### TEST BORING LOG

**Client:** IDNR - Site 2226  
**Project Name:** Target Grouting Areas - Site 2226  
**Project Location:** North of Brazil, Indiana

**Boring #**  
BH6-1  

**Location Details**  
- North of Brazil, Indiana  
- Client IDNR - Site 2226  
- Project Name: Target Grouting Areas - Site 2226  
- Project Location: North of Brazil, Indiana

**Drilling and Sampling Information**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>9/13/13</th>
<th>Hammer Wt.</th>
<th>140 lbs.</th>
<th>Date Completed</th>
<th>9/13/13</th>
<th>Hammer Drop</th>
<th>30 in.</th>
<th>Drill Foreman</th>
<th>W. Bates</th>
<th>Spoon Sampler OD</th>
<th>2.0 in.</th>
<th>Inspector</th>
<th>J. Noel</th>
<th>Rock Core Dia.</th>
<th>2.0 in.</th>
<th>Boring Method</th>
<th>HSA</th>
<th>Shelby Tube OD</th>
</tr>
</thead>
</table>

**Soil Classification**

<table>
<thead>
<tr>
<th>Surface Elevation</th>
<th>Stratum Elevation ft</th>
<th>Depth Stratum Sample No.</th>
<th>Sampler Type</th>
<th>Sample Recovery</th>
<th>Sample Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>700.8</td>
<td>700.8</td>
<td>1</td>
<td>SS</td>
<td>X</td>
<td>8-4-6</td>
<td></td>
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<tr>
<td>688.3</td>
<td>685.8</td>
<td>2</td>
<td>SS</td>
<td>X</td>
<td>4-3-4</td>
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<tr>
<td>685.8</td>
<td>685.8</td>
<td>3</td>
<td>SS</td>
<td>X</td>
<td>4-5-8</td>
<td>4-5-8</td>
</tr>
<tr>
<td>682.8</td>
<td>682.8</td>
<td>4</td>
<td>SS</td>
<td>X</td>
<td>4-5-8</td>
<td></td>
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<tr>
<td>682.8</td>
<td>682.8</td>
<td>5</td>
<td>SS</td>
<td>X</td>
<td>3-2-2</td>
<td>Moist from 11-12.5 ft</td>
</tr>
<tr>
<td>682.8</td>
<td>682.8</td>
<td>6</td>
<td>SS</td>
<td>X</td>
<td>18-21-21</td>
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<tr>
<td>682.8</td>
<td>682.8</td>
<td>7</td>
<td>SS</td>
<td>X</td>
<td>39-50/0.3&quot;</td>
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<tr>
<td>668.8</td>
<td>668.8</td>
<td>RC-1</td>
<td>RC</td>
<td>Y</td>
<td>RQD=0%, RC-1 from 18.6 ft to 20.0 ft</td>
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<tr>
<td>668.8</td>
<td>668.8</td>
<td>RC-2</td>
<td>RC</td>
<td>Y</td>
<td>RQD=26%, RC-2 from 20.0 ft to 25.0 ft</td>
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<tr>
<td>668.8</td>
<td>668.8</td>
<td>RC-3</td>
<td>RC</td>
<td>Y</td>
<td>RQD=30%, RC-3 from 25.0 ft to 30.0 ft</td>
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<tr>
<td>668.8</td>
<td>668.8</td>
<td>RC-4</td>
<td>RC</td>
<td>Y</td>
<td>RQD=34%, RC-4 from 30.0 ft to 35.0 ft</td>
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<tr>
<td>668.8</td>
<td>668.8</td>
<td>RC-5</td>
<td>RC</td>
<td>Y</td>
<td>RQD=96%, RC-5 from 35.0 ft to 40.0 ft</td>
<td></td>
</tr>
</tbody>
</table>

**Boring Methods**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
## Test Boring Log

**Client:** IDNR - Site 2226  
**Project Name:** Target Grouting Areas - Site 2226  
**Project Location:** North of Brazil, Indiana

### Drilling and Sampling Information

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<td>Drill Foreman</td>
<td>W. Bates</td>
<td>Spoon Sampler OD</td>
<td>2.0 in.</td>
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<tr>
<td>Inspector</td>
<td>J. Noel</td>
<td>Rock Core Dia.</td>
<td>2.0 in.</td>
</tr>
<tr>
<td>Boring Method</td>
<td>HSA</td>
<td>Shelby Tube OD</td>
<td>-- in.</td>
</tr>
</tbody>
</table>

### Soil Classification (continued)

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Statum Depth, ft.</th>
<th>Stratum Elevation, ft.</th>
<th>Depth Scale, ft.</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sampler Graphics</th>
<th>Sample Limestone or Chalk</th>
<th>Standard Penetration Test, Blow per 6 in Increments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERCLAY, gray</td>
<td>660.8</td>
<td>40.5</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=66%, RC-6 from 40.0 ft to 45.0 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, black, with thin sand interbeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, gray, with interbedded shale</td>
<td>647.3</td>
<td>54.0</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=100%, RC-7 from 45.0 ft to 50.0 ft</td>
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<td></td>
<td></td>
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<tr>
<td>COAL</td>
<td>643.9</td>
<td>57.4</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=82%, RC-8 from 50.0 ft to 55.0 ft</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, black</td>
<td>641.3</td>
<td>60.0</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=22%, RC-9 from 55.0 ft to 60.0 ft</td>
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<td></td>
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<tr>
<td>SHALE, black, clayey</td>
<td>640.9</td>
<td>60.4</td>
<td>RC-10</td>
<td>RC</td>
<td>RQD=54%, RC-10 from 60.0 ft to 65.0 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, black</td>
<td>640.5</td>
<td>60.8</td>
<td></td>
<td></td>
<td>Grouted hole at completion. Capped with bentonite chips and plugged with concrete.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SANDSTONE, gray and white, fine to medium grained</td>
<td>639.2</td>
<td>62.1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>UNDERCLAY, light gray</td>
<td>636.3</td>
<td>65.0</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Bottom of Test Boring at 65.0 ft

### Sample Type
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

### Boring Method
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### CLIENT
IDNR - Site 2226

### PROJECT NAME
Target Grouting Areas - Site 2226

### PROJECT LOCATION
North of Brazil, Indiana

### BORING #
BH6-2

### Noting
Northing
Easting
86.05957.0016

### DRILLING and SAMPLING INFORMATION

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Date Completed</th>
<th>Hammer Wt.</th>
<th>Hammer Drop</th>
<th>Spoon Sampler OD</th>
<th>Rock Core Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/16/13</td>
<td>9/16/13</td>
<td>140 lbs.</td>
<td>30 in.</td>
<td>2.0 in.</td>
<td>2.0 in.</td>
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</tbody>
</table>

### Inspector
S. Bruder

### Drill Foreman
W. Bates

### Boring Method
HSA

### SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Surface Elevation</th>
<th>Stratum Elevation</th>
<th>Stratum Depth</th>
<th>Depth Scale</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Standard Penetration Test - Blows per 6 in. Increments</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>695.046</td>
<td>691.0</td>
<td>4.0</td>
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<td></td>
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<tr>
<td></td>
<td>SILTY CLAY, dark brown, with sand</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>691.0</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>SILTY CLAY, brown, moist, with trace sand</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>680.5</td>
<td>14.5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>SHALE, gray, weathered</td>
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<tr>
<td></td>
<td>676.5</td>
<td>18.5</td>
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<tr>
<td></td>
<td>Interbedded SHALE and SANDSTONE, gray, slightly weathered, moderately hard, broken</td>
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<tr>
<td></td>
<td>668.9</td>
<td>26.1</td>
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<td></td>
<td>VOID - Open</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>MINE COLLAPSE - clay, sandy clay, interbedded shale and sandstone fragments</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>667.4</td>
<td>27.6</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>UNDERCLAY, light gray</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>660.8</td>
<td>34.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SHALEY SANDSTONE, light gray, unweathered, moderately hard, fissile</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>658.0</td>
<td>37.0</td>
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<tr>
<td></td>
<td>655.8</td>
<td>39.2</td>
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</tr>
</tbody>
</table>

### TEST DATA

- **Test Boring Log BH6-2**
- **Northing**: 1571395
- **Easting**: 2945943
- **Job #**: 86.05957.0016
- **Drill Foreman**: W. Bates
- **Inspector**: S. Bruder
- **Boring Method**: HSA

### Soil Classification

- **Silty Clay, dark brown, with sand**
- **Silty Clay, brown, moist, with trace sand**
- **Shale, gray, weathered**
- **Interbedded Shale and Sandstone, gray, slightly weathered, moderately hard, broken**
- **Void - Open**
- **Mine Collapse - Clay, sandy clay, interbedded shale and sandstone fragments**
- **Underclay, light gray**
- **Shaley Sandstone, light gray, unweathered, moderately hard, fissile**

### Sample Type

- **SS**: Driven Split Spoon
- **ST**: Pressed Shelby Tube
- **CA**: Continuous Flight Auger
- **RC**: Rock Core
- **CU**: Cuttings
- **CT**: Continuous Tube

### Depth to Groundwater

- **33.7 ft.**

### Boring Method

- **HSA**: Hollow Stem Augers
- **CFA**: Continuous Flight Auger
- **DC**: Driving Casing
- **MD**: Mud Drilling
- **HA**: Hand Auger

---

Page 1 of 2
1. **CLIENT**: IDNR - Site 2226
2. **PROJECT NAME**: Target Grouting Areas - Site 2226
3. **PROJECT LOCATION**: North of Brazil, Indiana
4. **BORING #**: BH6-2
   - **North**: 1571395
   - **East**: 2945943
   - **JOB #**: 86.05957.0016

**DRILLING and SAMPLING INFORMATION**

- **Date Started**: 9/16/13
- **Hammer Wt.**: 140 lbs.
- **Date Completed**: 9/16/13
- **Hammer Drop**: 30 in.
- **Drill Foreman**: W. Bates
  - **Spoon Sampler OD**: 2.0 in.
- **Inspector**: S. Bruder
  - **Rock Core Dia.**: 2.0 in.
- **Boring Method**: HSA
  - **Shelby Tube OD**: -- in.

**SOIL CLASSIFICATION (continued)**

- **SHALE**, dark gray, unweathered, soft, fissile, few sandstone laminations
  - **Depth @ 645.3 ft**: 49.7 ft

- **MINE COLLAPSE - VOIDS**, small open and filled, fragments of sandy shale and sandstone
  - **Depth @ 635.2 ft**: 59.8 ft

- **SHALE**, dark gray, unweathered, soft
  - **Depth @ 630.4 ft**: 64.6 ft

- **Bottom of Test Boring at 64.6 ft**

**TEST DATA**

- **RQD = 38%**, **RC-5 from 39.6 ft to 44.6 ft**
  - After Run #5, water level 33.7 in drill rods
- **RQD = 46%**, **RC-6 from 44.6 ft to 49.6 ft**
- **RQD = 6%**, **RC-7 from 49.6 ft to 54.6 ft**
  - Lost water at 49.7 ft
- **RQD = 0%**, **RC-8 from 54.6 ft to 59.6 ft**
- **RQD = 14%**, **RC-9 from 59.6 ft to 64.6 ft**
  - Install 2 in. PVC with 10 ft screen to 63.7 ft. Bentonite chips 1.0 to 19.6 ft.

**Sample Type**

- **SS**: Driven Split Spoon
- **ST**: Pressed Shelby Tube
- **CA**: Continuous Flight Auger
- **RC**: Rock Core
- **CU**: Cuttings
- **CT**: Continuous Tube

**Depth to Groundwater**

- **Noted on Drilling Tools**: 33.7 ft
- **At Completion**: ___ ft
- **After ____ hours**: ___ ft
- **Cave Depth**: ___ ft

**Boring Method**

- **HSA**: Hollow Stem Augers
- **CFA**: Continuous Flight Augers
- **DC**: Driving Casing
- **MD**: Mud Drilling
- **HA**: Hand Auger
**Drilling and Sampling Information**

- **Date Started:** 9/12/13
- **Date Completed:** 9/12/13
- **Hammer Drop:** 30 in.
- **Hammer Wt.:** 140 lbs.
- **Drill Foreman:** W. Bates
- **Spoon Sampler OD:** 2.0 in.
- **Rock Core Dia.:** 2.0 in.
- **Drilling Method:** HSA
- **Shelby Tube OD:** -- in.

**Soil Classification**

- **Surface Elevation:** 690.363

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Elevation, ft</th>
<th>Depth, ft</th>
<th>Sample Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTY CLAY, brown, moist</td>
<td>674.9</td>
<td>15.5</td>
<td>RC-1, RC</td>
<td>RQD=0%, RC-1 from 19.2 ft to 20.0 ft</td>
</tr>
<tr>
<td>SANDY SILT with gravel and clay, brown, hard</td>
<td>671.2</td>
<td>19.2</td>
<td>RC-2, RC</td>
<td>RQD=0%, RC-2 from 20.0 ft to 25.0 ft</td>
</tr>
<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard, highly broken, clay seams</td>
<td>663.2</td>
<td>27.2</td>
<td>RC-3, RC</td>
<td>RQD=30%, RC-3 from 25.0 ft to 30.0 ft</td>
</tr>
<tr>
<td>COAL, black</td>
<td>659.8</td>
<td>30.6</td>
<td>RC-4, RC</td>
<td>RQD=72%, RC-4 from 30.0 ft to 35.0 ft</td>
</tr>
<tr>
<td>UNDERCLAY, light gray, soft</td>
<td>656.1</td>
<td>34.3</td>
<td>RC-5, RC</td>
<td>RQD=78%, RC-5 from 35.0 ft to 40.0 ft</td>
</tr>
<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard, very fine grained, thin claystone laminations</td>
<td>653.6</td>
<td>36.8</td>
<td>RC-5, RC</td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, some sandstone laminations</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Depth to Groundwater**

- **Noted on Drilling Tools:** 51.4 ft.
- **At Completion:** 51.4 ft.
- **Cave Depth:** 51.4 ft.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
**Cardno**

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

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**TEST BORING LOG**

**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

**BORING #**
BH6-3

**Drilling and Sampling Information**

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<tr>
<td>Inspector</td>
<td>S. Bruder</td>
<td>Rock Core Dia.</td>
<td>2.0 in.</td>
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<tr>
<td>Boring Method</td>
<td>HSA</td>
<td>Shelby Tube OD</td>
<td>-- in.</td>
</tr>
</tbody>
</table>

**Test Data**

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<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-6</td>
<td></td>
<td>RQD=36%, RC-6 from 40.0 ft to 45.0 ft</td>
</tr>
<tr>
<td>RC-7</td>
<td></td>
<td>RQD=78%, RC-7 from 45.0 ft to 50.0 ft</td>
</tr>
<tr>
<td>RC-8</td>
<td></td>
<td>RQD=80%, RC-8 from 50.0 ft to 55.0 ft</td>
</tr>
<tr>
<td>RC-9</td>
<td></td>
<td>Lost water at 54.5 ft \ RQD=0%, RC-9 from 55.0 ft to 60.0 ft</td>
</tr>
<tr>
<td>RC-10</td>
<td></td>
<td>RQD=54%, RC-10 from 60.0 ft to 65.0 ft</td>
</tr>
</tbody>
</table>

---

**Soil Classification**

(continued)

- SHALE, dark gray, unweathered, soft, some sandstone laminations
- SANDSTONE, light gray, unweathered, moderately hard, (rooted sandstone)
- SANDY SHALE, dark gray, unweathered, soft
- VOID - Filled
- UNDERCLAY, light gray, soft
- SHALE, dark gray, unweathered, soft
- Bottom of Test Boring at 65.0 ft

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**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

---

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

Page 2 of 2
**TEST BORING LOG**

**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

**BORING #**
BH6-4

**Date Started**
9/12/13

**Hammer Wt.**
140 lbs.

**Date Completed**
9/12/13

**Hammer Drop**
30 in.

**Drill Foreman**
W. Bates

**Spoon Sampler OD**
2.0 in.

**Inspector**
S. Bruder

**Rock Core Dia.**
2.0 in.

**Boring Method**
HSA

**Shelby Tube OD**
--- in.

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>SURFACE ELEVATION</th>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Graphics</th>
<th>Standard Penetration Test, Boring per ft</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>687.013</td>
<td>671.0</td>
<td>16.0</td>
<td>10</td>
<td>RC-1</td>
<td>RC</td>
<td>RQD=0%, RC-1 from 18.8 ft to 19.6 ft</td>
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<tr>
<td></td>
<td>667.4</td>
<td>19.6</td>
<td>20</td>
<td>RC-2</td>
<td>RC</td>
<td>RQD=58%, RC-2 from 19.6 ft to 24.6 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>666.9</td>
<td>20.1</td>
<td>20</td>
<td>RC-2</td>
<td>RC</td>
<td>RQD=70%, RC-3 from 24.6 ft to 29.6 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>663.5</td>
<td>23.5</td>
<td>25</td>
<td>RC-3</td>
<td>RC</td>
<td>RQD=23%, RC-4 from 29.6 ft to 39.6 ft</td>
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</tr>
<tr>
<td></td>
<td>655.9</td>
<td>31.1</td>
<td>30</td>
<td>RC-4</td>
<td>RC</td>
<td>Lost water at 31.1 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>651.7</td>
<td>35.3</td>
<td>35</td>
<td>RC-4</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>650.9</td>
<td>36.1</td>
<td>35</td>
<td>RC-4</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>647.7</td>
<td>39.3</td>
<td>30</td>
<td>RC-4</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sample Type**
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**
- Noted on Drilling Tools ft.
- At Completion 31.3 ft.
- After _____ hours ft.
- Cave Depth ft.

**Boring Method**
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Auger
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

**Page 1 of 2**
**TEST BORING LOG**

**CLIENT** | IDNR - Site 2226
---|---
**PROJECT NAME** | Target Grouting Areas - Site 2226
**PROJECT LOCATION** | North of Brazil, Indiana
**BORING #** | BH6-4

<table>
<thead>
<tr>
<th>Northing</th>
<th>1572169</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easting</td>
<td>2945947</td>
</tr>
<tr>
<td>JOB #</td>
<td>86.05957.0016</td>
</tr>
</tbody>
</table>

**DATE**

| Date Started | 9/12/13 |
| Date Completed | 9/12/13 |

**DRILLING and SAMPLING INFORMATION**

| Hammer Wt. | 140 lbs. |
| Hammer Drop | 30 in. |
| Spoon Sampler OD | 2.0 in. |
| Rock Core Dia. | 2.0 in. |
| Shelby Tube OD | -- in. |

**Boring Method** | HSA - Hollow Stem Augers

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft.</th>
<th>Stratum Depth, ft.</th>
<th>Sample Scale, ft.</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SANDSTONE, gray, unweathered, moderately hard, fine grained</td>
<td>647.5</td>
<td>39.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNDERCLAY, light gray, soft, thin sandstone laminations</td>
<td>647.4</td>
<td>39.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of Test Boring at 39.6 ft

**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**

- Noted on Drilling Tools
- At Completion: 31.3 ft.
- After hours: 31.3 ft.
- Cave Depth: 31.3 ft.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

Page 2 of 2
**Date Started:** 9/11/13  
**Date Completed:** 9/11/13

**Hammer Wt.:** 140 lbs.  
**Hammer Drop:** 30 in.

**Drill Foreman:** W. Bates  
**Spoon Sampler OD:** 2.0 in.

**Boring Method:** HSA  
**Shelby Tube OD:** -- in.

---

**SOIL CLASSIFICATION**

**SURFACE ELEVATION:** 680.972

- **10 in. Topsoil**
  - **680.2:** 0.8 ft

- **Silty Clay, brown, moist**
  - **666.5:** 14.5 ft

- **Silty Clay with rock fragments, brown, hard**
  - **664.1:** 16.9 ft
  - **663.6:** 17.4 ft

- **Loam, yellowish brown (10YR 5/4), slightly moist, slightly plastic, non-effervescent, few limestone fragments**
  - **660.8:** 20.2 ft

- **Clay Loam, gray (10YR 5/1), moist, plastic, effervescent**
  - **656.0:** 25.0 ft

- **Sandy Clay, brown and grey, moist, plastic, mixed with limestone fragments**
  - **654.7:** 26.3 ft

- **Shale, dark gray, unweathered, moderately hard, with sandstone laminations**
  - **651.1:** 29.9 ft

- **Shale, dark gray, unweathered, soft**
  - **642.5:** 38.5 ft

- **Sandstone, dark and light gray, unweathered, moderately hard, with shale laminations (rooted sandstone), thinly bedded with soft shale from 35 ft to 35.6 ft**
  - **641.0:** 40.0 ft

Sample Type:
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**

- **41.1 ft**

**Drilling and Sampling Information**

- **Easting:** 2945940
- **Northing:** 1572687
- **JOB #:** 86.05957.0016
- **Hammer Wt.:** 140 lbs.
- **Hammer Drop:** 30 in.
- **Drill Foreman:** W. Bates
- **Spoon Sampler OD:** 2.0 in.
- **Shelby Tube OD:** -- in.
- **Boring Method:** HSA

**TEST DATA**

- **RQD=16%, RC-1 from 16.9 ft to 20.0 ft**
- **RQD=0%, RC-2 from 20.0 ft to 25.0 ft**
- **RQD=60%, RC-3 from 25.0 ft to 30.0 ft**
- **RQD=72%, RC-4 from 30.0 ft to 35.0 ft**
- **RQD=58%, RC-5 from 35.0 ft to 40.0 ft**

**Boring Method:**
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### TEST BORING LOG

**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

---

**BORING #**
BH6-5

**Northing**
1572687

**Easting**
2945940

**JOB #**
86.05957.0016

---

### DRILLING and SAMPLING INFORMATION

- **Date Started**: 9/11/13  
  **Hammer Wt.**: 140 lbs.
- **Date Completed**: 9/11/13  
  **Hammer Drop**: 30 in.
- **Drill Foreman**: W. Bates  
  **Spoon Sampler OD**: 2.0 in.
- **Inspector**: S. Bruder  
  **Rock Core Dia.**: 2.0 in.
- **Boring Method**: HSA  
  **Shelby Tube OD**: -- in.

---

### TEST DATA

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Standard Penetration Test, Blow per in increments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>hard, fissile, highly crushed/intensely disintegrated at 40 ft</td>
<td>636.9</td>
<td>44.1</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=74%, RC-6 from 40.0 ft to 45.0 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interbedded SHALE and SANDSTONE, gray and light gray, unweathered, moderately hard, fissile</td>
<td>636.5</td>
<td>44.5</td>
<td>RC-7</td>
<td>RC</td>
<td>Lost water at 44.1 ft, RQD=0%, RC-7 from 45.0 ft to 50.0 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOID: 0.4 ft</td>
<td>631.0</td>
<td>50.0</td>
<td>50</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MINE COLLAPSE: interbedded shale and sandstone, very soft, dark gray shale, coal, sandstone, shale</td>
<td>636.9</td>
<td>44.1</td>
<td>45</td>
<td>RC-7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Bottom of Test Boring at 50.0 ft**

---

**Sample Type**
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

---

**Depth to Groundwater**
- **At Completion**: 41.1 ft.
- **After _______ hours**: _______ ft.
- **Cave Depth**: _______ ft.

---

**Boring Method**
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

*Page 2 of 2*
**TEST BORING LOG**

**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

**BORING #**
BH6-6

**JOB #**
86.05957.0016

**Drilling and Sampling Information**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>9/3/13</th>
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<tbody>
<tr>
<td>Date Completed</td>
<td>9/4/13</td>
</tr>
<tr>
<td>Drill Foreman</td>
<td>W. Bates</td>
</tr>
<tr>
<td>Inspector</td>
<td>S. Bruder</td>
</tr>
<tr>
<td>Boring Method</td>
<td>HSA</td>
</tr>
</tbody>
</table>

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Elevation</th>
<th>Stratum Depth, ft</th>
<th>Depth, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Groundwater Recovery</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
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<td>675.3</td>
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<td>1</td>
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<td>X</td>
<td>8-7-14</td>
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<td>670.3</td>
<td>6.5</td>
<td>2</td>
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<td>X</td>
<td>17-19-30</td>
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<td>667.8</td>
<td>9.0</td>
<td>4</td>
<td>SS</td>
<td>X</td>
<td>17-24-50/0.05'</td>
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<td></td>
</tr>
<tr>
<td>663.0</td>
<td>13.8</td>
<td>10</td>
<td>RC-1</td>
<td>RC</td>
<td>RQD=0%</td>
<td>RC-1 from 9.0 ft to 9.8 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RC-2</td>
<td>RC</td>
<td>RQD=54%</td>
<td>RC-2 from 9.8 ft to 14.8 ft</td>
<td></td>
</tr>
<tr>
<td>666.8</td>
<td>20.0</td>
<td>20</td>
<td>RC-3</td>
<td>RC</td>
<td>RQD=0%</td>
<td>RC-3 from 14.8 ft to 19.8 ft</td>
<td></td>
</tr>
<tr>
<td>655.5</td>
<td>21.3</td>
<td>30</td>
<td>RC-4</td>
<td>RC</td>
<td>RQD=62%</td>
<td>RC-4 from 19.8 ft to 24.8 ft</td>
<td></td>
</tr>
<tr>
<td>647.6</td>
<td>29.2</td>
<td>35</td>
<td>RC-5</td>
<td>RC</td>
<td>RQD=66%</td>
<td>RC-5 from 24.8 ft to 29.8 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=78%</td>
<td>RC-6 from 29.8 ft to 34.8 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=82%</td>
<td>RC-7 from 34.8 ft to 39.8 ft</td>
<td></td>
</tr>
</tbody>
</table>

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

**Additional Information**

- Noted on Drilling Tools: None
- At Completion: 34.0 ft
- After ___ hours
- Cave Depth: ___ ft
- Auger refusal at 9.0 ft
- RQD=0%, RC-1 from 9.0 ft to 9.8 ft
- RQD=54%, RC-2 from 9.8 ft to 14.8 ft
- RQD=0%, RC-3 from 14.8 ft to 19.8 ft
- RQD=62%, RC-4 from 19.8 ft to 24.8 ft
- RQD=66%, RC-5 from 24.8 ft to 29.8 ft
- RQD=78%, RC-6 from 29.8 ft to 34.8 ft
- RQD=82%, RC-7 from 34.8 ft to 39.8 ft
### THREATS TO THE SUSTAINABILITY OF THE BORING LOG

#### CLIENT
IDNR - Site 2226

#### PROJECT NAME
Target Grouting Areas - Site 2226

#### PROJECT LOCATION
North of Brazil, Indiana

#### Cardno ATC
7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

#### TEST BORING LOG

<table>
<thead>
<tr>
<th>BORING #</th>
<th>BH6-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>1572993</td>
</tr>
<tr>
<td>Easting</td>
<td>2945933</td>
</tr>
<tr>
<td>JOB #</td>
<td>86.05957.0016</td>
</tr>
</tbody>
</table>

#### DRILLING and SAMPLING INFORMATION

- **Date Started**: 9/3/13
- **Date Completed**: 9/4/13
- **Hammer Wt.**: 140 lbs.
- **Hammer Drop**: 30 in.
- **Spoon Sampler OD**: 2.0 in.
- **Rock Core Dia.**: 2.0 in.
- **Drill Foreman**: W. Bates
- **Inspector**: S. Bruder
- **Boring Method**: HSA
- **Shelby Tube OD**: -- in.

#### SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td>0.0 ft.</td>
<td>HSA - Hollow Stem Augers</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td>34.0 ft.</td>
<td>CFA - Continuous Flight Augers</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td>33.0 ft.</td>
<td>DC - Driving Casing</td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td>32.0 ft.</td>
<td>MD - Mud Drilling</td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td>31.0 ft.</td>
<td>HA - Hand Auger</td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td>30.0 ft.</td>
<td></td>
</tr>
</tbody>
</table>

#### TEST DATA

- **RQD=96%**, RC-6 from 39.8 ft to 44.8 ft
- **RQD=86%**, RC-9 from 44.8 ft to 49.8 ft
- **RQD=70%**, RC-10 from 49.8 ft to 54.8 ft
- **RQD=76%**, RC-11 from 54.8 ft to 59.8 ft
- **RQD=98%**, RC-12 from 59.8 ft to 64.8 ft
- **RQD=68%**, RC-13 from 64.8 ft to 69.8 ft
- **RQD=66%**, RC-14 from 69.8 ft to 74.8 ft
- **RQD=50%**, RC-15 from 74.8 ft to 79.8 ft
**TEST BORING LOG**

**CLIENT**  
IDNR - Site 2226

**PROJECT NAME**  
Target Grouting Areas - Site 2226

**PROJECT LOCATION**  
North of Brazil, Indiana

**BORING #**  
BH6-6

**JOB #**  
86.05957.0016

---

**DRILLING and SAMPLING INFORMATION**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Hammer Wt.</th>
<th>Date Completed</th>
<th>Hammer Drop</th>
<th>Drill Foreman</th>
<th>Spoon Sampler OD</th>
<th>Rock Core Dia.</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/3/13</td>
<td>140 lbs.</td>
<td>9/4/13</td>
<td>30 in.</td>
<td>W. Bates</td>
<td>2.0 in.</td>
<td>2.0 in.</td>
<td>HSA</td>
</tr>
</tbody>
</table>

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td><strong>None</strong> ft.</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td><strong>None</strong> ft.</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td><strong>None</strong> ft.</td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td><strong>None</strong> ft.</td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td><strong>None</strong> ft.</td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td><strong>None</strong> ft.</td>
</tr>
</tbody>
</table>

**Remarks**

- Grouted hole at completion, plugged with bentonite chips

---

**TEST DATA**

<table>
<thead>
<tr>
<th>Standard Penetration Test</th>
<th>Blow per 6 in. Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQD=56%, RC-16 from 79.8 ft to 84.8 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=80%, RC-17 from 84.8 ft to 89.8 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=78%, RC-18 from 89.8 ft to 94.8 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=72%, RC-19 from 94.8 ft to 99.8 ft</td>
<td></td>
</tr>
</tbody>
</table>

---

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

**Bottom of Test Boring at 99.8 ft**

---

**Cardno**

7988 Centerpoint Drive, Suite 100  
Indianapolis, IN 46256  
(317) 849-4990  
Fax (317) 849-4278
## Test Boring Log

**Client:** IDNR - Site 2226  
**Project Name:** Target Grouting Areas - Site 2226  
**Project Location:** North of Brazil, Indiana

### Drilling and Sampling Information

| Date Started | 9/4/13 | Hammer Wt. | 140 lbs. |
| Date Completed | 9/14/13 | Hammer Drop | 30 in. |
| Drill Foreman | W. Bates | Spoon Sampler OD | 2.0 in. |
| Inspector | S. Bruder | Rock Core Dia. | 2.0 in. |
| Boring Method | HSA | Shelby Tube OD | -- in. |

### Soil Classification

<table>
<thead>
<tr>
<th>Surface Elevation</th>
<th>Stratum Elevation, ft.</th>
<th>Stratum Depth, ft.</th>
<th>Depth Scale, ft.</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Soil Type</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>688.394</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SILTY CLAY, brown, moist</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>SHALE, gray, soft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, gray and dark gray, soft, broken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, slightly weathered, soft, highly broken, thin sandstone laminations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, brownish gray, unweathered, soft, fissile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, brownish gray, soft, broken, thinly bedded with sandstone (2 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, moderately hard, slightly broken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOID - Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINE COLLAPSE: highly broken, brownish gray shale, sections of unweathered, moderately broken, shale, small open voids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Test Data

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td>• Noted on Drilling Tools</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td>▼ At Completion</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td>▼ After ___ hours</td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td>▼ Cave Depth</td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td></td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boring Method</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSA - Hollow Stem Augers</td>
<td>48.0 ft.</td>
</tr>
<tr>
<td>CFA - Continuous Flight Augers</td>
<td></td>
</tr>
<tr>
<td>DC - Driving Casing</td>
<td></td>
</tr>
<tr>
<td>MD - Mud Drilling</td>
<td></td>
</tr>
<tr>
<td>HA - Hand Auger</td>
<td></td>
</tr>
</tbody>
</table>
CLIENT: IDNR - Site 2226
PROJECT NAME: Target Grouting Areas - Site 2226
PROJECT LOCATION: North of Brazil, Indiana

BH6-7

<table>
<thead>
<tr>
<th>Date Started</th>
<th>9/4/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Completed</td>
<td>9/14/13</td>
</tr>
<tr>
<td>Drill Foreman</td>
<td>W. Bates</td>
</tr>
<tr>
<td>Inspector</td>
<td>S. Bruder</td>
</tr>
<tr>
<td>Boring Method</td>
<td>HSA</td>
</tr>
</tbody>
</table>

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Groundwater Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE COLLAPSE: highly broken, brownish gray shale, sections of unweathered, moderately broken, shale, small open voids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COAL, black</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, grayish brown, broken, soft (underclay)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, grayish brown, unweathered, moderately hard (underclay)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom of Test Boring at 55.0 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Depth to Groundwater**

- At Completion: 48.0 ft
- After ___ hours: ___ ft
- Cave Depth: ___ ft

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

**Remarks**

- Abandon hole with shale trap at 10.0 ft, bentonite chips to 1.0 ft, then concrete to surface
**Cardno ATC**

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

---

**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

---

**BORING #**
BH6-8

---

**DATE**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>9/15/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Completed</td>
<td>9/15/13</td>
</tr>
</tbody>
</table>

**Hammer Wt.**
140 lbs.

**Hammer Drop**
30 in.

**Drill Foreman**
W. Bates

**Inspector**
S. Bruder

**Boring Method**
HSA

**TEST DATA**

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Completion</td>
<td>46.5 ft.</td>
</tr>
<tr>
<td>After ________ hours</td>
<td>________ ft.</td>
</tr>
<tr>
<td>Cave Depth</td>
<td>________ ft.</td>
</tr>
</tbody>
</table>

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>656.8</td>
<td>SILTY CLAY with trace sand and rock fragments, brown</td>
</tr>
<tr>
<td>654.5</td>
<td>SHALE, gray and brown, soft</td>
</tr>
<tr>
<td>653.0</td>
<td>LOAM, brown (10YR 4/13), brown, moist</td>
</tr>
<tr>
<td>650.6</td>
<td>SHALE, gray and brown, moderately weathered, soft</td>
</tr>
<tr>
<td>649.4</td>
<td>SHALE, gray, unweathered, soft</td>
</tr>
<tr>
<td>649.9</td>
<td>SHALE, brownish gray, unweathered, soft, fissile, thin sandstone laminations</td>
</tr>
<tr>
<td>646.9</td>
<td>SHALE, dark gray, unweathered, soft, fissile, partial water loss at 22 ft</td>
</tr>
<tr>
<td>638.0</td>
<td>SILTSTONE, dark gray, unweathered, moderately hard</td>
</tr>
<tr>
<td>637.5</td>
<td>VOID - Open</td>
</tr>
<tr>
<td>636.2</td>
<td>MINE COLLAPSE - Interbedded SHALE and SANDSTONE, dark gray, slightly weathered, fissile, broken at 35.3 ft, 40.3 ft, 43.2 ft, no drop in rods or open voids noted</td>
</tr>
</tbody>
</table>

---

**TEST BORING LOG**

**BH6-8**

| Northing | 1573758 |
| Easting | 2945949 |

**JOB #**
86.05957.0016
# Test Boring Log

## Client
- **IDNR** - Site 2226

## Project Name
- **Target Grouting Areas - Site 2226**

## Project Location
- North of Brazil, Indiana

---

## Drilling and Sampling Information

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Date Completed</th>
<th>Hammer Wt.</th>
<th>Hammer Drop</th>
<th>Spoon Sampler OD</th>
<th>Rock Core Dia.</th>
<th>Boring Method</th>
<th>Shelby Tube OD</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/15/13</td>
<td>9/15/13</td>
<td>140 lbs.</td>
<td>30 in.</td>
<td>2.0 in.</td>
<td>2.0 in.</td>
<td>HSA</td>
<td>-- in.</td>
</tr>
</tbody>
</table>

## Soil Classification

- **MINE COLLAPSE** - Interbedded SHALE and SANDSTONE, dark gray, slightly weathered, fissile, broken at 35.3 ft, 40.3 ft, 43.2 ft, no drop in rods or open voids noted.

- SHALE, black, unweathered, fissile

- SHALE with COAL, black

- SHALE, brownish gray and gray, soft, fissile, crushed at 57 ft (underclay)

- Bottom of Test Boring at 60.3 ft

---

## Test Data

- **RQD=85%**, **RC-7** from 40.3 ft to 45.3 ft
- **RQD=0%**, **RC-8** from 45.3 ft to 50.3 ft
- **RQD=26%**, **RC-9** from 50.3 ft to 55.3 ft
- **RQD=42%**, **RC-10** from 55.3 ft to 60.3 ft

- Installed shale trap with capped pipe to 13.8 ft, chips to 12.0 ft, grout to 3.0 ft, chips to 1.0 ft, concrete then topsoil

---

## Sample Type
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube
**Client**: IDNR - Site 2226  
**Project Name**: Target Grouting Areas - Site 2226  
**Project Location**: North of Brazil, Indiana

**Date Started**: 9/11/13  
**Date Completed**: 9/11/13

**Hammer Wt.**: 140 lbs.  
**Hammer Drop**: 30 in.

**Drill Foreman**: W. Bates  
**Spoon Sampler OD**: 2.0 in.

**Inspector**: C. Bishop  
**Rock Core Dia.**: 2.0 in.

**Boring Method**: HSA  
**Shelby Tube OD**: -- in.

---

**Soil Classification**

<table>
<thead>
<tr>
<th>Surface Elevation</th>
<th>Stratum</th>
<th>Depth, ft.</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Standard Penetration Test, Blow per foot (Feet)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>643.2</td>
<td>RC-1</td>
<td>3.4</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=0%, RC-1 from 3.4 ft to 4.7 ft</td>
<td></td>
</tr>
<tr>
<td>637.4</td>
<td>RC-2</td>
<td>9.2</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=50%, RC-2 from 4.7 ft to 8.7 ft</td>
<td></td>
</tr>
<tr>
<td>631.6</td>
<td>RC-3</td>
<td>15.0</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>Lost water at 9.2 ft</td>
<td></td>
</tr>
<tr>
<td>628.0</td>
<td>RC-4</td>
<td>18.6</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=0%, RC-3 from 9.7 ft to 14.7 ft</td>
<td></td>
</tr>
<tr>
<td>620.8</td>
<td>RC-5</td>
<td>25.8</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>Small filled voids with collapse rock in RC-3.</td>
<td></td>
</tr>
<tr>
<td>614.6</td>
<td>RC-6</td>
<td>32.0</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=30%, RC-5 from 19.7 ft to 24.7 ft</td>
<td></td>
</tr>
<tr>
<td>614.6</td>
<td>RC-7</td>
<td>35.0</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=64%, RC-6 from 24.7 ft to 29.7 ft</td>
<td></td>
</tr>
<tr>
<td>614.6</td>
<td>RC-8</td>
<td>38.0</td>
<td>RC</td>
<td>RC</td>
<td></td>
<td>RQD=64%, RC-7 from 29.7 ft to 34.7 ft</td>
<td></td>
</tr>
</tbody>
</table>

**Sample Type**:  
- SS - Driven Split Spoon  
- ST - Pressed Shelby Tube  
- CA - Continuous Flight Auger  
- RC - Rock Core  
- CU - Cuttings  
- CT - Continuous Tube  

**Depth to Groundwater**: 17.0 ft.

**Boring Method**:  
- HSA - Hollow Stem Augers  
- CFA - Continuous Flight Augers  
- DC - Driving Casing  
- MD - Mud Drilling  
- HA - Hand Auger
### CLIENT
IDNR - Site 2226

### PROJECT NAME
Target Grouting Areas - Site 2226

### PROJECT LOCATION
North of Brazil, Indiana

<table>
<thead>
<tr>
<th>BORING #</th>
<th>BH6-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northing</td>
<td>1574166</td>
</tr>
<tr>
<td>Easting</td>
<td>2945974</td>
</tr>
<tr>
<td>JOB #</td>
<td>86.05957.0016</td>
</tr>
</tbody>
</table>

**DRILLING and SAMPLING INFORMATION**

- **Date Started**: 9/11/13
- **Hammer Wt.**: 140 lbs.
- **Date Completed**: 9/11/13
- **Hammer Drop**: 30 in.
- **Drill Foreman**: W. Bates
- **Spoon Sampler OD**: 2.0 in.
- **Inspector**: C. Bishop
- **Rock Core Dia.**: 2.0 in.
- **Boring Method**: HSA
- **Shelby Tube OD**: -- in.

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No</th>
<th>Sample Type</th>
<th>Standard Penetration Test, Blow per in.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>605.6</td>
<td>41.0</td>
<td></td>
<td></td>
<td>RC-9</td>
<td>RQD=64%, RC-9 from 39.7 ft to 44.7 ft</td>
<td></td>
</tr>
<tr>
<td>596.9</td>
<td>49.7</td>
<td></td>
<td></td>
<td>RC-10</td>
<td>RQD=56%, RC-10 from 44.7 ft to 49.7 ft</td>
<td></td>
</tr>
</tbody>
</table>

- **Bottom of Test Boring at 49.7 ft**

**TEST DATA**

- Note on Drilling Tools: 17.0 ft.
- At Completion: __________ ft.
- After ______ hours: __________ ft.
- Cave Depth: __________ ft.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

---

**Page 2 of 2**
**Client:** IDNR - Site 2226  
**Project Name:** Target Grouting Areas - Site 2226  
**Project Location:** North of Brazil, Indiana

**Boring #**  
BH6-10  
**Job #** 8605957.0016

**Drilling and Sampling Information**

| Date Started | 9/15/13 | Hammer Weight | 140 lbs. |
| Date Completed | 9/15/13 | Hammer Drop | 30 in. |
| Drill Foreman | W. Bates |
| Inspector | S. Bruder |
| Boring Method | HSA |

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Recovery</th>
<th>Groundwater</th>
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</thead>
<tbody>
<tr>
<td>627.3</td>
<td>2.0</td>
<td>1</td>
<td>SS</td>
<td>-</td>
<td>7-5-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>625.8</td>
<td>3.5</td>
<td>2</td>
<td>SS</td>
<td>-</td>
<td>4-2-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>623.3</td>
<td>6.0</td>
<td>3</td>
<td>SS</td>
<td>-</td>
<td>2-4-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>621.1</td>
<td>8.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test Data**

- **RQD=73%, RC-1 from 9.0 ft to 10.1 ft**
- **RQD=86%, RC-2 from 10.1 ft to 15.1 ft**
- **RQD=88%, RC-3 from 15.1 ft to 20.1 ft**
- **RQD=65%, RC-4 from 20.1 ft to 25.1 ft**
- **RQD=66%, RC-5 from 25.1 ft to 30.1 ft**
- **RQD=68%, RC-6 from 30.1 ft to 35.1 ft**

Grouted hole at completion by tremie. Plugged at the surface with concrete.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

**Surface Elevation:** 629.301

**Bottom of Test Boring at 35.1 ft**

**Sample Types**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**

- Noted on Drilling Tools: 6.0 ft.
- At Completion: 6.9 ft.
- After ________ hours: ________ ft.
- Cave Depth: ________ ft.
**CLIENT**
IDNR - Site 2226

**PROJECT NAME**
Target Grouting Areas - Site 2226

**PROJECT LOCATION**
North of Brazil, Indiana

---

**DRILLING and SAMPLING INFORMATION**

| Date Started | 9/15/13 | Hammer Wt. | 140 lbs. |
| Date Completed | 9/15/13 | Hammer Drop | 30 in. |
| Drill Foreman | W. Bates | Spoon Sampler OD | 2.0 in. |
| Inspector | S. Bruder | Rock Core Dia. | 2.0 in. |
| Boring Method | HSA | Shelby Tube OD | -- in. |

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>SURFACE ELEVATION</th>
<th>644.834</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILT</td>
<td>with sand and gravel, brown to dark brown</td>
</tr>
<tr>
<td>SILTY CLAY</td>
<td>with trace sand and rock fragments, brown, moist</td>
</tr>
<tr>
<td>SANDY CLAY</td>
<td>dark brown, very moist</td>
</tr>
<tr>
<td>SANDSTONE, weathered</td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, brown, slightly weathered, moderately hard, medium grained, well sorted</td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, light gray, with gray sandstone laminations, unweathered, moderately hard, medium grained, well sorted</td>
<td></td>
</tr>
</tbody>
</table>

---

**TEST DATA**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample No.</th>
<th>Standard Penetration Test Blow per 6 in. increments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td></td>
<td></td>
<td>Auger refusal at 13.7 ft</td>
</tr>
<tr>
<td>ST</td>
<td></td>
<td></td>
<td>RQD=0%, RC-1 from 13.7 ft to 14.5 ft</td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td></td>
<td>RQD=92%, RC-2 from 14.5 ft to 19.5 ft</td>
</tr>
<tr>
<td>RC</td>
<td></td>
<td></td>
<td>RQD=76%, RC-3 from 19.5 ft to 24.5 ft</td>
</tr>
<tr>
<td>CT</td>
<td></td>
<td></td>
<td>RQD=94%, RC-4 from 24.5 ft to 29.5 ft</td>
</tr>
<tr>
<td>RC</td>
<td></td>
<td></td>
<td>RQD=80%, RC-5 from 29.5 ft to 34.5 ft</td>
</tr>
<tr>
<td>RC</td>
<td></td>
<td></td>
<td>RQD=88%, RC-6 from 34.5 ft to 39.5 ft</td>
</tr>
<tr>
<td>Lost water at 35.0 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
CLIENT: IDNR - Site 2226
PROJECT NAME: Target Grouting Areas - Site 2226
PROJECT LOCATION: North of Brazil, Indiana

BOARING #: BH6-11

Date Started: 9/15/13
Date Completed: 9/15/13
Drill Foreman: W. Bates
Inspector: S. Bruder
Boring Method: HSA

Hammer Wt.: 140 lbs.
Hammer Drop: 30 in.
Spoon Sampler OD: 2.0 in.
Rock Core Dia.: 2.0 in.

SOIL CLASSIFICATION

(continued)

SANDSTONE, light gray, with gray sandstone laminations, unweathered, moderately hard, medium grained, well sorted

Bottom of Test Boring at 49.5 ft

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td>Noted on Drilling Tools</td>
<td>HSA - Hollow Stem Augers</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td>At Completion</td>
<td>CFA - Continuous Flight Augers</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td>After hours</td>
<td>DC - Driving Casing</td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td></td>
<td>MD - Mud Drilling</td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td></td>
<td>HA - Hand Auger</td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grouted hole at completion, plugged at the surface with bentonite chips covered by concrete.
CLIENT: IDNR - Site 2226
PROJECT NAME: Target Grouting Areas - Site 2226
PROJECT LOCATION: North of Brazil, Indiana

BORING #: BH6-12
Nothing: 1575368
Easting: 2945986
JOB #: 86.05957.0016

DRILLING and SAMPLING INFORMATION
Date Started: 9/9/13
Date Completed: 9/9/13
Drill Foreman: W. Bates
Inspector: S. Bruder
Boring Method: HSA

SOIL CLASSIFICATION
SURFACE ELEVATION: 663.377

- SILTY CLAY with trace sand and rock fragments, brown, moist
- SHALE, brown, weathered
- SHALE, dark gray, slightly weathered, very soft
- SANDY SHALE, dark gray, unweathered, soft
- SHALE, dark gray, unweathered, with thin sandstone laminations, fissile
- SANDSTONE, dark gray, unweathered, moderately hard
- SANDY SHALE, dark gray, unweathered, moderately hard
- COAL with SHALE
- SHALE, dark gray, unweathered, moderately hard

DEPTH TO GROUNDWATER
- RQD=0%, RC-1 from 13.6 ft to 14.6 ft
- RQD=44%, RC-2 from 14.6 ft to 19.6 ft
- RQD=100%, RC-3 from 19.6 ft to 24.6 ft
- RQD=74%, RC-4 from 24.6 ft to 29.6 ft
- RQD=44%, RC-5 from 29.6 ft to 34.6 ft
- Lost water at 33.1 ft
- RQD=16%, RC-6 from 34.6 ft to 39.6 ft

Sample Type:
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

Depth to Groundwater:
- At Completion: 33.6 ft
- After _______ hours: _______ ft
- Cave Depth: _______ ft

Boring Method:
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
**TEST BORING LOG**

**CLIENT** IDNR - Site 2226

**PROJECT NAME** Target Grouting Areas - Site 2226

**PROJECT LOCATION** North of Brazil, Indiana

**BORING #** BH6-12

**NORTHING** 1575368

**EASTING** 2945986

**JOB #** 86.05957.0016

---

**DRILLING and SAMPLING INFORMATION**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Hammer Wt.</th>
<th>Date Completed</th>
<th>Hammer Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/9/13</td>
<td>140 lbs.</td>
<td>9/9/13</td>
<td>30 in.</td>
</tr>
</tbody>
</table>

**Drill Foreman** W. Bates

**Inspector** S. Bruder

**Boring Method** HSA

**Shelby Tube OD** -- in.

---

**SOIL CLASSIFICATION**

**(continued)**

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>74.6 ft</td>
<td>RC-7 RC</td>
</tr>
<tr>
<td>619.8 ft</td>
<td>RC-6 RC</td>
</tr>
<tr>
<td>618.8 ft</td>
<td>RC-5 RC</td>
</tr>
<tr>
<td>614.9 ft</td>
<td>RC-4 RC</td>
</tr>
<tr>
<td>609.6 ft</td>
<td>RC-3 RC</td>
</tr>
<tr>
<td>603.6 ft</td>
<td>RC-2 RC</td>
</tr>
<tr>
<td>588.8 ft</td>
<td>RC-1 RC</td>
</tr>
</tbody>
</table>

**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger

---

**TEST DATA**

**RC-7**

- RQD=36%
- RC-7 from 39.6 ft to 44.6 ft

**RC-8**

- RQD=38%
- RC-8 from 44.6 ft to 49.6 ft

**RC-9**

- RQD=50%
- RC-9 from 49.6 ft to 54.6 ft

**RC-10**

- RQD=84%
- RC-10 from 54.6 ft to 59.6 ft

**RC-11**

- RQD=78%
- RC-11 from 59.6 ft to 64.6 ft

**RC-12**

- RQD=70%
- RC-12 from 64.6 ft to 69.6 ft

**RC-13**

- RQD=86%
- RC-13 from 69.6 ft to 74.6 ft

**Set 2 in. PVC piezometer screened from 30 ft to 40 ft. Shale trap at 13.6 ft.**
**Cardno ATC**

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

---

**CLIENT**  
IDNR - Site 2226

**PROJECT NAME**  
Target Grouting Areas - Site 2226

**PROJECT LOCATION**  
North of Brazil, Indiana

---

**BORING #**  
BH6-13

**Noting**  
1575688

**Easting**  
2945993

**JOB #**  
86.05957.0016

---

**DRILLING and SAMPLING INFORMATION**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>9/10/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Completed</td>
<td>9/10/13</td>
</tr>
<tr>
<td>Drill Foreman</td>
<td>W. Bates</td>
</tr>
<tr>
<td>Inspector</td>
<td>S. Bruder</td>
</tr>
<tr>
<td>Boring Method</td>
<td>HSA</td>
</tr>
</tbody>
</table>

**Hammer Wt.**  
140 lbs.

**Hammer Drop**  
30 in.

**Spoon Sampler OD**  
2.0 in.

**Rock Core Dia.**  
2.0 in.

**Drilling Tools**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft.</th>
<th>Stratum Depth, ft.</th>
<th>Depth to Groundwater, ft.</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>656.1</td>
<td>14.7</td>
<td>RC-1</td>
<td>RC</td>
</tr>
<tr>
<td>648.2</td>
<td>22.6</td>
<td>RC-2</td>
<td>RC</td>
</tr>
<tr>
<td>644.1</td>
<td>26.7</td>
<td>RC-3</td>
<td>RC</td>
</tr>
<tr>
<td>637.7</td>
<td>33.1</td>
<td>RC-6</td>
<td>RC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sample No.</td>
</tr>
</tbody>
</table>

**SOIL CLASSIFICATION**

- **Surface Elevation 670.843**

- **Silty Clay, brown, moist**

- **Loam, light brownish gray (10YR 6/2), and very soft, dark gray shale**

- **Coal, black, depth estimated**

- **Sandy shale (underclay), light gray, unweathered, soft**

- **Shale, dark gray, unweathered, soft, some sandstone laminations**

**Sample Recovery**

- Noted on Drilling Tools 12.0 ft.
- At Completion 12.0 ft.
- After ____ hours ___ ft.
- Cave Depth ___ ft.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### TEST BORING LOG

**BOARING #** BH6-13

**Nothing** 1575688

**Easting** 2945993

**JOB #** 86.05957.0016

---

**CLIENT** IDNR - Site 2226

**PROJECT NAME** Target Grouting Areas - Site 2226

**PROJECT LOCATION** North of Brazil, Indiana

---

**Date Started** 9/10/13

**Date Completed** 9/10/13

**Drill Foreman** W. Bates

**Inspector** S. Bruder

**Boring Method** HSA

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td></td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td></td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td></td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td></td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td></td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of Test Boring at 59.7 ft**

---

**TEST DATA**

<table>
<thead>
<tr>
<th>Standard Penetration Test</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQD=70%, RC-7 from 39.7 ft to 44.7 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=70%, RC-8 from 44.7 ft to 49.7 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=28%, RC-9 from 49.7 ft to 54.7 ft</td>
<td></td>
</tr>
<tr>
<td>RQD=22%, RC-10 from 54.7 ft to 59.7 ft</td>
<td></td>
</tr>
</tbody>
</table>

Grouted hole at completion. Plugged with bentonite chips covered with concrete at the surface.
CLIENT: IDNR - Site 2226
PROJECT NAME: Target Grouting Areas - Site 2226
PROJECT LOCATION: North of Brazil, Indiana

BORING #: BH6-14
North: 1576156
East: 2945998
JOB #: 86.05957.0016

Date Started: 9/10/13
Date Completed: 9/10/13
Hammer Wt.: 140 lbs.
Hammer Drop: 30 in.

Drill Foreman: W. Bates
Spoon Sampler OD: 2.0 in.

Inspector: S. Bruder
Rock Core Dia.: 2.0 in.

SURFACE ELEVATION: 670.383

SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td>Noted on Drilling Tools</td>
<td></td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td>At Completion</td>
<td></td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td>After _____ hours</td>
<td></td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td>Cave Depth</td>
<td></td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEST DATA

RQD=0%, RC-1 from 13.9 ft to 15.0 ft
RQD=0%, RC-2 from 15.0 ft to 20.0 ft
RQD=0%, RC-3 from 20.0 ft to 25.0 ft
RQD= %, RC-4 from 25.0 ft to 27.0 ft
RQD= %, RC-5 from 27.0 ft to 30.0 ft
RQD=60%, RC-6 from 30.0 ft to 35.0 ft
RQD=44%, RC-7 from 35.0 ft to 40.0 ft

Boring Method:
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
HA - Hand Auger
Cardno
ATC

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT IDNR - Site 2226
PROJECT NAME Target Grouting Areas - Site 2226
PROJECT LOCATION North of Brazil, Indiana

BORING # BH6-14

Date Started 9/10/13
Date Completed 9/10/13
Hammer Wt. 140 lbs.
Hammer Drop 30 in.

Drill Foreman W. Bates
Inspector S. Bruder

Boring Method HSA

Drilling and SAMPLING INFORMATION

Date Started: 9/10/13
Date Completed: 9/10/13
Hammer Wt.: 140 lbs.
Hammer Drop: 30 in.

Drill Foreman: W. Bates
Inspector: S. Bruder

Boring Method: HSA

SOIL CLASSIFICATION

Shale, gray, soft, disintegrated at 39.2 ft to 39.9 ft
Shale, gray, unweathered, moderately hard, with thin sandstone laminations
Interbedded Shale and Sandstone, gray, unweathered, moderately hard

Shale, gray, unweathered, moderately hard, with thin sandstone laminations

Interbedded Shale and Sandstone, gray, unweathered, moderately hard

Bottom of Test Boring at 55.0 ft

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools
At Completion
After hours
Cave Depth

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
HA - Hand Auger
### Test Boring Log

**Client:** IDNR - Site 2227  
**Project Name:** Target Grouting Areas - Site 2227  
**Project Location:** North of Brazil, Indiana

#### Drilling and Sampling Information
- **Date Started:** 9/18/13  
- **Date Completed:** 9/18/13  
- **Drill Foreman:** W. Bates  
- **Inspector:** S. Bruder  
- **Boring Method:** HSA  

#### Soil Classification

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Sample Type</th>
<th>Depth, ft</th>
<th>Sample No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SANDY SILT, dark brown, with gravel</td>
<td>SS</td>
<td>650.9</td>
<td>1</td>
<td>Noted on Drilling Tools</td>
</tr>
<tr>
<td>SANDY SILT, brown, slightly moist, with gravel</td>
<td>SS</td>
<td>648.2</td>
<td>1</td>
<td>At Completion</td>
</tr>
<tr>
<td>CLAY LOAM, yellowish brown (10YR 6/6), moist, plastic, non-effervescent</td>
<td>RC-1</td>
<td>645.7</td>
<td>2</td>
<td>After 2.0 hours</td>
</tr>
<tr>
<td>UNDERCLAY, light gray</td>
<td>RC-2</td>
<td>643.4</td>
<td>2</td>
<td>Cave Depth</td>
</tr>
<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard</td>
<td>RC-3</td>
<td>640.1</td>
<td>2</td>
<td>33.8 ft.</td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, thin sandstone laminations</td>
<td>RC-4</td>
<td>628.3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, dark gray, unweathered, moderately hard, rooted structures</td>
<td>RC-5</td>
<td>623.3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, fissile</td>
<td>RC-6</td>
<td>622.2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>VOID - MINE COLLAPSE, filled, shale and some coal fragments</td>
<td>RC-7</td>
<td>617.2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, fissile</td>
<td>RC-8</td>
<td>612.2</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

#### Test Data

**Standard Penetration Test, Blows per 6 in. Increments**
- **RQD=78%, RC-1 from 3.6 ft to 4.6 ft**
- **RQD=62%, RC-2 from 4.6 ft to 9.6 ft**
- **RQD=54%, RC-3 from 9.6 ft to 14.6 ft**
- **RQD=78%, RC-4 from 14.6 ft to 19.6 ft**
- **RQD=22%, RC-5 from 19.6 ft to 24.6 ft**
- **RQD=0%, RC-7 from 29.6 ft to 34.6 ft**
- **RQD=80%, RC-8 from 34.6 ft to 39.6 ft**
- **Retrieved 0.3 ft core from previous run**
- **Lost water at 29.6 ft**
- **Set 2 in. PVC with 10 ft screen to 37.5 ft**

**Boring Method:** HSA - Hollow Stem Augers  
**CFA - Continuous Flight Augers**  
**DC - Driving Casing**  
**MD - Mud Drilling**  
**HA - Hand Auger**  

---

**Surface Elevation:** 651.789  
**Depth to Groundwater:** 33.8 ft.  
**Remarks:**  
- Noted on Drilling Tools  
- At Completion  
- After 2.0 hours  
- Cave Depth  

---

**Test Boring Log**

---

**Drill and Sampling Information**

- **Date Started:** 9/18/13  
- **Date Completed:** 9/18/13  
- **Drill Foreman:** W. Bates  
- **Inspector:** S. Bruder  
- **Boring Method:** HSA  

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Sample Type</th>
<th>Depth, ft</th>
<th>Sample No.</th>
<th>Remarks</th>
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</thead>
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<tr>
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<td>SS</td>
<td>648.2</td>
<td>1</td>
<td>At Completion</td>
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<tr>
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<td>RC-1</td>
<td>645.7</td>
<td>2</td>
<td>After 2.0 hours</td>
</tr>
<tr>
<td>UNDERCLAY, light gray</td>
<td>RC-2</td>
<td>643.4</td>
<td>2</td>
<td>Cave Depth</td>
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<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard</td>
<td>RC-3</td>
<td>640.1</td>
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<td>622.2</td>
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<tr>
<td>VOID - MINE COLLAPSE, filled, shale and some coal fragments</td>
<td>RC-7</td>
<td>617.2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, fissile</td>
<td>RC-8</td>
<td>612.2</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
### TEST BORING LOG

**CLIENT** | **IDNR - Site 2227**
--- | ---
**PROJECT NAME** | **Target Grouting Areas - Site 2227**
--- | ---
**PROJECT LOCATION** | **North of Brazil, Indiana**
--- | ---

**BORING #** | **BH7-1**
--- | ---
**Northing** | **1571005**
--- | ---
**Easting** | **2943926**
--- | ---
**JOB #** | **86.05957.0016**
--- | ---

### DRILLING and SAMPLING INFORMATION

| Date Started | 9/18/13 | Hammer Wt. | 140 lbs. |
--- | --- | --- | --- |
| Date Completed | 9/18/13 | Hammer Drop | 30 in. |
--- | --- | --- | --- |
| Drill Foreman | W. Bates | Spoon Sampler OD | 2.0 in. |
--- | --- | --- | --- |
| Inspector | S. Bruder | Rock Core Dia. | 2.0 in. |
--- | --- | --- | --- |
| Boring Method | HSA | Shelby Tube OD | -- in. |
--- | --- | --- | --- |

### TEST DATA

| Sample Type | Depth to Groundwater | Boring Method |
--- | --- | --- |
| SS - Driven Split Spoon | ☀ Noted on Drilling Tools | HSA - Hollow Stem Augers |
| ST - Pressed Shelby Tube | © At Completion 33.8 ft. | CFA - Continuous Flight Augers |
| CA - Continuous Flight Auger | ✈ After _______ hours _______ ft. | DC - Driving Casing |
| RC - Rock Core | ☉ Cave Depth _______ ft. | MD - Mud Drilling |
| CU - Cuttings | | HA - Hand Auger |
| CT - Continuous Tube | | |

**SOIL CLASSIFICATION**

| Stratum | Depth, ft | Sample No. | Sample Graphics | Remarks |
--- | --- | --- | --- | --- |
| (continued) | | | | |

**Bottom of Test Boring at 39.6 ft**
# Test Boring Log

## Drilling and Sampling Information

- **Date Started:** 10/2/13
- **Date Completed:** 10/2/13
- **Hammer Wt.:** 140 lbs.
- **Hammer Drop:** 30 in.
- **Drill Foreman:** W. Bates
- **Spoon Sampler OD:** 2.0 in.
- **Inspector:** S. Bruder
- **Rock Core Dia.:** 2.0 in.
- **Boring Method:** HSA
- **Shelby Tube OD:** -- in.

## Test Data

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.7 ft.</td>
<td>HSA - Hollow Stem Augers</td>
</tr>
<tr>
<td>26.7 ft.</td>
<td>CFA - Continuous Flight Augers</td>
</tr>
<tr>
<td>26.7 ft.</td>
<td>DC - Driving Casing</td>
</tr>
<tr>
<td>26.7 ft.</td>
<td>MD - Mud Drilling</td>
</tr>
<tr>
<td>26.7 ft.</td>
<td>HA - Hand Auger</td>
</tr>
</tbody>
</table>

## Soil Classification

- **SANDY SILTY CLAY, brown, moist**
- **SANDY SILTY CLAY, brown, very moist**
- **SHALE, gray**
- **CLAYEY SHALE, dark gray and brown, very soft**
- **COAL, black**
- **UNDERCLAY, beige, soft**
- **SANDSTONE, light beige, moderately hard, slightly weathered, thin clay laminations**
- **SHALE, dark gray, slightly weathered, soft, fissile, broken from 34.0-35.5 ft, thin sandstone laminations**
## DRILLING and SAMPLING INFORMATION

| Date Started | 10/2/13 |
| Date Completed | 10/2/13 |
| Drill Foreman | W. Bates |
| Inspector | S. Bruder |
| Boring Method | HSA |

## TEST DATA

<table>
<thead>
<tr>
<th>Depth</th>
<th>Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>636.5</td>
<td>40.5</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=74%, RC-6 from 39.5 ft to 44.5 ft</td>
</tr>
<tr>
<td>631.7</td>
<td>45.3</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=64%, RC-7 from 44.5 ft to 49.5 ft</td>
</tr>
<tr>
<td>630.9</td>
<td>46.1</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=60%, RC-8 from 49.5 ft to 54.5 ft</td>
</tr>
<tr>
<td>627.5</td>
<td>49.5</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=24%, RC-9 from 54.5 ft to 59.5 ft</td>
</tr>
</tbody>
</table>

- **Bottom of Test Boring at 59.5 ft**
- **Set well at 58.6 ft**

### SOIL CLASSIFICATION

- **SHALE, dark gray, slightly weathered, soft, fissile, broken from 34.0-35.5 ft, thin sandstone laminations**
- **SHALEY SANDSTONE, gray, slightly weathered, moderately hard, rooted structures**
- **VOID**
- **SANDY SHALE, dark gray, unweathered, slightly fissile**
- **UNDERCLAY, gray, soft**
- **SHALE, dark gray, soft, fissile, with plant fossils**

## SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
</tr>
<tr>
<td>RC - Rock Core</td>
</tr>
<tr>
<td>CU - Cuttings</td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
</tr>
</tbody>
</table>

## REMARKS

- **Standard Penetration Test, Blows per 6 in. Increments**
- **Groundwater**

## TEST BORING LOG

**CLIENT** | IDNR - Site 2227
**PROJECT NAME** | Target Grouting Areas - Site 2227
**PROJECT LOCATION** | North of Brazil, Indiana
**BORING #** | BH7-2
**Northing** | 1570995
**Easting** | 2944288
**JOB #** | 86.05957.0016

**DRILLING and SAMPLING INFORMATION**

| Date Started | 10/2/13 |
| Date Completed | 10/2/13 |
| Drill Foreman | W. Bates |
| Inspector | S. Bruder |
| Boring Method | HSA |

**SOIL CLASSIFICATION**

- **SHALE, dark gray, slightly weathered, soft, fissile, broken from 34.0-35.5 ft, thin sandstone laminations**
- **SHALEY SANDSTONE, gray, slightly weathered, moderately hard, rooted structures**
- **VOID**
- **SANDY SHALE, dark gray, unweathered, slightly fissile**
- **UNDERCLAY, gray, soft**
- **SHALE, dark gray, soft, fissile, with plant fossils**

**TEST DATA**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>636.5</td>
<td>40.5</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=74%, RC-6 from 39.5 ft to 44.5 ft</td>
</tr>
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<td>631.7</td>
<td>45.3</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=64%, RC-7 from 44.5 ft to 49.5 ft</td>
</tr>
<tr>
<td>630.9</td>
<td>46.1</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=60%, RC-8 from 49.5 ft to 54.5 ft</td>
</tr>
<tr>
<td>627.5</td>
<td>49.5</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=24%, RC-9 from 54.5 ft to 59.5 ft</td>
</tr>
</tbody>
</table>

- **Bottom of Test Boring at 59.5 ft**
- **Set well at 58.6 ft**

### Sample Type

- **SS** - Driven Split Spoon
- **ST** - Pressed Shelby Tube
- **CA** - Continuous Flight Auger
- **RC** - Rock Core
- **CU** - Cuttings
- **CT** - Continuous Tube

### Depth to Groundwater

- **At Completion** 26.7 ft.
- **After _____ hours** 26.7 ft.
- **Cave Depth** 26.7 ft.

### Boring Method

- **HSA** - Hollow Stem Augers
- **CFA** - Continuous Flight Augers
- **DC** - Driving Casing
- **MD** - Mud Drilling
- **HA** - Hand Auger
<table>
<thead>
<tr>
<th>Stratum</th>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty Clay, brown, moist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silty Clay, dark brown, with sand and rock fragments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandstone, light gray and gray, slightly weathered, moderately hard</td>
<td>RC-1, RC-2</td>
<td></td>
<td>RQD=0%, RC-1 from 19.2 ft to 20.0 ft RQD=7%, RC-2 from 20.0 ft to 25.0 ft</td>
</tr>
<tr>
<td>Sandstone, light brown, slightly weathered, moderately hard</td>
<td>RC-3</td>
<td></td>
<td>RQD=53%, RC-3 from 25.0 ft to 30.0 ft</td>
</tr>
<tr>
<td>Sandstone, light gray, unweathered, moderately hard</td>
<td>RC-4</td>
<td></td>
<td>RQD=14%, RC-4 from 30.0 ft to 35.0 ft</td>
</tr>
<tr>
<td>Shale, dark gray, soft</td>
<td>RC-5</td>
<td></td>
<td>RQD=20%, RC-5 from 35.0 ft to 40.0 ft</td>
</tr>
<tr>
<td>Underclay, light gray, soft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**
- Noted on Drilling Tools
- At Completion 3.8 ft.
- After _________ hours _________ ft.
- Cave Depth _________ ft.
### DRILLING and SAMPLING INFORMATION

<table>
<thead>
<tr>
<th>Depth, ft</th>
<th>Sample Type</th>
<th>SOIL CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.0</td>
<td>SS</td>
<td>Interbedded SHALE and SANDSTONE, light gray, unweathered, moderately hard, fissile</td>
</tr>
<tr>
<td>50.0</td>
<td>ST</td>
<td>SHALE, dark gray, unweathered, soft, fissile</td>
</tr>
<tr>
<td>55.0</td>
<td>CA, RC</td>
<td>SANDSTONE, dark gray, unweathered, moderately hard, with shale laminations, rooted structures</td>
</tr>
<tr>
<td>60.0</td>
<td>SS, ST, CA</td>
<td>COAL, black</td>
</tr>
<tr>
<td>65.0</td>
<td>CT</td>
<td>UNDERCLAY, gray</td>
</tr>
<tr>
<td>70.0</td>
<td>CT, CC</td>
<td>SHALE, dark gray, unweathered, fissile</td>
</tr>
</tbody>
</table>

### TEST DATA

- **RQD=42%, RC-6 from 40.0 ft to 45.0 ft**
- **RQD=60%, RC-7 from 45.0 ft to 50.0 ft**
- **RQD=72%, RC-8 from 50.0 ft to 55.0 ft**
- **RQD=56%, RC-9 from 55.0 ft to 60.0 ft**
- **RQD=49%, RC-10 from 60.0 ft to 64.5 ft**
- **RQD=38%, RC-11 from 64.5 ft to 70.0 ft**

Grouted hole at completion, plugged with chips, patched with concrete

### Remarks

- Standard Penetration Test: Blows per 6 in. increments
- Groundwater: 3.8 ft.
- Cave Depth: 610.9 ft.
- Drilling and Sampling Information

---

**CLIENT**: IDNR - Site 2227

**PROJECT NAME**: Target Grouting Areas - Site 2227

**PROJECT LOCATION**: North of Brazil, Indiana

**BORING #**: BH7-3

**Easting**: 2944729

**Northing**: 1570992

**JOB #:** 86.05957.0016
RQD=29%, RC-1 from 13.6 ft to 14.8 ft
RQD=8%, RC-2 from 14.8 ft to 19.8 ft
RQD=62%, RC-3 from 19.8 ft to 24.8 ft
RQD=70%, RC-4 from 24.8 ft to 29.8 ft
RQD=90%, RC-5 from 29.8 ft to 34.8 ft
RQD=36%, RC-6 from 34.8 ft to 39.8 ft

SILTY CLAY, brown, moist, with sand
SILTY CLAY, gray, moist, with trace sand and rock fragments
SANDY SILT, brown, slightly moist
SANDSTONE, brown, weathered
SANDSTONE, light brown, slightly weathered, moderately hard, highly broken, very fine grained, well sorted, thin claystone laminations at 17.2 ft
SANDSTONE, light gray, unweathered, moderately hard
SANDY SHALE, dark gray, unweathered, soft, thinly laminated with sandstone
SANDSTONE, dark gray, unweathered, moderately hard, thin shale laminations
SHALE, dark gray, unweathered, soft, fissile
COAL, black

Remarks
Standard Penetration Test, Blows per 6 in. Increments
Groundwater

SOIL CLASSIFICATION

SURFACE ELEVATION 679.596

SILTY CLAY, brown, moist, with sand
SILTY CLAY, gray, moist, with trace sand and rock fragments
SANDY SILT, brown, slightly moist
SANDSTONE, brown, weathered
SANDSTONE, light brown, slightly weathered, moderately hard, highly broken, very fine grained, well sorted, thin claystone laminations at 17.2 ft
SANDSTONE, light gray, unweathered, moderately hard
SANDY SHALE, dark gray, unweathered, soft, thinly laminated with sandstone
SANDSTONE, dark gray, unweathered, moderately hard, thin shale laminations
SHALE, dark gray, unweathered, soft, fissile
COAL, black

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

3.3 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
HA - Hand Auger
<table>
<thead>
<tr>
<th>Stratum Description</th>
<th>Depth, ft</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERCLAY, gray and light gray</td>
<td>638.8</td>
<td>RQD=70%, RC-7 from 39.8 ft to 44.8 ft</td>
</tr>
<tr>
<td>Interbedded SHALE and SANDSTONE, light</td>
<td>634.5</td>
<td>RQD=70%, RC-8 from 44.8 ft to 49.8 ft</td>
</tr>
<tr>
<td>gray, unweathered, moderately hard, fissile</td>
<td>632.4</td>
<td>RQD=28%, RC-9 from 49.8 ft to 54.8 ft</td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, moderately hard and soft, sandstone laminations</td>
<td>624.8</td>
<td>RQD=86%, RC-10 from 54.8 ft to 59.8 ft</td>
</tr>
<tr>
<td>SHALEY SANDSTONE, dark gray, unweathered, moderately hard</td>
<td>624.8</td>
<td>RQD=96%, RC-11 from 59.8 ft to 64.8 ft</td>
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<tr>
<td>COAL, black</td>
<td>610.9</td>
<td>RQD=64%, RC-12 from 64.8 ft to 69.8 ft</td>
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<tr>
<td>UNDERCLAY, gray</td>
<td>608.1</td>
<td>RQD=54%, RC-13 from 69.8 ft to 74.8 ft</td>
</tr>
<tr>
<td>SHALE, gray, unweathered, soft</td>
<td>604.8</td>
<td>Grouted hole at completion, plugged with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>concrete and chips</td>
</tr>
</tbody>
</table>

**Drilling and Sampling Information**

- Date Started: 9/17/13
- Date Completed: 9/17/13
- Drill Foreman: W. Bates
- Inspector: S. Bruder
- Boring Method: HSA
- Hammer Wt.: 140 lbs.
- Hammer Drop: 30 in.
- Spoon Sampler OD: 2.0 in.
- Rock Core Dia.: 2.0 in.
- Shelby Tube OD: -- in.

**Test Data**

- Standard Penetration Test, Blows per 6 in. Increments
- Groundwater

**SOIL CLASSIFICATION**

- Sample Type: SS, ST, CA, RC, CU, CT
- Sample Graphics: RC, RC
- Recovery Graphics: RC, RC
- Sample Type: SS, ST, CA, RC, CU, CT
- Client: IDNR - Site 2227
- Project Name: Target Grouting Areas - Site 2227
- Project Location: North of Brazil, Indiana
- Date Started: 9/17/13
- Date Completed: 9/17/13
- Drill Foreman: W. Bates
- Inspector: S. Bruder
- Boring Method: HSA
- Hammer Wt.: 140 lbs.
- Hammer Drop: 30 in.
- Spoon Sampler OD: 2.0 in.
- Rock Core Dia.: 2.0 in.
- Shelby Tube OD: -- in.
# Test Boring Log

**CLIENT:** IDNR - Site 2227  
**PROJECT NAME:** Target Grouting Areas - Site 2227  
**PROJECT LOCATION:** North of Brazil, Indiana  

**BORING #:** BH7-5

---

**Drilling and Sampling Information**

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Date Completed</th>
<th>Drill Foreman</th>
<th>Inspector</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/17/13</td>
<td>9/17/13</td>
<td>W. Bates</td>
<td>S. Bruder</td>
<td>HSA</td>
</tr>
</tbody>
</table>

**Groundwater**

- **Depth to Groundwater:** 11.0 ft.
- **Cave Depth:** 33.4 ft.
- **Cave Depth:** 12 hours
- **At Completion:** 4.6 ft.

---

**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft.</th>
<th>Stratum Depth, ft.</th>
<th>Depth Scale, ft.</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Organics</th>
<th>Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>687.1</td>
<td>3.0</td>
<td></td>
<td>1</td>
<td>SS</td>
<td></td>
<td></td>
<td>3-3-3</td>
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<tr>
<td>684.1</td>
<td>6.0</td>
<td></td>
<td>2</td>
<td>SS</td>
<td></td>
<td></td>
<td>3-2-3</td>
</tr>
<tr>
<td>678.1</td>
<td>12.0</td>
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<td>3</td>
<td>SS</td>
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<td>3-3-4</td>
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<td>674.4</td>
<td>15.7</td>
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<td>5</td>
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<td>16-50/0.4'</td>
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<td>671.1</td>
<td>19.0</td>
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<td>6</td>
<td>RC-1</td>
<td>RC</td>
<td></td>
<td>RQD=50%, RC-1 from 15.0 ft to 20.0 ft</td>
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<td>RC</td>
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<td></td>
<td>RC</td>
<td>RC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

- **RQD=50%, RC-1 from 15.0 ft to 20.0 ft**
- **RQD=74%, RC-2 from 20.0 ft to 25.0 ft**
- **RQD=98%, RC-3 from 25.0 ft to 30.0 ft**
- **RQD=68%, RC-4 from 30.0 ft to 35.0 ft**
- **RQD= not recorded, RC-5 from 35.0 ft to 40.0 ft**

---

**Test Data**

- **Standard Penetration Test, Blows per 6 in. Increments**
- **Groundwater**
- **Remarks**
### TEST BORING LOG

**CLIENT:** IDNR - Site 2227  
**PROJECT NAME:** Target Grouting Areas - Site 2227  
**PROJECT LOCATION:** North of Brazil, Indiana

**BORING #** BH7-5  
**Northing:** 1570969  
**Easting:** 2945505  
**JOB #:** 86.05957.0016

---

#### DRILLING and SAMPLING INFORMATION

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Date Completed</th>
<th>Drill Foreman</th>
<th>Inspector</th>
<th>Boring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/17/13</td>
<td>9/17/13</td>
<td>W. Bates</td>
<td>S. Bruder</td>
<td>HSA</td>
</tr>
</tbody>
</table>

#### TEST DATA

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Standard Penetration Test, Blows per 6 in. Increments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>649.4</td>
<td>648.3</td>
<td>40.7</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=64%, RC-6 from 40.0 ft to 45.0 ft</td>
<td></td>
</tr>
<tr>
<td>641.4</td>
<td>633.0</td>
<td>48.7</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=44%, RC-7 from 45.0 ft to 50.0 ft</td>
<td></td>
</tr>
<tr>
<td>630.1</td>
<td>626.6</td>
<td>60.0</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=82%, RC-8 from 50.0 ft to 55.0 ft</td>
<td></td>
</tr>
<tr>
<td>626.6</td>
<td>625.1</td>
<td>63.5</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=40%, RC-9 from 55.0 ft to 60.0 ft</td>
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<tr>
<td>625.1</td>
<td>65.0</td>
<td>65.0</td>
<td>RC-10</td>
<td>RC</td>
<td>RQD=84%, RC-10 from 60.0 ft to 65.0 ft</td>
<td></td>
</tr>
</tbody>
</table>

Grouted hole at completion, plugged with chips and concrete

---

#### SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Elevation, ft</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHALE, gray, unweathered, soft, thinly laminated with sandstone</td>
<td>649.4</td>
<td>Driven Split Spoon</td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, thin sandstone laminations</td>
<td>641.4</td>
<td>Pressed Shelby Tube</td>
</tr>
<tr>
<td>SHALEY SANDSTONE, dark gray, unweathered, moderately hard, rooted structures</td>
<td>633.0</td>
<td>Continuous Flight Auger</td>
</tr>
<tr>
<td>COAL, black, shale seam from 59.6-59.9 ft</td>
<td>630.1</td>
<td>Rock Core</td>
</tr>
<tr>
<td>SHALE, gray and dark gray</td>
<td>626.6</td>
<td>Cuttings</td>
</tr>
<tr>
<td>SANDY UNDERCLAY, light beige</td>
<td>625.1</td>
<td>Continuous Tube</td>
</tr>
<tr>
<td>SANDSTONE, light beige, unweathered, moderately hard, from 65.0 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of Test Boring at 65.0 ft

---

#### Sample Type

- SS - Driven Split Spoon  
- ST - Pressed Shelby Tube  
- CA - Continuous Flight Auger  
- RC - Rock Core  
- CU - Cuttings  
- CT - Continuous Tube

#### Depth to Groundwater

- 11.0 ft.  
- 4.6 ft.  
- 12 ft.  
- 33.4 ft.

#### Boring Method

- HSA - Hollow Stem Augers  
- CFA - Continuous Flight Augers  
- DC - Driving Casing  
- MD - Mud Drilling  
- HA - Hand Auger
SILTY CLAY, brown, moist
SANDY CLAY, brown, moist
SILTY CLAY, brown, moist, with trace sand and rock fragments
SILTY CLAY, dark brown
Augered to 29 ft
VOID, dry, 41/4 center bit dropped to 33.5 ft.
Blind drilled - 33.5 to 39.1 ft

Soil classification

Sample Type: SS - Driven Split Spoon, ST - Pressed Shelby Tube, CA - Continuous Flight Auger, RC - Rock Core, CU - Cuttings, CT - Continuous Tube.

Depth to Groundwater:
- Noted on Drilling Tools
- At Completion
- After ______ hours
- Cave Depth

Boring Method: HSA - Hollow Stem Augers, CFA - Continuous Flight Augers, DC - Driving Casing, MD - Mud Drilling, HA - Hand Auger.
NO RQD, RC-1 from 39.1 ft to 40.0 ft
RQD=38%, RC-2 from 40.0 ft to 45.0 ft
RQD=32%, RC-3 from 45.0 ft to 50.0 ft
RQD=52%, RC-4 from 50.0 ft to 55.0 ft
RQD=68%, RC-5 from 55.0 ft to 60.0 ft
RQD=100%, RC-6 from 60.0 ft to 65.0 ft
RQD=88%, RC-7 from 65.0 ft to 70.0 ft
Plugged hole with 5 bags of chips and capped with concrete

MINE COLLAPSE - shaley sandstone and small voids
UNDERCLAY, light gray
SANDY SHALE, dark gray, unweathered, moderately hard, thin sandstone laminations, fissile
SHALEY SANDSTONE, dark gray, unweathered, moderately hard
SHALE, dark gray, unweathered, moderately hard
Bottom of Test Boring at 70.0 ft
**TEST BORING LOG**

**CLIENT**  IDNR - Site 2227  
**PROJECT NAME**  Target Grouting Areas - Site 2227  
**PROJECT LOCATION**  North of Brazil, Indiana  
**BORING #**  BH7-7

**Date Started**  9/19/13  
**Date Completed**  9/20/13  
**Hammer Wt.**  140 lbs.  
**Hammer Drop**  30 in.  
**Drill Foreman**  W. Bates  
**Spoon Sampler OD**  2.0 in.  
**Inspector**  S. Bruder  
**Rock Core Dia.**  2.0 in.  
**Boring Method**  HSA  
**Shelby Tube OD**  -- in.  

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>SURFACE ELEVATION</th>
<th>687.845</th>
</tr>
</thead>
</table>

- **11 in. Topsoil**
- **SILT, light brown and brown**
- **CLAYEY SILT, gray with brown**
- **SILTY CLAY, gray and brown, with little sand**
- **SILTY CLAY, brown and gray**
- **SILTY CLAY, gray with brown, with trace sand and rock fragments, with little sand at 21.0 ft**
- **SILTY CLAY, brown, with some sand and rock fragments**
- **SILTY SAND, brown, moist, with clay and rock fragments**
- **SANDY SHALE, gray, weathered**
- **SANDSTONE, light gray, unweathered, moderately hard, thinly laminated with shale, broken**
- **COAL, black, void or loose coal from 39.0-39.5 ft and from 39.5-40.0 ft**

**TEST DATA**

- **Depth to Groundwater**  65.8 ft.
- **Remarks**  Lost water at 36.9 ft. Depth to groundwater is 39.7 ft after Run #3.

**Groundwater**

- **RQD=0%**, **RC-1 from 34.0 ft to 35.0 ft**
- **RQD=16%**, **RC-2 from 35.0 ft to 40.0 ft**

**Remarks**

- Noted on Drilling Tools
- At Completion
- After ______ hours
- Cave Depth
- RQD=0%, RC-1 from 34.0 ft to 35.0 ft
- RQD=16%, RC-2 from 35.0 ft to 40.0 ft

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
RQD=80%, RC-3 from 40.0 ft to 45.0 ft
RQD=64%, RC-4 from 45.0 ft to 50.0 ft
RQD=72%, RC-5 from 50.0 ft to 55.0 ft
RQD=60%, RC-6 from 55.0 ft to 60.0 ft
Lost water again at 59.5 ft
RQD=20%, RC-7 from 60.0 ft to 65.0 ft
Water at 66.2 ft after Run #9
Set well at 68.1 ft, see diagram
RQD=20%, RC-9 from 70.0 ft to 75.0 ft

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERCLAY, gray, sandy from 45.0-45.8 ft</td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, soft, fissile</td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, gray, unweathered, rooted structures, small void</td>
<td></td>
</tr>
<tr>
<td>MINE COLLAPSE, open voids from 57.5-59.0 ft and 65.5-67.0 ft, filled voids-shale</td>
<td></td>
</tr>
<tr>
<td>COAL, with shale</td>
<td></td>
</tr>
<tr>
<td>COAL, black</td>
<td></td>
</tr>
<tr>
<td>SANDSTONE, beige, slightly weathered, moderately hard</td>
<td></td>
</tr>
<tr>
<td>UNDERCLAY, beige</td>
<td></td>
</tr>
<tr>
<td>Bottom of Test Boring at 75.0 ft</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

- RQD=80%, RC-3 from 40.0 ft to 45.0 ft
- RQD=64%, RC-4 from 45.0 ft to 50.0 ft
- RQD=72%, RC-5 from 50.0 ft to 55.0 ft
- RQD=60%, RC-6 from 55.0 ft to 60.0 ft
- Lost water again at 59.5 ft
- RQD=20%, RC-7 from 60.0 ft to 65.0 ft
- RQD=18%, RC-8 from 65.0 ft to 70.0 ft
- Water at 66.2 ft after Run #9
- Set well at 68.1 ft, see diagram
- RQD=20%, RC-9 from 70.0 ft to 75.0 ft
**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth, Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Organics</th>
<th>Sample Moisture</th>
<th>Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>681.9</td>
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<td>671.9</td>
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<td>658.1</td>
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<tr>
<td>656.9</td>
<td>30.0</td>
<td></td>
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<td>658.3</td>
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<td>652.3</td>
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<td>647.3</td>
<td>33.0</td>
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<tr>
<td>642.3</td>
<td>34.0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>637.3</td>
<td>35.0</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEST DATA**

- **RQD=75%**, RC-1 from 28.8 ft to 30.0 ft
- **RQD=80%**, RC-2 from 30.0 ft to 35.0 ft
- **RQD=94%**, RC-3 from 35.0 ft to 40.0 ft

**Sample Type**
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube
**Soil Classification and Test Data**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Standard Penetration Test, Blows per 6 in. increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>643.2</td>
<td>43.7</td>
<td>45</td>
<td>RC-4</td>
<td>RC</td>
<td>RQD=74%, RC-4 from 40.0 ft to 45.0 ft</td>
</tr>
<tr>
<td>641.6</td>
<td>45.3</td>
<td>45</td>
<td>RC-5</td>
<td>RC</td>
<td>RQD=82%, RC-5 from 45.0 ft to 50.0 ft</td>
</tr>
<tr>
<td>641.2</td>
<td>45.7</td>
<td></td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=82%, RC-6 from 50.0 ft to 55.0 ft</td>
</tr>
<tr>
<td>636.1</td>
<td>50.8</td>
<td>50</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=48%, RC-7 from 55.0 ft to 60.0 ft</td>
</tr>
<tr>
<td>634.7</td>
<td>52.2</td>
<td></td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=38%, RC-8 from 60.0 ft to 65.0 ft</td>
</tr>
<tr>
<td>632.4</td>
<td>54.5</td>
<td></td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=56%, RC-10 from 70.0 ft to 75.0 ft</td>
</tr>
<tr>
<td>620.4</td>
<td>66.5</td>
<td>66</td>
<td>RC-10</td>
<td>RC</td>
<td>Grouted hole at completion, plugged with chips, patched with concrete</td>
</tr>
<tr>
<td>616.8</td>
<td>70.1</td>
<td>70</td>
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<td></td>
<td></td>
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<tr>
<td>612.7</td>
<td>74.2</td>
<td>74</td>
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<td></td>
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<tr>
<td>611.9</td>
<td>75.0</td>
<td>75</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

- Grouted hole at completion, plugged with chips, patched with concrete

**Drilling and Sampling Information**

- Date Started: 9/23/13
- Date Completed: 9/25/13
- Drill Foreman: W. Bates
- Inspector: S. Bruder
- Boring Method: HSA

**Test Data**

- Hammer Wt.: 140 lbs.
- Hammer Drop: 30 in.
- Spoon Sampler OD: 2.0 in.
- Rock Core Dia.: 2.0 in.
**TEST BORING LOG**

**CLIENT**  
IDNR - Site 2227

**PROJECT NAME**  
Target Grouting Areas - Site 2227

**PROJECT LOCATION**  
North of Brazil, Indiana

**BORING #**  
BH7-9

**SURFACE ELEVATION**  
685.547

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### DRILLING and SAMPLING INFORMATION

| Date Started | 9/25/13 |
| Date Completed | 9/25/13 |
| Drill Foreman | W. Bates |
| Inspector | S. Bruder |
| Boring Method | HSA |
| Hammer Wt. | 140 lbs. |
| Hammer Drop | 30 in. |
| Spoon Sampler OD | 2.0 in. |
| Rock Core Dia. | 2.0 in. |

---

### SOIL CLASSIFICATION

<p>| SURFACE ELEVATION | 685.547 |</p>
<table>
<thead>
<tr>
<th>Stratum Depth, ft</th>
<th>Stratum Depth, ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>682.5</td>
<td>3.0</td>
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<tr>
<td>675.0</td>
<td>671.3</td>
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<td>671.3</td>
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<td>649.1</td>
<td>646.8</td>
</tr>
<tr>
<td>646.8</td>
<td>646.4</td>
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</table>

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### TEST DATA

<table>
<thead>
<tr>
<th>Stratum Depth, ft</th>
<th>Sample Type</th>
<th>Sample Recovery</th>
<th>Standard Penetration Test, Blows per 6 in. increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>SS</td>
<td>X</td>
<td>7-5-5</td>
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<tr>
<td>10.5</td>
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<td>4-5-8</td>
</tr>
<tr>
<td>14.2</td>
<td>SS</td>
<td>X</td>
<td>3-3-5</td>
</tr>
<tr>
<td>16.5</td>
<td>SS</td>
<td>X</td>
<td>3-4-5</td>
</tr>
<tr>
<td>21.0</td>
<td>RC</td>
<td>X</td>
<td>32-38-42</td>
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<td>25</td>
<td>RC</td>
<td>X</td>
<td>12-22-28</td>
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<tr>
<td>30.5</td>
<td>RC</td>
<td>X</td>
<td>13-7-10</td>
</tr>
<tr>
<td>35</td>
<td>RC</td>
<td>X</td>
<td>13-11-22</td>
</tr>
</tbody>
</table>
| 41.6              | RC          | X               | RQD=88%, RC-1 from 24.4 ft to 25.2 ft  
RQD=82%, RC-2 from 25.2 ft to 30.2 ft  
RQD=98%, RC-3 from 30.2 ft to 35.2 ft  
RQD=64%, RC-4 from 35.2 ft to 40.2 ft |

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**Remarks**

- Noted on Drilling Tools
- At Completion
- After **12** hours
- Cave Depth
- **41.6** ft.

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
<table>
<thead>
<tr>
<th>Stratum</th>
<th>Elevation, ft</th>
<th>Depth, ft</th>
<th>Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SANDY SHALE, grayish beige, soft, unweathered, clayey</td>
<td>633.5</td>
<td>52.0</td>
<td>45</td>
<td>RC-5</td>
<td>RC</td>
<td>RQD=62%, RC-5 from 40.2 ft to 45.2 ft</td>
</tr>
<tr>
<td></td>
<td>632.6</td>
<td>52.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE, dark gray, unweathered, moderately hard</td>
<td>629.2</td>
<td>56.3</td>
<td>50</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=80%, RC-6 from 45.2 ft to 50.2 ft</td>
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<td></td>
</tr>
<tr>
<td>SHALE, light beige, unweathered, moderately hard, thinly bedded with very fine sandstone</td>
<td>628.5</td>
<td>56.7</td>
<td>55</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=100%, RC-7 from 50.2 ft to 55.2 ft</td>
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</tr>
<tr>
<td>SANDSTONE, light beige, unweathered, moderately hard</td>
<td>621.0</td>
<td>59.0</td>
<td>60</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=76%, RC-8 from 55.2 ft to 60.2 ft</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>SANDY SHALE, dark gray, unweathered, soft, thin sandstone laminations</td>
<td>617.0</td>
<td>68.5</td>
<td>65</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=96%, RC-9 from 60.2 ft to 65.2 ft</td>
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<tr>
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</tr>
<tr>
<td>Bottom of Test Boring at 75.2 ft</td>
<td>610.3</td>
<td>75.2</td>
<td>70</td>
<td>RC-10</td>
<td>RC</td>
<td>RQD=58%, RC-10 from 65.2 ft to 70.2 ft</td>
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</tr>
</tbody>
</table>

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**
- **Noted on Drilling Tools:** 41.6 ft.
- **At Completion:** 12 hours
- **After 12 hours:** 41.6 ft.
### Test Boring Log

**CLIENT**  
IDNR - Site 2228

**PROJECT NAME**  
Target Grouting Areas - Site 2228

**PROJECT LOCATION**  
North of Brazil, Indiana

**BORING #**  
BH8-1

**Date Started**  
9/26/13

**Date Completed**  
9/26/13

**Drill Foreman**  
W. Bates

**Inspector**  
S. Bruder

**Boring Method**  
HSA

### Drilling and Sampling Information

- **Stratum**  
  - SILTY CLAY, light brown and brown, moist
  - SILTY CLAY, brown and gray, moist, trace gravel
  - SANDSTONE, brown, decomposed
  - SHALE, gray, weathered
  - SHALE, dark gray, unweathered, soft, siltstone laminae at 24.5 ft
  - COAL, black
  - UNDERCLAY, light gray, soft, shaley
  - SHALE, gray, unweathered, soft, fissile, sandy

### Test Data

- **Standard Penetration Test, Blows per 6 in. Increments**
  - RQD=100%, RC-1 from 14.3 ft to 15.0 ft
  - RQD=94%, RC-2 from 15.0 ft to 20.0 ft
  - RQD=70%, RC-3 from 20.0 ft to 25.0 ft
  - RQD=28%, RC-4 from 25.0 ft to 30.0 ft
  - RQD=42%, RC-5 from 30.0 ft to 35.0 ft
  - RQD=58%, RC-6 from 35.0 ft to 40.0 ft

### Remarks

- **Remarks**
  - RQD=100%, RC-1 from 14.3 ft to 15.0 ft
  - RQD=94%, RC-2 from 15.0 ft to 20.0 ft
  - RQD=70%, RC-3 from 20.0 ft to 25.0 ft
  - RQD=28%, RC-4 from 25.0 ft to 30.0 ft
  - RQD=42%, RC-5 from 30.0 ft to 35.0 ft
  - RQD=58%, RC-6 from 35.0 ft to 40.0 ft

### Sample Type

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

### Depth to Groundwater

- **Depth Scale, ft**
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9

### Groundwater

- **Surfaced Elevation**  
  701.497

### Boring Method

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
**Soil Classification**

<table>
<thead>
<tr>
<th>Stratum Description</th>
<th>Elevation, ft</th>
<th>Depth, ft</th>
<th>Sample Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHALE, gray, unweathered, soft, fissile, sandy</td>
<td>660.9</td>
<td>40.6</td>
<td>RC-7</td>
<td>RQD=90%, RC-7 from 40.0 ft to 45.0 ft</td>
</tr>
<tr>
<td>SANDSTONE, gray, unweathered, moderately hard, rooted</td>
<td>657.2</td>
<td>44.3</td>
<td>RC-7</td>
<td>RQD=54%, RC-8 from 45.0 ft to 50.0 ft</td>
</tr>
<tr>
<td>COAL, black</td>
<td>654.4</td>
<td>47.1</td>
<td>RC-8</td>
<td></td>
</tr>
<tr>
<td>UNDERCLAY, light gray, sandy</td>
<td>651.5</td>
<td>50.0</td>
<td>RC-7</td>
<td></td>
</tr>
<tr>
<td>Bottom of Test Boring at 50.0 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**RID = 0%, RC-1 from 18.3 ft to 19.5 ft**

**RID = 40%, RC-2 from 19.5 ft to 24.5 ft**

**RID = 90%, RC-3 from 24.5 ft to 29.5 ft**

**RID = 78%, RC-4 from 29.5 ft to 34.5 ft**

**RID = 14%, RC-5 from 34.5 ft to 39.5 ft**

**Water at 34.5 ft after Run #6**

---

**SILTY CLAY, brown, moist**

**SILTY CLAY, brown, moist, trace sand and few gravel**

**SILTY CLAY, brown, moist, little sand and trace gravel**

**SHALE, gray, weathered**

**SHALE, black, with coal**

**COAL, black**

**UNDERCLAY, light gray/light beige**

**SHALE, dark gray, unweathered, soft, fissile**

**SHALEY SANDSTONE, gray, unweathered, moderately hard, rooted**

**MINE COLLAPSE - VOID, 1.5 ft open void, then mine collapse, followed by 1.0 open voids, then collapse, then 1.0 ft open void and collapse**

---

**Remarks**

**Standard Penetration Test, Blows per 6 in. Increments**

---

**SURFACE ELEVATION 706.889**

---

**SILTY CLAY, brown, moist**

---

**SILTY CLAY, brown, moist, trace sand and few gravel**

---

**SILTY CLAY, brown, moist, little sand and trace gravel**

---

**SHALE, gray, weathered**

---

**SHALE, black, with coal**

---

**COAL, black**

---

**UNDERCLAY, light gray/light beige**

---

**SHALE, dark gray, unweathered, soft, fissile**

---

**SHALEY SANDSTONE, gray, unweathered, moderately hard, rooted**

---

**MINE COLLAPSE - VOID, 1.5 ft open void, then mine collapse, followed by 1.0 open voids, then collapse, then 1.0 ft open void and collapse**

---

**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**

- Noted on Drilling Tools
- At Completion
- After ______ hours
- Cave Depth

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### Test Boring Log

**Client** | IDNR - Site 2228
---|---
**Project Name** | Target Grouting Areas - Site 2228
**Project Location** | North of Brazil, Indiana

**Boring #** | BH8-2
**Job #** | 86.05957.0016

**Drilling and Sampling Information**

| Date Started | 9/26/13 | Hammer Wt. | 140 lbs. |
| Date Completed | 9/26/13 | Hammer Drop | 30 in. |
| Drill Foreman | W. Bates | Spoon Sampler OD | 2.0 in. |
| Inspector | S. Bruder | Rock Core Dia. | 2.0 in. |
| Boring Method | HSA | Shelby Tube OD | -- in. |

**Soil Classification**

- **Sequence, 2-6 in. open voids from 42.5-45.5 ft, followed by mine collapse**
- **Shaley Sandstone, dark gray, unweathered, moderately hard**
- **Underclay, light gray, soft**
- **Sandy Shale, light gray, unweathered, moderately hard**
- Bottom of Test Boring at 49.5 ft

**Test Data**

- **RQD=20%, RC-6 from 39.5 ft to 44.5 ft**
- **RQD=76%, RC-7 from 44.5 ft to 49.5 ft**
- Set 2 in. piezometer with 10 ft screen at 46.6 ft
- Bentonite seal from 16.3-18.3 ft, grout to 3.0 ft, chips to 1.0 ft

**Sample Type**

- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

**Depth to Groundwater**

- **RC-6**
  - **Stratum Elevation**: 661.2, 45.7 ft
  - **Sample No.**: 45
  - **Sample Type**: SS
- **RC-7**
  - **Stratum Elevation**: 660.1, 46.8 ft
  - **Sample No.**: 46
  - **Sample Type**: SS

**Remarks**

- **RQD=20%, RC-6 from 39.5 ft to 44.5 ft**
- **RQD=76%, RC-7 from 44.5 ft to 49.5 ft**
- Set 2 in. piezometer with 10 ft screen at 46.6 ft
- Bentonite seal from 16.3-18.3 ft, grout to 3.0 ft, chips to 1.0 ft

**Boring Method**

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### TEST BORING LOG

**CLIENT**  
IDNR - Site 2228

**PROJECT NAME**  
Target Grouting Areas - Site 2228

**PROJECT LOCATION**  
North of Brazil, Indiana

**BORING #**  
BH8-3

**DATE**  
9/26/13

**DRILLING and SAMPLING INFORMATION**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Depth, ft</th>
<th>Hammer Wt. (lbs)</th>
<th>Hammer Drop (in)</th>
<th>Spoon Sampler OD (in)</th>
<th>Rock Core Dia. (in)</th>
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</thead>
<tbody>
<tr>
<td>RC-1</td>
<td>16.0</td>
<td>140</td>
<td>30</td>
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<tr>
<td>RC-2</td>
<td>17.5</td>
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<tr>
<td>RC-3</td>
<td>22.1</td>
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<tr>
<td>RC-4</td>
<td>26.0</td>
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<tr>
<td>RC-5</td>
<td>29.6</td>
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</table>

**SOIL CLASSIFICATION**

- **SURFACE ELEVATION**: 710.653

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Elevation, ft</th>
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<tbody>
<tr>
<td>SILTY CLAY, brown, moist</td>
<td>694.7</td>
</tr>
<tr>
<td>CLAYEY SHALE, gray, soft, slightly weathered (underclay)</td>
<td>693.2</td>
</tr>
<tr>
<td>COAL, decomposed, broken - no recovery</td>
<td>688.6</td>
</tr>
<tr>
<td>SHALE, dark gray/black, broken, trace coal</td>
<td>686.1</td>
</tr>
<tr>
<td>UNDERCLAY, light gray, soft, slightly weathered</td>
<td>684.7</td>
</tr>
<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard, very fine grained</td>
<td>682.4</td>
</tr>
<tr>
<td>MINE COLLAPSE-SANDSTONE, light gray, slightly weathered, moderately hard, with clay laminations</td>
<td>678.2</td>
</tr>
<tr>
<td>MINE COLLAPSE-CLAYEY SHALE, light gray, moderately weathered, soft</td>
<td>676.7</td>
</tr>
<tr>
<td>MINE COLLAPSE-SHALE, dark gray/black, unweathered, soft</td>
<td>675.0</td>
</tr>
<tr>
<td>MINE COLLAPSE-SANDSTONE, gray, unweathered, moderately hard</td>
<td>672.0</td>
</tr>
</tbody>
</table>

**TEST DATA**

- **Standard Penetration Test, Blows per 6 in. Increments**: 694.7, 693.2, 688.6, 686.1, 684.7, 682.4, 678.2, 676.7, 675.0, 672.0
- **Groundwater Depth**: 693.2, 686.1, 684.7, 682.4, 678.2, 676.7, 675.0, 672.0

**Remarks**

- RQD=80%, RC-1 from 18.6 ft to 19.6 ft
- RQD=14%, RC-2 from 19.6 ft to 24.6 ft
- RQD=68%, RC-3 from 24.6 ft to 29.6 ft
- RQD=34%, RC-4 from 29.6 ft to 34.6 ft
- RQD=70%, RC-5 from 34.6 ft to 39.6 ft
- Lost water at 30.0 ft
- Water after Run #8 at 36.3 ft

**SOIL CLASSIFICATION**

- **Sample Type**
  - SS - Driven Split Spoon
  - ST - Pressed Shelby Tube
  - CA - Continuous Flight Auger
  - RC - Rock Core
  - CU - Cuttings
  - CT - Continuous Tube

- **Depth to Groundwater**
  - 694.7 ft
  - 693.2 ft
  - 688.6 ft
  - 686.1 ft
  - 684.7 ft
  - 682.4 ft
  - 678.2 ft
  - 676.7 ft
  - 675.0 ft
  - 672.0 ft

- **Boring Method**
  - HSA - Hollow Stem Augers
  - CFA - Continuous Flight Augers
  - DC - Driving Casing
  - MD - Mud Drilling
  - HA - Hand Auger
### TEST BORING LOG

**CLIENT**
IDNR - Site 2228

**PROJECT NAME**
Target Grouting Areas - Site 2228

**PROJECT LOCATION**
North of Brazil, Indiana

**BORING #**
BH8-3

**Northing**
1570809

**Easting**
2950743

**JOB #**
86.05957.0016

---

#### DRILLING and SAMPLING INFORMATION

| Date Started | 9/26/13 | Hammer Wt. | 140 lbs. |
| Date Completed | 9/26/13 | Hammer Drop | 30 in. |
| Drill Foreman | W. Bates | Spoon Sampler OD | 2.0 in. |
| Inspector | S. Bruder | Rock Core Dia. | 2.0 in. |
| Boring Method | HSA | Shelby Tube OD | -- in. |

---

#### TEST DATA

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Elevation, ft</th>
<th>Sample No.</th>
<th>Sampler Type</th>
<th>Recovery Graphics</th>
<th>Groundwater Level</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE COLLAPSE-SHALE, dark gray, moderately weathered, soft, broken, small 0.5 ft void at 39.1 ft, additional 6 in. voids, trace coal from 44.5-45.6 ft</td>
<td>665.1</td>
<td>RC-6</td>
<td>45.6</td>
<td>45</td>
<td>RC</td>
<td>RQD=18%, RC-6 from 39.6 ft to 44.6 ft</td>
</tr>
<tr>
<td>SANDSTONE, light gray/beige, unweathered, moderately hard, very fine grained</td>
<td>661.1</td>
<td>RC-7</td>
<td>49.6</td>
<td></td>
<td>RC</td>
<td>RQD=78%, RC-7 from 44.6 ft to 49.6 ft</td>
</tr>
</tbody>
</table>

- Set piezometer at 48.8 ft with 10 ft screen

---

#### SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Depth to Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Driven Split Spoon</td>
<td>Noted on Drilling Tools</td>
</tr>
<tr>
<td>ST - Pressed Shelby Tube</td>
<td>At Completion</td>
</tr>
<tr>
<td>CA - Continuous Flight Auger</td>
<td>After ______ hours</td>
</tr>
<tr>
<td>RC - Rock Core</td>
<td>Cave Depth</td>
</tr>
<tr>
<td>CU - Cuttings</td>
<td></td>
</tr>
<tr>
<td>CT - Continuous Tube</td>
<td></td>
</tr>
</tbody>
</table>

---

**Boring Method**
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
### DRILLING and SAMPLING INFORMATION

<table>
<thead>
<tr>
<th>Date Started</th>
<th>10/1/13</th>
<th>Hammer Wt.</th>
<th>140 lbs.</th>
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<tbody>
<tr>
<td>Date Completed</td>
<td>10/1/13</td>
<td>Hammer Drop</td>
<td>30 in.</td>
</tr>
<tr>
<td>Drill Foreman</td>
<td>W. Bates</td>
<td>Spoon Sampler OD</td>
<td>2.0 in.</td>
</tr>
<tr>
<td>Inspector</td>
<td>J. Noel</td>
<td>Rock Core Dia.</td>
<td>2.0 in.</td>
</tr>
<tr>
<td>Boring Method</td>
<td>HSA</td>
<td>Shelby Tube OD</td>
<td>-- in.</td>
</tr>
</tbody>
</table>

### TEST DATA

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.6-5 ft</td>
<td>Mottled brown and gray 8.5-10 ft</td>
</tr>
<tr>
<td>1.2-1 ft</td>
<td></td>
</tr>
<tr>
<td>4.4-4 ft</td>
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</tr>
<tr>
<td>2.2-3</td>
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</tr>
<tr>
<td>3.4-5</td>
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<td>2.3-5</td>
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<td>3.6-7</td>
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<tr>
<td>6.7-12</td>
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<tr>
<td>6.9-25</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>RQD=43%, RC-1 from 23.6 ft to 25.0 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQD=36%, RC-2 from 25.0 ft to 30.0 ft</td>
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</tr>
<tr>
<td>RQD=86%, RC-3 from 30.0 ft to 35.0 ft</td>
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</tr>
<tr>
<td>RQD=88%, RC-4 from 35.0 ft to 40.0 ft</td>
<td></td>
</tr>
</tbody>
</table>

### SOIL CLASSIFICATION

- **SILT LOAM**, gray (10YR 5/1, broken, dry), non-plastic, sticky, non-effervescent
- **CLAY**, reddish gray mottled (10YR 5/3 to 10YR 5/1, broken, moist), plastic, sticky
- **SILTY CLAY**, brown (10YR 5/3, broken, moist), non-plastic, slightly sticky
- **COAL**
- **UNDERCLAY**, gray (gley 17/1, broken, dry)
- **SHALE**, dark gray, laminated, with plant fossils
- **SHALE**, black
- **SANDSTONE**, fine grained
- **SILTY CLAY**, brown (10YR 5/3, broken, moist), non-plastic, slightly sticky
- **UNDERCLAY**, gray (gley 17/1, broken, dry)
- **SHALEY COAL**
- **CLAYSTONE (UNDERCLAY)**, gray
- **SHALE**, gray

### Sample Type
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

### Boring Method
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- HA - Hand Auger
RQD=64%, RC-5 from 40.0 ft to 45.0 ft

Water level after Run #10 at 41.4 ft

RQD=20%, RC-6 from 45.0 ft to 50.0 ft

Lost water at 48.7 ft

Drilling through collapse zone 48.7 ft

RQD=0%, RC-7 from 50.0 ft to 55.0 ft

RQD=0%, RC-8 from 55.0 ft to 60.0 ft

RQD=8%, RC-9 from 60.0 ft to 65.0 ft

RQD=24%, RC-10 from 65.0 ft to 70.0 ft

Set well at 67.3 ft
**RQD=58%, RC-1 from 14.9 ft to 19.9 ft**

**RQD=18%, RC-2 from 19.9 ft to 24.9 ft**

**RQD=20%, RC-3 from 24.9 ft to 29.9 ft**

**RQD=88%, RC-4 from 29.9 ft to 34.9 ft**

**RQD=84%, RC-5 from 34.9 ft to 39.9 ft**

**SILTY CLAY, brown and gray, moist**

**SILTY CLAY, brown, moist**

**SILTY CLAY, brown, moist, trace sand and gravel**

**SANDSTONE, light gray and brown, slightly weathered, moderately hard, very fine grained**

**SANDY SHALE, light gray, slightly weathered, soft, thin sandstone laminations**

**SANDSTONE, light gray, unweathered, moderately hard, thin claystone laminations, fissile**

**COAL, black**

**UNDERCLAY, light beige**

**SANDSTONE, brownish gray, moderately weathered, moderately hard and soft, coarse grained**

**SHALE, light gray and beige, unweathered, soft, fissile, sandy, thinly bedded with fine grained sandstone**

---

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth, ft</th>
<th>Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Org.</th>
<th>Sample Graphics</th>
<th>Remarks</th>
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<td>701.2</td>
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<td>688.4</td>
<td>15.8</td>
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<td>RC-1</td>
<td>RC</td>
<td></td>
<td>RQD=58%, RC-1 from 14.9 ft to 19.9 ft</td>
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<tr>
<td>684.6</td>
<td>19.6</td>
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<td>RC-2</td>
<td>RC</td>
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<td>RQD=18%, RC-2 from 19.9 ft to 24.9 ft</td>
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<td>680.7</td>
<td>23.5</td>
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<td>RC-3</td>
<td>RC</td>
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<td>RQD=20%, RC-3 from 24.9 ft to 29.9 ft</td>
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<td>678.1</td>
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<td>RC-4</td>
<td>RC</td>
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<td>RQD=88%, RC-4 from 29.9 ft to 34.9 ft</td>
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<td>670.0</td>
<td>34.2</td>
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<td>RC-5</td>
<td>RC</td>
<td></td>
<td>RQD=84%, RC-5 from 34.9 ft to 39.9 ft</td>
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<tr>
<td>669.1</td>
<td>35.1</td>
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<tr>
<td>664.4</td>
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</tbody>
</table>
RQD=64%, RC-6 from 39.9 ft to 44.9 ft
RQD=94%, RC-7 from 44.9 ft to 49.9 ft
RQD=84%, RC-8 from 49.9 ft to 54.9 ft
RQD=72%, RC-9 from 54.9 ft to 59.9 ft
RQD=62%, RC-10 from 59.9 ft to 64.9 ft
RQD=100%, RC-11 from 64.9 ft to 69.9 ft

Grouted hole at completion, plugged with chips, patched with concrete
<table>
<thead>
<tr>
<th>Depth, ft</th>
<th>Stratum</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Standard Penetration Test, Blows per 6 in. Increments</th>
<th>Remarks</th>
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<tbody>
<tr>
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**SOIL CLASSIFICATION**

- **SURFACE ELEVATION 700.582**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Depth, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Graphics</th>
<th>Standard Penetration Test, Blows per 6 in. Increments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTY CLAY, brown, moist, trace sand</td>
<td>684.6</td>
<td>RC-1</td>
<td>RC</td>
<td>RQD=0%, RC-1 from 19.1 ft to 20.0 ft</td>
<td>RQD=16%, RC-2 from 20.0 ft to 25.0 ft</td>
<td></td>
</tr>
</tbody>
</table>

- SANDY SHALE, gray, slightly weathered, soft | 683.6 | RC-2 | RC | RQD=16%, RC-3 from 25.0 ft to 30.0 ft |

- SHALEY SANDSTONE, gray, moderately weathered, moderately hard | 680.6 | RC-3 | RC | RQD=94%, RC-4 from 30.0 ft to 35.0 ft |

- SANDY SHALE, dark gray, moderately weathered, soft | 676.1 | RC-4 | RC | RQD=92%, RC-5 from 35.0 ft to 40.0 ft |

- COAL, black | 675.6 | RC | RC | |

- UNDERCLAY, light gray, soft | 672.8 | RC | RC | |

- SANDY SHALE, gray, unweathered, soft and moderately hard | 669.0 | RC | RC | |

- SHALE, gray, unweathered, soft and moderately hard, thin sandstone seam at 48.9 ft | 662.6 | RC | RC | |

**CLIENT** IDNR - Site 2228  
**PROJECT NAME** Target Grouting Areas - Site 2228  
**PROJECT LOCATION** North of Brazil, Indiana  
**BORING #** BH8-6  
**Job #** 86.05957.0016  
**Date Started** 10/1/13  
**Date Completed** 10/1/13  
**Hammer Wt.** 140 lbs.  
**Hammer Drop** 30 in.  
**Drill Foreman** W. Bates  
**Spoon Sampler OD** 2.0 in.  
**Inspector** S. Bruder  
**Rock Core Dia.** 2.0 in.  
**Boring Method** HSA  
**Shelby Tube OD** -- in.  
**Surf. Elev.** 700.582

**Groundwater** TEST BORING LOG

**Drilling and Sampling Information**

**Sample Type**
- SS: Driven Split Spoon  
- ST: Pressed Shelby Tube  
- CA: Continuous Flight Auger  
- RC: Rock Core  
- CU: Cuttings  
- CT: Continuous Tube  

**Depth to Groundwater**
- Noted on Drilling Tools  
- At Completion  
- After ____ hours  
- Cave Depth  

**Boring Method**
- HSA: Hollow Stem Augers  
- CFA: Continuous Flight Augers  
- DC: Driving Casing  
- MD: Mud Drilling  
- HA: Hand Auger

**SURFACE ELEVATION** 700.582
RQD=94%, RC-6 from 40.0 ft to 45.0 ft
RQD=86%, RC-7 from 45.0 ft to 50.0 ft
RQD=74%, RC-8 from 50.0 ft to 55.0 ft
RQD=38%, RC-9 from 55.0 ft to 60.0 ft
RQD=78%, RC-10 from 60.0 ft to 65.0 ft
RQD=98%, RC-11 from 65.0 ft to 70.0 ft
Grout hole at completion, plugged with chips, patched with concrete

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Description</th>
<th>Elevation, ft</th>
<th>Depth, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Standard Penetration Test, Blows per 6 in. increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHALE, gray, unweathered, soft and moderately hard, thin sandstone seam at 48.9 ft</td>
<td>648.0</td>
<td>52.6</td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=94%, RC-6 from 40.0 ft to 45.0 ft</td>
</tr>
<tr>
<td>SANDSTONE, gray, slightly weathered, moderately hard, thinly bedded with shale</td>
<td>641.9</td>
<td>58.7</td>
<td>RC-7</td>
<td>RC</td>
<td>RQD=86%, RC-7 from 45.0 ft to 50.0 ft</td>
</tr>
<tr>
<td>SANDY SHALE, dark gray, unweathered, soft</td>
<td>640.6</td>
<td>60.0</td>
<td>RC-8</td>
<td>RC</td>
<td>RQD=74%, RC-8 from 50.0 ft to 55.0 ft</td>
</tr>
<tr>
<td>SANDSTONE, light gray, unweathered, moderately hard, very fine grained</td>
<td>630.6</td>
<td>70.0</td>
<td>RC-9</td>
<td>RC</td>
<td>RQD=38%, RC-9 from 55.0 ft to 60.0 ft</td>
</tr>
<tr>
<td>Bottom of Test Boring at 70.0 ft</td>
<td>630.6</td>
<td>70.0</td>
<td>RC-10</td>
<td>RC</td>
<td>RQD=78%, RC-10 from 60.0 ft to 65.0 ft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RC-11</td>
<td>RC</td>
<td>RQD=98%, RC-11 from 65.0 ft to 70.0 ft</td>
</tr>
</tbody>
</table>

**Remarks**
Grout hole at completion, plugged with chips, patched with concrete
Test Boring Log

**Client:** IDNR - Site 2228

**Project Name:** Target Grouting Areas - Site 2228

**Project Location:** North of Brazil, Indiana

**Boring #** BH8-7

**Date Started:** 9/30/13

**Date Completed:** 9/30/13

**Hammer Weight:** 140 lbs.

**Hammer Drop:** 30 in.

**Spoon Sampler OD:** 2.0 in.

**Rock Core Dia.:** 2.0 in.

**Drill Foreman:** W. Bates

**Inspector:** S. Bruder

**Boring Method:** HSA

**Northing:** 1572073

**Easting:** 2951240

**Job #:** 86.05957.0016

**Surface Elevation:** 696.909

**Stratum Classification:**

- **Silty Sand, brown, trace clay**
  - Depth: 690.9 ft
  - Elevation: 690.9 ft

- **Silty Clay, brown, moist, trace sand**
  - Depth: 678.2 ft
  - Elevation: 678.2 ft

- **Mine Collapse-Sandstone, light beige, broken, mixed with crushed shale, clay and small pieces of coal**
  - Depth: 671.9 ft
  - Elevation: 671.9 ft

- **Mine Collapse-Clay, dark gray, very soft**
  - Depth: 670.7 ft
  - Elevation: 670.7 ft

- **Mine Collapse-Shaley Sandstone, light gray, slightly weathered, soft and moderately hard, broken at 26.2 ft**
  - Depth: 668.1 ft
  - Elevation: 668.1 ft

- **Mine Collapse-Void**
  - Depth: 664.4 ft
  - Elevation: 664.4 ft

- **Underclay, beige, soft**
  - Depth: 657.8 ft
  - Elevation: 657.8 ft

- **Underclay, beige, soft**
  - Depth: 656.9 ft
  - Elevation: 656.9 ft

**Sample Type:**

- **SS:** Driven Split Spoon
- **ST:** Pressed Shelby Tube
- **CA:** Continuous Flight Auger
- **RC:** Rock Core
- **CU:** Cuttings
- **CT:** Continuous Tube

**Remarks:**

- **Noted on Drilling Tools:** 22.4 ft
- **At Completion:** 11 ft
- **After 24 hours:** 11 ft
- **Cave Depth:** 11 ft

**Special Features:**

- **RQD = 0%, RC-1 from 18.7 ft to 20.0 ft**
- **RQD = 28%, RC-3 from 25.0 ft to 30.0 ft**
- **RQD = 50%, RC-4 from 30.0 ft to 35.0 ft**
- **RQD = 74%, RC-5 from 35.0 ft to 40.0 ft**

**Additional Information:**

- **Groundwater Depth:** 22.2 ft after Run #6
- **Lost Water:** 28.8 ft
- **Depth to Groundwater:** 22.2 ft after Run #6
- **RQD = 0%, RC-1 from 18.7 ft to 20.0 ft**
- **RQD = 28%, RC-3 from 25.0 ft to 30.0 ft**
- **RQD = 50%, RC-4 from 30.0 ft to 35.0 ft**
- **RQD = 74%, RC-5 from 35.0 ft to 40.0 ft**
RQD=100%, RC-6 from 40.0 ft to 45.0 ft
Set well at 41.7 ft

COAL, black
SANDY SHALE, brown, unweathered, moderately hard

Bottom of Test Boring at 45.0 ft

**SOIL CLASSIFICATION**

<table>
<thead>
<tr>
<th>Stratum Elevation, ft</th>
<th>Stratum Depth, ft</th>
<th>Depth, Scale, ft</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Organic Matter Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>651.9</td>
<td>45</td>
<td></td>
<td>RC-6</td>
<td>RC</td>
<td>RQD=100%, RC-6 from 40.0 ft to 45.0 ft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set well at 41.7 ft</td>
</tr>
</tbody>
</table>

**TEST DATA**

**Remarks**

- Standard Penetration Test, Blows per 6 in. increments
- Groundwater

**TEST BORING LOG**

**DRILLING and SAMPLING INFORMATION**

- Date Started: 9/30/13
- Date Completed: 9/30/13
- Drill Foreman: W. Bates
- Inspector: S. Bruder
- Boring Method: HSA

**CLIENT**

- IDNR - Site 2228

**PROJECT NAME**

- Target Grouting Areas - Site 2228

**PROJECT LOCATION**

- North of Brazil, Indiana

**JOB #**

- 86.05957.0016

**BORING #**

- BH8-7

**Northing**

- 1572073

**Easting**

- 2951240

**Groundwater**

- TEST BORING LOG

**Depth to Groundwater**

- S Noted on Drilling Tools
- t At Completion 22.4 ft.
- ¥ After ________ hours ________ ft.
- e Cave Depth ________ ft.
### TEST BORING LOG

**CLIENT**  IDNR - Site 2228  
**PROJECT NAME**  Target Grouting Areas - Site 2228  
**PROJECT LOCATION**  North of Brazil, Indiana  
**BORING #**  BH8-8  

### SURFACE ELEVATION 690.791

<table>
<thead>
<tr>
<th>Depth to Groundwater</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stratum Elevation, ft</td>
<td>Sample Relevance</td>
</tr>
<tr>
<td>689.5</td>
<td>1.3</td>
</tr>
<tr>
<td>685.3</td>
<td>5.5</td>
</tr>
<tr>
<td>680.3</td>
<td>10.5</td>
</tr>
<tr>
<td>673.8</td>
<td>17.0</td>
</tr>
<tr>
<td>671.3</td>
<td>19.5</td>
</tr>
<tr>
<td>670.6</td>
<td>20.2</td>
</tr>
<tr>
<td>660.2</td>
<td>30.6</td>
</tr>
<tr>
<td>659.7</td>
<td>31.1</td>
</tr>
<tr>
<td>660.0</td>
<td>34.8</td>
</tr>
<tr>
<td>655.7</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**SOIL CLASSIFICATION**

- ASPHALT, subbase
- SILTY CLAY, brown, moist
- SILTY CLAY, brown and gray, moist, trace sand and gravel
- SILTY CLAY, brown, slightly moist, some sand and gravel
- SILTY SAND, gray, moist, trace clay
- SANDY SHALE, gray, decomposed
- MINE COLLAPSE-SANDSTONE and filled voids, light gray, slightly weathered, moderately hard, small filled voids, sections of highly broken sandstone
- MINE COLLAPSE-SANDY SHALE, dark gray (wood at 30.6 ft)
- SANDY UNDERCLAY, light beige
- SANDY SHALE, dark gray, unweathered, moderately hard
- SANDY SHALE, light gray, unweathered, soft and moderately hard, thinly bedded with sandstone

**DRILLING and SAMPLING INFORMATION**

- **Date Started:** 10/3/13
- **Date Completed:** 10/3/13
- **Drill Foreman:** W. Bates
- **Inspector:** S. Bruder
- **Boring Method:** HSA

**TEST DATA**

- **Sample Type:** Driven Split Spoon, Pressed Shelby Tube, Continuous Flight Auger, Rock Core, Cuttings, Continuous Tube
- **Sample Graphics:** HA, SS, RC
- **Sample Relevance:** Hand clear to 5.0 ft
- **Groundwater:** At Completion
- **Remarks:** Hand clear to 5.0 ft
<table>
<thead>
<tr>
<th>Depth, ft</th>
<th>Stratum Elevation, ft</th>
<th>Sample Type</th>
<th>RQD</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.7</td>
<td>648.1</td>
<td>RC-5</td>
<td>32%</td>
<td>RQD=32%, RC-5 from 40.2 ft to 42.7 ft</td>
</tr>
<tr>
<td>45.2</td>
<td>645.6</td>
<td>RC-6</td>
<td>68%</td>
<td>RQD=68%, RC-6 from 42.7 ft to 45.2 ft</td>
</tr>
<tr>
<td>45.2</td>
<td>623.3</td>
<td>RC-7</td>
<td>74%</td>
<td>RQD=74%, RC-7 from 45.2 ft to 50.2 ft</td>
</tr>
<tr>
<td>45.2</td>
<td>620.7</td>
<td>RC-8</td>
<td>96%</td>
<td>RQD=96%, RC-8 from 50.2 ft to 55.2 ft</td>
</tr>
<tr>
<td>67.5</td>
<td>621.1</td>
<td>RC-9</td>
<td>84%</td>
<td>RQD=84%, RC-9 from 55.2 ft to 60.2 ft</td>
</tr>
<tr>
<td>67.5</td>
<td>620.6</td>
<td>RC-10</td>
<td>90%</td>
<td>RQD=90%, RC-10 from 60.2 ft to 65.2 ft</td>
</tr>
<tr>
<td>70.2</td>
<td>620.6</td>
<td>RC-11</td>
<td>44%</td>
<td>RQD=44%, RC-11 from 65.2 ft to 70.2 ft</td>
</tr>
<tr>
<td>70.2</td>
<td>620.6</td>
<td>RC-11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drilling and Sampling Information**
- Date Started: 10/3/13
- Date Completed: 10/3/13
- Drill Foreman: W. Bates
- Inspector: S. Bruder
- Boring Method: HSA

**Soil Classification**
- SANDY SHALE, light gray, unweathered, soft and moderately hard, thinly bedded with sandstone
- SHALEY SANDSTONE, light gray and beige, unweathered, moderately hard
- SANDSTONE, light gray/beige, unweathered, moderately hard, very fine grained
- SANDSTONE, gray, unweathered, moderately hard, thin black shale laminations
- CLAY, dark gray, very soft
- SHALE, dark gray, soft

**Test Data**
- Standard Penetration Test: Blows per 6 in. increments
- Groundwater

**Remarks**
- RQD=32%, RC-5 from 40.2 ft to 42.7 ft
- RQD=68%, RC-6 from 42.7 ft to 45.2 ft
- Core block
- RQD=74%, RC-7 from 45.2 ft to 50.2 ft
- RQD=96%, RC-8 from 50.2 ft to 55.2 ft
- RQD=84%, RC-9 from 55.2 ft to 60.2 ft
- RQD=90%, RC-10 from 60.2 ft to 65.2 ft
- RQD=44%, RC-11 from 65.2 ft to 70.2 ft