

**GEOTECHNICAL EXPLORATION AND
ENGINEERING SERVICES REPORT**

CONDUCTED FOR:

City of Naples Beach Restoration and
Water Quality Improvements Project
Beach Access at 3rd Avenue North
Naples, Collier County, Florida

PREPARED FOR:

Ms. Christin Perkinson, Ph.D., P.E., D.CE.
Senior Coastal Engineer
Erickson Consulting Engineers, Inc.
7201 Delainey Court
Sarasota, Florida 34240

11 April 2017
YPC Project No. 17GY125



***YPC Consulting Group, PL
5931 Country Lakes Drive
Fort Myers, Florida 33905
Phone (239) 693-7700
Fax (239) 690-0271***



YPC Consulting Group, P.L.
5931 Country Lakes Drive
Fort Myers, Florida 33905
Phone (239) 693-7700
Fax (239) 690-0271

Florida Certificate of Authorization No. 28233

Ms. Christin Perkinson, Ph.D., P.E., D.CE.
Senior Coastal Engineer
Erickson Consulting Engineers, Inc.
7201 Delainey Court
Sarasota, Florida 34240

11 April 2017

**Subject: *Geotechnical Exploration and Engineering Services Report
City of Naples Beach Restoration and Water Quality Improvements Project
Beach Access at 3rd Avenue North
Naples, Collier County, Florida***

YPC Project No. 17GY125

Dear Ms. Perkinson:

YPC Consulting Group, P.L. is pleased to submit the *Geotechnical Exploration and Engineering Services Report* for the project referenced above.

It has been a pleasure to work for you on this project. Please contact us should you have any questions or if you require additional information.

copies to: 1, email only to Christin@ericksonconsultingengineers.com

-
- ***Geotechnical Engineering***
 - ***Construction Materials Testing***
 - ***Pile Monitoring Services***
 - ***Pre-Condition Surveys***
 - ***Threshold Inspection Services***
 - ***Vibration Monitoring Services***

TABLE OF CONTENTS

1.0	INTRODUCTION
	1.1 Terms of Reference
	1.2 Project Description
	1.3 Purpose and Scope of Work
2.0	FIELD EXPLORATION AND LABORATORY TESTING & INSPECTION PROGRAMS
	2.1 Field Exploration Program
	2.2 Laboratory Testing and Inspection Program
3.0	SITE, GROUND-WATER, AND SOIL CONDITIONS
	3.1 Site Features
	3.2 Ground-Water Conditions
	3.3 Subsurface Soil Conditions
4.0	OBSERVATIONS AND COMMENTS
5.0	LIMITATIONS
6.0	ACKNOWLEDGMENT
Figure 1	Project Site Location and Vicinity Map
Figure 2	Project Layout and Test Location Plan
Figure 3	Boring Log Profiles
APPENDIX A	LABORATORY TESTING DATA
	A-1 & A-2 - Particle Size Distribution Curves

1.0 INTRODUCTION

1.1 Terms of Reference

YPC Consulting Group, P.L. (YPC) was retained by the Client to provide geotechnical exploration and engineering services for the City of Naples Beach Restoration and Water Quality Improvements Project located at the beach access at 3rd Avenue North in Naples, Collier County, Florida (hereafter referred to as the "project site"). Please refer to **Figure 1** for a Project Site Location and Vicinity Map. These services were performed in general accordance with the revised YPC Proposal No. 16485YFM-Revised dated 22 September 2016, and subsequent written contract dated 8 March 2017.

1.2 Project Description

The geotechnical scope of services for the proposed project included drilling one (1) test boring at the selected location to determine the depths to the rock strata and the general subsurface soil conditions. One (1) Standard Penetration Test (SPT) boring to the termination depth of 100-ft was requested by the Client and the location was selected in by the Client. It is understood that the information compiled from the field exploration and laboratory testing programs performed by YPC will be utilized by the Client for design and permitting of a pump station and horizontal directional drilled (HDD) pipeline in the project area.

1.3 Purpose and Scope of Work

The purpose of the geotechnical exploration and engineering services completed by YPC for the project was to describe, in general terms, soil and ground-water conditions encountered at the project site. To achieve this purpose, the scope of services has included the elements listed below.

- ▶ obtaining utility clearance from Sunshine State One Call of Florida, Inc. at the test location;
- ▶ obtaining a Right-of-Way (ROW) permit from the City of Naples to perform work at the project site;
- ▶ exploring subsurface soil and groundwater conditions by advancing one (1) SPT boring to a depth of approximately 100-ft below the existing ground surface (egs);
- ▶ recording time-pressure limestone cutting profiles;

- ▶ recording the groundwater level in the test boring at the time of testing;
- ▶ grouting the boring in general accordance with regulatory requirements;
- ▶ installing an asphalt patch where the test boring penetrated the existing roadway;
- ▶ reviewing soil samples and conducting laboratory tests on selected samples to evaluate pertinent engineering characteristics of the soils and assist in their classification;
- ▶ classifying soil samples retrieved during the field exploration, in general accordance with the Unified Soil Classification System (USCS);
- ▶ compiling data from the field exploration and laboratory testing program;
- ▶ evaluating generalized boring data as well as ground-water conditions;
- ▶ providing observations and comments for use by the Client in planning for the project; and,
- ▶ compiling the field exploration data, laboratory test data, and observations and comments in this report of findings.

2.0 FIELD EXPLORATION AND LABORATORY TESTING & INSPECTION PROGRAMS

2.1 Field Exploration Program

The field exploration program, consisting of the elements described in Section 1.3 above, was performed in general accordance with relevant portions of applicable testing procedures on 28 and 29 March 2017.

The test boring was advanced by a drilling subcontractor, under the supervision of a YPC engineer, using a wet-rotary procedure. Representative soil samples were obtained using split-barrel sampling procedures. In this procedure, a 2-in. outer-diameter, split-barrel sampler is driven into the soil by a 140-lb hammer with a free-fall of 30-in. The number of blows required to drive the sampler through a 12-in. interval is termed the Standard Penetration Resistance, or "N", value, and is indicated for each sample on the boring logs. The "N" value is an indication of the relative density of granular soils in-situ.

Soil samples obtained during the field exploration program were sealed immediately in the field and brought to YPC's laboratory for further examination and testing. The test boring location was selected in coordination with the client and marked in the field by the Client. The test borings were advanced at the approximate locations illustrated in the Project Layout and Test Location Plan presented in **Figure 2**.

2.2 Laboratory Testing and Inspection Program

Laboratory tests are generally performed to assist in the classification of soils based on their mechanical and physical behavior. Based on the results of laboratory tests, an indication of engineering properties for a soil can be established. Laboratory tests completed on soil samples retrieved for this project include:

- ▶ two (2) moisture content determinations;
- ▶ two (2) minus #200 sieve tests to determine total silt and clay particle contents;
- ▶ two (2) particle size analyses; and
- ▶ classification of each soil sample based on visual inspection.

Results of laboratory tests are indicated on the individual boring log profiles presented in **Figure 3**. Particle size distribution curves are included in **Appendix A**.

3.0 SITE, GROUND-WATER, AND SOIL CONDITIONS

3.1 Site Features

The project site is located at the beach access at 3rd Avenue North in Naples, Collier County, Florida. The project site is generally open, level, and clear of any major obstructions. The test boring location is within the City of Naples right-of-way. The test boring was advanced in the roadway area, thus penetrating the existing pavement section. The Gulf of Mexico is to the west of the beach access roadway where the test boring was drilled.

3.2 Ground-Water Conditions

At the time of the field exploration program, the ground-water level was recorded at approximately 5.0-ft below the egs in the test boring. It is noted that any ground-water table will be subject to fluctuation due to seasonal climatic changes, construction and development activities, rainfall variations, surface-water runoff, the extent of artificial

drainage, tidal influences, and other site-specific factors. Since ground-water level variations are anticipated, design drawings and specification should incorporate such possibilities and provide for dewatering, as required, during construction.

3.3 Subsurface Soils

General subsurface soil conditions at the boring location are described below (please refer to **Figure 2** for the Project Layout and Test Location Plan and **Figure 3** for the boring log profile).

- ▶ Subsurface soils encountered in test boring SB-1 generally consist of **poorly-graded sand (SP)**, **sandy silt (ML)**, **silty sand (SM)**, **weathered and/ or fractured limestone (WLS)**, and **limestone (LS)** to the boring termination depth 101-ft below the egs. The existing asphalt paving section was penetrated to advance the test boring.

4.0 OBSERVATIONS AND COMMENTS

Based on current conditions and data obtained during the field exploration and visual inspection of soil samples for this project, observations and comments are presented below:

- ▶ Subsurface soils generally consist of poorly-graded sand (SP), sandy silt (ML), silty sand (SM), weathered and/ or fractured limestone (WLS), and limestone (LS) to the boring termination depths 101-ft below the egs.
- ▶ Dense weathered and/or fractured limestone and very hard limestone were encountered at various depths as shown in **Figure 3**. This should be taken into account during planning with respect to excavation for any pump station of Horizontal Directional Drilled (HDD) pipelines.
- ▶ The subsurface soils profile presented in **Figure 3**, along with the time-pressure limestone cutting profiles and laboratory test results, will be utilized by the Client in planning for this project. YPC can provide further assistance, if necessary, after additional project information becomes available.

5.0 LIMITATIONS

This geotechnical and engineering services report has been prepared for the exclusive use of the Client. No other warranty is expressed nor implied. It is noted that the information presented in this report address only soils and deposits that would normally be influenced by the proposed construction. The scope of services does not include an evaluation of deep soil or rock conditions where limestone cavities may exist due to sinkhole activity. Deep borings/ soundings, geophysical exploration, and/or resistivity surveys would be required in order to evaluate the structural condition and stability of deep soil and rock formations, and is beyond the scope of services for this project.

This report has been prepared to aid in the evaluation of the property and to assist the owner and/or engineer in planning and design of this project. The scope of services is limited to the specific project and locations described herein, and the description of the project as described herein represents YPC's understanding of significant project aspects related to soil characteristics. In the event that any changes in the design or location of the structures as outlined in the report are planned, YPC must be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing. **Any conclusions or recommendations made by others based on the data contained herein are not the responsibility of YPC, unless we are advised of the same in writing and given the opportunity to review those conclusions and recommendations.**

The analyses and recommendations submitted in this report are based upon the data obtained from field exploration program at locations indicated in the Project Layout and Test Location Plan presented in **Figure 2**, as well as any other information discussed in this report. In the performance of a subsurface exploration, specific information is obtained at specific locations at specific times. However, it is known that site and subsurface conditions can change over time. Additionally, variations in soil and rock exist on most sites between test locations. The nature and extent of such variations may not become evident until after the start of construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report after performing on-site observations during the construction period and/or performing supplemental tests.

It is the responsibility of the Client to see that the recommendations in this report are brought to the attention of all concerned parties. Because of the possibility of unanticipated subsurface conditions occurring, it is recommended that a "changed condition" clause be provided in contracts with the general contractor and with subcontractors involved in foundations or earthwork construction. Furthermore, it is necessary that YPC be retained to review the site preparations and foundation phases of construction. Otherwise, no responsibility for construction compliance with the design concepts, plans, specifications, and recommendations presented herein can be assumed.

Ms. Christin Perkinson, Ph.D., P.E., D.CE.
Erickson Consulting Engineers, Inc.
Geotechnical Exploration and Engineering Service Report
City of Naples Beach Restoration and Water Quality Improvements Project
Beach Access at 3rd Avenue North
Naples, Collier County, Florida
YPC Project No. 17GY125

YPC Consulting Group, P.L.
11 April 2017

The reproduction of any portion of this report in plans or other engineering documents supplied to parties other than the Client or assigned parties must bear the language indicating that the information contained in the report is for general information only, and that neither the Client nor YPC are liable to such parties.

6.0 ACKNOWLEDGMENT

YPC appreciates the opportunity to work with you on this project. Please contact us should you have any questions concerning this report or if you require additional information.

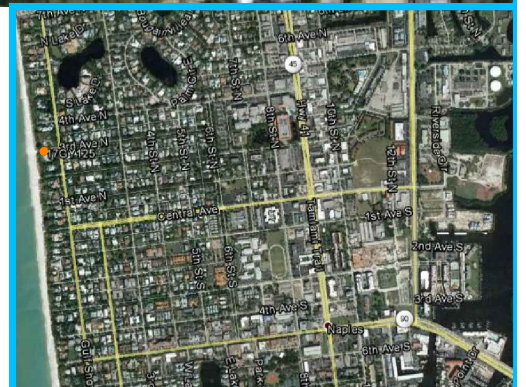
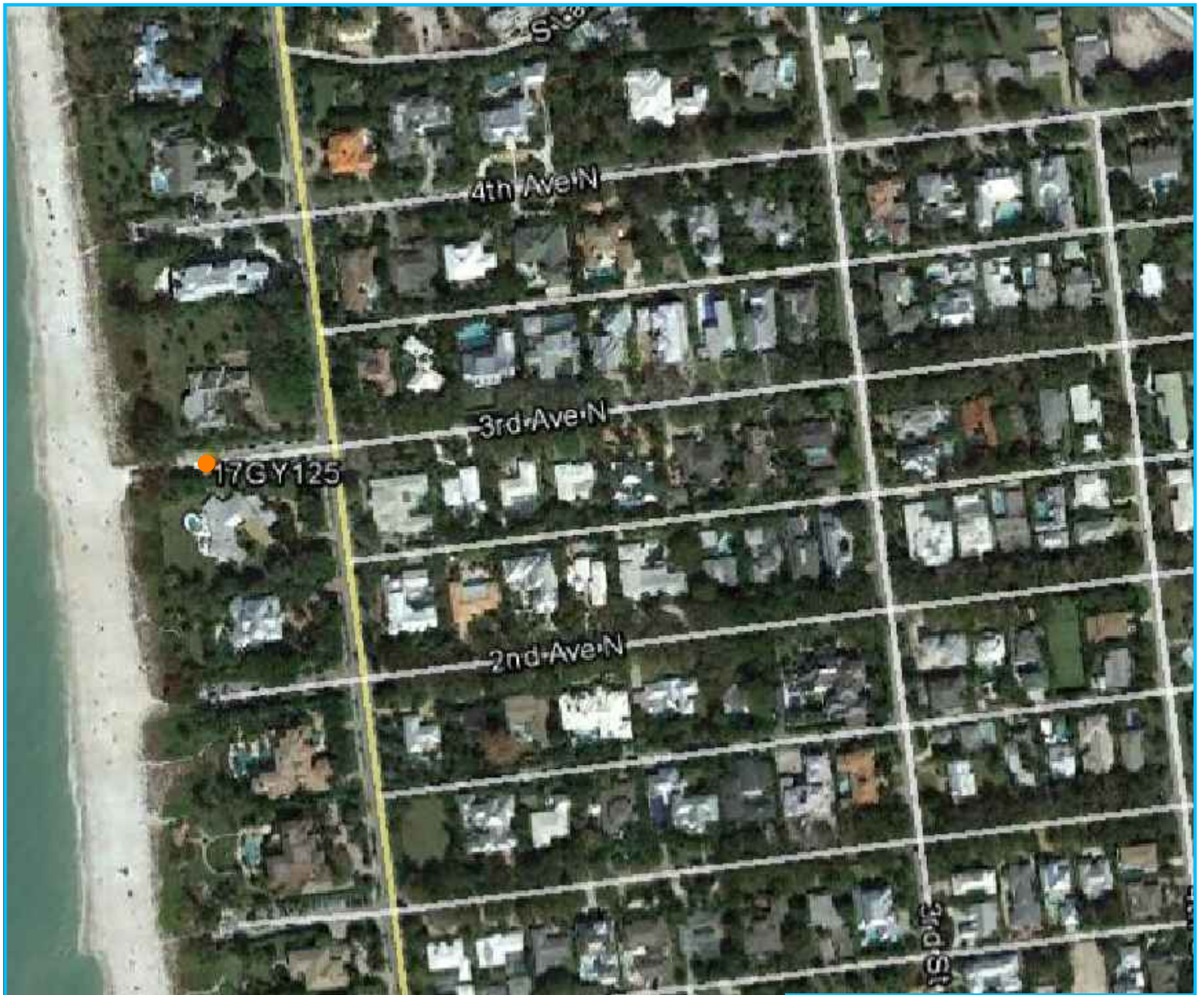
Sincerely,

YPC Consulting Group, P.L.
Florida Certificate of Authorization No. 28233

*This document has been electronically signed
& sealed using a digital signature by:*

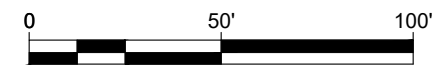
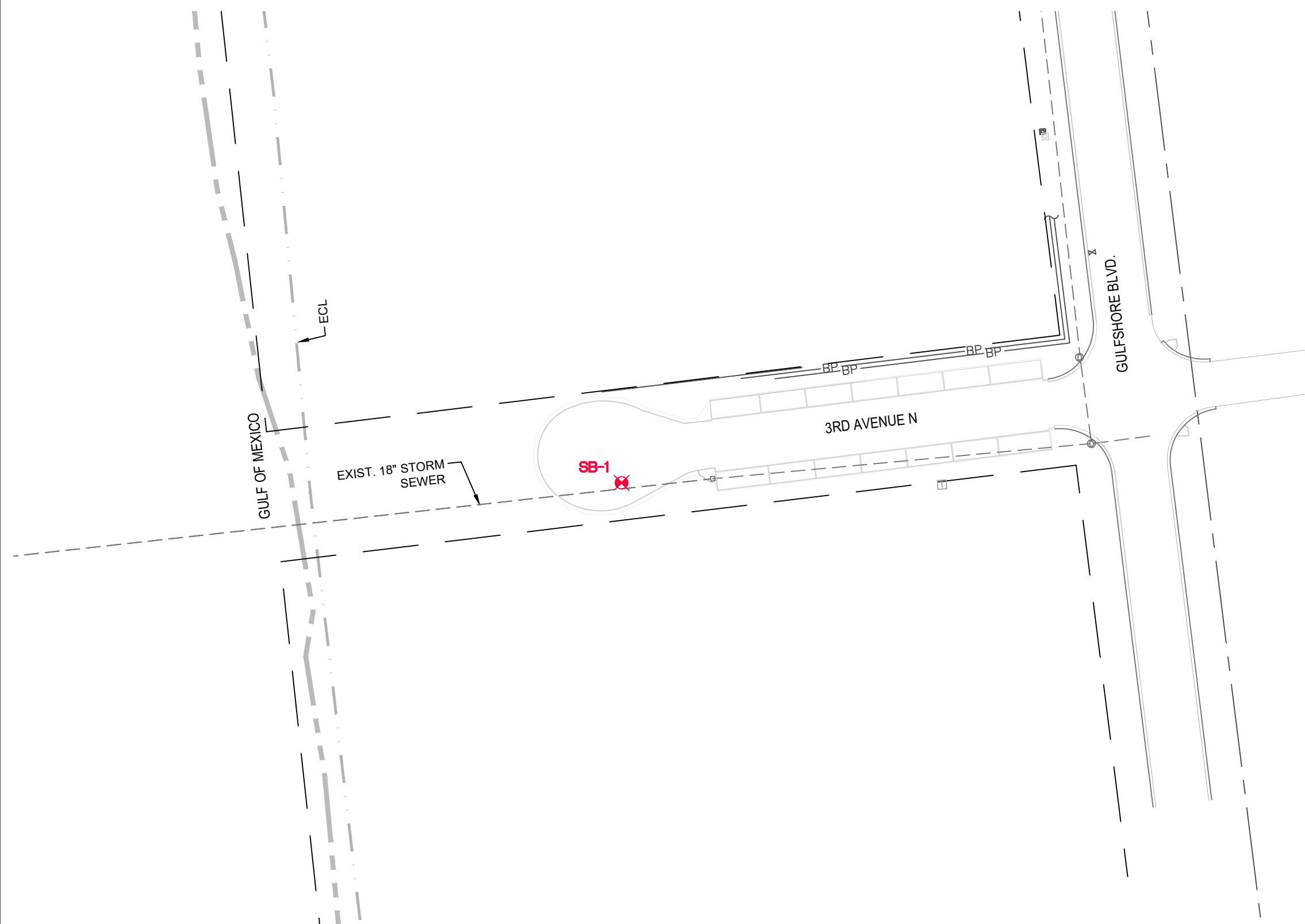
Yen-Po Chiu, P.E.
Senior Project Manager
Florida Registration No. 62391

*Printed copies of this document are not considered signed and sealed and
the signature must be verified on any electronic copies.*



WGS84
 LAT: ° N
 LONG: ° W
 17GY125.dwg (04-08-2017)

TITLE Project Site Location and Vicinity Map		SOURCE Google Earth	FIGURE NO. 1
	DATE 8th April 2017	Geotechnical Exploration and Engineering Services Report City of Naples Beach Restoration and Water Quality Improvements Project Beach Access at 3rd Avenue North Naples, Collier County, Florida for: Ms. Christin L. Perkinson, Ph.D., P.E., D.C.E. Erickson Consulting Engineers, Inc. Sarasota, Florida	
	DRAWN BY JIDS-JBC		
	CHECKED BY YPC		
	SCALE nts		
	PROJECT NO. 17GY125		



LEGEND	
SB-1	SPT Test Boring(s)
	Location and Identification.

17GY125.dwg (04-08-2017)

NO.	REVISIONS	DATE	BY	NAME	DATE
	DESIGNED				
	DRAWN		JIDS		04/17
	CHECKED		YPC		04/17
	APPROVED		YPC		04/17



SEAL

PROJECT NAME
 Geotechnical Exploration and Engineering Services Report
City of Naples Beach
Restoration and Water Quality Improvements Project
 Beach Access at 3rd Avenue North
 Naples, Collier County, Florida

CLIENT
 Ms. Christin L. Perkinson, Ph.D., P.E., D.CE.
 Erickson Consulting Engineers, Inc.
 Sarasota, Florida

SHEET TITLE		Figure No.
Project Layout and Test Location Plan		2
SOURCE	PROJECT NO.	
Base Plan Acquired from: Erickson Consulting Engineers, Inc.	17GY125	

NO.	176Y125.dwg (04-08-2017)
REVISIONS	
DATE	
BY	
DESIGNED	JLS
DRAWN	JLS
CHECKED	JPC
APPROVED	JPC
NAME	JLS
DATE	04/17
DATE	04/17
DATE	04/17
PROJECT NAME	Geotechnical Exploration and Engineering Services Report City of Naples Beach Restoration and Water Quality Improvements Project Beach Access at 3rd Avenue North Naples, Collier County, Florida
CLIENT	Ms. Christin L. Perkinson, Ph.D., P.E., D.CE. Erickson Consulting Engineers, Inc. Sarasota, Florida
SHEET TITLE	Boring Log Profiles
SOURCE	Standard Penetration Boring Logs
PROJECT NO.	176Y125
Figure No.	3

NOTES:

- THE BORINGS SHOWN REPRESENT SUBSURFACE CONDITIONS WITHIN THE BOREHOLE AT THE TIME OF DRILLING. NO WARRANTY AS TO THE SUBSURFACE CONDITIONS, STRATA DEPTH OR SOIL CONSISTENCY BETWEEN OR OUTSIDE THE BORING LOCATIONS IS EXPRESSED OR IMPLIED BY THIS DRAWING. DO NOT ASSUME THIS DATA IS A GUARANTEE OF THE DEPTH, EXTENT, OR CHARACTER OF THE MATERIAL PRESENT.
- REFER TO TEST LOCATION PLAN (FIGURE 3) FOR TEST LOCATIONS.

GWT or GROUND WATER TABLE LEVEL (OBSERVED)
SHWL or SEASONAL HIGH WATER LEVEL (ESTIMATED)
TYPE OF RIG: AD-2 (Manual Hammer) and Tripod Drilling Equipment

SOIL PROPERTIES

GRANULAR SOILS (COHESIONLESS)

DESCRIPTIVE TERM FOR RELATIVE DENSITY	SPT N-VALUE (blows per ft)
very loose	0 - 4
loose	5 - 10
medium dense	11 - 30
dense	31 - 50
very dense	over 50

FINE GRAINED SOILS (COHESIVE)

DESCRIPTIVE TERM FOR CONSISTENCY	SPT N-VALUE (blows per ft)
very soft	0 - 2
soft	3 - 4
firm	5 - 8
stiff	9 - 15
very stiff	16 - 30
hard	31-50
very hard	over 50

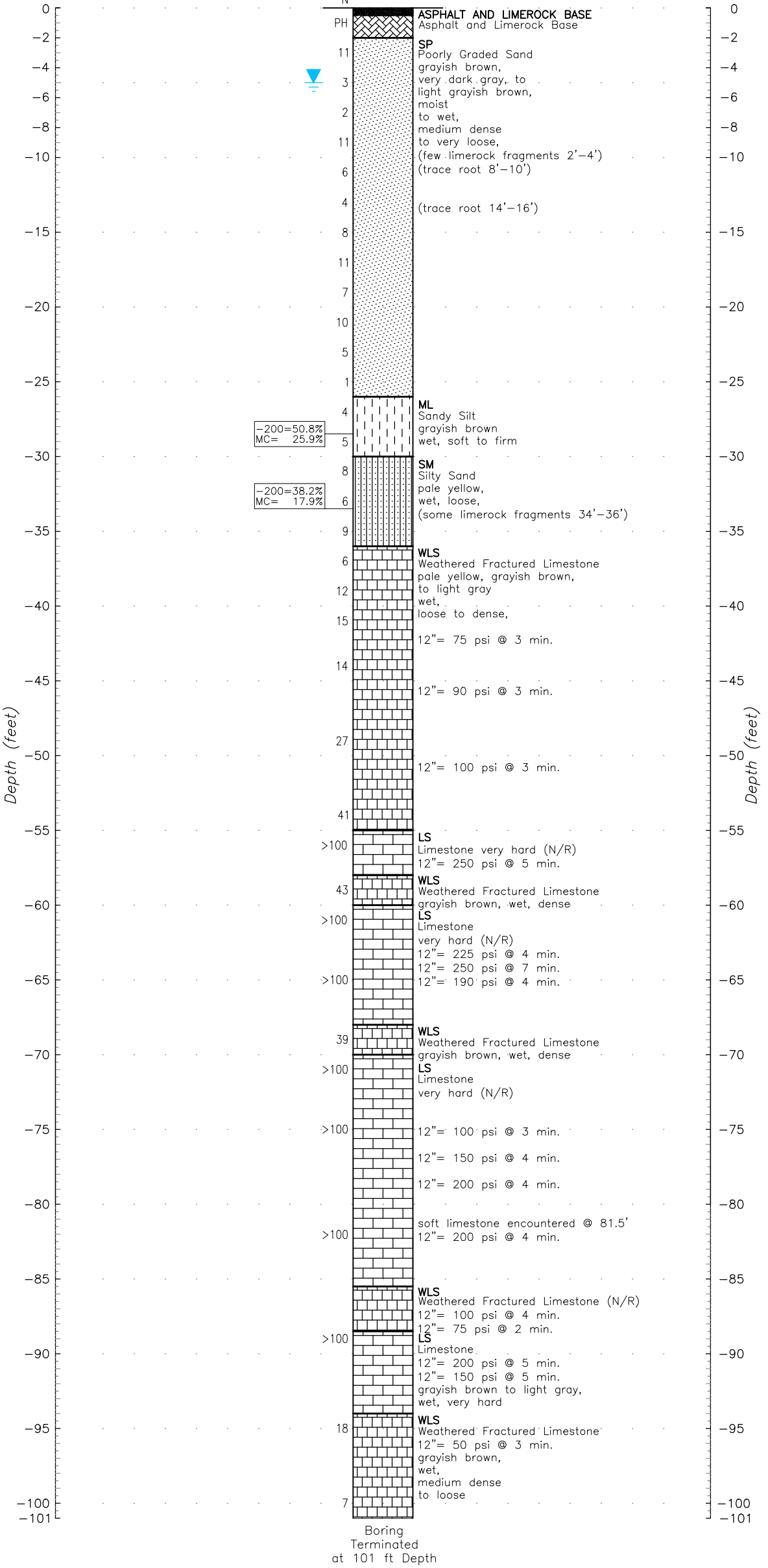
MOISTURE DESCRIPTION

- dry - absence of moisture, dusty, dry to the touch
- moist - damp, but no visible water
- wet - visible free water, usually soil is below water table
- GNE GROUND WATER NOT ENCOUNTERED
- GNM GROUND WATER NOT MEASURED
- LL LIQUID LIMIT
- PL PLASTIC LIMIT
- PI PLASTICITY INDEX
- 200 PERCENT PASSING NO. 200 U.S. STANDARD SIEVE (%)
- MC NATURAL MOISTURE CONTENT (%)
- WR WEIGHT OF ROD
- WOH WEIGHT OF HAMMER
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER 1ft (2ft SPOON - ASTM D-1586)
- ORG ORGANIC CONTENT
- TOD TIME OF DRILLING
- PH POSTHOLE DIGGING
- GSE GROUND SURFACE ELEVATION CASING USED
- SP USCS SOIL CLASSIFICATION
- NR LOSS OF CIRCULATION NO RECOVERY

LEGEND

	SP SAND		MH ELASTIC SILT
	SM SILTY SAND		CH FAT CLAY
	SC CLAYEY SAND		PT MUCK/PEAT
	LS HARD LIMESTONE		CONCRETE
	WLS WEATHERED OR SOFT LIMESTONE		AS ASPHALT
	SP-SC		LB LIMEROCK BASE
	SP-SM		DEBRIS
	GP GRAVEL		ML SILT
	SANDY-GRAVEL		CL LEAN CLAY
	GM SILTY-GRAVEL		SH SHELL
	OL ORGANIC SILTS		SHELLY-GRAVEL
	OH ORGANIC CLAY		SHELLY-SAND
	GC GRAVELLY-CLAY		SHELLY-CLAY
	CAVITY		SOIL/CEMENT

BORING No.: SB-1
GWT: 5.0-FT.
GSE: N/A
DATE: 02/29/17



Ms. Christin Perkinson, Ph.D., P.E., D.CE.
Erickson Consulting Engineers, Inc.
Geotechnical Exploration and Engineering Service Report
City of Naples Beach Restoration and Water Quality Improvements Project
Beach Access at 3rd Avenue North
Naples, Collier County, Florida
YPC Project No. 17GY125

YPC Consulting Group, P.L.
11 April 2017

APPENDIX A

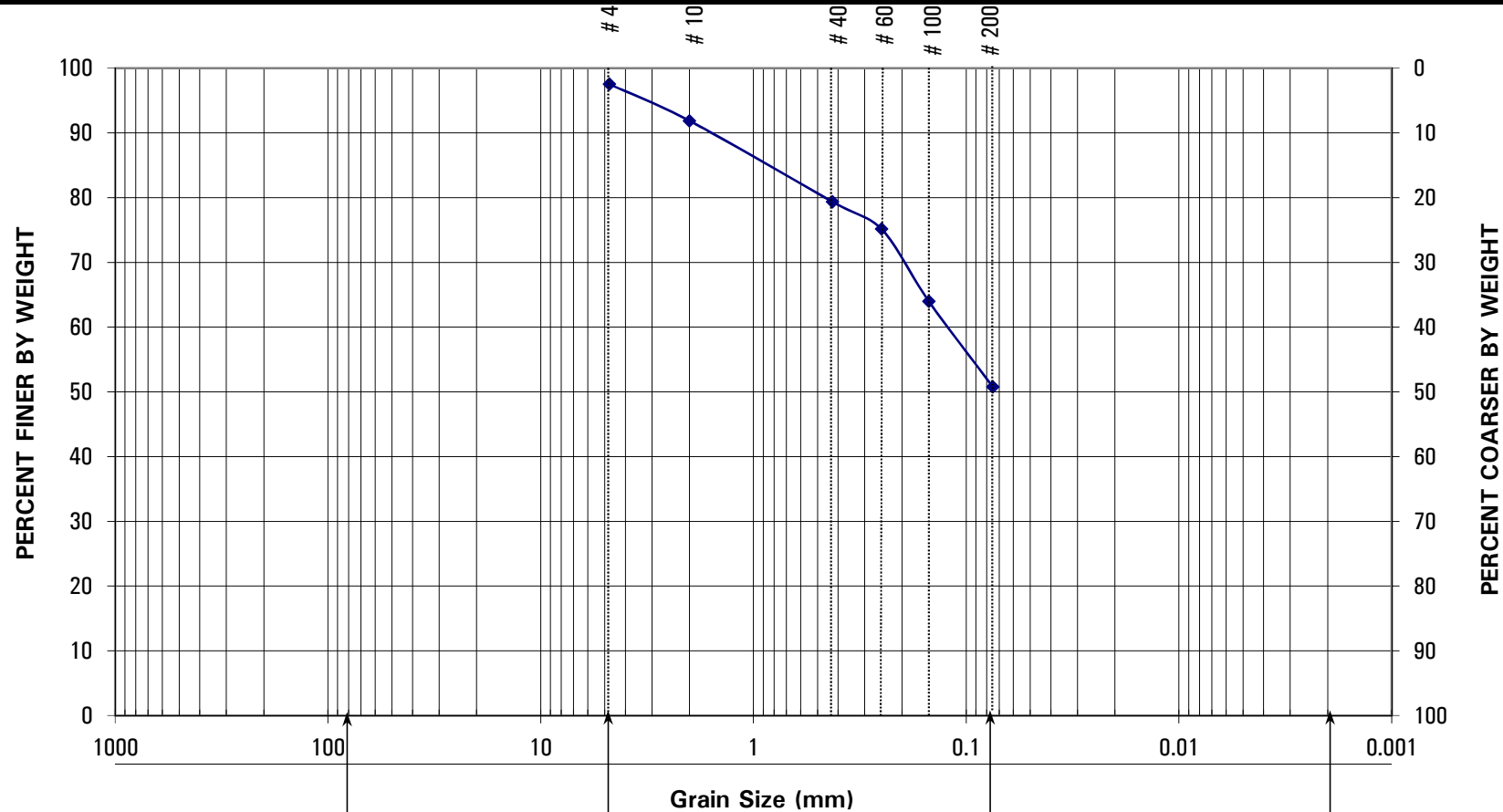
LABORATORY TESTING DATA

A-1 and A-2 - Particle Size Distribution Curves

GRAIN SIZE DISTRIBUTION CURVE

Erickson Consulting Engineers, Inc.
City of Naples Beach Restoration and Water Quality Improvements

ASTM D-2487



BOULDERS/COBBLES	GRAVEL		SAND				SILT					CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE							

SYMBOL	SAMPLE No.	SAMPLE DESCRIPTION & SOURCE	WATER CONTENT %	LL	PL	PI	SG	GRAVEL %	SAND %	SILT & CLAY %	D ₁₀	D ₃₀	D ₆₀	C _c	C _u	USCS

YPC CONSULTING GROUP, P.L.

Job Number:
17GY125

Approved By:
YPC

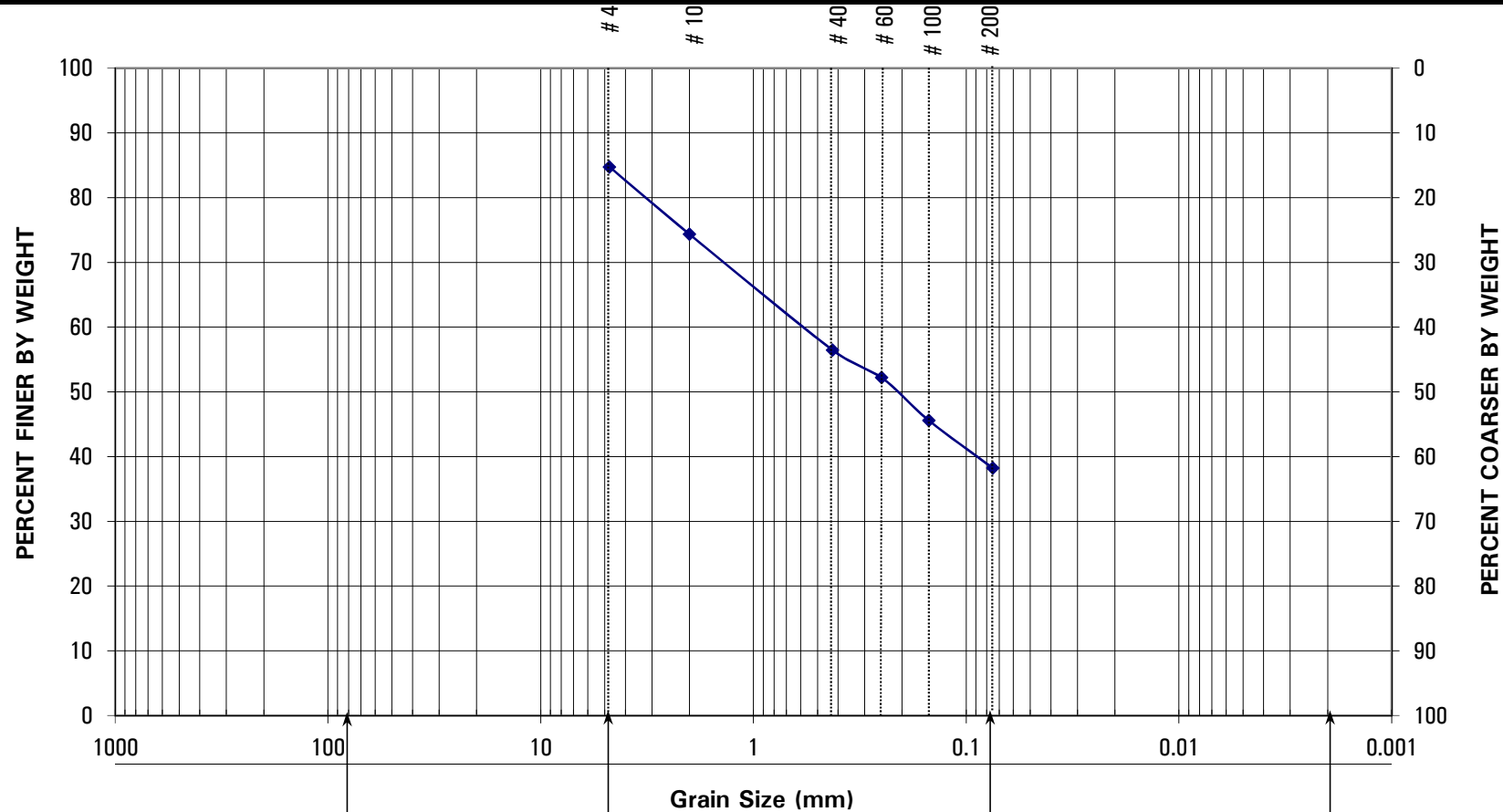
Date:
4/9/2017

A-1

GRAIN SIZE DISTRIBUTION CURVE

Erickson Consulting Engineers, Inc.
City of Naples Beach Restoration and Water Quality Improvements

ASTM D-2487



BOULDERS/COBBLES	GRAVEL		SAND				SILT					CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE							

SYMBOL	SAMPLE No.	SAMPLE DESCRIPTION & SOURCE	WATER CONTENT %	LL	PL	PI	SG	GRAVEL %	SAND %	SILT & CLAY %	D ₁₀	D ₃₀	D ₆₀	C _c	C _u	USCS

YPC CONSULTING GROUP, P.L.

Job Number:
17GY125

Approved By:
YPC

Date:
4/9/2017

A-2