GEOTECHNICAL ENGINEERING SERVICES REPORT

For the

PROPOSED UTILITY CROSSING
BRUCE B. DOWNS BOULEVARD
TAMPA, FLORIDA

Prepared for

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PSI Project No. 0775-270

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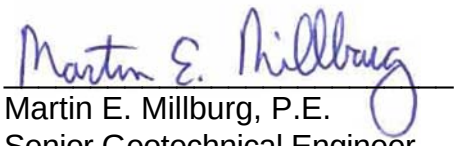

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ATTACHMENTS

1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided through a Subconsultant Agreement issued September 17, 2009 by George F. Young, Inc. for Project No. 0913-0080-04. This study was conducted in accordance with our proposal for these services dated September 14, 2009, PSI Proposal No. 0775-8263 (rev.1).

1.2 PROJECT DESCRIPTION

We understand the City of Tampa Waste Water Department has hired George F. Young, Inc. to provide consulting services for sanitary sewer improvements along Bruce B. Downs Boulevard in Tampa, Florida. We understand the project includes the installation of a waste water pipe for a distance of about 2,200 feet. It is our understanding the pipe will be installed using directional drilling methods. Most of the waste water pipe will be installed within 10 feet of the ground surface but two locations will be installed deeper to avoid utility conflicts. PSI has been employed to perform soil borings at these two deeper locations. Some of this utility installation will consist of relatively shallow installation using conventional "cut and cover" installation techniques.

Should any of the above information or assumptions made by PSI be inconsistent with the planned construction, we request that you contact us immediately to allow us to make any necessary modifications to the recommendations contained herein.

1.3 PURPOSE AND SCOPE OF WORK

The purpose of this study is to provide a geotechnical study for developing geotechnical design criteria for the project site. In this regard, engineering assessments of the following items have been formulated:

1. General location and description of potentially deleterious materials discovered in the borings that may interfere with construction progress and structure performance.

2. Define subsurface statigraphy at each boring location.

3. Identification of groundwater levels and an estimation of seasonal high groundwater levels.

The following services have been provided in order to achieve the preceding objectives:

1. Executed a program of subsurface exploration consisting of subsurface sampling and field-testing. Two (2) Standard Penetration Test (SPT) borings were performed to depths of 25 feet at the requested locations. In each boring, samples

were collected and SPT resistances were measured virtually continuously for the top 10 feet and on intervals of 5 feet thereafter. In accordance with local regulations the borings were grouted to the surface upon completion.

2. Visually classified representative soil samples in the laboratory using the Unified Soil Classification System (USCS). Conducted a limited laboratory testing program. Identified soil conditions at each boring location and formed an opinion of the site soil stratigraphy.

3. Reviewed available published topographic and soils information. This published information was obtained from the "Sulphur Springs, Florida" Quadrangle Map published by the United States Geological Survey (USGS) and the "Soil Survey of Hillsborough County, Florida" published by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS).

4. Collected groundwater level measurements and estimated normal wet seasonal high groundwater levels at the boring locations.

5. The results of the exploration have been used in the engineering analysis and the formulation of recommendations. The results of the subsurface exploration, including the recommendations and the data on which they are based, are presented in this report supervised by a professional engineer.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, ground water, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, unusual or suspicious items or conditions are strictly for the information of our client.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

This project is located in Sections 4 & 5, of Township 28 South, and Range 19 East in Hillsborough County, Florida. The elevation of the site is approximately +45 to +50 feet NGVD based on the 2000 U.S. Geological Survey quadrangle map titled "Sulphur Springs, Florida". The proposed pipeline area included in this study is located on

the south side of Bruce B. Downs Boulevard from Bearss Ave East to North 37th Street in Tampa, Florida. The right of way areas where the proposed pipeline will be placed are generally grassy adjacent to an existing stormwater ditch. The soil borings were performed in this stormwater ditch which are estimated to be 2 ½ to 3 feet below the pavement elevation and about 15 feet from the edge of pavement. The areas to the south of Bruce B. Downs are developed with multifamily residential housing units and office parks. The USGS Vicinity Map for this project area is presented on **Sheet 1** of the **Appendix**.

2.2 HILLSBOROUGH COUNTY SOIL SURVEY

The "Soil Survey of Hillsborough County, Florida" published by the USDA, SCS, was reviewed for general near surface soil information. This information indicated three mapping soil units are present along the proposed utility route.

Candler fine sand, 0 to 5 percent slopes (mapping unit 7) is nearly level to gently sloping and excessively drained located on the uplands. This soil unit typically has a seasonal high water table deeper than 80 inches. The permeability is rapid and the available water capacity is very low. The risk of corrosion of uncoated steel is low for this soil type, but has a high risk for concrete corrosion. This soil unit is mapped on the eastern side of the project site.

Myakka fine sand (mapping unit 29) is a nearly level and poorly drained soil on broad plains and on the flatwoods. This soil unit typically has a seasonal high groundwater table which fluctuates from the soil surface to a depth of 40 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low. The risk of corrosion of uncoated steel and concrete is high for this soil type. This soil mapping unit is located on the western side of the project site.

Zolfo fine sand (mapping unit 61) is a nearly level somewhat poorly drained soil located on broad low ridges on the flatwoods. This soil unit includes most of the project site included in this study. The seasonal high water table for this soil is within a depth of 24 to 40 inches of the surface for more than 2 to 6 months and recedes to a depth of 60 inches during prolonged dry periods. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low. The risk of corrosion of uncoated steel is low for this soil type, with a moderate risk of corrosion for concrete.

It should be noted that information contained in the USDA Soil Survey is very general and may be outdated. It may not therefore be reflective of actual soil and groundwater conditions, particularly if recent development in the project vicinity has modified soil conditions or surface/subsurface drainage. The USDA Vicinity Map is presented on **Sheet 1** of the **Appendix**.

2.3 SUBSURFACE CONDITIONS

As noted above, the subsurface conditions were explored using two (2) SPT borings extended to a depth of 25 feet below current ground surface. The boring locations were

performed at locations requested by George F. Young and were located in the field by PSI personnel by measuring distances from known features. The borings were performed about 15 feet off the edge of pavement in the middle of the stormwater ditch. This ditch is estimated to be 2 ½ to 3 feet below the pavement elevation. The boring locations presented on **Sheet 2** of the **Appendix** should be considered approximate.

The SPT borings were advanced utilizing rotary mud drilling methods and soil samples were routinely obtained at select intervals during the drilling process. Samples obtained in the field were returned to the laboratory for visual classification and laboratory testing. Drilling and sampling techniques were accomplished in general accordance with ASTM Standards.

In general, the borings encountered fine sand to slightly silty fine sand (Unified Classification SP/SP-SM) in the upper 10 to 12 feet of the borings. The SPT resistances in these upper soils indicate very loose to loose soils with N-values (blow counts) of 4 to 6 blows per foot (BPF). Very loose slightly clayey sand (SM-SC) was encountered below at approximately 15 feet with N-values of 2 BPF. The soils from about 15 to 20 feet deep to the boring termination depth of 25 feet were medium dense fine sand (SP-SP-SM) with N-values ranging from 10 to 22 BPF.

The description presented above is of a generalized nature to highlight the major subsurface features and material characteristics. The soil profiles included on **Sheet 2** of the **Appendix** should be reviewed for specific information at individual boring locations. These profiles include soil description, stratifications, and laboratory classification of soils. The stratifications shown on the boring profiles represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

2.4 GROUNDWATER INFORMATION

The groundwater table was measured at depths of 9 to 10 feet below current grades at the boring locations. The borings were performed in the stormwater ditch about 2 ½ to 3 feet below the elevation of the pavement on Bruce B. Downs Boulevard. It should be noted that groundwater conditions tend to fluctuate with environmental changes and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as swales, drainage ponds, etc. Based on a review of the SCS data and the borings performed for our evaluation we estimate seasonal high groundwater level at the project site be approximately 7 feet below existing grades at the boring locations.

In general, the estimated seasonal high groundwater level is not intended to define a limit or ensure that future seasonal fluctuations in groundwater levels will not exceed the estimated levels. Groundwater levels could exceed the estimated seasonal high groundwater levels as a result of a series of rainfall events, changed conditions at the site that alter surface water drainage characteristics, and/or variations in duration, intensity, or total volume of rainfall.

2.5 SOIL PARAMETERS

Soil parameters for each boring are included in the Appendix of this report.

3.0 EVALUATIONS AND RECOMMENDATIONS

3.1 GENERAL

The following design evaluations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. PSI anticipates that some of the pipeline will be installed using conventional cut and cover installation methods after proper dewatering has been completed, as needed. We recommend the groundwater be lowered to at least 2 feet below the lowest depth of anticipated excavations prior to construction. Care will be required during the excavation process to protect adjacent surface structures and adjacent utilities within 20 feet of the excavations. The contractor should provide a protection plan for adjacent facilities to the engineer for review prior to excavation.

During deeper utility excavations and backfill compaction, vibrations are common. We recommend a preconstruction crack and condition survey be considered for every sensitive structure within 100 feet of the pipeline alignment. Also, we recommend vibration monitoring be performed during construction within 100 feet of sensitive structures for documentation purposes in case of future damage claims.

3.2 EXCAVATIONS

In our opinion, the soils at the boring locations can be excavated with conventional heavy duty excavation equipment. Special hard rock excavation is not expected to be necessary along the pipeline alignment. However, to perform cut and cover operations, digging through roadways may be required at paved locations.

3.3 TRENCH BACKFILL RECOMMENDATIONS

Trench backfill supporting the pipe should consist of select fill. Materials defined as select fill are clean to slightly silty sands (SP/SP-SM) containing less than 5% organic matter or other deleterious substances such as debris or large rock fragments. These materials should have a fines content that does not exceed 12 percent (i.e. less than 12 percent by dry weight passing the U.S. Standard Number 200 sieve). If required, materials with fines contents up to 20 percent can be used as backfill. However, these materials are moisture sensitive and will be more difficult to compact.

Trench backfill should be placed at a moisture content near optimum and in uniform lifts not exceeding 12 inches in loose thickness. The fill should be brought up evenly on each side of the pipe. It should be thoroughly compacted to at least 95 percent of its modified Proctor maximum dry density to provide support for the pipe. Backfill placed on

top of the pipeline in landscaped areas may be placed with a lower degree of compaction, if desired. All backfill below paved roadways, sidewalks or any other structures should be compacted to 95% of the maximum modified Proctor dry density.

3.4 SOIL BORINGS WITH UNSUITABLE PIPELINE BEDDING

Some of the soil borings performed along the pipeline alignment encountered slightly clayey soils (Stratum 2). These soils were deeper and are not expected to be present in the upper 10 feet. They are less acceptable for pipe bedding purposes. If excessively clayey soils (greater than 20% fines content) or soils with organic contents greater than 5 percent are found, they will need to be removed to a minimum depth of 6 to 12 inches below the bottom of the pipe and replaced with select fill in accordance with the recommendations presented above.

After removing unsuitable pipeline bedding material, select fill material for pipe bedding should be selected from excavated soils. Materials from Stratum 1 can be used as pipeline bedding provided the selected soils are free of debris, rock fragments and other unsuitable materials. Selected portions of Stratum 2 (slightly clayey fine sands) may be used for trench backfill above the pipeline, provided these materials have fines contents of 20% or less.

The pipe manufacturer's recommendations for pipe bedding should be followed closely. If these recommendations are not available, PSI recommends at least 6 to 12 inches of compacted granular materials be present at the bottom of the trench prior to placement of the pipe. These materials may be soils containing a maximum of 12% fines, compacted to a minimum dry density of 95% of their modified Proctor value. Gravel meeting FDOT CA-57 requirements may also be used.

3.5 SOIL MODULUS

The pipeline will be surrounded by compacted granular soils. Published values for a soil modulus (E') range from approximately 30 pounds per cubic inch (pci) for a loose wet sand to 1,160 pci for a dense sand. A value of 1,000 pci may be used for pipeline design, provided backfill around the pipe is compacted as recommended in this report.

3.0 CONSTRUCTION CONSIDERATIONS

3.1 GENERAL

It is recommended that PSI be retained to provide observation and testing of construction activities involved in any pavements, earthwork or related activities of this project. This will promote project continuity and will reduce the potential for misinterpretation of our recommendations.

3.2 DRAINAGE AND GROUNDWATER MANAGEMENT

The groundwater levels presented in this report are levels that were measured at the time of our field activities. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impacts on the construction procedures.

Dewatering may be necessary in deeper excavations for this pipeline installation depending upon the final invert elevations and the time of year the pipeline is installed. It is suggested that the dewatering system be designed by a qualified dewatering professional in order to achieve the desired dewatering results. Dewatering should lower groundwater to at least 2 feet below the lowest expected excavations.

Water should also not be allowed to collect in the excavations, either during or after construction. Undercut or excavated areas should be sloped towards one corner to facilitate removal of any collected rainwater, groundwater or surface runoff. Dewatering must be conducted with care. The contractor should anticipate settlement would occur as a result of dewatering in these areas. Settlement will continue as long as dewatering is maintained and will generally increase the further that water is depressed.

3.3 EXCAVATIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the current OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractors "responsible person", as defined in 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal safety or other regulations.

4.0 REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by George F. Young, Inc. for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required.

Much of the State of Florida is underlain by a soluble limestone foundation. This limestone can dissolve, resulting in the formation of a sinkhole. An evaluation of the risk of sinkhole development was not included in the Scope of work for this study.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. This report has been prepared for the exclusive use of George F. Young, Inc. and its consultants for the specific application to the proposed pipeline located along the south side of Bruce B. Downs Boulevard from Bearss Avenue East to North 37th Street in Tampa, Florida.

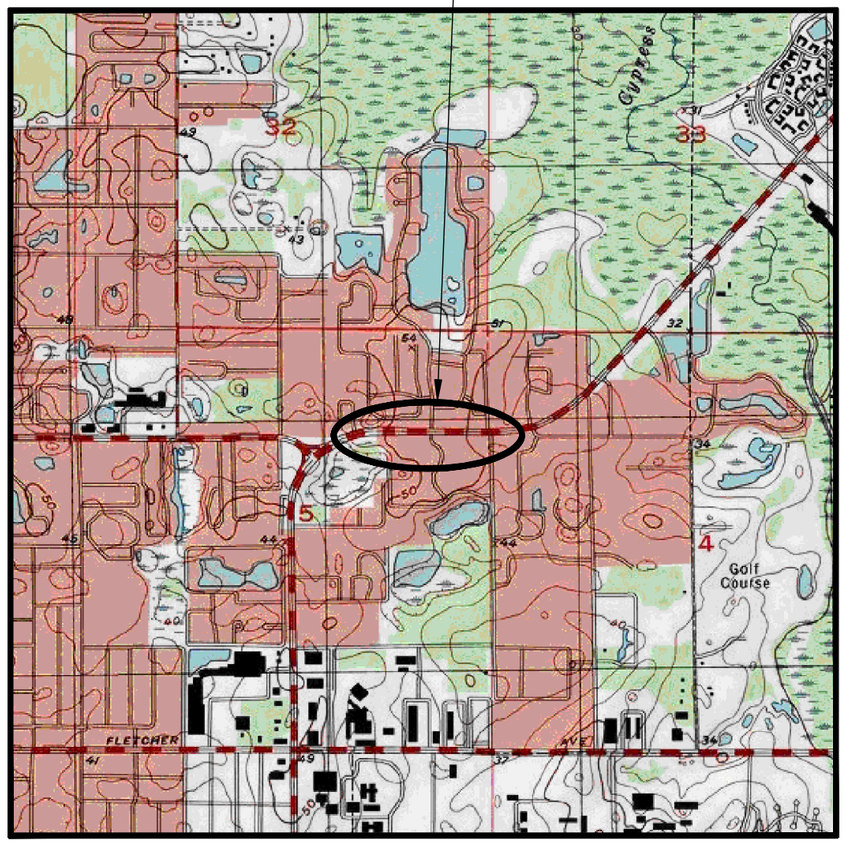
APPENDIX

APPROXIMATE SITE LOCATION

REFERENCE: USDA SCS, "SOIL SURVEY OF HILLSBOROUGH COUNTY, FLORIDA"
TOWNSHIP: 28 SOUTH
RANGE: 19 EAST
SECTIONS: 4 & 5
ISSUED: 1989
PHOTO: 1982
SCALE: 1" = 2000'

USDA VICINITY MAP

APPROXIMATE SITE LOCATION



REFERENCE: USGS "SULPHUR SPRINGS, FLORIDA" QUADRANGLE MAP
TOWNSHIP: 28 SOUTH
RANGE: 19 EAST
SECTIONS: 4 & 5
MAP VERSION: 1995
PHOTOREVISED: –
SCALE: 1" = 2000'

USGS VICINITY MAP

DRAWN	DJG
CHECKED	JH
APPROVED	MEM
SCALE	NOTED

USDA & USGS VICINITY MAPS
UTILITY CROSSING
BRUCE B DOWNS BLVD, TAMPA, FLORIDA

psi Information To Build On
Engineering • Consulting • Testing

DATE	PROJ. NO.	SHEET
OCT 09	0775270	SHEET 1

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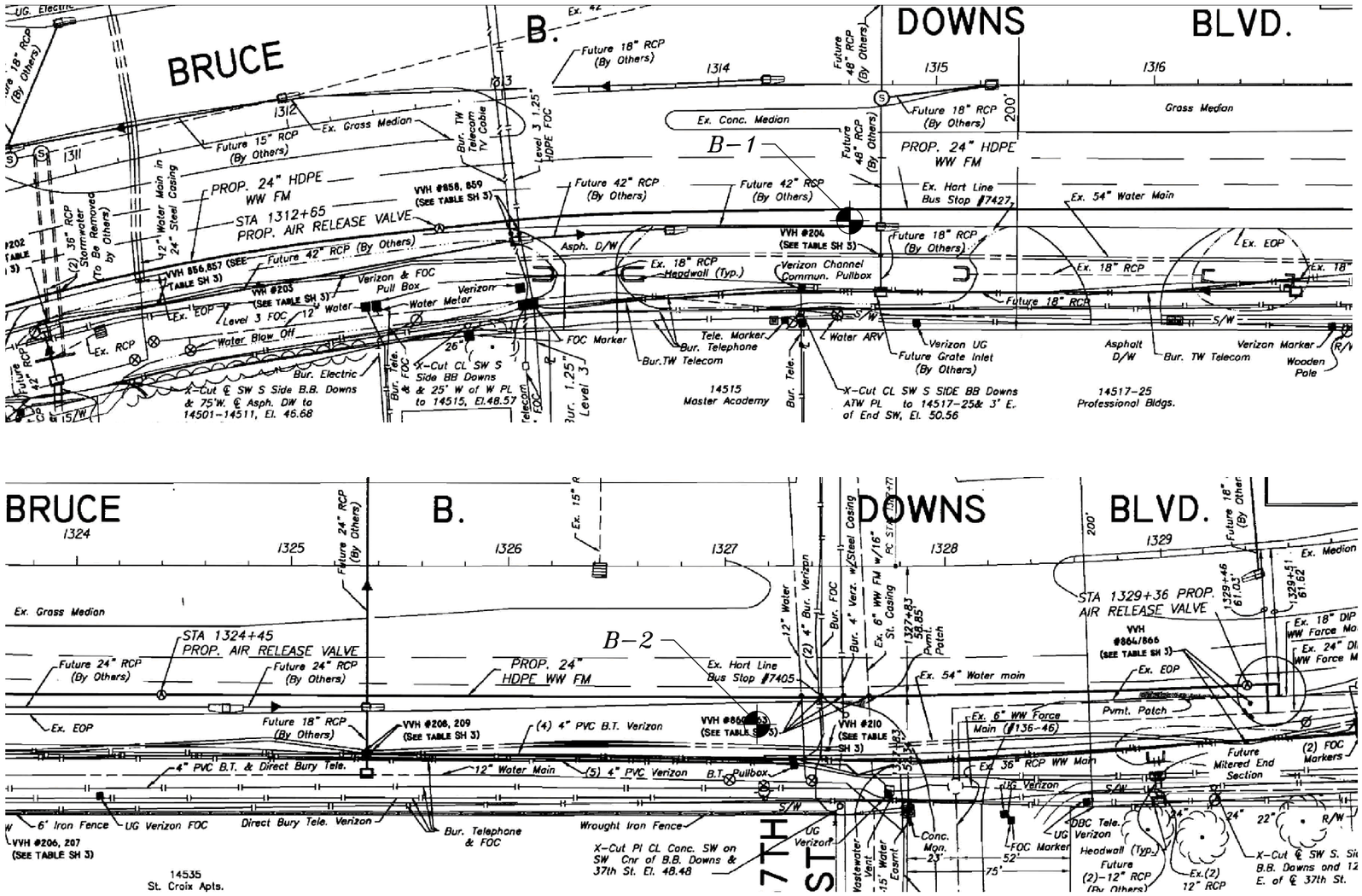
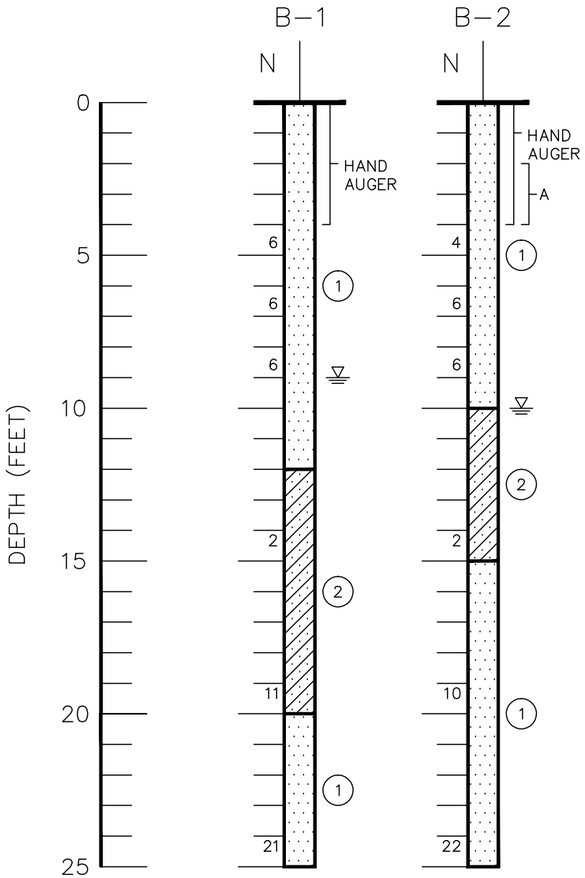


BORING LOCATION PLAN

0 60'

PLAN SCALE



SOIL PROFILES

0 5'

VERTICAL SCALE

LEGEND

1 Light to dark brown fine SAND to slightly silty fine SAND (SP/SP-SM)

2 Brown slightly clayey fine SAND (SM-SC)

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

Groundwater level, October 2009

N SPT N-value in blows/foot

A Trace clayey sand fill

Approximate SPT boring location

DRAWN	DJG
CHECKED	JH
APPROVED	MEM
SCALE	NOTED

GEOTECHNICAL SERVICES

UTILITY CROSSING

BRUCE B DOWNS BLVD, TAMPA, FLORIDA

psi Information To Build On

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DATE	PROJ. NO.	SHEET
OCT 09	0775270	2

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TABLE 1
Geotechnical Engineering Parameters

Project: Bruce B. Downs Boulevard - Utility Installation

PSI Project No. 0775-270

Client: George F. Young, Inc.

Date: October 8, 2009

Boring No.	Depth (ft)	Soil Description	Soil Type	Average SPT-N	Unit Weight (pcf)		Cohesion (psf)	Friction Angle (degree)	Coefficient of Lateral Pressure		
					Total	Submerge			Ka	Kp	Ko
B-1	0-10	SP/SP-SM	Cohesionless	6	105	42.6	-	29	0.34	2.91	0.46
	10-15	SM-SC	Cohesionless	2	100	37.6	-	28	0.36	2.81	0.47
	15-25	SP/SP-SM/SM-SC	Cohesionless	16	110	47.6	-	31	0.32	3.15	0.43
B-2	0-10	SP/SP-SM	Cohesionless	5	105	42.6	-	29	0.35	2.88	0.47
	10-15	SM-SC	Cohesionless	2	100	37.6	-	28	0.36	2.81	0.47
	15-25	SP/SP-SM	Cohesionless	16	110	47.6	-	31	0.32	3.15	0.43