.00 | 179.00 | 176.03 | 178.01 | 179.04 | 176.80 | 170.02 |
| ST1 | 171.93 | 171.14 | 163.02 | 169.00 | 169.99 | 172.98 | 170.95 | 173.96 | 171.04 | 168.73 | 167.03 |
| ST2 | 152.91 | 149.00 | 149.00 | 149.16 | 153.96 | 151.03 | 150.92 | 151.97 | 155.00 | 152.27 | 149.95 |
| GC | 139.93 | 142.04 | 137.97 | 137.43 | 143.01 | 137.03 | 138.96 | 138.00 | 139.00 | 140.17 | 137.01 |
| CG | 132.99 | 133.07 | 131.98 | 132.90 | 135.98 | 130.96 | ------ | ------ | 133.02 | ------ | ------ |
| BASE | 129.79 | 102.70 | 128.13 | 129.80 | 133.10 | 129.48 | 130.18 | 129.54 | 130.96 | 138.96 | 130.88 |
| Layer Thickness (ft) | | | | | | | | | | | |
| | CPT-13 | CPT-14 | CPT-15 | CPT-16 | CPT-17 | CPT-18 | CPT-19 | CPT-20 | CPT-21 | CPT-22 | CPT-22A |
| TR1 | 9.77 | 18.00 | 17.19 | 13.15 | 15.15 | 14.97 | 15.10 | 11.21 | 12.62 | 13.90 | 16.42 |
| TR1A | 15.06 | 16.79 | 19.97 | 10.72 | 12.95 | 13.96 | 17.89 | 17.98 | 18.05 | 18.20 | 16.95 |
| TR2A | 26.05 | 17.98 | 35.04 | 27.07 | 28.01 | 27.08 | 27.07 | 28.01 | 26.00 | 28.48 | 30.07 |
| TR2B | 22.00 | 21.64 | 24.96 | 22.89 | 19.04 | 23.01 | 21.10 | 23.02 | 23.08 | 25.17 | 28.95 |
| TR3/TR4 | 7.93 | 6.35 | 2.95 | 6.82 | 9.05 | 5.98 | 7.90 | 6.02 | 6.95 | 3.95 | 2.99 |
| DB1/DB3 | 32.05 | 31.72 | 23.01 | 28.22 | 26.90 | 29.00 | 28.01 | 26.95 | 25.96 | 24.10 | 26.00 |
| DB4/DB5 | 5.00 | 6.08 | 8.99 | 5.93 | 6.01 | 6.02 | 5.08 | 4.05 | 8.00 | 8.07 | 2.99 |
| ST1 | 19.02 | 22.14 | 14.02 | 19.84 | 16.03 | 21.95 | 20.03 | 21.99 | 16.04 | 16.46 | 17.08 |
| ST2 | 12.98 | 6.96 | 11.03 | 11.73 | 10.95 | 14.00 | 11.96 | 13.97 | 16.00 | 12.10 | 12.94 |
| GC | 6.94 | 8.97 | 5.99 | 4.53 | 7.03 | 6.07 | 8.78 | 8.46 | 5.98 | ------ | 6.13 |
| CG | ------ | 30.37 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1B Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-23 | CPT-24 | CPT-25 | CPT-26 | CPT-27 | CPT-28 | CPT-29 | CPT-30 | CPT-31 | CPT-32 | CPT-32A |
| SURFACE | 290.90 | 290.00 | 290.10 | 289.50 | 290.30 | 289.80 | 288.10 | 288.80 | 290.70 | 289.50 | 288.00 |
| TR1 | 290.90 | 290.00 | 290.10 | 289.50 | 290.30 | 289.80 | ------ | 288.80 | 290.70 | 289.50 | 288.00 |
| TR1A | 274.94 | 277.04 | 272.99 | 278.99 | 277.01 | 280.97 | 288.10 | 275.36 | 274.95 | 276.94 | 280.02 |
| TR2A | 258.03 | 261.99 | 255.97 | 265.00 | 259.04 | 263.96 | 265.97 | 267.01 | 257.94 | 267.75 | 265.00 |
| TR2B | 229.97 | 233.96 | 230.00 | 239.04 | 232.01 | 236.94 | 239.09 | 240.08 | 230.00 | 239.98 | 238.02 |
| TR3/TR4 | 209.02 | 207.03 | 207.02 | 217.01 | 205.04 | 213.03 | 217.95 | 215.92 | 206.98 | 217.10 | 213.88 |
| DB1/DB3 | 204.02 | 201.96 | 201.02 | 210.00 | 199.99 | 207.96 | 212.03 | 207.98 | 201.02 | 212.97 | 209.96 |
| DB4/DB5 | 177.00 | 174.94 | 176.09 | 179.05 | 174.01 | 176.94 | 181.04 | 180.01 | 176.05 | 182.10 | 181.03 |
| ST1 | 171.95 | 167.97 | 170.04 | 172.88 | 167.96 | 171.00 | 175.00 | 174.02 | 172.05 | 178.10 | 176.99 |
| ST2 | 150.01 | 147.04 | 153.98 | 152.12 | 150.13 | 154.03 | 150.94 | 155.98 | 148.98 | 153.94 | 154.99 |
| GC | 137.94 | 134.99 | 139.97 | 143.03 | 137.03 | 138.03 | 144.98 | 146.00 | 135.97 | 140.89 | 139.94 |
| CG | 133.19 | ------ | 133.05 | ------ | 131.98 | ------ | 140.03 | ------ | ------ | ------ | ------ |
| BASE | 131.92 | 128.31 | 132.04 | 139.34 | 131.73 | 131.05 | 138.91 | 143.33 | 131.96 | 133.51 | 133.86 |

| Layer Thickness (ft) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-23 | CPT-24 | CPT-25 | CPT-26 | CPT-27 | CPT-28 | CPT-29 | CPT-30 | CPT-31 | CPT-32 | CPT-32A |
| TR1 | 15.96 | 12.96 | 17.11 | 10.51 | 13.29 | 8.83 | 0.00 | 13.44 | 15.75 | 12.56 | 7.98 |
| TR1A | 16.91 | 15.05 | 17.02 | 13.99 | 17.97 | 17.01 | 22.13 | 8.35 | 17.01 | 9.19 | 15.02 |
| TR2A | 28.06 | 28.03 | 25.97 | 25.96 | 27.03 | 27.02 | 26.88 | 26.93 | 27.94 | 27.77 | 26.98 |
| TR2B | 20.95 | 26.93 | 22.98 | 22.03 | 26.97 | 23.91 | 21.14 | 24.16 | 23.02 | 22.88 | 24.14 |
| TR3/TR4 | 5.00 | 5.07 | 6.00 | 7.01 | 5.05 | 5.07 | 5.92 | 7.94 | 5.96 | 4.13 | 3.92 |
| DB1/DB3 | 27.02 | 27.02 | 24.93 | 30.95 | 25.98 | 31.02 | 30.99 | 27.97 | 24.97 | 30.87 | 28.93 |
| DB4/DB5 | 5.05 | 6.97 | 6.05 | 6.17 | 6.05 | 5.94 | 6.04 | 5.99 | 4.00 | 4.00 | 4.04 |
| ST1 | 21.94 | 20.93 | 16.06 | 20.76 | 17.83 | 16.97 | 24.06 | 18.04 | 23.07 | 24.16 | 22.00 |
| ST2 | 12.07 | 12.05 | 14.01 | 9.09 | 13.10 | 16.00 | 5.96 | 9.98 | 13.01 | 13.05 | 15.05 |
| GC | 4.75 | 6.68 | 6.92 | ------ | 5.05 | 6.98 | 4.95 | ------ | ------ | 7.38 | 6.08 |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1C Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-33 | CPT-34 | CPT-35 | CPT-36 | CPT-37 | CPT-38 | CPT-39 | CPT-40 | CPT-41 | CPT-42 | CPT-43 |
| SURFACE | 290.10 | 290.30 | 290.00 | 291.70 | 292.00 | 290.00 | 290.00 | 286.60 | 289.50 | 287.50 | 289.00 |
| TR1 | 290.10 | 290.30 | 290.00 | 291.70 | 292.00 | 290.00 | 290.00 | ------ | 289.50 | ------ | 289.00 |
| TR1A | 275.99 | 274.97 | 275.96 | 276.94 | 278.35 | 274.97 | 272.01 | 286.60 | 270.97 | 287.50 | 270.00 |
| TR2A | 260.02 | 256.01 | 262.98 | 263.01 | 259.99 | 256.01 | 254.92 | 266.04 | 252.97 | 264.02 | 250.91 |
| TR2B | 232.04 | 229.97 | 236.06 | 236.16 | 232.21 | 238.00 | 233.92 | 240.04 | 232.97 | 237.05 | 234.94 |
| TR3/TR4 | ~~296.00~~ | 204.03 | 212.01 | 213.83 | 212.05 | 217.05 | 211.98 | 218.06 | 208.99 | 217.01 | 215.02 |
| DB1/DB3 | 201.97 | 199.97 | 205.94 | 205.85 | 204.81 | 210.02 | 204.95 | 211.08 | 205.04 | 210.08 | 210.03 |
| DB4/DB5 | 175.90 | 174.93 | 176.94 | 180.04 | 174.37 | 178.96 | 174.98 | 178.02 | 169.99 | 178.07 | ------ |
| ST1 | 169.99 | 169.03 | 171.00 | 172.61 | 171.70 | 175.01 | 167.96 | 173.96 | 166.96 | 173.00 | ------ |
| ST2 | 151.07 | 147.99 | 151.01 | 155.49 | 154.93 | 154.93 | 153.04 | 153.97 | 147.01 | 153.98 | ------ |
| GC | 138.10 | 137.00 | 136.95 | 139.08 | 137.36 | ------ | 139.07 | 141.03 | 133.99 | 148.95 | ------ |
| CG | 133.00 | ------ | 130.02 | 134.93 | 132.96 | ------ | ------ | ------ | ------ | ------ | ------ |
| BASE | 132.83 | 131.73 | 129.91 | 134.81 | 132.10 | 147.02 | 133.32 | 136.78 | 130.85 | 145.66 | 206.13 |

| Layer Thickness (ft) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-33 | CPT-34 | CPT-35 | CPT-36 | CPT-37 | CPT-38 | CPT-39 | CPT-40 | CPT-41 | CPT-42 | CPT-43 |
| TR1 | 14.11 | 15.33 | 14.04 | 14.76 | 13.65 | 15.03 | 17.99 | 0.00 | 18.53 | 0.00 | 19.00 |
| TR1A | 15.97 | 18.96 | 12.98 | 13.93 | 18.36 | 18.96 | 17.09 | 20.56 | 18.00 | 23.48 | 19.09 |
| TR2A | 27.98 | 26.04 | 26.92 | 26.85 | 27.78 | 18.01 | 21.00 | 26.00 | 20.00 | 26.97 | 15.97 |
| TR2B | 25.06 | 25.94 | 24.05 | 22.33 | 20.16 | 20.95 | 21.94 | 21.98 | 23.98 | 20.04 | 19.92 |
| TR3/TR4 | 5.01 | 4.06 | 6.07 | 7.98 | 7.24 | 7.03 | 7.03 | 6.98 | 3.95 | 6.93 | 4.99 |
| DB1/DB3 | 26.07 | 25.04 | 29.00 | 25.81 | 30.44 | 31.06 | 29.97 | 33.06 | 35.05 | 32.01 | ------ |
| DB4/DB5 | 5.91 | 5.90 | 5.94 | 7.43 | 2.67 | 3.95 | 7.02 | 4.06 | 3.03 | 5.07 | ------ |
| ST1 | 18.92 | 21.04 | 19.99 | 17.12 | 16.77 | 20.08 | 14.92 | 19.99 | 19.95 | 19.02 | ------ |
| ST2 | 12.97 | 10.99 | 14.06 | 16.41 | 17.57 | 7.91 | 13.97 | 12.94 | 13.02 | 5.03 | ------ |
| GC | 5.10 | ------ | 6.93 | 4.15 | 4.40 | ------ | 5.75 | 4.25 | ------ | 3.29 | ------ |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1D Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-43A | CPT-44 | CPT-45 | CPT-46 | CPT-48 | CPT-51 | CPT-52 | CPT-53 | CPT-103 | CPT-104 | CPT-113 |
| SURFACE | 289.00 | 285.50 | 287.40 | 286.00 | 285.80 | 286.70 | 288.80 | 289.90 | 271.70 | 274.20 | 276.70 |
| TR1 | 289.00 | 285.50 | ------ | ------ | ------ | ------ | 288.80 | 289.90 | ------ | ------ | ------ |
| TR1A | 267.99 | 271.89 | 287.40 | 286.00 | 285.80 | 286.70 | 269.89 | 276.77 | 271.70 | 274.20 | 276.70 |
| TR2A | 248.98 | 262.89 | 263.96 | 259.97 | 263.02 | 261.01 | 260.76 | 264.55 | 256.91 | 257.89 | 259.82 |
| TR2B | 234.93 | 236.97 | 238.05 | 235.00 | 235.95 | 235.94 | 236.80 | 235.74 | 238.88 | 240.95 | 236.01 |
| TR3/TR4 | 213.95 | 217.93 | 217.04 | 213.01 | 212.96 | 215.04 | 216.81 | 215.48 | 209.90 | 211.89 | 210.03 |
| DB1/DB3 | 208.95 | 207.94 | 210.02 | 204.02 | 205.03 | 204.97 | 209.98 | 209.12 | 199.94 | 199.96 | 203.85 |
| DB4/DB5 | ------ | 177.95 | 177.97 | 176.93 | 173.92 | 179.90 | 176.99 | 177.47 | 177.86 | 178.88 | 181.92 |
| ST1 | ------ | 171.87 | 172.99 | 171.03 | 166.94 | 172.92 | 172.98 | 173.78 | 167.91 | 171.87 | 172.08 |
| ST2 | ------ | 155.00 | 155.02 | 152.97 | 149.94 | 154.01 | 149.92 | 153.35 | 151.93 | 155.92 | 152.68 |
| GC | ------ | 148.96 | 142.00 | ------ | 138.01 | 138.01 | 139.04 | 143.64 | 142.93 | 147.92 | 138.73 |
| CG | ------ | 145.01 | ------ | ------ | ------ | 132.98 | 132.95 | ------ | 132.89 | ------ | 133.52 |
| BASE | 204.71 | 144.30 | 136.46 | 139.70 | 130.71 | 132.10 | 132.44 | 139.90 | 115.85 | 143.08 | 130.76 |

| Layer Thickness (ft) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-43A | CPT-44 | CPT-45 | CPT-46 | CPT-48 | CPT-51 | CPT-52 | CPT-53 | CPT-103 | CPT-104 | CPT-113 |
| TR1 | 21.01 | 13.61 | 0.00 | 0.00 | 0.00 | 0.00 | 18.91 | 13.13 | 0.00 | 0.00 | 0.00 |
| TR1A | 19.01 | 9.00 | 23.44 | 26.03 | 22.78 | 25.69 | 9.13 | 12.22 | 14.79 | 16.31 | 16.88 |
| TR2A | 14.05 | 25.92 | 25.91 | 24.97 | 27.07 | 25.07 | 23.96 | 28.81 | 18.03 | 16.94 | 23.81 |
| TR2B | 20.98 | 19.04 | 21.01 | 21.99 | 22.99 | 20.90 | 19.99 | 20.26 | 28.98 | 29.06 | 25.98 |
| TR3/TR4 | 5.00 | 9.99 | 7.02 | 8.99 | 7.93 | 10.07 | 6.83 | 6.36 | 9.96 | 11.93 | 6.18 |
| DB1/DB3 | ------ | 29.99 | 32.05 | 27.09 | 31.11 | 25.07 | 32.99 | 31.65 | 22.08 | 21.08 | 21.93 |
| DB4/DB5 | ------ | 6.08 | 4.98 | 5.90 | 6.98 | 6.98 | 4.01 | 3.69 | 9.95 | 7.01 | 9.84 |
| ST1 | ------ | 16.87 | 17.97 | 18.06 | 17.00 | 18.91 | 23.06 | 20.43 | 15.98 | 15.95 | 19.40 |
| ST2 | ------ | 6.04 | 13.02 | ------ | 11.93 | 16.00 | 10.88 | 9.71 | 9.00 | 8.00 | 13.95 |
| GC | ------ | 3.95 | 5.54 | ------ | 7.30 | 5.03 | 6.09 | ------ | 10.04 | 4.84 | 5.21 |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1E Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-114 | CPT-115 | CPT-116 | CPT-126 | CPT-127 | CPT-128 | CPT-129 | CPT-143 | CPT-147 | CPT-148 | CPT-149 |
| SURFACE | 273.60 | 272.00 | 270.10 | 278.90 | 279.30 | 279.30 | 277.20 | 286.10 | 284.80 | 284.10 | 274.80 |
| TR1 | 273.60 | 272.00 | ------ | 278.90 | 279.30 | 279.30 | 277.20 | 286.10 | 284.80 | 284.10 | ------ |
| TR1A | 267.64 | 266.26 | 270.10 | 265.32 | 267.78 | 262.88 | 265.95 | 265.85 | 267.88 | 274.16 | 274.80 |
| TR2A | 259.83 | 260.15 | 258.03 | 258.49 | 259.91 | 250.83 | 253.90 | 246.90 | 252.67 | 252.56 | 256.92 |
| TR2B | 236.66 | 236.94 | 238.06 | 230.15 | 231.85 | 227.91 | 236.94 | 234.98 | 235.70 | 235.35 | 245.89 |
| TR3/TR4 | 212.40 | 209.10 | 211.44 | 203.78 | 203.01 | 205.92 | 211.87 | 210.87 | 210.02 | 209.84 | 220.96 |
| DB1/DB3 | 203.28 | 202.01 | 202.94 | 199.16 | 196.88 | 196.88 | 203.90 | 202.92 | 204.58 | 204.93 | 214.93 |
| DB4/DB5 | 178.04 | 174.96 | 169.91 | 175.98 | 176.02 | 176.94 | 174.88 | 175.89 | 173.25 | 172.18 | 188.94 |
| ST1 | 170.06 | 167.77 | ------ | 164.29 | 165.36 | 167.91 | 167.96 | 165.93 | 164.98 | 161.78 | 179.96 |
| ST2 | 149.81 | 148.01 | 149.95 | 147.13 | 148.53 | 148.94 | 149.95 | 152.94 | 148.88 | 149.57 | 158.92 |
| GC | 142.45 | 140.91 | 140.72 | 140.83 | 135.07 | 141.88 | 140.88 | 141.91 | 135.60 | 137.01 | 149.94 |
| CG | 136.15 | 133.47 | ------ | 131.75 | 131.65 | ------ | 131.89 | 131.91 | 129.73 | 128.58 | 136.90 |
| BASE | 128.02 | 127.98 | 137.51 | 125.93 | 114.60 | 132.04 | 129.12 | 130.02 | 127.34 | 126.62 | 131.92 |
| Layer Thickness (ft) | | | | | | | | | | | |
| | CPT-114 | CPT-115 | CPT-116 | CPT-126 | CPT-127 | CPT-128 | CPT-129 | CPT-143 | CPT-147 | CPT-148 | CPT-149 |
| TR1 | 5.96 | 5.74 | 0.00 | 13.58 | 11.52 | 16.42 | 11.25 | 20.25 | 16.92 | 9.94 | 0.00 |
| TR1A | 7.81 | 6.11 | 12.07 | 6.83 | 7.87 | 12.05 | 12.05 | 18.95 | 15.21 | 21.60 | 17.88 |
| TR2A | 23.17 | 23.21 | 19.97 | 28.34 | 28.06 | 22.92 | 16.96 | 11.92 | 16.97 | 17.21 | 11.03 |
| TR2B | 24.26 | 27.84 | 26.62 | 26.37 | 28.84 | 21.99 | 25.07 | 24.11 | 25.68 | 25.51 | 24.93 |
| TR3/TR4 | 9.12 | 7.09 | 8.50 | 4.62 | 6.13 | 9.04 | 7.97 | 7.95 | 5.44 | 4.91 | 6.03 |
| DB1/DB3 | 25.24 | 27.05 | 33.03 | 23.18 | 20.86 | 19.94 | 29.02 | 27.03 | 31.33 | 32.75 | 25.99 |
| DB4/DB5 | 7.98 | 7.19 | 19.96 | 11.69 | 10.66 | 9.03 | 6.92 | 9.96 | 8.27 | 10.40 | 8.98 |
| ST1 | 20.25 | 19.76 | 0.00 | 17.16 | 16.83 | 18.97 | 18.01 | 12.99 | 16.10 | 12.21 | 21.04 |
| ST2 | 7.36 | 7.10 | 9.23 | 6.30 | 13.46 | 7.06 | 9.07 | 11.03 | 13.28 | 12.56 | 8.98 |
| GC | 6.30 | 7.44 | ------ | 9.08 | 3.42 | 9.84 | 8.99 | 10.00 | 5.87 | 8.43 | 13.04 |
| CG | ------ | ------ | ------ | ------ | ------ | | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1F Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-151 | CPT-155 | CPT-156 | CPT-157 | CPT-159 | CPT-163 | CPT-167 | CPT-171 | CPT-172 | CPT-173 | CPT-174 |
| SURFACE | 290.10 | 289.10 | 289.20 | 283.10 | 293.70 | 293.90 | 296.70 | 298.50 | 295.40 | 297.60 | 301.50 |
| TR1 | 290.10 | 289.10 | 289.20 | 283.10 | 293.70 | 293.90 | 296.70 | 298.50 | ------ | 297.60 | 301.50 |
| TR1A | 269.57 | 276.66 | 278.85 | 273.38 | 277.77 | 278.97 | 280.31 | 284.98 | 295.40 | 287.49 | 292.68 |
| TR2A | 254.70 | 260.61 | 261.87 | 260.20 | 259.97 | 265.96 | 265.38 | 269.96 | 265.99 | 262.56 | 269.97 |
| TR2B | 232.48 | 232.44 | 233.47 | 239.80 | 232.20 | 237.99 | 239.72 | 232.80 | 239.98 | 241.93 | 241.63 |
| TR3/TR4 | 210.09 | 204.92 | 209.68 | 216.16 | 210.68 | 217.00 | 218.16 | 212.85 | 220.96 | 221.08 | 219.01 |
| DB1/DB3 | 203.10 | 199.95 | 204.57 | 207.35 | 204.09 | 213.62 | 211.86 | 204.59 | 215.03 | 214.07 | 212.00 |
| DB4/DB5 | 171.03 | 167.94 | 164.94 | 180.04 | 171.58 | 178.00 | ------ | 180.05 | 189.03 | 186.01 | 184.19 |
| ST1 | 165.12 | 163.61 | 163.07 | 173.37 | 168.37 | 174.53 | ------ | 173.57 | 185.00 | 177.57 | 171.52 |
| ST2 | 143.80 | 146.95 | 149.97 | 158.34 | 149.71 | 154.00 | ------ | ------ | 163.02 | 161.54 | 159.53 |
| GC | 138.42 | 135.35 | 135.67 | 145.43 | 138.55 | 140.99 | ------ | ------ | 149.00 | 153.66 | 143.58 |
| CG | 134.66 | 128.40 | 130.04 | 135.92 | 132.25 | 132.10 | ------ | ------ | 138.07 | ------ | 135.63 |
| BASE | 134.14 | 126.05 | 128.15 | 130.92 | 129.13 | 128.87 | 181.49 | 166.43 | 133.28 | 147.41 | 130.12 |
| Layer Thickness (ft) | | | | | | | | | | | |
| | CPT-151 | CPT-155 | CPT-156 | CPT-157 | CPT-159 | CPT-163 | CPT-167 | CPT-171 | CPT-172 | CPT-173 | CPT-174 |
| TR1 | 20.53 | 12.44 | 10.35 | 9.72 | 15.93 | 14.93 | 16.39 | 13.52 | 0.00 | 10.11 | 8.82 |
| TR1A | 14.87 | 16.05 | 16.98 | 13.18 | 17.80 | 13.01 | 14.93 | 15.02 | 29.41 | 24.93 | 22.71 |
| TR2A | 22.22 | 28.17 | 28.40 | 20.40 | 27.77 | 27.97 | 25.66 | 37.16 | 26.01 | 20.63 | 28.34 |
| TR2B | 22.39 | 27.52 | 23.79 | 23.64 | 21.52 | 20.99 | 21.56 | 19.95 | 19.02 | 20.85 | 22.62 |
| TR3/TR4 | 6.99 | 4.97 | 5.11 | 8.81 | 6.59 | 3.38 | 6.30 | 8.26 | 5.93 | 7.01 | 7.01 |
| DB1/DB3 | 32.07 | 32.01 | 39.63 | 27.31 | 32.51 | 35.62 | 30.37 | 24.54 | 26.00 | 28.06 | 27.81 |
| DB4/DB5 | 5.91 | 4.33 | 1.87 | 6.67 | 3.21 | 3.47 | ------ | 6.48 | 4.03 | 8.44 | 12.67 |
| ST1 | 21.32 | 16.66 | 13.10 | 15.03 | 18.66 | 20.53 | ------ | ------ | 21.98 | 16.03 | 11.99 |
| ST2 | 5.38 | 11.60 | 14.30 | 12.91 | 11.16 | 13.01 | ------ | ------ | 14.02 | 7.88 | 15.95 |
| GC | 3.76 | 6.95 | 5.63 | 9.51 | 6.30 | 8.89 | ------ | ------ | 10.93 | ------ | 7.95 |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1G Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-175 | CPT-176 | CPT-177 | CPT-178 | CPT-179 | CPT-180 | CPT-181 | CPT-182 | CPT-183 | CPT-185 | CPT-186 |
| SURFACE | 303.10 | 297.60 | 301.70 | 305.60 | 301.40 | 302.30 | 304.90 | 304.80 | 301.70 | 308.20 | 304.50 |
| TR1 | 303.10 | 297.60 | 301.70 | 305.60 | 301.40 | 302.30 | 304.90 | ------ | 301.70 | 308.20 | 304.50 |
| TR1A | 287.49 | 288.74 | 278.78 | 295.07 | 288.11 | 287.00 | 294.89 | 304.80 | 281.93 | 294.90 | 290.82 |
| TR2A | 280.12 | 267.97 | 267.07 | 272.77 | 276.49 | 245.96 | 271.29 | 278.00 | 272.72 | 271.45 | 267.44 |
| TR2B | 244.00 | 246.19 | 244.43 | 246.03 | 248.28 | 224.92 | 244.29 | 259.01 | 246.32 | 242.18 | 246.99 |
| TR3/TR4 | 220.02 | 221.70 | 225.62 | 219.93 | 225.11 | 213.99 | 212.65 | 219.00 | 228.60 | 217.08 | 222.31 |
| DB1/DB3 | 214.01 | 216.89 | 217.00 | 213.16 | 219.97 | ------ | 202.88 | 208.97 | 220.00 | 202.02 | 211.96 |
| DB4/DB5 | 184.17 | 187.83 | 186.07 | 186.21 | 192.24 | 184.02 | 178.85 | 183.96 | 190.87 | 181.06 | 184.01 |
| ST1 | 173.01 | 179.91 | 179.84 | 173.30 | 188.46 | ------ | 172.25 | 180.03 | 187.31 | 172.97 | 178.90 |
| ST2 | 157.58 | 160.86 | ------ | 158.69 | ------ | ------ | ------ | ------ | ------ | ------ | 161.96 |
| GC | 143.80 | 158.27 | ------ | 144.96 | ------ | ------ | ------ | ------ | ------ | ------ | 153.98 |
| CG | 137.70 | ------ | ------ | 140.93 | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| BASE | 136.17 | 150.95 | 169.10 | 137.25 | 177.46 | 181.45 | 166.17 | 164.70 | 186.74 | 171.34 | 149.52 |

| Layer Thickness (ft) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPT-175 | CPT-176 | CPT-177 | CPT-178 | CPT-179 | CPT-180 | CPT-181 | CPT-182 | CPT-183 | CPT-185 | CPT-186 |
| TR1 | 15.61 | 8.86 | 22.92 | 10.53 | 13.29 | 15.30 | 10.01 | 0.00 | 19.77 | 13.30 | 13.68 |
| TR1A | 7.37 | 20.77 | 11.71 | 22.30 | 11.62 | 41.04 | 23.60 | 26.80 | 9.21 | 23.45 | 23.38 |
| TR2A | 36.12 | 21.78 | 22.64 | 26.74 | 28.21 | 21.04 | 27.00 | 40.01 | 26.40 | 29.27 | 20.45 |
| TR2B | 23.98 | 24.49 | 18.81 | 26.10 | 23.17 | 10.93 | 31.64 | 10.03 | 17.72 | 25.10 | 24.68 |
| TR3/TR4 | 6.01 | 4.81 | 8.62 | 6.77 | 5.14 | 29.97 | 9.77 | 28.94 | 8.60 | 15.06 | 10.35 |
| DB1/DB3 | 29.84 | 29.06 | 30.93 | 26.95 | 27.73 | 0.00 | 24.03 | 3.93 | 29.13 | 20.96 | 27.95 |
| DB4/DB5 | 11.16 | 7.92 | 6.23 | 12.91 | 3.78 | ------ | 6.60 | 3.56 | 3.56 | 8.09 | 5.11 |
| ST1 | 15.43 | 19.05 | ------ | 14.61 | ------ | ------ | ------ | ------ | ------ | ------ | 16.94 |
| ST2 | 13.78 | 2.59 | ------ | 13.73 | ------ | ------ | ------ | ------ | ------ | ------ | 7.98 |
| GC | 6.10 | ------ | ------ | 4.03 | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| CG | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1H Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| Layer Elevation (ft above MSL) | | | | | |
|---|---|---|---|---|---|
| | CPT-188 | CPT-189 | CPT-196 | AVG | STD DEV |
| SURFACE | 310.40 | 309.20 | 290.10 | 290.08 | 8.24 |
| TR1 | 310.40 | ------ | 290.10 | 290.95 | 7.27 |
| TR1A | 296.70 | 309.20 | 273.07 | 278.42 | 8.71 |
| TR2A | 273.60 | 276.04 | 260.22 | 261.51 | 6.51 |
| TR2B | 246.28 | 242.99 | 235.74 | 236.46 | 5.59 |
| TR3/TR4 | 221.38 | 219.99 | 212.36 | 213.08 | 5.63 |
| DB1/DB3 | 210.87 | 212.96 | 208.42 | 206.30 | 5.26 |
| DB4/DB5 | 186.99 | 187.98 | 173.50 | 177.99 | 5.13 |
| ST1 | 181.00 | 179.95 | 168.87 | 171.72 | 5.13 |
| ST2 | ------ | ------ | ------ | 152.42 | 3.75 |
| GC | ------ | ------ | ------ | 141.10 | 4.66 |
| CG | ------ | ------ | ------ | 133.87 | 3.29 |
| BASE | 168.56 | 175.16 | 168.31 | | |
| **Layer Thickness (ft)** | | | | | |
| | CPT-188 | CPT-189 | CPT-196 | AVG | STD DEV |
| TR1 | 13.70 | 0.00 | 17.03 | 11.66 | 6.17 |
| TR1A | 23.10 | 33.16 | 12.85 | 16.90 | 5.79 |
| TR2A | 27.32 | 33.05 | 24.48 | 25.28 | 5.02 |
| TR2B | 24.90 | 23.00 | 23.38 | 23.05 | 3.22 |
| TR3/TR4 | 10.51 | 7.03 | 3.94 | 7.23 | 3.97 |
| DB1/DB3 | 23.88 | 24.98 | 34.92 | 27.72 | 5.37 |
| DB4/DB5 | 5.99 | 8.03 | 4.63 | 6.44 | 2.74 |
| ST1 | ------ | ------ | ------ | 18.15 | 3.53 |
| ST2 | ------ | ------ | ------ | 11.24 | 3.15 |
| GC | ------ | ------ | ------ | 6.65 | 2.06 |
| CG | ------ | ------ | ------ | 30.37 | ------ |

NOTE: ELEVATIONS ARE TO TOP OF LAYER

Table 3.3-1l Summary of CPT Layer Picks (Layer Tops and Layer Thicknesses for APSF and Northeast Expansion)

| | Source | Fill | TR1 | TR1A | TR2A | TR2B | TR3/4 | DB1/3 | DB4/5 | ST* | GC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPT N-Value | F-Area Report | 23 | 25 | 25 | 28 | 36 | 18 | 33 | 15 | 47 | 21 |
| (blows/foot) | APSF Data | - | 33 | 27 | 34 | 38 | 19 | 50 | 21 | 46 | 49 |
| | NEC Data | N/A | 31 | 31 | 37 | 39 | 27 | 37 | 29 | 43 | 39 |
| qt/N | F-Area Report | 4.9 | 3.7 | 4.8 | 5.2 | 5.5 | 3.1 | 5.1 | 4.1 | 2.8 | 2.7 |
| | APSF Data | - | 4.3 | 2.5 | 4.0 | 4.1 | 1.9 | 3.3 | 2.5 | 3.0 | 1.6 |
| | NEC Data | N/A | 3.8 | 4.1 | 5.2 | 4.6 | 4.1 | 5.9 | 4.5 | 2.9 | 4.6 |
| Shear Wave Velocity | F-Area Report | 978 | 1455 | 1348 | 1256 | 1254 | 1074 | 1157 | 1140 | 1353 | 1675 |
| (ft/sec) | APSF Data | - | 1637 | 1464 | 1284 | 1215 | 1020 | 1197 | 1231 | 1223 | 1160 |
| | NEC Data | N/A | 1544 | 1454 | 1257 | 1165 | 1056 | 1176 | 1180 | 1273 | 1319 |
| Corrected Tip Resistance | F-Area Report | 112 | 91 | 120 | 147 | 201 | 55 | 172 | 61 | 131 | 58 |
| (tons/foot$^2$) | APSF Data | - | 142 | 68 | 136 | 154 | 37 | 166 | 52 | 137 | 79 |
| | NEC Data | N/A | 95 | 103 | 146 | 164 | 73 | 194 | 67 | 138 | 97 |
| Friction Ratio | F-Area Report | 2 | 4 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |
| (%) | APSF Data | - | 2 | 4 | 1 | 1 | 2 | 1 | 2 | 1 | 2 |
| | NEC Data | N/A | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | 2 |
| Percent Fines | F-Area Report | 25 | 33 | 30 | 17 | 19 | 64 | 14 | 22 | 29 | 39 |
| (%) | APSF Data | - | 25 | 37 | 16 | 11 | 34 | 9 | 21 | 18 | 52 |
| | NEC Data | N/A | 34 | 30 | 14 | 10 | 36 | 11 | 20 | 19 | 33 |
| Plasticity Index | F-Area Report | 15 | 17 | 14 | 10 | 18 | 58 | 19 | 28 | 18 | 47 |
| (%) | APSF Data | - | 11 | 22 | 10 | NP | 19 | NP | 11 | 25 | 30 |
| | NEC Data | N/A | 23 | 20 | 9 | 12 | 19 | 16 | 11 | 14 | 27 |
| Liquid Limit | F-Area Report | 32 | 38 | 36 | 33 | 41 | 96 | 44 | 48 | 40 | 83 |
| (%) | APSF Data | - | 30 | 46 | 33 | NP | 54 | NP | 45 | 49 | 57 |
| | NEC Data | N/A | 48 | 35 | 28 | 24 | 54 | 11 | 45 | 23 | 42 |
| Water Content | F-Area Report | 13 | 15 | 19 | 17 | 22 | 51 | 27 | 39 | 29 | 32 |
| (%) | APSF Data | - | 16 | 20 | 21 | 24 | 42 | 27 | 38 | 30 | 28 |
| | NEC Data | N/A | 18 | 19 | 17 | 18 | 34 | 25 | 36 | 30 | 32 |

Notes

1. Data for the APSF Investigation includes CPTs 1-17, 36, 37, and 44 and Borings FB-3 through FB-12
2. The ST layer was not subdivided for analysis
3. Data for the Northeast Expansion included CPT's 103-196 and borings FB-17 through FB-30
4. Laboratory data for a portion of the DB1/3 layer from FB-22 (samples SS50-SS53 ) were omitted due to a significant material change considered to be localized in the vicinity of FB-22

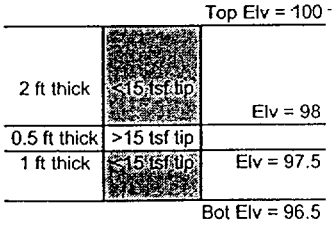
Table 3.3-2 Summary of Engineering Soil Properties

| CPT No. | Top Elv | Bot Elv | Appx. Thickness |
|---|---|---|---|
| 2 | 150.68 | 144.47 | 5.97 |
| | 173.28 | 170.65 | 2.63 |
| 3 | 170.35 | 166.05 | 3.93 |
| 6 | 145.10 | 138.46 | 6.28 |
| | 175.86 | 170.43 | 5.04 |
| 18 | 138.70 | 136.51 | 2.19 |
| 20A | 150.90 | 148.79 | 2.11 |
| | 146.05 | 139.70 | 5.44 |
| 23 | 208.90 | 204.25 | 4.65 |
| 24 | 174.27 | 169.56 | 4.71 |
| 25 | 142.87 | 138.35 | 4.52 |
| 27 | 147.08 | 144.87 | 2.21 |
| 29 | 151.08 | 146.66 | 3.45 |
| | 181.30 | 175.34 | 5.21 |
| 32 | 144.31 | 139.78 | 3.50 |
| 32A | 144.00 | 140.15 | 3.36 |
| 33 | 140.18 | 138.77 | 1.41 |
| | 174.68 | 170.67 | 2.62 |
| 38 | 178.74 | 175.41 | 3.03 |
| 39 | 207.44 | 205.50 | 1.94 |
| 46 | 176.43 | 172.44 | 3.99 |
| 51 | 177.90 | 172.98 | 4.07 |
| 103 | 177.60 | 171.21 | 2.88 |
| 157 | 215.13 | 211.21 | 3.39 |
| | 179.80 | 173.46 | 6.19 |
| SPT No. | Top Elv | Bot Elv | Appx. Thickness |
| FB-1 | 155.1 | 146.6 | 8.5 |
| FB-4 | 177.8 | 172.1 | 5.70 |
| FB-17 | 183.10 | 176.10 | 7.00 |
| | 157.60 | 151.60 | 6.00 |
| FB-19 | 189.60 | 186.60 | 3.00 |
| FB-20 | 179.00 | 172.90 | 6.10 |

SOFT ZONE THICKNESS CRITERIA:

1. For a CPT to be labelled as a soft zone "hit" it must have a zone with a corrected tip stress of less than 15 tsf over a 2 ft thick (or greater) interval. Professional judgment may include a few zones that approach 2 ft in thickness. For a boring to be labelled as a soft zone "hit" it must have a WR, WH or N-value <=5 over a 2 ft or greater interval.

2. About two-thirds of the CPTs have soft zone thicknesses which consist of two or more intervals having <15 tsf tip stresses. The criteria for combining these separate soft intervals into a single zone is an intervening harder layer less than 1 foot in thickness. In these instances the Top Elv, Bot Elv, and appx. zone thickness were calculated excluding the harder layer as shown in the following example:




***Top Elv = 100***
***Bot Elv = 96.5***
***Appx. Thickness = 3.0 ft***

Table 3.3-3 Summary of Soft Zone Intervals

| SAMPLE NUMBER | ADJACENT CPT | TOP ELEV. | TOP DEPTH | BOTTOM DEPTH | SOFT INTERVAL | LAB TESTING ASSIGNMENTS |
|---|---|---|---|---|---|---|
| F235 CSS38 | 38 | 177.5 | 112 | 114 | UPPER ST | UW, Cons, Hyd, AL, MC |
| F235 CSS38 | 38 | 175.5 | 114 | 116 | UPPER ST | UW, Cons, Hyd, AL, MC |
| F235 CSS53B | 53 | 154.9 | 135 | 137 | LOWER ST | UW, Hyd, AL, MC |
| F235 CSS 53 | 53 | 154.9 | 135 | 139 | LOWER ST | UW, Hyd, AL, MC |
| F235 CSS32 | 32 | 141.5 | 148 | 148.8 | LOWER ST | Hyd, Cons, UCC, AL |
| F235 CSS32 | 32 | 140.7 | 148.8 | 150 | LOWER ST | Hyd |
| F235 CSS32 | 32 | 139.5 | 150 | 150.5 | LOWER ST | Hyd |

| SAMPLE NUMBER | Dry UW lb/ft^3 | MC % | Wet UW lb/ft^3 | %Sand | %Fines | %Clay | D50 mm | LL % | PI % | Class |
|---|---|---|---|---|---|---|---|---|---|---|
| F235 CSS38 | 65.2 | 61.56 | 105.3 | 61.8 | 38.2 | 29.5 | 0.14 | 44 | 20 | SC |
| F235 CSS38 | 77.8 | 42.37 | 110.7 | 85.5 | 14.5 | 11.5 | 0.17 | NL | NP | SM |
| F235 CSS53B | 83 | 34.6 | 111.7 | 90.6 | 9.4 | 1.9 | 0.14 | NL | NP | SP-SM |
| F235 CSS 53 | 75.1 | 42 | 106.7 | 90.9 | 9.1 | 1.7 | 0.13 | NL | NP | SP-SM |
| F235 CSS32 | 97.9 | 25 | 122.4 | 48.3 | 51.7 | 24.2 | 0.07 | 44 | 24 | CL |
| F235 CSS32 | | | | 64.9 | 35.1 | 5.9 | 0.09 | | | SM |
| F235 CSS32 | | | | 62.6 | 37.4 | 6 | 0.08 | | | SM |

| SAMPLE NUMBER | Cc | eo | SG | Pc ksf | Po' ksf | OCR | su ksf |
|---|---|---|---|---|---|---|---|
| F235 CSS38 | | | | | | | |
| F235 CSS38 | 0.23 | 1.1954 | 2.65 | 0.71 | 11.3 | 0.1 | |
| F235 CSS53B | | | | | | | |
| F235 CSS 53 | | | | | | | |
| F235 CSS32 | 0.26 | 0.6902 | 2.65 | 10.7 | 13.3 | 0.8 | 3.4 |
| F235 CSS32 | | | | | | | |
| F235 CSS32 | | | | | | | |

Note: This data is presented solely for interpretation. Refer to Section 3.3.1.3 in the report text for more information.

Table 3.3-4 Summary of Soft Zone Soil Properties

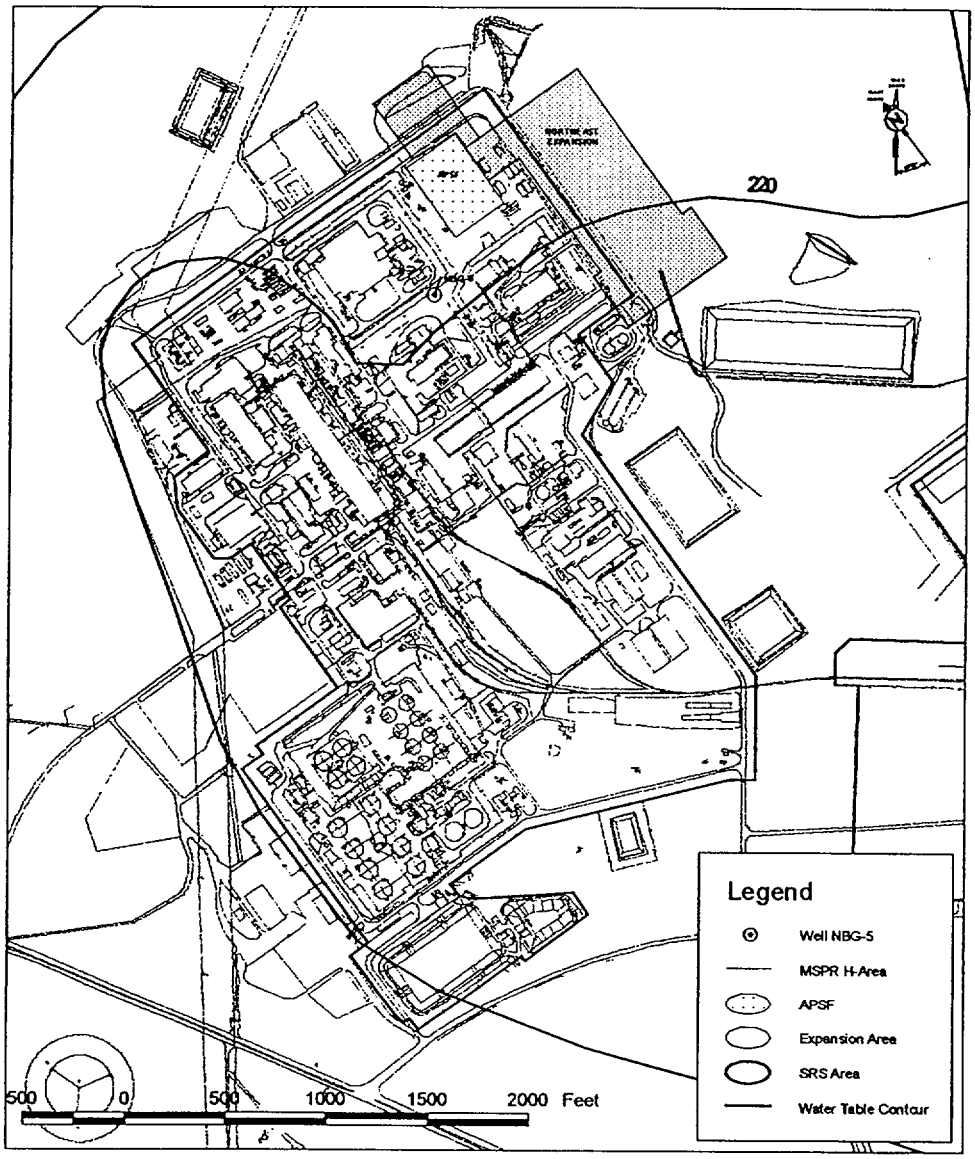



Figure 1.0-1 Location Map of F-Area and the Northeast Expansion Area

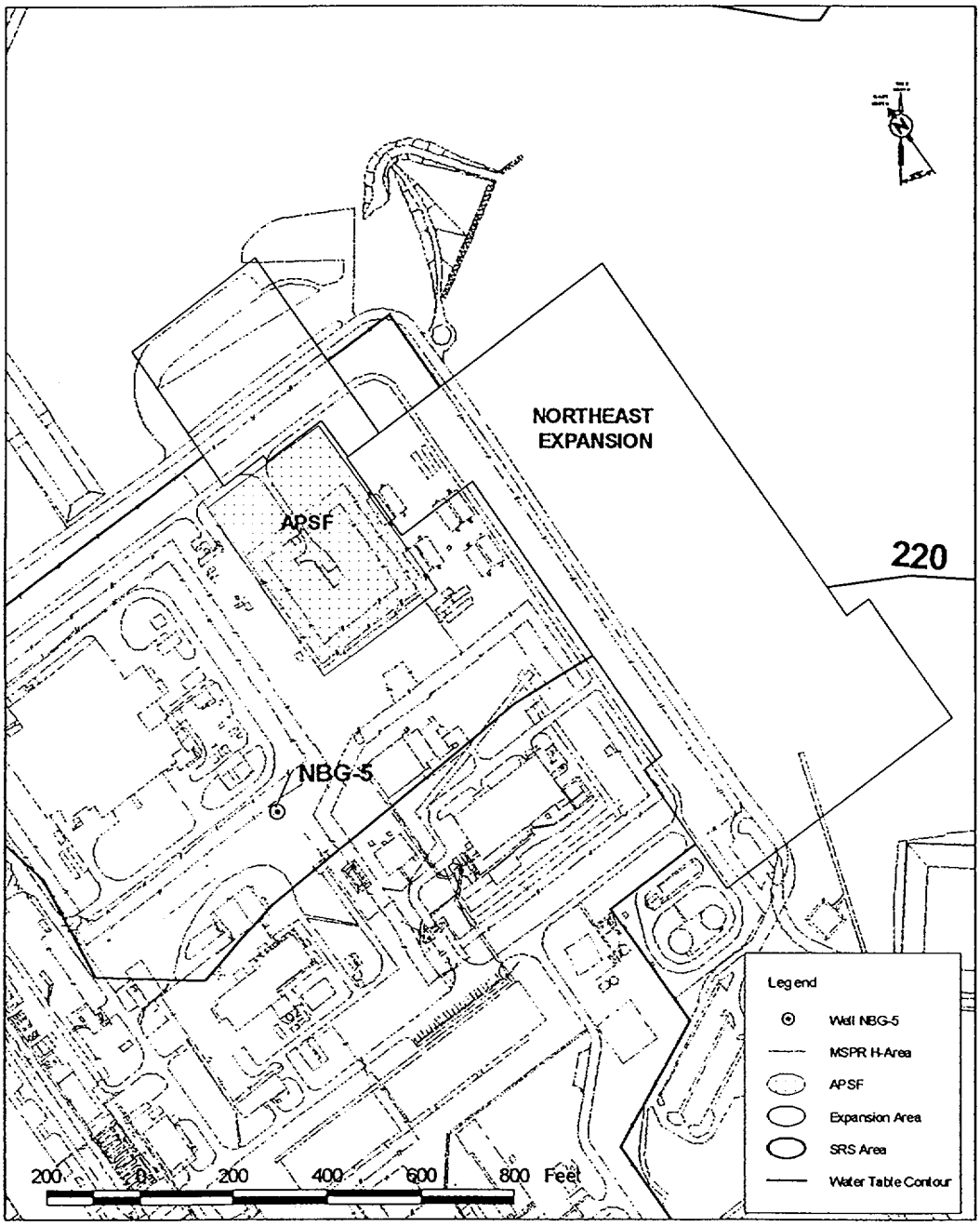
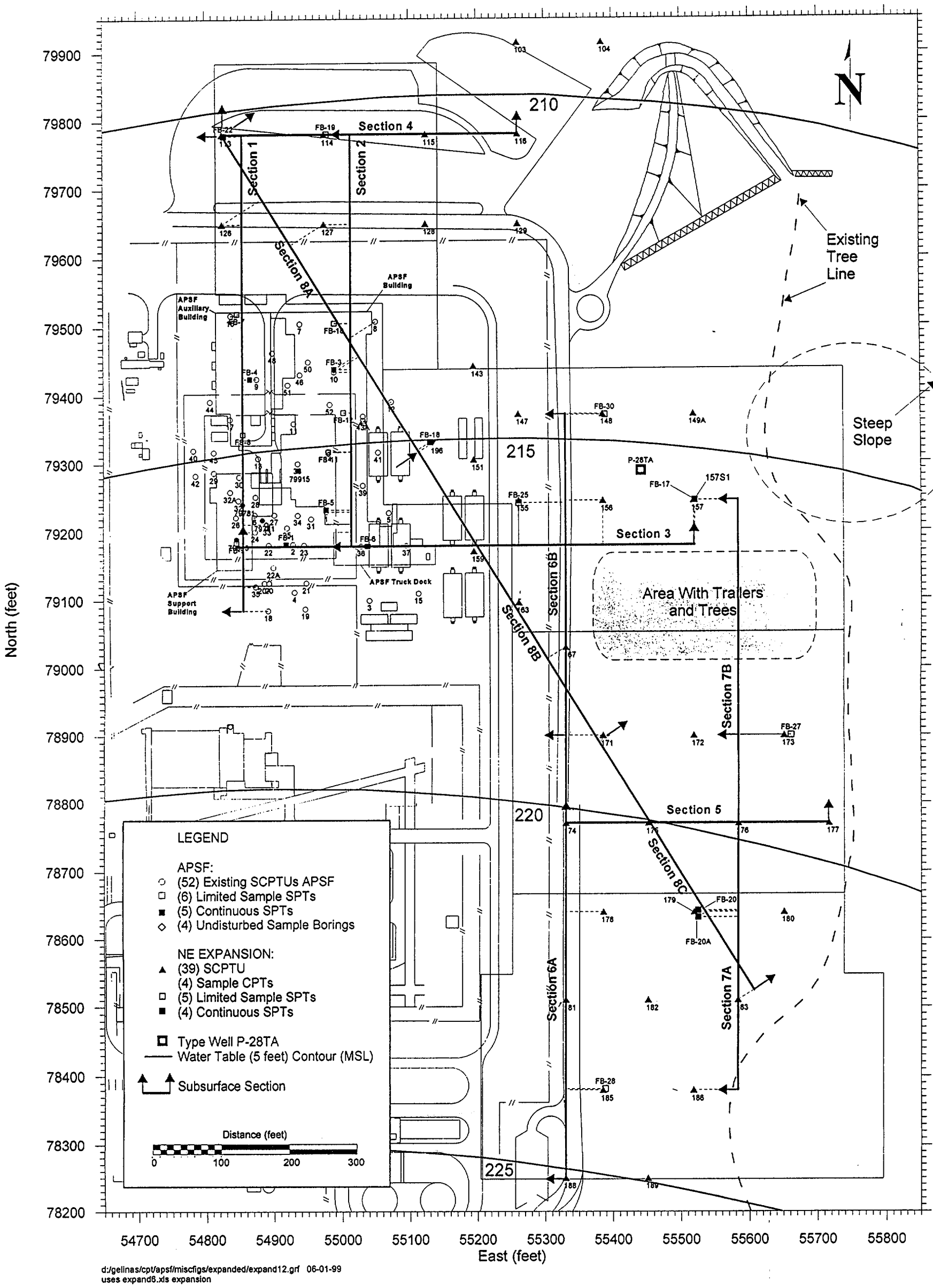



Figure 1.0-2 Location Map of the Northeast Expansion Area and APSF




APSF structure/facility outline provided by project team (SRS Drawing C-CG-F-0042) and is considered approximate.
F-Area facility boundaries obtained from SRS maps MSRP0884.DGN and MSRP0854.DGN.

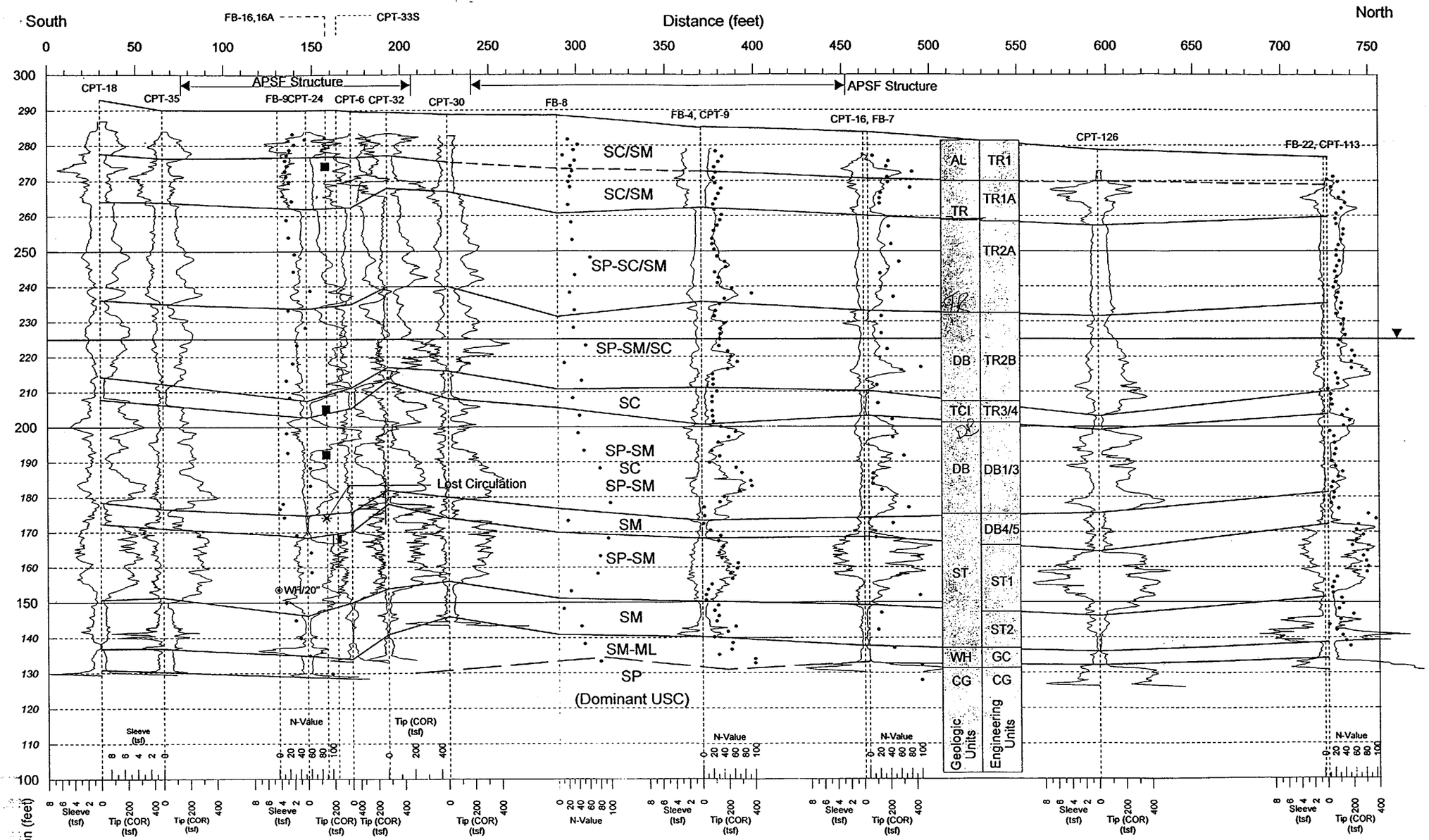
Figure 2.0-1 Exploration Location Map

Prepared By: Robert Helmis  Checked By: ES.
Approved By:  Revision: 0  Date: 5-27-99

# APSF NE Expansion Section Line 1

**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◫ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊛ Weight of Hammer or Rod

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne1-g.grf
uses ne-sect.xls:sheet.1 05/18/99

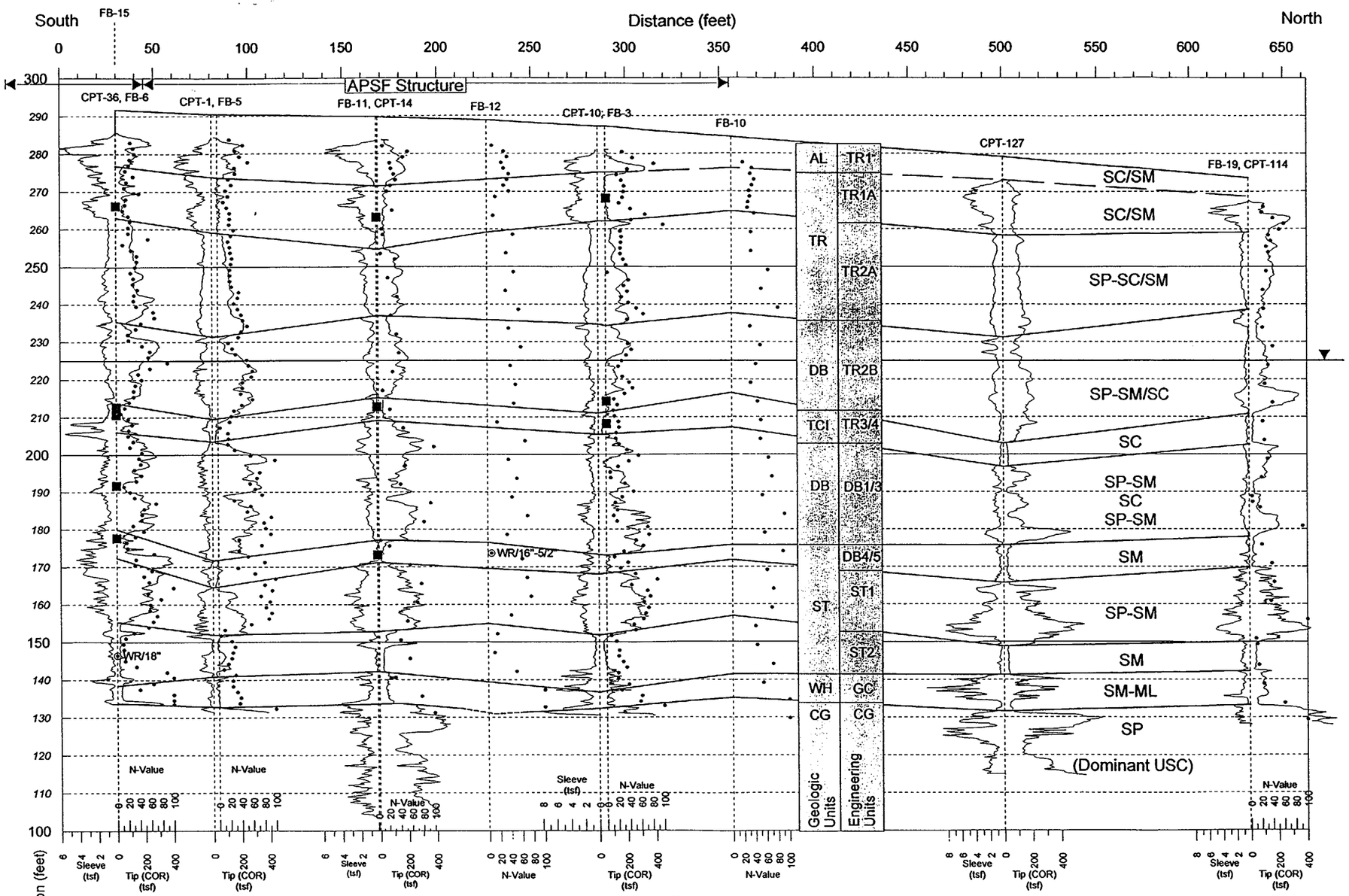
Figure 3.0-1 Subsurface Cross-section 1

Prepared By: Robert Gelinas  Checked By: F.S.
Approved By: [illegible]  Revision: 0  Date: 5-27-99

# APSF NE Expansion Section Line 2

**PRELIMINARY**

**Vertical Exaggeration = 2X**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◫ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod

Scale for CPT Sleeve Stress, Resistance in TSF — Sleeve (tsf) 8 6 4 2 0

Tip (COR) (tsf) 0 200 400

N-Value 0 20 40 60 80 100

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne2-f.grf
uses ne-sect.xls sheet 2  05/18/99

Figure 3.0-2 Subsurface Cross-section 2

Prepared By: Robert Gelinas  Checked By: T.S.
Approved By: [illegible]  Revision: 0  Date: 5-27-99

# APSF NE Expansion Section Line 3

**Vertical Exaggeration = 2X**

**PRELIMINARY**

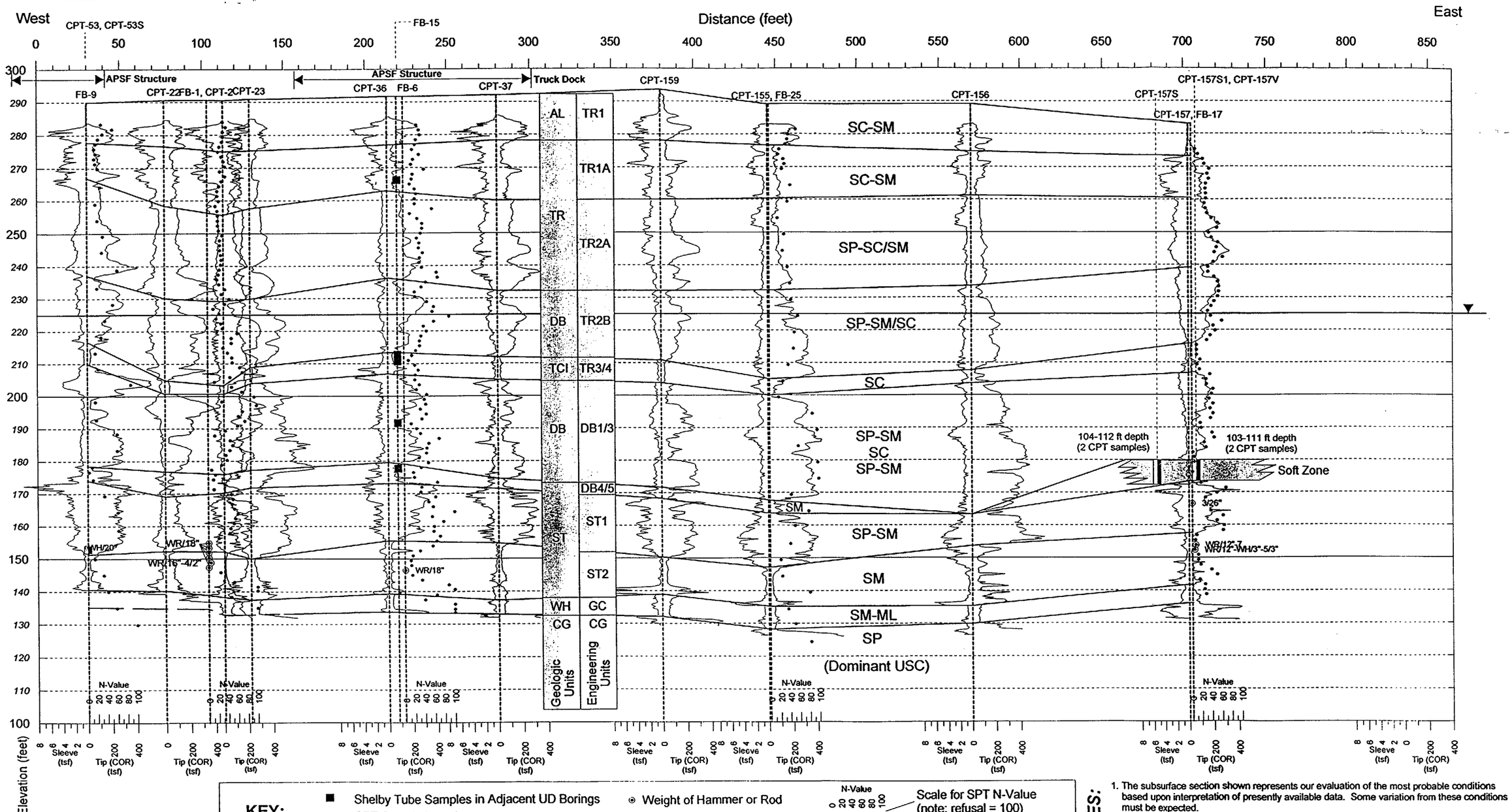



Figure 3.0-3 Subsurface Cross-section 3

**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

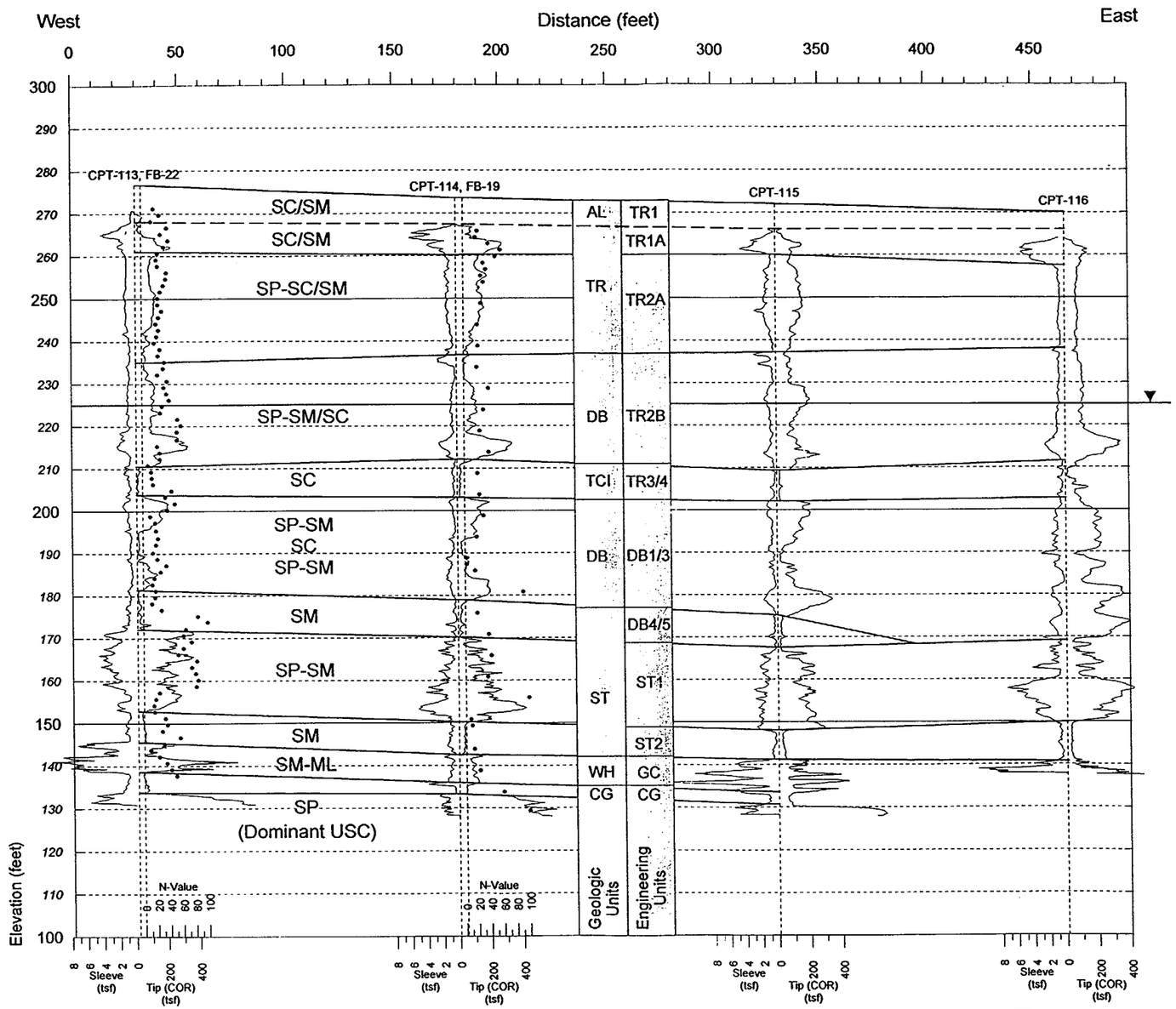
d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne3-f.grf
uses ne-sect.xls sheet 3  05/18/99

Prepared By: Robert Gelinas  Checked By: F.S.
Approved By: [illegible]  Revision: 0  Date: 5-27-99

# APSF NE Expansion Section Line 4

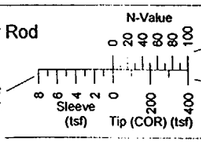
**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◨ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod




Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne4-f.grf
uses ne-sect.xls sheet 4  05/18/99

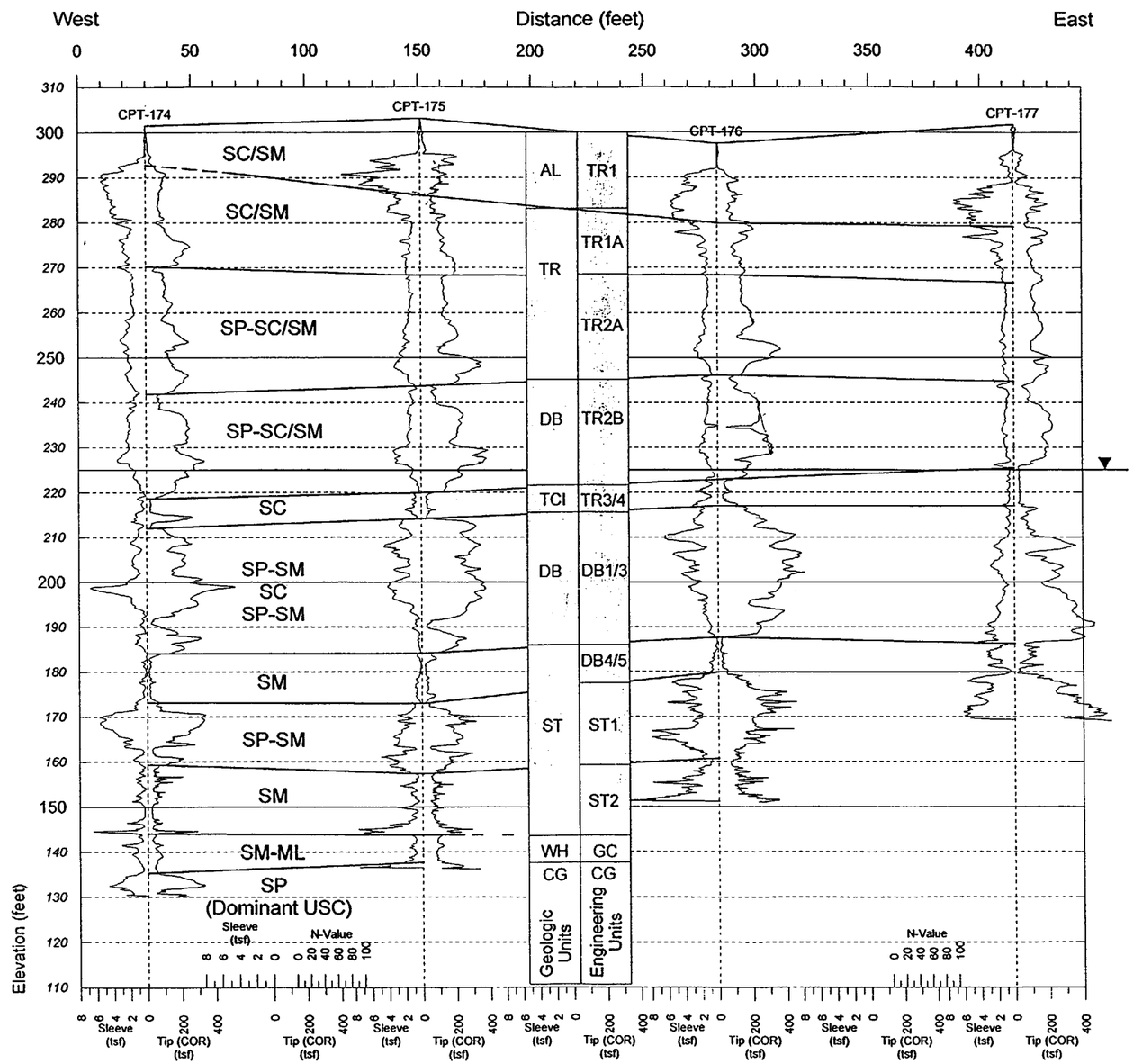
Figure 3.0-4 Subsurface Cross-section 4

| | | | |
|---|---|---|---|
| Prepared By: Robert Gelynas | Checked By: F.S. | | |
| Approved By: | Revision: 0 | Date: 5-27-99 | |

# APSF NE Expansion Section Line 5

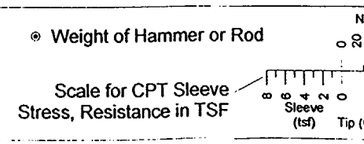
**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◨ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊗ Weight of Hammer or Rod




**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne5-f.grf
uses ne-sect.xls sheet 5 05/18/99

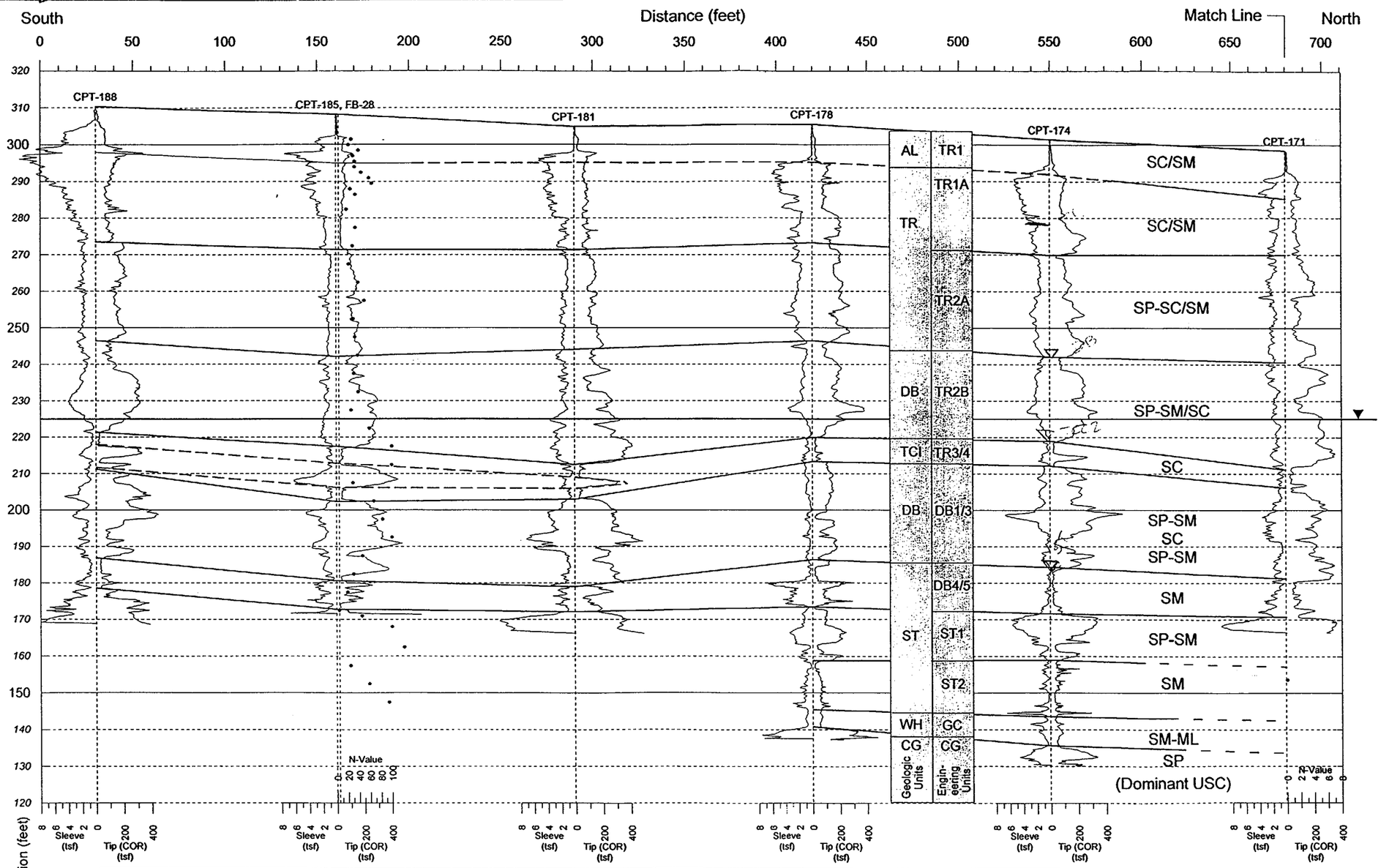
Figure 3.0-5 Subsurface Cross-section 5

| | | | |
|---|---|---|---|
| Prepared By: Robert Gelinas | Checked By: F.S. | | |
| Approved By: | Revision: 0 | Date: 5-27-99 | |

# APSF NE Expansion Section Line 6A

**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- Shelby Tube Samples in Adjacent UD Borings
- CPT Sample Location
- SPT N-Value
- Approximate Water Table
- Weight of Hammer or Rod

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne6a-f.grf
uses ne-sect.xls sheet 6a 05/18/99

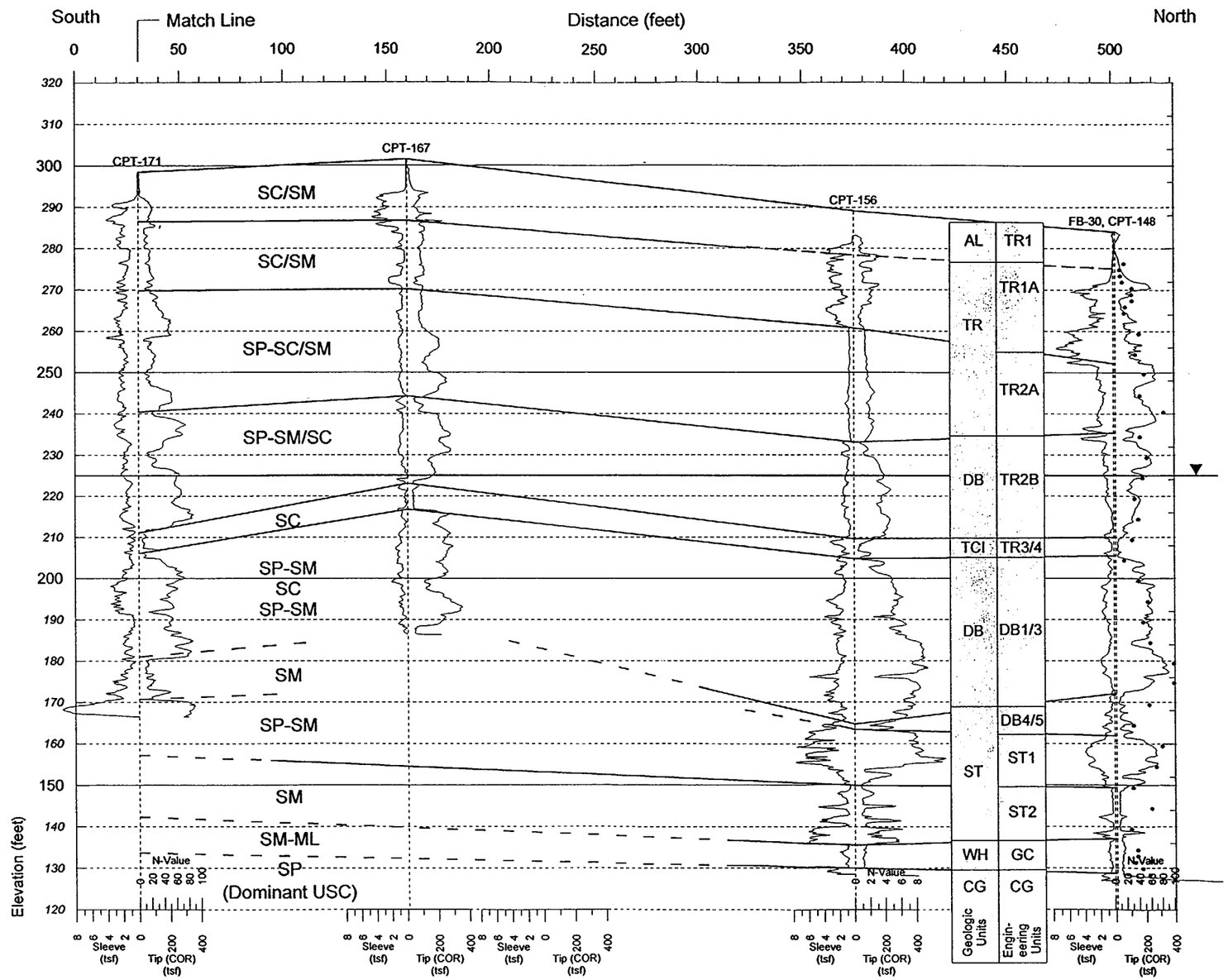
Figure 3.0-6 Subsurface Cross-section 6A

| | | | |
|---|---|---|---|
| Prepared By: Robert Gelinas | | Checked By: F.S. | |
| Approved By: | | Revision: 0 | Date: 5-27-99 |

# APSF NE Expansion Section Line 6B

**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◫ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne6b-f.grf
uses ne-sect.xls sheet 7b 05/18/99

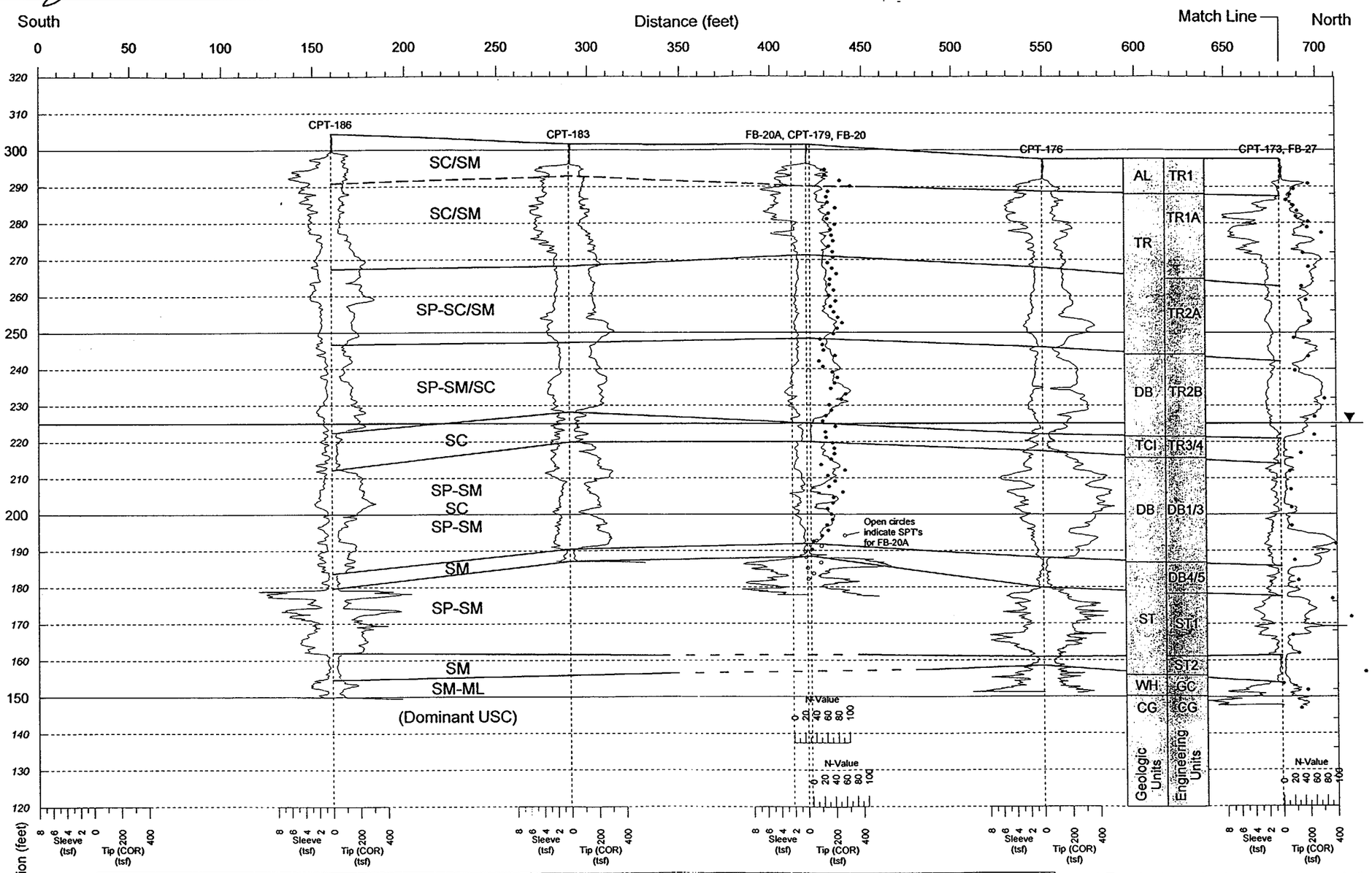
Figure 3.0-6 Subsurface Cross-section 6B

Prepared By: Robert Gelinas Checked By: F.S.
Approved By: Revision: 0 Date: 5-27-99

# APSF NE Expansion Section Line 7A

**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- Shelby Tube Samples in Adjacent UD Borings
- CPT Sample Location
- SPT N-Value
- Approximate Water Table
- Weight of Hammer or Rod

Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Sleeve Stress, Resistance in TSF

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne7a-f.grf
uses ne-sect.xls sheet 7a 05/18/99

Subsurface Cross-section 7A

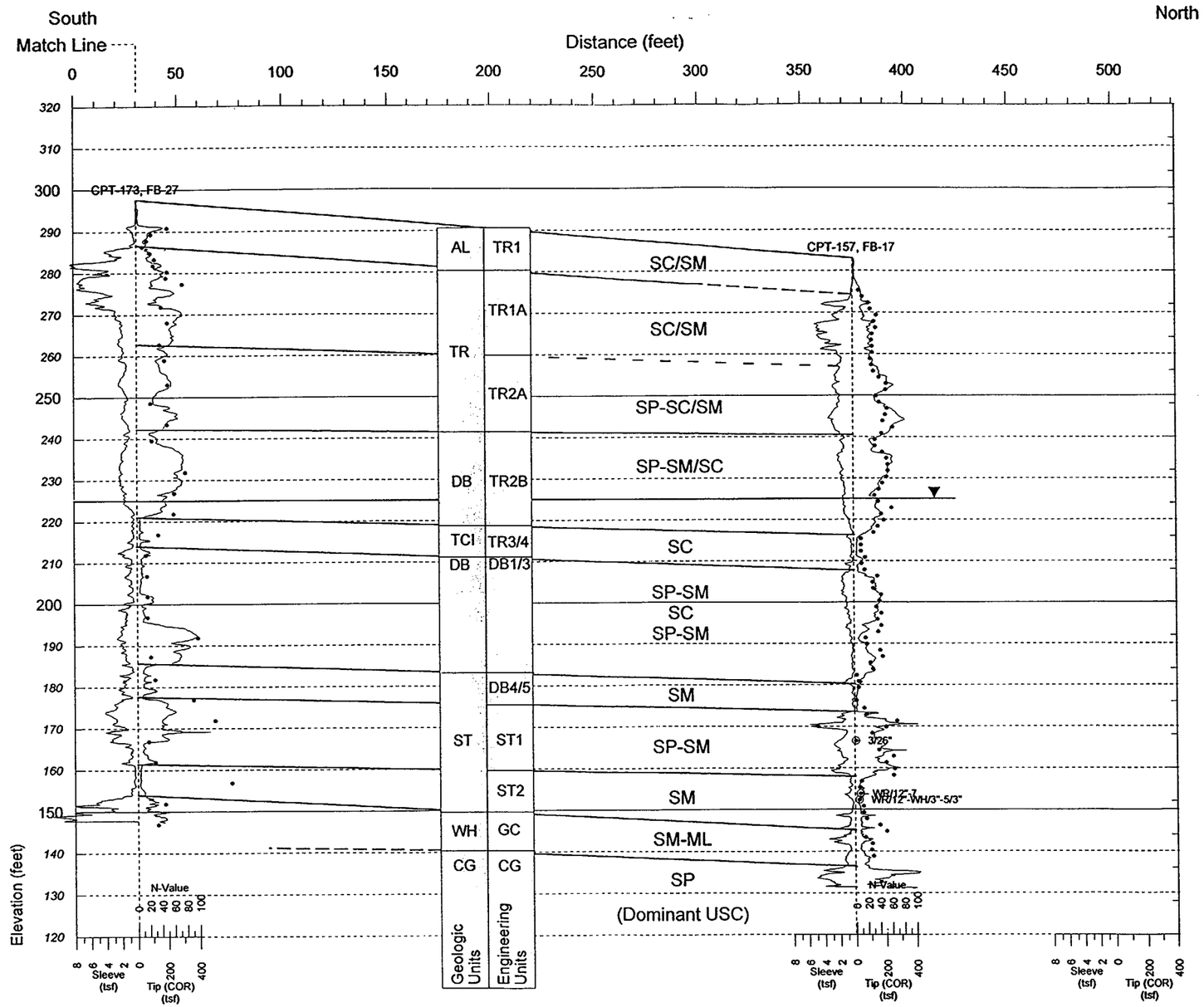
Figure 3.0-7

Prepared By: Robert Gelinas Checked By: F.S.
Approved By: Revision: 0 Date: 5-27-99

# APSF NE Expansion Section Line 7B

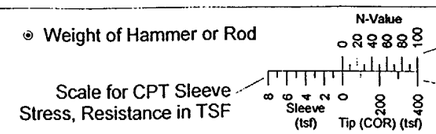
**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- Shelby Tube Samples in Adjacent UD Borings
- CPT Sample Location
- SPT N-Value
- Approximate Water Table
- Weight of Hammer or Rod




**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne7b-f.grf
uses ne-sect.xls sheet 7b 05/18/99

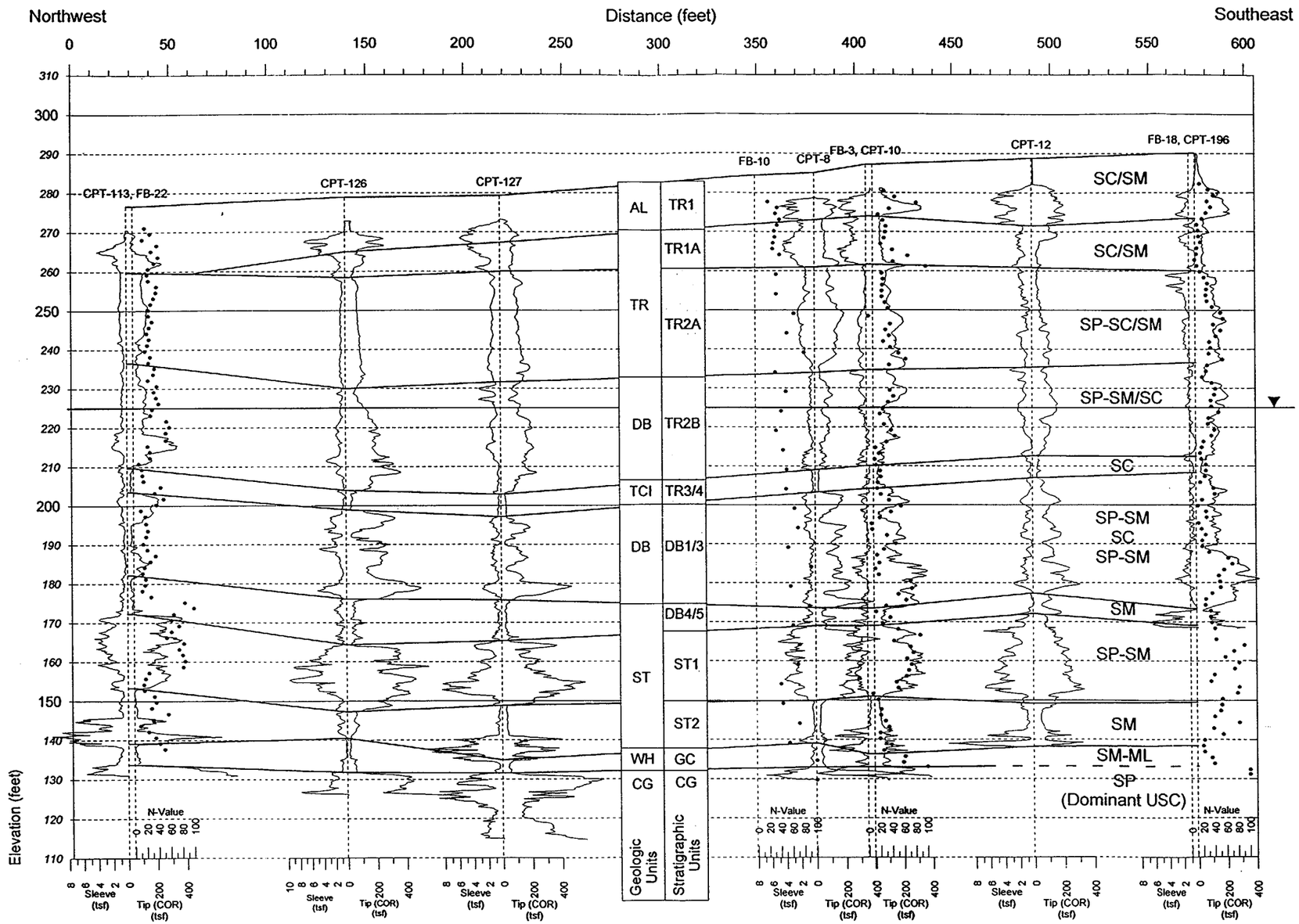
Figure 3.0-7 Subsurface Cross-section 7B

| | | | |
|---|---|---|---|
| Prepared By: Robert Gelinas | Checked By: F.S. | | |
| Approved By: | Revision: 0 | Date: 5-27-99 | |

# APSF NE Expansion Section Line 8A

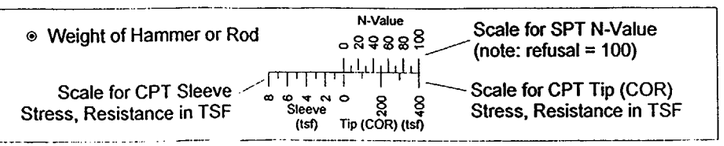
**Vertical Exaggeration = 2X**

**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod




**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
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3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne8a-f.grf
uses ne-sect.xls sheet 8a 05/18/99

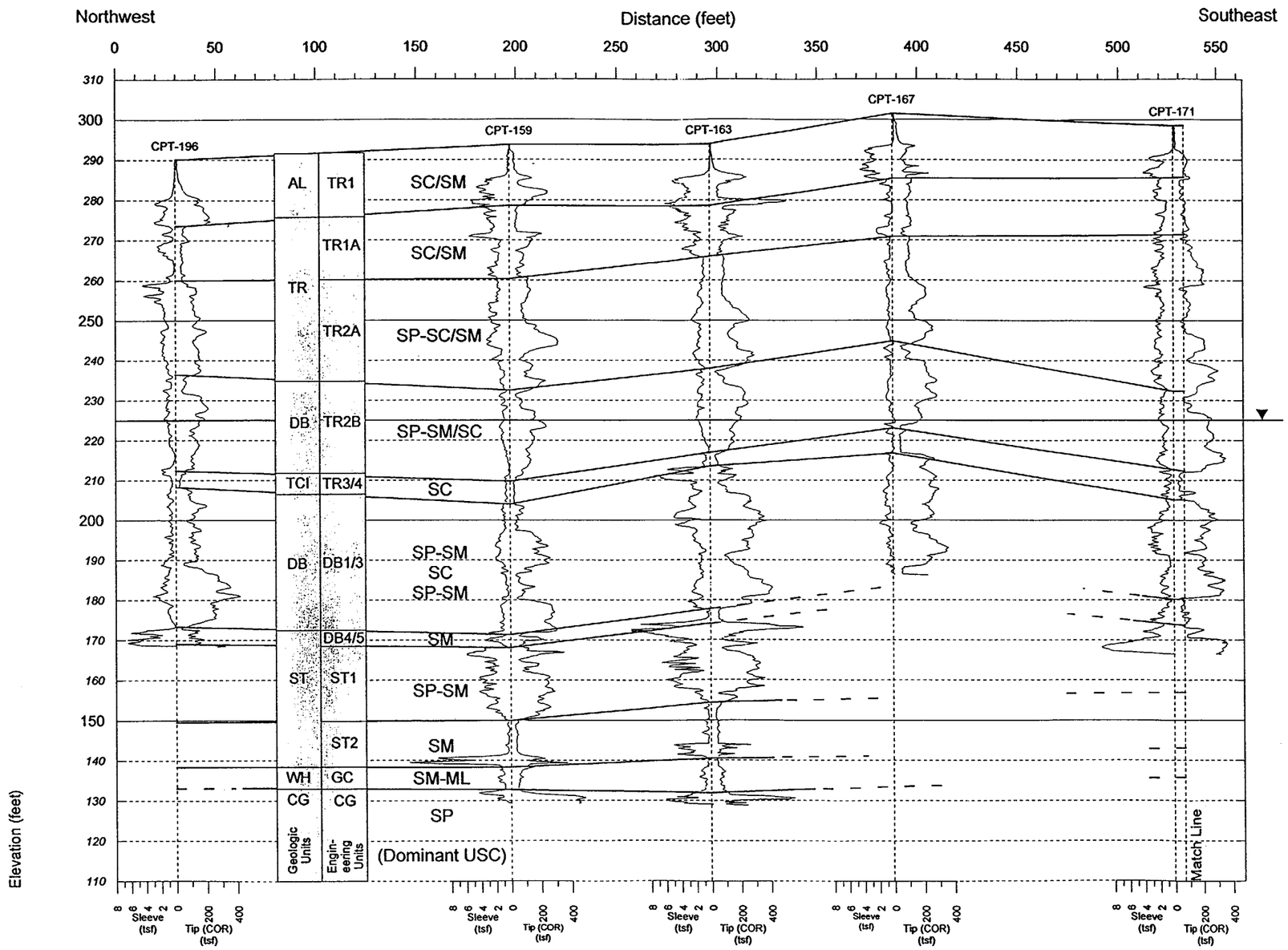
Figure 3.0-8 Subsurface Cross-section 8A

| | | | |
|---|---|---|---|
| Prepared By: Robert Gelinas | | Checked By: F.S. | |
| Approved By: | | Revision: 0 | Date: 5-27-99 |

# APSF NE Expansion Section Line 8B

**Vertical Exaggeration = 2X**

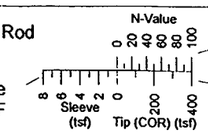
**PRELIMINARY**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◨ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod

Scale for CPT Sleeve Stress, Resistance in TSF




Scale for SPT N-Value (note: refusal = 100)

Scale for CPT Tip (COR) Stress, Resistance in TSF

**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne8b-e.grf
uses ne-sect.xls sheet 8b 05/18/99

Subsurface Cross-section 8B

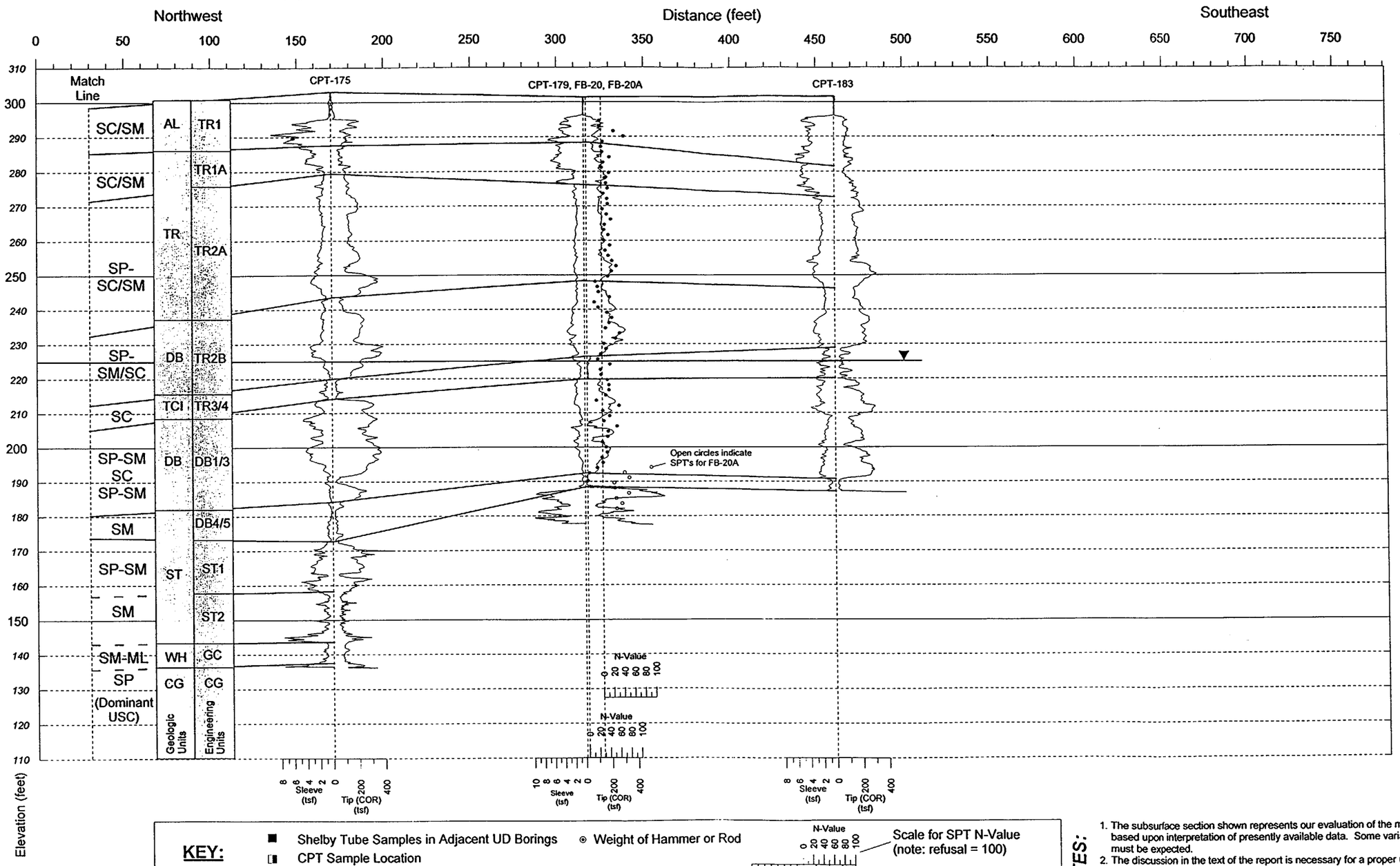
Figure 3.0-8

Prepared By: Robert Gelinas  Checked By: F.S.
Approved By: [illegible]  Revision: 0  Date: 5-27-99

# APSF NE Expansion Section Line 8C

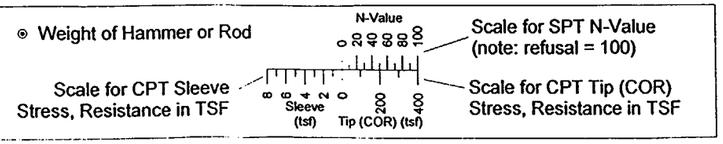
**PRELIMINARY**

**Vertical Exaggeration = 2X**




**KEY:**

- ■ Shelby Tube Samples in Adjacent UD Borings
- ◧ CPT Sample Location
- • SPT N-Value
- ▼ Approximate Water Table
- ⊙ Weight of Hammer or Rod




**NOTES:**

1. The subsurface section shown represents our evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions must be expected.
2. The discussion in the text of the report is necessary for a proper understanding of the nature of the subsurface material.
3. The use of the geologic formation designation of soils encountered is used for ease of description and should not be interpreted as a textural or engineering description.
4. Water talbe elev shown represents an average high and generalized across the area. Refer to report for actual water table data.
5. USC = Unified Soil Classification.

d:/gelinas/cpt/apsf/miscfigs/sections/expand.ne/ne8c-b.grf
uses ne-sect.xls sheet 8c 05/18/99

Figure 3.0-8 Subsurface Cross-section 8C

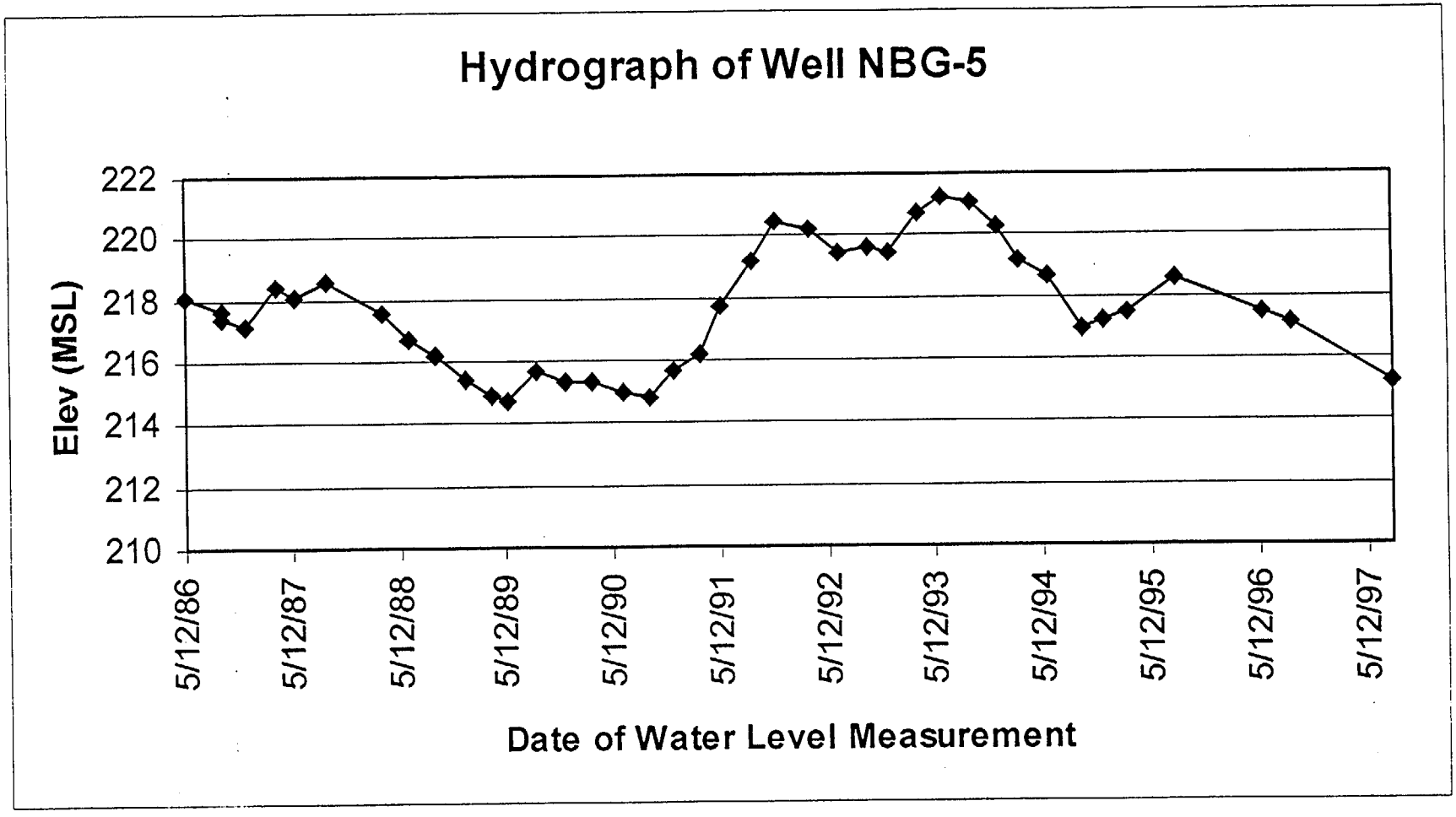



Figure 3.2-1 Hydrograph of Water Table Measurements for Well NBG-5

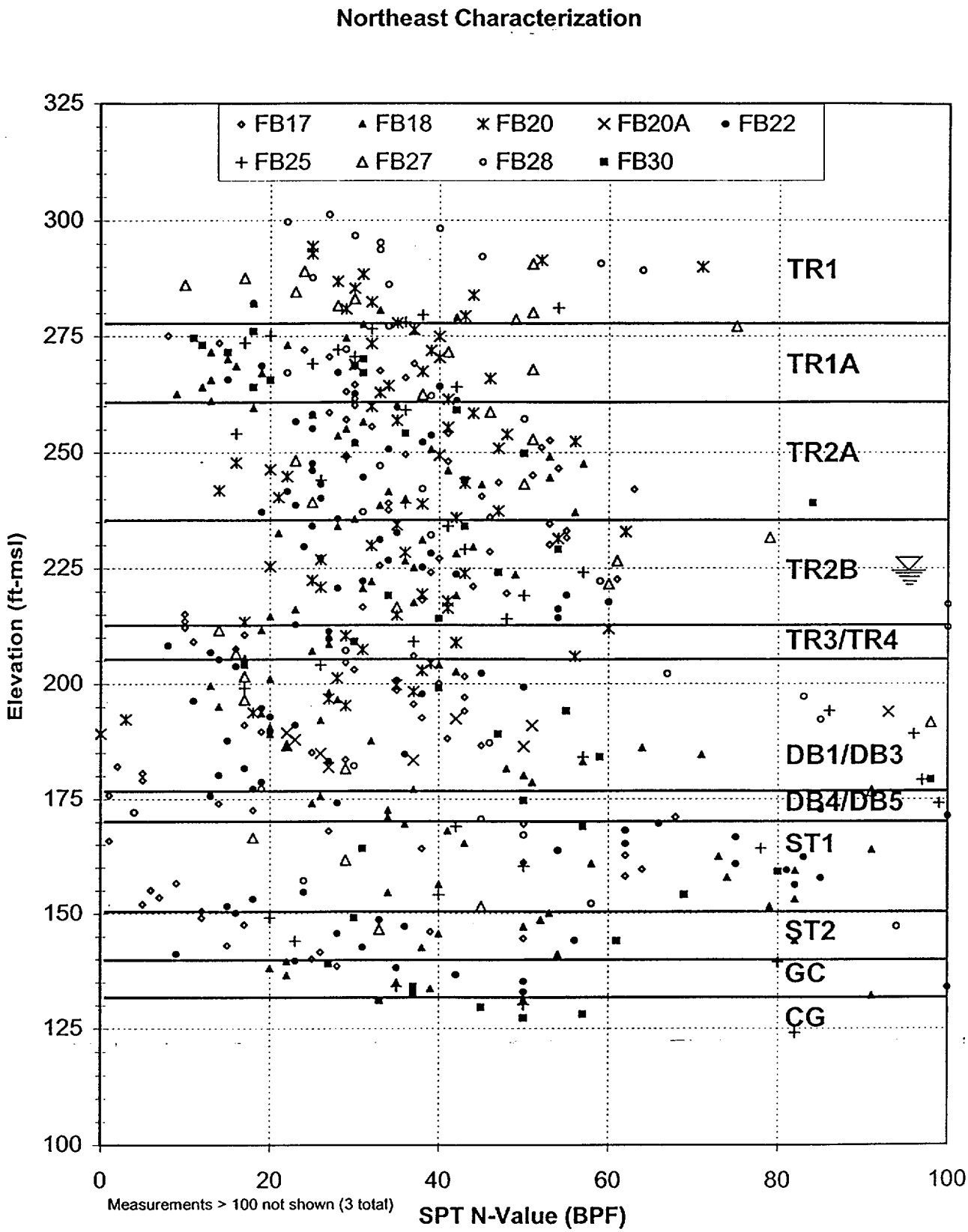



Figure 3.3-1 Range of SPT N-value Measurements

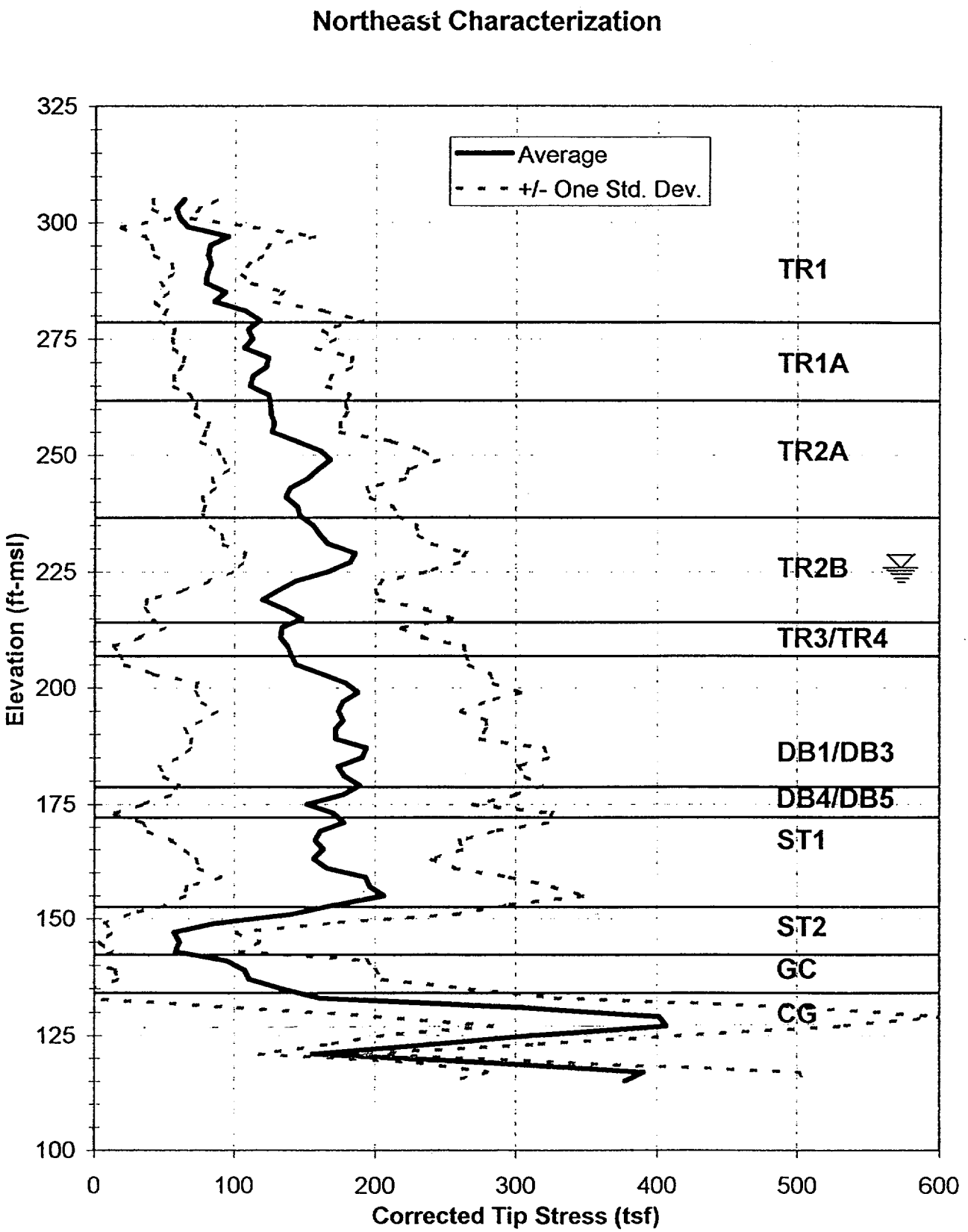



Figure 3.3-2 CPT Corrected Tip Resistance ($q_t$)

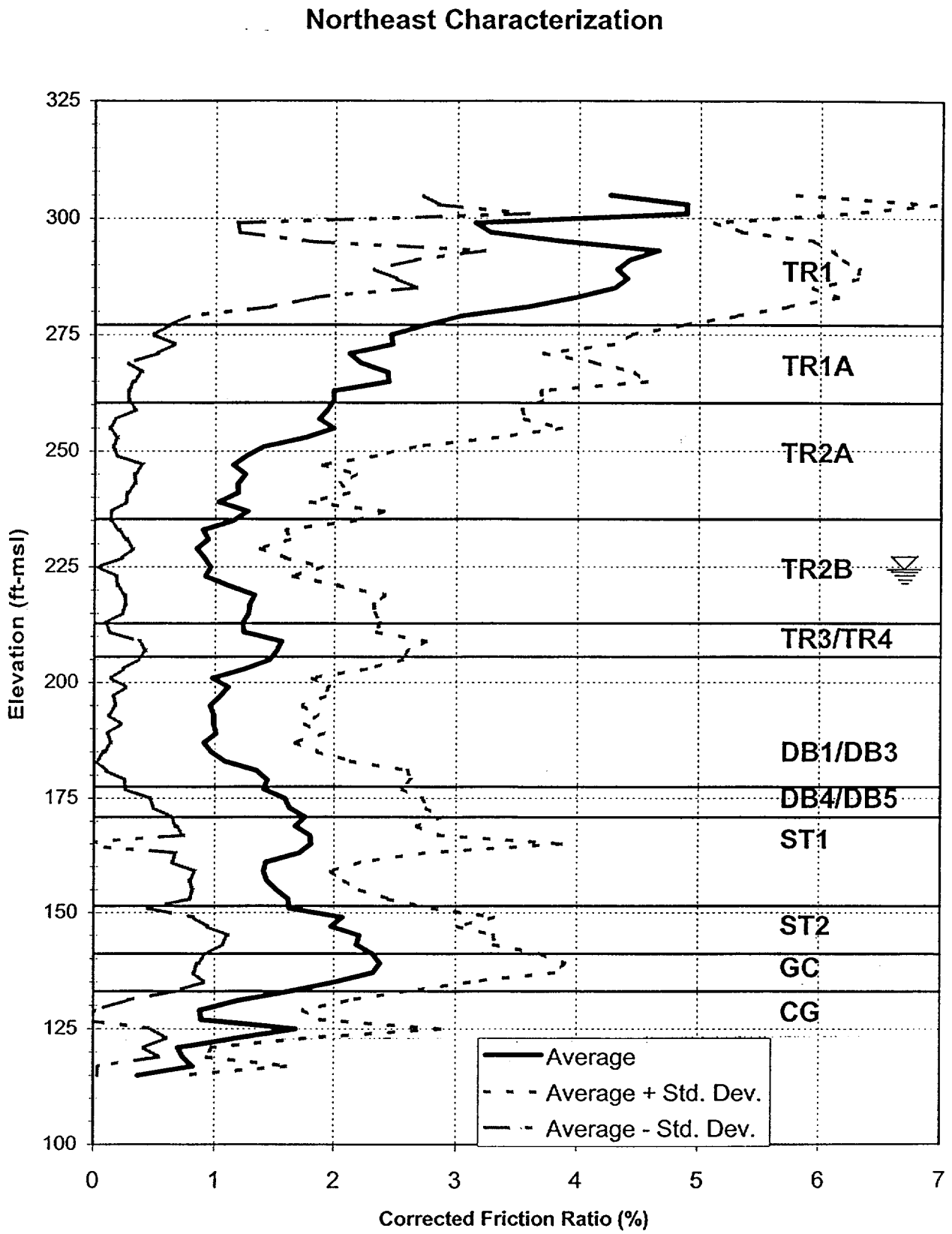



Figure 3.3-3 CPT Friction Ratio (Rf)

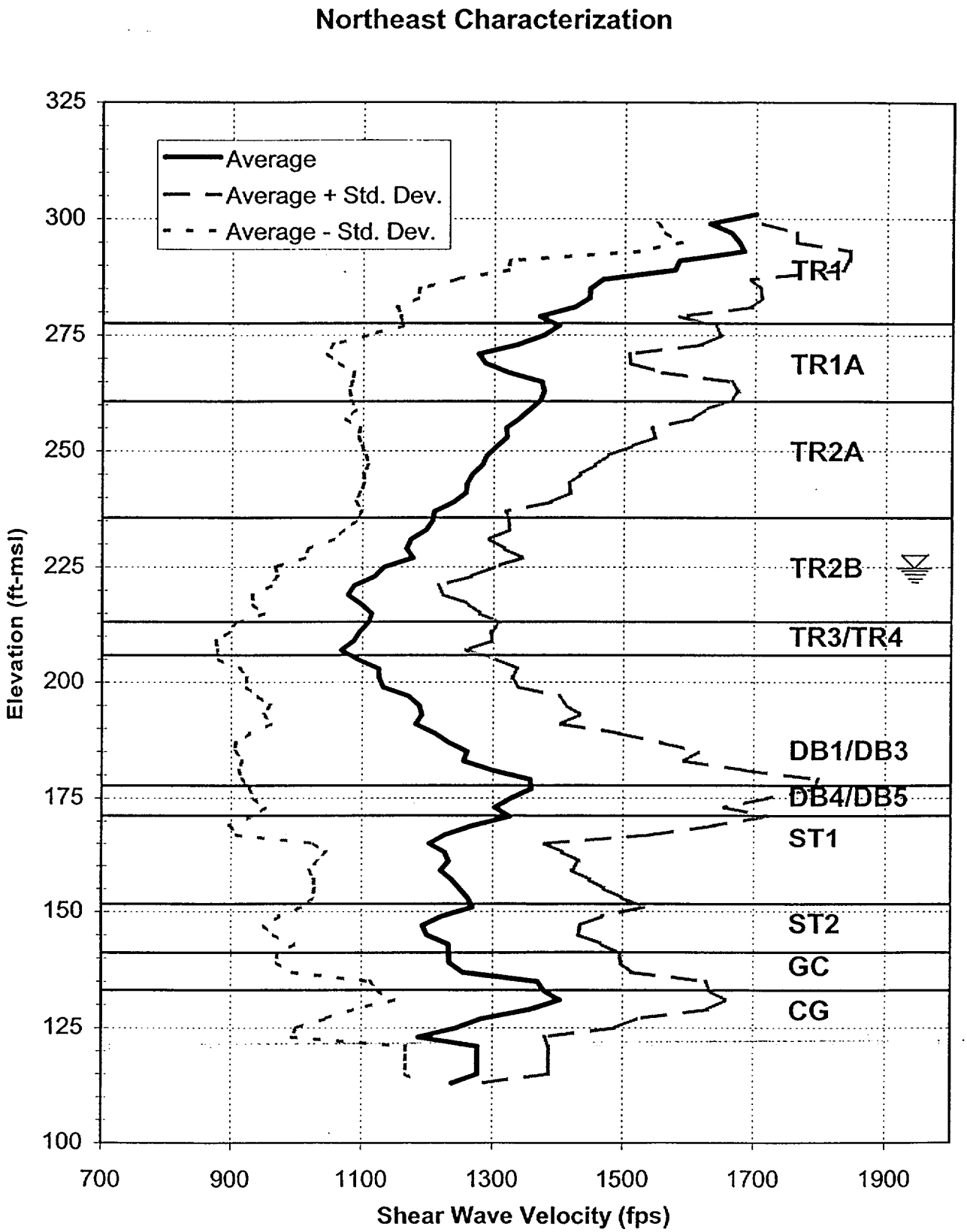
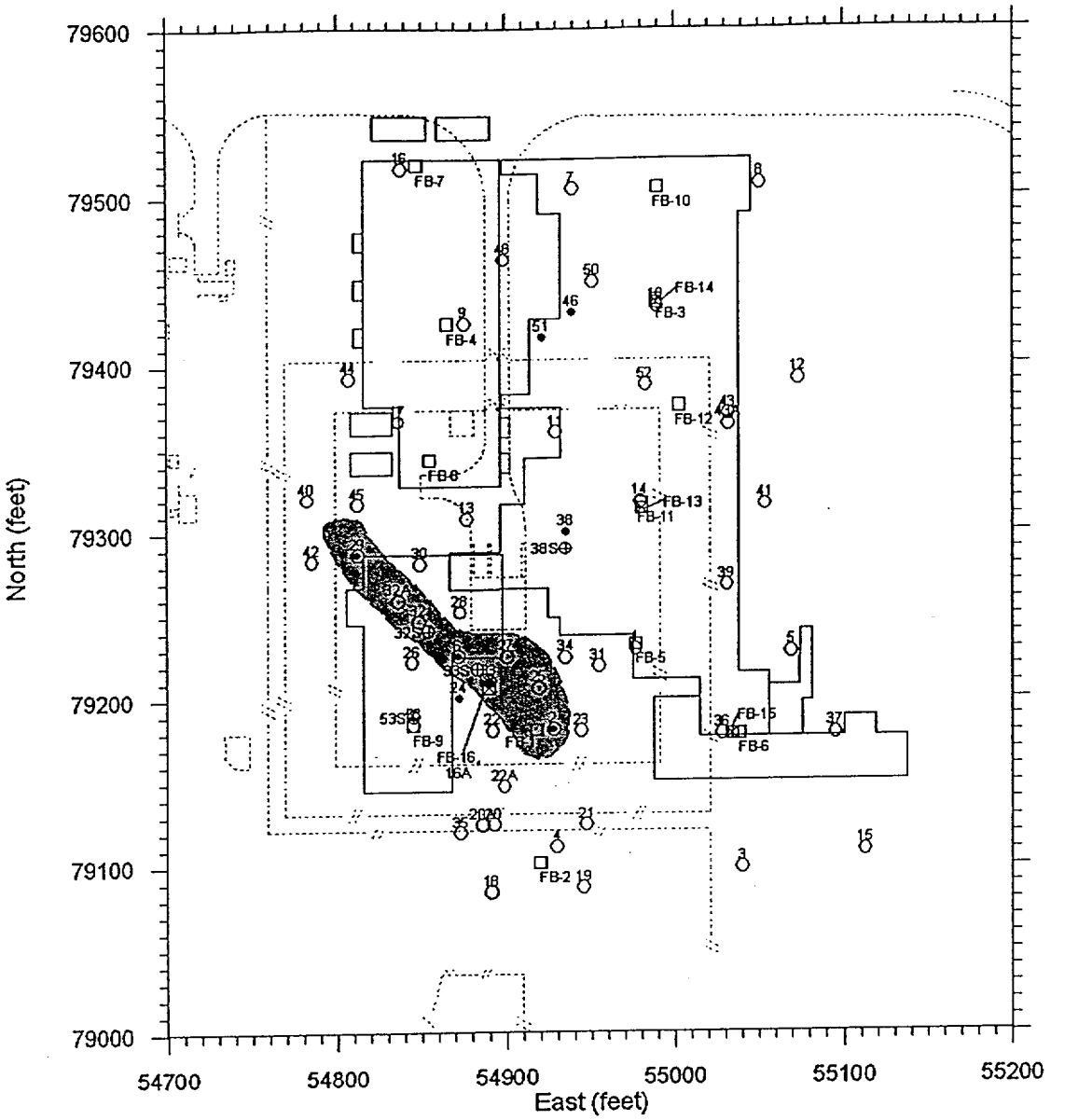



Figure 3.3-4 Average Shear Wave Velocity

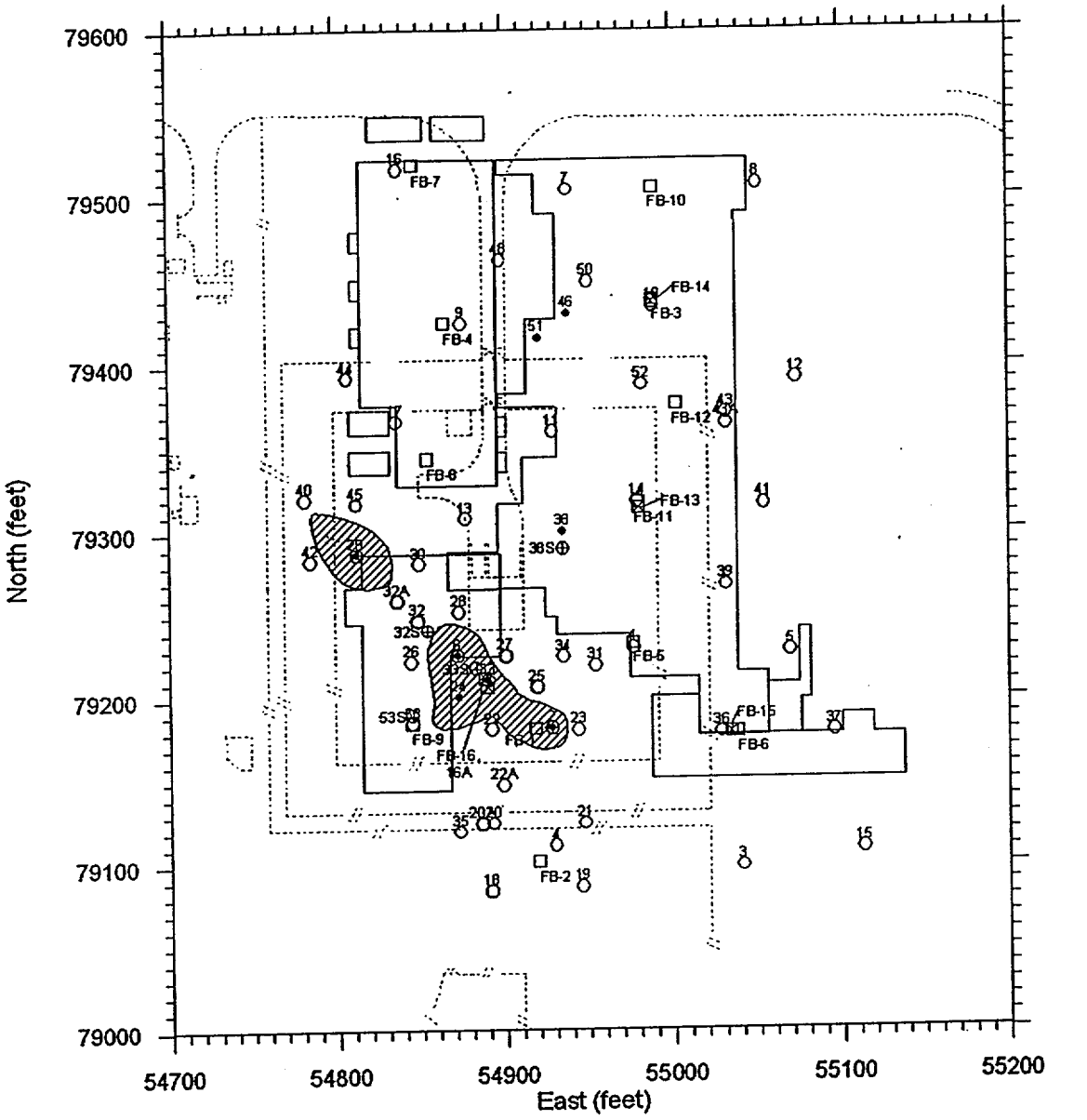



| | |
|---|---|
| ○ Soft zone near elevation 140; blue shaded areas postulated extent of soft zone(s) | ⊕ CPT sample push |
| • Soft zone near elevation 170 | □ SPT Boring with soft zone |
| ○ CPT with no soft zones or no soft zones in excess of 2.0 ft in thickness | □ SPT Boring with NO soft zone |
| | ⊠ Undisturbed (Shelby Tube) Boring |

d:\gallinas\cpt\apsf\misc\figs\stiklelg\rotfz10b.grf 04/28/00
ucar location.xls sheet softzone1

Figure modified from WSRC (1998a) APSF Confirmatory Drilling Program Results, June, 1998, PECD-SGS-98-0115

Figure 3.3-5 Map of APSF Area and Mapped Extent of Lower Soft Zone




| | | | |
|---|---|---|---|
| ○ | Soft zone near elevation 140 | ⊕ | CPT sample push |
| • | Soft zone near elevation 170; blue shaded areas postulated extent of soft zone(s) | □ | SPT Boring with soft zone |
| | | □ | SPT Boring with NO soft zone |
| ○ | CPT with no soft zones or no soft zones in excess of 2.0 ft in thickness | ⊠ | Undisturbed (Shelby Tube) Boring |

Figure modified from WSRC (1998a) APSF Confirmatory Drilling Program Results, June, 1998, PECD-SGS-98-0115

Figure 3.3-6 Map of APSF Area and Mapped Extenet of Upper Soft Zone

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 1 OF 6 | FB-1 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| Pu Repackaging Facility F-Area | N 79,182 E 54,918 | Vertical |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 8-22-95 | 9-8-95 | EEI | Mobile B-57 | 8"/5" | 140 Lbs/ 30" | 156.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.6 | ▽ 69.0/221.6 69' | F.H. Syms |

▲ N-VALUE (SPT)
○ WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 290.6 | | | |
| | | 289.1 | | Red brown Clayey Sand (SC) with cobbles and quartz pebbles, dry. | Hole advanced using 8" od hollow stem augers from 0.0' to 70.5'. |
| | | | 5 | Light brown Poorly Graded Sand (SP) mostly medium to fine sand, dry | Mud rotary drilling methods using a 5" drag bit was used from 70.5' to 156.5'. Aw rods were used for split spoon from 0.0' to 91.5'. "N" rods were used for split spoon sampling from 91.5' to 156.5' |
| SS 1 | 8 12 20 | 284.1 | | similar to above material | Recovery 18"/18" |
| SS 2 | 11 16 22 | | | Red brown Clayey Sand (SC) 70% fine sand, 30% fines, medium plasticity, dense, cohesive, mottled color. similar to above material | Recovery 18"/18" |
| SS 3 | 13 13 19 | | 10 | similar to above material except, becoming less dense, less plastic | Recovery 18"/18" |
| SS 4 | 12 15 17 | | | similar to above material | Recovery 12"/18" |
| SS 5 | 12 12 18 | | | similar to above material except, grain size is increasing slightly to include very few medium sand. | Recovery 14"/18" |
| SS 6 | 11 13 12 | 276.1 | | similar to above material | Recovery 16"/18" |
| | | 275.6 | 15 | Red brown Silty Sand (SM) 70% very fine sand, 30% fines, medium plasticity, medium dense | |
| SS 7 | 8 10 12 | | | Light brown Clayey Sand (SC) 5% rounded coarse sand, 70% fine sand, 25% fines, medium plasticity, dense, slightly moist. | Recovery 12"/18" |
| SS 8 | 9 15 14 | | | similar to above material occasional rounded quartz pebbles @ 17' | Recovery 13"/18" |
| SS 9 | 9 15 18 | | | Red brown Clayey Sand (SC) ~65% fine sand, 5% medium sand, 30% fines, medium plasticity, slightly moist. | Recovery 12"/18" |
| SS 10 | 12 19 17 | | 20 | similar to above material except grain size increases to ~10% medium sand,slightly micaceous and high dry strength. | Recovery 12"/18" |
| SS 11 | 10 13 13 | | | similar to above material | Recovery 15"/18" |
| SS 12 | 12 16 20 | | | similar to above material except mottled purple brown color. | Recovery 15"/18" |
| SS 13 | 13 14 | 266.1 | | similar to above material | Recovery 14"/18" |
| | | | | Purple Silty Sand (SM) mostly fine to medium sand, | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 2 OF 6 | FB-1 |

▲ N-VALUE (SPT)
O WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | 15 | | | nonplastic, low cohesion slightly moist, <1% mica flakes present. | |
| SS 14 | 9 11 13 | | | similar to above material | Recovery 13"/18" |
| SS 15 | 10 9 11 | | | similar to above material | Recovery 10"/18" |
| SS 16 | 6 9 11 | | | similar to above material except with wispy laminations | Recovery 10"/18" |
| | | 260.8 | | | |
| SS 17 | 8 11 12 | 260.4 | 30 | Red brown Clayey Sand (SC) medium to low plasticity, soft, moist. | Recovery 18"/18" |
| | | 259.6 | | Purple Silty Sand (SM) mostly very fine sand to silt size mica, low dry strength, wispy laminations. | |
| | | 259.1 | | Poorly Graded Sand (SP-SM) | |
| SS 18 | 7 7 9 | | | Red brown, purple Silty Sand (SM) mostly very fine sand to silt size, laminated with up to 1/4" clay layers of medium to highly plasticity, soft. | Recovery 14"/18" |
| SS 19 | 6 9 11 | | | similar to above material | Recovery 17"/18' |
| SS 20 | 9 10 11 | | 35 | similar to above material except, becoming light brown, nonplastic, less moisture. | Recovery 14"/18" |
| SS 21 | 10 10 11 | | | similar to above material | Recovery 14"/18" |
| SS 22 | 8 11 10 | | | similar to above material | Recovery 13'/18" |
| | | 251.6 | | | |
| SS 23 | 11 11 12 | | 40 | Red brown Poorly Graded Sand with Clay (SP-SC) 80% fine quartz sand, 20% fines,medium plasticity to nonplastic, medium dry strength, moist. | Recovery 12"/18" |
| SS 24 | 11 15 15 | | | similar to above material | Recovery 16"/18" |
| SS 25 | 11 12 13 | | | similar to above material except few wispy laminations of kaolin | Recovery 18"/18" |
| SS 26 | 11 12 13 | | | similar to above material | Recovery 13"/18" |
| SS 27 | 10 11 14 | | 45 | similar to above material | Recovery 14"/18" |
| | | 244.1 | | | |
| SS 28 | 11 12 15 | | | Red brown Clayey Sand (SC) 70% fine sand, trace medium sand, 30% fines. | Recovery 16"/18" |
| SS 29 | 11 14 14 | | | becoming light brown similar to above material | Recovery 12"/18" |
| SS 30 | 11 12 15 | | 50 | similar to above material | Recovery 13"/18" |
| SS 31 | 12 12 12 | | | similar to above material | Recovery 12"/18" |
| SS 32 | 10 10 12 | | | similar to above material | Recovery 11"/18" |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 3 OF 6 | FB-1 |

▲ N-VALUE (SPT)
O WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 33 | 8 7 12 | | 55 | similar to above material except moisture content is increasing | Recovery 13"/18" |
| SS 34 | 12 10 13 | 233.6 | | similar to above material | Recovery 13"/18" |
| SS 35 | 12 15 20 | | | Brown red Poorly Graded Sand (SP) ~90% fine to medium sand, <10% fines, nonplastic, medium dense, low to no dry strength. | Recovery 15"/18" |
| SS 36 | 13 13 15 | | | similar to above material | Recovery 14"/18" |
| SS 37 | 16 21 23 | | 60 | similar to above material | Recovery 18"/18" |
| SS 38 | 11 16 19 | 227.8 | | similar to above material | Recovery 17"/18" |
| SS 39 | 10 5 6 | 226.4 | | Light brown Clayey Sand (SC) medium plasticity, soft. | Recovery 13"/18" |
| SS 40 | 9 11 12 | 226.1 | 65 | Light brown Clay with sand (CH) kaolinitic, some medium sand, mostly fines highly plastic, moist<br>Light brown Clayey Sand (SC) mostly fine to medium sand, medium plasticity, kaolinitic laminations. | Recovery 16"/18" |
| SS 41 | 10 7 10 | | | similar to above material | Recovery 17"/18" |
| SS 42 | 7 11 16 | 223.1 | | Light brown Silty Sand (SM) 70% medium sand, 30% fines, medium plasticity to nonplastic, wet. | Recovery 15"/18" |
| SS 43 | 10 13 17 | | 70 | similar to above material except becoming red brown. | Recovery 13"/18" |
| SS 44 | 17 23 37 | 220.1 | | Red brown Well Graded Sand with Clay (SP-SC) mostly medium to coarse sand, medium plasticity, wet. | Recovery 8"/18" |
| SS 45 | 21 27 21 | 218.6 | | Red brown Clayey Sand (SC) ~80% fine sand, 20% fines low plasticity. | Recovery 12"/18" |
| SS 46 | 11 19 29 | | | similar to above material | Recovery 8"/18" |
| SS 47 | 15 14 17 | | 75 | similar to above material | Recovery 8"/18" |
| SS 48 | 13 17 23 | 214.1 | | Light brown Poorly Graded Sand with Clay (SP-SC) mostly fine sand, medium plasticity to nonplastic, wet. | Recovery 8"/18" |
| SS 49 | 15 20 29 | | | similar to above material | Recovery 7"/18" |
| SS 50 | 19 22 28 | | 80 | similar to above material | Recovery 6"/18" |
| SS 51 | 18 28 37 | | | similar to above material | Recovery 8"/18" |

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PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 4 OF 6 | FB-1 |

▲ N-VALUE (SPT)
O WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 208.1 | | | |
| SS 52 | 19 34 36 | | | Brownish red Poorly Graded Sand (SP) 95% medium sand, <5% fines, nonplastic, dense. | Recovery 6"/18" |
| SS 53 | 9 24 21 | | 85 | similar to above material except becoming coarser (medium to coarse sand) | Recovery 5"/18" |
| | | 205.1 | | | |
| SS 54 | 6 6 7 | | | Yellow brown Clay (CH) highly plastic, laminated with silt and sand. | Recovery 14"/18" -HCl |
| | | 203.9 | | | |
| | | 203.4 | | Silty Sand (SM) | |
| SS 55 | 13 22 26 | | | Yellow brown Clay (CH) highly plastic, laminated with silt and sand. | Recovery 16"/18" -HCl |
| | | 202.6 | | | |
| | | 202.2 | | Yellow brown Clayey Sand (SC) mostly fine to coarse sand | |
| SS 56 | 18 30 39 | | | Light brown Poorly Graded Sand (SP) mostly fine to medium sand, dense. | Recovery 12"/18" -HCl |
| SS 57 | 26 44 50 | | 90 | similar to above material | Recovery 12"/18" -HCl |
| SS 58 | 8 9 19 | | | similar to above material except with a 2" layer of clay highly plastic, laminated, kaolin. | Recovery 6"/18" -HCl |
| SS 59 | 33 50/4" | | | similar to above material | Recovery 8"/10" -HCl |
| SS 60 | 36 35 35 | | 95 | similar to above material | Recovery 7"/18" -HCl |
| | | 194.6 | | | |
| SS 61 | 25 28 34 | | | Light brownish yellow Well Graded Sand with Clay (SW-SC) mostly well graded fine to coarse quartz sand, with fat clay layers up to 1/4" thick. | Recovery 10"/18" -HCl |
| | | 193.6 | | | |
| SS 62 | 27 37 38 | | | Light brown Poorly Graded Sand (SP) mostly fine quartz sand, <5% fines, dense wet. similar to above material | Recovery 8"/18" -HCl |
| | | 191.6 | | | |
| SS 63 | 34 28 32 | | 100 | Light brown Poorly Graded Sand with Silt (SP-SM) mostly fine quartz sand, trace coarse quartz sand, laminated. | Recovery 11"/18" -HCL |
| SS 64 | 17 23 12 | | | similar to above material | Recovery 10"/18" -HCl |
| | | 188.4 | | similar to above material | |
| SS 65 | 7 6 7 | | | Brownish yellow Clayey Sand (SC) ~20% coarse sand, 30% fine to medium sand, 30% fines, 20% lignite,soft to medium stiff | Recovery 18"/18" -HCl |
| SS 66 | 14 21 24 | | | similar to above material | Recovery 10"/18" -HCl |
| | | 186.3 | | | |
| SS 67 | 13 23 27 | | 105 | Light brown Poorly Graded Sand (SP) mostly medium sand trace lignite. similar to above material | Recovery 10"/18" -HCl |
| SS 68 | 20 21 23 | | | similar to above material | Recovery 16"/18" -HCl |
| SS 69 | 8 15 21 | | | similar to above material occasional rounded pebbles | Recovery 5"/18" -HCl |
| SS 70 | 17 20 18 | | 110 | similar to above material except becoming well graded medium to coarse sand, dense, <5% fines. | Recovery 8"/18" -HCl |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 5 OF 6 | FB-1 |

▲ N-VALUE (SPT)
O WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 71 | 13 16 11 | | | similar to above material | Recovery 6"/18" -HCl |
| SS 72 | 8 3 3 | 177.9 | | Light brownish red Clayey Sand (SC) mostly fine to coarse sand, medium plasticity, soft. | Recovery 6"/18" -HCl |
| SS 73 | 7 6 8 | | 115 | similar to above material except becoming highly plastic. | Recovery 24"/18" -HCl, sample expanded |
| SS 74 | 6 5 5 | | | Similar to above material except becoming laminated with lignite and clay stringers, soft to medium stiff, highly plastic. | Recovery 20"/18" -HCl, sample expanded |
| | | | | | overdrilled from 117.0 to 118.5' |
| SS 75 | 1/8" 4 7 | 171.1 | | similar to above material | Recovery 20"/18" -HCl, losing fluid stabilizing @ 20-25' |
| SS 76 | 10 23 24 | | 120 | Yellowish brown Poorly graded Sand with Clay (SP-SC) 70% fine sand, 20% fines, 10% lignite, low plasticity, moist, clay wisps. similar to above material | Recovery 7"/18" -HCl |
| SS 77 | 18 23 27 | | | similar to above material | Recovery 12"/18" -HCl |
| SS 78 | 19 21 27 | | | similar to above material except lignite content decreasing and clay content increasing | Recovery 10"/18" -HCl |
| SS 79 | 19 25 28 | | 125 | similar to above material | Recovery 13"/18" -HCl |
| SS 80 | 28 34 26 | 164.6 | | Light brown Poorly Graded Sand (SP) 90% fine sand, trace medium to coarse sand, 10% fines dense, wet. | Recovery 8"/18" -HCl |
| SS 81 | 17 27 28 | | | similar to above material except fines content decreasing to <1% | Recovery 7"/18" -HCl |
| SS 82 | 24 24 28 | | 130 | similar to above material | Recovery 8"/18" -HCl PP 1.25 TSF |
| SS 83 | 20 21 24 | | | similar to above material except becoming very fine sand | Recovery 10"/18" -HCl PP 1.00 TSF |
| SS 84 | 22 22 21 | | | similar to above material<br>trace shell fragments in 1" layer, fragments <1/16". | Recovery 10"/18" -HCl PP 1.25 TSF |
| SS 85 | 11 14 7 | | | similar to above material | Recovery 6"/18" -HCl PP 0.75 TSF |
| SS 86 | WR/18" | 155.1 | 135 | similar to above material<br>Light brown Clayey Sand (SC) 70% very fine sand, 30% fines medium plasticity. | Recovery 20"/18" sample expanded -HCl PP 0.50 TSF |
| SS 87 | WR/18" | | | similar to above material except becoming highly plastic | Recovery 19"/18" sample expanded -HCl PP 0.50 TSF |
| SS 88 | WR/18" | 151.9 | | similar to above material<br>Light brown Silt with Sand (MH)some very fine | Recovery 0"/18" |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 6 OF 6 | FB-1 |

▲ N-VALUE (SPT)
O WATER CONTENT %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 89 | | WR/18" | | 140 | | sand, mostly fines, highly plastic, soft, laminated with wispy layers of very thin clay, silicified shell fragments, low dry strength, slightly moist. similar to above material | Recovery 18"/18" -HCl PP 0.0 TSF |
| SS 90 | | WR/16" 4 | | | | similar to above material except denser and possibly slight silicification | Recovery 18"/18" -HCl PP 0.0 TSF, PP 3.90 TSF (bottom) |
| SS 91 | | WR/18" | | | | similar to above material | Recovery 18"/18" -HCl PP 2.5 TSF |
| SS 92 | | 7 9 15 | | 145 | | similar to above material | Recovery 81"/18" -HCl PP 3.5 TSF |
| | | | 145.1 | | | similar to above material except becoming less plastic, less moist, and medium stiff. | Recovery 20"/18" sample expanded -HCL PP 3.5 TSF |
| SS 93 | | 17 23 29 | 142.3 | | | similar to above material except light olive green color. | Recovery 16"/16" -HCl PP+4.5 TSF |
| SS 94 | | 24 34 50/4" | 141.6 | | | becoming mottled light olive and brown, appears burrowed, medium plasticity, stiff. | Recovery 10"/ 8" sample expanded -HCl PP+4.5 TSF |
| | | | 141.3 | | | Brown Poorly Graded sand (SP) mostly fine sand, cemented. | |
| SS 95 | | 34 50/2" | | 150 | | Light olive green Silt with sand (ML) mottled, stiff some fine sand to pebble size, mostly fines, dry, highly plastic with water added. similar to above material. becoming Dark Green | Recovery 18"/18" -HCl PP 4.0 TSF |
| SS 96 | | 23 21 25 | | | | | |
| SS 97 | | 24 43 50/4" | | 155 | | | Recovery 16"/16" -HCl PP+4.5 TSF |
| | | | 134.6 | | | Congaree | |
| | | | 134.1 | | | Brown Well Graded Sand (SW) mostly quartz sand, < 20% fines, dense, moist. | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-1

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 1 OF 6 | FB-2 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| Pu Repackaging Facility | N 79,102 E 54,920 | Vertical |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 9-11-95 | 9-18-95 | EEI | Mobile B-57 | 6" | N/A | 151.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 292.2 | 65.0/227.2 65' | F.H. Syms |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ WATER CONTENT % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 292.2 | | | Hand excavated from surface to 3 .0'SP-SC type material with cobbles and road aggregate. | Hole was advanced using mud rotary drilling methods with a 5" drag bit from 0.0' to 156.5'. "N" rods were used for shelby tube sampling from 0.0' to 156.5' |
| ST 1 | | | | 289.2 | | | Brown Sand (SP)95% fine sand, 5% fines, medium dense to dense. | Recovery 24"/24" Sample graphics are based on descriptions from tube trimmings. |
| ST 2 | | | | 285.4 | 5 | | similar to above material | Recovery 24"/24" |
| ST 3 | | | | 283.2 | | | similar to above material except Light brown color | Recovery 24"/24" |
| ST 4 | | | | 281.3 | 10 | | similar to above material except brown color | Recovery 24"/24" |
| ST 5 | | | | 279.3 | | | Tan Silty Sand (SM) | Recovery 22"/12" slough in tube |
| ST 6 | | | | | | | Reddish brown and brown Clayey Sand (SC) 70% fine to medium sand, 30% fines, medium plastic. | Recovery 23"/24" |
| ST 7 | | | | | 15 | | similar to above material except red brown | Recovery 24"/24" |
| | | | | | | | grades to gray Sandy Clay | |
| ST 8 | | | | | | | | Recovery 0"/21" |
| ST 9 | | | | | 20 | | | Recovery 0"/12" |
| ST 10 | | | | | | | | Recovery 16"/24" |
| ST 11 | | | | 267.8 | | | Red Brown Clayey Sand (SC) | Recovery 24"/24" |
| | | | | | | | grades into Light purple Silty Sand (SM) | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 2 OF 6 | FB-2 |

▲ N-VALUE (SPT)
○ WATER CONTENT %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|
| ST 12 | | | similar to above material | Recovery 15"/23" |
| | 265.8 | | grades in to reddish brown Clayey Sand (SC) | |
| ST 13 | | | similar to above material | Recovery 17.5"/24" |
| ST 14 | | | similar to above material | Recovery 21"/24" |
| | | 30 | | |
| | 261.2 | | similar to above material<br>drilled to 35.0' without sampling | |
| ST 15 | | 35 | Clayey Sand (SC) | Recovery 14"/24" |
| | 255.6 | | Drilled to 40.0' without sampling | |
| ST 16 | | 40 | Brownish red Clayey Sand (SC) | Recovery 17"/17" |
| | 250.8 | | Drilled to 50.0' without sampling | |
| | | | | Sampling intervals determined from adjacent CPT-2 |
| | | 45 | | |
| ST 17 | | 50 | light brown and white Clayey Sand (SC) | Recovery 11"/18" |
| | 240.7 | | Drilled to 60.0' without sampling | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 3 OF 6 | FB-2 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ WATER CONTENT % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 55 | | | |
| ST 18 | | | | | 60 | | Light brown Sand (SP) | Recovery 10"/24" |
| | | | | 230.2 | | | Drilled to 75.0' without sampling | |
| | | | | | 65 | | | |
| | | | | | 70 | | | |
| ST 19 | | | | | 75 | | Red brown Clayey Sand (SC) with coarse quartz sand | Recovery 17"/24" |
| | | | | 215.8 | | | Drilled to 83.0' without sampling | |
| | | | | | 80 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 4 OF 6 | FB-2 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) O WATER CONTENT % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| ST 20 | | | | | | | Red brown Clayey Sand (SC) | Recovery 24"/24" |
| | | | | 207.2 | 85 | | Drilled to 100.0' without sampling | |
| | | | | | 90 | | | |
| | | | | | 95 | | | |
| ST 21 | | | | | 100 | | Red Brown Clayey Sand (SC) fine to medium quartz sand. | Recovery 12"/12" |
| | | | | 191.2 | | | Drilled to 120.0' without sampling | |
| | | | | | 105 | | | |
| | | | | | 110 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 5 OF 6 | FB-2 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ WATER CONTENT % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 115 | | | |
| ST 22 | | | | | 120 | | Light brown Poorly Graded Sand with Clay (SP-SC) mostly fine sand. | Recovery 16"/16" |
| | | | | 170.9 | | | Drilled to 145.0' without sampling | |
| | | | | | 125 | | | |
| | | | | | 130 | | | |
| | | | | | 135 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| F AREA INVESTIGATION | | 6 OF 6 | FB-2 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ WATER CONTENT % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 140 | | | |
| ST 23 | | | | | 145 | | Light brown Silt with Sand (ML) | Recovery 20"/24" |
| ST 24 | | | | | | | similar to above material | Recovery 20"/24" |
| ST 25 | | | | | 150 | | similar to above material except yellow brown in color. | Recovery 19"/24" |
| | | | | 141.2 | | | Total depth of boring 151.0 feet | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-2

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-3 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79439 E 54990 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/16/98 | 2/19/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 154.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 287.2 | ▽ / ▼ / | R. Gelinas/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 287.2 | | | Hand auger to 6 feet to check for underground interferences, then used 5 3/4 tricone for 1st 20 feet or so (19.5). |
| | | | 5 | | |
| SS 1 | 5-14-15 | 279.7 | | CLAYEY SAND (SC); medium grayish brown and medium red; medium dense; damp; subangular; poorly graded; fine to medium grained | Shoe came off in hole. |
| SS 2 | 9-26-21 | 278.2 | | no recovery | |
| SS 3 | 23-40-44 | 276.7 | 10 | same as above; medium reddish brown; very dense; moist | |
| SS 4 | 14-25-13 | 275.2 | | same as above; with some gray zones; dense | |
| SS 5 | 6-8-11 | 273.7 | | same as above; medium brownish red with some yellowish brown and gray zones; medium dense | |
| SS 6 | 11-12-15 | 272.2 | | SANDY LEAN CLAY (CL); with clayey sand interbeds; medium red; very stiff; damp; medium plasticity; sand fraction is fine to medium grained | |
| SS 7 | 10-15-17 | 270.7 | 15 | same as above; with some yellowish gray oxidation zones; hard | |
| SS 8 | 10-14-17 | 269.2 | | same as above; dark red; sand fraction is fine grained | |
| SS 9 | 8-16-13 | 267.7 | | CLAYEY SAND (SC); with sandy lean clay portions; medium brownish red; medium dense; moist; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 10 | 6-10-13 | 266.2 | 20 | SANDY LEAN CLAY (CL); with clayey sand portions; medium red; very stiff; moist; medium plasticity; sand is fine to medium grained | |
| SS 11 | 10-17-26 | 264.7 | | same as above; medium brownish red; hard | |
| SS 12 | 10-33-36 | 263.2 | | no recovery | |
| SS 13 | 15-23-21 | 261.7 | 25 | CLAYEY SAND (SC); ~~medium~~ reddish brown; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 14 | 36-50/5in | 260.8 | | same as above; very dense | |
| SS 15 | 11-13-12 | 258.7 | | same as above; medium yellowish brown; medium dense | |
| SS 16 | 9-13-14 | 257.2 | | SILTY SAND (SM); with clay; medium grayish brown and reddish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 17 | 11-12-14 | 255.7 | 30 | CLAYEY SAND (SC); medium yellowish brown and brownish red; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 18 | 14-13-12 | 254.2 | | same as above | |
| SS 19 | 18-13-12 | 252.7 | | same as above | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-3

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-3 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 20 | 21-16-14 | 251.2 | | same as above; medium brownish yellow and yellowish brown | |
| SS 21 | 16-18-17 | 249.7 | | SILTY SAND (SM); medium yellowish brown; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 22 | 2-2/24in | 247.2 | | no recovery | |
| SS 23 | 14-20-19 | 245.7 | 40 | same as above; with clay; medium brownish red reddish brown and some yellowish brown; wet | |
| SS 24 | 18-14-17 | 244.2 | | CLAYEY SAND (SC); medium reddish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 25 | 24-20-17 | 242.7 | | same as above; medium yellowish brown and brownish red with few light gray zones | |
| SS 26 | 19-14-13 | 241.2 | 45 | POORLY GRADED SAND WITH SILT (SP-SM); some portions are silty sand; light brown to medium reddish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 27 | 12-15-24 | 239.7 | | CLAYEY SAND (SC); with silty sand interbeds; medium brown; dense; wet; subangular; poorly graded; fine to medium grained with trace lower coarse | |
| SS 28 | 22-29-24 | 238.2 | | POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; very dense; wet; angular; poorly graded; medium to lower coarse grained | |
| SS 29 | 40-31-34 | 236.7 | 50 | no recovery | |
| SS 30 | 18-16-21 | 235.2 | | CLAYEY SAND (SC); dark red; dense; wet; subangular; poorly graded; fine to lower coarse grained | Dry Branch |
| | | | 55 | | |
| SS 31 | 12-16-22 | 228.7 | | SILTY SAND (SM); medium reddish brown; dense; wet; subangular; poorly graded; fine to medium grained | Driller overdrilled interval? (52'). |
| SS 32 | 19-20-24 | 227.2 | | same as above; medium brown; fine to lower coarse grained | |
| SS 33 | 16-17-18 | 225.7 | 60 | same as above; medium brown and yellowish brown | |
| SS 34 | 8-15-12 | 224.2 | | CLAYEY SAND (SC); medium yellowish brown with light gray zones; medium dense; moist; subangular; poorly graded; very fine to fine grained | |
| SS 35 | 10-10-11 | 222.7 | | same as above; wet; fine to medium grained | |
| | | | 65 | | Driller didn't clean out and took spoon over previous interval (13-16-12) bad blow count. |
| SS 36 | 15-12-16 | 220.0 | | same as above; medium brown; very fine to fine grained | |
| SS 37 | 17-17-23 | 218.5 | | SILTY SAND (SM); medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 38 | 20-22-24 | 217.0 | 70 | CLAYEY SAND (SC); medium reddish brown; dense; wet; angular; well graded; fine to coarse grained | |
| SS 39 | 26-19-13 | 216.0 | | same as above | |
| SS 40 | 5-6-7 | 215.5 | | SILTY SAND (SM); light brown to medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 41 | 9-10-9 | 214.0 | | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace lower coarse | |
| | | 213.2 | | same as above; medium brown; moist; angular; well graded; fine to upper coarse grained | |
| | | 212.5 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-3**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-3 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 42 | 8-7-5 | 211.0 | | same as above; wet; subangular; poorly graded; fine to med grained | |
| SS 43 | 8-6-8 | 209.5 | | same as above; med yellowish brown; fine to lower med grained | |
| SS 44 | 9-11-10 | 208.0 | | same as above; fine to medium grained with some fine to coarse grained layers<br>no recovery | Core catcher is good. |
| SS 45 | 6-9-13 | 207.6 | | same as above; fine to medium grained | |
| | | 206.9 | 80 | SANDY LEAN CLAY (CL); lt yellowish brown with some dk gray patches; very stiff; moist; med plasticity; sand fraction is fine to med grained | Top Tan Clay |
| SS 46 | 3-9-8 | 206.5 | | same as 79.2-79.6; two jars | |
| SS 47 | 5-5-11 | 205.0 | | SANDY LEAN CLAY (CL); med yellowish brown; very stiff; moist; med plasticity; sand fraction is fine to upper med grained | Bottom Tan Clay |
| SS 48 | 4-6-16 | 203.5 | | SILTY SAND (SM); med yellowish brown; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 49 | 10-13-23 | 202.0 | 85 | POORLY GRADED SAND WITH SILT (SP-SM); light brown; medium dense; wet; subangular; poorly graded; fine to upper medium grained | |
| SS 50 | 19-24-32 | 200.5 | | SILTY SAND (SM); light brown; dense; wet; subangular; poorly graded; fine to medium grained<br>no recovery | Catcher is good. |
| SS 51 | 19-22-17 | 199.0 | | POORLY GRADED SAND WITH SILT (SP-SM); light brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 52 | 8-12-8 | 197.5 | 90 | SILTY SAND (SM); portions with clay; medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | Driller overdrilled interval? (52') |
| SS 53 | 2-3-3 | 196.0 | | CLAYEY SAND (SC); medium yellowish brown; loose; wet; subangular; poorly graded; fine to medium grained | |
| SS 54 | 4-2-5 | 194.5 | | same as above | |
| SS 55 | 9-12-20 | 193.0 | 95 | SILTY SAND (SM); portions are poorly graded sand with silt; medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 56 | 9-21-26 | 191.5 | | no recovery | Catcher is good. |
| SS 57 | 15-13-14 | 189.4 | | SILTY SAND (SM); light brown to medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 58 | 2-6-9 | 187.9 | 100 | CLAYEY SAND (SC); some portions are silty sand; medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 59 | 6-7-12 | 186.4 | | POORLY GRADED SAND WITH CLAY (SP-SC); some silty sand layers; med brown; med dense; wet; subangular; poorly graded; fine to lower cse grading down to fine to med | |
| SS 60 | 6-3-9 | 184.4 | | CLAYEY SAND (SC); med yellowish brown; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 61 | 4-7-11 | 182.9 | 105 | same as above; some thin poorly graded sand with clay layers; medium brown | |
| SS 62 | 13-31-41 | 181.4 | | no recovery | Catcher is good. |
| SS 63 | 14-30-44 | 179.9 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 64 | 17-22-29 | 177.9 | 110 | same as above; with some silty sand and poorly graded sand with clay interbeds; light brown | Driller didn't clean out and took spoon over previous interval 65.7-67.2 ft. (13-16-12) bad blow count. |
| SS 65 | 18-32-32 | 176.4 | | same as above; light brown to medium brown; angular; medium grained | |
| SS 66 | 15-16-14 | 174.9 | | POORLY GRADED SAND (SP) trace silt; with some poorly graded sand with silt layers; light brown to medium brown; medium dense; wet; angular; poorly graded; fine to lower coarse grained | |
| SS 67 | 4-5-8 | 173.4 | | no recovery | Santee? Changed to metal |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-3**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-3 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 171.9 | | CLAYEY SAND (SC); light grayish brown and yellowish brown; dense; moist; subangular; poorly graded; fine grained; distinctive thin laminations | catcher. |
| SS 68 | 8-14-23 | 170.4 | | same as above; medium yellowish brown and yellowish gray; medium dense; fine to medium grained | |
| SS 69 | 6-10-14 | 168.9 | | same as above; with shell fragments; dense; wet; angular; well graded; fine to coarse grained | |
| SS 70 | 14-21-29 | 167.4 | 120 | same as above; medium yellowish brown and reddish brown; very dense; subangular; poorly graded; very fine to fine grained | |
| SS 71 | 15-40-48 | 165.9 | | SILTY SAND (SM); trace fine shell fragments; medium brownish yellow and light yellowish gray; dense; wet; subangular; poorly graded; very fine to fine grained | Metal catcher is good. |
| SS 72 | 18-24-19 | 164.4 | | same as above; medium yellowish brown; very dense; fine grained; trace upper medium | |
| SS 73 | 22-32-39 | 162.9 | 125 | same as above; fine grained | |
| SS 74 | 25-35-41 | 161.4 | | no recovery | Plastci orange catcher has two teeth missing. |
| SS 75 | 26-21-44 | 159.9 | | POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 76 | 17-31-42 | 158.4 | | SILTY SAND (SM); portions are poorly graded sand with silt; medium yellowish brown; very dense; wet; subangular; poorly graded; fine to lower medium grained | |
| SS 77 | 23-30-38 | 156.9 | 130 | same as above; with thin orangish brown clayey sand interbed; light gray; very fine to fine grained | |
| SS 78 | 17-33-31 | 155.4 | | same as above; few very thin light gray clay laminations; medium yellowish brown; dense; very fine grained | |
| SS 79 | 19-21-26 | 153.9 | | same as above; with light gray limestone fragments and some clayey sand interbeds; fine to lower coarse grained; limestone fragments to 0.5 inch diameter | |
| SS 80 | 14-29-21 | 152.4 | 135 | same as above; trace turritella shells; loose; very fine to fine grained | |
| SS 81 | 6-3-4 | 150.9 | | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; very fine to fine grained | |
| SS 82 | 6-6-10 | 149.4 | | | |
| SS 83 | 5-9-12 | | | same as above; with turritella shells; light yellowish brown and yellowish gray; moist | |
| SS 84 | 7-9-11 | 147.0 | 140 | same as above; trace shell and limestone fragments; medium yellowish brown and light gray | |
| SS 85 | 8-12-16 | 145.5 | | same as above | |
| SS 86 | 12-10-24 | 144.0 | | same as above; with sandy lean clay interbeds; dense; wet; angular; fine to lower coarse grained | |
| SS 87 | 10-8-11 | 142.5 | 145 | SANDY SILT (MH); medium yellowish brown; very stiff; wet; low plasticity; sand fraction is very fine to fine grained | Warley Hill |
| SS 88 | 2-7-12 | 141.0 | | no recovery | Plastic orange catcher is broken. |
| SS 89 | 3-18-20 | 139.5 | | no recovery | New catcher has several teeth broken off. |
| SS 90 | 13-8-17 | 138.0 | 150 | SANDY LEAN CLAY (CL); silicified nodule at 149.7 ft; dark yellowish brown and yellowish gray; very stiff; moist; medium plasticity; sand fraction is very fine to fine grained | |
| SS 91 | 11-21-40 | 136.5 | | no recovery | New catcher has several teeth missing. |
| SS 92 | 17-20-38 | 135.0 | | CLAYEY SAND (SC); medium reddish brown and grayish brown; very dense; moist; angular; poorly graded; fine to lower coarse grained | |
| SS 93 | 40-50/3in | 133.6 | | same as above; dark grayish green; subangular; fine to medium grained | Congaree |
| | | 133.5 | | | |
| | | 132.7 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-3**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-3 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | same as above; with lean clay and silty sand interbeds (highly variable); medium reddish brown, dark grayish red, and dark grayish green; wet; angular; fine to lower coarse grained<br>Total depth of boring 154.5 feet. | Hole abandoned with with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-3

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 4 | FB-4 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79425 E 54865 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/27/98 | 3/4/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 152.4 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 285.1 | ▽ / ▼ / | R. Gelinas/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 285.1 | | | Hand auger to 6 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 10-14-14 | 277.6 | | CLAYEY SAND (SC); medium reddish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; lost shoe in hole | Lost shoe down hole. |
| SS 2 | 10-20-20 | 276.1 | | SANDY LEAN CLAY (CL); medium red; hard; moist; medium plasticity; sand fraction is fine to medium grained | |
| SS 3 | 9-13-20 | 274.6 | 10 | same as above | |
| SS 4 | 6-12-13 | 273.1 | | same as above; medium brownish red; very stiff | |
| SS 5 | 9-13-15 | 271.6 | | CLAYEY SAND (SC); medium brownish red and yellowish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 6 | 7-11-13 | 270.1 | | same as above; medium red | |
| SS 7 | 8-13-14 | 268.6 | 15 | same as above; medium brownish red; fine grained | |
| SS 8 | 18-19-19 | 267.1 | | same as above; dense; wet; fine to lower coarse grained | |
| SS 9 | 2-14-19 | 265.6 | | CLAYEY SAND WITH GRAVEL (SC); medium reddish brown; dense; wet; subangular; well graded; fine to coarse grained; gravel to 2 inch diameter | |
| SS 10 | 3-12-16 | 264.1 | 20 | SANDY LEAN CLAY (CL); medium reddish brown, maroon, yellowish brown, and tan; very stiff; moist; medium plasticity; sand fraction very fine to fine grained | |
| SS 11 | 6-9-14 | 262.6 | | SANDY SILT (ML); with some clayey sand interbeds; medium red, maroon, medium gray, and grayish yellow; very stiff; moist; low plasticity; sand fraction is very fine grained | |
| SS 12 | 11-13-12 | 261.1 | | CLAYEY SAND (SC); medium yellowish brown with light yellowish gray blebs; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 13 | 13-18-21 | 259.6 | 25 | same as above; portions silty; dense; moist | |
| SS 14 | 11-16-20 | 258.1 | | same as above | |
| SS 15 | 10-16-15 | 256.6 | | same as above | |
| SS 16 | 8-10-14 | 255.1 | 30 | same as above; medium yellowish brown and reddish brown; medium dense | |
| SS 17 | 8-11-10 | 252.8 | | same as above; medium reddish brown | |
| SS 18 | 8-10-11 | 251.3 | | same as above; medium yellowish brown with some reddish brown and light gray zones | |
| SS 19 | 11-11-14 | | | same as above; medium reddish brown | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-4

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 4 | FB-4 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 249.8 | | | |
| SS 20 | 9-14-16 | 247.8 | | same as above; some portions are silty; medium yellowish brown; wet | |
| SS 21 | 10-22-23 | 246.3 | | SILTY SAND (SM); medium reddish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 22 | 16-22-25 | 244.8 | 40 | same as above; few clayey portions; and streaks of light gray | |
| SS 23 | 15-15-11 | 243.3 | | CLAYEY SAND (SC); medium yellowish brown and tan streaks; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 24 | 12-16-17 | 241.8 | | same as above; portions silty; medium reddish brown; dense | |
| SS 25 | 12-15-16 | 240.3 | | same as above | |
| SS 26 | 13-23-35 | 238.8 | 45 | POORLY GRADED SAND WITH CLAY (SP-SC); dark red; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 27 | 27-46-50 | 237.3 | | POORLY GRADED SAND (SP) trace clay; medium reddish brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 28 | 20-22-22 | 235.8 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown with reddish brown zones; dense; wet; subangular; poorly graded; fine to upper medium grained | |
| SS 29 | 13-19-16 | 234.3 | 50 | same as above; medium brown to light brown | |
| SS 30 | 10-13-14 | 232.3 | | CLAYEY SAND (SC); medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | Dry Branch |
| SS 31 | 10-13-12 | 230.8 | | same as above; with a few sandy clay layers; some light gray blebs | |
| SS 32 | 13-19-24 | 228.8 | 55 | same as above; with two thin grayish brown layers; dense | |
| SS 33 | 16-16-20 | 227.3 | | POORLY GRADED SAND (SP); trace clay; medium brown; dense; wet; subangular; poorly graded; fine to upper medium grained | |
| SS 34 | 14-16-20 | 225.8 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium grayish brown; dense; wet; subangular; poorly graded; fine to lower coarse grained | |
| SS 35 | 15-17-18 | 224.3 | 60 | POORLY GRADED SAND (SP); trace silt; medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 36 | 12-15-18 | 222.3 | | SILTY SAND (SM); medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 37 | 14-24-26 | 220.8 | | CLAYEY SAND (SC); trace fine gravel; medium brown; dense; wet; subangular; well graded; fine to coarse grained | |
| SS 38 | 31-22-34 | 219.3 | 65 | POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained trace coarse | |
| SS 39 | 34-33-35 | 217.8 | | same as above; one thin lean clay interbed | |
| SS 40 | 28-31-19 | 216.1 | | CLAYEY SAND (SC); medium yellowish brown; dense; wet; subrounded; well graded; fine to coarse grained | |
| SS 41 | 8-10-11 | 215.8 | 70 | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 42 | 8-8-14 | 214.3 | | CLAYEY SAND (SC); with interbeds of poorly graded sand with clay; medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 43 | 8-9-13 | 212.8 | | same as above; with sandy clay interbeds | Top Tan Clay |
| | | 211.3 | | LEAN CLAY WITH SAND (CL); a few clayey sand interbeds; med yellowish brown; very stiff; moist; med plasticity; sand is fine to med grained | |
| SS | 8-14-15 | | | LEAN CLAY (CL); trace sand; medium yellowish gray and | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-4

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 4 | FB-4 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 44 | | 209.4 | | yellowish brown; very stiff; moist; medium plasticity; sand fraction is very fine grained | |
| SS 45 | 7-8-12 | | | same as above; abundant black Mn? staining; sand is fine grained | |
| | | 207.9 | | | |
| SS 46 | 6-8-12 | | | no recovery | Bottom Tan Clay Catcher has one tooth broken. |
| | | 206.4 | | | |
| SS 47 | 5-8-12 | | 80 | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace coarse grains | |
| | | 203.8 | | | |
| SS 48 | 6-11-10 | | | same as above; moist; very fine to fine grained | |
| | | 202.3 | | | |
| SS 49 | 5-7-15 | | | same as above; light gray, tan, and yellowish brown; wet; fine to medium grained; black Mn? staining | |
| | | 200.8 | | | |
| SS 50 | 12-19-17 | | 85 | same as above; very light yellowish green with medium orange mottles; dense | |
| | | 199.3 | | | |
| SS 51 | 15-28-36 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown and reddish brown; very dense; wet; subangular; poorly graded; medium grained; trace heavies | |
| | | 197.8 | | | |
| SS 52 | 22-27-24 | | | same as above with very light brown band of cleaner, finer material | |
| | | 196.3 | | | |
| SS 53 | 11-14-17 | | | same as above; some zones are borderline clayey sand; dense | |
| | | 194.8 | 90 | | |
| SS 54 | 7-7-12 | | | CLAYEY SAND (SC); medium yellowish brown and grayish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 192.4 | | | |
| SS 55 | 17-18-16 | | | POORLY GRADED SAND (SP); trace silt; light brown; dense; wet; angular; poorly graded; medium to coarse grained | |
| | | 190.9 | | | |
| SS 56 | 7-7-8 | | 95 | CLAYEY SAND (SC); light yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 189.1 | | | |
| SS 57 | 15-26-39 | | | POORLY GRADED SAND (SP); trace silt; light brown; very dense; wet; subangular; poorly graded; medium to coarse grained; tip of spoon as above but clayey | |
| | | 187.6 | | | |
| SS 58 | 17-35-41 | | | same as above | |
| | | 186.8 | | | |
| | | 186.1 | | CLAYEY SAND (SC); light yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 59 | 21-48-45 | | 100 | POORLY GRADED SAND (SP); trace silt; light brown; very dense; wet; subangular; poorly graded; medium to coarse grained | |
| | | 184.5 | | | |
| | | 183.8 | | CLAYEY SAND (SC); medium brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 60 | 18-44-51 | | | | |
| | | 182.3 | | POORLY GRADED SAND (SP); trace silt; light brown; very dense; wet; subangular; poorly graded; medium to coarse grading down to lower medium | |
| SS 61 | 20-35-36 | | | | |
| | | 180.8 | | same as above; trace silt and gravel; medium brown; fine to lower coarse grained | |
| SS 62 | 16-18-24 | | 105 | same as above; trace clay; light brown to medium brown; dense; medium to lower coarse grained | |
| | | 179.3 | | | |
| SS 63 | 17-20-14 | | | POORLY GRADED SAND WITH SILT (SP-SM); light brown to medium brown; dense; wet; subangular; poorly graded; fine to lower coarse grained | |
| | | 177.8 | | | |
| SS 64 | 5-2-2 | | | CLAYEY SAND (SC); medium yellowish brown, brown, and dark gray; very loose; wet; subangular; poorly graded; fine to lower coarse grained; Mn? staining | |
| | | 176.3 | | | |
| SS 65 | 1-2-3 | | 110 | same as above; loose | Santee |
| | | 174.5 | | | |
| | | 173.8 | | SANDY FAT CLAY (CH); light brownish gray, tan, and black; firm; moist; high plasticity; sand fraction is fine to medium grained; Mn? staining | |
| SS 66 | 1-2-1/9in | | | same as above; jar #1; soft | |
| | | 172.1 | | | |
| | | 171.5 | | CLAYEY SAND (SC); light grayish brown, tan, and yellowish brown; very loose; wet; subangular; poorly graded; fine to medium grained | |
| SS | 7-7-9 | | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-4

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 4 | FB-4 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 169.7 | | same as above; medium yellowish brown and yellowish gray; medium dense | |
| SS 67 | 5-14-21 | 168.2 | | same as above; dense | |
| SS 68 | 6-14-17 | 167.1 | | same as above; fine to lower coarse grained | |
| SS 69 | 11-19-21 | 166.7 | | POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 70 | 16-16-16 | 165.2 | 120 | CLAYEY SAND (SC); trace shell material; medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained; black Mn? staining | |
| SS 71 | 13-18-19 | 163.8 | | SILTY SAND (SM); med yellowish brown; dense; wet; subangular; poorly graded; fine grained | |
| SS 72 | 27-34-34 | 163.4 | | CLAYEY SAND (SC); med yellowish brown; dense; wet; subangular; poorly graded; fine to med grained trace lower coarse | |
| SS 73 | 21-32-34 | 161.9 | | SILTY SAND (SM); med yellowish brown; dense; wet; subangular; poorly graded; v. fine to fine grained; trace Mn? staining | |
| SS 74 | 19-30-23 | 160.4 | 125 | same as above; lt yellowish brown; very dense | |
| SS 75 | 17-23-34 | 158.9 | | same as above; thin lt gray lean clay laminations; med yellowish brown | |
| SS 76 | 8-8-10 | 157.4 | | same as above; fine to lower medium grained | |
| SS 77 | 8-7-4 | 155.9 | | POORLY GRADED SAND WITH SILT (SP-SM); med brownish yellow with orange mottles; very dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 78 | 1-3-4 | 154.4 | 130 | same as above; lt brownish white with med orange laminae; med dense; fine grained | |
| SS 79 | 6-2-5 | 152.9 | | POORLY GRADED SAND WITH CLAY (SP-SC); lt brownish white with lt orangish brown zones; med dense; wet; subangular; poorly graded; fine grained; trace heavies and mica | At 130 feet depth check OK. |
| SS 80 | WR/6in-11-19 | 151.4 | | same as above; med yellowish brown with very lt brown wisps; loose | |
| SS 81 | 7-10-13 | 149.9 | 135 | CLAYEY SAND (SC); med yellowish brown; loose; wet; subangular; poorly graded; fine grained; trace heavies and mica | |
| SS 82 | 11-15-16 | 148.4 | | same as above; slightly higher clay content and lt green wisps; med dense; black wisps (Mn?); turritella fragments | |
| SS 83 | 4-9-18 | 146.9 | | same as above; med reddish brown with lt green wisps and dk reddish orange mottles | |
| SS 84 | 9-35-28 | 145.4 | | same as above; with zones of poorly graded sand with clay; med yellowish brown; dense; fine to med grained | At 138 feet depth check OK. |
| SS 85 | 13-24-24 | 143.9 | 140 | same as above; med dense; fine grained; black mottles (Mn?); turritella casts | |
| SS 86 | 11-11-11 | 142.4 | | same as above; very dense | |
| SS 87 | 7-50/4in | 140.9 | | FAT CLAY WITH SAND (CH); medium brownish yellow; hard; wet; high plasticity; sand is fine grained; trace mica; trace heavies; shoe lost downhole | Warley Hill |
| SS 88 | 11-21-34 | 139.4 | 145 | same as above; very stiff; (material may be sloughed) | |
| SS 89 | 9-13-18 | 138.1 | | same as above; very hard; refusal caused by a silicified nodule lodged in the shoe | At 146 depth check off adjusted to 146.2. |
| SS 90 | 31-50/4in | 135.9 | | LEAN CLAY (CL); trace sand; with interlaminated sand; very light gray with orange mottles; hard; wet; medium plasticity; sand is fine grained; mottles are clayey sand | |
| SS 91 | 50/2in | 134.4 | 150 | no recovery; shoe lost downhole | |
| SS 92 | | 133.6 | | CLAYEY SAND (SC); with gravel; very dark grayish green; very dense; wet; subangular; well graded; fine to coarse grained; 'green clay' | |
| | | 132.7 | | no recovery | |
| | | | | Total depth of boring 152.4 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-4**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-5 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79233 E 54977 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/12/98 | 2/20/98 | Graves/A. Jackson | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 158.8 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.5 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 290.5 | | | Hand auger to 6 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 4-8-13 | 283.0 | | POORLY GRADED SAND (SP) trace clay; light brown; medium dense; dry; subangular; poorly graded; fine to medium grained | |
| SS 2 | 12-18-27 | 281.5 | | CLAYEY SAND (SC); medium brownish red and light brown; dense; damp; subangular; poorly graded; fine to medium grained; black mottles (organic material?) | |
| SS 3 | 8-14-17 | 280.0 | 10 | POORLY GRADED SAND WITH CLAY (SP-SC); medium red with light brown mottles; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 4 | 12-17-22 | 278.5 | | CLAYEY SAND (SC); light yellowish brown, light yellow, and light brown; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 5 | 16-28-26 | 277.0 | | same as above; medium red, light yellow, and white; very dense | |
| SS 6 | 10-13-17 | 275.5 | | same as above; medium red; medium dense; moist | |
| SS 7 | 12-16-15 | 274.0 | 15 | same as above; damp | |
| SS 8 | 8-9-10 | 272.5 | | LEAN CLAY WITH SAND (CL); medium red with light yellow zones; very stiff; damp; medium plasticity; sand is fine to medium grained | |
| SS 9 | 6-10-14 | 271.0 | | same as above, coarse fraction is fine grained sand to fine gravel | |
| SS 10 | 6-8-6 | 269.5 | 20 | same as above; stiff; with slightly more fine gravel | |
| SS 11 | 7-10-8 | 268.0 | | SANDY LEAN CLAY (CL); medium red; very stiff; damp; medium plasticity; sand fraction is fine to coarse grained | |
| SS 12 | 4-5-5 | 266.5 | | CLAYEY SAND (SC); medium red; loose; damp; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 13 | 4-7-9 | 265.0 | 25 | same as above; medium dense; with occasional coarse grains | |
| SS 14 | 7-10-11 | 263.5 | | SILTY SAND (SM); medium red with white and yellow bands and sparse purple mottles; medium dense; damp; subangular; poorly graded; fine grained | |
| SS 15 | 8-9-12 | 262.0 | | same as above; trace mica; no mottles | |
| SS 16 | 8-9-11 | 260.5 | | SILT (ML) trace sand; medium red, purple, white, orange, and yellow; very stiff; damp; medium plasticity; sand fraction is fine grained | |
| SS 17 | 7-12-16 | 259.0 | 30 | same as above; low plasticity | |
| SS 18 | 7-11-12 | 257.5 | | CLAYEY SAND (SC); silty in places; lt yellow and med red; med dense; moist; subangular; poorly graded; fine to med grained; top of the interval is silt | |
| SS 19 | 8-9-9 | 256.0 | | POORLY GRADED SAND WITH CLAY (SP-SC); med yellowish brown and reddish brown; med dense; damp; subangular; poorly graded; fine to med grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-5

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-5 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 20 | 8-10-11 | 254.5 | | same as above; light red, yellow, orange and white; moist | |
| SS 21 | 8-11-11 | 253.0 | | same as above | |
| SS 22 | 13-13-12 | 251.5 | | same as above; but clayey in places and more fine grained sand fraction | |
| SS 23 | 10-10-13 | 250.0 | 40 | same as above; clayey in places | |
| SS 24 | 7-10-11 | 248.5 | | same as above; clayey in places; trace mica | |
| SS 25 | 11-10-11 | 247.0 | | same as above; fine to medium grained | |
| SS 26 | 9-10-11 | 245.5 | | same as above | |
| SS 27 | 9-12-12 | 244.0 | 45 | same as above | |
| SS 28 | 12-16-21 | 242.5 | | CLAYEY SAND (SC); medium red, yellow, and orange with white mottles; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 29 | 14-17-18 | 241.0 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium red and yellow with white mottles; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 30 | 12-13-15 | 239.5 | 50 | CLAYEY SAND (SC); medium red, brownish yellow, and white; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 31 | 13-17-18 | 238.0 | | same as above; with white wisps; dense | |
| SS 32 | 17-20-21 | 236.5 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow with dark brown wisps and white wisps; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 33 | 17-20-24 | 235.0 | 55 | same as above; medium red with brownish yellow bands | |
| SS 34 | 16-22-30 | 233.5 | | same as above; medium red and reddish yellow; very dense; few flattened quartz pebbles | |
| SS 35 | 20-19-22 | 232.0 | | POORLY GRADED SAND (SP) trace clay; medium yellow with red and orange zones and white wisps; dense; wet; subangular; poorly graded; fine to medium grained | Dry Branch |
| SS 36 | 18-17-19 | 230.5 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium red with brownish yellow zones; dense; wet; subangular; poorly graded; medium grained | |
| SS 37 | 9-9-9 | 229.0 | 60 | CLAYEY SAND (SC); medium brownish yellow and yellow with dark brown wisps and white wisps; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 38 | 8-11-14 | 227.5 | | same as above; less clayey in places; medium brownish yellow with light brown zones | |
| SS 39 | 8-16-15 | 226.0 | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey in places; medium yellowish brown with white wisps; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 40 | 15-22-29 | 224.5 | 65 | same as above; medium reddish yellow; very dense; black Mn? pellets | |
| SS 41 | 19-24-30 | 223.0 | | POORLY GRADED SAND (SP) trace clay; with clay in places; medium reddish yellow; very dense; wet; subangular; poorly graded; medium grained with occasional coarse grains | |
| SS 42 | 22-30-31 | 221.5 | | same as above, brownish yellow | |
| SS 43 | 24-28-31 | 220.0 | 70 | POORLY GRADED SAND WITH CLAY (SP-SC); medium red; very dense; wet; subangular; poorly graded; medium grained with occasional coarse grains | |
| SS 44 | 20-21-22 | 218.5 | | same as above; dense; fine to medium grained | |
| SS 45 | 18-17-26 | 217.0 | | CLAYEY SAND (SC); med red with med brownish yellow bands of sand trace clay; dense; wet; subangular; poorly graded; fine to med grained | |
| SS 46 | 19-21-19 | 215.5 | | POORLY GRADED SAND (SP) trace clay; lt brown, lt brownish yellow, and lt red; dense; wet; subangular; poorly | |

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PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-5

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-5 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | | | graded; fine to med grained | |
| SS 47 | 17-29-32 | 214.0 | | POORLY GRADED SAND WITH CLAY (SP-SC); med reddish brown, lt brown, and brownish yellow; very dense; wet; subangular; poorly graded; fine to med grained | Sample fell out of the tube onto the ground. |
| SS 48 | 18-20-22 | 212.5 | | WELL GRADED SAND (SW) trace clay; lt brown and lt reddish brown; dense; wet; subrounded; well graded; fine to coarse grained | |
| SS 49 | 12-13-15 | 211.0 | | same as above; med dense | |
| SS 50 | 10-11-12 | 209.5 | 80 | POORLY GRADED SAND (SP) trace clay; lt brown few lt brownish yellow zones; med dense; wet; subrounded; poorly graded; fine to med grained and sltly more clay at top of interval; fine to cse grained at bottom of interval; black Mn? pellets | |
| SS 51 | 10-10-10 | 208.0 | | POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC); lt brown with lt yellowish brown zones; med dense; wet; subrounded; well graded; fine grained sand to gravel size; some zones less clayey; black Mn? pellets | |
| SS 52 | 2-1-2 | 206.5 | | SILTY SAND (SM); lt yellowish brown; very loose; wet; subangular; poorly graded; fine grained | Top Tan Clay |
| SS 53 | 5-7-10 | 205.0 | 85 | LEAN CLAY (CL) trace sand; lt brownish yellow with orange sand stringers; very stiff; wet; medium plasticity; interlaminated orange fine sand | |
| SS 54 | 7-8-10 | 203.5 | | same as above; sand stringers are dk brown and black; Mn? pellets | |
| SS 55 | 6-8-9 | 202.0 | | same as above; with sand and interbedded clayey sand; sand is fine to coarse grained; black Mn? pellets | Bottom Tan Clay |
| SS 56 | 7-12-17 | 200.5 | 90 | POORLY GRADED SAND (SP) trace clay; lt brown; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 57 | 21-27-30 | 199.0 | | same as above; very dense | |
| SS 58 | 38-50/5in | 198.1 | | same as above; with a band of clayey sand | |
| SS 59 | 50-50/4in | 196.7 | | same as above; very lt brown; trace heavy minerals | |
| SS 60 | 27-38-35 | 194.5 | 95 | same as above; with a zone of poorly graded sand with clay | |
| SS 61 | 22-33-35 | 193.0 | | POORLY GRADED SAND WITH CLAY (SP-SC); lt red with very lt brown zone at top; very dense; wet; subangular; poorly graded; fine to med grained | |
| SS 62 | 20-22-34 | 191.5 | | same as above; clayey in places; med red with lt red zones | |
| SS 63 | 25-28-37 | 190.0 | 100 | same as above; med red grades into lt brown zone at bottom of interval | |
| SS 64 | 39-36-41 | 188.5 | | POORLY GRADED SAND (SP) trace clay; med brown with a lt red band; very dense; wet; subangular; poorly graded; med grained | |
| SS 65 | 7-11-17 | 187.0 | | CLAYEY SAND (SC), some zones less clayey; lt yellowish brown with white wisps; med dense; wet; subangular; fine to coarse grained | |
| SS 66 | 21-24-33 | 185.5 | 105 | POORLY GRADED SAND WITH CLAY (SP-SC); lt brownish yellow; very dense; wet; subangular; poorly graded; fine to med grained; black Mn? wisps | |
| SS 67 | 8-18-33 | 184.0 | | POORLY GRADED SAND (SP) trace clay; lt brown; very dense; wet; subangular; poorly graded; fine to med grained; black Mn? pellets | |
| SS 68 | 27-43-50 | 182.5 | | same as above; without black pellets | |
| SS 69 | 34-40-40 | 181.0 | | same as above; with occasional coarse grains; trace heavies | |
| SS 70 | 28-41-42 | 179.5 | 110 | same as above | |
| SS 71 | 33-42-50 | 178.0 | | same as above; with sporadic clay pods | |
| SS 72 | 18-18-18 | 176.5 | | POORLY GRADED SAND WITH CLAY (SP-SC), and lt brownish yellow clay stringers; lt brown and lt yellow; dense; wet; subangular; poorly graded | |
| SS | 12-34-42 | | | CLAYEY SAND (SC), with less clayey zones and a clean | |

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SITE

**FINAL LOG**

HOLE NO. **FB-5**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-5 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 73 SS 74 | 19-19-17 | 175.0 | | sand zone at top of interval; lt brown, lt brownish yellow, and red; very dense; wet; subangular; poorly graded; fine to med grained; few lt yellow clay balls | |
| SS 75 | 4-21-31 | 173.5 / 173.0 / 172.8 | | POORLY GRADED SAND WITH CLAY (SP-SC), clayey and trace clay zones; med yellowish brown and lt brown with lt yellow clay wisps; dense; wet; subangular; poorly graded; fine to med grained; black Mn? mottles | Santee |
| SS 76 | 25-44-37 | 172.0 | | same as above; very dense | |
| | | | | SANDY FAT CLAY (CH); dk brown; hard; wet; high plasticity | |
| SS 77 | 7-12-22 | 170.5 | 120 | POORLY GRADED SAND (SP) trace clay; lt brown; very dense; wet; subangular; poorly graded; fine to med grained | |
| SS 78 | 14-24-40 | 169.0 | | same as above; occasional coarse sand | |
| | | | | POORLY GRADED SAND WITH CLAY (SP-SC); med yellowish brown with lt yellow clay laminae; dense; wet; subangular; poorly graded; fine to med grained; becomes lter colored and med grained at bottom of interval | |
| SS 79 | 19-49-50/4in | 167.5 | | | |
| | | 166.2 | | SILTY SAND (SM); lt brown and lt yellowish brown with white wisps; very dense; wet; subangular; poorly graded; fine grained; black Mn? wisps | |
| SS 80 | 21-33-48 | | 125 | POORLY GRADED SAND (SP) trace clay; very lt brown becoming orange brown near the bottom of interval; very dense; wet; subangular; poorly graded; fine to med grained; clay content increases sltly with depth | |
| SS 81 | 24-44-50 | 164.5 | | | |
| SS 82 | 40-35-39 | 163.0 | | same as above; trace silt; lt brown and lt brownish yellow with lt yellow clay laminae; some zones contain sltly more silt | |
| | | | | same as above; trace clay; fine to med grained | |
| SS 83 | 12-40-50 | 161.5 | | same as above; occasional clay stringers; fine grained; trace heavies | |
| | | | 130 | same as above; trace silt; occasional black Mn? mottles | |
| SS 84 | 28-33-50 | 160.0 | | same as above; with lt brown and white clayey bands and lt yellow clay laminae; trace mica; top 0.2 ft is clean lt brown sand; borderline with silt | |
| SS 85 | 47-48-45 | 158.5 | | same as above; no white zone and no brown sand | |
| SS 86 | 31-38-50 | 157.0 | | same as above; lt brown clean sand at very top of interval | |
| SS 87 | 26-29-28 | 155.5 | 135 | POORLY GRADED SAND WITH SILT (SP-SM); lt yellowish brown with lt brown zones; very dense; wet; subangular; poorly graded; fine to med grained; black Mn? pellets; trace mica | |
| SS 88 | 8-3-7 | 154.0 | | CLAYEY SAND (SC), becomes less clayey toward bottom of interval; med yellowish brown with lt greenish brown mottles; loose; wet; subangular; poorly graded; fine grained; trace mica | |
| SS 89 | 1/3in-1/6in-2/9in | 152.5 | | | |
| | | 151.0 | | same as above; no mottles; very loose; black Mn? pellets | |
| SS 90 | WR/9in-6/3in-16 | | 140 | same as above; med brownish yellow; med dense | |
| SS 91 | 7-13-15 | 149.5 | | same as above; white wisps | |
| SS 92 | 4-11-13 | 148.0 | | same as above; with lt greenish gray laminae; clay content increases with depth | |
| SS 93 | 7-10-12 | 146.5 | | same as above | |
| SS 94 | 5-8-8 | 145.0 | 145 | POORLY GRADED SAND WITH CLAY (SP-SC); lt brown with med yellow clay balls; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 95 | 5-4-4 | 143.5 | | CLAYEY SAND (SC); med brownish yellow and lt brown; loose; wet; subangular; poorly graded; fine grained; trace heavy minerals | 2/18/98 water level is @ 75-78' bls. |
| SS 96 | WR/8in-11-18 | 142.0 | | same as above; interbedded clay with sand; med yellowish brown; med dense; fine to med grained | |
| SS 97 | 7-10-14 | 140.5 | 150 | same as above; zones of interbedded lt brown sand with clay and sandy fat clay | |
| SS 98 | WR/6in-10-14 | 139.0 | | SANDY FAT CLAY (CH); med brownish yellow with greenish yellow mottles; very stiff; wet; high plasticity; sand fraction is fine grained; trace heavy minerals | Warley Hill |
| SS 99 | 11-15-17 | 137.5 | | same as above; with interlaminated orange sand; med reddish brown with lt greenish gray laminations; hard; sand fraction is fine to coarse grained | |
| | | 136.0 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-5**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-5 |

▲ N-VALUE (SPT)
O RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | 20 40 60 80 | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 100 | | ▲ O | 12-15-23 | 134.5 | | | CLAYEY SAND (SC), interlaminated lean clay; lt brownish yellow with lt greenish gray laminations; dense; wet; subangular; poorly graded; fine to med grained; lower part of interval has thicker clay laminae | |
| SS 101 | | | 16-17-19 | 133.8 | | | POORLY GRADED SAND WITH CLAY (SP-SC); lt brown; dense; wet; subangular; poorly graded; fine to med grained with occasional coarse | |
| SS 102 | | | 13-48-50/4in | 133.0 | | | SANDY FAT CLAY (CH); med reddish yellow with lt greenish gray clay laminae; hard; wet; high plasticity (CH); fine to coarse grained | Congaree |
| | | | | 131.9 | | | same as above; very hard | Hole abandoned with grout mix per 3Q5. |
| | | | | 131.7 | | | CLAYEY SAND (SC); med greenish brown and brownish orange; very dense; wet; subrounded; poorly graded; med to coarse grained (probable congaree); black Mn? mottles | |
| | | | | | | | Total depth of boring 158.8 feet. | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-5

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-6 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79179 E 55038 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/2/98 | 2/11/98 | Graves/A. Jackson & E. Plush | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 158.3 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 291.7 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80)

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 291.7 | | | Hand auger to 6 feet to check for inderground interferences. |
| | | | 5 | | Drilled out from 6 to 8 feet. |
| SS 1 | 12-14-12 | 282.2 | | CLAYEY SAND (SC); light brown with red bands; medium dense; dry; subangular; poorly graded; fine to medium grained | |
| SS 2 | 9-15-16 | 280.7 | 10 | same as above; dark red with light brown mottles; dense; damp | |
| SS 3 | 12-15-18 | 279.2 | | same as above; medium red with light yellow mottles | |
| SS 4 | 9-14-11 | 277.7 | | same as above; no mottles; medium dense | |
| SS 5 | 15-11-12 | 276.2 | 15 | same as above | |
| SS 6 | 7-7-10 | 274.7 | | SANDY LEAN CLAY (CL); light yellowish red; very stiff; damp; low plasticity; sand fraction is fine to medium grained | |
| SS 7 | 6-13-18 | 273.2 | | no recovery | |
| SS 8 | 6-9-10 | 271.7 | 20 | LEAN CLAY (CL) trace sand and trace gravel; medium red; very stiff; moist; medium plasticity; thin layer of gravelly clay (<0.1 foot thick); sand fraction is fine to medium grained | Tobacco Road |
| SS 9 | 6-7-8 | 270.2 | | CLAYEY SAND (SC); medium red; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 10 | 6-20-21 | 268.7 | | same as above; dense; well graded; fine sand to fine gravel grain size | |
| SS 11 | 5-8-10 | 267.2 | | SILT WITH SAND (ML); medium reddish gray with medium grayish red zones; very stiff; dry; low plasticity; sand fraction is fine grained; trace mica | |
| SS 12 | 5-7-9 | 265.7 | 25 | same as above | |
| SS 13 | 6-6-6 | 264.2 | | same as above; stiff | |
| SS 14 | 5-10-12 | 262.7 | | same as above; with a plug of medium purple lean clay near the top of the interval; very stiff | |
| SS 15 | 8-14-11 | 261.2 | 30 | CLAYEY SAND (SC); medium brownish yellow with white mottles; medium dense; moist; subangular; poorly graded; fine to medium grained; plug of yellow clay (<0.1' thick) at top of interval | |
| SS 16 | 10-10-12 | 259.7 | | same as above | |
| SS 17 | 8-11-11 | 258.2 | | same as above | |
| SS 18 | 10-32-25 | 256.7 | | same as above; with light red zones; very dense | |

SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-6

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-6 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 19 | 1-3-9 | | | same as above; medium red; medium dense | |
| | | 255.2 | | | |
| SS 20 | 12-15-12 | | | POORLY GRADED SAND WITH CLAY (SP-SC); medium red with white and medium brownish yellow streaks; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| | | 253.7 | | | |
| SS 21 | 12-17-20 | | | same as above; light red; dense | |
| | | 252.2 | | | |
| SS 22 | 12-17-20 | | 40 | POORLY GRADED SAND WITH SILT (SP-SM); light red; dense; moist; subangular; poorly graded; fine to medium grained | |
| | | 250.7 | | | |
| SS 23 | 12-15-19 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light red grading downward to light yellow; dense; moist; subangular; poorly graded; fine to medium grained | |
| | | 249.2 | | | |
| SS 24 | 10-13-13 | | | same as above; light red and light orange; medium dense | |
| | | 247.7 | | | |
| SS 25 | 12-15-16 | | | same as above; light brownish yellow with red zones; dense | |
| | | 246.2 | 45 | | |
| SS 26 | 11-13-17 | | | same as above; light yellow with white and dark brown mottles and some light brown wisps; medium dense; some zones are wet | |
| | | 244.7 | | | |
| SS 27 | 11-19-19 | | | same as above; becomes clayey sand at the bottom of the interval; becomes red at bottom of interval; dense; wet | |
| | | 243.2 | | | |
| SS 28 | 13-16-16 | | | CLAYEY SAND (SC); light red with an orange band; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 241.7 | 50 | | |
| SS 29 | 12-13-18 | | | same as above; moist | |
| | | 240.2 | | | |
| SS 30 | 15-18-18 | | | same as above; light red | |
| | | 238.7 | | | |
| SS 31 | 21-28-38 | | | same as above; light red and orange; very dense; wet; medium grained | |
| | | 237.2 | | | |
| SS 32 | 28-37-31 | | 55 | POORLY GRADED SAND WITH CLAY (SP-SC); medium reddish yellow; very dense; wet; subangular; poorly graded; medium grained; black Mn? pellets | |
| | | 235.7 | | | |
| SS 33 | 15-20-24 | | | same as above; light brown; dense | Dry Branch |
| | | 234.2 | | | |
| SS 34 | 15-15-20 | | | same as above; medium yellowish brown | |
| | | 232.7 | | | |
| SS 35 | 7-9-12 | | 60 | CLAYEY SAND (SC); medium yellow; medium dense; wet; subangular; poorly graded; fine to medium grained; a thin, mostly medium grained, zone is more clayey than the rest | |
| | | 231.2 | | | |
| SS 36 | 16-10-12 | | | same as above; medium brownish yellow | |
| | | 229.7 | | | |
| SS 37 | 12-16-30 | | | same as above; dense | |
| | | 228.2 | | | |
| SS 38 | 19-25-35 | | | same as above; medium brown and brownish red; very dense | |
| | | 226.7 | 65 | | |
| SS 39 | 23-28-29 | | | same as above; light reddish brown and red; subrounded; medium grained | |
| | | 225.2 | | | |
| SS 40 | 36-41-50 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light reddish brown and red; very dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 223.7 | | | |
| SS 41 | 19-26-34 | | | POORLY GRADED SAND WITH SILT (SP-SM); light reddish brown with yellow and white wisps; very dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 222.2 | | | |
| SS 42 | 17-19-20 | | 70 | POORLY GRADED SAND (SP) trace silt; medium yellowish brown with light brown zones; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 220.7 | | | |
| SS 43 | 12-21-24 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 219.2 | | | |
| SS 44 | 13-17-17 | | | same as above; light brown; trace heavy minerals | |
| | | 217.7 | | | |
| SS | 11-13-18 | | | POORLY GRADED SAND WITH SILT (SP-SM); light | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-6

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-6 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 45 SS 46 | 13-15-16 | 216.2 | | yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 214.7 | | same as above | |
| SS 47 | 10-11-12 | | | POORLY GRADED SAND (SP) trace clay; light yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 213.2 | | | |
| SS 48 | 9-7-8 | | | CLAYEY SAND (SC); med brownish yellow with lt brown band at bottom and black band in middle of interval; med dense; wet; subangular; poorly graded; fine to med grained; black band and black pellets are Mn?; 0.1 ft thick med yellow sandy clay near middle of interval | |
| | | 211.7 | 80 | | |
| SS 49 | 2-2-6 | | | | |
| | | 210.2 | | same as above; with interbedded clay; loose | |
| SS 50 | 5-7-14 | | | SILTY SAND (SM); with interbedded lean clay; lt brown with dk reddish brown bands; clay is med yellow and v. lt brown; med dense; wet; subangular; poorly graded; fine to med grained | |
| | | 208.7 | | | Top Tan Clay |
| SS 51 | 8-12-16 | | | LEAN CLAY (CL); few sand stringers; light brownish yellow with black and dark reddish brown wisps; very stiff; damp; medium plasticity; sand fraction is fine grained | |
| | | 207.2 | 85 | | |
| SS 52 | 7-10-12 | | | same as above; sandy, with interbedded silt and sand; moist; sand fraction is fine to very coarse grained | |
| | | 205.7 | | | |
| SS 53 | 4-8-13 | | | same as above | |
| | | 204.2 | | | Bottom Tan Clay |
| SS 54 | 6-11-19 | | | CLAYEY SAND (SC); light brown with light yellowish brown and black mottles; medium dense; wet; subangular; poorly graded; fine to medium grained; top 0.1 foot is same as above | |
| | | 202.7 | | | |
| SS 55 | 7-8-16 | | 90 | same as above; with interbedded sand, clay, and silty sand | |
| | | 201.2 | | | |
| SS 56 | 12-20-25 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 199.7 | | | |
| SS 57 | 11-16-24 | | | same as above; silty in places; light and medium brownish yellow | |
| | | 198.2 | | | |
| SS 58 | 18-25-18 | | | no recovery | |
| | | 196.7 | 95 | | |
| SS 59 | 10-15-17 | | | CLAYEY SAND (SC); with silty zones and thin interlaminated clays; medium brown with light brownish yellow zones and thin black wisps; dense; wet; subangular; poorly graded; fine to medium grained; black Mn? wisps | |
| | | 195.2 | | | |
| SS 60 | 16-25-19 | | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey sand in places; light brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 193.7 | | | |
| SS 61 | 13-18-17 | | | same as above; light brown with white wisps | |
| | | 192.2 | | | |
| SS 62 | 9-6-7 | | 100 | CLAYEY SAND (SC); lt yellowish brown and lt brown with lt yellow zones and white wisps; med dense; wet; subangular; poorly graded; fine to med grained | |
| | | 190.7 | | | |
| SS 63 | 8-11-13 | | | same as above; with bands of sandy clay; fine to lower coarse grained | |
| | | 189.2 | | | |
| SS 64 | 13-15-17 | | | POORLY GRADED SAND WITH CLAY (SP-SC); with zones of clayey sand; light brown with light yellow and white wisps; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | 187.7 | | | |
| SS 65 | 22-30-40 | | | same as above; very dense; trace coarse sand | |
| | | 186.2 | 105 | | |
| SS 66 | 25-25-24 | | | WELL GRADED SAND WITH CLAY (SW-SC); light brown; dense; wet; subangular; well graded; fine to medium grained with some coarse sand and gravel; black Mn? pellets | |
| | | 184.7 | | | |
| SS 67 | 16-19-26 | | | same as above; with light yellow and white wisps; top 0.1 ft clayey | |
| | | 183.2 | | | |
| SS 68 | 29-25-19 | | | same as above; light brown; subrounded; fine to coarse grained with some fine gravel | |
| | | 181.7 | 110 | | |
| SS 69 | 14-12-17 | | | POORLY GRADED SAND WITH CLAY (SP-SC); lt yellowish and lt brown with black and lt yellow clay stringers; med dense; wet; subangular; poorly graded; fine to med grained with trace cse and fine gravel; black wisps are Mn? | |
| | | 180.2 | | | |
| SS 70 | 23-24-24 | | | | |
| | | 178.7 | | same as above; with dark brown mottles; dense; trace heavy minerals | |
| SS 71 | 10-18-15 | | | CLAYEY SAND (SC); with sandy clay zones; very light brown with light orange and purple wisps; dense; wet; | |
| | | 177.2 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-6

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-6 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 72 | 3-5-12 | 175.7 | | subangular; well graded; fine to upper coarse grained with trace gravel | Santee |
| SS 73 | 6-10-9 | 175.4 | | SANDY LEAN CLAY (CL); with interbedded silt; lt gray, lt green, and lt purple; very stiff; wet; low plasticity; sand is fine to medium grained | |
| SS 74 | 5-21-45 | 174.5 | | same as above | |
| SS 75 | 14-19-15 | 174.2 | | POORLY GRADED SAND WITH CLAY (SP-SC); med brown with lt brown mottles; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 76 | 5-10-22 | 172.7 | | same as above; med to coarse grained trace gravel | |
| SS 77 | 15-29-33 | 171.2 | 120 | same as above; grading to orange and yellow; very dense; fine to med grained; clay content increases downward | |
| SS 78 | 20-24-24 | 169.7 | | same as above; lt brown few dark brown wisps; dense; with sparse coarse sand and fine gravel | |
| SS 79 | 12-21-36 | 168.2 | | CLAYEY SAND (SC); med brownish yellow; dense; wet; subangular; poorly graded; fine to med grained, trace coarse sand and fine gravel | |
| SS 80 | 15-21-50/5.5in | 166.7 | 125 | POORLY GRADED SAND WITH CLAY (SP-SC); med yellowish red with lt brown mottles; very dense; wet; subangular; poorly graded; fine grained | |
| SS 81 | 30-27-28 | 165.2 | | same as above; med reddish yellow; dense | |
| SS 82 | 22-36-42 | 163.7 | | CLAYEY SAND (SC); some places are silty; very lt greenish yellow with med reddish yellow speckles; very dense; wet; subangular; poorly graded; fine grained | |
| SS 83 | 23-23-36 | 162.2 | | POORLY GRADED SAND (SP); with clay in places; very lt greenish brown, lt brown, and lt yellow; very dense; wet; subangular; poorly graded; fine grained; upper 0.2 feet are fine to med grained | Catcher teeth broken off. |
| SS 84 | 25-27-31 | 160.7 | | no recovery | |
| SS 85 | 22-33-38 | 159.2 | 130 | POORLY GRADED SAND WITH CLAY (SP-SC); med brownish yellow; very dense; wet; subangular; poorly graded; fine grained; trace heavies | |
| SS 86 | 20-27-37 | 157.7 | | no recovery | Catcher teeth broken off. |
| SS 87 | 26-24-32 | 156.2 | | same as above; with white bands and orange wisps | |
| SS 88 | 15-13-17 | 155.0 | | same as above; lt brownish yellow with lt brown zones | |
| SS 89 | 7-9-6 | 154.7 | 135 | same as above; trace mica | |
| SS 90 | 4-5-6 | 153.5 | | same as above; lt brown; fine to med grained | |
| SS 91 | 4-6-6 | 153.2 | | same as above; lt yellowish brown with lt brown zones and orange wisps; fine grained; trace mica and heavy minerals | |
| SS 92 | WR/18in | 151.7 | | same as above; lt brown; fine to med grained | |
| SS 93 | 4-5-9 | 150.2 | 140 | same as above; med yellowish brown; med dense; fine grained; black Mn? mottles | |
| SS 94 | WR/4in-2-10-24 | 148.7 | | same as above | |
| SS 95 | 42-42-46 | 148.0 | | CLAYEY SAND (SC); med yellowish brown with lt green wisps; med dense; wet; subangular; poorly graded; fine grained | |
| SS 96 | 20-27-50/4in | 147.2 | | POORLY GRADED SAND (SP) trace silt; lt brown; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 97 | 18-30-34 | 145.7 | 145 | CLAYEY SAND (SC); med yellowish brown with interlaminated lt green wisps; med dense; wet; subangular; poorly graded; fine grained; black Mn? pellets | |
| SS 98 | 6-16-24 | 145.0 | | same as above; some zones of clay with sand; very loose; several silicified turritella casts | |
| | | 144.2 | | same as above; medium dense; no shells | |
| | | 143.1 | | same as above; med brown; abundant shell fragments and silicified casts | |
| | | 142.7 | | same as above; few clay pods; dense | |
| | | 141.2 | 150 | FAT CLAY WITH SAND (CH); interbedded orange sand; med yellowish red and brownish yellow with green mottles; hard; wet; high plasticity; sand fraction is fine grained; interbedded sand is fine to med grained; turritella fragments present; silicified chips | Warley Hill |
| | | 139.9 | | same as above; lt brownish yellow and yellowish red with green zones; very hard; sand fraction fine grained | |
| | | 138.2 | | same as above; interbedded lt green silt; sand fraction fine to med grained with some coarse | |
| | | 136.7 | | same as above; with interlaminated sand; med yellowish red, greenish brown, and brown with orange laminae; turritella fragments | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-6

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-6 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | N-VALUE (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 99 | | | 12-20-50/4in | | | | same as above; hard | |
| | | | | 135.4 | | | same as above; sandy; very hard; sand fraction fine to coarse grained | |
| SS 100 | | | 20-50-50/2in | | | | WELL GRADED SAND WITH CLAY (SW-SC), clayey sand in places; lt brown; very dense; wet; subangular; well graded; fine to coarse grained; congaree? | Congaree |
| | | | | 134.0 | | | | |
| SS 101 | | | 50/3in | 133.4 | | | no recovery; congaree? | |
| | | | | | | | Total depth of boring 158.3 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-6

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-7 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79520 E 54847 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/20/98 | 2/23/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 156.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 283.8 | ▽ / ▼ / | R. Gelinas/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 39 | ~~50/4in~~ | 283.8 | | | Hand auger to 6 feet to check for undergroung interferences. |
| | | | 5 | | |
| SS 1 | 2-2-7 | 276.3 | | CLAYEY SAND (SC); medium reddish brown; loose; moist; subangular; poorly graded; fine to medium grained | |
| SS 2 | 3-16-23 | 274.8 | | no recovery | Shoe lost down hole. |
| SS 3 | 11-19-16 | 273.3 | 10 | SANDY LEAN CLAY (CL); medium reddish brown and yellowish brown; hard; damp; medium plasticity; sand fraction is fine to medium grained | |
| SS 4 | 29-43-41 | 271.8 | | CLAYEY SAND (SC); medium brownish red; very dense; wet; subangular; poorly graded; fine to upper medium grained | Tobacco Road |
| SS 5 | 13-18-19 | 270.3 | | same as above; medium reddish brown and brownish gray; dense; moist; fine to medium grained | |
| SS 6 | 14-20-18 | 268.8 | | same as above; with sandy clay portions; medium reddish brown and yellowish brown | |
| SS 7 | 37-40-40 | 267.3 | 15 | same as above; very dense; wet; fine to upper medium grained | |
| SS 8 | 11-13-11 | 265.8 | | SILTY SAND (SM); medium brown; medium dense; moist; subangular; poorly graded; very fine to lower medium grained | |
| SS 9 | 13-12-10 | 264.3 | | same as above; portions are sandy silt; micaceous | |
| SS 10 | 10-11-11 | 262.8 | 20 | SANDY LEAN CLAY (CL); medium reddish brown and grayish brown; very stiff; moist; low plasticity; sand fraction is very fine grained | |
| | | | 25 | | |
| SS 11 | 17-19-20 | 256.3 | | SILTY SAND (SM); with clay; light yellowish brown and light gray; dense; moist; subangular; poorly graded; fine to medium grained | |
| | | | 30 | | |
| SS 12 | 18-24-20 | 251.3 | | same as above; with clayey sand interbeds | Had driller pull spoon and clean out wash/cave material back down to 31 feet. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-7

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-7 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 13 | 50-34-25 | 246.3 | | same as above; portions with clay; medium brown, orangish brown, and light brownish gray; very dense | First two blow count intervals in washed/caved material. |
| SS 14 | 2-3-20 | 243.0 | 40 | same as above; with clay; medium dense; wet. | |
| | | | 45 | | |
| SS 15 | 22-21-27 | 236.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | | 50 | | |
| SS 16 | 9-11-14 | 230.8 | | SILTY SAND (SM); with clay; medium reddish brown and light gray; medium dense; moist; subangular; poorly graded; fine to upper medium grained | Dry Branch? |
| | | | 55 | | |
| SS 17 | 9-12-13 | 225.9 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| | | | 60 | | |
| SS 18 | 13-18-18 | 221.4 | | CLAYEY SAND (SC); medium brown; dense; moist; subangular; poorly graded; fine to medium grained | |
| | | | 65 | | |
| SS 19 | 103 39-50-53/3in | 216.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown to medium brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| | | | 70 | | |
| SS 20 | 2-8-8 | 211.2 | | same as above; medium yellowish brown; medium dense | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-7

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-7 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 21 | 5-10-8 | 206.0 | 80 | ELASTIC SILT WITH SAND (MH); medium yellowish brown; very stiff; moist; low plasticity; sand fraction is very fine to fine grained | Tan Clay Interval |
| SS 22 | 8-19-26 | 201.4 | 85 | CLAYEY SAND (SC); grading down to poorly graded sand with clay; medium brown with a few black Mn zones; dense; wet; subangular; poorly graded; fine to medium grained; trace coarse sand | |
| SS 23 | 40-28-18 | 196.3 | 90 | POORLY GRADED SAND WITH SILT (SP-SM); light brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 24 | 21-34-33 | 191.0 | 95 | same as above; very dense | |
| SS 25 | 3-5-4 | 186.0 | | CLAYEY SAND (SC); medium brown and grayish brown; loose; wet; angular; poorly graded; fine to lower coarse grained | |
| SS 26 | 2-3-5 | 184.5 | | same as above; medium yellowish brown, dark brown, and light grayish brown; subangular; fine to medium grained | |
| SS 27 | 2-4-4 | 183.0 | 100 | same as above; trace black charcoal fragments; medium yellowish brown; angular; fine to lower coarse grained | |
| SS 28 | 5-7-18 | 181.3 | 105 | same as above; grading to poorly graded sand with silt at bottom of interval; medium dense; subangular; fine to medium grained | |
| SS 29 | 20-35-41 | 176.3 | 110 | POORLY GRADED SAND (SP) trace silt; grading down to poorly graded sand with clay; medium brown; very dense; wet; subangular; poorly graded; fine to upper medium grained | Santee |
| SS 30 | 12-13-33 | 171.8 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brown; dense; wet; subangular; poorly graded; fine to lower coarse grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-7

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-7 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 31 | | 5-4-9 | 167.8 | | | CLAYEY SAND (SC); with a 0.05 ft shell hash layer at 115 ft and few thin sandy lean clay interbeds; dark yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | 1/23/98 water level 22, this must be bad (atrificially high reading). |
| SS 32 | | 21-43-51 | 162.3 | 120 | | SILTY SAND (SM); some layers with clay; medium yellowish brown; very dense; wet; subangular; poorly graded; very fine to fine grained | |
| SS 33 | | 14-25-35 | 157.3 | 125 | | same as above | |
| | | | | 130 | | | |
| SS 34 | | 29-50-47 | 151.3 | | | same as above; medium yellowish brown and light brown | |
| | | | | 135 | | | |
| SS 35 | | 5-13-10 | 146.3 | | | same as above; with clay; medium yellowish brown; medium dense; moist; fine to lower medium grained | |
| | | | | 140 | | | |
| SS 36 | | 6-8-9 | 141.5 | | | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; very fine to fine grained | Warley Hill |
| | | | | 145 | | | |
| SS 37 | | 13-26-21 | 136.3 | | | same as above; dense; fine to lower medium grained, trace lower coarse | |
| | | | | 150 | | | |
| SS 38 | | 25-50/3in | 131.8 | | | SILTY SAND (SM); with thin gray clay laminae; light brown to yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained | Congaree |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-7

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-7 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 127.8 | | | same as above; medium brown; angular; fine to lower coarse grained<br>Total depth of boring 156 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-7

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-8 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79344 E 54855 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/23/98 | 2/24/98 | Graves/A. Jackson | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 155.8 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 288.5 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 288.5 | | | Hand auger to 6 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 2-6-16 | 281.0 | | CLAYEY SAND (SC); medium red with orange band; medium dense; dry; subangular; poorly graded; fine to medium grained | |
| SS 2 | 13-18-23 | 279.5 | | SANDY LEAN CLAY (CL); medium red with brownish yellow mottles; hard; dry; medium plasticity; sand fraction is fine to medium grained | |
| SS 3 | 12-15-18 | 278.0 | 10 | same as above | |
| SS 4 | 3-3-9 | 276.5 | | same as above; stiff; bentonite present in tube | |
| SS 5 | 10-15-20 | 275.0 | | LEAN CLAY (CL) with sand; medium red; hard; damp; medium plasticity; sand fraction is fine to medium grained | |
| SS 6 | 7-12-15 | 273.5 | | same as above; very stiff | |
| SS 7 | 7-11-19 | 272.0 | 15 | same as above | |
| SS 8 | 4-11-15 | 270.5 | | same as above; with brownish yellow mottles and slightly more sand | |
| SS 9 | 8-10-13 | 269.0 | | SANDY LEAN CLAY (CL); medium red; very stiff; damp; medium plasticity; sand is fine to medium grained | |
| SS 10 | 7-11-15 | 267.5 | 20 | CLAYEY SAND (SC); medium red with brownish yellow mottles; medium dense; damp; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 11 | 8-10-12 | 262.5 | 25 | same as above; light brownish yellow with white wisps; trace mica | |
| SS 12 | 7-12-16 | 257.5 | 30 | same as above; with red zones | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-8

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-8 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 13 | 22-14-16 | 252.5 | | same as above; slightly less clay | |
| SS 14 | 22-30-34 | 247.5 | 40 | POORLY GRADED SAND WITH CLAY (SP-SC), clayey in places; light brownish yellow with red bands and white wisps; very dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 15 | 9-13-22 | 242.5 | 45 | same as above; medium brownish yellow with a medium yellowish brown band; with band of clayey sand; dense | |
| SS 16 | 9-11-14 | 237.5 | 50 | POORLY GRADED SAND (SP) trace clay, with clay in places; medium brown and dark brown; medium dense; wet; subrounded; poorly graded; medium grained with some lower coarse | Dry Branch |
| SS 17 | 10-15-19 | 232.5 | 55 | POORLY GRADED SAND WITH CLAY (SP-SC), with band of clayey sand; light brown with dark brown and white wisps; dense; wet; subangular; poorly graded; fine to medium grained; black Mn? pellets | |
| SS 18 | 6-14-18 | 227.5 | 60 | same as above; light brown and light red; black Mn? mottles | |
| SS 19 | 27-29-26 | 222.5 | 65 | no recovery | Catcher is good. |
| SS 20 | 6-7-7 | 217.5 | 70 | CLAYEY SAND (SC); medium brownish yellow; medium dense; wet; subangular; poorly graded; fine to medium grained; black Mn? mottles | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-8

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-8 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 21 | | 13-18-29 | 212.5 | | | LEAN CLAY WITH SAND (CL), interlaminated sand stringers; very light yellowish green with medium brown bands and medium yellowish red wisps; hard; wet; medium plasticity; sand is fine to medium grained; black Mn? wisps | Tan Clay Interval |
| SS 22 | | 9-10-20 | 207.5 | 80 | | POORLY GRADED SAND (SP) trace clay, some zones with clay; light brown with light yellowish brown zones; medium dense; wet; subangular; poorly graded; fine to medium grained; black Mn? mottles | |
| SS 23 | | 12-23-20 | 202.5 | 85 | | same as above; some zones with clay; dense | |
| SS 24 | | 24-16-24 | 197.5 | 90 | | POORLY GRADED SAND WITH CLAY (SP-SC), with sand trace clay interbeds; light brown and light yellowish brown with white wisps; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 25 | | 13-21-30 | 192.5 | 95 | | POORLY GRADED SAND (SP) trace clay; light brown with light yellow mottles; very dense; wet; subrounded; poorly graded; fine to medium grained; trace heavy minerals | |
| SS 26 | | 26-31-50 | 187.5 | 100 | | WELL GRADED SAND (SW) trace clay, with clay in places; light brown with light red mottles; very dense; wet; subangular; well graded; fine to coarse grained | |
| SS 27 | | 31-50-47 | 182.5 | 105 | | POORLY GRADED SAND (SP), trace clay; light brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 28 | | 15-50-50/4in | 177.7 | 110 | | WELL GRADED SAND WITH CLAY (SW-SC), some bands of clayey sand; light brown with white wisps; very dense; wet; subangular; well graded; fine to coarse grained; trace heavy minerals | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-8

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-8 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 29 | 13-8-12 | 172.5 | | CLAYEY SAND (SC); medium brownish yellow with very light green mottles; medium dense; wet; subangular; poorly graded; fine to medium grained | Santee |
| SS 30 | 43-49-47 | 167.5 | 120 | POORLY GRADED SAND (SP), trace clay; medium brownish yellow; very dense; wet; subangular; poorly graded; fine to lower medium grained; trace mica | |
| SS 31 | 24-31-50 | 162.5 | 125 | same as above; with a <0.1 ft layer of medium yellow lean clay | |
| SS 32 | 22-39-37 | 157.5 | 130 | same as above; with yellow bands and yellow clay pods; black Mn? pellets | |
| SS 33 | 13-12-13 | 152.5 | 135 | POORLY GRADED SAND WITH CLAY (SP-SC), clayey sand in places; medium brownish yellow; medium dense; wet; subangular; poorly graded; fine to medium grained; trace heavy minerals | |
| SS 34 | 3-4-7 | 147.5 | 140 | CLAYEY SAND (SC), some zones contain less clay; medium brownish yellow with very light brown zones; medium dense; wet; subangular; poorly graded; fine grained; trace heavy minerals | |
| SS 35 | 11-17-28 | 142.5 | 145 | FAT CLAY (CH), trace sand; very light brown with medium orange flecks; hard; wet; high plasticity; sand fraction is fine grained; trace heavy minerals | Warley Hill |
| SS 36 | 28-25-26 | 137.5 | 150 | CLAYEY SAND (SC), with light brown clean sand layer at top of interval; medium brownish yellow; very dense; wet; subangular; poorly graded; fine to medium grained; most of interval is composed of silicified chips | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-8

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-8 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 37 | | | 28-31-50/3in | 132.9 | | | same as above; very dark greenish gray; 'green clay' | |
| | | | | 132.7 | | | POORLY GRADED SAND (SP) trace clay; medium yellowish red; very dense; wet; subangular; poorly graded; fine to medium grained; overlying 'green clay' grades into this interval; the transition is darker orange than the sand and includes some light gray lean clay | Congaree |
| | | | | | | | Total depth of boring 155.8 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-8

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-9 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79185 E 54845 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/24/98 | 2/26/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 160.3 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.0 | ∇ 70.1/219.9 2/26/98 / | R. Gelinas/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| | | | 290.0 | | | | Hand auger to 6 feet to check for interferences. |
| | | | 287.5 | | | Some asphaltic fill. | |
| | | | | 5 | | | |
| SS 1 | | 6-14-15 | 282.5 | | | SILTY SAND (SM), trace clay; medium brown, reddish brown, and grayish brown; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 2 | | 9-26-26 | 281.0 | | | same as above; with clay; medium brownish red; very dense; moist | |
| SS 3 | | 14-16-16 | 279.5 | 10 | | same as above; with two thin light brown layers; dense | |
| SS 4 | | 9-11-12 | 278.0 | | | SANDY LEAN CLAY (CL); medium brownish red and some light brown; very stiff; moist; low plasticity; sand fraction is very fine to fine grained | |
| SS 5 | | 5-8-10 | 276.5 | | | same as above; wet; sand fraction is fine to medium grained | |
| SS 6 | | 7-7-8 | 275.0 | | | same as above; stiff; moist | |
| SS 7 | | 6-9-9 | 273.5 | 15 | | CLAYEY SAND (SC); medium reddish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 8 | | 5-7-8 | 272.0 | | | same as above; medium brown | |
| SS 9 | | 7-7-10 | 270.5 | | | same as above; medium brown and reddish brown | |
| SS 10 | | 1-10-12 | 269.0 | 20 | | same as above; medium brownish red, yellowish brown, and light gray | |
| SS 11 | | 9-12-15 | 263.5 | 25 | | SANDY LEAN CLAY (CL), with clayey sand interbeds; medium yellowish brown with light gray and maroon zones; very stiff; moist; medium plasticity | |
| SS 12 | | 7-9-8 | 258.2 | 30 | | CLAYEY SAND (SC), with some sandy clay interbeds; medium brownish red; medium dense; moist; subangular; poorly graded; fine to medium grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-9

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-9 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 13 | | 10-9-12 | 253.2 | | | same as above | |
| SS 14 | | 12-16-16 | 248.4 | 40 | | same as above; medium yellowish brown; dense | |
| SS 15 | | 13-15-15 | 243.5 | 45 | | same as above; medium dense | |
| SS 16 | | 13-24-37 | 238.0 | 50 | | SILTY SAND (SM); medium brown, light brown, and some red oxidiation spots; very dense; wet; angular; poorly graded; fine to lower coarse grained | Dry Branch |
| SS 17 | | 8-9-11 | 232.5 | 55 | | CLAYEY SAND (SC); medium yellowish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 18 | | 15-17-35 | 227.5 | 60 | | SILTY SAND (SM); medium brown; very dense; wet; subangular; well graded; fine to coarse grained trace fine water rounded gravel | |
| SS 19 | | 14-17-19 | 222.5 | 65 | | CLAYEY SAND (SC), with some thin clayey sand portions; light brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 20 | | 11-13-15 | 217.4 | 70 | | SILTY SAND (SM), with thin clayey sand layers; light brown to medium brown; medium dense; wet; subangular; poorly graded; fine to lower coarse grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-9

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-9 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 21 | 4-6-10 | 212.5 | 80 | LEAN CLAY (CL), with sand and highly variable sandy clay and clayey sand layers; medium yellowish gray and yellowish brown; very stiff; wet; medium plasticity; sand fraction is fine to medium grained trace coarse | Tan Clay Interval |
| SS 22 | 3-8-14 | 207.6 | 85 | CLAYEY SAND (SC), with sandy clay layers; medium yellowish gray and yellowish brown; subangular; medium dense; wet; poorly graded; fine to medium grained | |
| SS 23 | 38-50/5in | 203.1 | 90 | POORLY GRADED SAND WITH SILT (SP-SM); light brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 24 | 5-6-10 | 197.5 | 95 | CLAYEY SAND (SC), with sandy clay interbeds; medium yellowish brown; medium dense; wet; subangular; poorly graded; very fine to fine grained; with black Mn? staining | |
| SS 25 | 10-9-9 | 191.9 | 100 | same as above; medium yellowish brown and grayish brown; fine to medium grained | |
| SS 26 | 18-30-30 | 187.6 | 105 | POORLY GRADED SAND WITH SILT (SP-SM); light brown to medium brown; very dense; wet; subangular; poorly graded; fine to upper medium grained | |
| SS 27 | 18-30-30 | 182.5 | 110 | same as above | |
| SS 28 | 4-4-5 | 177.4 | | CLAYEY SAND (SC); medium yellowish brown; loose; wet; subangular; poorly graded; fine to medium grained; with black Mn? staining | Santee |
| SS 29 | 1-1-2 | 175.9 | | same as above; dark yellowish brown; very loose | Overdrill |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-9**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-9 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 30 | 4-3-8 | 173.5 | | SILTY SAND (SM), portions with clay; medium reddish brown and brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 31 | 16-16-18 | 168.5 | 120 | same as above; with a few thin gray clay laminations; medium yellowish brown; dense; very fine to fine grained | |
| SS 32 | 22-29-32 | 163.5 | 125 | POORLY GRADED SAND WITH SILT (SP-SM), with interbeds of lean clay and clayey sand; light brown, yellowish grayish brown, and light gray; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 33 | 18-27-35 | 157.9 | 130 | same as above; light brown grading to yellowish brown; very fine to medium grained | |
| SS 34 | WH/20in | 152.8 | 135 | CLAYEY SAND (SC); medium yellowish brown; very loose; wet; subangular; poorly graded; very fine to fine grained; very uniform | Overdrill on clean out. |
| SS 35 | 5-6-8 | 149.2 | 140 | same as above; light yellowish brown; medium dense; moist; trace turitella shells | |
| SS 36 | 12-13-19 | 144.2 | 145 | SANDY LEAN CLAY (CL), with clayey sand interbeds; medium brownish gray and yellowish brown; hard; wet; medium plasticity; sand fraction is very fine to fine grained | Warley Hill |
| SS 37 | 17-20-21 | 139.2 | 150 | same as above; medium yellowish brown; sand is fine grained; with silicified chips | |
| SS | 13-29-29 | | | CLAYEY SAND (SC); dark yellowish red with light green | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-9**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-9 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| 38 | | | | 134.2 | | | wispy laminae; very dense; wet; subangular; well graded; fine to coarse grained | 1/26/98 water level @ 710.1 feet. |
| ~~SS~~ 39 | | ▲ ○ | ~~50/3in~~ | 129.7 | 160 | | SILTY SAND (SM); light brown to medium brown; very dense; wet; subrounded; well graded; fine to coarse grained | Congaree<br>Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-9**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-10 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79506 E 54990 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/26/98 | 2/27/98 | Graves/A. Jackson | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 154.8 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 284.4 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 284.4 | | | Hand auger to 6 feet to check for interferences. |
| | | | 5 | | |
| SS 1 | 5-7-13 | 276.9 | | SANDY LEAN CLAY (CL); medium red with light yellow and white mottles; very stiff; dry; medium plasticity; sand is fine to medium grained | |
| SS 2 | 15-14-22 | 275.4 | | same as above; hard | |
| SS 3 | 8-13-20 | 273.9 | 10 | same as above; moist; no mottles | |
| SS 4 | 11-17-23 | 272.4 | | same as above | |
| SS 5 | 9-16-20 | 270.9 | | CLAYEY SAND (SC); medium red; dense; damp; subangular; poorly graded; fine to coarse grained | Tobacco Road |
| SS 6 | 7-14-17 | 269.4 | | same as above; fine to medium grained; fragment of typical Altamaha cobble in spoon | |
| SS 7 | 8-13-19 | 267.9 | 15 | LEAN CLAY WITH SAND (CL); medium red; hard; damp; medium plasticity; sand is fine to medium grained | |
| SS 8 | 7-12-17 | 266.4 | | SANDY LEAN CLAY (CL); medium red; very stiff; moist; medium plasticity; sand is fine to medium grained | |
| SS 9 | 6-12-16 | 264.9 | | LEAN CLAY WITH SAND (CL); medium red with light yellow and light purple mottles; very stiff; moist; medium plasticity (CL); sand is fine grained; trace mica | |
| SS 10 | 9-14-26 | 263.4 | 20 | SILT (ML), sandy in places; red, white, yellow, multicolored; hard; moist; sand fraction is fine grained; trace mica | |
| SS 11 | 10-14-20 | 258.4 | 25 | SILTY SAND (SM); light red with white mottles and occasional medium yellow bands; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 12 | 9-14-20 | 253.4 | 30 | same as above; sand is mostly fine grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-10

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-10 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 13 | 15-27-37 | 248.4 | | POORLY GRADED SAND WITH SILT (SP-SM); light red and medium orange; very dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 14 | 14-24-28 | 243.4 | 40 | POORLY GRADED SAND WITH CLAY (SP-SC), portions silty; light brownish yellow with white laminae; very dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 15 | 20-32-49 | 238.4 | 45 | same as above; light yellowish brown with light reddish purple zones; wet; subrounded | |
| SS 16 | 9-15-17 | 233.4 | 50 | CLAYEY SAND (SC); medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | Dry Branch |
| SS 17 | 16-20-30 | 228.4 | 55 | WELL GRADED SAND WITH CLAY (SW-SC); medium yellowish brown with medium reddish brown and medium brownish yellow zones; very dense; wet; subangular; well graded; fine to coarse grained | |
| SS 18 | 12-19-23 | 223.4 | 60 | POORLY GRADED SAND WITH CLAY (SP-SC), clayey in places; medium brownish yellow with white wisps and light reddish brown zones; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 19 | 10-14-19 | 218.4 | 65 | same as above; occasional coarse sand grains; black Mn? pellets | |
| SS 20 | 6-16-29 | 213.4 | 70 | same as above; with interlayered medium yellow clay and dark orange sand; black Mn? wisps; trace heavy minerals; flattened quartz pebbles at top of interval | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-10**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-10 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 21 | | 16-23-28 | 208.4 | | | LEAN CLAY (CL), trace sand; light brownish yellow with dark orange laminae; hard; moist; medium plasticity; sand is fine to coarse grained; black Mn? pellets | Tan Clay Interval |
| SS 22 | | 8-19-31 | 203.4 | 80 | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown; dense; wet; subangular; poorly graded; fine to medium grained; trace heavy minerals; top half of the interval is light yellow sandy clay | |
| SS 23 | | 15-25-39 | 198.4 | 85 | | same as above; clayey in places; medium yellowish brown; very dense; black Mn? wisps; light yellow interlaminated clay | |
| SS 24 | | 25-39-31 | 193.4 | 90 | | POORLY GRADED SAND (SP), trace clay; light brown with very light brown zones; very dense; wet; subrounded; poorly graded; fine to medium grained; black Mn? pellets; almost no clay in the top of the interval; trace heavy minerals | |
| SS 25 | | 26-23-30 | 188.4 | 95 | | same as above; with clay at the bottom of the interval; light brownish yellow; light brown at the top of the interval | |
| SS 26 | | 26-42-50 | 183.4 | 100 | | same as above; trace clay; light brown; black Mn? wisps | 1/24/98 water level @ 26.68 ft. Water level not consistant with other measurements taken in nearby borings. |
| SS 27 | | 17-24-33 | 178.4 | 105 | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown and light yellow; very dense; wet; subangular; poorly graded; fine to medium grained; black Mn? wisps; also heavy mineral stringers | |
| SS 28 | | 25-41-48 | 173.4 | 110 | | no recovery | Plastic catcher is good. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-10

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-10 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 29 | 20-31-30 | 168.4 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; very dense; wet; subangular; poorly graded; fine grained; black Mn? mottles; trace heavy minerals | Santee |
| SS 30 | 26-36-36 | 163.4 | 120 | same as above; with interlaminated very light green clay wisps | |
| SS 31 | 34-33-36 | 158.4 | 125 | same as above; color grades downward to light yellow; dark reddish brown; iron cemented sand nodule at top of interval | |
| SS 32 | 9-16-24 | 153.4 | 130 | same as above; no light yellow zones; medium dense | 1/27/98 water level @ 36.68 ft. Water level not consistant with other water level readings in the area. |
| SS 33 | 17-21-22 | 148.4 | 135 | CLAYEY SAND (SC), with clay stringers; very light brown, light yellowish brown, and orange with light green stringers; dense; wet; subangular; poorly graded; fine grained; trace heavy minerals; trace mica; silicified turritella shells | |
| SS 34 | 19-31-40 | 143.4 | 140 | same as above; with no light green clay stringers; very dense | |
| SS 35 | 7-18-36 | 138.4 | 145 | CLAYEY SAND (SC), with interbedded lean clay, trace fine to coarse sand layers; medium yellowish brown with orange zones and light brownish yellow mottles; very dense; wet; subangular; poorly graded; fine grained; trace mica; trace heavy minerals; silicified turritella shells | |
| SS 36 | 50/5in | 134.5 | 150 | SANDY FAT CLAY (CH); very dark grayish green with very light green band; hard; wet; high plasticity; sand is fine to coarse grained; 'green clay' | Warley Hill |
| | | 129.6 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-10**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-10 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 37 | | | 50/4in | | | | no recovery<br>Total depth of boring 154.8 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-10

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-11 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79317 E 54981 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/19/98 | 2/20/98 | Graves/A. Jackson | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 158.7 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 289.8 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 289.8 | | | Hand auger to 6 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 1-2-9 | 281.3 | | CLAYEY SAND (SC); dark brown; medium dense; dry; subangular; poorly graded; fine to medium grained; some cement in interval (from nearby CPT push?) | |
| SS 2 | 19-26-29 | 279.8 | | no soil recovery; cement in shoe (from nearby CPT push?); very dense | |
| SS 3 | 15-22-25 | 278.3 | 10 | CLAYEY SAND (SC); medium red with light brown mottles; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 4 | 2-4-20 | 276.8 | | same as above; medium dense; bentonite is present within the interval; actual soil recovery is less (about 0.3 feet) | |
| SS 5 | 9-13-13 | 275.3 | | same as above with no bentonite | |
| SS 6 | 11-15-16 | 273.8 | 15 | same as above; dense | |
| SS 7 | 11-16-18 | 272.3 | | same as above | |
| SS 8 | 10-13-12 | 270.8 | | same as above; slightly higher clay content; medium dense | |
| SS 9 | 6-8-10 | 269.3 | 20 | same as above; sand is fine grained | Tobacco Road? |
| SS 10 | 7-12-16 | 264.3 | 25 | SANDY LEAN CLAY (CL); medium red; very stiff; damp; medium plasticity; sand fraction is fine to coarse grained | |
| SS 11 | 4-4-5 | 259.3 | 30 | CLAYEY SAND (SC); medium red; loose; damp; subangular; poorly graded; fine to medium grained | |
| SS 12 | 4-5-6 | 257.8 | | same as above; medium dense; moist | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-11

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-11 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 13 | | 3-2-5 | 252.8 | | | same as above; loose | |
| SS 14 | | 6-15-18 | 251.3 | 40 | | same as above; medium red, medium purple, and medium yellow; dense | |
| SS 15 | | 6-9-11 | 246.3 | 45 | | same as above; some zones contain less clay; medium brownish yellow with white wisps; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 16 | | 11-16-20 | 241.3 | 50 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown with dark brown wisps; dense; wet; subrounded; poorly graded; medium grained | |
| SS 17 | | 5-11-14 | 236.3 | 55 | | CLAYEY SAND (SC); medium brownish yellow; medium dense; wet; subangular; poorly graded; fine to medium grained | Dry Branch |
| SS 18 | | 12-18-17 | 231.3 | 60 | | same as above; with medium gray zones; dense | |
| SS 19 | | 16-22-17 | 226.3 | 65 | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey in places; very light brown and very light brownish yellow with white wisps; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 20 | | 9-15-13 | 221.3 | 70 | | same as above; medium dense; trace mica | |
| SS 21 | | 3-5-5 | 216.3 | | | CLAYEY SAND (SC); some zones contain less clay; interbedded clay layer at bottom of interval; medium red grading downward to grayish red; loose; wet; subangular; poorly graded; fine to medium grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-11

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-11 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | | | | Tan Clay Interval? |
| SS 22 | 8-11-12 | 211.3 | | same as above; interbedded sandy lean clay; medium brownish yellow with white wisps and dark brown and dark gray mottles; medium dense | |
| | | | 80 | | |
| SS 23 | 10-24-22 | 206.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown with light brownish yellow zones; dense; wet; subangular; poorly graded; fine to medium grained | |
| | | | 85 | | |
| SS 24 | 27-50-50/5in | 201.4 | | POORLY GRADED SAND (SP) trace clay; light brown; very dense; wet; subrounded; poorly graded; fine to medium grained | |
| | | | 90 | | |
| SS 25 | 15-23-26 | 196.3 | | same as above; dense; trace heavies | |
| | | | 95 | | |
| SS 26 | 6-14-27 | 191.3 | | CLAYEY SAND (SC); some zones are clay with sand; medium brownish yellow with white wisps; dense; wet; subangular; poorly graded; fine to medium grained; black pellets (Mn?) | |
| | | | 100 | | |
| SS 27 | 26-50-44 | 186.3 | | POORLY GRADED SAND (SP) trace clay; some zones contain slightly more clay; light brown and brownish yellow; very dense; wet; subrounded; poorly graded; fine to medium grained | |
| | | | 105 | | |
| SS 28 | 19-37-45 | 181.3 | | same as above except no brownish yellow color | |
| | | | 110 | | |
| SS 29 | 2-2-3 | 176.3 | | FAT CLAY (CH) with interlaminated sand; clay becomes sandy in places; white and very light brown; firm; wet; high plasticity; sand is fine to coarse grained; possible weathered shell fragments; black pellets (Mn?) | Santee |
| SS 30 | 7-8-13 | 174.8 | | SANDY FAT CLAY (CH); with interlaminated sand and | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-11

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-11 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| | | | | | | clay layers; very light green with medium yellowish brown mottles; very stiff; wet; high plasticity; sand is fine to medium grained with occasional coarse grains; black pellets (Mn?) | |
| SS 31 | | 12-24-33 | 169.8 | 120 | | CLAYEY SAND (SC); very light brown and medium brownish yellow; very dense; wet; subangular; poorly graded; fine grained; black pellets (Mn?) | |
| SS 32 | | 18-34-43 | 164.8 | 125 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; very dense; wet; subangular; poorly graded; fine grained; trace heavies | |
| SS 33 | | 22-26-44 | 159.8 | 130 | | same as above with wisps of light green clay | |
| SS 34 | | 24-28-24 | 154.8 | 135 | | same as above; medium yellowish brown with light yellow mottles | |
| SS 35 | | 20-23-17 | 149.8 | 140 | | same as above; light yellowish brown with dark brown clay laminae; dense; the very top of the interval is medium orange clayey sand, which grades downward into the interval (color and clay content); turritella shell at very top of interval | |
| SS 36 | | 11-26-30 | 144.8 | 145 | | FAT CLAY (CH); sandy in places; light brownish yellow; hard; wet; high plasticity; sand fraction is fine grained; turritella shell fragments | Warley Hill |
| SS 37 | | 15-11-20 | 139.8 | 150 | | SANDY FAT CLAY (CH); medium yellowish red and brownish yellow with light green wisps; hard; damp; high plasticity; sand is fine to coarse grained | |
| SS 38 | | 28-37-40 | 134.8 | | | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; very dense; wet; subrounded; | Congaree |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-11

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-11 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | poorly graded; medium to coarse grained (congaree ?) | |
| SS 39 | | ▲ | ~~50-50/2in~~ | 131.1 | | | A small amount of clayey and sandy/gravelly material was pulled from the shoe. this material is probably sloughed | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-11**

# GEOTECHNICAL LOG

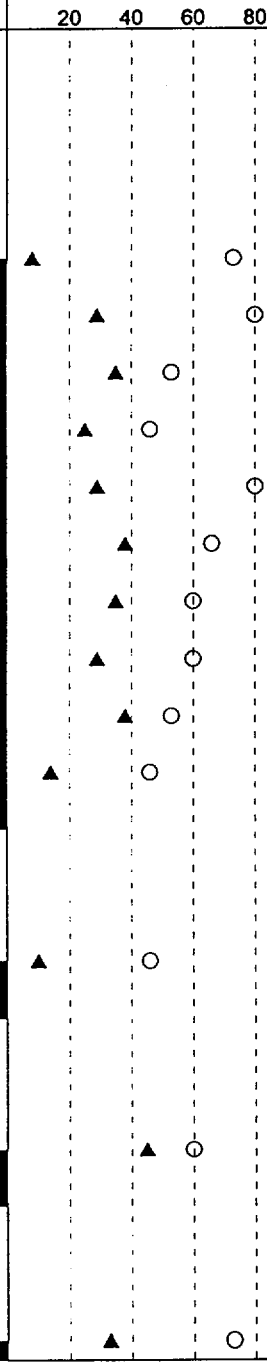
| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 5 | FB-12 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79376 E 55003 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 2/27/98 | 3/3/98 | Graves/A. Jackson | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 156.3 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 288.9 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS %




| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 288.9 | | | Hand auger to 6 feet to check for interferences. |
| | | | 5 | | |
| SS 1 | 1-2-6 | 281.4 | | CLAYEY SAND (SC); medium red; loose; moist; subangular; poorly graded; fine to medium grained | |
| SS 2 | 8-12-17 | 279.9 | | same as above; medium dense | |
| SS 3 | 8-13-22 | 278.4 | 10 | same as above; dense | |
| SS 4 | 8-12-13 | 276.9 | | same as above; medium dense; clay content increases with depth | |
| SS 5 | 7-12-17 | 275.4 | | same as above; clay content is consistent through the interval | |
| SS 6 | 8-18-20 | 273.9 | | POORLY GRADED SAND WITH CLAY (SP-SC); light red; dense; moist; subangular; poorly graded; fine to medium grained | Tobacco Road |
| SS 7 | 14-15-20 | 272.4 | 15 | same as above; fine to lower medium grained | |
| SS 8 | 12-12-17 | 270.9 | | same as above; medium dense; fine to medium grained | |
| SS 9 | 11-19-19 | 269.4 | | same as above; dense; borderline clayey sand | |
| SS 10 | 12-7-7 | 267.9 | 20 | same as above; medium dense | |
| SS 11 | 4-5-5 | 262.9 | 25 | CLAYEY SAND (SC); medium red; loose; moist; subangular; poorly graded; fine grained; occasional medium to coarse grains | |
| SS 12 | 12-18-27 | 257.9 | 30 | same as above; dense; damp; fine to medium grained with occasional coarse sand and fine gravel | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-12

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 5 | FB-12 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 13 | 10-15-18 | 252.9 | | same as above; light reddish yellow; moist; fine to lower medium grained | |
| SS 14 | 14-21-25 | 247.9 | 40 | POORLY GRADED SAND WITH CLAY (SP-SC); borderline trace clay; light reddish yellow with medium red bands; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 15 | 8-14-18 | 242.9 | 45 | CLAYEY SAND (SC); light reddish yellow with light yellowish red zones and white wisps; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 16 | 18-30-25 | 237.9 | 50 | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; very dense; moist; subrounded; poorly graded; fine to medium grained | Dry Branch |
| SS 17 | 9-14-23 | 232.9 | 55 | CLAYEY SAND (SC); medium yellow with dark yellowish brown zones; dense; moist; subangular; poorly graded; medium grained | Water level 16.92 ft. This water level reading is inconsistant with the water level measurements from other borings in the area. |
| SS 18 | 15-25-34 | 227.9 | 60 | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish red; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 19 | 25-19-21 | 222.9 | 65 | same as above; clayey in places; medium brownish yellow; dense | |
| SS 20 | 18-21-28 | 217.9 | 70 | same as above; trace heavies | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-12

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 5 | FB-12 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 21 | | 19-25-21 | 212.9 | | | CLAYEY SAND (SC); light brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained; black mottles (Mn?); flat quartz pebbles at top of interval; trace heavies | |
| SS 22 | | 3-6-10 | 207.9 | 80 | | SANDY LEAN CLAY (CL); medium brownish yellow, white, and medium orange; very stiff; wet; medium plasticity sand is fine to medium grained; trace heavies | Tan Clay Interval |
| SS 23 | | 32-35-31 | 202.9 | 85 | | No recovery | |
| SS 24 | | 9-18-18 | 197.9 | 90 | | POORLY GRADED SAND WITH CLAY (SP-SC); borderline clayey sand; light brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 25 | | 16-21-30 | 192.9 | 95 | | same as above; some areas have trace clay; light brown and light reddish brown with areas of light brownish yellow; very dense | |
| SS 26 | | 16-20-22 | 187.9 | 100 | | same as above; light brownish yellow and light yellow; dense; moist; black pellets (Mn?) | |
| SS 27 | | 28-29-41 | 182.9 | 105 | | POORLY GRADED SAND (SP) trace clay; light brown; very dense; wet; subrounded; poorly graded; fine to medium grained; trace heavies; black pellets (Mn?) | |
| SS 28 | | 18-16-17 | 177.9 | 110 | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown; dense; wet; subrounded; poorly graded; fine to medium grained with occasional coarse grains; trace heavies | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-12

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 4 OF 5 | FB-12 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 29 | | WR/16in-5/2in | 172.9 | | | CLAYEY SAND (SC); medium yellowish brown; loose; wet; subangular; poorly graded; fine grained; trace heavies | |
| SS 30 | | 38-24-36 | 171.4 | | | same as above; zone of very sticky sandy fat clay; very dense; fine to medium grained | Santee |
| | | | | 120 | | | |
| SS 31 | | 17-27-42 | 166.4 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained; trace heavies; trace mica | |
| | | | | 125 | | | |
| SS 32 | | 26-37-39 | 161.4 | | | same as above | |
| | | | | 130 | | | |
| SS 33 | | 17-12-28 | 156.4 | | | same as above with white bands; dense; fine to lower medium grained | |
| | | | | 135 | | | |
| SS 34 | | 5-7-8 | 151.4 | | | CLAYEY SAND (SC); medium reddish brown with very light brown zones; medium dense; wet; subangular; poorly graded; fine grained; black mottles (Mn?); trace heavies | |
| | | | | 140 | | | |
| SS 35 | | 4-3-7 | 146.4 | | | same as above; loose; clay content is slightly higher | |
| | | | | 145 | | | |
| SS 36 | | 12-19-30 | 141.4 | | | SANDY FAT CLAY (CH); very light green and light brownish yellow with medium orange wisps; color grades downward to dark orange; hard; wet; high plasticity; sand is fine to medium grained; trace heavies | Warley Hill |
| | | | | 150 | | | |
| SS 37 | | 11-34-50/3in | 136.6 | | | same as above; medium brownish red with light green wisps; very hard | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-12

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 5 OF 5 | FB-12 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 38 | ■ | ○ ▲ | 50/4in | 132.6 | | | no recovery<br>Total depth of boring 156.3 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-12**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 3 | FB-13 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79314 E 54981 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 3/5/98 | 3/6/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 117.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 289.7 | ▽ / ▼ / | N. Kidd/SAIC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 289.7 | | | | Hand auger to 6 feet to check for underground interferences |
| | | | | | 5 | | | |
| | | | | | 10 | | | |
| | | | | | 15 | | | |
| | | | | | 20 | | | |
| | | | | | 25 | | | |
| ST 1 | | | | 262.2 | | | SANDY LEAN CLAY (CL); borderline clay with sand; medium red; damp; medium plasticity; sand fraction is fine to medium grained | 250 psi, rest 15 min. |
| | | | | | 30 | | | |
| | | | | | 35 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-13

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 3 | FB-13 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 45 | | | |
| | | | | | 50 | | | |
| | | | | | 55 | | | |
| | | | | | 60 | | | |
| | | | | | 65 | | | |
| | | | | | 70 | | | |
| | | | | | 75 | | | |
| ST 2 | | | ○ | 212.7 | | | POORLY GRADED SAND WITH CLAY (SP-SC); medium reddish brown with light yellow, purple, and white clay stringers; wet; subangular; poorly graded; fine to medium grained | 200 psi, rest 15 min. |
| | | | | 211.7 | | | LEAN CLAY WITH SAND (CL); sandy in places; black, light tan, white, and brown; wet; medium plasticity; sand fraction is fine grained; trace heavies | |
| | | | | | 80 | | | |
| | | | | | 85 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-13

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 3 | FB-13 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 90 | | | |
| | | | | | 95 | | | |
| | | | | | 100 | | | |
| | | | | | 105 | | | |
| | | | | | 110 | | | |
| | | | | | 115 | | | |
| ST 3 | | ○ | | 173.2 | | | CLAYEY SAND (SC); (may be sloughed material); medium brown with white wisps; wet; subangular; poorly graded; fine to medium grained | 900 psi, rest, 10 min. |
| | | | | 172.2 | | | SANDY LEAN CLAY (CL); light greenish yellow; wet; medium plasticity; sand fraction is fine grained | Hole abandoned with grout mix per 3Q5. |
| | | | | | | | Total depth of boring 117.5 feet. | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-13**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 1 | FB-14 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79437 E 54990 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 3/6/98 | 3/6/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 80.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 287.2 | ▽ / ▼ / | N. Kidd/SAIC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 287.2 | | | | |
| | | | | | 5, 10, 15 | | | |
| ST 1 | | | | 267.2 | 20 | | SANDY LEAN CLAY (CL); medium red; damp; low plasticity; sand fraction is fine to medium grained | 700 psi, rest 15 min. |
| | | | | | 25, 30, 35, 40, 45, 50, 55, 60, 65, 70 | | | |
| ST 2 | | | | 214.2 / 213.2 | 75 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium red; wet; subangular; poorly graded; medium grained; could be washed out material | 300 psi, rest 15 min. |
| ST 3 | | | | 208.2 / 207.2 | 80 | | same as above; some zones are clayey; medium brownish yellow; fine to medium grained<br>SANDY LEAN CLAY (CL); with interbedded light yellow clay; medium red, white, and medium brownish yellow; wet; medium plasticity; sand fraction is coarse grained<br>CLAYEY SAND (SC); medium brownish yellow; wet; subangular; poorly graded; fine to medium grained; trace mica; trace heavies<br>Total depth of boring 80 feet | 300 psi, rest 15 min.<br>Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-14

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 3 | FB-15 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79179 E 55034 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 3/6/98 | 3/9/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 115.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 291.7 | ▽ / ▼ / | N. Kidd/SAIC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 291.7 | | | | |
| | | | | | 5 | | | |
| | | | | | 10 | | | |
| | | | | | 15 | | | |
| | | | | | 20 | | | |
| ST 1 | | | | 266.2 | 25 | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey in places; medium red; moist; subangular; poorly graded; medium to coarse grained; may be washed out material | 400 psi, rest 15 min. |
| | | | | 265.2 | | | SILT (ML); dark red, very light red, and white with very light purple wisps of clay; moist; low plasticity | |
| | | | | | 30 | | | |
| | | | | | 35 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-15

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 3 | FB-15 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 45 | | | |
| | | | | | 50 | | | |
| | | | | | 55 | | | |
| | | | | | 60 | | | |
| | | | | | 65 | | | |
| | | | | | 70 | | | |
| | | | | | 75 | | | |
| ST 2 | | ○ | | | | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; wet; subangular; poorly graded; fine to coarse grained; sample was falling out of tube when withdrawn from the hole | 500 psi, rest 15 min. |
| ST 3 | | | ○ | 211.7 | 80 | | CLAYEY SAND (SC); medium brownish yellow; wet; subangular; poorly graded; fine to medium grained with occasional coarse grains | 500 psi, rest 15 min. |
| | | | | 210.7 | | | LEAN CLAY (CL); interlaminated sands; light brownish yellow with medium brownish yellow zones and black wisps; wet; medium plasticity; sand is fine to medium grained; black wisps (Mn?) | |
| | | | | 209.7 | 85 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-15

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 3 | FB-15 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 90 | | | |
| | | | | | 95 | | | |
| ST 4 | | ○ | | 190.7 | 100 | | CLAYEY SAND (SC); some zones are sand with clay; light brown with white and very light yellow mottles; wet; subangular; poorly graded; fine to medium grained; black mottles (Mn?) | 350 psi, rest 15 min. |
| | | | | | 105 | | | |
| | | | | | 110 | | | |
| ST 5 | | ○ | | 176.7 | 115 | | same as above; zones of sandy clay; medium reddish brown with light gray and white zones | 700 psi, rest 15 min. Tube is crushed at th bottom. |
| | | | | | | | Total depth of boring 115 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-15**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 3 | FB-16 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79212 E 54889 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 3/9/98 | 3/11/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 120.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.1 | ▽ / ▼ / | N. Kidd/SAIC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 290.1 | | | | Hand auger to 6 feet to check for underground interferences. |
| | | | | | 5 | | | |
| | | | | | 10 | | | |
| ST 1 | | | ○ | 274.1 | 15 | | CLAYEY SAND (SC); medium red; damp; subangular; poorly graded; fine grained | 500 psi, 15 min. |
| | | | | 273.1 | | | same as above; medium brownish yellow; fine to medium grained; trace heavies | |
| | | | | | 20 | | | |
| | | | | | 25 | | | |
| | | | | | 30 | | | |
| | | | | | 35 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-16

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 2 OF 3 | FB-16 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 45 | | | |
| | | | | | 50 | | | |
| | | | | | 55 | | | |
| | | | | | 60 | | | Lost 800 gallons of water. See * |
| | | | | | 65 | | | |
| | | | | | 70 | | | |
| | | | | | 75 | | | |
| | | | | | 80 | | | |
| ST 2 | | | | | 85 | | LEAN CLAY WITH SAND (CL); sandy in places; interbedded sand stringers; medium brownish yellow, | 350 psi, rest 15 min. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-16**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 3 OF 3 | FB-16 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | 204.1 | | | white, and light red; wet; medium plasticity; sand is fine to medium grained; this zone is highly variable with respect to sand content | |
| | | | | | 90 | | | |
| | | | | | 95 | | | |
| ST 3 | | | ○ | 191.1 | | | CLAYEY SAND (SC); medium brownish yellow with light yellow and white zones; wet; subangular; poorly graded; fine to medium grained; black wisps (Mn?) | 250 psi, rest 15 min. |
| | | | | | 100 | | | |
| | | | | | 105 | | | |
| | | | | | 110 | | | |
| | | | | | 115 | | | Lost circulation at 118 ft., culd not recover. Lost over 1000 gallones of water. |
| | | | | | 120 | | Total depth of boring 120 feet, | * After loss of circulation two buckets of bentonite pellets were placed in the hole and allowed to hydrate for approximately 1 hour. Tried to resume drilling and after 60 feet, rods got stuck in the hole. The hole took an additional 800 gallons of water. Hole finally abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-16**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| APSF | APSF | 1 OF 1 | FB-16A |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF | N 79207 E 54890 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 3/11/98 | 3/12/98 | Graves/S. Rodgers | Failing 1500 | 3 7/8 in | 140 lb/ 30 in | 116.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.1 | ∇ / ▼ / | N. Kidd/SAIC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) O RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET (290.1) | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115 | | | Hand auger to 6 feet to check for undergroune interferences. Advance hole with mude rotary method to resume sampling at 118 ft, because of lost circulation at that depth in hole FB-16. |
| | | | | | | | Total depth of boring 116 feet. | Lost circulaion at 116 feet. Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-16A**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 4 | FB-17 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79244 E 55520 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/13/98 | 4/20/98 | B. Cunningham/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 145.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 283.1 | ∇ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 283.1 | | | Hand auger to 7 feet to check for underground interferences. |
| SS 1 | 3-4-4 | 274.6 | 5 | POORLY GRADED SAND (SP) trace clay; light brown; loose; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 2 | 3-5-9 | 273.1 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown with medium yellowish red mottles; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 3 | 9-9-15 | 271.6 | 10 | CLAYEY SAND (SC); light red with yellowish red, brownish yellow, and gray zones; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 4 | 7-14-13 | 270.1 | | same as above; medium red with light yellow and white mottles | |
| SS 5 | 10-15-22 | 268.6 | | LEAN CLAY WITH SAND (CL); light brownish red, brownish yellow, and gray; hard; damp; medium plasticity; sand is fine to medium grained | |
| SS 6 | 9-14-19 | 267.1 | 15 | SANDY LEAN CLAY (CL) with clayey sand zones; medium brownish yellow with medium red zones; hard; damp; medium plasticity; sand is fine to medium grained | |
| SS 7 | 12-15-21 | 265.6 | | CLAYEY SAND (SC); light brownish yellow with white wisps and medium red zones; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 8 | 10-14-16 | 264.1 | | same as above; light red with white flecks and medium yellowish brown zones; medium dense; fine to lower medium grained; trace mica | |
| SS 9 | 10-12-17 | 262.6 | 20 | same as above; light red; no mica observed | |
| SS 10 | 10-13-17 | 261.1 | | SILTY SAND (SM) some areas are clayey; medium red with brownish yellow, brown, and white bands; medium dense; damp; subangular; poorly graded; fine to lower medium grained | |
| SS 11 | 9-14-16 | 259.6 | | CLAYEY SAND (SC); medium red; medium dense; damp; subangular; poorly graded; fine to lower medium grained | |
| SS 12 | 10-12-15 | 258.1 | | same as above; silty in places; medium red with white and brownish yellow zones | |
| SS 13 | 11-13-16 | 256.6 | 25 | same as above; light yellowish brown with light red zones; fine to medium grained | |
| SS 14 | 13-15-17 | 255.1 | | same as above; with white wisps; dense | |
| SS 15 | 12-19-22 | 253.6 | | POORLY GRADED SAND WITH CLAY (SP-SC); some areas trace clay; light brownish yellow with light red and light brown zones; dense; wet; subangular; poorly graded; medium grained | |
| SS 16 | 17-24-29 | 252.1 | 30 | POORLY GRADED SAND (SP) trace clay; some areas with clay; light red with light reddish brown zones and dark yellowish brown wisps; very dense; damp; subangular; poorly graded; medium grained | |
| SS 17 | 20-31-21 | 250.6 | | same as above; light red with very light orange and white zones | |
| SS 18 | 12-17-19 | 249.1 | | CLAYEY SAND (SC) some zones are less clayey; light reddish yellow with light red zones and white pellets; dense; damp; subangular; poorly graded; fine to medium | |
| SS | 15-20-21 | | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-17

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 4 | FB-17 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|
| 19 | | 247.6 | | grained |
| SS 20 | 14-25-29 | | | same as above; medium yellowish brown with light yellowish brown zones and white wispy striations; moist |
| | | 246.1 | | POORLY GRADED SAND WITH CLAY (SP-SC) some areas trace clay; medium brownish yellow with dark brown pods; very dense; damp; subangular; poorly graded; medium grained |
| SS 21 | 18-23-28 | | | |
| | | 244.6 | | same as above; clayey in places; medium yellowish brown; moist |
| SS 22 | 19-22-25 | | | |
| | | 243.1 | 40 | same as above; dense; wet |
| SS 23 | 15-27-36 | | | same as above; clayey in places; very dense; moist |
| | | 241.6 | | |
| SS 24 | 19-20-25 | | | same as above; borderline clayey sand; dense |
| | | 240.1 | | |
| SS 25 | 14-14-20 | | | CLAYEY SAND (SC); medium brownish red with dark yellowish brown zones and wispy white striations; dense; moist; subangular; poorly graded; fine to medium grained |
| | | 238.6 | 45 | |
| SS 26 | 14-18-16 | | | same as above; medium red |
| | | 237.1 | | |
| SS 27 | 11-20-26 | | | POORLY GRADED SAND WITH CLAY (SP-SC) some areas clayey; medium reddish brown; very dense; damp; subangular; poorly graded; fine to medium grained |
| | | 235.6 | | |
| SS 28 | 22-26-27 | | | same as above; light reddish brown with white zones; moist; poorly graded |
| | | 234.1 | | |
| SS 29 | 21-24-31 | | | same as above |
| | | 232.6 | 50 | |
| SS 30 | 23-27-28 | | | POORLY GRADED SAND (SP) trace clay; some areas with clay; light brown with light brownish yellow and white mottles; very dense; damp; subangular; poorly graded; fine to medium grained |
| | | 231.1 | | |
| SS 31 | 20-24-29 | | | same as above; light brownish yellow |
| | | 229.6 | | |
| SS 32 | 18-21-25 | | | same as above; some zones with clay; dense |
| | | 228.1 | 55 | |
| SS 33 | 12-21-19 | | | POORLY GRADED SAND WITH CLAY (SP-SC) some areas trace clay; medium reddish yellow; dense; moist; subangular; poorly graded; fine to medium grained |
| | | 226.6 | | |
| SS 34 | 7-18-15 | | | same as above; light brownish yellow; trace heavies |
| | | 225.1 | | |
| SS 35 | 14-17-22 | | | same as above; some zones clayey; medium yellowish brown; fine to lower coarse grained |
| | | 223.6 | | |
| SS 36 | 18-27-34 | | 60 | same as above; very dense |
| | | 222.1 | | |
| SS 37 | 21-19-25 | | | same as above; dense |
| | | 220.6 | | |
| SS 38 | 19-22-26 | | | same as above; medium brownish yellow; fine to medium grained; trace lower coarse |
| | | 219.1 | | |
| SS 39 | 14-17-21 | | | same as above; light brown |
| | | 217.6 | 65 | |
| SS 40 | 15-16-15 | | | same as above; some zones are clayey sand; medium brownish yellow |
| | | 216.1 | | |
| SS 41 | 4-4-6 | | | SANDY LEAN CLAY (CL) with interlaminated sand and lean clay; lt brownish yellow with med reddish brown zones; stiff; wet; med plasticity; sand is fine to med grained; black staining (Mn?); trace heavies; flattened quartz pebbles |
| | | 214.6 | | |
| SS 42 | 3-4-6 | | | |
| | | 213.1 | 70 | SANDY FAT CLAY (CH) some zones are lean clay; interlaminated cse sand; med yellowish brown with med reddish brown and white zones; stiff; wet; high plasticity; sand is fine to med grained with some cse sand; black staining (Mn?); trace heavies |
| SS 43 | 4-4-6 | | | |
| | | 211.6 | | |
| SS 44 | 5-8-9 | | | CLAYEY SAND (SC) with lean clay pods; med yellowish brown with lt brownish yellow zones; loose; wet; subangular; poorly graded; fine to lwr med grained; trace heavies; black staining (Mn?) |
| | | 210.1 | | |
| SS 45 | 6-5-6 | | | |
| | | 208.6 | | same as above; interbedded lt brownish yellow lean clay |

NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-17**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 4 | FB-17 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 46 | 5-7-9 | 207.1 | | and med brownish yellow sand; med brownish yellow with v lt yellow and dk reddish brown laminae; med dense; fine to med grained; clay content varies widely | |
| SS 47 | 8-14-23 | 205.6 | | same as above; with lt brownish yellow lean clay laminae; med reddish yellow with dk brown zones; moist; heavy black staining (Mn?) | |
| SS 48 | 12-14-15 | 204.1 | | LEAN CLAY (CL); lt brownish yellow with dk reddish brown and black fracture coatings (Mn?); v stiff; wet; med plasticity; sand is fine grained and sparse | |
| SS 49 | 8-14-16 | 202.6 | 80 | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; lt brownish yellow clay at top of sample; med yellowish brown with v lt yellow zones; dense; wet; subangular; poorly graded; fine to med grained; black pellets (Mn?); trace heavies | |
| SS 50 | 10-18-25 | 201.1 | | same as above; med dense | |
| SS 51 | 14-20-20 | 199.6 | | same as above; lt yellowish brown | |
| SS 52 | 12-18-17 | 198.1 | 85 | same as above; dense | |
| SS 53 | 14-22-21 | 196.6 | | POORLY GRADED SAND WITH SILT (SP-SM) with v lt yellow clay wisps; lt yellowish brown; dense; wet; subangular; poorly graded; fine to med grained; abundant black (Mn?) and dk brown staining | |
| SS 54 | 13-16-21 | 195.1 | | same as above with white streaks | |
| SS 55 | 17-16-27 | 193.6 | | same as above with some clayey zones | |
| SS 56 | 13-20-18 | 192.1 | 90 | same as above | |
| SS 57 | 10-10-7 | 190.6 | | CLAYEY SAND (SC); lt reddish brown; dense; wet; subangular; well graded; fine to lwr cse grained; black zone within interval is Mn? | |
| SS 58 | 4-6-13 | 189.1 | | same as above; some zones are sand with clay; lt brown with white zones; Mn? staining | |
| SS 59 | 13-20-21 | 187.6 | 95 | same as above; interbedded white clayey sands; lt reddish brown with white zones; med dense; poorly graded; fine to med grained | |
| SS 60 | 16-23-22 | 186.1 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey sand; lt reddish brown with white zones; med dense; wet; subangular; poorly graded; fine to med grained; trace lwr cse | |
| SS 61 | 9-10-15 | 184.6 | | same as above; some zones are sandy clay; lt brown with v lt yellow zones; dense; Mn? staining | |
| SS 62 | 12-13-16 | 183.1 | 100 | POORLY GRADED SAND (SP) trace clay; lt brown; dense; wet; subrounded; poorly graded; med to cse grained; trace heavies | |
| SS 63 | 1/2 in-1/15 in-1/1 in | 181.6 | | WELL GRADED SAND WITH CLAY (SW-SC) bottom of interval is sand trace clay; lt brown with white zones; med dense; wet; subrounded; well graded; trace heavies; fine to coarse grained | Possible location of a soft zone @ 100 ft. Losing drilling fluid. |
| SS 64 | 1/10 in-1/2 in-4 | 180.1 | | same as above; med brown and lt brown with dk reddish brown mottles; subangular; fine to cse grained; black pellets (Mn?) | |
| SS 65 | 3-3-2 | 178.6 | | CLAYEY SAND (SC) clay content varies; med brown with lt brown and white zones and dk brown wisps; v loose; wet; subangular; poorly graded; fine to med grained; black stains (Mn?) | |
| | | | 105 | same as above; few interlaminated lt yellowish brown clay wisps; lt reddish brown with lt brown and white zones; loose; trace heavies | |
| SS 66 | 1/21 in | 175.4 | | same as above; med reddish brown with v lt green clay laminae; fine grained | Overdrilled |
| SS 67 | 7-6-8 | 173.6 | | same as above; with silty zones; white, v lt green, and lt brown; v loose; v fine to lwr med grained; weathered shell fragments?; silicified zone at top of interval; trace heavies | |
| SS 68 | 5-9-9 | 172.1 | 110 | same as above; interlayered with sand with clay; white and lt brown with v lt green zone at top of interval; med dense; fine to med grained; pelecypod fragments | |
| SS 69 | 19-36-32 | 170.6 | | WELL GRADED SAND WITH CLAY (SW-SC) bands of clayey sand; lt brown and lt yellow with white clayey sand bands; med dense; wet; subangular; well graded; fine to lwr cse grained; trace heavies; pelecypod fragment | |
| SS 70 | 15-26-24 | 169.1 | | POORLY GRADED SAND (SP) trace clay; lt brown with v lt brown and v lt green zones; v dense; wet; subangular; poorly graded; fine to med grained; abundant heavies; shell fragments; calcareous nodules | |
| SS | 9-14-13 | | | SILTY SAND (SM); lt yellowish brown with white clayey zones; dense; wet; subangular; poorly graded; fine grained; | Circulation good but |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-17**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 4 | FB-17 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 167.6 | | calcareous nodules; pelecypod fragments | |
| 71 SS 72 | 3/26 in | | | POORLY GRADED SAND WITH SILT (SP-SM); lt brown and lt yellowish brown; med dense; wet; subangular; poorly graded; fine grained; trace heavies | continuing to lose drilling fluid. Rod drop @ 115.5-117.67 ft. |
| | | 165.4 | | same as above; lt brown; v loose; v fine grained; dk purple mottle | |
| SS 73 | 8-14-24 | | | SILTY SAND (SM); v lt yellowish brown with orange mottles and lt green zones; dense; wet; subangular; poorly graded; v fine grained; trace heavies | Lost over 1000 gallons of water from 116.67-122 ft. |
| | | 163.6 | | | |
| SS 74 | 10-27-35 | | 120 | same as above; borderline sand with silt; v lt greenish brown and v lt brown; some zones have lt orange mottles; v dense | |
| | | 162.1 | | | |
| SS 75 | 12-20-30 | | | same as above; v lt brown to lt brown; dense | |
| | | 160.6 | | | |
| SS 76 | 13-28-36 | | | POORLY GRADED SAND (SP) trace silt; v lt brown with white zones; v dense; wet; subangular; poorly graded; v fine grained; trace heavies | |
| | | 159.1 | | | |
| SS 77 | 15-30-32 | | | same as above | Lost 1000 gallons of fluid betewwn 124 and 134.5 feet. |
| | | 157.6 | 125 | | |
| SS 78 | 8-5-4 | | | SILTY SAND (SM); lt greenish brown; med dense; wet; subangular; poorly graded; v fine grained; trace heavies | |
| | | 156.1 | | | |
| SS 79 | 1/9 in-1/3 in-5 | | | same as above; with white clay wisps; loose; fine grained | |
| | | 154.6 | | | |
| SS 80 | WR/12 in-7 | | | CLAYEY SAND (SC) some zones are silty; lt greenish brown with v lt gray zones; loose; wet; subangular; poorly graded; v fine grained | |
| | | 153.1 | 130 | | |
| SS 81 | WR/12 in-WH/3 in-5/3 in | | | same as above | |
| | | 151.6 | | | |
| SS 82 | WR/6 in-4-8 | | | same as above; lt yellowish brown with lt orange mottles; med dense; silicified turritella shells; trace heavies | |
| | | 150.1 | | | |
| SS 83 | 3-5-7 | | | same as above; lt brown with lt orange mottles | |
| | | 148.6 | | | |
| SS 84 | 4-8-9 | | 135 | same as above | Continuing to lose fluid. |
| | | 147.1 | | | |
| SS 85 | 8-14-25 | | | POORLY GRADED SAND WITH SILT (SP-SM) some zones are same as above; lt greenish brown; dense; wet; subangular; poorly graded; fine grained; silicified turritella shells; trace heavies | |
| | | 145.6 | | | |
| SS 86 | 5-12-38 | | | CLAYEY SAND (SC) with wispy lt greenish gray clay; lt grayish brown with lt orange mottles; dense; wet; subangular; poorly graded; fine to med grained; silicified chips and shells | |
| | | 144.1 | | | |
| SS 87 | 5-7-8 | | 140 | | |
| | | 142.6 | | | |
| SS 88 | WR/3 in 2/3 in-8-18 | | | same as above; some zones silty; lt greenish brown; med dense; v fine grained; silicified nodules and pelecypod shells; trace heavies; trace mica | |
| | | 141.1 | | | |
| SS 89 | 4-13-12 | | | same as above; sandy clay in places; white and dk brownish red; dense; fine to med grained; clay content varies, some material calcareous mud?; shell fragments | |
| | | 139.6 | | | |
| SS 90 | 9-12-16 | | | same as above; with interlaminated lt green clays; med green and dk reddish orange with white pellets and lt green clay laminae and dk green at tip of interval; med dense | |
| | | 138.1 | 145 | same as above; intermixed with lean clay; dk greenish gray; fine grained; abundant mica; 'green clay' | |
| | | | | Total depth of boring 145 feet. | Hole caved in over weekend 4/18,19. Had to be cleaned out before grouting. |
| | | | | | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-17**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 5 | FB-18 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79331 E 55131 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/20/98 | 4/27/98 | B Cunningham/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 159.3 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 290.1 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 290.1 | | | Hand auger to 7 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 5-7-11 | 281.6 | | POORLY GRADED SAND (SP) trace clay; light reddish brown; medium dense; damp; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 2 | 6-13-20 | 280.1 | | same as above; light yellowish red with light brown zones; dense | |
| SS 3 | 11-19-23 | 278.6 | 10 | CLAYEY SAND (SC); medium red; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 4 | 12-14-17 | 277.1 | | same as above; wet | |
| SS 5 | 12-14-23 | 275.6 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium reddish brown; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 6 | 12-13-16 | 274.1 | 15 | CLAYEY SAND (SC); medium red; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 7 | 10-12-10 | 272.6 | | same as above; trace mica | |
| SS 8 | 5-6-7 | 271.1 | | SILTY SAND (SM); medium red with light brown wisps; medium dense; moist; subangular; poorly graded; fine grained; trace mica; trace heavies | |
| SS 9 | 4-7-8 | 269.6 | 20 | CLAYEY SAND (SC); medium reddish brown; medium dense; moist; subangular; poorly graded; fine to medium grained with lower coarse grains | |
| SS 10 | 6-8-8 | 268.1 | | SANDY LEAN CLAY (CL); medium reddish brown; very stiff; moist; medium plasticity; sand is fine to coarse grained | |
| SS 11 | 7-10-9 | 266.6 | | CLAYEY SAND (SC); medium red; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 12 | 6-6-7 | 265.1 | | same as above; trace coarse grains | |
| SS 13 | 5-6-6 | 263.6 | 25 | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown with dark red mottles; medium dense; moist; subangular; poorly graded; fine to lower medium grained; trace mica | |
| SS 14 | 3-4-5 | 262.1 | | CLAYEY SAND (SC); medium yellowish brown; loose; wet; subangular; poorly graded; fine to lower medium grained; trace mica | |
| SS 15 | 4-5-8 | 260.6 | | same as above; medium brown; medium dense; moist; fine to medium grained | |
| SS 16 | 6-9-9 | 259.1 | 30 | SANDY LEAN CLAY (CL); medium reddish brown; very stiff; moist; low plasticity; sand is fine to lower coarse grained | |
| SS 17 | 6-9-16 | 257.6 | | CLAYEY SAND (SC); medium reddish brown; medium dense; moist; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 18 | 12-16-15 | 256.1 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light brownish yellow with light red bands and white wisps; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS | 12-14-15 | | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-18

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 5 | FB-18 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 19 SS 20 | 8-14-14 | 254.6 | | CLAYEY SAND (SC); light yellowish brown with medium red bands; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 21 | 10-15-15 | 253.1 | | same as above; light brownish yellow with light red bands and white wisps; trace heavies | |
| SS 22 | 11-19-20 | 251.6 | | same as above; some zones are sand with clay; light brownish yellow with light orange bands; trace mica | |
| SS 23 | 17-24-29 | 250.1 | 40 | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light yellowish brown with light red zones and white wisps; dense; moist; subangular; poorly graded; fine to medium grained; some zones are wet | |
| SS 24 | 17-30-27 | 248.6 | | same as above; light red and light brownish yellow with white wisps; very dense | |
| SS 25 | 20-17-24 | 247.1 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; medium red with light brownish yellow zones and white wisps; very dense; wet; subangular; poorly graded; fine to medium grained; trace coarse grains | |
| SS 26 | 22-22-31 | 245.6 | | same as above; dense | |
| SS 27 | 13-22-23 | 244.1 | 45 | POORLY GRADED SAND WITH CLAY (SP-SC); light brownish yellow and light red with white spots; very dense; moist; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 28 | 14-14-20 | 242.6 | | same as above; dense | |
| SS 29 | 16-18-18 | 241.1 | | CLAYEY SAND (SC) borderline sand with clay; light red and light brownish yellow; dense; moist; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 30 | 10-13-20 | 239.6 | 50 | POORLY GRADED SAND (SP) trace clay; upper part of the interval is sand with clay (as above); medium brown with light red and light brownish yellow zones and white wisps; dense; wet; subrounded; poorly graded; fine to medium grained; trace mica; trace heavies | |
| SS 31 | 20-26-30 | 238.1 | | CLAYEY SAND (SC); light brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 32 | 17-14-16 | 236.6 | | POORLY GRADED SAND (SP) trace clay; medium brown; very dense; wet; subrounded; poorly graded; medium to lower coarse grained | |
| SS 33 | 11-13-15 | 235.1 | 55 | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown with light red zones; medium dense; wet; subrounded; poorly graded; medium to lower coarse grained; trace heavies | |
| SS 34 | 10-9-12 | 233.6 | | CLAYEY SAND (SC); medium red; medium dense; wet; subangular; poorly graded; fine to medium grained; black spots | |
| SS 35 | 12-16-22 | 232.1 | | same as above; medium yellowish brown with dark brown zones and white wisps; trace heavies | |
| SS 36 | 14-19-25 | 230.6 | 60 | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; dense; moist; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 37 | 16-20-22 | 229.1 | | same as above | |
| SS 38 | 16-17-19 | 227.6 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; light brown; dense; wet; subrounded; poorly graded; fine to lower coarse grained | |
| SS 39 | 14-15-22 | 226.1 | | same as above; medium yellowish brown with medium brown bands; moist; subangular; fine to medium grained; trace coarse grains; trace heavies | |
| SS 40 | 20-22-27 | 224.6 | 65 | same as above; wet | |
| SS 41 | 16-14-18 | 223.1 | | same as above | |
| SS 42 | 12-13-18 | 221.6 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained; trace coarse; trace heavies | |
| SS 43 | 16-19-23 | 220.1 | 70 | same as above; light brownish yellow; moist; black mottles (Mn?) | |
| SS 44 | 16-16-21 | 218.6 | | same as above; some zones trace clay; wet | |
| SS 45 | 12-10-13 | 217.1 | | POORLY GRADED SAND (SP) some zones with clay; medium brown with white wisps; dense; wet; subangular; poorly graded; fine to medium grained; trace coarse; trace heavies | |
| | | 215.6 | | WELL GRADED SAND WITH CLAY (SW-SC) clay content varies widely from trace clay to clayey in places; | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-18**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 5 | FB-18 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 46 | 7-9-11 | 214.1 | | medium brown with white and very light yellow zones; medium dense; wet; subangular; well graded; fine to coarse grained; black mottles (Mn?); trace heavies | |
| SS 47 | 7-8-9 | 212.6 | | same as above; trace clay in places; med brown; subrounded | |
| SS 48 | 7-9-10 | 211.1 | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey sand at base of interval; med brownish yellow with lt tan clay balls; med dense; wet; subangular; poorly graded; fine to med grained; trace cse | |
| SS 49 | 10-12-15 | 209.6 | 80 | LEAN CLAY (CL) trace sand; lt brownish yellow with dk orange wisps; v stiff; wet; med plasticity; sand is fine grained; black zones (lignite?); zones of med orange fine sand | |
| SS 50 | WH/6 in-10-17 | 208.1 | | LEAN CLAY WITH SAND (CL) sandy lean clay in places; med brown with white clay laminae; v stiff; wet; med plasticity; sand is fine to cse grained | |
| SS 51 | 10-13-12 | 206.6 | | CLAYEY SAND (SC); med yellowish brown with lt yellow and white streaks; med dense; wet; subangular; well graded; fine to cse grained | |
| SS 52 | 8-8-9 | 205.1 | 85 | POORLY GRADED SAND WITH CLAY (SP-SC) some clayey zones; lt brownish yellow; med dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 53 | 10-16-24 | 203.6 | | same as above; med yellowish brown with white clayey sand wisps | |
| SS 54 | 13-20-22 | 202.1 | | same as above; some clayey zones; lt brown with lt brownish yellow bands; dense | |
| SS 55 | 11-10-10 | 200.6 | | POORLY GRADED SAND (SP) trace clay; lt brown with lt brownish yellow wisps; dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 56 | 8-6-7 | 199.1 | 90 | POORLY GRADED SAND WITH CLAY (SP-SC) some clayey zones; lt brown; med dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 57 | 6-10-17 | 197.6 | | CLAYEY SAND (SC) interlayered sand with clay; lt brownish yellow; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 58 | 11-13-15 | 196.1 | | same as above; lt brownish yellow and lt brown with white and lt yellow wisps; trace heavies | |
| SS 59 | 6-8-6 | 194.6 | 95 | same as above; with interlaminated clay; med brown and lt brownish yellow with lt tan clay wisps | |
| SS 60 | 5-5-14 | 193.1 | | POORLY GRADED SAND WITH CLAY (SP-SC) some clayey zones; lt brownish yellow; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 61 | 10-12-14 | 191.6 | | CLAYEY SAND (SC); lt brown and lt yellowish brown with reddish brown zones; med dense; wet; subangular; poorly graded; fine to med grained; black wisps (Mn?) | |
| SS 62 | 6-9-11 | 190.1 | 100 | POORLY GRADED SAND WITH CLAY (SP-SC); with a clayey zone; lt brown with a lt reddish brown zone; med dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 63 | 6-7-13 | 188.6 | | CLAYEY SAND (SC); some sand with clay zones; lt brown with lt brownish yellow zones; med dense; wet; subangular; poorly graded; fine to med grained; trace heavies | |
| SS 64 | 10-15-17 | 187.1 | | same as above; med yellowish brown with v lt yellow zones; black pellets (Mn?) | |
| SS 65 | 18-30-34 | 185.6 | | POORLY GRADED SAND WITH CLAY (SP-SC) some clayey zones; lt brown and lt yellowish brown; dense; wet; subangular; poorly graded; fine to med grained; trace cse | |
| SS 66 | 18-29-42 | 184.1 | 105 | POORLY GRADED SAND (SP) trace clay; lt brown; v dense; wet; rounded; poorly graded; fine to med grained; trace heavies | |
| SS 67 | 19-23-34 | 182.6 | | same as above with few lt orange clay pods; subrounded; abundant black staining (Mn?) | |
| SS 68 | 10-22-26 | 181.1 | | same as above with some med brown zones; some zones with clay; subangular | |
| SS 69 | 16-21-29 | 179.6 | 110 | same as above; dense; subrounded; abundant heavies | |
| SS 70 | 15-25-26 | 178.1 | | same as above; with lt orange clay pods; v dense; subangular; trace heavies | |
| SS 71 | 11-18-19 | 176.6 | | same as above | |
| SS 72 | 8-11-15 | 175.1 | | POORLY GRADED SAND WITH CLAY (SP-SC); clayey sand at base of sample; lt brown and lt brownish yellow; dense; wet; subangular; poorly graded; fine to lwr cse grained; trace heavies; black wisps (Mn?) | |
| | | | | same as above; interbedded clayey sand zones; lt brown; | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-18**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 5 | FB-18 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | | | med dense; fine to med grained; black staining (Mn?) | |
| SS 73 | 10-12-13 | 173.6 | | CLAYEY SAND (SC) with sandy clay bands; lt brown with v lt greenish brown bands; med dense; wet; subangular; well graded; fine to cse grained; larger grains are subrounded to rounded | |
| SS 74 | 8-20-14 | 172.1 | | SANDY LEAN CLAY (CL) with clayey sand zones; med reddish brown with v lt brown zones; hard; wet; med plasticity; fine to med grained; trace mica; trace heavies | |
| SS 75 | 7-14-20 | 170.6 | | CLAYEY SAND (SC); lt reddish brown with v lt brown zones; dense; wet; subangular; poorly graded; fine grained | |
| SS 76 | 7-14-22 | 169.1 | 120 | same as above; med yellowish brown with black Mn spots; fine to lwr med grained with Mn staining | |
| SS 77 | 12-16-25 | 167.6 | | same as above; with some silty sand layers; med reddish brown with lt brown zones; trace clay rip-ups | |
| SS 78 | 8-17-26 | 164.8 | 125 | SILTY SAND (SM); med yellowish brown; dense; wet; subangular; poorly graded; fine to lwr cse grained | |
| SS 79 | 18-43-48 | 163.3 | | POORLY GRADED SAND WITH SILT (SP-SM); med yellowish brown; v dense; wet; subangular; poorly graded; fine to lwr med grained | |
| SS 80 | 23-30-43 | 161.8 | | CLAYEY SAND (SC); med yellowish brown and lt greenish gray with brownish orange mottles; v dense; moist; subangular; poorly graded; fine to lwr med grained | |
| SS 81 | 26-27-31 | 160.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); med yellowish brown with some lt yellowish gray zones; v dense; wet; subangular; poorly graded; fine to lwr med grained | |
| SS 82 | 13-32-50 | 158.8 | 130 | CLAYEY SAND (SC); med yellowish brown with some lt greenish gray zones; v dense; wet; subangular; poorly graded; v fine to fine grained | |
| SS 83 | 30-32-42 | 157.3 | | same as above; with some lt gray zones | |
| SS 84 | 19-22-18 | 155.8 | | POORLY GRADED SAND WITH SILT (SP-SM); lt greenish brown and lt grayish brown; dense; wet; subangular; poorly graded; v fine to fine grained | |
| SS 85 | 9-11-23 | 154.1 | 135 | SILTY SAND (SM); med yellowish brown and whitish brown; dense; wet; subangular; poorly graded; v fine to fine grained | |
| SS 86 | 26-35-47 | 152.6 | | same as above; med brown to orangish brown; v dense; v fine to lwr med grained | |
| SS 87 | 37-37-42 | 151.1 | | same as above; med yellowish brown with some lt gray zones; v fine to fine grained | |
| SS 88 | 26-23-30 | 149.6 | 140 | POORLY GRADED SAND (SP) trace silt; lt gray clayey sand layer at 140 ft; med yellowish brown; v dense; wet; subangular; poorly graded; fine to lwr med grained | |
| SS 89 | 16-23-29 | 148.1 | | CLAYEY SAND (SC); med yellowish brown; v dense; wet; subangular; poorly graded; v fine to fine grained | |
| SS 90 | 19-20-30 | 146.6 | | POORLY GRADED SAND WITH SILT (SP-SM) some zones have clay; lt reddish brown with white bands; dense; wet; subangular; poorly graded; fine grained; trace mica; trace heavies | |
| SS 91 | 16-18-22 | 145.1 | | same as above; lt reddish brown with lt brownish yellow zones; med dense | |
| SS 92 | 13-39-43 | 143.6 | 145 | same as above; some zones are silty; lt reddish brown with lt brown zones; v dense | |
| SS 93 | 18-13-25 | 142.1 | | CLAYEY SAND (SC) some zones have less clay; lt reddish brown; dense; wet; subangular; poorly graded; fine grained; trace mica; trace heavies | |
| SS 94 | 15-21-33 | 140.6 | | POORLY GRADED SAND (SP) trace silt; lt yellowish brown; v dense; wet; subangular; poorly graded; fine grained; trace mica; trace heavies | |
| SS 95 | 12-8-14 | 139.1 | 150 | CLAYEY SAND (SC); med brownish red with v lt green wisps; med dense; wet; subangular; poorly graded; fine to lwr med grained; trace mica; trace heavies | |
| SS 96 | 6-9-11 | 137.6 | | same as above; med brownish yellow with med reddish brown zones and v lt green clay wisps | |
| SS 97 | 7-9-13 | 136.1 | | same as above; clayey at base of sample; med reddish brown with v lt green wisps; occasional rounded cse grains | |
| SS | 10-16-19 | | | LEAN CLAY WITH SAND (CL) with interbedded clayey | |

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PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-18**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 5 OF 5 | FB-18 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | 20 40 60 80 | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| 98 SS 99 | | ▲ | 14-20-19 | 134.6 | | | sand; v lt green with med and dk orange zones; hard; wet; med plasticity; sand is fine to lwr med grained; trace mica | |
| SS 100 | | ○ ▲ | 19-41-50/5.5 in | 133.1 | | | SANDY LEAN CLAY (CL); med reddish brown with dk orange zones and v lt green wisps; hard; wet; med plasticity; sand is fine to cse grained | |
| SS 101 | | | 41-50/4 in | 131.6 | | | CLAYEY SAND (SC) sandy lean clay at top of sample; med reddish brown with lt yellow and dk orange zones and lt green clay wisps; v dense; wet; subangular; poorly graded; fine to med grained | |
| | | | | 130.8 | | | WELL GRADED SAND (SW) trace clay to clayey; lt yellow and orange with med to dk orange zones; v dense; wet; subrounded; well graded; fine to cse grained; probable Congaree | Hole abandoned with grout mix per 3Q5. |
| | | | | | | | Total depth of boring 159.33. | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-18**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 4 | FB-19 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79781 E 54979 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/27/98 | 4/29/98 | M Rizer/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 144.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 273.6 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| | | | 273.6 | | | | Hand auger to 7 feet to check for interferences. |
| | | | | 5 | | | |
| SS 1 | | 6-10-14 | 265.1 | | | CLAYEY SAND (SC); light reddish yellow; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 2 | | 7-8-13 | 263.6 | 10 | | same as above; light yellow, light red, and light orange | |
| SS 3 | | 11-16-25 | 262.1 | | | same as above; medium yellowish red with light yellow and white mottles; dense | |
| SS 4 | | 15-31-29 | 260.6 | | | same as above; medium yellowish red with light reddish purple bands; very dense | |
| SS 5 | | 17-27-25 | 259.1 | | | same as above; medium yellow with light to medium red zones and light gray mottles | |
| SS 6 | | 12-16-17 | 257.6 | 15 | | same as above; light brownish yellow with white wisps; dense | |
| SS 7 | | 7-14-23 | 256.1 | | | same as above; with light red | |
| SS 8 | | 11-13-16 | 254.6 | | | same as above; medium dense; moist | |
| SS 9 | | 11-14-19 | 253.1 | 20 | | same as above; with zones of sand with clay; light brownish yellow; dense | |
| SS 10 | | 9-14-15 | 248.1 | 25 | | POORLY GRADED SAND WITH CLAY (SP-SC) some areas are clayey; light brownish yellow with light brown bands and white wisps; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 11 | | 7-11-12 | 243.1 | 30 | | same as above; light brownish yellow with white wisps and light reddish bands; trace mica; some zones are wet | |
| SS | | 7-10-14 | | | | same as above; with two bands of clayey sand; various | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-19

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 4 | FB-19 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 12 | | | 238.1 | | | shades of yellowish brown; wet | |
| SS 13 | | 6-11-11 | 233.1 | 40 | | CLAYEY SAND (SC); light brownish yellow; medium dense; moist; subangular; poorly graded; fine to coarse grained; black wisps (Mn?); trace mica | |
| SS 14 | | 11-16-24 | 228.1 | 45 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; light brown; dense; moist; subangular; poorly graded; fine to medium grained with some lower coarse; trace heavies | |
| SS 15 | | 9-14-18 | 223.1 | 50 | | same as above; clay content varies from trace to clayey; light brown with light yellow pods; medium grained | |
| SS 16 | | 11-12-14 | 218.1 | 55 | | POORLY GRADED SAND WITH SILT (SP-SM); light brown with very light brown zones; medium dense; moist; subangular; poorly graded; fine to medium grained trace coarse; some zones are wet | |
| SS 17 | | 16-17-23 | 213.1 | 60 | | WELL GRADED SAND WITH CLAY (SW-SC); light brown; dense; moist; subrounded; well graded; fine to coarse grained; trace heavies; some zones are wet | |
| SS 18 | | 7-9-13 | 208.1 | 65 | | SANDY LEAN CLAY (CL); light yellow with medium reddish brown zones; very stiff; moist; medium plasticity; sand is fine to medium grained with some coarse grains; trace heavies | |
| SS 19 | | 4-6-19 | 203.1 | 70 | | CLAYEY SAND (SC); light yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace heavies; top 0.4' of this spoon was the same as the last sample (tan clay); contact is sharp | |
| SS | | 13-15-16 | | | | POORLY GRADED SAND (SP) trace clay; light brown; | |

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SITE

**FINAL LOG**

HOLE NO. **FB-19**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 4 | FB-19 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 20 | | | 198.1 | | | dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 21 | | 5-6-14 | 193.1 | 80 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light yellowish brown with white wisps; medium dense; wet; subangular; poorly graded; fine to medium grained; black zones (Mn?) | |
| SS 22 | | 4/50 in-1/2 in-2 | 188.1 | 85 | | same as above; white zones are clayey sand; light brownish yellow with light yellow and white zones; very loose; trace heavies | |
| SS 23 | | WR/2 in-3/6 in-1/4 in-3 | 186.6 | | | CLAYEY SAND (SC); light yellow with very light brown zones; very loose; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 24 | | 3-4-13 | 185.1 | | | same as above; interbedded sand with clay and sandy lean clay; light yellow; medium dense; fine to coarse grained; black wisps (Mn?) | |
| | | | | 90 | | | |
| SS 25 | | 18-42-50 | 180.1 | | | POORLY GRADED SAND (SP) trace clay; light brown with a light reddish brown wisp; very dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| | | | | 95 | | | |
| SS 26 | | 9-9-11 | 175.1 | | | CLAYEY SAND (SC); light reddish brown with very light brown zones; medium dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| | | | | 100 | | | |
| SS 27 | | 10-13-25 | 170.1 | | | same as above; light reddish brown with very light greenish yellow clay wisps; dense; black pellets (Mn?) | |
| | | | | 105 | | | |
| SS 28 | | 9-20-22 | 165.1 | | | POORLY GRADED SAND (SP) trace clay; yellow zones contain more clay; light brown with light yellow wisps; dense; wet; subrounded; poorly graded; fine to lower medium grained; trace heavies | |
| | | | | 110 | | | |
| SS 29 | | 11-9-27 | 160.1 | | | POORLY GRADED SAND WITH CLAY (SP-SC) intermixed with clayey sand; medium yellowish red with light brown zones and light yellow clay wisps; dense; wet; subangular; poorly graded; fine grained; trace heavies | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-19**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 4 | FB-19 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 30 | | 24-50-50/4 in | 155.3 | 120 | | POORLY GRADED SAND (SP) trace clay; yellowish red bands are sand with clay; light brown with medium yellowish red wispy bands; very dense; wet; subrounded; poorly graded; fine grained; trace heavies; trace mica | |
| SS 31 | | 10-5-4 | 150.1 | | | SILTY SAND (SM) some zones are sand with silt; med yellowish red; loose; wet; subangular; poorly graded; fine grained; black speckles (Mn?); trace heavies; silicified turritella shell | |
| SS 32 | | WR/2 in-1/4 in-5-6 | 148.6 | 125 | | CLAYEY SAND (SC) some zones appear to be silty; med yellowish red with v lt green clay wisps; med dense; wet; subangular; poorly graded; fine grained; trace heavies | |
| SS 33 | | 4-7-7 | 143.1 | 130 | | same as above | |
| SS 34 | | 6-8-15 | 138.1 | 135 | | SILTY SAND (SM); light greenish brown; medium dense; wet; subangular; poorly graded; fine grained; black zones (Mn?); trace heavies; trace mica | |
| SS 35 | | 9-20-40 | 133.1 | 140 | | CLAYEY SAND (SC); medium reddish brown with very light green wisps; very dense; wet; subangular; well graded; fine to coarse grained | |
| SS 36 | | 100/6" | 129.1 | | | WELL GRADED SAND (SW) trace clay; light brown; very dense; wet; subrounded; well graded; fine to medium grained; trace heavies; trace mica<br>Total depth of boring 144.5 feet | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-19**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 3 | FB-20 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 78642 E 55518 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/29/98 | 5/13/98 | J Corbitt/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 112.7 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 301.4 | ▽ / ▼ / | C. Rothammer/WSRC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80)

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|
| | | 301.4 | | |
| | | | 5 | |
| SS 1 | 9-11-14 | 293.9 | | SILTY SAND (SM); with clay; medium reddish brown; medium dense; wet; subangular; poorly graded; fine to medium grained, lithic fragments |
| SS 2 | 7-10-15 | 292.4 | | CLAYEY SAND (SC); dark yellowish brown and red with tan; medium dense; moist; subangular; poorly graded; fine to medium grained |
| SS 3 | 9-21-31 | 290.9 | 10 | CLAYEY SAND WITH GRAVEL (SC); very dense; same as above |
| SS 4 | 18-31-40 | 289.4 | | CLAYEY SAND (SC); dark brownish yellow with tan; very dense; moist; subangular; poorly graded; fine to medium grained, lithic fragments |
| SS 5 | 24-17-14 | 287.9 | | CLAYEY SAND WITH GRAVEL (SC); medium purple, orange, and yellow; dense; moist; subangular; well graded; fine to medium grained |
| SS 6 | 6-12-16 | 286.4 | | SANDY FAT CLAY (CH); medium purple with white; very stiff; moist; high plasticity |
| SS 7 | 6-11-19 | 284.9 | 15 | CLAYEY SAND WITH GRAVEL (SC); medium white, yellow, orange, and purple; medium dense; wet; subangular; well graded; fine to coarse grained |
| SS 8 | 10-14-30 | 283.4 | | SILTY SAND (SM) with clay; medium reddish brown; dense; wet; subangular; poorly graded; fine to medium sand |
| SS 9 | 10-15-17 | 281.9 | | same as above; reddish brown with yellow |
| SS 10 | 7-12-17 | 280.4 | 20 | same as above; medium dense |
| SS 11 | 12-23-20 | 278.9 | | same as above; dense |
| SS 12 | 12-18-17 | 277.4 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brownish red; dense; wet; subangular; poorly graded; fine to medium grained |
| SS 13 | 11-15-22 | 275.9 | 25 | CLAYEY SAND (SC); medium brownish red with white; dense; wet; subangular; poorly graded; fine to medium grained |
| SS 14 | 15-19-21 | 274.4 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brownish red, yellow, and orange; dense; wet; subangular; poorly graded; fine to medium grained |
| SS 15 | 12-14-18 | 272.9 | | SILTY SAND (SM); medium brownish red, white, and yellow; banded; dense; moist; subangular; poorly graded; fine to very fine grained |
| SS 16 | 10-18-21 | 271.4 | 30 | same as above; light reddish brown and red |
| SS 17 | 17-19-21 | 269.9 | | same as above; light brown with yellow and orange; subrounded; well graded; fine to medium grained |
| SS 18 | 11-14-16 | 268.4 | | same as above; with clay; medium red, white, yellow, purple, and orange; some mottling; medium dense; subangular; poorly graded |
| SS 19 | 10-17-21 | 266.9 | | same as above; dense |

NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING

Hand auger to 6 feet to check for underground interferences and then switch to mud rotary.

SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-20

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 3 | FB-20 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 20 | 16-18-28 | 265.4 | | same as above; dark brownish red with white and yellow | |
| SS 21 | 10-16-18 | 263.9 | | same as above; with clay; dark red with yellow | |
| SS 22 | 14-14-19 | 262.4 | | same as above; dark red, white, and yellow | |
| SS 23 | 9-19-22 | 260.9 | 40 | same as above | |
| SS 24 | 15-16-16 | 259.4 | | same as above; medium brownish yellow with red and white | |
| SS 25 | 12-19-25 | 257.9 | | CLAYEY SAND (SC); medium brownish yellow with white; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 26 | 9-16-19 | 256.4 | 45 | SILTY SAND (SM) with clay; medium dark red, white, and yellow; mottled; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 27 | 14-15-26 | 254.9 | | CLAYEY SAND (SC); medium dark red, white, and yellow; mottled; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 28 | 20-22-26 | 253.4 | | same as above; dark red; wet; trace coarse sand | |
| SS 29 | 19-30-26 | 251.9 | | SILTY SAND (SM); dark red, white, yellow, and purple; very dense; wet; subangular; poorly graded; fine to medium grained, trace coarse sand | |
| SS 30 | 12-20-27 | 250.4 | 50 | POORLY GRADED GRAVEL WITH SILT (GP-GM); medium red, yellow, and tan; dense; wet; subangular; poorly graded; fine to coarse grained | |
| SS 31 | 6-15-25 | 248.9 | | POORLY GRADED SAND WITH SILT (SP-SM); medium reddish brown with yellow; dense; wet; subrounded; poorly graded; fine to medium grained, trace gravel | |
| SS 32 | 10-10-6 | 247.4 | | CLAYEY SAND (SC); medium brownish white and yellow; mottled; medium dense; moist; subangular; well graded; fine to coarse grained | |
| SS 33 | 8-10-10 | 245.9 | 55 | SILTY SAND (SM) with clay; medium brownish red; medium dense; moist; subangular; well graded; fine to medium grained | |
| SS 34 | 6-10-12 | 244.4 | | same as above; medium brownish yellow | |
| SS 35 | 16-20-23 | 242.9 | | WELL GRADED SAND WITH SILT (SW-SM); medium orange; dense; wet; subrounded; well graded; fine to coarse grained | |
| SS 36 | 6-6-8 | 241.4 | 60 | CLAYEY SAND (SC); medium brownish orange with white; medium dense; wet; subangular; well graded; fine to coarse grained | |
| SS 37 | 3-8-13 | 239.9 | | SILTY SAND (SM) with clay; medium brownish yellow; medium dense; wet; subangular; well graded; fine to coarse grained | |
| SS 38 | 16-20-18 | 238.4 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brownish orange; dense; wet; angular; poorly graded; fine to coarse grained | |
| SS 39 | 19-21-26 | 236.9 | | no recovery | Catcher broken |
| SS 40 | 12-20-22 | 235.4 | 65 | SILTY SAND (SM); medium orange; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 41 | 10-11-24 | 233.9 | | CLAYEY SAND (SC); medium brownish orange; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 42 | 17-28-34 | 232.4 | | SILTY SAND (SM) with clay; medium brownish orange with pink and white; very dense; wet; subangular; well graded; fine to coarse grained, lenses of moist clayey sand | |
| SS 43 | 10-26-28 | 230.9 | 70 | POORLY GRADED SAND WITH SILT (SP-SM); medium brownish orange with medium gray; very dense; wet; subangular; poorly graded; medium to coarse grained | |
| SS 44 | 10-11-21 | 229.4 | | SILTY SAND (SM); medium brownish orange; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 45 | 21-24-12 | 227.9 | | no recovery | |
| SS 46 | 13-13-13 | 226.4 | | CLAYEY SAND (SC); medium brownish orange; medium dense; moist; subangular; well graded; fine to coarse | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-20**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 3 | FB-20 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | | | grained, trace gravel | |
| SS 47 | 6-10-10 | 224.9 | | same as above; with silt; medium brownish yellow with black; wet; lithic fragment; Mn present; lenses of fat clay | |
| SS 48 | 12-21-22 | 223.4 | | SANDY LEAN CLAY (CL); medium brownish yellow with white, black, and brown; mottled; hard; moist; medium plasticity; Mn present | |
| SS 49 | 7-10-15 | 221.9 | | same as above; with orange and tan zones; very stiff; lenses of fat clay | |
| SS 50 | 19-16-10 | 220.4 | 80 | FAT CLAY (CH); light yellowish brown with black streaks; very stiff; moist; high plasticity | |
| SS 51 | 10-17-21 | 218.9 | | CLAYEY SAND (SC); medium yellowish brown with black, white, and brown; mottled; dense; moist; subangular; poorly graded; fine to medium grained, Mn present, clay lenses | |
| SS 52 | 13-19-22 | 217.4 | | same as above; with silt; wet | |
| SS 53 | 17-19-22 | 215.9 | 85 | SILTY SAND (SM) with clay; medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 54 | 10-15-20 | 214.4 | | CLAYEY SAND (SC); medium yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 55 | 18-7-10 | 212.9 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish orange; medium dense; wet; subangular; poorly graded; fine to medium grained, trace gravel | |
| SS 56 | 14-24-36 | 211.4 | | WELL GRADED SAND WITH CLAY (SW-SC); medium brownish orange; very dense; wet; subangular; well graded; fine to coarse grained | |
| SS 57 | 29-15-14 | 209.9 | 90 | POORLY GRADED SAND WITH SILT (SP-SM); light brown with tan; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 58 | 10-19-23 | 208.4 | | POORLY GRADED SAND (SP) trace silt; light brown; dense; moist; subangular; poorly graded; fine to medium grained, trace coarse sand | |
| SS 59 | 10-16-15 | 206.9 | | SILTY SAND (SM); brownish orange; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 60 | 19-25-31 | 205.4 | 95 | same as above (top 0.6 ft.); remaining portion is yellowish brown fat clay with sand (CH), hard, moist, high plasticity | |
| SS 61 | 16-18-21 | 203.9 | | same as above; medium brownish orange with black; wet; Mn present | |
| SS 62 | 8-13-25 | 202.4 | | CLAYEY SAND WITH GRAVEL (SC); medium brown; dense; moist; subangular; well graded; fine to very coarse grained | |
| SS 63 | 4-9-19 | 200.8 | 100 | CLAYEY SAND (SC) with 0.4 ft thick grayish brown lean clay layer at 100.0 ft; medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | Loas circulation (5/6/98). |
| SS 64 | 15-16-19 | 199.3 | | same as above; medium yellowish brown to grayish brown; dense; some Mn staining | |
| SS 65 | 17-18-19 | 197.8 | | POORLY GRADED SAND (SP) trace clay; medium grayish brown; dense; wet; subangular; poorly graded; fine to medium grained | Lost circulation on 5/12/98 while attempting to redrill to 180 feet for geophysical logging. |
| SS 66 | 12-12-15 | 196.3 | 105 | same as above; trace silt; medium dense; with black Mn staining | |
| SS 67 | 9-14-15 | 194.8 | | POORLY GRADED SAND WITH SILT (SP-SM); medium grayish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace Mn staining | |
| SS 68 | 10-9-9 | 193.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium grayish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 69 | 1-2-1 | 191.8 | | LEAN CLAY WITH SAND (CL); light grayish white, light brown, and black; soft; wet; medium plasticity; sand fraction is very fine to fine grained | |
| SS 70 | WR/37 in | 188.7 | 110 | CLAYEY SAND (SC); medium grayish brown; very loose; wet; subangular; poorly graded; fine to medium grained | Lost circulation and could not regain. Pumped two mud tubs into hole with 500 gallons water will take one more spoon (5/7/98). |
| | | | | Total depth of boring 112.7 fet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-20**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 3 | FB-20A |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 78642 E 55518 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/29/98 | 5/13/98 | J Corbitt/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 120.0 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 301.4 | ▽ / ▼ / | C. Rothammer/WSRC |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET (301.4) | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 5, 10, 15, 20, 25, 30, 35 | | | Hand auger to 6 feet to check for underground interferences. Then switch to mud rotary.<br>Straight drill to 106.5 feet to begin sampling. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-20A

| GEOTECHNICAL LOG | PROJECT Northeast Expansion | JOB NO. NEX | SHEET NO. 2 OF 3 | HOLE NO. FB-20A |
|---|---|---|---|---|

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | | | 45 | | | |
| | | | | | 50 | | | |
| | | | | | 55 | | | |
| | | | | | 60 | | | Adding quick gel. |
| | | | | | 65 | | | |
| | | | | | 70 | | | |
| | | | | | 75 | | | |
| | | | | | 80 | | | |
| | | | | | 85 | | | |

| SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER | SITE FINAL LOG | HOLE NO. FB-20A |
|---|---|---|

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 3 | FB-20A |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | | 90 | | |
| | | | 95 | | |
| | | | 100 | | |
| | | | 105 | | Lost circulation at 102 feet. Mixed two batches OF grout. On 3/11/98 tagged grout at 75 feet. Continued drilling down to 106.5 feet and started sampling. |
| SS 1 | 18-48-45 | 193.4 | | POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 2 | 17-20-22 | 191.9 | | same as above; dense | |
| SS 3 | 17-21-30 | 190.4 | 110 | POORLY GRADED SAND (SP) trace silt; medium yellowish brown; very dense; wet; subangular; poorly graded; fine to coarse grained | |
| SS 4 | 9-10-12 | 188.9 | | WELL GRADED SAND WITH CLAY (SW-SC); medium yellowish brown; medium dense; wet; subangular; well graded; fine to coarse grained. Mn present | |
| SS 5 | 8-10-13 | 187.4 | | FAT CLAY (CH); med yellowish brown with red and black streaks; v stiff; moist; high plasticity; upper 6 inches are clayey sand, black is Mn | |
| SS 6 | 16-25-25 | 185.9 | 115 | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; dense; wet; subangular; poorly graded; very fine to fine grained | |
| SS 7 | 10-12-14 | 184.4 | | CLAYEY SAND (SC); medium yellowish brown with tan, white, and black; medium dense; wet; subangular; well graded; fine to coarse grained | |
| SS 8 | 4-16-21 | 182.9 | | same as above; dense | |
| SS 9 | 13-14-13 | | 120 | Total depth of boring 120 feet. | Lost circulation, never recovered.<br>Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-20A**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 4 | FB-22 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79779 E 54828 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 5/1/98 | 5/7/98 | M Rizer/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 144.3 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 276.7 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80)

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 276.7 | | | Hand auger to 7 feet to check for underground interferences. |
| | | | 5 | | |
| SS 1 | 6-7-12 | 268.2 | | POORLY GRADED SAND (SP) trace clay; light brown with dark reddish bands; medium dense; moist; subangular; poorly graded; fine to medium grained; trace heavies; probable fill | |
| SS 2 | 7-14-14 | 266.7 | | no recovery | The shoe was plugged with crusher run that fell in from the surface. |
| SS 3 | 6-7-8 | 265.2 | 10 | CLAYEY SAND (SC); light yellow with dark red zones; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 4 | 8-17-23 | 263.7 | | LEAN CLAY (CL) with interlayered silt and very fine grained sand zones; medium red, white, and dark yellowish orange; hard; damp; medium plasticity; sand is very fine grained; abundant mica | |
| SS 5 | 9-14-16 | 262.4 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light reddish yellow grading downward to light red; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 6 | 10-20-22 | 262.2 | 15 | same as above; light yellowish brown with white wisps; dense; dry | |
| SS 7 | 12-15-20 | 260.7 | | same as above; light brownish yellow with white wisps; trace mica | |
| SS 8 | 6-11-14 | 259.2 | | CLAYEY SAND (SC); light brownish yellow with white wisps; medium dense; dry; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 9 | 8-11-12 | 257.7 | | same as above | |
| SS 10 | 8-12-13 | 256.2 | 20 | same as above; light yellow with light red and white bands; damp; trace mica | |
| SS 11 | 14-19-20 | 254.7 | | no recovery | Catcher looks normal, traces of medium sand (cave material? or sample?). |
| SS 12 | 14-19-19 | 253.2 | | no recovery | Catcher looks normal, bottom of shoe has been slightly deformed in places. |
| SS 13 | 12-17-17 | 251.7 | 25 | CLAYEY SAND (SC); light brownish yellow with white wisps; dense; damp; subangular; poorly graded; fine to medium grained; bottom of the interval is less clayey | |
| SS 14 | 11-14-15 | 250.2 | | POORLY GRADED SAND WITH CLAY (SP-SC) some bands of clayey sand; light brownish yellow with white wisps; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 15 | 10-12-13 | 248.7 | | CLAYEY SAND (SC); light brownish yellow with white wisps; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 16 | 10-11-14 | 247.2 | 30 | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light yellowish brown with light red bands and white wisps; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 17 | 13-15-16 | 245.7 | | same as above; light brownish yellow with white wisps; dense | |
| SS 18 | 12-12-14 | 244.2 | | same as above; light yellowish brown with white wisps and dark orange bands; medium dense; trace mica | |
| SS | 9-10-12 | 242.7 | | same as above; clay content increases with depth; grain size | |

SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-22

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 4 | FB-22 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 19 | | 241.2 | | decreases; medium brownish red with white wisps; wet; subrounded; trace lower coarse grains | |
| SS 20 | 9-12-14 | 239.7 | | same as above; medium brownish red | |
| SS 21 | 9-10-13 | 238.2 | | no recovery; catcher looks normal | |
| SS 22 | 6-9-10 | 236.7 | 40 | CLAYEY SAND (SC); light yellow and medium yellowish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 23 | 9-12-16 | 235.2 | | same as above; interlayered with sand with clay; light brown, medium orange, and medium yellow; black wisps (Mn?); trace heavies | |
| SS 24 | 10-12-13 | 233.7 | | POORLY GRADED SAND WITH CLAY (SP-SC); light yellowish brown; medium dense; moist; subangular; poorly graded; fine to medium grained; trace lower coarse grains | |
| SS 25 | 12-14-21 | 232.2 | | WELL GRADED SAND WITH CLAY (SW-SC); light brown; dense; moist; subangular; well graded; fine to coarse grained | |
| SS 26 | 14-17-16 | 230.7 | 45 | POORLY GRADED SAND WITH CLAY (SP-SC); light brown; dense; wet; subangular; poorly graded; fine to medium grained; trace lower coarse grains | |
| SS 27 | 3-8-16 | 229.2 | | POORLY GRADED SAND WITH SILT (SP-SM); medium brown; medium dense; wet; subangular; poorly graded; fine to upper lower coarse grained | |
| SS 28 | 17-18-21 | 227.7 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; dense; wet; subangular; poorly graded; fine to coarse grained | |
| SS 29 | 17-16-18 | 226.2 | 50 | same as above; fine to medium grained | |
| SS 30 | 13-16-22 | 224.7 | | POORLY GRADED SAND (SP) trace clay; medium brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 31 | 17-22-20 | 223.2 | | same as above; trace silt; fine to upper medium grained | |
| SS 32 | 11-13-18 | 221.7 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; dense; wet; subangular; poorly graded; fine to lower medium grained | |
| SS 33 | 16-13-15 | 220.2 | 55 | CLAYEY SAND (SC); medium brown; medium dense; wet; subangular; poorly graded; fine to medium coarse grained; some caved crushed stone | |
| SS 34 | 15-23-32 | 218.7 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 35 | 23-24-36 | 217.2 | | POORLY GRADED SAND (SP) trace clay; medium brown; very dense; wet; subangular; poorly graded; fine to lower coarse grained | |
| SS 36 | 15-23-31 | 215.7 | 60 | same as above; trace silt; fine to coarse grained; trace fine gravel | |
| SS 37 | 23-26-28 | 213.8 | | same as above; fine to medium grained | |
| SS 38 | 12-12-11 | 212.3 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 39 | 13-16-11 | 210.8 | 65 | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 40 | 13-16-11 | 209.3 | | same as above | |
| SS 41 | 3-4-4 | 207.8 | | same as above; with a few thin sandy clay interbeds and grayish brown zones; loose; fine to upper medium grained | |
| SS 42 | 4-6-7 | 206.3 | 70 | same as above; medium dense; angular; fine to lower coarse grained | |
| SS 43 | 3-6-8 | 204.8 | | LEAN CLAY WITH SAND (CL); medium brownish yellow and reddish brown; stiff; wet; medium plasticity; sand fraction is fine grained | |
| SS 44 | 4-8-8 | 203.3 | | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 45 | 14-21-24 | 201.8 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; dense; wet; subangular; poorly graded; fine to lower medium grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-22**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 4 | FB-22 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 46 | 12-16-19 | 200.3 | | same as above; fine to medium grained | |
| SS 47 | 16-23-27 | 198.8 | | same as above | |
| SS 48 | 25-22-16 | 197.3 | | same as above; fine to upper medium grained | |
| SS 49 | 4-5-6 | 195.8 | 80 | CLAYEY SAND (SC) with 0.2 ft thick lean clay interbeds; medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; clay layers have charcoal fragments | |
| SS 50 | 7-9-10 | 194.3 | | LEAN CLAY (CL) trace sand with sandy clay interbeds; med brownish yellow; v stiff; wet; med plasticity; sand fraction is fine grained | |
| SS 51 | 6-10-10 | 192.4 | | LEAN CLAY WITH SAND (CL); med brownish yellow; v stiff; moist; med plasticity; sand fraction is v fine to fine grained | |
| SS 52 | 9-11-12 | 190.6 | 85 | same as above; portions are sandy; med grayish yellow to brownish yellow | |
| SS 53 | 7-10-10 | 189.1 | | LEAN CLAY (CL) trace sand with few thin layers with sand; med brownish yellow; v stiff; moist; med plasticity; sand is v fine to fine grained | |
| SS 54 | 3-6-9 | 187.2 | | CLAYEY SAND (SC); lt brown with v lt brown zones; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 55 | 6-8-14 | 185.7 | 90 | POORLY GRADED SAND WITH CLAY (SP-SC); lt brown with lt orange zones; med dense; wet; subangular; poorly graded; fine to med grained; trace cse | |
| SS 56 | 8-12-24 | 184.2 | | CLAYEY SAND (SC); med reddish brown; dense; wet; subangular; well graded; fine to lwr cse grained | |
| SS 57 | 13-13-14 | 182.7 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; lt yellowish brown with med brown zones; med dense; wet; subangular; poorly graded; fine to med grained | |
| SS 58 | 6-8-9 | 181.2 | 95 | CLAYEY SAND (SC); some zones are sand with clay; med reddish brown with v lt brown zones; med dense; wet; subangular; poorly graded; fine to med grained; trace cse; black mottles (Mn?) | |
| SS 59 | 7-6-8 | 179.7 | | same as above; med reddish brown with lt brown zones; well graded; fine to lwr cse grained; black zones (Mn?); trace heavies | |
| SS 60 | 5-8-11 | 178.2 | | same as above; med reddish brown with v lt brown zones; poorly graded; fine to med grained; trace mica | |
| SS 61 | 5-7-11 | 176.7 | 100 | same as above; med reddish brown with v lt brown clay wisps | |
| SS 62 | 6-5-8 | 175.2 | | POORLY GRADED SAND WITH SILT (SP-SM); lt reddish brown with v lt brown zones; med dense; wet; subangular; poorly graded; fine to med gained; trace heavies; trace mica | |
| SS 63 | 8-13-15 | 173.7 | | SILTY SAND (SM); sand with silt zones; lt reddish brown with v lt brown zones; med dense; wet; subangular; poorly graded; fine to med grained; trace heavies; some zones contain silicified chips | |
| SS 64 | 12-35-50 | 172.2 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; lt brown with lt orange zones; v dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 65 | 22-50-50/4 in | 170.9 | 105 | same as above | |
| SS 66 | 20-29-37 | 169.2 | | no recovery; catcher looks normal | |
| SS 67 | 25-33-29 | 167.7 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; lt brown with lt orange zones; v dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 68 | 12-34-41 | 166.2 | 110 | same as above with lt gray lean clay wisps | |
| SS 69 | 17-27-35 | 164.7 | | POORLY GRADED SAND WITH SILT (SP-SM) some zones trace silt; with lt greenish gray lean clay wisps; lt orange with lt brown zones; v dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 70 | 13-16-38 | 163.2 | | same as above | |
| SS 71 | 28-34-49 | 161.7 | | same as above; with some clayey zones | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-22**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 4 | FB-22 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 72 | 19-35-40 | 160.2 | | POORLY GRADED SAND (SP) trace silt; some zones with silt; lt brown with lt orange zones; v dense; wet; subangular; poorly graded; fine grained; trace mica | |
| SS 73 | 11-31-50/4 in | 158.9 | | same as above; trace clay; some zones with clay; trace heavies; most of the sample is slough | |
| SS 74 | 14-35-50 | 157.2 | | same as above with lt yellow clay wisps | |
| SS 75 | 21-33-49 | 155.7 | 120 | POORLY GRADED SAND (SP) trace clay; sand with clay band and wisps of gray clay; lt orange with lt brown zones; v dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 76 | 6-9-15 | 154.2 | | POORLY GRADED SAND WITH CLAY (SP-SC); med reddish brown with lt brown zones; med dense; wet; subangular; poorly graded; fine grained; trace heavies; sloughed material contains shell fragments | |
| SS 77 | 8-8-10 | 152.7 | | CLAYEY SAND (SC) some zones are sand with clay; med reddish brown; med dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 78 | 6-6-9 | 151.2 | 125 | same as above; med yellowish brown; black wisps (Mn?); turritella shell fragments | |
| SS 79 | WR/9 in-5/3 in-11 | 149.7 | | same as above; med reddish brown; trace mica | |
| SS 80 | 10-14-19 | 148.2 | | same as above; with lt greenish gray clay wisps; dense; black pellets (Mn?) | |
| SS 81 | 11-16-20 | 146.7 | 130 | same as above; abundant turritella shells | |
| SS 82 | 7-10-18 | 145.2 | | same as above; med dense | |
| SS 83 | 6-15-41 | 143.7 | | same as above; v dense; fine to med grained; no turritella shells | |
| SS 84 | 13-17-14 | 142.2 | | LEAN CLAY WITH SAND (CL); lt greenish brown with lt greenish gray mottles; hard; wet; low plasticity; sand is fine grained; trace med grains | |
| SS 85 | WR/9 in-1/3 in-8 | 140.7 | 135 | SILTY SAND (SM); lt brownish yellow; loose; wet; subangular; poorly graded; fine grained; trace mica | |
| SS 86 | 17-9-14 | 139.2 | | POORLY GRADED SAND WITH SILT (SP-SM) and silicified sand chips; lt yellowish brown; med dense; wet; subangular; poorly graded; fine grained; trace mica | |
| SS 87 | 4-12-23 | 137.7 | | LEAN CLAY WITH SAND (CL); med reddish brown with lt grayish green wisps; hard; wet; med plasticity; sand is fine grained; trace med grains; trace mica | |
| SS 88 | 12-19-23 | 136.2 | 140 | CLAYEY SAND (SC); lt orange with dark orange bands and lt green interlaminated clay; dense; wet; subangular; poorly graded; fine grained; trace mica | |
| SS 89 | 14-21-29 | 134.7 | | same as above; med reddish brown with lt green interlaminated clay; fine to med grained; trace cse grains | |
| SS 90 | 14-50-50/3 in | 133.5 | | same as above; bottom 0.1 ft is sand (Congaree?); med reddish brown and med brown with lt brown and yellowish brown; v dense; 0.3 ft from bottom of interval is a 0.1 ft thick silicified fine to med sand | |
| SS 91 | 49-50/4 in | | | WELL GRADED SAND (SW) trace clay; lt orange and lt brown; v dense; wet; subrounded; well graded; fine to lwr cse grained; trace mica; Congaree | Hole grouted with grout mix per 3Q5 |
| | | | | Total depth of boring 144.3 feet. | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-22**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 5 | FB-25 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79242 E 55261 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 5/26/98 | 5/28/98 | J Corbitt/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 165.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 289.1 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 289.1 | | | Hand auger to 7 feet to check for interferences. |
| | | | 5 | | |
| SS 1 | 9-20-34 | 280.6 | | CLAYEY SAND (SC); light red and light orange with white mottles; very dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 2 | 15-17-21 | 279.1 | | same as above; light red; dense | |
| SS 3 | 11-16-20 | 277.6 | 10 | POORLY GRADED SAND WITH CLAY (SP-SC); light red and light orange with a white, very clean band of sand; dense; damp; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 4 | 10-16-16 | 276.1 | | CLAYEY SAND (SC); with sand with clay zones; light red with very light yellow band; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 5 | 8-10-10 | 274.6 | | same as above; some zones are silty; light red; medium dense; fine grained; trace medium; trace mica | |
| SS 6 | 5-7-10 | 273.1 | 15 | POORLY GRADED SAND WITH CLAY (SP-SC); light red with dark brown mottles; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 7 | 6-11-17 | 271.6 | | CLAYEY SAND (SC) trace gravel; light orange and red with light brownish yellow zones and white wispy clays; medium dense; damp; subangular; poorly graded; medium to coarse grained; trace gravel; silicified chips | |
| SS 8 | 10-15-15 | 270.1 | | SILTY SAND (SM) with interlaminated clayey sand; light red, light yellow, and light purplish gray; medium dense; moist; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 9 | 9-10-15 | 268.6 | 20 | same as above; light red with very light pinkish brown zones | |
| SS 10 | 17-19-23 | 263.6 | 25 | CLAYEY SAND (SC) with silty sand laminae; light red and light brownish orange; dense; moist; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 11 | 12-18-18 | 258.6 | 30 | SILTY SAND (SM) with clayey sand zones and a layer of light red lean clay with sand; light red, light purple, light grayish yellow, and light orange with light purple clay wisps; dense; damp; subangular; poorly graded; fine to medium grained | |
| SS | 7-7-9 | | | same as above; some zones are clayey; some zones are | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-25

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 5 | FB-25 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 12 | | 253.6 | | sandy silt; multicolored bands with red, yellow, orange, brown, and light gray; medium dense; wet; fine grained; trace mica | |
| SS 13 | 9-13-16 | 248.6 | 40 | CLAYEY SAND (SC); light brownish yellow with white wisps; medium dense; damp; subangular; poorly graded; fine to medium grained | |
| SS 14 | 8-10-16 | 243.6 | 45 | SILTY SAND (SM) some zones are silty; occasional sand with clay stringers; light red and light orange with light yellow and white mottles; medium dense; damp; subangular; poorly graded; fine to medium grained; trace mica | |
| SS 15 | 13-17-19 | 238.6 | 50 | CLAYEY SAND (SC) with silty zones; medium red, light red, medium yellowish brown, and white; dense; moist; subangular; poorly graded; fine to medium grained; trace mica; bottom of interval is wet | |
| SS 16 | 11-19-22 | 233.6 | 55 | same as above; light orange, medium red, light brownish yellow, and medium yellowish brown with white wispy clay; wet; no mica observed | |
| SS 17 | 12-19-24 | 228.6 | 60 | POORLY GRADED SAND WITH CLAY (SP-SC) and clay laminae; light brown, light yellow, and light purple; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 18 | 16-24-33 | 223.6 | 65 | CLAYEY SAND (SC) with a band of sand with clay; medium orange with white clay pellets; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 19 | 16-25-25 | 218.6 | 70 | POORLY GRADED SAND WITH CLAY (SP-SC) some very thin clay stringers; medium reddish brown; dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS | 11-22-26 | | | same as above; medium red and light brown | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-25**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 5 | FB-25 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 20 | | | 213.6 | | | | |
| SS 21 | | 16-21-16 | 208.6 | 80 | | WELL GRADED SAND WITH CLAY (SW-SC) some zones are clayey; light brown and light brownish yellow with white clay wisps; dense; wet; subangular; well graded; fine to medium grained; trace heavies | |
| SS 22 | | 6-12-14 | 203.6 | 85 | | CLAYEY SAND (SC) with light brownish yellow lean clay stringers; medium orange, light brown, and dark yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace coarse grains; trace heavies | |
| SS 23 | | 7-6-11 | 198.6 | 90 | | same as above; with lean clay laminae; medium brownish yellow with light brownish yellow lean clay wisps; well graded; fine to coarse grained | |
| SS 24 | | 41-41-45 | 193.6 | 95 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are borderline clayey sand; light red and light brown with a white band; very dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 25 | | 30-47-49 | 188.6 | 100 | | same as above; light red and light brown with light yellow bands | |
| SS 26 | | 18-28-29 | 183.6 | 105 | | CLAYEY SAND (SC); light brownish yellow with light brown zones; very dense; wet; subangular; well graded; fine to coarse grained | |
| SS 27 | | 24-47-50 | 178.6 | 110 | | WELL GRADED SAND (SW) trace clay; light brown; very dense; wet; subrounded; well graded; fine to coarse grained; trace heavies | |
| SS | | 32-49-50 | | | | same as above | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-25**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 5 | FB-25 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 28 | | | 173.6 | | | | |
| SS 29 | | 8-15-27 | 168.6 | 120 | | CLAYEY SAND (SC); dark brown with medium yellow zones; dense; wet; subangular; poorly graded; fine to medium grained; lignite present; trace heavies | |
| SS 30 | | 11-28-50 | 163.6 | 125 | | POORLY GRADED SAND WITH CLAY (SP-SC) borderline clayey sand; light to dark brown and medium orange; very dense; wet; subangular; poorly graded; fine to lower medium grained; lignite present; trace heavies; trace mica | |
| SS 31 | | 50/4 in | 159.8 | 130 | | same as above (slough?); not enough sample to jar; light brown and medium orange | |
| SS 32 | | 24-18-22 | 153.6 | 135 | | CLAYEY SAND (SC) with zones of sand with clay; light brownish yellow and light orange with light green wisps of clay; dense; wet; subangular; poorly graded; fine to lower medium grained; trace heavies | |
| SS 33 | | 6-7-13 | 148.6 | 140 | | SILTY SAND (SM) some zones are clayey; medium orange with light green wisps; dense; wet; subangular; poorly graded; fine grained; trace heavies; trace mica | |
| SS 34 | | 8-10-13 | 143.6 | 145 | | CLAYEY SAND (SC); medium orange with light green wispy clays; medium dense; wet; subangular; poorly graded; fine grained | |
| SS 35 | | 10-30-50/3 in | 138.9 | 150 | | same as above; light yellowish brown and light brown with light green wispy clays; very dense; very fine grained; trace mica; trace black staining (Mn?) | |
| SS | | 8-16-19 | | | | LEAN CLAY (CL) with interbedded sand; light green with | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-25

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 5 OF 5 | FB-25 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | 20 40 60 80 | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| 36 | | | | 133.6 | | | medium orange sand stringers; hard; wet; medium plasticity; sand is fine grained; black mottling (Mn?) | |
| SS 37 | | ▲ ○ | 50/5 in | 129.7 | 160 | | CLAYEY SAND (SC) with clean sand laminae; medium orange and medium yellow with light brown wisps; very dense; wet; subangular; well graded; fine to coarse grained; clayey slough at top of recovered interval; probable Congaree | |
| SS 38 | | ▲○ | 37-41-41 | 123.6 | 165 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium brown with dark brown wisps; very dense; wet; subangular; poorly graded; fine to medium grained; trace heavies; trace mica; Congaree<br>Total depth of boring 165.5 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-25**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 5 | FB-27 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 78900 E 56660 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/28/98 | 4/29/98 | J Corbitt/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 155.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 297.6 | ▽ / ▼ / | B. Gelinas/SAIC; C. Rothammer/WSRC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| | | 297.6 | | | Hand auger to 6 feet to check for interferences. |
| | | | 5 | | |
| SS 1 | 15-25-26 | 290.1 | | POORLY GRADED SAND WITH SILT (SP-SM); light brown to medium brown; very dense; moist; subangular; poorly graded; fine to lower medium grained | |
| SS 2 | 14-12-12 | 288.6 | | same as above; light brown with some black zones; medium dense; fine to medium grained | |
| SS 3 | 11-9-8 | 287.1 | 10 | same as above; medium brown; wet | |
| SS 4 | 8-5-5 | 285.6 | | SILTY SAND (SM); medium brown to light brown; loose; wet; subangular; poorly graded; fine to medium grained | |
| SS 5 | 3-8-15 | 284.1 | | CLAYEY SAND (SC) trace medium gravel; medium red, light brown, and grayish orange; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 6 | 4-13-17 | 282.6 | 15 | same as above; with fine to medium gravel; medium red, light brown, and gray | |
| SS 7 | 21-19-9 | 281.1 | | same as above; trace fine gravel; medium brownish red and medium grayish brown | |
| SS 8 | 10-25-26 | 279.6 | | same as above; trace coarse sand and fine gravel; medium brownish red with some light gray to white zones; very dense; wet | |
| SS 9 | 21-29-20 | 278.1 | | same as above; medium brownish red; dense | |
| SS 10 | 12-29-46 | 276.6 | 20 | same as above; with fine to medium gravel and few sandy clay layers; medium brownish red with light gray to white zones; very dense; fine to upper medium grained; joint at 20 ft depth | |
| SS 11 | 21-21-20 | 271.1 | 25 | POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish red; dense; moist; subangular; poorly graded; fine to upper medium grained | |
| SS 12 | 17-22-29 | 267.3 | 30 | same as above; with some light gray layers; very dense; wet; fine to medium grained | |
| SS | 14-18-20 | | | CLAYEY SAND (SC) with lean clay layer in tip of spoon; | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-27

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 5 | FB-27 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 13 | | | 262.0 | | | light yellowish brown to reddish brown and light gray to purple clay layer in tip of spoon; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 14 | | 13-23-23 | 258.2 | 40 | | same as above; few clay laminae; medium yellowish brown with light gray clay laminae | |
| SS 15 | | 18-21-30 | 252.3 | 45 | | same as above; portions silty sand; medium yellowish brown and reddish brown; very dense | |
| SS 16 | | 11-12-11 | 247.8 | 50 | | same as above; medium yellowish brown; medium dense | |
| SS 17 | | 30-26-24 | 242.7 | 55 | | POORLY GRADED SAND (SP) trace clay; light yellowish brown; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 18 | | 10-10-15 | 238.8 | 60 | | CLAYEY SAND (SC); dark yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 19 | | 24-39-40 | 231.1 | 65 | | same as above; medium yellowish brown; very dense | |
| SS 20 | | 27-29-32 | 226.1 | 70 | | same as above; dark yellowish brown with black specks; well graded; fine to coarse grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-27**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 5 | FB-27 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|
| SS 21 | | 30-28-32 | 221.1 | | POORLY GRADED SAND WITH SILT (SP-SM); dark orange; very dense; wet; subangular; poorly graded | |
| SS 22 | | 15-17-18 | 216.1 | 80 | WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM); dark yellowish brown; dense; wet; subangular; well graded; fine to very coarse grained | |
| SS 23 | | 3-5-9 | 211.1 | 85 | SANDY LEAN CLAY (CL); dark yellowish brown; stiff; wet; medium plasticity; trace of coarse sand | |
| SS 24 | | 6-7-9 | 206.1 | 90 | SANDY FAT CLAY (CH); dark yellowish brown; mottled with black; very stiff; moist; high plasticity; Mn present | |
| SS 25 | | 4-7-10 | 201.1 | 95 | SILTY SAND (SM); medium yellowish brown; medium dense; wet; subangular; well graded; fine to coarse grained | |
| SS 26 | | 6-8-9 | 196.1 | 100 | CLAYEY SAND WITH GRAVEL (SC); medium yellowish brown with white mottles; medium dense; wet; subrounded; well graded; fine sand to granule sized grains | |
| SS 27 | | 25-42-56 | 191.1 | 105 | WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM); medium yellowish brown; very dense; wet; subangular; well graded; medium to very coarse grained with gravel | |
| SS 28 | | 6-7-15 | 186.1 | 110 | CLAYEY SAND WITH GRAVEL (SC); light yellowish brown with tan and white mottles; medium dense; moist; subrounded; well graded; fine to very coarse grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-27**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 5 | FB-27 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 29 | | 15-12-17 | 181.1 | | | SILTY SAND (SM) with clay; medium yellowish brown; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 30 | | 25-36-55 | 176.1 | 120 | | POORLY GRADED SAND (SP) trace clay; white; very dense; moist; rounded; poorly graded; fine to very fine grained | |
| SS 31 | | 125 86-70-55 | 171.1 | 125 | | POORLY GRADED SAND WITH SILT (SP-SM); light tannish white; very dense; moist; rounded; poorly graded; fine to very fine grained | |
| SS 32 | | 10-7-11 | 166.1 | 130 | | same as above; light yellowish brown with white; medium dense | |
| SS 33 | | 8-11-18 | 161.1 | 135 | | ELASTIC SILT WITH SAND (MH); light yellowish brown with white; very stiff; moist; medium plasticity | |
| SS 34 | | 151 19-81-70 | 156.1 | 140 | | SILTY SAND (SM); medium yellowish brown with white; very dense; moist; subrounded; poorly graded; fine to very fine grained; silts are elastic | |
| SS 35 | | 20-22-23 | 151.1 | 145 | | same as above; with clay; dense | |
| SS 36 | | 12-14-19 | 146.1 | 150 | | CLAYEY SAND (SC); very dark greenish black; dense; moist; subangular; poorly graded; very fine grained, micaceous, green clay | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-27**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 5 OF 5 | FB-27 |

| SAMP. TYPE AND NO. | SAMPLE | ▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| | | | 27-34-55 | | | | Total depth of boring 155 feet. | Broke down spoon but did not bottle sample.<br>Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-27**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 5 | FB-28 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 78382 E 55388 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 4/29/98 | 5/4/98 | J Corbitt/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 161.5 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 308.2 | ▽ / ▼ / | C. Rothammer/WSRC |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| | | | 308.2 | | | | Hole offset 2 feet to the east of CPT. Hand auger to 6 feet to check for interferences. |
| | | | | 5 | | | |
| SS 1 | | 6-12-15 | 300.7 | | | CLAYEY SAND (SC); dark brownish red; medium dense; wet; subangular; well graded; fine to coarse grained, trace gravel | |
| SS 2 | | 6-10-12 | 299.2 | | | same as above; with yellow | |
| SS 3 | | 10-17-23 | 297.7 | 10 | | same as above; dense | |
| SS 4 | | 10-13-17 | 296.2 | | | same as above; medium dense; trace gravel and very coarse sand | |
| SS 5 | | 8-14-19 | 294.7 | | | same as above; dense | |
| SS 6 | | 9-14-19 | 293.2 | | | same as above; dark reddish brown with yellow and white; fine to very coarse grained; sandy clay lenses | |
| SS 7 | | 13-18-27 | 291.7 | 15 | | same as above | |
| SS 8 | | 12-22-37 | 290.2 | | | same as above; very dense | |
| SS 9 | | 15-27-37 | 288.7 | | | same as above; with gravel | |
| SS 10 | | 9-10-15 | 287.2 | 20 | | same as above; dark brownish red with white; medium dense; lithic fragments, trace gravel | |
| SS 11 | | 6-12-22 | 285.7 | | | no recovery | |
| SS 12 | | 6-7-11 | 281.7 | 25 | | CLAYEY SAND (SC); dark red with white and yellow; medium dense; wet; subangular; well graded; medium sand to gravel, lithic fragments | |
| SS 13 | | 9-13-21 | 276.7 | 30 | | FAT CLAY (CH); medium purple; hard; wet; high plasticity | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-28

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 5 | FB-28 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 14 | | 7-6-23 | 271.7 | | | same as above; with white; very stiff; moist | |
| SS 15 | | 7-10-12 | 266.7 | 40 | | POORLY GRADED SAND WITH CLAY (SP-SC); medium yellow with white; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 16 | | 10-20-19 | 261.7 | 45 | | POORLY GRADED SAND WITH SILT (SP-SM); light to medium yellow ,white, tan, and black; dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 17 | | 10-14-36 | 256.7 | 50 | | CLAYEY SAND (SC); light to medium yellow, white, purple, and tan; dense; moist; subangular; poorly graded; fine to medium grained, lenses of fat clay | |
| SS 18 | | 12-14-16 | 251.7 | 55 | | same as above; medium brownish yellow with white; medium dense; wet | |
| SS 19 | | 12-15-18 | 246.7 | 60 | | same as above; dense | |
| SS 20 | | 15-18-20 | 241.7 | 65 | | same as above | |
| SS 21 | | 10-12-19 | 236.7 | 70 | | same as above; medium red, white, and yellow; mottled; well graded; fine to coarse grained, trace gravel | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-28**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 5 | FB-28 |

▲ N-VALUE (SPT)
O RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| SS 22 | 16-21-18 | 231.7 | | same as above | |
| SS 23 | WR/3 in 9/3 in-10-16 | 226.7 | 80 | SILTY SAND (SM) with clay; medium dark brownish yellow; medium dense; wet; subrounded; well graded; medium to very coarse grained, trace gravel, Mn present | |
| SS 24 | 28-25-34 | 221.7 | 85 | same as above; medium yellowish brown; very dense; subangular; poorly graded; fine to medium grained | |
| SS 25 | 34-50-50/4 in | 216.7 | 90 | same as above; with gravel; with white; well graded; fine to very coarse grained | Cement in the hole from surface, attempted to ream it out to correct situation. |
| SS 26 | 27-50-50 | 211.7 | 95 | same as above; medium brownish yellow with orange, white, and black streaks; poorly graded; fine to medium grained, Mn present | |
| SS 27 | 15-14-15 | 206.7 | 100 | same as above; medium dense | |
| SS 28 | 126 28-38-29 | 201.7 | 105 | same as above; medium yellowish brown with white; very dense; well graded; lithic fragments | |
| SS 29 | 30-43-40 | 196.7 | 110 | POORLY GRADED SAND WITH SILT (SP-SM); dark yellowish orange; very dense; wet; subangular; poorly graded; fine to medium grained | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-28**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 5 | FB-28 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| SS 30 | | 29-35-50/4 in | 191.7 | | | same as above; with coarse sand | |
| SS 31 | | 22-24-22 | 186.7 | 120 | | SILTY SAND (SM); dark yellowish orange; dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 32 | | 12-14-16 | 181.7 | 125 | | CLAYEY SAND (SC); dark yellowish orange; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 33 | | 8-9-10 | 176.7 | 130 | | same as above; medium yellowish brown | |
| SS 34 | | WR/8 in-1/4 in-3 | 171.7 | 135 | | ELASTIC SILT (MH); medium yellowish brown with white; soft; moist; medium plasticity | |
| SS 35 | | 6-16-29 | 170.2 | | | SILTY SAND (SM); light medium brown with white and red; dense; wet; subrounded; poorly graded; very fine grained, silts are elastic | |
| SS 36 | | 50/4 in | 166.7 | 140 | | no recovery | |
| SS 37 | | 122 35-60-62 | 161.7 | 145 | | WELL GRADED SAND WITH GRAVEL (SW); light yellowish brown; very dense; wet; subrounded; well graded; medium to very coarse grained | |
| SS 38 | | 10-12-12 | 156.7 | 150 | | SILTY SAND (SM); light greenish yellow with orange; medium dense; moist; subangular; poorly graded; very fine to fine grained, silts are elastic | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-28**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 5 OF 5 | FB-28 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | 20 40 60 80 | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 39 | | | 19-20-38 | 151.7 | | | same as above; light yellowish brown; very dense | |
| SS 40 | | | 19-43-51 | 146.7 | 160 | | same as above | |
| | | | | | | | Total depth of boring 161.5 feet. | Hole abandoned with grout mix per 3Q5. |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

FINAL LOG

HOLE NO. FB-28

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 1 OF 5 | FB-30 |

| SITE | COORDINATES | ANGLE FROM HORIZONTAL |
|---|---|---|
| APSF-NE | N 79371 E 55388 | 90 |

| BEGUN | COMPLETED | DRILLER | DRILL MAKE AND MODEL | HOLE SIZE | SAMPLE HAMMER WEIGHT/FALL | TOTAL DEPTH |
|---|---|---|---|---|---|---|
| 5/7/98 | 5/12/98 | M Rizer/Graves | Failing 1500 | 3 7/8 in | 140 lb/30 in | 179.4 |

| GROUND EL. | DEPTH/EL. GROUND WATER | LOGGED BY: |
|---|---|---|
| 284.1 | ▽ / ▼ / | N. Kidd/SAIC |

▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| | | | 284.1 | | | | Hand auger to 6 feet to check for interferences. |
| | | | | 5 | | | |
| SS 1 | | 7-9-9 | 275.6 | | | POORLY GRADED SAND WITH CLAY (SP-SC); light brown; medium dense; wet; subangular; poorly graded; fine to medium grained; trace heavies; trace mica | |
| SS 2 | | 2-3-8 | 274.1 | 10 | | POORLY GRADED SAND (SP) trace clay; some zones with clay; light reddish brown; medium dense; moist; subangular; poorly graded; fine to medium grained; much bentonite in tube; no useful sample recovered; trace heavies | |
| SS 3 | | 5-6-6 | 272.6 | | | same as above; light brown; wet; no bentonite observed | |
| SS 4 | | 5-6-9 | 271.1 | | | same as above; moist; some zones are wet | |
| SS 5 | | 7-12-19 | 269.6 | | | same as above; very light brown with light brown areas; dense; trace mica | |
| SS 6 | | 13-15-15 | 268.1 | 15 | | CLAYEY SAND (SC); light orange and light red with light brown bands; medium dense; moist; subangular; poorly graded; fine to medium grained | |
| SS 7 | | 7-12-19 | 266.6 | | | same as above; with sandy lean clay zones; medium red and medium orange with light yellow and white zones; dense; trace lower coarse | |
| SS 8 | | 7-9-11 | 265.1 | | | same as above; medium red with light yellow and white zones; medium dense | |
| SS 9 | | 6-8-10 | 263.6 | 20 | | same as above; with sandy lean clay zones; medium brownish red; fine to lower coarse grained; trace mica | |
| SS 10 | | 16-16-26 | 258.6 | 25 | | same as above; medium brownish yellow with medium red zones; dense; fine to medium grained with coarse grains | |
| SS 11 | | 13-15-21 | 253.6 | 30 | | same as above; medium red with white wisps; fine to medium grained | |
| SS | | 47-50/4 in | 249.3 | | | same as above; medium brownish red with white wisps; | |

SS = SPLIT SPOON; ST = SHELBY TUBE; PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-30

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 2 OF 5 | FB-30 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|
| 12 | | | | | | very dense | |
| SS 13 | | 17-21-22 | 243.6 | 40 | | same as above; with interlaminated clean sands; medium brownish yellow with white wispy clays; dark yellowish brown zones and light red zones; dense | |
| SS 14 | | 27-42-42 | 238.6 | 45 | | same as above; dark red; very dense; wet; trace coarse grains | Drillers depth for the 44-45.5 ft. interval was shallow (43-44.5 ft.) |
| SS 15 | | 17-21-22 | 233.6 | 50 | | WELL GRADED SAND WITH CLAY (SW-SC) borderline clayey sand; medium brown; dense; moist; subangular; well graded; fine to coarse grained | |
| SS 16 | | 18-27-27 | 228.6 | 55 | | same as above; some zones are clayey sand; medium brown and medium purplish brown with light brown zones; very dense; some zones are wet | |
| SS 17 | | 14-22-25 | 223.6 | 60 | | same as above; medium brownish yellow with occasional white wisps; dense; wet; trace heavies | |
| SS 18 | | 8-14-20 | 218.6 | 65 | | CLAYEY SAND (SC) with interlayered sand with clay; medium brownish yellow; dense; wet; subangular; well graded; fine to coarse grained | |
| SS 19 | | 14-18-22 | 213.6 | 70 | | WELL GRADED SAND WITH CLAY (SW-SC) some zones are clayey; medium brownish yellow; dense; wet; subangular; well graded; fine to coarse grained | |
| SS | | 12-16-14 | | | | CLAYEY SAND (SC); medium brownish yellow; medium | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-30**

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 3 OF 5 | FB-30 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | N-VALUE / RECOVERY / ATT. LIMITS (20 40 60 80) | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| 20 | | | | 208.6 | | | medium dense; wet; subangular; well graded; fine to coarse grained; trace heavies | |
| SS 21 | | | 5-8-9 | 203.6 | 80 | | same as above; bottom 0.3' have tan lean clay interbeds; light yellowish brown with light yellow (tan) clay at the bottom of the interval; poorly graded; fine to medium grained; top of tan clay is about 0.3 ft above bottom of interval | |
| SS 22 | | | 8-16-24 | 198.6 | 85 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey; light brownish yellow; dense; wet; subangular; poorly graded; fine to medium grained; black stains (Mn?) | |
| SS 23 | | | 18-28-27 | 193.6 | 90 | | same as above; very dense; no black stains | |
| SS 24 | | | 18-23-24 | 188.6 | 95 | | same as above; medium yellowish brown clayey sand zones; dense; moist | |
| SS 25 | | | 17-27-32 | 183.6 | 100 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are clayey sand; light yellowish brown and light brown with occasional white wisps; very dense; wet; subangular; poorly graded; fine to medium grained; black mottles (Mn?) | |
| SS 26 | | | 34-48-50/5 in | 178.7 | 105 | | POORLY GRADED SAND (SP) trace clay; light brown with very light brown and light red zones; very dense; wet; subangular; poorly graded; fine to medium grained; trace heavies | |
| SS 27 | | | 39-50/5 in | 174.2 | 110 | | POORLY GRADED SAND WITH CLAY (SP-SC) some zones are trace clay; light brown with very light brown and light reddish brown zones; very dense; wet; subangular; poorly graded; fine to medium grained; black mottles (Mn?); trace heavies | |
| SS | | | 30-34-23 | | | | WELL GRADED SAND WITH CLAY (SW-SC) | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-30

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 4 OF 5 | FB-30 |

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %

20 40 60 80

| SAMP. TYPE AND NO. | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|
| 28 | | 168.6 | | clay content varies from trace to clayey; light red and light orange with light brown bands; very dense; wet; subrounded; well graded; fine to coarse grained; black mottles (Mn?) | |
| SS 29 | 20-16-15 | 163.6 | 120 | CLAYEY SAND (SC); medium reddish brown with light brown wisps; dense; wet; subangular; poorly graded; fine to medium grained; black wisps (Mn?) | |
| SS 30 | 25-39-41 | 158.6 | 125 | POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow; very dense; wet; subangular; poorly graded; fine grained | |
| SS 31 | 18-30-39 | 153.6 | 130 | no recovery; catcher torn out of spoon | |
| SS 32 | 14-14-16 | 148.6 | 135 | CLAYEY SAND (SC); medium yellowish brown; medium dense; wet; subangular; poorly graded; fine to medium grained | |
| SS 33 | 21-29-32 | 143.6 | 140 | POORLY GRADED SAND WITH SILT (SP-SM); medium yellow with medium orange and light brown zones and very light green clay wisps; very dense; wet; subangular; poorly graded; fine grained | |
| SS 34 | 11-12-15 | 138.6 | 145 | CLAYEY SAND (SC); medium brownish yellow; medium dense; wet; subangular; poorly graded; fine grained | |
| SS 35 | 10-15-22 | 133.6 | 150 | LEAN CLAY WITH SAND (CL) some zones are sandy; light green with medium to dark orange zones; hard; wet; medium plasticity; sand is fine to coarse grained | |
| SS 36 | 8-13-24 | 132.1 | | SANDY LEAN CLAY (CL) with interbedded sand; light green and reddish brown with medium orange sands; hard; wet; medium plasticity; fine to medium grained | |
| SS 37 | 12-14-19 | 130.6 | | CLAYEY SAND (SC) with sandy lean clay zones; medium reddish brown with light green clay wisps; dense; wet; subangular; well graded; fine to coarse | |
| SS 38 | 17-20-25 | 129.1 | | | |

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: FINAL LOG

HOLE NO. FB-30

# GEOTECHNICAL LOG

| PROJECT | JOB NO. | SHEET NO. | HOLE NO. |
|---|---|---|---|
| Northeast Expansion | NEX | 5 OF 5 | FB-30 |

▲ N-VALUE (SPT)
O RECOVERY %
+ ATT. LIMITS %

| SAMP. TYPE AND NO. | SAMPLE | 20 40 60 80 | BLOW COUNT | ELEVATION IN FEET | DEPTH IN FT | GRAPHICS | DESCRIPTION AND CLASSIFICATION | NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|
| SS 39 | | O ▲ | 18-21-36 | | | | grained | |
| | | | | 127.6 | | | same as above; dark brown; poorly graded; fine to medium grained | |
| SS 40 | | O ▲ | 25-50/4 in | 126.8 | | | WELL GRADED SAND WITH CLAY (SW-SC) clay content varies widely with depth; light brown, light gray, and light orange; very dense; wet; subangular; well graded; fine to coarse grained; larger grains are subrounded; probable Congaree at bottom of spoon | |
| | | | | | 160 | | same as above; some zones are trace clay; light brown with dark red zones; subrounded; fine to lower coarse grained; trace heavies; red zones are iron cemented; Congaree | |
| | | | | | 165 | | | |
| | | | | | 170 | | | |
| | | | | | 175 | | | |

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PS = STATIONARY PISTON; PB = PITCHER

SITE

**FINAL LOG**

HOLE NO. **FB-30**