Geotech Report

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Muscadine Subdivision Pond

Baldwin County, Alabama
LMJ File #: 22-196
June 1, 2022

Prepared for

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This document has been electronically signed and sealed by Keith V. Jacobs (license # 33791) on June 1, 2022. Printed copies of this document are not considered signed and sealed, and the signature must be verified on any electronic copies.

Subsurface Conditions

- The borings generally encountered poorly draining silty sand soils with some clay in the top roughly 18-23 feet underlain by moderate to well-draining sand soils with some silt to the bottom of the borings at 26-31 feet.
- Boring B-1 encountered a layer of slightly silty sand from roughly 14-18 feet.
- The soils in the borings were generally loose and very loose in the upper roughly 4-6 feet and medium dense below to the bottom of the boring at 26-31 feet.
- Groundwater was encountered in the borings at roughly 23.5-24 feet below grades at the time of drilling.
- The borings were drilled following a period of below average rainfall, based on reviewed information from local weather stations.
- Groundwater levels will vary with the amount of local rainfall and changes in site drainage characteristics and may be different at other times.

General Comments and Recommendations

- The pond borings encountered low permeability soils in the upper 14-19.5 feet that appear to be suitable for the construction of the proposed “wet” stormwater pond.
- The pond borings encountered relatively well-draining white/pink sand soils below roughly 18-23 feet that appear to be suitable for stormwater disposal using a sand chimney.
- LMJ should be notified if a sand chimney option is desired, and chimney recommendations can be provided.
- For the proposed “wet” pond, we recommend keeping the pond bottom depth limited to 12 feet in order to prevent punching through the low permeability soils into the underlying better draining sand.
- Note that a wet pond could dry out during drought periods since the bottom is not planned to be dug below the groundwater table.
- Providing a water source such as a well should be considered for this pond if it is desired to maintain a stable water level during drought periods.

Note: *The above summary is an overview of the report and should not be used by itself for planning, design, and/or construction. See the relevant sections for further details.*

Site Description

The site is located at the northeast corner of the intersection of Hickory Street and County Road 20 in Foley, Alabama. According to Baldwin County Property Appraiser's website, the site's Parcel ID # is 05-61-03-05-0-001-005.000. We understand that the site was previously used for farming and has roughly 6-10 inches of topsoil which is common for farmed areas. At the time of drilling, the site was grassed. Based on the provided topographic survey, the site in the proposed general pond area drops down in elevation from northeast to southwest from roughly elevation +60 feet to roughly elevation +56 feet.

Project Description

We understand that the project consists of the development of a townhouse subdivision with a large stormwater pond and associated pavement and driveway areas. The proposed pond is planned to be a roughly 2.7-acre wet stormwater pond planned to be constructed in the southwest corner of the site. The provided plans indicate the pond bottom is planned to be roughly elevation +48 feet. Our scope did not include services for the proposed pavement or structures.

Subsurface Exploration

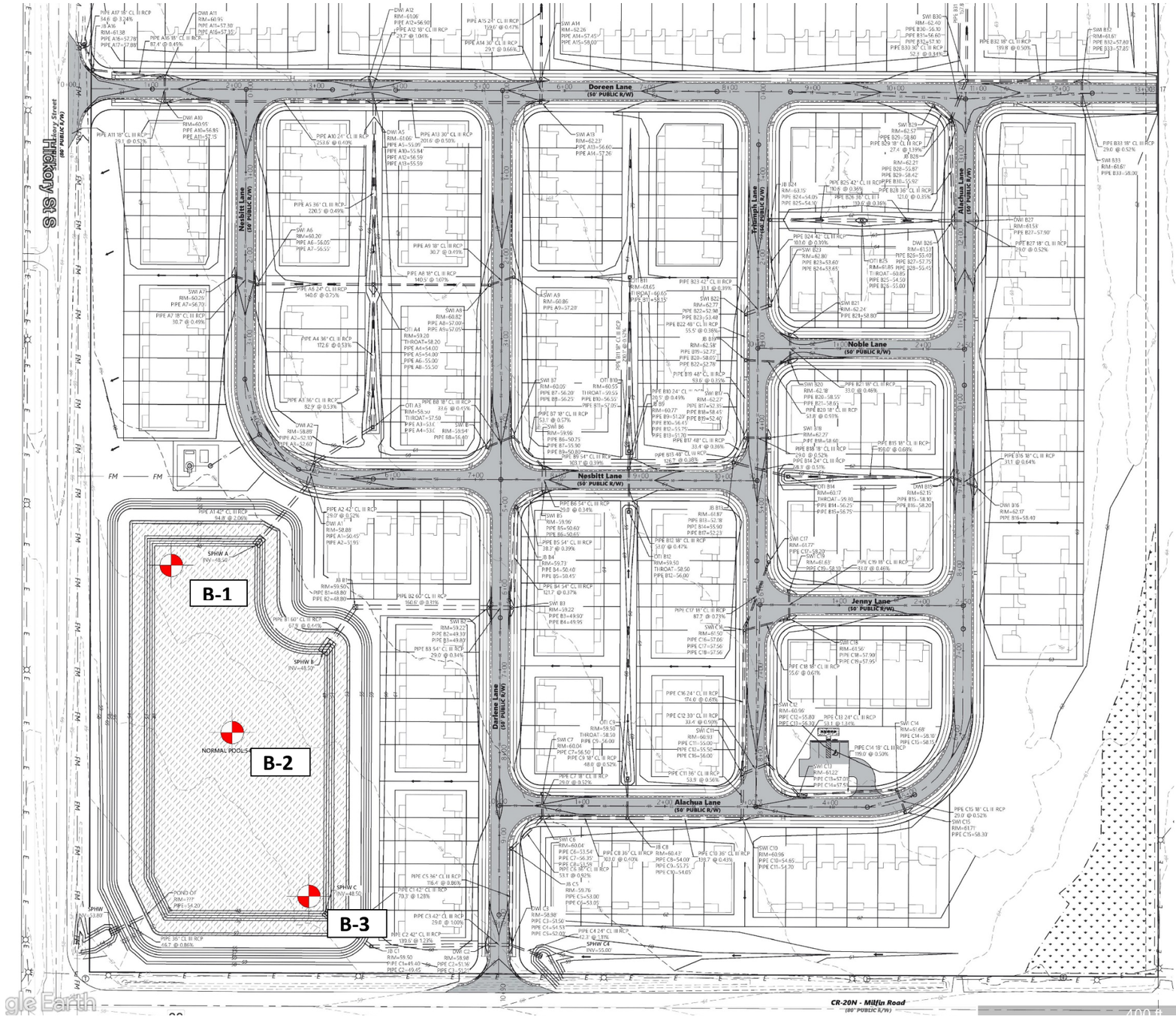
To evaluate the subsurface conditions in the proposed pond, we drilled three Standard Penetration Test (SPT) borings to a depth of 26-31 feet. Two Shelby tubes were collected for permeability testing. The SPT borings were drilled using a truck mounted drill rig, with an autohammer, and the borings were advanced between sampling using flight auger above groundwater table and a "mud" jetting technique with Bentonite drilling mud below. The subsurface conditions encountered in the borings can be found on the boring logs here.

The above information is the basis of our recommendations. If the information in this section changes or is incorrect, our office should be notified, and changes to our report may be needed.

Pond

- The pond borings encountered low permeability soils in the upper 14-19.5 feet that appear to be suitable for the construction of the proposed “wet” stormwater pond.
- The pond borings encountered relatively well-draining white/pink sand soils below roughly 18-23 feet that appear to be suitable for stormwater disposal using a sand chimney.
- LMJ should be notified if a sand chimney option is desired, and chimney recommendations can be provided.
- For the proposed “wet” pond, we recommend keeping the pond bottom depth limited to 12 feet in order to prevent punching through the low permeability soils into the underlying better draining sand.
- We recommend that the pond excavation be evaluated by LMJ staff to make sure the soils encountered are consistent with what was encountered in the borings.
- It’s possible that the better draining sandier soils could be encountered shallower than in the borings due to natural soil variation (and considering the 5-foot sampling intervals).
- If sandier soils are encountered in the pond excavation, we would recommend over-excavating these soils a minimum of 2 feet and replacing them with excavated low permeability soils, placed in 8-inch lifts and compacted to a minimum of 92% of the Modified Proctor (ASTM D1557).
- For pond analysis and design, we recommend a **seasonal high groundwater elevation of 36 feet** based on a review of local rainfall and estimating the ground elevations of the borings using the provided topographic site plan.
- Note that a wet pond could dry out during drought periods since the bottom is not planned to be dug below the groundwater table.
- Providing a water source such as a well should be considered for this pond if it is desired to maintain a stable water level during drought periods.
- The soils encountered in the stormwater pond borings can be used as for fill in the roadways or structure areas provided they are free of organic or deleterious materials and non-plastic.
- The soils encountered at the proposed pond depth retain excess moisture, drain slowly, and can become unworkable when too wet, and this should be considered when using these materials for fill.

Boring Location Plan



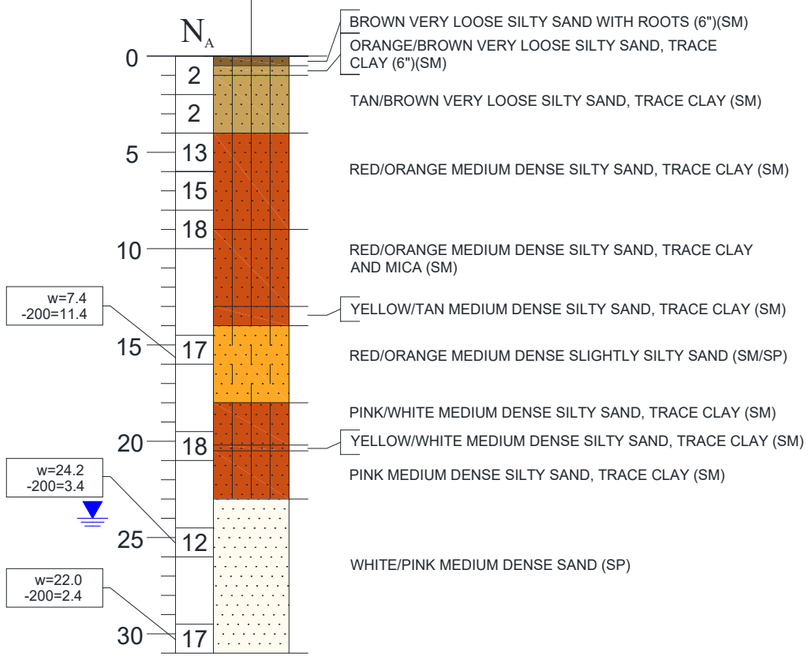
STANDARD PENETRATION TEST BORING

ALL BORING LOCATIONS ARE APPROXIMATE

Borings

B-1

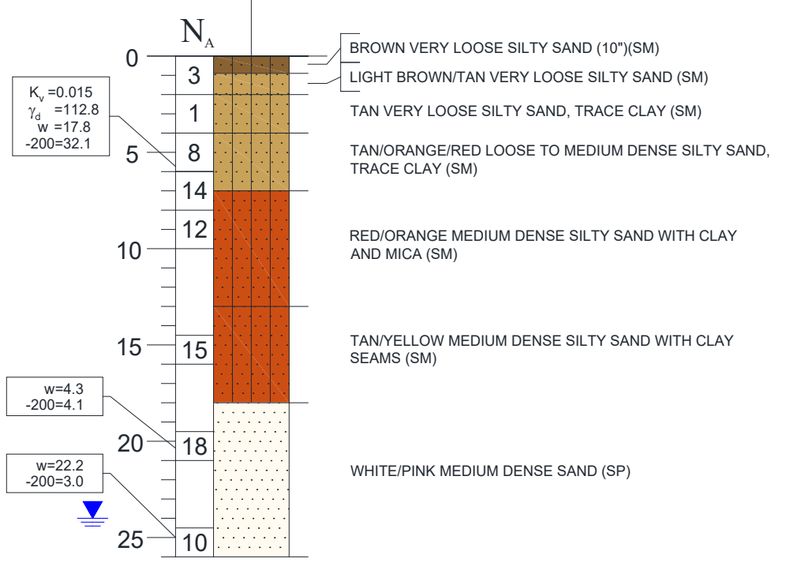
05-03-22



*HAMMER BLOWS:
0-2 FT SAMPLE: 1/1/1/1
2-4 FT SAMPLE: 0/1/1/2

B-2

05-11-22

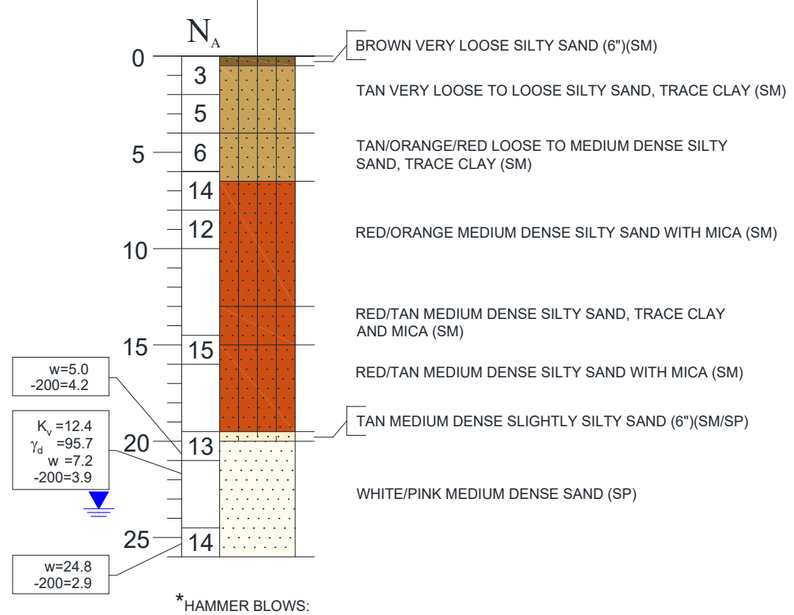


*HAMMER BLOWS:
0-2 FT SAMPLE: 0/1/2/1
2-4 FT SAMPLE: 0/0/1/1

NOTE: SHELBY TUBE SAMPLE COLLECTED AT 4-6 FT FROM ADJACENT BOREHOLE

B-3

05-11-22



*HAMMER BLOWS:
0-2 FT SAMPLE: 1/1/2/2
2-4 FT SAMPLE: 2/2/3/3

NOTE: SHELBY TUBE SAMPLE COLLECTED FROM 20-22 FT IN ADJACENT BOREHOLE

Test Results

Laboratory testing for this project included wash #200 sieve tests and natural moisture content tests run on the spilt spoon samples to assist in soil classification and to evaluate and document soil properties. These can be found on the boring logs adjacent to the sample tested. Laboratory testing also included two falling head permeability tests run on collected Shelby Tube samples. The results of the falling head permeability tests are summarized in the following tables and noted on the boring logs adjacent to the sample tested.

Falling Head Permeability Test Results

Boring	Sample Depth (ft)	Soil Description	Dry Unit Weight (pcf)	Saturated Vertical Hydraulic Conductivity (K_{vs}) (ft/day)	Percent Fines
B-2	5-6	Tan/Orange/Red Silty Sand, Trace Clay	112.8	0.015	32.1
B-3	21-22	White/Pink Sand	95.7	12.4	3.9

Basis of Recommendations

Recommendations rendered herein are based on assumed and/or design information available at the time of this report, the subsurface conditions encountered in the test borings, generally accepted geotechnical engineering principles and practices, and our experience with similar soil and groundwater conditions. Should final project information or existing conditions differ from the information used in this report, or should any soil conditions not discussed in this report be encountered during construction, our office should be notified and retained so that this report can be modified as needed. LMJ should be provided the final plans and specifications for review to determine if any changes to our report are needed based on the final design and that our recommendations have been properly interpreted.

This report and any correspondence are intended for the exclusive use of our client for the specific application to the project discussed. LMJ is not responsible for the interpretations, conclusions, or recommendations made by others based on the information in this report.

Regardless of the care exercised in performing a Geotechnical Exploration, the possibility always exists that soil and/or groundwater conditions will differ from those encountered at the specific boring locations. In addition, construction operations may alter the soil conditions. Therefore, it is recommended that a representative from LMJ be involved during the construction phases discussed in this report.

Test Methods

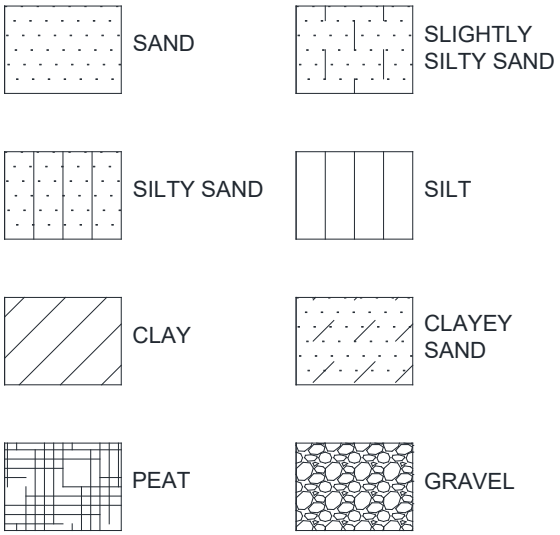
Standard Penetration Test

The Standard Penetration Test (SPT) consists of driving a 2-inch diameter split spoon sampler into the ground using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler one foot (after seating it 6 inches) is referred to as the blow count or “N” value and represents the relative density of subsurface soils. “N” values can be found on the boring logs. The borings were drilled in general accordance with ASTM D1586 using truck mounted drill rigs and were drilled using solid-stem flight auger above the water table and a mud jetting technique with a Bentonite drilling mud below the water table. Each sample was removed from the sampler, classified in the field by the driller, and packaged for visual classification by our engineering staff and laboratory testing. The borings were sampled using an autohammer. FDOT converts auto hammer to safety hammer using a conversion factor of 1.24.

Other Test Methods

Wash #200 Sieve (ASTM D1140), Moisture Content (ASTM D2216) and Falling Head Permeability (ASTM D5856).

LEGEND



NOTES

1) SPT BORINGS PERFORMED IN GENERAL ACCORDANCE WITH ASTM D1586
2) SUBSURFACE CONDITIONS ARE AT BORING LOCATIONS AND ACTUAL CONDITIONS BETWEEN BORINGS MAY VARY
3) ALL CLASSIFICATIONS ARE BASED ON VISUAL EXAMINATION UNLESS ACCOMPANIED BY LABORATORY TEST RESULTS
4) BOUNDARIES BETWEEN SOIL LAYERS SHOULD BE CONSIDERED APPROXIMATE AS THE ACTUAL TRANSITION MAY BE GRADUAL
5) DEPTH OF BORING IS BELOW EXISTING GRADE AT TIME OF DRILLING
6) ELEVATIONS, IF SHOWN, WERE ESTIMATED FROM PROVIDED TOPOGRAPHIC SURVEY
7) COLORS USED FOR BORING HATCHING MAY NOT REPRESENT THE ACTUAL SOIL COLORS

SAFETY HAMMER

GRANULAR SOILS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-3	VERY LOOSE
4-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
> 50	VERY DENSE

COHESIVE SOILS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-1	VERY SOFT
2-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
> 30	HARD

AUTOMATIC HAMMER

GRANULAR SOILS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-2	VERY LOOSE
3-8	LOOSE
9-24	MEDIUM DENSE
25-40	DENSE
> 40	VERY DENSE

COHESIVE SOILS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
<1	VERY SOFT
1-3	SOFT
4-6	MEDIUM STIFF
7-12	STIFF
13-24	VERY STIFF
> 24	HARD

GNE
GROUNDWATER NOT ENCOUNTERED AT TIME OF DRILLING

N
STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

N_A
STANDARD PENETRATION RESISTANCE USING AUTOHAMMER

ENCOUNTERED GROUNDWATER LEVEL

ENCOUNTERED PERCHED WATER LEVEL

50/2"
NUMBER OF BLOWS REQUIRED (50) TO ADVANCE SPLIT SPOON SAMPLER A SPECIFIC DISTANCE (2) INCHES

HW
SPLIT SPOON SAMPLE ADVANCED UNDER WEIGHT OF ROD AND HAMMER

HA
HAND AUGER

SHELBY TUBE SAMPLER

w
NATURAL MOISTURE CONTENT (%)

-200
FINES PASSING #200 SIEVE (%)

O.C.
ORGANIC CONTENT (%)

LL
LIQUID LIMIT

PL
PLASTIC LIMIT

LI
LIQUIDITY INDEX

$C \approx$
APPROXIMATE COHESION VALUE (PSF) BASED ON POCKET PENETROMETER READINGS

K_v
SATURATED VERTICAL HYDRAULIC CONDUCTIVITY (FT/DAY)

γ_d
DRY UNIT WEIGHT (PCF)

γ_m
ESTIMATED MOIST UNIT WEIGHT (PCF)

γ_b
ESTIMATED BUOYANT UNIT WEIGHT (PCF)

ϕ
ESTIMATED ANGLE OF INTERNAL FRICTION (DEGREES)