Brunswick Harbor Modifications Study, Glynn County, GA

Attachment B-4

Engineering and Design

Subsurface Exploration and Geotechnical Engineering Data Report

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT
100 WEST OGLETHORPE AVENUE
SAVANNAH, GEORGIA  31401

July 2021
**TABLE OF CONTENTS**

1.0 INTRODUCTION AND SCOPE OF WORK ................................................................. 1

2.0 FIELD EXPLORATION PROGRAM ............................................................................ 2
   2.1 Standard Penetration Testing .............................................................................. 2
   2.2 Core Sampling .................................................................................................... 3

3.0 LABORATORY TESTING PROGRAM ........................................................................ 5
   3.1 Index Testing ....................................................................................................... 5
      3.1.1 Soil Classification ....................................................................................... 5
      3.1.2 Water Content Determination ..................................................................... 5
      3.1.3 Particle-Size Distribution .......................................................................... 6
      3.1.4 Atterberg Limits ......................................................................................... 6
      3.1.5 Specific Gravity .......................................................................................... 6
   3.2 Sedimentation Rate Testing ................................................................................. 8
   3.3 Strength Testing of Cores .................................................................................. 8
      3.3.1 Unconfined Compression Test .................................................................... 10
      3.3.2 Split Tensile Test ...................................................................................... 10
      3.3.3 Point Load Test ......................................................................................... 10

4.0 SUBSURFACE CONDITIONS .................................................................................... 10

5.0 CLOSURE .................................................................................................................. 12

APPENDIX A FIELD EXPLORATION AND SAMPLING METHODS ............................... A
APPENDIX B BORING AND CORING LOGS ................................................................. B
APPENDIX C PHOTOGRAPHS OF SPT SAMPLES ....................................................... C
APPENDIX D PHOTOGRAPHS OF CORE SAMPLES ...................................................... D
APPENDIX E PARTICLE SIZE ANALYSIS CURVES AND INDEX TEST RESULTS .......... E
APPENDIX F SETTLING TEST RESULTS AND PROCEDURE ...................................... F
APPENDIX G UNCONFINED COMPRESSION TEST RESULTS .................................... G
APPENDIX H SPLIT TENSILE STRENGTH TEST RESULTS ......................................... H
APPENDIX I POINT LOAD TEST RESULTS ................................................................. I
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Summary of Section A Field Exploration</td>
</tr>
<tr>
<td>1B</td>
<td>Summary of Section B Field Exploration</td>
</tr>
<tr>
<td>2A</td>
<td>Summary of Index Test Results for Section A Borings</td>
</tr>
<tr>
<td>2B</td>
<td>Summary of Index Test Results for Section B Borings</td>
</tr>
<tr>
<td>3</td>
<td>Summary of Sedimentation Rate Test Results</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Boring Location Plan Sections A and B</td>
</tr>
<tr>
<td>2</td>
<td>Boring Location Plan Section A</td>
</tr>
<tr>
<td>3</td>
<td>Boring Location Plan Section B</td>
</tr>
<tr>
<td>4</td>
<td>Boring Profiles TB-B-01 to TB-B-08</td>
</tr>
<tr>
<td>5</td>
<td>Boring Profiles TB-B-08 to TB-B-15</td>
</tr>
<tr>
<td>6</td>
<td>Boring Profiles WB-B-01 to WB-B-05</td>
</tr>
<tr>
<td>7</td>
<td>SPT N-value, Water Content and Fines Content versus Elevation Section A borings</td>
</tr>
<tr>
<td>8</td>
<td>SPT N-value, Water Content and Fines Content versus Elevation Section B borings</td>
</tr>
</tbody>
</table>
February 9, 2021
File Number 20-13-0122

U.S. Army Engineer District, Savannah
100 West Oglethorpe Avenue
Savannah, GA 31402

Attention: Mr. Michael R. Loveland, P.G.

Subject: Brunswick Harbor Modification Study, Subsurface Exploration and Geotechnical Engineering Data Report, Glynn County, Georgia

Dear Mr. Loveland:

As authorized, we have completed a subsurface soil exploration program for the Brunswick Harbor Modification Study at Glynn County, Georgia. The purpose of performing this exploration was to collect samples to be used in evaluating the general subsurface conditions at the proposed dredge locations.

It is our understanding that the data from the exploration and laboratory testing will be used to identify and characterize the soil that will be encountered during dredging of the turning basin and channel bend widener expansion. This data report summarizes the work efforts undertaken and the findings derived from the completed field geotechnical exploration and laboratory soil testing program.

We appreciate the opportunity of assisting the U.S. Army Corps of Engineers on this interesting project and look forward to working with you on future projects. If you have any questions or comments, please contact the undersigned.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
A Tetra Tech Company

[Signature]
John E. Garlanger, Ph.D., P.E.
Senior Consultant

[Stamp]
Mohamed Al-hawaree, P.E., P.Eng.
President, Senior Consultant
Georgia License No. 39495
EXECUTIVE SUMMARY

Navigation channel improvements are proposed at the channel Turning Basin and Bend Widener areas as part of the Brunswick harbor modification study. These areas are proposed to be dredged to -36 feet (MLLW) with a 2-foot over-depth. Tetra Tech was tasked by the U.S. Army Corps of Engineers (USACE), Savannah District to perform subsurface exploration for the Brunswick Harbor modification study under Corps of Engineers Contract Number W912HN-17-D-0005 and Delivery Order W912HN20F2042.

Subsurface exploration was performed at the Turning Basin and Bend Widener areas and laboratory testing was performed on the samples collected. The drilling program was conducted between October 21 and November 24, 2020. Twenty-four Standard Penetration Test (SPT) borings were advanced to elevations between -48.29 and -52.53 feet (MLLW) and one coring was performed between elevations -35.82 and -40.82 feet (MLLW).

Tetra Tech - Ardaman & Associates, Inc. (Tetra Tech – AAI) was retained to perform the following tasks on this phase of the project:

- Advance fifteen borings/corings over water at locations designated by the U.S. Army Corps of Engineers (USACE) along the turning basin (Section A) area and collect representative disturbed soil samples for laboratory testing.
- Advance five borings/corings over water at locations designated by the USACE along the bend widener (Section B) area and collect representative disturbed soil samples for laboratory testing.
- Conduct visual classification of the soils and perform sieve analysis, Atterberg limits, specific gravity and sedimentation rate tests on disturbed samples from the borings selected by USACE.
- Conduct unconfined compression, split tensile, point load, Cerchar abrasivity index and permeability tests on core samples from the corings selected by USACE.
- Prepare a geotechnical data report that will include the boring location plan, boring logs and laboratory testing results.

The materials encountered in the Section A borings generally consist of very loose to loose sand to silty sand and clayey sand with shell fragments to approximate elevation -24 feet (MLLW) underlain by generally very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments to the boring termination elevations of -48.9 to -52.3 feet (MLLW). High blow count material (N-value greater than 30) were encountered in the following borings: very dense silty sand between approximate elevations -43.5 and -48.5 feet (MLLW) in boring TB-B-02B; hard clay with limestone fragments between approximate elevations -26.9 and -28.4 feet (MLLW) and dense clayey sand with limestone fragments between approximate elevations -34.4 and -35.9 feet (MLLW) in boring TB-B-04; dense clayey sand with limestone fragments between approximate elevations -28.5 and -30.0 feet (MLLW) and between approximate elevations -40.5 and -43.5 feet (MLLW) in boring TB-B-06; hard clay with limestone fragments between approximate elevations -28.3 and -29.8 feet (MLLW) and very dense silty sand between approximate elevations -47.8 and -49.3 feet (MLLW) in boring
TB-B-07; dense sand between approximate elevations -37.6 and -39.1 feet (MLLW) in boring TB-B-08; dense sand with shell fragments between approximate elevations -17.6 and -19.1 feet (MLLW), hard clay with shell fragments between approximate elevations -31.1 and -34.1 feet (MLLW) and dense clayey sand with shell and limestone fragments between approximate elevations -40.1 and -41.6 feet (MLLW) in boring TB-B-09; dense to very dense clayey sand with shell and sandstone fragments between approximate elevations -27.5 and -30.5 feet (MLLW) and between approximate elevations -33.5 and -35.0 feet (MLLW) in boring TB-B-10; sandstone fragments between approximate elevations -29.7 and -30.2 feet (MLLW) and very dense clayey sand with shell and limestone fragments between approximate elevations -31.7 and -33.2 feet (MLLW) in boring TB-B-11; and hard sandy clay between approximate elevations -29.9 and -32.9 feet (MLLW), dense clayey sand between approximate elevations -32.9 and -34.4 feet (MLLW), dense clayey sand with limestone fragments between approximate elevations -37.4 and -39.3 feet (MLLW) and dense silty sand with limestone fragments between approximate elevations -39.3 and -40.4 feet (MLLW) in boring TB-B-13. Stiff to hard clay at varying elevations were encountered in the following borings: TB-B-02A, TB-B-04, TB-B-07, TB-B-09, TB-B-10, TB-B-11, TB-B-13, TB-B-14A and TB-B-15B.

The materials encountered in the Section B borings generally consist of very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments to the boring termination elevations of -48.3 to -51.0 feet (MLLW). High blow count material (N-value greater than 30) were encountered at the following locations: dense sand with sandstone fragments between approximate elevations -28.0 and -31.0 feet (MLLW), dense clayey sand with sandstone fragments between approximate elevations -32.5 and -34.0 feet (MLLW) and approximate elevations -35.5 and -37.0 feet (MLLW), very dense sand between approximate elevations -38.5 and -40.0 feet (MLLW) and undetermined strata between approximate elevations -40.0 and -41.5 feet (MLLW) in boring BW-B-01; very dense clayey sand with sandstone fragments between approximate elevations -33.0 and -34.5 feet (MLLW), hard clay with gravel between approximate elevations -34.5 and -36.5 feet (MLLW) and very dense clayey sand between approximate elevations -48.0 and -49.5 feet (MLLW) in boring BW-B-02; very dense clayey sand with shell fragments between approximate elevations -34.8 and -37.8 feet (MLLW), limestone between approximate elevations -37.8 and -39.3 feet (MLLW) and very dense sand with shell and siltstone fragments between approximate elevations -39.3 and -40.8 feet (MLLW) in boring BW-B-03; dense clayey sand and hard clay with sand between approximate elevations -43.4 and -49.4 feet (MLLW) in boring BW-B-04; and dense sand with shell fragments between approximate elevations -26.7 and -28.2 feet (MLLW), hard clay between approximate elevations -39.2 and -40.2 feet (MLLW), dense clayey sand between approximate elevations -44.7 and -46.2 feet (MLLW) and dense sand with shell fragments between approximate elevations -46.2 and -49.2 feet (MLLW) in boring BW-B-05. Very stiff to hard clay at varying elevations were encountered in borings BW-B-02, BW-B-03 and BW-B-05.
1.0 INTRODUCTION AND SCOPE OF WORK

Portions of the Brunswick navigation channel Turning Basin (Section A) and Bend Widener (Section B) are proposed to be dredged to -36 feet (MLLW) with a 2-foot over-depth as part of improvements for the Brunswick Harbor modification study. To identify and characterize the soil that will be encountered during dredging, subsurface exploration was performed at these areas and laboratory testing were performed on the samples collected.

The subsurface exploration program was conducted between October 21 and November 24, 2020. Seventeen Standard Penetration Test (SPT) borings at seventeen locations were advanced continuously from the mudline to depths of 15.0 to 36.0 feet (Elevation -48.3 to -52.0 feet MLLW). Seven SPT borings at three locations were continuously advanced to depths of 3.0 to 18.0 feet (Elevation -35.2 to -52.5 feet MLLW) from the existing mudline or from wash depths when a previous boring from the same general location was terminated shallower than the intended depth. Coring was performed in one location between Elevation -35.8 and -40.8 feet MLLW. All samples and cores were brought to our Orlando, Florida laboratory.

Sieve analysis, Atterberg limits, specific gravity and sedimentation rate tests, on disturbed samples from the borings selected by the U.S. Army Corps of Engineers (USACE), were performed in our Orlando, Florida laboratory. The USACE designated unconfined compression, split tensile and axial point load tests for the three available cores. One core sample was tested for unconfined compression strength in our Orlando, Florida laboratory. Two cores were sent to GeoTesting Express in Acton, MA for split tensile and axial point load tests.

The purpose of this report is to present the results of the field exploration and laboratory testing performed on selected samples obtained along the turning basin and bend widener areas.

The extent of our services for this phase of the project was as follows:

- Advance fifteen borings/corings over water at locations designated by the USACE along the turning basin (Section A) area and collect representative disturbed soil samples for laboratory testing.

- Advance five borings/corings over water at locations designated by the USACE along the bend widener (Section B) area and collect representative disturbed soil samples for laboratory testing.

- Conduct visual classification of the soils and perform sieve analysis, Atterberg limits, specific gravity and sedimentation rate tests on disturbed samples from the borings selected by USACE.

- Conduct unconfined compression, split tensile, point load, Cerchar abrasivity index and permeability tests on core samples from the corings selected by USACE.

- Prepare a geotechnical data report that will include the boring location plan, boring logs and laboratory testing results.
Tetra Tech - AAI has prepared this report for the exclusive use of the USACE for the specific application of identifying and characterizing the soil that will be encountered during dredging of the Brunswick Harbor turning basin and channel bend widener expansion areas in Brunswick, Glynn County, Georgia. The report was prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

The findings of this data report are based on the results of the field exploration and laboratory tests performed. While the borings and coring are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations are anticipated and may be encountered during construction activities. The boring and coring logs and related information are based on the drilling logs, coring log, visual examination of selected samples in the laboratory and laboratory index testing and coring testing results. The delineations between soil types shown on the logs are approximate and the description represents our interpretation of subsurface conditions at the designated boring locations on the date drilled.

2.0 FIELD EXPLORATION PROGRAM

The field exploration program consisted of twenty-four Standard Penetration Test (SPT) borings and one coring. An overview of the boring location plan for the Brunswick Harbor modification study area, showing Section A and Section B, is presented in Figure 1.

2.1 Standard Penetration Testing

Standard Penetration Test (SPT) borings were advanced using a truck-mounted CME 55 drilling equipment on a 30- x 60-ft barge using the methodology outlined in ASTM D1586. A summary of this field procedure is included in Appendix A. Field logs for each boring were prepared by a field geotechnical engineer. These logs included visual classifications of the material encountered during drilling. Soil samples were generally obtained continuously from the existing mudline surface to the termination depth of the boreholes. All samples, which were visually field classified, were classified in accordance with the Unified Soils Classification System (USCS) as required in Engineering Manual 1110-1-1804. A photograph was taken of the split-spoon sample, using a ruler for scale, before representative portions of the samples were placed in sealed sample jars. Each jar was uniquely identified on the top of the jar lid and exterior side of the jar body. Information recorded on the jar lid and exterior side included Project Number, Boring ID, Sample Number and Depth (from __ to __). The SPT sample jars were successively placed in core boxes.

Nineteen SPT borings were advanced at fifteen general locations in the turning basin area (Section A) as presented in Figure 2. Twelve SPT borings at twelve locations (TB-B-01, TB-B-03 to TB-B-13) were advanced continuously from the existing mudline to depths of 18.0 to 36.0 feet (Elevation -49.0 to -52.0 feet MLLW) to the boring termination depth. At three general locations, the initial boring (TB-B-02A, TB-B-14A and TB-B-15A) was drilled continuously from the existing mudline but was terminated shallower than the intended depth (Elevation -48.0 feet MLLW) due to either stopping work because of bad weather or the barge spuds being pulled out because of rising water due to incoming tide. Sister borings (TB-B-02B, TB-B-14B and TB-B-15B) were drilled next to the initial boring and were advanced continuously from the wash depths to the boring termination depths except at TB-B-14B where another sister boring, TB-B-
14C, was drilled and advanced from the wash depth to the boring termination depth. The seven SPT borings (TB-B-02A, TB-B-02B, TB-B-14A, TB-B-14B, TB-B-14C, TB-B-15A and TB-B-15B) were continuously advanced to depths of 3.0 to 18.0 feet (Elevation -35.2 to -52.5 feet MLLW) from the existing mudline or from wash depths. The subsurface exploration program in Section A was conducted between October 21 and November 17, 2020.

Five SPT borings were advanced at five general locations in the bend widener area (Section B) as presented in Figure 3. The borings were advanced continuously from the existing mudline to depths of 15.0 to 24.0 feet (Elevation -48.3 to -51.0 feet MLLW) to the boring termination depth. The subsurface exploration program in Section B was conducted between November 20 and 23, 2020.

All the borings were located on site by a Tetra Tech - AAI engineer using a Trimble Geo7X differential Global Positioning System (GPS), which has a typical accuracy of 1 foot. Positions of the boreholes are reported in Georgia State Plane NAD83 coordinates (feet).

Mudline elevation at each boring location was determined by plotting the boring coordinates on the hydrographic survey maps, located at https://navigation.usace.army.mil/Survey/Hydro, provided by the USACE. The most recent survey at each location was used. Most of the mudline elevation was determined using the hydrographic survey dated 09/25/2020 except borings TB-B-09, TB-B-11, TB-B-13 and TB-B-14 where the hydrographic survey dated 06/21/19 and borings BW-B-01, BW-B-03 and BW-B-05 where the hydrographic survey dated 12/18/17 were used. In addition, the mudline elevation was also calculated by measuring the water depth at each boring location and subtracting it from the predicted tide height at the Howe St Pier Station (https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=8677406) prior to start of drilling. The more conservative determined mudline elevation, i.e., the higher elevation, was used to determine boring depth to terminate past elevation -48.0 feet MLLW.

Tables 1A and 1B summarize the Section A and Section B field exploration, respectively, conducted for the project. The mudline elevation used in this report are those determined from the hydrographic surveys. The individual test boring logs are presented in Appendix B. Photographs of the samples are presented in Appendix C.

All soil samples recovered during the field exploration program were brought back to our laboratory in Orlando, Florida for additional classification and testing. All laboratory tests, where applicable, were performed in general accordance with ASTM standards.

### 2.2 Core Sampling

The hard strata encountered in the SPT borings were normally a thin layer, no thicker than 1-2 feet, except in boring BW-B-03 where about 3 feet of hard material was encountered. Coring was performed using a 4-inch diameter and 5 feet long core barrel near the location of BW-B-03 from a depth of 8.0 to 13.0 feet (Elevation -35.8 to -40.8 feet MLLW) on November 24, 2020.

Three cores were recovered from BW-B-03 Core and were approximately 17 inches in total length. A photograph was taken of the core samples with a ruler for scale. The cores were individually wrapped in plastic and taped tight to maintain its moisture prior to placement in the core box. The core samples were brought back to our laboratory in Orlando, Florida for
additional classification and testing. All laboratory tests, where applicable, were performed in general accordance with ASTM standards.

The BW-B-03 Core information is summarized in Table 1B. The core log is presented in Appendix B and core photographs are presented in Appendix D.

**Table 1A Summary of Section A Field Exploration**

<table>
<thead>
<tr>
<th>Boring Name</th>
<th>Georgia State Plane Coordinates (feet, NAD83)</th>
<th>Mudline Elevation (feet, MLLW)</th>
<th>Total Depth (feet)</th>
<th>End of Boring Elevation (feet, MLLW)</th>
<th>Start of Drilling</th>
<th>Completion of Drilling</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB-B-02A</td>
<td>412,715.236 854,194.765</td>
<td>-20.2</td>
<td>15.0</td>
<td>-35.2</td>
<td>10/21/2020</td>
<td>10/21/2020</td>
</tr>
<tr>
<td>TB-B-02B</td>
<td>412,718.236 854,194.265</td>
<td>-19.5</td>
<td>33.0</td>
<td>-52.5</td>
<td>10/22/2020</td>
<td>10/22/2020</td>
</tr>
<tr>
<td>TB-B-03</td>
<td>412,473.952 854,534.897</td>
<td>-31.5</td>
<td>20.5</td>
<td>-52.0</td>
<td>10/29/2020</td>
<td>10/29/2020</td>
</tr>
<tr>
<td>TB-B-06</td>
<td>412,129.581 855,659.706</td>
<td>-22.5</td>
<td>27.0</td>
<td>-49.5</td>
<td>11/07/2020</td>
<td>11/07/2020</td>
</tr>
<tr>
<td>TB-B-07</td>
<td>411,964.473 855,945.882</td>
<td>-21.3</td>
<td>28.0</td>
<td>-49.3</td>
<td>11/01/2020</td>
<td>11/01/2020</td>
</tr>
<tr>
<td>TB-B-08</td>
<td>411,866.568 856,124.927</td>
<td>-29.6</td>
<td>20.0</td>
<td>-49.6</td>
<td>11/16/2020</td>
<td>11/16/2020</td>
</tr>
<tr>
<td>TB-B-10</td>
<td>411,900.872 856,576.343</td>
<td>-18.5</td>
<td>31.5</td>
<td>-50.0</td>
<td>10/27/2020</td>
<td>10/27/2020</td>
</tr>
<tr>
<td>TB-B-11</td>
<td>411,931.108 856,782.625</td>
<td>-19.7</td>
<td>31.5</td>
<td>-51.2</td>
<td>10/26/2020</td>
<td>10/26/2020</td>
</tr>
<tr>
<td>TB-B-12</td>
<td>411,770.122 856,952.449</td>
<td>-30.6</td>
<td>20.5</td>
<td>-51.1</td>
<td>10/28/2020</td>
<td>10/28/2020</td>
</tr>
<tr>
<td>TB-B-13</td>
<td>411,855.282 857,200.656</td>
<td>-23.9</td>
<td>25.5</td>
<td>-49.4</td>
<td>10/25/2020</td>
<td>10/25/2020</td>
</tr>
<tr>
<td>TB-B-14B</td>
<td>411,994.583 857,432.139</td>
<td>-27.2</td>
<td>15.0</td>
<td>-42.2</td>
<td>10/24/2020</td>
<td>10/24/2020</td>
</tr>
<tr>
<td>TB-B-14C</td>
<td>411,952.222 857,468.938</td>
<td>-29.8</td>
<td>22.5</td>
<td>-52.3</td>
<td>10/25/2020</td>
<td>10/25/2020</td>
</tr>
<tr>
<td>TB-B-15B</td>
<td>411,673.741 857,427.744</td>
<td>-38.4</td>
<td>10.5</td>
<td>-48.9</td>
<td>10/24/2020</td>
<td>10/24/2020</td>
</tr>
</tbody>
</table>
Table 1B Summary of Section B Field Exploration

<table>
<thead>
<tr>
<th>Boring Name</th>
<th>Georgia State Plane Coordinates (feet, NAD83)</th>
<th>Mudline Elevation (feet, MLLW)</th>
<th>Total Depth (feet)</th>
<th>End of Boring Elevation (feet, MLLW)</th>
<th>Start of Drilling</th>
<th>Completion of Drilling</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-B-01</td>
<td>402,886.394 879,294.947</td>
<td>-28.0</td>
<td>21.0</td>
<td>-49.0</td>
<td>11/22/20202</td>
<td>11/22/2020</td>
</tr>
<tr>
<td>BW-B-02</td>
<td>402,653.563 879,701.010</td>
<td>-33.0</td>
<td>18.0</td>
<td>-51.0</td>
<td>11/23/2020</td>
<td>11/23/2020</td>
</tr>
<tr>
<td>BW-B-03</td>
<td>402,809.630 880,151.887</td>
<td>-27.3</td>
<td>21.0</td>
<td>-48.3</td>
<td>11/20/2020</td>
<td>11/20/2020</td>
</tr>
<tr>
<td>BW-B-03 Core</td>
<td>402,813.444 880,186.528</td>
<td>-27.8</td>
<td>8.0 - 13.0</td>
<td>-40.8</td>
<td>11/24/2020</td>
<td>11/24/2020</td>
</tr>
<tr>
<td>BW-B-04</td>
<td>402,573.885 880,506.694</td>
<td>-34.4</td>
<td>15.0</td>
<td>-49.4</td>
<td>11/23/2020</td>
<td>11/23/2020</td>
</tr>
<tr>
<td>BW-B-05</td>
<td>402,828.000 880,813.892</td>
<td>-25.2</td>
<td>24.0</td>
<td>-49.2</td>
<td>11/21/2020</td>
<td>11/21/2020</td>
</tr>
</tbody>
</table>

3.0 LABORATORY TESTING PROGRAM

The laboratory testing program was mostly conducted in our USACE approved laboratory in Orlando, Florida on selected samples from the field exploration. The program included visual classification, water content, particle-size distribution, Atterberg limits determinations, specific gravity and sedimentation rate test on selected samples obtained from the borings. The testing assignments were provided to us by the USACE.

In addition, strength testing consisting of unconfined compression, split tensile and point load tests were performed on core samples. The unconfined compression testing was performed in our Orlando, Florida laboratory while the split tensile and point load tests were performed by GeoTesting Express in Acton, Massachusetts. GeoTesting Express is also an USACE approved laboratory. As with the soil samples, the core test assignments were provided to us by USACE.

3.1 Index Testing

3.1.1 Soil Classification

Visual classifications of soil samples were performed in accordance with ASTM Standard D2488 on representative portions of each soil sample. Unified soil classification was performed on selected soil samples in accordance with ASTM Standard D2847.

3.1.2 Water Content Determination

Water content determinations were performed in accordance with ASTM Standard D2216 on representative portions of selected soil samples oven dried at 107.5±2.5°C. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
3.1.3 Particle-Size Distribution
The particle-size distributions of soil samples were determined using mechanical sieving test methods in general accordance with ASTM Standard D6913.

3.1.4 Atterberg Limits
Liquid and plastic limit measurements were performed on soil samples in general accordance with ASTM Standard D4318 (Method A).

3.1.5 Specific Gravity
Specific gravity of soil samples was determined in general accordance with ASTM Standard D854.

Tables 2A and 2B summarize the index testing results for Section A and Section B, respectively, conducted for this project. The plots of particle-size analyses are presented in Appendix E.

### Table 2A Summary of Index Test Results for Section A Borings

<table>
<thead>
<tr>
<th>Boring Name</th>
<th>Stratum Upper Elev. (ft MLLW)</th>
<th>Stratum Lower Elev. (ft MLLW)</th>
<th>Sample Number</th>
<th>Soil Description</th>
<th>SPT N-value (blows/ft)</th>
<th>Water Content (%)</th>
<th>Percent Passing U.S. Std. No. 200 Sieve (%)</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB-B-01</td>
<td>-36.0</td>
<td>-37.5</td>
<td>5</td>
<td>SAND WITH SILT (SP-SM), fine to medium; gray, trace shell fragments, calcareous.</td>
<td>WOH¹</td>
<td>29</td>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-37.5</td>
<td>-39.0</td>
<td>6</td>
<td>SILTY SAND (SM), fine to medium; gray, with gravel, with shell and limestone fragments, calcareous.</td>
<td>4</td>
<td>18</td>
<td>14</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-02A</td>
<td>-21.7</td>
<td>-23.2</td>
<td>2</td>
<td>SILTY SAND (SM), fine; dark greenish gray, slightly calcareous.</td>
<td>1</td>
<td>82</td>
<td>43</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-02B</td>
<td>-36.0</td>
<td>-37.5</td>
<td>12</td>
<td>CLAYEY SAND (SC), fine to medium; light gray, calcareous. Specific Gravity = 2.70</td>
<td>18</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-04</td>
<td>-19.4</td>
<td>-20.9</td>
<td>3</td>
<td>SAND (SP), fine; gray. Specific Gravity = 2.66</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-25.9</td>
<td>-26.9</td>
<td>9</td>
<td>SANDY CLAY (CL), gray, with shell fragments, calcareous.</td>
<td>17</td>
<td>19</td>
<td>66</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>-31.4</td>
<td>-32.9</td>
<td>14</td>
<td>CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.</td>
<td>15</td>
<td>26</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-05</td>
<td>-37.1</td>
<td>-38.6</td>
<td>4</td>
<td>SAND WITH SILT (SP-SM), medium to coarse; light gray, some shell fragments, calcareous. Specific Gravity = 2.69</td>
<td>15</td>
<td>22</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

¹ WOH = SPT split-spoon sampler advanced by Weight of Hammer
<table>
<thead>
<tr>
<th>Boring Name</th>
<th>Stratum Upper Elev. (ft MLLW)</th>
<th>Stratum Lower Elev. (ft MLLW)</th>
<th>Sample Number</th>
<th>Soil Description</th>
<th>SPT N-value (blows/ft)</th>
<th>Water Content (%)</th>
<th>Percent Passing U.S. Std. No. 200 Sieve (%)</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB-B-06</td>
<td>-25.5</td>
<td>-27.0</td>
<td>3</td>
<td>SILTY SAND (SM), fine; gray, some clay, some limestone fragments, calcareous.</td>
<td>18</td>
<td>24</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-28.5</td>
<td>-30.0</td>
<td>5</td>
<td>CLAYEY SAND (SC), fine to medium; gray, with limestone fragments, trace shell fragments, calcareous. Specific Gravity = 2.70</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TB-B-07</td>
<td>-29.8</td>
<td>-31.1</td>
<td>2</td>
<td>CLAYEY SAND (SC), dark gray, calcareous.</td>
<td>25</td>
<td>29</td>
<td>50</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>-37.3</td>
<td>-38.8</td>
<td>7</td>
<td>CLAYEY SAND (SC), gray, trace limestone fragments, trace shell fragments, calcareous.</td>
<td>21</td>
<td>26</td>
<td>45</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-08</td>
<td>-37.6</td>
<td>-39.1</td>
<td>1</td>
<td>SAND (SP), fine; gray, with shell fragments, calcareous.</td>
<td>31</td>
<td>34</td>
<td>4</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-16.1</td>
<td>-17.6</td>
<td>3</td>
<td>SAND (SP), fine; gray, trace shell fragments, calcareous. Specific Gravity = 2.66</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TB-B-09</td>
<td>-22.1</td>
<td>-23.6</td>
<td>7</td>
<td>CLAYEY SAND (SC), gray, some silt, some shell fragments, calcareous.</td>
<td>5</td>
<td>41</td>
<td>39</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-29.6</td>
<td>-31.1</td>
<td>12</td>
<td>SANDY CLAY (CL), gray, trace shell fragments, calcareous.</td>
<td>29</td>
<td>19</td>
<td>70</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>TB-B-10</td>
<td>-27.5</td>
<td>-29.0</td>
<td>10</td>
<td>CLAYEY CLAY (SC), gray, trace shell fragments, calcareous.</td>
<td>52</td>
<td>21</td>
<td>50</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>-38.0</td>
<td>-39.5</td>
<td>20</td>
<td>SILTY SAND (SM), fine to medium; gray, some clay, some limestone fragments, calcareous.</td>
<td>25</td>
<td>21</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TB-B-11</td>
<td>-27.2</td>
<td>-28.7</td>
<td>6</td>
<td>SILTY SAND (SM), fine; gray, with shell fragments, calcareous.</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-30.2</td>
<td>-31.7</td>
<td>9</td>
<td>CLAY WITH SAND (CL), gray, trace shell fragments, calcareous.</td>
<td>29</td>
<td>18</td>
<td>74</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TB-B-13</td>
<td>-26.9</td>
<td>-27.9</td>
<td>4</td>
<td>SILTY SAND (SM), fine; gray, some shell fragments, some clay, calcareous.</td>
<td>18</td>
<td>30</td>
<td>13</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-31.4</td>
<td>-32.9</td>
<td>8</td>
<td>SANDY CLAY (CL), gray, calcareous.</td>
<td>49</td>
<td>21</td>
<td>60</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>TB-B-14A</td>
<td>-33.5</td>
<td>-35.0</td>
<td>5</td>
<td>CLAY WITH SAND (CL), gray, calcareous.</td>
<td>22</td>
<td>24</td>
<td>76</td>
<td>38</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>-35.0</td>
<td>-36.5</td>
<td>6</td>
<td>CLAY WITH SAND (CL), gray, calcareous.</td>
<td>25</td>
<td>30</td>
<td>70</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Table 2B Summary of Index Test Results for Section B Borings

<table>
<thead>
<tr>
<th>Boring Name</th>
<th>Stratum Upper Elev. (ft MLLW)</th>
<th>Stratum Lower Elev. (ft MLLW)</th>
<th>Sample Number</th>
<th>Soil Description</th>
<th>SPT N-value (blows/ft)</th>
<th>Water Content (%)</th>
<th>Percent Passing U.S. Std. No. 200 Sieve (%)</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-B-01</td>
<td>-38.5</td>
<td>-40.0</td>
<td>8</td>
<td>SAND (SP), fine; gray. Specific Gravity = 2.66</td>
<td>76</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BW-B-02</td>
<td>-34.5</td>
<td>-36.0</td>
<td>2</td>
<td>SANDY CLAY (CL), gray, trace gravel.</td>
<td>50/4*</td>
<td>14</td>
<td>56</td>
<td>38</td>
<td>16</td>
</tr>
<tr>
<td>BW-B-03</td>
<td>-28.8</td>
<td>-30.3</td>
<td>2</td>
<td>SAND WITH SILT (SP-SM), fine; gray, with shell fragments, calcareous.</td>
<td>19</td>
<td>20</td>
<td>10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-31.8</td>
<td>-33.3</td>
<td>4</td>
<td>CLAY WITH SAND (CH), gray.</td>
<td>20</td>
<td>61</td>
<td>82</td>
<td>112</td>
<td>71</td>
</tr>
<tr>
<td>BW-B-04</td>
<td>-37.4</td>
<td>-38.9</td>
<td>5</td>
<td>SAND WITH SILT (SP-SM), fine; gray, with shell fragments.</td>
<td>6</td>
<td>26</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BW-B-05</td>
<td>-26.7</td>
<td>-27.7</td>
<td>2</td>
<td>SAND (SP), fine; gray, trace shell fragments, calcareous. Specific Gravity = 2.67</td>
<td>38</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-31.2</td>
<td>-32.7</td>
<td>6</td>
<td>SAND WITH CLAY (SP-SC), fine; gray, with shell fragments, calcareous.</td>
<td>6</td>
<td>32</td>
<td>10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### 3.2 Sedimentation Rate Testing

Sedimentation tests were conducted on four composite soil samples from depth intervals and borings designated by the USACE (BW-B-01, TB-B-02A, TB-B-07 and TB-B-14A) created by combining two to four Standard Penetration Test jar samples from each boring. The resulting composite samples were homogenized and scalped on the U.S. Standard No. 4 sieve for obtaining specimens for testing. The sedimentation tests were performed in general accordance with the USACE South Atlantic Division Laboratory’s sedimentation-rate test procedure using initial suspension concentrations of 50 and 100 grams (wet mass basis) per liter (see Appendix F). Water collected from Brunswick Harbor was used for the sedimentation tests.

The results of the sedimentation tests are presented in Appendix F with plots of height of suspended sediment versus both time and log time. Sieve analysis test results for the composite sample are also presented in Appendix F. A summary of test results is tabulated in Table 3 below.
Table 3 Summary of Sedimentation Rate Test Results

<table>
<thead>
<tr>
<th>Boring</th>
<th>Samples</th>
<th>Description [As-received]</th>
<th>Particle-Size Fraction (% dry mass basis)</th>
<th>Minus No. 4 Fraction Water Content (%)</th>
<th>Initial Suspension Concentration</th>
<th>Initial Setting Velocity (cm/min)</th>
<th>Final Settled Sediment Concentration and Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sample Gravel Size</td>
<td></td>
<td></td>
<td></td>
<td>Wet Mass (gr/liter)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coarse Medium Fine</td>
<td></td>
<td></td>
<td></td>
<td>Dry Mass (gr/liter)</td>
</tr>
<tr>
<td>BW-B</td>
<td>2; 3</td>
<td>Gray silty sand (SM)</td>
<td>As-Received 9.4 12.6 35.3 29.8 12.9</td>
<td>16.3</td>
<td>50 43</td>
<td>---*</td>
<td>1,429 1,228</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scalped</td>
<td>0 13.8 39.0 32.9 14.3</td>
<td></td>
<td>100 86</td>
<td>---*</td>
<td>1,449 1,246</td>
</tr>
<tr>
<td>TB-B</td>
<td>02A</td>
<td>Greenish-gray sand with clay and shell (SP-SC)</td>
<td>As-Received 11.3 12.4 37.9 28.6 9.8</td>
<td>29.9</td>
<td>50 38</td>
<td>1.4</td>
<td>877 675</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scalped</td>
<td>0 13.6 42.9 32.4 11.1</td>
<td></td>
<td>100 77</td>
<td>1.1</td>
<td>917 706</td>
</tr>
<tr>
<td>TB-B</td>
<td>07</td>
<td>Gray clayey sand with gravel and trace shell (SC)</td>
<td>As-Received 15.0 5.8 27.7 26.4 25.1</td>
<td>27.8</td>
<td>50 39</td>
<td>1.3</td>
<td>806 631</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scalped</td>
<td>0 6.7 32.6 31.1 29.6</td>
<td></td>
<td>100 78</td>
<td>0.8</td>
<td>820 641</td>
</tr>
<tr>
<td>TB-B</td>
<td>14A</td>
<td>Greenish-gray clayey sand with gravel (SC)</td>
<td>As-Received 19.8 5.1 11.6 30.2 33.3</td>
<td>27.0</td>
<td>50 39</td>
<td>0.8</td>
<td>917 722</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scalped</td>
<td>0 6.5 14.3 37.7 41.5</td>
<td></td>
<td>100 79</td>
<td>0.6</td>
<td>847 667</td>
</tr>
</tbody>
</table>

*Sample was sandy and settled immediately. Suspension did not develop an interface.
3.3 **Strength Testing of Cores**

Strength testing consisting of unconfined compression, split tensile and point load tests were performed on core samples from BW-B-03 Core. The unconfined compression testing was performed in our Orlando, Florida laboratory while the split tensile and point load tests were performed by GeoTesting Express in Acton, Massachusetts.

3.3.1 **Unconfined Compression Test**

Unconfined compression test was performed in general accordance with ASTM Standard D7012 on the top core from boring BW-B-03 Core.

The result of the test shows an unconfined compressive strength of 56 psi for the tested core. The stress-strain plot of the sample tested is presented in Appendix G. Initial and final test specimen conditions are also summarized on the same figure.

3.3.2 **Split Tensile Test**

Split tensile test was performed in general accordance with ASTM Standard D3967 on the middle core from boring BW-B-03 Core.

The result of the test shows a split tensile strength of 52 psi for the tested core. Test results as well as initial and final test specimen conditions are presented in Appendix H.

3.3.3 **Point Load Test**

Point load test was performed in general accordance with ASTM Standard D5731 on the bottom core from boring BW-B-03 Core. The sample was loaded axially.

The result of the test shows a point load strength index (corrected for size) of 25 psi for the tested core with an estimated compressive strength of 434 psi. Test results as well as initial and final test specimen conditions are presented in Appendix I.

4.0 **SUBSURFACE CONDITIONS**

The samples were visually classified in accordance with ASTM Standard D2488 and by Unified soil classification in accordance with ASTM Standard D2847 based on the results of the index and strength tests. Soil boring profiles for Section A borings are presented in Figure 4 for borings TB-B-01 to TB-B-08 and in Figure 5 for borings TB-B-08 to TB-B-15. Soil boring profiles for Section B borings are presented in Figure 6 for borings WB-B-01 to WB-B-05. The plots of SPT N-value, fines content and water content of Sections A and B borings are plotted versus elevation in Figures 7 and 8, respectively.

The materials encountered in the Section A borings generally consist of very loose to loose sand to silty sand and clayey sand with shell fragments to approximate elevation -24 feet (MLLW) underlain by generally very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments to the boring termination elevations of -48.9 to -52.3 feet (MLLW). Note that high blow count material (N-value greater than 30) were encountered in the following borings: very dense silty sand between approximate elevations -43.5 and -48.5 feet (MLLW) in boring TB-B-02B; hard clay with limestone fragments between
approximate elevations -26.9 and -28.4 feet (MLLW) and dense clayey sand with limestone fragments between approximate elevations -34.4 and -35.9 feet (MLLW) in boring TB-B-04; dense clayey sand with limestone fragments between approximate elevations -28.5 and -30.0 feet (MLLW) and between approximate elevations -40.5 and -43.5 feet (MLLW) in boring TB-B-06; hard clay with limestone fragments between approximate elevations -28.3 and -29.8 feet (MLLW) and very dense silty sand between approximate elevations -47.8 and -49.3 feet (MLLW) in boring TB-B-07; dense sand between approximate elevations -37.6 and -39.1 feet (MLLW) in boring TB-B-08; dense sand with shell fragments between approximate elevations -17.6 and -19.1 feet (MLLW), hard clay with shell fragments between approximate elevations -31.1 and -34.1 feet (MLLW) and dense clayey sand with shell and limestone fragments between approximate elevations -40.1 and -41.6 feet (MLLW) in boring TB-B-09; dense to very dense clayey sand with shell and sandstone fragments between approximate elevations -27.5 and -30.5 feet (MLLW) and between approximate elevations -33.5 and -35.0 feet (MLLW) in boring TB-B-10; sandstone fragments between approximate elevations -29.7 and -30.2 feet (MLLW) and very dense clayey sand with shell and limestone fragments between approximate elevations -31.7 and -33.2 feet (MLLW) in boring TB-B-11; and hard sandy clay between approximate elevations -29.9 and -32.9 feet (MLLW), dense clayey sand between approximate elevations -32.9 and -34.4 feet (MLLW), dense clayey sand with limestone fragments between approximate elevations -37.4 and -39.3 feet (MLLW) and dense silty sand with limestone fragments between approximate elevations -39.3 and -40.4 feet (MLLW) in boring TB-B-13. Stiff to hard clay at varying elevations were encountered in the following borings: TB-B-02A, TB-B-04, TB-B-07, TB-B-09, TB-B-10, TB-B-11, TB-B-13, TB-B-14A and TB-B-15B. Refer to Appendix B for soil profile details.

The materials encountered in the Section B borings generally consist of very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments to the boring termination elevations of -48.3 to -51.0 feet (MLLW). Note that high blow count material (N-value greater than 30) were encountered at the following locations: dense sand with sandstone fragments between approximate elevations -28.0 and -31.0 feet (MLLW), dense clayey sand with sandstone fragments between approximate elevations -32.5 and -34.0 feet (MLLW) and approximate elevations -35.5 and -37.0 feet (MLLW), very dense sand between approximate elevations -38.5 and -40.0 feet (MLLW) and undetermined stratum between approximate elevations -40.0 and -41.5 feet (MLLW) in boring BW-B-01; very dense clayey sand with sandstone fragments between approximate elevations -33.0 and -34.5 feet (MLLW), hard clay with gravel between approximate elevations -34.5 and -36.5 feet (MLLW) and very dense clayey sand between approximate elevations -48.0 and -49.5 feet (MLLW) in boring BW-B-02; very dense clayey sand with shell fragments between approximate elevations -34.8 and -37.8 feet (MLLW), limestone between approximate elevations -37.8 and -39.3 feet (MLLW) and very dense sand with shell and siltstone fragments between approximate elevations -39.3 and -40.8 feet (MLLW) in boring BW-B-03; dense clayey sand and hard clay with sand between approximate elevations -43.4 and -49.4 feet (MLLW) in boring BW-B-04; and dense sand with shell fragments between approximate elevations -26.7 and -28.2 feet (MLLW), hard clay between approximate elevations -39.2 and -40.2 feet (MLLW), dense clayey sand between approximate elevations -44.7 and -46.2 feet (MLLW) and dense sand with shell fragments between approximate elevations -46.2 and -49.2 feet (MLLW) in boring BW-B-05. Very stiff to hard clay at varying elevations were encountered in borings BW-B-02, BW-B-03 and BW-B-05. Refer to Appendix B for soil profile details.
5.0 CLOSURE

We understand that the Turning Basin (Section A) and Bend Widener (Section B) areas are proposed to be dredged to elevation -36 feet (MLLW) plus 2 feet of over-dredge. Based on the results of our subsurface exploration and laboratory program, the materials that will be encountered in Section A during dredging will most likely be very loose to loose sand to silty sand and clayey sand with shell fragments to approximate elevation -24 feet (MLLW) underlain by generally very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments. Note that high blow count material (N-value greater than 30) were encountered in the following borings: hard clay with limestone fragments between approximate elevations -26.9 and -28.4 feet (MLLW) and dense clayey sand with limestone fragments between approximate elevations -34.4 and -35.9 feet (MLLW) in boring TB-B-04; dense clayey sand with limestone fragments between approximate elevations -28.5 and -30.0 feet (MLLW) in boring TB-B-06; hard clay with limestone fragments between approximate elevations -17.6 and -19.1 feet (MLLW), hard clay with shell fragments between approximate elevations -31.1 and -34.1 feet (MLLW) in boring TB-B-09; dense to very dense clayey sand with shell and sandstone fragments between approximate elevations -27.5 and -30.5 feet (MLLW) and between approximate elevations -33.5 and -35.0 feet (MLLW) in boring TB-B-10; sandstone fragments between approximate elevations -29.7 and -30.2 feet (MLLW) and very dense clayey sand with shell and limestone fragments between approximate elevations -31.7 and -33.2 feet (MLLW) in boring TB-B-11; and hard sandy clay between approximate elevations -29.9 and -32.9 feet (MLLW), dense clayey sand between approximate elevations -32.9 and -34.4 feet (MLLW), and dense clayey sand with limestone fragments between approximate elevations -37.4 and -39.3 feet (MLLW) in boring TB-B-13. Stiff to hard clay at varying elevations were encountered in the following borings: TB-B-02A, TB-B-04, TB-B-07, TB-B-09, TB-B-10, TB-B-11, TB-B-13 and TB-B-14A.

The materials that will be encountered in Section B during dredging to elevation -36 feet (MLLW) plus 2 feet of over-dredge will most likely be very loose to medium dense sand to silty sand and clayey sand with shell, limestone and sandstone fragments. Note that high blow count material (N-value greater than 30) were encountered at the following locations: dense sand with sandstone fragments between approximate elevations -28.0 and -31.0 feet (MLLW), dense clayey sand with sandstone fragments between approximate elevations -32.5 and -34.0 feet (MLLW) and approximate elevations -35.5 and -37.0 feet (MLLW) in boring BW-B-01; very dense clayey sand with sandstone fragments between approximate elevations -33.0 and -34.5 feet (MLLW) and hard clay with gravel between approximate elevations -34.5 and -36.5 feet (MLLW) in boring BW-B-02; very dense clayey sand with shell fragments between approximate elevations -34.8 and -37.8 feet (MLLW), limestone between approximate elevations -37.8 and -39.3 feet (MLLW) in boring BW-B-03; and dense sand with shell fragments between approximate elevations -26.7 and -28.2 feet (MLLW) in boring BW-B-05. Hard clay was encountered in boring BW-B-02 between approximate elevations -34.5 and -36.0 feet (MLLW), and very stiff fat clay was encountered in boring BW-B-03 between approximate elevations -31.8 and -33.3 feet (MLLW).

The data submitted herein are based on the samples obtained from the soil borings presented in Appendix B and the results of the laboratory tests. The delineations between soil types shown
on the logs are approximate and the description represents our interpretation of subsurface conditions at the designated boring locations on the particular date drilled. This report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until during construction.

This data report has been prepared for the exclusive use of the U.S. Army Corps of Engineers in accordance with generally accepted geotechnical engineering practices for the Brunswick Harbor Modification Study in Brunswick, Glynn County, Georgia. No other warranty, expressed or implied, is made.
The above soil profiles are outlined in general terms only. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory tests of the recovered samples. The stratification lines represent the approximate boundary between soil types at the boring location. On the date drilled, the actual transitions may be more gradual than implied. Please refer to Appendix B for soil profile details.
ABBREVIATIONS & SYMBOLS

N  STANDARD PENETRATION TEST RESISTANCE IN BLOWS/FOOT
WCH  WEIGHT OF CHAMBER
WOR  WEIGHT OF RODS
50/S  50 BLOWS FOR 3 INCHES PENETRATION
WM  WATER CONTENT IN PERCENT
-200%  PERCENT PASSING U.S. STD. NO. 200 SIEVE %
LL  LIQUID LIMIT
PI  PLASTIC INDEX
G  SPECIFIC GRAVITY

BORING PROFILES
BW-B-01 TO BW-B-05

Note: All SPT split-spoon samplers encountering refusal were considered to have an N-value of 100
Note: All SPT split-spoon samplers encountering refusal were considered to have an N-value of 100
APPENDIX A

FIELD EXPLORATION AND SAMPLING METHODS
The standard penetration test is a widely accepted test method of *in situ* testing of foundation soils (ASTM D1586). A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load.

The tests are usually performed at 5-foot intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, NX-size flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils at every 5 feet of drilled depth and from every different stratum are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary. Samples not used in testing are stored for 30 days prior to being discarded. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed, if necessary, and backfilled.
APPENDIX B
BORING AND CORING LOGS
**Boring Designation**

TB-B-01

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5 ft</th>
<th>N&lt;sub&gt;i&lt;/sub&gt;</th>
<th>N&lt;sub&gt;co&lt;/sub&gt;</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>28.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0' to 28.52': WATER.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Boring Data**

- **Hole Number**: TB-B-01
- **Location Coordinates**: N 412,934.0, E 853,765.0
- **Project**: Brunswick Harbor Modification Study
- **Drilling Agency**: Tetra Tech - AAI
- **Driller**: Donald Tindall, Randy Orr, Andrew Larkins
- **Direction of Boring**: Vertical
- **Depth Drilled into Rock**: 0.0 ft
- **Total Depth of Boring**: 49.5 ft
- **Thickness of Overburden**: 49.5 ft
- **Total Number Core Boxes**: 0
- **Date Boring Started**: 11/17/20
- **Date Boring Completed**: 11/17/20
- **Total Samples**: 13 Disturbed, 0 Undisturbed
- **Elevation Ground Water (ft)**: N/A
- **Elevation Top of Boring (ft)**: 0.0
- **Total Core Recovery for Boring**: N/A

**Remarks**

40' of 4'' casing

**Laboratory**

- **Sample No.**
- **Gravel**
- **Sand**
- **Fines**
- **MC**
- **SM**
- **CL**
- **PI**

**Signature and Title of Inspector**

Mark Zrallack, Project Engineer
### Boring Designation: TB-B-01

**Location Coordinates:**
- **Elevation Top of Boring (ft):** 0.0
- **Location Coordinates:**
  - **N:** 412,934.0
  - **E:** 853,765.0

**Classification of Materials (Description):**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>Classification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 28.52</td>
<td>0</td>
<td>WATER</td>
<td>(continued)</td>
</tr>
<tr>
<td>28.52 to 30.02</td>
<td></td>
<td>NO RETURN, WEIGHT OF ROD.</td>
<td>0 -</td>
</tr>
<tr>
<td>30.02 to 33.02</td>
<td></td>
<td>SILTY SAND (SM), fine; gray.</td>
<td>30 1</td>
</tr>
<tr>
<td>33.02 to 34.52</td>
<td></td>
<td>SAND (SP), fine; gray, trace shell fragments.</td>
<td>40 3</td>
</tr>
<tr>
<td>34.52 to 39.02</td>
<td></td>
<td>SAND WITH SILT (SP-SM), fine to medium; gray, trace shell fragments, calcareous.</td>
<td>30 4</td>
</tr>
<tr>
<td>39.02 to 42.02</td>
<td></td>
<td>SAND (SP), fine to medium; gray, with shell fragments, calcareous.</td>
<td>60 7</td>
</tr>
</tbody>
</table>

**Drilling Log:**

- **Boring Designation:** TB-B-01
- **Elevation Top of Boring:** 0.0
- **Location Coordinates:**
  - **N:** 412,934.0
  - **E:** 853,765.0

**Classifications:**
- **WATER**
- **NO RETURN, WEIGHT OF ROD**
- **SILTY SAND (SM), fine; gray.**
- **SAND (SP), fine; gray, trace shell fragments.**
- **SAND WITH SILT (SP-SM), fine to medium; gray, trace shell fragments, calcareous.**
- **SAND (SP), fine to medium; gray, with shell fragments, with limestone fragments, calcareous.**
- **SAND (SP), medium; gray, with shell fragments, with limestone fragments, calcareous.**
### DRILLING LOG (Cont Sheet)

#### Boring Designation
TB-B-01

#### PROJECT
BRUNSWICK HARBOR MODIFICATION STUDY

#### LOCATION COORDINATES
N 412,934.0 E 853,765.0

#### ELEVATION TOP OF BORING (ft)
0.0

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N, Nc</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sand</th>
<th>Clay</th>
<th>Fines</th>
<th>MC</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-48.0</td>
<td>48.0</td>
<td>9</td>
<td>18</td>
<td>42.02' to 48.02': SAND (SP), medium; gray, with shell fragments, with limestone fragments, calcareous. (continued)</td>
<td>50</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.0</td>
<td>48.0</td>
<td>9</td>
<td>22</td>
<td></td>
<td></td>
<td>50</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.0</td>
<td>48.0</td>
<td>7</td>
<td>16</td>
<td></td>
<td></td>
<td>50</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.5</td>
<td>49.5</td>
<td>8</td>
<td>19</td>
<td>48.02' to 49.52': SAND WITH CLAY (SP-SC), medium; gray, with shell fragments, with limestone fragments, calcareous.</td>
<td>80</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.5 feet.

### NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8” ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3” = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water
### Boring Designation: TB-B-02A

**Drilling Log (Cont Sheet)**

**Location Coordinates**
- N 412,715.2
- E 854,194.8

**Elevation Top of Boring (ft)**: 0.0

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>Nc</th>
<th>Classification of Materials (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>-23.2</td>
<td>23.2</td>
<td>0</td>
<td>1</td>
<td>23.19' to 28.19': SAND (SP), medium to coarse; greenish gray, some shells, slightly calcareous.</td>
<td>2</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-28.2</td>
<td>28.2</td>
<td>0</td>
<td>0</td>
<td>28.19' to 29.19': SAND WITH CLAY (SP-SC), fine to medium; greenish gray, with shell fragments.</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-29.2</td>
<td>29.2</td>
<td>0</td>
<td>0</td>
<td>29.19' to 33.19': SILTY SAND (SM), fine to medium; dark greenish gray, some shells, slightly calcareous.</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-33.2</td>
<td>33.2</td>
<td>3</td>
<td>10</td>
<td>33.19' to 34.19': CLAY (CL), light gray, calcareous.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-34.2</td>
<td>34.2</td>
<td>3</td>
<td>26</td>
<td>34.19' to 35.19': CLAYEY SAND (SC), fine to medium; light gray, some coarse limestone fragments, calcareous.</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of hole at 35.2 feet.**

**NOTES:**

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
### DRILLING LOG

**Boring Designation**: TB-B-02B

1. **PROJECT**: BRUNSWICK HARBOR MODIFICATION STUDY
2. **HOLE NUMBER**: TB-B-02B
3. **DRILLING AGENCY**: Tetra Tech - AAI
4. **NAME OF DRILLER**: Donald Tindall, Randy Orr, Andrew Larkins
5. **DIRECTION OF BORING**: Vertical
6. **THICKNESS OF OVERBURDEN**: 52.5'
7. **DEPTH DRILLED INTO ROCK**: 0.0
8. **TOTAL DEPTH OF BORING**: 52.5'
9. **COORDINATE SYSTEM**: GA State Plane NAD83 MLLW
10. **SIZE AND TYPE OF BIT**: 2 7/8" Tricone
11. **MANUFACTURER'S DESIGNATION OF DRILL**: CME-550X/Barge
12. **TOTAL SAMPLES**: Disturbed: 12, Undisturbed: 0
13. **TOTAL NUMBER CORE BOXES**: 0
14. **ELEVATION GROUND WATER (ft)**
15. **DATE BORING STARTED**: 10/22/20
16. **ELEVATION TOP OF BORING (ft)**: 0.0
17. **TOTAL CORE RECOVERY FOR BORING**: N/A
18. **SIGNATURE AND TITLE OF INSPECTOR**: Jeremy Clark, Project Engineer

---

### classification of materials

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Classification</th>
<th>% REC</th>
<th>Sample No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>WATER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.5</td>
<td>Gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.5</td>
<td>Gravel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### remarks

- 35' of 4" casing
- 0' to 19.53': WATER.
- 19.53' to 34.53': WASH BORING.
**Boring Designation**

**TB-B-02B**

**Classification of Materials (Description)**

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N</th>
<th>N&lt;sub&gt;c&lt;/sub&gt;</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Type</th>
<th>PI</th>
<th>MC</th>
<th>ASTM</th>
<th>NRM SCD</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.53 to 34.53'</td>
<td>WASH BORING. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.53 to 35.28'</td>
<td>CLAYEY SAND (SC), fine to medium; light gray, some coarse limestone fragments, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.28 to 38.53'</td>
<td>CLAYEY SAND (SC), fine to medium; light gray, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.53 to 41.53'</td>
<td>SAND (SP), fine to medium; light gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.53 to 49.53'</td>
<td>SILTY SAND (SM), fine; greenish gray, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specific Gravity = 2.70**

**LOCATION COORDINATES**

**NAD83**

**Brunswick, Georgia**

**GA State Plane**

**HORIZONTAL VERTICAL**

**REMARKS**

**ELEVATION TOP OF BORING (ft)**

**0.0**

**PROJECT**

**BRUNSWICK HARBOR MODIFICATION STUDY**

**COORDINATE SYSTEM**

**NAD83**

**MLLW**

**INSTALLATION**

**DRILLING LOG (Cont Sheet)**

**SHEET 2 of 3**

---

**SPK FORM 1836-A**

**Boring Designation**

**TB-B-02B**

**SEP 05**

---

**N 412,718.2 E 854,194.3**

**Sheet 2 of 3**

---

**Fish Pass Test Area 1836-A DRILLING LOG**

**ACE MVD WITH RAPID CPT 2009 08 18 08 19 20 21**

---

**Sheet of 3**
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>BLOWS 0.5 FT</th>
<th>NI</th>
<th>Nc</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.5</td>
<td>37</td>
<td>74</td>
<td></td>
<td>41.53' to 49.53': SILTY SAND (SM), fine, greenish gray, calcareous. ([continued])</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>50/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>50/3&quot;</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.5</td>
<td>5</td>
<td>16</td>
<td></td>
<td>49.53' to 52.53': SAND (SP), medium to coarse; gray, some limestone fragments, some shells, calcareous.</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom of hole at 52.5 feet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N60</th>
<th>N60</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% RECOVERY</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0' to 31.52': WATER.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

50' of 4" casing
### Boring Designation: TB-B-03

#### DRILLING LOG (Cont Sheet)

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Borel</th>
<th>N</th>
<th>N0</th>
<th>Ni</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sample No.</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0' to 31.52': WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.5</td>
<td>31.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31.52' to 41.52': NO RETURN, WEIGHT OF ROD.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.5</td>
<td>41.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41.52' to 43.52': SILTY SAND (SM), gray to dark gray.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.5</td>
<td>43.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43.52' to 44.52': SAND (SP), fine; gray, calcareous.</td>
<td>50</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

#### Location Coordinates

- **N**: 412,474.0
- **E**: 854,534.9
- **Elevation Top of Boring (ft)**: 0.0

#### Project
- **BRUNSWICK HARBOR MODIFICATION STUDY**
- **Coordinate System**: NAD83, GA State Plane
- **Elevation Reference**: MLLW

#### Remarks

- **Boring Designation**: TB-B-03
- **Location Code**: SHEET 2 of 3
- **Spk Form**: 1836-A
- **Remarks**: SAND, FINE, GRAY, CALCAREOUS.
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>Nø</th>
<th>Nøo</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-44.5</td>
<td>-44.5</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>44.52' to 46.02': SAND (SP), fine; gray, trace silt, calcareous.</td>
<td>50</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>-46.0</td>
<td>-46.0</td>
<td>7</td>
<td>5</td>
<td>14</td>
<td>46.02' to 48.02': SAND (SP), fine to medium; gray, some shell fragments, calcareous.</td>
<td>50</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>-48.0</td>
<td>-48.0</td>
<td>1</td>
<td>5</td>
<td>14</td>
<td>48.02' to 49.02': SAND (SP), fine to medium; light gray, some shell fragments, calcareous.</td>
<td>60</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>-49.0</td>
<td>-49.0</td>
<td>7</td>
<td>9</td>
<td>25</td>
<td>49.02' to 52.02': CLAYEY SAND (SC), fine to medium; light gray, some shell fragments, calcareous.</td>
<td>70</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>-52.0</td>
<td>-52.0</td>
<td>10</td>
<td>16</td>
<td>16</td>
<td>80</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 52 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5 ft</th>
<th>N1</th>
<th>N2o</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sample No</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0' to 13.38': WATER.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-13.4</td>
<td>13.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>13.38' to 16.38': NO RETURN, WEIGHT OF ROD.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-16.4</td>
<td>16.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16.38' to 23.38': SAND (SP), fine; gray.</td>
<td>20</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

40' of 4" casing

Mark Zrallack  Project Engineer

49.4'
Specific Gravity = 2.66

Sieve Analysis was performed on Sample 9

SAND (SP), fine; gray, (continued)

CL
SC

CLAY (CL), gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.

SAND (SP), fine; gray, (continued)

CLAY (CL), gray, some shell fragments, trace clay, calcareous.

CLAY (CL), gray, with shell fragments, calcareous.

CLAY (CL), gray, with limestone fragments, calcareous.

CLAY (CL), gray, with limestone fragments, calcareous.

CLAYEY SAND (SC), gray, with limestone fragments, calcareous.
Bottom of hole at 49.4 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
### Boring Designation: TB-B-05

#### Project Information
- **1. Project**: Brunswick Harbor Modification Study
- **2. Hole Number**: TB-B-05

#### Drilling Information
- **3. Drilling Agency**: Tetra Tech - AAI
- **4. Name of Driller**: Donald Tindall, Randy Orr, Andrew Larkins
- **5. Direction of Boring**: Vertical
- **6. Thickness of Overburden**: 49.1'
- **7. Depth Drilled into Rock**: 0.0
- **8. Total Depth of Boring**: 49.1'

#### Core Data
- **Boring Designation**: TB-B-05

#### Core Recovery
- **9. Coordinate System**: HORIZONTAL NAD83, VERTICAL MLLW
- **10. Size and Type of Bit**: 2 7/8" Tricone
- **11. Manufacturer's Designation of Drill**: CME-550X/Barge
- **12. Total Samples**: Disturbed: 11; Undisturbed: 0

#### Lab Results
- **13. Total Number Core Boxes**: 0
- **14. Elevation Ground Water (ft)**
- **15. Date Boring**: Started: 10/23/20; Completed: 10/23/20
- **16. Elevation Top of Boring (ft)**: 0.0
- **17. Total Core Recovery for Boring**: N/A

#### Classification of Materials

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Boreway Direction</th>
<th>Ni</th>
<th>NcNo</th>
<th>Classification of Materials (Description)</th>
<th>% REC</th>
<th>Sample No.</th>
<th>Laboratory</th>
</tr>
</thead>
</table>

- 0' to 31.05': WATER.

#### Remarks

- 55' of 4" casing

#### Signature

Jeremy Clark, Project Engineer
### DRILLING LOG (Cont Sheet)

**Boring Designation**: TB-B-05

**Project**: Brunswick Harbor Modification Study

**Location Coordinates**

N 412,242.9  E 855,199.8

**Elevation Top of Boring (ft)**: 0.0

#### Table: Classification of Materials (Description)

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Classification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 31.05'</td>
<td>WATER.</td>
<td>(continued)</td>
</tr>
<tr>
<td>31.05' to 35.55'</td>
<td>NO RETURN.</td>
<td></td>
</tr>
<tr>
<td>35.55' to 37.05'</td>
<td>SILTY SAND (SM), fine to medium; greenish gray, some shell fragments, slightly calcareous.</td>
<td></td>
</tr>
<tr>
<td>37.05' to 47.05'</td>
<td>SAND WITH SILT (SP-SM), medium to coarse; light gray, some shell fragments, calcareous.</td>
<td>Specific Gravity = 2.69</td>
</tr>
</tbody>
</table>

#### Laboratory Data

- **Sample No.**: LL
- **Sand**: 4
- **Fines**: 12
- **MC**: 81
- **ASTM**: 6
- **PI**: 22
- **SP-SM**: 22

#### REMARKS

- **Blows/0.5 ft**: 0, 0, 0, 0, 0, 0, 0, 0, 4, 4, 7, 6
- **Elevation (ft)**: 0, 0, 0, 0, 0, 0, 0, 0, 4, 4, 7, 6
- **Depth (ft)**: 0, 0, 0, 0, 0, 0, 0, 0, 4, 4, 7, 6
### DRILLING LOG (Cont Sheet)

#### BORING DESIGNATION
- **Boring Designation**: TB-B-05
- **Location Coordinates**: N 412,242.9 E 855,199.8

#### Classification of Materials

<table>
<thead>
<tr>
<th>Class Code</th>
<th>Description</th>
<th>Sample No.</th>
<th>Gravel</th>
<th>Sand</th>
<th>Fines</th>
<th>MC</th>
<th>Lab Test</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.05' to 47.05':</td>
<td>SAND WITH SILT (SP-SM), medium to coarse; light gray, some shell fragments, calcareous.</td>
<td>(continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.05' to 49.05':</td>
<td>SILTY SAND (SM), fine to medium; greenish gray, some shell fragments, some limestone fragments, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Water Contents

- Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.

#### Notes:
1. **BLOWS/FOOT**: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using an automatic hammer.
4. **WOR** = Weight of Rods
5. **WOH** = Weight of Hammer
6. 50/3" = 50 Blows for 3 inches penetration
7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.

**Bottom of hole at 49.1 feet.**
**DRILLING LOG**

**PROJECT**
BRUNSWICK HARBOR MODIFICATION STUDY

**DIVISION**
South Atlantic

**INSTALLATION**
Brunswick, Georgia

**HOLE NUMBER**
TB-B-06

**LOCATION COORDINATES**
N 412,129.6   E 855,659.7

**DRILLING AGENCY**
Tetra Tech - AAI

**NAME OF DRILLER**
Donald Tindall, Randy Orr, Andrew Larkins

**DIRECTION OF BORING**

<table>
<thead>
<tr>
<th>DEG FROM VERTICAL</th>
<th>BEARING</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTICAL</td>
<td>0</td>
</tr>
<tr>
<td>INCLINED</td>
<td>0</td>
</tr>
</tbody>
</table>

**THICKNESS OF OVERBURDEN**
49.5

**DEPTH DRILLED INTO ROCK**
0.0

**TOTAL DEPTH OF BORING**
49.5'

**ELEVATION GROUND WATER (ft)**

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>22.48</td>
</tr>
</tbody>
</table>

**CLASSIFICATION OF MATERIALS (Description)**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 22.48</td>
<td>WATER.</td>
</tr>
</tbody>
</table>

**SIGNATURE AND TITLE OF INSPECTOR**
Mark Zrallack, Project Engineer

**TOTAL SAMPLES**
19

**TOTAL NUMBER CORE BOXES**
0

**TOTAL CORE RECOVERY FOR BORING**
N/A

**DATE BORING STARTED**
11/7/20

**DATE BORING COMPLETED**
11/7/20

**SIZE AND TYPE OF BIT**
2 7/8" Tricone

**MANUFACTURER'S DESIGNATION OF DRILL**
CME-550X/Barge

**COORDINATE SYSTEM**

<table>
<thead>
<tr>
<th>HORIZONTAL</th>
<th>VERTICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD83</td>
<td>MLLW</td>
</tr>
</tbody>
</table>

**COORDINATE SYSTEM**

<table>
<thead>
<tr>
<th>SHEET 1</th>
<th>OF 3 SHEETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET 1</td>
<td>OF 3 SHEETS</td>
</tr>
</tbody>
</table>

**REMARKS**

0' to 22.48' WATER.
Specific Gravity = 2.70

0' to 22.48': WATER. (continued)

22.48' to 23.98': SAND (SP), fine; gray, trace shell fragments, trace clay, calcareous.

23.98' to 25.48': SAND (SP), fine; gray, trace clay, trace limestone fragments, calcareous.

25.48' to 26.98': SILTY SAND (SM), fine; gray, some clay, some limestone fragments, calcareous.

26.98' to 28.48': SILTY SAND (SM), fine, gray, with limestone fragments, trace clay and shell fragments, calcareous.

28.48' to 31.48': CLAYEY SAND (SC), fine to medium; gray, with limestone fragments, trace shell fragments, calcareous.

31.48' to 40.98': SAND (SP), fine to medium; gray, with limestone fragments, calcareous.

40.98' to 41.98': CLAYEY SAND (SC), fine; gray, trace limestone fragments.

41.98' to 43.48': CLAYEY SAND (SC), fine; gray, with limestone fragments, calcareous.
### Classification of Materials

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>N&lt;sub&gt;c&lt;/sub&gt;</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-45.0</td>
<td>45.0</td>
<td>10</td>
<td>28</td>
<td>43.48' to 44.98': CLAYEY SAND (SC), fine; gray, trace sandstone fragments. (continued)</td>
<td>70 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.0</td>
<td>48.0</td>
<td>7</td>
<td>26</td>
<td>44.98' to 47.98': CLAYEY SAND (SC), fine; gray, with shell fragments, calcareous.</td>
<td>90 17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.5</td>
<td>49.5</td>
<td>17</td>
<td>26</td>
<td>47.98' to 49.48': CLAYEY SAND (SC), gray to dark gray, with shell fragments, calcareous.</td>
<td>80 19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.5 feet.

**NOTES:**

1. **BLOWS/FOOT:** number required to drive 1 3/8" ID split spoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. **WOR** = Weight of Rods

5. **WOH** = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th><strong>DRILLING LOG</strong></th>
<th><strong>DIVISION</strong></th>
<th><strong>INSTALLATION</strong></th>
<th><strong>COORDINATE SYSTEM</strong></th>
<th><strong>TOTAL NUMBER CORE BOXES</strong></th>
<th><strong>DATE BORING STARTED</strong></th>
<th><strong>ELEVATION GROUND WATER (ft)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT</strong></td>
<td>South Atlantic</td>
<td>Brunswick, Georgia</td>
<td>GA State Plane: NAD83 MLLW</td>
<td>0</td>
<td>11/1/20</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>HOE NUMBER</strong></td>
<td>TB-B-07</td>
<td><strong>LOCATION COORDINATES</strong></td>
<td>N 411,964.5 E 855,945.9</td>
<td><strong>TOTAL SAMPLES</strong></td>
<td><strong>DISTURBED</strong></td>
<td><strong>UNDISTURBED</strong></td>
</tr>
<tr>
<td><strong>DRILLING AGENCY</strong></td>
<td>Tetra Tech - AAI</td>
<td><strong>MANUFACTURER’S DESIGNATION OF DRILL</strong></td>
<td>CME-550X/Barge</td>
<td>15</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>NAME OF DRILLER</strong></td>
<td>Donald Tindall, Randy Orr, Andrew Larkins</td>
<td><strong>SIZE AND TYPE OF BIT</strong></td>
<td>2 7/8&quot; Tricone</td>
<td>11/1/20</td>
<td>11/1/20</td>
<td></td>
</tr>
<tr>
<td><strong>DIRECTION OF BORING</strong></td>
<td><strong>THICKNESS OF OVERBURDEN</strong></td>
<td>49.3</td>
<td><strong>DEPTH DRILLED INTO ROCK</strong></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL DEPTH OF BORING</strong></td>
<td><strong>TOTAL SAMPLES</strong></td>
<td>15</td>
<td><strong>DISTURBED</strong></td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Classification of Materials

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>Ni</th>
<th>Nco</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>21.28</td>
<td>WATER.</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Remarks

- 40' of 4" casing
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>N</th>
<th>Classification of Materials (Description)</th>
<th>% REC</th>
<th>Sample No.</th>
<th>Gravel</th>
<th>Sand</th>
<th>Fines</th>
<th>MC</th>
<th>PI</th>
<th>ASTM C 123</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>20.0</td>
<td>20</td>
<td>73</td>
<td>0' to 21.28': WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-21.3</td>
<td>21.3</td>
<td></td>
<td></td>
<td>21.28' to 28.28': NO RETURN, WEIGHT OF ROD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-28.3</td>
<td>28.3</td>
<td>20</td>
<td>47</td>
<td>28.28' to 29.78': CLAY (CL), gray to dark gray, trace limestone fragments, calcareous.</td>
<td>90</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-29.8</td>
<td>29.8</td>
<td>12</td>
<td>25</td>
<td>29.78' to 31.28': CLAYEY SAND (SC), dark gray, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-31.3</td>
<td>31.3</td>
<td>11</td>
<td>13</td>
<td>31.28' to 35.78': CLAYEY SAND (SC), gray, with limestone fragments, calcareous.</td>
<td>80</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-35.8</td>
<td>35.8</td>
<td>10</td>
<td>12</td>
<td>35.78' to 37.28': SILTY SAND (SM), fine to medium; gray, trace clay, calcareous.</td>
<td>70</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-37.3</td>
<td>37.3</td>
<td>8</td>
<td>21</td>
<td>37.28' to 38.78': CLAYEY SAND (SC), gray, trace limestone fragments, trace shell fragments, calcareous.</td>
<td>70</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-38.8</td>
<td>38.8</td>
<td>5</td>
<td>12</td>
<td>38.78' to 41.78': SILTY SAND (SM), fine to medium; gray, with limestone fragments, calcareous.</td>
<td>70</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-41.8</td>
<td>41.8</td>
<td>7</td>
<td>11</td>
<td>41.78' to 44.78': SAND (SP), fine to medium; gray, some limestone fragments, some shell fragments, calcareous.</td>
<td>40</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Boring Designation**

**TB-B-07**

**Drilling Log (Cont Sheet)**

**Project**: Brunswick Harbor Modification Study

**Location Coordinates**

N 411,964.5 E 855,945.9

**Elevation Top of Boring (ft)**: 0.0

<table>
<thead>
<tr>
<th>Elev (ft)</th>
<th>Depth (ft)</th>
<th>Blows/0.5 ft</th>
<th>N1</th>
<th>N2</th>
<th>Classification of Materials (Description)</th>
<th>% Rec</th>
<th>Sample No</th>
<th>Gravel</th>
<th>Sand</th>
<th>PI</th>
<th>MC</th>
<th>ASTM Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>-44.8</td>
<td>44.8</td>
<td>3</td>
<td></td>
<td></td>
<td>44.78' to 47.78': SAND (SP), fine to medium; gray, some sandstone fragments, some shell fragments, calcareous.</td>
<td>30 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-47.8</td>
<td>47.8</td>
<td>4</td>
<td></td>
<td></td>
<td>47.78' to 48.28': SILTY SAND (SM), dark gray, trace clay.</td>
<td>30 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.3</td>
<td>48.3</td>
<td>2</td>
<td></td>
<td></td>
<td>48.28' to 49.28': SILTY SAND (SM), gray.</td>
<td>50 14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.3</td>
<td>49.3</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.3 feet.

**Notes**:

1. **BLOWS/FOOT**: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. **WOR** = Weight of Rods

5. **WOH** = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Boreway DIA.</th>
<th>N&lt;sub&gt;j&lt;/sub&gt;</th>
<th>N&lt;sub&gt;c&lt;/sub&gt;</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sample No.</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>0' to 29.6': WATER.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- **SHOTS/0.5 FT:**
  - Blows: 120

- **LABORATORY REPORTING:**
  - Sample No.: TB-B-08
  - Laboratory: Tetra Tech - AAI

**SIGNATURE AND TITLE OF INSPECTOR:**
Mark Zarlack, Project Engineer

**TOTAL NUMBER CORE BOXES:**
0

**DATE BORING:**
11/16/20

**ELEVATION GROUND WATER (ft):**
N/A

**TOTAL CORE RECOVERY FOR BORING:**
N/A

**ELEVATION TOP OF BORING (ft):**
0.0

**INCLINED:**
45° of 4'' casing

**COORDINATE SYSTEM:**
- HORIZONTAL: GA State Plane NAD83
- VERTICAL: MLLW
0' to 29.6': WATER. (continued)

29.6' to 37.6': NO RETURN, WEIGHT OF ROD.

37.6' to 40.6': SAND (SP), fine; gray, with shell fragments, calcareous.

40.6' to 43.6': SAND (SP), fine; gray, trace shell fragments.

43.6' to 45.1': SAND (SP), fine; gray, trace clay.
### N 411,866.6 E 856,124.9

<table>
<thead>
<tr>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.6' to 45.1': SAND (SP), fine; gray, trace clay. (continued)</td>
<td>20</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td>45.1' to 46.6': SAND (SP), fine to medium; gray, trace shell fragments, trace clay, calcareous.</td>
<td>30</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>46.6' to 49.6': SAND (SP), fine to medium; gray, with shell fragments, calcareous.</td>
<td>40</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.6 feet.

**NOTES:**

1. BLOWS/FOOT: number required to drive 1 3/8” ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
### Boring Designation: TB-B-09

#### 1. Project
BRUNSWICK HARBOR MODIFICATION STUDY

#### 2. Hole Number: TB-B-09
Location Coordinates: N 412,009.4 E 856,321.1

#### 3. Drilling Agency
Tetra Tech - AAI

#### 4. Name of Driller
Donald Tindall, Randy Orr, Andrew Larkins

#### 5. Direction of Boring

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Depth (ft)</th>
<th>Borehole Diameter</th>
<th>N5</th>
<th>N60</th>
<th>Classification of Materials (Description)</th>
<th>Lab</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>-13.1</td>
<td>13.1</td>
<td>2.5</td>
<td>64</td>
<td>1</td>
<td>0' to 13.1': WATER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-14.6</td>
<td>14.6</td>
<td>2.5</td>
<td>64</td>
<td>1</td>
<td>14.6' to 19.1': SAND (SP), fine, gray, with limestone fragments, calcareous.</td>
<td>65 1</td>
<td></td>
</tr>
<tr>
<td>-19.1</td>
<td>19.1</td>
<td>2.5</td>
<td>64</td>
<td>1</td>
<td>19.1' to 20.6': SAND (SP), fine, gray, some shell fragments, calcareous.</td>
<td>65 1</td>
<td></td>
</tr>
</tbody>
</table>

#### 6. Thickness of Overburden
49.1

#### 7. Depth Drilled into Rock
0.0

#### 8. Total Depth of Boring
49.1'

#### 9. Coordinate System
HORIZONTAL: NAD83
VERTICAL: MLLW

#### 10. Size and Type of Bit
2 7/8" Tricone

#### 11. Manufacturer's Designation of Drill
CME-550X/Barge

#### 12. Total Samples
Disturbed: 26
Undisturbed: 0

#### 13. Total Number Core Boxes
0

#### 14. Elevation Ground Water (ft)
0.0

#### 15. Date Boring
Started: 10/28/20
Completed: 10/28/20

#### 16. Elevation Top of Boring (ft)
0.0

#### 17. Total Core Recovery for Boring
N/A

#### 18. Signature and Title of Inspector
Mark Zrallack  Project Engineer

#### Specific Gravity
Specific Gravity = 2.66
### Boring Designation: TB-B-09

#### DRILLING LOG (Cont Sheet)

**Project:** BRUNSWICK HARBOR MODIFICATION STUDY  
**Location Coordinates:**  
N 412,009.4  E 856,321.1

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>Nc</th>
<th>Classifications of Materials (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20.6</td>
<td>20.6</td>
<td>2</td>
<td></td>
<td><strong>20.6’ to 22.1’: CLAYEY SAND (SC), gray, some silt, trace shell fragments, calcareous.</strong></td>
<td>60</td>
<td>6</td>
</tr>
<tr>
<td>-22.1</td>
<td>22.1</td>
<td>1</td>
<td></td>
<td><strong>22.1’ to 23.6’: CLAYEY SAND (SC), gray, some silt, some shell fragments, calcareous.</strong></td>
<td>80</td>
<td>7 2 59 39  41 SC</td>
</tr>
<tr>
<td>-23.6</td>
<td>23.6</td>
<td>2</td>
<td></td>
<td><strong>23.6’ to 25.1’: SILTY SAND (SM), fine; gray, some shell fragments.</strong></td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>-25.1</td>
<td>25.1</td>
<td>5</td>
<td>8</td>
<td><strong>25.1’ to 28.1’: SAND (SP), fine; gray, trace silt, some shell fragments, calcareous.</strong></td>
<td>50</td>
<td>9</td>
</tr>
<tr>
<td>-28.1</td>
<td>28.1</td>
<td>6</td>
<td>10</td>
<td><strong>28.1’ to 29.6’: SILTY SAND (SM), gray, with shell fragments, calcareous.</strong></td>
<td>80</td>
<td>11</td>
</tr>
<tr>
<td>-31.1</td>
<td>31.1</td>
<td>8</td>
<td>29</td>
<td><strong>29.6’ to 31.1’: SANDY CLAY (CL), gray, trace shell fragments, calcareous.</strong></td>
<td>90</td>
<td>12 0 30  70 27 10 19 CL</td>
</tr>
<tr>
<td>-32.6</td>
<td>32.6</td>
<td>10</td>
<td>48</td>
<td><strong>31.1’ to 32.6’: CLAY (CL), gray, some shell fragments, calcareous.</strong></td>
<td>80</td>
<td>13</td>
</tr>
<tr>
<td>-34.1</td>
<td>34.1</td>
<td>20</td>
<td>48</td>
<td><strong>32.6’ to 34.1’: CLAY (CL), gray, trace shell fragments, calcareous.</strong></td>
<td>90</td>
<td>14</td>
</tr>
<tr>
<td>-37.6</td>
<td>37.6</td>
<td>7  13</td>
<td>10</td>
<td><strong>34.1’ to 37.6’: CLAYEY SAND (SC), gray, some limestone fragments, calcareous.</strong></td>
<td>90</td>
<td>15</td>
</tr>
<tr>
<td>-39.6</td>
<td>39.6</td>
<td>4  8</td>
<td>17</td>
<td><strong>37.6’ to 39.6’: SILTY SAND (SM), fine to medium; gray, some limestone fragments, calcareous.</strong></td>
<td>90</td>
<td>18 17</td>
</tr>
<tr>
<td>-40.1</td>
<td>40.1</td>
<td>10</td>
<td>25</td>
<td><strong>39.6’ to 40.1’: CLAY (CL), gray to dark gray, calcareous.</strong></td>
<td>80</td>
<td>19 20</td>
</tr>
<tr>
<td>-41.6</td>
<td>41.6</td>
<td>8  11</td>
<td>12</td>
<td><strong>40.1’ to 41.6’: CLAYEY SAND (SC), fine to medium; gray, some limestone fragments, calcareous.</strong></td>
<td>80</td>
<td>21</td>
</tr>
<tr>
<td>-43.1</td>
<td>43.1</td>
<td>5  8</td>
<td>16</td>
<td><strong>41.6’ to 43.1’: CLAYEY SAND (SC), fine to medium; gray, some shell fragments, some limestone fragments, calcareous.</strong></td>
<td>70</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70</td>
<td>23</td>
</tr>
</tbody>
</table>
43.1' to 44.6': SILTY SAND (SM), fine to medium; gray, trace clay, some shells and limestone fragments, calcareous. (continued)

44.6' to 47.6': SAND (SP), fine to medium; gray, trace silt, some shells and limestone fragments, calcareous.

47.6' to 49.1': SAND (SP), fine to medium; gray, some shells and limestone fragments, calcareous.

Bottom of hole at 49.1 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
### Drilling Log

<table>
<thead>
<tr>
<th>Boring Designation</th>
<th>TB-B-10</th>
</tr>
</thead>
</table>

#### Project
- **Brunswick Harbor Modification Study**
- **Location:** Brunswick, Georgia

#### Coordinates
- **Horizontal:** NAD83
- **Vertical:** MLLW

#### Drilling Information
- **Hole Number:** TB-B-10
- **Location Coordinates:** N 411,900.9  E 856,576.3
- **Drilling Agency:** Tetra Tech - AA
- **Driller:** Donald Tindall, Randy Orr, Andrew Larkins
- **Manufacturer's Designation of Drill:** CME-550X/Barge
- **Size and Type of Bit:** 2 7/8" Tricone

#### Drilling Log

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Classification of Materials (Description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0' to 18.49': WATER.</td>
</tr>
<tr>
<td>18.49'</td>
<td>SAND (SP), fine; gray, with shell fragments, calcareous.</td>
</tr>
</tbody>
</table>

#### Sampling Information
- **Total Samples:** 28
- **Disturbed:** 0
- **Undisturbed:** 28

#### Additional Information
- **Date Boring Started:** 10/27/20
- **Date Boring Completed:** 10/27/20
- **Elevation Ground Water (ft):** N/A
- **Elevation Top of Boring (ft):** 0.0
- **Total Number Core Boxes:** 0
- **Total Core Recovery for Boring:** N/A
- **Signature and Title of Inspector:** Mark Zrallack, Project Engineer

---

**LEGEND**

- N: Blows/0.5 ft
- E: Elevation (ft)
- D: Depth (ft)
- T: Boring Designation
- L: Laboratory
- M: MC
- R: PI
- F: Fines
- S: Sand
- G: Gravel
- P: PI
- L: Laboratory
- 0: Undisturbed
- 1: Disturbed

---

**Remarks**

SPK FORM 1836

Boring Designation TB-B-10
44.5' to 44.49': CLAYEY SAND (SC), fine to medium; gray, with limestone fragments, calcareous. (continued)

44.49' to 45.49': CLAY (CL), gray to dark gray, with shell fragments, trace limestone fragments.

45.49' to 46.99': CLAY (CL), dark gray, trace shell fragments.

46.99' to 49.99': CLAY (CL), gray.

Bottom of hole at 50 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID split spoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
**Boring Designation**  TB-B-11

### Project Details
- **Project:** Brunswick Harbor Modification Study
- **Location:** Brunswick, Georgia
- **Boring Agency:** Tetra Tech - AAI
- **Driller:** Donald Tindall, Randy Orr, Andrew Larkins
- **Manufacturer's Designation:** CME-550X/Barge
- **Ground Water Elev. (ft):** MLLW
- **Sample No.:** 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0
- **Classification of Materials:** Sand, Gravel, Fines
- **Laboratory:** MCI

### Drilling Log

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Blows/0.5 ft</th>
<th>Classification of Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- 0' to 19.73': WATER.
- 40' of 4" casing

---

**Boring Details**

1. **Hole Number:** TB-B-11
2. **Location Coordinates:** N 411,931.1, E 856,782.6
3. **Total Depth of Boring:** 51.2'
4. **Date Boring Started:** 10/26/20
5. **Total Samples:** Disturbed: 24, Undisturbed: 0
6. **Elevation Top of Boring:** 0.0
7. **Total Core Recovery:** N/A
8. **Elevation Ground Water:** MLLW
9. **Horizontal Coordinate System:** GA State Plane NAD83
10. **Size and Type of Bit:** 2 7/8" Tricone
11. **Total Number Core Boxes:** 0
12. **Total Number Samples:** Disturbed: 24, Undisturbed: 0
13. **Date Boring Completed:** 10/26/20
14. **Elevation Ground Water:** MLLW
15. **Date Boring Started:** 10/26/20
16. **Date Boring Completed:** 10/26/20
17. **Total Core Recovery:** N/A
18. **Signature and Title of Inspector:** Mark Zrallack, Project Engineer

---

**Classifications**

- **0' to 19.73':** WATER
- **19.7 - 19.7':** HORIZONTAL
- **-19.7 - 19.7':** VERTICAL

---

**Legends**

- **N:** Number
- **Ni:** Number of Blows
- **% REC:** Percentage Recovery
- **REMARKS:** 40' of 4" casing

---

**Signatures**

- **Mark Zrallack, Project Engineer**
Specific Gravity = 2.72

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Nc</th>
<th>NC</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sand</th>
<th>Gravel</th>
<th>Fines</th>
<th>MC</th>
<th>MSF</th>
<th>PI</th>
<th>SRF</th>
<th>CL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-21.2</td>
<td>21.2</td>
<td>0</td>
<td>1</td>
<td>19.73' to 21.23': SAND (SP), fine; gray, trace shell fragments, trace silt, calcareous. (continued)</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Specific Gravity = 2.72</td>
</tr>
<tr>
<td>-21.2</td>
<td>21.2</td>
<td>1</td>
<td>2</td>
<td>21.23' to 24.23': SAND (SP), fine; gray to brown, trace shell fragments, calcareous.</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-24.2</td>
<td>24.2</td>
<td>1</td>
<td>2</td>
<td>24.23' to 27.23': CLAYEY SAND (SC), gray, with shell fragments, some silt, calcareous.</td>
<td>60</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-27.2</td>
<td>27.2</td>
<td>2</td>
<td>8</td>
<td>27.23' to 29.73': SILTY SAND (SM), fine; gray, with shell fragments, calcareous.</td>
<td>60</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-29.7</td>
<td>29.7</td>
<td>8</td>
<td>22</td>
<td>29.73' to 30.23': SANDSTONE FRAGMENTS, dark gray, calcareous.</td>
<td>60</td>
<td>7</td>
<td>0</td>
<td>26</td>
<td>74</td>
<td>18</td>
<td>CL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30.2</td>
<td>30.2</td>
<td>11</td>
<td>12</td>
<td>30.23' to 31.73': CLAY WITH SAND (CL), gray, trace shell fragments, calcareous.</td>
<td>60</td>
<td>9</td>
<td>0</td>
<td>26</td>
<td>74</td>
<td>18</td>
<td>CL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-31.7</td>
<td>31.7</td>
<td>22</td>
<td>30</td>
<td>31.73' to 33.23': CLAYEY SAND (SC), gray, trace shell fragments, trace limestone fragments, calcareous.</td>
<td>90</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-33.2</td>
<td>33.2</td>
<td>11</td>
<td>12</td>
<td>33.23' to 37.73': CLAYEY SAND (SC), gray, with limestone fragments, trace shell fragments, calcareous.</td>
<td>100</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-37.7</td>
<td>37.7</td>
<td>7</td>
<td>21</td>
<td>37.73' to 41.23': CLAYEY SAND (SC), gray, some silt, some limestone fragments, calcareous.</td>
<td>100</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-41.2</td>
<td>41.2</td>
<td>7</td>
<td>16</td>
<td>41.23' to 42.23': CLAY (CL), gray to dark gray, with limestone fragments, calcareous.</td>
<td>80</td>
<td>16</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-42.2</td>
<td>42.2</td>
<td>7</td>
<td>18</td>
<td>42.23' to 43.73': SILTY SAND (SM), gray, some clay, trace limestone fragments, calcareous.</td>
<td>60</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-43.7</td>
<td>43.7</td>
<td>4</td>
<td>11</td>
<td>43.73' to 50.00': SAND (SP), fine; gray, trace shell fragments, trace silt, calcareous. (continued)</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SHEET 2 of 3
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Blows/0.5 ft</th>
<th>Sample No.</th>
<th>Classification of Materials (Description)</th>
<th>% REC Gravel</th>
<th>Sand</th>
<th>Fines</th>
<th>PI</th>
<th>MC</th>
<th>ASTM CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>47.7-47.8</td>
<td>2</td>
<td>70</td>
<td>47.73' to 47.73': CLAYEY SAND (SC), fine to medium; gray, with limestone fragments, calcareous. (continued)</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.2-48.3</td>
<td>10</td>
<td>22</td>
<td>47.73' to 47.73': SAND (SP), fine to medium; gray, trace limestone fragments, calcareous. (continued)</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.7-49.8</td>
<td>7</td>
<td>11</td>
<td>48.23' to 48.73': CLAYEY SAND (SC), fine to medium; gray to dark gray, with limestone fragments, calcareous.</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.2-51.3</td>
<td>8</td>
<td>3</td>
<td>49.73' to 51.23': CLAY WITH SAND (CL), gray to dark gray, calcareous.</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 51.2 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using an automatic hammer.
4. WOR = Weight of Rods
5. WOH = Weight of Hammer
6. 50/3" = 50 Blows for 3 inches penetration
7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows 0.5 ft</th>
<th>N&lt;sub&gt;i&lt;/sub&gt;</th>
<th>N&lt;sub&gt;co&lt;/sub&gt;</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sample No.</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0' to 30.64': WATER.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Remarks
- 40' of 4" casing

### Specifications
- **Boring Designation**: TB-B-12
- **Location**: N 411,770.1 E 856,952.4
- **Driller**: Donald Tindall, Randy Orr, Andrew Larkins
- **Drilling Agency**: Tetra Tech - AAI
- **Direction of Boring**: Vertical
- **Thickness of Overburden**: 51.1'
- **Depth Drill into Rock**: 0.0'
- **Total Depth of Boring**: 51.1'
- **Sample Recovery**: N/A
- **Elevation Ground Water**: 0.0 ft
- **Date Boring Started**: 10/28/20
- **Date Boring Completed**: 10/28/20
- **Total Samples**: 8
- **Total Core Recovery**: N/A

### Laboratory Results
- **ASTM Class**: PI, MC
- **Sample Description**: Fines, MC
- **Remarks**: 40' of 4" casing
0' to 30.64': WATER. (continued)

30.64' to 45.14': NO RETURN, WEIGHT OF ROD.
### Boring Designation: TB-B-12

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>No. Bends</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>Sample %RE</th>
<th>Sand</th>
<th>Fines</th>
<th>MC</th>
<th>PI</th>
<th>CAS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-45.1</td>
<td>-45.1</td>
<td></td>
<td></td>
<td>30.64' to 45.14': NO RETURN, WEIGHT OF ROD. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-45.6</td>
<td>-45.6</td>
<td>0</td>
<td></td>
<td>WOH</td>
<td>45.14' to 45.64': SILTY SAND (SM), gray, with shell fragments, calcareous.</td>
<td>60</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-46.6</td>
<td>-46.6</td>
<td>0</td>
<td></td>
<td>WOH</td>
<td>45.64' to 46.64': SILT (ML), gray, with shell fragments, calcareous.</td>
<td>60</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.1</td>
<td>-48.1</td>
<td>0</td>
<td></td>
<td>WOH</td>
<td>46.64' to 48.14': SAND (SP), fine to medium; gray, with shell fragments, calcareous.</td>
<td>70</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-50.1</td>
<td>-50.1</td>
<td>1</td>
<td></td>
<td></td>
<td>49.64' to 49.64': SAND (SP), fine to medium; gray, with shell fragments, with limestone fragments, calcareous.</td>
<td>60</td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-51.1</td>
<td>-51.1</td>
<td>8</td>
<td></td>
<td></td>
<td>50.14' to 51.14': SAND (SP), medium to coarse; gray, with shell fragments, with limestone fragments, calcareous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 51.1 feet.

**NOTES:**

1. **BLOWS/FOOT:** number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soil types are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. **WOR** = Weight of Rods

5. **WOH** = Weight of Hammer

6. **50/3"** = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>% REC</th>
<th>Blows/0.5 ft</th>
<th>Sand</th>
<th>Gravel</th>
<th>PI</th>
<th>MC</th>
<th>SM %</th>
<th>CD</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**0' to 23.93': WATER.**

**40' of 4" casing**

**Boring Designation**

<table>
<thead>
<tr>
<th>TB-B-13</th>
<th>Boring Designation</th>
<th>TB-B-13</th>
</tr>
</thead>
</table>

**LEGEND**

- N: 60
- Nc: 40

**CLASSIFICATION OF MATERIALS**

- ASTM Class
- % REC
- Blows/0.5 ft
- Sand
- Gravel
- PI
- MC
- SM %
- CD

**REMARKS**

- 40' of 4" casing
0' to 23.93': WATER. (continued)

23.93' to 24.43': SILTY SAND (SM), fine; dark gray, some clay, some shell fragments, calcareous.

24.43' to 25.43': CLAYEY SAND (SC), fine; gray, some shell fragments, some silt, calcareous.

25.43' to 27.93': SILTY SAND (SM), fine; gray, some shell fragments, some clay, calcareous.

27.93' to 28.43': CLAYEY SAND (SC), gray, some shell fragments, calcareous.

28.43' to 29.93': CLAYEY SAND (SC), gray, with shell fragments, calcareous.

29.93' to 32.93': SANDY CLAY (CL), gray, calcareous.

32.93' to 34.43': CLAYEY SAND (SC), gray, some silt, few limestone fragments, calcareous.

34.43' to 37.43': CLAYEY SAND (SC), gray, some silt, few limestone fragments, calcareous.

37.43' to 39.26': CLAYEY SAND (SC), gray, some silt, some limestone fragments, calcareous.

39.26' to 40.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous.

40.43' to 42.26': CLAYEY SAND (SC), gray, some silt, some limestone fragments, calcareous.

42.26' to 48.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous.
### Classification of Materials

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Depth (ft)</th>
<th>Blows/0.5 ft</th>
<th>N_1</th>
<th>N_2</th>
<th>Gen.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-49.4</td>
<td>0.0</td>
<td>60</td>
<td>48.3</td>
<td>Clay (CL)</td>
<td>dark gray, with shell fragments, calcareous. (continued)</td>
<td></td>
</tr>
<tr>
<td>-48.4</td>
<td>4.0</td>
<td>50</td>
<td>19</td>
<td>42.26' to 48.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous. (continued)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.4</td>
<td>8.0</td>
<td>48</td>
<td>10</td>
<td>50.2</td>
<td>42.26' to 48.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous. (continued)</td>
<td></td>
</tr>
<tr>
<td>-48.4</td>
<td>13.0</td>
<td>45</td>
<td>28</td>
<td>50.2</td>
<td>42.26' to 48.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous. (continued)</td>
<td></td>
</tr>
<tr>
<td>-48.4</td>
<td>15.0</td>
<td>50</td>
<td>20</td>
<td>42.26' to 48.43': SILTY SAND (SM), gray, some clay, some limestone fragments, calcareous. (continued)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.4</td>
<td>7.0</td>
<td>45</td>
<td>17</td>
<td>48.43' to 49.43': CLAY (CL), dark gray, with shell fragments, calcareous.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.4</td>
<td>10.0</td>
<td>50</td>
<td>21</td>
<td>48.43' to 49.43': CLAY (CL), dark gray, with shell fragments, calcareous.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.4</td>
<td>12.0</td>
<td>60</td>
<td>21</td>
<td>48.43' to 49.43': CLAY (CL), dark gray, with shell fragments, calcareous.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.4 feet.

**NOTES:**

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
### Boring Designation: TB-B-14A

#### DRILLING LOG

<table>
<thead>
<tr>
<th>1. PROJECT</th>
<th>BRUNSWICK HARBOR MODIFICATION STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. HOLE NUMBER</td>
<td>TB-B-14A</td>
</tr>
<tr>
<td>3. DRILLING AGENCY</td>
<td>Tetra Tech - AAI</td>
</tr>
<tr>
<td>4. NAME OF DRILLER</td>
<td>Donald Tindall, Randy Orr, Andrew Larkins</td>
</tr>
<tr>
<td>5. DIRECTION OF BORING</td>
<td>VERTICAL</td>
</tr>
<tr>
<td>6. THICKNESS OF OVERBURDEN</td>
<td>39.5'</td>
</tr>
<tr>
<td>7. DEPTH DRILLED INTO ROCK</td>
<td>0.0</td>
</tr>
<tr>
<td>8. TOTAL DEPTH OF BORING</td>
<td>39.5'</td>
</tr>
<tr>
<td>9. COORDINATE SYSTEM</td>
<td>GA State Plane: NAD83</td>
</tr>
<tr>
<td>10. SIZE AND TYPE OF BIT</td>
<td>2 7/8&quot; Tricone</td>
</tr>
<tr>
<td>11. MANUFACTURER'S DESIGNATION OF DRILL</td>
<td>CME-550X/Barge</td>
</tr>
<tr>
<td>12. TOTAL SAMPLES</td>
<td>DISTURBED: 8, UNDISTURBED: 0</td>
</tr>
<tr>
<td>13. TOTAL NUMBER CORE BOXES</td>
<td>0</td>
</tr>
<tr>
<td>14. ELEVATION GROUND WATER (ft)</td>
<td>10/24/20</td>
</tr>
<tr>
<td>15. DATE BORING</td>
<td>STARTED: 10/24/20, COMPLETED: 10/24/20</td>
</tr>
<tr>
<td>16. ELEVATION TOP OF BORING (ft)</td>
<td>0.0</td>
</tr>
<tr>
<td>17. TOTAL CORE RECOVERY FOR BORING</td>
<td>N/A</td>
</tr>
<tr>
<td>18. SIGNATURE AND TITLE OF INSPECTOR</td>
<td>Jeremy Clark, Project Engineer</td>
</tr>
</tbody>
</table>

#### SHEET 1 of 2

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5ft</th>
<th>N,</th>
<th>N&lt;sub&gt;0&lt;/sub&gt;</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Core No.</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' to 27.52'</td>
<td>WATER.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

- 45' of 4" casing

#### Laboratory Results

- **ASTM Class:**
  - **Class:**  |
  - **Method:** |
  - **Clay:** |
  - **Sand:** |
  - **Silt:** |
  - **Gravel:** |

---

**Legend:**

- **Fines:** |
- **Gravel:** |
- **Sand:** |
- **Silt:** |
- **Clay:** |
- **Mc:** |
- **Mc:** |
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N&lt;sub&gt;1&lt;/sub&gt;</th>
<th>N&lt;sub&gt;c&lt;/sub&gt;</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Gravel</th>
<th>Sand</th>
<th>Fines</th>
<th>PI</th>
<th>MC</th>
<th>VS</th>
<th>QD</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-27.5</td>
<td>27.5</td>
<td>0</td>
<td>7</td>
<td>0' to 27.52' : WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-28.5</td>
<td>28.5</td>
<td>4</td>
<td>7</td>
<td>27.52' to 28.52' : CLAYEY SAND (SC), fine to medium; greenish gray, some shell fragments, calcareous.</td>
<td>1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>8</td>
<td>28.52' to 30.52' : SAND (SP), medium to coarse; greenish gray, some shell fragments, some clay, interbedded clayey sand and some sandstone.</td>
<td>1B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30.5</td>
<td>30.5</td>
<td>2</td>
<td>8</td>
<td>30.52' to 32.27' : SAND (SP), medium to coarse; light gray, some shell fragments, some silt, some limestone fragments, calcareous.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>8</td>
<td>32.27' to 36.52' : CLAY WITH SAND (CL), gray, calcareous.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-36.5</td>
<td>36.5</td>
<td>6</td>
<td>22</td>
<td>36.52' to 39.52' : CLAYEY SAND (SC), fine to medium; greenish gray, some silt, some sandstone fragments, calcareous.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>25</td>
<td></td>
<td>5</td>
<td>5</td>
<td>19</td>
<td>76</td>
<td>38</td>
<td>21</td>
<td>24</td>
<td>CL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>16</td>
<td></td>
<td>6</td>
<td>7</td>
<td>23</td>
<td>70</td>
<td>30</td>
<td></td>
<td></td>
<td>CL</td>
<td></td>
</tr>
<tr>
<td>-39.5</td>
<td>39.5</td>
<td>11</td>
<td>20</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>15</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 39.5 feet.

NOTES:
1. BLOWS/FOOT: number required to drive 1 3/8" ID slitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using an automatic hammer.
4. WOR = Weight of Rods
5. WOH = Weight of Hammer
6. 50/3" = 50 Blows for 3 inches penetration
7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
**Boring Designation**  
TB-B-14B

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>Nø</th>
<th>Nsci</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Sample No</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>27.2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>0' to 27.2': WATER.</td>
<td>LL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS**

45' of 4" casing

---

**PROJECT**  
BRUNSWICK HARBOR MODIFICATION STUDY

**LOCATION COORDINATES**  
TB-B-14B  
N 411,994.6  
E 857,432.1

**DATE BORING STARTED**  
10/24/20

**ELEVATION GROUND WATER (ft)**  
N/A

**TOTAL NUMBER CORE BOXES**  
0

**TOTAL SAMPLES**  
2

**TOTAL CORE RECOVERY FOR BORING**  
N/A

**MANUFACTURER'S DESIGNATION OF DRILL**  
CME-550X/Barge

**HOLE NUMBER**  
TB-B-14B

**NAME OF DRILLER**  
Donald Tindall, Randy Orr, Andrew Larkins

**NAME OF DRILL**  
2 7/8" Tricone

**SIZE AND TYPE OF BIT**  
2 7/8" Tricone

**INSTALLATION**  
BRUNSWICK HARBOR MODIFICATION STUDY

**DIVISION**  
South Atlantic

**SIGNATURE AND TITLE OF INSPECTOR**  
Jeremy Clark  
Project Engineer

---

**LEGEND**

- **PI**: Particle Size
- **LL**: Liquid Limit
- **MC**: Moisture Content
- **Nø**: Norrish Number
- **Nsci**: Scaled Number
- **Fines**: Fine Grains
- **Gravel**: Gravel
- **Sand**: Sand
- **CL**: Clay
- **PI**: Plasticity Index
- **MC**: Moisture Content

**CLASSIFICATION OF MATERIALS**

- **ASTM Class**:
- **% REC**:
- **Laboratory**:

**REMARKS**

- **0' to 27.2': WATER.**
- **45' of 4" casing**

---

**LOCATION COORDINATES**

- **SHEET**
- **DIVISION**: Brunswick, Georgia
- **COORDINATE SYSTEM**: NAD83
- **HORIZONTAL**: MLLW
- **VERTICAL**: GA State Plane
- **BRUNSWICK, GEORGIA**: NAD83N 411,994.6  E  857,432.1

---

**SIGNATURE AND TITLE OF INSPECTOR**

Jeremy Clark  
Project Engineer
**Boring Designation**

**TB-B-14B**

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N$_i$</th>
<th>N$_{co}$</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0' to 27.2': WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-27.2</td>
<td>-27.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27.2' to 39.2': WASH BORING.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-39.2</td>
<td>-39.2</td>
<td>3</td>
<td>8</td>
<td>20</td>
<td></td>
<td>39.2' to 42.2': CLAYEY SAND (SC), fine to medium; greenish gray, some silt, some limestone fragments, calcareous.</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-42.2</td>
<td>-42.2</td>
<td>11</td>
<td>14</td>
<td>25</td>
<td>11</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 42.2 feet.

**NOTES:**

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3' = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
40' of 4" casing

0' to 29.79': WATER.

40' of 4" casing
0' to 29.79': WATER. (continued)

29.79' to 38.79': WASH BORING.

38.79' to 43.29': CLAYEY SAND (SC), fine; gray, some silt, some limestone fragments, calcareous.
### Boring Log

**Boring Designation:** TB-B-14C

**Location Coordinates:**
- **North:** 411,952.2
- **East:** 857,468.9

**Depth Ranges and Descriptions:**
- **44.8' to 44.79':** Clayey Sand (SC), fine; gray, some sandstone fragments, calcareous. (continued)
- **44.79' to 46.29':** Clayey Sand (SC), fine; gray, with limestone fragments, some shell fragments, calcareous.
- **46.29' to 50.79':** Silty Sand (SM), fine to medium; greenish gray, some limestone fragments, calcareous.
- **50.79' to 52.29':** Silty Sand (SM), fine to medium; greenish gray, some limestone fragments, calcareous.

**Bottom of Hole:** At 52.3 feet.

**Notes:**
1. **BLOWS/FOOT:** Number required to drive 1 3/8" ID split spoon with a 140 lb. hammer falling 30 inches.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using an automatic hammer.
4. **WOR = Weight of Rods**
5. **WOH = Weight of Hammer**
6. **50/3'' = 50 Blows for 3 inches penetration**
7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
<table>
<thead>
<tr>
<th>SAMPLE No.</th>
<th>Classification of Materials (Description)</th>
<th>% Rec.</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 39.03'</td>
<td>WATER.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- 50' of 4" casing

**SPK FORM 1836**

**Boring Designation:** TB-B-15A

**Location:** Brunswick, Georgia

**Date Boring Started:** 10/23/20

**Date Boring Completed:** 10/23/20

**Elevation Ground Water:** N/A

**Drilling Agency:** Tetra Tech - AAI

**Driller:** Donald Tindall, Randy Orr, Andrew Larkins

**Manufacturer's Designation of Drill:** CME-550X/Barge

**Size and Type of Bit:** 2 7/8" Tricone

**Depth Drilled into Rock:** 0.0

**Total Depth of Boring:** 46.5'
### Boring Designation TB-B-15A

**DRILLING LOG (Cont Sheet)**

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5 ft</th>
<th>N&lt;sub&gt;i&lt;/sub&gt;</th>
<th>N&lt;sub&gt;co&lt;/sub&gt;</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0' to 39.03': WATER. (continued)</td>
</tr>
<tr>
<td>-39.0</td>
<td>39.0</td>
<td></td>
<td></td>
<td></td>
<td>39.03' to 42.78': SAND (SP), medium to coarse; greenish gray, some shell fragments, trace silt, calcareous.</td>
</tr>
<tr>
<td>-42.8</td>
<td>42.8</td>
<td>2</td>
<td>2</td>
<td></td>
<td>42.78' to 46.53': SAND (SP), medium to coarse; light gray, some shell fragments, some limestone and gravel, calcareous.</td>
</tr>
</tbody>
</table>

**LOCATION COORDINATES**

N 411,661.4 E 857,437.2

**ELEVATION TOP OF BORING (ft)**

0.0

**PROJECT**

BRUNSWICK HARBOR MODIFICATION STUDY

**COORDINATE SYSTEM**

GA State Plane - NAD83 - MLLW

**REMARKS**

Sand, Gravel, Fines, PI, MC, SPT, LL
42.78' to 46.53': SAND (SP), medium to coarse; light gray, some shell fragments, some limestone and gravel, calcareous.

Bottom of hole at 46.5 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8” ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3” = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water
| **CLASSIFICATION OF MATERIALS** (Description) | 0' to 38.41': WATER. |
| **LEGEND** | |
| **ELEV (ft)** | **DEPTH (ft)** | **Blows/0.5 ft** | **Ni** | **N0** | **% REC** | **Sample No** | **Gravel** | **Sand** | **PI** | **PI** | **MC** | **ASTM Class** | **Remarks** |
| 0.0 | 0.0 | 82 | 60 | 60 | 100 | 100 | FINE | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**50' of 4'' casing**
Boring Designation
DRILLING LOG (Cont Sheet)
BRUNSWICK HARBOR MODIFICATION STUDY
LOCATION COORDINATES

HORIZONTAL

GA State Plane

NAD83

MLLW

0.0
ASTM
Class

MC

PI

LL

Fines

Laboratory
Sand

%
REC

Gravel

CLASSIFICATION OF MATERIALS
(Description)

Samp No.

N60

LEGEND

Blows/
0.5 ft

Nf

COORDINATE SYSTEM

2

OF 3 SHEETS
VERTICAL

ELEVATION TOP OF BORING (ft)

N 411,673.7 E 857,427.7
DEPTH
(ft)

SHEET

Brunswick, Georgia

PROJECT

ELEV
(ft)

TB-B-15B

INSTALLATION

REMARKS

20.0

0' to 38.41': WATER. (continued)


22.5

25.0

27.5

30.0

32.5

35.0

37.5
-38.4

38.4
38.41' to 45.91': WASH BORING.

40.0

42.5

SPK FORM 1836-A
SEP 05

Boring Designation

TB-B-15B

SHEET 2 of 3


### CLASSIFICATION OF MATERIALS

<table>
<thead>
<tr>
<th>Blows/0.5 ft</th>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>Nco</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-45.9</td>
<td>45.9</td>
<td>38.41' to 45.91': WASH BORING. (continued)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-45.9</td>
<td>48.9</td>
<td>45.91' to 48.91': CLAY (CL), greenish gray, trace fine sand, some limestone and gravel, slightly calcareous.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of hole at 48.9 feet.**

### NOTES:

1. **BLOWS/FOOT**: number required to drive 1 3/8" ID split spoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. **WOR** = Weight of Rods

5. **WOH** = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
**DRILLING LOG**

**Boring Designation** BW-B-01

<table>
<thead>
<tr>
<th>1. PROJECT</th>
<th>2. HOLE NUMBER</th>
<th>3. DRILLING AGENCY</th>
<th>4. NAME OF DRILLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRUNSWICK HARBOR MODIFICATION STUDY</td>
<td>BW-B-01</td>
<td>Tetra Tech - AAI</td>
<td>Donald Tindall, Randy Orr, Andrew Larkins</td>
</tr>
</tbody>
</table>

**LOCATION COORDINATES**

- N 402,886.4 E 879,294.9

**DIVISION**

- South Atlantic

**INSTALLATION**

- Brunswick, Georgia

**SHRINK PASS TEST DATE**

- SEP 05

**SPK FORM 1836**

**ELEVATION GROUND WATER (ft)**

- MLLW

**ELEVATION TOP OF BORING (ft)**

- 0.0

**TOTAL NUMBER CORE BOXES**

- 13

**SIGNATURE AND TITLE OF INSPECTOR**

- Mark Zrallack, Project Engineer

**MANDATORY INFORMATION**

- 27/8" Tricone
- N/A
- 11/22/20
- 11/22/20

**DESCRIPTION OF MATERIALS (Description)**

- 0' to 27.98': WATER.

- 40' of 4" casing

**CLASSIFICATION OF MATERIALS**

- **ASTM Class**
- **% REC**
- **Sample No.**
- **Laboratory**
- **REMARKS**

**LEGEND**

- **N**
- **60**
- **Blows/0.5 ft**
- **ELEV(ft)**
- **DEPTH(ft)**
- **Boring Designation** BW-B-01

**COMMENTS**

- 50.00.049'
- 3.25.049'
- 5.00.049'
- 7.50.049'
- 10.00.049'
- 12.50.049'
- 15.00.049'
- 17.50.049'
- 20.00.049'

**NOTES**

- **PI**
- **MC**
- **LL**
- **PI**
- **MC**
- **PI**
- **MC**
- **PI**
- **MC**

**DATE BORING**

- 11/22/20

**TOTAL SAMPLES**

- DISTURBED: 13
- UNDISTURBED: 0

**TOTAL CORE RECOVERY FOR BORING**

- N/A

**TOTAL NUMBER SAMPLES**

- 0

**TOTAL NUMBER CORE BOXES**

- 0

**DATE BORING**

- 11/22/20

**DATE COMPLETED**

- 11/22/20

**TOTAL SAMPLES**

- DISTURBED: 13
- UNDISTURBED: 0

**COORDINATE SYSTEM HORIZONTAL**

- GA State Plane NAD83

**COORDINATE SYSTEM VERTICAL**

- MLLW

**SIZE AND TYPE OF BIT**

- 2 7/8" Tricone

**MANUFACTURER'S DESIGNATION OF DRILL**

- CME-550X/Barge

**DATE BORING STARTED**

- 11/22/20

**DATE BORING COMPLETED**

- 11/22/20

**VERTICAL DEPTH**

- 49'

**TOTAL CORE RECOVERY FOR BORING**

- N/A
Specific Gravity = 2.66

### Classification of Materials

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>WATER</td>
<td>(continued)</td>
</tr>
<tr>
<td>27.98'</td>
<td>SILTY SAND (SM)</td>
<td>fine; gray, with sandstone fragments.</td>
</tr>
<tr>
<td>32.48'</td>
<td>CLAYEY SAND (SC)</td>
<td>fine; gray, trace sandstone fragments.</td>
</tr>
<tr>
<td>33.98'</td>
<td>SAND (SP)</td>
<td>coarse; gray, trace clay.</td>
</tr>
<tr>
<td>35.48'</td>
<td>CLAYEY SAND (SC)</td>
<td>fine; gray, trace sandstone fragments, with gravel.</td>
</tr>
<tr>
<td>36.98'</td>
<td>SAND (SP)</td>
<td>fine; gray, trace clay.</td>
</tr>
<tr>
<td>38.48'</td>
<td>SAND (SP)</td>
<td>fine; gray.</td>
</tr>
<tr>
<td>39.98'</td>
<td>NO RETURN (NS)</td>
<td></td>
</tr>
<tr>
<td>39.98'</td>
<td>SAND (SP)</td>
<td>fine; gray, with gravel.</td>
</tr>
<tr>
<td>41.48'</td>
<td>CLAYEY SAND (SC)</td>
<td>fine; gray, with gravel.</td>
</tr>
</tbody>
</table>

### Remarks

- Specific Gravity = 2.66
### Boring Designation

**BW-B-01**

#### DRILLING LOG (Cont Sheet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-B-01</td>
<td>Boring Designation</td>
<td>45.0</td>
<td>70</td>
<td>11</td>
<td>46.0</td>
<td>49.0</td>
<td>60</td>
</tr>
</tbody>
</table>

**Bottom of hole at 49 feet.**

**NOTES:**

1. **BLOWS/FOOT:** number required to drive 1 3/8” ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using an automatic hammer.
4. **WOR** = Weight of Rods
5. **WOH** = Weight of Hammer
6. $50/3^\circ = 50$ Blows for 3 inches penetration
7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water
**Boring Designation**

**BW-B-02**

**Drilling Agency**
Tetra Tech - AAI

**Location Coordinates**
N 402,653.6 E 879,701.0

**Drilling Agency**
Tetra Tech - AAI

**Location**
Brunswick, Georgia

**Elevation Ground Water (ft)**
N/A

**Date Boring Started**
11/23/20

**Date Boring Completed**
11/23/20

**Total Core Recovery For Boring**
N/A

**Signature and Title of Inspector**
Mark Zrallack, Project Engineer

**Classification of Materials (Description)**

<table>
<thead>
<tr>
<th>ELEV.</th>
<th>DEPTH</th>
<th>Blows/0.5 ft</th>
<th>Nᵢ</th>
<th>Nᵢ₀</th>
<th>%REC</th>
<th>GRAVEL</th>
<th>SAND</th>
<th>FINE</th>
<th>WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'</td>
<td>32.99'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>WATER</td>
</tr>
</tbody>
</table>

**Remarks**

45' of 4'' casing

**Thickness of Overburden**
51.0

**Depth Drilled Into Rock**
0.0

**Total Depth of Boring**
51'

**Total Number Core Boxes**
0

**Total Samples**

<table>
<thead>
<tr>
<th>DISTURBED</th>
<th>UNDISTURBED</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>0</td>
</tr>
</tbody>
</table>

**Cooper & Tindall, Randy Orr, and Andrew Larkins**

**State Plane**
Brunswick, Georgia

**Coordinate System**
NAD83

**Size and Type of Bit**
2 7/8'' Tricone

**Manufacturer's Designation of Drill**
CME-550X/Barge

**Project**
Brunswick Harbor Modification Study

**Drilling Agency**
Tetra Tech - AAI

**Name of Driller**
Donald Tindall, Randy Orr, and Andrew Larkins

**Direction of Boring**
**Degree from vertical**: 0.0

**Degree of Inclination**: 0

**Legend**

- Fines
- Laboratory
- PI
- MC
- ASTM C-352

**Remarks**

0' to 32.99': WATER.
**Classifications of Materials (Description)**

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N_\text{Blow}/0.5 ft</th>
<th>SAMP NO.</th>
<th>REACTION</th>
<th>SAND</th>
<th>Fines</th>
<th>MC</th>
<th>LABORATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' to 32.99': WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.99' to 34.49': CLAYEY SAND (SC), fine; gray, with sandstone fragments, with gravel.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.49' to 36.49': SANDY CLAY (CL), gray, trace gravel.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.49' to 37.49': SAND (SP), fine to medium; gray, with gravel, trace clay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.49' to 44.99': CLAYEY SAND (SC), fine; gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

First three feet of borehole might have elevated SPT-N values due to overdriven casing.
### Boring Log (Cont Sheet)

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N_1</th>
<th>N_60</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>-45.0</td>
<td>45.0</td>
<td>3</td>
<td>7</td>
<td></td>
<td>44.99' to 46.99': CLAYEY SAND (SC), fine; gray, trace gravel.</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-47.0</td>
<td>47.0</td>
<td>3</td>
<td>12</td>
<td>8</td>
<td>46.99' to 47.99': SAND (SP), fine; gray.</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-48.0</td>
<td>48.0</td>
<td>10</td>
<td>23</td>
<td></td>
<td>46.99' to 48.99': CLAYEY SAND (SC), gray.</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-49.0</td>
<td>49.0</td>
<td>8</td>
<td>33</td>
<td>50/4'</td>
<td>47.99' to 50.49': CLAYEY SAND (SC), light gray.</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-50.5</td>
<td>50.5</td>
<td>5</td>
<td>11</td>
<td>28</td>
<td>50.49' to 50.99': CLAYEY SAND (SC), gray.</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 51 feet.

**NOTES:**

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
**DRILLING LOG**

<table>
<thead>
<tr>
<th><strong>1. PROJECT</strong></th>
<th><strong>9. COORDINATE SYSTEM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BRUNSWICK HARBOR MODIFICATION STUDY</td>
<td>HORIZONTAL NAD83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>2. HOLE NUMBER</strong></th>
<th><strong>10. SIZE AND TYPE OF BIT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-B-03</td>
<td>2 7/8&quot; Tricone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>3. DRILLING AGENCY</strong></th>
<th><strong>11. MANUFACTURER'S DESIGNATION OF DRILL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetra Tech - AAI</td>
<td>CME-550X/Barge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>4. NAME OF DRILLER</strong></th>
<th><strong>12. TOTAL SAMPLES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Donald Tindall, Randy Orr, Andrew Larkins</td>
<td>DISTURBED 17 UNDISTURBED 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>5. DIRECTION OF BORING</strong></th>
<th><strong>13. TOTAL NUMBER CORE BOXES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTICAL</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>6. THICKNESS OF OVERBURDEN</strong></th>
<th><strong>14. ELEVATION GROUND WATER (ft)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>48.3</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>7. DEPTH DRILLED INTO ROCK</strong></th>
<th><strong>15. DATE BORING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>11/20/20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>8. TOTAL DEPTH OF BORING</strong></th>
<th><strong>16. ELEVATION TOP OF BORING (ft)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>48.3'</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>9. LOCATION COORDINATES</strong></th>
<th><strong>17. TOTAL CORE RECOVERY FOR BORING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>N 402,809.6  E 880,151.9</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>10. TYPE OF BIT</strong></th>
<th><strong>18. SIGNATURE AND TITLE OF INSPECTOR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricone</td>
<td>Mark Zrallack  Project Engineer</td>
</tr>
</tbody>
</table>

**LEGEND**

- Blows/0.5 ft: ELEV(ft) DEPTH(ft)Bowd D/Ft
- CLASSIFICATION OF MATERIALS:
  - Blows/0.5 ft:
    - 0' to 27.29': WATER.

**REMARKS**

- 40' of 4" casing
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>Nv</th>
<th>Nc</th>
<th>LE GND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Percentages</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-27.3</td>
<td>27.3</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>0’ to 27.29’: WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-27.29’</td>
<td>31.79’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>27.29’ to 31.79’: SAND WITH SILT (SP-SM), fine; gray, with shell fragments, calcareous.</td>
<td>80</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-31.79’</td>
<td>33.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>31.79’ to 33.29’: CLAY WITH SAND (CH), gray.</td>
<td>70</td>
<td>4</td>
<td>0</td>
<td>18 82 112</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-33.29’</td>
<td>34.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>33.29’ to 34.29’: CLAYEY SAND (SC), fine; gray, with shell fragments.</td>
<td>70</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-34.29’</td>
<td>34.79’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>34.29’ to 34.79’: CLAYEY SAND (SC), light gray, trace shell fragments.</td>
<td>70</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-34.79’</td>
<td>36.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>34.79’ to 36.29’: CLAYEY SAND (SC), fine to medium; light gray, with shell fragments.</td>
<td>60</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-36.29’</td>
<td>37.79’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>36.29’ to 37.79’: CLAYEY SAND (SC), light gray, with shell fragments, with gravel.</td>
<td>60</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-37.79’</td>
<td>39.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>37.79’ to 39.29’: NO RETURN (NS).</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-39.29’</td>
<td>40.79’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>39.29’ to 40.79’: SAND (SP), fine; gray, with shell fragments, trace siltstone fragments.</td>
<td>10</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40.79’</td>
<td>42.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>40.79’ to 42.29’: SAND (SP), fine; gray, with shell fragments, some gravel.</td>
<td>50</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-42.29’</td>
<td>42.79’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>42.29’ to 42.79’: CLAYEY SAND (SC), fine; gray, with shell fragments.</td>
<td>70</td>
<td>11 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-42.79’</td>
<td>45.29’</td>
<td></td>
<td>2</td>
<td>7</td>
<td></td>
<td>42.79’ to 45.29’: SAND (SP), fine to medium; gray, trace shell fragments.</td>
<td>70</td>
<td>11 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Boring Designation**: BW-B-03

**Project**: Brunswick Harbor Modification Study

**Location Coordinates**: N 402,809.6 E 880,151.9

**Coordinate System**: GA State Plane NAD83 MLLW

**Elevation Top of Boring (ft)**: 0.0
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N</th>
<th>Nco</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-45.3</td>
<td>-45.3</td>
<td>12</td>
<td></td>
<td>42.79' to 45.29': SAND (SP), fine to medium; gray, trace shell fragments. (continued)</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-45.3</td>
<td></td>
<td>11</td>
<td>19</td>
<td>45.29' to 47.79': CLAYEY SAND (SC), fine; gray, trace shell fragments, some gravel.</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-47.8</td>
<td>-47.8</td>
<td>4</td>
<td></td>
<td>47.79' to 48.29': CLAYEY SAND (SC), light gray, trace shell fragments. Bottom of hole at 48.3 feet.</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
**Boring Designation**  BW-B-03 Core

**DIVISION**  South Atlantic  
**PROJECT**  BRUNSWICK HARBOR MODIFICATION STUDY

**HOLE NUMBER**  BW-B-03 Core  
**LOCATION COORDINATES**  N 402,813.4  E 880,186.5

**DRILLING AGENCY**  Tetra Tech - AAI  
**NAME OF DRILLER**  Donald Tindall, Randy Orr, Andrew Larkins

**ELEVATION GROUND WATER (ft)**

**DATE BORING STARTED**  11/24/20  
**DATE BORING COMPLETED**  11/24/20

**ELEVATION TOP OF BORING (ft)**  0.0

**TOTAL SAMPLES**  1  
**TOTAL NUMBER CORE BOXES**  1

**TOTAL CORE RECOVERY FOR BORING**  N/A

**SIGNATURE AND TITLE OF INSPECTOR**  Mark Zrallack  Project Engineer

---

**LEGEND**

| 0' to 27.82': WATER. |

---

**REMARKS**

45' of 4" casing
## CLASSIFICATION OF MATERIALS

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N₁</th>
<th>Nₚ₀₀</th>
<th>DESCRIPTION</th>
<th>% REC</th>
<th>GRAVEL</th>
<th>SAND</th>
<th>FINE</th>
<th>ML</th>
<th>PI</th>
<th>MC</th>
<th>ATMOS.</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0&quot; to 27.8&quot;</td>
<td>27.8&quot;</td>
<td></td>
<td></td>
<td></td>
<td>WATER. (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.8&quot; to 35.8&quot;</td>
<td>35.8&quot;</td>
<td></td>
<td></td>
<td></td>
<td>WASH BORING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.8&quot; to 37.8&quot;</td>
<td>37.8&quot;</td>
<td></td>
<td></td>
<td></td>
<td>NO RETURN.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.8&quot; to 39.3&quot;</td>
<td>39.3&quot;</td>
<td></td>
<td></td>
<td></td>
<td>SANDY LIMESTONE, gray, Moderately Hard.</td>
<td>C-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.3&quot; to 40.8&quot;</td>
<td>40.8&quot;</td>
<td></td>
<td></td>
<td></td>
<td>NO RETURN.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 40.8 feet.

**NOTES:**

1. Core was performed using a 4-inch diameter core barrel.
2. Soils are visually classified in accordance with the Unified Soil Classification System.
1. **PROJECT**: BRUNSWICK HARBOR MODIFICATION STUDY
2. **HOLE NUMBER**: BW-B-04
3. **DRILLING AGENCY**: Tetra Tech - AAI
4. **NAME OF DRILLER**: Donald Tindall, Randy Orr, Andrew Larkins
5. **DIRECTION OF BORING**: Vertical
6. **THICKNESS OF OVERBURDEN**: 49.4'
7. **DEPTH DRILLED INTO ROCK**: 0.0
8. **TOTAL DEPTH OF BORING**: 49.4'
9. **COORDINATE SYSTEM**: GA State Plane, NAD83
10. **SIZE AND TYPE OF BIT**: 2 7/8" Tricone
11. **MANUFACTURER'S DESIGNATION OF DRILL**: CME-550X/Barge
12. **TOTAL SAMPLES**: Disturbed: 13, Undisturbed: 0
13. **TOTAL NUMBER CORE BOXES**: 0
14. **ELEVATION GROUND WATER (ft)**
   - Undisturbed: N/A
   - Disturbed: 34.38'
16. **ELEVATION TOP OF BORING (ft)**: 0.0
17. **TOTAL CORE RECOVERY FOR BORING**: N/A
18. **SIGNATURE AND TITLE OF INSPECTOR**: Mark Zrallack, Project Engineer

### CLASSIFICATION OF MATERIALS

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5 ft</th>
<th>N_s</th>
<th>N_co</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0' to 34.38':</td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS**: 45' of 4" casing

**LEGEND**: PI = Plasticity Index, CL = Consistency Limit, MC = Maximum Moisture Content, FM = Fines Content, F = Fines, S = Sand, G = Gravel

**REMARKS**: Fish Pass Test - ACE 1836-A [DRILLING LOG] 20-13-0122 BRUNSWICK HARBOR MOD STUDY WITH LAB RESULTS.GPJ, ACE MOD WITH RAPID CPT 2009_08_18.GDT, 2/5/21
First 1.5 feet of borehole might have elevated SPT-N values due to overdriven casing.

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N&lt;sub&gt;i&lt;/sub&gt;</th>
<th>N&lt;sub&gt;co&lt;/sub&gt;</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' to 34.38': (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.38' to 34.88': SILT (ML), gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.88' to 36.88': SAND (SP), fine; gray, trace shell fragments.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.88' to 37.38': SILTY SAND (SM), gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.38' to 38.88': SAND WITH SILT (SP-SM), fine; gray, with shell fragments.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.88' to 41.88': SAND (SP), fine; gray, with sandstone fragments.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.88' to 43.38': CLAYEY SAND (SC), gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.38' to 44.88': CLAYEY SAND (SC), gray, trace gravel.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DRILLING LOG (Cont Sheet)

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blows/0.5 ft</th>
<th>N</th>
<th>N_60</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>-44.9</td>
<td>44.9</td>
<td>22</td>
<td></td>
<td></td>
<td>44.88' to 46.38': CLAYEY SAND (SC), gray.</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>-46.4</td>
<td>46.4</td>
<td>5</td>
<td>22</td>
<td>46</td>
<td>46.88' to 46.88': SAND WITH CLAY (SP-SC), fine; gray, with gravel.</td>
<td>70</td>
<td>11</td>
</tr>
<tr>
<td>-46.9</td>
<td>46.9</td>
<td>22</td>
<td>50</td>
<td>50/5</td>
<td>46.88' to 49.38': CLAYEY SAND (SC), gray, with gravel.</td>
<td>90</td>
<td>13</td>
</tr>
<tr>
<td>-49.4</td>
<td>49.4</td>
<td>20</td>
<td></td>
<td></td>
<td>Bottom of hole at 49.4 feet.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water.
BRUNSWICK HARBOR MODIFICATION STUDY

HOLE NUMBER: BW-B-05
LOCATION COORDINATES: N 402,828.0  E 880,813.9

DRILLING AGENCY: Tetra Tech - AAI
NAME OF DRILLER: Donald Tindall, Randy Orr, Andrew Larkins
DIRECTION OF BORING: VERTICAL
MANUFACTURER'S DESIGNATION OF DRILL: CME-550X/Barge
SIZE AND TYPE OF BIT: 7/8" Tricone

THICKNESS OF OVERBURDEN: 49.2'
DEPTH DRILLED INTO ROCK: 0.0
TOTAL DEPTH OF BORING: 49.2'
TOTAL SAMPLES: 18
TOTAL CORE RECOVERY: N/A

ELEVATION GROUND WATER (ft): 11/21/20
TOTAL NUMBER CORE BOXES: 0

Boring Designation: BW-B-05

<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>Blow/0.5 ft</th>
<th>N_b</th>
<th>N_c</th>
<th>Classification of Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>2.5</td>
<td>7.5</td>
<td>10.0</td>
<td>12.5</td>
<td>15.0</td>
</tr>
</tbody>
</table>

**Remarks:**
0' to 25.17': WATER.
40' of 4" casing

Laboratory Tests:
- Sand
- Fines
- PI
- MC
- SM/Sh

Mark Zrallack  Project Engineer
First three feet of borehole might have elevated SPT-N values due to overdriven casing. Specific Gravity = 2.67
<table>
<thead>
<tr>
<th>ELEV (ft)</th>
<th>DEPTH (ft)</th>
<th>N₁</th>
<th>N₂</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% REC</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>43.17' to 46.17': CLAYEY SAND (SC), fine to medium; gray, calcareous. (continued)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>12</td>
<td>37</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>12</td>
<td>25</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>6</td>
<td>31</td>
<td>46.17' to 49.17': SAND (SP), fine to medium; gray, trace shell fragments, calcareous.</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>15</td>
<td>31</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>16</td>
<td>31</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>11</td>
<td>30</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>12</td>
<td>30</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>46.2</td>
<td>46.2</td>
<td>18</td>
<td>30</td>
<td></td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Bottom of hole at 49.2 feet.

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.

2. Soils are visually classified in accordance with the Unified Soil Classification System.

3. SPT boring performed using an automatic hammer.

4. WOR = Weight of Rods

5. WOH = Weight of Hammer

6. 50/3" = 50 Blows for 3 inches penetration

7. Water contents are based on measured total dry mass and are not corrected for the salt concentration of the pore water
APPENDIX C

PHOTOGRAPHS OF SPT SAMPLES
TB-B-01 Photographs
Depth: 1.5 – 3.0 feet; Approximate Elevation: -30.0 to -31.5 feet MLLW

Depth: 3.0 – 4.5 feet; Approximate Elevation: -31.5 to -33.0 feet MLLW
Depth: 4.5 – 6.0 feet; Approximate Elevation: -33.0 to -34.5 feet MLLW

Depth: 6.0 – 7.5 feet; Approximate Elevation: -34.5 to -36.0 feet MLLW
Depth: 7.5 – 9.0 feet; Approximate Elevation: -36.0 to -37.5 feet MLLW

Depth: 9.0 – 10.5 feet; Approximate Elevation: -37.5 to -39.0 feet MLLW
Depth: 10.5 – 12.0 feet; Approximate Elevation: -39.0 to -40.5 feet MLLW

Depth: 12.0 – 13.5 feet; Approximate Elevation: -40.5 to -42.0 feet MLLW
Depth: 13.5 – 15.0 feet; Approximate Elevation: -42.0 to -43.5 feet MLLW

Depth: 15.0 – 16.5 feet; Approximate Elevation: -43.5 to -45.0 feet MLLW
Depth: 16.5 – 18.0 feet; Approximate Elevation: -45.0 to -46.5 feet MLLW

Depth: 18.0 – 19.5 feet; Approximate Elevation: -46.5 to -48.0 feet MLLW
Depth: 19.5 – 21.0 feet; Approximate Elevation: -48.0 to -49.5 feet MLLW
TB-B-02 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -20.2 to -21.7 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -21.7 to -23.2 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -23.2 to -24.7 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -24.7 to -26.2 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -26.2 to -27.7 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -27.7 to -29.2 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -29.2 to -30.7 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -30.7 to -32.2 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -32.2 to -33.7 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -33.7 to -35.2 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -34.5 to -36.0 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -36.0 to -37.5 feet MLLW
Depth: 18.0 – 19.5 feet; Approximately Elevation: -37.5 to -39.0 feet MLLW

Depth: 19.5 – 21.0 feet; Approximately Elevation: -39.0 to -40.5 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -40.5 to -42.0 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -42.0 to -43.5 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -43.5 to -45.0 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -45.0 to -46.5 feet MLLW
Depth: 27.0 – 28.5 feet; Approximate Elevation: -46.5 to -48.0 feet MLLW

Depth: 28.5 – 30.0 feet; Approximate Elevation: -48.0 to -49.5 feet MLLW
Depth: 30.0 – 31.5 feet; Approximate Elevation: -49.5 to -51.0 feet MLLW

Depth: 31.5 – 33.0 feet; Approximate Elevation: -51.0 to -52.5 feet MLLW
TB-B-03 Photographs
Depth: 10.0 – 11.5 feet; Approximate Elevation: -41.5 to -43.0 feet MLLW

Depth: 11.5 – 13.0 feet; Approximate Elevation: -43.0 to -44.5 feet MLLW
Depth: 13.0 – 14.5 feet; Approximate Elevation: -44.5 to -46.0 feet MLLW

Depth: 14.5 – 16.0 feet; Approximate Elevation: -46.0 to -47.5 feet MLLW
Depth: 16.0 – 17.5 feet; Approximate Elevation: -47.5 to -49.0 feet MLLW

Depth: 17.5 – 19.0 feet; Approximate Elevation: -49.0 to -50.5 feet MLLW
Depth: 19.0 – 20.5 feet; Approximate Elevation: -50.5 to -52.0 feet MLLW
TB-B-04 Photographs
Depth: 3.0 – 4.5 feet; Approximate Elevation: -16.4 to -17.9 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -17.9 to -19.4 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -19.4 to -20.9 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -20.9 to 22.4 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -22.4 to -23.9 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -23.9 to -25.4 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -25.4 to -26.9 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -26.9 to –28.4 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -28.4 to -29.9 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -29.9 to -31.4 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -31.4 to -32.9 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -32.9 to 34.4 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -34.4 to -35.9 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -35.9 to -37.4 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -37.4 to -38.9 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -38.9 to -40.4 feet MLLW
Depth: 27.0 – 28.5 feet; Approximate Elevation: -40.4 to -41.9 feet MLLW

Depth: 28.5 – 30.0 feet; Approximate Elevation: -41.9 to -43.4 feet MLLW
Depth: 30.0 – 31.5 feet; Approximate Elevation: -43.4 to -44.9 feet MLLW

Depth: 31.5 – 33.0 feet; Approximate Elevation: -44.9 to -46.4 feet MLLW
Depth: 33.0 – 34.5 feet; Approximate Elevation: -46.4 to -47.9 feet MLLW

Depth: 34.5 – 36.0 feet; Approximate Elevation: -47.9 to -49.4 feet MLLW
TB-B-05 Photographs
Depth: 0 – 3.0 feet; Approximate Elevation: -31.0 to -34.0 feet MLLW

Depth: 3.0 – 4.5 feet; Approximate Elevation: -34.0 to -35.5 feet MLLW
Depth: 4.5 – 6.0 feet; Approximate Elevation: -35.5 to -37.0 feet MLLW

Depth: 6.0 – 7.5 feet; Approximate Elevation: -37.0 to -38.5 feet MLLW
Depth: 7.5 – 9.0 feet; Approximate Elevation: -38.5 to -40.0 feet MLLW

Depth: 9.0 – 10.5 feet; Approximate Elevation: -40.0 to -41.5 feet MLLW
Depth: 10.5 – 12.0 feet; Approximate Elevation: -41.5 to -43.0 feet MLLW

Depth: 12.0 – 13.5 feet; Approximate Elevation: -43.0 to -44.5 feet MLLW
Depth: 13.5 – 15.0 feet; Approximate Elevation: -44.5 to -46.0 feet MLLW

Depth: 15.0 – 16.5 feet; Approximate Elevation: -46.0 to -47.5 feet MLLW
Depth: 16.5 – 18.0 feet; Approximate Elevation: -47.5 to -49.0 feet MLLW
TB-B-06 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -22.5 to -24.0 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -24.0 to -25.5 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -25.5 to -27.0 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -27.0 to -28.5 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -28.5 to -30.0 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -30.0 to -31.5 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -31.5 to -33.0 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -33.0 to -34.5 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -34.5 to -36.0 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -36.0 to -37.5 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -37.5 to -39.0 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -39.0 to -40.5 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -40.5 to -42.0 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -42.0 to -43.5 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -43.5 to -45.0 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -45.0 to -46.5 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -46.5 to -48.0 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -48.0 to -49.5 feet MLLW
TB-B-07 Photographs
Depth: 7.0 – 8.5 feet; Approximate Elevation: -28.3 to -29.8 feet MLLW

Depth: 8.5 – 10.0 feet; Approximate Elevation: -29.8 to -31.3 feet MLLW
Depth: 10.0 – 11.5 feet; Approximate Elevation: -31.3 to -32.8 feet MLLW

Depth: 11.5 – 13.0 feet; Approximate Elevation: -32.8 to -34.3 feet MLLW
Depth: 13.0 – 14.5 feet; Approximate Elevation: -34.3 to -35.8 feet MLLW

Depth: 14.5 – 16.0 feet; Approximate Elevation: -35.8 to -37.3 feet MLLW
Depth: 16.0 – 17.5 feet; Approximate Elevation: -37.3 to -38.8 feet MLLW

Depth: 17.5 – 19.0 feet; Approximate Elevation: -38.8 to -40.3 feet MLLW
Depth: 19.0 – 20.5 feet; Approximate Elevation: -40.3 to -41.8 feet MLLW

Depth: 20.5 – 22.0 feet; Approximate Elevation: -41.8 to -43.3 feet MLLW
Depth: 22.0 – 23.5 feet; Approximate Elevation: -43.3 to -44.8 feet MLLW

Depth: 23.5 – 25.0 feet; Approximate Elevation: -44.8 to -46.3 feet MLLW
Depth: 25.0 – 26.5 feet; Approximate Elevation: -46.3 to -47.8 feet MLLW

Depth: 26.5 – 28.0; Approximate Elevation: -47.8 to -49.3 feet MLLW
TB-B-08 Photographs
Depth: 8.0 – 9.5 feet; Approximate Elevation: -37.6 to -39.1 feet MLLW

Depth: 9.5 – 11.0 feet; Approximate Elevation: -39.1 to -40.6 feet MLLW
Depth: 11.0 – 12.5 feet; Approximate Elevation: -40.6 to -42.1 feet MLLW

Depth: 12.5 – 14.0 feet; Approximate Elevation: -42.1 to -43.6 feet MLLW
Depth: 14.0 – 15.5 feet; Approximate Elevation: -43.6 to -45.1 feet MLLW

Depth: 15.5 – 17.0 feet; Approximate Elevation: -45.1 to -46.6 feet MLLW
Depth: 17.0 – 18.5 feet; Approximate Elevation: -46.6 to -48.1 feet MLLW

Depth: 18.5 – 20.0 feet; Approximate Elevation: -48.1 to -49.6 feet MLLW
TB-B-09 Photographs
Depth: 0.0 – 1.5 feet; Approximate Elevation: -13.1 to -14.6 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -14.6 to -16.1 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -16.1 to -17.6 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -17.6 to -19.1 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -19.1 to -20.6 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -20.6 to -22.1 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -22.1 to -23.6 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -23.6 to -25.1 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -25.1 to -26.6 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -26.6 to -28.1 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -28.1 to -29.6 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -29.6 to -31.1 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -31.1 to -32.6 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -32.6 to -34.1 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -34.1 to -35.6 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -35.6 to -37.1 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -37.1 to -38.6 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -38.6 to -40.1 feet MLLW
Depth: 27.0 – 28.5 feet; Approximate Elevation: -40.1 to -41.6 feet MLLW

Depth: 28.5 – 30.0 feet; Approximate Elevation: -41.6 to -43.1 feet MLLW
Depth: 30.0 – 31.5 feet; Approximate Elevation: -43.1 to -44.6 feet MLLW

Depth: 31.5 – 33.0 feet; Approximate Elevation: -44.6 to -46.1 feet MLLW
Depth: 33.0 – 34.5 feet; Approximate Elevation: -46.1 to -47.6 feet MLLW

Depth: 34.5 – 36.0 feet; Approximate Elevation: -47.6 to -49.1 feet MLLW
Depth: 34.5 – 36.0 feet; Approximate Elevation: -47.6 to -49.1 feet MLLW
TB-B-10 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -18.5 to -20.0 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -20.0 to -21.5 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -21.5 to -23.0 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -23.0 to -24.5 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -24.5 to -26.0 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -26.0 to -27.5 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -27.5 to -29.0 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -29.0 to -30.5 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -30.5 to -32.0 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -32.0 to -33.5 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -33.5 to -35.0 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -35.0 to -36.5 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -36.5 to -38.0 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -38.0 to -39.5 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -39.5 to -41.0 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -41.0 to -42.5 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -42.5 to -44.0 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -44.0 to -45.5 feet MLLW
Depth: 27.0 – 28.5 feet; Approximate Elevation: -45.5 to -47.0 feet MLLW

Depth: 28.5 – 30.0 feet; Approximate Elevation: -47.0 to -48.5 feet MLLW
Depth: 30.0 – 31.5 feet; Approximate Elevation: -48.5 to -50.0 feet MLLW
TB-B-11 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -19.7 to -21.2 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -21.2 to -22.7 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -22.7 to -24.2 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -24.2 to -25.7 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -25.7 to -27.2 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -27.2 to -28.7 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -28.7 to -30.2 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -30.2 to -31.7 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -31.7 to -33.2 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -33.2 to -34.7 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -34.7 to -36.2 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -36.2 to -37.7 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -37.7 to -39.2 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -39.2 to -40.7 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -40.7 to -42.2 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -42.2 to -43.7 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -43.7 to -45.2 feet MLLW

Depth: 25.5 – 27.0 feet; Approximate Elevation: -45.2 to -46.7 feet MLLW
Depth: 27.0 – 28.5 feet; Approximate Elevation: -46.7 to -48.2 feet MLLW

Depth: 28.5 – 30.0 feet; Approximate Elevation: -48.2 to -49.7 feet MLLW
Depth: 30.0 – 31.5 feet; Approximate Elevation: -49.7 to -51.2 feet MLLW
TB-B-12 Photographs
Depth: 14.5 – 16.0 feet; Approximate Elevation: -45.1 to -46.6 feet MLLW

Depth: 16.0 – 17.5 feet; Approximate Elevation: -46.6 to -48.1 feet MLLW
Depth: 17.5 – 19.0 feet; Approximate Elevation: -48.1 to -49.6 feet MLLW

Depth: 19.0 – 20.5 feet; Approximate Elevation: -49.6 to -51.1 feet MLLW
TB-B-13 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -23.9 to -25.4 feet MLLW

Depth: 3.0 – 4.5 feet; Approximate Elevation: -26.9 to -28.4 feet MLLW
Depth: 4.5 – 6.0 feet; Approximate Elevation: -28.4 to -29.9 feet MLLW

Depth: 6.0 – 7.5 feet; Approximate Elevation: -29.9 to -31.4 feet MLLW
Depth: 7.5 – 9.0 feet; Approximate Elevation: -31.4 to -32.9 feet MLLW

Depth: 9.0 – 10.5 feet; Approximate Elevation: -32.9 to -34.4 feet MLLW
Depth: 10.5 – 12.0 feet; Approximate Elevation: -34.4 to -35.9 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -37.4 to -38.9 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -38.9 to -40.4 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -40.4 to -41.9 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -41.9 to -43.4 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -43.4 to -44.9 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -44.9 to -46.4 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -46.4 to -47.9 feet MLLW
Depth: 24.0 – 25.5 feet; Approximate Elevation: -47.9 to -49.4 feet MLLW
TB-B-14 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation: -27.5 to -29.0 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -29.0 to -30.5 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -30.5 to -32.0 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -32.0 to -33.5 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -33.5 to -35.0 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -35.0 to -36.5 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -36.5 to -38.0 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -38.0 to -39.5 feet MLLW
Brunswick River Modification Study
Boring TB-B-14A, TB-B-14B and TB-B-14C

Page 5 of 15

Depth: 12.0 – 13.5 feet; Approximate Elevation: -39.2 to -40.7 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -40.7 to -42.2 feet MLLW
Depth: 9.0 – 10.5 feet, Approximate Elevation: -38.8 to -40.3 feet MLLW

Depth: 10.5 – 12.0 feet, Approximate Elevation: -40.3 to -41.8 feet MLLW
Depth: 12.0 – 13.5 feet, Approximate Elevation: -41.8 to -43.3 feet MLLW

Depth: 13.5 – 15.0 feet, Approximate Elevation: -43.3 to -44.8 feet MLLW
Depth: 15.0 – 16.5 feet, Approximate Elevation: -44.8 to -46.3 feet MLLW

Depth: 16.5 – 18.0 feet, Approximate Elevation: -46.3 to -47.8 feet MLLW
Depth: 18.0 – 19.5 feet, Approximate Elevation: -47.8 to -49.3 feet MLLW

Depth: 19.5 – 21.0 feet, Approximate Elevation: -49.3 to -50.8 feet MLLW
Depth: 21.0 – 22.5 feet, Approximate Elevation: -50.8 to -52.3 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -38.8 to -40.3 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -40.3 to -41.8 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -41.8 to -43.3 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -43.3 to -44.8 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -44.8 to -46.3 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -46.3 to -47.8 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -47.8 to -49.3 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -49.3 to -50.8 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -50.8 to -52.3 feet MLLW
TB-B-15 Photographs
Depth: 0 – 1.5 feet; Approximate Elevation -39.0 to -40.5 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation -40.5 to -42.0 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation -42.0 to -43.5 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation -43.5 to -45.0 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation -45.0 to -46.5 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation -45.9 to -47.4 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation -47.4 to -48.9 feet MLLW
BW-B-01 Photographs
Depth: 0.0 – 1.5 feet; Approximate Elevation: -28.0 to -29.5 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -29.5 to -31.0 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -31.0 to -32.5 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -32.5 to -34.0 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -34.0 to -35.5 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -35.5 to -37.0 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -37.0 to -38.5 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -38.5 to -40.0 feet MLLW
Depth: 13.5 – 15.0 feet; Approximate Elevation: -41.5 to -43.0 feet MLLW

Depth: 15.0 – 16.5 feet; Approximate Elevation: -43.0 to -44.5 feet MLLW
Depth: 16.5 – 18.0 feet; Approximate Elevation: -44.5 to -46.0 feet MLLW

Depth: 18.0 – 19.5 feet; Approximate Elevation: -46.0 to -47.5 feet MLLW
Depth: 19.5 – 21.0 feet; Approximate Elevation: -47.5 to -49.0 feet MLLW
BW-B-02 Photographs
Depth: 0.0 – 1.5 feet; Approximate Elevation: -33.0 to -34.5 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -34.5 to -36.0 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -36.0 to -37.5 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -37.5 to -39.0 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -39.0 to -40.5 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -40.5 to -42.0 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -42.0 to -43.5 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -43.5 to -45.0 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -45.0 to -46.5 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -46.5 to -48.0 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -48.0 to -49.5 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -49.5 to -51.0 feet MLLW
BW-B-03 Photographs
Depth: 0.0 – 1.5 feet; Approximate Elevation: -27.3 to -28.8 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -28.8 to -30.3 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -30.3 to -31.8 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -31.8 to -33.3 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -33.3 to -34.8 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -34.8 to -36.3 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -36.3 to -37.8 feet MLLW

Depth: 12.0 – 13.5 feet; Approximate Elevation: -39.3 to -40.8 feet MLLW
Depth: 13.5 – 15.0 feet; Approximate Elevation: -40.8 to -42.3 feet MLLW

Depth: 15.0 – 16.5 feet; Approximate Elevation: -42.3 to -43.8 feet MLLW
Depth: 16.5 – 18.0 feet; Approximate Elevation: -43.8 to -45.3 feet MLLW

Depth: 18.0 – 19.5 feet; Approximate Elevation: -45.3 to -46.8 feet MLLW
Depth: 19.5 – 21.0 feet; Approximate Elevation: -46.8 to -48.3 feet MLLW
Depth: 0.0 – 1.5 feet; Approximate Elevation: -34.4 to 35.9 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -35.9 to -37.4 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -37.4 to 38.9 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -38.9 to -40.4 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -40.4 to -41.9 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -41.9 to 43.4 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -43.4 to 44.9 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -44.9 to -46.4 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -46.4 to -47.9 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -47.9 to -49.4 feet MLLW
Depth: 0.0 – 1.5 feet; Approximate Elevation: -25.2 to -26.7 feet MLLW

Depth: 1.5 – 3.0 feet; Approximate Elevation: -26.7 to -28.2 feet MLLW
Depth: 3.0 – 4.5 feet; Approximate Elevation: -28.2 to -29.7 feet MLLW

Depth: 4.5 – 6.0 feet; Approximate Elevation: -29.7 to -31.2 feet MLLW
Depth: 6.0 – 7.5 feet; Approximate Elevation: -31.2 to -32.7 feet MLLW

Depth: 7.5 – 9.0 feet; Approximate Elevation: -32.7 to -34.2 feet MLLW
Depth: 9.0 – 10.5 feet; Approximate Elevation: -34.2 to -35.7 feet MLLW

Depth: 10.5 – 12.0 feet; Approximate Elevation: -35.7 to -37.2 feet MLLW
Depth: 12.0 – 13.5 feet; Approximate Elevation: -37.2 to -38.7 feet MLLW

Depth: 13.5 – 15.0 feet; Approximate Elevation: -38.7 to -40.2 feet MLLW
Depth: 15.0 – 16.5 feet; Approximate Elevation: -40.2 to -41.7 feet MLLW

Depth: 16.5 – 18.0 feet; Approximate Elevation: -41.7 to -43.2 feet MLLW
Depth: 18.0 – 19.5 feet; Approximate Elevation: -43.2 to -44.7 feet MLLW

Depth: 19.5 – 21.0 feet; Approximate Elevation: -44.7 to -46.2 feet MLLW
Depth: 21.0 – 22.5 feet; Approximate Elevation: -46.2 to -47.7 feet MLLW

Depth: 22.5 – 24.0 feet; Approximate Elevation: -47.7 to -49.2 feet MLLW
APPENDIX D

PHOTOGRAPHS OF CORE SAMPLES
Depth: 8.0 – 13.0 feet; Approximate Elevation: -35.8 to -40.8 feet MLLW
Top Core

Top Core - Top
Top Core - Bottom
Middle Core

Middle Core - Top
Middle Core - Bottom
Bottom Core - Bottom
APPENDIX E

PARTICLE SIZE ANALYSIS CURVES AND INDEX TEST RESULTS
Sample No. | Elev / Depth | Classification | Nat w % | LL | PL | PI | Project
--- | --- | --- | --- | --- | --- | --- | ---
5 | -36.0 / 36.0 | SP-SM | 29.4 | | | | BRUNSWICK HARBOR MODIFICATION STUDY
6 | -37.5 / 37.5 | SM | 18.2 | | | | Area

Boring No. TB-B-01

Date 1/12/21
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev. / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-21.7 / 21.7</td>
<td>SM</td>
<td>81.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project:** BRUNSWICK HARBOR MODIFICATION STUDY

**Date:** 1/12/21

**Boring No.:** TB-B-02A
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-37.1 / 37.1</td>
<td>SP-SM</td>
<td>21.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project**: BRUNSWICK HARBOR MODIFICATION STUDY

**Area**

**Boring No.**: TB-B-05

**Date**: 1/12/21
Sample No. | Elev / Depth | Classification | Nat w % | LL | PL | PI | Project | BRUNSWICK HARBOR MODIFICATION STUDY
--- | --- | --- | --- | --- | --- | --- | --- | ---
3 | -25.5 / 25.5 | SM | 24.3 | 24.3 | 24.3 | 24.3 | 24.3 | 24.3 | 24.3

Area
Boring No. TB-B-06
Date 1/12/21
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>● 7</td>
<td>-22.1 / 22.1</td>
<td>SC</td>
<td>41.1</td>
<td></td>
<td></td>
<td></td>
<td>BRUNSWICK HARBOR MODIFICATION STUDY</td>
</tr>
<tr>
<td>[</td>
<td>-29.6 / 29.6</td>
<td>CL</td>
<td>18.9</td>
<td>27</td>
<td>17</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring No.</td>
</tr>
</tbody>
</table>

**Date** 1/12/21

**GRADATION CURVES**
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>● 10</td>
<td>-27.5 / 27.5</td>
<td>SC</td>
<td>20.6</td>
<td>36</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>□ 20</td>
<td>-38.0 / 38.0</td>
<td>SM</td>
<td>21.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project:** BRUNSWICK HARBOR MODIFICATION STUDY

**Area:**

**Boring No.:** TB-B-10

**Date:** 1/12/21

---

**GRADATION CURVES**

[Graph showing gradation curves]
### U.S. Standard Sieve Opening in Inches

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Numbers</th>
<th>Hydrometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>0.001</td>
</tr>
<tr>
<td>140</td>
<td>0.005</td>
</tr>
<tr>
<td>100</td>
<td>0.010</td>
</tr>
<tr>
<td>70</td>
<td>0.015</td>
</tr>
<tr>
<td>50</td>
<td>0.020</td>
</tr>
<tr>
<td>30</td>
<td>0.025</td>
</tr>
<tr>
<td>20</td>
<td>0.030</td>
</tr>
<tr>
<td>16</td>
<td>0.035</td>
</tr>
<tr>
<td>14</td>
<td>0.040</td>
</tr>
<tr>
<td>10</td>
<td>0.050</td>
</tr>
<tr>
<td>8</td>
<td>0.060</td>
</tr>
<tr>
<td>6</td>
<td>0.080</td>
</tr>
<tr>
<td>4</td>
<td>0.100</td>
</tr>
<tr>
<td>3</td>
<td>0.125</td>
</tr>
<tr>
<td>2</td>
<td>0.160</td>
</tr>
</tbody>
</table>

### U.S. Standard Sieve Numbers

- 50
- 40
- 30
- 20
- 16
- 14

### Grain Size in Millimeters

- **COBBLES**
- **GRAVEL**
- **SAND**
- **SILT OR CLAY**

<table>
<thead>
<tr>
<th>Size Class</th>
<th>Classification</th>
<th>COARSE</th>
<th>FINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 -26.9 / 26.9</td>
<td>SM</td>
<td>29.6</td>
<td></td>
</tr>
<tr>
<td>8 -31.4 / 31.4</td>
<td>CL</td>
<td>20.8</td>
<td></td>
</tr>
</tbody>
</table>

**Project:** BRUNSWICK HARBOR MODIFICATION STUDY

**Sample No.**
- 4
- 8

**Elev / Depth**
- 29.6
- 20.8

**Classification**
- SM
- CL

**Nat w %**
- 29.6
- 20.8

**LL**
- 33

**PL**
- 14

**PI**
- 19

**Date:** 1/12/21

**Boring No.:** TB-B-13
**Sample No.**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>● 5</td>
<td>-33.5 / 33.5</td>
<td>CL</td>
<td>24.1</td>
<td>38</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>□ 6</td>
<td>-35.0 / 35.0</td>
<td>CL</td>
<td>30.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project:** BRUNSWICK HARBOR MODIFICATION STUDY

**Area:**

**Boring No.:** TB-B-14A

**Date:** 1/12/21

**GRADATION CURVES**
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>● 2</td>
<td>-28.8 / 28.8</td>
<td>SP-SM</td>
<td>19.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ 4</td>
<td>-31.8 / 31.8</td>
<td>CH</td>
<td>61.4</td>
<td>112</td>
<td>41</td>
<td>71</td>
</tr>
</tbody>
</table>

Project: BRUNSWICK HARBOR MODIFICATION STUDY

Area

Boring No. BW-B-03

Date 1/12/21
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elevation / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>-37.4 / 37.4</td>
<td>SP-SM</td>
<td>25.7</td>
<td></td>
<td></td>
<td></td>
<td>BRUNSWICK HARBOR MODIFICATION STUDY</td>
</tr>
</tbody>
</table>

**GRADATION CURVES**

---

**U.S. STANDARD SIEVE OPENING IN INCHES**

<table>
<thead>
<tr>
<th>U.S. STANDARD SIEVE NUMBERS</th>
<th>HYDROMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.005</td>
</tr>
<tr>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>0.100</td>
<td>0.050</td>
</tr>
<tr>
<td>1.000</td>
<td>0.100</td>
</tr>
</tbody>
</table>

**GRAIN SIZE IN MILLIMETERS**

- **COBBLES**
  - coarse
  - fine
- **GRAVEL**
  - coarse
  - fine
- **SAND**
  - coarse
  - medium
  - fine
- **SILT OR CLAY**

---

**Note:**

- **ENG**
- **1 MAY 63**
- **2087**
COBBLES | GRAVEL | SAND | SILT OR CLAY
---|---|---|---
COARSE | FINE | COARSE | MEDIUM | FINE

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev / Depth</th>
<th>Classification</th>
<th>Nat w %</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>-31.2 / 31.2</td>
<td>SP-SC</td>
<td>31.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project: BRUNSWICK HARBOR MODIFICATION STUDY

Area

Boring No. BW-B-05

Date 1/12/21

ENG 1 MAY 63 2087
APPENDIX F

SETTLING TEST RESULTS AND PROCEDURE
CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

DATE SAMPLE DRILLED: 11/22/20
DATE TEST SET-UP: 12/30/20
DATE REPORTED: 02/09/21

INCOMING SAMPLE NO.: -----  BORING: BW-B-01  SAMPLE: 2, 3

ELEVATION: -29.5 to -32.5 (MLLW)  ❑ feet; ❑ meters
LABORATORY IDENTIFICATION: 200122/BWB01

SAMPLE DESCRIPTION: Silty sand (SM), gray
(Sample scalped on U.S. Standard No. 4 sieve)
Water Content Fraction Passing No. 4 Sieve = 16.3 %

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.25</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>3.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample was sandy and settled immediately. Suspension did not develop an interface

Initial Settling Velocity

\[ V_s = \text{Not applicable} \quad \text{cm/minute} \]

Time Interval: ----- minutes

Comments: Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 194.92
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,231.3
Total Composite Sample Wet Mass (grams) = 1,426.2

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: __________________ Date:___________

S:\Projects\2020\20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Settling Test Results 2-9-21.docx
# Settling Test Report

**Client:** U.S. Army Corps of Engineers  
**Project:** Brunswick Harbor Modification Study  
**File No.:** 20-13-0122  
**Date Sample Drilled:** 11/22/20  
**Date Test Set-Up:** 12/30/20  
**Date Reported:** 02/09/21  
**Incoming Sample No.:** ------  
**Boring:** BW-B-01  
**Sample:** 2, 3  
**Elevation:** -29.5 to -32.5 (MLLW)  
**Laboratory Identification:** 200122/BWB01  
**Sample Description:** Silty sand (SM), gray  

- Water Content Fraction Passing No. 4 Sieve = 16.3%  

---

**Settling Column Diameter:** 2.54 cm  
**Initial Slurry Height:** 100 cm  
**Initial Concentration:** 100 grams/liter (wet mass basis)  
**Initial Concentration:** 86 grams/liter (dry mass basis)  
**Final Settled Height:** 350 cm  
**Test Duration:** 1 day  
**Final Concentration:** 1,449 grams/liter (wet mass basis)  
**Final Concentration:** 1,246 grams/liter (dry mass basis)  
**Final Settled Dry Density:** 76.9 lb/ft$^3$  

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.25</td>
<td>4.3</td>
<td>0.5</td>
<td>4.8</td>
</tr>
<tr>
<td>1</td>
<td>5.0</td>
<td>2</td>
<td>5.4</td>
</tr>
<tr>
<td>4</td>
<td>6.5</td>
<td>8</td>
<td>9.0</td>
</tr>
<tr>
<td>15</td>
<td>8.9</td>
<td>30</td>
<td>8.15</td>
</tr>
<tr>
<td>60</td>
<td>7.45</td>
<td>120</td>
<td>7.2</td>
</tr>
<tr>
<td>240</td>
<td>7.0</td>
<td>360</td>
<td>6.9</td>
</tr>
<tr>
<td>460</td>
<td>6.9</td>
<td>1,440</td>
<td>6.9</td>
</tr>
</tbody>
</table>

**Initial Settling Velocity $V_s$:** Not applicable cm/minute  
**Time Interval:** ------ minutes

---

**Comments:**  
- Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 194.92  
- Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,231.3  
- Total Composite Sample Wet Mass (grams) = 1,426,2

---

*The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.*

---

*Checked By:________________________Date:_________
S:\Projects\2020\20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Settling Test Results 2-9-21.docx*
CLIENT: U.S. Army Corps of Engineers  
PROJECT: Brunswick Harbor Modification Study  
FILE NO.: 20-13-0122  

DATE SAMPLE DRILLED: 10/21/20  
DATE TEST SET-UP: 12/30/20  
DATE REPORTED: 02/09/21  

INCOMING SAMPLE NO.: ------  
BORING: TB-B-02A  
SAMPLE: 5A, 5B, 6A, 6B  
ELEVATION: -26.2 to -29.2 (MLLW)  
LABORATORY IDENTIFICATION: 200122/TBB02A  
SAMPLE DESCRIPTION: Sand with clay (SP-SC), with shell, greenish-gray  
Sample scalped on U.S. Standard No. 4 sieve)  
Water Content Fraction Passing No. 4 Sieve = 29.9%

Settling Column Diameter: 2.54 cm  
Initial Slurry Height: 100 cm  
Initial Concentration: 50 grams/liter (wet mass basis)  
Final Settled Height: 5.7 cm  
Test Duration: 5 days  
Final Concentration: 877 grams/liter (wet mass basis)  
Final Settled Dry Density: 41.7 lb/ft³

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>99.6</td>
<td>0.25</td>
<td>2.1</td>
</tr>
<tr>
<td>8</td>
<td>97.5</td>
<td>0.5</td>
<td>2.4</td>
</tr>
<tr>
<td>15</td>
<td>82.1</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>30</td>
<td>53.7</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>60</td>
<td>14.2</td>
<td>4</td>
<td>2.5</td>
</tr>
<tr>
<td>120</td>
<td>10.8</td>
<td>8</td>
<td>2.5</td>
</tr>
<tr>
<td>240</td>
<td>8.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>7.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>6.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,407</td>
<td>5.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7,200</td>
<td>5.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Setting Velocity  
Vₛ: 1.4 cm/minute  
Time Interval: 0 - 60 minutes

Comments:  
Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 189.18  
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,216.2  
Total Composite Sample Wet Mass (grams) = 1,405.4

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: __________________ Date:___________
INCOMING SAMPLE NO.: -----
LABORATORY IDENTIFICATION: 200122/TBB02A
SAMPLE DESCRIPTION: Sand with clay (SP-SC), with shell, greenish-gray
Sample scalped on U.S. Standard No. 4 sieve)

Water Content Fraction Passing No. 4 Sieve = 29.9 %

Initial Settling Velocity

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>4</td>
<td>99.1</td>
<td>0.25</td>
<td>4.5</td>
</tr>
<tr>
<td>8</td>
<td>94.7</td>
<td>0.5</td>
<td>4.7</td>
</tr>
<tr>
<td>15</td>
<td>84.2</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>30</td>
<td>64.3</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td>60</td>
<td>36.5</td>
<td>4</td>
<td>4.8</td>
</tr>
<tr>
<td>120</td>
<td>24.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>18.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>17.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>16.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,358</td>
<td>11.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7,200</td>
<td>10.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Settling Velocity

V_s: 1.1 cm/minute

Time Interval: 0 - 60 minutes

Comments: Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 189.18
          Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,216.2
          Total Composite Sample Wet Mass (grams) = 1,405.4

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: __________________Date:___________

S:\Projects\2020\20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Settling Test Results 2-9-21.docx
SETTLING TEST REPORT

CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

DATE SAMPLE DRILLED: 11/01/20
DATE TEST SET-UP: 01/04/21
DATE REPORTED: 02/09/21

INCOMING SAMPLE NO.: ----
BORING: TB-B-07
SAMPLE: 3A, 3B, 4A, 4B
ELEVATION: -31.3 to -34.3 (MLLW) feet; meters
LABORATORY IDENTIFICATION: 200122/TBB07
SAMPLE DESCRIPTION: Clayey sand with gravel (SC), with trace shell, gray
Sample scalped on U.S. Standard No. 4 sieve)
Water Content Fraction Passing No. 4 Sieve = 27.8%

Settling Column Diameter: 2.54 cm
Initial Slurry Height: 100 cm
Initial Concentration: 50 grams/liter (wet mass basis)
Initial Concentration: 39 grams/liter (dry mass basis)
Final Settled Height: 6.2 cm
Test Duration: 3 days
Final Concentration: 806 grams/liter (wet mass basis)
Final Concentration: 631 grams/liter (dry mass basis)
Final Settled Dry Density: 38.9 lb/ft³

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>99.5</td>
<td>0.25</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>95.8</td>
<td>0.5</td>
<td>1.1</td>
</tr>
<tr>
<td>8</td>
<td>90.5</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>15</td>
<td>79.8</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>30</td>
<td>54.7</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>60</td>
<td>20.6</td>
<td>8</td>
<td>1.5</td>
</tr>
<tr>
<td>120</td>
<td>13.0</td>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>240</td>
<td>11.0</td>
<td>30</td>
<td>1.4</td>
</tr>
<tr>
<td>360</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>9.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>6.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,370</td>
<td>6.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Settling Velocity
\[ V_s = \frac{1.3}{60} \text{ cm/minute} \]
Time Interval: 0 - 60 minutes

Comments: Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 530.0
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,554.0
Total Composite Sample Wet Mass (grams) = 2,084.0

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: Date: 
S:\Projects\2020-20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Settling Test Results 2-9-21.docx
CLINT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

DATE SAMPLE DRILLED: 11/01/20
DATE TEST SET-UP: 01/04/21
DATE REPORTED: 02/09/21

INCORPOR SAMPLE NO.: -----
BORING: TB-B-07
SAMPLE: 3A, 3B, 4A, 4B
ELEVATION: -31.3 to -34.3 (MLLW) feet; meters
LABORATORY IDENTIFICATION: 200122/TBB07
SAMPLE DESCRIPTION: Clayey sand with gravel (SC), with trace shell, gray
Sample scalped on U.S. Standard No. 4 sieve)
Water Content Fraction Passing No. 4 Sieve = 27.8%

Settling Column Diameter: 2.54 cm
Initial Slurry Height: 100 cm
Initial Concentration: 100 grams/liter (wet mass basis)
Initial Concentration: 78 grams/liter (dry mass basis)
Final Settled Height: 12.2 cm
Test Duration: 3 days
Final Concentration: 820 grams/liter (wet mass basis)
Final Concentration: 641 grams/liter (dry mass basis)
Final Settled Dry Density: 39.6 lb/ft³

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>99.6</td>
<td>0.25</td>
<td>2.0</td>
</tr>
<tr>
<td>4</td>
<td>98.3</td>
<td>0.5</td>
<td>2.7</td>
</tr>
<tr>
<td>8</td>
<td>95.3</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>15</td>
<td>88.9</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>30</td>
<td>74.1</td>
<td>4</td>
<td>3.7</td>
</tr>
<tr>
<td>60</td>
<td>49.9</td>
<td>8</td>
<td>3.9</td>
</tr>
<tr>
<td>120</td>
<td>34.7</td>
<td>15</td>
<td>3.9</td>
</tr>
<tr>
<td>240</td>
<td>22.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>20.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>19.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>15.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,370</td>
<td>12.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Settling Velocity
Vs: 0.8 cm/minute
Time Interval: 0 - 60 minutes

Comments:
Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 530.0
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,554.0
Total Composite Sample Wet Mass (grams) = 2,084.0

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.
**ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY**

**SETTLING TEST REPORT**

**CLIENT:** U.S. Army Corps of Engineers  
**PROJECT:** Brunswick Harbor Modification Study  
**FILE NO.:** 20-13-0122  
**DATE SAMPLE DRILLED:** 10/24/20  
**DATE TEST SET-UP:** 12/30/20  
**DATE REPORTED:** 02/09/21  
**BORING:** TB-B-14A  
**SAMPLES:** 2A, 2B, 3A, 3B  
**ELEVATION:** -29.0 to -32.0 (MLLW)  
**LABORATORY IDENTIFICATION:** 200122/TBB14A  
**SAMPLE DESCRIPTION:** Clayey sand with gravel (SC) greenish-gray  
**Water Content Fraction Passing No. 4 Sieve = 27.0 %**

---

**Settling Column Diameter: 2.54 cm**

**Initial Slurry Height:** 100 cm

**Initial Concentration:** 50 grams/liter (wet mass basis)
**Final Settled Height:** 5.45 cm

**Test Duration:** 2 days

**Final Concentration:** 917 grams/liter (wet mass basis)
**Final Settled Dry Density:** 44.6 lb/ft$^3$

**Time (minutes)**  
<table>
<thead>
<tr>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>99.9</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>99.7</td>
<td>0.5</td>
</tr>
<tr>
<td>8</td>
<td>96.3</td>
<td>1.8</td>
</tr>
<tr>
<td>15</td>
<td>91.2</td>
<td>2.18</td>
</tr>
<tr>
<td>35</td>
<td>74.6</td>
<td>4.18</td>
</tr>
<tr>
<td>60</td>
<td>50.6</td>
<td>8.18</td>
</tr>
<tr>
<td>120</td>
<td>12.7</td>
<td>15.18</td>
</tr>
<tr>
<td>240</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>2,880</td>
<td>5.45</td>
<td></td>
</tr>
</tbody>
</table>

**Initial Settling Velocity**

\[ V_s = \frac{H_0 - H_f}{T} \]

\[ V_s = \frac{100 - 5.45}{540} = 0.8 \text{ cm/minute} \]

**Comments:** Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 344.23  
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,284.6
**Total Composite Sample Wet Mass (grams) = 1,628.8**

---

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

---

**Checked By:** __________________  **Date:**___________
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST REPORT

CLIENT:     U.S. Army Corps of Engineers
PROJECT:  Brunswick Harbor Modification Study
FILE NO.:   20-13-0122

DATE SAMPLE DRILLED:  10/24/20
DATE TEST SET-UP:          12/30/20
DATE REPORTED:              02/09/21

LABORATORY IDENTIFICATION:   200122/TBB14A
SAMPLE DESCRIPTION: Clayey sand with gravel (SP), greenish-gray
(Sample scalped on U.S. Standard No. 4 sieve)
Water Content Fraction Passing No. 4 Sieve = 27.0 %

Settling Column Diameter: 2.54 cm
Initial Slurry Height: 100 cm
Initial Concentration: 100 grams/liter (wet mass basis)
Initial Concentration: 79 grams/liter (dry mass basis)
Final Settled Height: 11.8 cm
Test Duration: 2 days
Final Concentration: 847 grams/liter (wet mass basis)
Final Concentration: 667 grams/liter (dry mass basis)
Final Settled Dry Density: 41.2 lb/ft³

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Top Down (cm)</th>
<th>Time (minutes)</th>
<th>Bottom Up (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>99.6</td>
<td>0.25</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>99.4</td>
<td>0.5</td>
<td>3.9</td>
</tr>
<tr>
<td>8</td>
<td>97.2</td>
<td>1</td>
<td>4.1</td>
</tr>
<tr>
<td>15</td>
<td>93.3</td>
<td>2</td>
<td>4.2</td>
</tr>
<tr>
<td>30</td>
<td>84.1</td>
<td>4</td>
<td>4.2</td>
</tr>
<tr>
<td>60</td>
<td>65.6</td>
<td>8</td>
<td>4.2</td>
</tr>
<tr>
<td>120</td>
<td>38.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>22.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>363</td>
<td>18.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>463</td>
<td>17.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,440</td>
<td>13.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,880</td>
<td>11.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Settling Velocity
Vₗ: 0.6 cm/minute
Time Interval: 0 - 60 minutes

Comments:  Wet Mass Retained on U.S. Std. No. 4 Sieve Fraction (grams) = 344.23
Wet Mass Passing U.S. Std. No. 4 Sieve Fraction (grams) = 1,284.6
Total Composite Sample Wet Mass (grams) = 1,628.8

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: __________________Date:___________

S:\Projects\2020\20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Settling Test Results 2-9-21.docx
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
PARTICLE-SIZE ANALYSIS TEST REPORT

CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

INCOMING SAMPLE NO.: BORING: BW-B-01
SAMPLE: 2, 3 Composite

DATE SAMPLE RECEIVED: 11/24/20
DATE TEST SET-UP: 01/15/21
DATE REPORTED: 02/09/21

ELEVATION: -29.5 to -32.5 (MLLW) ft; m

LABORATORY IDENTIFICATION:

SAMPLE DESCRIPTION: Silty sand (SM), gray

TEST PROCEDURES

- ASTM Standard D6913
- Other: _____________        __

Water Content (%): 8.6 [coarse], 15.6 [fine]
Mass Dry Solids (grams): 177.50 [coarse], 297.71 [fine]

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
PARTICLE-SIZE ANALYSIS TEST REPORT

CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

DATE SAMPLE RECEIVED: 11/24/20
DATE TEST SET-UP: 01/15/21
DATE REPORTED: 02/09/21

INCOMING SAMPLE NO.: BORING: TB-B-02A
SAMPLE: 5A, 5B, 6A, 6B Composite
ELEVATION: -26.2 to -29.2 (MLLW) ft; m
LABORATORY IDENTIFICATION: SAMPLE DESCRIPTION: Sand with clay (SP- SC), with shell, greenish-gray

TEST PROCEDURES
ASTM Standard D6913 Other: ________ Water Content (%): 11.5 [coarse], 29.3 [fine]
Mass Dry Solids (grams): 168.55 [coarse], 271.03 [fine]

U.S. STANDARD SIEVE SIZE

<table>
<thead>
<tr>
<th>GRAVEL</th>
<th>SAND</th>
<th>SILT</th>
<th>CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coarse</td>
<td>Fine</td>
<td>Coarse</td>
<td>Medium</td>
</tr>
</tbody>
</table>

- TOTAL GRADATION AS RECEIVED
- GRADATION FOR SEDIMENTATION RATE TESTS (SCALPED)

Soil Passing U.S. Standard Sieve (% dry mass basis)

<table>
<thead>
<tr>
<th>U.S. Sieve Size</th>
<th>Gravel</th>
<th>Coarse Sand</th>
<th>Medium Sand</th>
<th>Fine Sand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&quot;</td>
<td>3/4&quot;</td>
<td>3/8&quot; No. 4</td>
<td>No. 10</td>
</tr>
<tr>
<td>AsReceived</td>
<td>100</td>
<td>99.1</td>
<td>95.1</td>
<td>88.7</td>
</tr>
<tr>
<td></td>
<td>96.3</td>
<td>95.1</td>
<td>88.7</td>
<td>76.3</td>
</tr>
<tr>
<td>Scalped</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>86.4</td>
<td>66.7</td>
<td>43.5</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>27.8</td>
<td>15.5</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>11.1</td>
</tr>
</tbody>
</table>

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By:  Date:  S:\Projects\2020\20-13-0122 Brunswick Harbor Mod Study\Laboratory Testing\Geotech\Sedimentation Test\Sieve analysis report 2-9-21.doc
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
PARTICLE-SIZE ANALYSIS TEST REPORT

CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

DATE SAMPLE RECEIVED: 11/24/20
DATE TEST SET-UP: 01/15/21
DATE REPORTED: 02/09/21

INCOMING SAMPLE NO.: BORING: TB-B-07
SAMPLE: 3A, 3B, 4A, 4B Composite
ELEVATION: -31.3 to -34.3 (MLLW) ft; m

LABORATORY IDENTIFICATION:
SAMPLE DESCRIPTION: Clayey sand with gravel (SC), with trace shell, gray

TEST PROCEDURES
☐ ASTM Standard D6913 ☐ Other: _____________

<table>
<thead>
<tr>
<th>Water Content (%)</th>
<th>Coarse: 12.2</th>
<th>Fine: 27.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass Dry Solids</td>
<td>Coarse: 470.49</td>
<td>Fine: 269.22</td>
</tr>
</tbody>
</table>

U.S. STANDARD SIEVE SIZE

<table>
<thead>
<tr>
<th>Soil Passing U.S. Standard Sieve (% dry mass basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>U.S. Sieve Size</td>
</tr>
<tr>
<td>As Received</td>
</tr>
<tr>
<td>Scalped</td>
</tr>
</tbody>
</table>

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: __________________ Date: ____________
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
PARTICLE-SIZE ANALYSIS TEST REPORT

CLIENT: U.S. Army Corps of Engineers
PROJECT: Brunswick Harbor Modification Study
FILE NO.: 20-13-0122

INCOMING SAMPLE NO.: BORING: TB-B-14A
SAMPLE: 2A, 2B, 3A, 3B Composite

ELEVATION: -29.0 to -32.0 (MLLW) ft; m
LABORATORY IDENTIFICATION:
SAMPLE DESCRIPTION: Clayey sand with gravel (SC), greenish-gray

TEST PROCEDURES
ASTM Standard D6913
Other: 
Water Content (%): 16.5 [coarse], 27.1 [fine]
Mass Dry Solids (grams): 293.13 [coarse], 289.97 [fine]

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.
OUTLINE OF SEDIMENTATION-RATE TESTS AND PROCEDURES
South Atlantic Division Laboratory

1. **DEFINITION.** The Sedimentation-Rate test is an empirical test that indicates the settleability of soil when dispersed in water simulating the field conditions.

2. **APPARATUS.**
   
   a. **Balances**, sensitive to 0.1 gram.
   
   b. **Glass bottom withdrawal sedimentation tubes** having a volume of 500 ml and calibrated in centimeters (see attached sketch).
   
   c. **Glass beakers** with ml capacity.
   
   d. **Clock** with second hand.
   
   e. **Backs** to hold the bottom withdrawal tubes in upright position while tests are in progress, preferably against a wall in well lighted area.
   
   f. Other apparatus required for water content determinations (see Appendix I of EM 1110-2-1906).

3. **PROCEDURES.**

   a. Thoroughly mix the moist sample as received in the laboratory and separate approximately 100 grams of representative material for moisture content determination. This same specimen can also be used for Specific Gravity determination if desired.

   b. If laboratory classification tests, e.g. grain size analysis and Atterberg limits, are desired, approximately 100 grams and 300 grams respectively, of representative material should be separated for those tests.

   c. Prepare two specimens for the sedimentation-rate tests by placing 25 grams and 50 grams, respectively, of moist material into 100 ml beakers. Add sea water, or other water representative of the field environment, to completely submerge the specimens.

   d. After the specimens have slaked in the sea water, preferably overnight, wash each specimen into a bottom-withdrawal tube.

   e. Fill each tube to the 100 cm mark with sea water or other water representative of the field environment. The tube containing 25 gms of moist material will therefore have an initial density of 50 grams/liter when it is uniformly dispersed. The tube containing 50 grams of material will likewise have an initial concentration of 100 grams/liter.
f. Seal the open end of the tube with the palm of the hand and shake the suspended material about 2 minutes (depending on type of material) to evenly disperse material throughout the tube.

g. Place the tube containing the dispersed material in an upright position in a rack. This is time zero for the start of observations.

h. Observe and record the height of the suspended sediment in the tube at elapsed time intervals following a logarithmic pattern (i.e. 1/4, 1/2, 1, 2, 4, 8, 16 min., etc.). This height of the suspended sediment is interpreted to be the line of demarcation between the sediment settling in the tube and "clear" water on top. Since this is a subjective observation in many instances, it is important that the same technician make the observations for all tests.

i. Continue to read and record the observations until a semi-log plot of the "height of suspended sediment" versus log of time indicates the slope of the sediment curve approaches the horizontal. This usually occurs within 24 hours elapsed time.

j. When observations are completed, the tube may be emptied and cleaned for future tests.

4. COMPUTATIONS.

Compute the "final" concentration of the sedimented material in each tube based on its final height as follows:

\[
\text{Final Concentration} = \frac{100 \text{ cm}}{\text{gms/liter}} \times \frac{\text{Final height}}{\text{in cm}}
\]

Note this concentration is based on the initial moist weight of the specimen. Thus, to determine the concentration of the dry solids, it must be corrected for the initial moisture content of the material, determined on a companion specimen as indicated in paragraph 3a above.

4. REPORTS.

a. Semi-log graphs of the observations for both the 50 and the 100 gram/liter initial concentrations are shown on the same graph for comparison. See examples attached.

b. Where applicable, separate companion reports of laboratory classification tests should be prepared. See example attached.

Encls
1. Sketch
2 -3. Example Reports
Bottom withdrawal sedimentation tube
Total Gradation as Received

Gradation for Sedimentation Rate Tests

**Sample No.**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Elev or Depth</th>
<th>Visual Classification</th>
<th>Mx w%</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Project</th>
<th>Lab. No.</th>
<th>Area</th>
<th>Sample No.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B</td>
<td></td>
<td>Gray clayey sand (SC)</td>
<td>59.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>57/4663 (3M-114)*</td>
<td></td>
<td>3B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>w/some shell.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Minus #4 only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Specific Gravity = 2.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GRADATION CURVES**

* Sedimentation Rate Tests
NOTES:
1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Sedimentation test specimens contain only Minus No. 4 material and all plus No. 4 shells were scalped.

5. Minus No. 4 moisture content = 77.9%.

---

Moist Weight of Specimen
**Final Concentration**

---

PROJECT
Panama City Harbor, Mobile District

Lab. No. 57/4663 (3M-114)

<table>
<thead>
<tr>
<th>AREA</th>
<th>DEPTH</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SUSPENDED SEDIMENT-TIME CURVES

SAD Form 3023
26 Oct 72
APPENDIX G

UNCONFINED COMPRESSION TEST RESULTS
# INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

**CLIENT:** U.S. Army Corps of Engineers  
**PROJECT:** Brunswick Harbor Modification Study  
**FILE NO.:** 20-13-0122  
**DATE SAMPLE RECEIVED:** 11/24/20  
**DATE TEST SET-UP:** 01/09/21  
**DATE REPORTED:** 02/09/21

**INCOMING SAMPLE NO.:**  
**BORING:** BW-B-03  
**SAMPLE:** Core C1 - TOP  
**ELEVATION:** -37.8 to -39.3 (MLLW)  
**SAMPLE DESCRIPTION:** Gray sandy limestone

<table>
<thead>
<tr>
<th>Specimen Dimensions</th>
<th>Initial Conditions</th>
<th>Rate of Loading</th>
<th>Time to Failure (minutes)</th>
<th>Strain at Failure (%)</th>
<th>Unconfined Compressive Strength, $\sigma_a^{(ult)}$ (lb/in$^2$)</th>
<th>Young’s Tangent Modulus, $E_50$ (lb/in$^2$)</th>
<th>Modulus Ratio $[E_50 / \sigma_a^{(ult)}]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>H (cm)</td>
<td>D (cm)</td>
<td>H/D</td>
<td>$w_c$ (%)</td>
<td>$\gamma_d$ (lb/ft$^3$)</td>
<td>S (%)</td>
<td>$\dot{\varepsilon}$ (cm/minute)</td>
<td>$\varepsilon$ (%/minute)</td>
</tr>
<tr>
<td>11.74</td>
<td>9.80</td>
<td>1.2</td>
<td>10.9</td>
<td>123.3</td>
<td>82</td>
<td>0.1501</td>
<td>1.278</td>
</tr>
</tbody>
</table>

**TEST PROCEDURES**

ASTM Standard D7012 [Method C] and D4543 for specimen preparation  
Air Temperature (°C): 21.0  
Capping Material:  
- None
- Lab-Stone

**SPECIMEN PREPARATION**

- Original Core Diameter (inch): 4.0  
- Specimen Sub-Cored for Testing:  
  - Yes
  - No

- Specimen Side Straightness (Procedure S1):  
  - Satisfies Criterion of ≤ 0.020 inches
  - Does Not Satisfy Criterion:___ ___

- Specimen Side Parallelism (Procedure P2):  
  - Satisfies Criterion of ≤ 0.43%
  - Does Not Satisfy Criterion:___ ___

- Specimen End Flatness (Procedure FP2):  
  - Specimen Capped – Not Applicable
  - Satisfies Criterion of ≤ 0.001 inches
  - Does Not Satisfy Criterion

- $G_s$: 2.68  
  - Assumed
  - Measured

**FAILURE SKETCH**

---

The test data and all associated project information presented here shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where:  
- $H$ = Specimen height; $D$ = Specimen diameter; $w_c$ = Water content (ASTM D2216); $\gamma_d$ = Dry density; $S$ = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate;  
- $G_s$ = Specific gravity; and $E_50$ = Young’s tangent modulus at 50% of unconfined compressive strength unless indicated otherwise.
APPENDIX H

SPLIT TENSILE STRENGTH TEST RESULTS
### Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

<table>
<thead>
<tr>
<th>Specimen Depth</th>
<th>Test No</th>
<th>Thickness (L), in</th>
<th>Diameter (D), in</th>
<th>Thickness to Diameter Ratio (L/D)</th>
<th>Failure Load (P), lbs</th>
<th>Splitting Tensile Strength, psi</th>
<th>Failure Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.8-39.3 ft</td>
<td>ST-1</td>
<td>1.63</td>
<td>3.9</td>
<td>0.42</td>
<td>519</td>
<td>52</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: Strain rate: 2.5%/min.
ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)
APPENDIX I

POINT LOAD TEST RESULTS
**Axial Point Load Strength Index of Rock by ASTM D5731**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Specimen Depth</th>
<th>Diameter, in</th>
<th>Thickness, in</th>
<th>Failure Load (P), lbs</th>
<th>De, sq in</th>
<th>De, in</th>
<th>Is, psi</th>
<th>F</th>
<th>Is(50mm), psi</th>
<th>Generalized Correction Factor, K</th>
<th>Estimated Compressive Strength, psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLA-1</td>
<td>37.8-39.3 ft</td>
<td>3.9</td>
<td>1.67</td>
<td>171</td>
<td>8.27</td>
<td>2.88</td>
<td>21</td>
<td>1.186</td>
<td>25</td>
<td>21</td>
<td>434</td>
</tr>
</tbody>
</table>

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

**Intact Material Failure**

Before

![Before Image]

After

![After Image]