



Addendum No. III

ITB No. 25-04

Saga Bay Drainage Improvements Project

Addendum No. 1 form shall be part of the original ITB No. 25-04 Saga Bay Drainage Improvements Project document and modifies the original ITB:

Geotechnical Engineering Services Report

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January 5, 2022

Kimley-Horn
8201 Peters Road, Suite 2200
Plantation, FL 33324
Attn: Stefano Viola, P.E.
Email: Stefano.viola@kimley-horn.com

Re: **Borehole Permeability and Pavement Cores**
Saga Bay
Cutler Bay, Florida
TSF File No. 7111-21-541

Dear Stefano:

TSF is pleased to transmit our Geotechnical Engineering Services Report for the referenced project. An exploration of the subsurface conditions has been completed for the proposed Saga Bay Drainage Improvements, located in Cutler Bay, Florida. A total of three (3) Standard Penetration Test (SPT) borings were performed, along with three (3) Borehole Permeability (BHP) tests and three (3) asphalt pavement cores. As a typical profile, the soil taken from beneath the topsoil consisted mainly of limerock and limestone strata. The groundwater was encountered between approximately 4 and 5 feet below grade. See the Boring Location Plan/Soil Profiles for more information. All depths should be considered approximate.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site is located in the Saga Bay community located in Cutler Bay, Florida. At the time of field exploration, the site was primarily covered by grass and pavement.

Subsurface Conditions

An exploration and evaluation of the subsurface conditions have been completed for the proposed drainage improvements for the project noted above, located in Cutler Bay, Florida. A total of three (3) Standard Penetration Tests (SPT) were completed, along with three (3) Borehole Permeability (BHP) tests and three (3) asphalt pavement cores. The SPT tests were conducted using a CME-45 drilling rig and a split spoon sampler. SPT readings were taken at regular intervals through the

boring. Samples of the in-place material were recovered at 2-foot intervals up to 10 feet and at 5-foot intervals to the boring termination depth.

The soils encountered at the boring site consist mainly of limerock and limestone to a depth of 20 feet. A thin layer of topsoil approximately 3 inches thick was found at the top of each of the borings taken. In boring SPT-1, a thin layer of silt was encountered from a depth of 2-4 feet below the existing grade. The boring data is attached as **Boring Location Plan/Soil Profiles – Sheets 1-2**.

Groundwater Information

Groundwater levels were measured in the borings upon completion of the drilling activities. The groundwater was encountered between approximately 4 feet to 5 feet below existing grade across the site at the time the boring was taken. See Soil Profiles for additional information. We expect groundwater to, typically, fluctuate within about 2 feet of where it was encountered during the drilling operation.

In general, the 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. Post-development groundwater levels could exceed the normal seasonal high groundwater level estimate as a result of a series of rainfall events, changed conditions at the site that alter surface water drainage characteristics, or variations in the duration, intensity, or total volume of rainfall. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on his or her construction procedures.

Borehole Permeability (BHP) Test Results

Three (3) BHP tests were performed in the same locations as the SPT borings using the usual open-hole, constant head methodology. The holes were advanced to approximately 15 feet below grade and were drilled with a hollow stem auger so that soil samples could be retrieved for visual classification by an engineer. The borings were completed as open well with gravel pack (6-20 silica sand). The well-screen slot widths were 0.020 inches. Water from the drill rig tank was then pumped into the open well, and the amount of water required maintaining a constant head was recorded. The test results are attached as **Summary of Exfiltration Test Results**.

Pavement Cores

Three (3) pavement cores were obtained within the project limits. Core samples were returned to the laboratory for a general layer classification (layer thickness and layer type identification). The layer classification is based on visual review only. An extraction and gradation would be necessary to verify the visual classification. A summary of the core data is attached as the **Pavement Evaluation Coring and Condition Data**. Photos of cores locations in the field, and photos of the core sample in the lab are attached as **Core Photos**.

Laboratory Classification Testing

Representative soil samples collected from the borings were classified and stratified in general accordance with the Unified Soil Classification System. Our classification was based on visual inspection, using the results from the laboratory testing as confirmation. The laboratory tests performed include natural moisture content, grain size analysis, and Atterberg limits. Laboratory test results are presented in the appendix as **Summary of Laboratory Tests** and **Grain Size Data Sheets**. Tests were performed in general accordance with the test methods noted in Table 1 below.

Table 1 – Soil Sample Testing Methods	
Test Type	Test Method
Sieve Analysis	ASTM C 136 (AASHTO T 27)
Moisture Content	ASTM D 2216 (AASHTO T 265)
Atterberg Limits	Liquid Limit : ASTM D 4318 (AASHTO T 89) Plastic Limit : ASTM D 4318 (AASHTO T 90)

CLOSING

If deviations from the subsurface conditions noted in this report are encountered during construction, TSF should be notified immediately to determine if changes in the foundation recommendations are required. If TSF is not retained to perform these functions, TSF will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings 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.

We appreciate the opportunity to perform this Geotechnical Study and look forward to continued participation during construction phases of this project.

If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,

TIERRA SOUTH FLORIDA, INC.

Ramakumar Vedula, P.E.
Principal Engineer
FL Registration No. 54873

Sean Tromans, E.I.

KV/ST
7111-21-541

Attachments:

- Boring Location Plan/Soil Profile – Sheet 1
- Summary of Exfiltration Test Results
- Pavement Evaluation and Coring Data
- Core Photos
- Summary of Laboratory Tests
- Grain Size Data Sheets

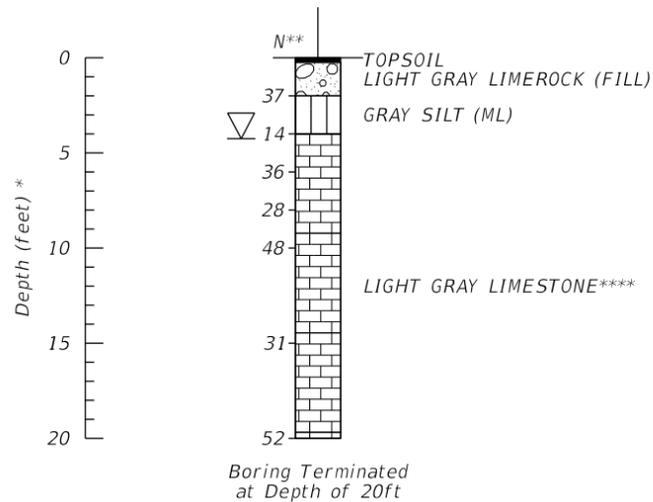


BORINGS LOCATION PLAN

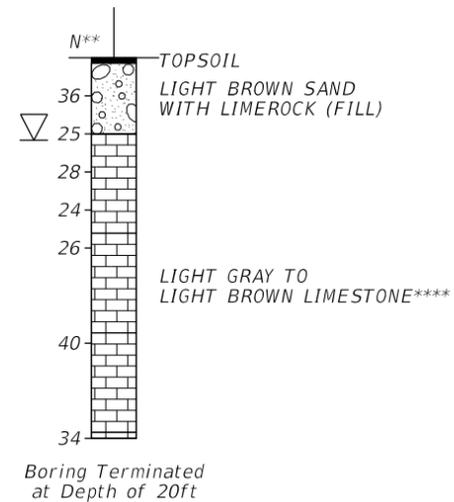
Approximate Location of SPT Boring and Pavement Cores

DRAWN BY: NG CHECKED BY: RV	APPROVED BY: RV DATE: 1/4/2022	ENGINEER OF RECORD: RAMAKUMAR VEDULA, P.E. FLORIDA LICENSE NO.: 54873	 TIERRA SOUTH FLORIDA 2765 VISTA PARKWAY, S-10 WEST PALM BEACH, FL 33411	SCALE: NTS	PROJECT NUMBER: 7111-21-541	BORING LOCATION PLAN SAGA BAY DRAINAGE IMPROVEMENTS CUTLER BAY, FLORIDA	Sheet: 1
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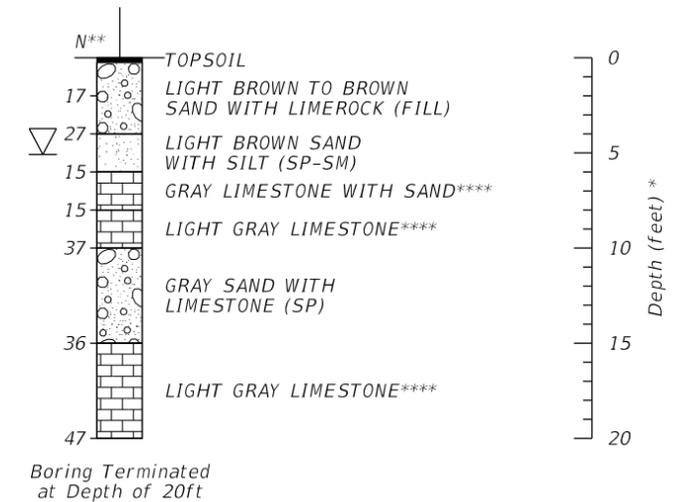
BOR # SPT-1
 DATE 12/21/2021
 HAMMER AUTO
 RIG CME-45
 ***LATITUDE 25.582494°
 ***LONGITUDE -80.325223°



BOR # SPT-2
 DATE 12/21/2021
 HAMMER AUTO
 RIG CME-45
 ***LATITUDE 25.580992°
 ***LONGITUDE -80.319230°



BOR # SPT-3
 DATE 12/21/2021
 HAMMER AUTO
 RIG CME-45
 ***LATITUDE 25.585018°
 ***LONGITUDE -80.318850°



LEGEND

- Encountered Groundwater Table
- Topsoil
- Gravelly Sand
- Silt
- Limestone Hard
- Sand

NOTES

- * DENOTES DEPTH IN FEET FROM EXISTING GROUND SURFACE
- ** SPT N-VALUES SHOWN ABOVE WERE OBTAINED USING AUTOMATIC HAMMERS. GENERALLY DESIGN CORRELATIONS AND PROGRAMS USE SAFETY HAMMER N-VALUES. HENCE, THE ABOVE N-VALUES NEED TO BE MULTIPLIED BY 1.24 TO OBTAIN EQUIVALENT SAFETY HAMMER N-VALUES FOR DESIGN PURPOSE.
- *** LATITUDE AND LONGITUDE ARE APPROXIMATE, BASED ON HANDHELD GPSMap GARMIN 78s. ACTUAL BORING LOCATIONS COULD VARY
- **** THE LIMESTONE STRATA ENCOUNTERED WITHIN THE PROJECT SITE CORRESPOND TO A ROCK FORMATION THAT TYPICALLY OFFER HIGH RESISTANCE TO EXCAVATION AND DRILLING. SPECIAL EQUIPMENT AND BREAKING TOOLS ARE TYPICALLY REQUIRED TO EXCAVATE AND DRILL WITHIN THESE LIMESTONE LAYERS. THESE LIMESTONE LAYERS ARE ALSO DIFFICULT TO DEWATER DUE TO THEIR HIGH POROSITY AND PERMEABILITY.

DRAWN BY:
NG

APPROVED BY:
RV

ENGINEER OF RECORD:
RAMAKUMAR VEDULA, P.E.
FLORIDA LICENSE NO.:
54873



TIERRA SOUTH FLORIDA
 2765 VISTA PARKWAY, S-10
 WEST PALM BEACH, FL 33411

SCALE:
NTS

PROJECT NUMBER:
7111-21-541

SOIL PROFILES
SAGA BAY DRAINAGE IMPROVEMENTS
 CUTLER BAY, FLORIDA

Sheet:
2

Summary of Exfiltration Test Results

**Geotechnical Services for Saga Bay Drainage Improvements (KHA)
Cutler Bay, Florida
TSF Project No. 7111-21-541**

Test Location	Date Performed	Diameter		Depth of Hole (Feet)	Depth to Groundwater Level Below Ground Surface (Feet)		Hydraulic Head, H ₂ (Feet)	Saturated Hole Depth, D _s (Feet)	Average Flow Rate, Q (gpm)	Horizontal Hydraulic Conductivity (K)
		Hole (Inches)	Casing (Inches)		Prior to Test	During Test				(ft ³ /sec/ft ² -ft Head)
BHP-1	12/21/2021	6	4	15.0	4.25	0.0	4.3	10.8	1.10	4.25E-05
BHP-2	12/21/2021	6	4	15.0	4.33	0.0	4.3	10.7	3.30	1.26E-04
BHP-3	12/21/2021	6	4	15.0	5.08	0.0	5.1	9.9	1.60	5.35E-05

Note:

- (1) The above hydraulic conductivity values represent an ultimate value. The designer should decide on the required factor of safety
- (2) The hydraulic conductivity values were calculated based on the South Florida Water Management District's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure.
- (3) Casing diameter was used for the calculation of hydraulic conductivity values.

**Geotechnical Services for Saga Bay Drainage Improvements (KHA)
Cutler Bay, Florida
TSF Project No. 7111-21-541**

Pavement and Base Material Data Sheet

Latitude	Longitude	Core ID	Core Date	Number of Layers Estimated	Pavement Layers (in.)						Total Core Length (in.)	Base Material	Subgrade			Crack	Pavement Condition*	Cross Slope (%)	Notes
					Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6			Base Stratum 1 LR	Type Stratum	Thickness (in.)				
25.582494°	-80.325223°	PC-01	12/21/2021	1	0.8						0.8	5.5	YES - LIGHT GRAY SAND WITH LIMEROCK	11.0		GOOD	3.1		
25.580992°	-80.319230°	PC-02	12/21/2021	1	4.3						4.3	6.5	YES - LIGHT GRAY SAND WITH LIMEROCK	10.0		FAIR	3.1		
25.585018°	-80.318850°	PC-03	12/21/2021	1	1.4						1.4	6	YES - LIGHT GRAY SAND WITH LIMEROCK	9.0		BAD	3.1		

Note - Latitude and Longitude are approximate

ESTIMATE OF ASPHALT TYPE *
Pavement Layer Code (1) SPIF

Pavement Conditions:

- G = Good
- F = Fair
- P = Poor
- B = Bad

* Pavement conditions based on visual observations only.



Core ID PC-01
 Core Date 12/21/2021
 Latitude 25.582494°
 Longitude -80.325223°
 Pavement Layer 1 SP1F 0.8
 Total Core Length (in.) 0.8
 Base Material Thickness (in.) 1 LR 5.5
 Stabilized Subgrade? YES - LIGHT GRAY SAND
 WITH LIMEROCK
 Stabilized Subgrade Thickness (in.) 11
 Pavement Condition GOOD
 Cross Slope (%) 3.1



Core ID PC-02
 Core Date 12/21/2021
 Latitude 25.580992°
 Longitude -80.319230°
 Pavement Layer 1 SP1F 4.3
 Total Core Length (in.) 4.3
 Base Material Thickness (in.) 1 LR 6.5
 Stabilized Subgrade? YES - LIGHT GRAY SAND
 WITH LIMEROCK
 Stabilized Subgrade Thickness (in.) 10
 Pavement Condition FAIR
 Cross Slope (%) 3.1



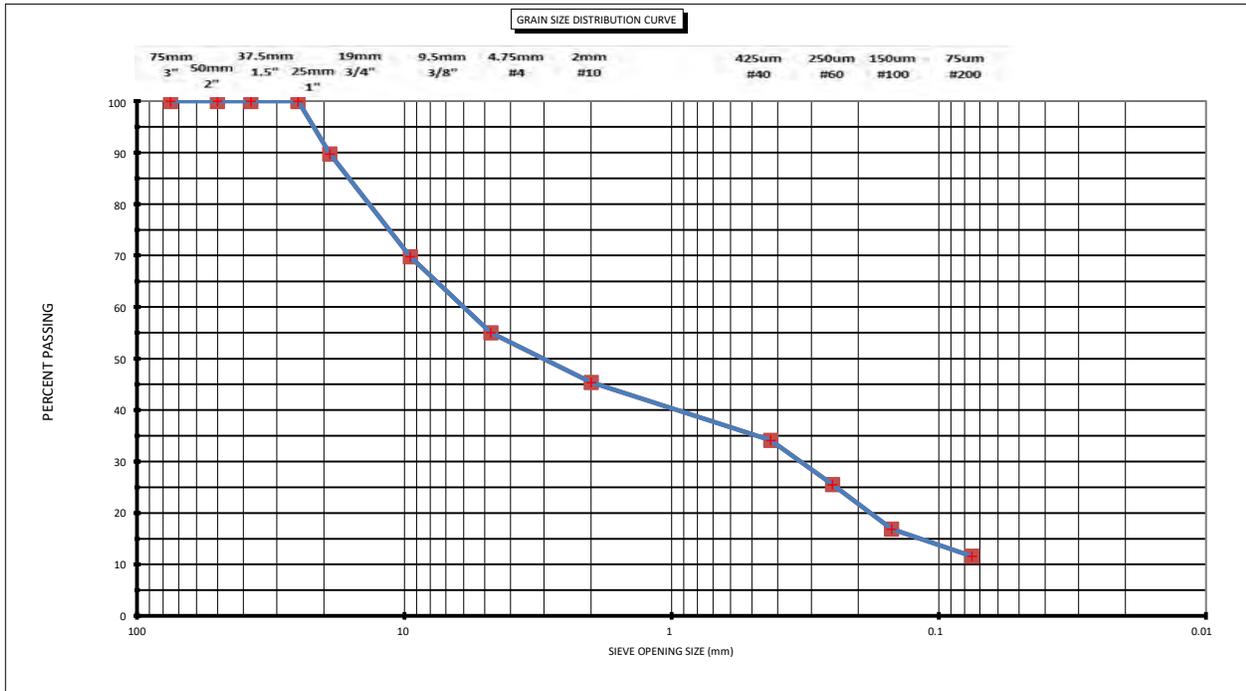
Core ID PC-03
Core Date 12/21/2021
Latitude 25.585018°
Longitude -80.318850°
Pavement Layer 1 SP1F 1.4
Total Core Length (in.) 1.4
Base Material Thickness (in.) 1 LR 6
Stabilized Subgrade? YES - LIGHT GRAY SAND
WITH LIMEROCK
Stabilized Subgrade Thickness (in.) 9
Pavement Condition BAD
Cross Slope (%) 3.1



GRAIN SIZE DATA SHEET

PROJECT INFORMATION
 Geotechnical Services for Saga Bay Drainage Improvements (KHA)
 Cutler Bay, Florida
 TSF Project No. 7111-21-541

DATE: 12/22/2021



ASTM D 2487 Classification of Soil for Engineering Purposes		Coarse Sand	< #4 and > #10	$C_u = D_{60} / D_{10} = 4$
Coarse Gravel	< 3" and > 3/4"	Medium Sand	< #10 and > #40	$C_c = (D_{30})^2 / (D_{10} \times D_{60}) = 0$
Fine Gravel	< 3/4" and > #4	Fine Sand	< #40 and > #200	

BORING # SPT-3 SAMPLE # 3 DEPTH (ft): 4 TO 6
 STRATUM: 0

SOIL CLASSIFICATION: A-1-b
 MC% 15.8
 OC% -
 -200% 12

ATTEBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	N/P