



Cal -Tech Testing, Inc.

- Engineering
- Geotechnical
- Environmental

LABORATORIES

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January 23, 2020

Mr. Frank V. Tipton
University of Florida
P.O. Box 115350
Gainesville Florida 32611

**RE: Geotechnical Exploration & Field Soil Permeability Testing Report
UF/IFAS Facility-New Building Structure & Retention Pond Expansion
Live Oak, Florida
Cal-Tech Testing, Inc. Project No. 20-00002-01**

Dear Mr. Frank V. Tipton:

This report presents the results of our geotechnical exploration and field soil permeability testing performed for the construction of the proposed new building structure and retention pond expansion at the University of Florida IFAS facility in Live Oak Florida. Our services were performed in accordance with our proposals and subsequent authorizations.

The purposes of our geotechnical exploration and soil testing were to obtain subsurface soil profile and soil permeability information to aid in the design and construction of the proposed structure and retention pond expansion.

SITE & PROJECT INFORMATION

Based on our observations during our field exploration, the proposed new building site consists of a vacant portion of grassed land surrounded by the facility complex of 1-story structures and the access driveway. The retention pond expansion is a few hundred feet to the southeast of the facility building complex.

Based on the information in a draft site layout you provided to us the project consist of the construction of a 1-story, 10,000 ft², building structure and the expansion of an existing retention pond. No information in regards to the column and wall load system was available for preparation of this report.

FIELD EXPLORATION

Per your request, our field exploration was done on January 6, 2020 and consisted of three (3), 15-ft deep, Standard Penetration Test (SPT) borings (B1 through B3) at locations within the proposed building structure footprint and one (1), 15-ft deep, SPT boring (B4) within the proposed retention pond expansion area.

Subsequently, we performed one (1) soil field permeability test using a 5 ft. long, 2.81-in I.D. casing driven 0.5 ft. from the bottom of a 4 ft. deep borehole hand-augered next to B4. During the permeability test and after soil saturation for 30 minutes, we recorded the volume required to keep water at the top of the casing at 5-minute intervals for 30 minutes.

Boring locations were selected by our geotechnical engineer and laid out by our field crew from the information on the draft site layout you provided to us. Global Positioning System (GPS) coordinates were recorded from each location. Refer to the enclosed Boring Location Plan. At completion, the boreholes were backfilled with soil cuttings.

The sampling and penetration procedures of the SPT borings were in general accordance with ASTM D-1586 Penetration Test and Split-Barrel Sampling of Soil, using a power rotary drill rig and a 3-in diameter continuous flight auger. The standard penetration test was performed by driving a standard 1³/₈ inch I.D. and 2 inches O.D. split-spoon sampler with a manual 140-lb hammer falling 30 inches. The number of hammer blows required to drive the sampler a total of 24 inches (i.e. boring upper 10 ft.) or 18 inches in 6-inch increments were recorded in the boring logs. The penetration resistance, N-values, is the summation of the second and third 6-inch increments. The blow counts and N-values are recorded in the enclosed Boring Logs.

The soil samples obtained from the borings were delivered to our laboratory and visually classified by our geotechnical engineer in general accordance with the Unified Soil Classification System (ASTM D-2487). Refer to the enclosed boring logs for the subsurface soil classification at the test locations.

SUBSURFACE SOIL CONDITIONS

BUILDING STRUCTURE

Generalized Subsurface Soil Profile

A generalized subsurface soil profile inferred from the SPT borings B1 through B3 consists of a 8 ft. to 14 ft. thick UPPER SAND (SP) stratum underlain by approximately 6 ft. thick slightly SILTY SAND (SM) stratum and the BOTTOM SAND (SP) to the termination depth of the borings thereafter.

The soil penetration resistance N-values revealed a Loose (i.e. $5 < N < 10$) relative density in the SAND stratum and Medium Dense (i.e. $11 < N < 30$) in the SILTY SAND stratum.

Detailed subsurface soil conditions including strata soil classification and N-values are shown in the boring logs enclosed to this report.

Groundwater

The groundwater was encountered at a depth of 12 ft. while drilling at the boring locations within the proposed building structure. The United States Department of Agriculture (USDA), National Resources Conservation Service (NRCS) indicates the groundwater at depths of 24 inches to 36 inches below natural ground elevations for the soil map covering the proposed building location.

The Federal Emergency Management Administration (FEMA) Flood Map No. 12121CO170B (enclosed) effective September 9, 2007, indicates the proposed building structure is within an Area of Minimal Flood Hazard, Zone X.

RETENTION POND EXPANSION

Generalized Subsurface Soil Profile

The information obtained from the SPT boring B4 indicates a subsurface soil profile consisting of SAND underlain by a SILTY SAND (confining stratum) from a depth of 14 ft. to the termination depth of the boring at 15 ft.

Groundwater

No groundwater was encountered while drilling the boring location B4. The United States Department of Agriculture (USDA), National Resources Conservation Service (NRCS) indicates the groundwater at depths of 24 inches to 42 inches below natural ground elevations for the soil map covering the proposed pond expansion area.

The Federal Emergency Management Administration (FEMA) Flood Map No. 12121CO170B (enclosed) effective September 9, 2007, indicates the proposed pond expansion area is within a Special Flood Hazard Area-Zone A with not determined base Flood Elevation.

Groundwater is subject to seasonal variations; however, observed typical yellowish-brown-colored soil particles resulting from iron-oxide coating appear to indicate the Seasonal High Groundwater Table (SHGWT) at a depth of 7 ft. at boring location B4.

Soil Permeability & Hydrologic Group

Analyses of data obtained during the soil field permeability test indicate a soil hydraulic conductivity as shown in the following table:

Test Location	Depth (ft)	Vertical Unsaturated Soil Hydraulic Conductivity (K_{vu}) (ft/day)	Horizontal Soil Hydraulic Conductivity (K_h) (ft/day)	Fillable Porosity (%)
B4	4	4.2	9.5	30

In addition, based on the USDA NRCS criteria, the estimated depth to the SHGWT, the depth to the confining stratum and the soil Hydraulic Conductivity, the soil by boring location B4 could be assigned the Hydraulic Soil Group (HSG) "A".

GEOTECHNICAL EVALUATIONS & RECOMMENDATIONS

BUILDING STRUCTURE

Our evaluations of the field exploration results indicate the encountered subsurface soil conditions beneath the proposed locations for the 1-story building are suitable to support the structures on a system of shallow foundations. Our settlement estimates indicate tolerable settlements within 1 inch would occur under footings designed for a safe soil contact pressure of 2,000 lb/ft² after performance of a site preparation work in accordance with our recommendations.

The site preparation work should consist of stripping the topsoil and removal-backfilling of existing underground utilities with subsequent compaction of the resulting subgrade with several passes of a large vibratory roller. During compaction, any observed soft and yielding subgrade should be removed and replaced with approved fill material.

After compaction, the subgrade could be raised to the proposed finished floor elevations with loose, 12-in thick, lifts of approved fill material. Each lift should be compacted to at least 95% of the material's Maximum Dry Density (ASTM D-1557).

Approved fill material should consist of granular soils with size particles not larger than 3 inches and maximum 12% of fines (i.e. wash 200) and no organic content. Fill material with higher fines content might be approved by the geotechnical engineer; however, will likely be difficult to compact unless at the material's Optimum Moisture.

At completion the footings should be cast at least 12 inches into the existing or fill soils with the subgrade upper 12 inches compacted to at least 95% of the material's Maximum Dry Density (ASTM D-1557).

A sliding friction coefficient of 0.35 could be used for the design of the footings cast on existing or fill material compacted as indicated.

Ground Floor Slab

Based on the encountered soil subsurface conditions, the proposed ground floor slab could be supported on-grade after compacting the subgrade upper 12 inches to at least 95% of the material's Maximum Dry Density (ASTM D-1557).

LIMITATIONS

Information on subsurface strata and groundwater levels shown on the boring logs represent conditions encountered only at the locations indicated and at the time of the investigation.

CLOSURE

It has been a pleasure working with you and we look forward to continuing our work on this and future projects.

Sincerely,

Cal-Tech Testing, Inc.

Ivan E. Marciano, M.S., P.E.
Sr. Geotechnical Engineer

Enclosures:
Boring Location Plan
FEMA Flood Map
Boring Logs



Mike Stalvey, Jr.
Vice President



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BORING LOCATION PLAN

UF/IFAS Facility-New Building & Retention Pond Expansion

Live Oak, Florida

National Flood Hazard Layer FIRMette



30°18'22.55"N



USGS The National Map: Orthoimagery Data refreshed April, 2019



30°17'51.49"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Without Base Flood Elevation (BFE)
Zone A, V, AE

With BFE or Depth Zone AE, AO, AH, VE, AR

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile

Future Conditions 1% Annual Chance Flood Hazard Zone A

Area with Reduced Flood Risk due to Levee, See Notes, Zone 2

Area with Flood Risk due to Levee Zone C

OTHER AREAS OF FLOOD HAZARD

Area of Minimal Flood Hazard Zone A

Effective LOMRs

OTHER AREAS

Area of Undetermined Flood Hazard Zone

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

GENERAL STRUCTURES

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

OTHER FEATURES

Digital Data Available

No Digital Data Available

Unmapped

MAP PANELS

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/23/2020 at 3:18:08 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



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BORING NUMBER B1

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CLIENT University of Florida-Gmuer Engineering

PROJECT NAME UF/IFAS Facility-New Bldg. and Retention Pond Expansion

PROJECT NUMBER 20-00002-01

PROJECT LOCATION Live Oak Florida

DATE STARTED 1/6/20 COMPLETED 1/6/20

GROUND ELEVATION 0 ft HOLE SIZE 3-in dia. x 15 ft. depth

DRILLING CONTRACTOR Cal-Tech Testing, Inc.

GROUND WATER LEVELS:

DRILLING METHOD Continuous Flight Auger/Split Spoon

AT TIME OF DRILLING ---

LOGGED BY M.S. CHECKED BY I.M.

AT END OF DRILLING 12.00 ft / Elev -12.00 ft

NOTES Elev. referred to ground surface

AFTER DRILLING ---

ELEV. (ft)	MATERIAL DESCRIPTION	SYMBOL LOG	DEPTH SCALE (ft)	SAMPLE DATA				REMARKS (DRILLING FLUID, DEPTH OF CASING, FLUID LOSS, DRILLING RESISTANCE, ETC.)
				NUMBER	TYPE	RECOVERY (%) (ROD) %	BLOW COUNTS (N VALUE)	
	(SP) Very dark grayish brown SAND		1	1	SS	96	3-3-4-4 (7)	Boring Location Coordinates: N30°18'06.85" W82°53'59.62" SS=Split Spoon sampler
			2					
	(SP) Yellowish brown SAND		4	2	SS	88	2-2-2-3 (4)	
-5			6					
	(SP) Light gray SAND		8	3	SS	83	2-2-2-3 (4)	
			10					
-10	(SP) Very dark grayish brown SAND		12	4	SS	83	3-4-5-5 (9)	
			14					
			16	5	SS	79	4-5-5-6 (10)	
			18					
	(SM) Reddish gray slightly SILTY SAND		20	6	SS	78	4-6-7 (13)	
-15			22					
	Bottom of borehole at 15.0 feet.							



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BORING NUMBER B2

PAGE 1 OF 1

CLIENT University of Florida-Gmuer Engineering PROJECT NAME UF/IFAS Facility-New Bldg. and Retention Pond Expansion
PROJECT NUMBER 20-00002-01 PROJECT LOCATION Live Oak Florida
DATE STARTED 1/6/20 COMPLETED 1/6/20 GROUND ELEVATION 0 ft HOLE SIZE 3-in dia. x 15 ft. depth
DRILLING CONTRACTOR Cal-Tech Testing, Inc. GROUND WATER LEVELS:
DRILLING METHOD Continuous Flight Auger/Split Spoon AT TIME OF DRILLING ---
LOGGED BY M.S. CHECKED BY I.M. ▼ AT END OF DRILLING 12.00 ft / Elev -12.00 ft
NOTES Elev. referred to ground surface AFTER DRILLING ---

ELEV. (ft)	MATERIAL DESCRIPTION	SYMBOL LOG	DEPTH SCALE (ft)	SAMPLE DATA				REMARKS (DRILLING FLUID, DEPTH OF CASING, FLUID LOSS, DRILLING RESISTANCE, ETC.)
				NUMBER	TYPE	RECOVERY (%) (ROD) %	BLOW COUNTS (N VALUE)	
	(SP) Very dark grayish brown SAND		1	1	SS	92	3-3-6-4 (9)	Boring Location Coordinates: N30°18'07.28" W82°53'58.72" SS=Split Spoon sampler
			2	2	SS	92	4-3-2-3 (5)	
			4					
-5	(SP) Yellowish brown SAND		3	3	SS	88	2-2-3-4 (5)	
			6					
	(SP) Light gray SAND		4	4	SS	83	5-5-6-6 (11)	
			8					
	(SM) Grayish brown SILTY SAND		5	5	SS	83	5-6-9-10 (15)	
-10			10					
			12					
			14	6	SS	67	5-8-8 (16)	
-15	(SP) Reddish gray SAND							
	Bottom of borehole at 15.0 feet.							



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BORING NUMBER B3

PAGE 1 OF 1

CLIENT University of Florida-Gmuer Engineering
PROJECT NUMBER 20-00002-01
DATE STARTED 1/6/20 **COMPLETED** 1/6/20
DRILLING CONTRACTOR Cal-Tech Testing, Inc.
DRILLING METHOD Continuous Flight Auger/Split Spoon
LOGGED BY M.S. **CHECKED BY** I.M.
NOTES Elev. referred to ground surface

PROJECT NAME UF/IFAS Facility-New Bldg. and Retention Pond Expansion
PROJECT LOCATION Live Oak Florida
GROUND ELEVATION 0 ft **HOLE SIZE** 3-in dia. x 15 ft. depth
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING 12.00 ft / Elev -12.00 ft
AFTER DRILLING ---

ELEV. (ft)	MATERIAL DESCRIPTION	SYMBOL LOG	DEPTH SCALE (ft)	SAMPLE DATA				REMARKS <small>(DRILLING FLUID, DEPTH OF CASING, FLUID LOSS, DRILLING RESISTANCE, ETC.)</small>
				NUMBER	TYPE	RECOVERY (%) (ROD) %	BLOW COUNTS (N VALUE)	
	(SP) Very dark grayish brown SAND		1	1	SS	92	3-5-4-4 (9)	Boring Location Coordinates: N30°18'07.43" W82°53'59.48" SS=Split Spoon sampler
			2					
	(SP) Yellowish brown SAND		2	2	SS	88	3-3-2-2 (5)	
			4					
-5			6	3	SS	83	2-2-2-3 (4)	
	(SP) Light gray SAND		8	4	SS	79	4-4-5-7 (9)	
			10					
-10	(SM) Reddish gray SILTY SAND		10	5	SS	92	6-7-7-6 (14)	
			12					
			14					
-15	(SP) Reddish gray SAND		14	6	SS	67	3-4-4 (8)	
	Bottom of borehole at 15.0 feet.							



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BORING NUMBER B4-Pond

PAGE 1 OF 1

CLIENT University of Florida-Gmuer Engineering
PROJECT NUMBER 20-00002-01
DATE STARTED 1/6/20 **COMPLETED** 1/6/20
DRILLING CONTRACTOR Cal-Tech Testing, Inc.
DRILLING METHOD Continuous Flight Auger/Split Spoon
LOGGED BY M.S. **CHECKED BY** I.M.
NOTES Elev. referred to ground surface

PROJECT NAME UF/IFAS Facility-New Bldg. and Retention Pond Expansion
PROJECT LOCATION Live Oak Florida
GROUND ELEVATION 0 ft **HOLE SIZE** 3-in dia. x 15 ft. depth
GROUND WATER LEVELS:
AT TIME OF DRILLING --- Not encountered
AT END OF DRILLING ---
AFTER DRILLING ---

ELEV. (ft)	MATERIAL DESCRIPTION	SYMBOL LOG	DEPTH SCALE (ft)	SAMPLE DATA				REMARKS (DRILLING FLUID, DEPTH OF CASING, FLUID LOSS, DRILLING RESISTANCE, ETC.)
				NUMBER	TYPE	RECOVERY (%) (ROD) %	BLOW COUNTS (N VALUE)	
	(SP) Very dark gray SAND		1	1	SS	92	3-2-3-3 (5)	Boring Location Coordinates: N30°18'00.76" W82°53'51.55" SS=Split Spoon sampler
	(SP) Yellowish brown SAND		2	2	SS	92	2-2-2-2 (4)	
			4	3	SS	83	2-1-2-2 (3)	
-5	(SP) Light gray SAND		6	4	SS	92	2-2-3-3 (5)	
	...slightly pink		8	5	SS	92	3-2-4-4 (6)	
-10			10					Yellowish brown mottle at 7.5 ft.
			12					
	(SM) Gray SILTY SAND		14	6	SS	100	9-10-11 (21)	
-15	Bottom of borehole at 15.0 feet.							