REPORT OF THE
GEOTECHNICAL INVESTIGATION

PROPOSED PIPELINE
MANATEE COUNTY NWRF
MANATEE COUNTY, FLORIDA

Driggers Engineering Services Incorporated

DRIGGERS ENGINEERING SERVICES INCORPORATED
Geotechnical Engineering & Construction Materials Testing

June 28, 2019

Jacobs Engineering Group, Inc.
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

Attn: Mr. Joseph C. Goldbach, P.E.

RE: Report of the Geotechnical Investigation
Proposed Pipeline
Manatee County NWRF
Manatee County, Florida
Our File: DES 188328

Dear Mr. Goldbach:

Pursuant to your authorization, **DRIGGERS ENGINEERING SERVICES, INC. (DESI)** has completed the requested investigation of subsurface conditions in the areas where the subject improvements are planned. Included herein are the results of our testing together with geotechnical recommendations for your consideration.

INVESTIGATION PROGRAM

The subject improvements include construction of a 12 to 14 inch DIP reclaim water line along with the installation of a 2 inch monitoring well drain pipe across the central portion of the project. It is our understanding that the proposed piping will be installed utilizing the open cut method at depths ranging from 5 to 10 feet below existing grade. A program of exploratory borings was conducted along the alignment of the planned pipeline route at select intervals. The borings were located in the field by our representative with reference to existing site features. These locations should be considered approximate since they were not precisely surveyed at the time of this writing.

To investigate subsurface soil and groundwater conditions along the proposed route, a combined program of two (2) Standard Penetration Test (SPT) borings and nine (9) hand auger

and hand cone penetrometer test borings were conducted. The depth of the borings varied from a nominal depth of 10 feet to 15 feet below grade. The detailed locations of the borings will be checked in the field by your surveyors and will be depicted on the civil plan and profile sheets. However, for general reference, we have provided the approximate boring locations on Plate I of the report attachments.

The Standard Penetration Test (SPT) borings were performed in general accordance with ASTM D-1586. The Standard Penetration method of sampling was incorporated to obtain soil samples for visual classification and to develop penetration resistance data for use in evaluating subgrade preparation requirements. Logs of the Standard Penetration Test borings are presented in the attachments, together with a brief description of this sampling and testing technique.

GENERALIZED SUBSURFACE CONDITIONS

SOIL CONDITIONS - The borings generally revealed fine sands with variable silt and clay fines to the termination depth of the borings at 10 to 15 feet below existing grade. In general, the soils within this stratum were representative of the SP, SP-SM, SM, SM-SC and SC Unified Soil Classification System (USCS) designation and A-3, A-2-4 and A-2-6 AASHTO designation. It should be noted that boring B-2 penetrated a thin layer of sandy clay soil from about 12 to 14 feet below grade. It should also be recognized that boring HA-3 encountered an obstruction at a depth of 6 feet below grade which appeared to be concrete. This obstruction could be buried concrete debris or possible abandoned utility.

GROUNDWATER CONDITIONS - Groundwater levels throughout the investigated areas ranged from about 3.7 to 8.8 feet below grade. The groundwater level at each boring was recorded during the course of our geotechnical investigation at the depths noted on each respective boring log. You will note that these observations were generally obtained in early June which would typically be considered the dry season. Groundwater levels should be expected to fluctuate throughout the year in response to rainfall.

EVALUATION AND GEOTECHNICAL RECOMMENDATIONS

PROPOSED PIPELINE- Based on the information provided, the bottom of the piping will likely range from about 5 feet below grade to about 10 feet below grade. The following presents a discussion of the geotechnical considerations for pipeline construction.

Pipeline Subgrade Conditions - Much of the pipeline construction will occur within predominantly sandy soils. However, as indicated by the boring logs, portions of the pipeline may also be embedded within clayey, silty sands. In all cases, subgrade preparation should conform to project specification requirements. We would anticipate this would include placement of at least 6 to 12 inches of compacted select backfill bedding material per project specifications.

During pipeline construction, the contractor should avoid any remolding or disturbance of the subgrade soils that would then necessitate further undercutting and replacement with a suitable compacted backfill material per project specification requirements.

As briefly discussed, boring HA-3 identified an obstruction at a depth of about 6 feet below existing grade. An offset boring (HA-3A) was conducted approximately 20 feet to the northeast and was advanced to the planned depth of 10 feet below existing grade. We recommend conducting additional offset probes around this area to better define the limits of potential deleterious materials that would not be considered suitable for the planned construction and would warrant removal and replacement.

Need for Geotechnical Inspection - It is recommended that the excavations for construction of the pipeline be carefully inspected and probed by a representative of the geotechnical engineer. The purpose of this inspection would be to identify any weak or compressible zones along with potential debris zones that may warrant deeper undercutting and replacement, or specialized subgrade preparation. This will be especially important in areas that would penetrate into deeper clayey soils.

With proper inspection and subgrade preparation, we would expect that maximum settlements would be less than 1 inch with the majority of this movement occurring during dewatering and construction activities. Following placement and compaction of backfill and the re-establishment of normal groundwater levels, the net stress increase below manholes and piping will be minimal.

SUITABILITY OF EXCAVATED SOILS FOR USE AS BACKFILL - Fine sands with minimal fines would represent an excellent material for replacement and compaction as backfill following pipeline installation. These fine sands comprising the SP to SP-SM Unified Soil Classification and the AASHTO A-3 Soil designation should respond effectively to conventional vibratory compaction. Of course, all backfill soils must comply with project specification requirements. Soils representing the CH (A-7-6), SC (A-2-6) and Pt (A-8) would not be

considered suitable for use as backfill. Of course, debris laden soils would also not be suitable for use as backfill materials. Depending on the ratio of sandy soil to debris and the nature of the debris may allow for shacking or removal of debris to separate the clean sandy soils that could possibly be utilized as backfill soils.

It is important to recognize that some of the soils excavated above the water table may have a very low natural moisture content depending upon the rainfall occurring at the time of construction and may require addition of water. Further, soils excavated below the water table may require processing to reduce the moisture content to help facilitate compaction. Accordingly, these soil types may require some adjustment in moisture content to achieve efficient and effective compaction. In general, it is beneficial to adjust moisture contents to within ±2% of the optimum moisture as established by the Modified Proctor moisture-density relationship as set forth in ASTM D-1557 or AASHTO T-180. All backfill soils should be compacted to project specifications.

CONSTRUCTION CONSIDERATIONS - We would anticipate that the majority of the pipeline construction would incorporate trench box construction. Where trench box construction is implemented, care must be exercised so that backfill materials are properly placed and compacted to project specifications, including the void left as the trench box is being advanced. Improper backfilling and compaction of the sidewalls of the trench box can result in lateral relaxation of previously compacted backfill soils which could result in pipe movement depending on the trench box width in relation to the pipe diameter. Portions of the pipeline which may be below the practical depth capability of trench boxes will likely be constructed within a sheeted and braced excavation. Portions of the pipeline may also be constructed utilizing open-cutting and rapid backfilling following pipeline installation. Depending on the depth of the cut, it may be necessary to adjust the slope ratios to no steeper than about 1.5 horizontal to 1.0 vertical in order to minimize sloughing or caving during the backfilling operations. Utilization of this slope ratio will necessitate proper dewatering and protection of the slope with respect to erosion and sloughing. Naturally, the contractor must comply with applicable OSHA requirements with respect to trench safety.

Some of the very shallow embedded portions of the alignment may not require significant dewatering effort depending on the time of year of construction. However, the majority of the alignment will most certainly require dewatering to lower groundwater to depths suitable for placement and compaction of backfill soils. Of course, abnormal rainfall could produce higher than expected groundwater levels and necessitate some local management of groundwater along any portion during pipeline construction.

The implementation of appropriate dewatering is a critical aspect of construction so as to allow proper preparation of the subgrade and appropriate backfilling and compaction of

surrounding soils. Improper implementation of dewatering can result in de-stabilization of the subgrade soils disturbance and enhanced total and differential settlement. It is recommended that the dewatering system consist of a properly designed wellpoint system. Due to the potentially stratified nature of the soils and the required depth of dewatering, we would strongly recommend that the contractor retain the services of a qualified dewatering consultant to appropriately design and monitor performance of the dewatering system. As a minimum, the wellpoint should be fully slotted encased in properly designed filter media and more than likely incorporate drawdown tubes for more effective dewatering.

We recommend piezometer observation wells be installed to permit checking the effectiveness of the dewatering system prior to initiation of excavation activities within critical areas. The dewatering system should be installed so as to maintain groundwater levels to no less than 1 foot below the bottom of the excavation.

Care should be exercised by the contractor in his ways and means of construction to avoid significant vibrations that could result in settlement or damage to neighboring structures or appurtenant utilities. This, of course, would include the contractor's selection of means and methods for installation and removal of sheetpiling that may be required for deep excavation as well as the selection of equipment for compaction activities. The contractor should certainly consider appropriate vibration monitoring to check that the vibratory accelerations or displacements are within acceptable limits.

LIMITATIONS

The geotechnical investigation program was undertaken to provide general information to assist in the design and construction of the planned facilities. It is recognized that variations in subsurface conditions may occur and there is the ever-present possibility of unsuitable materials being encountered in localized areas that may have been undetected in our general pattern of test borings. It is therefore recommended that a representative of the project geotechnical engineer be present during the construction stage to inspect subgrade conditions and assist in developing geotechnical decisions and recommendations as to the need, if any, for removal and replacement of unsuitable materials or other geotechnical issues that may require an expedited decision to facilitate construction and prevent delays. The representative would also be available to perform compaction tests as would be required.

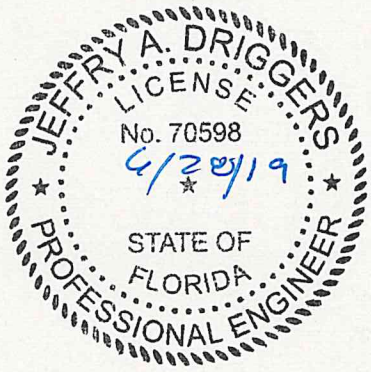
It should also be noted that our investigation may not have included all information that the prospective contractor may require in the preparation of his bid proposal. The contractor is

certainly encouraged to conduct such additional studies as he may deem necessary to qualify his proposal. Further, the studies herein was limited to an examination of subsurface soil and groundwater conditions so as to address geotechnical design and construction issues. Studies relative to environmental issues or impacts was not within the authorized scope of services of our firm.

DRIGGERS ENGINEERING SERVICES, INC. appreciates the opportunity to be of service to you on this project and we trust if you have any questions concerning our report, you will hesitate to contact the undersigned at your convenience.

Respectfully submitted,
DRIGGERS ENGINEERING SERVICES, INC.

Jeffry A. Driggers, P.E.
Project Engineer
FL Registration No. 70598



JAD-REP\188328
Copies submitted: (1)

APPENDIX

PLATE I - BORING LOCATION PLAN

STANDARD PENETRATION TEST BORING LOGS

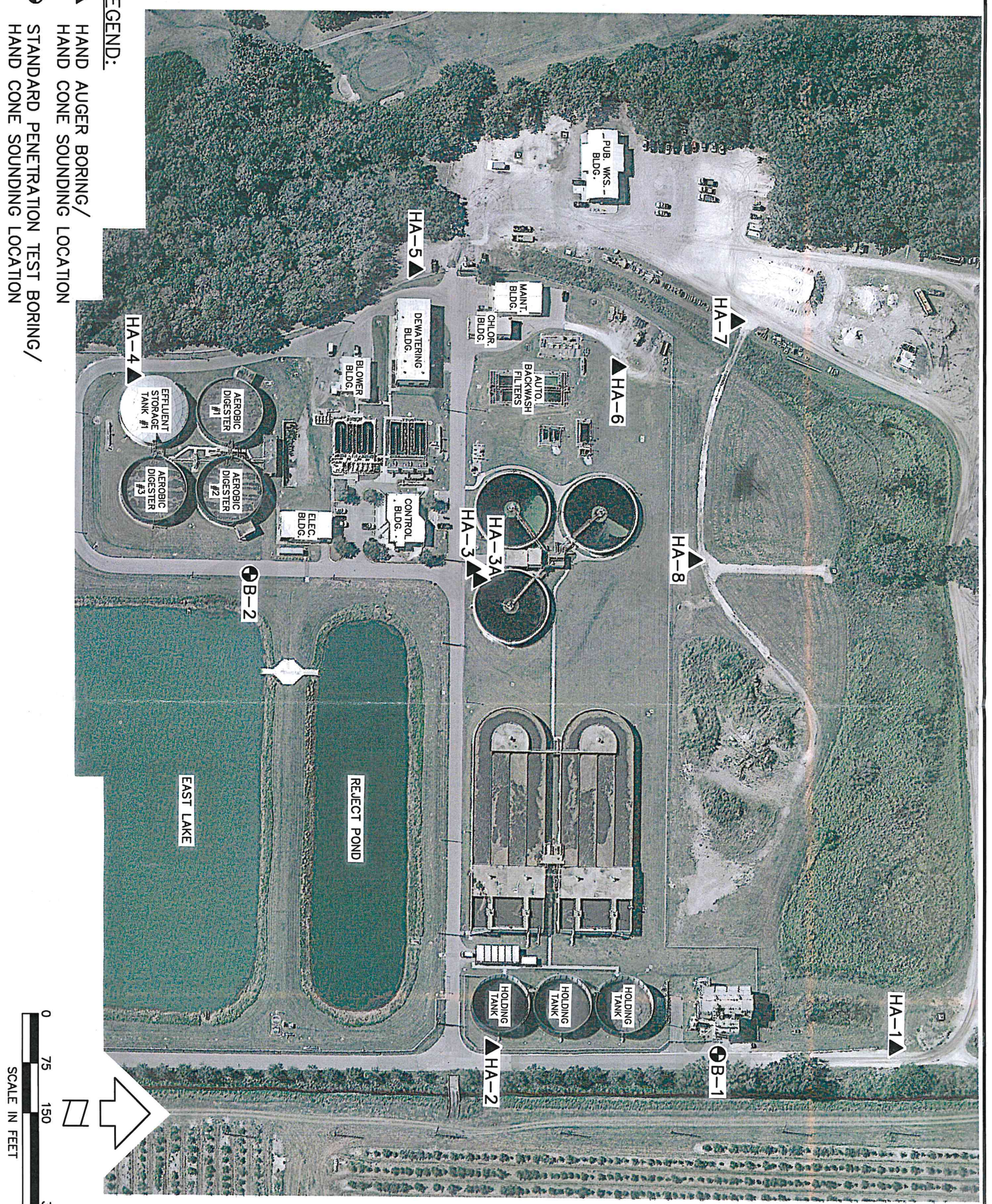
HAND AUGER/ HAND CONE PENETROMETER BORINGS

SUMMARY OF LABORATORY TEST RESULTS

GRAINSIZE ANALYSES

METHOD OF TESTING

PLATE I - BORING LOCATION PLAN



DATE: 6/20/19

CAD / ENGINEER	SHEET TITLE	PROJECT NO.
R.D.B. / J.A.D.	BORING LOCATION PLAN	DES 188328
PREPARED BY	PROJECT NAME	SHEET NO.
DRIGGERS ENGINEERING SERVICES, INCORPORATED	MANATEE NORTH RECLAMATION FACILITY 8500 69th STREET EAST PALMETTO, FLORIDA	PLATE 1

STANDARD PENETRATION TEST BORING LOGS

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 188328 **BORING NO.** B-1

Project Manatee North Reclamation Facility, 8500 69th Street East, Palmetto, Florida

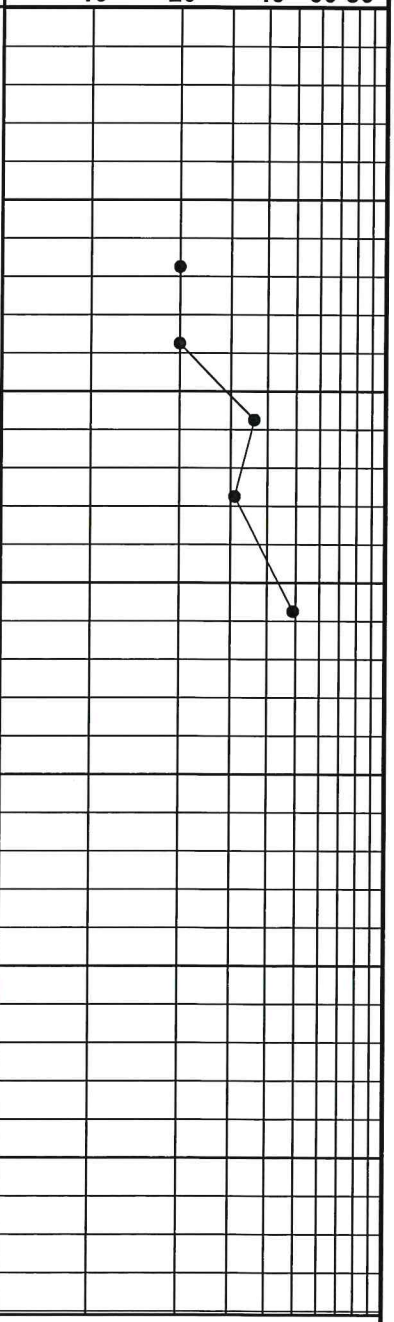
Location See Plate I **Foreman** C.O.

Completion Depth 16.5' **Date** 5/6/19 **Depth To Water** ** **Time** **Date** 5/6/19

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.
			SURF. EL:	
0			Light brown Fine SAND with shell and gravel (SP) (A-3)	
			Dark grayish-brown Fine SAND with trace of shell and gravel (SP) (A-3)	
			Grayish-brown slightly silty Fine SAND with trace of shell (SP-SM) (A-3)	
5			Grayish-brown Fine SAND with trace of shell (SP) (A-3)	
			Grayish-brown slightly silty Fine SAND (SP-SM) (A-3)	9/8/12
			Gray Fine SAND (SP) (A-3)	6/9/11
			Dark brown Fine SAND (SP) (A-3)	
10			Brown Fine SAND (SP) (A-3)	15/15/21
			Light brown Fine SAND (SP) (A-3)	
			Medium dense grayish-brown silty, slightly clayey Fine SAND (SM) (A-2-4)	15/17/14
			Dense light brown silty Fine SAND (SM) (A-2-4)	
15			Dense light brown slightly phosphatic Fine SAND (SP) (A-3)	20/21/28
			Dense light brown phosphatic Fine SAND (SP) (A-3)	
20				
25				
30				

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP

10 20 40 60 80



Remarks Borehole Grouted

** Water Table not encountered within depth of 10.0' **Casing Length**

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 188328 **BORING NO.** B-2

Project Manatee North Reclamation Facility, 8500 69th Street East, Palmetto, Florida

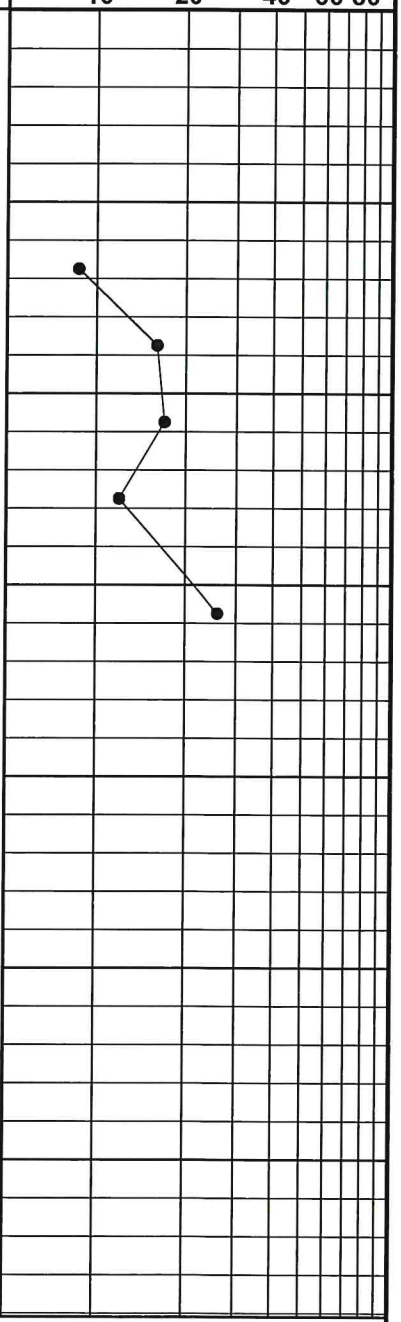
Location See Plate I **Foreman** C.O.

Completion Depth 16.5' **Date** 5/6/19 **Depth To Water** 8.8' **Time** _____ **Date** 5/6/19

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.
			SURF. EL:	
0			Dark brown Fine SAND with roots (SP) (A-3)	
			Gray Fine SAND (SP) (A-3)	
			Dark brown and gray Fine SAND (SP) (A-3)	
			Light brown Fine SAND (SP) (A-3)	
5			Light brown slightly silty Fine SAND (SP-SM) (A-3)	
			Loose to medium dense light brown silty Fine SAND (SM) (A-2-4)	3/3/5
				5/8/8
10			Medium dense light grayish-brown silty, slightly clayey Fine SAND (SM) (A-2-4)	5/6/11
			Stiff light gray sandy CLAY with trace of phosphate (CH) (A-7-6)	6/6/6
15			Medium dense light gray phosphatic, silty, clayey Fine SAND (SM-SC) (A-2-6)	9/11/15
20				
25				
30				

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP

10 20 40 60 80



Remarks Borehole Grouted

Casing Length _____

HAND AUGER BORING / HAND CONE SOUNDING LOGS

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328		**CLIENT:** Jacobs Engineering Group, Inc.	
		WATER TABLE: See "Note"	**DATE:** 5/6/19
TECHNICIAN: C.O./R.O.		**DATE:** 5/6/19	**COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I		**TEST NUMBER:** B-1	

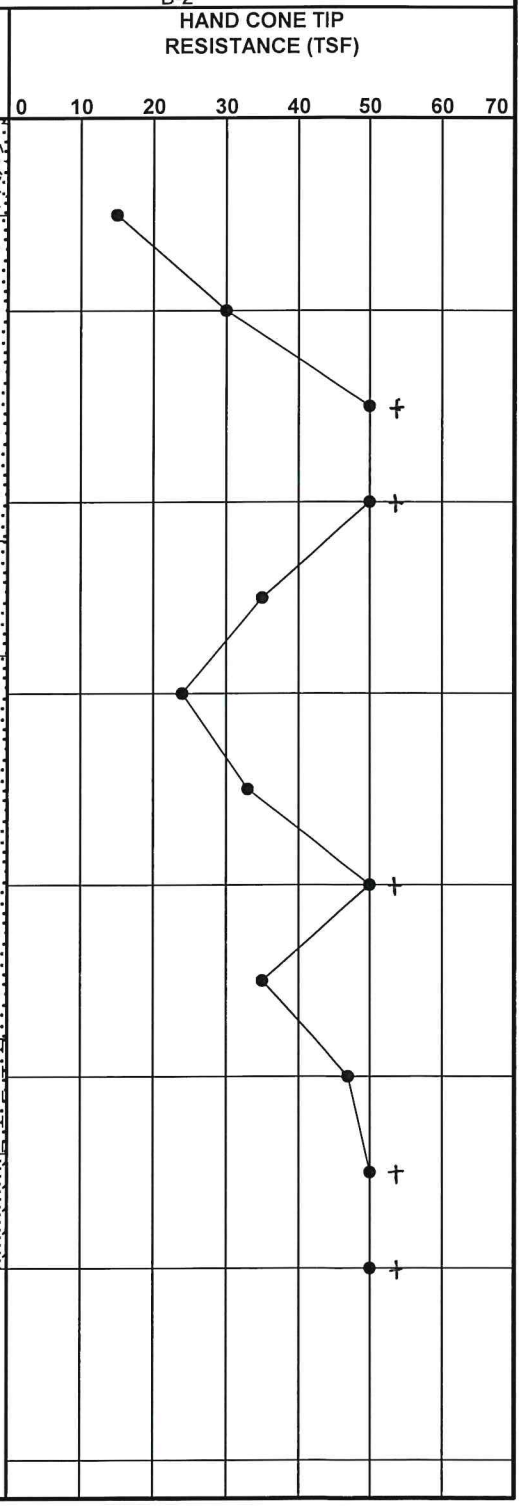
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	HAND CONE TIP RESISTANCE (TSF) 0 10 20 30 40 50 60 70
	Light brown Fine SAND with shell and gravel (SP) (A-3)	0		
	Dark grayish-brown Fine SAND with trace of shell and gravel (SP) (A-3)			
	Grayish-brown slightly silty Fine SAND with trace of shell (SP-SM) (A-3)	1		
		2		
	Grayish-brown Fine SAND with trace of shell (SP) (A-3)			
	Grayish-brown slightly silty Fine SAND (SP-SM) (A-3)	3		
	Gray Fine SAND (SP) (A-3)			
	Dark brown Fine SAND (SP) (A-3)	4		
	Brown Fine SAND (SP) (A-3)	5		
	Light brown Fine SAND (SP) (A-3)	6		
	Note: Water Table not encountered within depth of 6.0'. LEGEND: ● + Denotes Penetration Resistance in excess of 50 TSF	7		

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc. **WATER TABLE:** See "Note" **DATE:** 5/6/19
TECHNICIAN: C.O./R.O.	**DATE:** 5/6/19 **COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I	**TEST NUMBER:** B-2

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
	Dark brown Fine SAND with roots (SP) (A-3)	0	
	Gray Fine SAND (SP) (A-3)	1	
		2	
	Dark brown and gray Fine SAND (SP) (A-3)		
	Light brown Fine SAND (SP) (A-3)	3	
		4	
	Light brown slightly silty Fine SAND (SP-SM) (A-3)	5	
	Light brown silty Fine SAND (SM) (A-2-4)	6	
	Note: Water Table not encountered within depth of 6.0'. LEGEND: ● + Denotes Penetration Resistance in excess of 50 TSF	7	

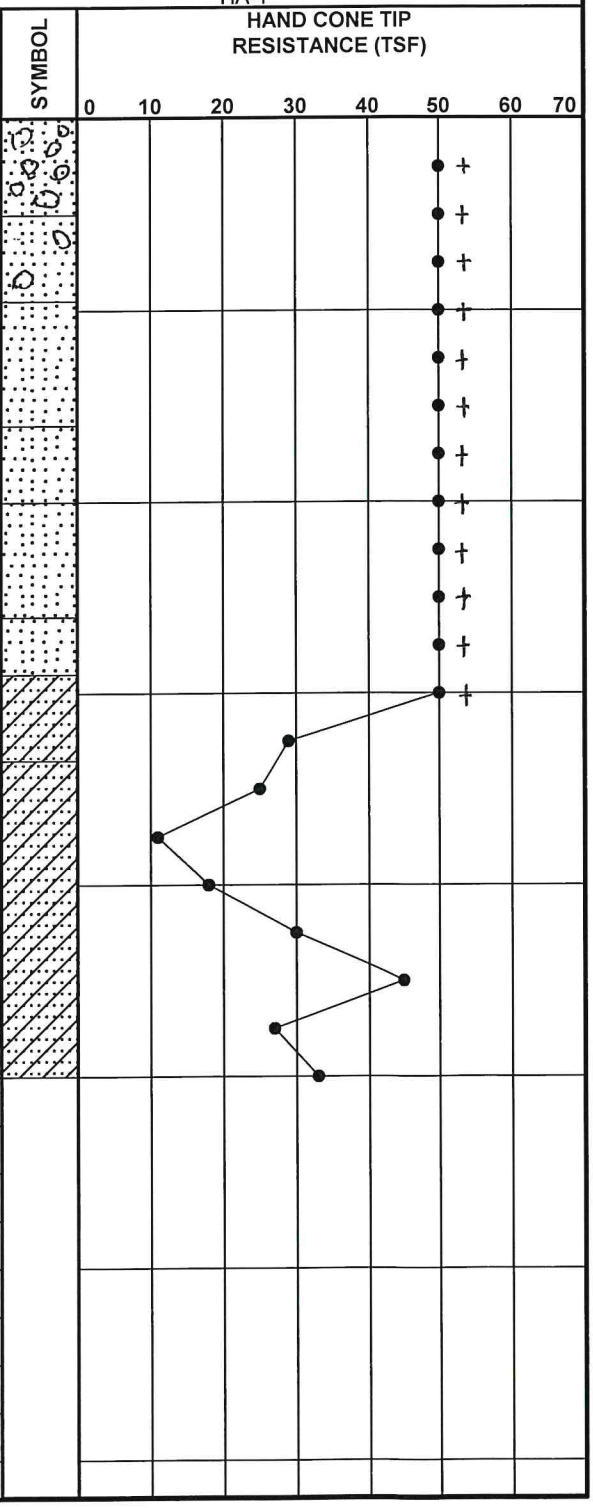


DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc.
TECHNICIAN: K.A.	**WATER TABLE:** See "Note" / **DATE:** 5/6/19
LOCATION: See Plate I	**DATE:** 5/6/19 / **COMPLETION DEPTH:** 10.0'
	TEST NUMBER: HA-1

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Brown Fine SAND with gravel (SP) (A-3)	0
	Grayish-brown Fine SAND with trace of gravel (SP) (A-3)	
	Brown Fine SAND (SP) (A-3)	2
	Grayish-brown Fine SAND (SP) (A-3)	
	Gray Fine SAND (SP) (A-3)	4
	Dark brown Fine SAND (SP) (A-3)	
	Grayish-brown clayey Fine SAND (SC) (A-2-6)	6
	Light grayish-brown clayey Fine SAND (SC) (A-2-6)	8
		10
	Note: Water Table not encountered within depth of 10.0'.	12
	LEGEND: ● + Denotes Penetration Resistance in excess of 50 TSF	14



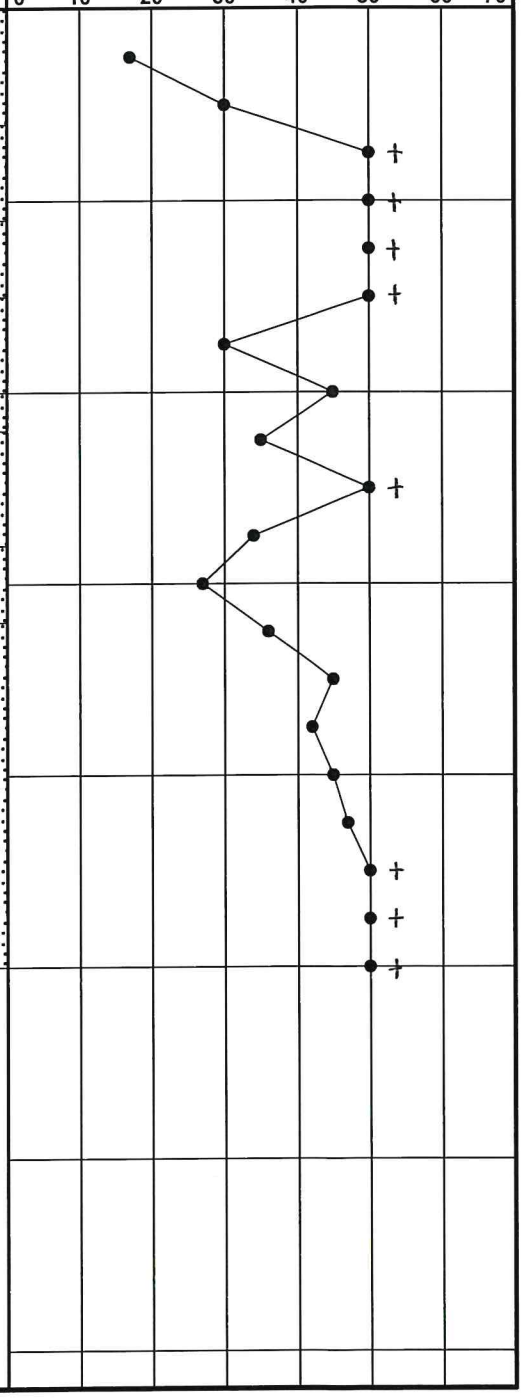
DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc.
TECHNICIAN: R.O.	**WATER TABLE:** See "Note" / **DATE:** 5/9/19
LOCATION: See Plate I	**DATE:** 5/9/19 / **COMPLETION DEPTH:** 10.0'
	TEST NUMBER: HA-2

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Grayish-brown Fine SAND with trace of roots (SP) (A-3)	0
	Grayish-brown Fine SAND with trace of gravel (SP) (A-3)	2
	Light gray Fine SAND (SP) (A-3)	
	Dark grayish-brown Fine SAND (SP) (A-3)	4
	Gray Fine SAND (SP) (A-3)	
	Light gray Fine SAND (SP) (A-3)	
	Brownish-gray Fine SAND (SP) (A-3)	6
	Light brown Fine SAND (SP) (A-3)	
		8
		10
	Note: Water Table not encountered within depth of 10.0'.	12
	LEGEND: • + Denotes Penetration Resistance in excess of 50 TSF	14

SYMBOL



DRIGGERS ENGINEERING SERVICES INCORPORATED

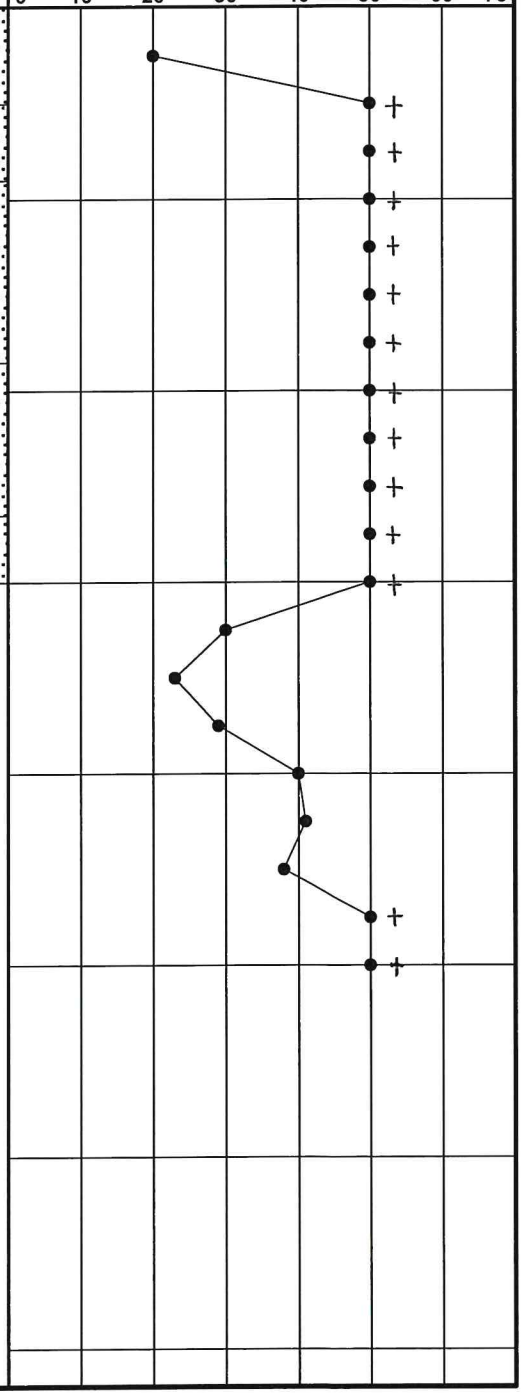
HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc.
	WATER TABLE: 5.5' — **DATE:** 5/6/19
TECHNICIAN: K.A.	**DATE:** 5/6/19 — **COMPLETION DEPTH:** 6.0'*
LOCATION: See Plate I	**TEST NUMBER:** HA-3

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Grayish-brown Fine SAND with trace of roots (SP) (A-3)	0
	Grayish-brown Fine SAND with trace of shell (SP) (A-3)	
	Brown Fine SAND with trace of shell (SP) (A-3)	2
	Light brown Fine SAND with trace of clayey Fine SAND pockets (SP) (A-3)	4
	Brown Fine SAND (SP) (A-3)	6
	* Encountred buried concrete at depth 6.0' - terminated boring.	8
		10
		12
	LEGEND: • + Denotes Penetration Resistance in excess of 50 TSF	14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

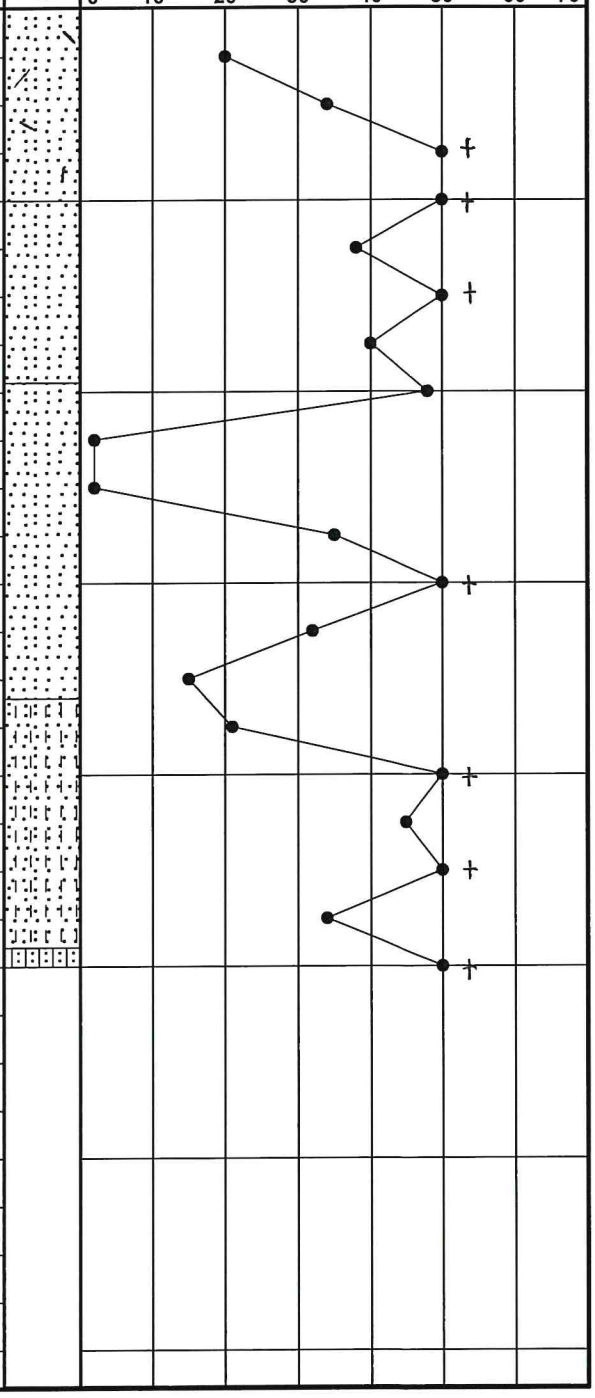
PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc.
TECHNICIAN: N.N.	**WATER TABLE:** 3.7' / **DATE:** 6/14/19
LOCATION: See Plate I	**DATE:** 6/14/19 / **COMPLETION DEPTH:** 10.0'
	TEST NUMBER: HA-3A

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Dark brown Fine SAND with trace of roots (SP) (A-3)	0
	Brown Fine SAND (SP) (A-3)	2
	Brown and light brown Fine SAND (SP) (A-3)	4
	Brown slightly silty Fine SAND (SP-SM) (A-3)	6
	Light grayish-brown silty Fine SAND (SM) (A-2-4)	8
		10
		12
		14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)

0 10 20 30 40 50 60 70



LEGEND:

● + Denotes Penetration Resistance in excess of 50 TSF

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

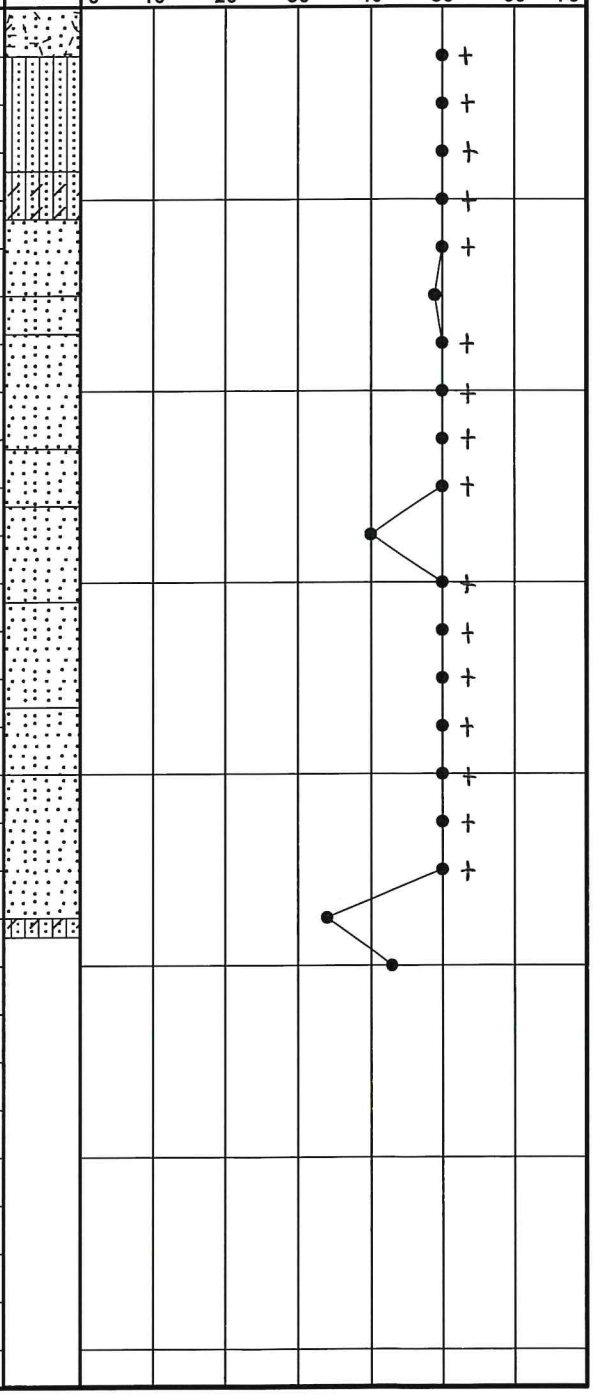
PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc.
TECHNICIAN: K.A.	**WATER TABLE:** 9.0' — **DATE:** 5/5/19
LOCATION: See Plate I	**DATE:** 5/5/19 — **COMPLETION DEPTH:** 9.7'
	TEST NUMBER: HA-4

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Brown Fine SAND with roots (SP) (A-3)	0
	Light brown silty Fine SAND (SM) (A-2-4)	
	Light brown silty, slightly clayey Fine SAND (SM) (A-2-4)	2
	Light brown Fine SAND (SP) (A-3)	
	Brown Fine SAND (SP) (A-3)	
	Dark brown Fine SAND (SP) (A-3)	4
	Light brown Fine SAND (SP) (A-3)	
	Dark gray Fine SAND (SP) (A-3)	6
	Dark brown Fine SAND (SP) (A-3)	
	Brown Fine SAND (SP) (A-3)	8
	Light brown Fine SAND (SP) (A-3)	
	Grayish-brown silty, slightly clayey Fine SAND (SM) (A-2-4)	10
		12
		14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)

0 10 20 30 40 50 60 70



LEGEND:

● + Denotes Penetration Resistance in excess of 50 TSF

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

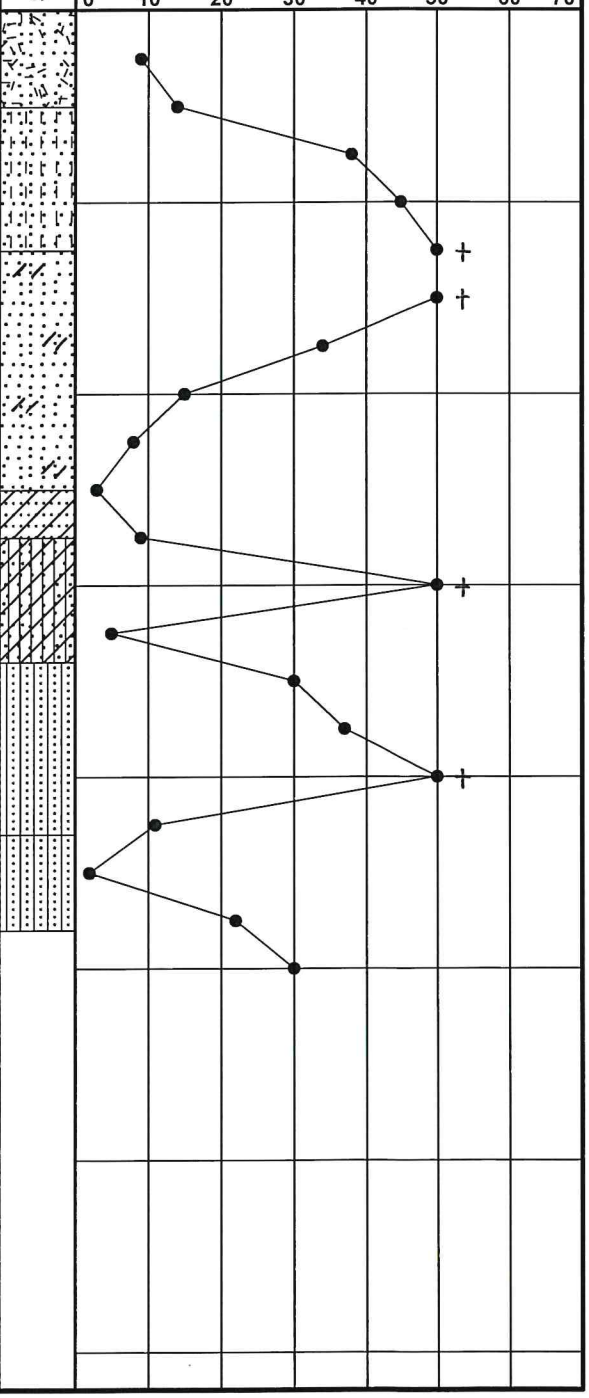
PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc. **WATER TABLE:** 5.5' **DATE:** 5/5/19
TECHNICIAN: K.A.	**DATE:** 5/5/19 **COMPLETION DEPTH:** 9.6'
LOCATION: See Plate I	**TEST NUMBER:** HA-5

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Dark brown Fine SAND with roots (SP) (A-3)	0
	Brown slightly silty Fine SAND (SP-SM) (A-3)	2
	Light brown Fine SAND with trace of clayey Fine SAND pockets (SP) (A-3)	4
	Brown clayey Fine SAND (SC) (A-2-6)	
	Brown silty, clayey Fine SAND (SM-SC) (A-2-6)	6
	Brown silty Fine SAND (SM) (A-2-4)	8
	Light grayish-brown silty Fine SAND (SM) (A-2-4)	
		10
		12
		14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)

0 10 20 30 40 50 60 70



LEGEND:

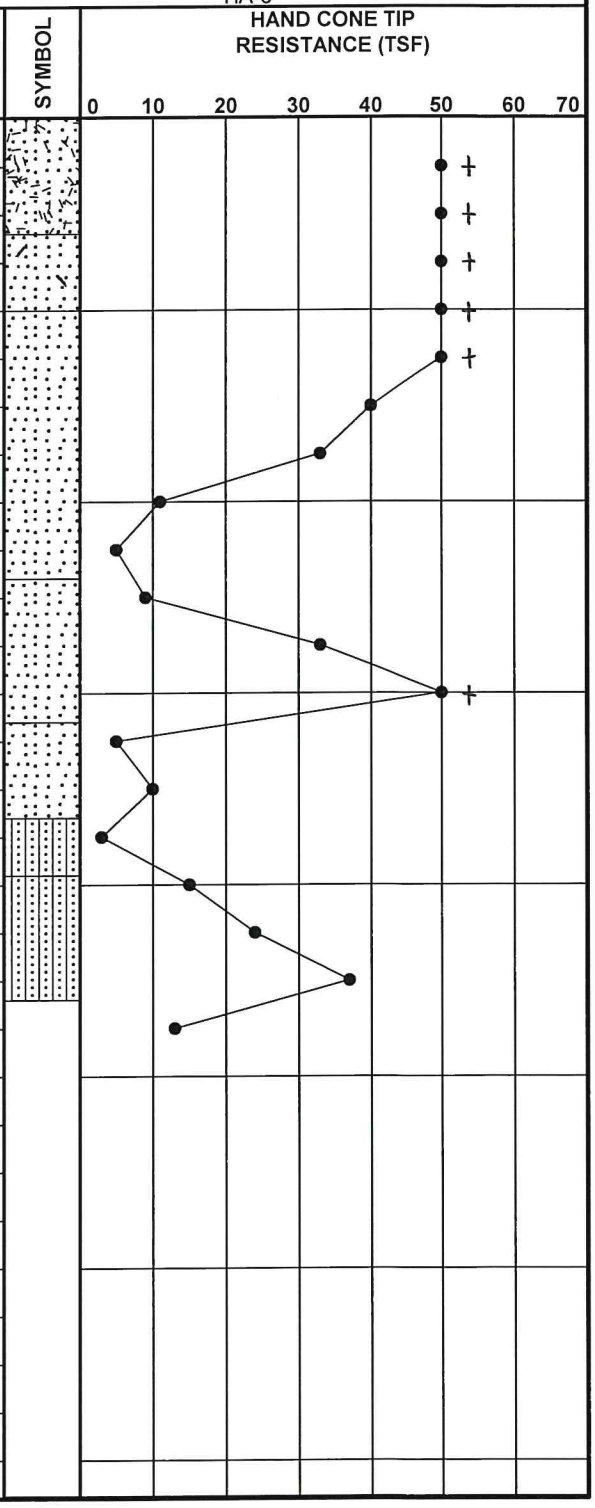
• + Denotes Penetration Resistance in excess of 50 TSF

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc. **WATER TABLE:** 5.4' **DATE:** 5/6/19
TECHNICIAN: K.A.	**DATE:** 5/6/19 **COMPLETION DEPTH:** 9.2'
LOCATION: See Plate I	**TEST NUMBER:** HA-6

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Brown Fine SAND with roots (SP) (A-3)	0
	Brown Fine SAND with trace of roots (SP) (A-3)	2
	Grayish-brown Fine SAND (SP) (A-3)	4
	Light brown Fine SAND (SP) (A-3)	6
	Dark brown Fine SAND (SP) (A-3)	
	Grayish-brown silty Fine SAND (SM) (A-2-4)	8
	Light grayish-brown silty Fine SAND (SM) (A-2-4)	10
		12
	LEGEND: ● + Denotes Penetration Resistance in excess of 50 TSF	14



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

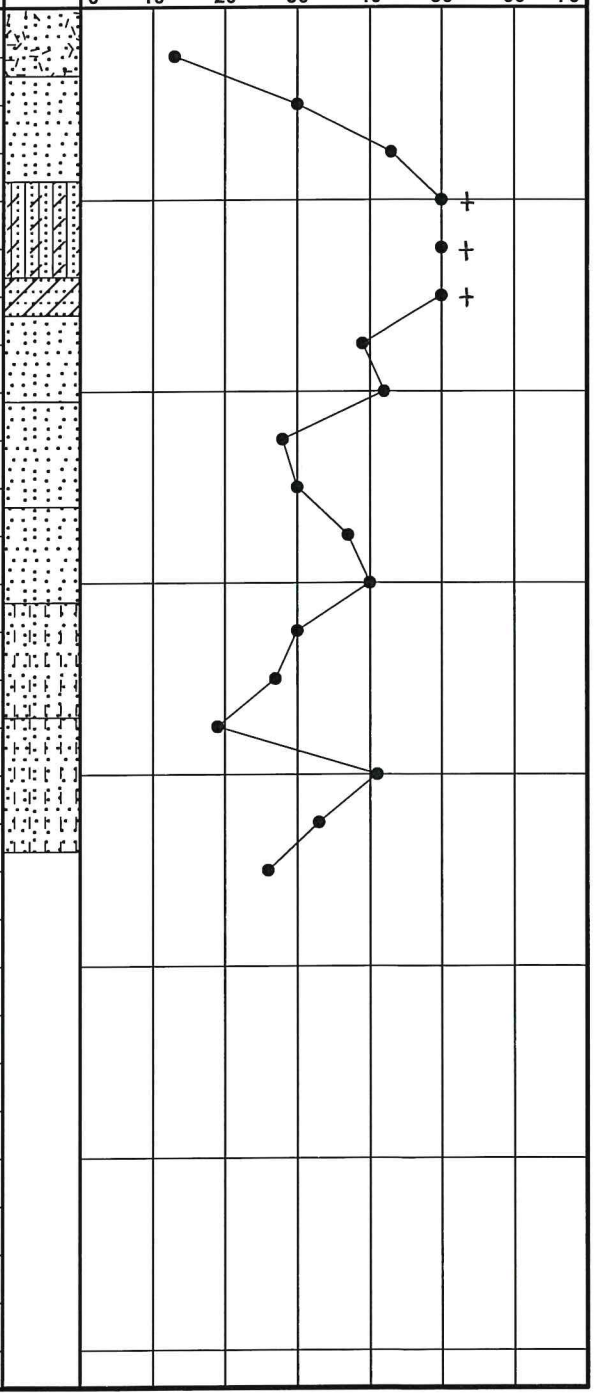
PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc. **WATER TABLE:** 5.4' **DATE:** 5/13/19
TECHNICIAN: R.O.	**DATE:** 5/13/19 **COMPLETION DEPTH:** 8.8'
LOCATION: See Plate I	**TEST NUMBER:** HA-7

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Dark grayish-brown Fine SAND with roots (SP) (A-3)	0
	Brownish-gray Fine SAND (SP) (A-3)	
	Light brown silty, slightly clayey Fine SAND (SM) (A-2-4)	2
	Grayish-brown clayey Fine SAND (SC) (A-2-6)	
	Gray Fine SAND (SP) (A-3)	4
	Light gray Fine SAND (SP) (A-3)	
	Light brown Fine SAND (SP) (A-3)	6
	Light brown slightly silty Fine SAND (SP-SM) (A-3)	
	Brown slightly silty Fine SAND (SP-SM) (A-3)	8
		10
		12
		14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)

0 10 20 30 40 50 60 70



LEGEND:

• + Denotes Penetration Resistance in excess of 50 TSF

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

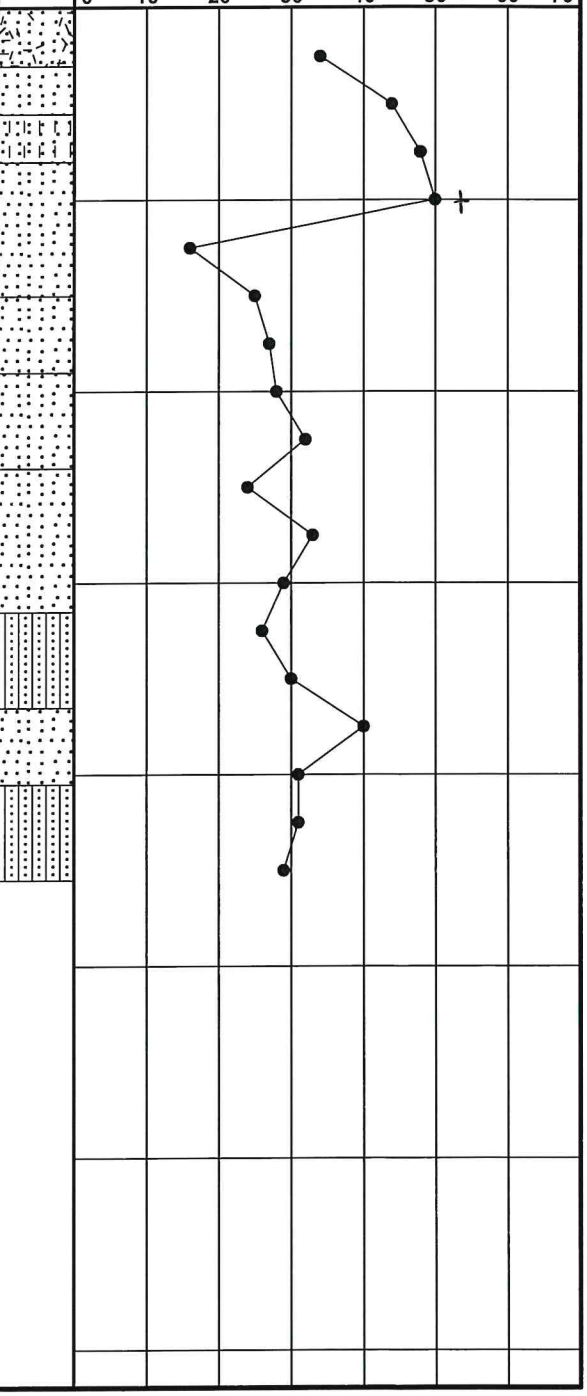
PROJECT: Manatee North Reclamation Facility 8500 69th Street East Palmetto, Florida Project No.: DES 188328	**CLIENT:** Jacobs Engineering Group, Inc. **WATER TABLE:** 5.3' **DATE:** 5/13/19
TECHNICIAN: R.O.	**DATE:** 5/13/19 **COMPLETION DEPTH:** 9.1'
LOCATION: See Plate I	**TEST NUMBER:** HA-8

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	Brown Fine SAND with roots (SP) (A-3)	0
	Light brown Fine SAND (SP) (A-3)	
	Light brown slightly silty Fine SAND (SP-SM) (A-3)	
	Gray Fine SAND (SP) (A-3)	2
	Brownish-gray Fine SAND (SP) (A-3)	
	Dark grayish-brown Fine SAND (SP) (A-3)	4
	Light brown Fine SAND (SP) (A-3)	
	Light grayish-brown silty Fine SAND (SM) (A-2-4)	6
	Brown Fine SAND (SP) (A-3)	
	Grayish-brown silty Fine SAND (SM) (A-2-4)	8
		10
		12
		14

SYMBOL

HAND CONE TIP RESISTANCE (TSF)

0 10 20 30 40 50 60 70



LEGEND:

● + Denotes Penetration Resistance in excess of 50 TSF

SUMMARY OF LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y_d (pcf)	G_s	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON.	G.S.	ORG. (%)	pH	Cl. (ppm)	SO_4 (ppm)	RES. (ohm-cm)
						LL	PL	PI									
B-1	6.0-7.5	Grayish-brown silty, slightly clayey Fine SAND	19.2			NP	NP					** 19.5					
B-1	8.0-9.5	Grayish-brown silty, slightly clayey Fine SAND										** 13.2					
B-2	5.5-6.0	Light brown silty Fine SAND										*					
B-2	10.0-11.5	Light grayish-brown silty, slightly clayey Fine SAND										** 15.5					
HA-1	5.8-6.7	Grayish-brown clayey Fine SAND	16.2			26	19	7				** 22.8					
HA-3A	3.9-7.2	Brown and light brown Fine SAND										*					
HA-5	5.0-5.5	Brown clayey Fine SAND	18.6			22	17	5				** 22.5					
HA-8	1.6-3.0	Gray Fine SAND										*					

W % = Water Content
Y_d (pcf) = Dry Density
G_S = Specific Gravity
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
P.P. (tsf) = Pocket Penetrometer
U.C. = Unconfined Compression

Con. = Consolidation Test
G.S. (+1) = Grainsize Analysis (Hydrometer)
ORG. (%) = Organic Content
Cl. (ppm) = Total Chloride
SO_4 (ppm) = Total Sulfate
RES. (ohm-cm) = Lab Resistivity
* = See Test Curves
** = Percent Passing No. 200 Sieve

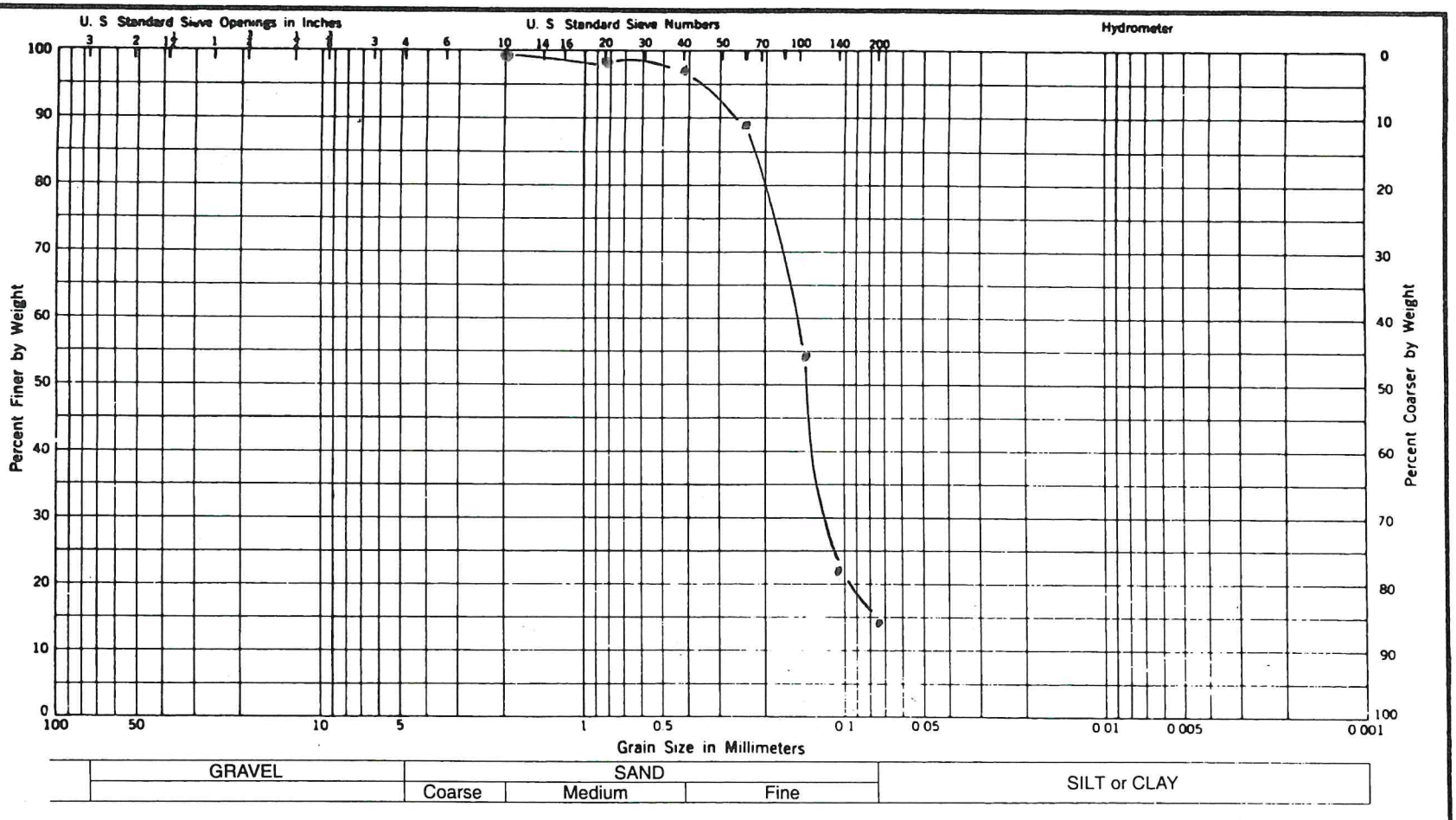
CLIENT: Jacobs Engineering Group, Inc.

PROJECT: Manatee North Reclamation Facility, 8500 69th Street East, Palmetto, Florida

FILE: DES 188328

GRAINSIZE ANALYSES

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
B-2	5.5' - 6.0'					Light brown silty Fine SAND

CLIENT: Jacobs Engineering Group, Inc.

PROJECT: Manatee North Reclamation Facility,
8500 69th Street East,
Palmetto, Florida

FILE: DES 188328

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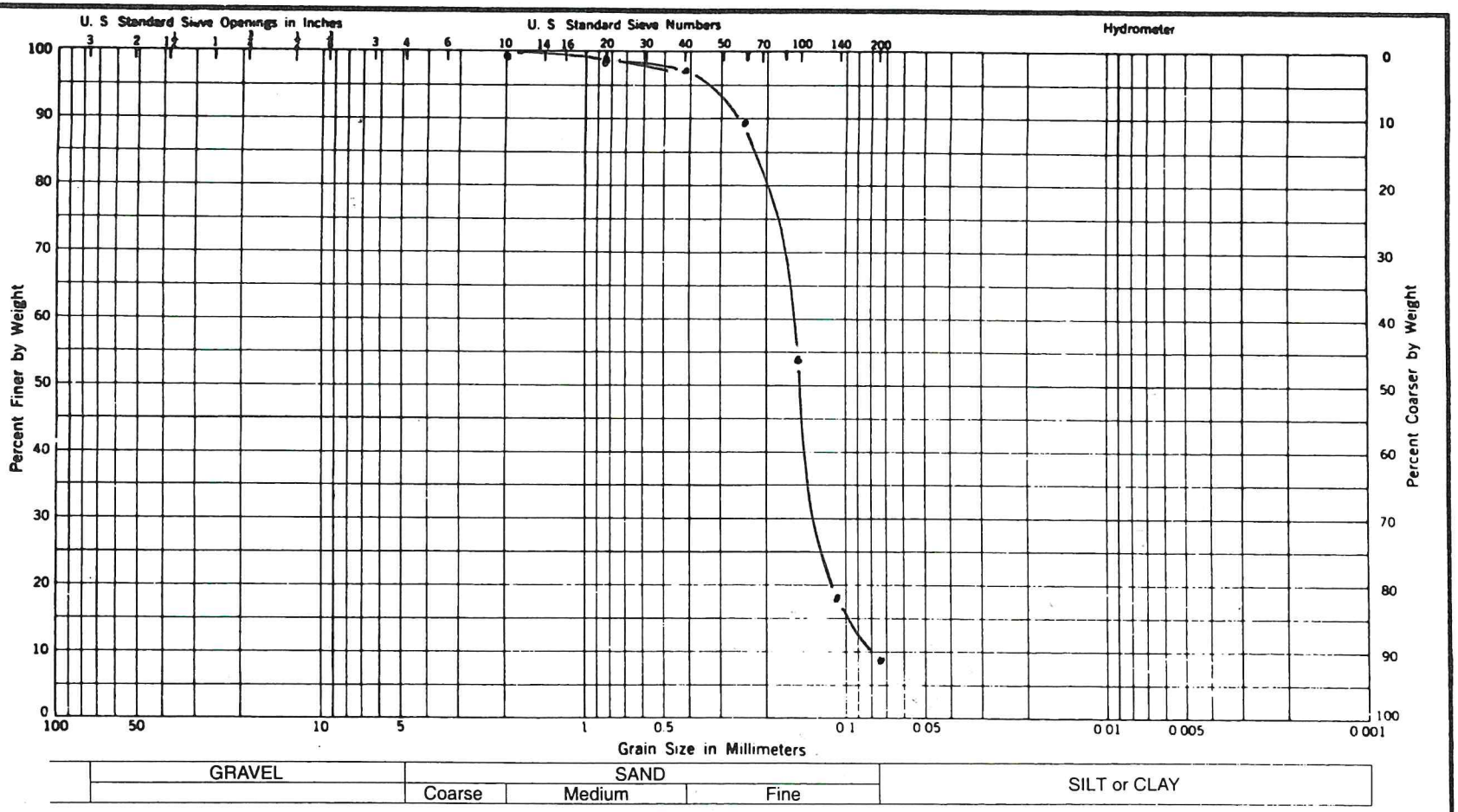


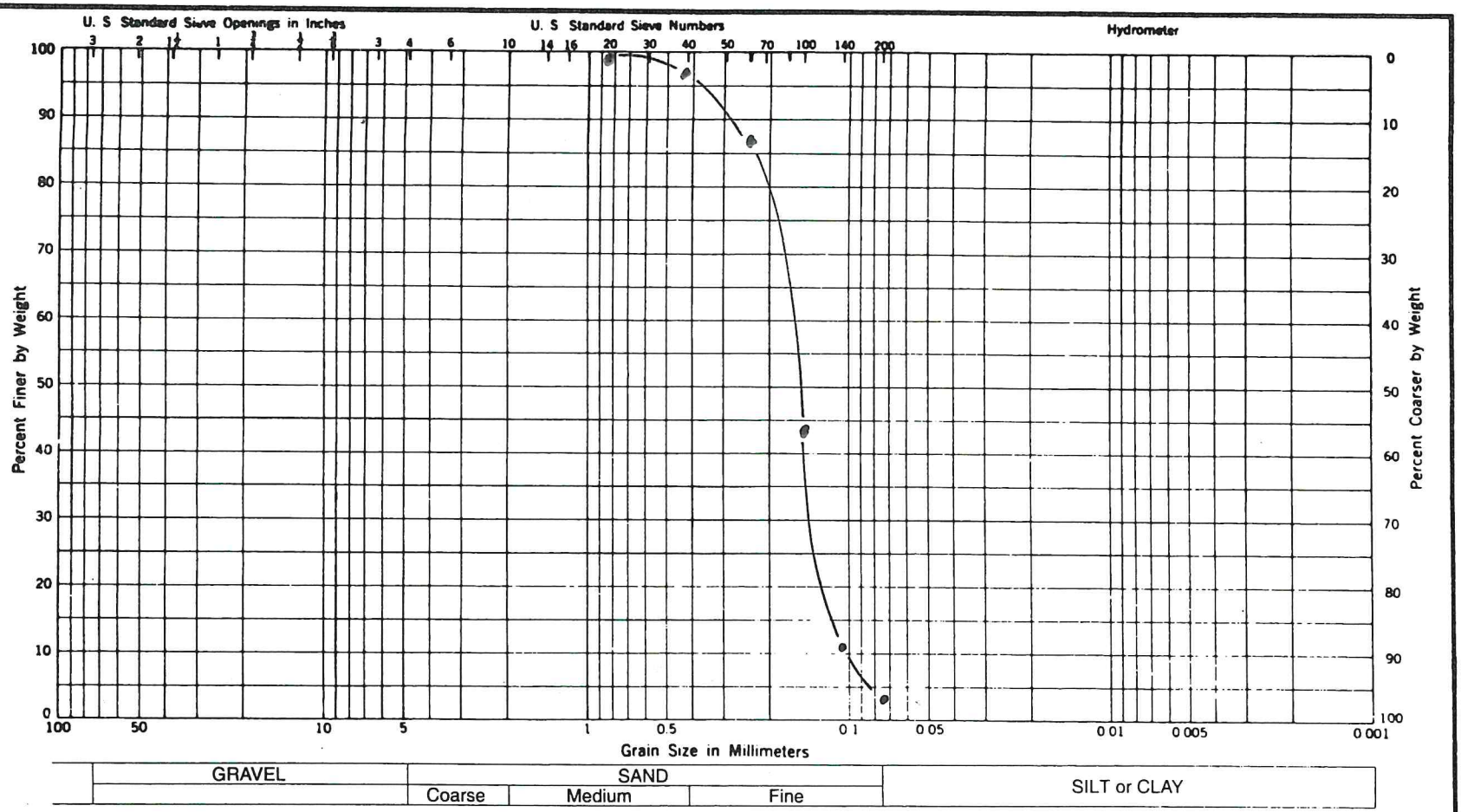
Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
HA-3A	3.9' - 7.2'					Brown and light brown Fine SAND

CLIENT: Jacobs Engineering Group, Inc.

PROJECT: Manatee North Reclamation Facility,
8500 69th Street East,
Palmetto, Florida

FILE: DES 188328

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
HA-8	1.6' - 3.0'					Gray Fine SAND

CLIENT: Jacobs Engineering Group, Inc.

PROJECT: Manatee North Reclamation Facility,
8500 69th Street East,
Palmetto, Florida

FILE: DES 188328

METHOD OF TESTING

STANDARD PENETRATION TEST
AND
SOIL CLASSIFICATION

STANDARD PENETRATION TEST (ASTM D-1586)

In the Standard Penetration Test borings, a rotary drilling rig is used to advance the borehole to the desired test depth. A viscous drilling fluid is circulated through the drill rods and bit to stabilize the borehole and to assist in removal of soil and rock cuttings up and out of the borehole.

Upon reaching the desired test depth, the 2 inch O.D. split-barrel sampler or "split-spoon", as it is sometimes called, is attached to an N-size drill rod and lowered to the bottom of the borehole. A 140 pound hammer, attached to the drill string at the ground surface, is then used to drive the sampler into the formation. The hammer is successively raised and dropped for a distance of 30 inches using a rope and "cathead" assembly. The number of blows is recorded for each 6 inch interval of penetration or until virtual refusal is achieved. In the above manner, the samples are ideally advanced a total of 18 inches. The sum of the blows required to effect the final 12 inches of penetration is called the blowcount, penetration resistance or "N" value of the particular material at the sample depth.

After penetration, the rods and sampler are retracted to the ground surface where the core sample is removed, sealed in a glass jar and transported to the laboratory for verification of field classification and storage.

SOIL SYMBOLS AND CLASSIFICATION

Soil and rock samples secured in the field sampling operation were visually classified as to texture, color and consistency. The Unified Soil Classification was assigned to each soil stratum per ASTM D-2487. Soil classifications are presented descriptively and symbolically for ease of interpretation. The stratum identification lines represent the approximate boundary between soil types. In many cases, this transition may be gradual.

Consistency of the soil as to relative density or undrained shear strength, unless otherwise noted, is based upon Standard Penetration resistance values of "N" values and industry-accepted standards. "N" values, or blowcounts, are presented in both tabular and graphical form on each respective boring log at each sample interval. The graphical plot of blowcount versus depth is for illustration purposes only and does not warrant continuity in soil consistency or linear variation between sample intervals.

The borings represent subsurface conditions at respective boring locations and sample intervals only. Variations in subsurface conditions may occur between boring locations. Groundwater depths shown represent water depths at the dates and time shown only. The absence of water table information does not necessarily imply that groundwater was not encountered.

HAND CONE PENETRATION TEST

The cone penetration test was performed using a DGSI Model S-215 double rod Static Cone Penetrometer.

Dual rods enable the cone stress to be measured directly. Soil friction on the outer rod does not influence the reading. Depending upon the application, either the maximum bearing for an increment of push or the least bearing for an increment can be reported. If you were investigating for soft spots, you would take the least reading. In typical use, you would force the cone into the soil 6 inches, retract the cone slightly until the gauge reads zero, then advance an additional 6 inch increment. If you meet with refusal, the cone can be removed and the hole opened with a hand auger to permit a continuation of measurements against depth.

The tool has been designed to allow a maximum force of 250 lbs. to be applied, somewhat more than the average weight of an operator. The unit can be operated in a vertical or horizontal position. The cone tip has an included angle of 60°. The cone has a section area of 1.5 cm^2. The maximum total bearing (Q_c) is 70 kg/cm^2.

The reading (Q_c) is in kg/cm^2 which is essentially equal to ton/ft^2.

The cone index (Q_c) is read directly. The correlation between the cone index and soil constants is not absolute. Generally, the following results have been determined through extensive field use of the unit. Further verification of correlation in your local soil types is essential.

Standard Penetration (Sands)	**Strength and Cohesion**
Test "N" Value $Q_c = 4$ "N"	Q_u - Unconfined compression (kg/cm^2) c - Cohesion (kg/cm2)
	Uniform clay and silty clays: $Q_c = 5\ Q_u$ $Q_c = 10\ c$
	Clayey Silts: $Q_c = (10 \text{ to } 20)\ Q_u$ $Q_c = (20 \text{ to } 40)\ c$