SUBSURFACE INVESTIGATION
GRAND RIVER LANDING
FAIRPORT HARBOR, OHIO

Report to

LAKE METROPARKS.
CONCORD TOWNSHIP, LAKE COUNTY, OHIO

Prepared by

BBC&M ENGINEERING, INC.
GEOSCIENCES AND MATERIALS CONSULTANTS
WILLOUGHBY HILLS, OHIO

JUNE 2004
Mr. Eric Stechschulte  
Lake MetroParks  
11211 Spear Road  
Concord Township, Lake County, Ohio 44077

Re:  Subsurface Investigation  
      Grand River Landing

Dear Mr. Stechschulte:

In accordance with our proposal dated May 13, 2004, and accepted June 7, 2004, BBC&M Engineering, Inc. has completed a subsurface investigation for the proposed Grand River Landing located along St. Clair Street in Fairport Harbor, Ohio. The site location is shown on the Vicinity Map submitted as Plate 1 in the Appendix to this report.

The purposes of this investigation are to determine the existing subsurface conditions in the area of the proposed boat launch ramp, concrete slab-on-grade for restroom construction, and adjacent parking lot, and to provide recommendations for site preparation, earthwork, design and construction of the footings, floor slab-on-grade, pavement, management of groundwater during construction, and other information pertinent to design and construction of the proposed slabs-on-grade and parking lot.

PROJECT NARRATIVE

Project information was obtained through a phone conversation on June 9, 2004, and from the request for proposal dated May 6, 2004. Based on this information, we understand that the planned construction will consist of pre-cast concrete slab that will be placed for the boat launch ramp. De-watering for the ramp construction will not be necessary, however, construction below the seasonal ground water table may require de-watering. The concrete slab-on-grade for the restrooms will consist of a turn down slab connected to a below grade tank for support. We understand that the final grades will remain at approximately the same elevation as that of the existing grades and that significant cut/fill will not be required except near the entrance at St. Clair Street where some fill will need to be placed to meet existing grades.

At the time of this investigation, the area of the proposed construction consisted of lightly wooded and grass landscaping. The area where the planned restrooms and proposed roadway embankment will be constructed consists of uncontrolled rubble fill (large pieces of broken concrete and asphalt) and brush.
FIELD WORK

On June 15, 2004, four (4) borings were drilled at the project site with an ATV-mounted drilling rig using 3-1/4" I.D. hollow-stem augers. Borings B-1 through B-4 were drilled to depths of ten (10) feet within the proposed parking lot and slab-on-grade construction. The Ohio Utilities Protection Service (OUPS) and any other appropriate utility companies were notified of our field work at least 48 hours (excluding weekends and holidays) prior to drilling.

Boring locations were selected and field marked by Lake MetroParks personnel at the locations shown on the Plan of Borings submitted as Plate 2 in the Appendix to this report. Relative ground surface elevations provided on the individual boring logs and on the Plan of Borings were submitted to BBC&M by Lake MetroParks.

At regular intervals, disturbed but representative samples were obtained by driving a 2-inch O.D. split-barrel sampler in accordance with ASTM designation: D 1586 (Standard Penetration Test). Split-barrel samples were examined immediately after recovery and representative portions were preserved in airtight glass jars. All samples were transported to the soils laboratory of BBC&M Engineering, Inc. for further identification and testing.

In the field, experienced personnel provided supervision of the drilling and sampling procedures and performed the following specific duties: assumed responsibility for handling and preserving all samples after they were recovered; prepared a log of each boring; documented seepage and groundwater observations; and served as liaison with our Project Engineer so that the program of exploration could be effectively modified, if required.

LABORATORY TESTING

In the laboratory, under the direction of a Professional Engineer, selected samples were visually identified and tested for natural moisture content, liquid and plastic (Atterberg) limits, and/or grain-size distribution. Results of the tests permit an evaluation of strength and other engineering properties of the soils by comparison with similar soils. All of the cohesive samples were tested with a hand penetrometer. Hand penetrometer values are roughly equivalent to the unconfined compressive strengths of the cohesive fraction of the soil. Results of the laboratory testing are shown on the Log of Borings and the gradation curves are included as Plates 8 and 9 of the Appendix.

Based upon the visual identifications and test results, the field logs were modified, where necessary, and copies of the laboratory-corrected logs of the borings have been submitted as Plates 4 through 7 in the Appendix. The logs show: descriptions of stratigraphy encountered; depths from which samples were preserved; effort required to obtain samples; and groundwater and seepage observations.
Soils described in this report have been classified in general accordance with the Unified Soil Classification System, augmented by the use of adjectives to designate the approximate percentages of minor soil components. Definitions of these adjectives and an explanation of the notes and symbols used on the boring logs are presented on Plate 3 of the Appendix.

GENERAL SUBSURFACE CONDITIONS

**Geologic Setting**

Based upon our geologic references, the uppermost soils consist of alluvium deposits consisting of silts, and sands underlain by lacustrine silt and clayey deposits of Pleistocene and recent age. The uppermost bedrock formation at the site may consist of the Olentangy and Ohio shale formation of the Devonian Age. Shale bedrock is estimated to be within 30 to 50 feet of the existing ground surface at the project site and was not encountered during our subsurface investigation.

**Subsurface Stratigraphy**

Topsoil was encountered at the ground surface in Borings B-1 through B-4 and was approximately twelve (12) inches in thickness. Underlying the topsoil at each boring location, and continuing to a depths ranging from two and a half (1.5) to four (4) feet below the ground surface, were soils identified as silty clay and clayey silt. These cohesive soils were stiff to very-stiff in consistency. Underlying the stiff to very-stiff soils and continuing to depths of seven and a half (7.5) feet below the ground surface were clayey silt soils that were very-soft to medium stiff in consistency or very loose silts. Underlying the cohesive soils and continuing to boring termination depths of ten (10) feet were soils described as very-loose to loose sands.

Groundwater was encountered during this investigation at depths ranging five (5) to eight (8) feet below the ground surface. Based on the measurements, it appears that the ground water level is at or slightly below the level of the river.

Please refer to the individual Logs of Borings for a summary of the encountered soil and groundwater conditions at each boring location. Inferences should not be made to the subsurface conditions in areas between or away from the borings without field verification.
ANALYSES AND RECOMMENDATIONS

General Considerations

The cohesive soils encountered in each of the borings are judged suitable for support of the anticipated construction. Potential de-watering for this site will need to be addressed prior to any construction below Elevation 572 feet.

Demolition and Site Preparation

Prior to construction, all existing sod, topsoil, trees, vegetation, existing pavements and granular base materials, demolition rubble, old footings and floor slabs, miscellaneous debris, and any other materials (including existing fill) judged unsuitable by the geotechnical engineer for support of the planned site improvements should be completely removed from the proposed limits of the planned slab-on-grade structures and parking area, and from any areas to be cut or to receive new fill. All resulting demolition debris should be wasted from the site. The demolition operations should be observed by a qualified on-site geotechnical engineer to ensure that all unsuitable materials have been removed.

All surfaces cut to subgrade elevation and subgrades to receive fill should be proof-rolled (where possible) with multiple passes of a fully-loaded, tandem-axle dump truck under the direction of an on-site geotechnical engineer. Any remaining soft, very-loose, yielding, or obviously organically contaminated zones should either be undercut and replaced, moisture conditioned and recompacted, or improved in place by other suitable methods as directed by the geotechnical engineer. Any required filling and undercut backfilling should be performed according to the recommendations discussed below under “Earthwork”.

It is likely that a proof roll within 2 feet of the groundwater table will fail. A failing proofroll will require the use of a bridge lift prior to fill placement. The bridge lift may include the use of No. 1 and No. 2 crushed angular stone with a geofabric separator to prevent piping of the clayey silt/silty soils.

Earthwork

New fill used to support the slab-on-grade and the pavement should consist of inorganic soil that is free of any miscellaneous materials, shale, cobbles, and boulders. It is recommended that new fill be moisture conditioned to within ±2% of its optimum moisture content, placed in uniform, horizontal, thin lifts, with each lift carefully compacted to a stable condition and to at least 100% of its Standard Proctor maximum dry unit weight as determined in the laboratory by means of the Test Method for Laboratory Compaction Characteristics using Standard Effort (ASTM D 698). If a clean granular soil is used as fill, it may not be possible to determine a maximum unit weight using ASTM D 698. In that case, the soil should be tested in accordance with ASTM D 4254, and a minimum relative density of 85% should be specified. Fill should not be placed in a frozen condition or upon a frozen subgrade.
The existing inorganic clayey/silty soils on the site could be reused as engineered fill (except that silty soils are not allowed within two feet of the bottom of asphalt pavement). However, silt(y) soils are extremely moisture sensitive and the on-site soils may be too wet to achieve the densities recommended above without some amount of discing and drying back of the soils prior to their compaction. It is recommended that bulk samples of on-site soils be procured and tested several weeks in advance of engineered fill placement to determine their compaction characteristics and to have compaction data available at the beginning of filling operations.

The silty site soils are sensitive to variations in moisture content and can become unstable from repetitive construction traffic. Thus, special attention should be given to design of the pavement system to ensure that surface and subsurface water be kept out of the immediate pavement subgrade to reduce frost-heave and pumping tendencies of the fine-grained soils. It is recommended that a combination of asphalt and free draining granular base be used for the pavement system. The base material should meet ODOT Item 304 specifications, and should be provided with positive drainage outlets to dispose of any water entering the base material. The granular base should be provided with positive drainage outlets to prevent long-term saturation of the silty subgrade soils. The quality of the subgrade preparation and compaction is extremely important to the success of the pavement.

**Foundation Support**

All wall footings for the retaining wall and turned down slabs should be proportioned using a net allowable bearing pressure not to exceed 1,000 pounds per square foot (psf) when founded on the stiff undisturbed clayey silt site soils. Undisturbed site soils judged suitable for support of the foundations were encountered at a depth of forty-two (42) inches below existing grade elevations.

A minimum width of three (3) feet is recommended for all wall footings. Footings designed in accordance with the above recommendations will have a factor of safety of at least three (3) with respect to the soil shear strength. All exterior footings should be embedded to depths consistent with protection from frost damage (forty-two (42) inches below adjacent exterior site grades). All footings should contain sufficient steel reinforcing to help the footings span over softer zones. In order to determine whether the soils exposed at the bottom of the excavations are suitable for support of the structure, it is recommended that all foundation bearing soils be observed and evaluated by a geotechnical engineer or an experienced soils technician under the supervision of a geotechnical engineer.

Foundation bearing surfaces and floor slab subgrades should be protected from exposure to water prior to installation of footing concrete and placement of granular base. Seepage or surface water runoff should not be permitted to collect and stand in the footing excavations or within the building and pavement footprints. Soils softened or loosened by standing water or disturbed by construction activities should be removed from the footing excavations and floor slab and pavement subgrades prior to placing base material. The area around the proposed
structure should be graded such that all water runoff is directed away from the structure during and upon completion of construction.

**Floor Slab-on-Grade and Pavement Support**

The subgrade soils encountered within the proposed parking area consist of silty clay/clayey silt and silts. The clayey silts and silts encountered are extremely susceptible to frost heave and are not recommended within the frost penetration depth of 42 inches below the top of pavement. As such, these should be undercut and removed. However, if some frost heaving and associated pavement cracking are deemed acceptable, silts and clayey silts should be removed a minimum of 24 inches below top of pavement. This could be accomplished by using six (6) inches of No. 1 and 2 crushed angular stone placed on the stiff or better subgrade soils followed by a geogrid such as Tensar BX1300 or equivalent. Another one (1) foot of No. 1 and 2 stone followed by six (6) inches of ODOT Item 304 crushed angular stone should be placed. Prior to placing the first six (6) inches of No. 1 and No. 2 stone, a geofabric should be placed as a separator to prevent soil piping into the stone. The geofabric should be sized based on the gradation of the soils encountered at the subgrade level. All stone should be placed in accordance with the “Earthwork” specifications for compaction.

We understand that Type “A” rip-rap will be placed around the edge of the boat launch ramp and that the ramp is a pre-cast structure that will be set into place. Prior to installation of the ramp, one (1) foot of No. 1 and 2 crushed angular stone should be placed to help promote drainage between the ground surface and slab to minimize any frost heave of the soils that may occur.

Subsequent to the completion of site preparation and earth fill operations in accordance with the guidelines discussed under “Demolition and Site Preparation” and “Earthwork”, floor slabs for the proposed building may be supported either on new, properly compacted, controlled earth fill, or on competent existing site soils approved by a qualified Geotechnical Engineer, whichever will be present at the required subgrade elevation. Slabs-on-grade should be designed using a **Modulus of Subgrade Reaction (K)** of 120 pci provided that the floor subgrades consist of the existing, in-situ, loose sand soils that are prepared as discussed above under “Demolition and Site Preparation” and “Earthwork”. If an off-site borrow source is used for fill beneath the slabs-on-grade then a different Modulus of Subgrade Reaction may be required for design depending upon the material type and thickness. Pavements supported on stiff to very-stiff clayey silt soils encountered at the site should be designed using a **California Bearing Ratio (CBR)** of 4.0.

**Lateral Earth Pressures for Design of Retaining Walls**

The proposed bridge abutments must be designed to withstand lateral earth pressures, as well as hydrostatic pressures, that may develop behind the structures. The magnitude of the lateral earth pressures varies on the basis of soil type, permissible wall movement, and the configuration of the backfill.
To minimize lateral earth pressures, the zone behind abutment walls should be backfilled with granular soil, and the backfill should be effectively drained. For effective drainage, a zone of free-draining gravel (ODOT Item 518.03) should be used directly behind the structures for a minimum thickness of 18 inches in accordance with ODOT Item 518.05. This granular zone should drain to either weepholes or a pipe, so that hydrostatic pressures do not develop against the walls.

The type of backfill beyond the free-draining granular zone will, however, govern the magnitude of the pressure to be used for structural design. Pressures of a relatively low magnitude will be developed by the use of granular backfill, whereas a cohesive (clay) backfill will result in the development of much higher pressures.

It is recommended that granular backfill be used next to the abutments. The backfill should be placed in a wedge formed by the back of the structure and a line rising from the base of the structure footings at an angle no greater than 60 degrees from the horizontal. Granular backfill behind the structures should be compacted in accordance with Item 203, "Embankment Compaction", of the Construction and Materials Specifications, Department of Transportation, State of Ohio. Overcompaction in areas directly behind the walls should be avoided as this might cause damage to the structure.

If proper drainage is provided and the granular backfill material is compacted as specified, an equivalent fluid unit weight of 40 pounds per cubic foot (lb/ft$^3$) may be used when a movement equivalent to 1.8/1000 times the height of the structure (H) is allowed to occur (i.e., the "active" earth pressure condition). In this case, the resultant lateral force should be taken as acting at 0.42 (H). If "at-rest" conditions are expected -- that is to say -- no lateral movement can occur, an equivalent fluid unit weight of 55 lb/ft$^3$ should be used for design of the abutments.

If granular backfill is used and compacted as specified without providing either a pipe drain or weepholes, an undrained equivalent fluid unit weight of 85 lb/ft$^3$ should be used if the above-mentioned wall movement is allowed to occur. If "at-rest" conditions are expected without providing the proper drainage, an undrained equivalent fluid unit weight of 95 lb/ft$^3$ should be used for design.

Compacted cohesive materials tend alternatively to shrink, and expand over periods of time and can create significant lateral pressures. Because of the long-term adverse effects, it is believed that, if proper drainage is provided, an equivalent fluid unit weight of 80 lb/ft$^3$ should be used for design of the abutment walls. Without proper drainage, the design should be based on an equivalent fluid unit weight of 105 lb/ft$^3$.

A value of 0.35 may be used for the coefficient of friction between the foundation subgrade soils and new concrete spread footings as long as the footings bear on an undisturbed subgrade previously recommended. Appropriate factors of safety should be applied to the coefficients of friction provided above.
Construction Groundwater Considerations

Based on observations made at the time of this investigation, significant groundwater problems ARE anticipated in connection with construction of the retaining wall footings and below grade tank for the restroom facility. Groundwater problems are not anticipated during site preparation or filling operations. The finished footing elevation for the retaining wall footing and bottom of tank for the restroom is planned to be at or below the current river level. Granular seams encountered during this investigation allow for easy flow of ground water that may prohibit the use of a sump pump.

The groundwater table at this site is known to fluctuate with river levels and was located near ±Elevation 572 at the time of this investigation. The shallow groundwater table will require extraordinary design considerations for the boat launch ramp area including abutment and retaining wall foundations, and rest room tank, as discussed in the next sections. Long-term groundwater management will be required to prevent frost heave of the slabs and foundations. Other than the installation of the loading dock ramp and restroom tank, excavations deeper than Elevation 572 ft. are not expected.

All subsurface drainage systems for the boat launch ramp retaining wall foundations, and restroom tank should be coordinated with the site civil engineer to assure that the designed storm sewers can effectively handle the new anticipated sump and perimeter drain flows.

Temporary dewatering should be anticipated for the construction of foundations, loading dock ramp, restroom tank and any deep utilities excavated below Elevation 572. All excavations should be dewatered prior to the excavation, and kept dry until the concrete and backfill have been placed. Well points may be required to sufficiently lower the groundwater table for excavations. This design is unique and extraordinary due to the relatively shallow groundwater table experienced at this site and the presence of sands and silts. The design of this system is beyond BBC&M’s scope of services for this investigation.

Seismic Criteria

Based on the subsurface stratigraphy encountered within the borings, the estimated depth to bedrock from ODNR mapping, and the estimated stratigraphy located above the bedrock and below the bottoms of the borings, it is the opinion of BBC&M that this site is best characterized by the 2002 Ohio Building Code (OBC) as site class E. Considering this site classification and the location of the site within the state, BBC&M further recommends that an $S_{DS}$ value of 0.369 and an $S_{D1}$ value of 0.134 be used for seismic analysis in accordance with the 2002 OBC.

Based on the above information, as well as our understanding of the proposed structure, it is preliminarily estimated that the restroom structure will fall under Seismic Design Category (SDC) C. Appropriate geotechnical recommendations have been included with this report based on this SDC. If following final design, the SDC is found to be different from that
estimated by BBC&M, we should be notified so that our recommendations may be modified, if necessary.

**Final Considerations**

It is recommended that our office be retained to review the foundation plans to verify that the design conforms with our assumptions and recommendations. Any changes to the anticipated structural loads, parking lot location or configuration, or finished subgrade elevations should be evaluated by our office, and revised recommendations will be prepared, if warranted. It is recommended that a representative from our office be on site during subgrade preparation, proof-rolling, earth fill placement and compaction, and foundation and pavement construction.

We appreciate the opportunity to have been of service on this project. Please contact this office if you have any questions in connection with this report.

Respectfully Submitted,

**BBC&M ENGINEERING, Inc.**
**Willoughby Hills, Ohio**

Brian E. Meluch, EI  
Staff Engineer

Glen R. Andersen, ScD, PE  
Northeast Regional Manager

Submitted: 3 copies via US mail
TOPSOIL - 12 INCHES

Stiff brown clayey silt, little fine to medium sand, contains few iron oxide staining and roots.

Soft to medium-stiff brown mottled with gray clayey silt, little fine sand, contains few iron oxide staining and few roots.

Very-loose gray and black fine to medium sand, little silt, slightly organic.

NOTES:
- Encountered water at 8.0'.

SYMBOLS USED TO INDICATE TEST RESULTS:

- G - GRADATION
- Q - UNCONFINED COMPR
- T - TRIAXIAL COMPR
- C - CONSOLIDATION
- S - SEPARATE CURVES
- H - PENETROMETER (tsf)
- M - UNIT DRY WEIGHT (pcf)
- D - RELATIVE DENSITY (%)
## LOG OF BORING NO. B-2
### GRAND RIVER LANDING
#### FAIRPORT HARBOR, OHIO

**LOCATION:** SEE PLATE 2  
**ELEVATION:** 576.6  
**DATE:** 6/15/04  
**COMPLETION DEPTH:** 10.0'

**DRILLING METHOD:** 3-1/4" I.D. Hollow-stem Auger  
**SAMPLER(S):** 2" O.D. Split-barrel Sampler

<table>
<thead>
<tr>
<th>DEPTH (FEET)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE EFFORT</th>
<th>DESCRIPTION</th>
<th>TEST RESULTS</th>
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<tr>
<td>0</td>
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<td>TOPSOIL - 12 INCHES</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stiff to very-stiff brown clayey silt, little fine to medium sand, contains few iron oxide stains and few roots.</td>
<td>H=2.0-2.25</td>
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<td>H=1.4-1.75</td>
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<td>Soft to medium-stiff brown mottled with gray clayey silt, little fine to medium sand, contains few fine to medium sand lenses.</td>
<td>H=0.25-0.5</td>
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<tr>
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<td></td>
<td></td>
<td>Very-loose gray fine to coarse sand, little fine gravel, trace silt.</td>
<td></td>
</tr>
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**NOTES:**  
- Encountered water at 7.0'.

**WATER LEVEL:**  
**WATER NOTE:** Encountered  
**DATE:** 6/15/04

**SYMBOLS USED TO INDICATE TEST RESULTS**

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<td>T</td>
<td>Triaxial Compr</td>
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<td>Unit Dry Weight (pcf)</td>
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<tr>
<td>S</td>
<td>Separate Curves</td>
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<tr>
<td>D</td>
<td>Relative Density ($)</td>
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</table>
**LOG OF BORING NO. B-3**  
GRAND RIVER LANDING  
FAIRPORT HARBOR, OHIO  

**LOCATION:** SEE PLATE 2  
**ELEVATION:** 577.9  
**DATE:** 6/15/04  
**COMPLETION DEPTH:** 10.0'  

**DRILLING METHOD:** 3-1/4" I.D. Hollow-stem Auger  
**SAMPLE(S):** 2" and 2-1/2" O.D. Split-barrel Samplers

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<thead>
<tr>
<th>DEPTH</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE EFFORT</th>
<th>DESCRIPTION</th>
<th>NATURAL CONSISTENCY INDEX</th>
<th>TEST RESULTS</th>
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<td>1/2/2</td>
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**TOPSOIL - 12 INCHES**

- Stiff to very-stiff brown clayey silt, little fine to medium sand, contains few iron oxide stains and few roots.  
  - Natural moisture content: H=1.75-2.25  
- Medium-stiff brown mottled with gray silty clay, little fine to medium sand, contains few roots.  
  - Natural moisture content: H=2.0-2.25  
- Very-soft to soft brown mottled with gray silty clay, little fine to medium sand, contains few roots.  
  - Natural moisture content: H=1.0-1.5  
- Very-loose gray fine to coarse sand, trace fine gravel, trace silt.  
  - Natural moisture content: H=0.0-0.3

**NOTES:**  
- Encountered water at 5.0'.

**WATER LEVEL:**  
- WATER NOTE:  
  - Drinking water encountered at 5.0'  
  - Caved at 6.5'  
- DATE: 6/15/04  

**SYMBOLS USED TO INDICATE TEST RESULTS:**  
- G - GRADATION  
- Q - UNCONFINED COMPR  
- T - TRIAXIAL COMPR  
- C - CONSOLIDATION  
- S - SEE  
- M - PENETROMETER (tsf)  
- W - UNIT DRY WEIGHT (pcf)  
- D - RELATIVE DENSITY (%)  

**PLATE 6**
**LOG OF BORING NO. B-4**  
GRAND RIVER LANDING  
FAIRPORT HARBOR, OHIO

**LOCATION:** SEE PLATE 2  
**ELEVATION:** 576.3  
**DATE:** 6/15/04  
**COMPLETION DEPTH:** 10.0'

**DRILLING METHOD:** 3-1/4" I.D. Hollow-stem Auger  
**SAMPLER(S):** 2" O.D. Split-barrel Sampler

<table>
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<th>DEPTH</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE</th>
<th>SAMPLE EFFORT</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>1/2/2</td>
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<td>Stiff to very-stiff brown clayey silt, little fine to medium sand, contains few roots.</td>
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<tr>
<td>5</td>
<td>2</td>
<td>1/1/1</td>
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<td>Stiff brown mottled with gray clayey silt, little fine to medium sand, contains few roots and fine sand lenses.</td>
</tr>
<tr>
<td>10</td>
<td>3A</td>
<td>1/1/1</td>
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<td>Very-loose dark gray organic silt, some fine to medium sand, little clay, contains few roots.</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>2/3/2</td>
<td></td>
<td>Loose gray fine to coarse sand, little fine to coarse gravel, trace silt.</td>
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</table>

**DESCRIPTION:** TOPSOIL - 12 INCHES

**TEST RESULTS**

- **NATURAL CONSISTENCY INDEX**
  - Natural Moisture Content
    - Plastic Limit
    - Liquid Limit

- **H = 1.75 - 2.3**
- **H = 1.0 - 1.5**
- **H = 1.0**

**NOTES:**
- Encountered water at 5.0'.

**SYMBOLS USED TO INDICATE TEST RESULTS**

**WATER LEVEL:**  
- 5.0
- 3.5

**WATER NOTE:**  
- Encountered: 6/15/04  
- Caved at: 6/15/04
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<thead>
<tr>
<th>Specimen Identification - Depth</th>
<th>Classification</th>
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<th>PL</th>
<th>PI</th>
<th>opt mc %</th>
<th>max pcf</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-4 S-1 (1.0 - 2.2)</td>
<td>Stiff to very-stiff brown clayey silt, little fine to medium sand, contains few roots.</td>
<td>28</td>
<td>38</td>
<td>29</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen Identification - Depth</th>
<th>D100</th>
<th>D60</th>
<th>D30</th>
<th>D10</th>
<th>%Gravel</th>
<th>%Sand</th>
<th>%Silt</th>
<th>%Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-4 S-1 (1.0 - 2.2)</td>
<td>2.0000</td>
<td>0.0203</td>
<td>0.0</td>
<td>11.7</td>
<td>56.0</td>
<td></td>
<td></td>
<td>32.3</td>
</tr>
</tbody>
</table>

PROJECT: GRAND RIVER LANDING
LOCATION: FAIRPORT HARBOR, OHIO
JOB NO.: 012-00819.300
DATE: 7/7/04
**Specimen Identification - Depth:**

- B-1 S-2 (2.5 - 4.0)

**Classification:** Soft to medium-stiff brown mottled with gray clayey silt, little fine sand, contains few roots and iron oxide staining.

- **MC%**: 33
- **LL**: 34
- **PL**: 26
- **PI**: 8
- **opt mc %**: 
- **max pcf**: 

**Specimen Identification - Depth:**

- B-1 S-2 (2.5 - 4.0)

- **D100**: 2.0000
- **D60**: 0.0234
- **D30**: 0.0069
- **D10**: 0.0
- **%Gravel**: 11.4
- **%Sand**: 65.0
- **%Silt**: 23.6
- **%Clay**: 

**GRADATION CURVE**

**PROJECT LOCATION:**

- **GRAND RIVER LANDING**
- **FAIRPORT HARBOR, OHIO**

**JOB NO.**

- 012-00819.300

**DATE**

- 7/7/04