GEOTECHNICAL INVESTIGATION

EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

Prepared For:

PBS&J
2639 NORTH MONROE STREET
BUILDING C
TALLAHASSEE, FLORIDA 32303

Prepared By:

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.
3154 ELIZA ROAD
TALLAHASSEE, FLORIDA 32308
(850) 386-1253

November 2010
22-32-10-02

EGS

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

November 19, 2010

EGS File Number: 22-32-10-02

PBS&J, Inc.
2639 North Monroe Street
Building C
Tallahassee, FL 32303

ATTN: Kathy Burke, P.E.
Project Manager

SUBJECT: Report of Geotechnical Investigation
East Stormwater Management Facility
Flood Mitigation Project
Timberlake Subdivision
Leon County, Florida

Dear Kathy:

Enclosed is Copy of the Report of Geotechnical Investigation prepared for the above referenced project. Presented in this Report is a summary of the field investigation, subsurface materials encountered, laboratory test results, requested infiltration rates, geotechnical design recommendations, and construction considerations.

Environmental and Geotechnical Specialists, Inc. (**EGS**) appreciates the opportunity to be of service on this project.

Very truly yours,

Environmental and Geotechnical Specialists, Inc.
Florida Certificate of Engineering Authorization 6222

11-19-10

Myron L. Hayden, Ph.D., P.E.
Consulting Geotechnical Engineer
FL P.E. No. 34067

Enclosure

104 NORTH MAGNOLIA DRIVE / TALLAHASSEE, FL 32301 / (850) 386-1253 / FAX (850) 385-8050

Table of Contents

SECTIONS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Environmental and Geotechnical Specialists, Inc. (**EGS**) has completed the subsurface investigation as authorized by PBS&J to evaluate the subsurface conditions for a possible stormwater management facility (**SWMF**) immediately east of the existing **SWMF** that serves Timberlake Subdivision. In general, the project is to consist of stabilizing the existing erosion at the project area, possibly constructing impoundment berms to retain the stormwater, and overexcavate beneath the proposed **SWMF** to increase its storage volume. This purpose of this **SWMF** is to relieve some of the flooding currently being experienced in the area.

This Report includes a summary of the geotechnical investigation conducted for this study, an evaluation of field and laboratory test data, groundwater conditions, infiltration design recommendations, geotechnical recommendations for design of the impoundment berms, and construction considerations.

2.0 SCOPE OF SERVICES

The following Scope of Services comprised the work authorized for this study:

- Installation of five (5) soil borings varying in depths from 20 to 70 feet;
- Installation of three (3) piezometers at depths varying from 10 to 30 feet;
- Conducting laboratory testing to classify the subsurface materials, strength parameters and permeability rates;
- Monitoring the piezometers for 14 days after installation to determine the vertical rate of groundwater flow;
- Developing recommendations for the design and construction of the impoundment berms to retain the stormwater;
- Develop recommendations for the infiltration rate of stormwater in the soils beneath the proposed **SWMF**;
- Develop recommendations to stabilize the areas currently experiencing severe surface erosion; and,
- Preparation of this Report.

3.0 SITE LOCATION

The proposed **SWMF** is to be located immediately east of the existing Timberlake Subdivision **SWMF** along US 27 (Apalachee Parkway), approximately one (1) mile east of the City of Tallahassee in Leon County, Florida. A Site Location Map has been included as **Figure 1**.

The location of the proposed **SWMF** is shown on the **USGS** Topographic Survey Map provided as **Figure 2**. As can be seen in **Figure 2**, the ground surface in the area of the proposed **SWMF** slopes to the west (toward Timberlake Subdivision) and then to the north toward Piney Z Lake. Normal seasonal high groundwater appears to be around EL 50 feet with a general flow of the groundwater to the north toward Piney Z Lake. The hydraulic gradient of the surficial aquifer in the area appears to be fairly flat at around 0.001 foot/foot to the north.

The site has been cleared in the past and used as pasture for cattle. Lately, the site has remained vacant and is covered with typical pasture vegetation. Photographs of the project site and typical ground cover are shown in **Figures 3A** through **3C**.

There are locations within the project area where severe surface erosion is occurring. A photograph of one (1) of those locations is shown in **Figure 3D**. It is likely these erosion areas are caused by the channelization of surface stormwater runoff and the fact that the surface soils are a combination of uniform silty fine (**SM/A-2-4**) and low plasticity clayey fine sands (**SC/A-2-6**). These soils are likely loessial (wind deposited) soils which are subject to severe erosion when the ground cover has been removed. It should be noted that significant surface erosion of the area could occur during construction if bare soils are left exposed for any significant period of time.

4.0 SUBSURFACE INVESTIGATION

EGS conducted the subsurface investigation described in this Report in September and October of 2010. The investigation was conducted under the supervision of Myron L. Hayden, Ph.D., P.E., Geotechnical Engineer with Matthew Landschoot, E.I. of **EGS** serving as the field coordinator.

The five (5) soil borings installed for this project were labeled **EP-1** through **EP-5**. Soil Borings **EP-1**, **EP-2**, **EP-3**, **EP-4**, and **EP-5** where installed to depths of 20, 30, 40, 50, and 70 feet below the existing ground surface, respectively. A Soil Boring Location Map has been included as **Figure 4** with a Generalized Soil Profile shown in **Figure 5**.

Cone Penetration Index (**CPI**) tests were conducted on two and one-half (2 ½) feet intervals in the top five (5) feet of each soil boring and Standard Penetration Tests (**SPT**) were conducted on two and one-half (2 ½) feet intervals from a depth of seven and one half (7 ½) feet to the soil boring termination. The **CPI** test results have been converted to equivalent **SPT** '**N**' values in this Report values using the correlation **SPT** '**N**' = **CPI** /4.

Soil samples were collected on one (1) foot intervals in the top seven (7) feet and at each **SPT** location. The soil samples were classified in the field by **EGS** personnel and then sealed and transported to **EGS**'s laboratory for additional testing. The laboratory tests included water contents, grain-size distribution, Atterberg limits, organic contents, permeability, and shear strength.

All soil samples were classified with respect to the Unified Soil Classification system (**UNIFIED**) and the American Association of State Highway and Transportation Officials (**AASHTO**) soil classification system. The results of the laboratory testing are summarized on the Soil Survey provided in **APPENDIX A**. Copies of the individual Soil Boring Logs and Soil Classification Data Sheets have been provided in **APPENDICES B** and **C**, respectively.

As part of this study, three (3) piezometers labeled **EP-PZ-10**, **EP-PZ-20** and **EP-PZ-30** were installed at the location of Soil Boring **EP-5**. The numbering of the piezometers corresponds to the depth that they were installed (i.e. **EP-PZ-10** was installed to a depth of 10 feet below the ground surface). Each piezometer was installed with two (2) feet of 0.002 inch slotted screen contained within a 20/30 sand filter that extended six (6) inches above the top of the slotted screen.

The location and depths of each piezometer are provided in **TABLE 1**. The purpose of installing a piezometer at different depths was to determine if there is significant vertical infiltration of the surficial groundwater into the underlying rock and, if there is vertical flow of groundwater, what that vertical infiltration rate is. The piezometers were also used to conduct in situ falling permeability tests to measure the in situ permeability of the soils.

5.0 SUBSURFACE CONDITIONS

5.1 Soils

A "Generalized" Soil Profile of the subsurface conditions is shown in **Figure 5**. As can be seen in this **Figure**, the subsurface materials generally consist of the following:

- 0.0 – 15.0 feet - Loose to Very Loose Silty to Clayey Fine Sand (**SM/SC / A-2-4/A-2-6 / STRATA 2** and **3**)
- 15.0 – 30.0 feet – Medium Dense Clayey Fine Sand (**SC / A-2-6 / STRATUM 3**)
- 30.0 – 40.0 feet – Stiff Highly Plastic Clay (**CH / A-7-5 / STATUM 6**)
- 40.0 – 60.0 feet – Soft to Very Soft Limestone (**STRATUM 7**)
- 60.0^{+} – Hard Limestone (**STRATUM 8**)

5.2 Groundwater

Groundwater was encountered in all five (5) soil borings installed for this study. The approximate elevations of both the measured and the seasonal high groundwater are provided in **TABLE 2**.

The depths to groundwater in each piezometer were recorded after 24-hours, 7-days, and 14-days after they were installed. A summary of the groundwater readings taken during this period are provided in **TABLE 3**.

5.3 USDA Soil Survey

As part of this investigation, **EGS** reviewed the United States Department of Agriculture's (**USDA**) Soil Survey of Leon County. The soils reported in the **USDA** Soil Survey consist of Orangeburg Fine Sandy Loam (MATERIAL 34), which was consistent with the soils encountered during the field investigation. Variations in soil properties will occur when comparing data from the **USDA** Soil Survey and data obtained in the field.

A summary of the pertinent **USDA** Soil Survey Data has been provided in **TABLE 4**. Copies of selected TABLES from the **USDA** Soil Survey and **Figure D-1** have been provided as **APPENDIX D**.

5.4 Soil Permeability Values

As mentioned previously, field infiltration tests were conducted in the three (3) piezometers. The results of the field tests and corresponding field permeability values are provided in **APPENDIX E** and summarized in **TABLE 5**.

To verify and check the permeability rates determined from field-testing, representative samples of the soil were tested in the laboratory for grain-size distribution. The grain-size distribution of a soil can be used to obtain an approximate estimate of its permeability. Based on the grain-size distribution of representative soil samples, the permeability was estimated from correlations developed at the University of Florida for Florida soils. Estimates of the permeability for materials encountered on this project, based on grain-size distribution correlations, are summarized in **TABLE 5** with the actual grain-size correlations provided in **APPENDIX E**.

The permeability data shown in **TABLE 5** includes the permeability rates measured in the field, the permeability rates measured in the laboratory, the permeability rates estimated from grain-size distribution correlations, and the soil permeabilities reported in the **USDA** Soil Survey. Based on these permeability rates, a recommended average saturated and unsaturated permeability rate for **STRATA 1** through **6** have been included in **TABLE 4**. It should be noted that the "recommended permeability rates" in **TABLE 4** are **not** infiltration rates and as such do not account for effects of groundwater mounding or contain a factor of safety.

5.5 Possible Active Karst Feature

As part of this study, the Leon County / City of Tallahassee GIS database was reviewed to identify possible karst features that may exist within the project area. The results of this database search are shown in **Figure 6**. As can be seen in **Figure 6**, the project site is located within an area identified as possibly containing an underlying active karst feature. Based on the subsurface investigation conducted for this study, it appears that the site is underlain by a "relic" karst feature; however, the karst feature does not appear to be active.

This belief is based on the fact that there is about 10 feet of highly plastic low permeable clay (**STRATUM 6**) covering the rock surface, which retards the migration of water and fines into the underlying limestone. Based on the groundwater measurements made using the piezometers installed for this study, the vertical infiltration of groundwater into the underlying rock is approximately 0.004 inch per hour, which corresponds to approximately 3.2×10^{-8} cm/sec. This infiltration rate is consistent with the site being underlain with a plastic clay confining layer. A copy of the sample calculations is included in **APPENDIX G**.

5.6 Clay Content of Subsoils

As part of this study, the percentage of clay was determined from representative samples of the subsoils. This determination was made in accordance with ASTM Procedure D422 using a calibrated hydrometer. Copies of the hydrometer test data have been included in **APPENDIX F**. The percentages of sand, silt, and clay are summarized on the Soil Survey sheets provided in **APPENDIX A**. As can be seen in the Soil Survey Sheets the percentage of clay for **STRATUM 3** varies from 25.4 to 27.0 percent. Based on this study, it is clearly shown that there is more than 20 feet of soil with a clay content (less than 0.002 mm) of over 10 percent.

6.0 RECOMMENDATIONS

6.1 Field Infiltration Rates

The infiltration rate of stormwater into the subsoils can be determined using the following equation:

$$I_f = \{(K)*(A)*(T)*(\delta H/L)\} / (F_s) \qquad \textit{Equ. 6.1}$$

Where:
- I_f = design infiltration rate
- K = soil permeability given in **TABLE 4**
- A = cross-sectional area normal to flow
- T = time for infiltration
- δH = change in hydraulic head
- L = length of shortest seepage path
- F_s = factor of safety (at least 2)

It should be noted that for the design of this **SWMF**, groundwater mounding must be considered. The mounding of groundwater causes the hydraulic head (δh) to reduce as the length of seepage (L) increases; thus, causing the hydraulic gradient ($\delta h/L$) to reduce. As the hydraulic gradient reduces, the effective infiltration rate through the bottom of the stormwater pond also reduces with time.

To evaluate the effects of the groundwater mounding on the effective infiltration rate, the geotechnical design parameters have been provided in **TABLE 6**. Sample calculations conducted for this study indicate the following:

Height of Retained Water	Effective Infiltration Rate
0.0 – 0.5 feet	1.8 inch/day
0.5 – 1.0 feet	1.0 inch/day
1.0 – 2.0 feet	0.7 inch/day
2.0 – 3.0 feet	0.6 inch/day
3.0^{+} feet	0.5 inch/day

It should be noted that the above values do not include any factor of safety. **EGS recommends** that a factor of safety of at least two (2) be used for the effective infiltration rate.

6.2 Presence of Clay Beneath the SWMF

Based on the analyses conducted for this study, it can be seen that there is over twenty (20) feet of low permeability material with a percentage of clay fraction (having a particle size less than 0.002 mm) of over 25 percent.

6.3 Existence of an Active Karst Feature

Based on this investigation, it is unlikely that an active karst feature exists beneath this area. It is likely this area is underlain by an old "relic" karst feature that has plugged itself off with clay.

6.4 Water Retention Embankment (From Soil Boring EP-1 to EP-5)

The following embankment recommends apply for any water retention embankment constructed over six (6) feet in height with a retained water height of no more than four (4) feet. The recommendations in this Section (Section 6.4) do not apply to existing slopes.

6.4.1 Foundation Preparation - The area beneath the proposed impoundment berm should be cleared and grubbed of existing vegetation. The ground surface should be overexcavated to EL 48 feet, with the overexcavation extending at least five (5) feet beyond the edge of the embankment toe. All high-density root masses, individual roots over one (1) inch in diameter, and all unsuitable soils should be removed and disposed of off site or in a location designated by the owner.

The excavated bearing surface should be compacted to at least 95 percent of the soil's standard Proctor dry density for a depth of at least one (1) foot. Lowering of the groundwater to at least EL 46 feet may be necessary to achieve the required compacted density.

6.4.2 Seepage Cutoff Wall- After preparing the foundation as described above, a groundwater cutoff wall should be installed. The cutoff wall should be constructed of steel sheet piling installed to a tip elevation of at least EL 30 feet. The sheet piling should have a minimum section modulus (S_x) equal to greater than that of a PZ-27. The following note should be added to the Plans:

The Contractor shall have the necessary means and methods to install the sheet piling to the required tip elevation.

6.4.3 Embankment Construction – After construction of the seepage cutoff wall, the embankment should be constructed using either clayey fine sand (**SC/A-2-6/STRAUM 3**) or clayey sand (**SC/A-6/STRATUM 4)** with a Plasticity Index (PI) greater than ten (10) and a Liquid Limit less than fifty (50). The soils should be compacted to a dry density of at least 95% of the soil's modified Proctor dry density using lifts not to exceed nine (9) inches of loose soil.

6.4.4 Embankment Slopes – If the impoundment structure is constructed as outlined above, the following side slopes can be safely used:

- upstream – one (1) vertical on four (4) horizontal
- downstream – one (1) vertical on three (3) horizontal

Surface erosion of the upstream and downstream face could be a problem; therefore, **EGS recommends** the following:

- After the slope has been shaped and constructed, place a plastic erosion mat from the top of the embankment to the bottom of the embankment face, pinning the erosion mat in place using stakes or pins spaced three (3) feet apart in a staggered pattern;
- The erosion mat should conform to Florida Department of Transportation's (**FDOT**) Standard Specification 501;
- If the erosion mat does not come with fertilizer already placed in the mat, then fertilizer should be added prior to placing the sod to enhance quick root development of the sod; and,
- After the erosion mat is installed, place and stake/pin the sod in place.

6.4.5 Seepage Control – If the impoundment structure is constructed as outlined above, seepage beneath and through the impoundment structure will not be significant. However, seepage along a pipe which may penetrate the embankment could be a problem.

To eliminate this seepage problem, **EGS recommends** that an anti-seepage collar be installed around the discharge pipe. This anti-seepage collar should be at least twelve (12) inches thick, and extend at least two (2) feet beyond the circumference of the pipe. The anti-seepage control collar should be located upstream of the center of impoundment structure. A typical detail for an antiseepage collar is shown in **Figure 7**.

It should be noted that soils immediately around the discharge pipe will be difficult to compact. Therefore, **EGS recommends** flowable fill be used as backfill beneath and around the pipe, up to mid-height (spring line), to reduce the potential for piping of the soils along the pipe.

6.4.6 Embankment Settlement – If the embankment foundation is prepared as described above, settlement at the center of the structure will be less than two (2) inches with about one (1) inch of the settlement occurring during construction. This magnitude of settlement will likely not cause any significant problems to the integrity of the overflow structure.

6.4.7 Overflow Spillway - If an overflow spillway is to be constructed, then the following is recommended:

- the spillway channel over the top of the structure should be paved with concrete;
- the channel on the downstream face should also be paved with concrete; and,
- The bottom of the overflow spillway should have an energy dissipating system consisting of embedded blocks or broken rock that have a weight sufficiently large that they will not move as a result of the overflow of the water.

6.5 Erosion of the Existing Impoundment Area

Surface erosion of the areas surrounding the proposed **SWMF** or any existing "recontoured" slope should be stabilized in the following manner:

- The ground surface should be cleared of all vegetation;
- Grade the slope not to exceed a one (1) vertical on four (4) horizontal;
- Place a plastic erosion mat over the area, pinning the erosion mat in place using stakes or pins spaced three (3) to four (4) feet apart in a staggered pattern;
- The erosion mat should conform to Florida Department of Transportation's (**FDOT**) Standard Specification 501; and,
- After the erosion mat is installed, place and stake/pin the sod in place.

7.0 CLOSURE

The data and results presented in this Report are intended for the use of **PBS&J** and **Leon County** for the design of the Stormwater Management Facility on the east side of Timberlake Subdivision, described herein. This Report is not intended for any other use and will likely not be applicable. The data and recommendations presented in this Report are based on the borings made at the specific locations and depths noted. Subsurface conditions at other locations may vary significantly from those presented herein. Should data become available which is different from the data presented herein, Environmental and Geotechnical Specialists, Inc. requests the opportunity to review the data and make any modifications to the design recommendations which may be appropriate.

8.0 SIGNATURE

Environmental and Geotechnical Specialists, Inc.
Florida Certificate of Engineering Authorization Number 6222

11-19-10

Myron L. Hayden, P.E.
Senior Consulting Geotechnical Engineer
FL P.E. Number 34067

TABLES

TABLE 1
SOIL BORING/PIEZOMETER LOCATION DATA
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

LOCATION NUMBER	DEPTH [1] (FEET)	ELEVATION [2] (FEET)	GLOBAL POSITIONING SATELLITE SYSTEM COORDINATES			
			LATITUDE		LONGITUDE	
			DEG(^{0})	MIN(')	DEG(^{0})	MIN(')
SOIL BORING LOCATIONS						
EP-1	20.0	59.8	30	25.558	84	11.566
EP-2	30.0	55.5	30	25.588	84	11.566
EP-3	40.0	55.0	30	25.634	84	11.566
EP-4	50.0	56.5	30	25.655	84	11.566
EP-5	70.0	61.3	30	25.674	84	11.557
PIEZOMETER / CASED HOLE TEST LOCATIONS						
EP-PZ-10	10.0	61.3	30	25.671	84	11.560
EP-PZ-20	20.0	60.8	30	25.671	84	11.558
EP-PZ-30	30.0	60.5	30	25.669	84	11.559

NOTES: 1. DEPTHS ARE BELOW EXISTING GROUND SURFACE.
2. ELEVATIONS ESTIMATED FROM TOPOGRAPHIC DRAWINGS PROVIDED BY PBS&J

TABLE 2
GROUNDWATER DATA
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

LOCATION NUMBER	DEPTH [1] (FEET)	ELEVATION [2] (FEET)	GROUNDWATER DATA			
			MEASURED GROUNDWATER [3]		ESTIMATED SEASONAL HIGH GROUNDWATER	
			DEPTH [1] (FEET)	ELEVATION [2] (FEET)	DEPTH [1] (FEET)	ELEVATION [2] (FEET)
SOIL BORINGS						
EP-1	20.0	59.8	15.0	44.8	11.0	48.8
EP-2	30.0	55.5	9.0	46.5	5.0	50.5
EP-3	40.0	55.0	7.0	48.0	3.0	52.0
EP-4	64.0	56.5	10.0	46.5	5.0	51.5
EP-5	56.5	61.3	15.0	46.3	11.0	50.3
AVERAGES				**46.4**		**50.6**
PIEZOMETER / CASED HOLE TEST LOCATIONS						
EP-PZ-10	10.0	61.3	> 10.0	> 51.3		
EP-PZ-20	20.0	60.8	14.9	45.9		
EP-PZ-30	30.0	60.5	15.0	45.5		

NOTES: 1. DEPTH IS BELOW EXISTING GROUND SURFACE
2. ELEVATIONS ESTIMATED FROM TOPOGRAPHIC DRAWINGS PROVIDED BY PBS&J.
3. MEASURED GROUNDWATER BASED ON 24-HOUR MEASURED WATER LEVELS.

TABLE 3
PIEZOMETER DATA
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

LOCATION NUMBER	ELEVATION TOP OF CASING	24-HOUR WATER LEVELS (9-1-10)		7-DAY WATER LEVELS (9-8-10)		14-DAY WATER LEVELS (9-15-10)		AVERAGE WATER ELEVATIONS
		DEPTH [1]	ELEVATION	DEPTH [1]	ELEVATION	DEPTH [1]	ELEVATION	
(FEET)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
PIEZOMETER / CASED HOLE TEST LOCATIONS								
EP-PZ-10	**64.0**	> 10.0	**> 51.3**	> 10.0	**> 51.3**	> 10.0	**> 51.3**	**> 51.3**
EP-PZ-20	**63.1**	14.9	**45.9**	14.8	**46.0**	16.1	**44.7**	**45.6**
EP-PZ-30	**62.5**	15.0	**45.5**	14.9	**45.6**	15.9	**44.6**	**45.2**

NOTES: 1. DEPTHS ARE BELOW GROUND SURFACE.
2. ELEVATIONS ESTIMATED FROM TOPOGRAPHIC DRAWINGS PROVIDED BY PBS&J.

TABLE 4
USDA SOIL SURVEY DATA
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

SOIL BORING	MATERIAL REFERENCE [1]	DEPTH (INCHES)	MATERIAL DESCRIPTION	MATERIAL CLASSIFICATION	USDA ESTIMATED "NORMAL" SEASONAL HIGH GROUNDWATER (FEET)
EP-1, EP-2, EP-3, EP-4, EP-5	34	0-10	ORANGEBURG FINE SANDY LOAM	SM	> 6.0
		10-80	ORANGEBURG SANDY CLAY LOAM	SC, CL	

NOTE: 1. BASED ON THE USDA SOIL SURVEY REPORT FOR LEON COUNTY, FLORIDA

TABLE 5
SOIL PERMEABILITY ESTIMATES
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

STRATA NUMBER	MATERIAL CLASSIFICATION		SOIL PERMEABILITY VALUES						
	AASHTO	UNIFIED	USDA SOIL TEXTURAL CLASSIFICATION	USDA SOIL SURVEY ESTIMATE [1] (IN/HR)	LABORATORY GRAIN-SIZE ESTIMATE [2] (IN/HR)	LABATORY TEST RESULTS [3] (IN/HR)	FIELD TEST RESULTS [4] (IN/HR)	AVERAGE SATURATED PERMEABILITY VALUE [5] (IN/HR)	AVERAGE UNSATURATED PERMEABILITY VALUE [5] (IN/HR)
1	SM	A-2-4	LOAMY SAND	2.3 - 3.1	3.5 - 4.3	--	2.00	**2.0**	**1.3**
2	SM	A-2-4	LOAMY FINE SAND	1.4 - 2.3	1.1 - 3.4	1.52 - 3.58	1.52	**1.5**	**1.0**
3	SC	A-2-6	SANDY LOAM	0.1 - 0.7	0.1 - 0.9	0.11 - 0.37	0.11 - 0.21	**0.15**	**0.10**
4	SC	A-6	SANDY CLAY LOAM	--	< 0.1	--	--	**0.04**	**0.03**
5	SC	A-7-5	SANDY CLAY	--	< 0.01	--	--	**0.00**	**0.00**
6	CH	A-7-5	CLAY	--	< 0.01	--	< 0.01	**0.00**	**0.00**

NOTES:

1. REPORTED IN USDA SOIL SURVEY FOR LEON COUNTY
2. ESTIMATED FROM GRAIN-SIZE DISTRIBUTION CURVES
3. PERMEABILITY VALUES DETERMINED FROM FALLING HEAD PERMEABILITY TEST
4. PERMEABILITY VALUES DETERMINED FROM "CASED HOLE" PIEZOMETER ANALYSIS
5. AVERAGE PERMEABILITY VALUES SHOWN ARE NOT INFILTRATION VALUES SINCE THEY DO NOT INCLUDE THE EFFECTS OF GROUNDWATER MOUNDING, CLOGGING WITH FINES OR FACTOR OF SAFETY
6. SOME MATERIALS IDENTIFIED ABOVE MAY NOT BE ENCOUNTERED THROUGHOUT THE ENTIRE PROJECT LIMITS. REFER TO SOIL BORING LOGS PROVIDED IN APPENDIX B FOR FURTHER INFORMATION.

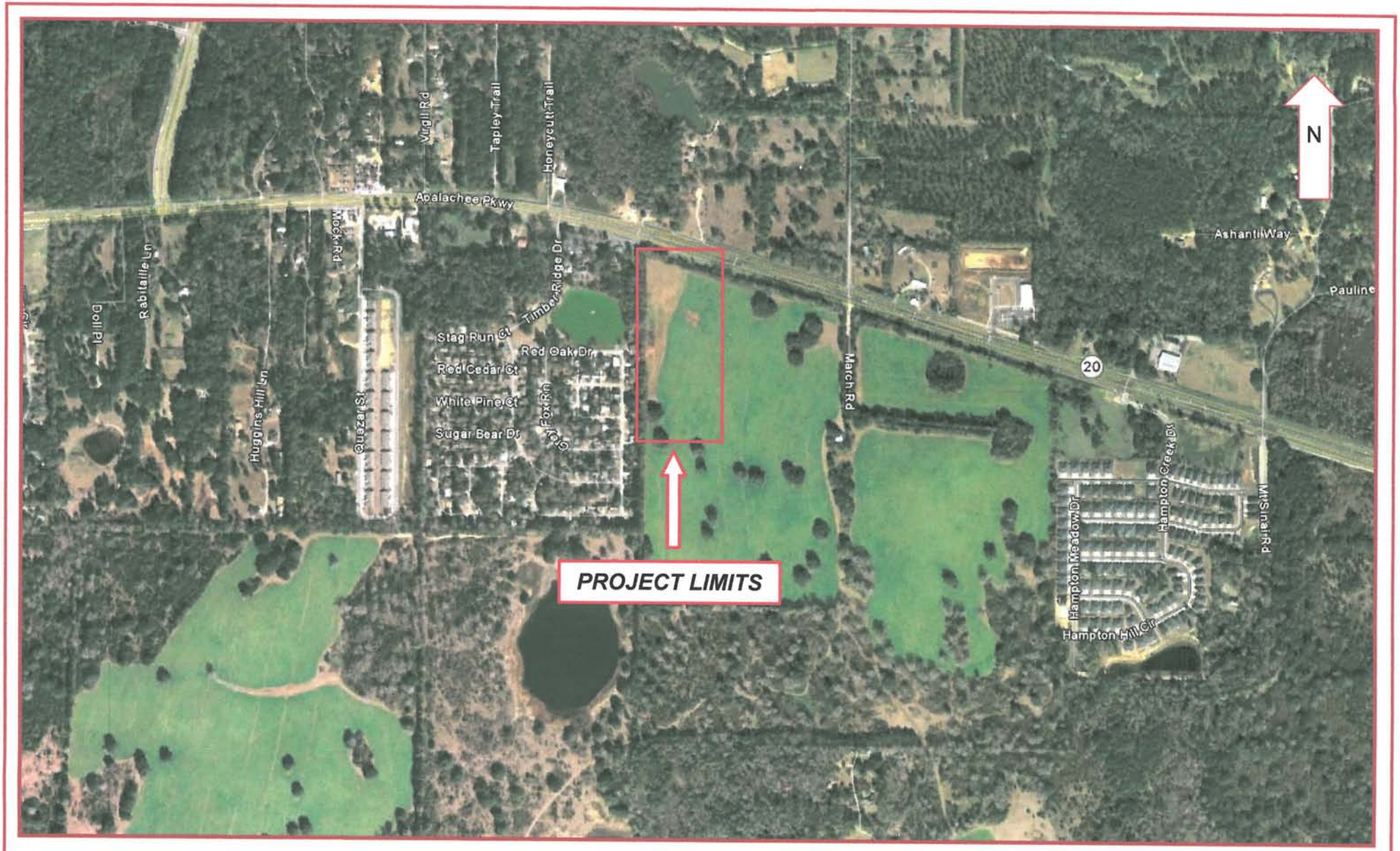
-- MEANS NOT TESTED

TABLE 6
GEOTECHNICAL INFILTRATION PARAMETERS
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

PARAMETER	ELEVATION (FEET)	VALUE/UNITS
UNSATURATED VERTICAL PERMEABILITY [1]	50.6 - 55.0	0.10 INCHES/HOUR
SATURATED VERTICAL PERMEABILITY [1]	30.0 - 55.0	0.15 INCHES/HOUR
AVERAGE EFFECTIVE STORAGE COEFFICIENT	50.6 - 55.0	0.11
ELEVATION OF CONFINING LAYER	30.0	FEET
ELEVATION OF EXISTING GROUNDWATER	46.4	FEET
ELEVATION OF SEASONAL HIGH GROUNDWATER	50.6	FEET
HORIZONTAL UNSATURATED PERMEABILITY [1]	50.6 - 55.0	0.15 INCHES/HOUR
HORIZONTAL SATURATED PERMEABILITY [1]	30.0 - 55.0	0.23 INCHES/HOUR
AVERAGE SPECIFIC YIELD	50.6 - 55.0	11 %

NOTE: 1. THE VALUES **DO NOT** INCLUDE A FACTOR OF SAFETY

FIGURES

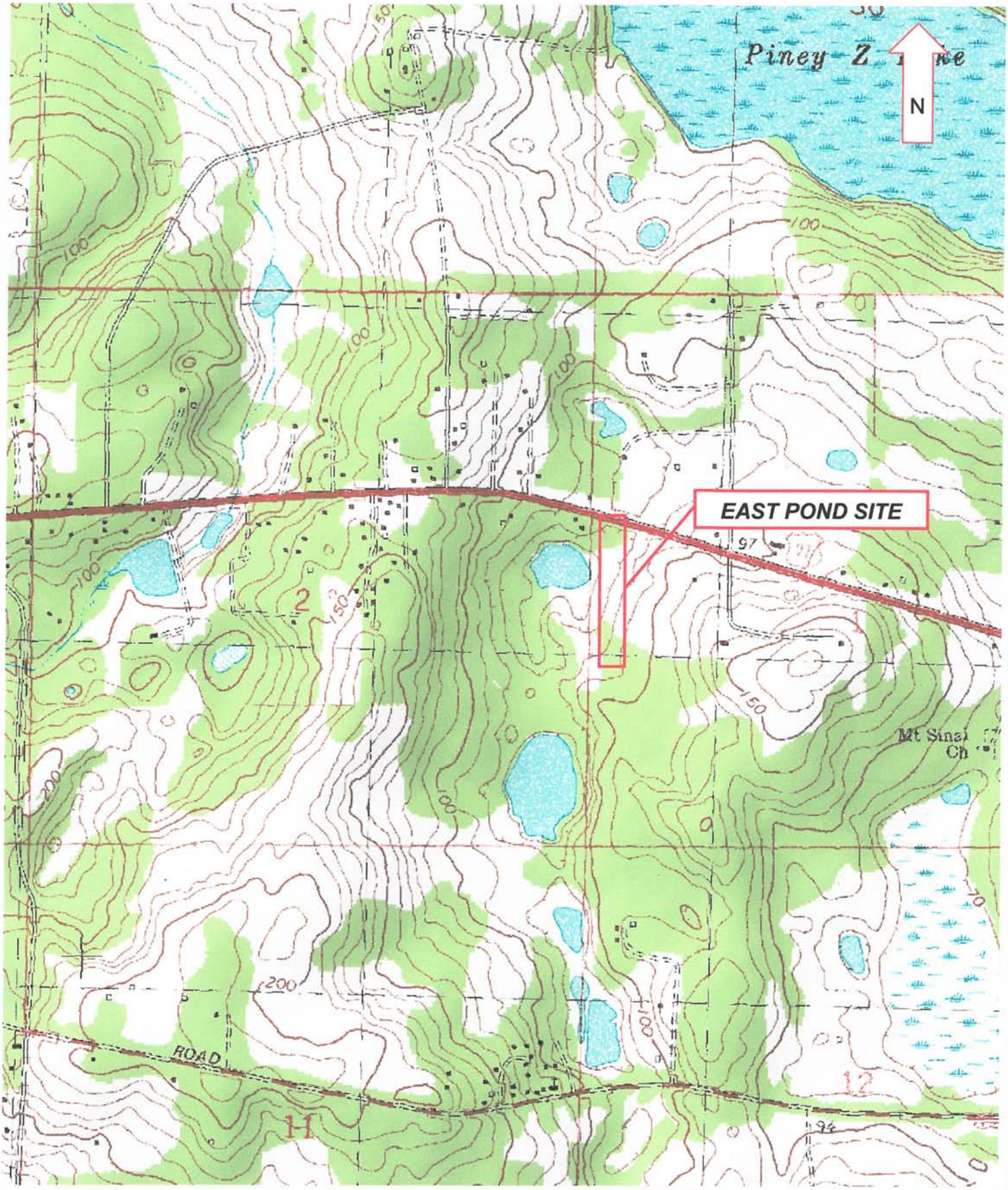


DRAWN: M. LANDSCHOOT, E.I.	CHECKED: T. HAYDEN, P.E.
ENGINEER: M. HAYDEN, P.E.	
CLIENT: PBS&J	
PROJ. NO.: 22-32-10-02	SCALE:

EGS Environmental and Geotechnical Specialists, Inc.
3154 Eliza Road | Tallahassee, Florida 32308
Office #: (850) 386-1253 | Fax #: (850) 385-8050

TITLE:
SITE LOCATION MAP
EAST STORMWATER MANAGEMENT FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

DATE: OCTOBER 2010	FIGURE NO.: 1



DRAWN: M. LANDSCHOOT, E.I.	CHECKED: T. HAYDEN, P.E.	EGS Environmental and Geotechnical Specialists, Inc.	TITLE: USGS TOPOGRAPHICAL MAP EAST SWMF FLOOD MITIGATION PROJECT TIMBERLAKE SUBDIVISION LEON COUNTY, FLORIDA
ENGINEER: M. HAYDEN, P.E.			
CLIENT: PBS&J			
PROJ. NO.: 22-32-10-02	SCALE:		DATE: OCT 2010 / FIGURE NO.: 2

3154 ELIZA ROAD | TALLAHASSEE, FLORIDA 32308
OFFICE #: (850) 386-1253 | FAX #: (850) 385-8050

FIGURE 3A: VIEW OF THE EASTERN POND SITE (FACING SOUTH)

FIGURE 3B: VIEW OF STANDING WATER AT LOW POINT (FACING SOUTH)

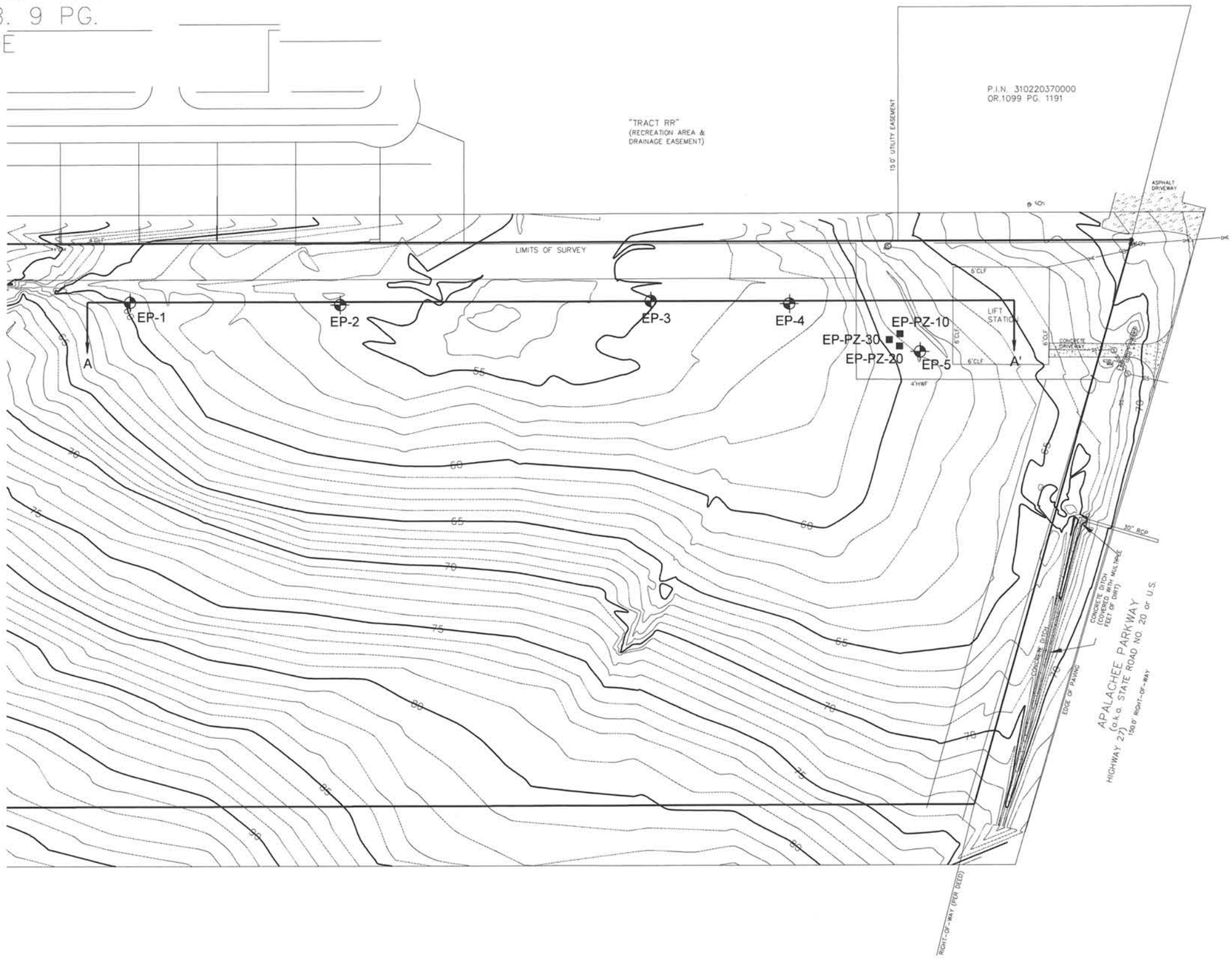
FIGURE 3C: VIEW OF THE EXISTING LIFT STATION
(FACING NORTH)

FIGURE 3D: VIEW OF SIGNIFICANT EROSION
(FACING SOUTH)

TIMBER LAKE
SUBDIVISION
PB. 9 PG.
70-70E

N

0 20 100
Feet



- SOIL BORING LOCATION
- PIEZOMETER AND CASED HOLE LOCATIONS

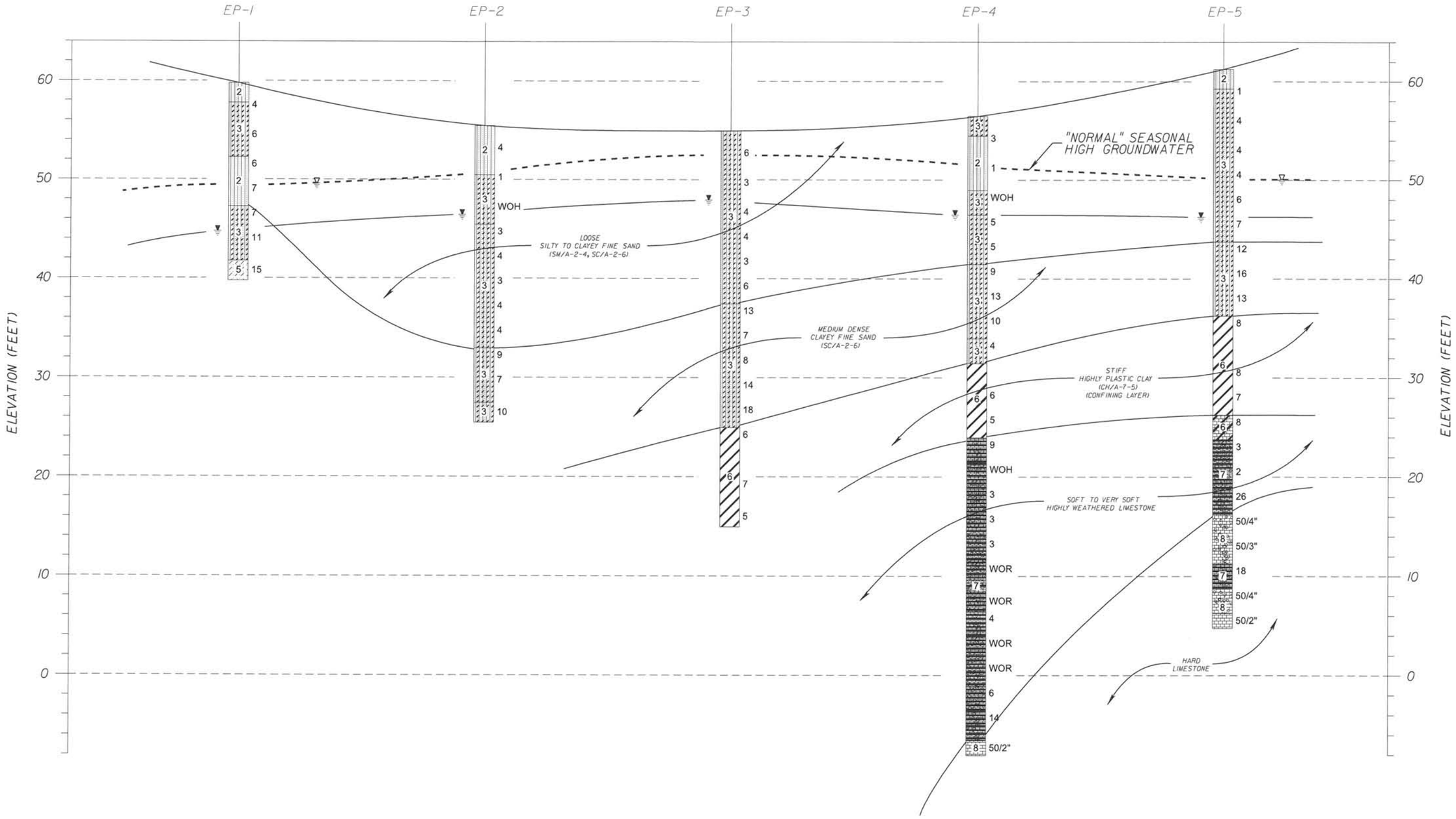
PREPARED BY:	M. LANDSCHOOT, E.I.
REVISED:	M. LANDSCHOOT, E.I.
CHECKED:	T. HAYDEN, P.E.
ENGINEER:	M. HAYDEN, P.E.
SR. ENGINEER:	M. HAYDEN, P.E.

EGS
Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office : (850) 386-1253 Fax : (850) 385-8050

SOIL BORING AND TEST LOCATION MAP
EAST SWMF
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

SCALE:	DATE: OCTOBER 2010
PROJ. NO.: 22-32-10-02	FIGURE NO.: 4

"GENERALIZED" SOIL PROFILE



NOTES:

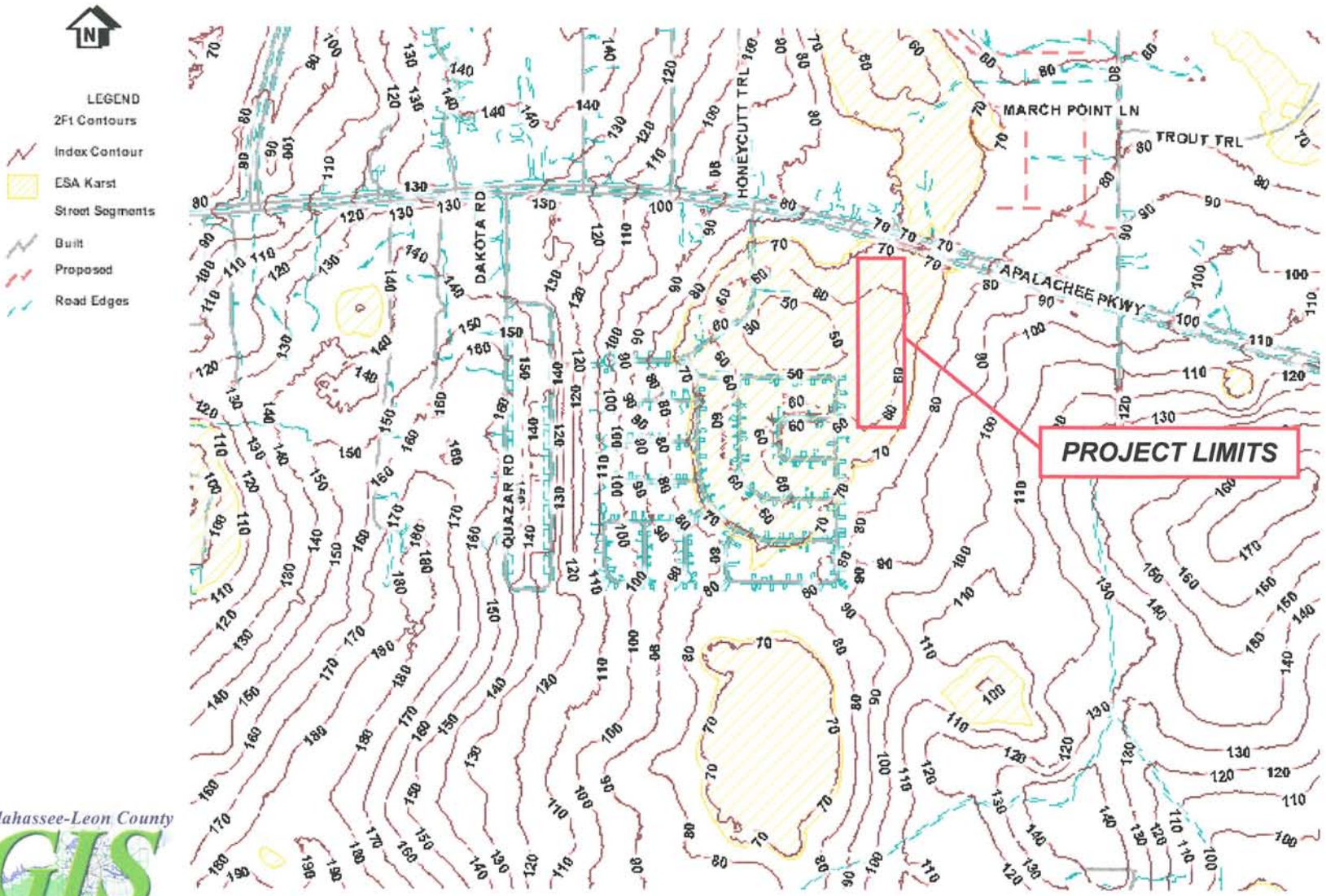
1. SOIL BORINGS PLOTTED TO ELEVATION.
2. NUMBERS RIGHT OF BORINGS INDICATE MEASURED STANDARD PENETRATION VALUES (SPT) 'N' VALUES.
3. ▼ 24-HOUR MEASURED GROUNDWATER LEVEL.

PREPARED BY:	M. LANDSCHOOT, E.I.
REVISED:	M. LANDSCHOOT, E.I.
CHECKED:	T. HAYDEN, P.E.
ENGINEER:	M. HAYDEN, P.E.
SR. ENGINEER:	M. HAYDEN, P.E.

EGS
Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office : (850) 386-1253 Fax : (850) 385-8050

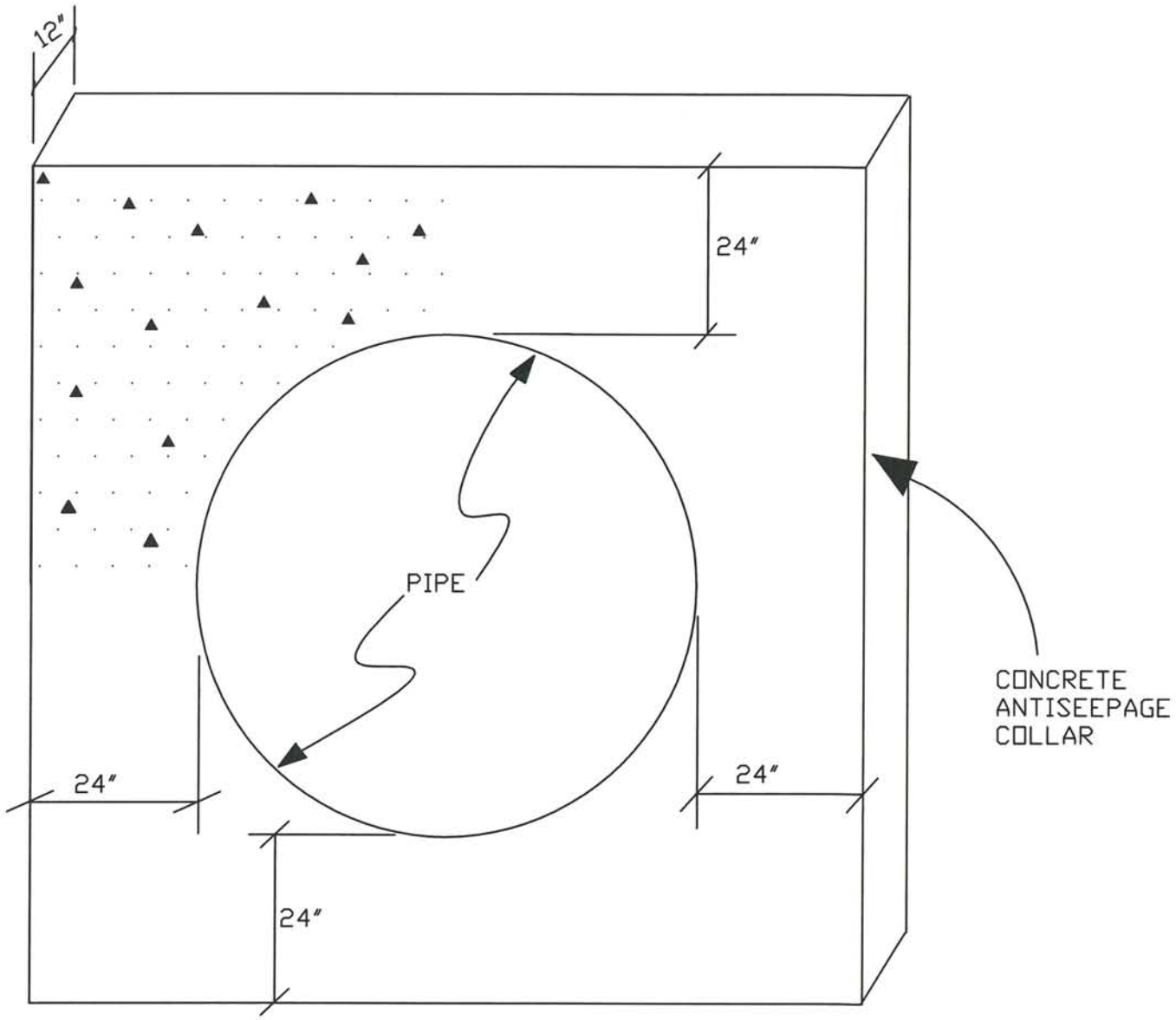
"GENERALIZED" SOIL PROFILE
EAST SWMF
TIMBERLAKE FLOOD MITIGATION
LEON COUNTY, FLORIDA

SCALE:	DATE: OCTOBER 2010
PROJ. NO.: 22-32-10-02	FIGURE NO.: 5



DRAWN: M. LANDSCHOOT, E.I.	CHECKED: T. HAYDEN, P.E.	EGS Environmental and Geotechnical Specialists, Inc.	TITLE: KARST FEATURES MAP EAST STORMWATER MANAGEMENT FACILITY FLOOD MITIGATION PROJECT TIMBERLAKE SUBDIVISION LEON COUNTY, FLORIDA
ENGINEER: M. HAYDEN, P.E.			
CLIENT: PBS&J			
PROJ. NO.: 22-32-10-02	SCALE:		DATE: OCTOBER 2010 / FIGURE NO.: 6

3154 ELIZA ROAD | TALLAHASSEE, FLORIDA 32308
OFFICE #: (850) 386-1253 | FAX #: (850) 385-8050



ANTISEEPAGE COLLAR
TYPICAL DETAIL

INCHES
0 12 24

PREPARED BY:	M. LANDSCHOOT, E.I
REVISED:	M. LANDSCHOOT, E.I.
CHECKED:	M. HAYDEN, P.E.
ENGINEER:	M. HAYDEN, P.E.

EGS
Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office : (850) 386-1253 Fax : (850) 385-8050

TYPICAL ANTI-SEEPAGE COLLAR DETAIL
EAST SWMF FACILITY
FLOOD MITIGATION PROJECT
TIMBERLAKE SUBDIVISION
LEON COUNTY, FLORIDA

SCALE:	DATE: OCT. 2010
PROJ. NO.: 22-32-10-02	FIGURE NO.: 7

APPENDIX A
REPORT OF CORE BORINGS

REPORT OF TESTS
SOIL SURVEY – TIMBERLAKE SUBDIVISION
FLOOD MITIGATION

DATE OF SURVEY: 9-24-2010
SURVEY MADE BY: ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.
SUBMITTED BY: M. HAYDEN, P.E.

LOCATION: TALLAHASSEE, FLORIDA
COUNTY: LEON

	ORGANIC CONTENT			SIEVE ANALYSIS RESULTS PERCENT PASSING						ATTERBERG LIMITS (%)			CLASSIFICATION			
STRATUM NO.	NO. OF TESTS	MOISTURE CONTENT	PERCENT (%) ORGANIC	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	USCS GROUP	AASHTO GROUP	COLOR	DESCRIPTION
1	–	–	–	9	100	80–99	54–94	22–45	14–19	–	–	–	SM	A-2-4	BROWN, PURPLE	SILTY FINE SAND
2	–	–	–	9	100	84–99	65–89	38–56	20–29	1	24	4	SM	A-2-4	BROWN, GRAY	SILTY FINE SAND
3	1	24	2.1	32	100	71–100	53–98	30–80	21–35	20	18–39	11–22	SC	A-2-6	BROWN, GRAY, RED, PURPLE	CLAYEY FINE SAND
4	–	–	–	6	100	86–99	73–93	55–81	36–49	2	32–39	11–21	SC	A-6	BROWN, GRAY, RED, PURPLE	CLAYEY SAND
5	–	–	–	1	100	97	88	45	36	1	65	34	SC	A-7-5	BROWN	SANDY CLAY
6	–	–	–	12	100	94–100	84–100	68–99	52–95	9	57–100	25–68	CH	A-7-5	BROWN, GRAY	HIGHLY PLASTIC CLAY
7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	GRAY	WEATHERED LIMESTONE
8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	GRAY	LIMESTONE

STANDARD PENETRATION NOTES

Granular Materials Relative Density	SPT (blows/12 in.)	Silts and Clays Consistency	SPT (blows/12 in.)
Very Loose	Less than 3	Very Soft	Less than 1
Loose	3 – 8	Soft	1 – 3
Medium or Compact	8 – 24	Firm	3 – 6
Dense	24 – 40	Stiff	6 – 12
Very Dense	Greater than 40	Very Stiff	12 – 24
		Hard	Greater than 24

SPLIT-SPOON:
INSIDE DIAMETER: 1⅜ in.
OUTSIDE DIAMETER: 2.0 in.
AVG. HAMMER DROP: 30.0 in.
HAMMER WEIGHT: 140 lbs.
HAMMER TYPE: Automatic

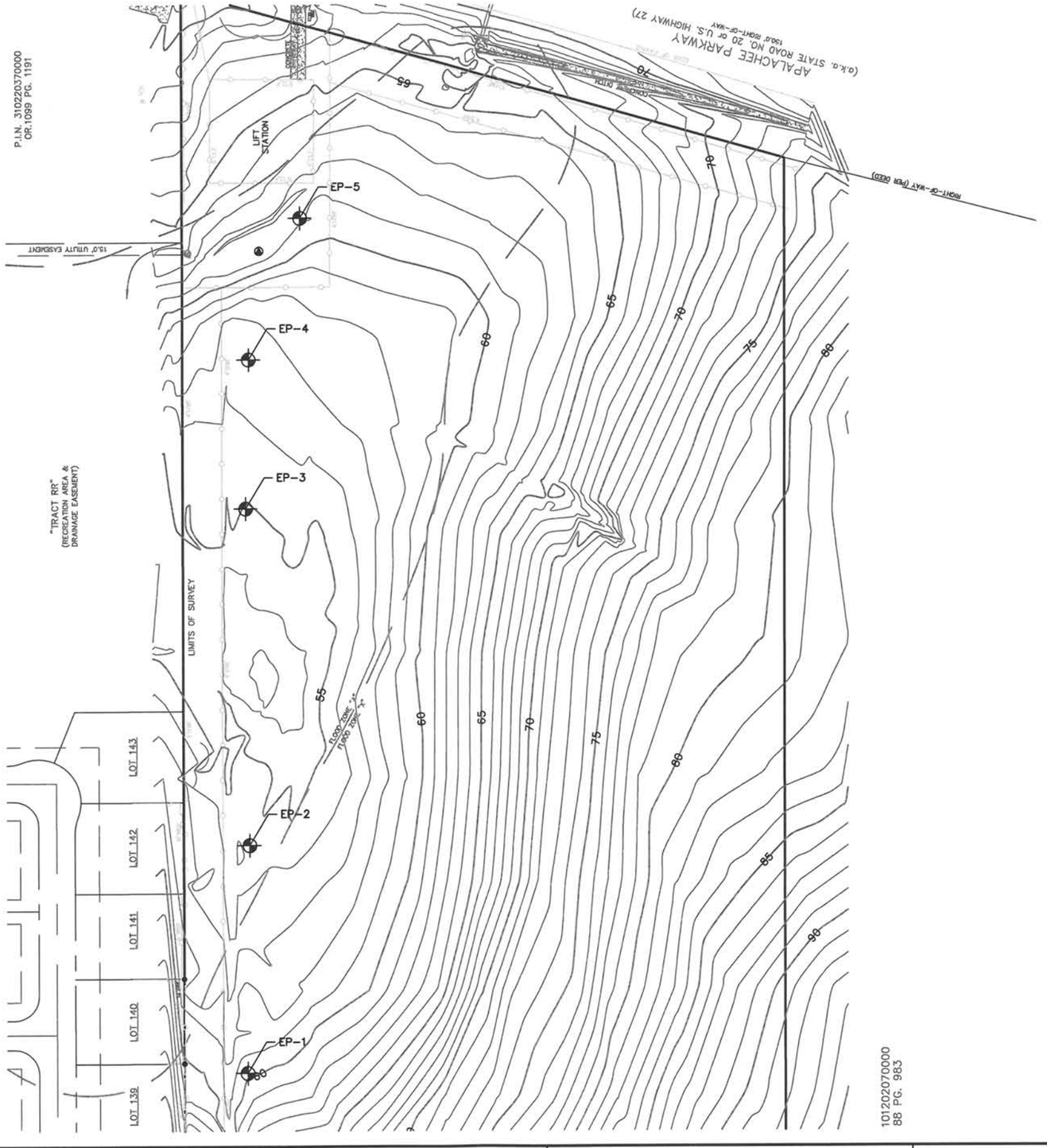
LEGEND

SOIL BORING LOCATION
LEVEL OF WATER AT 24 HOURS
SOIL PROPERTIES NOT DETERMINED --

GENERAL NOTES

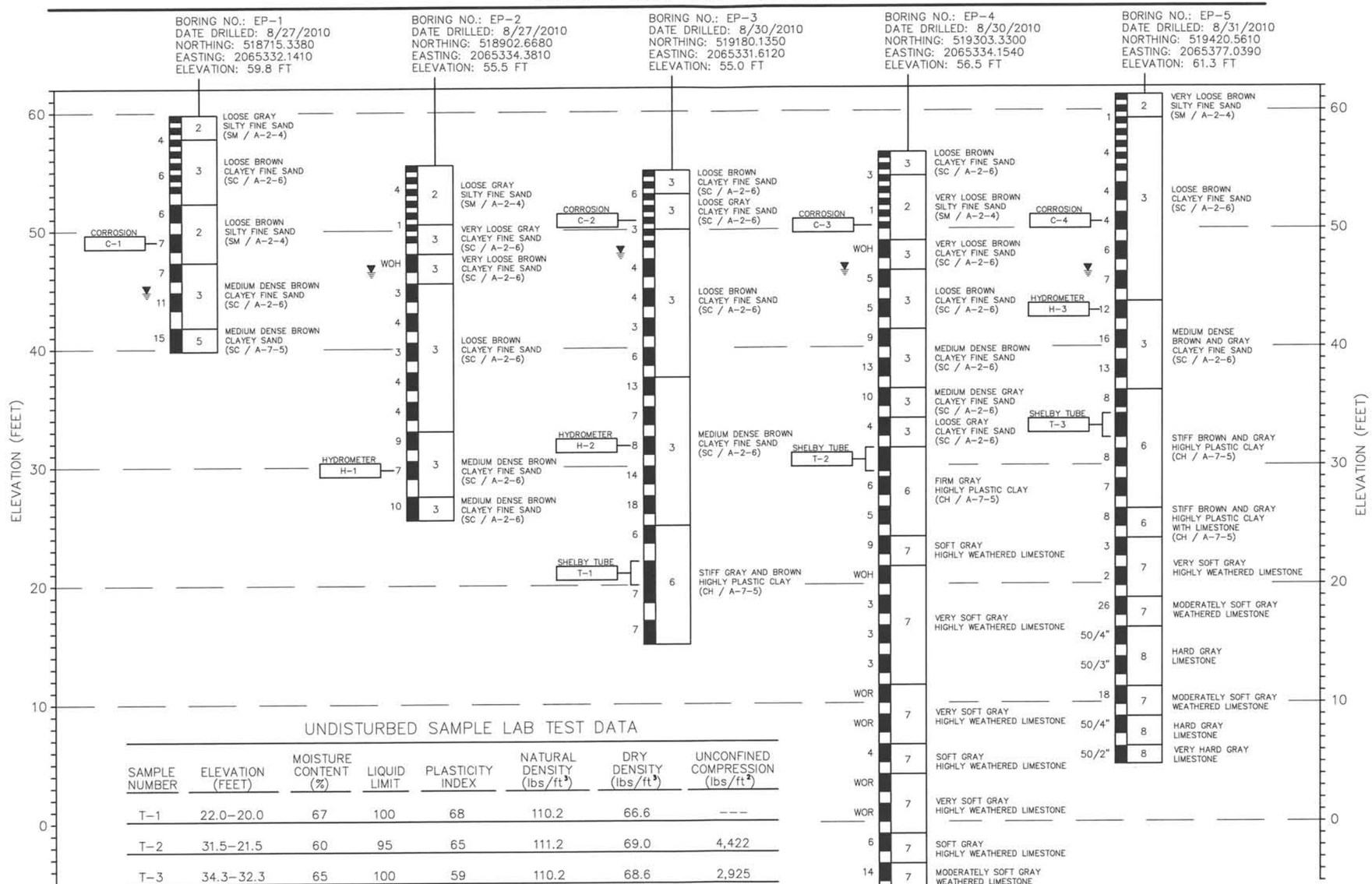
1. Numbers left of borings indicate standard penetration test (SPT) N-values for 12 in. penetration (Unless otherwise noted).
2. Numbers in center of borings indicate the stratum number.
3. Soil descriptions, test data, and standard penetration values shown are for the soil boring only and may not apply to any other location. Extrapolation of the soil boring data to other locations is the sole responsibility of the person performing the extrapolation.
4. Strata boundaries are approximate.
5. Water Levels shown represent the water elevations of the water encountered. Fluctuations in the elevations of the water should be expected.
6. Elevations at Soil Boring locations have been estimated from survey contours provided by PBS&J.
7. Some of the materials identified above may not be encountered within the project limits. Refer to "Report of Core Borings" for further detail regarding site classification.

REVISIONS	SEAL:	Environmental & Geotechnical Specialists, Inc.	PBS&J	SOIL SURVEY REPORT OF TESTS AND NOTES	SHEET NO.
	M. HAYDEN, P.E.	EGS 3154 ELIZA ROAD TALLAHASSEE, FLORIDA 32308 OFFICE: (850) 386-1253 FAX: (850) 385-8050	PROJECT TITLE		
	P.E. NO.: 34067	Cert. of Auth.: 6222	TIMBERLAKE FLOOD MITIGATION		



	SEAL: M. HAYDEN, P.E. P.E. NO.: 34067	Environmental & Geotechnical Specialists, Inc. EGS Cert. of Auth.: 6222 3154 ELIZA ROAD TALLAHASSEE, FLORIDA 32308 OFFICE: (850) 386-1253 FAX: (850) 385-8050	PBS&J PROJECT TITLE TIMBERLAKE FLOOD MITIGATION	*SOIL SURVEY SOIL BORING LOCATIONS (EAST SWMF)*	SHEET NO.

EAST POND SOIL BORINGS



UNDISTURBED SAMPLE LAB TEST DATA

SAMPLE NUMBER	ELEVATION (FEET)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	NATURAL DENSITY (lbs/ft^3)	DRY DENSITY (lbs/ft^3)	UNCONFINED COMPRESSION (lbs/ft^2)
T-1	22.0-20.0	67	100	68	110.2	66.6	---
T-2	31.5-21.5	60	95	65	111.2	69.0	4,422
T-3	34.3-32.3	65	100	59	110.2	68.6	2,925

HYDROMETER RESULTS

SAMPLE NUMBER	ELEVATION (FEET)	PERCENT GRAVEL CONTENT (> 2.0mm)	PERCENT SAND CONTENT (2.0mm-0.075mm)	PERCENT SILT CONTENT (0.075mm-0.002mm)	PERCENT CLAY CONTENT (< 0.002mm)
H-1	29.5-30.5	0.0	69.8	4.8	25.4
H-2	22.5-24.0	0.0	65.0	8.0	27.0
H-3	17.5-19.0	0.0	69.0	5.6	25.4

CORROSION TEST RESULTS

SAMPLE NUMBER	ELEVATION (FEET)	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
C-1	48.2-49.8	8,200	25	7.0	7.1
C-2	29.0-30.5	21,000	30	5.0	7.2
C-3	50.0-50.5	35,000	25	6.0	7.3
C-4	49.8-51.3	59,000	26	3.0	5.7

SEAL:

M. HAYDEN, P.E.

P.E. NO.: 34067

Environmental & Geotechnical Specialists, Inc.

EGS

Cert. of Auth.: 6222

3154 ELIZA ROAD
TALLAHASSEE, FLORIDA 32308
OFFICE: (850) 386-1253
FAX: (850) 385-8050

PBS&J

PROJECT TITLE

TIMBERLAKE FLOOD MITIGATION

SOIL SURVEY
REPORT OF SOIL BORINGS
(EAST SWMF)

SHEET NO.

APPENDIX B
SOIL BORING LOGS

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA
ELEVATION (FEET): 59.8'
BORING NO.: EP-1
DATE: 8-27-2010
DRILLER: B. GUERRA
FLUID LOSS: NONE
DEPTH TO -WATER> INITIAL: ▽ 15.0' **AFTER 24 HOURS:** ▼ 15.0' **CAVING>** NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
0	0			LOOSE GRAY SILTY FINE SAND	SM A-2-4	-200%=29	12, 13		
	4			LOOSE BROWN CLAYEY FINE SAND	SC A-2-6	-200%=34 LL=30 PI=11	14, 16, 16, 16, 14	4, 6	
2	8			LOOSE BROWN SILTY FINE SAND	SM A-2-4	-200%=24	10, 7	6, 7	
	12								
4				MEDIUM DENSE BROWN CLAYEY FINE SAND	SC A-2-6		13, 16	7, 11	
	16			MEDIUM DENSE BROWN CLAYEY SAND	SC A-7-5	-200%=36 LL=65 PI=34	19	15	
6	20								
	24								
8	28								

Wc (%): 10 20 30 40 60
N-Value*: 10 20 30 40 60 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA **ELEVATION (FEET):** 55.5'
BORING NO.: EP-2 **DATE:** 8-27-2010
DRILLER: B. GUERRA **FLUID LOSS:** NONE
DEPTH TO -WATER> INITIAL: ▽ 11.0' **AFTER 24 HOURS:** ▽ 9.0' **CAVING>** ℄ NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
0	0			LOOSE GRAY SILTY FINE SAND	SM A-2-4	-200%=20	20 11 16 10 19	4	
	4			VERY LOOSE GRAY CLAYEY FINE SAND	SC A-2-6	-200%=34 LL=31 PI=11	19 19	1	
2	8			VERY LOOSE BROWN CLAYEY FINE SAND			23	WOH	
	12			LOOSE BROWN CLAYEY FINE SAND	SC A-2-6	-200%=27	21 23 20 19 19	3 4 3 4 4	
4	16								
6	20								
	24			MEDIUM DENSE BROWN CLAYEY FINE SAND	SC A-2-6	-200%=28 LL=27 PI=15	16 20	9 7	
8	28			MEDIUM DENSE BROWN CLAYEY FINE SAND	SC A-2-6		19	10	

Wc (%) scale: 10 20 30 40 60
N-Value* scale: 10 20 30 40 60 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA
ELEVATION (FEET): 55.0'
BORING NO.: EP-3
DATE: 8-30-2010
DRILLER: B. GUERRA
FLUID LOSS: NONE
DEPTH TO -WATER> INITIAL: ▽ 5.0' **AFTER 24 HOURS:** ▽ 7.0' **CAVING>** C NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
0	0			LOOSE BROWN CLAYEY FINE SAND		-200%=33 LL=18 PI=11	14		
							13		
							14	6	
				LOOSE GRAY CLAYEY FINE SAND			25		
	4						17		
	▽						20	3	
2	▼					-200%=31	22		
	8				SC A-2-6		21	4	
				LOOSE BROWN CLAYEY FINE SAND			20	4	
	12					-200%=30 LL=27 PI=11	17	3	
4									
	16						20	6	
							24	13	
6	20						24	7	
				MEDIUM DENSE BROWN CLAYEY FINE SAND		-200%=35	28	8	
	24				SC A-2-6				
8							21	14	
	28						20	18	

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA
ELEVATION (FEET): 55.0'
BORING NO.: EP-3
DATE: 8-30-2010
DRILLER: B. GUERRA
FLUID LOSS: NONE
DEPTH TO -WATER> INITIAL: ▽ 5.0' **AFTER 24 HOURS:** ▽ 7.0' **CAVING>** ℄ NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
10	32			STIFF GRAY AND BROWN HIGHLY PLASTIC CLAY		-200%=80	56	6	
				STIFF GRAY AND BROWN HGHLY PLASTIC CLAY SHELBY TUBE	CH A-7-5	-200%=93 LL=100 PI=90	68		
	36						48	7	
				STIFF GRAY AND BROWN HIGHLY PLASTIC CLAY					
12	40					-200%=52 LL=57 PI=26	43	5	
	44								
14	48								
	52								
16									
	56								
18	60								

Wc (%): 10 20 30 40 60

N-Value*: 10 20 30 40 60 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA
ELEVATION (FEET): 56.5'
BORING NO.: EP-4
DATE: 8-30-2010
DRILLER: B. GUERRA
FLUID LOSS: NONE
DEPTH TO -WATER> INITIAL: ▽ 10.0' **AFTER 24 HOURS:** ▽ 10.0' **CAVING>** ℄ NONE

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
0	0			LOOSE BROWN CLAYEY FINE SAND	SC A-2-6	-200%=34 LL=18 PI=11	16, 14		
							11	3	
	4			VERY LOOSE BROWN SILTY FINE SAND	SM A-2-4	-200%=21	10, 12, 12, 12	1	
2	8			VERY LOOSE BROWN CLAYEY FINE SAND	SC A-2-6		18	WOH	
						-200%=34	20	5	
	12			LOOSE BROWN CLAYEY FINE SAND	SC A-2-6		20	5	
4						-200%=34 LL=39 PI=21	25	9	
	16			MEDIUM DENSE BROWN CLAYEY FINE SAND	SC A-2-6		27	13	
6	20			MEDIUM DENSE GRAY CLAYEY FINE SAND		-200%=26 LL=38 PI=14	24	10	
	24			LOOSE GRAY CLAYEY FINE SAND	SC A-2-6		24	4	
8						-200%=88 LL=95 PI=65	59		
	28			FIRM GRAY HIGHLY PLASTIC CLAY SHELBY TUBE	CH A-7-5	-200%=89 LL=90 PI=51	69	6	

Figure

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA **ELEVATION (FEET):** 56.5'
BORING NO.: EP-4 **DATE:** 8-30-2010
DRILLER: B. GUERRA **FLUID LOSS:** NONE
DEPTH TO -WATER> INITIAL: ▽ 10.0' **AFTER 24 HOURS:** ▼ 10.0' **CAVING>** ⌭ NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
							33	5	
	32								
10				SOFT GRAY HIGHLY WEATHERED LIMESTONE				9	
	36							WOH	
								3	
12				VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE					
	40							3	
								3	
	44								
14				VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE				WOR	
	48							WOR	
				SOFT GRAY HIGHLY WEATHERED LIMESTONE				4	
16	52								
				VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE				WOR	
	56							WOR	
				SOFT GRAY HIGHLY WEATHERED LIMESTONE				6	
18	60								

Wc (%) scale: 10, 20, 30, 40, 60
N-Value* scale: 10, 20, 30, 40, 60, 80

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA **ELEVATION (FEET):** 56.5'
BORING NO.: EP-4 **DATE:** 8-30-2010
DRILLER: B. GUERRA **FLUID LOSS:** NONE
DEPTH TO -WATER> INITIAL: ▽ 10.0' **AFTER 24 HOURS:** ▽ 10.0' **CAVING>** C. NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
				MODERATELY SOFT GRAY WEATHERED LIMESTONE				14	
	64			VERY HARD GRAY LIMESTONE				50/2"	50/2"
20									
	68								
22	72								
	76								
24									
	80								
	84								
26									
	88								

Wc (%): 10 20 30 40 60
N-Value*: 10 20 30 40 60 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA
ELEVATION (FEET): 61.3'
BORING NO.: EP-5
DATE: 8-31-2010
DRILLER: B. GUERRA
FLUID LOSS: NONE
DEPTH TO -WATER> INITIAL: ▽ 15.0' **AFTER 24 HOURS:** ▽ 15.0' **CAVING>** ℄ NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
0	0			VERY LOOSE BROWN SILTY FINE SAND	SM A-2-4	-200%=21	12, 13		
	4			LOOSE BROWN CLAYEY FINE SAND	SC A-2-6	-200%=34 LL=33 PI=16	17, 19, 17	1	
2							16, 16	4	
	8					-200%=29	15	4	
	12						16	4	
4						-200%=26	19	6	
	16						24	7	
6	20			MEDIUM DENSE BROWN AND GRAY CLAYEY FINE SAND	SC A-2-6	-200%=31	24	12	
							26	16	
	24					-200%=32 LL=37 PI=13	24	13	
8				STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY			39	8	
	28			STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY SHELBY TUBE		-200%=95 LL=100 PI=59	70		

Wc (%) axis: 10, 20, 30, 40, 60
N-Value* axis: 10, 20, 30, 40, 60, 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

EGS
ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

PROJECT: TIMBERLAKE FLOOD MITIGATION - EAST POND
CLIENT: PBS&J
PROJECT NO.: 22-32-10-02
PROJECT LOCATION: LEON COUNTY, FLORIDA **ELEVATION (FEET):** 61.3'
BORING NO.: EP-5 **DATE:** 8-31-2010
DRILLER: B. GUERRA **FLUID LOSS:** NONE
DEPTH TO -WATER> INITIAL: ▽ 15.0' **AFTER 24 HOURS:** ▽ 15.0' **CAVING>** ℄ NONE

DEPTH (METERS)	DEPTH (FEET)	SAMPLE	SYMBOL	DESCRIPTION	USCS/ AASHTO	TEST RESULTS	Wc (%)	N*	N-Value*
10	32			STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY	CH A-7-5	-200%=86 LL=96 PI=55	63	8	
							48	7	
	36			STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY WITH LIMESTONE	CH A-7-5		45	8	
12	40			VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE				3	
								2	
	44			MODERATELY SOFT GRAY WEATHERED LIMESTONE				26	
14				HARD GRAY LIMESTONE				50/4"	50/4"
	48							50/3"	50/3"
				MODERATELY SOFT GRAY WEATHERED LIMESTONE				18	
16	52			HARD GRAY LIMESTONE				50/4"	50/4"
	56			VERY HARD GRAY LIMESTONE				50/2"	50/2"
18	60								

Wc (%): 10 20 30 40 60
N-Value*: 10 20 30 40 60 80

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

APPENDIX C

SOIL CLASSIFICATION DATA SHEETS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-1

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
0.0 - 0.5	12												SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
1.0 - 1.5	13	100	100	99	93	79	49	29					SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
2.0 - 2.5	14											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
3.0 - 3.5	16												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
4.0 - 4.5	16	100	100	99	93	80	54	34	30	11			SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
5.0 - 5.5	16											6	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
6.0 - 6.5	14												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
7.5 - 9.0	10	100	100	98	91	76	47	24				6	SM	A-2-4	2	LOOSE BROWN SILTY FINE SAND
10.0 - 11.5	7											7	SM	A-2-4	2	LOOSE BROWN SILTY FINE SAND
12.5 - 14.0	13											7	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
15.0 - 16.5	16											11	SC	A-2-6	3	MEDIUM DENSE BROWN

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-1

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
																CLAYEY FINE SAND
18.0 - 20.0	19	100	100	99	97	88	45	36	65	34		15	SC	A-7-5	5	MEDIUM DENSE BROWN CLAYEY SAND

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-2

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
0.0 - 0.5	20												SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
1.0 - 1.5	11	100	100	99	90	71	41	20					SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
2.0 - 2.5	16											4	SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
3.0 - 3.5	10												SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
4.0 - 4.5	19												SM	A-2-4	2	LOOSE GRAY SILTY FINE SAND
5.0 - 5.5	19											1	SC	A-2-6	3	VERY LOOSE GRAY CLAYEY FINE SAND
6.0 - 6.5	19	100	100	99	92	78	53	34	31	11			SC	A-2-6	3	VERY LOOSE GRAY CLAYEY FINE SAND
7.5 - 9.0	23											WOH	SC	A-2-6	3	VERY LOOSE BROWN CLAYEY FINE SAND
10.0 - 11.5	21											3	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
12.5 - 14.0	23											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
15.0 - 16.5	20	100	100	98	92	77	47	27				3	SC	A-2-6	3	VERY LOOSE BROWN

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J **Project No.: 22-32-10-02**

Boring: EP-2 **Location: LEON COUNTY, FLORIDA**

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
																CLAYEY FINE SAND
17.5 - 19.0	19											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
20.0 - 21.5	19											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
22.5 - 24.0	16											9	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
25.0 - 26.5	20	100	100	99	93	80	46	28	27	15		7	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
28.0 - 30.0	19											10	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-3

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
0.0 - 0.5	14												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
1.0 - 1.5	13	100	100	98	88	72	53	33	18	11			SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
2.0 - 2.5	14											6	SC	A-2-6	3	LOOSE GRAY CLAYEY FINE SAND
3.0 - 3.5	25												SC	A-2-6	3	LOOSE GRAY CLAYEY FINE SAND
4.0 - 4.5	17												SC	A-2-6	3	LOOSE GRAY CLAYEY FINE SAND
5.0 - 5.5	20											3	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
6.0 - 6.5	22	100	100	99	92	79	55	31					SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
7.5 - 9.0	21											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
10.0 - 11.5	20											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
12.5 - 14.0	17	100	100	99	91	77	51	30	27	11		3	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
15.0 - 16.5	20											6	SC	A-2-6	3	LOOSE BROWN

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J **Project No.: 22-32-10-02**

Boring: EP-3 **Location: LEON COUNTY, FLORIDA**

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
																CLAYEY FINE SAND
17.5 - 19.0	24											13	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
20.0 - 21.5	24											7	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
22.5 - 24.0	28	100	100	100	99	92	51	35				8	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
25.0 - 26.5	21											14	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
27.5 - 29.0	20											18	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
30.0 - 31.5	56	100	100	100	100	98	94	80				6	CH	A-7-5	6	STIFF GRAY AND BROWN HIGHLY PLASTIC CLAY
33.0 - 35.0	68	100	100	100	100	100	97	93	100	90			CH	A-7-5	6	STIFF GRAY AND BROWN HGHLY PLASTIC CLAY SHELBY TUBE
35.0 - 36.5	48											7	CH	A-7-5	6	STIFF GRAY AND BROWN HIGHLY PLASTIC CLAY
38.0 - 40.0	43	100	100	99	96	84	68	52	57	26		5	CH	A-7-5	6	FIRM GRAY AND BROWN HIGHLY PLASTIC CLAY

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-4

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
0.0 - 0.5	16												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
1.0 - 1.5	14	100	100	100	96	85	67	34	18	11			SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
2.0 - 2.5	11											3	SM	A-2-4	2	VERY LOOSE BROWN SILTY FINE SAND
3.0 - 3.5	10												SM	A-2-4	2	LOOSE BROWN SILTY FINE SAND
4.0 - 4.5	12												SM	A-2-4	2	LOOSE BROWN SILTY FINE SAND
5.0 - 5.5	12	100	100	99	90	74	46	21				1	SM	A-2-4	2	VERY LOOSE BROWN SILTY FINE SAND
6.0 - 6.5	12												SM	A-2-4	2	VERY LOOSE BROWN SILTY FINE SAND
7.5 - 9.0	18											WOH	SC	A-2-6	3	VERY LOOSE BROWN CLAYEY FINE SAND
10.0 - 11.5	20	100	100	99	93	79	55	34				5	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
12.5 - 14.0	20											5	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
15.0 - 16.5	25	100	100	100	99	90	48	34	39	21		9	SC	A-2-6	3	MEDIUM DENSE BROWN

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J **Project No.: 22-32-10-02**

Boring: EP-4 **Location: LEON COUNTY, FLORIDA**

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
																CLAYEY FINE SAND
17.5 - 19.0	27											13	SC	A-2-6	3	MEDIUM DENSE BROWN CLAYEY FINE SAND
20.0 - 21.5	24	100	100	100	100	98	80	26	38	14		10	SC	A-2-6	3	MEDIUM DENSE GRAY CLAYEY FINE SAND
22.5 - 24.0	24											4	SC	A-2-6	3	LOOSE GRAY CLAYEY FINE SAND
25.0 - 27.0	59	100	100	100	99	97	95	88	95	65			CH	A-7-5	6	FIRM GRAY HIGHLY PLASTIC CLAY SHELBY TUBE
27.5 - 29.0	69	100	100	100	100	99	95	89	90	51		6	CH	A-7-5	6	FIRM GRAY HIGHLY PLASTIC CLAY
30.0 - 31.5	33											5	CH	A-7-5	6	FIRM GRAY HIGHLY PLASTIC CLAY
32.5 - 34.0												9			7	SOFT GRAY HIGHLY WEATHERED LIMESTONE
35.0 - 36.5												WOH			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
37.5 - 39.0												3			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
40.0 - 41.5												3			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J **Project No.: 22-32-10-02**

Boring: EP-4 **Location: LEON COUNTY, FLORIDA**

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
42.5 - 44.0												3			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
45.0 - 46.5												WOR			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
48.0 - 50.0												WOR			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
50.0 - 51.5												4			7	SOFT GRAY HIGHLY WEATHERED LIMESTONE
52.5 - 54.0												WOR			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
55.0 - 56.5												WOR			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
57.5 - 59.0												6			7	SOFT GRAY HIGHLY WEATHERED LIMESTONE
60.0 - 61.5												14			7	MODERATELY SOFT GRAY WEATHERED LIMESTONE
62.5 - 64.0												50/2"			8	VERY HARD GRAY LIMESTONE

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-5

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
0.0 - 0.5	12												SM	A-2-4	2	VERY LOOSE BROWN SILTY FINE SAND
1.0 - 1.5	13	100	100	97	84	65	42	21					SM	A-2-4	2	LOOSE BROWN SILTY FINE SAND
2.0 - 2.5	17											1	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
3.0 - 3.5	19	100	100	99	92	80	59	34	33	16			SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
4.0 - 4.5	17												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
5.0 - 5.5	16											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
6.0 - 6.5	16												SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
7.5 - 9.0	15	100	100	99	92	78	53	29				4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
10.0 - 11.5	16											4	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
12.5 - 14.0	19	100	100	98	92	79	49	26				6	SC	A-2-6	3	LOOSE BROWN CLAYEY FINE SAND
15.0 - 16.5	24											7	SC	A-2-6	3	LOOSE BROWN

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J

Project No.: 22-32-10-02

Boring: EP-5

Location: LEON COUNTY, FLORIDA

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
																CLAYEY FINE SAND
17.5 - 19.0	24	100	100	100	99	90	45	31				12	SC	A-2-6	3	MEDIUM DENSE BROWN AND GRAY CLAYEY FINE SAND
20.0 - 21.5	26											16	SC	A-2-6	3	MEDIUM DENSE BROWN AND GRAY CLAYEY FINE SAND
22.5 - 24.0	24	100	100	100	100	98	80	32	37	13		13	SC	A-2-6	3	MEDIUM DENSE BROWN AND GRAY CLAYEY FINE SAND
25.0 - 26.5	39											8	CH	A-7-5	6	STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY
27.0 - 29.0	70	100	100	100	100	100	99	95	100	59			CH	A-7-5	6	STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY SHELBY TUBE
30.0 - 31.5	63	100	100	100	100	99	95	86	96	55		8	CH	A-7-5	6	STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY
32.5 - 34.0	48											7	CH	A-7-5	6	STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY
35.0 - 36.5	45											8	CH	A-7-5	6	STIFF BROWN AND GRAY HIGHLY PLASTIC CLAY WITH LIMESTONE
37.5 - 39.0												3			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE
40.0 - 41.5												2			7	VERY SOFT GRAY HIGHLY WEATHERED LIMESTONE

EGS

SOIL CLASSIFICATION DATA

Project: TIMBERLAKE FLOOD MITIGATION - EAST POND

Client: PBS&J **Project No.: 22-32-10-02**

Boring: EP-5 **Location: LEON COUNTY, FLORIDA**

DEPTH (FEET)	Wc (%)	-4 (%)	-10 (%)	-20 (%)	-40 (%)	-60 (%)	-100 (%)	-200 (%)	LL	PI	Org. (%)	N Value	USCS	AASHTO	Mat. No.	Description
42.5 - 44.0												26			7	MODERATELY SOFT GRAY WEATHERED LIMESTONE
45.0 - 46.5												50/4"			8	HARD GRAY LIMESTONE
47.5 - 49.0												50/3"			8	HARD GRAY LIMESTONE
50.0 - 51.5												18			7	MODERATELY SOFT GRAY WEATHERED LIMESTONE
52.5 - 54.0												50/4"			8	HARD GRAY LIMESTONE
55.0 - 56.5												50/2"			8	VERY HARD GRAY LIMESTONE

EGS

APPENDIX D

USDA SOIL SURVEY DATA

DRAWN: M. LANDSCHOOT, E.I.	CHECKED: T. HAYDEN, P.E.	EGS Environmental and Geotechnical Specialists, Inc.	TITLE: USDA SOIL SURVEY FLOOD MITIGATION PROJECT EAST SWMF ADDITION TIMBERLAKE SUBDIVISION LEON COUNTY, FLORIDA
ENGINEER: M. HAYDEN, P.E.			
CLIENT: PBS&J			
PROJ. NO.: 22-32-10-02	SCALE:		DATE: OCT 2010 / FIGURE NO.: D-1

3154 Eliza Road | Tallahassee, Florida 32308
Office #: (850) 386-1253 | Fax #: (850) 385-8050

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
23---------- Leon	0-25	Sand----------	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	2-12	---	NP
	25-41	Sand, fine sand	SM, SP-SM, SP	A-3, A-2-4	0	100	100	80-100	3-20	---	NP
	41-80	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	2-12	---	NP
24, 25---------- Lucy	0-30	Fine sand-------	SM, SP-SM	A-2	0	98-100	95-100	50-87	10-30	---	NP
	30-36	Sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	97-100	95-100	55-95	15-50	10-30	NP-15
	36-80	Sandy loam, sandy clay loam, clay loam.	SC, SM-SC, SM	A-2, A-6, A-4	0	100	95-100	60-95	20-50	20-40	5-20
26---------- Lutterloh	0-59	Fine sand-------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	85-95	2-15	---	NP
	59-71	Fine sandy loam, very fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	100	100	85-95	20-40	<35	NP-20
	71-80	Sandy clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0	100	100	90-100	40-60	35-70	20-42
27---------- Lynchburg	0-18	Fine sandy loam	SM, ML	A-2, A-4	0	92-100	90-100	75-100	25-65	<30	NP-7
	18-65	Sandy clay loam, sandy loam, clay loam.	SM-SC, SC, CL, CL-ML	A-2, A-4, A-6	0	92-100	90-100	70-100	25-67	15-40	4-18
	65-80	Variable---------	---	---	---	---	---	---	---	---	---
28*---------- Meggett	0-12	Very fine sandy loam	SM	A-2, A-4	0	100	90-100	85-100	13-41	---	NP
	12-50	Clay, sandy clay, clay loam.	CH, MH, CL	A-6, A-7	0	100	90-100	85-100	51-90	30-70	20-40
	50-80	Sandy clay, clay loam, sandy clay loam.	CL, SC, SM	A-4, A-6, A-2	0	90-100	65-100	50-100	40-60	<40	NP-25
29, 30---------- Norfolk	0-8	Loamy fine sand	SM	A-2	0	95-100	92-100	50-91	13-30	<20	NP
	8-58	Sandy loam, sandy clay loam, clay loam.	SC, SM-SC, CL, CL-ML	A-2, A-4, A-6	0	95-100	91-100	70-96	30-55	20-38	4-15
	58-80	Sandy clay loam, clay loam, sandy clay.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	100	98-100	65-98	36-72	20-45	4-22
31---------- Norfolk	0-7	Loamy sand------	SM	A-2-4	0	95-100	95-100	85-95	13-25	---	NP
	7-14	Sandy loam------	SM, SM-SC	A-2-4	0	95-100	95-100	85-95	13-35	<23	NP-7
	14-64	Sandy clay loam, clay loam.	SC, SM-SC, CL, CL-ML	A-2-4, A-2-6, A-4, A-6	0	95-100	95-100	85-95	30-55	20-40	4-20
	64-80	Sandy clay, clay	CH	A-7	0	95-100	95-100	85-100	51-100	50-100	23-60

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32----------	0-29	Sand----------	SM, SP-SM	A-2, A-3	0	100	95-100	75-100	8-35	---	NP
Ocilla	29-80	Sandy loam, sandy clay loam.	SM, CL, SC	A-2, A-4, A-6	0	100	95-100	80-100	30-55	<40	NP-18
33, 34, 35----------	0-10	Fine sandy loam	SM	A-2	0	98-100	95-100	75-95	20-35	---	NP
Orangeburg	10-80	Sandy clay loam	SC, CL	A-6, A-4	0	98-100	95-100	71-91	38-55	22-40	8-19
36:*											
Orangeburg--------	0-10	Fine sandy loam	SM	A-2	0	98-100	95-100	75-95	20-35	---	NP
	10-80	Sandy clay loam	SC, CL	A-6, A-4	0	98-100	95-100	71-91	38-55	22-40	8-19
Urban land.											
37----------	0-10	Sand----------	SP, SP-SM	A-3	0	100	100	90-100	3-8	---	NP
Ortega	10-99	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-7	---	NP
38:*											
Pamlico----------	0-32	Muck----------	Pt	---	0	---	---	---	---	---	---
	32-80	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-20	---	NP
Dorovan----------	0-5	Mucky peat------	Pt	---	0	---	---	---	---	---	---
	5-65	Muck----------	Pt	---	0	---	---	---	---	---	---
	65-80	Sand, loamy sand, loam.	SP-SM, SM-SC, SM	A-1, A-3, A-4, A-2-4	0	100	100	5-70	5-49	<20	NP-7
39----------	0-26	Fine sand-------	SM	A-2	0	100	95-100	75-90	15-30	---	NP
Pelham	26-80	Sandy clay loam, sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	95-100	65-90	30-50	15-30	2-12
40.*											
Pits											
41----------	0-61	Fine sand-------	SM, SP-SM	A-2-4, A-3	0	100	100	75-96	5-26	---	NP
Plummer	61-80	Sandy loam, sandy clay loam, fine sandy loam.	SM, SC, SM-SC	A-2-4, A-2-6	0	100	97-100	76-96	26-35	<31	NP-14
42----------	0-60	Mucky fine sand	SM, SP-SM	A-2-4, A-3	0	100	100	75-96	5-26	---	NP
Plummer	60-80	Sandy loam, sandy clay loam, fine sandy loam.	SM, SC, SM-SC	A-2-4, A-2-6	0	100	97-100	76-96	26-35	<31	NP-14
43, 44*----------	0-23	Loamy fine sand	SM, SP-SM	A-2, A-3	0	95-100	95-100	50-80	5-35	<25	NP
Rutlege	23-82	Sand, loamy sand, loamy fine sand.	SP-SM, SP, SM	A-2, A-3	0	95-100	95-100	50-80	2-25	<20	NP

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
20:* Kershaw	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
Urban land.													
21 Lakeland	A	None	---	---	>6.0	---	---	>72	---	---	---	Low	Moderate.
22 Leefield	C	None	---	---	1.5-2.5	Apparent	Dec-Mar	>60	---	---	---	Moderate	High.
23 Leon	A/D	None	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High	High.
24, 25 Lucy	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
26 Lutterloh	C	None	---	---	1.5-2.5	Apparent	Dec-Mar	>60	---	---	---	High	Moderate.
27 Lynchburg	B/D	None	---	---	0.5-1.5	Apparent	Nov-Apr	>60	---	---	---	High	High.
28* Meggett	D	Frequent	Long	Dec-Apr	0-1.0	Apparent	Nov-Apr	>60	---	---	---	High	Moderate.
29, 30 Norfolk	B	None	---	---	4.0-6.0	Perched	Jan-Mar	>60	---	---	---	Moderate	High.
31 Norfolk	B	None	---	---	5.0-6.0	Perched	Jan-Apr	>60	---	---	---	Moderate	High.
32 Ocilla	C	None	---	---	1.0-2.5	Apparent	Dec-Apr	>60	---	---	---	High	Moderate.
33, 34, 35 Orangeburg	B	None	---	---	>6.0	---	---	>60	---	---	---	Moderate	Moderate.
36:* Orangeburg	B	None	---	---	>6.0	---	---	>60	---	---	---	Moderate	Moderate.
Urban land.													

See footnote at end of table.

TABLE 17.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample number	Depth	Horizon	Particle size distribution: Sand: Very coarse (2-1 mm)	Sand: Coarse (1-0.5 mm)	Sand: Medium (0.5-0.25 mm)	Sand: Fine (0.25-0.1 mm)	Sand: Very fine (0.1-0.05 mm)	Sand: Total (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Hydraulic conductivity	Bulk density (field moist)	Water content: 1/10 bar	Water content: 1/3 bar	Water content: 15 bar
	In		Percent								Cm/hr	Grams/cm	Percent (wt)		
Norfolk loamy fine sand:															
S76FL-073-004-1	0-4	A1	0.1	1.8	14.1	49.7	17.2	82.9	10.7	6.4	33.5	1.38	11.7	7.1	3.1
S76FL-073-004-2	4-8	A2	0.1	2.1	14.1	50.9	17.8	85.0	7.1	7.9	21.6	1.42	9.6	6.3	3.0
S76FL-073-004-3	8-15	B21t	0.1	1.8	12.8	48.4	17.7	80.8	7.1	12.1	10.8	1.52	10.8	7.5	4.1
S76FL-073-004-4	15-31	B22t	0.1	1.6	8.8	35.8	14.6	60.9	5.5	33.6	10.8	1.48	20.9	17.6	11.1
S76FL-073-004-5	31-44	B23t	0.1	1.4	8.6	35.9	14.4	60.4	5.6	34.0	1.3	1.64	18.2	15.5	9.7
S76FL-073-004-6	44-58	B24t	0.1	1.8	11.1	38.4	14.1	65.5	3.1	31.4	3.3	1.61	20.7	18.4	11.9
S76FL-073-004-7	58-68	B3	0.2	1.5	10.0	35.0	13.0	59.7	2.6	37.7	0.1	1.67	20.6	18.4	12.2
S76FL-073-004-8	68-80	C	0.1	1.1	8.8	33.3	12.5	55.8	2.5	41.7	0.8	1.66	20.4	18.8	14.4
Norfolk loamy sand clayey substratum															
S76FL-073-009-1	0-7	Ap	0.3	4.3	27.1	43.0	10.2	84.9	6.3	8.8	3.4	1.59	11.9	8.0	5.2
S76FL-073-009-2	7-14	B21t	0.1	2.7	23.8	41.5	10.0	78.1	8.2	13.7	3.9	1.65	10.3	10.2	6.1
S76FL-073-009-3	14-29	B22t	0.1	2.6	20.5	35.9	9.1	68.2	6.8	25.0	1.2	1.58	17.6	14.9	10.9
S76FL-073-009-4	29-51	B23t	0.2	2.6	20.5	36.2	9.0	68.5	5.1	26.4	0.5	1.73	17.3	15.4	10.2
S76FL-073-009-5	51-59	B24t	0.2	2.7	20.0	32.5	7.5	62.9	5.3	31.8	0.0	1.75	18.6	17.1	12.3
S76FL-073-009-6	59-64	B25t	0.2	2.6	20.2	31.2	7.2	61.4	6.7	31.9	0.1	1.76	19.5	18.2	12.5
S76FL-073-009-7	64-80	IIC	0.0	0.2	0.6	3.4	3.4	7.6	20.0	72.4	5.8	1.32	30.0	27.6	24.3
Ocilla fine sand:															
S77FL-073-026-1	0-3	A1	0.1	2.6	13.5	55.2	17.4	88.8	7.5	3.7	---	---	---	---	---
S77FL-073-026-2	3-6	A21	0.2	2.7	13.9	54.2	16.4	87.4	9.0	3.6	25.4	1.38	11.2	7.7	2.4
S77FL-073-026-3	6-22	A22	0.1	2.8	14.0	54.3	15.3	86.5	8.8	4.7	17.5	1.52	10.3	7.2	2.5
S77FL-073-026-4	22-29	B1	0.1	2.4	13.5	51.1	15.2	82.3	9.3	8.4	18.0	1.44	10.6	7.2	2.3
S77FL-073-026-5	29-39	B21t	0.2	2.8	13.0	45.0	7.4	68.4	17.0	14.6	5.4	1.59	15.5	12.6	4.5
S77FL-073-026-6	39-56	B22tg	0.2	2.4	11.4	42.0	12.6	68.6	11.3	20.1	1.7	1.67	17.3	15.5	8.5
S77FL-073-026-7	56-80	B23tg	0.2	1.8	8.8	33.4	11.0	55.2	14.2	30.6	0.7	1.62	21.5	20.8	12.7
Orangeburg fine sandy loam:															
S76FL-073-008-1	0-5	A1	0.3	5.0	21.9	39.3	8.3	75.4	11.0	13.6	27.0	1.42	15.4	12.1	6.6
S76FL-073-008-2	5-10	B1t	0.4	5.7	22.8	38.1	7.6	74.6	8.4	17.0	7.0	1.58	15.0	11.8	7.3
S76FL-073-008-3	10-16	B21t	0.4	5.0	21.3	34.3	7.0	68.0	5.5	26.5	5.9	1.50	22.1	13.7	8.1
S76FL-073-008-4	16-41	B22t	0.3	4.3	17.8	33.3	7.6	63.3	7.6	29.1	3.5	1.53	19.6	15.6	9.2
S76FL-073-008-5	41-62	B23t	0.5	4.5	18.7	30.7	6.1	60.5	2.9	36.6	7.9	1.71	19.2	16.6	11.3
S76FL-073-008-6	62-80	B23t	0.6	5.2	20.3	30.9	5.8	62.8	2.3	34.9	1.8	1.71	18.0	15.5	10.5
Ortega sand:															
S76FL-073-003-1	0-4	A1	0.1	3.6	28.7	46.5	13.9	92.8	4.9	2.3	41.4	1.39	8.4	5.3	2.2
S76FL-073-003-2	4-10	C1	0.2	3.9	30.3	47.4	13.4	99.1	0.5	0.4	16.1	1.55	5.8	3.3	1.3
S76FL-073-003-3	10-28	C2	0.2	3.9	29.0	48.0	14.3	95.4	2.4	2.2	33.5	1.53	5.7	3.0	1.3
S76FL-073-003-4	28-44	C3	0.2	3.7	27.8	49.5	14.5	95.7	1.9	2.4	34.2	1.58	4.7	2.5	0.9
S76FL-073-003-5	44-58	C4	0.2	4.2	28.0	49.9	14.2	96.5	1.9	1.6	35.5	1.52	4.0	2.2	0.7
S76FL-073-003-6	58-72	C5	0.2	4.0	27.8	50.2	14.8	97.0	2.0	1.0	33.5	1.51	5.1	2.7	0.6
S76FL-073-003-7	72-96	C6	0.1	2.9	23.7	54.5	17.1	98.3	1.1	0.6	30.9	1.51	3.5	1.8	0.4

APPENDIX E
INFILTRATION DATA

CASED HOLE INFILTRATION TEST DATA

DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	8:00 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-10
DEPTH:	7.5 - 10.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN CLAYEY FINE SAND		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	BELOW BOTTOM OF CASING		

EQUATION:

$$k_h := \frac{d^2 \cdot \ln\left(\frac{2 \cdot m \cdot L}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\left(\frac{H_1}{H_2}\right)$$

where:

k = Permeability (cm/sec)	=	COMPUTED	$T_2 - T_1$ = Duration of Test (sec)	=	VARIES
d = Dia of Piezometer (cm)	=	5.08	H_1 = Head at Start of Test (cm)	=	387.00
D = Dia of Piezometer Filter (cm)	=	7.62	H_2 = Head at Finish of Test (cm)	=	371.86
m = Tranformation Ratio	=	1.0	L = Length of Filter (cm)	=	76.20

TEST RESULTS:

TEST NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)
1	20	0.08	0.0003	0.36
2	24	0.17	0.0002	0.30
3	28	0.25	0.0002	0.26
4	30	0.33	0.0002	0.24
5	33	0.42	0.0002	0.22
6	**36**	**0.50**	**0.0001**	**0.20**
7	38	0.58	0.0001	0.19
8	39	0.67	0.0001	0.18
9	40	0.75	0.0001	0.18
10	42	0.83	0.0001	0.17
11	43	0.92	0.0001	0.17
12	**45**	**1.00**	**0.0001**	**0.16**
13	48	1.08	0.0001	0.15
14	48	1.17	0.0001	0.15
15	50	1.25	0.0001	0.14
16	51	1.33	0.0001	0.14
17	52	1.42	0.0001	0.14
18	**52**	**1.50**	**0.0001**	**0.14**
19	52	1.58	0.0001	0.14
20	53	1.67	0.0001	0.14
21	54	1.75	0.0001	0.13
22	54	1.83	0.0001	0.13
23	55	1.92	0.0001	0.13
24	**56**	**2.00**	**0.0001**	**0.13**
25	56	2.08	0.0001	0.13
26	57	2.17	0.0001	0.13
27	57	2.25	0.0001	0.13
28	58	2.33	0.0001	0.12
29	59	2.42	0.0001	0.12
30	**59**	**2.50**	**0.0001**	**0.12**
31	60	2.58	0.0001	0.12
32	61	2.67	0.0001	0.12
33	62	2.75	0.0001	0.12
34	62	2.83	0.0001	0.12
35	63	2.92	0.0001	0.11
36	**63**	**3.00**	**0.0001**	**0.11**

NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)
37	64	**3.08**	0.0001	0.11
38	63	3.17	0.0001	0.11
39	64	3.25	0.0001	0.11
40	65	3.33	0.0001	0.11
41	64	3.42	0.0001	0.11
42	**63**	**3.50**	**0.0001**	**0.11**
43	65	3.58	0.0001	0.11
44	66	3.67	0.0001	0.11
45	64	3.75	0.0001	0.11
46	65	3.83	0.0001	0.11
47	65	3.92	0.0001	0.11
48	**66**	**4.00**	**0.0001**	**0.11**

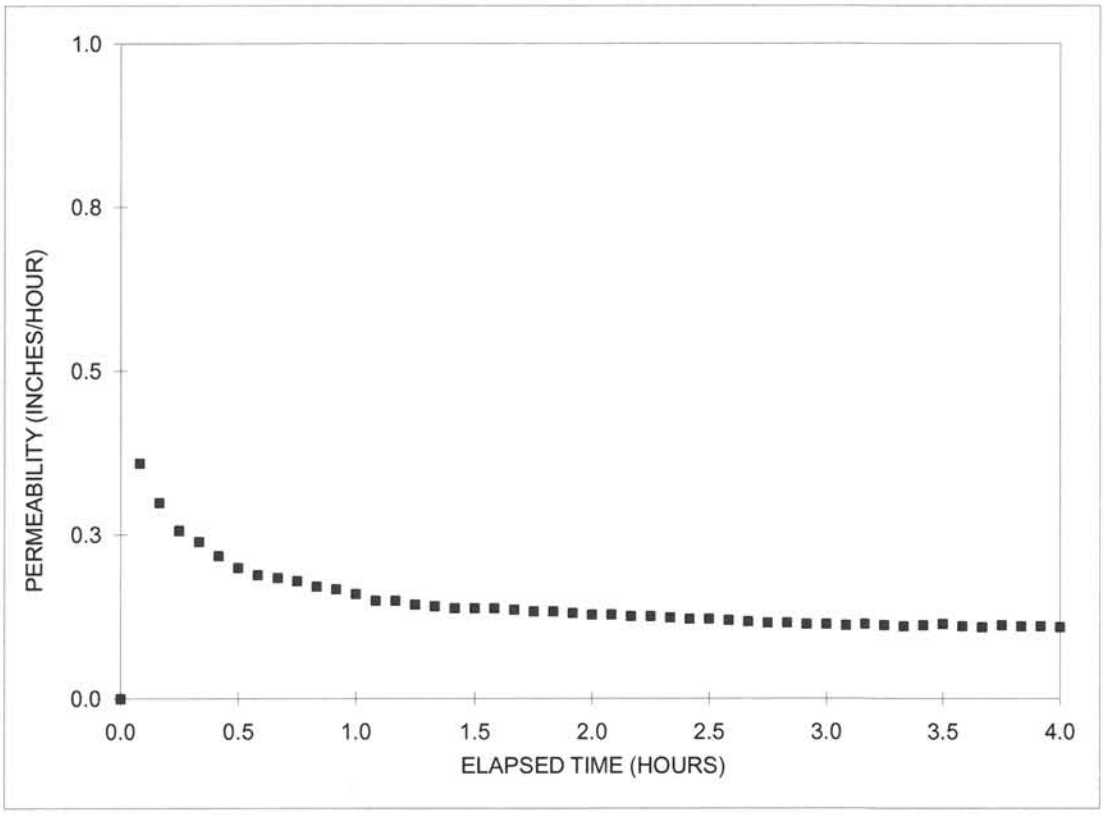
DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	8:00 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-10
DEPTH:	7.5 - 10.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN CLAYEY FINE SAND		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	BELOW BOTTOM OF CASING		

GRAPHICAL PRESENTATION:



MEASURED "STEADY STATE" HORIZONTAL PERMEABILITY

AVERAGE OF LAST HOUR **Kh = 0.11 INCHES/HOUR**

DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	9:20 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-20
DEPTH:	17.5 - 20.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN CLAYEY FINE SAND		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	18.4 FEET FROM TOP OF CASING		

EQUATION:

$$k_h := \frac{d^2 \cdot \ln\left(\frac{2 \cdot m \cdot L}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\left(\frac{H_1}{H_2}\right)$$

where:

k = Permeability (cm/sec)	=	COMPUTED	$T_2 - T_1$ = Duration of Test (sec)	=	VARIES
d = Dia of Piezometer (cm)	=	5.08	H_1 = Head at Start of Test (cm)	=	560.83
D = Dia of Piezometer Filter (cm)	=	7.62	H_2 = Head at Finish of Test (cm)	=	545.59
m = Tranformation Ratio	=	1.0	L = Length of Filter (cm)	=	76.20

TEST RESULTS:

TEST NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)
1	10	0.08	0.0003	0.5
2	12	0.17	0.0003	0.4
3	15	0.25	0.0002	0.3
4	17	0.33	0.0002	0.3
5	19	0.42	0.0002	0.3
6	20	0.50	0.0002	0.2
7	21	0.58	0.0002	0.2
8	22	0.67	0.0002	0.2
9	22	0.75	0.0002	0.2
10	22	0.83	0.0002	0.2
11	22	0.92	0.0002	0.2
12	**22**	**1.00**	**0.0002**	**0.2**
13	22	1.08	0.0002	0.2
14	22	1.17	0.0002	0.2
15	22	1.25	0.0002	0.2
16	22	1.33	0.0002	0.2
17	22	1.42	0.0002	0.2
18	22	1.50	0.0002	0.2
19	22	1.58	0.0002	0.2
20	23	1.67	0.0002	0.2
21	23	1.75	0.0002	0.2
22	23	1.83	0.0002	0.2
23	23	1.92	0.0002	0.2
24	**23**	**2.00**	**0.0002**	**0.2**
25	23	2.08	0.0002	0.2
26	23	2.17	0.0002	0.2
27	23	2.25	0.0002	0.2
28	23	2.33	0.0002	0.2
29	23	2.42	0.0002	0.2
30	24	2.50	0.0001	0.2
31	24	2.58	0.0001	0.2
32	24	2.67	0.0001	0.2
33	24	2.75	0.0001	0.2
34	25	2.83	0.0001	0.2
35	25	2.92	0.0001	0.2
36	**25**	**3.00**	**0.0001**	**0.2**

NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)
37	25	3.08	0.0001	0.2
38	25	3.17	0.0001	0.2
39	25	3.25	0.0001	0.2
40	25	3.33	0.0001	0.2
41	25	3.41	0.0001	0.2
42	**25**	3.50	0.0001	0.2
43	25	3.58	0.0001	0.2
44	25	3.66	0.0001	0.2
45	25	3.75	0.0001	0.2
46	25	3.83	0.0001	0.2
47	25	3.91	0.0001	0.2
48	**25**	**4.00**	**0.0001**	**0.2**

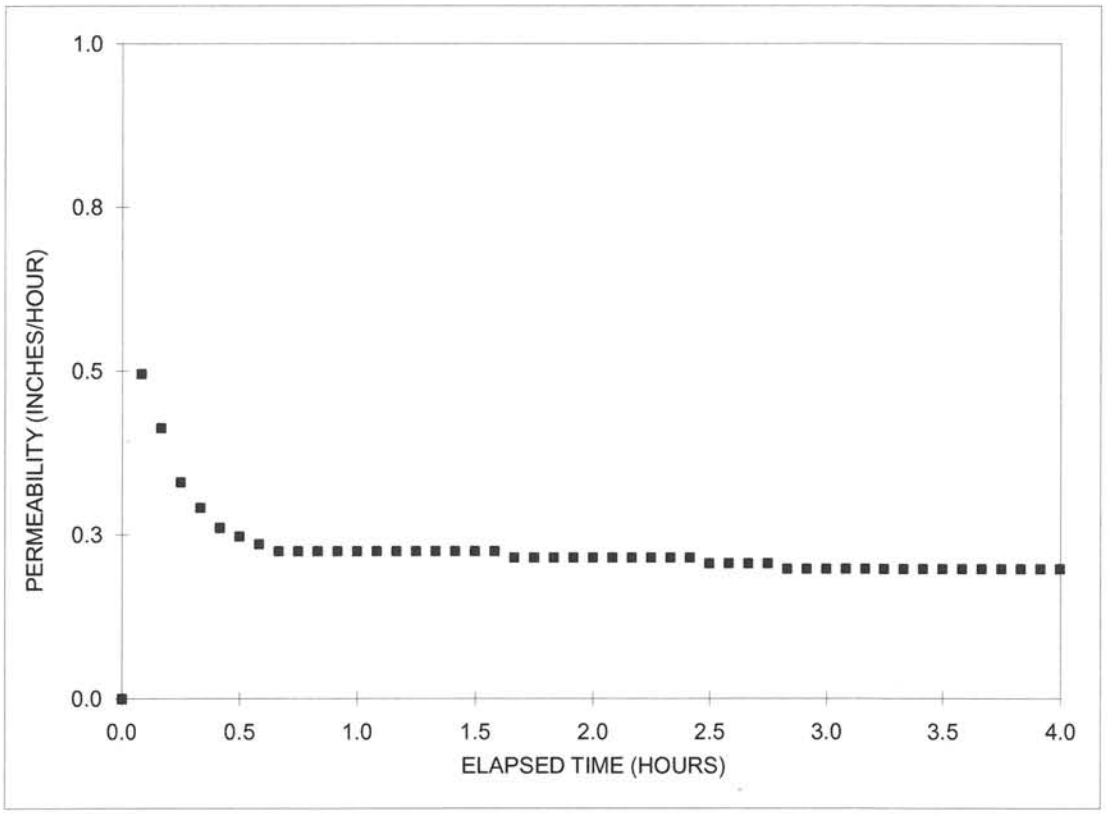
DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	9:20 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-20
DEPTH:	17.5 - 20.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN CLAYEY FINE SAND		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	18.4 FEET FROM TOP OF CASING		

GRAPHICAL PRESENTATION:



MEASURED "STEADY STATE" HORIZONTAL PERMEABILITY

AVERAGE OF LAST HOUR **Kh = 0.2 INCHES/HOUR**

DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	9:20 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-30
DEPTH:	27.5 - 30.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN AND GRAY HIGHLY PLASTIC CLAY		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	18.1 FEET FROM TOP OF CASING		

EQUATION:

$$k_h := \frac{d^2 \cdot \ln\left(\frac{2 \cdot m \cdot L}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\left(\frac{H_1}{H_2}\right)$$

where:

k = Permeability (cm/sec)	=	COMPUTED	$T_2 - T_1$ = Duration of Test (sec)	=	VARIES
d = Dia of Piezometer (cm)	=	5.08	H_1 = Head at Start of Test (cm)	=	551.69
D = Dia of Piezometer Filter (cm)	=	7.62	H_2 = Head at Finish of Test (cm)	=	536.45
m = Tranformation Ratio	=	1.0	L = Length of Filter (cm)	=	76.20

TEST RESULTS:

TEST NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)
1	936	0.26	0.0000	0.01
2	1,335	0.63	0.0000	0.00
3	1,278	0.99	0.0000	0.00
4	1,406	1.38	0.0000	0.00
5	1,280	1.73	0.0000	0.00
6	1,282	2.09	0.0000	0.00
7	1,290	2.45	0.0000	0.00
8	1,283	2.80	0.0000	0.00
9	1,296	3.16	0.0000	0.00
10	1,300	3.52	0.0000	0.00
11	1,292	3.88	0.0000	0.00
12	1,295	4.24	0.0000	0.00

NO	T2 - T1 (sec)	ELAPSED TIME (hr)	PERMEABILITY (cm/sec)	PERMEABILITY (in/hr)

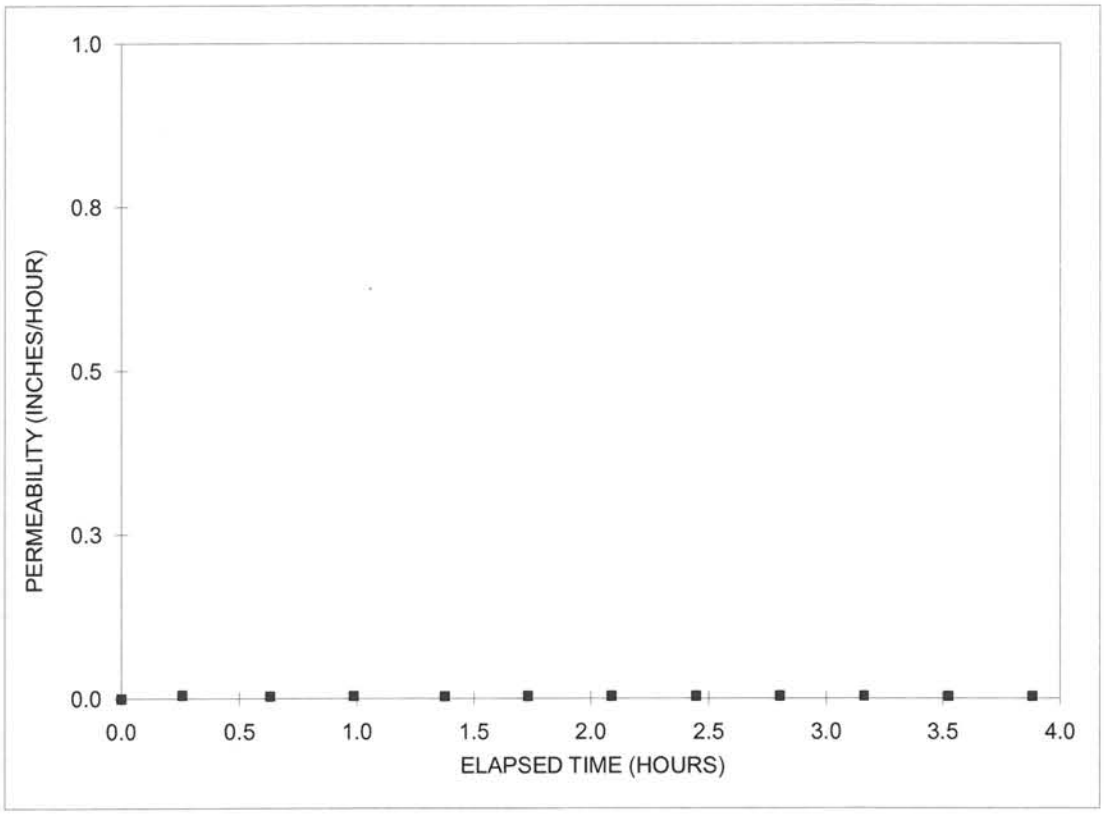
DATA SHEET

"CASED HOLE" PIEZOMETER ANALYSIS

TEST IDENTIFICATION:

DATE:	9/23/2010	TIME:	9:20 AM
PROJECT NO:	22-32-09-02	TEST NO:	EP-PZ-30
DEPTH:	27.5 - 30.0 FEET	TESTED BY:	M. LANDSCHOOT, E.I.
SOIL DESCRIPTION:	BROWN AND GRAY HIGHLY PLASTIC CLAY		
WEATHER CONDITIONS:	CLEAR / SUNNY 85 - 90 DEGREES		
PROJECT DESCRIPTION:	TIMBERLAKE - EAST POND SITE INVESTIGATION		
DEPTH TO GROUNDWATER:	18.1 FEET FROM TOP OF CASING		

GRAPHICAL PRESENTATION:



MEASURED "STEADY STATE" HORIZONTAL PERMEABILITY

AVERAGE OF LAST HOUR **Kh = < 0.01 INCHES/HOUR**

LABORATORY TEST DATA

DATA SHEET
FALLING HEAD PERMEABILITY TESTING
FINE-GRAINED SOILS
(FM5-513)

PROJECT NUMBER: 22-32-10-02 **BORING NO:** EP-1 **DATE:** 9/23/2010

PROJECT NAME: TIMBERLAKE EAST POND **DEPTH:** 7' 6" - 9' 0" **TESTED BY:** J.M.

SAMPLE DESCRIPTION: BROWN SILTY FINE SAND

SM A-2-4

INITIAL CONDITIONS

DIAMETER OF TEST CELL (cm): 10.12 **WEIGHT OF SOIL TESTED (gm):** 500.0 **DRY DENSITY - γ_{dry} (g/cm^3):** 1.46

DIAMETER OF STANDPIPE (cm): 1.21

THICKNESS OF STANDPIPE (cm): 0.17

LENGTH OF SAMPLE - L (cm) 3.88 **WATER CONTENT OF SOIL (%):** 10.0 **DRY DENSITY - γ_{dry} (lb/ft^3):** 90.9

AREA OF SAMPLE - A (cm^2) 80.4

AREA OF STANDPIPE - a (cm^2) 0.30

TEST DATA

TEST NUMBER	HEAD$_1$ (h_1) (cm)	HEAD$_2$ (h_2) (cm)	TIME (T) (sec)	GRADIENT (H/L) (cm/cm)	VELOCITY (Q/AT) (cm/sec)	PERMEABILITY (K) (UNCORRECTED) (cm/sec)	TEMPERATURE (°C)	VISCOSITY RATIO	PERMEABILITY (K_{20C}) (CORRECTED) (cm/sec)	(in/hr)
1	70.0	20.0	6.4	18.0	0.0390	2.85E-03	20.0	0.91	2.59E-03	3.6725
2	70.0	20.0	6.5	18.0	0.0380	2.78E-03	20.0	0.91	2.53E-03	3.5826
3	70.0	20.0	6.2	18.0	0.0403	2.94E-03	20.0	0.91	2.67E-03	3.7913
4	70.0	20.0	6.3	18.0	0.0396	2.89E-03	20.0	0.91	2.63E-03	3.7310
5	70.0	20.0	6.2	18.0	0.0402	2.93E-03	20.0	0.91	2.67E-03	3.7852
6	70.0	20.0	6.3	18.0	0.0394	2.87E-03	20.0	0.91	2.62E-03	3.7073
7	70.0	20.0	6.4	18.0	0.0387	2.83E-03	20.0	0.91	2.57E-03	3.6496
8	70.0	20.0	6.2	18.0	0.0401	2.93E-03	20.0	0.91	2.66E-03	3.7730
9	70.0	20.0	6.3	18.0	0.0392	2.87E-03	20.0	0.91	2.61E-03	3.6956
10	70.0	20.0	6.3	18.0	0.0397	2.90E-03	20.0	0.91	2.64E-03	3.7429

DATA SHEET
FALLING HEAD PERMEABILITY TESTING
FINE-GRAINED SOILS
(FM5-513)

PROJECT NUMBER: 22-32-10-02 **BORING NO:** EP-2 **DATE:** 9/23/2010

PROJECT NAME: TIMBERLAKE EAST POND **DEPTH:** 15' 0" - 16' 6" **TESTED BY:** J.M.

SAMPLE DESCRIPTION: BROWN CLAYEY FINE SAND

SC A-2-6

INITIAL CONDITIONS

DIAMETER OF TEST CELL (cm): 10.12 **WEIGHT OF SOIL TESTED (gm):** 709.0 **DRY DENSITY - γ_{dry} (g/cm^3):** 1.34

DIAMETER OF STANDPIPE (cm): 1.21

THICKNESS OF STANDPIPE (cm): 0.17

LENGTH OF SAMPLE - L (cm) 5.50 **WATER CONTENT OF SOIL (%):** 20.0 **DRY DENSITY - γ_{dry} (lb/ft^3):** 83.4

AREA OF SAMPLE - A (cm^2) 80.4

AREA OF STANDPIPE - a (cm^2) 0.30

TEST DATA

TEST NUMBER	HEAD$_1$ (h_1) (cm)	HEAD$_2$ (h_2) (cm)	TIME (T) (sec)	GRADIENT (H/L) (cm/cm)	VELOCITY (Q/AT) (cm/sec)	PERMEABILITY (K) (UNCORRECTED) (cm/sec)	TEMPERATURE (^{0}C)	VISCOSITY RATIO	PERMEABILITY (K_{20c}) (CORRECTED) (cm/sec)	(in/hr)
1	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7795
2	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7793
3	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7793
4	70.0	20.0	42.7	12.7	0.0058	6.03E-04	20.0	0.91	5.49E-04	0.7782
5	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7791
6	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7789
7	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7791
8	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7795
9	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7789
10	70.0	20.0	42.6	12.7	0.0058	6.04E-04	20.0	0.91	5.50E-04	0.7791

DATA SHEET
FALLING HEAD PERMEABILITY TESTING
FINE-GRAINED SOILS
(FM5-513)

PROJECT NUMBER: 22-32-10-02 **BORING NO:** EP-3 **DATE:** 9/23/2010

PROJECT NAME: TIMBERLAKE EAST POND **DEPTH:** 17' 6" - 19' 0" **TESTED BY:** J.M.

SAMPLE DESCRIPTION: BROWN CLAYEY FINE SAND

SC A-2-6

INITIAL CONDITIONS

DIAMETER OF TEST CELL (cm): 10.12 **WEIGHT OF SOIL TESTED (gm):** 709.0 **DRY DENSITY - γ_{dry} (g/cm^3):** 1.29

DIAMETER OF STANDPIPE (cm): 1.21

THICKNESS OF STANDPIPE (cm): 0.17

LENGTH OF SAMPLE - L (cm) 5.50 **WATER CONTENT OF SOIL (%):** 24.0 **DRY DENSITY - γ_{dry} (lb/ft^3):** 80.7

AREA OF SAMPLE - A (cm^2) 80.4

AREA OF STANDPIPE - a (cm^2) 0.30

TEST DATA

TEST NUMBER	HEAD$_1$ (h_1) (cm)	HEAD$_2$ (h_2) (cm)	TIME (T) (sec)	GRADIENT (H/L) (cm/cm)	VELOCITY (Q/AT) (cm/sec)	PERMEABILITY (K) (UNCORRECTED) (cm/sec)	TEMPERATURE (^{0}C)	VISCOSITY RATIO	PERMEABILITY (K_{20C}) (CORRECTED)	
									(cm/sec)	(in/hr)
1	70.0	20.0	47.7	12.7	0.0052	5.40E-04	20.0	0.91	4.92E-04	0.6970
2	70.0	20.0	47.8	12.7	0.0052	5.39E-04	20.0	0.91	4.91E-04	0.6956
3	70.0	20.0	47.7	12.7	0.0052	5.40E-04	20.0	0.91	4.92E-04	0.6967
4	70.0	20.0	47.7	12.7	0.0052	5.40E-04	20.0	0.91	4.91E-04	0.6961
5	70.0	20.0	47.7	12.7	0.0052	5.40E-04	20.0	0.91	4.91E-04	0.6959
6	70.0	20.0	47.8	12.7	0.0052	5.39E-04	20.0	0.91	4.91E-04	0.6954
7	70.0	20.0	47.8	12.7	0.0052	5.38E-04	20.0	0.91	4.90E-04	0.6943
8	70.0	20.0	47.8	12.7	0.0052	5.39E-04	20.0	0.91	4.90E-04	0.6951
9	70.0	20.0	47.7	12.7	0.0052	5.40E-04	20.0	0.91	4.91E-04	0.6959
10	70.0	20.0	47.8	12.7	0.0052	5.39E-04	20.0	0.91	4.90E-04	0.6950

GRAIN-SIZE CORRELATIONS

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-1 **DEPTH:** 7.5-9.0 (FEET)

SOIL DESCRIPTION: BROWN SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	98
40	0.425	91
60	0.250	76
100	0.150	47
200	0.075	24

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.036 mm

D_{50} = 0.17 mm

D_{60} = 0.19 mm

K = 0.0008 (cm/sec)

1.1 (in/hr)

C_u = 5.3

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

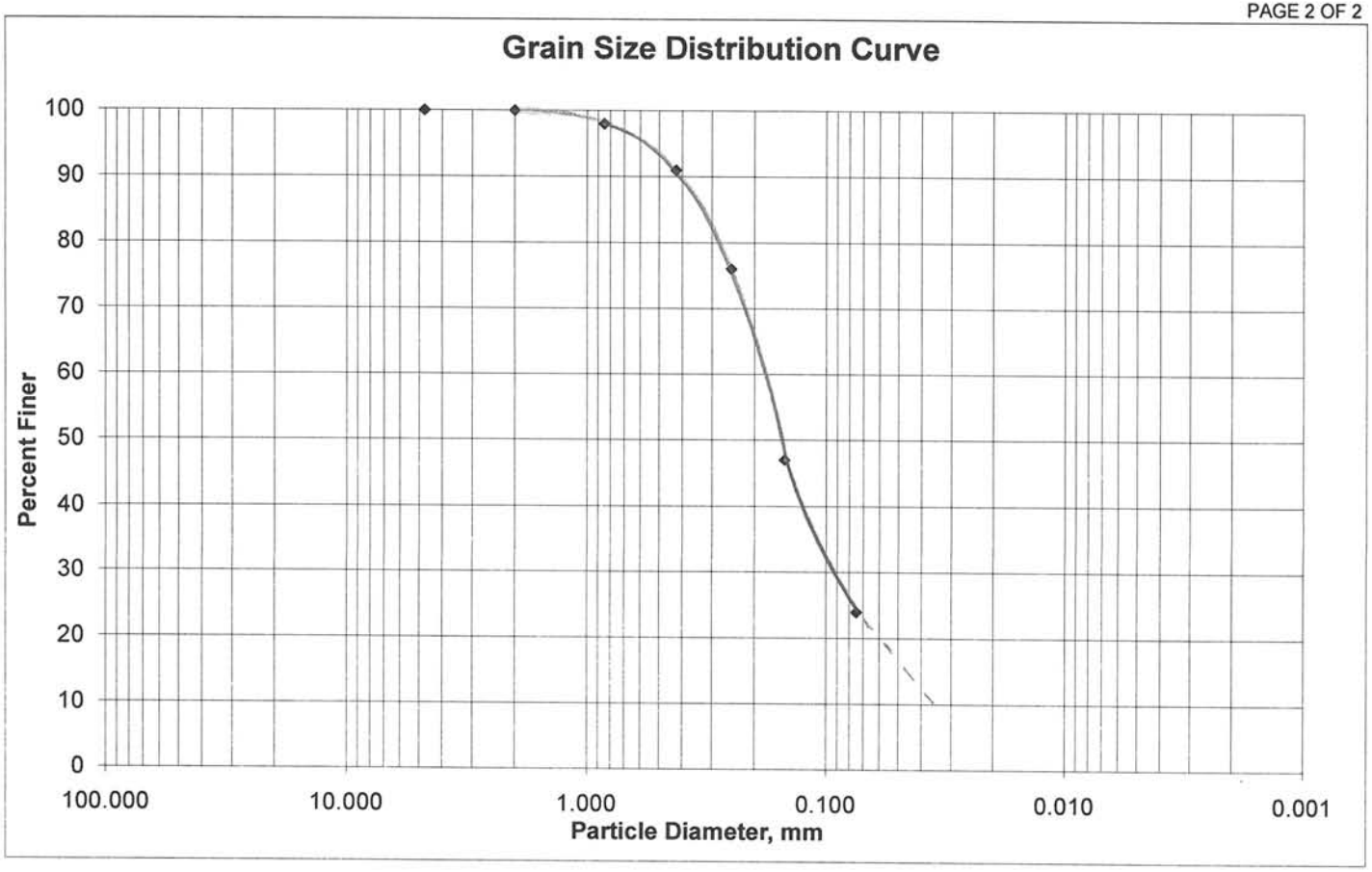
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-1 **DEPTH:** 7.5-9.0 (FEET)

SOIL DESCRIPTION: BROWN SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

GRAPHICAL REPRESENTATION OF TEST RESULTS



MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-2 **DEPTH:** 1.0 - 1.5 (FEET)

SOIL DESCRIPTION: GRAY SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	99
40	0.425	90
60	0.250	71
100	0.150	41
200	0.075	20

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.045 mm

D_{50} = 0.18 mm

D_{60} = 0.22 mm

K = 0.0022 (cm/sec)

3.1 (in/hr)

C_u = 4.9

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

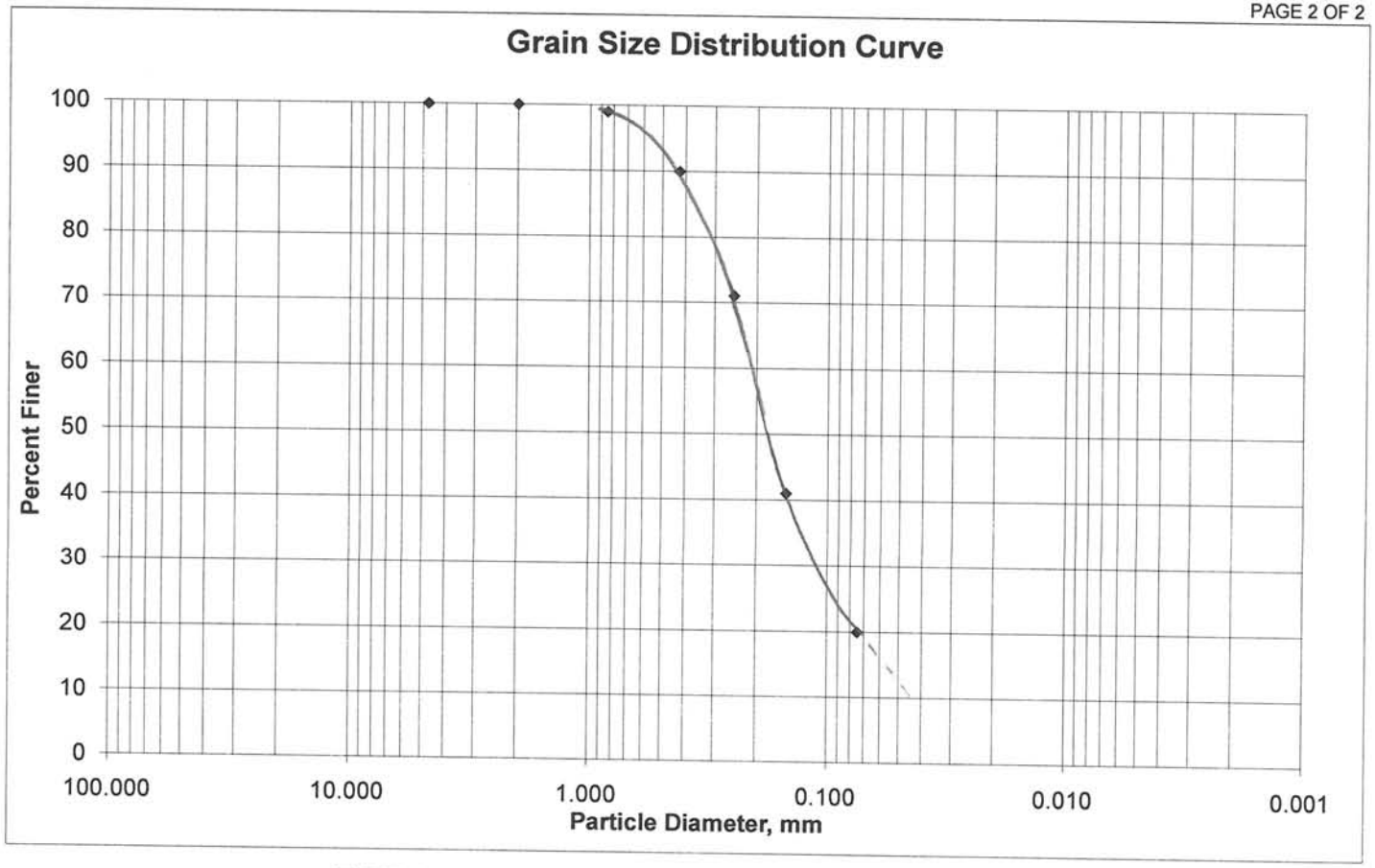
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-2 **DEPTH:** 1.0 - 1.5 (FEET)

SOIL DESCRIPTION: GRAY SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-4 **DEPTH:** 5.0-5.5 (FEET)

SOIL DESCRIPTION: BROWN SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	99
40	0.425	90
60	0.250	74
100	0.150	46
200	0.075	21

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.046 mm

D_{50} = 0.17 mm

D_{60} = 0.19 mm

K = 0.0024 (cm/sec)

3.4 (in/hr)

C_u = 4.1

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

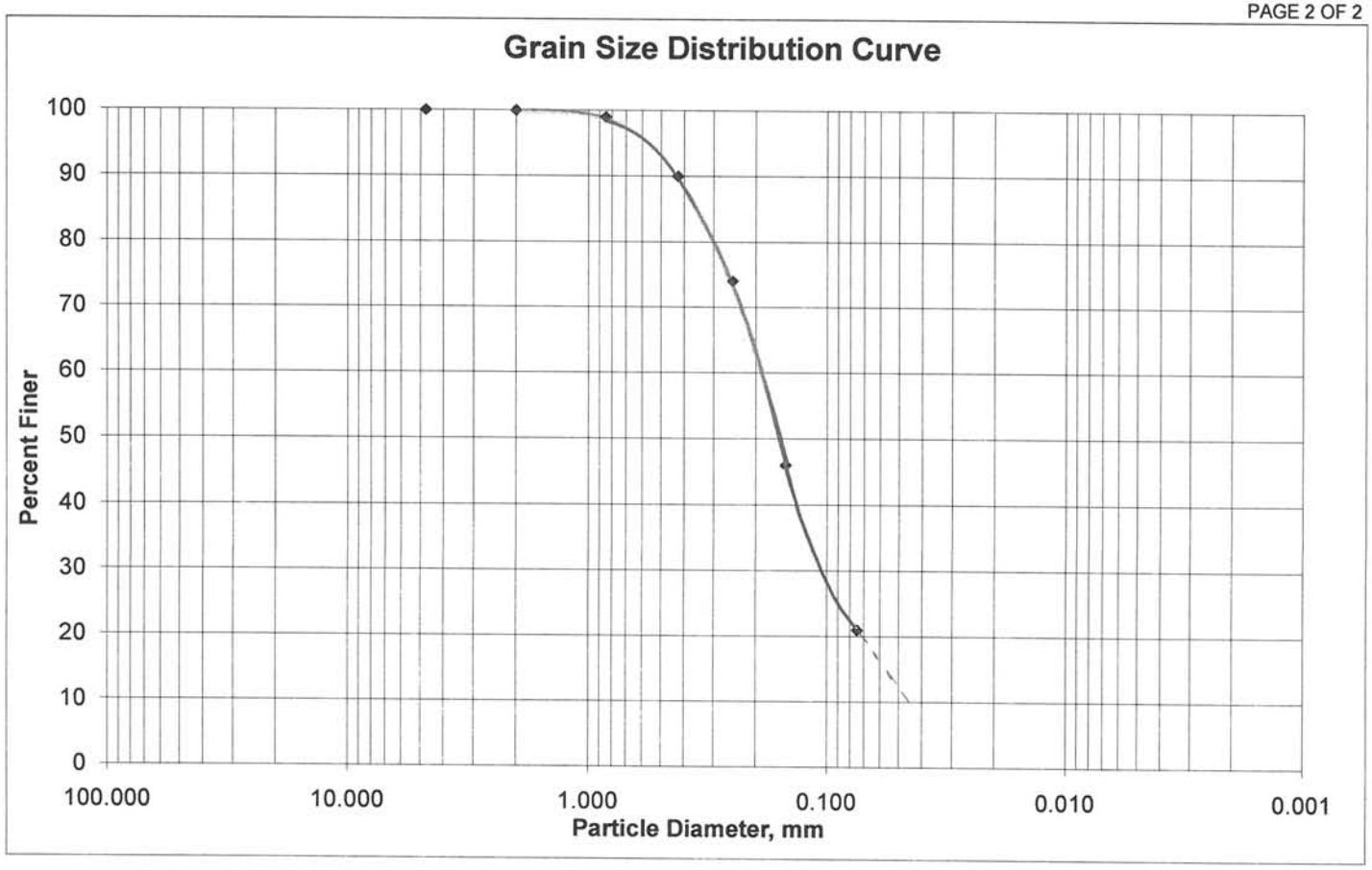
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-4 **DEPTH:** 5.0-5.5 (FEET)

SOIL DESCRIPTION: BROWN SILTY FINE SAND
STRATUM 2 (SM /A-2-4)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-2 **DEPTH:** 6.0 - 6.5 (FEET)

SOIL DESCRIPTION: GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	99
40	0.425	92
60	0.250	78
100	0.150	53
200	0.075	34

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.009 mm

D_{50} = 0.15 mm

D_{60} = 0.18 mm

K = 0.0001 (cm/sec)

0.1 (in/hr)

C_u = 20.0

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

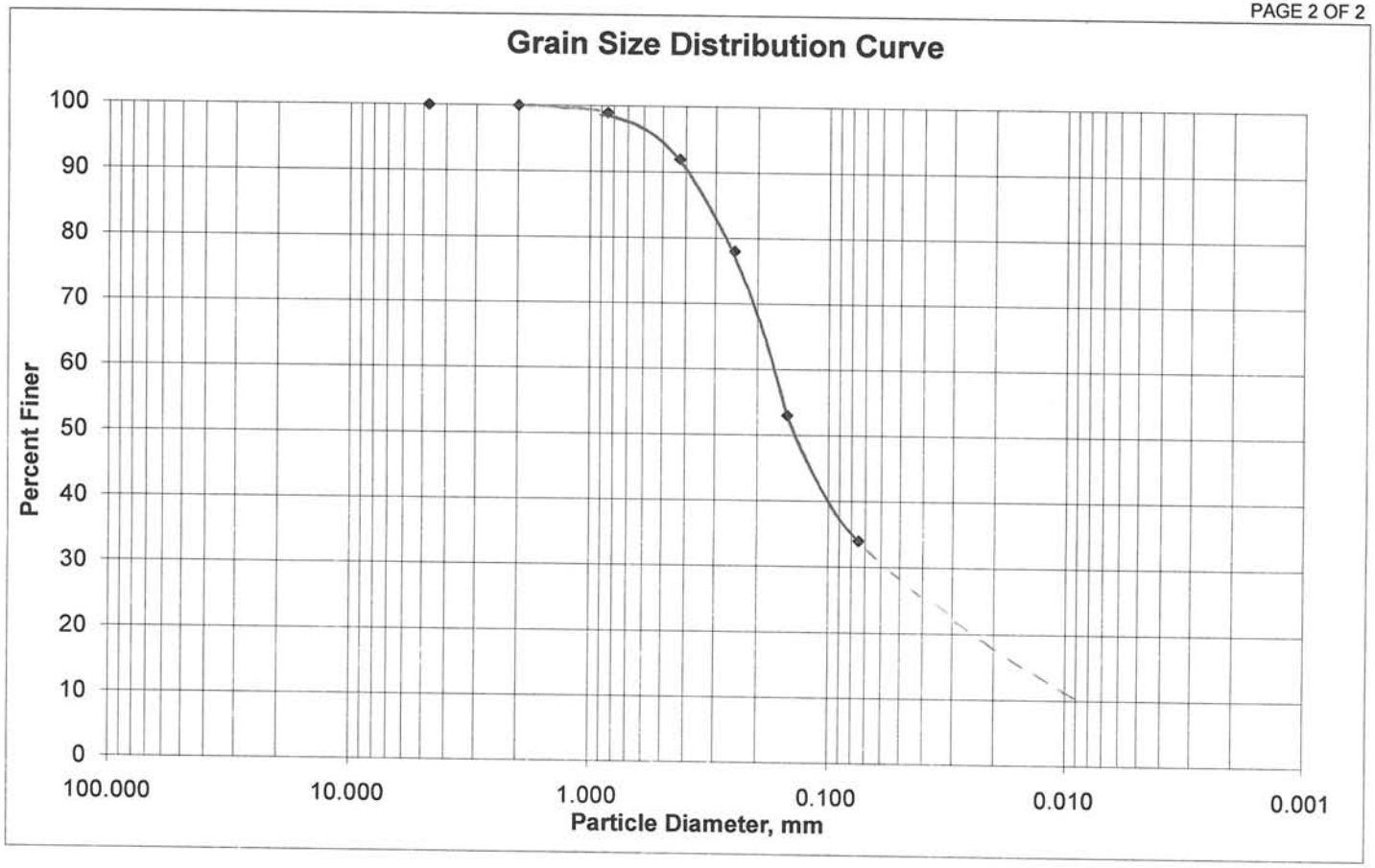
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-2 **DEPTH:** 6.0 - 6.5 (FEET)

SOIL DESCRIPTION: GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-3 **DEPTH:** 22.5 - 24.0 (FEET)

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	100
40	0.425	99
60	0.250	92
100	0.150	51
200	0.075	35

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.008 mm

D_{50} = 0.16 mm

D_{60} = 0.17 mm

K = 0.0001 (cm/sec)

0.1 (in/hr)

C_u = 21.3

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

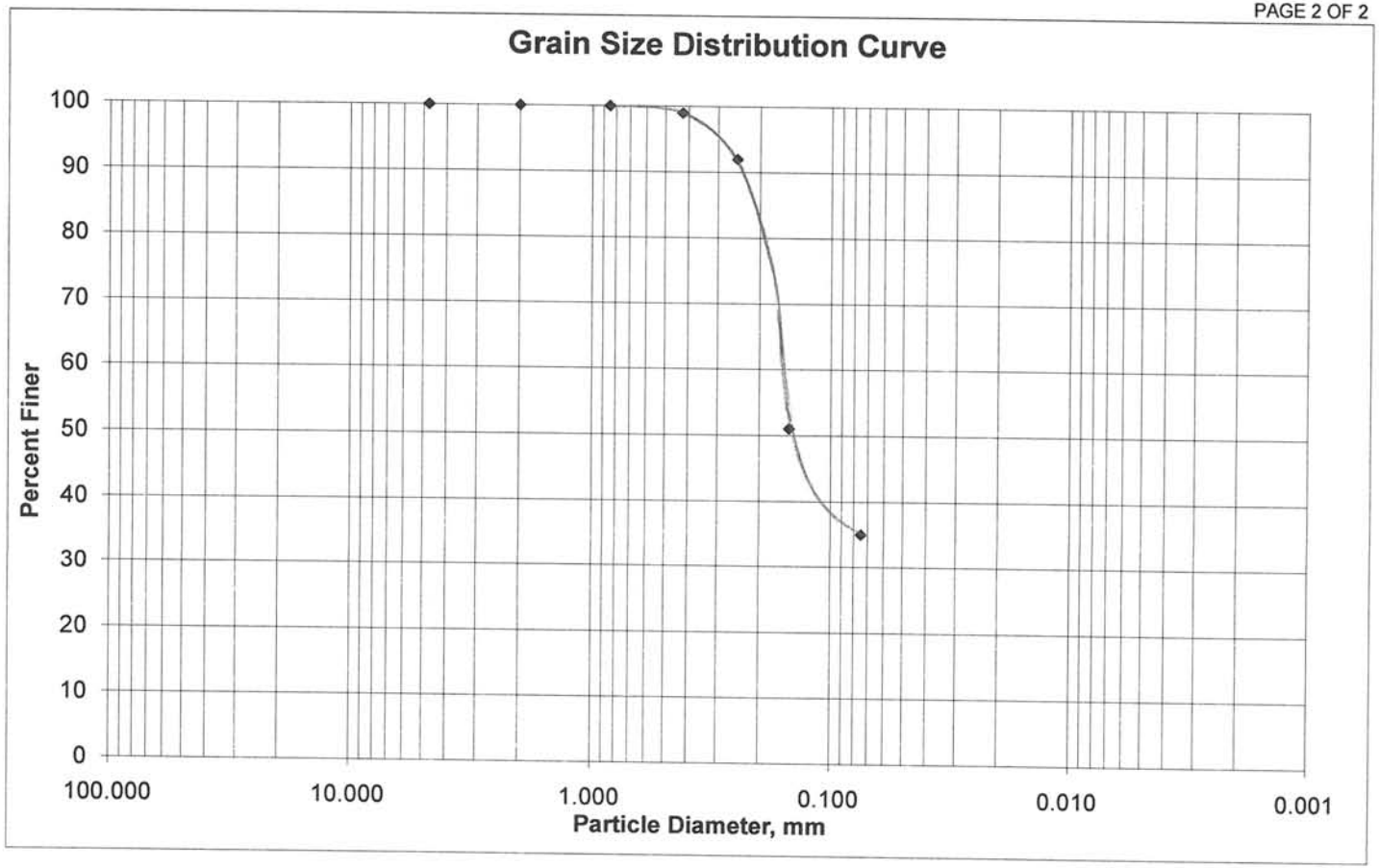
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-3 **DEPTH:** 22.5 - 24.0 (FEET)

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-4 **DEPTH:** 20.0 - 21.5 (FEET)

SOIL DESCRIPTION: GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	100
40	0.425	100
60	0.250	98
100	0.150	80
200	0.075	26

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.028 mm

D_{50} = 0.13 mm

D_{60} = 0.14 mm

K = 0.0006 (cm/sec)

0.9 (in/hr)

C_u = 5.0

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

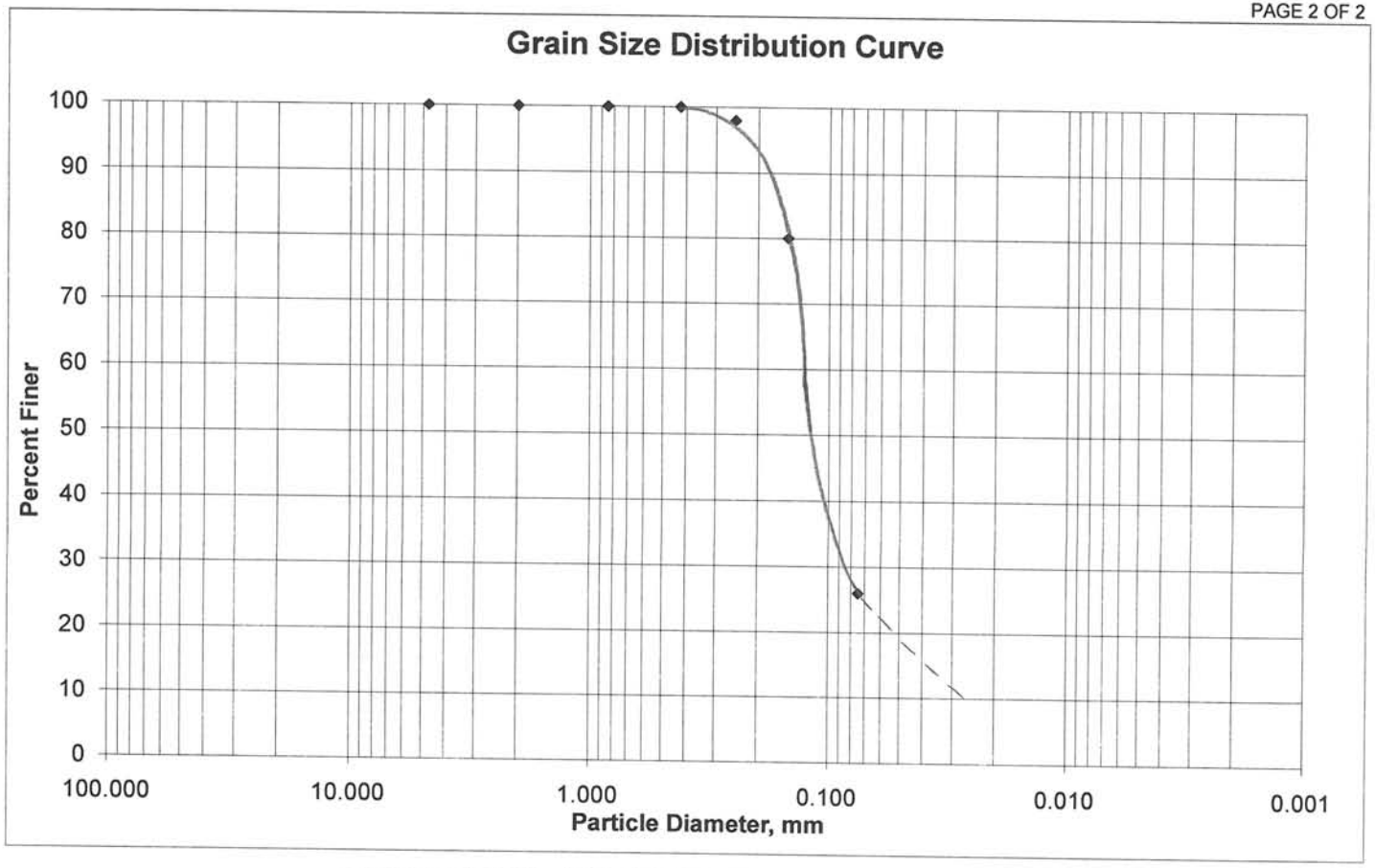
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-4 **DEPTH:** 20.0 - 21.5 (FEET)

SOIL DESCRIPTION: GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-5 **DEPTH:** 17.5 - 19.0 (FEET)

SOIL DESCRIPTION: BROWN AND GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	100
40	0.425	99
60	0.250	90
100	0.150	45
200	0.075	31

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.008 mm

D_{50} = 0.17 mm

D_{60} = 0.18 mm

K = 0.0001 (cm/sec)

0.1 (in/hr)

C_u = 22.5

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

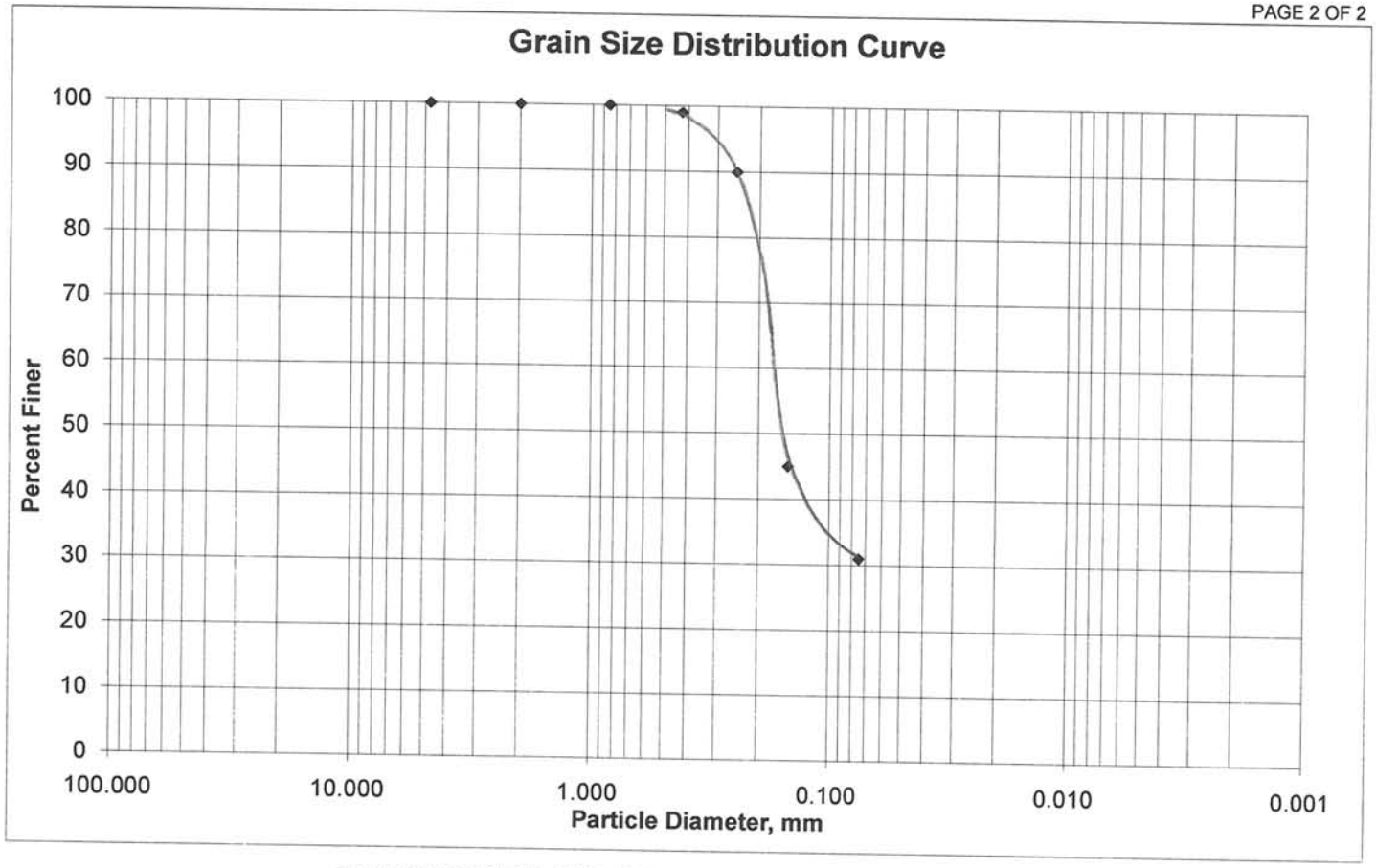
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-5 **DEPTH:** 17.5 - 19.0 (FEET)

SOIL DESCRIPTION: BROWN AND GRAY CLAYEY FINE SAND
STRATUM 3 (SC /A-2-6)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-1 **DEPTH:** 18.0-20.0 (FEET)

SOIL DESCRIPTION: BROWN CLAYEY SAND
STRATUM 5 (SC /A-7-5)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	99
40	0.425	97
60	0.250	88
100	0.150	45
200	0.075	36

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.002 mm

D_{50} = 0.17 mm

D_{60} = 0.18 mm

K = < .0001 (cm/sec)

< 0.01 (in/hr)

C_u = 90.0

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

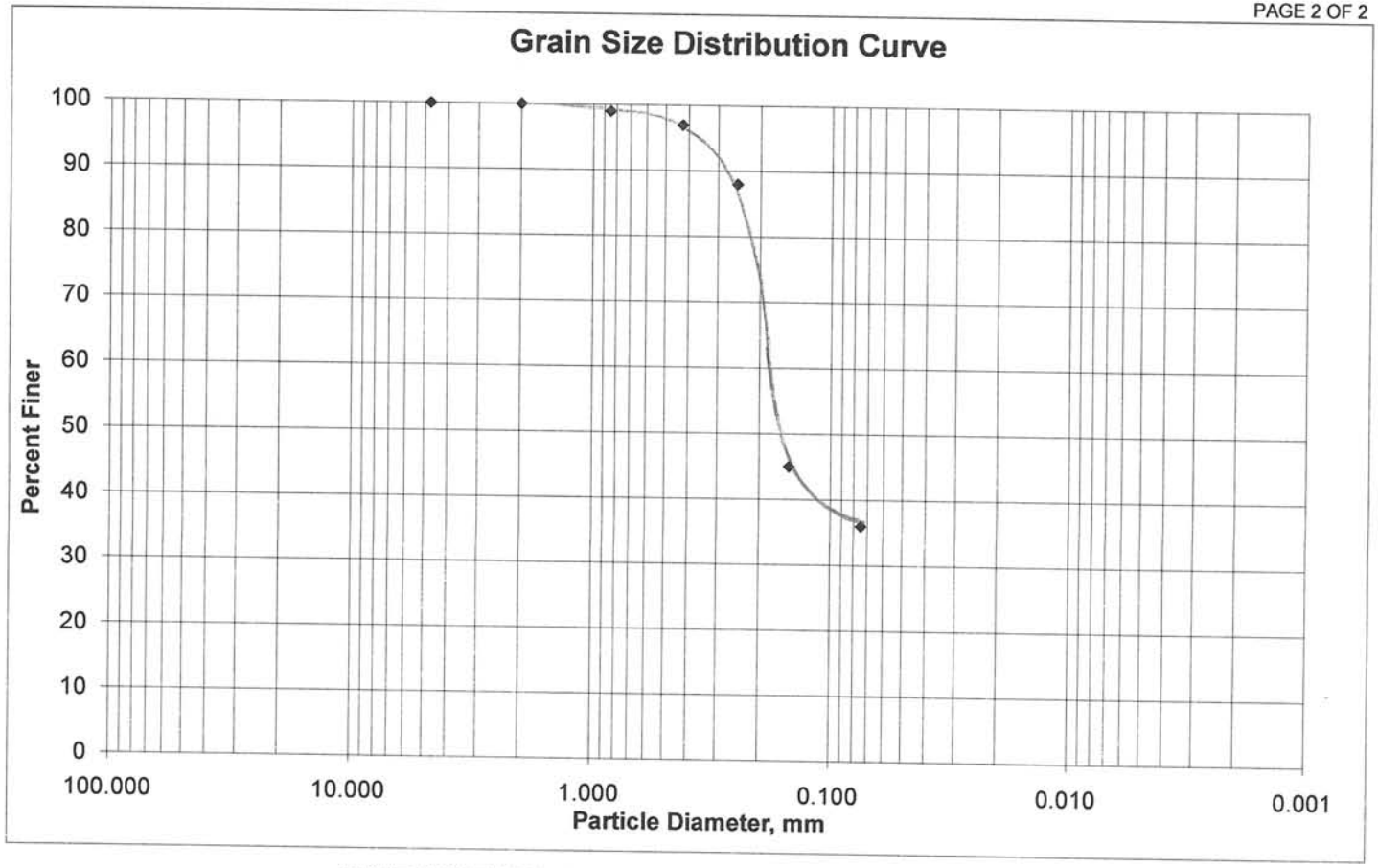
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-1 **DEPTH:** 18.0-20.0 (FEET)

SOIL DESCRIPTION: BROWN CLAYEY SAND
STRATUM 5 (SC /A-7-5)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-3 **DEPTH:** 38.0 - 40.0 (FEET)

SOIL DESCRIPTION: GRAY AND BROWN HIGHLY PLASTIC CLAY
STRATUM 6 (CH /A-7-5)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	99
40	0.425	96
60	0.250	84
100	0.150	68
200	0.075	52

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = 0.001 mm

D_{50} = 0.08 mm

D_{60} = 0.12 mm

K = < .0001 (cm/sec)

< 0.01 (in/hr)

C_u = 120.0

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

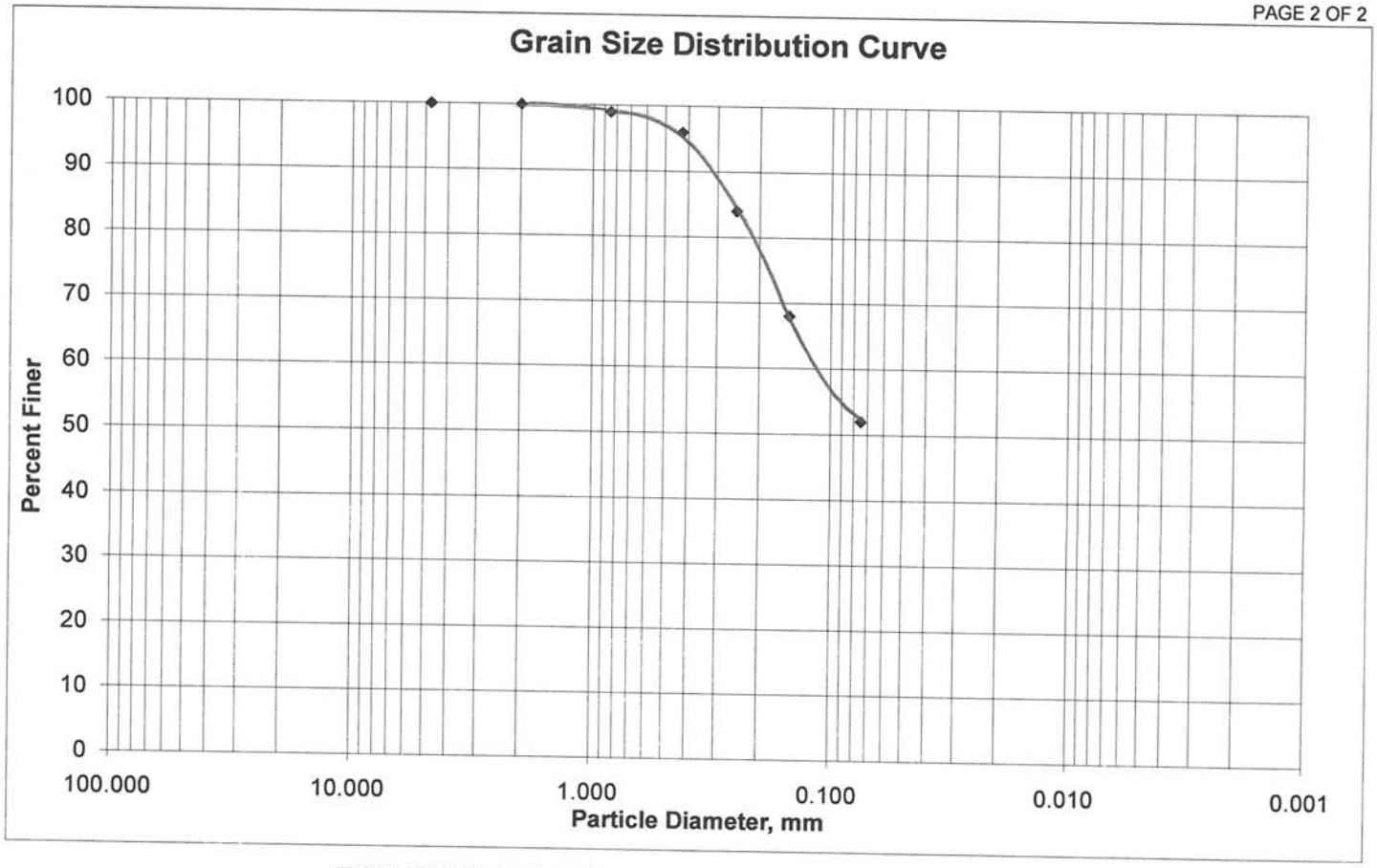
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-3 **DEPTH:** 38.0 - 40.0 (FEET)

SOIL DESCRIPTION: GRAY AND BROWN HIGHLY PLASTIC CLAY
STRATUM 6 (CH /A-7-5)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

TEST INFORMATION:

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-5 **DEPTH:** 27.0 - 29.0 (FEET)

SOIL DESCRIPTION: GRAY AND BROWN HIGHLY PLASTIC CLAY
STRATUM 6 (CH /A-7-5)

TEST RESULTS:

Sieve No.	Diameter (Millimeters)	Percent Passing (%)
4	4.750	100
10	2.000	100
20	0.850	100
40	0.425	100
60	0.250	100
100	0.150	99
200	0.075	95

NOTE: THE FOLLOWING VALUES ARE ESTIMATED FROM THE GRAIN-SIZE DATA

D_{10} = < 0.001 mm

D_{50} = < 0.010 mm

D_{60} = < 0.010 mm

K = < .0001 (cm/sec)

< 0.01 (in/hr)

C_u = N/A

Where:
K = Coefficient of Permeability
Cu = Coefficient Of Uniformity

MECHANICAL GRAIN-SIZE ANALYSIS
(ASTM D1140-54)

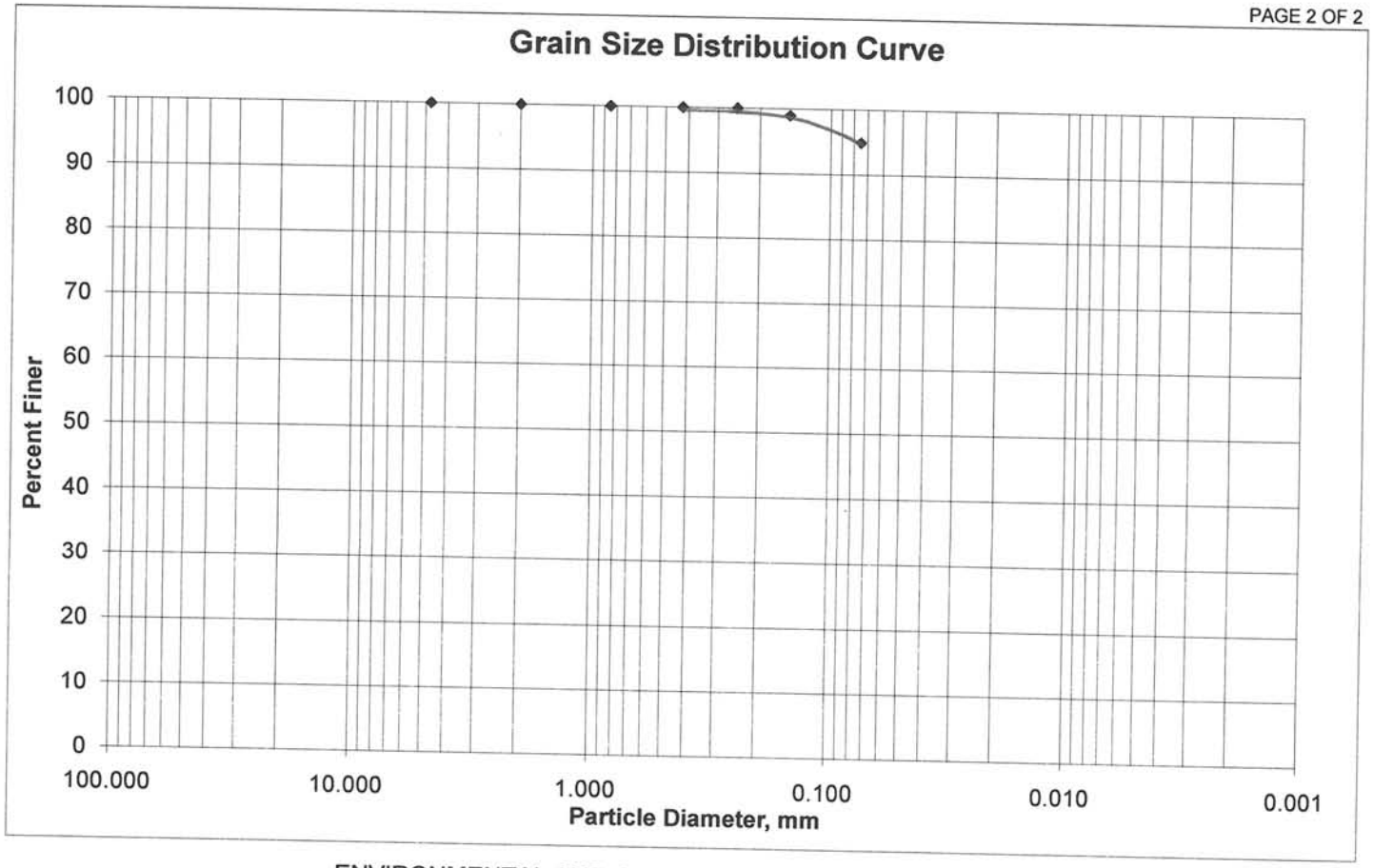
TEST INFORMATION

PROJECT NO.: 22-32-10-02 **DATE:** 9/24/2010

BORING NO.: EP-5 **DEPTH:** 27.0 - 29.0 (FEET)

SOIL DESCRIPTION: GRAY AND BROWN HIGHLY PLASTIC CLAY
STRATUM 6 (CH /A-7-5)

GRAPHICAL REPRESENTATION OF TEST RESULTS



ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

APPENDIX F
ADVANCED TESTING DATA

SHELBY TUBE DATA

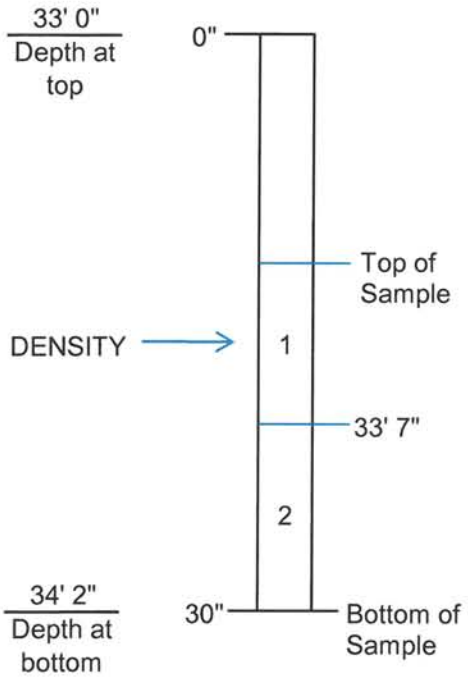
SHELBY TUBE LABORATORY DATA SHEET

EGS

Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office: (850) 386-1253 Fax: (850) 385-8050

DATE:	9/15/2010
PROJECT:	TIMBERLAKE EAST POND
PROJECT NO.:	22-32-10-02
BORING NO.:	EP-3
DEPTH:	33' 0" - 35' 0"

SAMPLE DIAGRAM



SOIL IDENTIFICATION

1) BROWN AND GRAY HIGHLY PLASTIC CLAY (CH A-7-5)
2) BROWN AND GRAY HIGHLY PLASTIC CLAY (CH A-7-5)
3)
4)
5)

GRAIN SIZE ANALYSIS (%) PASSING						
SAMPLE NO.	1	2				
4	100					
10	100					
20	100					
40	100					
60	100					
100	97					
200	93					

MOISTURE CONTENT					
SAMPLE NO.	1	2			
TARE NO.	A	B			
WT. TARE	0.45	0.45			
WWS + TARE	15.94	13.52			
WDS + TARE	9.68	8.32			
MS%	68	66			

ATTERBERG LIMITS					
SAMPLE NO.	1	2			
LIQUID LIMIT	100				
PLASTIC LIMIT	32				
PLASTICITY INDEX	68				

UNIT WEIGHTS					
SAMPLE NO.	1	2			
LENGTH (IN)	5.6				
DIAMETER (IN)	2.8				
NATURAL DENSITY (LB/CU FT)	110.2				
DRY DENSITY (LB/CU FT)	66.6				

ORGANIC CONTENT					
SAMPLE NO.	1	2			
ORG %					
ORG %					
ORG %					

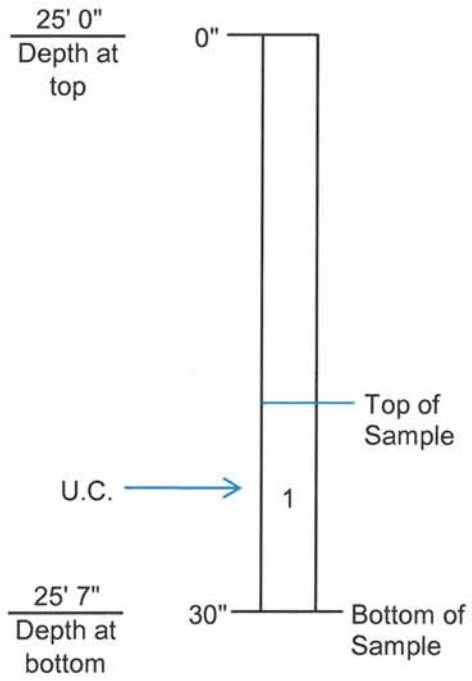
SHELBY TUBE LABORATORY DATA SHEET

EGS

Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office: (850) 386-1253 Fax: (850) 385-8050

DATE:	9/15/2010
PROJECT:	TIMBERLAKE EAST POND
PROJECT NO.:	22-32-10-02
BORING NO.:	EP-4
DEPTH:	25' 0" - 27' 0"

SAMPLE DIAGRAM



SOIL IDENTIFICATION

1) GRAY HIGHLY PLASTIC CLAY (CH A-7-5)
2)
3)
4)
5)

GRAIN SIZE ANALYSIS (%) PASSING					
SAMPLE NO.	1				
4	100				
10	100				
20	100				
40	99				
60	97				
100	95				
200	88				

MOISTURE CONTENT					
SAMPLE NO.	1				
TARE NO.	A				
WT. TARE	0.45				
WWS + TARE	9.16				
WDS + TARE	5.92				
MS%	59				

ATTERBERG LIMITS					
SAMPLE NO.	1				
LIQUID LIMIT	95				
PLASTIC LIMIT	30				
PLASTICITY INDEX	65				

UNIT WEIGHTS					
SAMPLE NO.	1				
LENGTH (IN)	5.6				
DIAMETER (IN)	2.8				
NATURAL DENSITY (LB/CU FT)	111.2				
DRY DENSITY (LB/CU FT)	69.0				

ORGANIC CONTENT					
SAMPLE NO.	1	2	3		
ORG %					
ORG %					
ORG %					

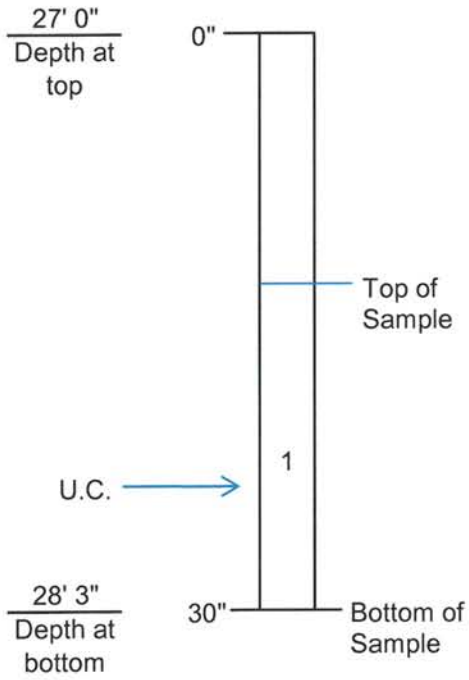
SHELBY TUBE LABORATORY DATA SHEET

EGS

Environmental & Geotechnical Specialists, Inc.
3154 Eliza Road
Tallahassee, Florida 32308
Office: (850) 386-1253 Fax: (850) 385-8050

DATE:	9/15/2010
PROJECT:	TIMBERLAKE EAST POND
PROJECT NO.:	22-32-10-02
BORING NO.:	EP-5
DEPTH:	27' 0" - 29' 0"

SAMPLE DIAGRAM



SOIL IDENTIFICATION

1) BROWN AND GRAY HIGHLY PLASTIC CLAY (CH A-7-5)

2)

3)

4)

5)

GRAIN SIZE ANALYSIS (%) PASSING					
SAMPLE NO.	1				
4	100				
10	100				
20	100				
40	100				
60	100				
100	99				
200	95				

MOISTURE CONTENT					
SAMPLE NO.	1				
TARE NO.	A				
WT. TARE	0.45				
WWS + TARE	19.70				
WDS + TARE	11.77				
MS%	70				

ATTERBERG LIMITS					
SAMPLE NO.	1				
LIQUID LIMIT	100				
PLASTIC LIMIT	41				
PLASTICITY INDEX	59				

UNIT WEIGHTS					
SAMPLE NO.	1				
LENGTH (IN)	5.6				
DIAMETER (IN)	2.8				
NATURAL DENSITY (LB/CU FT)	110.2				
DRY DENSITY (LB/CU FT)	68.6				

ORGANIC CONTENT					
SAMPLE NO.	1	2	3		
ORG %					
ORG %					
ORG %					

UNCONFINED COMPRESSION TEST RESULTS

DATA SHEET

COMPRESSIVE STRENGTH
STRESS - STRAIN

TEST IDENTIFICATION:

DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **BORING NO:** EP-4

DEPTH: 25' 0" - 27' 0" SEC 1 **TESTED BY:** JM/ZB

SOIL DESCRIPTION: GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:

INITIAL SOIL DENSITY:

WEIGHT OF SAMPLE	1006.1	gm		
DIAMETER OF SAMPLE	2.80	in	7.11	cm
HEIGHT OF SAMPLE	5.60	in	14.22	cm
VOLUME OF SAMPLE	34.46	in^3	564.77	cm^3
WET DENSITY OF SAMPLE	1.78	gm/cc		
WET DENSITY OF SAMPLE	111.2	lb/cu ft		
DRY DENSITY OF SAMPLE	**1.11**	**gm/cc**		
DRY DENSITY OF SAMPLE	**69.0**	**lb/cu ft**		

WATER CONTENT:

TARE NUMBER	1	2	3
WEIGHT OF TARE (gm)	0.45	0.45	0.45
WET WEIGHT OF SOIL + TARE (gm)	17.58	10.52	17.90
DRY WEIGHT OF SOIL + TARE (gm)	11.10	6.72	11.21
WATER CONTENT (%)	60.8	60.6	62.2

AVERAGE WATER CONTENT **61.2** **%**

INITIAL VOID RATIO:

DRY MASS OF SOIL	624.1	gm		
SPECIFIC GRAVITY OF SOLIDS	2.75			
UNIT WEIGHT OF WATER	62.4	lb/cu ft	1.00	gm/cm^3
VOLUME OF SOLIDS	13.849	in^3	226.945	cm^3
VOLUME OF VOIDS	20.616	in^3	337.829	cm^3
VOID RATIO	**1.489**			

DATA SHEET

UNCONFINED COMPRESSION
STRESS - STRAIN

TEST IDENTIFICATION:

DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **BORING NO:** EP-4

DEPTH: 25' 0" - 27' 0" SEC 1 **TESTED BY:** JM/ZB

SOIL DESCRIPTION: GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:

VERTICAL LOAD (LBS)	VERTICAL DIAL READING (INCHES)	VERTICAL DEFLECTION (INCHES)	VERTICAL STRAIN (INCHES/INCH)	UNCONFINED COMPRESSION (LB/SQ FT)
		INITIAL READING		
75	0.010	0.010	0.0018	1,755
117	0.020	0.020	0.0036	2,738
144	0.030	0.030	0.0054	3,369
158	0.040	0.040	0.0071	3,697
174	0.050	0.050	0.0089	4,071
180	0.060	0.060	0.0107	4,212
185	0.070	0.070	0.0125	4,329
188	0.080	0.080	0.0143	4,399
189	0.090	0.090	0.0161	4,422
188	0.100	0.100	0.0179	4,399
182	0.110	0.110	0.0196	4,258

DATA SHEET

UNCONFINED COMPRESSION
STRESS - STRAIN

TEST IDENTIFICATION:

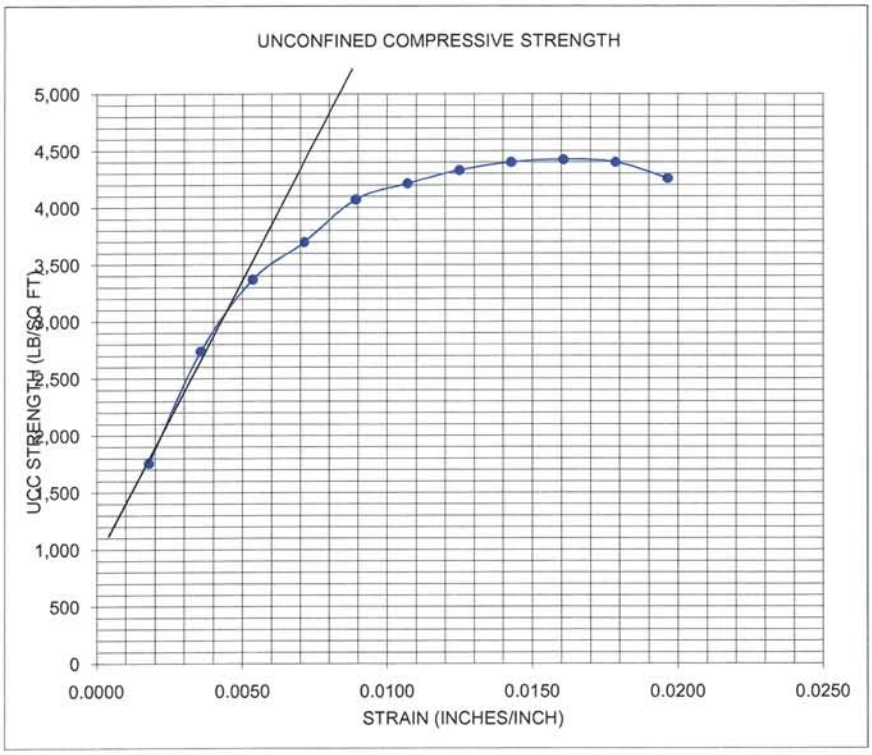
DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **TEST NO:** EP-4

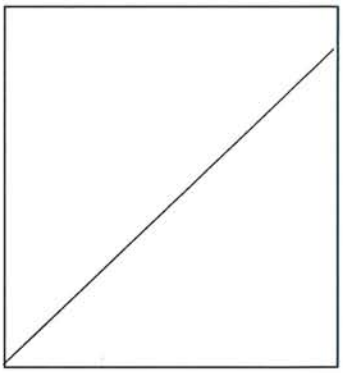
DEPTH: 25' 0" - 27' 0" SEC 1 **TESTED BY:** JM/ZB

SOIL DESCRIPTION: GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:



FAILURE DIAGRAM



FAILURE ANGLE

65°

COMPRESSION MODULUS (LB/SQ FT)

452,047

NOTES: COMPRESSION LOAD RATE: 0.05 IN/MIN

VANE SHEAR = (0.45) (2.5) = 1.13 TSF

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

DATA SHEET

COMPRESSIVE STRENGTH
STRESS - STRAIN

TEST IDENTIFICATION:

DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **BORING NO:** EP-5

DEPTH: 27' 0" - 29' 0" SEC 1 **TESTED BY:** JM

SOIL DESCRIPTION: BROWN AND GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:

INITIAL SOIL DENSITY:

WEIGHT OF SAMPLE	997.0	gm		
DIAMETER OF SAMPLE	2.80	in	7.11	cm
HEIGHT OF SAMPLE	5.60	in	14.22	cm
VOLUME OF SAMPLE	34.46	in^3	564.77	cm^3
WET DENSITY OF SAMPLE	1.77	gm/cc		
WET DENSITY OF SAMPLE	110.2	lb/cu ft		
DRY DENSITY OF SAMPLE	**1.10**	**gm/cc**		
DRY DENSITY OF SAMPLE	**68.6**	**lb/cu ft**		

WATER CONTENT:

TARE NUMBER	1	2	3
WEIGHT OF TARE (gm)	0.45	0.45	0.45
WET WEIGHT OF SOIL + TARE (gm)	12.00	18.84	19.70
DRY WEIGHT OF SOIL + TARE (gm)	7.41	12.39	12.36
WATER CONTENT (%)	65.9	54.0	61.6

AVERAGE WATER CONTENT **60.5** **%**

INITIAL VOID RATIO:

DRY MASS OF SOIL	621.1	gm		
SPECIFIC GRAVITY OF SOLIDS	2.75			
UNIT WEIGHT OF WATER	62.4	lb/cu ft	1.00	gm/cm^3
VOLUME OF SOLIDS	13.782	in^3	225.839	cm^3
VOLUME OF VOIDS	20.683	in^3	338.935	cm^3
VOID RATIO	**1.501**			

DATA SHEET

UNCONFINED COMPRESSION
STRESS - STRAIN

TEST IDENTIFICATION:

DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **BORING NO:** EP-5

DEPTH: 27' 0" - 29' 0" SEC 1 **TESTED BY:** JM

SOIL DESCRIPTION: BROWN AND GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:

VERTICAL LOAD (LBS)	VERTICAL DIAL READING (INCHES)	VERTICAL DEFLECTION (INCHES)	VERTICAL STRAIN (INCHES/INCH)	UNCONFINED COMPRESSION (LB/SQ FT)
		INITIAL READING		
57	0.010	0.010	0.0018	1,334
97	0.020	0.020	0.0036	2,270
116	0.030	0.030	0.0054	2,714
125	0.040	0.040	0.0071	2,925
124	0.050	0.050	0.0089	2,901
91	0.060	0.060	0.0107	2,129

DATA SHEET

UNCONFINED COMPRESSION
STRESS - STRAIN

TEST IDENTIFICATION:

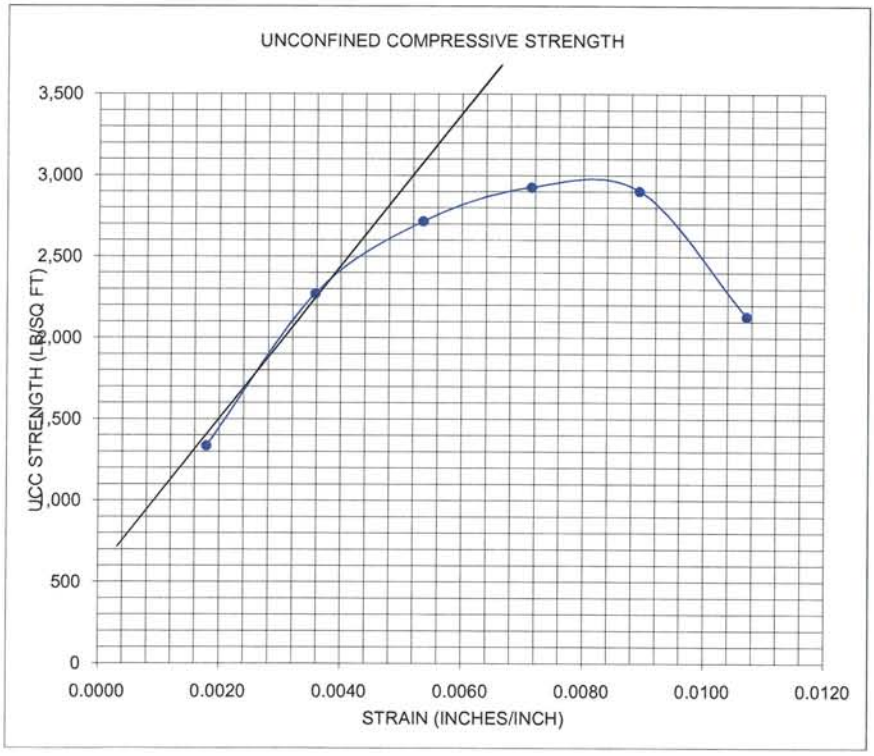
DATE: 9/9/2010 **TIME:**

PROJECT NO: 22-32-10-02 **TEST NO:** EP-5

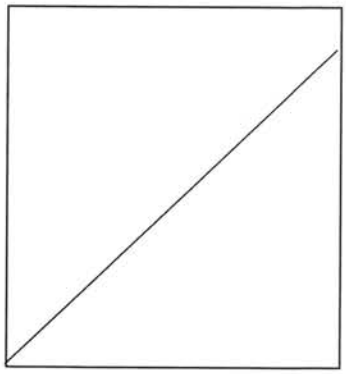
DEPTH: 27' 0" - 29' 0" SEC 1 **TESTED BY:** JM

SOIL DESCRIPTION: BROWN AND GRAY HIGHLY PLASTIC CLAY
CH A-7-5

TEST DATA:



FAILURE DIAGRAM



FAILURE ANGLE

60°

COMPRESSION MODULUS (LB/SQ FT)

386,533

NOTES: COMPRESSION LOAD RATE: 0.05 IN/MIN

VANE SHEAR = (0.5) (2.5) = 1.25 TSF

HYDROMETER TEST RESULTS

DATA SHEET

HYDROMETER ANALYSIS

(AASHTO T88 / FM-T88 / ASTM D422)

TEST IDENTIFICATION:

DATE: 9/16/2010 **TIME:** 1:00 PM

PROJECT NO: 22-32-10-02 **BORING NO:** EP-2

DEPTH: 25' 0" - 26' 6" **TESTED BY:** JM

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
SC A-2-6

TEST DATA:

HYDROMETER H151 NUMBER: #2 **CYLINDER NUMBER:** B

TEST VOLUME 1000 cm^3 **SAMPLE WEIGHT (W):** 100.0 gm

SPECIFIC GRAVITY OF SOILIDS (G) : 2.7

TEST DATA: **K CONSTANT:** 0.00425

TEMP (^{0}C)	TIME	ELAPSED TIME (T) (MIN)	HYDROMETER READING			DIAMETER IN SUSPENSION (mm)	EFFECTIVE DEPTH (L) (mm)	PERCENT BY WEIGHT IN SUSPENSION (%)
			SUSPENSION	CONTROL (G_1)	CORRECTED (R)			
FIRST READING								
20.0	6 SEC	0.10	--	--	--	-	-	-
20.0	15 SEC	0.25	1.023	1.004	1.019	-	-	-
20.0	30 SEC	0.50	1.022	1.004	1.018	-	-	-
20.0	60 SEC	1.00	1.021	1.004	1.017	-	-	-
20.0	2 MIN	2.00	1.021	1.004	1.017	-	-	-
SECOND READING								
20.0	6 SEC	0.10	--	--	--			
20.0	15 SEC	0.25	1.023	1.004	1.019	**0.08585**	102	**30.2**
20.0	30 SEC	0.50	1.022	1.004	1.018	**0.06159**	105	**28.6**
20.0	60 SEC	1.00	1.021	1.004	1.017	**0.04396**	107	**27.0**
20.0	2 MIN	2.00	1.021	1.004	1.017	**0.03109**	107	**27.0**
20.0	5 MIN	5.00	1.020	1.004	1.016	**0.01993**	110	**25.4**
20.0	15 MIN	15.00	1.020	1.004	1.016	**0.01151**	110	**25.4**
20.0	30 MIN	30.00	1.020	1.004	1.016	**0.00814**	110	**25.4**
20.2	1 HR	60.00	1.020	1.004	1.016	**0.00575**	110	**25.4**
20.2	2 HR	120.00	1.020	1.004	1.016	**0.00412**	113	**25.4**
20.2	4 HR	240.00	1.020	1.004	1.016	**0.00292**	113	**25.4**
20.0	24 HR	1440.00	1.020	1.004	1.016	**0.00119**	113	**25.4**

EQUATIONS
(OBTAINED FROM AASHTO T88)

EFFECTIVE DEPTH: FROM TABLE 2 OF AASHTO T-88
K CONSTANT: FROM TABLE 3 OF AASHTO T-88

DIAMETER IN SUSPENSION: $(K)(^{L}/_{T})^{.5}$

PERCENT BY WEIGHT IN SUSPENSION (P): $\frac{(100)\,(1606)\,(R-1)\,a}{W}$ WHERE (a): $\frac{(0.62264)\,G}{G-1}$

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE: 9/16/2010 TIME: 1:00 PM

PROJECT #: 22-32-10-02 BORING NO.: EP-2

DEPTH: 25' 0" - 26' 6" TESTED BY: JM

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
SC A-2-6

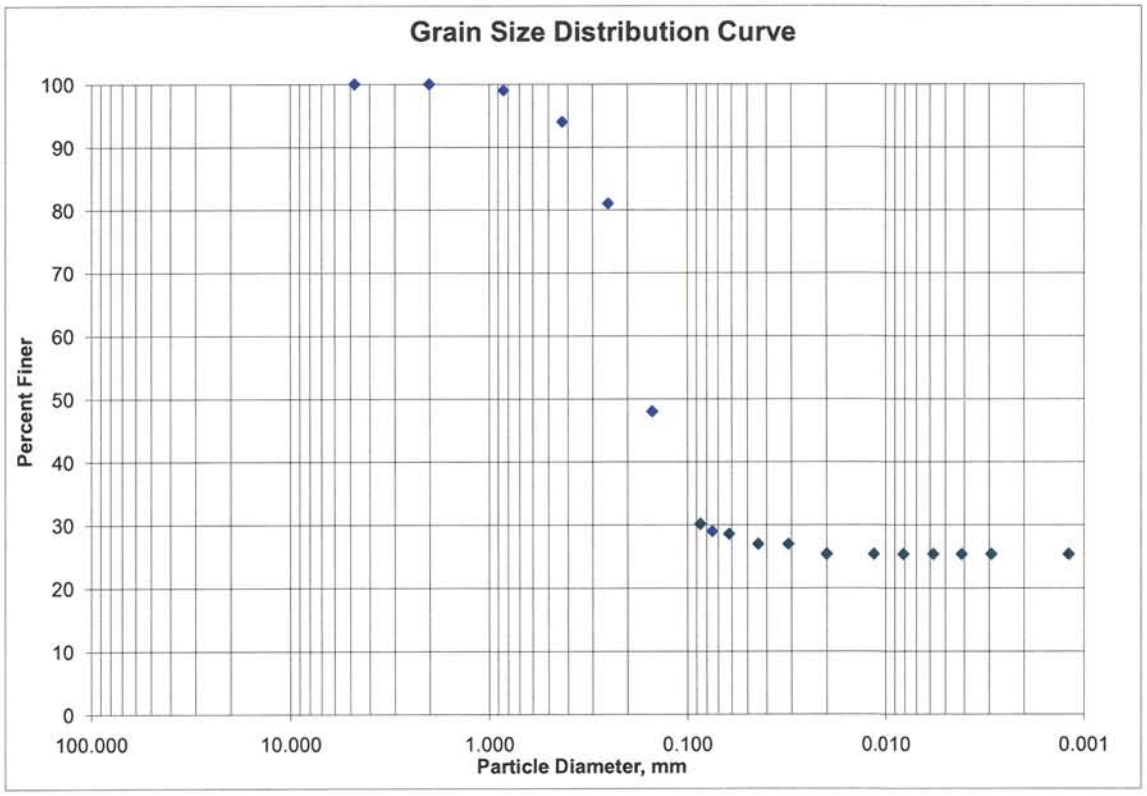
INITIAL DRY MASS OF SOIL: 100.0 gm

SIEVE NO.	SIEVE OPENING SIZE (mm)	CUMULATIVE MASS RETAINED (gm)	PERCENT RETAINED %	PERCENT PASSING %
4	4.750			100.0
10	2.000			100.0
20	0.840	1.0	1.0	99.0
40	0.425	6.0	6.0	94.0
60	0.250	19.0	19.0	81.0
100	0.150	52.0	52.0	48.0
200	0.075	71.0	71.0	29.0

ENVIRONMENTAL & GEOTECHNICAL SPECIALISTS, INC.

DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE:	9/16/2010	TIME:	1:00 PM
PROJECT #:	22-32-10-02	BORING NO.:	EP-2
DEPTH:	25' 0" - 26' 6"	TESTED BY:	JM
SOIL DESCRIPTION:	BROWN CLAYEY FINE SAND SC A-2-6		



DATA SHEET

HYDROMETER ANALYSIS

(AASHTO T88 / FM-T88 / ASTM D422)

TEST IDENTIFICATION:

DATE: 9/16/2010 **TIME:** 9:00 AM

PROJECT NO: 22-32-10-02 **BORING NO:** EP-3

DEPTH: 22' 6" - 24' 0" **TESTED BY:** JM

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
SC A-2-6

TEST DATA:

HYDROMETER H151 NUMBER: #2 **CYLINDER NUMBER:** B

TEST VOLUME 1000 cm^3 **SAMPLE WEIGHT (W):** 100.0 gm

SPECIFIC GRAVITY OF SOILIDS (G) : 2.7

TEST DATA: **K CONSTANT:** 0.0042

TEMP (^0C)	TIME	ELAPSED TIME (T) (MIN)	HYDROMETER READING			DIAMETER IN SUSPENSION (mm)	EFFECTIVE DEPTH (L) (mm)	PERCENT BY WEIGHT IN SUSPENSION (%)
			SUSPENSION	CONTROL (G_1)	CORRECTED (R)			
FIRST READING								
21.1	6 SEC	0.10	1.028	1.004	1.024	-	-	-
21.1	15 SEC	0.25	1.027	1.004	1.023	-	-	-
21.1	30 SEC	0.50	1.026	1.004	1.022	-	-	-
21.1	60 SEC	1.00	1.026	1.004	1.022	-	-	-
21.1	2 MIN	2.00	1.025	1.004	1.021	-	-	-
SECOND READING								
21.1	6 SEC	0.10	1.028	1.004	1.024	**0.12530**	89	**38.1**
21.1	15 SEC	0.25	1.027	1.004	1.023	**0.08057**	92	**36.5**
21.1	30 SEC	0.50	1.026	1.004	1.022	**0.05759**	94	**34.9**
21.1	60 SEC	1.00	1.026	1.004	1.022	**0.04072**	94	**34.9**
21.1	2 MIN	2.00	1.025	1.004	1.021	**0.02925**	97	**33.4**
21.1	5 MIN	5.00	1.025	1.004	1.021	**0.01850**	97	**33.4**
21.1	15 MIN	15.00	1.024	1.004	1.020	**0.01084**	100	**31.8**
21.3	30 MIN	30.00	1.023	1.004	1.019	**0.00774**	102	**30.2**
21.3	1 HR	60.00	1.023	1.004	1.019	**0.00548**	102	**30.2**
21.3	2 HR	120.00	1.022	1.004	1.018	**0.00393**	105	**28.6**
21.3	4 HR	240.00	1.021	1.004	1.017	**0.00280**	107	**27.0**
21.3	24 HR	1440.00	1.021	1.004	1.017	**0.00114**	107	**27.0**

EQUATIONS
(OBTAINED FROM AASHTO T88)

EFFECTIVE DEPTH: FROM TABLE 2 OF AASHTO T-88
K CONSTANT: FROM TABLE 3 OF AASHTO T-88

DIAMETER IN SUSPENSION: $(K)(^L/_T)^{.5}$

PERCENT BY WEIGHT IN SUSPENSION (P): $\frac{(100)\,(1606)\,(R-1)\,a}{W}$ WHERE (a): $\frac{(0.62264)\,G}{G-1}$

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE: 9/16/2010 TIME: 9:00 AM

PROJECT #: 22-32-10-02 BORING NO.: EP-3

DEPTH: 22' 6" - 24' 0" TESTED BY: JM

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
SC A-2-6

INITIAL DRY MASS OF SOIL: 100.0 gm

SIEVE NO.	SIEVE OPENING SIZE (mm)	CUMULATIVE MASS RETAINED (gm)	PERCENT RETAINED %	PERCENT PASSING %
4	4.750			100.0
10	2.000			100.0
20	0.840			100.0
40	0.425	1.0	1.0	99.0
60	0.250	8.0	8.0	92.0
100	0.150	49.0	49.0	51.0
200	0.075	65.0	65.0	35.0

ENVIRONMENTAL & GEOTECHNICAL SPECIALISTS, INC.

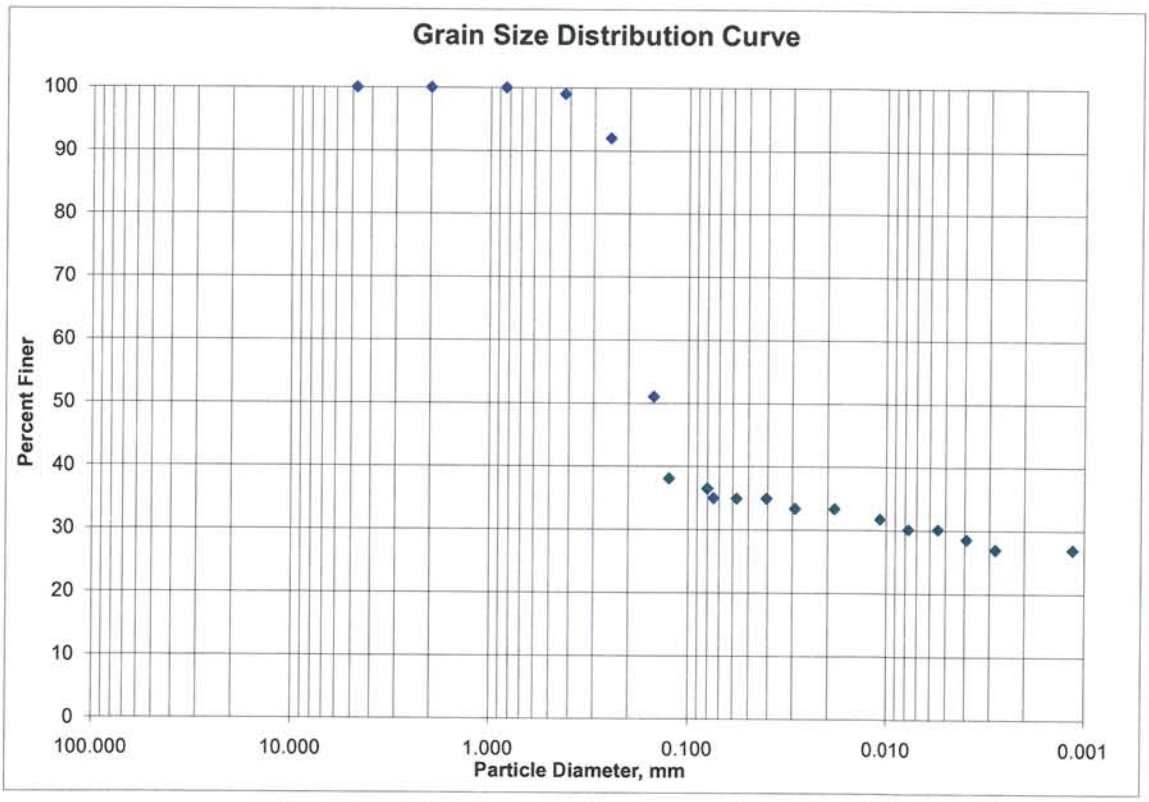
DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE: 9/16/2010 TIME: 9:00 AM

PROJECT #: 22-32-10-02 BORING NO.: EP-3

DEPTH: 22' 6" - 24' 0" TESTED BY: JM

SOIL DESCRIPTION: BROWN CLAYEY FINE SAND
SC A-2-6



DATA SHEET

HYDROMETER ANALYSIS

(AASHTO T88 / FM-T88 / ASTM D422)

TEST IDENTIFICATION:

DATE: 9/16/2010 **TIME:** 1:00 PM

PROJECT NO: 22-32-10-02 **BORING NO:** EP-5

DEPTH: 17' 6" - 19' 0" **TESTED BY:** JM

SOIL DESCRIPTION: BROWN AND GRAY CLAYEY FINE SAND
SC A-2-6

TEST DATA:

HYDROMETER H151 NUMBER: #2 **CYLINDER NUMBER:** A

TEST VOLUME 1000 cm^3 **SAMPLE WEIGHT (W):** 100.0 gm

SPECIFIC GRAVITY OF SOILIDS (G) : 2.7

TEST DATA: **K CONSTANT:** 0.004149

TEMP (^{0}C)	TIME	ELAPSED TIME (T) (MIN)	HYDROMETER READING			DIAMETER IN SUSPENSION (mm)	EFFECTIVE DEPTH (L) (mm)	PERCENT BY WEIGHT IN SUSPENSION (%)
			SUSPENSION	CONTROL (G_1)	CORRECTED (R)			
FIRST READING								
22.0	6 SEC	0.10	1.024	1.004	1.020	-	-	-
22.0	15 SEC	0.25	1.024	1.004	1.020	-	-	-
22.0	30 SEC	0.50	1.024	1.004	1.020	-	-	-
22.0	60 SEC	1.00	1.023	1.004	1.019	-	-	-
22.0	2 MIN	2.00	1.023	1.004	1.019	-	-	-
SECOND READING								
22.0	6 SEC	0.10	1.024	1.004	1.020	**0.13120**	100	**31.8**
22.0	15 SEC	0.25	1.024	1.004	1.020	**0.08298**	100	**31.8**
22.0	30 SEC	0.50	1.024	1.004	1.020	**0.05868**	100	**31.8**
22.0	60 SEC	1.00	1.023	1.004	1.019	**0.04190**	102	**30.2**
22.0	2 MIN	2.00	1.023	1.004	1.019	**0.02963**	102	**30.2**
22.0	5 MIN	5.00	1.022	1.004	1.018	**0.01901**	105	**28.6**
22.0	15 MIN	15.00	1.022	1.004	1.018	**0.01098**	105	**28.6**
22.0	30 MIN	30.00	1.021	1.004	1.017	**0.00784**	107	**27.0**
22.1	1 HR	60.00	1.021	1.004	1.017	**0.00554**	107	**27.0**
22.1	2 HR	120.00	1.021	1.004	1.017	**0.00392**	107	**27.0**
22.1	4 HR	240.00	1.020	1.004	1.016	**0.00281**	110	**25.4**
21.9	25 HR	1500.00	1.020	1.004	1.016	**0.00112**	110	**25.4**

EQUATIONS
(OBTAINED FROM AASHTO T88)

EFFECTIVE DEPTH: FROM TABLE 2 OF AASHTO T-88
K CONSTANT: FROM TABLE 3 OF AASHTO T-88

DIAMETER IN SUSPENSION: $(K)(^{L}/_{T})^{.5}$

PERCENT BY WEIGHT IN SUSPENSION (P): $\frac{(100)\,(1606)\,(R-1)\,a}{W}$ WHERE (a): $\frac{(0.62264)\,G}{G-1}$

ENVIRONMENTAL AND GEOTECHNICAL SPECIALISTS, INC.

DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE: 9/16/2010 TIME: 1:00 PM

PROJECT #: 22-32-10-02 BORING NO.: EP-5

DEPTH: 17' 6" - 19' 0" TESTED BY: JM

SOIL DESCRIPTION: BROWN AND GRAY CLAYEY FINE SAND
SC A-2-6

INITIAL DRY MASS OF SOIL: 100.0 gm

SIEVE NO.	SIEVE OPENING SIZE (mm)	CUMULATIVE MASS RETAINED (gm)	PERCENT RETAINED %	PERCENT PASSING %
4	4.750			100.0
10	2.000			100.0
20	0.840			100.0
40	0.425	1.0	1.0	99.0
60	0.250	10.0	10.0	90.0
100	0.150	55.0	55.0	45.0
200	0.075	69.0	69.0	31.0

ENVIRONMENTAL & GEOTECHNICAL SPECIALISTS, INC.

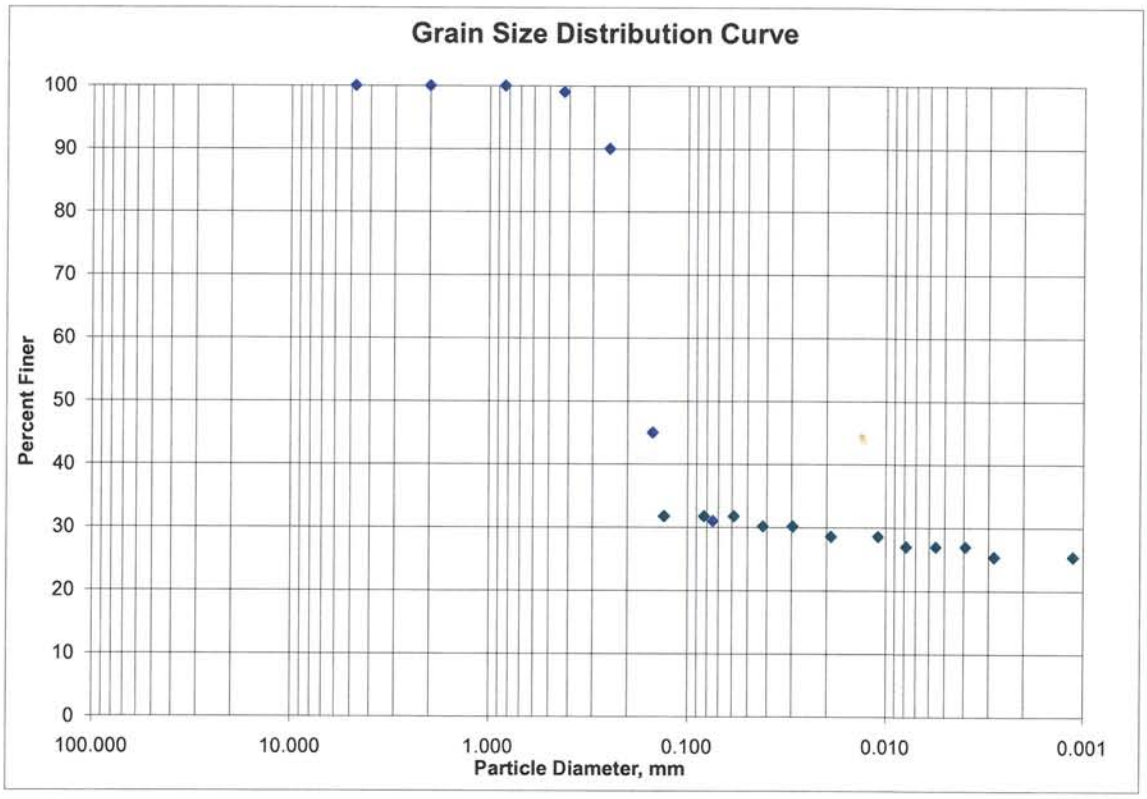
DATA SHEET
PARTICLE ANALYSIS OF SOILS - FULL SET
(AASHTO T88 / FM-T88 / ASTM D422)

DATE: 9/16/2010 TIME: 1:00 PM

PROJECT #: 22-32-10-02 BORING NO.: EP-5

DEPTH: 17' 6" - 19' 0" TESTED BY: JM

SOIL DESCRIPTION: BROWN AND GRAY CLAYEY FINE SAND
SC A-2-6



ENVIRONMENTAL & GEOTECHNICAL SPECIALISTS, INC.

APPENDIX G
SAMPLE CALCULATIONS

SWMF PARAMETERS

East SWMF Design Parameters

Boring EP-1

$k_1 = 1.5$ in/hr	$L_1 = 2.0$ ft	(mat)	
$k_2 = 0.15$ in/hr	$L_2 = 5.5$ ft	(#2)	
$k_3 = 1.5$ in/hr	$L_3 = 5.0$ ft	(#3)	
$k_4 = 0.15$ in/hr	$L_4 = 5.5$ ft	(#2)	
$k_5 < 0.01$ in/hr	$L_5 = 2.0$ ft	(#3)	
Confining Layer > 20.0 ft		(#5)	

$$SVIR = \frac{20}{\left(\frac{2.0}{1.5} + \frac{5.5}{0.15} + \frac{5.0}{1.5} + \frac{5.5}{0.15} + \frac{2.0}{0.01}\right)}$$

$$= 0.08 \text{ in/hr}$$

Boring EP-2

$k_1 = 1.5$ in/hr	$L_1 = 5.0$ ft	(#2)	
$k_2 = 0.15$ in/hr	$L_2 = 25.0$ ft	(#3)	
Confining Layer > 30.0 ft			

$$SVIR = \frac{30}{\left(\frac{5.0}{1.5} + \frac{25.0}{0.15}\right)}$$

$$= 0.18 \text{ in/hr}$$

Boring EP-3

$k_1 = 0.15$ in/hr $L_1 = 30.0$ ft (#3) $SVIR = 0.15$ in/hr

Confining Layer @ 30.0 ft

Boring EP-4

$k_1 = 0.15$ in/hr $L_1 = 25.0$ ft (#3) $SVIR = 0.15$ in/hr

Confining Layer @ 25.0 ft

Boring EP-5

$k_1 = 0.15$ in/hr $L_1 = 25.0$ ft (#3) $SVIR = 0.15$ in/hr

Confining Layer @ 25.0 ft

Average Saturated Vertical Permeability Rate

$$K_{avg} = \frac{0.08 + 0.18 + 0.15 + 0.15 + 0.15}{5}$$

$$\approx \underline{0.15 \text{ in/hr}}$$

Storage Coefficient (S_c)

n = Average Porosity $\approx$ 0.35
w = water content $\approx$ 13%
γ_{dry} = dry unit wt. of soil $\approx$ 100 lb/ft^3
γ_w = unit wt. of water $\approx$ 62.4 lb/ft^3

$$S_c = \left((0.9)\cdot n\right) - \left(\frac{w \cdot \gamma_{dry}}{\gamma_w}\right)$$

$$= \left((0.9)\cdot(.35)\right) - \left(\frac{(.13)\cdot(100)}{62.4}\right)$$

$$= \underline{0.11}$$

INFILTRATION ANALYSIS

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : TIMBERLAKE SUBDIVISION EASTSIDE SWMF
POLLUTION VOLUME RUNOFF DATA USED
UNSATURATED ANALYSIS INCLUDED

Pond Bottom Area	70,000.00 ft²
Pond Volume between Bottom & DHWL	280,000.00 ft³
Pond Length to Width Ratio (L/W)	7.00
Elevation of Effective Aquifer Base	30.00 ft
Elevation of Seasonal High Groundwater Table	50.60 ft
Elevation of Starting Water Level	55.00 ft
Elevation of Pond Bottom	55.00 ft
Design High Water Level Elevation	59.00 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.11
Unsaturated Vertical Hydraulic Conductivity	0.20 ft/d
Factor of Safety	1.00
Saturated Horizontal Hydraulic Conductivity	0.44 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.11
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

MODRET

TIME - RUNOFF INPUT DATA

PROJECT NAME: TIMBERLAKE SUBDIVISION EASTSIDE SWMF

STRESS PERIOD NUMBER	INCREMENT OF TIME (hrs)	VOLUME OF RUNOFF (ft^3)
Unsat	58.08	33,880.01
1	1.00	176,119.98
2	30.11	0.00
3	30.11	0.00
4	30.11	0.00
5	30.11	0.00
6	30.11	0.00
7	30.11	0.00
8	30.11	0.00
9	30.11	0.00

MODRET

SUMMARY OF RESULTS

PROJECT NAME : TIMBERLAKE SUBDIVISION EASTSIDE SWMF

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
00.00 - 0.00	50.600	0.000 *		
			0.00000	
0.00	50.600	0.23446		
			0.16023	
59.08	57.513	0.08600		0.00
			0.04817	
89.20	57.439	0.04502		0.00
			0.04187	
119.31	57.374	0.03926		0.00
			0.03664	
149.43	57.317	0.03449		0.00
			0.03235	
179.54	57.267	0.03063		0.00
			0.02891	
209.65	57.222	0.02752		0.00
			0.02613	
239.77	57.182	0.02502		0.00
			0.02391	
269.88	57.145	0.02299		0.00
			0.02208	
300.00	57.110			0.00

Maximum Water Elevation: 57.513 feet @ 59.08 hours Recovery @ > 300.000 hours

* Time increment when there is no runoff

Maximum Infiltration Rate: 0.198 ft/day

TIMBERLAKE SWMF
EASTSIDE