### Field Data

**Station:** 173189A  
**Location:** Norfolk and Portsmouth, VA  
**Structure:**  
**Offset:**  
**Surface Elevation:** 9.4 ft  
**Coord. Datum:** NAD 83

#### Field Description of Strata

**Date(s) Drilled:** 12/2/10 - 12/2/10  
**Drilling Method(s):** Rotary Wash  
**SPT Method:** Automatic Hammer  
**Other Test(s):** undisturbed  
**Driller:** Fishburne, Rollen Ross  
**Logger:** C Stewart, J Kotova

#### Ground Water

Yellow gray mottled orange, coarse to fine SAND, little Clayey Silt, trace fine Gravel.  

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Depth (ft)</th>
<th>Soil Recovery (%)</th>
<th>Core Recovery (%)</th>
<th>Stratigraphic Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-35</td>
<td>46.5</td>
<td>75</td>
<td>45</td>
<td>SM</td>
</tr>
<tr>
<td>-40</td>
<td>47.7</td>
<td>100</td>
<td>50</td>
<td>Yorktown Formation (Ty)</td>
</tr>
</tbody>
</table>
| -45           | 48.7       | 95                | 53                | Greenish gray, coarse to fine SAND, some Clay and Silt, sand sized shell fragments scattered throughout.  
Other Test(s): undisturbed  
**Driller:** Fishburne, Rollen Ross  
**Logger:** C Stewart, J Kotova

### Lab Data

#### Field Description of Strata

**46.5 / -37.1**  
**Yorktown Formation (Ty)**  
Greenish gray, coarse to fine SAND, some Clay and Silt, sand sized shell fragments scattered throughout.  

**47.7 / -38.3**  
Greenish gray, coarse (+) to fine SAND, some Silt and Clay, abundant gravel to sand sized shell fragments throughout.  

**58.0 / -48.6**  
Greenish gray, fine GRAVEL, and coarse to fine Sand, some Silt and Clay, abundant gravel to sand sized shell fragments throughout, interlayered greenish gray, coarse to fine Sand, some (+) Silty Clay.  

**63.0 / -53.6**  
Greenish gray, coarse to fine SAND, some Clay and Silt, abundant gravel to sand sized shell fragments throughout.  

#### Field Data

**Date(s) Drilled:** 12/2/10 - 12/2/10  
**Drilling Method(s):** Rotary Wash  
**SPT Method:** Automatic Hammer  
**Other Test(s):** undisturbed  
**Driller:** Fishburne, Rollen Ross  
**Logger:** C Stewart, J Kotova

#### Remarks:  
**Rig Type:** Track Mounted CME-55.  
**4" ID casing to 7 ft.**
### Field Data

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Soil Recovery (%)</th>
<th>Rock Quality Designation</th>
<th>Sample Interval (ft)</th>
<th>DIP °</th>
</tr>
</thead>
</table>

**Remarks:**
- RIG TYPE: Track Mounted CME-55.
- Driller: Fishborne, Rollen Ross
- Other Test(s): undisturbed

**Ground Water**
- And Clay and Silt 78'

**Laboratory Data**

<table>
<thead>
<tr>
<th>Liquid Limit (LL)</th>
<th>Plasticity Index (PI)</th>
<th>Moisture Content (%)</th>
</tr>
</thead>
</table>

**Additional Information**
- Date(s) Drilled: 12/2/10 - 12/2/10
- Drilling Method(s): Rotary Wash
- SPT Method: Automatic Hammer
- Logger: C Stewart, J Kotova

**Contextual Data**
- **Project #:** 173189A
- **Location:** Norfolk and Portsmouth, VA
- **Station:**
  - **Latitude:** 36.853810° N
  - **Longitude:** 76.320060° W
  - **Surface Elevation:** 9.4 ft
  - **Offset:**
- **Structure:**
  - **Latitude:** 36.853810° N
  - **Surface Elevation:** 9.4 ft

**Copyright:** 2011, Commonwealth of Virginia
### Field Data

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Soil Recovery (%)</th>
<th>Core Recovery (%)</th>
<th>Strata Legend</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>16</td>
<td>-25</td>
<td>10</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>18</td>
<td>-30</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>22</td>
<td>-40</td>
<td>10</td>
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</table>

### Lab Data

<table>
<thead>
<tr>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
<th>Moisture Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 / 9.5</td>
<td>Artifical Fill (af)</td>
<td></td>
</tr>
<tr>
<td>0.7 / 8.8</td>
<td>Brown, Clay and Silt, and medium to fine Sand, trace roots. (Topsoil, No sample retained)</td>
<td></td>
</tr>
<tr>
<td>1.4 / 8.1</td>
<td>Gray, coarse to fine GRAVEL, and coarse to fine Sand, some Clay and Silt.</td>
<td></td>
</tr>
<tr>
<td>4.0 / 5.5</td>
<td>Dark gray to black, coarse to fine SAND, and organic Clay and Silt, trace organic fibers, strong hydrocarbon odor.</td>
<td></td>
</tr>
<tr>
<td>8.0 / 1.5</td>
<td>Gray coarse to fine SAND, some Silt and Clay.</td>
<td></td>
</tr>
<tr>
<td>16.0 / 6.5</td>
<td>Dark gray, Silty CLAY interlayered with black organic Clayey Silt, some coarse to fine Sand, trace fine Gravel.</td>
<td></td>
</tr>
<tr>
<td>19.4 / 9.9</td>
<td>Dark gray, CLAY, some coarse to fine Sand, numerous organic fibers and fragments.</td>
<td></td>
</tr>
<tr>
<td>24.5 / 15.0</td>
<td>Dark gray, coarse to fine SAND, and organic CLAY, trace fine Gravel, numerous organic fibers.</td>
<td></td>
</tr>
<tr>
<td>28.0 / 18.5</td>
<td>Dark gray, organic CLAY, little coarse to fine Sand, numerous organic fibers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-trace medium to fine Sand, 33'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-some coarse to fine Sand, 38'</td>
<td></td>
</tr>
</tbody>
</table>

### Field Description of Strata

- **0.0 / 9.5** Artifical Fill (af)
  - Brown, Clay and Silt, and medium to fine Sand, trace roots. (Topsoil, No sample retained)
- **0.7 / 8.8** Gray, coarse to fine GRAVEL, and coarse to fine Sand, some Clay and Silt.
- **1.4 / 8.1** Brown to dark gray, coarse to fine SAND, some Silt and Clay.
- **4.0 / 5.5** Dark gray to black, coarse to fine SAND, and organic Clay and Silt, trace organic fibers, strong hydrocarbon odor.
- **8.0 / 1.5** Gray coarse to fine SAND, some Silt and Clay.
- **16.0 / 6.5** Dark gray, Silty CLAY interlayered with black organic Clayey Silt, some coarse to fine Sand, trace fine Gravel.
- **19.4 / 9.9** Dark gray, CLAY, some coarse to fine Sand, numerous organic fibers and fragments.
- **24.5 / 15.0** Dark gray, coarse to fine SAND, and organic CLAY, trace fine Gravel, numerous organic fibers.
- **28.0 / 18.5** Dark gray, organic CLAY, little coarse to fine Sand, numerous organic fibers.

### Remarks
- RIG TYPE: Track Mounted CME-55.
- 4" ID casing to 7 ft.
## Field Description of Strata

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Soil</th>
<th>Rock</th>
<th>Pi</th>
<th>Lab Data</th>
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</thead>
<tbody>
<tr>
<td>43</td>
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<td>1</td>
<td>1</td>
<td>43</td>
<td>LL 43.0 / -33.5</td>
</tr>
<tr>
<td>44</td>
<td>35</td>
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<td>1</td>
<td>44</td>
<td>PI -33.5</td>
</tr>
<tr>
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<td>LL 43.0 / -33.5</td>
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<td>48</td>
<td>LL 44.5</td>
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<tr>
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<td>3</td>
<td>3</td>
<td>50</td>
<td>PI 44.5 / -35.0</td>
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<tr>
<td>53</td>
<td>25</td>
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<td>8</td>
<td>53</td>
<td>LL 44.5 / -35.0</td>
</tr>
<tr>
<td>55</td>
<td>25</td>
<td>5</td>
<td>8</td>
<td>55</td>
<td>PI TABB FORMATION (Qt)</td>
</tr>
<tr>
<td>58</td>
<td>20</td>
<td>4</td>
<td>7</td>
<td>58</td>
<td>LL 53.0 / -43.5</td>
</tr>
<tr>
<td>60</td>
<td>20</td>
<td>4</td>
<td>7</td>
<td>60</td>
<td>PI YORKTOWN FORMATION (Ty)</td>
</tr>
<tr>
<td>63</td>
<td>15</td>
<td>3</td>
<td>6</td>
<td>63</td>
<td>LL 53.0 / -43.5</td>
</tr>
<tr>
<td>66</td>
<td>15</td>
<td>3</td>
<td>6</td>
<td>66</td>
<td>PI YORKTOWN FORMATION (Ty)</td>
</tr>
<tr>
<td>68</td>
<td>10</td>
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<td>5</td>
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<td>LL 53.0 / -43.5</td>
</tr>
<tr>
<td>70</td>
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<td>2</td>
<td>5</td>
<td>70</td>
<td>PI YORKTOWN FORMATION (Ty)</td>
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<td>3</td>
<td>8</td>
<td>73</td>
<td>LL 53.0 / -43.5</td>
</tr>
<tr>
<td>75</td>
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<td>3</td>
<td>8</td>
<td>75</td>
<td>PI YORKTOWN FORMATION (Ty)</td>
</tr>
<tr>
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<td>0</td>
<td>3</td>
<td>3</td>
<td>78</td>
<td>LL 53.0 / -43.5</td>
</tr>
</tbody>
</table>

### Remarks
- Brown, organic Clayey Silt, some coarse to fine Sand, some fiberous Peat. **QL**
- wood chips, **44.5'**
- TABB FORMATION (Qt)
- Medium gray, coarse to fine (-) SAND, some (-) Clayey Silt. **SM**
- greenish gray, 58'
- greenish gray, medium to fine SAND, **68'**
- greenish gray, **2' thick shell layer, 74'**
- greenish gray, **78'**

### Project Information
- **Project #:** 173189A
- **Location:** Norfolk and Portsmouth, VA
- **Structure:** 10BH-027
- **Station:** 36.854070° N
- **Offset:** 76.319720° W
- **Surface Elevation:** 9.5 ft
- **Coord. Datum:** NAD 83

### Remarks
- **Rig Type:** Track Mounted CME-55.
- **4" ID casing to 7 ft.**
**FIELD DATA**

<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
<th>PENETRATION TEST HAMMER BLOWS</th>
<th>SOIL RECOVERY (%)</th>
<th>SAMPLE INTERVAL</th>
<th>ROCK QUALITY DESIGNATION</th>
<th>JOINTS</th>
<th>STRATA LEGEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>80°</td>
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<td></td>
</tr>
</tbody>
</table>

**LAB DATA**

<table>
<thead>
<tr>
<th>LIQUID LIMIT (LL)</th>
<th>PLASTICITY INDEX (PI)</th>
<th>MOISTURE CONTENT (%)</th>
</tr>
</thead>
</table>

**FIELD DESCRIPTION OF STRATA**

- **GROUND WATER**

**REMARKS:**
- RIG TYPE: Track Mounted CME-55.
- 4" ID casing to 7 ft.
**FIELD DATA**

Date(s) Drilled: 11/29/2010 - 11/29/2010
Drilling Method(s): Rotary Wash
SPT Method: Automatic Hammer
Other Test(s):
Driller: Fishburne, Rollen Ross
Logger: C Stewart, T Grifka

**GROUND WATER**

**FIELD DESCRIPTION OF STRATA**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>SOIL</th>
<th>ROCK</th>
<th>JOINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 / 10.0</td>
<td>Orange-brown, mixed coarse to fine SAND, and Clay, trace fine Gravel. SC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0 / 8.0</td>
<td>ALLUVIUM (Qal)</td>
<td>Orange-brown, coarse to fine SAND, trace to little Clayey Silt. SP-SM</td>
<td></td>
</tr>
<tr>
<td>10.0 / 0.0</td>
<td>Yellow-tan, coarse to fine(-) SAND, little Clayey Silt, trace fine Gravel. SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.7 / -8.7</td>
<td>Gray, fine SAND, some Silt and Clay. SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.5 / -11.5</td>
<td>Gray, CLAY, trace fine Sand. CH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**
RIG TYPE: Track Mounted CME-55.
4" ID casing to 7 ft.

**COORD. DATUM:** NAD 83

**Surface Elevation:** 10.0 ft
**FIELD DESCRIPTION OF STRATA**

- **0.0 / 4.6**
  - ARTIFICIAL FILL (af)
  - Tan mottled orange, mixed coarse to fine SAND, some Silt and Clay.  SM

- **2.0 / 2.6**
  - ALLUVIUM (Qal)
  - Orange-brown, medium to fine SAND, little (+) Clayey Silt.  SM

- **4.0 / 0.6**
  - Tan, coarse (-) to fine SAND, little Clayey Silt.  SM

- **6.0 / -1.4**
  - Orange-brown, medium to fine SAND, little (+) Clayey Silt.  SM

- **8.0 / -3.4**
  - Yellow-brown to orange-brown, coarse (-) to fine SAND, little Clayey Silt, trace fine Gravel.  SM

- **12.0 / -7.4**
  - Dark gray, Silty CLAY, little medium to fine Sand.  CH

- **16.5 / -11.9**
  - Gray Silty CLAY.  CH

- **21.5 / -16.9**
  - Gray CLAY.  CH

**REMARKS:**
RIG TYPE: Track Mounted CME-55.

4" ID casing to 7 ft.
FIELD DESCRIPTION OF STRATA

<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
<th>STANDARD PENETRATION TEST HAMMER BLOWS</th>
<th>SOIL RECOVERY (%)</th>
<th>SOIL LEGEND</th>
<th>ROCK QUALITY DESIGNATION</th>
<th>JOINTS</th>
<th>DIP °</th>
<th>STRATA LEGEND</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>3 3 4</td>
<td>35</td>
<td></td>
<td>0.0 / 6.1 ARTIFICIAL FILL (af)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brown SILT and CLAY, little medium to fine Sand, trace roots. (af)</td>
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<tr>
<td>2</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>ML</td>
<td>2.0 / 4.1 Brown, coarse to fine SAND, some Silt and Clay, trace fine Gravel, trace brick</td>
<td>SM</td>
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<td>4</td>
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<td>1</td>
<td>4.0 / 2.1 Brown, medium to fine GRAVEL, and coarse to fine Sand, some(-) Clayey Silt, trace metal fragments.</td>
<td>GM</td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>-5</td>
<td>3</td>
<td>3</td>
<td>6.0 / 0.1 ALLUVIUM (Qal)</td>
<td>Brown, coarse(-) to fine SAND, little(+) Clayey Silt.</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-10</td>
<td>8</td>
<td>8</td>
<td>11.8 / -5.7 Light gray mottled orange-brown, interlayered coarse to medium SAND, little Clayey Silt, interlayered with fine SAND, some Clayey Silt.</td>
<td>SM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>-15</td>
<td>4</td>
<td>4</td>
<td>13.7 / -7.6 Gray, Silty CLAY, little(+) coarse to fine Sand.</td>
<td>CH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>-20</td>
<td>1</td>
<td>1</td>
<td>16.5 / -10.4 Gray, CLAY, trace fine Sand.</td>
<td>CH</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>-25</td>
<td>woh</td>
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<td>- trace shell fragments, 23'</td>
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<td>- trace shell fragments, 28'</td>
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<td></td>
</tr>
<tr>
<td>20</td>
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<td>1</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Date(s) Drilled: 11/29/2010 - 11/29/2010
Drilling Method(s): Rotary Wash
SPT Method: Automatic Hammer
Other Test(s):
Driller: Fishburne, Rollen Ross
Logger: C Stewart, T Grifka

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1.1.3 Geotechnical Conditions - New Midtown Tunnel - CPT and DMT Soundings
PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
DATE(S) DRILLED: 7/20/2010 - 7/20/2010

CONCRETE PENETROMETER TEST LOG

CONE TYPE: DL
CONE ID No.: 215:T1500F15U500
LOGGER:

REMARKS:

SOIL BEHAVIOR TYPE:

* Campanella and Robertson (1983) Friction Ratio correlation

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CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec

DATE(S) DRILLED: 7/20/2010 - 7/20/2010

REMARKS:

* Campanella and Robertson (1983) Friction Ratio correlation
CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
DATE(S) DRILLED: 7/20/2010 - 7/20/2010

CONE TYPE: ConeTec
CONE SIZE: Cone T1500F15U500
CONE ID No.: 215:T1500F15U500
LOGGER:

SOIL BEHAVIOR TYPE

SENSITIVE FINE GRAINED
VERY STIFF FINE GRAINED
SANDY SILT TO CLAYEY SILT
CLAYEY SILT TO SILTY CLAY
CLAY TO SILTY CLAY
SILTY CLAY TO CLAY
GRAVELLY SAND TO SAND
SAND
SILT TO SILTY SILT
SILTY SAND TO SANDY SILT
SAND TO SILTY SAND
SENSITIVE FINE GRAINED

REMARKS:

* Campanella and Robertson (1983) Friction Ratio correlation

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# Cone Penetrometer Test Log

**Project #:** 173189A  
**Location:** Norfolk and Portsmouth, VA  
**Driller:** ConeTec  
**Date(s) Drilled:** 7/19/2010 - 7/19/2010  
**Benchmark Location:**  

## Soil Behavior Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
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<tbody>
<tr>
<td>Sensitive Fine Grained</td>
<td>SFG</td>
</tr>
<tr>
<td>Clay</td>
<td>CLAY</td>
</tr>
<tr>
<td>Silty Clay to Clayy Clay</td>
<td>CLAYYCLAY</td>
</tr>
<tr>
<td>Silty Silt to Clayy Silt</td>
<td>CLAYYCLAYYCLAY</td>
</tr>
<tr>
<td>Sandy Silt to Sandy Silt</td>
<td>SLYCLYCLY</td>
</tr>
<tr>
<td>Sand</td>
<td>SAND</td>
</tr>
<tr>
<td>Gravelly Sand to Sand</td>
<td>GSAND</td>
</tr>
<tr>
<td>Very Stiff Fine Grained</td>
<td>VSFG</td>
</tr>
<tr>
<td>Sandy to Clayy Silt</td>
<td>SLYCLAY</td>
</tr>
<tr>
<td>Sandy to Silty Silt</td>
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## Remarks

Campanella and Robertson (1983) Friction Ratio correlation

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<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Friction $f_s$ (tsf)</th>
<th>Cone Resistance $q_t$ (tsf)</th>
<th>Pore Pressure $u_2$ (tsf)</th>
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<tbody>
<tr>
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## Notes

- **Cone ID No.:** 215:T1500F15U500  
- **Logger:**  

---

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**CONE PENETROMETER TEST LOG**

**PROJECT #:** 173189A  
**LOCATION:** Norfolk and Portsmouth, VA  
**DATE(S) DRILLED:** 7/19/2010 - 7/19/2010

**DRILLER:** ConeTec  
**CONE TYPE:**  
**CONE SIZE:**  
**CONE ID No.:** 215:T1500F15U500  
**LOGGER:**

**REMARKS:**

* Campanella and Robertson (1983) Friction Ratio correlation

**SOIL BEHAVIOR TYPE:**

<table>
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<tr>
<th>Depth (ft)</th>
<th>Friction (tsf)</th>
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<th>Pore Pressure (tsf)</th>
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**Copyright 2011, Commonwealth of Virginia**
### Cone Penetrometer Test Log

**Project #:** 173189A  
**Location:** Norfolk and Portsmouth, VA  
**Cone Type:** ConeTec  
**Cone Size:** Cone ID No.: 215:T1500F15U500  
**Logger:**  
**Date(s) Drilled:** 7/19/2010 - 7/19/2010  
**Soil Behavior Type:**  

<table>
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<th>Soil Behavior Type</th>
<th>Organic Material</th>
<th>Clay</th>
<th>Silt to Clay</th>
<th>Silty Clay to Silty Silt</th>
<th>Sandy Silt to Silty Silt</th>
<th>Sandy Silt to Silty Sand</th>
<th>Gravelly Sand to Sand</th>
<th>Very Stiff Fine Grained</th>
<th>Sand to Clayey Sand</th>
<th>Clayey Sand to Clay</th>
<th>Clayey Silt to Clayey Silt</th>
<th>Clayey Silt to Clayey Silt</th>
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<th>Friction (tsf)</th>
<th>Cone Resistance (tsf)</th>
<th>Pore Pressure (tsf)</th>
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</tbody>
</table>

**Remarks:**  
* Campanella and Robertson (1983) Friction Ratio correlation  

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CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
CONET TYPE: ConeTec
CONID No.: 215:T1500F15U500

DATE(S) DRILLED: 7/19/2010 - 7/19/2010

LOGGER:

OFFSET:
LATITUDE: °N
COORD. DATUM: NAD 83

LANGUAGE: "SOIL BEHAVIOR TYPE"

SENSITIVE FINE GRAINED
SANDY SILT TO CLAYEY SILT
CLAY
SILTY CLAY TO SILTY CLAY
SAND TO CLAYEY SAND
SENSITIVE FINE GRAINED
SAND

REMARKS:
* Campanella and Robertson (1983) Friction Ratio correlation

Copyright 2011, Commonwealth of Virginia
DRILLER: ConeTec
DATE(S) DRILLED: 7/19/2010 - 7/19/2010
LOGGER:

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

STATION: OFFSET:
LATITUDE: ° N
LONGITUDE: ° W
SURFACE ELEVATION: 5.5
COORD. DATUM: NAD 83

BENCHMARK LOCATION:

SAND TO CLAYEY SAND

CLAYEY SILT TO SILTY CLAY

BENCHMARK LOCATION:

GRAVELLY SAND TO SAND

* Campanella and Robertson (1983) Friction Ratio correlation

SOIL BEHAVIOR TYPE*

SENSITIVE FINE GRAINED

ORGANIC MATERIAL

CLAY

SILTY CLAY TO SILTY CLAY

CLAYEY SILT TO CLAYEY SILT

SANDY SILT TO SANDY SILT

SAND TO SILTY SAND

GRAVELLY SAND TO SAND

VERY STIFF FINE GRAINED

SAND TO CLAYEY SAND

REMARKS:

PAGE 2 OF 2

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* Campanella and Robertson (1983) Friction Ratio correlation
CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
CONING TYPE:

CONE ID No.: 215:T1500F15U500
LOGGER:

DATE(S) DRILLED: 7/19/2010 - 7/19/2010

SOIL BEHAVIOR TYPE *

SENSITIVE FINE GRAINED
ORGANIC MATERIAL
CLAY
SILTY CLAY TO SILTY CLAY
SANDY SILT TO SILTY CLAY
SANDY SILT TO SANDY SILT
SAND TO SILTY SAND
GRAVELY SAND TO SAND
VERY STIFF FINE GRAINED
SAND TO CLAYEY SAND

REMARKS:

* Campanella and Robertson (1983) Friction Ratio correlation

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CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
CONES TYPE:
CONES SIZE:
CONES ID No.: 215:T1500F15U500

DATE(S) DRILLED: 7/19/2010 - 7/19/2010
BENCHMARK LOCATION:

REMARKS:

SENSITIVE FINE GRAINED
VERY STIFF FINE GRAINED

SOIL BEHAVIOR TYPE:

SENSITIVE FINE GRAINED
ORGANIC MATERIAL
SILTY CLAY TO CLAY
CLAYEY SILT TO SILTY CLAY
SAND TO CLAYEY SILT
SAND TO SILTY SILT
GRAVELY SAND TO SAND
VERY STIFF FINE GRAINED
SAND TO SENSITIVE

* Campanella and Robertson (1983) Friction Ratio correlation

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**CONE PENETROMETER TEST LOG**

**PROJECT #:** 173189A  
**LOCATION:** Norfolk and Portsmouth, VA

**DRILLER:** ConeTec  
**DATE(S) DRILLED:** 7/19/2010 - 7/19/2010

**CONE TYPE:**  
**CONE ID No.:** 215:T1500F15U500

**CONJECT:**

**REMARKS:**

**DATE(S) DRILLED:** 7/19/2010 - 7/19/2010

**LOGGER:**

**BLANIFICATION LOCATION:**

**PROJECT #:** 173189B  
**LOCATION:** Norfolk and Portsmouth, VA

**OFFSET:**

**LATITUDE:** °N  
**LONGITUDE:** °W  
**COORD. DATUM:** NAD 83

**STATION:**

**LATITUDE:** °N  
**LONGITUDE:** °W  
**COORD. DATUM:** NAD 83

**ELEVATION (ft):**

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<thead>
<tr>
<th>Depth (ft)</th>
<th>Friction (tsf)</th>
<th>Cone Resistance (tsf)</th>
<th>Pore Pressure (tsf)</th>
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<tbody>
<tr>
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</table>

**SOIL BEHAVIOR TYPE**

* Campanella and Robertson (1963) Friction Ratio correlation

**PORE PRESSURE:**

**FRICTION:**

**CONE RESISTANCE:**

**PAGE 4 OF 4**

**PAGE 4 OF 4**
### Soil Behavior Type

- Sensitive fine grained
- Very stiff fine grained
- Clay
- Silty clay to silty clay
- Sandy silt to Sandy silt
- Silty sand to sandy sand
- Gravelly sand to sand
- Very stiff fine grained
- Sandy sand to clayey sand

### Cone Penetrometer Test Log

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Friction ($f_s$ (tsf))</th>
<th>Cone Resistance ($q_t$ (tsf))</th>
<th>Pore Pressure ($u_2$ (tsf))</th>
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<tbody>
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<td>-95</td>
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<tr>
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<td>0.8</td>
<td>60</td>
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*Campanella and Robertson (1983) Friction Ratio correlation*

### Remarks:

- Cone size: Cone ID No.: 215:T1500F15U500
- Logger:
- Driller: ConeTec
- Date(s) drilled: 8/5/2010 - 8/5/2010

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CLAYEY SILT TO SILTY CLAY

DATE(S) DRILLED:
7/29/2010 - 7/29/2010

DRILLER: ConeTec
CONE TYPE:
CONE ID No.: 215:T1500F15U500
LOGGER:

REMARKS:
* Campanella and Robertson (1983) Friction Ratio correlation

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**CONE PENETROMETER TEST LOG**

**PROJECT #:** 173189A  
**LOCATION:** Norfolk and Portsmouth, VA  
**OFFSET:** 7/29/2010 - 7/29/2010

**DRILLER:** ConeTec  
**DATE(S) DRILLED:** 7/29/2010 - 7/29/2010

**CONE TYPE:** ConeTec  
**SOIL BEHAVIOR TYPE**

**CONIC ID No.:** 215:T1500F15U500  
**LOGGER:**

**NOTE:**

- **SAND TO CLAYEY SAND**
- **CLAYEY SILT TO SILTY CLAY**
- **GRAVELLY SAND TO SAND**
- **SANDY SILT TO CLAYEY SILT**
- **SENSITIVE FINE GRAINED**
- **VERY STIFF FINE GRAINED**

**ELEVATION (ft)**

- **-85**
- **-90**
- **-95**
- **-100**
- **-105**
- **-110**
- **-115**
- **-120**

**FRICITION**

- **f_s (tsf)**

**CONE RESISTANCE**

- **q_t (tsf)**

**PORR PRESSURE**

- **u_s (tsf)**

**SOIL BEHAVIOR TYPE**

- **SAND TO SILL TO SAND**
- **CLAYEY SILL TO CLAYEY Silt**
- **SENSITIVE FINE GRAINED**
- **CLAYEY CLAY TO CLAY**
- **GROVELY SILL TO SAND**
- **VERY STIFF FINE GRAINED**

**REMARKS:**

- *Campanella and Robertson (1963) Friction Ratio correlation*

**PAGE 2 OF 2**

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CONE PENETROMETER TEST LOG

PROJECT #: 173189A
LOCATION: Norfolk and Portsmouth, VA

DRILLER: ConeTec
CONE TYPE: ConeTec
CONE ID No.: 215:T1500F15U500

DATE(S) DRILLED: 8/4/2010 - 8/4/2010

BENCHMARK LOCATION:

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REMARKS:

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SOIL BEHAVIOR TYPE:

SENSITIVE FINE GRAINED
VERY STIFF FINE GRAINED

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* Campanella and Robertson (1983) Friction Ratio correlation

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DRILLER: ConeTec
DATE(S) DRILLED: 8/4/2010 - 8/4/2010
LOGGER:

SOIL BEHAVIOR TYPE*

- SENSITIVE FINE GRAINED
- ORGANIC MATERIAL
- CLAY
- SILTY CLAY TO SILTY CLAY
- CLAYY SLT TO CLAYY SLT
- SANDY SLT TO SANDY SLT
- SILTY SAND TO SILTY SAND
- SAND TO SILTY SAND
- GRAVELY SAND TO SAND
- VERY STIFF FINE GRAINED
- SAND TO CLAYEY SAND
- SAND
- CLAYEY SILT TO SILTY CLAY
- SANDY SILT TO CLAYEY SILT
- CLAY
- GRAVELLY SAND TO SAND
- SENSITIVE FINE GRAINED

* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS:

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**CONE PENETROMETER TEST LOG**

**PROJECT #:** 173189A  
**LOCATION:** Norfolk and Portsmouth, VA  
**OFFSET:** 76.313446°W  
**SURFACE ELEVATION:** -44.6  
**COORD. DATUM:** NAD 83

---  

**DRILLER:** ConeTec  
**DATE(S) DRILLED:** 8/3/2010 - 8/3/2010

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<thead>
<tr>
<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
<th>FRICITION (tsf)</th>
<th>CONE RESISTANCE (tsf)</th>
<th>PORE PRESSURE (tsf)</th>
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**SOIL BEHAVIOR TYPE**

- SEDIMENTARY MATERIAL
- ORGANIC MATERIAL
- CLAY
- SAND
- SANDY SILT
- CLAY
- SILTY CLAY
- CLAYEY SILT
- SANDY SILT
- SILTY SAND
- SANDY SAND
- GRAVELLY SAND
- SENSITIVE FINE GRAINED
- VERY STIFF FINE GRAINED

---  

**REMARKS:**

* Campanella and Robertson (1983) Friction Ratio correlation

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