City of Tampa
Jane Castor, Mayor

Contract Administration
Michael W. Chucran, Director
306 East Jackson Street, 4N
Tampa, FL 33602

Office (813) 274-8116
Fax: (813) 274-7368

ADDENDUM 2
Via E-Mail
DATE: February 24, 2021

Contract 21-C-00012 Hillsborough River Dam North Embankment Remediation

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: A site visit is scheduled for March 2, 2021 at 11:00 a.m. Interested prospective bidders should enter the Rowlett Park Main Entrance and drive to North Embankment security gate. The security gate is in the vicinity of the Dog Park. There is ample parking. One or more representatives of the Water Department will be present to provide site access.

Item 2: Section 03600-Grouting, 5, page SP-10, Delete the following paragraph:

> The GENERAL CONTRACTOR shall submit a description of the grouting program with the cost proposal. A description of the work procedures, ground monitoring techniques, and instrumentation program shall also be included.

Item3: Attached is a copy of the Hillsborough River Dam TO-3 Phase 2 Task 1 Geophysical Investigation Report dated February 7, 2019.

Item 4: Attached is a copy of the Hillsborough River Dam Final Engineering Report dated May 24, 2019.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Management Supervisor

URS

Memorandum

Date: February 7, 2019

To: John A. Rañon, P.E., Engineer III, Water Department

From: Joseph M. Ruperto, P.E.

cc: Les Bromwell, P.E./Wood; Mark Chomtid, P.E./Wood; Ramon Martinez, P.E./URS

Subject: Hillsborough River Dam TO-3 Phase 2 Task 1 Geophysical Investigation Report

The attached report documents the geophysical field investigations conducted at the Hillsborough River Dam North Embankment as part of TO-3 Phase 2 Task 1. Included with this report is a recommendation for proposed actions to be carried out in Task 2 of this project.

URS Corporation
7650 West Courtney
Campbell Causeway
Tampa, FL 33607-1462
Tel: 813.286.1711
Fax:813.286.6587
www.urscorp.com

wood.

[illegible] 2019

[illegible]

[illegible]

[illegible]

[illegible] 24 [illegible] 25 [illegible] 201[illegible]

[illegible] 4 [illegible] 5 [illegible] 201[illegible] 14 [illegible] 201[illegible]

- [illegible]

[illegible]
1101 [illegible] 200
[illegible]
[illegible] 1 [illegible] 2 [illegible] 9 [illegible] 0 [illegible] 50
[illegible] 1 [illegible] 2 [illegible] 9 [illegible] 54 [illegible] 4 [illegible]

- [illegible]
- [illegible]

[illegible] 1 [illegible] 201 [illegible] 1040 [illegible] on behalf of [illegible] 2 [illegible] 1 [illegible] 201 [illegible]

- [illegible] 2 [illegible] 201 [illegible] Figure 1 [illegible] 2 [illegible] 1 [illegible] Figure 1 [illegible]
- [illegible] 1 [illegible] 201 [illegible] 1 [illegible]
- [illegible] 2 [illegible] 4 [illegible] Figure 1 [illegible] 1 [illegible]

2[illegible] Figures 2 [illegible] 3[illegible]

- [illegible]
- [illegible]

[illegible] 29 [illegible] 201[illegible] on behalf of [illegible] Figure 4 [illegible] Figures 5 [illegible] 6 [illegible]

- [illegible] Figures 5 [illegible] 6 [illegible] 900 [illegible] 20 [illegible]
- [illegible] 2000 [illegible]
- [illegible] Figure 4 [illegible]

[illegible]

- [illegible] Figures 5 and 6 [illegible] 201 [illegible]
- [illegible] Figure 4 [illegible] 199 [illegible] Figures 7 and 8 [illegible]

[illegible] Figures 9 and 10 [illegible] 50 [illegible] 125 [illegible]

[illegible] Figure 11 [illegible]

[illegible] Figure 11 [illegible] 100 [illegible] 100 [illegible] 2 [illegible] 2 [illegible]

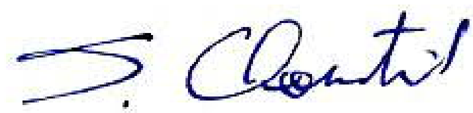
- [illegible]
- [illegible] 2 [illegible] 100 [illegible] 1 [illegible] 50 [illegible] 100 [illegible]

[illegible] 1 [illegible] 2 [illegible]

[illegible] "Task 2 Supplemental Geotechnical Investigation" will be submitted as a separated document to the City of Tampa Water Department for review and approval.

[illegible]

[illegible]

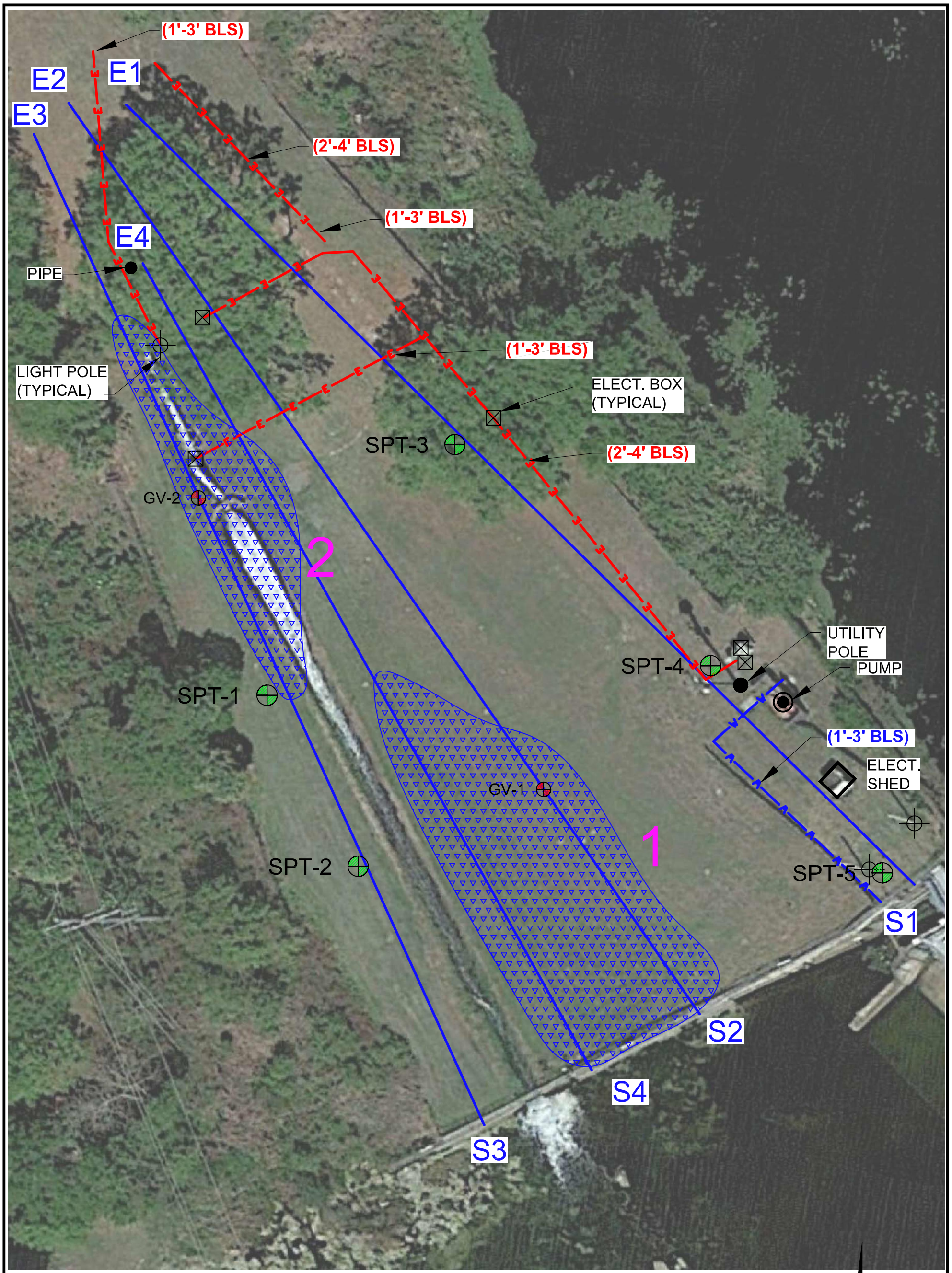


[illegible]

[illegible]

[illegible]

FIGURES



EXPLANATION

S1 E1 — ERI TRANSECT LINES WITH START AND END POINTS

LOCATION OF ERI ANOMALY WITH DESIGNATION

SPT-1 — APPROXIMATE LOCATION OF SPT BORING WITH DESIGNATION (BY OTHERS)

W — UNDERGROUND WATER LINE

E — UNDERGROUND ELECTRICAL LINE

GV-1 — LOCATION OF RECOMMENDED BORING

GOOGLE EARTH AERIAL 2018

N

0 30'

SCALE: 1"=30' APPROXIMATE

GeoView

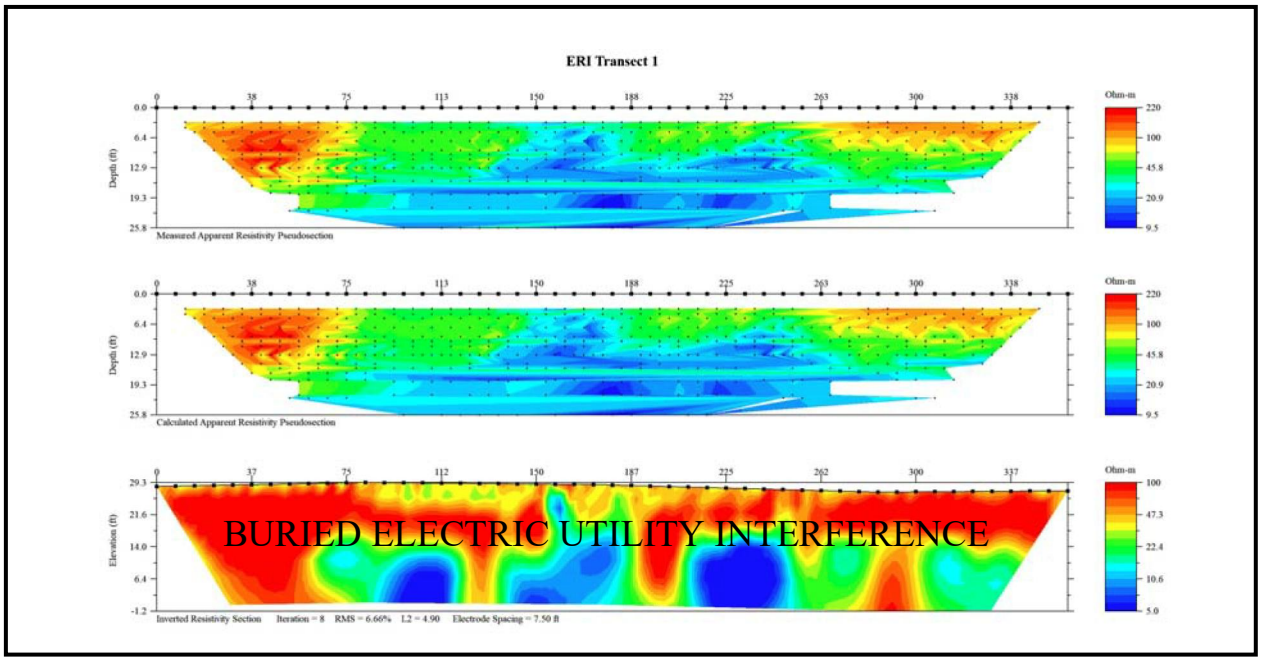
FIGURE - 1
LOCATION MAP OF ERI TRANSECTION LINES & ANOMALY FEATURES

HILLSBOROUGH RIVER DAM SITE
NORTH ROWLETT PARK DRIVE
TAMPA, FLORIDA

WOOD
TAMPA, FLORIDA

PROJECT: 27199
DATE: 08/20/18

FIGURE 2: ERI IMAGING DETAILS FOR ERI TRANSECTIONS 1 & 2



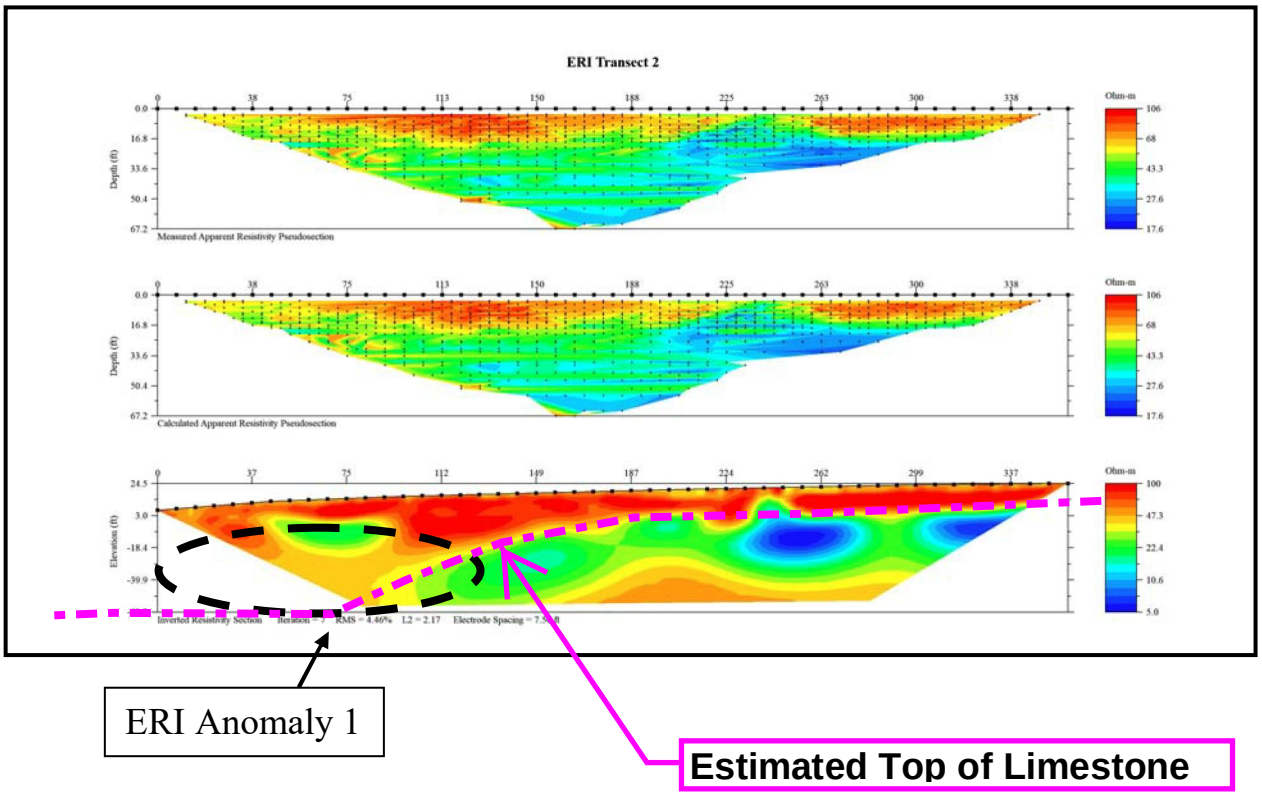
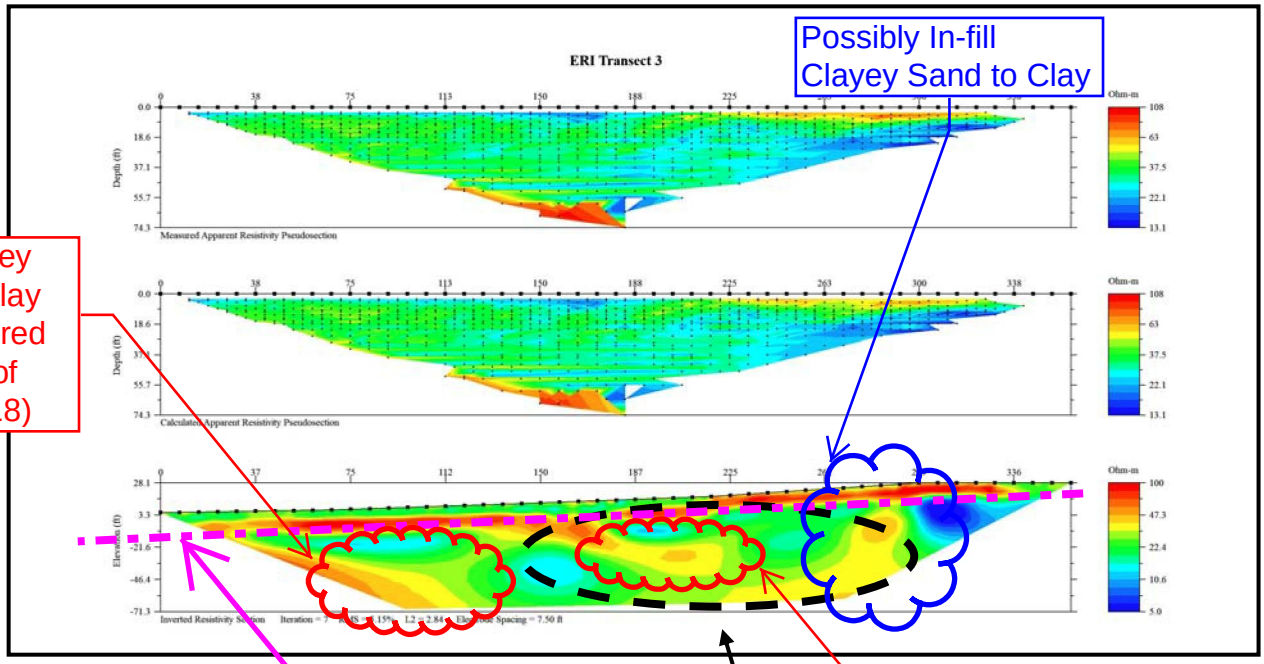
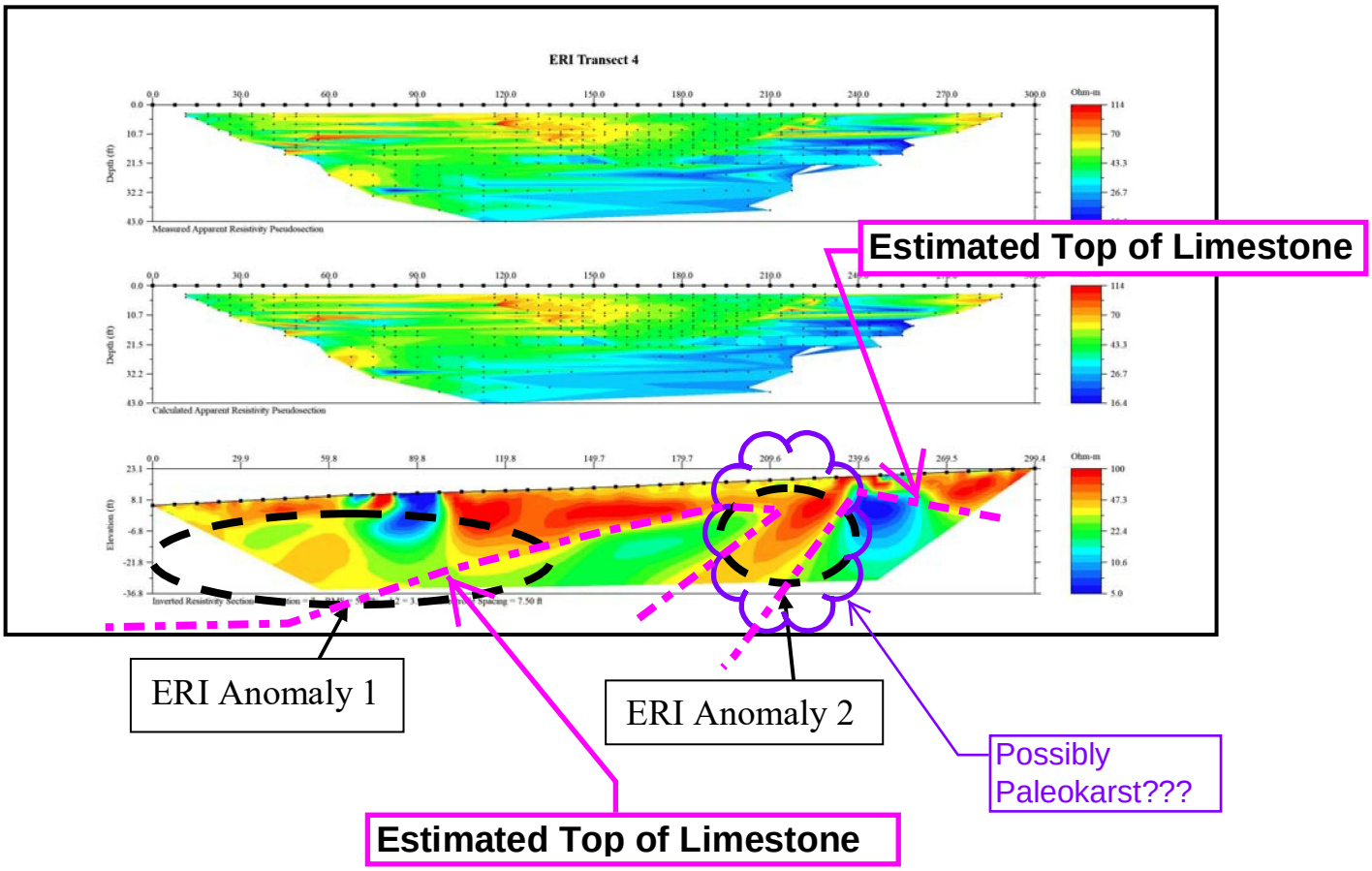
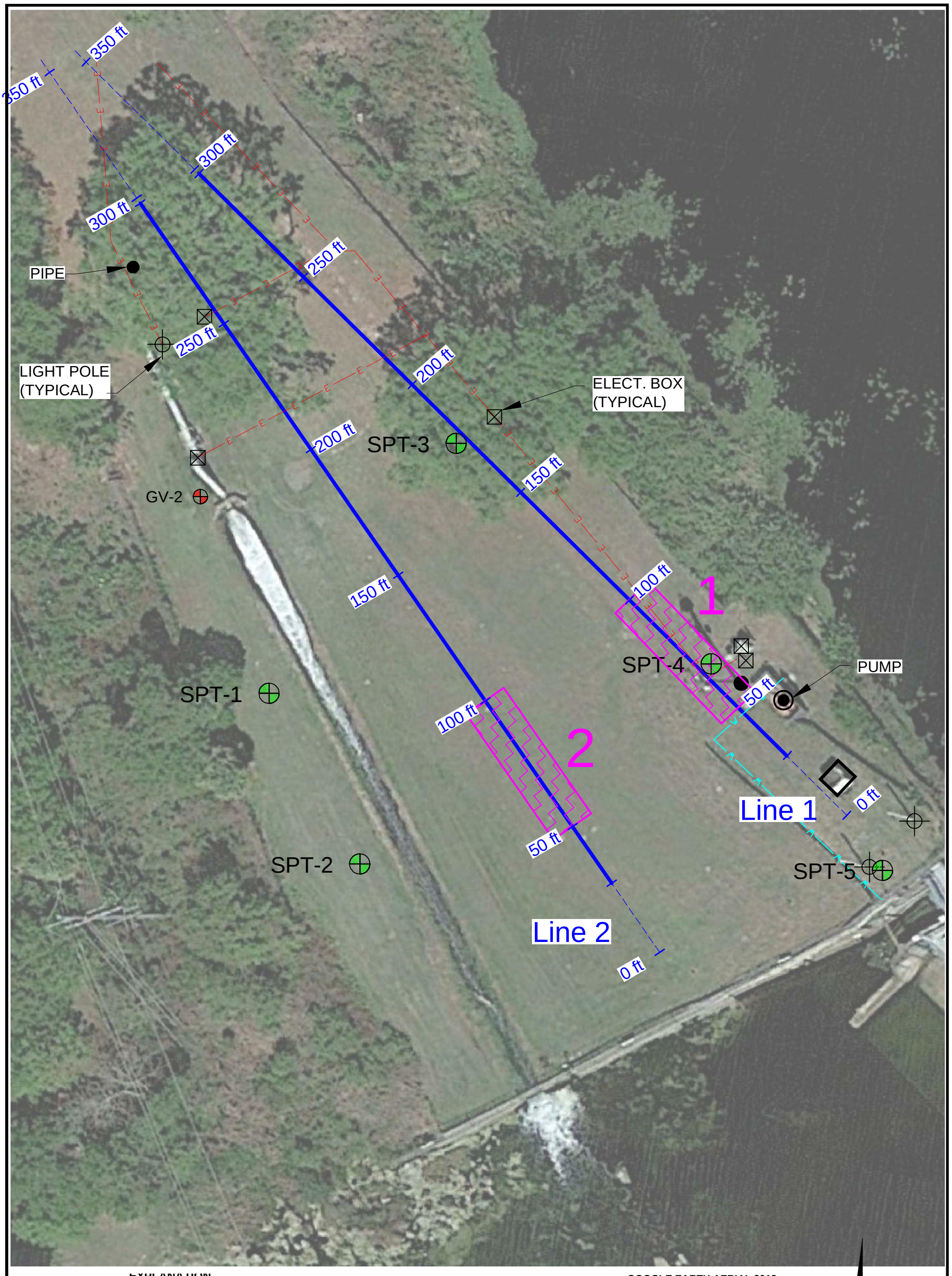


FIGURE 3: ERI IMAGING DETAILS FOR ERI TRANSECTIONS 3 & 4







EXPLANATION

- 40 ft / 90 ft — MASW TRANSECT LINES DISTANCE MARKS AND SHOT OFFSETS
- 1 — LOCATION OF MASW ANOMALY WITH DESIGNATION
- SPT-1 — APPROXIMATE LOCATION OF SPT BORING WITH DESIGNATION (BY OTHERS)
- W — UNDERGROUND WATER LINE
- E — UNDERGROUND ELECTRICAL LINE

GOOGLE EARTH AERIAL 2018

SCALE: 1"=30' APPROXIMATE

GeoView

FIGURE - 4
LOCATION MAP OF MASW TRANSECTION LINES & ANOMALY FEATURES

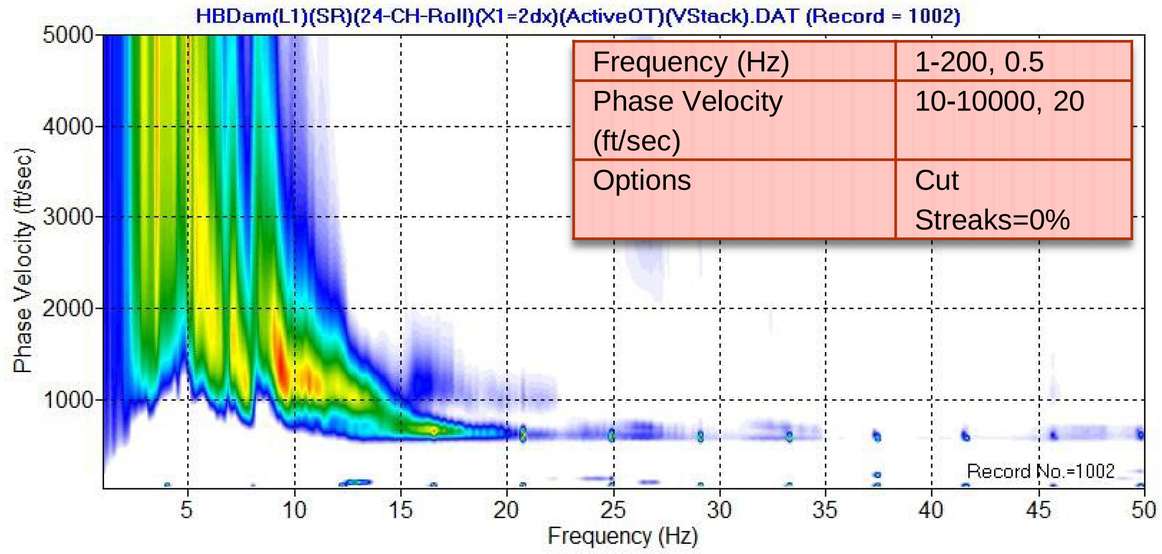
HILLSBOROUGH RIVER DAM SITE
NORTH ROWLETT PARK DRIVE
TAMPA, FLORIDA

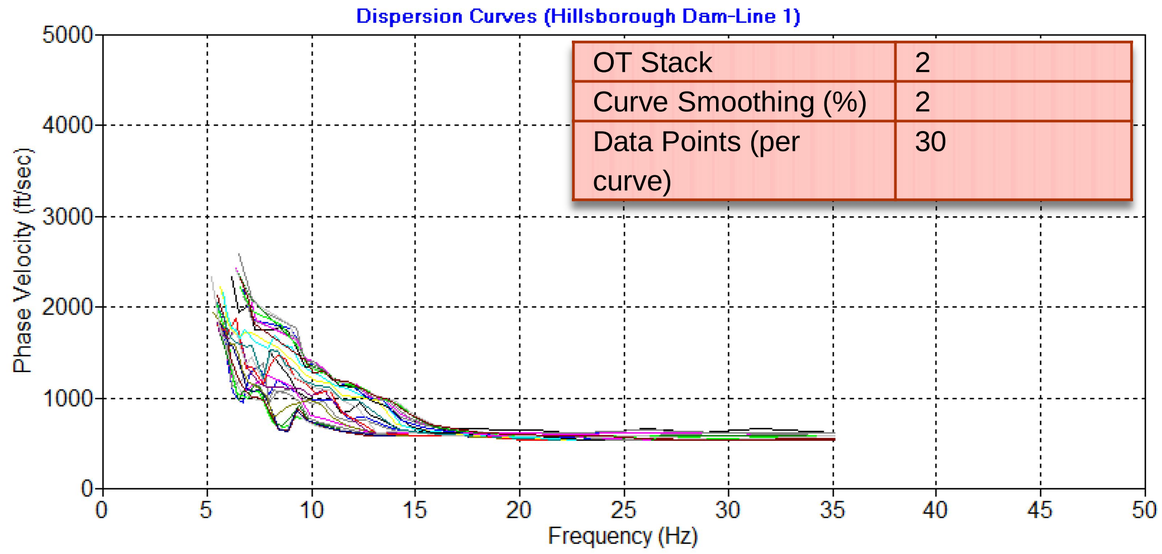
WOOD
TAMPA, FLORIDA

PROJECT: 27199.1
DATE: 10/22/18

FIGURE 5: MASW IMAGING DETAILS FOR MASW LINE 1

(a) Average Dispersion Image, (b) Extracted Dispersion Curves, and (c) Shear-Velocity (Vs) Cross Section





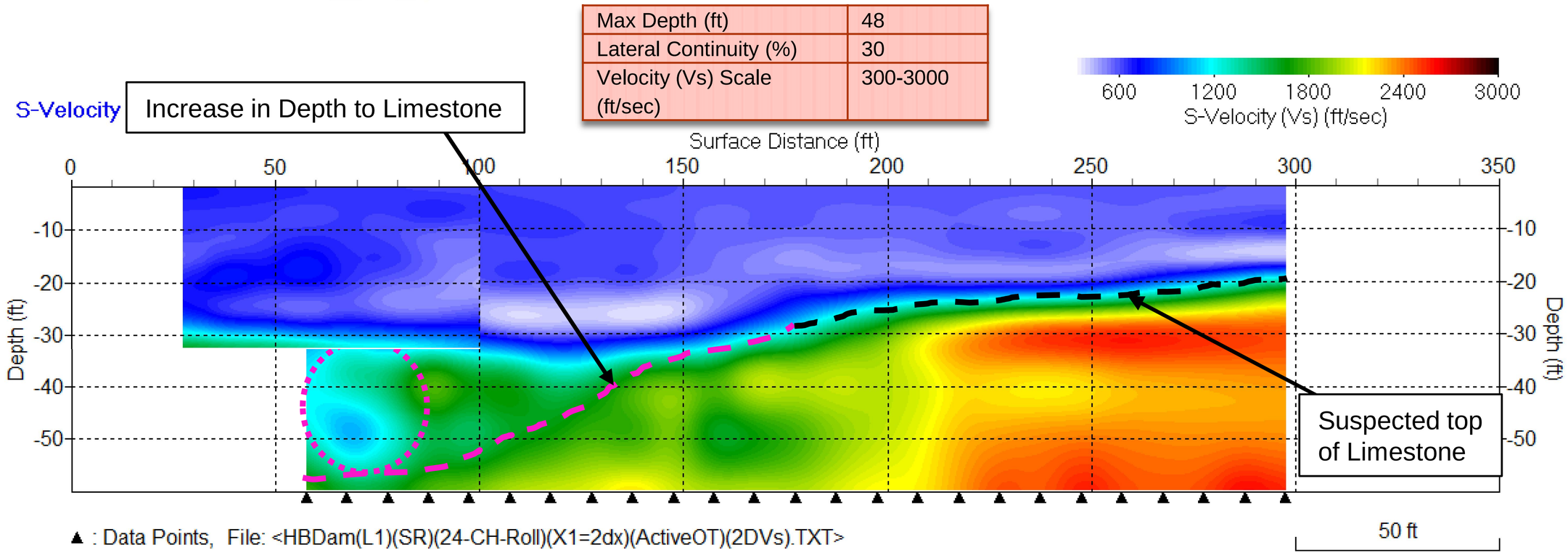
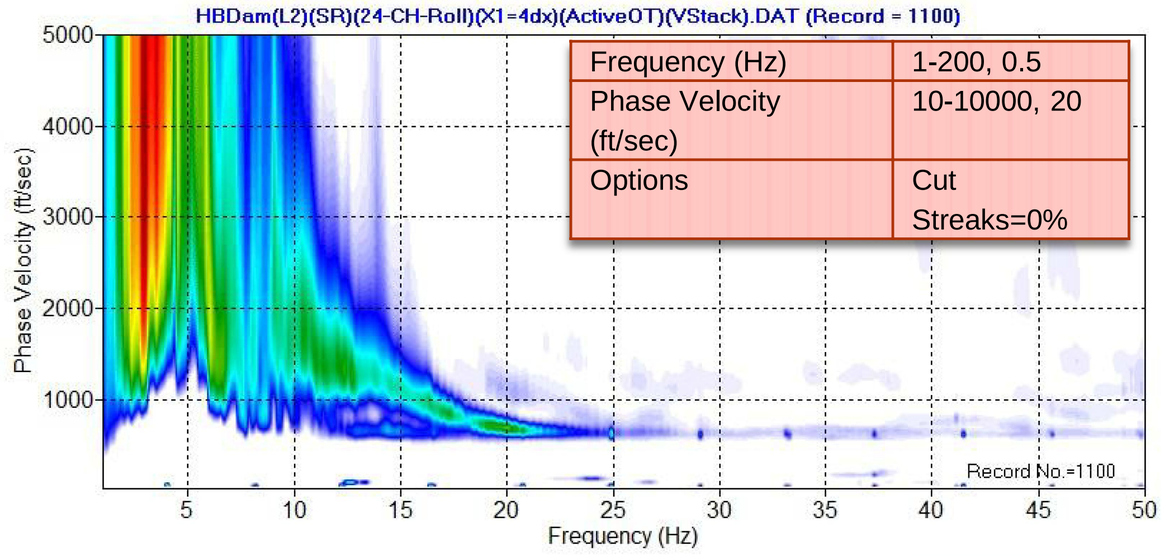
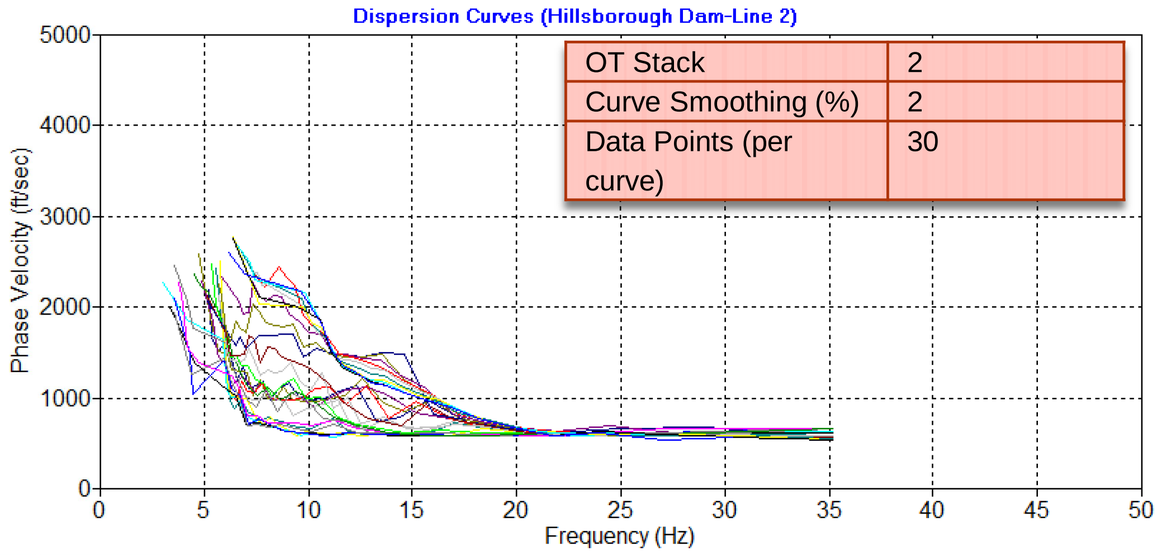


FIGURE 6: MASW IMAGING DETAILS FOR MASW LINE 2

(a) Average Dispersion Image, (b) Extracted Dispersion Curves, and (c) Shear-Velocity (Vs) Cross Section





Max Depth (ft)	50
Lateral Continuity (%)	30
Velocity (Vs) Scale (ft/sec)	300-3000

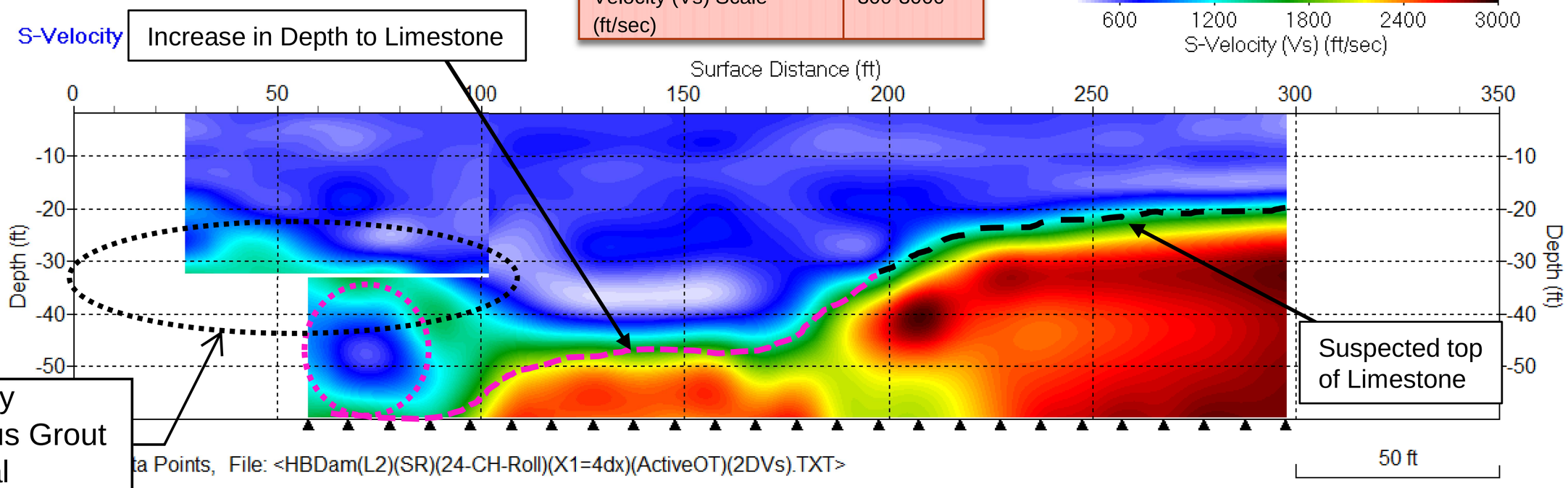
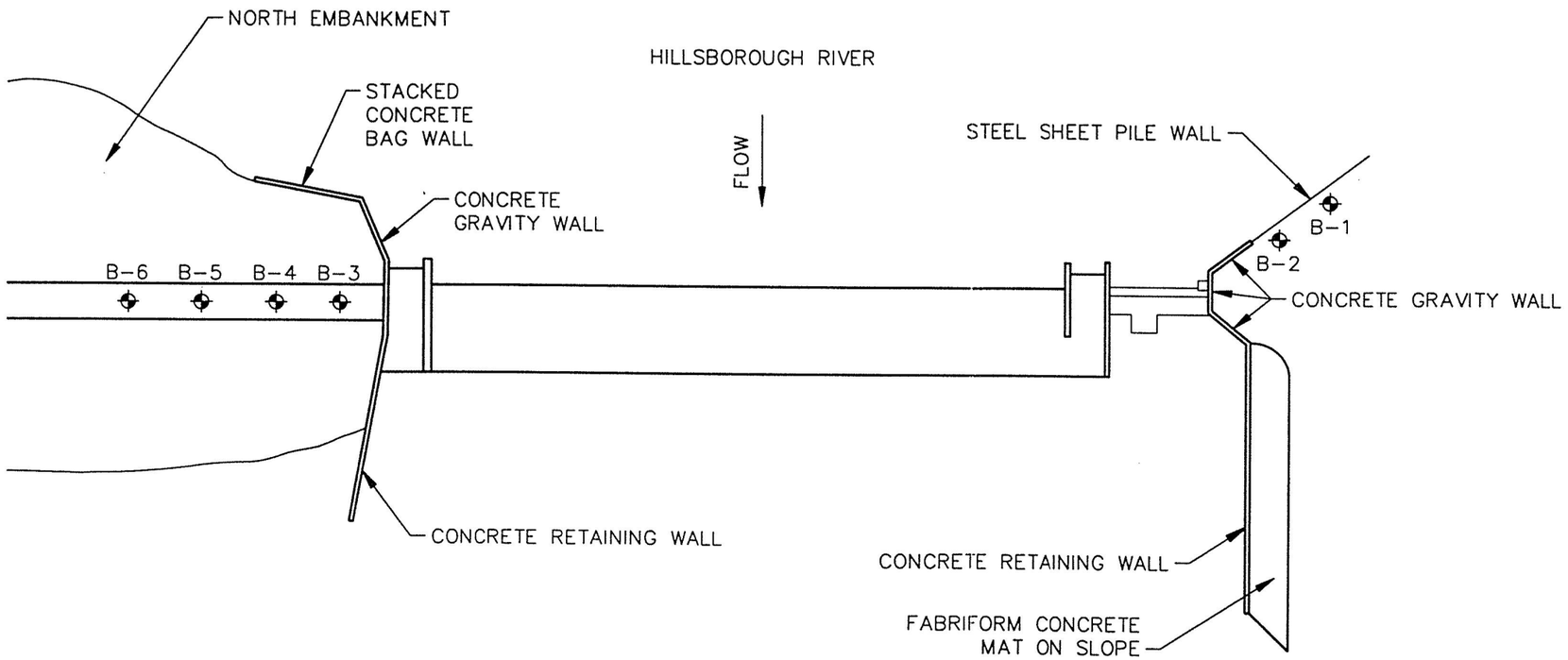


FIGURE 7: LOCATION OF 1998 SPT BORINGS BY PSI



LEGEND

⌖ Approximate SPT boring location

BORING LOCATION PLAN

NOT TO SCALE

DRAWN	JMM
CHECKED	PJE
APPROVED	CRN
SCALE	NOTED

GEOTECHNICAL SERVICES

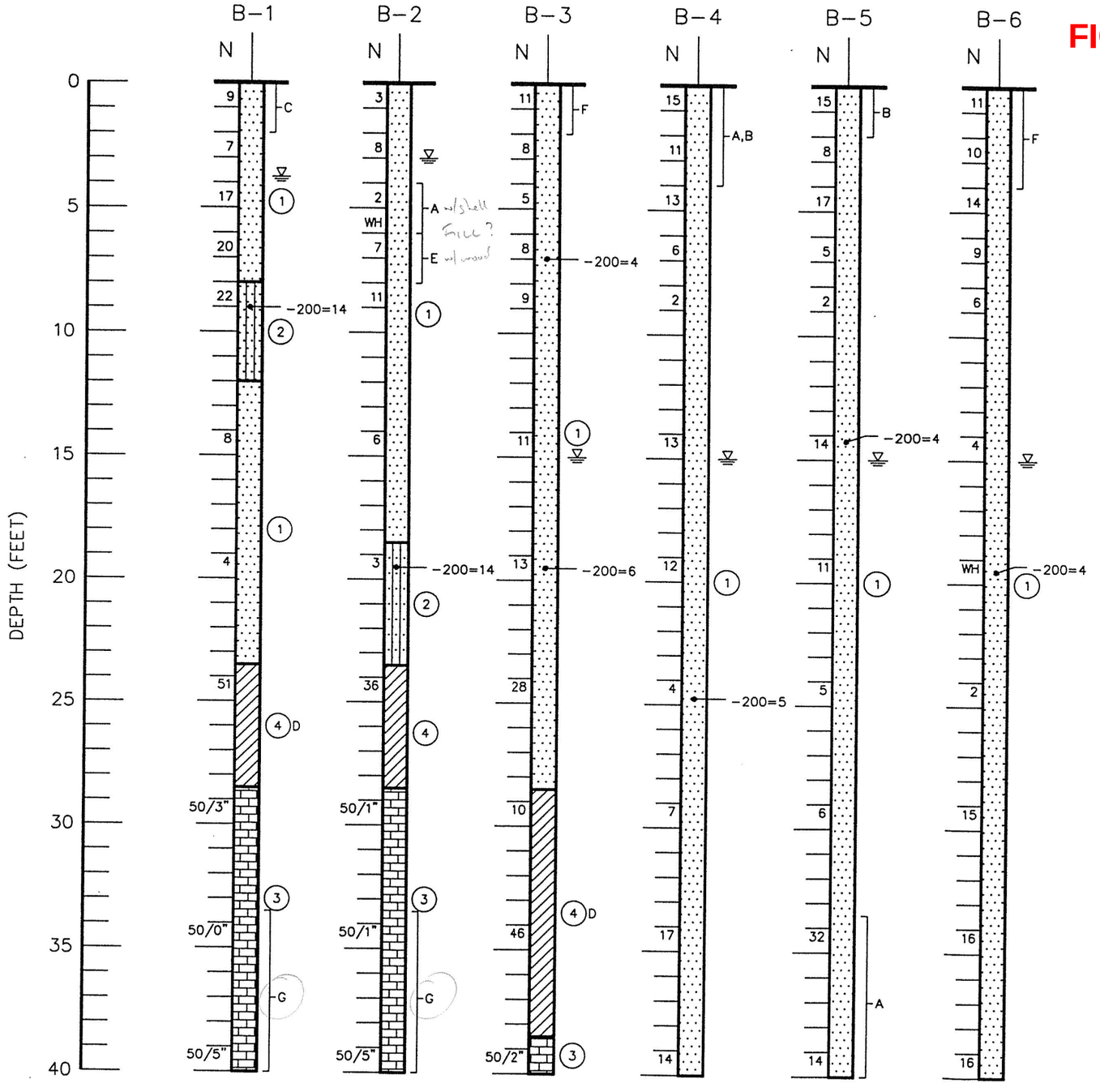
HILLSBOROUGH RIVER DAM

TAMPA, FLORIDA

psi ENVIRONMENTAL GEOTECHNICAL CONSTRUCTION

DATE	PROJ. NO.	
JAN 98	775-75361	

FIGURE 8: 1998 SPT BORING PROFILES BY PSI



SOIL PROFILES

0 5'

VERTICAL SCALE

LEGEND

1. Brown/gray to tan slightly silty fine SAND (SP/SP-SM)
2. Dark to light brown silty fine SAND (SM)
3. Weathered LIMESTONE
4. Tan to light green CLAY (CL/CH)

SP Unified Soil Classification System (ASTM D 2487) group symbol as determined by visual review

Groundwater level, October 1997

N SPT N-value in blows/foot

WH Fell under weight of rod & hammer

50/6" Fifty blows for six inches

-200 Fines passing No. 200 sieve (%)

A With shell fragments

B With clay lenses

C With slight roots

D With limestone fragments

E With wood

F With rocks

G With chert

DRAWN	KES
CHECKED	PJE
APPROVED	CRN
SCALE	NOTED

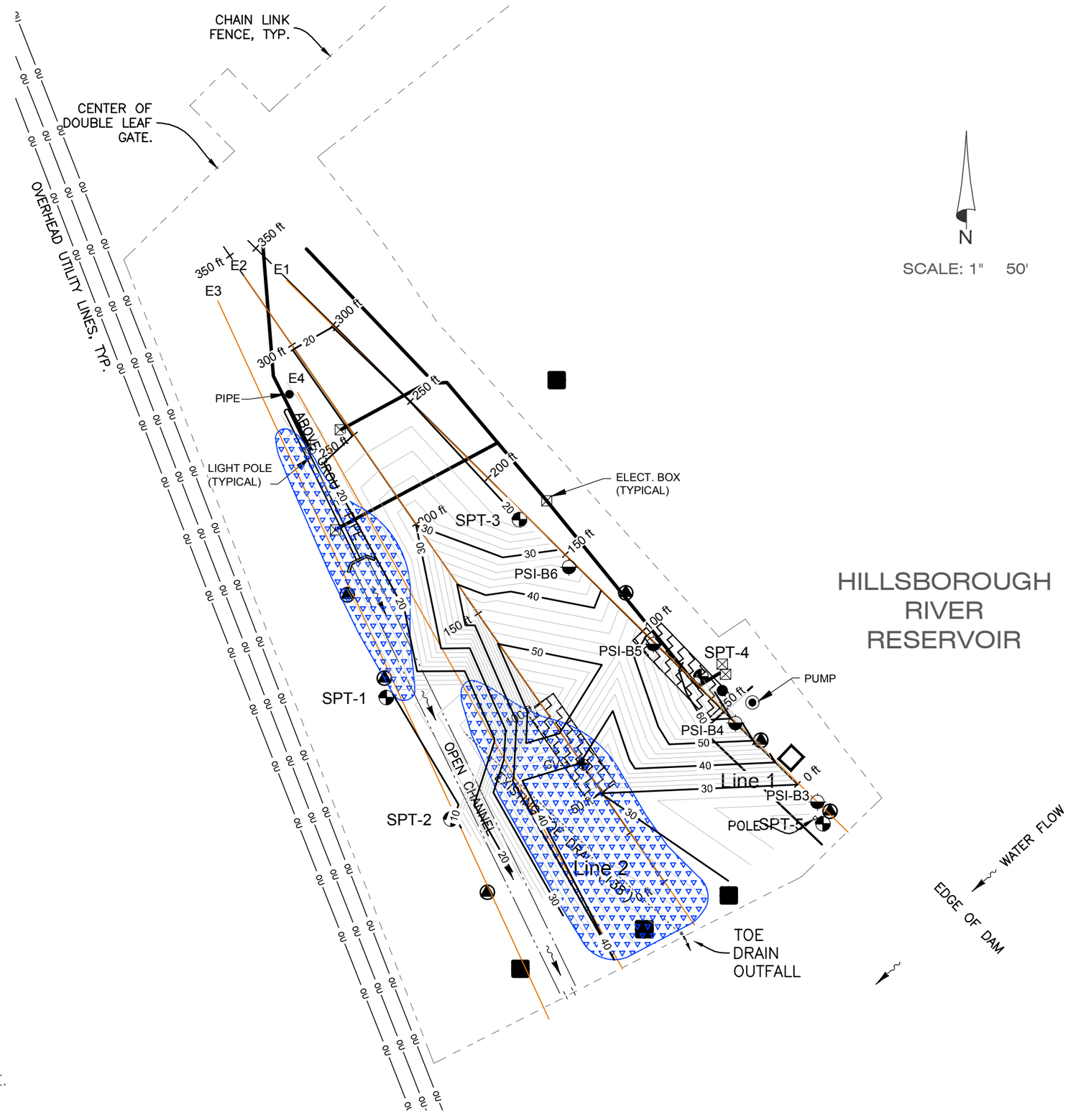
GEOTECHNICAL SERVICES

HILLSBOROUGH RIVER DAM

TAMPA, FLORIDA

psi ENVIRONMENTAL GEOTECHNICAL CONSTRUCTION

DATE JAN 98 | PROJ. NO. 775-75361



LEGEND:

- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

wood.
Environment & Infrastructure Solutions, Inc.
1715 North Westshore Blvd., Suite 625, Tampa, FL 33607
Phone: 1.813.286.0755 Fax: 1.813.286.5474
www.woodplc.com CA-0002

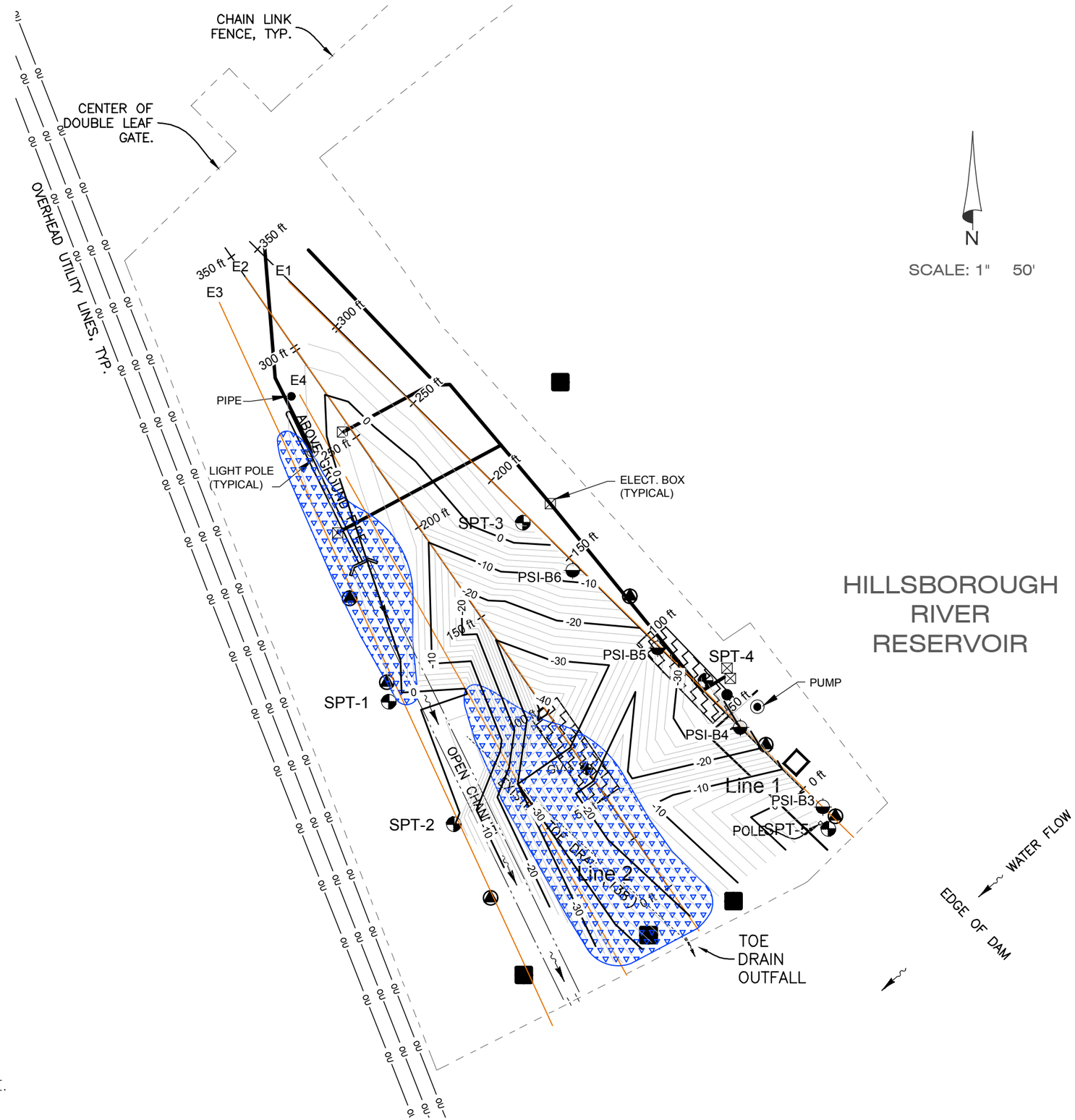
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
THICKNESS OF SURFICIAL SOIL
TAMPA, FLORIDA

DATE: December 12, 2018
DRAWN BY: M.VIVES
CHECKED BY: M. CHOMTID
PROJECT NO.: 300881x02

FIGURE 9

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2018\Nov_2018\300881x02_HR Dam_BL.dwg LAYOUT: FIGURE 9 SAVED: 12/12/2018 9:42 AM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 12/12/2018 10:12 AM BY: VIVES, MARTIN



LEGEND:

- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

wood.
Environment & Infrastructure Solutions, Inc.
1715 North Westshore Blvd., Suite 900, Tampa, FL 33607
Phone: +1.813.380.0756 Fax: +1.813.289.5474
www.woodplc.com CA-0002

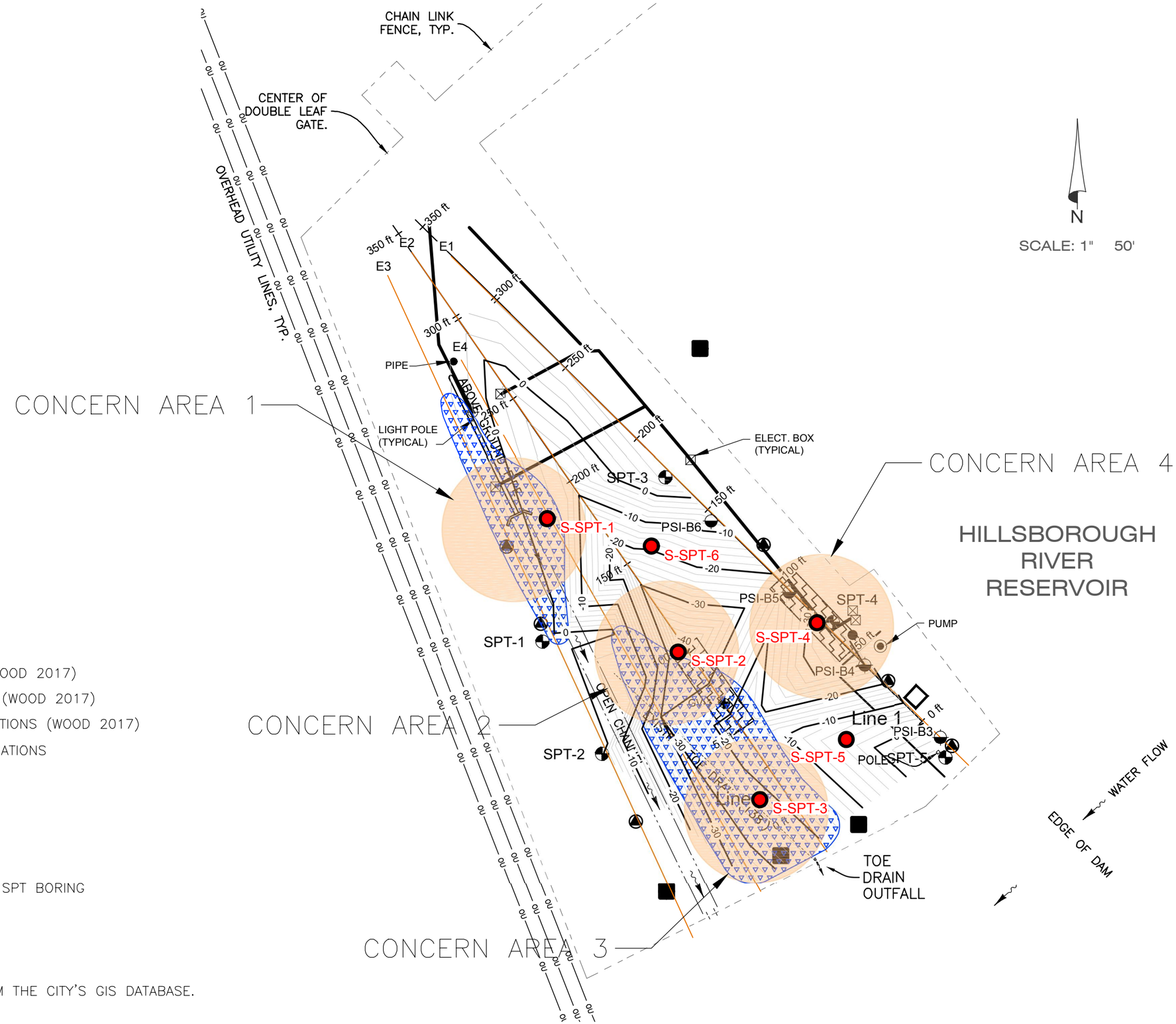
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
TOP ELEVATION OF LIMESTONE
TAMPA, FLORIDA

DATE: December 12, 2018
DRAWN BY: M.VIVES
CHECKED BY: M. CHOMTID
PROJECT NO.: 300881x02

FIGURE 10

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2018\Nov_2018\300881x02_HR Dam_BL.dwg LAYOUT: FIGURE 10 SAVED: 12/12/2018 9:42 AM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 12/12/2018 10:13 AM BY: VIVES, MARTIN



LEGEND:

- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE
- CONCERN AREA
- PROPOSED SUPPLEMENTAL SPT BORING

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

wood.
Environment & Infrastructure Solutions, Inc.
1715 North Westshore Blvd., Suite 900, Tampa, FL 33607
Phone: 1.813.286.0795 Fax: 1.813.286.5474
www.woodplc.com CA-0262

HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
CONCERN AREAS OF SINKHOLE ACTIVITY
AND PROPOSED SUPPLEMENTAL BORING LOCATIONS
TAMPA, FLORIDA

DATE: December 12, 2018
DRAWN BY: M.VIVES
CHECKED BY: M. CHOMTID
PROJECT NO.: 300881x02

FIGURE 11

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2018\Nov_2018\300881x02_HR Dam_BL.dwg LAYOUT: FIGURE 11 SAVED: 12/12/2018 9:42 AM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 12/12/2018 10:13 AM BY: VIVES, MARTIN

HILLSBOROUGH RIVER DAM
FINAL ENGINEERING REPORT

TASK ORDER 3 - NORTH EMBANKMENT STUDIES PHASE 2

Prepared for:

CITY OF TAMPA WATER DEPARTMENT
Hillsborough County, Florida

Prepared by

Wood Environment & Infrastructure Solutions, Inc.
1101 Channelside Drive, Suite 200
Tampa, Florida 33602

In Conjunction With:

7650 W. Courtney Campbell Causeway, Suite 700
Tampa, Florida 33602-1462

Wood Project No. 300881x3

May 24, 2019

CERTIFICATION
Tampa

Engineering Certification

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Wood Environment & Solutions, Inc., 1101 Channelside Drive, Suite 200, Tampa, FL 33602, a corporation authorized to operate as a business providing engineering consulting services (5392) by the State of Florida Department of Professional Regulation, Board of Engineers. I further certify that I, or others under my direct supervision, have prepared the geotechnical engineering evaluations, findings, opinions, calculations, conclusions or technical advice hereby represented in this report.

SIGNATURE: _____

NAME: Luis A. Garcia, P.E.

LICENSE NO: 76613

DATE: _____

Leslie J Bromwell

NAME: Les Bromwell, Sc.D., P.E.

LICENSE NO: 18234

DATE: 5/24/2019

Report Title: Hillsborough River Dam Final Engineering Report. Task Order 3 – North Embankment Studies Phase 2

Wood Project No: 300881x3

May 24, 2019

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LIST OF APPENDICES

1.0 BACKGROUND AND INTRODUCTION

During the past two years, in conjunction with URS, WOOD, has conducted studies of the physical conditions of the North Embankment Dam at the Hillsborough River Dam. The embankment was constructed in 1897 of earth fill. Although very little is known regarding the details of its construction, there is no record of significant issues or incidents involving the embankment since its construction.

As part of ongoing dam safety efforts by the Tampa Water Department, URS was retained to convene a Diagnostic Assessment Workshop on 24 and 25 September 2013. The assessment team identified and discussed a number of dam safety issues related to the dam. Recommendations and conclusions documented in the workshop proceedings (Silva, 2014) described a number of investigations and tasks that should be conducted to assess and improve the safety of the facility. The assessment team cited a lack of design information and geotechnical data regarding fill materials and foundation conditions at the North Embankment Dam and recommended that a geotechnical engineering evaluation be made.

In response to a proposal submitted by URS on September 6, 2017, the City of Tampa Water Department issued Task Order 3, Phase 1, under Agreement 14-D-0047 for professional engineering services between the City of Tampa and URS Corporation Southern to develop a better understanding of the physical conditions of the North Embankment Dam at the Hillsborough River Dam.

The work consisted of Standard Penetration Test (SPT) borings, CPT soundings, shallow hand auger borings, and laboratory testing of recovered samples to determine engineering parameters. Geotechnical analyses, including seepage and slope stability modeling, were performed.

The final Phase 1 engineering report was issued to the City of Tampa Water Department in June 2018. The Phase 1 investigation and evaluation concluded that the factor of safety against slope instability exceeds the minimum requirement of 1.5, and that there was no indication of instability of the downstream retaining wall. The Study also concluded that the calculated exit gradients for seepage at the downstream toe are acceptable for both normal and maximum operating water levels. Seepage through the embankment breaks out near the toe and the existing drain system along the downstream slope is partially blocked and not capable of controlling and collecting the seepage. Although current seepage conditions are not a dam safety issue, if it becomes necessary to mitigate the seepage, an adequate toe drain should be designed and installed to prevent seepage outbreaks

During the Phase 1 field investigation an infilled karst feature, caused by solutioning of the limestone bedrock over millenniums of time, was encountered in one of the SPT borings along the crest. Such in-filled paleo-karst features can reactivate, resulting in cover subsidence sinkholes, which generally settle slowly over time and can cause significant damage to

structures. The report recommended that the karst feature be further evaluated to determine if it is stable, or if remedial measures are required in order to stabilize it.

Based on the Phase 1 results, Wood recommended a Phase 2 investigation involving geophysical testing to identify the extent of anomalous subsurface conditions in the vicinity of the karst feature, which could lead to sinkhole activity.

In response to a proposal submitted by URS on January 15 of 2019, the City of Tampa Water Department issued Task Order 3, Phase 2, under Agreement 14-D-0047 for professional engineering services between the City of Tampa and URS Corporation Southern to develop a better understanding of the physical conditions of the North Embankment Dam. The results of these additional site investigations helped to develop a better characterization of the geological conditions at the site and to better identify the extent and properties of the karst feature identified in the Phase 1 work.

This report presents the results of the Phase 2 investigation and provides conclusions and recommendations for remediation of the karst feature.

1.1 Purpose and Scope of Work

Phase 2 of the North Embankment Dam Investigation involved the following tasks:

- Task 1: Perform Geophysical Investigation. The geophysical testing was conducted by Geoview, Inc. and consisted of an Electrical Resistivity Imaging (ERI) survey, supplemented by a Multi-Channel Analysis of Surface Waves (MASW) investigation. The MASW technology is a seismic exploration technique that evaluates ground stiffness by measuring shear-wave velocity of the subsurface at depths up to 30 meters. The seismic source is typically a sledge hammer or similar impact device.
- Task 2: Supplemental Geotechnical Investigation. Following the geophysical investigations, Wood performed six (6) additional SPT borings to help define the depth and extent of the karst feature, depths of the borings varied between 50 and 150 feet below ground surface. This task also included laboratory index testing on selected soil samples for classification and evaluation of remediation options.
- Task 3: Final Engineering Report and Remediation Design. The results of the ERI and MASW investigations are summarized herein. Conceptual recommendation alternatives and approximate cost estimates for the remediation have been developed and are presented.

2.0 PREVIOUS EXPLORATIONS AT THE SITE.

The previous site investigations performed at the site are as follows:

1. Geotechnical Engineering Services Embankment and Foundation Evaluation Hillsborough River Dam. Prepared on January 1998 by Professional Service Industries (PSI).

This investigation included six (6) SPT borings in the embankment and abutment areas and engineering analyses to verify the stability of the North Embankment and to evaluate the south wing wall. The PSI borings have been incorporated into this report.

2. Hillsborough River Dam Final Engineering Report – Task Order 3. North Embankment studies Phase 1. Prepared in June 2018 by Wood.

This investigation included, five SPT borings, 6 CPT soundings, and four shallow hand auger borings, along with laboratory testing and seepage and slope stability analyses. Wood recommended additional investigation of a karst feature identified along the crest of the North Embankment. The recommended additional investigation included geophysical tests and additional subsurface exploration.

3. Geophysical Investigation at Hillsborough River Dam Site. Final ERI Report. Prepared by GeoView, on behalf of Wood, on September 5th, 2018.

This additional investigation consisted of an Electrical Resistivity Imaging (ERI) survey within the footprint of the north portion of the Hillsborough River Dam. The goal was to characterize near-surface geological conditions and to identify subsurface features that may be associated with karst activity. GeoView recommended a supplemental geophysical investigation using the Multi-Channel Analysis of Surface Waves (MASW) methodology in order to collect additional data around the anomalous area.

4. Geophysical Investigation at Hillsborough River Dam Site. Final MASW Report. Prepared by GeoView, on behalf of Wood, on October 22nd, 2018.

The Multi-Channel Analysis of Surface Waves (MASW) seismic investigation consisted of two transect lines, one located along the embankment crest and the other on the downstream slope. Using the MASW results and the findings from the previous explorations, four (4) areas were identified as associated with the karst feature. These are indicators of in-filled paleo-karst activity. Due to the scattered distribution of the areas, a supplemental subsurface investigation consisting of six supplemental SPT borings was proposed in order to better define the extents of the feature.

3.0 SUPPLEMENTAL SUBSURFACE INVESTIGATION AT THE SITE

Standard Penetration Tests (SPT)

The six supplemental SPT borings were completed between February 11 and 21 of 2019. **Figure 1** shows the location of these SPT borings. **Figure 2** shows all of the SPT borings at the North Embankment dam, including those from Wood Phase 1 (2018) and PSI (1998).

The soils encountered in the borings were visually classified and logged in the field in accordance with ASTM D 2488 (Visual-Manual Procedures). Representative portions of the samples were transported to Wood's materials testing laboratory in Tampa, Florida for further classification and testing. The logs were then updated based on the results of the laboratory classification tests (see **Section 5.0**) using the Unified Soil Classification System (USCS) in accordance with ASTM D 2487.

The subsurface conditions encountered are presented on the supplemental soil boring logs (S-SPT-1 to S-SPT-6) in **Appendix A. Appendix A** also includes the previous borings performed by Wood in 2018 (SPT-1 to SPT-5). On completion, the SPT boring locations were surveyed to determine their coordinates using a handheld Garmin GPS model 72H with a reported accuracy of +/- 10 feet. The locations should therefore be considered as approximate. The ground surface elevations were estimated using the GIS contour lines obtained from the City of Tampa database.

The boring logs represent our interpretation of the subsurface conditions encountered in the field, the visual examination of field samples by our technical staff, and the results of our laboratory testing program. The lines designating the interfaces between various strata on the boring logs represent approximate interface locations. Actual transitions between strata may be gradual.

The SPT borings were performed by Madrid Engineering Group, Inc. (MEG). The drilling was completed using a track mounted drill rig. The SPT borings were conducted in general accordance with ASTM D 1586 using mud-rotary drilling methods. The top 4 feet of each SPT boring were drilled using hand augers. SPT testing was conducted continuously between 6 feet and 10 feet below ground surface and on 5-foot centers thereafter. Soil samples were collected from the borings using a 1.5-inch inner diameter split-spoon sampler driven with an automatic 140-pound slide hammer falling a distance of 30 inches. The soils from the recovered split spoon samples were visually logged in the field and the sample color was identified using Munsell color charts.

The six SPT borings were advanced to depths between 50 and 150 feet below ground surface. At the end of drilling, each SPT boring was filled with cement-bentonite grout.

Table 1 includes a list of the supplemental SPT borings performed at the site.

TABLE 1. Summary of supplemental SPT borings

Boring ID	Date Completed	Northing (ft)	Easting (ft)	Ground Elevation (NAVD 88, ft)	Boring Termination Depth (ft, BGS)
S-SPT-1	02/12/2019	1342133.8	517614.3	+18.0	50
S-SPT-2	02/14/2019	1342053.3	517695.5	+16.0	80
S-SPT-3	02/14/2019	1342006.0	517714.4	+10.0	70
S-SPT-4	02/20/2019	1342094.8	517738.2	+28.0	110
S-SPT-5	02/21/2019	1342049.5	517783.6	+21.0	55
S-SPT-6	02/19/2019	1342123.7	517664.8	+21.0	150

Notes:
Northing and Easting coordinates and elevations were measured using a Garmin GPS 72H model and rounded to the nearest tenth.
Northing and Easting coordinates are referenced to the US State Plane, Florida East Zone (901).
BGS = below ground surface.
Ground Elevations were estimated using the GIS contour lines obtained from the City of Tampa database.

Appendix B presents the January 1998 boring logs prepared by Professional Services Industries (PSI). Note that PSI borings B-1 and B-2 were not drilled at the North Embankment Dam.

4.0 SUBSURFACE CONDITIONS

Based on the findings of the subsurface investigations and laboratory testing, four generalized soil strata were identified at the site. **Figures 3** and **4** show the locations of the cross sections that were used to prepare the soil profiles presented in **Figures 5, 6** and **7**. The strata are distinguished by physical characteristics, typically grain size and plasticity. These units are described below.

Stratum 1 EMBANKMENT FILLS AND UNDIFFERENTIAL SURFICIAL SOILS.

Stratum 2 CLAYEY SANDS (SC) AND SANDS (SP), (SP-SM).

Stratum 3 LIMESTONE with trace calcareous CLAYS (CL).

Stratum 4 INFILL CLAYS: Calcareous SANDY CLAYS (CL) and CLAYS (CL) with fragments of limestone.

Stratum 1 is composed of embankment fills and undifferentiated surficial soils, sampled as SANDS (SP) to SANDS with CLAYS (SP-SC) to CLAYEY SANDS (SC) to SANDS with SILTS (SP-SM) to SILTY SANDS (SM). The color of the soils in this stratum varied from light brown to brown to light gray to gray to dark gray to orange brown to light orange brown. Also, this stratum

presented trace limestone fragments, trace shell fragments and trace organics. The depth of this stratum varied between 12 to 32 feet below the ground surface depending on the location on the slope of the embankment. The blow counts varied between 3 and 63 blows per foot, presenting very loose to very dense consistencies. In the in-filled karst zones the blow counts indicated very loose sands to very soft clays.

Stratum 2 consists of light gray to gray to dark gray to greenish gray to tan to light brown CLAYEY SANDS (SC) and SANDS (SP) with blow counts (N) varying from 3 to refusal, resulting in consistencies from very loose to very dense. This stratum varies in thickness from 5 to 20 feet and was encountered between 12 and 82 feet beneath the surface. Laboratory test results shown in **Appendix C** indicate moisture contents between 19% and 39%, fines (passing No. 200 sieve) content between 20% and 45% and plasticity index between Non-plastic (NP) and 19. These soils have infilled and replaced solutioned limestone in the karst feature. Some of the borings exhibited high blow counts, indicating stable in-filled conditions. Others, particularly in the vicinity of SPT borings SPT-4, S-SPT-4, S-SPT-6, and PSI borings PSI-B4, B-5, and B-6 exhibited low blow counts typical of raveled soils in active karst features.

Stratum 3 is composed of LIMESTONE with trace calcareous CLAY (CL). The unit consists of light gray to brown fragmented limestone with in-filled calcareous clay (CL). The blow counts present SPT-N values varying between 0 blows per foot to refusal, indicative of very weathered to hard limestone and very soft to hard clay. The thickness of this stratum varied between 5 and 13 feet and was encountered between 12 feet and 102 feet below surface. This limestone stratum was not encountered in supplemental borings S-SPT-2, S-SPT-3 nor S-SPT-4. It also was not encountered in previous boring SPT-4, or in PSI borings B-4, B-5, and B-6. The absence of limestone indicates the progression of weathering and solutioning over long periods of time. Estimated rates of solutioning of limestone in central Florida are in the range of 0.5 to 1 inch in 1,000 years (Lane, 1986).

Stratum 4 is composed of infill clays sampled as calcareous SANDY CLAYS (CL) and CLAYS (CL) with fragments of limestone. This unit consists of light gray to gray to dark gray to tan to light brown to blue gray sandy clays (CL) and clays (CL) with fragments of limestone. The thickness of this stratum varied between 5 and 43 feet and was encountered between 17 and 107 feet below ground surface. The blow counts varied from 4 to refusal, indicating consistencies of soft to hard. Areas of the karst feature with higher blow counts, including hard or refusal, are considered to be stable. Areas that have low blow counts and typically soft clays are likely active or subject to reactivation.

General Strata Observations

- **Figures 2, 3, and 4** show the anomaly areas indicated by the ERI and MASW geophysical investigations. The figures also show the location of loose or soft in-filled soils found in the SPT borings where the limestone is either highly weathered or absent due to solutioning. This part of the in-filled karst area is highlighted as "Area of Concern." This

area of concern is also shown on the soil profiles in **Figures 5**, **6** and **7**.

- **Figures 3 and 4** also show the locations of six cross sections selected to show subsurface soil and rock conditions at the North Embankment Dam. **Figures 5**, **6** and **7** show the cross sections, which include all of the SPT borings. It can be noticed that the top of the limestone rock, where limestone has not been completely solutioned, varies significantly between elevations +8 to -80.0 feet. This illustrates the tremendous variation in the solutioning of the limestone from one section of the dam to another. It is also worth noting that previous borings beneath the concrete dam section have indicated that the top of rock is at approximately elevation 0, with no indication of significant karst formation. However, it should be recognized that there are few borings beneath the concrete section, and they are limited to the northern part of the dam.

- Based on available information, it appears that the area susceptible to potential karst activity reactivation (Area of Concern – see **Figure 2**) extends along the crest of the southern part of the Embankment for a distance of approximately 300 feet and extends down from the crest elevation of 28 feet to an elevation of 17 feet on the downstream slope.

5.0 LABORATORY TESTING

The soil samples collected during the subsurface exploration program were transported to Wood's materials laboratory in Tampa, Florida. Selected samples were tested for natural moisture content (ASTM D 2216), percent of material finer than the #200 sieve (ASTM D1140), and Atterberg Limits (ASTM D 4318). Soils were classified in general accordance with ASTM D 2487. A summary of the laboratory test results is presented in **Table 2.** Laboratory test results are also presented in **Appendix C** and are generally consistent with our field descriptions. A detailed discussion of the strata encountered in this subsurface exploration was presented in **Section 4**.

The laboratory test results were used to modify the field logs for presentation in the Boring Logs in **Appendix A**.

TABLE 2. Laboratory Test Data Summary by Strata [(1)]

Stratum No.	Description	Moisture Content (%)	% Finer #200 Sieve	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
2	CLAYEY SANDS (SC) AND SANDS (SP)	19%-39%	20%-45%	34-37	15-24	NP-19
4	INFILL CLAYS: Calcareous SANDY CLAYS (CL) and CLAYS (CL)	51%-73%	58%-82%	54-66	18-23	31-48

(1) Strata 1 and 3 were not analyzed for laboratory tests.

6.0 GROUNDWATER CONDITIONS

The initial portion of each of the borings was advanced by dry-auger methods to depths of 4 ft below ground surface. Groundwater was not observed during these initial dry-auger borings. Following the hand augers, rotary mud drilling was utilized to the boring termination depths. Due to the wet method of drilling and since the boreholes were grouted after investigations were completed, the location of the phreatic line was not determined.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Karst feature stabilization

After reviewing the investigations performed at the site, it is Wood's opinion that a portion of the infilled karst feature found at the North Embankment Dam is potentially susceptible to reactivation that could result in significant subsidence and potential breaching of the dam.

Fluctuations in water levels in the dam, due to changes in reservoir and/or downstream water levels, as well as rainfall infiltration, result in changes in the state of stress within the karst feature. Such changes can cause reactivation of infilled karst features, leading to subsidence and sinkhole formation (Smith and Horowitz, 2004).

Although a portion of the infilled karst feature exhibits low blow counts and raveling of soils, there has been no surface indication of significant subsidence. Given the age of the Dam, the feature has been stable for a long period of time. Nevertheless, the consequences of a significant subsidence event, and the inability to forecast future events, require conservative thinking and planning regarding remediation and stabilization of the feature. Our recommendation is that the City Water Department proceed with the necessary work as soon as practical.

Based on our 30+ years of experience in sinkhole evaluations and remediation, it is our opinion that the only economic alternative to stabilize the karst feature on the North Embankment is by

grouting with a cementitious Low Mobility Grout (LMG) material. Therefore, this method is recommended to stabilize the North Embankment. The intent of the grouting is to densify and stabilize the raveled soil zones, infill the weathered limestone, and seal any karst-related fractures and/or cavities with a stable material.

The recommended grouting program should consist of a series of primary vertical grout injection points in the area of concern identified by the geotechnical explorations, as shown in **Figure 8**. A LMG grout should be utilized to ensure effective treatment of the loose/raveled zones and to reduce migration of grout beyond the affected areas.

We estimate the grout quantity will be between 1,130 and 2,260 cubic yards. The LMG grout should have a slump of 3 to 5 inches at the hopper with a minimum compressive strength of 400 psi at 28 days. The recommended maximum injection pressure should be 150 psi above line pressure.

The proposed remediation plan consists of one hundred twenty-six (126) primary vertical grout injection points, on a 10 ft by 10 ft pattern, at the locations shown on **Figure 8**. We note that additional, intermediate grout points (secondary and tertiary) may be necessary if high grout volumes are recorded during the grouting program. In that case the grouting program may move outside the proposed primary grouting area until stable conditions are encountered.

The grout casings should be installed into firm limestone bedrock or a competent soil stratum, which is estimated to occur at depths between 40 and 110 feet below grade based on the SPT borings. Due to the local zones of very soft and raveled soils, appropriate drilling equipment should be utilized to ensure the grout injection pipes are installed to the required depths. During grout point installation, care should also be taken to identify the soil materials to ensure the grout pipes are not installed to depths significantly below the competent limestone surface and should be limited to a maximum of 2 feet into competent limestone. Each grouting operation should start at the bottom depth and continue upward in 5-foot increments until reaching 10 feet from the ground surface. As grouting proceeds, constant monitoring of the ground surface will be required to avoid uplifting. Grouting pressures will be reduced as necessary to prevent uplift and no grouting will be done within 10 feet of the ground surface

During mobilization and prior to grouting, particular care should be taken to identify subsurface obstructions at the site that could potentially be damaged (such as underground pipes, utilities, etc.). In case grout point locations need to be moved, it is recommended to confirm with the owner's inspector.

During the grouting, it is recommended that the owner's inspector continue to monitor any seepage observed in the downstream portion of the North Embankment and to visually note any indications of surface movement or subsidence.

Depending upon the grout take volumes at injection points on the crest, it may be necessary to

grout on the upstream side of the dam. If upstream grouting is required, it may be necessary to either lower the reservoir water level, or mobilize a barge in order to access these grout locations.

Toe Drain

Figure 1 shows the location of an existing PVC toe drain on the downstream slope of the embankment, which originally was 200 feet long, and is located on the downstream side of the North Embankment. This toe drain was installed in early 1980s. An inspection of the drain on January 5, 2018 by Kissinger Campo, Inc. field technicians revealed that the pipe is plugged at a distance of 138 feet from the outlet, which is approximately where a discharge flume for water pumped from Sulphur Springs crosses the drain location.

Wood recommends performing a pipe inspection by a qualified company that can deploy a video camera inside the pipe and provide a video for engineering evaluation. The inspection should include a cleaning of the pipe, a determination of the cause of the obstruction and removal of it, if feasible.

It is worth noting that the location of the existing PVC toe drain does not interfere with the grouting locations shown in **Figure 8**.

Monitoring Wells

Monitoring wells and piezometers should be installed at the North Embankment Dam to provide ongoing information regarding changes in water levels and water pressures beneath the crest and at downstream toe of the dam. Such instrumentation will provide information regarding the future performance of the dam, and can indicate changes that may reflect the development of adverse conditions. A monitoring plan, identifying the locations and depths of the instruments, along with a cost estimate and schedule for reading the instruments, should be developed after the grouting plan is completed, in order to avoid potential damage to the instruments during grouting.

8.0 GROUTING COST ESTIMATE

Table 3 presents the conceptual cost estimate for the compaction grouting and **Table 4** presents the cost estimate for the grout monitoring work and as-built report:

Table 3. Conceptual Cost Estimate of the Low Mobility Grout Remediation Program (1)

Item	Estimated Quantity	Unit Cost	Sub-Total
Mob/Demob for LMG Grouting	2	$2,500	$5,000
Installation of LMG Grout Casing	11,310 feet	$18/LF	$203,580
LMG Grout Injection	1130 to 2,260 CY	$170/CY	$192,100 to $384,200
		TOTAL	$400,680 to $592,780

(1) This cost estimate only considers primary grout points. A supplemental cost estimate will be prepared if secondary and tertiary grout points are required.
(2) LMG = Low Mobility Grout

Table 4. Preliminary Cost Estimate of Monitoring the Grout Remediation Program (1)

Task / Deliverable	Unit Cost	Hours / Day	Days	Sub-Total	Comment
Principal Engineer	$205/hr	4	4	$3,280	Periodic Site visits
Sr. Geotechnical Engineer	$140/hr	4	12	$6,720	Periodic Site visits
2 Field Technicians	$75/hr	10	115	$172,500	Includes Grout Monitoring, Oversight and Progress Reporting
As-Built Report	$5,000	-	-	$5,000	Engineering Report Package (Lump Sum)
			TOTAL	$187,500	

(1) This cost estimate only considers primary grout points. Another cost estimate will be prepared if secondary and tertiary grout points are required.

The total conceptual cost estimate for the remediation work ranges from **$588,180** to **$780,280.**

Note that the estimated fees of the monitoring program will vary depending on actual construction activities and schedules, which will be determined by the contractor.

As mentioned before, the remediation plan and cost estimates were prepared assuming that only primary grouting points will be needed. We anticipate that a more detailed grouting plan, including bid documents, technical specifications and engineer's cost estimate, will be prepared in the next phase of the project.

9.0 REPORT LIMITATIONS

The conclusions and recommendations presented in this report assume that site conditions are not substantially different than those encountered by the explorations. If during construction, subsurface conditions are observed or appear to be different from those encountered in the explorations, Wood should be advised promptly so that those conditions can be reviewed, and recommendations reevaluated, where necessary.

The boring logs represent the subsurface conditions at the specific location at the time of the exploration. The subsurface conditions at other locations or at different times may differ, and no warranty as to the subsurface conditions elsewhere or at different times is expressed or implied by the data presented herein. Furthermore, the depths on the boring logs designating the interface between the various soils and rocks may only be approximate boundaries where the transition is gradual or could not be detected by the boring operations. In addition, the depth of the groundwater table, if encountered, is only indicative of the conditions at the time of the borings as groundwater level may fluctuate significantly because of various factors.

The recommendations provided in this report are based on the scope of the exploration and testing program. In addition, this report does not reflect the subsurface conditions below the tested depths.

The evaluation of conditions that may be encountered in construction requires engineering judgment and interpretation. For this reason, we recommend that Wood remain involved with this project during the construction process, particularly during grouting operations. If we are not retained during construction, we cannot assume responsibility for misinterpretation of our recommendations, or for unfavorable foundation performance as a result of judgments rendered by others.

10.0 REFERENCES

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Silva, Francisco, 2014. "Hillsborough River Dam Diagnostic Assessment Workshop Proceedings", prepared for City of Tampa Water Department.

Smith, Ted J. and Mark Horowitz, 2004, "Characteristics of Stable and Reactivated In-Filled Paleo-Karst Features in West-Central Florida," in Sinkholes and the Engineering and Environmental Impacts of Karst, Geotechnical Special Publication 122, ASCE.

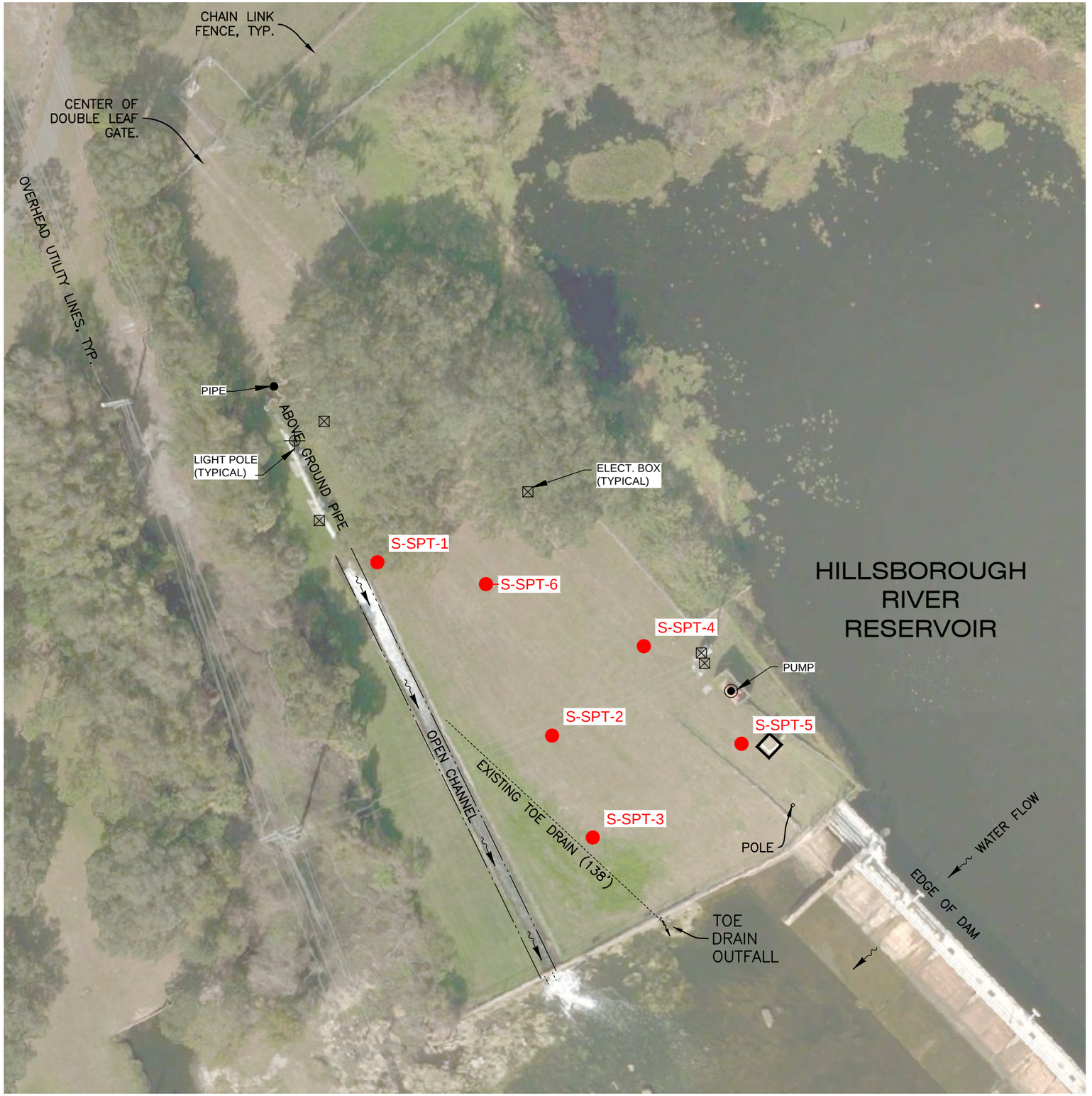
Stewart, J.W. and L.R. Mills, 1983, "Hydrogeology of the Sulphur Springs Area, Tampa, FL," USGS Water Resources Investigations Report 83-4085.

Wood Environment and Infrastructure Solutions, Inc., June 2018, "Hillsborough River Dam Final Engineering Report – Task Order 3. North Embankment studies Phase 1".

FIGURES

N

0 50 100 Feet



LEGEND:

- SUPPLEMENTAL SPT BORING (WOOD 2019)

NO.	DATE	REVISION

wood.
Environment & Infrastructure Solutions, Inc.
1011 Technology Park Drive, Glen Allen, VA 23059
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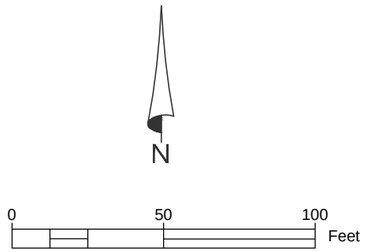
www.woodplc.com CA-0582

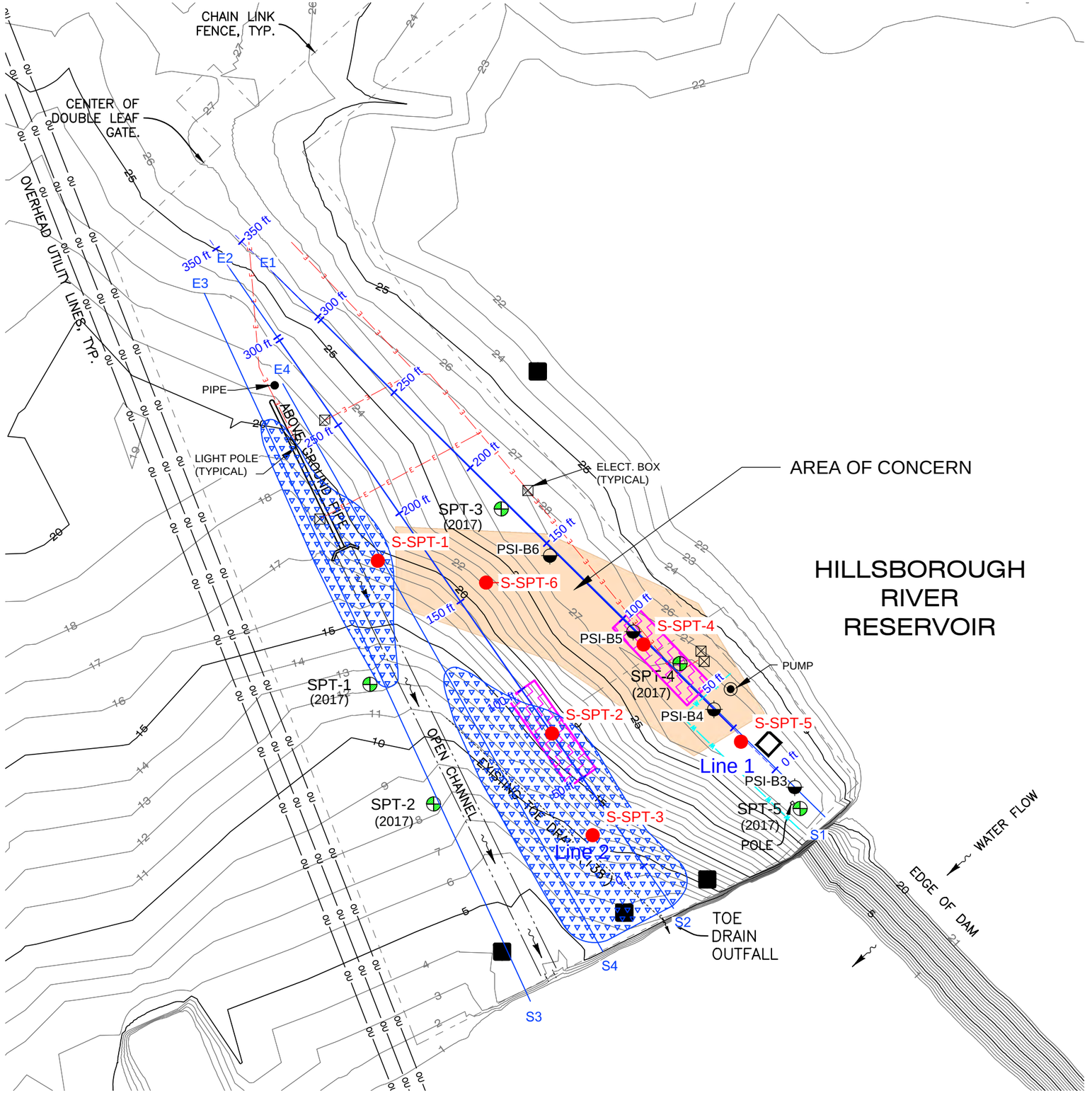
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
WOOD'S SUPPLEMENTAL BORING LOCATION MAP
TAMPA, FLORIDA

DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L. GARCIA
PROJECT NO.: 300881x02

FIGURE 1





LEGEND:

- SUPPLEMENTAL SPT BORING (WOOD 2019)
- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE
- AREA OF CONCERN

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

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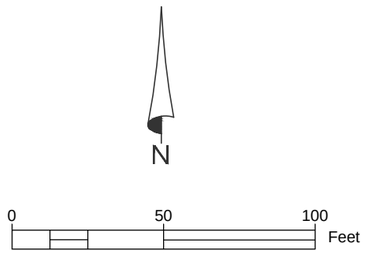
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

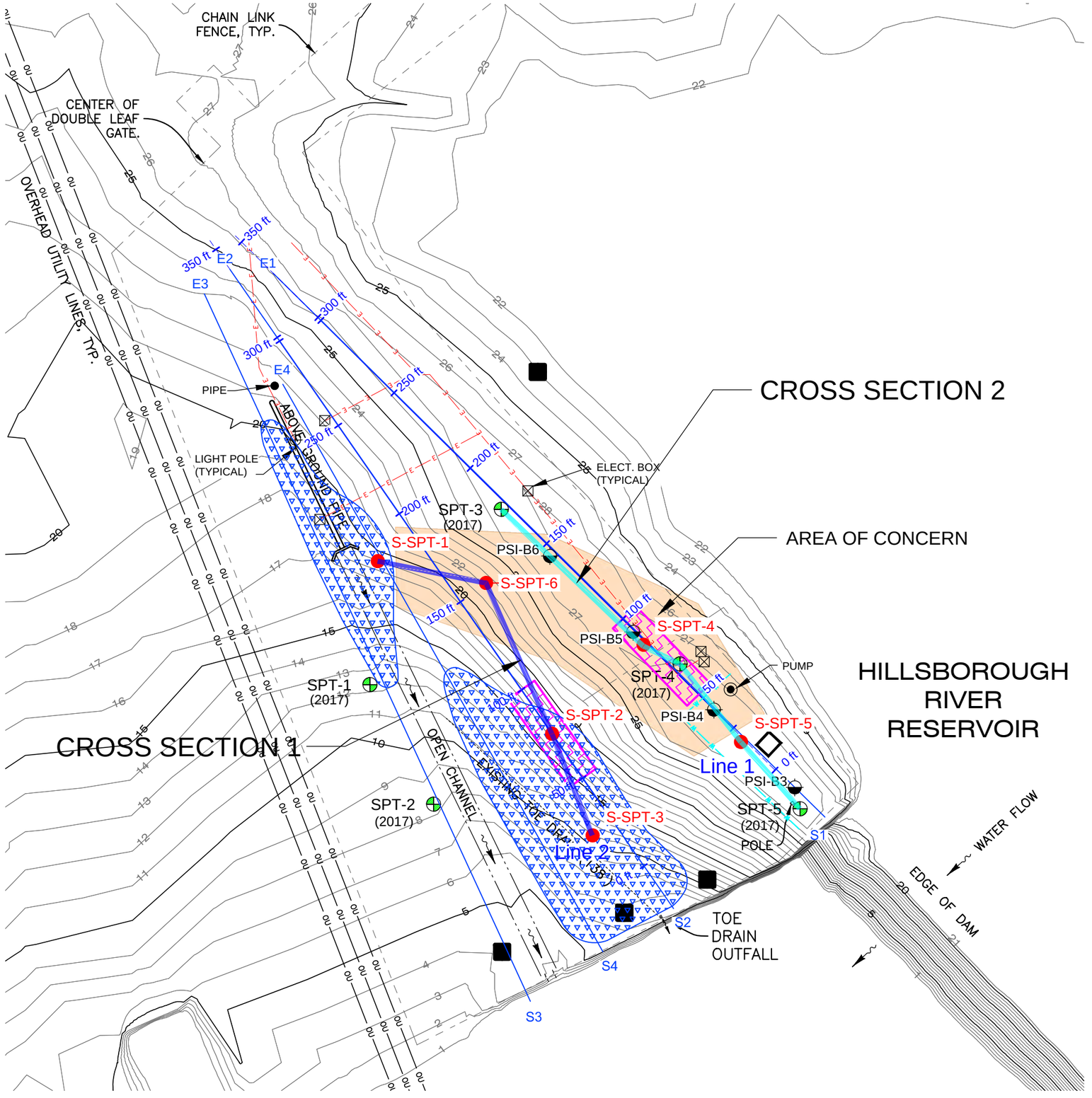
TO3 NORTH EMBANKMENT STUDIES
LOCATION MAP OF SUPPLEMENTAL SPT BORINGS AND GEOPHYSICAL WORKS AT THE SITE
TAMPA, FLORIDA

DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L. GARCIA
PROJECT NO.: 300881x02

FIGURE 2

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_BL_03-2019.dwg LAYOUT: FIGURE 2 SAVED: 5/9/2019 2:35 PM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 5/9/2019 2:37 PM BY: WVES, MARTIN





LEGEND:

- SUPPLEMENTAL SPT BORING (WOOD 2019)
- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE
- AREA OF CONCERN

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

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HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
SOIL PROFILES 1 & 2
TAMPA, FLORIDA

DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L. GARCIA
PROJECT NO.: 300881x02

FIGURE 3

PROJECT NUMBER: 300881x02 CITY: TAMPA
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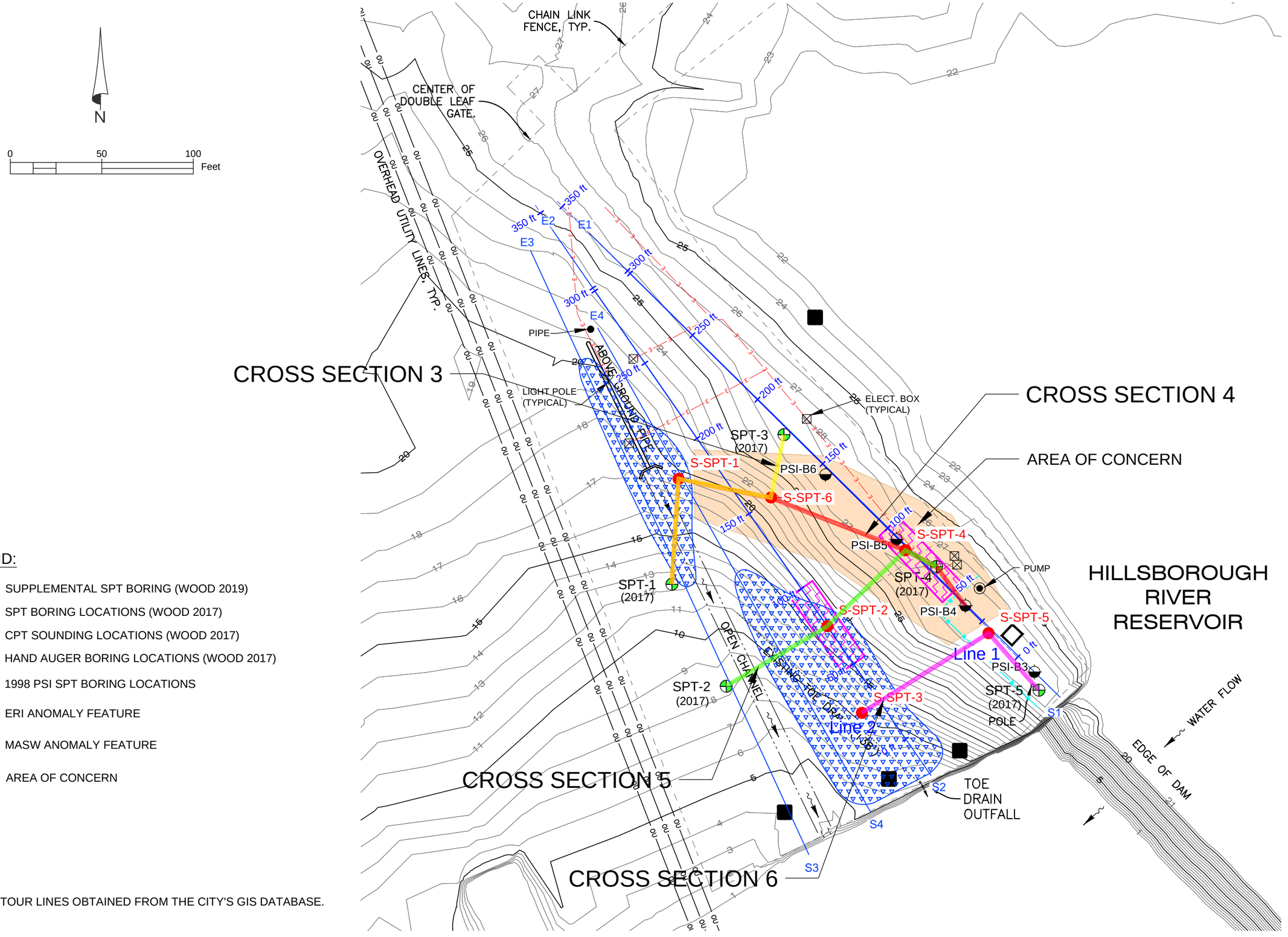

LEGEND:

- SUPPLEMENTAL SPT BORING (WOOD 2019)
- SPT BORING LOCATIONS (WOOD 2017)
- CPT SOUNDING LOCATIONS (WOOD 2017)
- HAND AUGER BORING LOCATIONS (WOOD 2017)
- 1998 PSI SPT BORING LOCATIONS
- ERI ANOMALY FEATURE
- MASW ANOMALY FEATURE
- AREA OF CONCERN

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

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Environment & Infrastructure Solutions, Inc.
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www.woodplc.com CA #2992

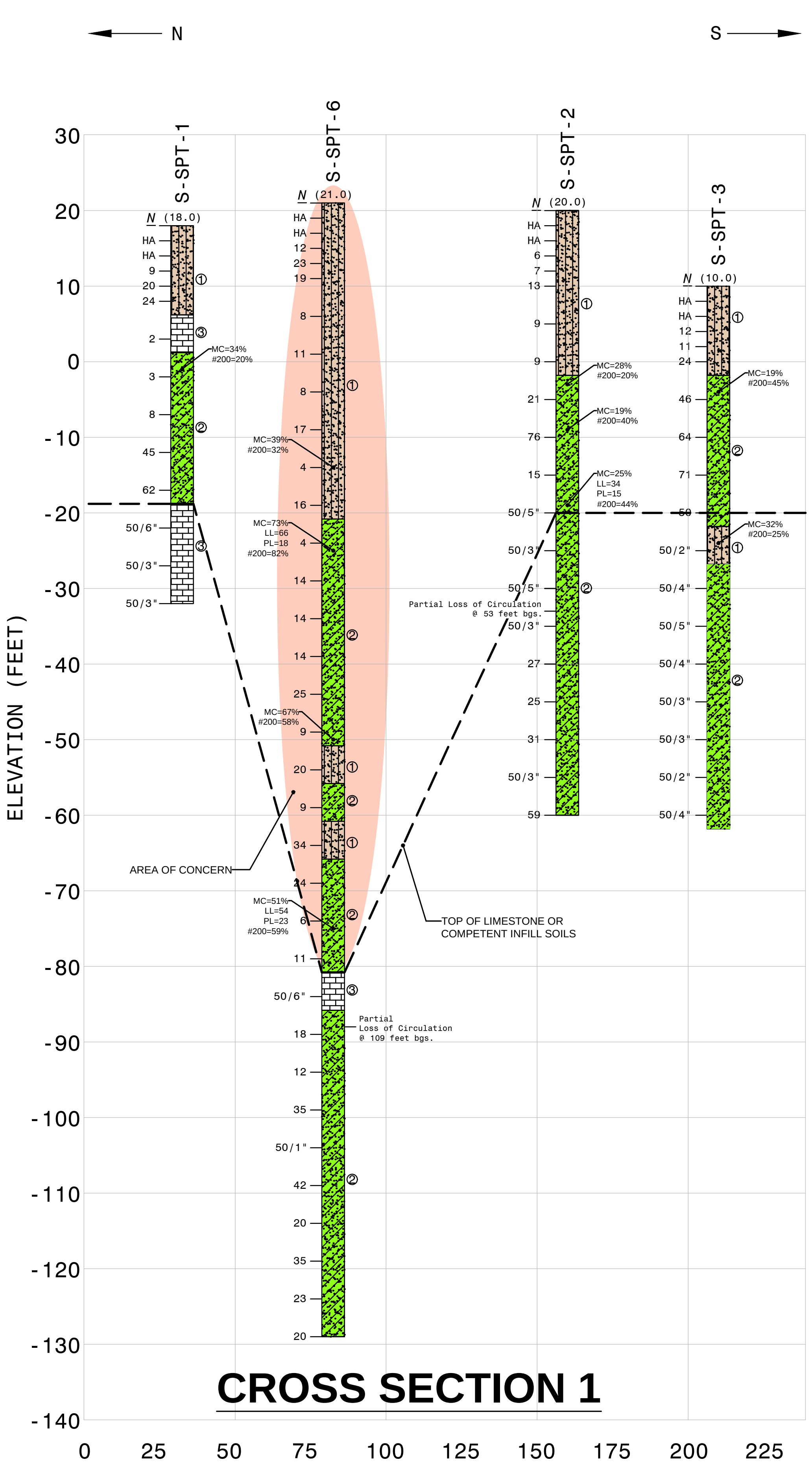
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
SOIL PROFILES 3, 4, 5 & 6
TAMPA, FLORIDA

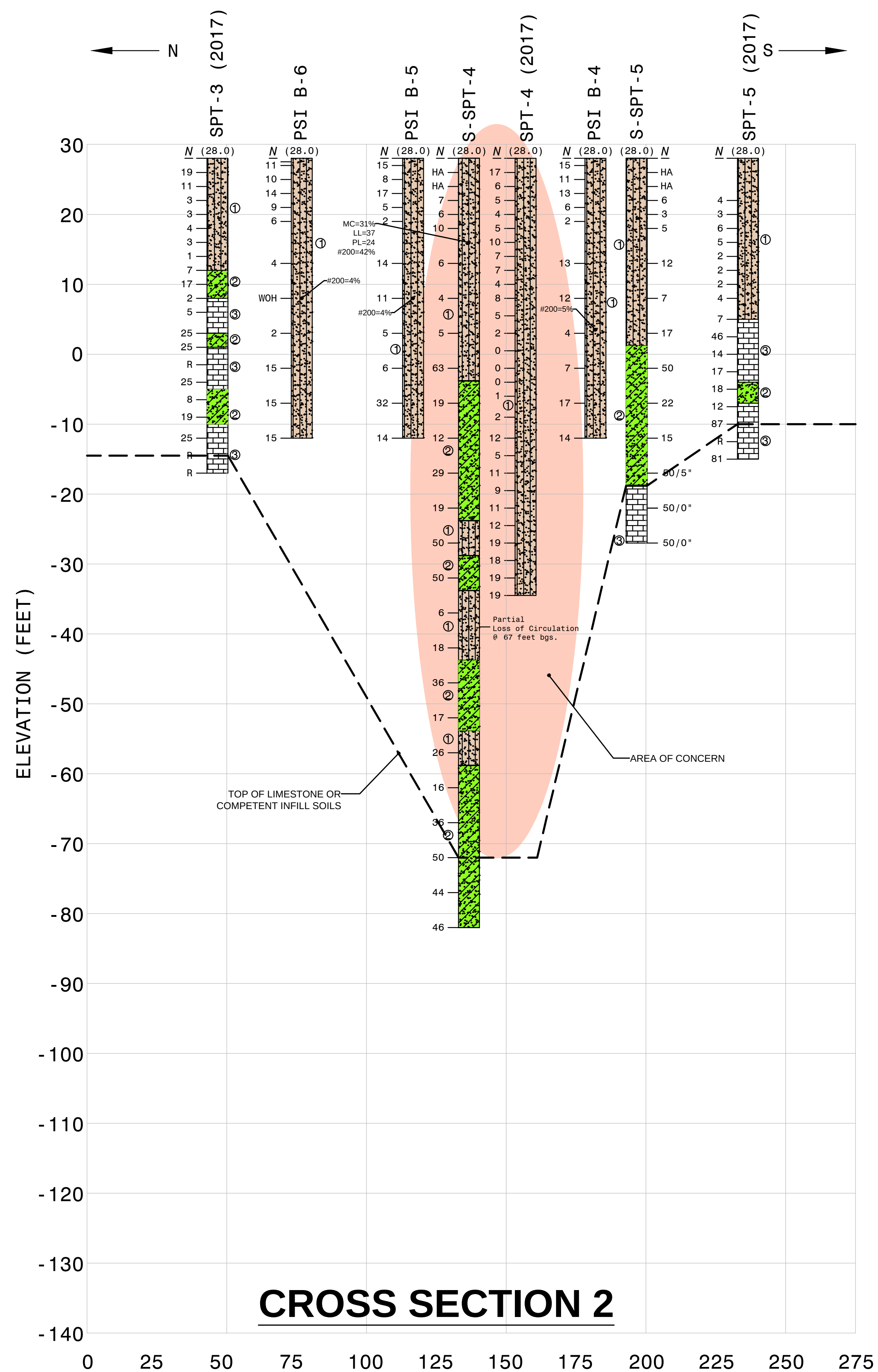
DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L. GARCIA
PROJECT NO.: 300881x02

FIGURE 4

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_BL_03-2019.dwg LAYOUT: FIGURE 4 SAVED: 5/9/2019 2:35 PM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 5/9/2019 2:37 PM BY: WVES, MARTIN



CROSS SECTION 1



CROSS SECTION 2

LEGEND

(1) EMBANKMENT FILLS AND UNDIFFERENTIAL SURFICIAL SOILS

(2) CLAYEY SANDS (SC) AND SANDS (SP)

(3) LIMESTONE WITH TRACE CALCAREOUS CLAYS (CL)

(4) INFILL CLAYS: CALCAREOUS SANDY CLAYS (CL) AND CLAYS (CL) WITH LIMESTONE FRAGMENTS

(28.0) APPROXIMATE GROUND ELEVATION (NAVD88)

R REFUSAL

DEPTH OF WATER TABLE

WOH WEIGHT OF HAMMER

NOTE:
ELEVATIONS ARE APPROXIMATED BASED ON CONTOUR MAP PROVIDED BY CITY OF TAMPA WATER DEPARTMENT

NO.	DATE	REVISION

wood.
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www.woodplc.com CA-5392

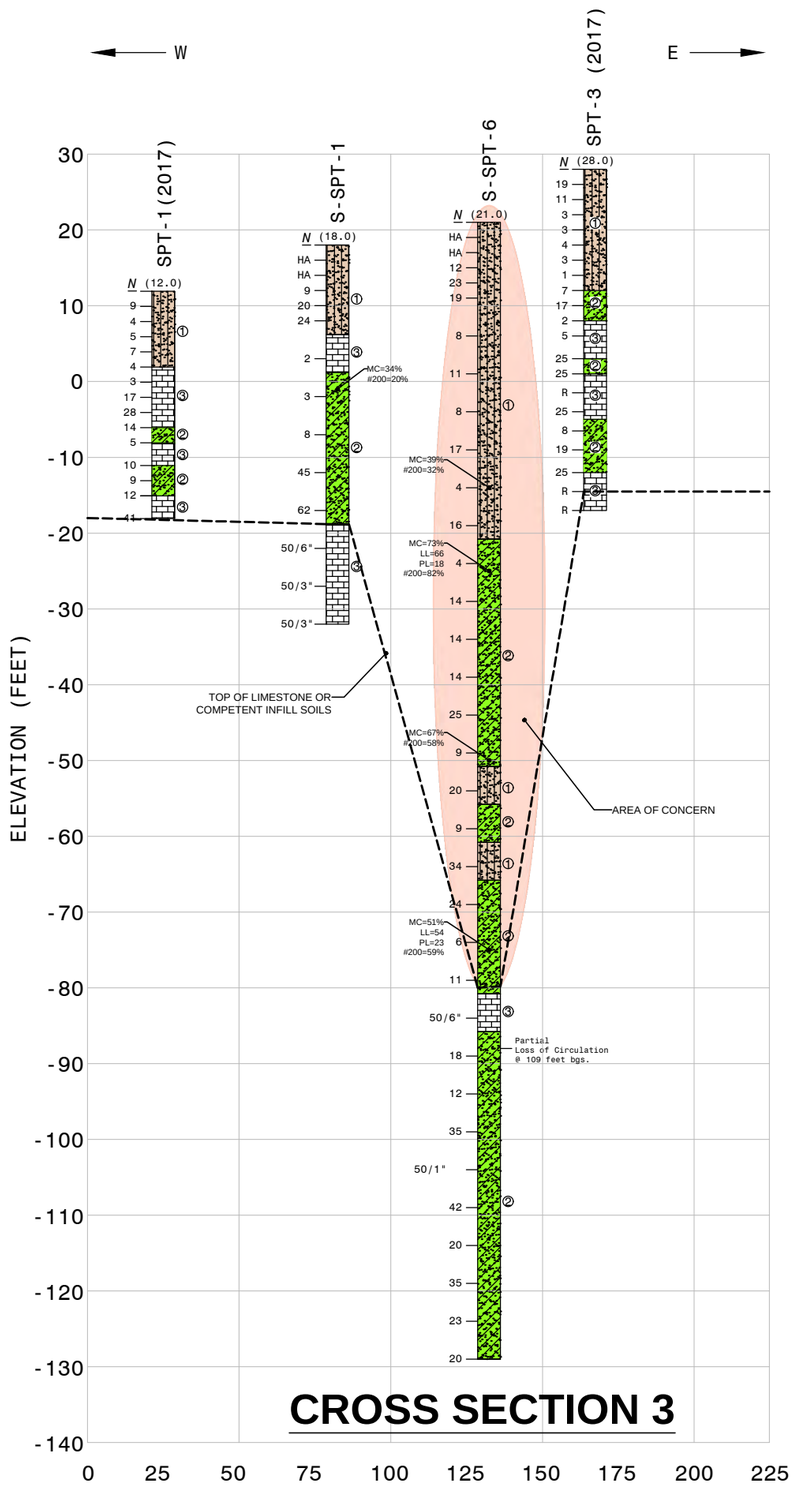
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

TO3 NORTH EMBANKMENT STUDIES
SUBSURFACE PROFILES (1 OF 3)
TAMPA, FLORIDA

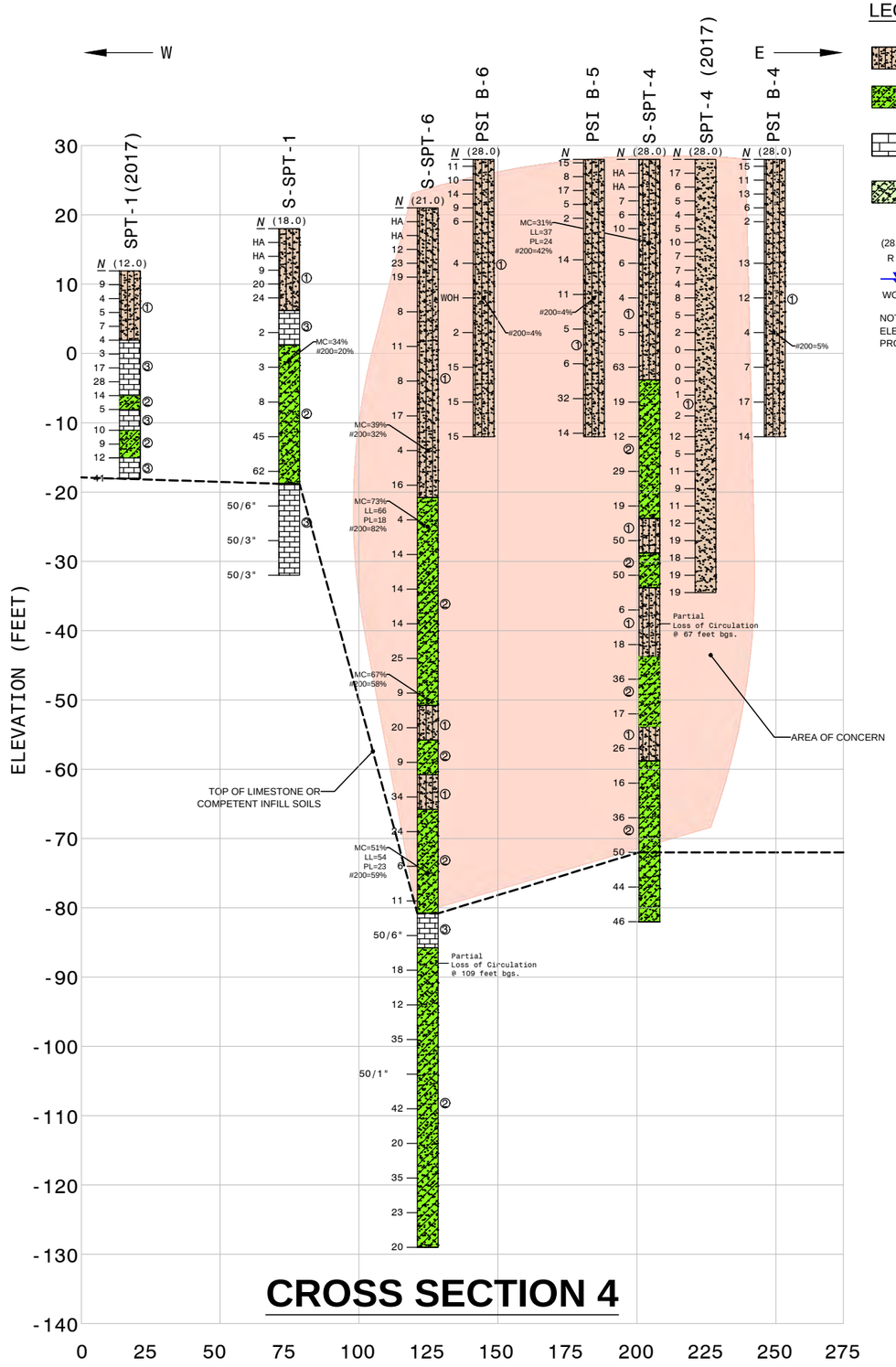
DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L.GARCIA
PROJECT NO.: 300881x02

FIGURE 5

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_Profiles_Phase 2.dwg LAYOUT: FIGURE 5 SAVED: 5/9/2019 2:31 PM PLOTSTYLETABLE: ---- PLOTTED: 5/9/2019 2:37 PM BY: VIVES, MARTIN



CROSS SECTION 3



CROSS SECTION 4

LEGEND

1. EMBANKMENT FILLS AND UNDIFFERENTIAL SURFICIAL SOILS
2. CLAYEY SANDS (SC) AND SANDS (SP)
3. LIMESTONE WITH TRACE CALCAREOUS CLAYS (CL)
4. INFILL CLAYS: CALCAREOUS SANDY CLAYS (CL) AND CLAYS (CL) WITH LIMESTONE FRAGMENTS

(28.0) APPROXIMATE GROUND ELEVATION (NAVD88)
R REFUSAL
DEPTH OF WATER TABLE
WOH WEIGHT OF HAMMER

NOTE:
ELEVATIONS ARE APPROXIMATED BASED ON CONTOUR MAP PROVIDED BY CITY OF TAMPA WATER DEPARTMENT

NO.	DATE	REVISION

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Environment & Infrastructure Solutions, Inc.
1011 Technology Drive, Suite 300, Rochester, NY 14623
Phone: 1.813.289.0750 Fax: 1.813.289.5474
www.woodplc.com CA-5092

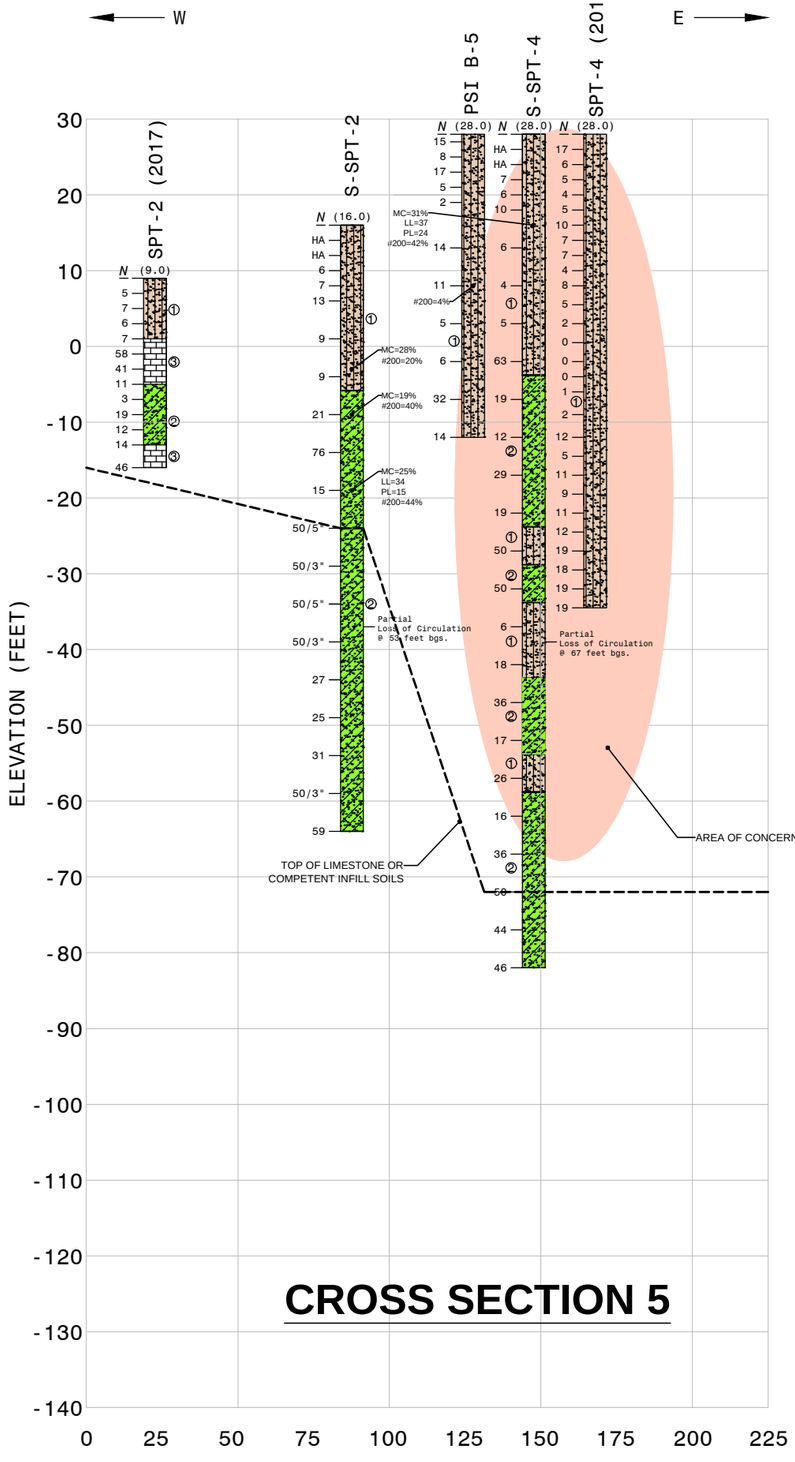
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
SUBSURFACE PROFILES (2 OF 3)
TAMPA, FLORIDA

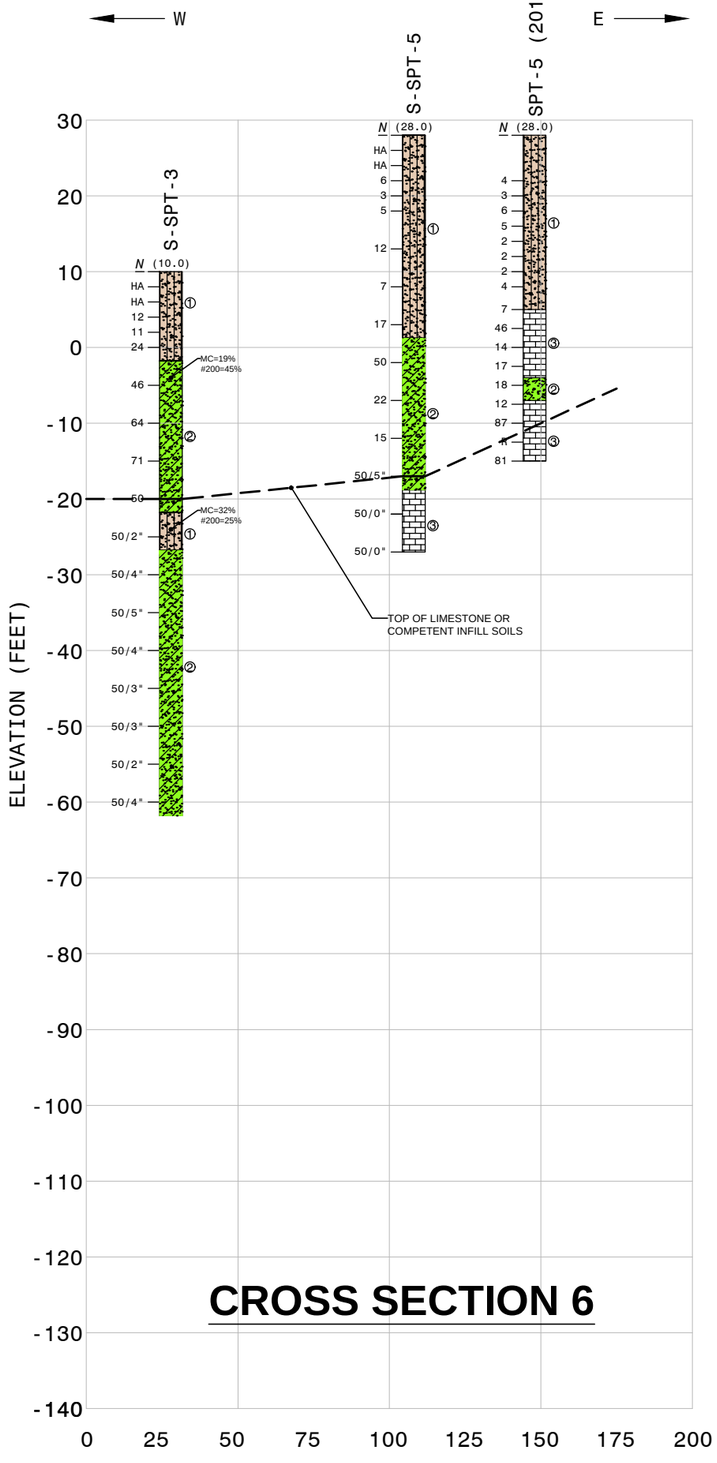
DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L.GARCIA
PROJECT NO.: 300881x02

FIGURE 6

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_Profiles_Phase2.dwg LAYOUT: FIGURE 6 SAVED: 5/9/2019 2:31 PM PLOTSTYLETABLE: ---- PLOTTED: 5/9/2019 2:37 PM BY: VIVES, MARTIN



CROSS SECTION 5



CROSS SECTION 6

LEGEND

1. EMBANKMENT FILLS AND UNDIFFERENTIAL SURFICIAL SOILS
2. CLAYEY SANDS (SC) AND SANDS (SP)
3. LIMESTONE WITH TRACE CALCAREOUS CLAYS (CL)
4. INFILL CLAYS: CALCAREOUS SANDY CLAYS (CL) AND CLAYS (CL) WITH LIMESTONE FRAGMENTS

(28.0) APPROXIMATE GROUND ELEVATION (NAVD88)
R REFUSAL
DEPTH OF WATER TABLE
WOH WEIGHT OF HAMMER

NOTE:
ELEVATIONS ARE APPROXIMATED BASED ON CONTOUR MAP PROVIDED BY CITY OF TAMPA WATER DEPARTMENT

NO.	DATE	REVISION

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Environment & Infrastructure Solutions, Inc.
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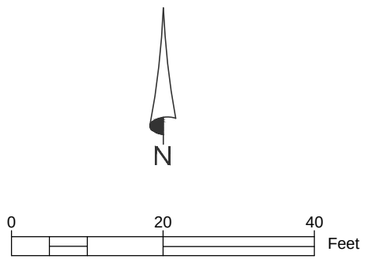
HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

T03 NORTH EMBANKMENT STUDIES
SUBSURFACE PROFILES (3 OF 3)
TAMPA, FLORIDA

DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L.GARCIA
PROJECT NO.: 300881x02

FIGURE 7

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_Profiles_Phase 2.dwg LAYOUT: FIGURE 7 SAVED: 5/9/2019 2:31 PM PLOTSTYLETABLE: ---- PLOTTED: 5/9/2019 2:37 PM BY: VIVES, MARTIN



HILLSBOROUGH RIVER RESERVOIR

AREA OF CONCERN

10'

10'

10'

PIPE

OPEN CHANNEL

EXISTING TOE

LEGEND:

- AREA OF CONCERN
- PRIMARY GROUTING POINT LOCATION
- UNDERGROUND WATER LINE
- UNDERGROUND ELECTRICAL LINE

NOTES:
1. CONTOUR LINES OBTAINED FROM THE CITY'S GIS DATABASE.

NO.	DATE	REVISION

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HILLSBOROUGH RIVER DAM
CITY OF TAMPA WATER DEPARTMENT

TO3 NORTH EMBANKMENT STUDIES
PROPOSED REMEDIATION PLAN
TAMPA, FLORIDA

DATE: May 9, 2019
DRAWN BY: M.VIVES
CHECKED BY: L. GARCIA
PROJECT NO.: 300881x02

FIGURE 8

PROJECT NUMBER: 300881x02 CITY: TAMPA
Z:\PROJECTS-C3D\300881 URS - COT Hillsborough Dam\2019\March_2019\300881x02_HR Dam_BL_03-2019.dwg LAYOUT: FIGURE 8 SAVED: 5/9/2019 2:35 PM PLOTSTYLETABLE: NEW2008 - WITH SCREENING.CTB PLOTTED: 5/9/2019 2:37 PM BY: WVES, MARTIN

APPENDIX A

BORING NUMBER S-SPT-1

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/11/19 **COMPLETED** 2/12/19
GROUND ELEVATION 18 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342133.8 , E517614.3
DRILLING METHOD Standard Penetration / Mud Rotary
▽ **GROUND WATER LEVEL AT TIME OF DRILLING** 4.00 ft / Elev 14.00 ft
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on toe of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SM		brown, gray, dark gray, SILTY SAND, fine grained quartz, trace gravel, trace clay, trace roots, moist
	AU 2					
						4.0 ▽ 14.0
5	SS 3	1-5-4-7 (9)		SP-SC		gray, brown, poorly sorted, fine grained quartz SAND with CLAY, wet
						6.0 12.0
	SS 4	10-11-9-11 (20)		SP		dark gray, gray, brown, poorly sorted, fine grained quartz SAND, trace clay, trace limestone fragments, wet
10	SS 5	13-18-6-5 (24)				Drilling fluid used below 10-feet
						11.8 6.3
						light gray, brown, LIMESTONE, fragmented, trace clay, trace fine grained quartz sand
15	SS 6	0-2-4 (6)				Blows - WOH/6", 2, 4
						16.8 1.3
				SC		gray, tan, light brown, CLAYEY SAND, fine grained quartz, calcareous, trace limestone fragments
20	SS 7	0-0-3 (3)	MC = 34% #200 = 29%			Blows - WOH/12", 3
25	SS 8	3-4-4 (8)				
						26.8 -8.8
				CL		gray, tan, light brown, SANDY CLAY, fine grained quartz, calcareous, trace limestone fragments
30	SS 9	30-28-17 (45)				

(Continued Next Page)

BORING NUMBER S-SPT-1

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				CL		gray, tan, light brown, SANDY CLAY, fine grained quartz, calcareous, trace limestone fragments *(continued)*
35	SS 10	11-20-42 (62)				
					36.8	-18.8
						light gray, LIMESTONE, fragmented, trace clay, trace fine grained quartz sand
40	SS 11	50-50/5"				Blows - 50/6-inches, 50/5-inches
45	SS 12	50/3"				Blows - 50/3-inches
50	SS 13	50/3"				Blows - 50/3-inches
					50.0	-32.0

Bottom of borehole at 50.0 feet.

BORING NUMBER S-SPT-2

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/14/19 **COMPLETED** 2/14/19
GROUND ELEVATION 16 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342053.3 , E517695.5
DRILLING METHOD Standard Penetration / Mud Rotary
▽ **GROUND WATER LEVEL AT TIME OF DRILLING** 6.00 ft / Elev 10.00 ft
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on mid slope of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SP		light brown, poorly sorted, fine grained quartz SAND, trace silt, moist
	AU 2					
					4.0	12.0
5	SS 3	1-2-4-4 (6)		SP-SC		light brown, gray, poorly sorted, fine grained quartz SAND with CLAY, with silt, moist
	SS 4	1-2-5-9 (7)				▽ wet below 6-feet
	SS 5	9-8-5-5 (13)				angular shell and oyster fragments from 6 to 10 feet
10						drilling fluid used below 10-feet
					11.8	4.3
15	SS 6	4-5-4 (9)		SP		gray, light gray, poorly sorted, fine grained quartz SAND, with limestone fragments, trace shell fragments
					16.8	-0.8
20	SS 7	7-5-4 (9)	MC = 28% #200 = 20%	SC		light brown, CLAYEY SAND, fine grained quartz, calcareous, with limestone fragments
25	SS 8	6-11-10 (21)	MC = 19% #200 = 40%			
					26.8	-10.8
30	SS 9	14-26-50 (76)		CL		light gray, gray, light brown, blue-gray, SANDY CLAY, calcareous, with limestone fragments

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				CL		light gray, gray, light brown, blue-gray, SANDY CLAY, calcareous, with limestone fragments *(continued)*
						31.8 -15.8
				SC		light gray, gray, light brown, CLAYEY SAND, fine grained quartz, calcareous, with limestone fragments
35	SS 10	8-5-10 (15)	MC = 25% #200 = 44% LL = 34 PL = 15 PI = 19			
						36.8 -20.8
				CL		light gray, gray, light brown, blue-gray, SANDY CLAY, calcareous, with limestone fragments
	SS 11	50/5"				Blows - 50/5-inches
40						
	SS 12	7-50/3"				Blows - 7, 50/3-inches
45						
	SS 13	39-50/5"				Blows - 39, 50/5-inches
50						
						partial loss of circulation and shell fragments from 53 to 55 feet
	SS 14	1-5-50/3"				Blows - 1, 5, 50/3-inches
55						
	SS 15	9-12-15 (27)				
60						

(Continued Next Page)

BORING NUMBER S-SPT-2

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
60						light gray, gray, light brown, blue-gray, SANDY CLAY, calcareous, with limestone fragments *(continued)*
65	SS 16	12-13-12 (25)				
70	SS 17	11-15-16 (31)		CL		
						partial loss of circulation below 73.5 feet
75	SS 18	0-26-50/3"				Blows - WOR/6-inches, 26, 50/3-inches
80	SS 19	28-20-39 (59)				80.0 -64.0

Bottom of borehole at 80.0 feet.

BORING NUMBER S-SPT-3

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/12/19 **COMPLETED** 2/14/19
GROUND ELEVATION 10 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342006 , E517714.4
DRILLING METHOD Standard Penetration / Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on mid slope of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SP		gray, light gray, light brown, poorly sorted, fine grained quartz SAND, moist
	AU 2					wet below 2 feet
5	SS 3	1-1-11-9 (12)				
					6.0	4.0
	SS 4	2-3-8-10 (11)		SP-SM		gray, dark gray, poorly sorted, fine grained quartz SAND with SILT, trace limestone fragments, wet
					8.0	2.0
10	SS 5	8-7-17-14 (24)		SP		gray, poorly sorted, fine grained quartz SAND, trace silt, trace limestone fragments, wet
						drilling fluid used below 10-feet
					11.8	-1.8
15	SS 6	19-16-30 (46)	MC = 19% #200 = 45%	SC		light gray, CLAYEY SAND, fine grained quartz, calcareous, with limestone fragments
					16.8	-6.8
20	SS 7	22-14-50/5"		CL		light gray, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments
						Blows - 22, 14, 50/5-inches
25	SS 8	21-21-50/5"				Blows - 21, 21, 50/5-inches
30	SS 9	31-23-27 (50)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				CL		light gray, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments *(continued)*
						31.8 -21.8
				SC		greenish-gray, CLAYEY SAND, fine grained quartz
35	SS 10	17-50/2"	MC = 32% #200 = 25%			Blows - 17, 50/2-inches
						36.8 -26.8
				CL		light gray, gray, light brown, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments
40	SS 11	50/4"				Blows - 50/4-inches
45	SS 12	50/5"				Blows - 50/5-inches
50	SS 13	19-50/4"				Blows - 19, 50/4-inches
						blue-gray to light brown, non-calacareous from 48.5 to 55 feet
55	SS 14	50/3"				Blows - 50/3-inches
60	SS 15	28-35-50/3"				Blows - 28, 35, 50/3-inches

(Continued Next Page)

BORING NUMBER S-SPT-3

CLIENT City of Tampa

PROJECT NAME Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3

PROJECT LOCATION Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
60						light gray, gray, light brown, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments *(continued)*
	SS 16	50/2"				
65				CL		Blows - 50/2-inches
	SS 17	50/4"				
70					70.0	Blows - 50/4-inches -60.0

Bottom of borehole at 70.0 feet.

BORING NUMBER S-SPT-4

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/20/19 **COMPLETED** 2/20/19
GROUND ELEVATION 28 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342094.8 , E517738.2
DRILLING METHOD Standard Penetration / Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on crest of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SP-SM		brown, light brown, poorly sorted, fine grained quartz SAND with SILT, with clay nodules, moist
	AU 2					
					4.0	24.0
5	SS 3	3-4-3-4 (7)				light brown, orange-brown, light gray, poorly sorted, fine grained quartz SAND, trace silt, moist trace gravel from 0 to 6 feet
	SS 4	4-3-3-5 (6)				
10	SS 5	3-5-5-5 (10)				drilling fluid used below 10-feet
15	SS 6	4-2-4 (6)				
				SP		
20	SS 7	3-2-2 (4)				trace limestrone fragments from 18.5 to 20 feet
25	SS 8	3-1-4 (5)				trace organics from 23.5 to 25 feet
30	SS 9	6-13-50/5"				limestone fragments and trace calcareous clay from 28.5 to 30 feet Blows - 6, 13, 50/5-inches

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				SP		light brown, orange-brown, light gray, poorly sorted, fine grained quartz SAND, trace silt, moist *(continued)*
						31.8 -3.8
				SC		light brown, light gray, CLAYEY SAND, fine grained quartz, calcareous, trace limestone fragments
35	SS 10	7-9-10 (19)				
40	SS 11	6-4-8 (12)	MC = 31% #200 = 42% LL = 37 PL = 24 PI = 13			
						41.8 -13.8
				CL		light brown, light gray, SANDY CLAY, fine grained quartz, calcareous, trace limestone fragments
45	SS 12	28-14-15 (29)				
50	SS 13	23-13-6 (19)				
						51.8 -23.8
				SC		light gray, greenish gray, CLAYEY SAND, fine grained quartz, trace limestone fragments
55	SS 14	50/5"				Blows - 50/5-inches
						56.8 -28.8
				CL		light gray, SANDY CLAY, fine grained quartz, calcareous, trace limestone fragments
60	SS 15	50/5"				Blows - 50/5-inches

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
60				CL		light gray, SANDY CLAY, fine grained quartz, calcareous, trace limestone fragments *(continued)*
						61.8 -33.8
				SP		brown, gray, poorly sorted, fine grained quartz SAND, trace silt
65	SS 16	4-3-3 (6)				
						partial loss of circulation below 67-feet
70	SS 17	11-8-10 (18)				
						71.8 -43.8
				CL		light gray, dark gray, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments
75	SS 18	16-15-21 (36)				
80	SS 19	6-8-9 (17)				
						81.8 -53.8
				SP		dark gray, poorly sorted, fine grained quartz SAND, trace silt, slightly calcareous, with limestone
85	SS 20	10-11-15 (26)				
						86.8 -58.8
				CL		light gray, tan, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments
90	SS 21	3-7-9 (16)				

(Continued Next Page)

BORING NUMBER S-SPT-4

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
90						light gray, tan, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments *(continued)*
95	SS 22	16-19-20 (39)				
100	SS 23	50		CL		Blows - 50/6-inches
105	SS 24	19-23-21 (44)				
110	SS 25	17-22-24 (46)				
					110.0	-82.0

Bottom of borehole at 110.0 feet.

BORING NUMBER S-SPT-5

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 21 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342049.5 , E517783.6
DRILLING METHOD Standard Penetration / Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on mid slope of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1		SP-SC		brown, orange brown, fine grained quartz SAND with CLAY, with angular shell fragments, moist
					2.0 / 19.0
	AU 2		SP		brown, light orange-brown, light gray, poorly sorted, fine grained quartz SAND, trace silt, moist
5	SS 3	5-4-2-2 (6)			
	SS 4	2-1-2-1 (3)			
	SS 5	3-2-3-2 (5)			
10					drilling fluid used below 10-feet
15	SS 6	3-4-8 (12)			
20	SS 7	3-4-3 (7)			
25	SS 8	9-10-7 (17)			trace organics and trace clay from 23.5 to 25 feet
					26.8 / -5.8
30	SS 9	12-23-27 (50)	CL		light brown, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments

(Continued Next Page)

BORING NUMBER S-SPT-5

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30			CL		light brown, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments *(continued)*
35	SS 10	3-7-15 (22)			
40	SS 11	7-8-7 (15)			
45	SS 12	50/5"			Blows - 50/5-inches
				46.8	-25.8
					light gray, LIMESTONE, trace fine grained quartz sand, trace clay
50	SS 13	50/0"			Blows - 50/0-inches
55	SS 14	50/0"			Blows - 50/0-inches
				55.0	-34.0

Bottom of borehole at 55.0 feet.

BORING NUMBER S-SPT-6

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam Phase II
PROJECT NUMBER 300881x3
PROJECT LOCATION Tampa, FL
DATE STARTED 2/15/19 **COMPLETED** 2/19/19
GROUND ELEVATION 21 ft **HOLE SIZE** 2.75 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION N1342123.7 , E517664.8
DRILLING METHOD Standard Penetration / Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION Tremie grout to surface
NOTES Located on mid slope of the embankment

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SP-SC		light brown, gray, poorly sorted, fine grained quartz SAND with CLAY, moist
	AU 2					
5	SS 3	5-6-6-8 (12)				
	SS 4	5-11-12-12 (23)				
	SS 5	6-6-13-14 (19)				
10						drilling fluid used below 10-feet
						11.8 9.3
				SP		light brown, dark gray, poorly sorted, fine grained quartz SAND, trace limestone fragments
15	SS 6	3-4-4 (8)				
20	SS 7	6-5-6 (11)				
						21.8 -0.8
				SC		light gray, dark gray, CLAYEY SAND, fine grained quartz
25	SS 8	2-3-5 (8)				limestone fragments and shells present from 23.5 to 25 feet
30	SS 9	8-8-9 (17)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				SC		light gray, dark gray, CLAYEY SAND, fine grained quartz *(continued)*
35	SS 10	3-1-3 (4)	MC = 39% #200 = 32%			
40	SS 11	7-7-9 (16)				limestone fragments present from 38.5 to 40 feet
						41.8 -20.8
45	SS 12	2-2-2 (4)	MC = 73% #200 = 82% LL = 66 PL = 18 PI = 48	CL		gray, dark gray, blue-gray, SANDY CLAY, fine grained quartz, fatty
50	SS 13	5-7-7 (14)				
55	SS 14	6-8-6 (14)				
60	SS 15	6-7-7 (14)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
60						gray, dark gray, blue-gray, SANDY CLAY, fine grained quartz, fatty *(continued)*
65	SS 16	7-10-15 (25)		CL		
70	SS 17	3-3-6 (9)	MC = 67% #200 = 58%			
						71.8 -50.8
75	SS 18	7-8-12 (20)		SP		light gray, poorly sorted, fine grained quartz SAND, trace clay, with limestone fragments
						76.8 -55.8
80	SS 19	3-4-5 (9)		CL		light gray, blue-gray, SANDY CLAY, fine grained quartz, slightly calcareous
						81.8 -60.8
85	SS 20	8-15-19 (34)		SP		light gray, poorly sorted, fine grained quartz SAND, trace clay, with limestone fragments
						86.8 -65.8
90	SS 21	5-10-14 (24)		CL		dark gray, brown, blue-gray, SANDY CLAY, fine grained quartz, fatty

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
90						dark gray, brown, blue-gray, SANDY CLAY, fine grained quartz, fatty *(continued)*
95	SS 22	3-3-3 (6)	MC = 51% #200 = 59% LL = 54 PL = 23 PI = 31	CL		
100	SS 23	6-6-5 (11)				101.8 -80.8
105	SS 24	50				light gray, LIMESTONE, fragmented, trace fine grained quartz sand, trace clay Blows - 50/6-inches
110	SS 25	7-8-10 (18)		CL		106.8 -85.8 light gray, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments partial loss of circulation below 109 feet
115	SS 26	5-5-7 (12)				
120	SS 27	14-13-22 (35)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam Phase II

PROJECT NUMBER 300881x3 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
120						light gray, SANDY CLAY, fine grained quartz, calcareous, with limestone fragments *(continued)*
125	SS 28	28-50/0"				Blows - 28, 50/1-inch
130	SS 29	39-22-20 (42)				
135	SS 30	11-9-11 (20)		CL		
140	SS 31	15-16-19 (35)				
145	SS 32	27-15-8 (23)				
150	SS 33	33-12-8 (20)				150.0 -129.0

Bottom of borehole at 150.0 feet.

BORING NUMBER SPT-1

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam
PROJECT NUMBER 300881x2
PROJECT LOCATION Tampa, FL
DATE STARTED 11/8/17 **COMPLETED** 11/8/17
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION _____
DRILLING METHOD Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION backfilled with cuttings and bentonite chips
NOTES W 82.42947 deg; N 28.02507 deg

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						
	SS 1	2-4-5-4 (9)		SC		dark gray, brown, CLAEY SAND, fine grain quartz, gravel and shell fragment present, moist
						2.0
	SS 2	3-1-3-4 (4)	MC = 21% #200 = 10%	SP-SC		brown, gray, fine grain quartz SAND with Clayey, shell fragments present, wet
5	SS 3	2-2-3-2 (5)				
						6.0
	SS 4	1-5-2-4 (7)		SP-SC		dark gray, gray, SAND with Clayey, fine grain quartz, wet
						8.0
	SS 5	3-3-1-3 (4)	MC = 24% #200 = 9%	SP-SM		gray, dark gray, fine grain quartz SAND with SILT clean sand lense in bottom 6" of spoon
10						10.0
	SS 6	3-1-2-10 (3)				very light brown, light brown LIMESTONE, with light brown calcareous clay present
	SS 7	7-3-14-15 (17)				
15	SS 8	4-9-19-16 (28)				
	SS 9	17-7-7-16 (14)				
						18.0
	SS 10	3-2-3-3 (5)	MC = 28% #200 = 50% LL = 36 PL = 14 PI = 22	CL		light brown, light orange-brown, Calcareous CLAY with traces of limestone and fine grain quartz sand present
20						20.0
	SS 11	4-5-5 (10)				very light brown, light brown, LIMESTONE with light brown calcareous clay present
						22.5
						gray, light gray, Calcareous CLAY, with traces of gray limestone present
25	SS 12	3-4-5 (9)	MC = 34% #200 = 64%	CL		
	SS 13	4-3-9 (12)				
						27.5
						light brown, light gray, LIMESTONE, with an abundance of light brown calcareous clay present
30	SS 14	14-17-24 (41)				30.0

Bottom of borehole at 30.0 feet.

BORING NUMBER SPT-2

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam
PROJECT NUMBER 300881x2
PROJECT LOCATION Tampa, FL
DATE STARTED 11/9/17 **COMPLETED** 11/9/17
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION _____
DRILLING METHOD Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION backfilled with cuttings and bentonite chips
NOTES W 82.42953 deg; N 28.02498 deg

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SS 1	2-2-3-5 (5)		SC		dark gray, gray, CLAYEY SAND, fine grain quartz, moist, traces of shell fragments
						2.0
	SS 2	2-2-5-4 (7)	MC = 22% #200 = 13%	SC		gray, light gray, brown, CLAYEY SAND, fine grain quartz, moist, traces of shell fragments
5	SS 3	1-1-5-11 (6)				
	SS 4	4-4-3-4 (7)	MC = 25% #200 = 13%			limestone found in bottom 2 inches of spoon
						8.0
	SS 5	5-8-50 (58)				very light brown, light brown, LIMESTONE, with light brown calcareous clay
10	SS 6	27-14-27-16 (41)				
	SS 7	8-6-5-9 (11)				
						14.0
15	SS 8	3-1-2-3 (3)				light brown, gray, light gray, calcareous CLAY, with sand and abundance of limestone
						orange-brown material found from 14 - 16 feet deep
	SS 9	7-12-7-10 (19)	MC = 23% #200 = 36%			
	SS 10	5-3-9-9 (12)	MC = 25% #200 = 44% LL = 44 PL = 19 PI = 25	CL		
20						
	SS 11	9-8-6 (14)				
						22.5
						gray, light gray, LIMESTONE with light gray calcareous clay
	SS 12	26-29-17 (46)				
25						25.0

Bottom of borehole at 25.0 feet.

BORING NUMBER SPT-3

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam
PROJECT NUMBER 300881x2
PROJECT LOCATION Tampa, FL
DATE STARTED 11/8/17 **COMPLETED** 11/8/17
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION _____
DRILLING METHOD Mud Rotary
▽ **GROUND WATER LEVEL AT TIME OF DRILLING** 8.00 ft
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION backfilled with cuttings and bentonite chips
NOTES W 82.42930 deg; N 28.02539 deg

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						
	SS 1	7-10-9-7 (19)		SP-SM		brown, light brown, SAND with Silty, fine grain quartz, gravel fragments, dry
	SS 2	4-5-6-5 (11)				
						4.0
5	SS 3	2-2-1-1 (3)				light brown, brown, fine grain quartz SAND with SILT, moist
	SS 4	1-1-2-1 (3)	MC = 6% #200 = 9%	SP-SM		
						▽ wet below 8 feet deep
10	SS 5	1-2-2-3 (4)				
						10.0
	SS 6	1-2-1-3 (3)		SP-SM		light gray, gray, fine grain quartz SAND with Silty, wet
						12.0
	SS 7	2-0-1-1 (1)		SP-SM		brown, light brow, fine grain quartz SAND with SILT
						14.0
15	SS 8	2-2-5-8 (7)	MC = 19% #200 = 22%	SC		gray, light brown, CLAYEY SAND, fine grain quartz, with silt
						16.0
	SS 9	6-8-9-8 (17)		CL		gray, yellowish brown, SANDY CLAY, traces of limestone
	SS 10	1-1-1-2 (2)				
20						20.0
	SS 11	0-0-5-9 (5)				very light brown, light brown, LIMESTONE, with very light brown calcareous clay
	SS 12	6-6-19 (25)				
25						25.0
				CL		very light brown, Calcareous CLAY, with an abundance of very light brown limestone
	SS 13	12-13-12 (25)				
						27.5
						very light brown, LIMESTONE, with very light brown calcareous clay
	SS 14	29-50				
30						

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam

PROJECT NUMBER 300881x2 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30						very light brown, LIMESTONE, with very light brown calcareous clay *(continued)*
	SS 15	13-9-16 (25)				
					33.5	
	SS 16	5-4-4 (8)	MC = 25% #200 = 42%	CL		greenish gray, Calcareous CLAY, abundance of limestone
35						
	SS 17	7-8-11 (19)				
	SS 18	6-6-19 (25)				
40					40.0	
	SS 19	50				very light brown, grayish brown, LIMESTONE, with very light brown calcareous clay
	SS 20	50				
45					45.0	

Bottom of borehole at 45.0 feet.

BORING NUMBER SPT-4

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam
PROJECT NUMBER 300881x2
PROJECT LOCATION Tampa, FL
DATE STARTED 11/7/17 **COMPLETED** 11/7/17
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION _____
DRILLING METHOD Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION backfilled with cuttings and bentonite chips
NOTES W 82.42912 deg; N 28.02521 deg

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SS 1	8-11-6-5 (17)		SP-SM		very light brown, light brown, fine grain quartz SAND with Silty, dry
						2.0
	SS 2	2-3-3-3 (6)		SM		light brown, brown, SILTY SAND, moist, traces of angular gravel
						4.0
5	SS 3	2-3-2-2 (5)	MC = 4% #200 = 6%	SP-SM		light brown, brown, fine grain quartz SAND with Silty, moist
	SS 4	2-2-2-2 (4)				light orange-brown material from 4 - 6 feet deep
10	SS 5	2-2-3-4 (5)				
	SS 6	3-3-7-5 (10)				
	SS 7	3-3-4-4 (7)				light orange-brown material from 12 - 14 feet deep
15	SS 8	1-2-5-5 (7)				
	SS 9	2-2-2-3 (4)	MC = 25% #200 = 5%			light gray material from 16 - 20 feet deep
20	SS 10	3-5-3-4 (8)				
						20.0
	SS 11	1-1-4 (5)		SP-SM		light gray, gray, fine grain quartz SAND SAND with Silty
25	SS 12	0-1-1 (2)				
	SS 13	0-0-0 (0)				
30	SS 14	1-0-0-0 (0)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam

PROJECT NUMBER 300881x2 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30						light gray, gray, fine grain quartz SAND SAND with Silty *(continued)*
	SS 15	0-0-0-1 (0)		SP-SM		dark gray material found 30 - 32 feet deep
	SS 16	0-1-0-1 (1)				
35	SS 17	0-0-2-7 (2)				light brown material found 34 -36 feet deep
						36.5 light brown, brown, fine grain quartz SAND SAND with Silty
40	SS 18	5-6-6 (12)				
	SS 19	3-3-2 (5)		SP-SM		
45	SS 20	2-5-6 (11)				
	SS 21	3-4-5 (9)				
50	SS 22	3-4-7 (11)				50.0
	SS 23	3-3-9 (12)	MC = 31% #200 = 22%	SM		gray, dark gray, SILTY SAND, fine grain quartz, dark gray clayey sand present
						52.5 gray, light brown, fine grain quartz SAND SAND with Silty, traces of phosphatic sand present
55	SS 24	4-8-11 (19)				
	SS 25	5-8-10 (18)		SP-SM		
60	SS 26	4-8-11 (19)				

(Continued Next Page)

wood.

CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam

PROJECT NUMBER 300881x2 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
60						
	SS 27	5-9-10 (19)		SP-SM		gray, light brown, fine grain quartz SAND SAND with Silty, traces of phosphatic sand present *(continued)* Dark gray material found beneath 61 feet BGS
						62.5

Bottom of borehole at 62.5 feet.

BORING NUMBER SPT-5

wood.

CLIENT City of Tampa
PROJECT NAME Hillsborough River Dam
PROJECT NUMBER 300881x2
PROJECT LOCATION Tampa, FL
DATE STARTED 11/7/17 **COMPLETED** 11/7/17
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Madrid Engineering Group
LOCATION _____
DRILLING METHOD Mud Rotary
GROUND WATER LEVEL AT TIME OF DRILLING ---
LOGGED BY CS **CHECKED BY** MC
HOLE COMPLETION backfilled with cuttings and bentonite chips
NOTES W 82.42887 deg; N 28.02499 deg

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	AU 1			SP-SM		brown, light brown, fine grain quartz SAND with Silty, dry, angular gravel fragments
	AU 2					
5	SS 3	3-2-2-1 (4)	MC = 8% #200 = 10%			
	SS 4	1-1-2-1 (3)				dry until 6 feet deep, then moist below
						8.0
	SS 5	3-3-3-3 (6)				brown, light brown, fine grain quartz, SAND with Silty traces of angular gravel fragments
10	SS 6	2-2-3-2 (5)				reddish-brown gravel present from 8 - 10 feet deep
	SS 7	0-0-2-2 (2)	MC = 24% #200 = 5%	SP-SM		
15	SS 8	1-1-1-2 (2)				
	SS 9	1-1-1-2 (2)				
						18.0
	SS 10	1-2-2-5 (4)				gray, light brown, fine grain quartz SAND with Silty
20				SP-SM		
	SS 11	2-3-4 (7)				
						22.5
	SS 12	8-29-17 (46)				light brown, gray, LIMESTONE, with an abundance of brown calcareous clay
25						
	SS 13	8-8-6 (14)				
						27.5
	SS 14	5-9-8 (17)				very light brown, LIMESTONE, with very light brown calcareous clay
30						

(Continued Next Page)

BORING NUMBER SPT-5

wood.

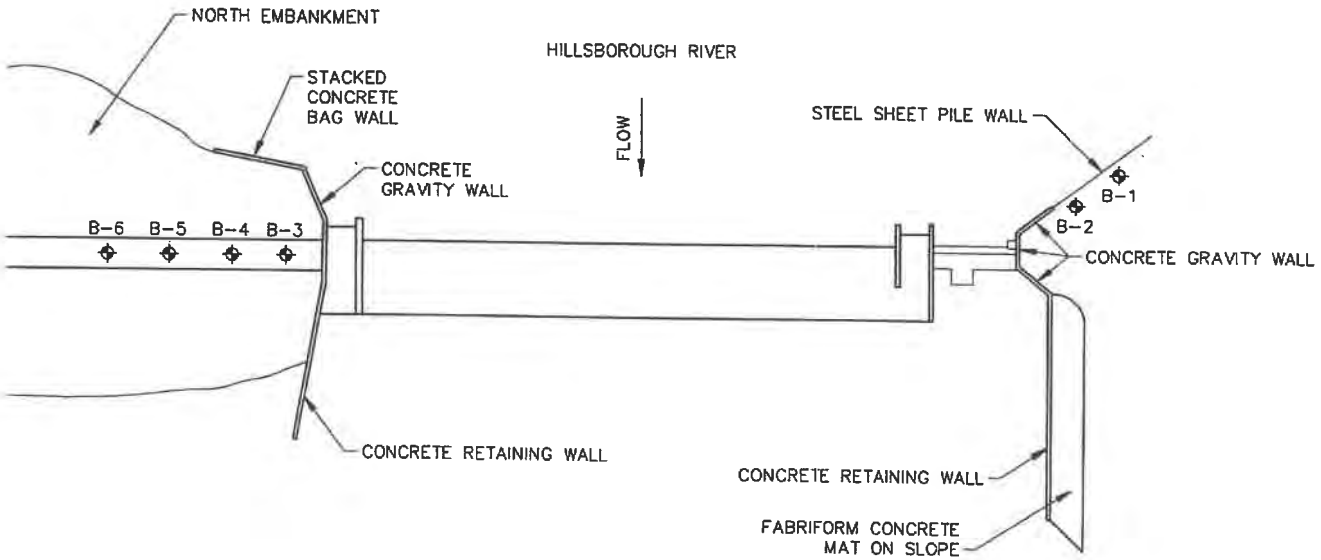
CLIENT City of Tampa **PROJECT NAME** Hillsborough River Dam

PROJECT NUMBER 300881x2 **PROJECT LOCATION** Tampa, FL

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30						very light brown, LIMESTONE, with very light brown calcareous clay *(continued)*
	SS 15	15-10-8 (18)				
					32.5	
				CL		very light brown, Calcareous CLAY, with limestone fragments, dark gray material in bottom 6" of spoon
	SS 16	2-3-9 (12)	MC = 37% #200 = 61%			
35					35.0	
						very light brown, LIMESTONE, with abundance of light brown calcareous clay in top 12" of spoon Abundance of light brown calcareous clay from 36 - 37 feet BGS
	SS 17	11-37-50 (87)				
	SS 18	50				
40						
	SS 19	27-31-50 (81)				
					42.5	

Bottom of borehole at 42.5 feet.

APPENDIX B



LEGEND

◆ Approximate SPT boring location

BORING LOCATION PLAN

NOT TO SCALE

DRAWN	JMM
CHECKED	PJE
APPROVED	CRN
SCALE	NOTED

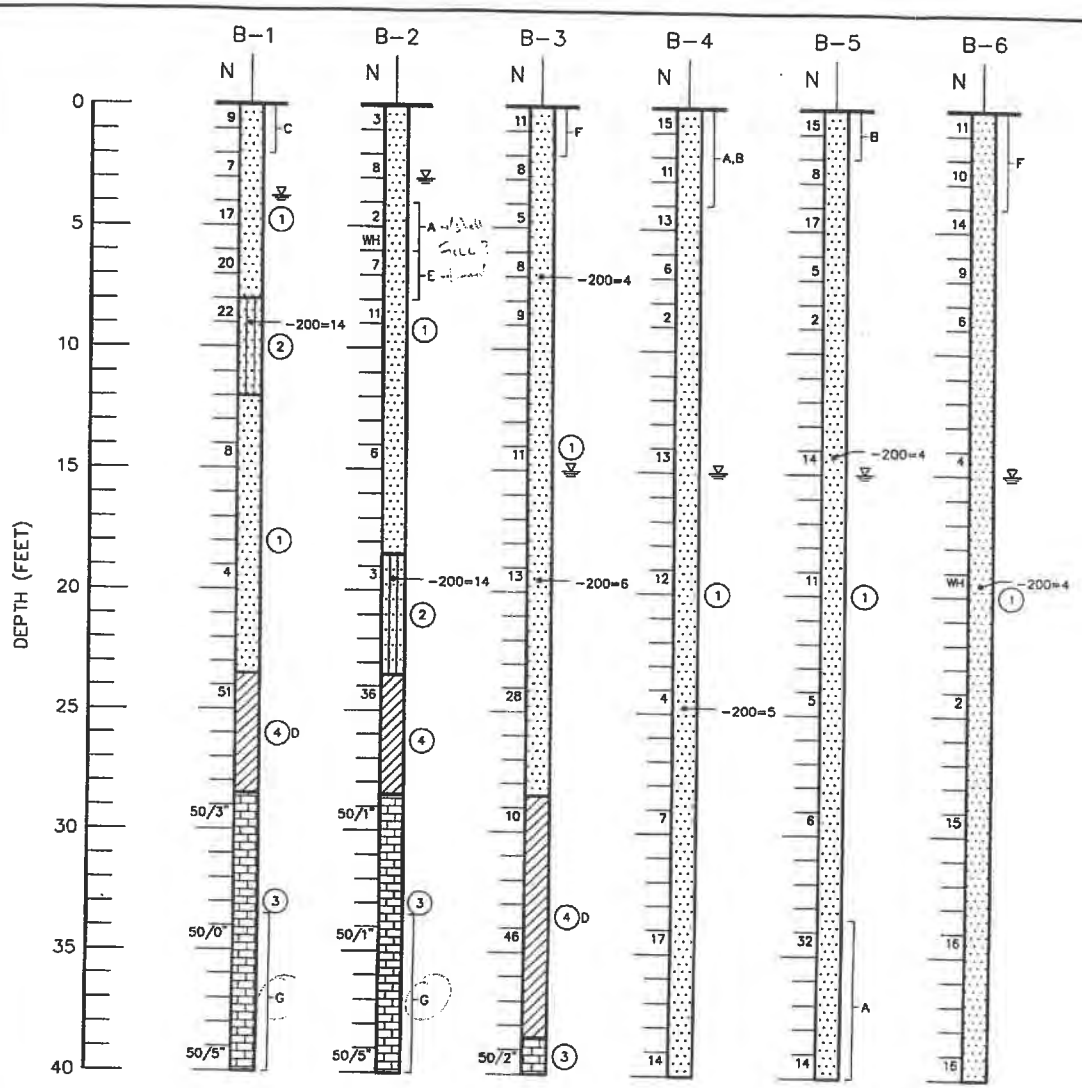
GEOTECHNICAL SERVICES

HILLSBOROUGH RIVER DAM

TAMPA, FLORIDA

PSI ENVIRONMENTAL GEOTECHNICAL CONSTRUCTION

DATE	PROJ. NO.	SHEET
JAN 98	775-75361	SHEET 2



SOIL PROFILES

0 5'

VERTICAL SCALE

LEGEND

1. Brown/gray to tan slightly silty fine SAND (SP/SP-SM)
2. Dark to light brown silty fine SAND (SM)
3. Weathered LIMESTONE
4. Tan to light green CLAY (CL/CH)

SP — Unified Soil Classification System (ASTM D 2487) group symbol as determined by visual review

Groundwater level, October 1997

N — SPT N-value in blows/foot

WH — Fell under weight of rod & hammer

50/6" — Fifty blows for six inches

-200 — Fines passing No. 200 sieve (%)

A — With shell fragments

B — With clay lenses

C — With slight roots

D — With limestone fragments

E — With wood

F — With rocks

G — With chert

DRAWN	KES
CHECKED	PJE
APPROVED	CRN
SCALE	NOTED

GEOTECHNICAL SERVICES

HILLSBOROUGH RIVER DAM

TAMPA, FLORIDA

PSI ENVIRONMENTAL GEOTECHNICAL CONSTRUCTION

DATE	PROJ. NO.	SHEET
JAN 98	775-75361	SHEET 3

APPENDIX C

Laboratory Test Result Summary

Boring ID	Depth (ft)	Moisture Content (%) [ASTM- D2216]	% Finer #200 Sieve (%) [ASTM-D1140]	Liquid Limit	Plastic Limit	Plasticity Index
SPT-1	18.5'-20.0'	33.8	29.2	-	-	NP
SPT-2	18.5'-20.0'	28.0	20.0	-	-	-
SPT-2	23.5'-25.0'	18.5	40.3	-	-	-
SPT-2	33.5'-35.0'	31.9	24.8	34	15	19
SPT-3	13.5'-15.0'	19.3	44.6	-	-	NP
SPT-3	33.5'-35.0'	31.9	24.8	-	-	-
SPT-4	38.5'-40.0'	31.4	42.4	37	24	13
SPT-6	33.5'-35.0'	39.3	31.9	-	-	-
SPT-6	43.5'-45.0'	72.9	82.3	66	18	48
SPT-6	68.5'-70.0'	67.1	57.9	-	-	-
SPT-6	93.5'-95.0'	51.0	59.2	54	23	31

MOISTURE CONTENT and WET SIEVE ANALYSIS

CLIENT: **URS & City of Tampa Water Department**
Address: **7650 W. Courtney Campbell Causeway**
Suite 700
Tampa, Florida 33602-1462

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

Test Date: March 13, 2019
Project #: 300881x3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C Suarez

% Solids, Moisture Content							Wet Sieve Test		
Sample No. and Depth	Tare ID	Weight of Container (g)	Weight of Container + Wet Soil (g)	Weight of Container + Dry Soil (g)	Solids Content (%)	Moisture Content (%)	Weight of Container + Dry Soil (g)	Weight of Container + Dry washed Soil (g)	% Finer than #200 Sieve (%)
SPT-1 18.5'-20'	1	8.39	231.04	174.80	74.74	33.8	174.80	126.28	29.2
SPT-2 18.5'-20'	2	8.40	352.02	276.85	78.12	28.0	276.85	223.09	20.0
SPT-2 23.5'-25'	3	8.39	258.75	219.66	84.39	18.5	219.66	134.50	40.3
SPT-2 33.5'-35'	4	8.35	237.26	190.89	79.74	25.4	190.89	111.57	43.5
SPT-3 13.5'-15'	5	8.35	302.40	254.91	83.85	19.3	254.91	145.05	44.6
SPT-3 33.5'-35'	6	8.34	246.96	189.24	75.81	31.9	189.24	144.43	24.8
SPT-4 38.5'-40'	7	8.35	209.36	161.36	76.12	31.4	161.36	96.41	42.4
SPT-6 33.5'-35'	9	8.34	283.90	206.17	71.79	39.3	206.17	143.14	31.9
SPT-6 43.5'-45'	10	8.33	213.36	126.92	57.84	72.9	126.92	29.37	82.3
SPT-6 68.5'-70'	11	8.33	212.30	130.41	59.85	67.1	130.41	59.77	57.9
SPT-6 93.5'-95'	12	8.29	215.15	145.30	66.23	51.0	145.30	64.21	59.2

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT: URS & City of Tampa Water Department
Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

Boring #: SPT-1
Sample #: 7
Depth: 18.5'-20'

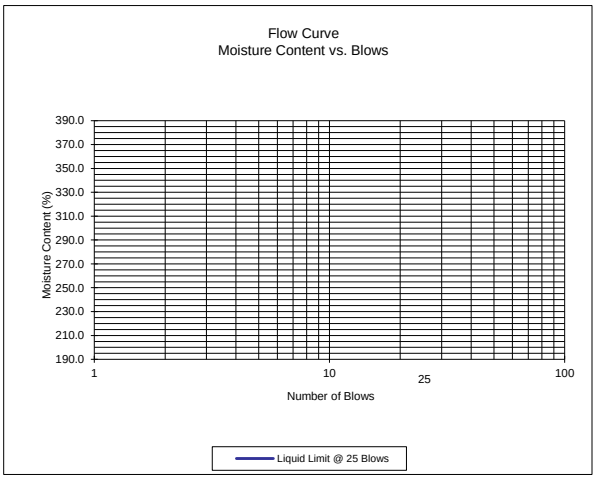
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)

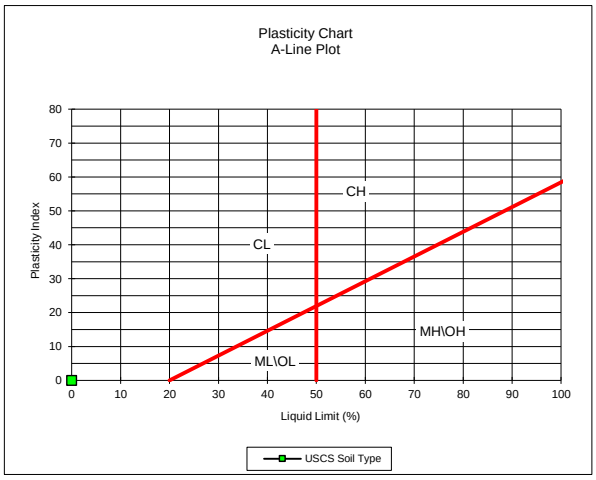
Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)

Results Summary

Liquid Limit:
Plastic Limit:
Plasticity Index: NP
In-situ Moist. Content: 33.8%
% Passing #200: 29.2%

29.2%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
231.04	174.8	8.39	33.8%	126.28	29.2%

NOTES:

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT: URS & City of Tampa Water Department
Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

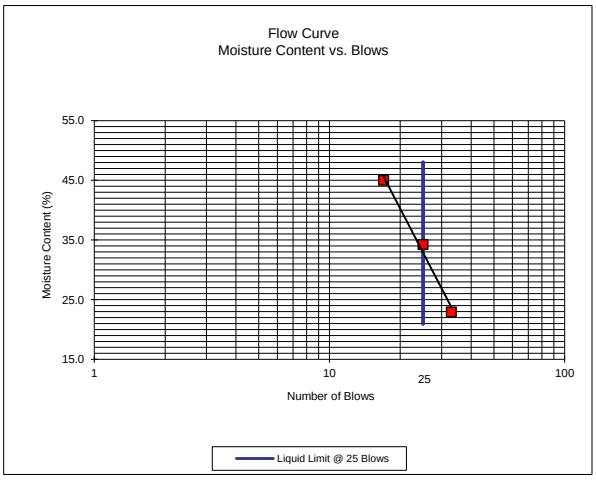
Boring #: SPT-2
Sample #: 10
Depth: 33.5-35

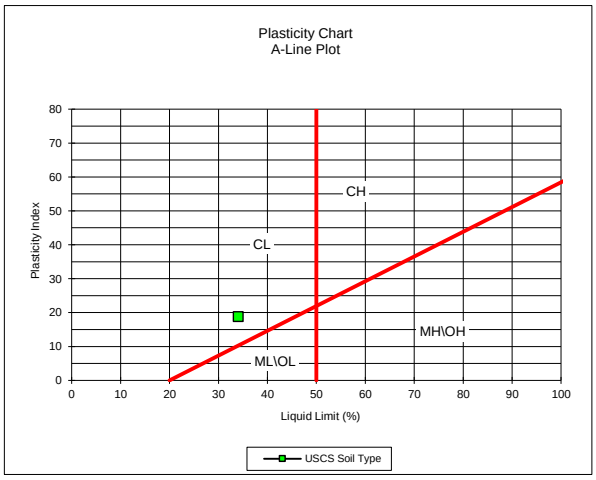
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
33	23.51	22.79	19.65	22.9
25	11.51	10.75	8.53	34.2
17	10.76	10.08	8.57	45.0

Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
15.96	14.97	8.56	15.4
14.52	13.75	8.60	15.0

Results Summary

Liquid Limit: 34
Plastic Limit: 15
Plasticity Index 19
In-situ Moist. Content: 25.4%
% Passing #200: 43.5%
43.5%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
237.26	190.89	8.39	25.4%	111.57	43.5%

NOTES:

ATTERBERG LIMITS TEST
ASTM D 4318

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Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

Boring #: SPT-3
Sample #: 6
Depth: 13.5'-15'

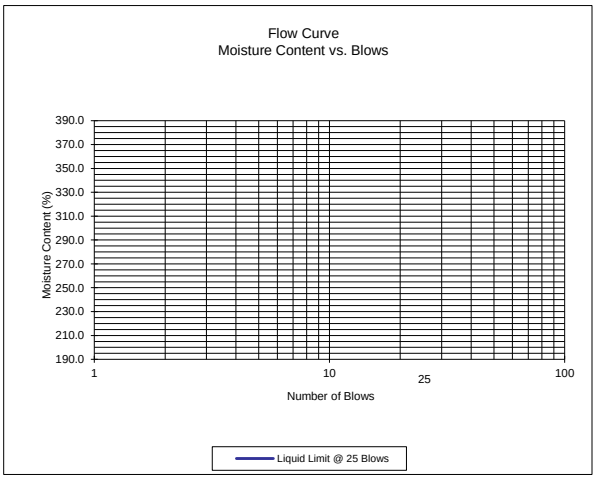
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)

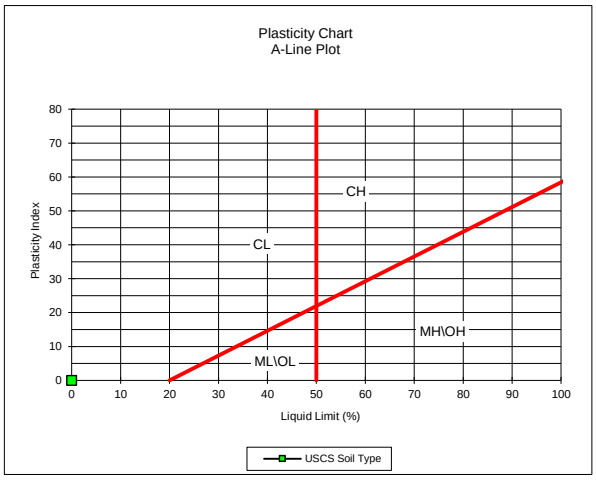
Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)

Results Summary

Liquid Limit:
Plastic Limit:
Plasticity Index: NP
In-situ Moist. Content: 33.8%
% Passing #200: 29.2%

29.2%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
231.04	174.8	8.39	33.8%	126.28	29.2%

NOTES:

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT: URS & City of Tampa Water Department
Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

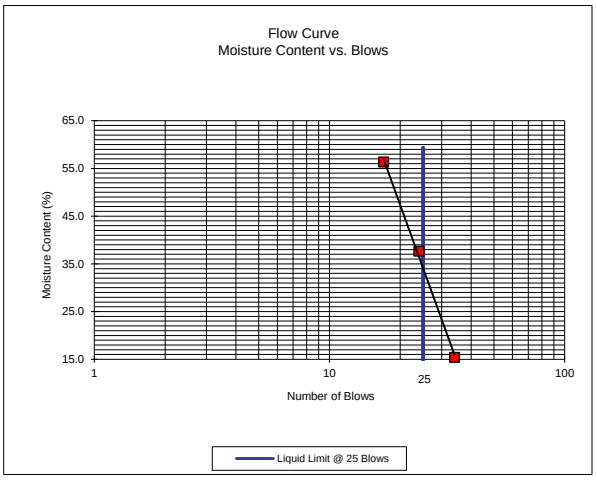
Boring #: SPT-4
Sample #: 11
Depth: 38.5-40

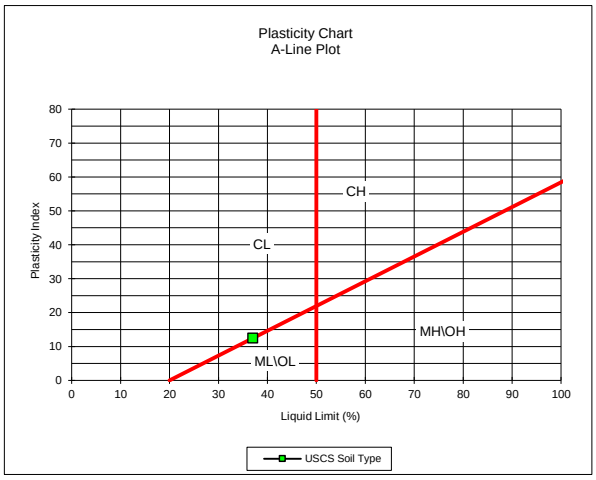
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
34	10.39	10.15	8.59	15.4
24	11.01	10.37	8.67	37.6
17	11.85	10.65	8.52	56.3

Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
15.59	14.25	8.56	23.6
16.78	15.12	8.59	25.4

Results Summary

Liquid Limit: 37
Plastic Limit: 24
Plasticity Index 13
In-situ Moist. Content: 31.3%
% Passing #200: 42.4%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
209.32	161.36	8.35	31.3%	96.41	42.4%

NOTES:

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT: URS & City of Tampa Water Department
Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

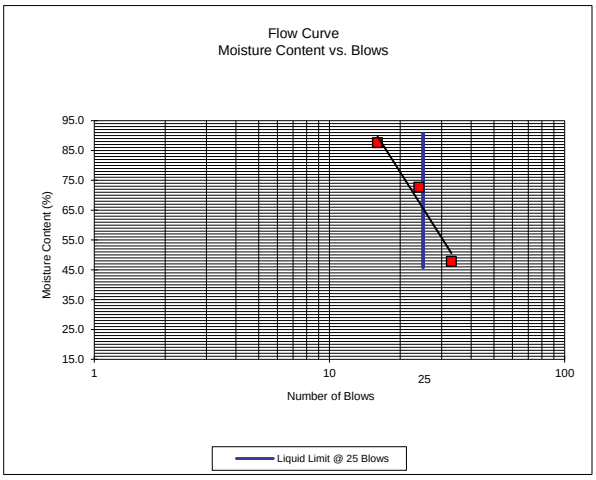
Boring #: SPT-6
Sample #: 12
Depth: 43.5-45

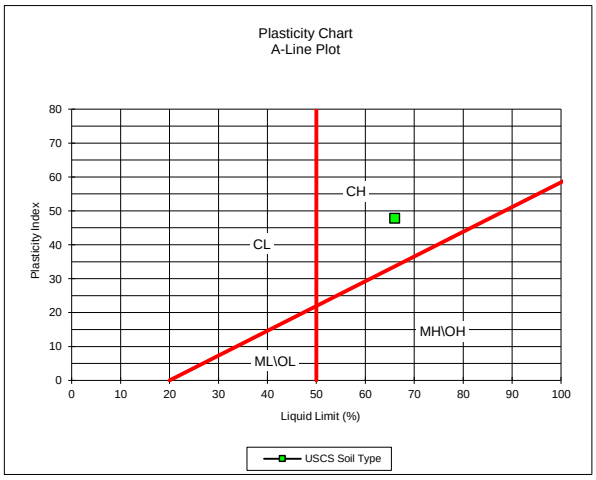
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
33	21.26	20.71	19.56	47.8
24	22.85	21.49	19.62	72.7
16	22.79	21.30	19.60	87.6

Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
26.41	25.39	19.61	17.6
25.95	24.98	19.79	18.7

Results Summary

Liquid Limit: 66
Plastic Limit: 18
Plasticity Index 48
In-situ Moist. Content: 72.9%
% Passing #200: 82.3%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
213.36	126.92	8.35	72.9%	29.37	82.3%

NOTES:

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT: URS & City of Tampa Water Department
Address: 7650 W. Courtney Campbell Causeway
Suite 700
Tampa, Florida 33602-1462

Date: March 12, 2019
Project #: 300881X3
Requested By: C. Suarez
Tested By: M. Hall
Checked By: C. Suarez

Project: Hillsborough River Dam Phase II
Location: Tampa, Florida

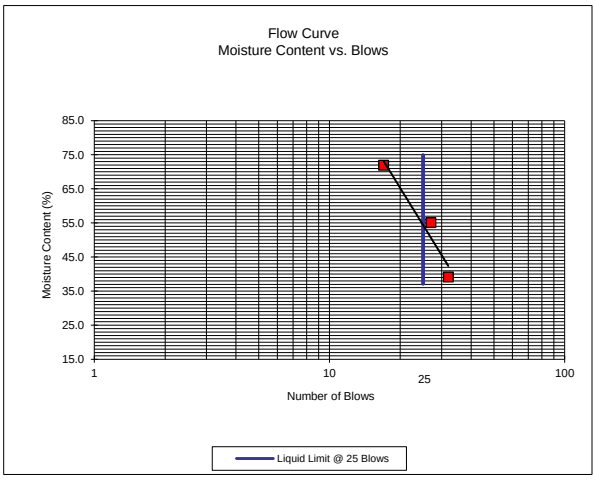
Boring #: SPT-6
Sample #: 22
Depth: 93.5-95

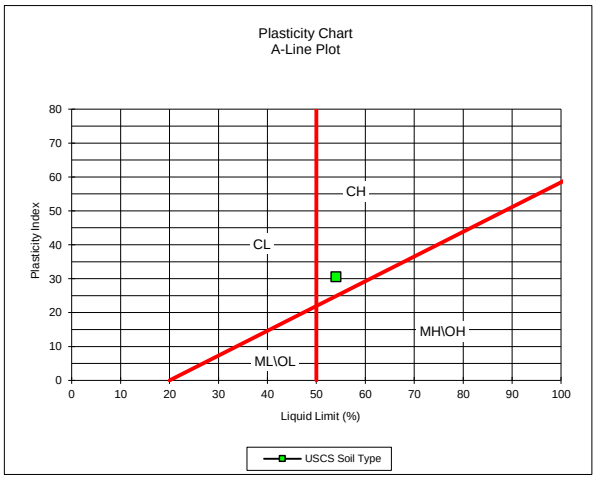
Liquid Limit				
Number of Blows	Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
32	21.26	20.81	19.66	39.1
27	22.85	21.72	19.67	55.1
17	22.79	21.51	19.73	71.9

Plastic Limit			
Weight of Cont. + Wet Soil (grams)	Weight of Cont. + Dry Soil (grams)	Weight of Container (grams)	Moisture Content (%)
27.12	25.76	19.72	22.5
26.22	24.95	19.75	24.4

Results Summary

Liquid Limit: 54
Plastic Limit: 23
Plasticity Index 31
In-situ Moist. Content: 51.0%
% Passing #200: 59.2%





Natural Moisture Content, Percent Passing #200 Sieve					
Cont+wet soil	Cont. + dry soil	Container wt.	Moisture Content	Cont+dry wash	% passing #200
215.15	145.3	8.35	51.0%	64.21	59.2%

NOTES: