MANATEE COUNTY
FLORIDA

December 27, 2012

TO: All Interested Bidders

SUBJECT: Invitation for Bid # 12-3098-DS
SEWRF Lake Filtration System Replacement

ADDENDUM # 2

Bidders are hereby notified that this Addendum shall be acknowledged on pages 00300-1 of the Bid Form and made a part of the above named bidding and contract documents. Bids submitted without acknowledgement of the Addendum will be considered incomplete.

The following items are issued to add to, modify, and clarify the bid and contract documents. These items shall have the same force and effect as the original bidding and contract documents, and cost involved shall be included in the bid prices. Bids to be submitted on the specified bid date, shall conform to the additions and revisions listed herein.

The deadline for clarification of questions is **January 4, 2013 at 3:00 pm.** This deadline has been established to maintain fair treatment of all potential bidders, while maintaining the expedited nature of the Economic Stimulus that the contracting of this work may achieve. Questions received after this date and time shall not be considered.

A public records request was made for the engineers estimate.

Attached is a copy of the engineer's estimate letter (1) page dated August 22, 2012.

A public records request was made for the attendee listing at the guided site visit and the Information Conference.

Attachment: Attendee listing for both the Guided Site Visit and the Information Conference. Both the scheduled Guided Site Visit and the Information Conference were non-mandatory. As noted in the IFB, a site inspection is a requirement to submit a bid. See article B.05 pages 00020-2. (4 pages)

Finance Management Department
Mailing Address: P.O. Box 1000; 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205
PHONE: 941-749-3045 * FAX: 941-749-3034
www.mymanatee.org

ADDENDUM # 2

A public request was made for the method to see the project site.

An interested bidder may call Mr. Dalton Cook, W/Ww Chief Operator, Utilities Department, at 941-792-8811 ext. 8021 or his cellular phone at 941-713-0269 to coordinate a site visit Monday thru Friday between the hours of 7:00 AM to 2:00 PM.

Contractor Questions and Responses:

Question 1:
Will profiles of the lakes where the pads are located be provided?

Response 1:
No. Approximate elevations based upon field survey for the bottom of the ponds are shown on sheet D-01.

Question 2:
It is stated that sheeting is to be used for two of the lakes, the GC needs profiles of the lakes and water levels to base his bid on, will this be provided?

Response 2:
Profiles will not be provided. Section 02221, Trenching, Bedding and Backfill for Pipe, includes information related to cofferdam design.

See update to Section 02221, Trenching, Bedding and Backfill for Pipe under Changes to Specifications.

Question 3:
From the pre-bid meeting it was stated that two lakes could be down at one time, does this mean that the lakes can be drained?

ADDENDUM # 2

Response 3:
To clarify, when a lake is out of service, the lift station at that lake will not be sending water back to the SEWRF, but the lake will still be able to receive water.

See update to Bid documents Section 00100, Bid Summary; paragraph D.01under Changes to Specifications below.

It will not be possible to drain any of the lakes. Installation of the lake intake structures shall be performed according to the contract drawings and specifications.

Question 4:
It is indicated that sheeting is needed for two of the intakes, but the drawings indicate that soil borings are up to the contractor, are there no soil borings from the area at all?

Response 4:
Contractor shall perform geotechnical assessment at the intake areas per the contract drawings and specifications.

A geotechnical report completed during design is provided as an attachment to this addendum and may be used as a reference as stipulated in the contract drawings and specifications.

Question 5:
No constraints are shown to when the Lake Filters can be taken off line, is there any?

Response 5:
The existing Lake Filters are not in service. There are no constraints on when they can be taken off-line within the construction schedule.

Question 6:
Shutdown A, B, C, and D, 2. e. "Install, check, and test the temporary pumping system" what is this referring to?

ADDENDUM # 2

Response 6:
This refers to a pumping system required to bypass equipment or piping so that the facility can continue operation.
See Changes to Specifications below for further discussion.

Question 7:
How deep is the 36" tie-in on C-03?

Response 7:
Depth to 36" tie-in is approximately 8'-0" from grade to the top of existing 36" pipe based on subsurface assessment performed during design phase.

Question 8:
Considering how deep the 36" Tie in is, why is the connection coming up from the bottom?

Response 8:
Based on potential conflicts with existing 42" SPW and 30" RW pipelines and electrical ductbank. It is approximately 12'-0" to the bottom of the pipelines based on subsurface assessment performed during design phase.

Question 9:
What is the depth of water for each lake?

Response 9:
"See update to Section 02221, Trenching, Bedding and Backfill for Pipe under Changes to Specifications."

Question 10:
What is the bottom of lake elevation for each lake?

Response 10:
See response to Question No. 1

Question 11:
Was there a Geotech done for the lakes? It states on sheet S-02 that we are responsible for a Geotechnical Investigation prior to construction but that does nothing for us for bidding purposes.

ADDENDUM # 2

Response 11:
See response to Question No. 4

Question 12:
Where can we discharge the water from dewatering activities in the lakes?

Response 12:
Water from dewatering activities shall be disposed of according to the general notes on the contract drawings and Divisions 1 and 2 of the contract specifications.

Changes to Specifications

Section 00100, Bid Summary:
Remove current language under paragraph D.01 that states the following:
~~The Bidder shall be aware that the construction of the lake intake structures for each lake must be performed in series. At no point may multiple lakes be taken out of service for construction or made otherwise unavailable for plant use. Moreover, construction of the lake intake structures must be completed and the lakes available for plant use by June 1, 2013~~

And replace with the language below:
The Bidder shall be aware that the construction of the lake intake structures can be performed with two lakes out of service at the same time. However, one of these lakes must be South Lake No. 1, which is currently not in use. At no point may South Lake No. 2 and East Lake be taken out of service for construction or made otherwise unavailable for plant use at the same time.

Construction of the lake intake structures will not be allowed from June 1, 2013 through November 1, 2013 to allow use of the lakes by the County Utilities Department during the rainy season. The Contractor shall construct the intake structure for at least one of the large lakes (either South Lake #2 or East Lake) and have it operational by June 1, 2013. The remaining lake intake structures shall be constructed after November 1, 2013 and within the time frame of the construction contract period. It is anticipated that a Notice to Proceed will be issued by the County for this project by the end of February 2013.

ADDENDUM # 2

Section 01143, Coordination with County's Operations
Remove the following paragraphs from the specification section:
Paragraph 3.2.A.2.e
Paragraph 3.2.B.2.e
Paragraph 3.2.C.2.e

Modify paragraph 3.2.D.2.e to read as follows:
"Install, check, and test the temporary pumping system, if system is required."

Section 02221, Trenching, Bedding and Backfill for Pipe
Update Table in Paragraph 1.2.A.5 as shown below:

Intake Structures Estimate Cofferdam Quantities

Lake Name	Retained soil Height	Retained water Height	Total Retained Height	Approximate Cofferdam Length
South Lake #1	----	-----	-----	Not Required
South Lake #2	7'	~~18'~~ 28'	~~25'~~ 35'	220'
East Lake	7'	20'	27'	220'

Changes to Drawings
None for Addendum No. 2.

If you have submitted a bid prior to receiving this addendum, you may request in writing that your original, sealed bid be returned to your firm. All sealed bids received will be opened on the date stated.

ADDENDUM # 2

The deadline for submitting sealed Bids at the Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205 is until 2:00 pm on January 16, 2013.

END ADDENDUM # 2

Sincerely,

Melissa M. Wendel, CPPO
Purchasing Official
/ds (Attachments: Geotech Report 10-21-11, Guided Non Mandatory Site Visit Log, Information Conference Attendance Log, and Engineers Estimate)

Finance Management Department
Mailing Address: P.O. Box 1000: 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205
PHONE: 941-749-3045 * FAX: 941-749-3034
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MALCOLM PIRNIE | ARCADIS

The Water Division of ARCADIS

ARCADIS U.S., Inc.
14025 Riveredge Drive
Suite 600
Tampa
Florida 33637
Tel 813 903 3100
Fax 813 903 9115
www.arcadis-us.com

Jeff Streitmatter III, P.E.
Project Manager
Manatee County Government
1022 26th Avenue East
Bradenton, FL 34208-3926

Subject:
Southeast Water Reclamation Facility Lake Filtration System

Dear Mr. Streitmatter:

The Engineer's Opinion of Probable Construction Cost (EOPCC) for the Southeast Water Reclamation Facility Lake Filtration System is $4,061,200.

Sincerely,

ARCADIS U.S., Inc.

John Pacifici, P.E.

Date:
August 22, 2012

Contact:
John Pacifici, P.E.

Phone:
813.353.5742

Email:
john.pacific@arcadis-us.com

Our ref:
0132008.0000

Copies:
File

GUIDED SITE VISIT ATTENDANCE RECORD

Title: SEWRF LAKE FILTRATION SYSTEM REPLACEMENT

Location: The Southeast Water Reclamation Facility (SEWRF) address: 3331 Lena Road, Bradenton, Florida 34202 (Manatee County).

IFB #: 12-3098-DS

Site Visit: December 7, 2012 at 10:30 am

NAME/PRINT	SIGNATURE	FIRM
Donna M. Stevens Contract Specialist	Donna Stevens	Manatee County Government
Kent Bontrager Project Engineer II		Manatee County Government
Jeff Streitmatter Project Management Div. Mgr		Manatee County Government
Andy Fischer Infrastructure Inspections Div. Mgr		Manatee County Government
Brandon Long Product Manager		NOVA Water Tech.
JOHN JULIAN		VOGEL BROS BUILDING Co LAKELAND FL 863 535 1021
ANDRÉ C. BUTCHER	A. C. Butcher	TLC DIVERSIFIED, INC.
Anthony Centurione Project Manager		Cardinal Contractors
KEN LAKE		MARCOBAY CONST INC

RFQ# 12-3098-DS

NAME/PRINT	SIGNATURE	FIRM
Helia Yazdian	Heeriw Yazdi	Wharton - Smith
Andrew Coleman		ARCADIS
DALTON COOLS	Walter & Cash	MANATEE CO.
Manny Juncal	Rain for Rent	Rain for Rent.
John Babuka		Reliable Electric

ATTENDANCE RECORD

NON-MANDATORY INFORMATION CONFERENCE

Title: SEWRF LAKE FILTRATION SYSTEM REPLACEMENT

Location: 1022 26th Street East, Conference Room A, Bradenton Florida 34208

IFB #: 12-3098-DS

Date / Time: December 7, 2012 @ (9:00 AM)

Deadline for Clarification Requests: January 4, 2013 at (3:00pm)

Bid Due Date: January 16, 2013 (2:00 PM)

Please print all entries

Name/Title	Firm	Phone #	Email Address
Donna M. Stevens DMS Contract Specialist	Manatee County Government (Purchasing Division)	(941) 749-3045	donna.stevens@mymanatee.org
Kent Bontrager Project Engineer II	Manatee County Government (Public Works Dept.)	(941) 708-7450 Ext. 7331	kent.bontrager@mymanatee.org
Jeff Streitmatter Project Management Div. Mgr	Manatee County Government (Public Works Dept.)	(941) 708-7450 Ext. 7335	jeff.streitmatter@mymanatee.org
~~Andy Fischer Infrastructure Inspections Div. Mgr~~	~~Manatee County Government (Public Works Dept.)~~	~~(941) 708-7450 Ext. 7347~~	~~andy.fischer@mymanatee.org~~
Helia Yazdian Project Engineer	Wharton-Smith, Inc.	(407) 321-8410	ENVestimating@whartonsmith.com
Anthony Centuolone Project Manager	Cardinal Contractors	(941) 377-8555	estimating@cardinalco.com
ANDLE BUTCHER	TLC DIVERSIFIED, INC.	941-722-0621	mheath@tlcdiversified.com

Name/Title	Firm	Phone #	Email Address
T.J. Chapman ACCT. MGR.	Mensino Dewatering	386-566-3891	TJ.Chapman@mensino.com
TIM WODZINSKI CONST. MANAGER	ARCADIS	813-325 0978	tim.wodzinski@arcadis-us.com
Andrew Coleman Project Engineer	ARCADIS	813 353 5714	andrew.coleman@arcadis-us.com
Dalton Todd Chief Oper	manatee	941 713 0219	
Chuck Froman Wastewater Plants Super	MCU-Utilities	941 792-8811 x 5162	chuckfroman@mymanatee.org
Kell Lalle ESTIMATING	MARCOBAT CONSTRUCTION INC	863-680-2293	KLA SSMITH@MARCOBAT.COM
Manny Juncal Sales	Rain for Rent Bypass	863 701 4157	MJuncal@RainforRent.com

NON- MANDATORY INFORMATION CONFERENCE

MC Squared, Inc.

Geotechnical Investigation Report

Southeast Water Reclamation Facility
Manatee County, Florida

Prepared for: **Arcadis U.S., Inc.**
14025 Riveredge Dr.
Suite 600
Tampa, Florida 33605

Prepared By:
MC Squared, Inc
5808-A Breckenridge Parkway
Tampa, Florida 33610

Project No. T021113.031
October 2011

MC²

GEOTECHNICAL • ENVIRONMENTAL
MATERIALS TESTING

MC²
GEOTECHNICAL • ENVIRONMENTAL
MATERIALS TESTING

October 21, 2011
Revised

Mr. John Pacifici, PE
Project Environmental Engineer
Arcadis U.S. Inc.
14025 Riveredge Dr., Suite 600
Tampa, Florida 33605

Geotechnical Engineering Services Report
Southeast Water Reclamation Facility
Lake Infiltration System
Manatee County, Florida
MC² Inc. Project No. T021113.031

MC Squared, Inc. (**MC²**) has performed geotechnical engineering services for the referenced project. The results of this exploration, together with our recommendations, are included in the accompanying report.

Often, because of design and construction details that occur on a project, questions arise concerning subsurface conditions. **MC²** will be pleased to continue our role as geotechnical consultants during the construction phase of this project to provide assistance with construction materials testing and inspection services and to verify that our recommendations are implemented.

We trust that this report will assist you in the design and construction of the proposed project. We appreciate the opportunity to be of service to you on this project. Should you have any questions, please do not hesitate to contact us.

Respectfully submitted,
MC²

Kermit Schmidt, PE
Vice President/Chief Engineer
PE No. 45603

Amanda S. Pereira, PE
Project Engineer

5808 – A Breckenridge Parkway, Tampa, Florida 33610
Phone (813) 623-3399, Fax (813) 623-6636
www.mc2engineers.com

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING SERVICES REPORT

INTRODUCTION

Authorization

This report presents the findings of the subsurface exploration and associated recommendations based on a geotechnical engineering evaluation for the Southeast Water Reclamation Facility in Manatee County, Florida. The services for this project were performed in general accordance with our Proposal T021113.031 dated February 18, 2011. Authorization to perform the exploration and evaluation was in the form of acceptance of our proposal by Mr. John Pacifici, PE with **Arcadis US, Inc.**

PROJECT INFORMATION

Site Location

The proposed site evaluated and reported herein is located east of I-75, south of SR 64, west of Lakewood Ranch Blvd. and north of SR 70 in Manatee County, Florida. **A Boring Location Plan** is included as **Sheet 1** in **Appendix A.**

Project Description

Project information has been provided by **Mr. Andrew Coleman** and **Mr. John Pacifici** of **Arcadis** through verbal and email communications including locations of requested borings for the project. Based on our understanding, the proposed work includes the design of three (3) new intake structures to be built at the existing East Lake, South Lake #1 and South Lake #2 return pump stations at the facility in Manatee County. In addition, a slab on grade foundation will be designed for a new set of gravity filters which are to be located south of the existing Automatic Backwash Filters.

A preliminary plan was provided by **Arcadis** for the intake structures. The intake structures will be installed below the existing pond bottom at each location and consists of a 48' x 32.67' slab supporting a 24" DIP intake and intake screens. A 12" layer of compacted #57 stone is being proposed by **Arcadis** below concrete slab. Temporary sheet pile shoring will be required for construction of the three intake structures.

Dimensions for the slab on grade foundation to support a new set of gravity filters were not provided by **Arcadis**.

We are assuming that the bottom slab of the intake structures will be poured monolithically. The load for the structures was not provided and we assumed it to be

less than 1,000 psf for both the intake and gravity filters structures.

This geotechnical report is based on information supplied to us by **Arcadis**. If any of the noted information is incorrect or has changed, please inform **MC²** so that we may amend the recommendations presented in this report, if appropriate or necessary. Based on the map provided by **Arcadis**, the borings were located in the field by representatives of **MC²** using existing features as references and considering utility constraints.

Purpose and Scope of Services

Four (4) Standard Penetration Test (SPT) borings were performed near the proposed intake structure and gravity filters locations to develop the recommendations presented in this report. In addition, two (2) hand auger borings were performed, extending to depths of 5 feet.

The purpose of this exploration was to evaluate subsurface conditions at the site and to provide recommendations regarding design and general site development for the proposed construction of three (3) intake structures and a new set of gravity filters.

Our geotechnical study and analyses consisted of a review of available subsurface test data. Sources include the USDA Manatee County Soil Survey, USGS Maps and previous geotechnical engineering studies performed by **MC²** in this area. The testing program consisted of the following services:

- Conducted a visual reconnaissance of each project site. The actual locations of the proposed structures were provided by **Arcadis** personnel. However, the final boring location was positioned considering existing piping and utility constraints. We determined the boring locations by taping distances from boundaries and existing features. The final boring locations were surveyed by **Arcadis.**

- Reviewed the USDA Soil Survey for Manatee County and the USGS topographic maps.

- Drilled four (4) Standard Penetration Test (SPT) borings at the site to provide site-specific deeper design information for the proposed intake structures and new set of gravity filters. The borings were labeled B-1 through B-4. The borings were performed to depths ranging from 30 to 50 feet below the existing grade.

- Performed two (2) hand auger borings extending to depths of 5 feet. The hand auger borings were labeled AB-1 and AB-2.

- Visually examined all recovered soil samples for the project using the Unified Soil Classification Systems (USCS). Performed laboratory tests including percent passing the 200 Sieve and natural moisture contents.

The data was used in performing engineering evaluations, analyses, and for developing geotechnical recommendations in the following areas:

1. General assessment of area geology based on our past experience, study of geological literature and boring information.

2. General location and description of potentially deleterious materials encountered in the borings, which may interfere with the proposed construction or performance, including existing fills or surficial organics.

3. Discussed critical design and/or construction considerations based on the soil and groundwater conditions developed from the borings including dewatering, hard soil conditions, etc.

4. Addressed groundwater levels in the borings and estimated seasonal high groundwater.

5. Recommendations for construction including a summary of findings and analysis.

6. Recommendations for shallow foundation design and construction including recommended horizontal earth pressures (active, passive and at-rest) for below grade walls.

All information will be provided in a Geotechnical Investigation Report which will generally include the following:

a. Description of the proposed project
b. Plot showing location of borings performed
c. Boring logs including water table where encountered
d. Description of surface and subsurface conditions encountered
e. Internal friction angles, cohesion
f. Active, passive and at-rest soil pressures
g. Retaining wall design criteria and recommendations (wall to be designed by others)
h. Recommendations for site preparation and engineered fill
i. Recommendations for support of slab-on-grade, underwater intake structures and below grade structures
j. Recommendations for temporary sheet pile shoring design

As requested by **Arcadis,** the borings for the intake structures (B-2 through B-4) were performed on top of the existing embankment. The location of the borings (**Boring Location Plan**) and soil profiles **(Report of Core Borings/Soil Profiles)** for the project

are shown in **Sheets 1 though 3 in Appendix A** of this report. Boring elevations were provided by **Arcadis.**

The geotechnical 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, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring log regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

GENERAL SITE AND SUBSURFACE CONDITIONS

Soil Survey of Manatee County

The U.S. Department of Agriculture - Soil Conservation Service now known as the Natural Resources Conservation Service (NRCS), has mapped the shallow soils in this area of Manatee County. This information was outlined in a report titled *The Soil Survey of Manatee County, Florida* using Version 7, dated January 26, 2010. The aerial images were photographed in June 8, 2007. The Soil Survey describes the soils at the site as EauGallie fine sand (mapping unit 20). Small areas of other soil types may be present within the mapping unit.

Typically the surface layer of the EauGallie soil is black fine sand. The surface layer is underlain by gray fine sand to a depth of 22 inches. Dark reddish brown sand grading to dark brown fine sand is usually indicated to a depth of 44 inches and is followed by gray fine sand. From depths of 48 to 66 inches, grayish brown sandy loam occurs, which grades to gray sandy loam that continues to a depth of about 80 inches or more. The EauGallie soil in its natural state has a seasonal high water table at a depth of 6 to 18 inches for 1 to 3 months and within a depth of 40 inches for 2 to 6 months. The water table recedes to a depth of more than 40 inches during extended dry periods.

The USDA Soil Survey is not necessarily an exact representation of the soils on the site. The mapping is based on interpretation of aerial maps with scattered shallow borings for confirmation. Accordingly, borders between mapping units are approximate and the change may be transitional. Differences may also occur from the typical stratigraphy, and small areas of other similar and dissimilar soils may occur within the soil-mapping unit. As such, there may be differences in the mapped description and the boring descriptions obtained for this report. The survey may, however, serve as a good basis for evaluating the shallow soil conditions of the area.

Subsurface Exploration

Subsurface conditions at the proposed three intake structures locations and new set of gravity filters was obtained by drilling four (4) Standard Penetration Test (SPT) boring at

the proposed locations to depths ranging from 30 to 50 feet and were labeled B-1 through B-4. The approximate boring locations are shown on the **Boring Location Plan (Sheet 1)** presented in **Appendix A.** SPT Borings B-2 through B-4 were drilled through the embankment. The height of the embankment (distance from the top of the embankment to the bottom of the lake) ranges from approximately 9.1 to 31.6 feet at borings/locations B-2, B-3 and B-4. This was determined based on surveyed elevation data, provided by **Arcadis,** for the boring locations and the pond bottom.

The SPT borings were conducted in general accordance with ASTM D-1586 (Standard Test Method for Penetration Test and Split Barrel Sampling of Soils) using the rotary wash method, where a clay slurry ("drill mud" or "drill fluid") was used to flush and stabilize the borehole. Standard Penetration sampling was performed at closely spaced intervals in the upper 10 feet and at 5-foot intervals thereafter. After seating the sampler 6 inches into the bottom of the borehole, the number of blows required to drive the sampler one foot further with a standard 140 pound hammer is known as the "N" value or blowcount. The blowcount has been empirically correlated to soil properties. The recovered samples were placed into containers and returned to our office for visual review.

Due to the height of the embankment, site conditions and level of water in the lakes, hand auger borings were not performed at boring locations B-2 and B-4. A hand auger boring was performed to a depth of 5 feet below the existing grade at SPT boring locations B-1 and B-3. The hand auger borings were performed by manually twisting and advancing a bucket auger into the ground in 4 to 6-inch increments. As each soil type was revealed, representative samples were placed in air-tight jars and returned to the **MC²** Tampa office for review by a geotechnical engineer and confirmation of the field classification.

Subsurface Conditions

The SPT soil samples were classified using the Unified Soil Classification System (USCS) in general accordance with ASTM test designation D-2488. This test method classifies soils into specific categories based upon the results of the laboratory testing program. The assignment of a group name and symbol is then used to aid in the evaluation of the significant engineering properties of a soil.

The following description is of a generalized nature, provided to highlight the major subsurface strata encountered in the borings performed at the site. The **Report of Core Boring Sheets 2 and 3** in **Appendix A** should be reviewed for specific soil and groundwater information at the boring locations. Boring elevations were provided by **Arcadis.** The stratifications shown on the boring logs represent the conditions only at the actual boring location. Variations may occur and should be expected across the site. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual.

It should be noted that, as requested by **Arcadis**, borings B-2, B-3 and B-4 were performed on top of the embankment and description below includes the soils from the top of the embankment. In addition, since borings B-2, B-3 and B-4 were not performed inside the lakes, we have assumed that the soils below the bottom of the lakes are the same as the soils found in the borings, at that depth.

New Set of Gravity Filters (Boring B-1)

In general, boring B-1 encountered medium dense to dense fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) to a depth of 22 feet (elev. 14.9 ft) with occasional traces to some phosphate fragments. Below the clean sands, the boring indicated stiff to very stiff sandy clay to clay (CL/CH) with occasional cemented clay to a termination depth of 30 feet (elev. 6.9 ft).

Intake Structure for South Lake #2 (Boring B-2)

In general, boring B-2 encountered medium dense to dense fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) to a depth of 27 feet (elev. 19.1 feet). Below the clean sands, the boring indicated medium dense clayey fine sand (SC) occasionally with cemented clay and/or traces to some phosphate fragments to a depth of 37 feet (elev. 9.1 feet). Next, the boring indicated firm sandy clay to clay (CL/CH) extending to a depth of 42 feet (elev. 4.1 ft) followed by medium dense to dense clayey fine sands (SC) extending to the boring termination depth of 50 feet (elev. -3.9 feet).

- *The bottom elevation at South Lake #2 ranges from about 14.5 to 16.2 feet and the soils at these depths consisted of medium dense clayey sands (SC) extending to elevation 9.1 feet and firm sandy clay to clay (CL/CH) to elevation 4.1 feet. The boring was terminated in medium dense to dense clayey fine sands (SC) at elevation -3.9 feet.*

Intake Structure for South Lake #1 (Boring B-3)

In general, boring B-3 encountered dense to very dense fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) to a depth of 8 feet (elev. 31.3 ft). Below the clean sands, the boring indicated layers of loose to medium dense silty fine sand (SM) and fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) extending to a depth of 22 feet (elev. 17.3 ft) . Next, the boring indicated firm sandy clay to clay (CL/CH) extending to a depth of 32 feet (elev. 7.3) followed by loose to very dense clayey fine sands (SC) extending to the boring termination depth of 50 feet (elev. -10.7).

- *The bottom elevation at South Lake #1 ranges from about 30.2 to 32.5 feet and the soils at these depths consisted of loose to medium dense silty sands (SM) fine sands, slightly silty and/or slightly clayey fine sands (SP/SP-SM/SP-SC)*

extending to elevation 17.3 feet. Next, the boring entered firm sandy clay to clay (CL/CH) to elevation 7.3 feet. The boring was terminated in loose to very dense clayey fine sands (SC) extending to the boring termination depth of elevation -10.7 feet.

Intake Structure for East Lake (Boring B-4)

In general, boring B-4 encountered dense to very dense fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) to a depth of 6 feet (elev. 43.1 ft). Below the clean sands, the boring indicated layers of dense clayey fine sand (SC) and medium dense fine sands to slightly silty fine sands to slightly clayey fine sand (SP/SP-SM/SP-SC) extending to a depth of 22 feet (elev. 27.1 ft). Next, the boring indicated firm to hard sandy clay to clay (CL/CH) with occasional traces to some phosphate fragments extending to a depth of 42 feet (elev. 7.1 ft).

The boring then entered very dense silty fine sand (SM) with traces to some phosphate fragments extending to 47 feet (elev. 2.1 ft) followed stiff sandy clay to clay (CL/CH) extending to the boring termination depth of 50 feet (elev. -0.9 ft).

- *The bottom elevation at East Lake ranges from about 24.3 to 24.7 feet and the soils at these depths consisted of very stiff to hard sandy clays to clays extending to elevation 7.1 feet. Next, the borings entered very dense silty fine sand (SM) to elevation 2.1 feet. The boring was terminated in stiff sandy clay to clay (CL/CH) extending to the boring termination depth of elevation -0.9 feet.*

Groundwater Information

The groundwater level at the new gravity filters and intake structures (boring B-1 through B-4) were not measured because the borings are performed using mud-rotary drilling methods which may yield an inaccurate measurement of the stabilized water level at the time of drilling. In addition, the SPT borings are filled with cement grout-bentonite chips upon completion; therefore, a stabilized water table reading is not generally obtained in these borings.

The water level in South Lake No. 2 and East Lake was provided by **Arcadis** and was approximately at elevation 33.5 feet. The water level in South Lake No. 1 was not provided.

The water table can be expected to vary at times and will fluctuate seasonally based on rainfall quantities, area geology, surface drainage conditions and other factors. The Soil Survey of Manatee County indicates that the site is in EauGallie fine sand (mapping unit no. 20) and seasonal high water tables provided ranges from about 0.5 to 1.5 feet below the existing surface. However, the level of the water inside the lakes varies depending on the control structures in the lakes.

Dewatering will be required and the intake structures design should take into account the effect of buoyancy. The buoyancy analysis should include determination of additional methods of restraint, such as increased bottom slab thickness or slab extension, if necessary.

EVALUATION AND RECOMMENDATIONS

General Site Development Considerations

A preliminary plan was provided by **Arcadis** for the intake structures. The intake structure will be installed below the existing lake bottom at each location and consists of a 48' x 32.67' slab supporting a 24" DIP intake and intake screens. A 12" layer of compacted #57 stone is being proposed by **Arcadis** below the concrete slab. Temporary sheet pile shoring will be required for construction of the three intake structures.

We understand that some soil will need to be excavated below the existing pond bottom to construct the intake structures. Based on the findings of our test boring, our understanding of the proposed structures, and our geotechnical engineering evaluation, monolithically poured foundations can be used for the proposed construction. However, there are some issues that will need to be addressed during design and construction especially with regards to the somewhat high water level at these locations.

The following sections further discuss specific geotechnical, foundation, design, and site grading concerns at the site.

Site Preparation

Area where the new set of gravity filters slab-on-grade foundation system is proposed

Prior to construction, the area should be stripped of any surface vegetation and any organic soil should be removed extending out at least 10 feet beyond the construction limits. Any areas requiring at grade structures or areas requiring fill should be proofrolled with a heavily loaded dump truck if accessible, to determine areas that may need additional removal of unsuitable bearing materials. In addition to stripping the area, the location of any existing underground utility lines within the construction area should be established. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations. In this regard, it should be noted that if abandoned underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which subsequently may result in excessive settlement. Any underground utility pipes not removed and being greater than 4 inches in diameter should be filled with "flowable" fill (lean concrete grout), while the ends of utility pipes

less than 4 inches in diameter should be plugged with concrete to prevent the inadvertent introduction of fluids into the construction area. All utility lines that are removed outside of the excavation limits should be backfilled with acceptable fill material. Fill placement and subgrade preparation recommendations are presented in the Construction Considerations, Fill Placement and Subgrade Preparation Section of this report.

Areas where the three (3) intake structures are being proposed (inside/bottom of lakes).

Site preparation should include dewatering the areas where the intake structures are being proposed. Dewatering consisting of cutoff walls (temporary shoring), cased well points and/or vacuum well points or a combination thereof, should be designed and installed to lower the groundwater table at least to a depth of 3 or more feet below the bottom of the excavation.

In addition, organic soils and clayey soils should be removed (if encountered) within 36 inches of the bottom of the intake structures and replaced with properly compacted clean sands (SP/SP-SM).

If the bottom of the excavation is dry, the bottom of the intake structures should be compacted to a dry density of at least 98% of the modified Proctor maximum dry density (ASTM D-1557) for a depth of at least 1 foot and 12 inches of compacted No. 57 stone wrapped in geo/filter fabric may added as proposed by **Arcadis.** If the bottom of the proposed intake structures is wet, then we recommend using 18 inches of No. 57 stone wrapped in geo/filter fabric, instead of the 12 inches proposed by **Arcadis** and placed on the approved subgrade to support the intake structures foundation concrete.

Groundwater Considerations and Dewatering (for Intake Structures)

At the time of our drilling, the water level in South Lake No. 1 and South Lake No. 2 ponds ranged from approximately 8 to 10 feet below the top of the embankment at those locations. Similarly, the water level in East Lake pond ranged from approximately 12 to 15 feet below the top of the embankment at this location.

The water table can be expected to vary at times and will fluctuate seasonally based on rainfall quantities, area geology, surface drainage conditions and other factors. The Soil Survey of Manatee County indicates that the site is in EauGallie fine sand (mapping unit no. 20) and seasonal high water tables provided ranges from about 0.5 to 1.5 feet below the existing surface. However, the groundwater and SHWT elevation inside the lakes vary depending on the control structures.

The contractor should determine the actual groundwater levels at the time of construction. The contract documents should indicate that dewatering design and implementation is the sole responsibility of the Contractor and should also contain the performance criteria for

assessing the effectiveness of the dewatering system actually installed. Dewatering consisting of cutoff walls (temporary shoring), cased well points and/or vacuum well points or a combination thereof, should be designed and installed to lower the groundwater table at least to a depth of 3 or more feet below the bottom of the excavation. The dewatering should be maintained continuously (7 days per week/ 24 hours per day) throughout the construction period, until the backfill has reached the existing grade, and until sufficient structural weight is in place to resist uplift pressures due to the existing groundwater levels. Temporary shoring is also anticipated along the perimeter of each of the proposed intake structures. The soil parameters to be used by others to design the temporary shoring are included in **Table 1** in **Appendix A.**

In addition to the primary dewatering system, pumping of miscellaneous inflow of water should be performed from sumps excavated and placed outside and just below the elevation of the proposed foundation area. Placement of compacted No. 57 stone wrapped in geo/filter fabric in the bottom of the excavation, beneath a pre-cast or cast in place concrete slab, will act as a medium for rainwater and groundwater inflows which will be pumped out of the recommended sump areas.

If the bottom of the excavation is dry, the bottom of the intake structures should be compacted to a dry density of at least 98% of the modified Proctor maximum dry density (ASTM D-1557) for a depth of at least 1 foot and 12 inches of compacted No. 57 stone wrapped in geo/filter fabric may added as proposed by **Arcadis.** If the bottom of the proposed intake structures is wet, then we recommend using 18 inches of No. 57 stone wrapped in geo/filter fabric instead of the 12 inches proposed by **Arcadis** and placed on the approved subgrade to support the intake structures foundation concrete.

The No. 57 stone should be extended 3 feet beyond the perimeter of the foundation footprint. The gravel will provide a stable working platform, will help to preserve the subgrade and will be used to facilitate dewatering of the excavation.

Depending upon shallow groundwater levels and the effectiveness of dewatering at the time of construction, seepage may enter the excavated trenches from the bottom and sides. Such seepage will act to loosen soils and create difficult working conditions. Groundwater levels should be determined immediately prior to construction.

Excavation Considerations

Excavation will be required to construct the three intake structures and any series of pipelines associated with the project. The dewatering system should be in place and functioning prior to any excavation taking place. Piezometers installed prior to excavation should be used to verify that the dewatering system is performing adequately.

The existing soils being excavated at the South Lake No. 1 and No. 2 intake structures (borings B-2 and B-3) sites generally consisted of loose to dense fine sands (SP/SP-

SM/SP-SC), silty sands (SM) and clayey fine sands (SC) and about 3 feet of firm sandy clay to clay (CL/CH) in boring B-4. We do not anticipate that excavation of these materials will be a problem.

Temporary shoring is also anticipated along the perimeter of the proposed intake structure. The soil parameters to be used by others to design the temporary shoring, using borings B-2, B-3 and B-4 are included in **Table 1** in **Appendix A.**

We recommend that the bottom of the intake structures be overexcavated approximately 18 inches and 3 feet wider than the perimeter of the foundation and replaced with compacted No. 57 stone, wrapped in geo/filter fabric.

All structure excavations should be observed by the Geotechnical Engineer or his representative to explore the extent of any fill and excessively loose, soft, or otherwise undesirable materials. If the excavation appears suitable as load bearing materials, the soils should be prepared for construction by compaction to a dry density of at least 98% of the modified Proctor maximum dry density (ASTM D-1557) for a depth of at least 1 foot below the compacted No. 57 stone wrapped in geo/filter fabric, which will serve as a foundation base.

If soft pockets are encountered in the bottom of the structure excavations, the unsuitable materials should be removed and the proposed foundation elevation re-established by backfilling after the undesirable material has been removed. This backfilling may be done with a very lean concrete or with a well-compacted, suitable fill such as clean sand, gravel, or crushed #57 or #67 stone. Sand backfill should be compacted to a dry density of at least 98% of the modified Proctor maximum dry density (ASTM D-1557), as previously described. Gravel, or crushed #57 or #67 stone, if used, should be compacted and the compaction confirmed by visual observation.

It is possible that the proposed construction will consist of both open-sloped excavations and the installation of bracing and/or sheet pile walls. Our scope of services did not include analysis of slope stability or sheet piling; however, for soils of the type present at the site we recommend that all excavations be sloped no steeper than 3H:1V. Please refer to the Federal Temporary Excavation Regulations reported below.

Federal Temporary Excavation Regulations

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 all excavations, whether they be utility trenches, basement excavations, or footing excavations, be constructed in accordance with the revised 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 contractor's 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 these local, state, and federal safety regulations.

We are providing this information solely as a service to our client. **MC²** is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Uplift Resistance

The structures should be designed to resist the hydrostatic pressure and uplift of the anticipated maximum groundwater levels. Maximum groundwater levels should be the highest of the proposed seasonal high groundwater level or the 100 year flood level for this site. Uplift resistance can be created by both the dead weight of the structure as well as any backfill on any projecting parts of the base slab.

Uplift resistance from proposed intake concrete slab should be calculated using a wedge from the outside upper edge of the base of the extended slab upward at a 30 degree angle to the ground surface. Below the water table, the backfill's buoyant weight should be used. We estimate, based on other projects in this area, that the buoyant weight of the fine sands is approximately 48 pcf.

Foundation Recommendations (Intake Structures)

It should be noted that, as requested by **Arcadis**, borings B-2, B-3 and B-4 were performed on top of the embankment and the description below includes the soils from the top of the embankment. In addition, since borings B-2, B-3 and B-4 were not performed inside the lakes, we have assumed that the soils below the bottom of the lakes are the same as the soils found in the borings, at that depth.

In general, the soils beneath the proposed bottom of the intake structures in South Lake No. 1 and No. 2 consist of loose to medium dense fine sands (SP/SP-SM/SP-SC), silty sands (SM) and clayey fine sands (SC) near the locations of SPT borings B-2 and B-3. The soils beneath the proposed bottom of the intake structure at East Lake generally consist of firm sandy clay to clay (CL/CH) near the location of SPT boring B-4. We anticipate that the intake structures will impose less foundation pressure than the weight of the material being removed. Based on the anticipated construction, a maximum net

allowable bearing pressure of 2,000 psf is available for support of the intake structures. Any structures or utilities founded within excavated areas placed on properly compacted structural fill should be designed for a net allowable bearing capacity of 2,000 psf.

We recommend that 18 inches of No. 57 stone wrapped in geo/filter fabric be placed on the approved subgrade to support the intake structure foundation concrete. The No. 57 stone should be extended 3 feet beyond the perimeter of the foundation footprint. The gravel will provide a stable working platform, will help to preserve the subgrade and will be used to facilitate dewatering of the excavation.

Slab-on-grade Foundation (Gravity Filters)

The proposed slab may be safely supported as a slab-on-grade provided any undesirable materials are removed and replaced with controlled structural fill. Based on correlation to published data and our analysis, the soils at the sites are expected to exhibit a modulus of subgrade reaction (k) of 100 pci, assuming the upper 8 inches of subgrade soils are uniformly compacted to at least 98 percent of the Modified Proctor maximum dry density. A maximum net allowable bearing pressure of 1200 psf can also be used for design.

The slabs should be jointed in accordance with American Concrete Institute (ACI) specifications to reduce the potential for cracking resulting from any differential movement and shrinkage.

Detailed analysis was not performed concerning total and differential post-construction settlement of the floor slabs. Based on the above noted assumptions, the slab loads, and the proposed design, we anticipate a maximum total slab settlement on the order of 1 inch or less, with differential slab settlements on the order of ½ inch or less across a horizontal distance of 50 feet.

An impermeable vapor barrier (such as polyethylene sheeting) beneath the building slab is likely not needed at this site due to the lower groundwater elevations in relation to the anticipated final grade. However, the final decision as to the use of a vapor barrier is left to the owner and designer.

The soil subgrade in the area of concrete slab-on-grade support is often disturbed during foundation and superstructure construction. We recommend that slab subgrades be evaluated by a representative of **MC²** immediately prior to beginning slab construction. If low consistency soils are encountered which cannot be adequately densified in place, such soils should be removed and replaced with well-compacted fill material or with well-compacted crushed stone materials.

Earth Slope and Retaining Wall Recommendations

Formal analysis of slope stability was beyond the scope of work for this project. Based on

the soil types encountered at the site, we recommend that temporary or permanent slopes not exceed 3(H) to 1(V) for this project. The crest or toe of slopes should be no closer than 10 feet to any structure foundation and no closer than 5 feet to the nearest edge of pavement.

Below grade walls such as the intake strucures walls must be designed to resist lateral earth pressures. The "at rest" earth pressure state should be used for soils supporting rigidly restrained walls such as those for the intake structures. The soils at the site consisting of fine sands (SP/SP-SM) are suitable materials for use as backfill. The table below presents recommended values of earth pressure coefficients for the select backfill materials, assuming an approximate angle of internal friction of 30 degrees. Equivalent fluid densities are frequently used for the calculation of lateral earth pressures. Equivalent fluid densities for the "at-rest" and active conditions based upon a total unit weight of 115 pcf and a fluid unit weight of 62.4 pcf are shown below.

Earth Pressure State	Earth Pressure Coefficient	Equivalent Fluid Density (pcf)		
		Above Water Table	Below Water Table (No Hydrostatic Pressure)	Below Water Table (with Hydrostatic Pressure)
At-Rest (soil backfill)	0.5	57	27	88
Active	0.3	35	16	78
Passive	3.0	345	150	220

The design values and recommendations presented on the previous page assume that the backfill behind the wall will be horizontal with no surcharge loads. Equivalent fluid densities for *no hydrostatic pressure and including hydrostatic pressure are given above. Walls below the groundwater level should include hydrostatic pressures.*

On Site Soil Suitability and Structural Fill

Soil Types SP/SP-SM/SP-SC, which were encountered in the borings performed, can be categorized as relatively clean fine sands, slightly silty fine sands and slightly clayey fine sands based on the Unified Soil Classification System (USCS). Typically, these materials are deemed suitable for reuse as fill. These soils can be used for grading purposes, site leveling, general engineered fill, structural fill and backfill against the structure wall as well as in other areas, provided the fill is free of organic materials, clays, debris or any other material deemed unsuitable for construction. These soil types will possess improved permeability or drainage characteristics as compared to the underlying soils with increased fines content. These fine sands should require minimal processing in order to properly place and compact. Moisture contents will probably require adjustment in order to affect maximum densification, depending upon

specification requirements. It is anticipated that the majority of these soil types will be excavated below the water table and can occur in a relatively saturated state, but should effectively drain within stockpiles. Soils not meeting these requirements will need to be evaluated by **MC²** during construction.

If off-site sources of fill are needed, they should consist of fine sand (SP/SP-SM) with less than 12% passing the No. 200 sieve, free of rubble, organics, clays, debris and other unsuitable material. The moisture content of fill soils at the time of placement and compaction should generally be within 2 percentage points of their optimum moisture content. All materials to be used for backfill or compacted fill construction should be evaluated and, if necessary, tested by **MC²** prior to placement to determine if they are suitable for the intended use. In general, based on the boring results, the majority of the on-site sandy materials excavated for the drainage improvements are suitable for use as structural fill and as general subgrade fill and backfill.

The fill material placed around the intake structures is critical to support any upper piping. Proper compaction and control of the fill being placed will be required from the bottom of the excavation to the surface in order to properly support utility or other structures.

Fill material placed adjacent to the walls and beneath structures and piping should be placed in 6 to 8 inch loose lifts compacted using a static roller if near existing structures. Within small excavations such as in utility trenches, around manholes, or within 5 feet of any of the structure walls, we recommend the use of smaller, hand or remote-guided equipment. Placement of loose lift thickness of 4 inches is recommended when using such equipment. All structural fill should be compacted to a dry density of at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557). A representative of **MC²** should perform field density testing on each lift as necessary to assure that adequate compaction is achieved.

Construction Considerations

General

It is recommended that **MC²** be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project to ensure that the recommendations contained herein are properly interpreted and implemented. If **MC²** is not retained to perform these functions, we cannot be responsible for the impact of those conditions on the performance of the project.

Fill Placement and Subgrade Preparation

The following are our general recommendations for overall site preparation and mechanical densification work for the proposed project based on the anticipated

construction and our boring results. These recommendations should be used as a guideline for the project general specifications by the Design Engineer.

1. The excavated subgrade (dewatered trench bottom) for the pipes and associated structures should be leveled, cut to grade if necessary, and then compacted with a vibratory compactor. Careful observations should be made during compaction to help identify any areas of soft yielding soils that may require overexcavation and replacement. If unsuitable material, such as organic or clayey soils, is encountered at the bottom of the pipe or structure embedment depth, overexcavation of an additional 2 and 3 feet of the material is recommended for the pipe and structure, respectively. The excavation should then be backfilled to foundation grade with clean sands in controlled lifts not exceeding 6-inches and compacted to a density of at least 98 percent of the maximum density as determined by ASTM D-1557. Care should be used when operating the compactor to avoid transmission of vibrations to existing structures or other construction operations that could cause settlement damage or disturb occupants. Dewatering may also have an effect on adjacent structures. A preconstruction survey with video and/or photographs of adjacent residences/structures is recommended to check for existing cracking prior to construction and during construction. Vibration and groundwater levels monitoring are also recommended.

2. Prior to beginning compaction, soil moisture contents may need to be controlled in order to facilitate proper compaction. A moisture content within 2 percentage points of the optimum indicated by the modified Proctor test (ASTM D-1557) is recommended.

3. Following satisfactory completion of the initial compaction on the excavation bottom, the construction areas may be brought up to finished subgrade levels. Fill should consist of fine sand with less than 12% passing the No. 200 sieve, free of rubble, organics, clay, debris and other unsuitable material. Fill should be tested and approved prior to acquisition and/or placement. Approved sand fill should be placed in loose lifts not exceeding 6-inches in thickness and should be compacted to a minimum of 98% of the maximum modified Proctor dry density (ASTM D-1557). Density tests to confirm minimum compaction requirement should be performed in each fill lift before the next lift is placed.

4. It is recommended that a representative from our firm be retained to provide on-site observation of earthwork activities. The field technician would monitor the placement of approved fills and

compaction and provide compaction testing. Density tests should be performed in subgrade sands after rolling and in each fill lift. It is important that **MC²** be retained to observe that the subsurface conditions are as we have discussed herein, and that construction and fill placement is in accordance with our recommendations.

REPORT LIMITATIONS

The recommendations detailed herein are based on the available soil information obtained by **MC²** and information provided by **Arcadis** 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, **MC²** should be notified immediately to determine if changes in the foundations or other recommendations are required. In the event that **MC²** is not retained to perform these functions, **MC²** cannot be responsible for the impact of those conditions on the performance of the project.

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.

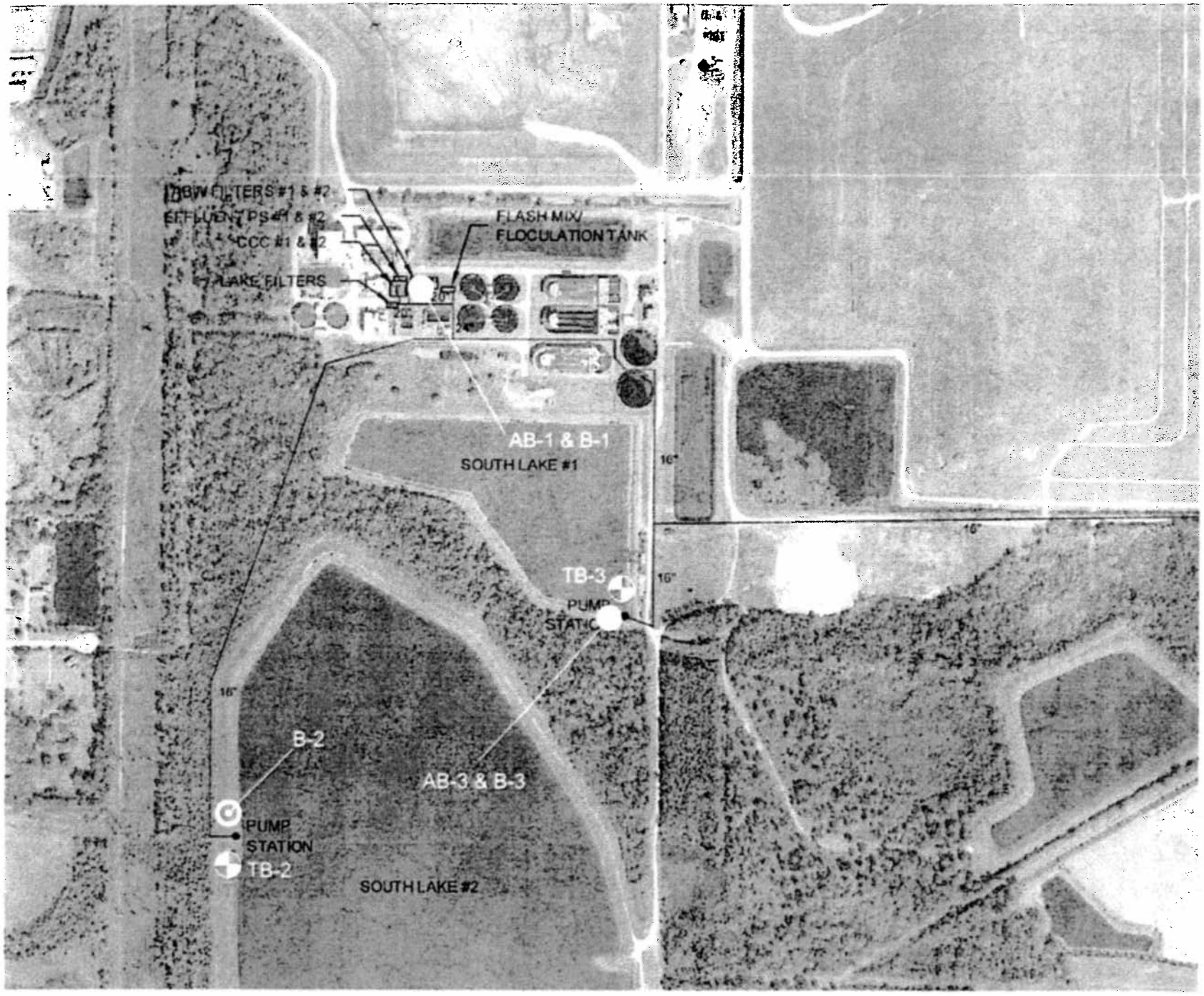
After the plans and specifications are more complete, the geotechnical engineer should be provided the opportunity to review the final design plans and specifications to assess that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of **Arcadis.**

APPENDIX A

Boring Location Plan – Sheet 1

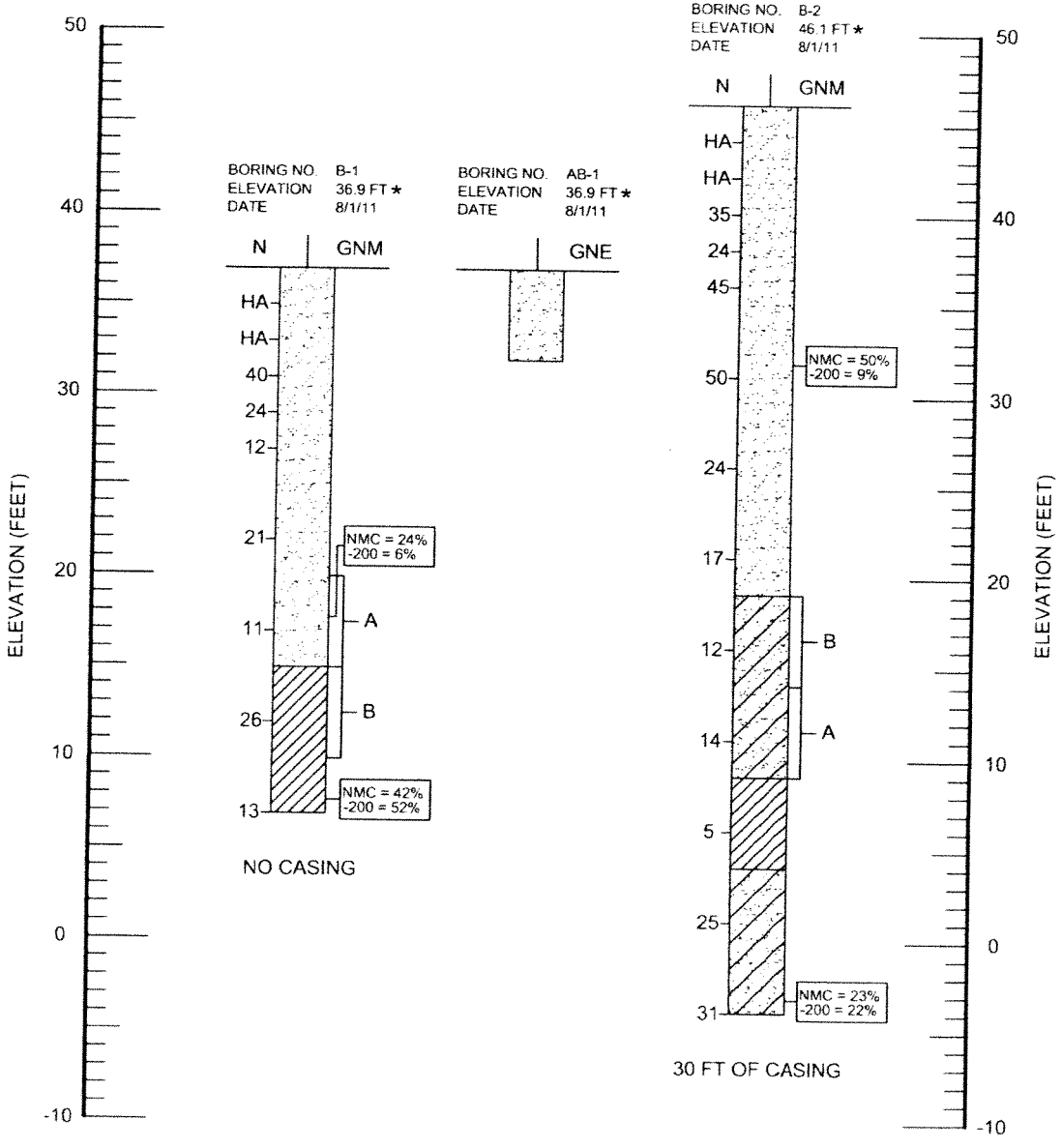
Report of Core Borings – Sheets 2 and 3

Soil Parameters - Table 1



SCALE: NOT TO SCALE

BORING ID	ELEV. RANGE NGVD, FT	DEPTH RANGE,
B-2	46.1-42.1	0-4
	42.1-38.1	4-8
	38.1-29.1	8-17
	29.1-19.1	17-2
	19.1-9.1	27-3
	9.1-4.1	37-4
	4.1-(-3.9)	42-5



LEGEND

(SP/SP-SM/SP-SC) PALE BR
FINE SAND, SLIGHTLY SILT
CLAYEY FINE SAND.

(SM) GRAY OR BROWN SIL

A

B

NOTES:

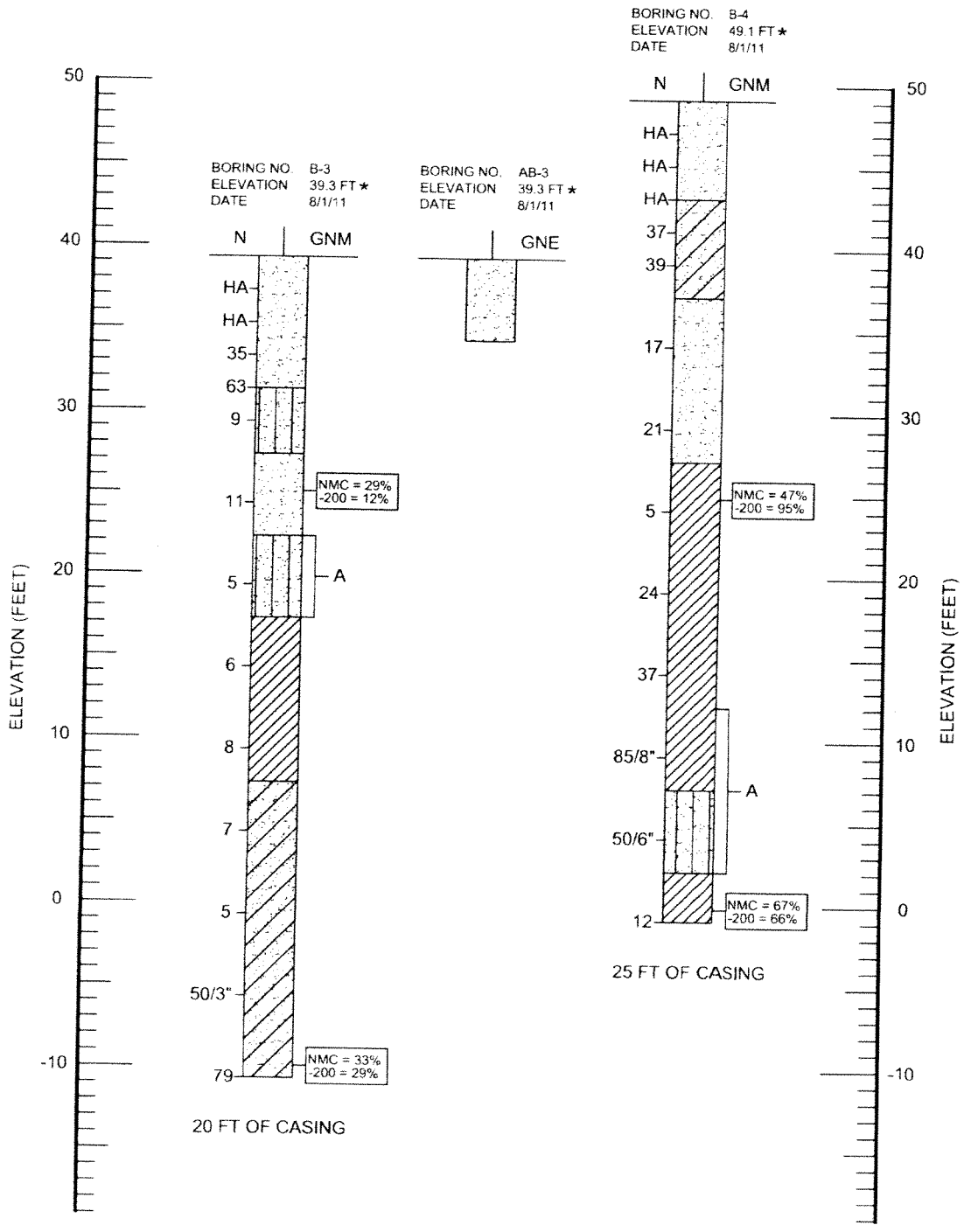
N SPT N-VALUE

HA HAND AUGER

GNM GROUNDWAT

GNE GROUNDWAT

GRANULAR MATERI
VERY LOOSE
LOOSE
MEDIUM
DENSE
VERY DENSE



BORING ID	ELEV. RANGE NGVD, FT	DEPTH RANGE, FT
B-3	39.3-35.3	0-4
	35.3-31.3	4-8
	31.3-17.3	8-22
	17.3-7.3	22-32
	7.3-(-2.7)	32-42
	(-2.7)-(-10.7)	42-50
B-4	49.1-43.1	0-6
	43.1-37.1	6-12
	37.1-27.1	12-22
	27.1-22.1	22-27
	22.1-12.1	27-37
	12.1-7.1	37-42
	7.1-2.1	42-47
	2.1-(-0.9)	47-50

LEGEND

(SP/SP-SM/SP-SC) PALE BR
FINE SAND, SLIGHTLY SILT
CLAYEY FINE SAND.

(SM) GRAY OR BROWN SIL

A

B

NOTES:

N SPT N-VALUE

HA HAND AUGER

GNM GROUNDWAT

GNE GROUNDWAT

GRANULAR MATERI
VERY LOOSE
LOOSE
MEDIUM
DENSE

Table 1
Summary of Soil Parameters
Southeast Water Reclamation Facility
Lake Infiltration System
Manatee County, Florida
MC^2 Inc. Project No. T021113.031

Boring No.	Elevation Range, NGVD, Ft	Depth range, ft	SPT "N" Value Range	Unified Soil Classification	Approximate Soil Unit Weight (pcf)		Soil Angle of Friction (degrees)	Cohesion (psf)	Earth Pressure Coefficient	
					saturated	submerged			Active (Ka)	Passive (Kp)
B-2	46.1-42.1	0-4	HA	SP/SP-SM/ SP-SC	100.0	37.6	28	0	0.361	2.77
	42.1-38.1	4-8	24-35	SP/SP-SM/ SP-SC	115.0	52.6	32	0	0.307	3.25
	38.1-29.1	8-17	45-50	SP/SP-SM/ SP-SC	125.0	62.6	34	0	0.283	3.54
	29.1-19.1	17-27	17-24	SP/SP-SM/ SP-SC	110.0	47.6	30	0	0.333	3.00
	19.1-9.1	27-37	12-14	SC	110.0	47.6	30	0	0.333	3.00
	9.1-4.1	37-42	5	CL/CH	115.0	52.6	0	625	1.000	1.00
	4.1- (-3.9)	42-50	25-31	SC	115.0	52.6	32	0	0.307	3.25

Table 1
Summary of Soil Parameters
Southeast Water Reclamation Facility
Lake Infiltration System
Manatee County, Florida
MC^2 Inc. Project No. T021113.031

Boring No.	Elevation Range, NGVD, Ft	Depth range, ft	SPT "N" Value Range	Unified Soil Classification	Approximate Soil Unit Weight (pcf)		Soil Angle of Friction (degrees)	Cohesion (psf)	Earth Pressure Coefficient	
					saturated	submerged			Active (Ka)	Passive (Kp)
B-3	39.3-35.3	0-4	HA	SP/SP-SM/ SP-SC	100.0	37.6	28	0	0.361	2.77
	35.3-31.3	4-8	35-63	SP/SP-SM/ SP-SC	120.0	57.6	33	0	0.295	3.39
	31.3-17.3	8-22	5-11	SP/SP-SM/ SP-SC and SM	105.0	42.6	29	0	0.347	2.88
	17.3-7.3	22-32	6-8	CL/CH	115.0	52.6	0	900	1.000	1.00
	7.3- (-2.7)	32-42	5-7	SC	105.0	42.6	29	0	0.347	2.88
	-2.7- (-10.7)	42-50	79-50/3"	SC	125.0	62.6	34	0	0.283	3.54
B-4	49.1-43.1	0-6	HA	SP/SP-SM/ SP-SC	100.0	37.6	28	0	0.361	2.77
	43.1-37.1	6-12	37-39	SC	120.0	57.6	33	0	0.295	3.39
	37.1-27.1	12-22	17-21	SP/SP-SM/ SP-SC	110.0	47.6	30	0	0.333	3.00
	27.1-22.1	22-27	5	CL/CH	115.0	52.6	0	600	1.000	1.00
	22.1-12.1	27-37	24-37	CL/CH	125.0	62.6	0	3800	1.000	1.00
	12.1-7.1	37-42	85/8"	CL/CH	125.0	62.6	0	5000	1.000	1.00
	7.1-2.1	42-47	50/6"	SM	125.0	62.6	34	0	0.283	3.54
	2.1- (-0.9)	47-50	12	CL/CH	120.0	57.6	0	1500	1.000	1.00

APPENDIX B

Test Procedures

TEST PROCEDURES

The general field procedures employed by MC Squared, Inc. (**MC²**) are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

Standard Drilling Techniques
To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. Some of these techniques are:

In Soils:

a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:

a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

The drilling method used during this exploration is presented in the following paragraph.

Hollow Stem Augering: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemented soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material which cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D-2113 using a diamond-studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes
Several techniques are used to obtain samples and data in soils in the field, however the most common methods in this area are:

a) Standard Penetration Testing
b) Undisturbed Sampling
c) Dynamic Cone Penetrometer Testing
d) Water Level Readings

The procedures utilized for this project are presented below.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2 inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140 pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Logs. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water level readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water level at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water level through short-term water level readings. Also, fluctuation in the water level should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Logs are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater level that may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone.

BORING LOGS

The subsurface conditions encountered during drilling are reported on a field boring log prepared by the Driller. The log contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of groundwater. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed a geotechnical professional classifies the soil samples and prepares the final Boring Logs, which are the basis for our evaluations and recommendations.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our Boring Logs.

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary; grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties are presented in this report.

The following table presents criteria that is typically utilized in the classification and description of soil and rock samples for preparation of the Boring Logs.

Relative Density of Cohesionless Soils From Standard Penetration Test		Consistency of Cohesive Soils	
Very Loose	≤ 4 bpf	Very Soft	≤ 2 bpf
Loose	5 - 10 bpf	Soft	3 - 4 bpf
Medium Dense	11 - 30 bpf	Firm	5 - 8 bpf
Dense	31 - 50 bpf	Stiff	9 - 15 bpf
Very Dense	> 50 bpf	Very Stiff	16 - 30 bpf
		Hard	30 – 50 bpf
(bpf = blows per foot, ASTM D 1586)		Very Hard	> 50 bpf

Relative Hardness of Rock		Particle Size Identification	
Very Soft	Hard Rock disintegrates or easily compresses to touch; can be hard to very hard soil.	Boulders	Larger than 12"
Soft	May be broken with fingers.	Cobbles	3" - 12"
Moderately Soft	May be scratched with a nail, corners and edges may be broken with fingers.	Gravel Coarse Fine	 3/4" - 3" 4.76mm - 3/4"
Moderately Hard	Light blow of hammer required to break samples.	Sand Coarse Medium Fine	 2.0 - 4.76 mm 0.42 - 2.00 mm 0.42 - 0.074 mm
Hard	Hard blow of hammer required to break sample.	Fines (Silt or Clay)	 Smaller than 0.074 mm

Rock Continuity		Relative Quality of Rocks	
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}} \times 100\ \%$		**RQD** = $\frac{\text{Total core, counting only pieces > 4" long}}{\text{Length of Core Run}} \times 100\ \%$	
Description	Core Recovery %	Description	RQD %
Incompetent	Less than 40	Very Poor	0 - 25 %
Competent	40 - 70	Poor	25 - 50 %
Fairly Continuous	71 - 90	Fair	50 - 75 %
Continuous	91 - 100	Good	75 - 90 %
		Excellent	90 - 100 %