Engineering Report

Geotechnical Investigation for the Proposed Citrus County Solid Waste Transfer Station

Prepared for

Citrus County, Florida

~~June~~ July 2009

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
AUG 26 2009
SOUTHWEST DISTRICT
TAMPA

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7/22/09

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AUG 26 2009
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Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
bgs	below ground surface
cm/sec	centimeters per second
cm^2	square centimeter
CMU	concrete masonry unit
CPT	cone penetration test
fc	sleeve friction
FGS	Florida Geological Survey
H	horizontal
LBR	Limerock Bearing Ratio
msl	mean sea level
N	standard penetration resistance
OSHA	Occupational Safety and Health Administration
pcf	pound per cubic foot
psf	pound per square foot
psi	pound per square inch
qc	tip resistance
SPT	standard penetration test
tcf	tons per cubic foot
UFAS	Upper Floridan aquifer system
USCS	Unified Soil Classification System
V	vertical

SECTION 1

Introduction

CH2M HILL conducted a geotechnical investigation to evaluate the subsurface conditions at the site of the proposed Citrus County Solid Waste Transfer Station for Citrus County, Florida The scope of work for this geotechnical investigation included the following tasks

- Conduct two phases of field exploration to ~~explore~~evaluate subsurface conditions at the site for developing facility foundation design recommendations Phase I exploration consisted of 12 Standard Penetration Test (SPT) (American Society for Testing and Materials [ASTM] D-1586) borings from 15 to 80 feet deep Phase II exploration consisted of ~~nine~~ eleven 25- to 50-foot-deep Cone Penetration Test (CPT) soundings (ASTM D-3441)
- Conduct ~~eleven~~ nine additional SPT borings from 20-to 40-foot-deep ~~SPT borings~~ for stormwater pond design
- Conduct 12 sieve analysis tests (ASTM D-422) on representative soil samples to assist in soil classification and evaluation of engineering properties of the soils
- Evaluate whether the project site is in a karst sensitive area
- Perform engineering analyses and develop geotechnical design recommendations based on the results
- Prepare a geotechnical report describing the field exploration and laboratory testing, and provide recommendations for the foundation design and construction of the proposed facilities

SECTION 2

Project Location and Proposed Construction

The Citrus County Transfer Station is located in the area west of Inverness, east of Crystal River, and south of State Road 44 as shown on **Figure 1**

The proposed construction area is generally clear of any trees At the time when the soundings were made, northern and central portion of the site was stock-piled with 10 to 15 feet of earthfill to be used as landfill daily cover The southern and western portions of the site are occupied by stormwater retention areas as deep as 10 feet from previous borrow operation

The proposed construction will consist of a transfer station building, a dry storage building, a household hazardous waste building~~,~~, a scale house and scales~~,~~, , a Citizens Service Area (CSA) CSA collection area including eight multi-purpose roll-off ~~area, a CSA collection area,~~sites, and bunkers for tires, scrap metal and bulky items such as furniture, a recycle collection center~~, and~~ , a fuel storage area -and an electrical building and generator The plan dimension, top of bottom slab elevation, estimated unit load, and type of construction of the proposed facilities are presented in **Table 1**

The southern two thirds of the proposed 110-foot-wide by 150-foot-long transfer station building will be constructed on top of a 21-foot-high embankment The northern 22 feet of the building will have a 21-foot-high tunnel for waste loading The building will be constructed of pre-engineered steel frame The base slab of the tunnel will be a rigid mat foundation to support the scales The entrance and exit ramps to the building will have 6 percent and 5 percent slopes, respectively The remaining perimeter area of the embankment will have side slope of 3 horizontal to 1 vertical

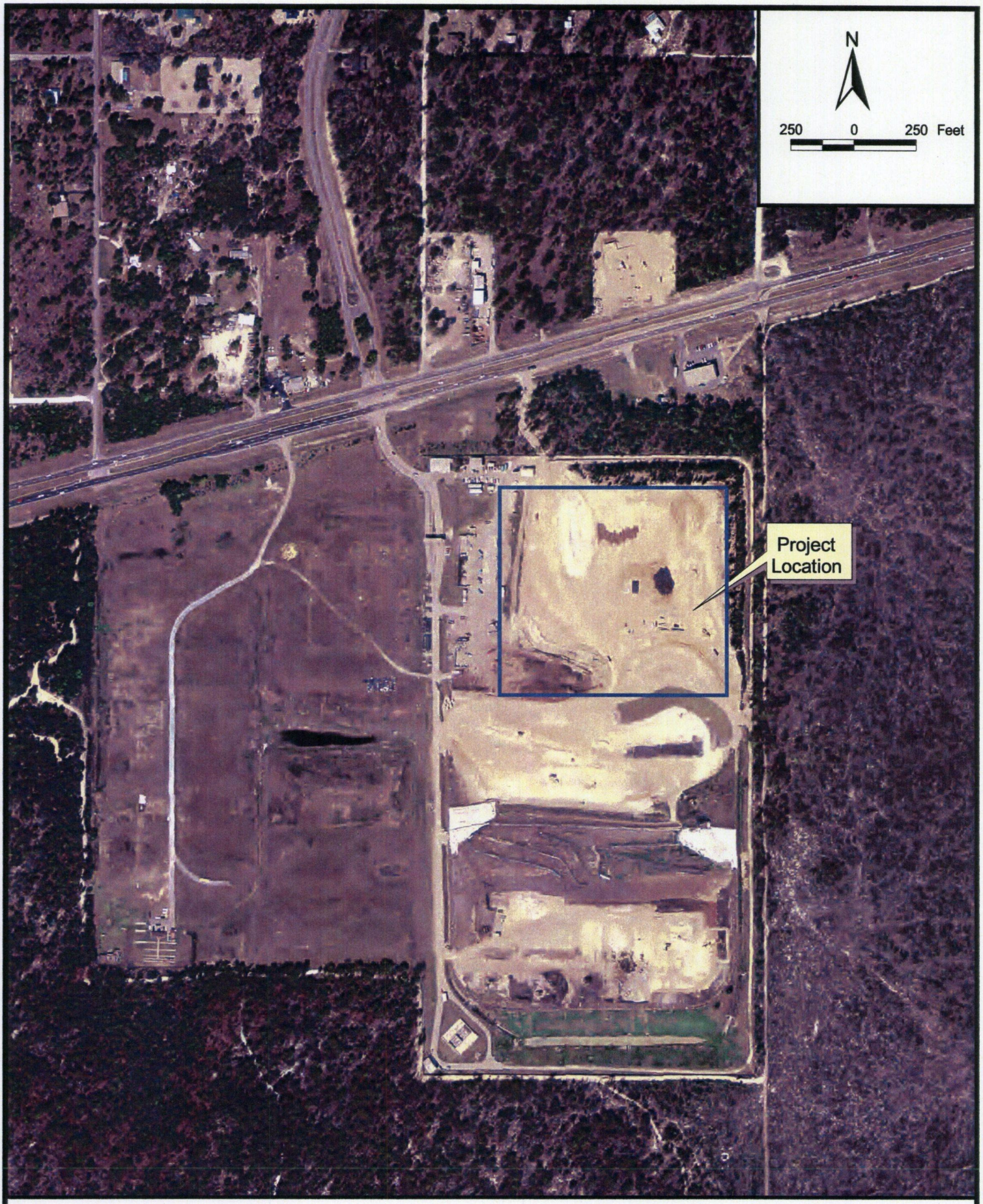

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FIGURE 1
Project Location

TABLE 1
Summary of Proposed Construction

Structural Description	Plan Dimension (feet)	Top of Bottom Slab Elevation (feet, msl)	Soil borings or soundings made in the facility location	Estimated Load	Type of Construction
1 Transfer Station Building	110 x 150	2/3 of the building on 21-foot high embankment	A-8, A-8A, A-9, B-4 and B-5	WLF=5000 PLF	Pre-engineered metal building
2 Dry Storage Building	41x41	On grade	A-1 and B-6 were made in the vicinity	WLF=4000 PLF	Pre-engineered metal building
3 Household Hazardous Waste Building	72 x 209	On grade	A-7 and B-3	WLF=4000 PLF	Pre-engineered metal building
4 Scale House and scale	20' to 43' wide x 59' long	On grade	B-1, A-2, and A-3	WLF=4000 PLF	Concrete Masonry
5 ~~Eight multi-purpose roll-off area~~CSA Collection Area	~~50 x 26~~40200 sf	On grade	B-2, A-~~4~~, A-5, A-6, and A-6A and A-8	NA	Retaining walls and Asphalt Concrete Paving
6 CSA~~Recycle~~ Collection Area~~Center~~	80 x ~~340~~180	On grade	~~B-2 and A-8~~1	NA	Asphalt Concrete Paving
~~7 Recycle Collection Center~~ Electrical Building and Generator Pad	~~80~~15 x ~~180~~20	On grade	~~A-1~~Based on P-10 at 80' north of the facility, proof rolling of subgrade is recommended	~~NA~~WLF=4000 PLF	~~Asphalt~~ Concrete ~~Paving~~Masonry
~~7~~ 8 Fuel Storage Area	40x44	On grade	~~A lightly loaded structure~~ Based on B-12 and A-8 proof rolling of subgrade is recommended	Unit Load = 400 psf	Concrete Pad

Notes

msl = Mean sea level
PLF = Pounds per linear foot
PSF = Pounds per square foot
Unit load = Uniformly distributed load
WLF = Wall footing load

SECTION 3

Field Exploration and Laboratory Testing

The initial field exploration was conducted in two phases. Phase I was conducted by Universal Engineering Science (UES) of Gainesville, Florida, on July 18, 2007 Phase II exploration was conducted by In-Situ Group of Orlando, Florida, on June 5, 2008 Nine additional borings for the stormwater pond design were completed in November 2008 by UES A CH2M HILL geotechnical engineer was onsite to observe the soil borings and soundings The site plan and boring and sounding locations are shown on **Figure 2.** The boring and sounding logs are presented in Appendix A The overall site plan for the proposed construction is presented in **Figure 2**

3.1 Standard Penetration Tests

Phase I exploration consisting of 12 SPT boring was conducted in conformance with ASTM D-1586 by driving a 2-inch outside diameter split-spoon sampler with an automatically controlled 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the last 12 inches of an 18-inch drive, or the middle 12 inches of a 24-inch drive, was recorded as the standard penetration resistance (N) value Continuous samples were taken to 10 feet below ground surface and at 5-foot intervals thereafter The bore holes were advanced with rotary drilling and cased with bentonite mud using a rotary drill rig mounted on a truck

For the stormwater pond design, additional nine SPT borings were made The borings were numbered from P-1 to P-13 However, after the boring numbers were staked at the site, some ponds were eliminated and borings P-2, P-9, P-11, and P-12 were not made

3.2 Cone Penetration Tests

Phase II exploration consisting of eleven CPT soundings was conducted at the site in accordance with ASTM D-3441 using an electrical cone This cone has a 10-square-centimeter (cm^2) cross section area with a 60-degree apex angle and a 150-cm^2 friction sleeve area The compressive force at the cone tip, termed the tip resistance (qc), is measured by a compression load cell within the cone housing The friction acting on the barrel shaped surface of the cone, termed the sleeve friction (fc), is measured by a separate load cell within the same housing

During testing, the penetrometer was hydraulically advanced at a rate of 2 centimeters per second (cm/sec) The cone tip resistance, sleeve friction, and pore water pressure were recorded at 5 cm intervals as the cone was advanced The cone soundings were pushed to 25 to 50 feet below the ground surface Descriptive logs of the sounding test results are included in Appendix A

3.3 Laboratory Tests

All disturbed samples were visually classified in the field in accordance with the Unified Soil Classification System (USCS) (ASTM D-2487). To aid in soil classification and evaluation of engineering properties of the soils, 12 sieve analysis tests (ASTM D-422) were conducted by UES The laboratory test results are presented in Appendix B

SECTION 4

Subsurface Conditions

The soil profile under all of the proposed facilities encountered in the soil borings and soundings generally ~~encountered~~ consists of medium dense to dense sand, silty sand, and clayey sand to the maximum borings and sounding depth of 80 feet, except for borings B-1, B-3, B-6, and B-12, which encountered very loose to loose sand from ground surface to approximately 10 feet below the ground surface The water table was not encountered in any of the borings

SECTION 5

Conclusions and Recommendations

The findings of the subsurface evaluation were used to draw conclusions and develop recommendations in the following areas

- Subgrade preparation
- Over-excavation and Backfill
- Fill and backfill
- Excavation
- Groundwater control
- Foundation design
- Lateral earth pressure
- Thrust block and thrust restraint
- Pavement design recommendations

5.1 Subgrade Preparation

Before the placement of fill, concrete, and pavement, the subgrade should be prepared as follows

- All surface vegetations and topsoil within 5 feet of the perimeter of the building should be excavated
- The subgrade should be proof rolled with a minimum of 15 overlapping passes using a 10-ton or heavier vibratory roller Any soft areas that cannot be compacted should be over-excavated and replaced with granular fill Granular fill should consist of sand, silty sand, or clayey sand classified as SP, SM, or SC in accordance with USCS (ASTM D-2487) Place granular fill in 8-inch lifts and compact each lift to 95 percent of the maximum dry density, as determined by ASTM D-1557 to the design footing or base slab grades
- The upper 12 inches of the subgrade should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D-1557

5.2 Over-Excavation and Backfill

5.2.1 Under the Proposed Scale House

Boring B-1 at the proposed scale house location encountered very loose sand to approximately 10 feet below ground surface. The following over-excavation and compaction procedures are recommended for the subgrade material at this location

- Over-excavate the loose sand to approximately 4 feet below the bottom of footings or slabs and to 5 feet beyond the footprint of the building Stockpile the over-excavated sand nearby
- Proof roll the excavation bottom with at least 15 overlapping passes using a 10-ton or heavier vibratory roller. Compact the upper 12 inches of excavation bottom to at least 95 percent of the maximum dry density as determined by ASTM D-1557
- Place the stockpiled sand back in excavation pit in 8-inch lifts and compact each lift to 95 percent of the maximum dry density as determined by ASTM D-1557 Place the compacted soil to the bottom of the base slab elevations

5.2.2 Under the Proposed Transfer Building

The proposed transfer building will be partially on undisturbed soil and partially on compacted granular fill to fill in the previous borrow pit areas The compacted granular fill could be as thick as 10 feet To minimize the potential differential settlements, the following over-excavation and compaction procedures are recommended for the subgrade material at this location

- Over-excavate the undisturbed soil to the same bottom elevation of the borrow pit The over-excavation should be extended to 20 feet beyond the footprint of the building Stockpile the over-excavated soil nearby
- Proof roll the excavation and borrow pit bottom with at least 15 overlapping passes using a 10-ton or heavier vibratory roller Compact the upper 12 inches of excavation bottom to at least 95 percent of the maximum dry density as determined by ASTM D-1557
- Place imported sand and the stockpiled sand back in the excavation pit in 8-inch lifts and compact each lift to 95 percent of the maximum dry density as determined by ASTM D-1557 Place the compacted soil to the bottom of the base slab elevations

5.3 Fill and Backfill

5.3.1 Granular Fill

Granular fill is recommended for the construction of the embankment or for fill to be placed beneath slabs, footings, and pavements The granular fill should be placed in 8-inch maximum loose lifts, with each lift compacted to at least 95 percent of the maximum dry density, as determined by ASTM D-1557 At the time of compaction, the fill material should be at optimum moisture content, ± 2 percent

Granular fill should be used for fill adjacent to walls The granular fill should be compacted with plate vibratory compactors or hand-operated power tampers. The backfill material should be placed in 8-inch maximum loose lifts with each lift compacted to 90 percent of the maximum dry density, as determined by ASTM D-1557. To prevent excessive lateral pressure on external walls, large compaction equipment should not be allowed within a zone formed by a 45-degree slope from the base of the wall footing

5.3.2 Pipe Trench Backfill

Pipe trench backfill beneath slabs, footings, pavements, and facilities should consist of the granular fill specified previously This granular fill should be placed in horizontal lifts not to exceed 8 inches in uncompacted thickness, and compacted to at least 95 percent of the maximum dry density, as determined by ASTM D-1557 In other areas, excavated material free of roots, debris, clay, organic material, rock larger than 3 inches, or other deleterious objects is suitable for use as trench backfill above the pipe crown In these areas, the excavated material should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D-1557

Backfill material for the pipe zone should consist of granular fill, as previously specified The granular fill should be placed simultaneously on both sides of the pipe in 6-inch lifts and should be tamped to 95 percent of the maximum dry density, as determined by ASTM D-1557

The pipe base material should consist of granular fill, as previously specified, and should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D-1557

5.3.3 Preloading the Tunnel Area

The southern two-thirds of the transfer station building will be found on 23 feet of compacted granular fill and the northern one-third of the building will be found on existing grade To minimize differential settlement between these two areas, CH2M HILL recommends preloading the northern one-third of building with 23 feet of granular fill Because the foundation soil under the building consists mainly of sand and silty sand, CH2M HILL anticipates that the majority of the settlement will occur within 2 weeks after placement of the fill Therefore, 2 weeks after placement of the preload, the granular fill in the tunnel area should be excavated and used to construct the entrance and exit ramps

The preload should be extended to at least 5 feet beyond the perimeter of the tunnel and should have a side slope no steeper than 1 5 H to 1 V

5.4 Excavation

The soil profiles indicate that excavation generally can be done with conventional earth-moving equipment, such as backhoes or front-end loaders An unbraced temporary excavation with side slope inclined at 1 5 H to 1 V or flatter is expected to remain stable if it is not subjected to surcharge load or vibration Excavations deeper than 5 feet should be sloped or shored in accordance with Occupational Safety and Health Administration (OSHA) requirements Surface water runoff should be prevented from entering the

excavation by berms, swales, or other methods All grass, topsoil, and organic material should be stripped before excavation begins. Excavation should be conducted in accordance with all federal, state, and local ordinances protecting workers

5.5 Groundwater Control

The groundwater table at the site is at a depth deeper than 80 feet below the ground surface CH2M HILL does not anticipate any dewatering difficulty during construction However, earthen berms should be constructed to prevent surface water from entering the excavation pits

5.6 Foundation Design Recommendations

5.6.1 Spread Footings, Slabs-on-grade, and Mat Foundation

Spread footings, slabs-on-grade, and mat foundation are recommended as support for the proposed facilities, provided that the foundation soils are prepared in accordance with the previously recommended procedures Spread footings should be at least 3 feet wide and embedded at least 2 feet below the finish grade. For spread footing design, a net allowable bearing pressure of 2,000 pounds per square foot (psf) is recommended for the proposed facilities

The slabs-on-grade and mat foundation should be designed using a modulus of subgrade reaction for a 1-foot square plate of 150 tons per cubic foot (tcf). This modulus of subgrade reaction should be adjusted to account for the difference in size between the plate and the actual foundation The following equation provides the necessary adjustments

$$K_s = K_1\left(\frac{B+1}{2B}\right)^2$$

where

K_s = Adjusted modulus of subgrade reaction, (tcf)

K_1 = Modulus of subgrade reaction for a 1-foot square plate, (tcf)

B = Width of slab or footing, (feet)

The total and differential settlements of the proposed facilities supported by the foundation recommended above were estimated to be less than 1 inch and 3/4 inch, respectively CH2M HILL believes that the estimated settlements are within tolerable limits for structures of this type

5.7 Lateral Earth Pressure

Granular fill, as recommended in Section 5.3, Fill and Backfill, should be used to backfill behind walls For walls backfilled with granular fill, the following equivalent earth pressures are recommended for calculating at-rest and active and passive earth pressures above the groundwater table

- Equivalent at-rest earth pressure 58 pounds per cubic foot (pcf)
- Equivalent active earth pressure· 39 pcf
- Equivalent passive earth pressure 345 pcf

5.8 Thrust Blocks and Thrust Restraint

Assuming soil is placed in accordance with the aforementioned recommendations, CH2M HILL recommends the following soil engineering properties for restrained pipe joint design

- Friction angle (ϕ) = 30°
- Cohesion (c) = 0 psf
- Unit weight (γ) = 115 pcf
- Soil/ductile iron pipe contact friction angle (δ) = 30°

5.9 Pavement Design Recommendations

New access roads and parking areas are proposed as part of the facility improvements The subgrade to be paved should be prepared as outlined in Section 5.1, Subgrade Preparation For the pavement design, a Limerock Bearing Ratio (LBR) of 15 for the compacted subgrade is recommended

The road base course should be constructed of limerock meeting Section 911 requirements of the *Florida Department of Transportation Standard Specifications for Road and Bridge Construction* The asphalt concrete should meet the requirements of Type SP-12 5 asphalt concrete, as stated in Section 331 of those specifications

5.10 Geohazard Assessment

5.10.1 Lithostratigraphy

The following discussion on the geology of Citrus County is largely from the Florida Geological Survey (Campbell and Scott, 1992) The oldest stratigraphic unit underlying Citrus County is the Avon Park Formation The Avon Park Formation consists of dolostone and silt-sized dolomite The Ocala Limestone overlies the Avon Park Formation and consists of very pure, highly fossiliferous grainstones and packstones The Ocala Limestone is overlain in places by the Suwannee Limestone, weathered Hawthorn sediments, unnamed dune sands or unnamed undifferentiated dune sands The Suwannee Limestone is found within the Brooksville Ridge, forming the tops of some of the hills in the central portion of the county and in a broader area in the southern part of the county The Suwannee Limestone consists of fossiliferous packstones and occasional grainstones which are slightly quartz sandy, predominantly in the lower part of the unit The Hawthorn Group, where present, overlies the Suwannee Limestone

The Hawthorn Group is only present as small outliers capping some of the highest hills in the central portion of the County The Hawthorn Group consists of clays, clayey sands, sandy, clayey limestone, all of which may be phosphatic The Hawthorn Group is overlain by weathered/reworked Hawthorn sediments and/or by undifferentiated sediments

Weathered Hawthorn sediments form the bulk of the Brooksville Ridge in Citrus County. These sediments have been called the Alachua Formation in the past and consist primarily of red, orange, and light yellow variably clayey sands Weathered Hawthorn sediments are overlain by variable thicknesses of undifferentiated sediments. Dune sands are present along the western flank of the Brooksville Ridge.

5.10.2 Hydrogeology

The hydrogeologic units that form the hydrogeologic framework in Citrus County include

1 A discontinuous siliciclastic surficial aquifer system,

2 A discontinuous, siliciclastic intermediate confining unit, and

3 The thick predominantly carbonate Upper Floridan aquifer (Knochenmus and Yobbi, 2001)

Although relatively thick saturated siliciclastic deposits are found in Citrus County, a hydraulically separated, regionally extensive surficial aquifer system does not exist The clay confining unit is breached by numerous sinkholes, allowing hydraulic connection between the aquifers Where clay deposits are sufficiently thick, perched water tables and lakes may be present

5.10.3 Physiography

The Brooksville Ridge trends northwest-southeast and has an irregular land surface It is characterized by rolling hills that consist of remnant marine deposits modifies by sub aerial erosion, karstification, and wave action Land surface altitudes vary by more than 100 feet over short distances and range from 70 to 275 feet above sea level Solution-feature density on top of the Brooksville Ridge ranges from 0 to 5 features per square mile

The available evidence suggests that catastrophic sinkhole formation as a result of the proposed construction activity is unlikely for the following reasons

- 12 SPT borings were made in conformance with ASTM D-1586 by driving a 2-inch outside diameter split-spoon sampler with an automatically controlled 140-pound hammer falling 30 inches Continuous samples were taken to 10 feet below ground surface and at 5-foot intervals thereafter The bore holes were advanced with rotary drilling and cased with bentonite mud using a rotary drill rig mounted on a truck

- 18 CPT soundings were completed at the project site in accordance with ASTM D-3441 using an electrical cone During testing, the penetrometer was hydraulically advanced at a rate of 2 cm/sec The cone tip resistance, sleeve friction, and pore water pressure were recorded at 5 cm intervals as the cone was advanced The cone soundings were pushed to 20 to 50 feet below the ground surface

- The soil borings and soundings generally encountered medium dense to dense sand, silty sand, and clayey sand to the maximum borings and sounding depth of 80 feet The water table was not encountered in any of the borings

- None of the borings or soundings encountered features that would suggest the presence of solution features or sinkholes

- The project site is located on the Brooksville Ridge in Citrus County The surficial deposits (mostly sand) resting on top of the limestone in this area are fairly thick There is little or no confinement of the Upper Floridan aquifer system (UFAS) in this area. Lithologically, it is sand resting on limestone. Any potential voids that develop in the upper mantle of the limestone will likely be filled with sand. As a result, development of a cover collapse or catastrophic sinkhole is unlikely One small diameter (less than a few feet in diameter) cover subsidence sinkhole has been reported on the project site. This feature is the surface expression of sand infilling small voids in the underlying limestone and typically does not result in direct connection of land surface with the UFAS

- Land surface of the project site ranges from 100 to 135 feet National Geodetic Vertical Datum (NGVD) in elevation (SCS Engineers, 2008). The elevation of the top of the UFAS is estimated to range from +60 feet to -40 feet NGVD The elevation of the potentiometric surface of the UFAS is estimated at +5 feet NGVD However, the term potentiometric surface should only be used in associating with confined aquifers There is little or no confinement in Citrus County. The appropriate term is water level The elevation of the potentiometric surface or water level is a gross estimate because it is based on limited regional data In any case, it is reasonablt to conclude that the there is a relatively thick sequence of sand sitting on top of limestone which likely contains some degree of karstification. The water level associated with the UFAS is relatively close to the top of limestone in terms of elevation The water level was not encountered in any of the onsite borings These factors taken together indicate that significant sinkhole formation has a low probability of occurrence. If sinkholes do occur, they will likely be small as discussed below

- The Florida Geological Survey (FGS) Sinkhole Database was accessed to determine the frequency of sinkhole occurrence within 5 miles of the project site Figure 3 shows the occurrence of sinkholes within 1, 2, and 5 miles of the project site One sinkhole was reported within a 1-mile radius Three additional sinkholes were reported between 1 and 2 miles of the project site. An additional 13 sinkholes have been reported between 2 and 5 miles from the project site The average diameter of the sinkholes was 5 feet and the average depth was 4 feet Most of the sinkholes were described as circular Of the 18 reported sinkholes, the most recent was reported in 2003 Only one sinkhole was reported since 2000 Three sinkholes were reported in the 1990s, and the remaining sinkholes were reported in the 1980s Clearly, this is not active area for sinkhole development When sinkholes do occur, they are relatively small

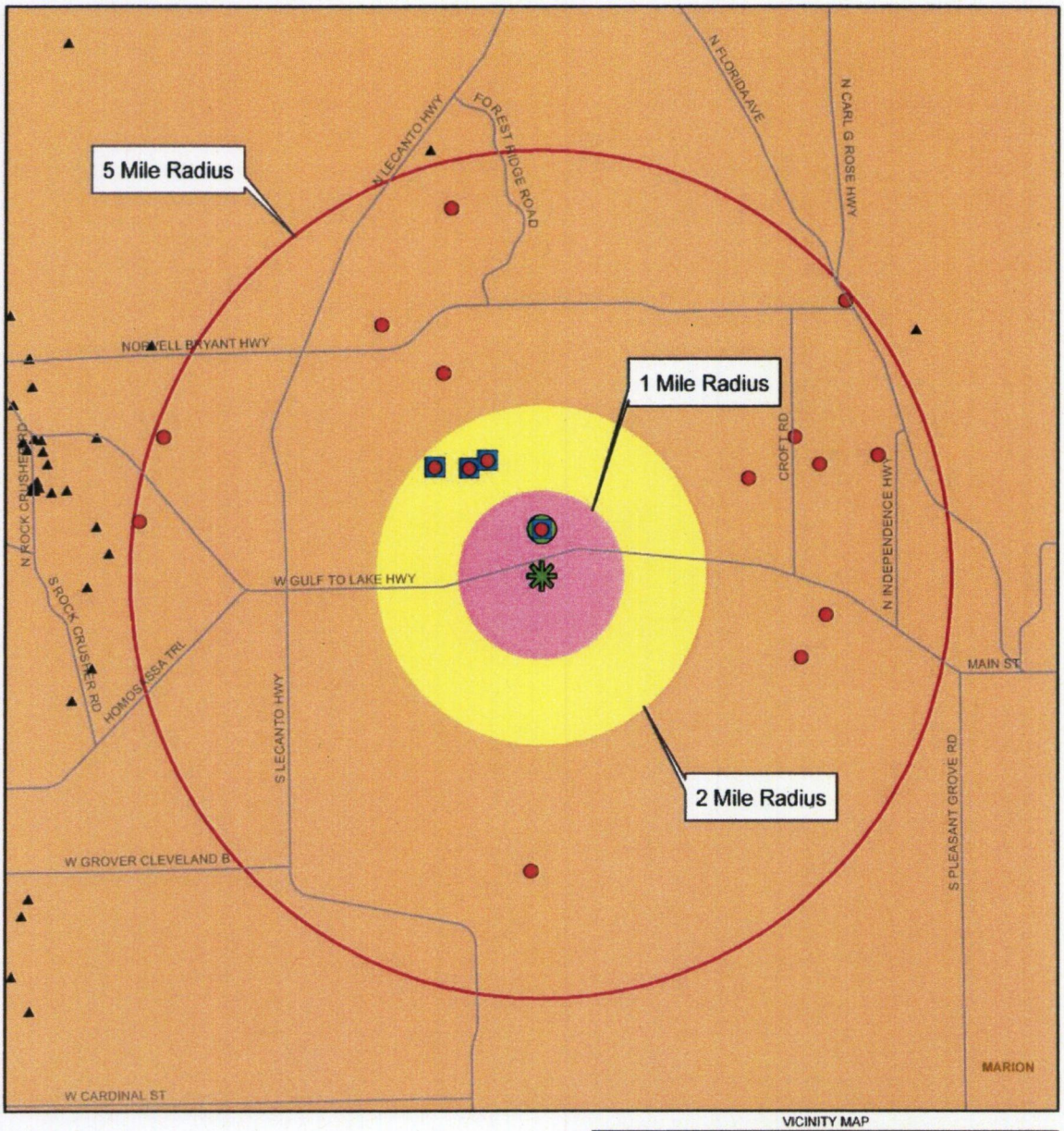
- The project site and surrounding area have been evaluated for the presence of photo lineaments (SCS, 2008; PBSJ, 1988) Both reports state that no photo lineaments pass through the project site. Furthermore, the PBSJ report (August 1988) concluded that no active sinkholes or solution features existed near the landfill

5.11 Summary

The findings and recommendations of this investigation are summarized below.

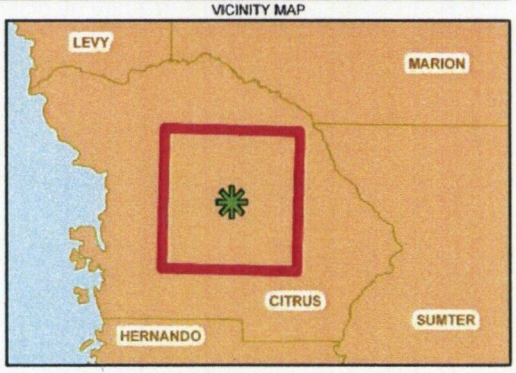
- The subgrade for footings, slabs, and pavement should be proof rolled with 15 overlapping passes using a 10-ton or heavier vibratory roller

- The subgrade for the transfer station building should be over-excavated to the bottom elevations of the existing borrow pit, the bottom of the excavation should be proof rolled, and the pit should be backfilled with compacted granular fill.
- Side slopes for excavations shallower than 5 feet should be no steeper than 1 5 H to 1 V. Excavations deeper than 5 feet should be sloped in accordance with OSHA requirements.
- Before fill, backfill, or concrete is placed, the upper 12 inches of the subgrade should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D-1557
- Granular fill should be used for embankment construction and should be placed beneath structures, piping, and roads in maximum 8-inch lifts. It should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D-1557
- To support the proposed facility, spread footings are recommended with a maximum allowable bearing net pressure of 2,000 psf. The footings should be at least 3 feet wide A modulus of subgrade reaction of 150 tcf should be used for the design of slabs-on-grade or mat foundation
- A LBR of 15 should be used in pavement design for the compacted subgrade materials



Source:
Sinkhome : Florida Department of Environmental Protection, FDEP, April 2007

VICINITY MAP



LEGEND

- Landfill
- Sinkholes within 1 Miles Radius
- Sinkholes within 2 Miles Radius
- Sinkholes within 5 Miles Radius
- All other Sinkhole
- 1 Mile Radius
- 2 Mile Radius
- 5 Mile Radius

N

0 5,000 10,000
Feet

FIGURE 3
Sinkhole Occurrence
Citrus County

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SECTION 6

Limitations

This report has been prepared for the exclusive use of Citrus County, for specific application to the proposed Solid Waste Transfer Station This report is prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made

The analyses and recommendations in this report are based on the data obtained from the soil borings and soundings The borings and soundings indicate soil conditions only at specific locations and times, and only to the depths penetrated They do not necessarily reflect strata variations that may exist between the boring locations. If variations in subsurface conditions from those described are noted during construction, recommendations in this report may need to be re-evaluated

If any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing CH2M HILL is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the express written authorization of CH2M HILL

SECTION 7

Works Cited

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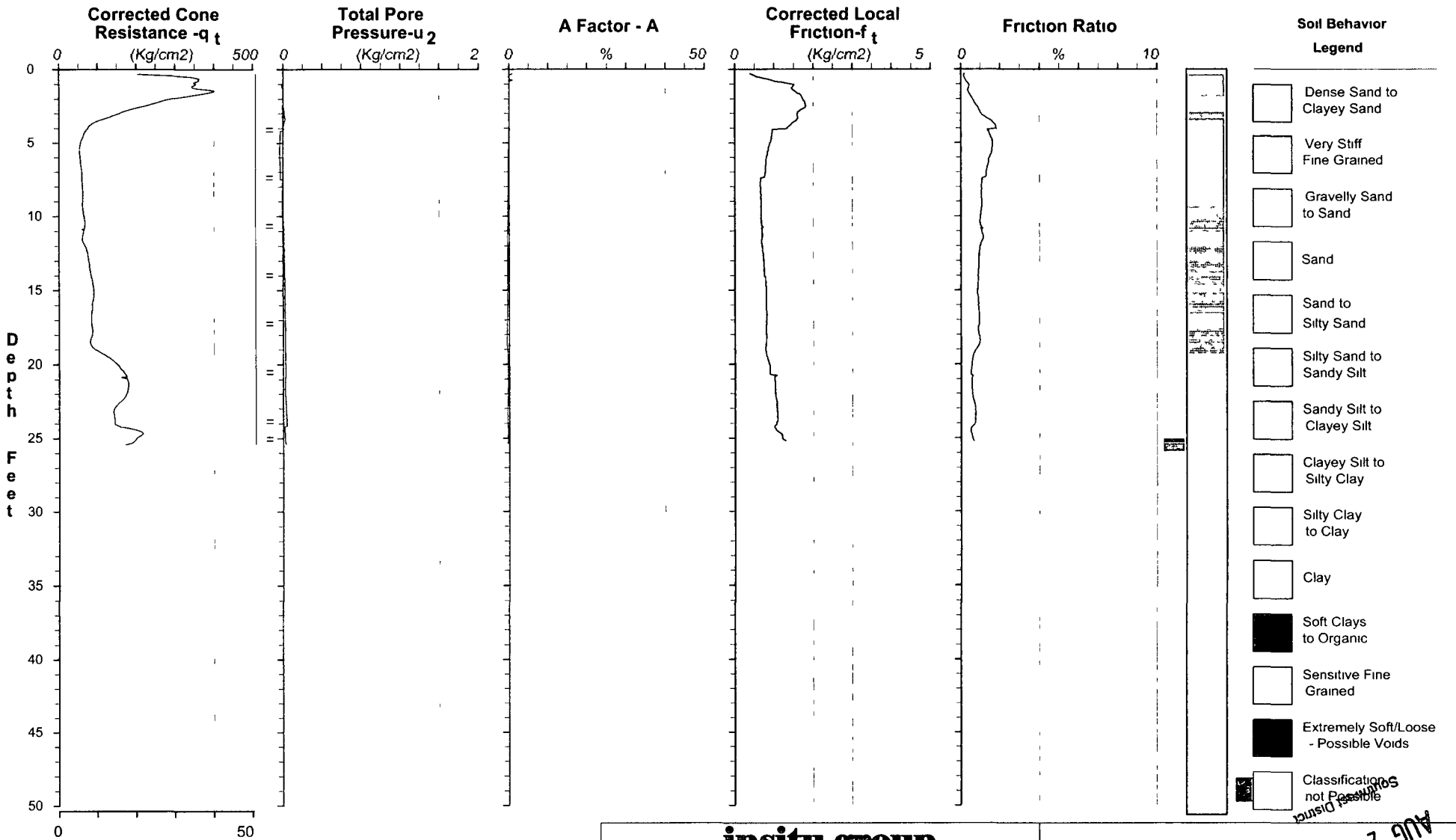
Post, Buckley, Schuh & Jernigan, Inc (PBSJ) 1988 Citrus County Central Sanitary Landfill Expansion Site Groundwater Monitoring Plan Prepared for Board of County Commissioners, Citrus County August

SCS Engineers, Inc (SCS) 2008 Citrus County Landfill Karst Sensitive Area Assessment December 18

Appendix A
Soil Boring and Sounding Logs

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-1



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-1
Test-Date 06-05-2008 15 35 23

AUG 26 2009
Dept Of Environmental Protection
Solutions Distrct

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

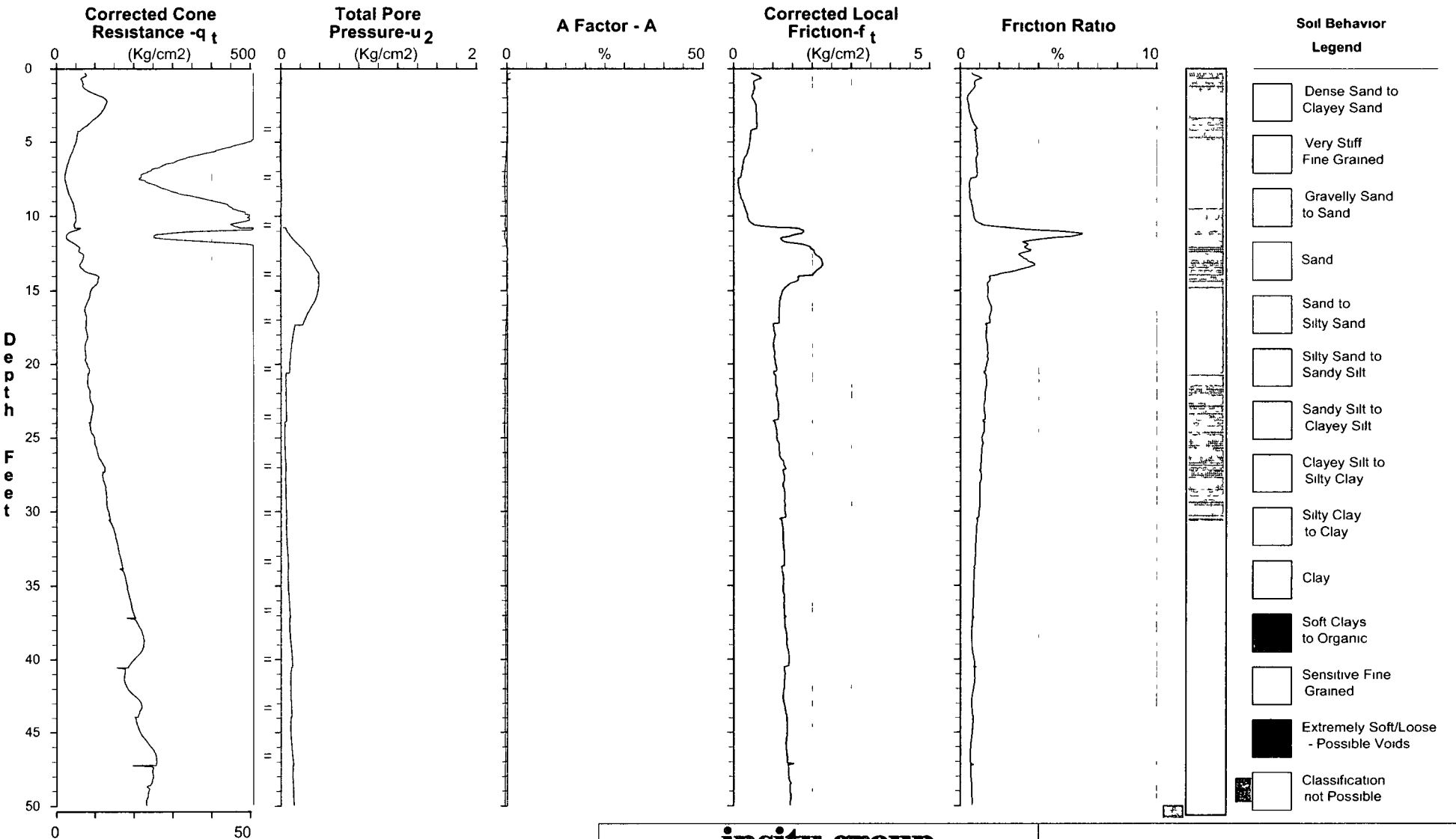
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	GRAVELLY SAND TO SAND	361 72	1 22	60	053	>85%	>43	795 8	--	--	--	--
2	SAND	288 04	1 72	58	107	>85%	>43	633 7	--	--	--	--
3	SAND TO SILTY SAND	148 62	1 63	37	163	>85%	>43	326 9	--	--	--	--
4	SILTY SAND TO SANDY SILT	72 45	1 14	24	189	58%-65%	41-43	159 4	--	--	--	--
5	SILTY SAND TO SANDY SILT	55 71	0 89	19	214	50%-58%	39-41	122 5	--	--	--	--
6	SILTY SAND TO SANDY SILT	54 76	0 8	18	24	50%-58%	39-41	120 4	--	--	--	--
7	SILTY SAND TO SANDY SILT	59 03	0 74	20	266	50%-58%	39-41	129 8	--	--	--	--
8	SILTY SAND TO SANDY SILT	60 9	0 65	20	291	50%-58%	39-41	133 9	--	--	--	--
9	SILTY SAND TO SANDY SILT	61 48	0 65	20	317	50%-58%	37-39	135 2	--	--	--	--
10	SAND TO SILTY SAND	65 73	0 66	16	343	50%-58%	37-39	144 6	--	--	--	--
11	SILTY SAND TO SANDY SILT	62 71	0 68	21	368	50%-58%	37-39	137 9	--	--	--	--
12	SAND TO SILTY SAND	70 06	0 69	18	394	50%-58%	37-39	154 1	--	--	--	--
13	SAND TO SILTY SAND	78 7	0 73	20	42	58%-65%	37-39	173 1	--	--	--	--
14	SAND TO SILTY SAND	85 85	0 76	21	446	58%-65%	37-39	188 8	--	--	--	--
15	SAND TO SILTY SAND	90 37	0 79	23	471	58%-65%	37-39	198 8	--	--	--	--
16	SAND TO SILTY SAND	86 44	0 8	22	497	58%-65%	37-39	190 1	--	--	--	--
17	SAND TO SILTY SAND	85 47	0 79	21	523	50%-58%	37-39	188	--	--	--	--
18	SAND TO SILTY SAND	84 1	0 79	21	548	50%-58%	37-39	185	--	--	--	--
19	SAND TO SILTY SAND	112 89	0 79	28	574	58%-65%	37-39	248 3	--	--	--	--
20	SAND	159 49	0 88	32	597	65%-85%	39-41	350 8	--	--	--	--
21	SAND	176 46	1 02	35	62	65%-85%	39-41	388 2	--	--	--	--
22	SAND	165 11	1 04	33	644	65%-85%	39-41	363 2	--	--	--	--
23	SAND	142 85	1 07	29	667	58%-65%	39-41	314 2	--	--	--	--
24	SAND	179 02	1 07	36	69	65%-85%	39-41	393 8	--	--	--	--
25	---------- END OF SOUNDING ----------	190 8										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-1
Test Date Test-Date 06-05-2008 15 35 23

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-2



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-2
Test-Date 06-05-2008 14 47 36

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND TO SILTY SAND	69 55	0 55	17	056	58%-65%	>43	153	--	--	--	--
2	SAND	118 73	0 49	24	109	>85%	>43	261 2	--	--	--	--
3	SAND	111 99	0 57	22	163	65%-85%	>43	246 3	--	--	--	--
4	SAND TO SILTY SAND	67 26	0 5	17	189	58%-65%	41-43	147 9	--	--	--	--
5	SILTY SAND TO SANDY SILT	48 18	0 39	16	214	50%-58%	39-41	106	--	--	--	--
6	SILTY SAND TO SANDY SILT	34 29	0 29	11	24	50%-58%	37-39	75 4	--	--	--	--
7	SILTY SAND TO SANDY SILT	23 34	0 18	8	266	42%-50%	35-37	51 3	--	--	--	--
8	SILTY SAND TO SANDY SILT	27 14	0 13	9	291	42%-50%	35-37	59 7	--	--	--	--
9	SILTY SAND TO SANDY SILT	41 27	0 23	14	317	50%-58%	37-39	90 8	--	--	--	--
10	SILTY SAND TO SANDY SILT	48 1	0 38	16	343	50%-58%	37-39	105 8	--	--	--	--
11	CLAYEY SILT TO SILTY CLAY	37 72	1 42	19	373	--	--	--	2 47	2 6	0	>6
12	SANDY SILT TO CLAYEY SILT	56 17	1 84	22	401	50%-58%	37-39	123 5	--	--	--	--
13	SANDY SILT TO CLAYEY SILT	65 2	2 21	26	43	50%-58%	37-39	143 4	--	--	--	--
14	SILTY SAND TO SANDY SILT	102 75	1 71	34	455	58%-65%	39-41	226	--	--	--	--
15	SILTY SAND TO SANDY SILT	88 02	1 24	29	481	58%-65%	37-39	193 6	--	--	--	--
16	SILTY SAND TO SANDY SILT	75 57	1 16	25	507	50%-58%	37-39	166 2	--	--	--	--
17	SILTY SAND TO SANDY SILT	76 62	1 07	26	532	50%-58%	37-39	168 5	--	--	--	--
18	SILTY SAND TO SANDY SILT	77 47	1 03	26	558	50%-58%	37-39	170 4	--	--	--	--
19	SILTY SAND TO SANDY SILT	74 2	1 03	25	584	50%-58%	37-39	163 2	--	--	--	--
20	SILTY SAND TO SANDY SILT	80 95	1 05	27	609	50%-58%	37-39	178 1	--	--	--	--
21	SILTY SAND TO SANDY SILT	81 06	1 07	27	635	50%-58%	37-39	178 3	--	--	--	--
22	SAND TO SILTY SAND	87 7	1 1	22	661	50%-58%	37-39	192 9	--	--	--	--
23	SAND TO SILTY SAND	91 99	1 13	23	686	50%-58%	37-39	202 3	--	--	--	--
24	SAND TO SILTY SAND	88 51	1 06	22	712	50%-58%	35-37	194 7	--	--	--	--
25	SAND TO SILTY SAND	99 97	1 12	25	738	50%-58%	37-39	219 9	--	--	--	--
26	SAND TO SILTY SAND	111 38	1 2	28	763	50%-58%	37-39	245	--	--	--	--
27	SAND TO SILTY SAND	121 97	1 28	30	789	58%-65%	37-39	268 3	--	--	--	--
28	SAND TO SILTY SAND	126 2	1 27	32	815	58%-65%	37-39	277 6	--	--	--	--
29	SAND TO SILTY SAND	130 09	1 29	33	84	58%-65%	37-39	286 2	--	--	--	--
30	SAND TO SILTY SAND	137 63	1 26	34	866	58%-65%	37-39	302 7	--	--	--	--
31	SAND	150 14	1 25	30	889	58%-65%	37-39	330 3	--	--	--	--
32	SAND	158 72	1 27	32	913	58%-65%	37-39	349 1	--	--	--	--
33	SAND	167 1	1 26	33	936	58%-65%	37-39	367 6	--	--	--	--
34	SAND	176 81	1 25	35	959	65%-85%	37-39	388 9	--	--	--	--
35	SAND	185 02	1 26	37	982	65%-85%	37-39	407	--	--	--	--
36	SAND	194 37	1 28	39	1 005	65%-85%	37-39	427 6	--	--	--	--
37	SAND	206 11	1 3	41	1 029	65%-85%	39-41	453 4	--	--	--	--
38	SAND	223 09	1 34	45	1 052	65%-85%	39-41	490 7	--	--	--	--
39	SAND	214 92	1 38	43	1 075	65%-85%	37-39	472 8	--	--	--	--
40	SAND	182 44	1 33	36	1 098	58%-65%	37-39	401 3	--	--	--	--

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-2
Test Date Test-Date 06-05-2008 14 47 36

STANDARD SOIL BEHAVIOR TABLE

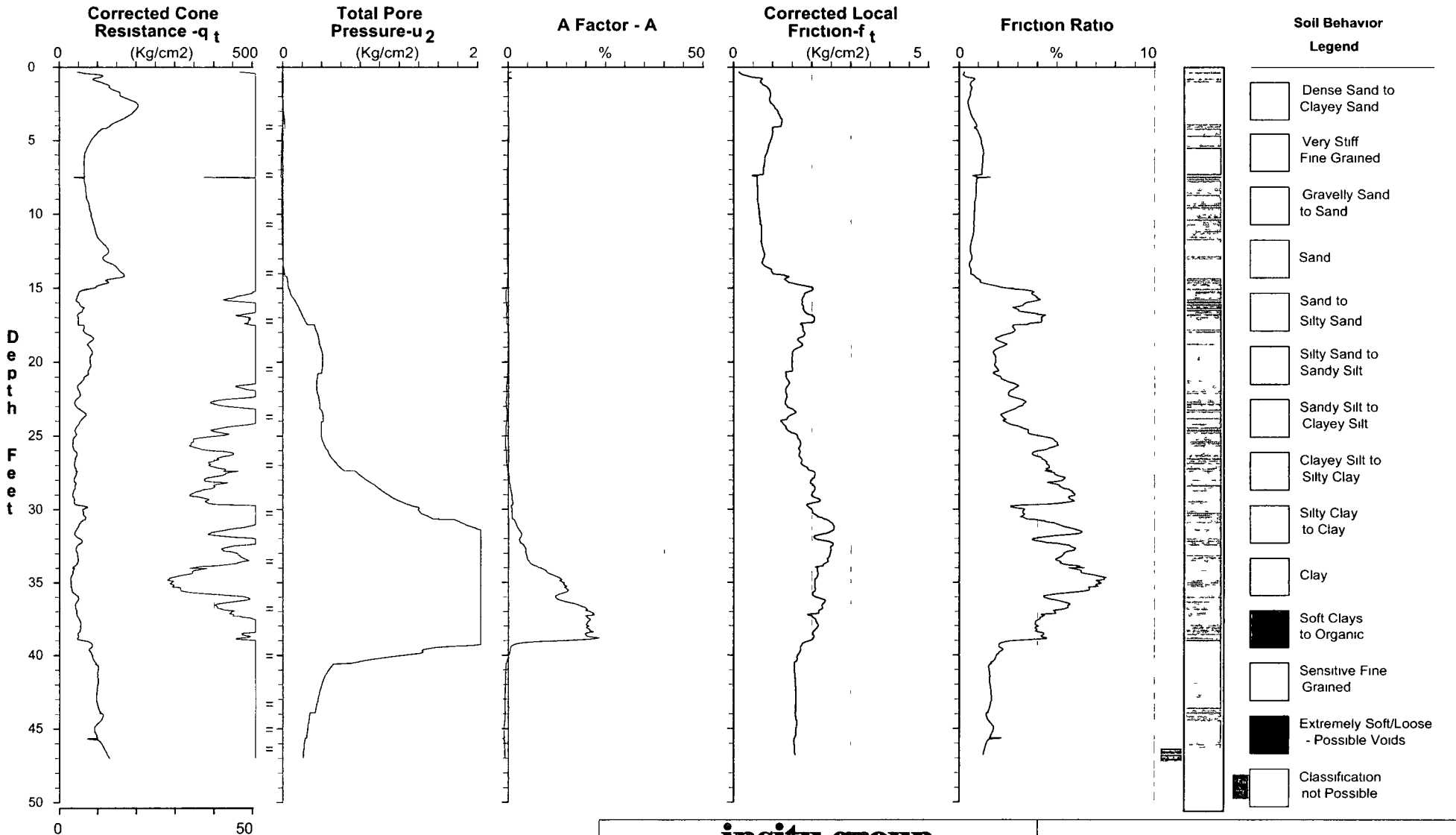
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
41	SAND	177 28	1 29	35	1 122	58%-65%	37-39	390	--	--	--	--
42	SAND	203 87	1 26	41	1 145	65%-85%	37-39	448 5	--	--	--	--
43	SAND	212 68	1 32	43	1 168	65%-85%	37-39	467 9	--	--	--	--
44	SAND	209 57	1 35	42	1 191	65%-85%	37-39	461	--	--	--	--
45	SAND	231 51	1 34	46	1 215	65%-85%	37-39	509 3	--	--	--	--
46	SAND	254 55	1 35	51	1 238	>85%	39-41	560	--	--	--	--
47	SAND	246 82	1 39	49	1 261	65%-85%	37-39	543	--	--	--	--
48	SAND	240 6	1 43	48	1 284	65%-85%	37-39	529 3	--	--	--	--
49	SAND	232 83	1 44	47	1 307	65%-85%	37-39	512 2	--	--	--	--
50 2	---------- END OF SOUNDING ----------	226 43										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-2
Test Date Test-Date 06-05-2008 14 47 36

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-3



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-3
Test-Date 06-05-2008 14 10 17

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	114 03	0 68	23	053	>85%	>43	250 8	--	--	--	--
2	SAND	172 29	0 93	34	107	>85%	>43	379	--	--	--	--
3	SAND	189 38	1 12	38	161	>85%	>43	416 6	--	--	--	--
4	SAND TO SILTY SAND	124 42	1 09	31	186	>85%	>43	273 7	--	--	--	--
5	SAND TO SILTY SAND	82 67	0 93	21	212	58%-65%	41-43	181 8	--	--	--	--
6	SILTY SAND TO SANDY SILT	66 45	0 82	22	238	58%-65%	39-41	146 1	--	--	--	--
7	SILTY SAND TO SANDY SILT	62 92	0 7	21	263	50%-58%	39-41	138 4	--	--	--	--
8	SAND TO SILTY SAND	67 4	0 6	17	289	58%-65%	39-41	148 2	--	--	--	--
9	SAND TO SILTY SAND	73 98	0 61	18	315	58%-65%	39-41	162 7	--	--	--	--
10	SAND TO SILTY SAND	83 9	0 65	21	34	58%-65%	39-41	184 5	--	--	--	--
11	SAND TO SILTY SAND	94 76	0 7	24	366	58%-65%	39-41	208 4	--	--	--	--
12	SAND	119 24	0 72	24	389	65%-85%	39-41	262 3	--	--	--	--
13	SAND	128 66	0 77	26	413	65%-85%	39-41	283	--	--	--	--
14	SAND	150 42	1 22	30	436	>85%	41-43	330 9	--	--	--	--
15	SANDY SILT TO CLAYEY SILT	67 27	1 85	27	464	50%-58%	37-39	147 9	--	--	--	--
16	SANDY SILT TO CLAYEY SILT	53 69	1 76	21	492	50%-58%	35-37	118 1	--	--	--	--
17	CLAYEY SILT TO SILTY CLAY	52 07	1 89	26	523	--	--	--	3 4	2 7	0	>6
18	SILTY SAND TO SANDY SILT	76 31	1 73	25	548	50%-58%	37-39	167 8	--	--	--	--
19	SILTY SAND TO SANDY SILT	80 82	1 58	27	574	50%-58%	37-39	177 8	--	--	--	--
20	SILTY SAND TO SANDY SILT	78 79	1 46	26	6	50%-58%	37-39	173 3	--	--	--	--
21	SANDY SILT TO CLAYEY SILT	59 52	1 36	24	628	50%-58%	35-37	130 9	--	--	--	--
22	SANDY SILT TO CLAYEY SILT	47 7	1 33	19	656	42%-50%	33-35	104 9	--	--	--	--
23	SANDY SILT TO CLAYEY SILT	56 72	1 44	23	684	42%-50%	35-37	124 7	--	--	--	--
24	SANDY SILT TO CLAYEY SILT	47 55	1 31	19	712	42%-50%	33-35	104 6	--	--	--	--
25	SILTY CLAY to CLAY	36 4	1 66	24	743	--	--	--	2 33	2 1	01	6
26	CLAYEY SILT TO SILTY CLAY	41 14	1 69	21	773	--	--	--	2 64	2 4	0	6
27	SILTY CLAY to CLAY	41 57	1 93	28	804	--	--	--	2 66	2 1	01	6
28	CLAYS	38 61	2 02	39	834	--	--	--	2 46	1 9	02	6
29	SILTY CLAY to CLAY	43 18	2 03	29	865	--	--	--	2 76	2 1	01	6
30	SANDY SILT TO CLAYEY SILT	62 8	2 17	25	893	42%-50%	33-35	138 1	--	--	--	--
31	CLAYS	44 34	2 43	44	923	--	--	--	2 83	1 8	02	6
32	SILTY CLAY to CLAY	49 15	2 4	33	954	--	--	--	3 15	2	01	6
33	CLAYS	45 57	2 39	46	985	--	--	--	2 91	1 9	02	6
34	CLAYS	32 41	2 12	32	1 015	--	--	--	2 03	1 5	03	6
35	CLAYS	33 87	2 05	34	1 046	--	--	--	2 12	1 6	02	6
36	SILTY CLAY to CLAY	43 93	2 25	29	1 076	--	--	--	2 78	1 9	01	6
37	CLAYEY SILT TO SILTY CLAY	49 31	2 06	25	1 107	--	--	--	3 14	2 3	0	6
38	CLAYEY SILT TO SILTY CLAY	50 82	2 06	25	1 137	--	--	--	3 24	2 4	0	6
39	SILTY SAND TO SANDY SILT	81 55	1 73	27	1 163	42%-50%	33-35	179 4	--	--	--	--
40	SILTY SAND TO SANDY SILT	94 2	1 57	31	1 189	50%-58%	33-35	207 2	--	--	--	--

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-3
Test Date Test-Date 06-05-2008 14 10 17

STANDARD SOIL BEHAVIOR TABLE

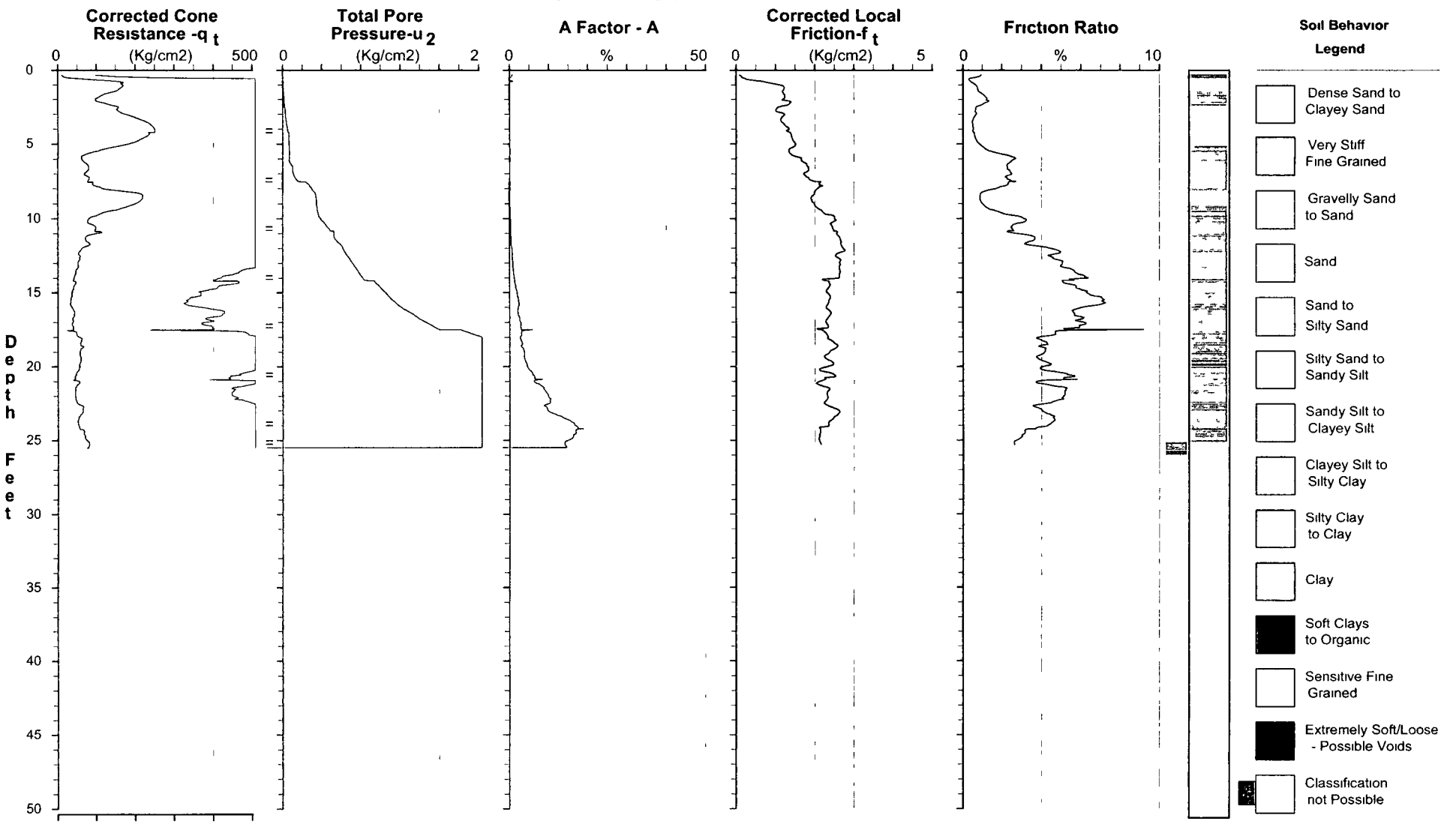
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
41	SILTY SAND TO SANDY SILT	100 06	1 56	33	1 214	50%-58%	35-37	220 1	--	--	--	--
42	SILTY SAND TO SANDY SILT	97 36	1 58	32	1 24	50%-58%	33-35	214 2	--	--	--	--
43	SILTY SAND TO SANDY SILT	103 42	1 57	34	1 266	50%-58%	35-37	227 5	--	--	--	--
44	SILTY SAND TO SANDY SILT	101 96	1 59	34	1 291	50%-58%	33-35	224 3	--	--	--	--
45	SILTY SAND TO SANDY SILT	98 26	1 56	33	1 317	50%-58%	33-35	216 1	--	--	--	--
46 4	---------- END OF SOUNDING ----------	122 09										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-3
Test Date Test-Date 06-05-2008 14 10 17

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-4



Coarse Scale

Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-4
Test-Date 06-05-2008 13 47 45

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

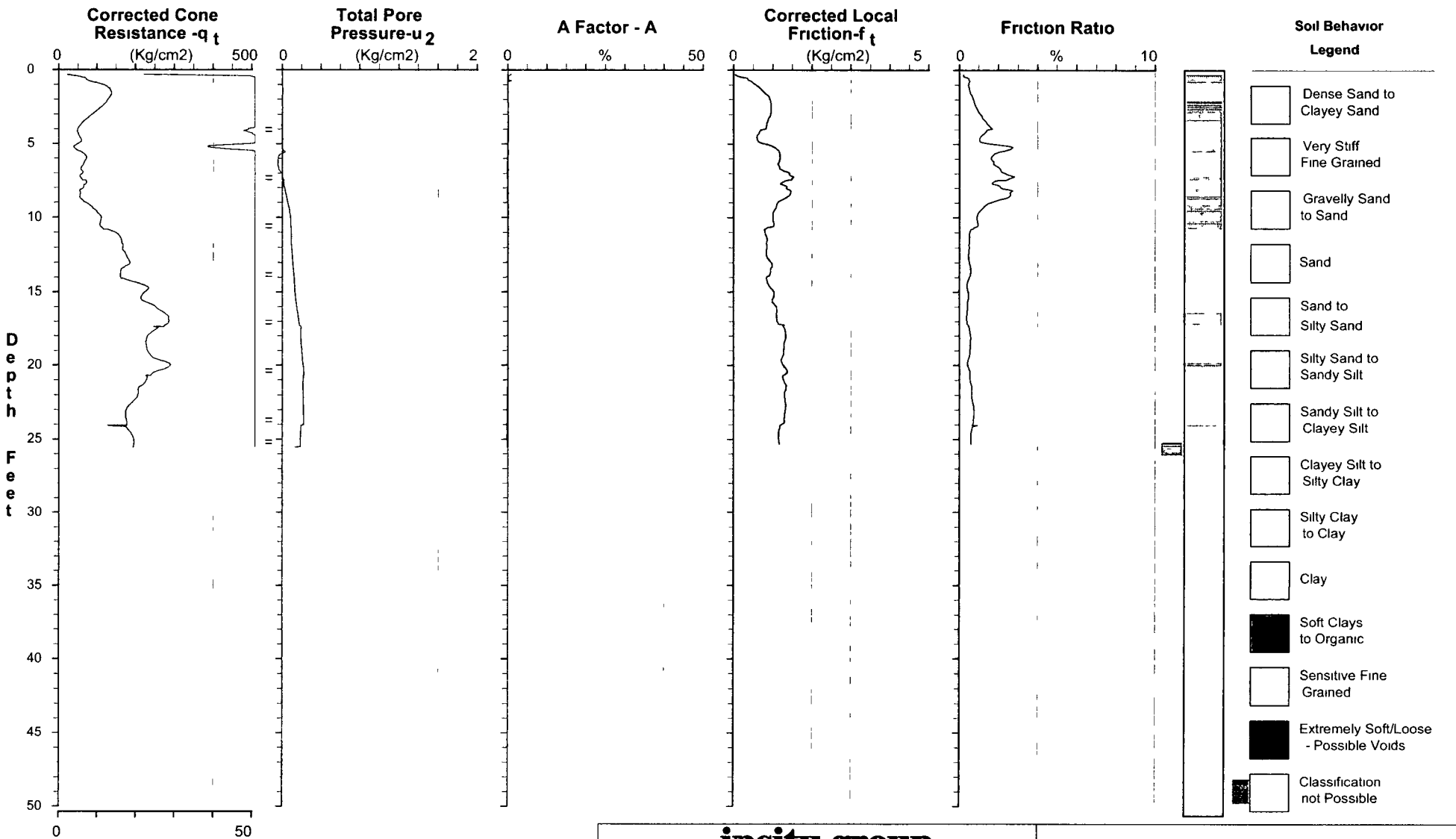
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	144 76	0 9	29	053	>85%	>43	318 4	--	--	--	--
2	SAND TO SILTY SAND	116 5	1 25	29	109	>85%	>43	256 3	--	--	--	--
3	SAND	186 28	1 12	37	163	>85%	>43	409 8	--	--	--	--
4	SAND	240 67	1 32	48	186	>85%	>43	529 4	--	--	--	--
5	SAND	161 61	1 43	32	21	>85%	>43	355 5	--	--	--	--
6	SILTY SAND TO SANDY SILT	70 62	1 62	24	235	58%-65%	39-41	155 3	--	--	--	--
7	SILTY SAND TO SANDY SILT	77 95	1 84	26	261	58%-65%	39-41	171 4	--	--	--	--
8	SAND TO SILTY SAND	154 23	2 04	39	287	>85%	>43	339 3	--	--	--	--
9	SAND TO SILTY SAND	179 91	2 02	45	312	>85%	>43	395 8	--	--	--	--
10	SANDY SILT TO CLAYEY SILT	90 36	2 43	36	34	58%-65%	39-41	198 8	--	--	--	--
11	SANDY SILT TO CLAYEY SILT	87 4	2 57	35	368	58%-65%	39-41	192 2	--	--	--	--
12	CLAYEY SILT TO SILTY CLAY	63 35	2 65	32	399	--	--	--	4 17	2 3	0	>6
13	SILTY CLAY to CLAY	51 3	2 63	34	43	--	--	--	3 37	1 9	01	>6
14	CLAYS	43 01	2 42	43	46	--	--	--	2 81	1 7	02	>6
15	CLAYS	35 81	2 34	36	491	--	--	--	2 33	1 5	02	>6
16	CLAYS	39 01	2 34	39	521	--	--	--	2 54	1 6	02	>6
17	CLAYS	38 78	2 25	39	552	--	--	--	2 52	1 7	02	>6
18	CLAYEY SILT TO SILTY CLAY	58 19	2 41	29	582	--	--	--	3 81	2 4	0	>6
19	CLAYEY SILT TO SILTY CLAY	58 47	2 35	29	613	--	--	--	3 82	2 4	0	>6
20	SILTY CLAY to CLAY	51 3	2 34	34	643	--	--	--	3 34	2 1	01	>6
21	SILTY CLAY to CLAY	47 37	2 22	32	674	--	--	--	3 07	2 1	01	>6
22	SILTY CLAY to CLAY	50 4	2 29	34	705	--	--	--	3 27	2 1	01	>6
23	CLAYEY SILT TO SILTY CLAY	58 68	2 51	29	735	--	--	--	3 82	2 3	0	>6
24	CLAYEY SILT TO SILTY CLAY	61 81	2 19	31	766	--	--	--	4 02	2 8	0	>6
25 1	---------- END OF SOUNDING ----------	77 87										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-4
Test Date Test-Date 06-05-2008 13 47 45

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-5



Coarse Scale

Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-5
Test-Date 06-05-2008 13 28 48

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

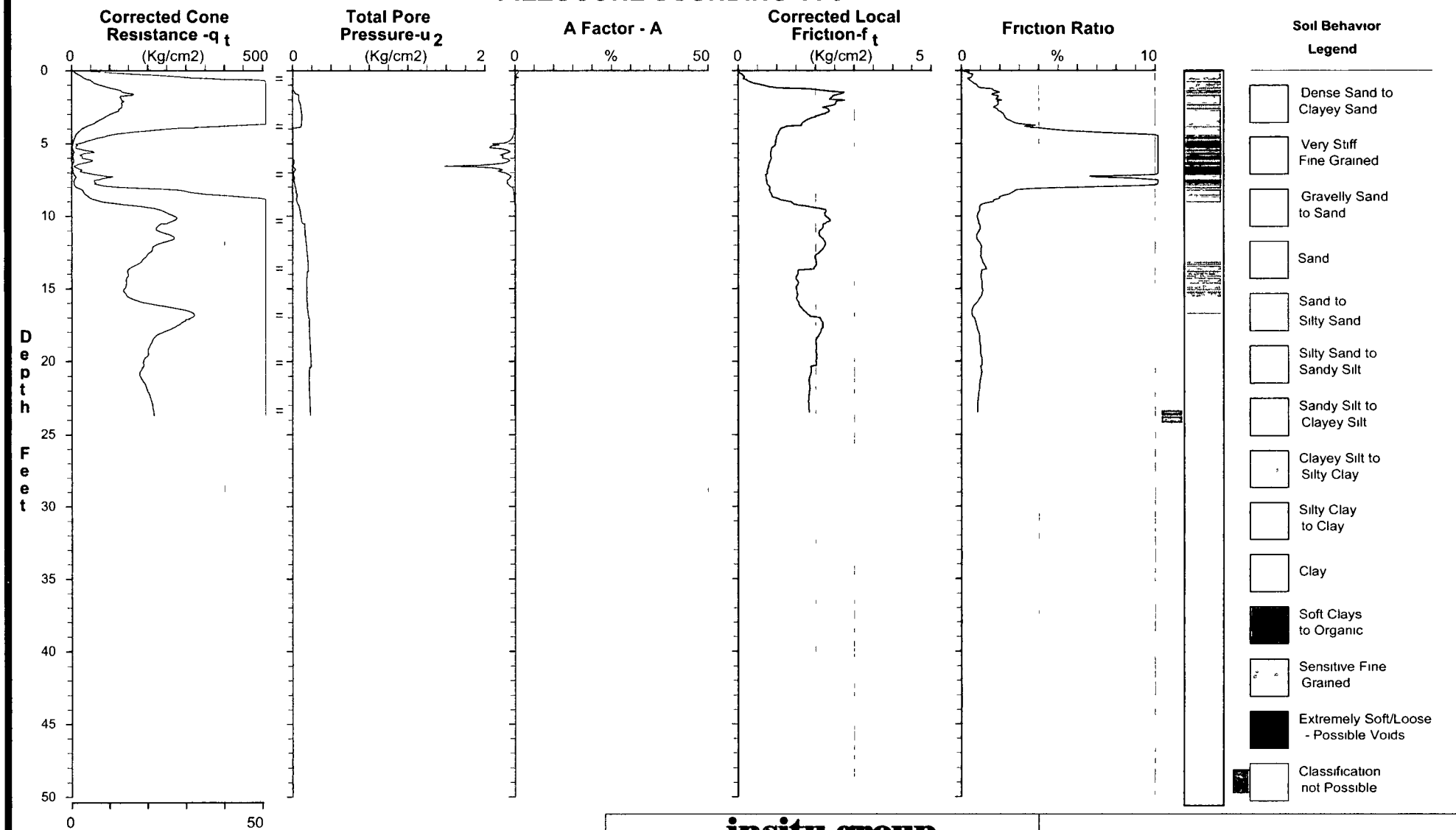
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	108 65	0 55	22	053	>85%	>43	239	--	--	--	--
2	SAND	126 65	0 91	25	107	>85%	>43	278 6	--	--	--	--
3	SAND TO SILTY SAND	84 83	0 92	21	163	58%-65%	41-43	186 6	--	--	--	--
4	SILTY SAND TO SANDY SILT	51 47	0 7	17	189	50%-58%	39-41	113 2	--	--	--	--
5	SILTY SAND TO SANDY SILT	49 51	0 86	17	214	50%-58%	39-41	108 9	--	--	--	--
6	SILTY SAND TO SANDY SILT	66 78	1 16	22	24	58%-65%	39-41	146 9	--	--	--	--
7	SANDY SILT TO CLAYEY SILT	60 37	1 38	24	268	50%-58%	39-41	132 8	--	--	--	--
8	SILTY SAND TO SANDY SILT	61 69	1 35	21	294	50%-58%	39-41	135 7	--	--	--	--
9	SILTY SAND TO SANDY SILT	76 04	1 14	25	32	58%-65%	39-41	167 2	--	--	--	--
10	SAND TO SILTY SAND	107 96	1 01	27	345	58%-65%	39-41	237 5	--	--	--	--
11	SAND	144 93	0 82	29	368	>85%	41-43	318 8	--	--	--	--
12	SAND	169 72	0 84	34	392	>85%	41-43	373 3	--	--	--	--
13	SAND	174 23	0 94	35	415	>85%	41-43	383 3	--	--	--	--
14	SAND	185 62	0 87	37	438	>85%	41-43	408 3	--	--	--	--
15	SAND	221 18	1	44	461	>85%	41-43	486 6	--	--	--	--
16	SAND	260 99	1 08	52	485	>85%	>43	574 1	--	--	--	--
17	SAND	270 17	1 2	54	508	>85%	>43	594 3	--	--	--	--
18	SAND	229 38	1 31	46	531	>85%	41-43	504 6	--	--	--	--
19	SAND	238 81	1 26	48	554	>85%	41-43	525 3	--	--	--	--
20	SAND	263 83	1 3	53	578	>85%	41-43	580 4	--	--	--	--
21	SAND	218 39	1 3	44	601	>85%	41-43	480 4	--	--	--	--
22	SAND	196 64	1 31	39	624	>85%	39-41	432 6	--	--	--	--
23	SAND	174 83	1 3	35	647	65%-85%	39-41	384 6	--	--	--	--
24	SAND	178 67	1 18	36	67	65%-85%	39-41	393	--	--	--	--
25 2	---------- END OF SOUNDING ----------	194 49										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-5
Test Date Test-Date 06-05-2008 13 28 48

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-6



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-6
Test-Date 06-05-2008 12 49 09

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND TO SILTY SAND	77 99	0 87	19	056	58%-65%	>43	171 5	--	--	--	--
2	SILTY SAND TO SANDY SILT	135 57	2 48	45	112	>85%	>43	298 2	--	--	--	--
3	SILTY SAND TO SANDY SILT	97 9	2 06	33	168	65%-85%	>43	215 3	--	--	--	--
4	SILTY CLAY to CLAY	26 65	1 18	18	199	--	--	--	1 76	2 2	02	>6
5	SOFT CLAYS TO ORGANIC	3 15	0 93	3	205	--	--	--	19	8	31	3
6	SOFT CLAYS TO ORGANIC	3 15	0 82	3	211	--	--	--	19	8	31	3
7	SOFT CLAYS TO ORGANIC	5 69	0 73	6	217	--	--	--	35	8	17	6
8	SILTY CLAY to CLAY	19 2	0 79	13	248	--	--	--	1 25	2 4	01	>6
9	SAND TO SILTY SAND	124 69	1 47	31	273	65%-85%	41-43	274 3	--	--	--	--
10	SAND	256 4	2 27	51	296	>85%	>43	564	--	--	--	--
11	SAND	242 59	2 13	49	32	>85%	>43	533 7	--	--	--	--
12	SAND	218 48	2 17	44	343	>85%	>43	480 6	--	--	--	--
13	SAND TO SILTY SAND	175 54	1 99	44	369	>85%	41-43	386 2	--	--	--	--
14	SAND TO SILTY SAND	145 78	1 53	36	394	>85%	41-43	320 7	--	--	--	--
15	SAND TO SILTY SAND	142 52	1 51	36	42	65%-85%	41-43	313 5	--	--	--	--
16	SAND	241 32	1 6	48	443	>85%	>43	530 9	--	--	--	--
17	SAND	296 81	2 07	59	466	>85%	>43	652 9	--	--	--	--
18	SAND	227 04	2 07	45	49	>85%	41-43	499 4	--	--	--	--
19	SAND	201 73	2 01	40	513	>85%	41-43	443 8	--	--	--	--
20	SAND	186 05	1 94	37	536	>85%	41-43	409 3	--	--	--	--
21	SAND	186 09	1 84	37	559	>85%	41-43	409 4	--	--	--	--
22	SAND	203 22	1 82	41	583	>85%	41-43	447	--	--	--	--
23 4	---------- END OF SOUNDING ----------	213 44										

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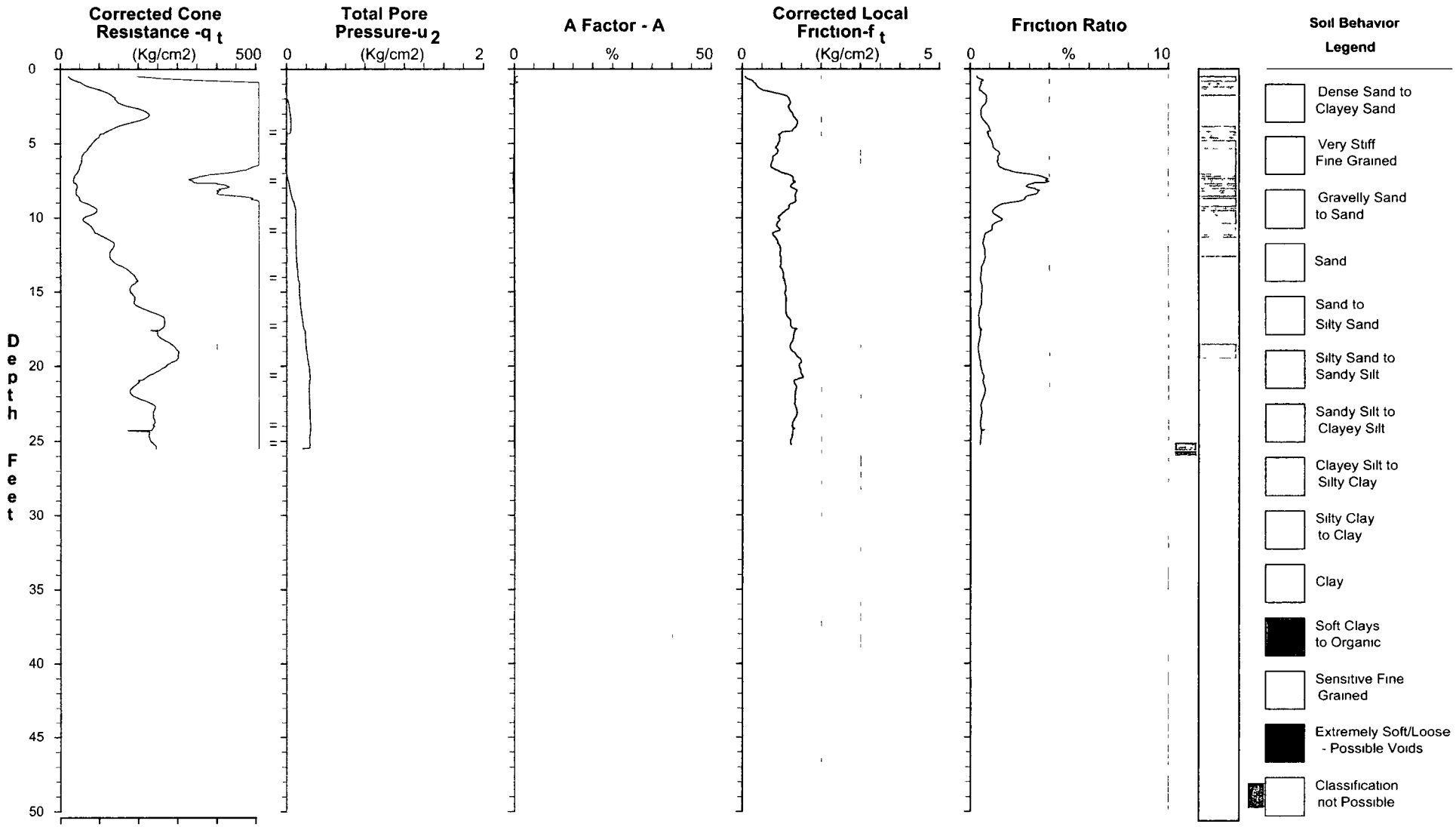
CH2M Hill
Citrus Co Transfer Station
Sounding # A-6
Test Date Test-Date 06-05-2008 12 49 09

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-6A



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-6A
Test-Date 06-05-2008 13 09 01

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND TO SILTY SAND	62 78	0 33	16	056	58%-65%	>43	138 1	--	--	--	--
2	SAND	143 39	1 12	29	109	>85%	>43	315 4	--	--	--	--
3	SAND	210 35	1 27	42	163	>85%	>43	462 7	--	--	--	--
4	SAND TO SILTY SAND	127 05	1 17	32	189	>85%	>43	279 5	--	--	--	--
5	SAND TO SILTY SAND	79 21	0 9	20	214	58%-65%	41-43	174 2	--	--	--	--
6	SILTY SAND TO SANDY SILT	54 56	0 78	18	24	50%-58%	39-41	120	--	--	--	--
7	SANDY SILT TO CLAYEY SILT	40 31	1 07	16	268	50%-58%	37-39	88 6	--	--	--	--
8	CLAYEY SILT TO SILTY CLAY	40 3	1 3	20	299	--	--	--	2 65	3	0	>6
9	SILTY SAND TO SANDY SILT	71 74	1 23	24	324	58%-65%	39-41	157 8	--	--	--	--
10	SILTY SAND TO SANDY SILT	71 3	0 93	24	35	58%-65%	39-41	156 8	--	--	--	--
11	SAND TO SILTY SAND	104 33	0 84	26	376	58%-65%	39-41	229 5	--	--	--	--
12	SAND	131 42	0 95	26	399	65%-85%	41-43	289 1	--	--	--	--
13	SAND	153 38	0 98	31	422	>85%	41-43	337 4	--	--	--	--
14	SAND	189 64	1 05	38	446	>85%	41-43	417 2	--	--	--	--
15	SAND	184 57	1 09	37	469	>85%	41-43	406	--	--	--	--
16	SAND	220 44	1 1	44	492	>85%	41-43	484 9	--	--	--	--
17	SAND	259 66	1 24	52	515	>85%	41-43	571 2	--	--	--	--
18	SAND	266 55	1 26	53	538	>85%	41-43	586 4	--	--	--	--
19	GRAVELLY SAND TO SAND	297 58	1 35	50	562	>85%	>43	654 6	--	--	--	--
20	SAND	251 14	1 46	50	585	>85%	41-43	552 5	--	--	--	--
21	SAND	194 02	1 35	39	608	>85%	39-41	426 8	--	--	--	--
22	SAND	212 75	1 32	43	631	>85%	41-43	468	--	--	--	--
23	SAND	238 23	1 33	48	655	>85%	41-43	524 1	--	--	--	--
24	SAND	227 47	1 26	45	678	>85%	41-43	500 4	--	--	--	--
25 1	---------- END OF SOUNDING ----------	237 6										

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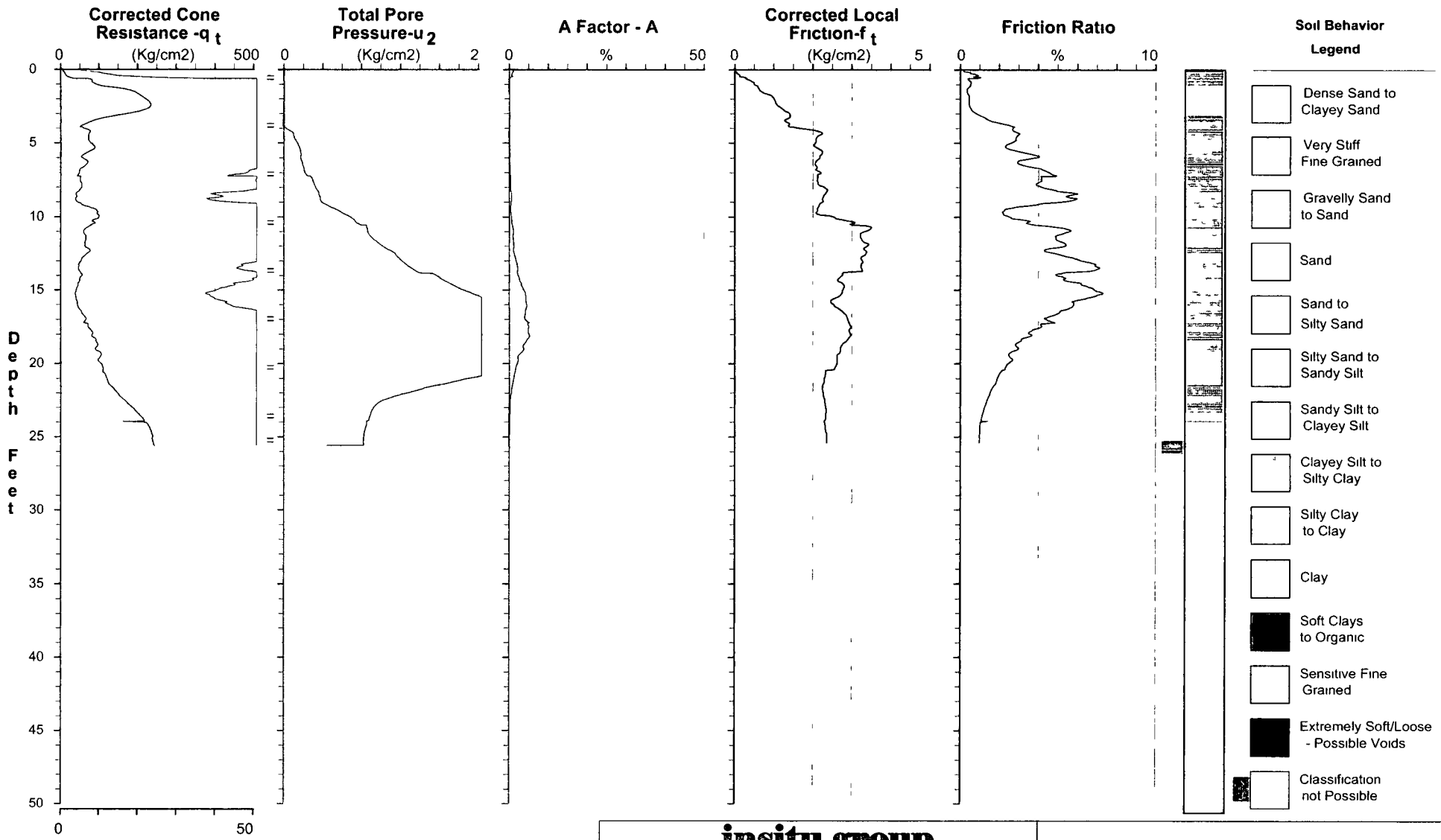
CH2M Hill
Citrus Co Transfer Station
Sounding # A-6A
Test Date Test-Date 06-05-2008 13 09 01

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-7



Coarse Scale

Fine Scale

'=' Push Interrupted To Add Rod

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CH2M Hill
Citrus Co Transfer Station
Sounding A-7
Test-Date 06-05-2008 12 30 19

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

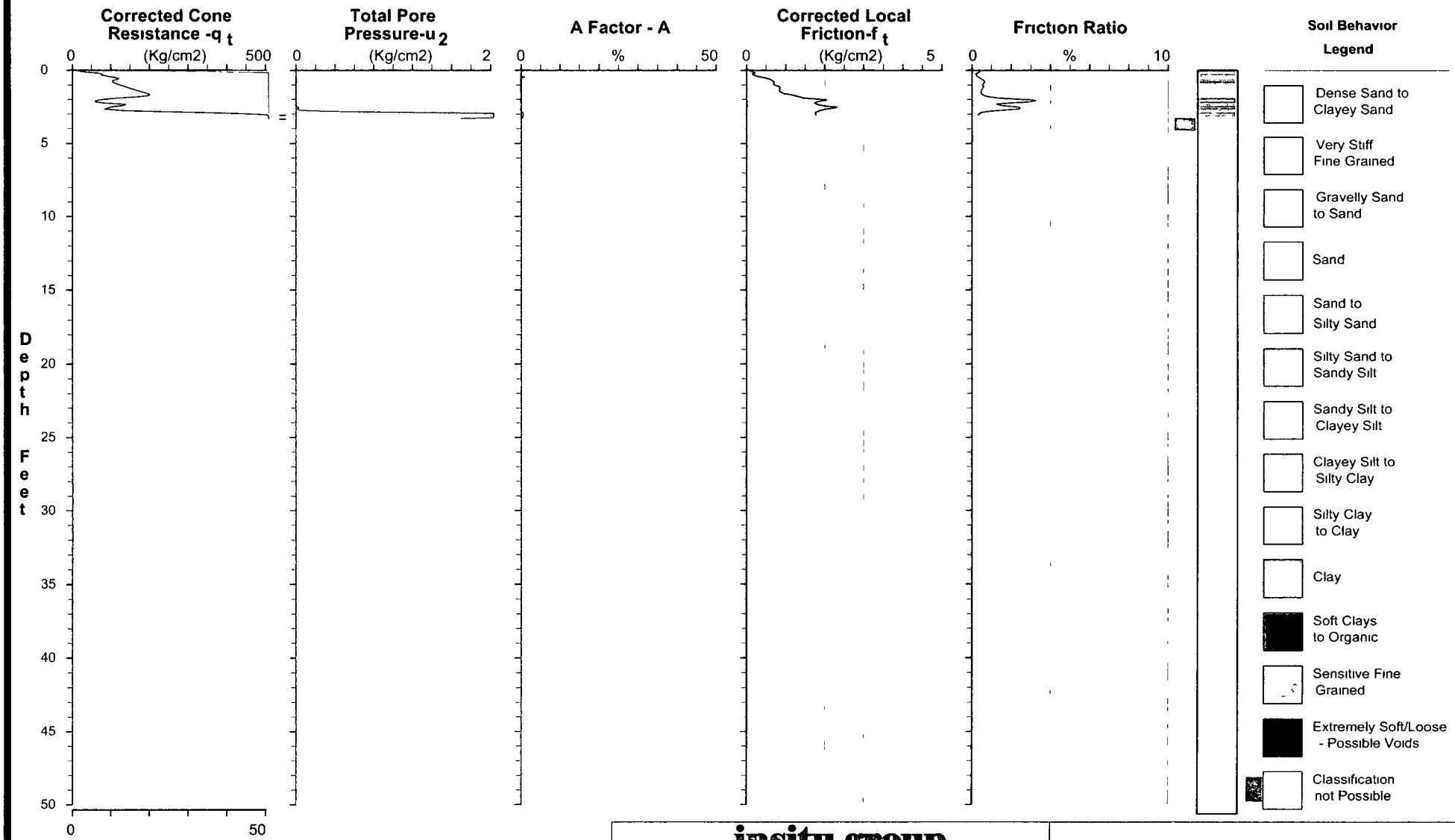
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	103 78	0 47	21	053	65%-85%	>43	228 3	--	--	--	--
2	SAND	220 72	0 98	44	107	>85%	>43	485 5	--	--	--	--
3	SAND	157 13	1 31	31	161	>85%	>43	345 7	--	--	--	--
4	SANDY SILT TO CLAYEY SILT	66	1 76	26	189	58%-65%	41-43	145 2	--	--	--	--
5	SANDY SILT TO CLAYEY SILT	80 2	2 08	32	217	58%-65%	41-43	176 4	--	--	--	--
6	SANDY SILT TO CLAYEY SILT	64 14	2 14	26	245	58%-65%	39-41	141 1	--	--	--	--
7	CLAYEY SILT TO SILTY CLAY	49 63	2 12	25	276	--	--	--	3 28	2 3	0	>6
8	SILTY CLAY to CLAY	49 39	2 25	33	306	--	--	--	3 26	2 1	01	>6
9	CLAYEY SILT TO SILTY CLAY	59 4	2 18	30	337	--	--	--	3 92	2 7	0	>6
10	SANDY SILT TO CLAYEY SILT	89 07	2 71	36	365	58%-65%	39-41	195 9	--	--	--	--
11	VERY STIFF FINE GRAINED	64 12	3 3	64	395	--	--	--	4 23	1 9	0	>6
12	VERY STIFF FINE GRAINED	67 96	3 34	68	426	--	--	--	4 48	2	0	>6
13	CLAYS	50 12	3 24	50	456	--	--	--	3 29	1 5	01	>6
14	CLAYS	50 33	2 75	50	487	--	--	--	3 3	1 8	01	>6
15	CLAYS	39 91	2 7	40	518	--	--	--	2 6	1 4	02	>6
16	CLAYS	48 16	2 61	48	548	--	--	--	3 14	1 8	02	>6
17	CLAYEY SILT TO SILTY CLAY	67 34	2 91	34	579	--	--	--	4 42	2 3	0	>6
18	SANDY SILT TO CLAYEY SILT	88 1	2 89	35	607	50%-58%	37-39	193 8	--	--	--	--
19	SILTY SAND TO SANDY SILT	99 28	2 66	33	632	50%-58%	37-39	218 4	--	--	--	--
20	SILTY SAND TO SANDY SILT	108 41	2 49	36	658	58%-65%	37-39	238 5	--	--	--	--
21	SILTY SAND TO SANDY SILT	125 88	2 27	42	684	58%-65%	37-39	276 9	--	--	--	--
22	SAND TO SILTY SAND	158 22	2 27	40	709	65%-85%	39-41	348	--	--	--	--
23	SAND TO SILTY SAND	197 95	2 32	49	735	>85%	39-41	435 5	--	--	--	--
24	SAND	224 12	2 31	45	758	>85%	39-41	493	--	--	--	--
25 2	---------- END OF SOUNDING ----------	239 58										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-7
Test Date Test-Date 06-05-2008 12 30 19

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-8



0 50

Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

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CH2M Hill
Citrus Co Transfer Station
Sounding A-8
Test-Date 06-05-2008 11 05 18

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	134 94	0 73	27	053	>85%	>43	296 8	--	--	--	--
2	SAND TO SILTY SAND	124	1 62	31	109	>85%	>43	272 8	--	--	--	--
3 2	---------- END OF SOUNDING ----------	356 17										

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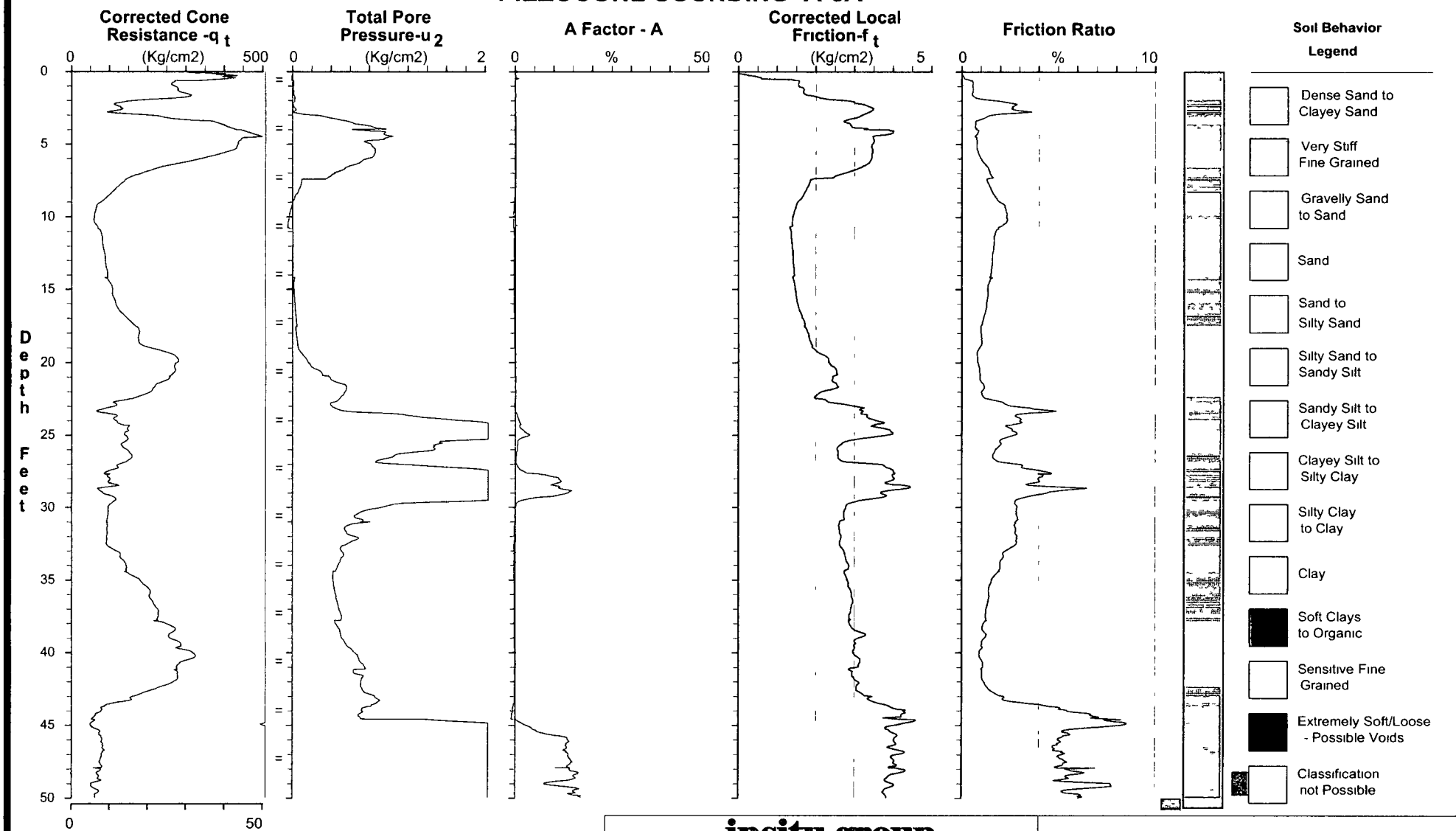
CH2M Hill
Citrus Co Transfer Station
Sounding # A-8
Test Date Test-Date 06-05-2008 11 05 18

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-8A



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

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CH2M Hill
Citrus Co Transfer Station
Sounding A-8A
Test-Date 06-05-2008 11 10 37

REV 04 - 34 93 - 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	287 62	1 58	58	053	>85%	>43	632 7	--	--	--	--
2	SAND TO SILTY SAND	187 04	2 71	47	109	>85%	>43	411 4	--	--	--	--
3	SAND TO SILTY SAND	227 51	3 11	57	166	>85%	>43	500 5	--	--	--	--
4	GRAVELLY SAND TO SAND	444 96	3 49	74	189	>85%	>43	978 9	--	--	--	--
5	GRAVELLY SAND TO SAND	430 94	3 46	72	212	>85%	>43	948	--	--	--	--
6	SAND	320 45	3 37	64	235	>85%	>43	705	--	--	--	--
7	SAND TO SILTY SAND	172 47	2 48	43	261	>85%	>43	379 4	--	--	--	--
8	SAND TO SILTY SAND	116 25	1 75	29	287	65%-85%	41-43	255 7	--	--	--	--
9	SILTY SAND TO SANDY SILT	75 09	1 53	25	312	58%-65%	39-41	165 2	--	--	--	--
10	SILTY SAND TO SANDY SILT	61 82	1 4	21	338	50%-58%	37-39	136	--	--	--	--
11	SILTY SAND TO SANDY SILT	77 47	1 35	26	364	58%-65%	39-41	170 4	--	--	--	--
12	SILTY SAND TO SANDY SILT	85 05	1 39	28	389	58%-65%	39-41	187 1	--	--	--	--
13	SILTY SAND TO SANDY SILT	90 5	1 42	30	415	58%-65%	39-41	199 1	--	--	--	--
14	SILTY SAND TO SANDY SILT	96 59	1 42	32	441	58%-65%	39-41	212 5	--	--	--	--
15	SAND TO SILTY SAND	108 6	1 47	27	466	58%-65%	39-41	238 9	--	--	--	--
16	SAND TO SILTY SAND	121 66	1 55	30	492	58%-65%	39-41	267 6	--	--	--	--
17	SAND TO SILTY SAND	158 39	1 69	40	518	65%-85%	39-41	348 4	--	--	--	--
18	SAND	176 82	1 81	35	541	65%-85%	41-43	389	--	--	--	--
19	SAND	236 58	2 05	47	564	>85%	41-43	520 4	--	--	--	--
20	SAND	272 53	2 42	55	587	>85%	41-43	599 5	--	--	--	--
21	SAND	241	2 48	48	611	>85%	41-43	530 2	--	--	--	--
22	SAND TO SILTY SAND	171 4	2 18	43	636	65%-85%	39-41	377	--	--	--	--
23	SANDY SILT TO CLAYEY SILT	100 17	3 14	40	664	50%-58%	37-39	220 3	--	--	--	--
24	SILTY SAND TO SANDY SILT	135 3	3 64	45	69	58%-65%	37-39	297 6	--	--	--	--
25	SILTY SAND TO SANDY SILT	139 94	3 16	47	716	58%-65%	37-39	307 8	--	--	--	--
26	SAND TO SILTY SAND	150 66	2 58	38	741	58%-65%	39-41	331 4	--	--	--	--
27	SANDY SILT TO CLAYEY SILT	107 61	3 83	43	769	50%-58%	37-39	236 7	--	--	--	--
28	VERY STIFF FINE GRAINED	94 61	4 05	95	8	--	--	--	6 2	2 3	0	>6
29	SANDY SILT TO CLAYEY SILT	103 31	3 36	41	828	50%-58%	35-37	227 2	--	--	--	--
30	SANDY SILT TO CLAYEY SILT	95 93	2 73	38	856	50%-58%	35-37	211	--	--	--	--
31	SANDY SILT TO CLAYEY SILT	93 86	2 6	38	884	50%-58%	35-37	206 5	--	--	--	--
32	SANDY SILT TO CLAYEY SILT	95 71	2 63	38	913	50%-58%	35-37	210 5	--	--	--	--
33	SILTY SAND TO SANDY SILT	130 62	2 76	44	938	58%-65%	37-39	287 3	--	--	--	--
34	SAND TO SILTY SAND	151 81	2 78	38	964	58%-65%	37-39	333 9	--	--	--	--
35	SAND TO SILTY SAND	196 46	2 86	49	99	65%-85%	37-39	432 2	--	--	--	--
36	SAND TO SILTY SAND	212 67	2 93	53	1 015	65%-85%	39-41	467 8	--	--	--	--
37	SAND	227 69	2 87	46	1 038	65%-85%	39-41	500 9	--	--	--	--
38	SAND	261 59	3 06	52	1 062	>85%	39-41	575 5	--	--	--	--
39	SAND	288 11	2 99	58	1 085	>85%	39-41	633 8	--	--	--	--
40	SAND	300 13	3 09	60	1 108	>85%	39-41	660 2	--	--	--	--

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-8A
Test Date Test-Date 06-05-2008 11 10 37

STANDARD SOIL BEHAVIOR TABLE

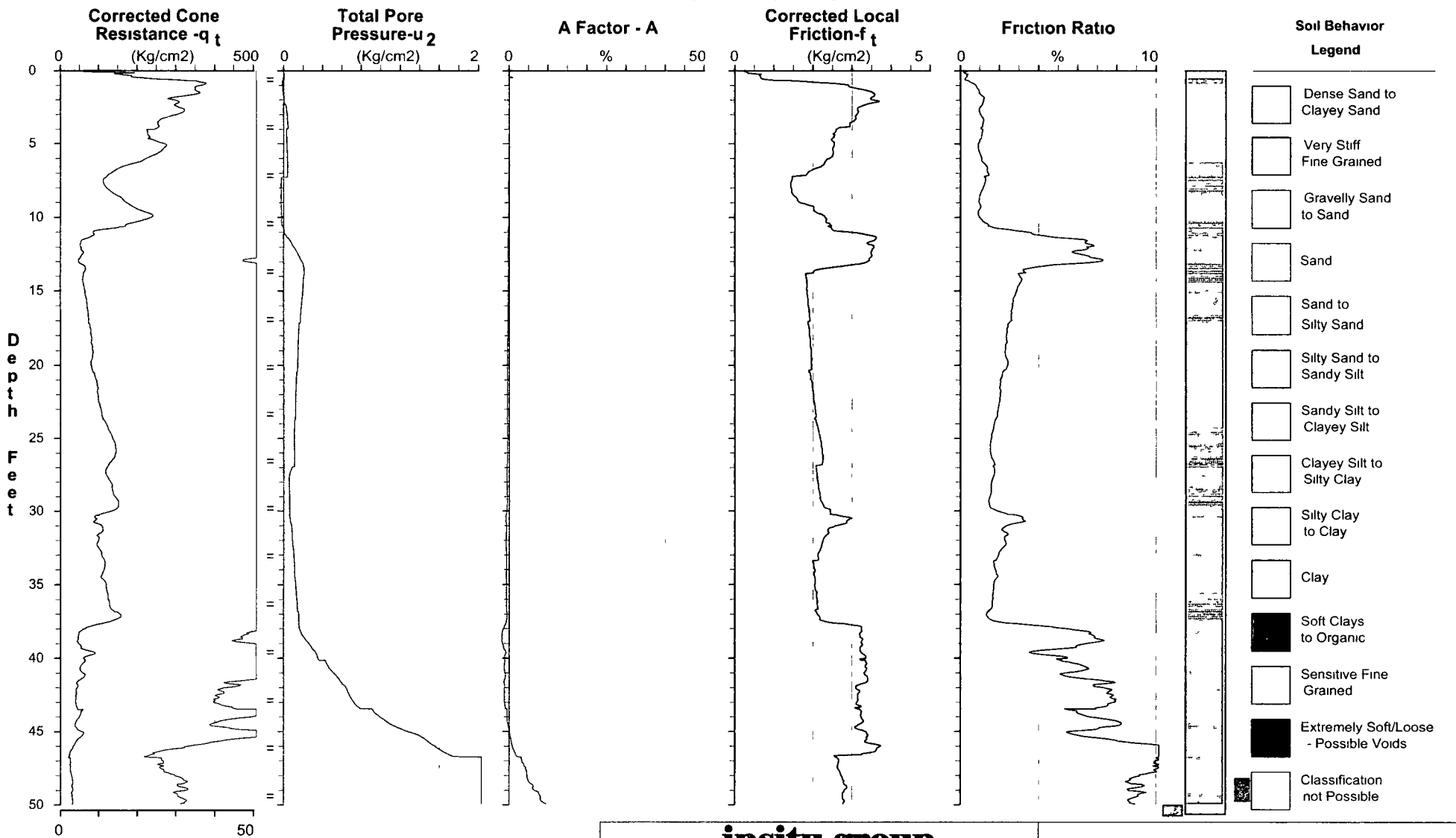
Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
41	SAND	275 28	2 94	55	1 131	>85%	39-41	605 6	--	--	--	--
42	SAND TO SILTY SAND	210 04	3 13	53	1 157	65%-85%	37-39	462 1	--	--	--	--
43	SANDY SILT TO CLAYEY SILT	109 86	3 74	44	1 185	50%-58%	35-37	241 7	--	--	--	--
44	VERY STIFF FINE GRAINED	57 94	4 24	58	1 216	--	--	--	3 69	1 3	0	6
45	VERY STIFF FINE GRAINED	72 88	3 97	73	1 246	--	--	--	4 69	1 8	0	6
46	VERY STIFF FINE GRAINED	81 91	4 07	82	1 277	--	--	--	5 28	2	0	>6
47	VERY STIFF FINE GRAINED	76 3	4 03	76	1 307	--	--	--	4 91	1 8	0	6
48	VERY STIFF FINE GRAINED	66 37	3 94	66	1 338	--	--	--	4 24	1 6	0	6
49	VERY STIFF FINE GRAINED	63 46	3 8	63	1 368	--	--	--	4 04	1 6	0	6
50 3	---------- END OF SOUNDING ----------	57 6										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-8A
Test Date Test-Date 06-05-2008 11 10 37

REV 04 - 34 93 - 0

PIEZOCONE SOUNDING A-9



Coarse Scale
Fine Scale

'=' Push Interrupted To Add Rod

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding A-9
Test-Date 06-05-2008 11 49 29

REV 04 - 34 93 0

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
1	SAND	344 96	2 29	69	053	>85%	>43	758 9	--	--	--	--
2	SAND	305 27	3 47	61	107	>85%	>43	671 6	--	--	--	--
3	SAND	288 77	3 1	58	161	>85%	>43	635 3	--	--	--	--
4	SAND	237 87	2 66	48	184	>85%	>43	523 3	--	--	--	--
5	SAND	259 99	2 5	52	207	>85%	>43	571 9	--	--	--	--
6	SAND	213 04	2 38	43	23	>85%	>43	468 6	--	--	--	--
7	SAND TO SILTY SAND	128 01	1 72	32	256	>85%	41-43	281 6	--	--	--	--
8	SAND TO SILTY SAND	127 51	1 45	32	282	65%-85%	41-43	280 5	--	--	--	--
9	SAND	181 47	1 79	36	305	>85%	>43	399 2	--	--	--	--
10	SAND	202 93	2 31	41	328	>85%	>43	446 4	--	--	--	--
11	SANDY SILT TO CLAYEY SILT	87 26	3 13	35	356	58%-65%	39-41	191 9	--	--	--	--
12	VERY STIFF FINE GRAINED	55 19	3 48	55	387	--	--	--	3 63	1 5	01	>6
13	VERY STIFF FINE GRAINED	57 06	2 93	57	417	--	--	--	3 75	1 9	01	>6
14	SANDY SILT TO CLAYEY SILT	60 16	1 84	24	446	50%-58%	37-39	132 3	--	--	--	--
15	SANDY SILT TO CLAYEY SILT	65 64	1 84	26	474	50%-58%	37-39	144 4	--	--	--	--
16	SANDY SILT TO CLAYEY SILT	71 53	1 88	29	502	50%-58%	37-39	157 3	--	--	--	--
17	SILTY SAND TO SANDY SILT	76 13	1 89	25	527	50%-58%	37-39	167 4	--	--	--	--
18	SILTY SAND TO SANDY SILT	81 65	1 91	27	553	50%-58%	37-39	179 6	--	--	--	--
19	SILTY SAND TO SANDY SILT	84 03	1 95	28	579	50%-58%	37-39	184 8	--	--	--	--
20	SILTY SAND TO SANDY SILT	84 81	1 93	28	604	50%-58%	37-39	186 5	--	--	--	--
21	SILTY SAND TO SANDY SILT	96 06	1 96	32	63	50%-58%	37-39	211 3	--	--	--	--
22	SILTY SAND TO SANDY SILT	99 91	2 01	33	656	50%-58%	37-39	219 8	--	--	--	--
23	SILTY SAND TO SANDY SILT	109 35	2 05	36	681	58%-65%	37-39	240 5	--	--	--	--
24	SAND TO SILTY SAND	125 58	2 12	31	707	58%-65%	37-39	276 2	--	--	--	--
25	SAND TO SILTY SAND	141 06	2 19	35	733	58%-65%	37-39	310 3	--	--	--	--
26	SAND TO SILTY SAND	137 47	2 24	34	758	58%-65%	37-39	302 4	--	--	--	--
27	SILTY SAND TO SANDY SILT	121 82	2 09	41	784	58%-65%	37-39	268	--	--	--	--
28	SAND TO SILTY SAND	134 95	2 13	34	81	58%-65%	37-39	296 8	--	--	--	--
29	SAND TO SILTY SAND	148 18	2 22	37	835	58%-65%	37-39	326	--	--	--	--
30	SILTY SAND TO SANDY SILT	103 53	2 66	35	861	50%-58%	35-37	227 7	--	--	--	--
31	SILTY SAND TO SANDY SILT	105 47	2 43	35	887	50%-58%	35-37	232	--	--	--	--
32	SILTY SAND TO SANDY SILT	101 17	2 2	34	913	50%-58%	35-37	222 5	--	--	--	--
33	SILTY SAND TO SANDY SILT	114 33	2 06	38	938	50%-58%	35-37	251 5	--	--	--	--
34	SILTY SAND TO SANDY SILT	112 49	2 04	37	964	50%-58%	35-37	247 4	--	--	--	--
35	SILTY SAND TO SANDY SILT	122 42	2 07	41	99	50%-58%	35-37	269 3	--	--	--	--
36	SAND TO SILTY SAND	135 12	2 1	34	1 015	58%-65%	37-39	297 2	--	--	--	--
37	SILTY SAND TO SANDY SILT	120 6	2 5	40	1 041	50%-58%	35-37	265 3	--	--	--	--
38	CLAYS	48 84	3 23	49	1 071	--	--	--	3 11	1 5	02	6
39	VERY STIFF FINE GRAINED	67 99	3 25	68	1 102	--	--	--	4 38	2	0	6
40	VERY STIFF FINE GRAINED	58 17	3 32	58	1 133	--	--	--	3 72	1 7	0	6

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-9
Test Date Test-Date 06-05-2008 11 49 29

STANDARD SOIL BEHAVIOR TABLE

Depth (Feet)	Soil Behavior Type	Qc (Kg/cm2)	Lf (Kg/cm2)	N (#)	Vertical Effective Stress (Kg/cm2)	Relative Density (%)	Friction Angle (Degrees)	Constrained Modulus (Kg/cm2)	Undrained Shear Strength (Kg/cm2)	Sens	Comp	OCR
41	CLAYS	51 07	3 29	51	1 163	--	--	--	3 24	1 5	01	6
42	CLAYS	40 83	3 14	41	1 194	--	--	--	2 56	1 2	02	6
43	CLAYS	48 93	3 18	49	1 224	--	--	--	3 09	1 5	02	6
44	CLAYS	44 97	3 21	45	1 255	--	--	--	2 83	1 3	02	6
45	CLAYS	44 81	3 44	45	1 285	--	--	--	2 81	1 3	02	6
46	CLAYS	25 52	3 04	26	1 316	--	--	--	1 52	8	03	6
47	CLAYS	27 25	2 66	27	1 346	--	--	--	1 63	1	03	6
48	CLAYS	31 79	2 8	32	1 377	--	--	--	1 93	1 1	03	6
49	CLAYS	30 91	2 7	31	1 408	--	--	--	1 87	1 1	03	6
50 1	---------- END OF SOUNDING ----------	44 95										

insitu group

CH2M Hill
Citrus Co Transfer Station
Sounding # A-9
Test Date Test-Date 06-05-2008 11 49 29

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-1** SHEET 1 of 2
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 18 N
082° 26' 08 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/18/07
DATE FINISHED 7/18/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Very loose brown fine SAND, with silt [SP-SM]						
	X	1-1-1	2			Very loose tan fine SAND [SP]						
	X	1-2-1	3									
5	X	1-2-1	3				4 7					
	X	1-1-2	3									
	X	1-1-2	3									
10	X	1-2-2	4									
						Medium dense orange and gray silty clayey SAND [SM-SC]						
15	X	5-6-7	13									
20	X	6-9-9	18									
25	X	5-8-8	16									
						Medium dense tan to orange fine SAND, with silt and clay [SP-SM]						
30	X	4-8-7	15									
						Medium dense tan to orange fine SAND, with silt [SP-SM]						
35	X	7-9-11	20									
40	X	8-9-12	21									
45	X	9-9-12	21									

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-1** SHEET 2 of 2

SECTION TOWNSHIP RANGE

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W T	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
45												
						Medium dense white silty fine SAND [SM]						
50	X	8-10-13	23									
55	X	9-8-10	18									
60	X	7-10-12	22									
						Boring Terminated at 60'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-2** SHEET 1 of 2
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 15 N
082° 26' 13 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/17/07
DATE FINISHED 7/17/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense tan and orange fine SAND, with silt [SP-SM]						
	X	2-9-10	19									
	X	10-15-18	33			Medium dense to dense tan and orange silty SAND, with clay [SP-SM]	9 4					
5	X	7-12-20	32			Dense tan fine SAND [SP]						
	X	8-12-16	28									
	X	3-4-4	8			Loose brown fine SAND, with silt [SP-SM]						
10	X	3-4-4	8			Loose tan fine SAND [SP]						
15	X	2-3-5	8									
20	X	5-10-14	24			Medium dense orange and tan silty fine SAND, with clay [SM]						
25	X	8-10-9	19			Medium dense orange silty clayey SAND [SM-SC]						
30	X	7-7-8	15			Medium dense orange silty fine SAND [SM]						
35	X	6-9-9	18									
40	X	7-8-7	15			Medium dense gray and orange silty clayey SAND [SM-SC]						
45	X	4-7-9	16									

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-2**

SECTION TOWNSHIP RANGE

SHEET 2 of 2

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
45												
50	X	5-6-6	12									
						Medium dense tan and orange fine SAND, with silt and clay [SP-SM]						
55	X	6-9-7	16									
60	X	14-16-20	36									
						Boring Terminated at 60'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-3** SHEET 1 of 2
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 15 N
082° 26' 09 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/18/07
DATE FINISHED 7/18/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Loose dark brown to tan SAND [SP]						
	X	1-2-2	4									
	X	2-3-3	6				4 8					
5	X	3-3-4	7									
	X	2-3-3	6									
	X	3-4-4	8									
10	X	3-4-4	8			Loose orange silty SAND, with clay [SM]						
15	X	10-14-20	34			Dense orange and gray clayey silty SAND [SC-SM]						
20	X	7-8-10	18			Medium dense orange and tan silty SAND, with clay [SM]						
						Medium dense tan fine SAND, with silt [SP-SM]						
25	X	8-11-12	23									
30	X	9-13-13	26									
35	X	12-17-18	35									
40	X	11-18-20	38									
45	X	12-17-21	38									

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-3** SHEET 2 of 2

SECTION. TOWNSHIP RANGE

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
45												
50	X	10-14-16	30									
						Medium dense tan silty SAND, with clay [SM]						
55	X	6-8-10	18									
						Dense tan SAND, with silt [SP-SM]						
60	X	13-18-25	43									
						Boring Terminated at 60'						

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PROJECT: CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

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SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 12 N
082° 26' 11 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/17/07
DATE FINISHED 6/17/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense to dense brown and orange silty clayey fine SAND [SM-SC]						
	X	2-5-5	10									
	X	10-12-21	33									
5	X	10-12-19	31									
	X	10-12-11	23									
	X	3-6-8	14			Medium dense tan fine SAND, with silt [SP-SM]						
10	X	3-7-7	14									
15	X	2-4-6	10			Medium dense tan fine SAND [SP]						
20	X	3-7-8	15									
						Medium dense orange silty clayey fine SAND [SM-SC]						
25	X	10-12-15	27									
30	X	6-7-7	14									
35	X	6-6-8	14									
40	X	7-10-11	21									
						Medium dense gray and orange silty fine SAND, with clay [SM]						
45	X	5-7-7	14									

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CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-4** SHEET 2 of 2

SECTION TOWNSHIP RANGE

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
45												
50	X	5-7-7	14									
						Medium dense gray and orange clayey silty SAND [SC-SM]						
55	X	4-6-7	13									
60	X	5-6-9	15									
						Boring Terminated at 60'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-5** SHEET 1 of 2

SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC

LOCATION SEE BORING LOCATION PLAN

REMARKS GPS COORDINATES
28° 51' 12 N
082° 25' 15 W

GS ELEVATION(ft)

WATER TABLE (ft) NE

DATE OF READING NA

EST WSWT (ft)

DATE STARTED 7/16/07

DATE FINISHED 7/17/07

DRILLED BY. J STILLSON

TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense dark brown silty SAND [SM]						
	X	5-5-6	11									
	X	5-10-12	22			Medium dense light brown fine SAND [SP-SM]	6 0					
5	X	10-15-15	30			Dense tan fine SAND, with silt [SP-SM]						
	X	10-12-15	27			Dense tan fine SAND [SP]						
	X	10-17-16	33									
10	X	10-10-9	19									
15	X	2-2-3	5									
20	X	2-3-6	9									
						Medium dense orange silty SAND, with clay [SM]						
25	X	7-5-7	12									
30	X	4-5-6	11									
35	X	4-5-6	11									
40	X	5-6-8	14			Medium dense brown fine SAND, with silt [SP-SM]						
						Loose gray silty clayey SAND [SM-SC]						
45	X	4-3-2	5									

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CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-5** SHEET 2 of 2

SECTION TOWNSHIP RANGE

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
45												
50	X	6-8-11	19									
55	X	3-5-7	12									
60	X	5-8-7	15									
65	X	8-12-12	24									
70	X	11-12-14	26			Medium dense orange and tan fine SAND, with silt [SP-SM]						
75	X	14-16-18	34									
80	X	16-23-25	48									
						Boring Terminated at 80'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-6** SHEET 1 of 2
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 20 N
082° 26' 16 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/16/07
DATE FINISHED 7/16/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Very loose brown to orange fine SAND [SP]						
	X	1-1-1	2									
	X	1-2-1	3									
5	X	1-1-1	2									
	X	1-2-1	3									
	X	1-2-2	4									
10	X	1-2-2	4									
15	X	2-4-6	10									
20	X	3-5-6	11			Medium dense orange clayey SAND, with silt [SC]						
25	X	5-8-9	17			Medium dense orange fine SAND, with silt [SP-SM]						
30	X	4-5-5	10			Medium dense orange silty SAND, with clay [SM]						
35	X	4-6-8	14			Medium dense orange fine SAND, with silt [SP-SM]						
40	X	6-7-10	17									
45	X	4-6-7	13									

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION. **B-6** SHEET 2 of 2

SECTION TOWNSHIP RANGE.

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG CONT (%)
45												
50	X	5-7-10	17									
55	X	5-8-13	21									
60	X	8-11-13	24									
						Medium dense tan fine SAND, with silt and clay [SP-SM]						
65	X	5-9-12	21									
70	X	6-9-12	21									
75	X	10-11-16	27									
80	X	14-17-21	38									
						Boring Terminated at 80'						

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PROJECT: CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-7** SHEET 1 of 1
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 17 N
082° 26' 06 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/18/07
DATE FINISHED 7/18/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense tan to orange silty clayey fine SAND [SM-SC]						
	X	4-5-8	13				29 0		26	6		
	X	8-8-10	18			Medium dense brown to orange fine SAND, with silt [SP-SM]						
5	X	10-13-13	26									
	X	7-6-6	12									
	X	5-4-3	7				6 1					
	X	3-2-2	4									
10												
	X	2-3-4	7			Loose to medium dense orange silty fine SAND [SM]						
15												
	X	3-5-7	12									
20												
	X	10-10-12	22			Medium dense tan fine SAND, with silt [SP-SM]						
25												
	X	6-8-11	19									
30						Boring Terminated at 30'						

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BORING LOG

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION. **B-8** SHEET 1 of 1
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 13 N
082° 26' 07 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/19/07
DATE FINISHED 7/19/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG. CONT (%)
0						Loose tan and orange fine SAND, with silt [SP-SM]						
	X	2-2-5	7									
	X	5-10-10	20			Loose orange and gray silty SAND, with clay [SM]	18 0		NP	NP		
5	X	10-15-15	30									
	X	10-10-10	20									
	X	7-7-6	13			Medium dense tan fine SAND, with silt [SP-SM]						
10	X	6-4-3	7			Loose orange fine SAND [SP]						
15	X	3-3-3	6			Boring Terminate at 15'						

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BORING LOG

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-9** SHEET 1 of 1
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 11 N
082° 26' 18 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/19/07
DATE FINISHED 7/19/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense brown to tan fine SAND, with silt [SP to SP-SM]						
	X	8-12-12	24									
	X	10-14-14	28				3 6					
5	X	10-19-19	38									
	X	10-20-21	41									
	X	10-20-21	41									
10	X	10-16-22	38									
15	X	2-2-3	5									
						Loose orange fine silty SAND, with clay [SM]						
20	X	2-3-4	7									
25	X	5-6-8	14									
						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO	28759-001-02
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-10** SHEET 1 of 1
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 18 N
082° 26' 06 W

GS ELEVATION(ft)
WATER TABLE (ft) NE
DATE OF READING NA
EST WSWT (ft)

DATE STARTED 7/18/07
DATE FINISHED 7/18/07
DRILLED BY J STILLSON
TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Loose orange and tan silty clayey SAND [SM-SC]						
	X	1-2-4	6									
	X	5-6-10	16				27 0		28	8		
5	X	11-15-16	31			Dense tan fine SAND, with silt [SP-SM]						
	X	10-14-15	29									
	X	4-5-6	11			Medium dense tan fine SAND [SP]	3 7					
10	X	4-5-5	10									
15	X	2-5-7	12									
20	X	8-10-9	19			Medium dense orange silty clayey SAND [SM-SC]						
25	X	5-8-8	16			Medium dense orange silty fine SAND, with clay [SM]						
						Medium dense tan fine SAND, with silt [SP-SM]						
30	X	7-8-9	17									
						Boring Terminated at 30'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

CITRUS COUNTY, FLORIDA

BORING DESIGNATION **B-11** SHEET 1 of 1

SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC

LOCATION SEE BORING LOCATION PLAN

REMARKS GPS COORDINATES
28° 51' 17 N
082° 26' 13 W

GS ELEVATION(ft)

WATER TABLE (ft) NE

DATE OF READING NA

EST WSWT (ft)

DATE STARTED 7/19/07

DATE FINISHED 7/19/07

DRILLED BY J STILLSON

TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense orange and tan silty clayey SAND [SM-SC]						
	X	2-5-7	12									
	X	7-4-7	11				25 0		29	7		
5	X	7-10-14	24			Medium dense tan fine SAND, with silt [SP-SM]						
	X	16-20-20	40									
	X	10-14-12	26			Medium dense tan fine SAND [SP]						
10	X	10-9-7	16									
15	X	2-4-6	10									
20	X	4-5-7	12			Medium dense orange silty clayey fine SAND [SM-SC]						
25	X	8-9-11	20			Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO	28759-001-02
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION
CITRUS COUNTY, FLORIDA

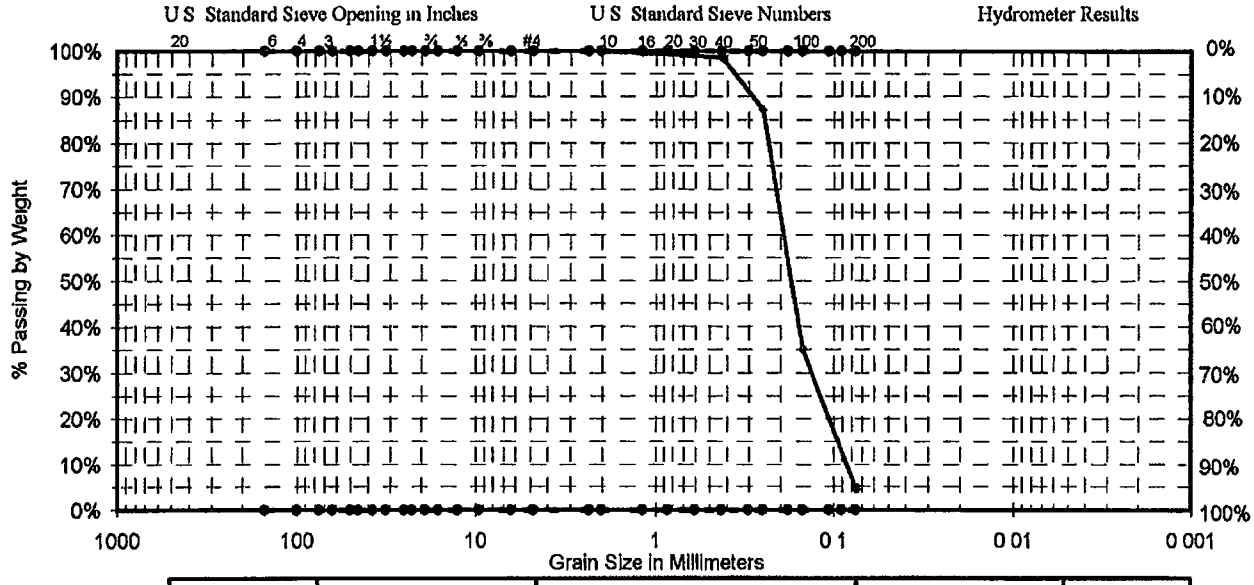
BORING DESIGNATION **B-12** SHEET 1 of 1
SECTION TOWNSHIP RANGE

CLIENT CH2M HILL, INC /KING ENGINEERING ASSOCIATES, INC
LOCATION SEE BORING LOCATION PLAN
REMARKS GPS COORDINATES
28° 51' 14 N
082° 26' 16 W

GS ELEVATION(ft)
WATER TABLE (ft)
DATE OF READING
EST WSWT (ft)

DATE STARTED 7/18/07
DATE FINISHED 7/18/07
DRILLED BY J STILLSON
TYPE OF SAMPLING

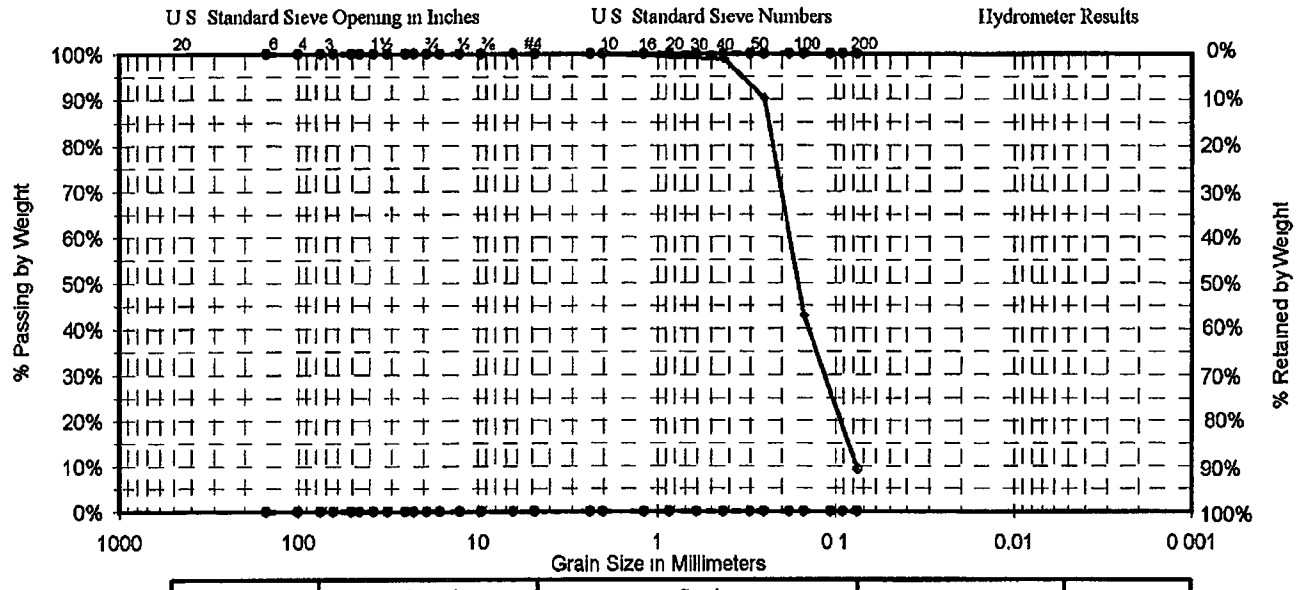
DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Very loose brown fine SAND, with silt [SP-SM]						
	X	1-2-1	3									
	X	1-1-1	2			Very loose dark brown organic fine SAND, with silt [PT]						
5	X	5-5-5	10				30 0					16 9
	X	4-5-6	11			Medium dense tan to orange fine SAND, with silt and clay [SP-SM]						
	X	20-22-22	44			Dense to medium dense tan fine SAND [SP]						
10	X	12-15-20	35									
15	X	4-5-6	11									
20	X	4-5-5	10									
						Boring Terminated at 20'						



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date	08/07/07	D_{10} = 0 09	**USCS Classification**	% Gravel	% Sand
Sample #	3	D_{30} = 0 14	SP, Poorly graded Sand	0 0%	95 3%
Sample ID		D_{60} = 0 20	**Specifications**		
Source		C_C = 1 09	No Specs		
Project	Citrus County Transfer Station	C_U = 2 25	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	4 7%	
Boring #	B-1	Plastic Limit= n/a	Fineness Modulus		
Depth	4' - 5 1/2'	Plasticity Index= n/a	0 76		

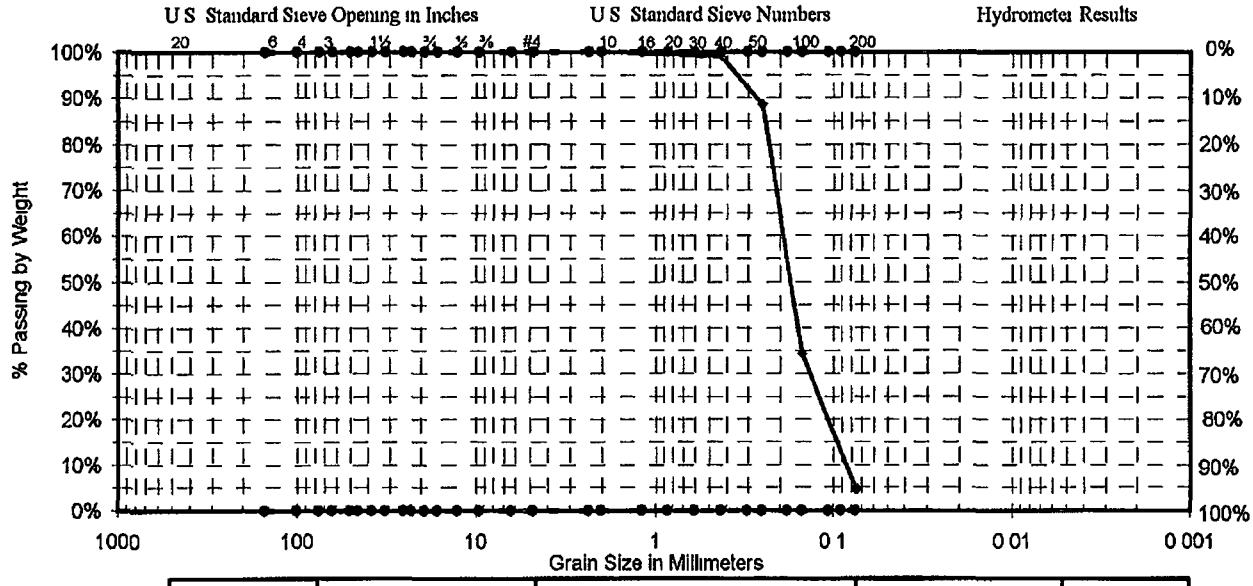
Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 3%		
2 00"	50 00		100 0%			#20	0 850		99 0%		
1 75"	45 00		100 0%			#30	0 600		98 8%		
1 50"	37 50		100 0%			#40	0 425	98 7%	98 7%		
1 25"	31 50		100 0%			#50	0 300		90 5%		
1 00"	25 00		100 0%			#60	0 250	87 3%	87 3%		
7/8"	22 40		100 0%			#80	0 180		50 7%		
3/4"	19 00		100 0%			#100	0 150	35 1%	35 1%		
5/8"	16 00		100 0%			#140	0 106		17 3%		
1/2"	12 50		100 0%			#170	0 090		10 8%		
3/8"	9 50		100 0%			#200	0 075	4 7%	4 7%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

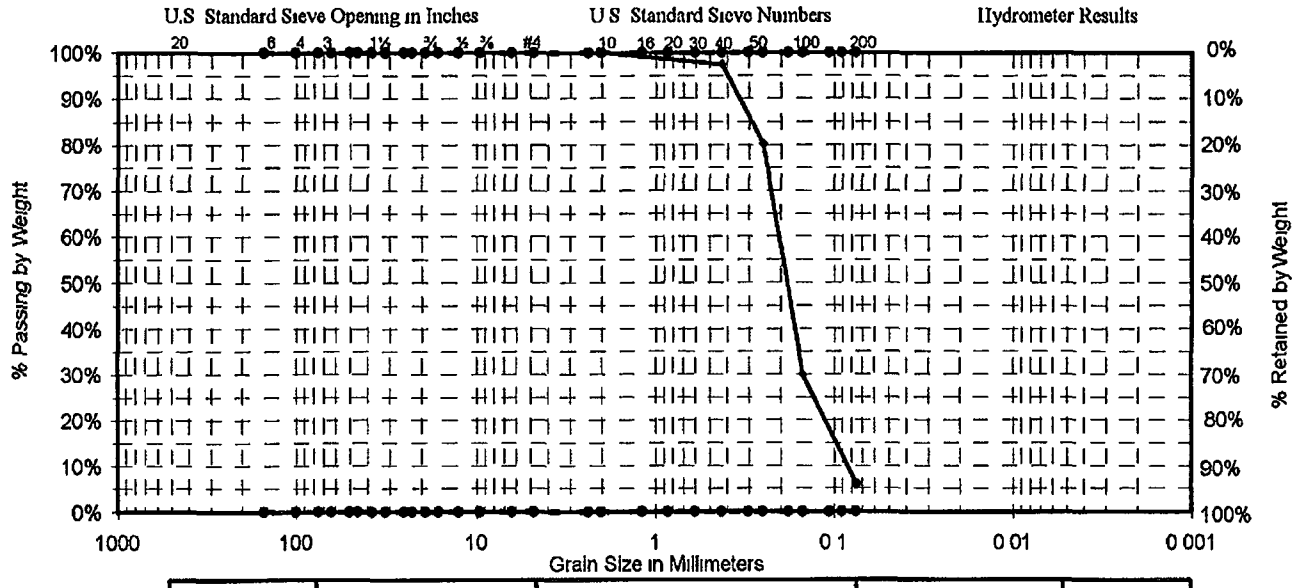
Date	08/07/07	D_{10} = 0 08	USCS Classification	% Gravel	% Sand
Sample #	3	D_{30} = 0 12	SP-SM, Poorly graded San	0 0%	90 6%
Sample ID		D_{60} = 0 19	Specifications		
Source		C_C = 1 03	No Specs		
Project	Citrus County Transfer Station	C_U = 2 44	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	9.4%	
Boring #	B-2	Plastic Limit= n/a	Fineness Modulus		
Depth	4' - 5 1/2'	Plasticity Index= n/a	0 66		

Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100.0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 4%		
2 00"	50 00		100 0%			#20	0 850		99 2%		
1 75"	45 00		100 0%			#30	0 600		99 0%		
1 50"	37 50		100 0%			#40	0 425	98 9%	98 9%		
1 25"	31 50		100 0%			#50	0 300		92 8%		
1 00"	25 00		100 0%			#60	0 250	90 3%	90 3%		
7/8"	22 40		100 0%			#80	0 180		57 1%		
3/4"	19 00		100 0%			#100	0 150	42 9%	42 9%		
5/8"	16 00		100 0%			#140	0 106		23 3%		
1/2"	12 50		100 0%			#170	0 090		16 1%		
3/8"	9 50		100 0%			#200	0 075	9 4%	9 4%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Date	08/07/07	D_{10} = 0 09	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 14	SP, Poorly graded Sand	0 0%	95 2%
Sample ID		D_{60} = 0 20	**Specifications**		
Source		C_C = 1 11	No Specs		
Project	Citrus County Transfer Station	C_U = 2 23	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	4 8%	
Boring #	B-3	Plastic Limit= n/a	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= n/a	0 75		

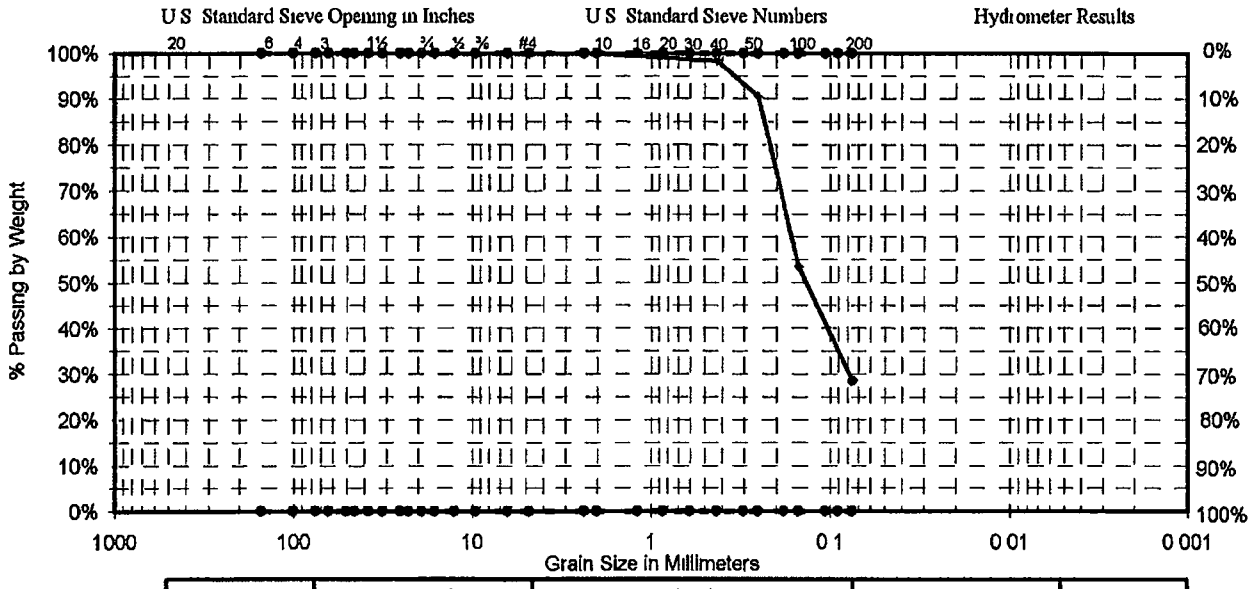
Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 5%		
2 00"	50 00		100 0%			#20	0 850		99 3%		
1 75"	45 00		100 0%			#30	0 600		99 1%		
1 50"	37 50		100 0%			#40	0.425	99 0%	99 0%		
1.25"	31 50		100 0%			#50	0 300		91 6%		
1 00"	25 00		100 0%			#60	0 250	88 7%	88 7%		
7/8"	22 40		100 0%			#80	0 180		50 7%		
3/4"	19 00		100 0%			#100	0 150	34 4%	34 4%		
5/8"	16 00		100 0%			#140	0 106		17 0%		
1/2"	12 50		100 0%			#170	0 090		10 7%		
3/8"	9 50		100 0%			#200	0 075	4 8%	4 8%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date	08/07/07	D_{10} = 0 09	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 15	SP-SM, Poorly graded San	0.0%	94 0%
Sample ID		D_{60} = 0 21	**Specifications**		
Source		C_C = 1 23	No Specs		
Project	Citrus County Transfer Station	C_U = 2 40	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	6 0%	
Boring #	B-5	Plastic Limit= n/a	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= n/a	0 89		

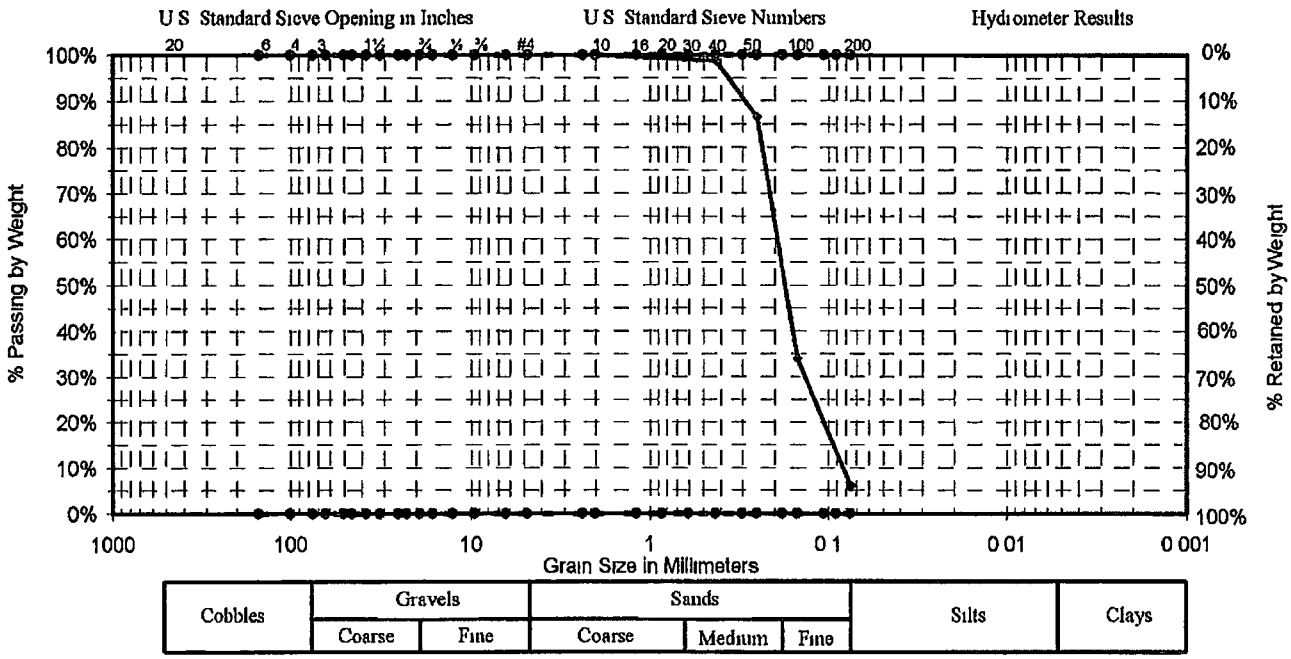
Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		99 9%		
3 00"	75 00		100 0%			#10	2 000	99 9%	99 9%		
2 50"	63 00		100 0%			#16	1 180		98 7%		
2 00"	50 00		100 0%			#20	0 850		98 2%		
1 75"	45 00		100 0%			#30	0 600		97 8%		
1 50"	37 50		100 0%			#40	0 425	97 5%	97 5%		
1 25"	31 50		100 0%			#50	0 300		85 2%		
1 00"	25 00		100 0%			#60	0 250	80 3%	80 3%		
7/8"	22 40		100 0%			#80	0 180		45 0%		
3/4"	19 00		100 0%			#100	0 150	29.8%	29 8%		
5/8"	16 00		100 0%			#140	0 106		15 9%		
1/2"	12 50		100 0%			#170	0 090		10 8%		
3/8"	9 50		100 0%			#200	0 075	6 0%	6 0%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date	08/07/07	D_{10} = 0 03	USCS Classification	% Gravel	% Sand
Sample #	1	D_{30} = 0 08	SM, Silty Sand	0 2%	71 3%
Sample ID		D_{60} = 0 17	Specifications		
Source		C_C = 1 43	No Specs		
Project	Citrus County Transfer Station	C_U = 6 39	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= 25 9%	n/a	28 6%	
Boring #	B-7	Plastic Limit= 19 7%	Fineness Modulus		
Depth	1' - 2 1/2'	Plasticity Index= 6 2%	0 56		

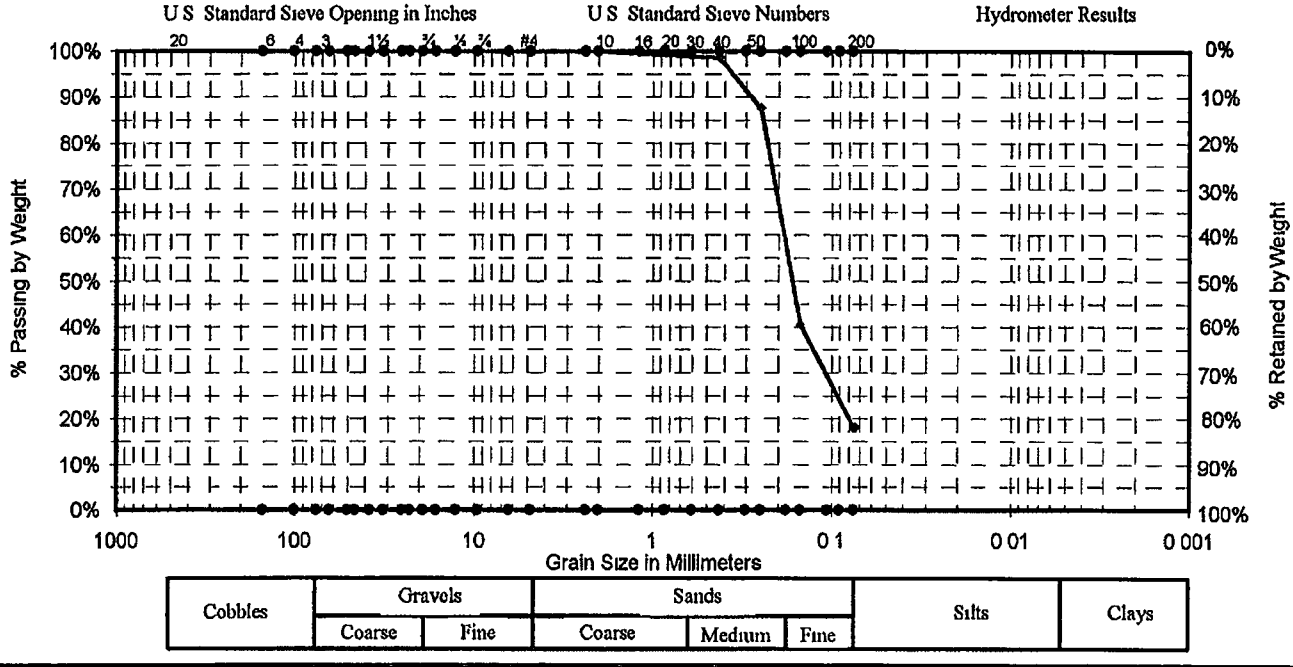
Coarse Section Sieve Size US	Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min	Fines Section Sieve Size US	Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6 00"	150 00		100 0%			#4	4 750	99 8%	99 8%		
4 00"	100 00		100.0%			#8	2 360		99 8%		
3 00"	75 00		100 0%			#10	2.000	99 8%	99 8%		
2 50"	63 00		100 0%			#16	1 180		99 1%		
2 00"	50 00		100 0%			#20	0 850		98 7%		
1 75"	45 00		100 0%			#30	0.600		98 5%		
1 50"	37 50		100 0%			#40	0 425	98 3%	98 3%		
1 25"	31 50		100.0%			#50	0 300		92 9%		
1 00"	25 00		100 0%			#60	0 250	90 7%	90 7%		
7/8"	22 40		100 0%			#80	0 180		64 6%		
3/4"	19 00		100 0%			#100	0 150	53 4%	53 4%		
5/8"	16 00		100 0%			#140	0 106		38.9%		
1/2"	12 50		100 0%			#170	0 090		33 6%		
3/8"	9 50		100 0%			#200	0 075	28 6%	28 6%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	99 8%	99 8%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date	08/07/07	D_{10} = 0 09	USCS Classification	% Gravel	% Sand
Sample #	5	D_{30} = 0 14	SP-SM, Poorly graded San	0.0%	93 9%
Sample ID		D_{60} = 0 20	Specifications		
Source		C_C = 1 14	No Specs		
Project	Citrus County Transfer Station	C_U = 2 33	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	6 1%	
Boring #	B-7	Plastic Limit= n/a	Fineness Modulus		
Depth	7' - 8 1/2'	Plasticity Index= n/a	0 78		

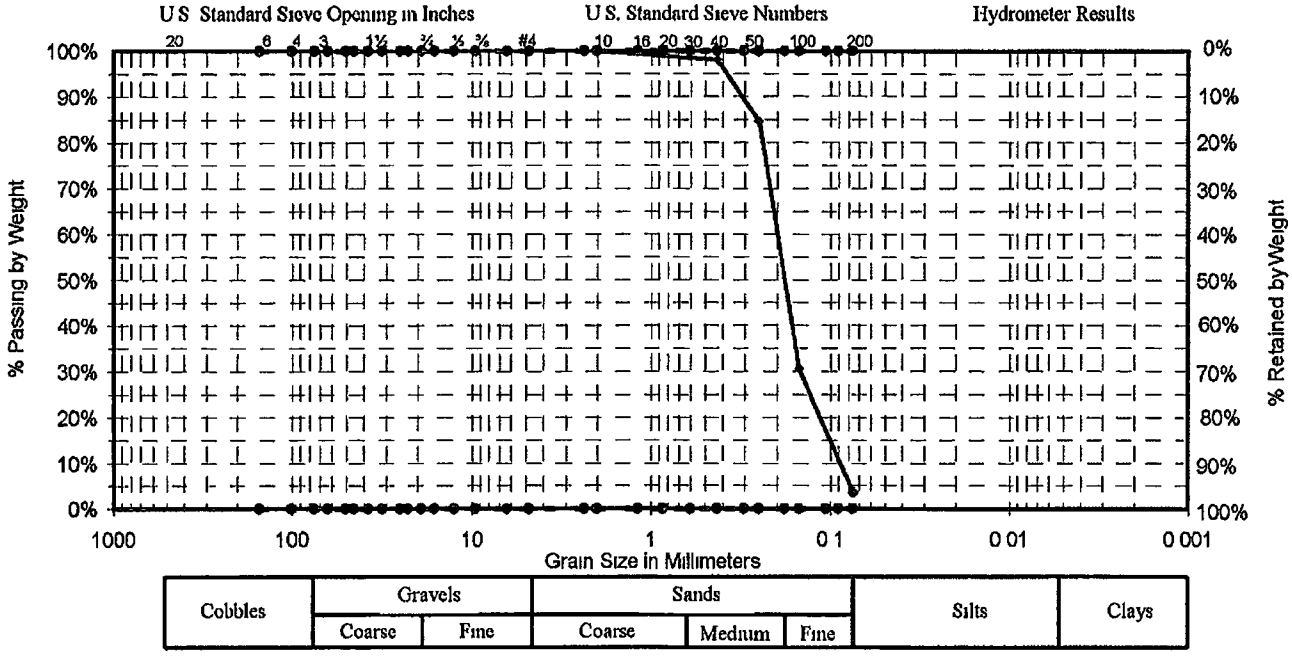
Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 4%		
2 00"	50 00		100 0%			#20	0 850		99 1%		
1 75"	45 00		100 0%			#30	0 600		98 9%		
1 50"	37 50		100 0%			#40	0 425	98 8%	98 8%		
1 25"	31 50		100 0%			#50	0 300		90 0%		
1 00"	25 00		100 0%			#60	0 250	86 5%	86 5%		
7/8"	22 40		100 0%			#80	0 180		49 7%		
3/4"	19 00		100 0%			#100	0 150	33 9%	33 9%		
5/8"	16 00		100 0%			#140	0 106		17 6%		
1/2"	12 50		100 0%			#170	0 090		11 6%		
3/8"	9 50		100 0%			#200	0 075	6 1%	6 1%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

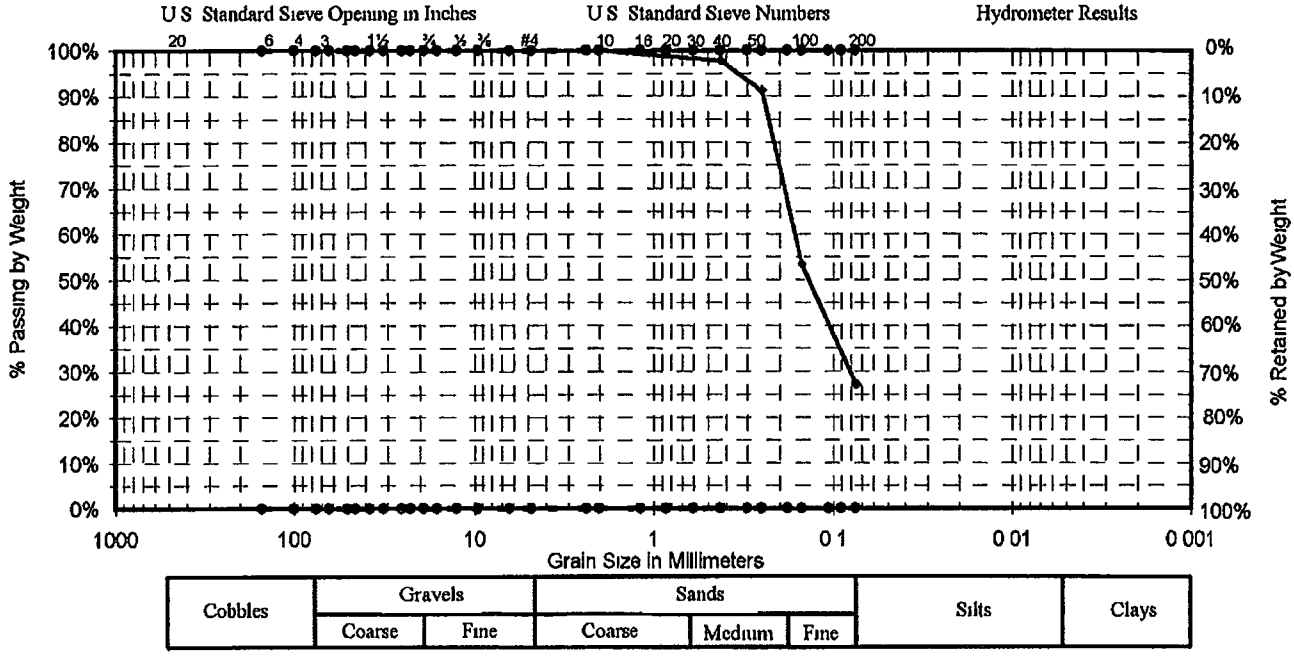
Date	08/07/07	D_{10} = 0 04	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 11	SM, Silty Sand	0 0%	81 8%
Sample ID		D_{60} = 0 19	**Specifications**		
Source		C_C = 1 67	No Specs		
Project	Citrus County Transfer Station	C_U = 4 65	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= 0 0%	n/a	18 2%	
Boring #	B-8	Plastic Limit= 0 0%	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= 0 0%	0 71		

Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 3%		
2 00"	50 00		100 0%			#20	0 850		99 0%		
1 75"	45 00		100 0%			#30	0 600		98 8%		
1 50"	37 50		100 0%			#40	0 425	98 6%	98 6%		
1 25"	31 50		100 0%			#50	0 300		90 8%		
1 00"	25 00		100 0%			#60	0 250	87 6%	87 6%		
7/8"	22 40		100 0%			#80	0 180		54 7%		
3/4"	19 00		100 0%			#100	0 150	40 6%	40 6%		
5/8"	16 00		100 0%			#140	0 106		27 5%		
1/2"	12 50		100 0%			#170	0 090		22 7%		
3/8"	9 50		100 0%			#200	0 075	18 2%	18 2%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



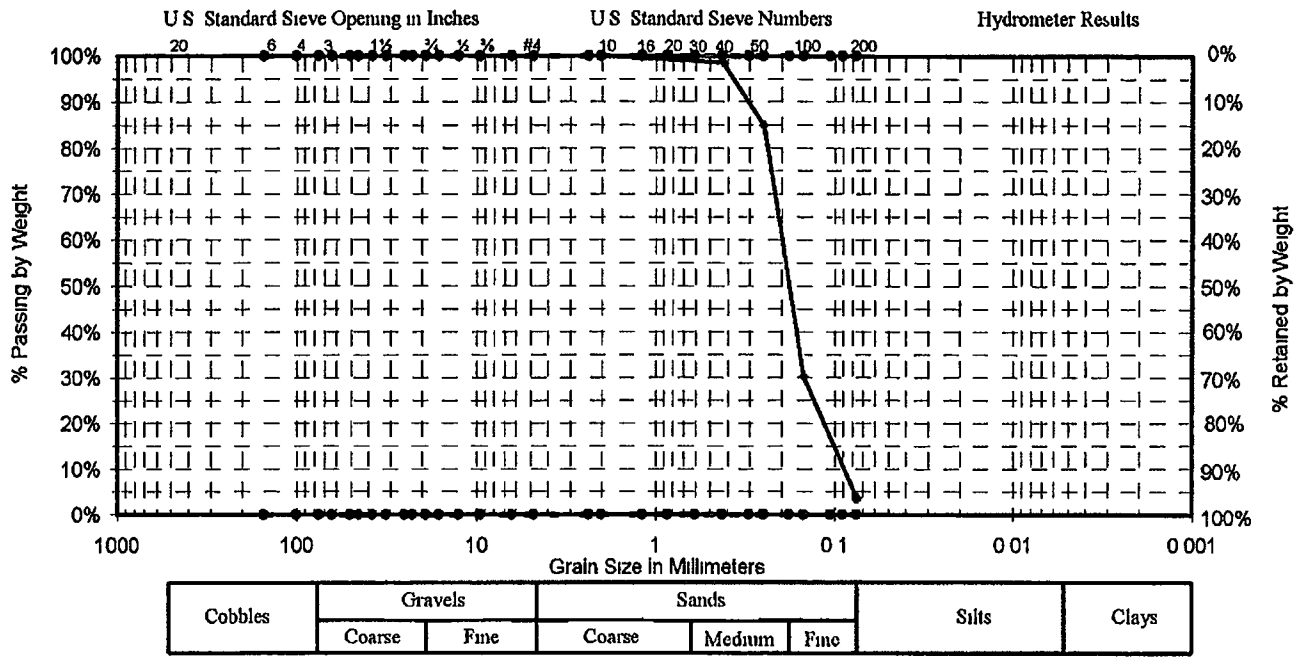
Date	08/07/07	D_{10} = 0 09	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 15	SP, Poorly graded Sand	0 0%	96 4%
Sample ID		D_{60} = 0 20	**Specifications**		
Source		C_C = 1 16	No Specs		
Project	Citrus County Transfer Station	C_U = 2 20	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	3 6%	
Boring #	B-9	Plastic Limit= n/a	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= n/a	0 84		

Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 0%		
2 00"	50 00		100 0%			#20	0 850		98 6%		
1 75"	45 00		100 0%			#30	0 600		98 3%		
1 50"	37 50		100 0%			#40	0 425	98 1%	98 1%		
1 25"	31 50		100 0%			#50	0 300		88 5%		
1 00"	25 00		100 0%			#60	0 250	84 6%	84 6%		
7/8"	22 40		100 0%			#80	0 180		46 8%		
3/4"	19 00		100 0%			#100	0 150	30 6%	30 6%		
5/8"	16 00		100 0%			#140	0 106		14 8%		
1/2"	12 50		100 0%			#170	0 090		9 0%		
3/8"	9 50		100 0%			#200	0 075	3 6%	3 6%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Date	08/07/07	D_{10} = 0 03	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 08	SM, Silty Sand	0 0%	72 6%
Sample ID		D_{60} = 0 17	**Specifications**		
Source		C_C = 1 48	No Specs		
Project	Citrus County Transfer Station	C_U = 6 13	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= 28 5%	n/a	27 4%	
Boring #	B-10	Plastic Limit= 20 2%	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= 8 2%	0 57		

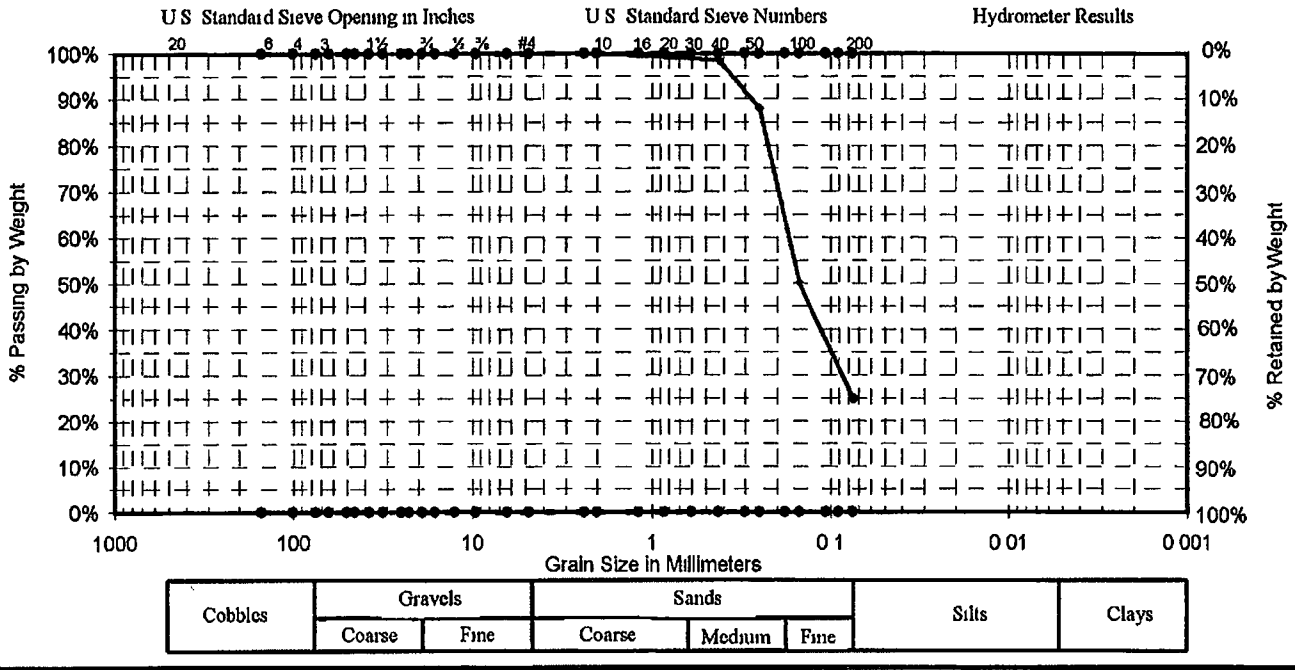
Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size US	Sieve Size Metric	Percent Passing	Percent Passing	Specs Max	Specs Min	Sieve Size US	Sieve Size Metric	Percent Passing	Percent Passing	Specs Max	Specs Min
6 00"	150 00		100.0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		98 8%		
2 00"	50 00		100 0%			#20	0 850		98 3%		
1 75"	45 00		100 0%			#30	0 600		98 0%		
1 50"	37 50		100 0%			#40	0 425	97 7%	97 7%		
1 25"	31 50		100 0%			#50	0.300		93.1%		
1 00"	25 00		100 0%			#60	0 250	91 3%	91 3%		
7/8"	22 40		100 0%			#80	0 180		64 6%		
3/4"	19 00		100 0%			#100	0 150	53 2%	53 2%		
5/8"	16 00		100 0%			#140	0 106		38 1%		
1/2"	12 50		100 0%			#170	0 090		32 6%		
3/8"	9 50		100 0%			#200	0 075	27 4%	27 4%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

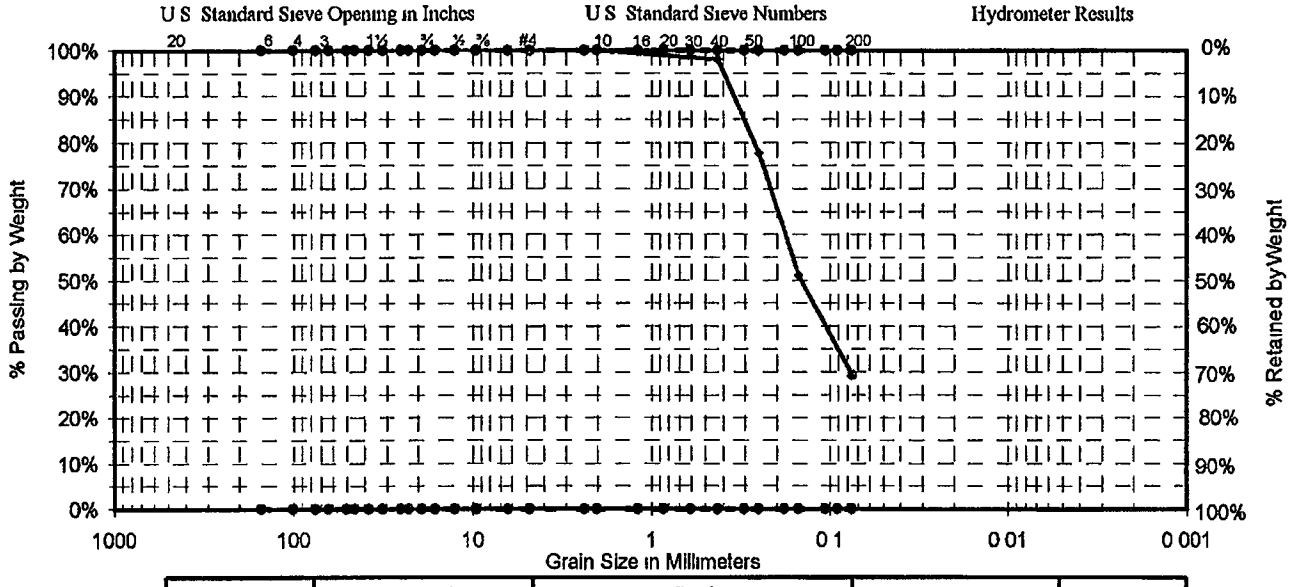
Date	08/07/07	D_{10} = 0 09	**USCS Classification**	% Gravel	% Sand	
Sample #	5	D_{30} = 0 15	SP, Poorly graded Sand	0 0%	96 3%	
Sample ID		D_{60} = 0 20	**Specifications**			
Source		C_C = 1 17	No Specs			
Project	Citrus County Transfer Station	C_U = 2 20	Sample Meets Specs	% Silt & Clay		
Location		Liquid Limit= n/a	n/a	3 7%		
Boring #	B-10	Plastic Limit= n/a	Fineness Modulus			
Depth	7' - 8 1/2'	Plasticity Index= n/a	0 83			

Coarse Section		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min	Fines Section		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size US	Sieve Size Metric					Sieve Size US	Sieve Size Metric				
6 00"	150.00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 3%		
2 00"	50 00		100 0%			#20	0 850		99 0%		
1 75"	45 00		100 0%			#30	0 600		98 7%		
1 50"	37 50		100 0%			#40	0 425	98 6%	98 6%		
1 25"	31 50		100 0%			#50	0 300		88.8%		
1 00"	25 00		100 0%			#60	0 250	84 9%	84 9%		
7/8"	22 40		100 0%			#80	0 180		46 7%		
3/4"	19 00		100 0%			#100	0 150	30 3%	30 3%		
5/8"	16 00		100 0%			#140	0 106		14 7%		
1/2"	12 50		100 0%			#170	0 090		9 0%		
3/8"	9 50		100 0%			#200	0 075	3 7%	3 7%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Date	08/07/07	D_{10} = 0 03	**USCS Classification**	% Gravel	% Sand
Sample #	2	D_{30} = 0 09	SM, Silty Sand	0 0%	74 9%
Sample ID		D_{60} = 0 18	**Specifications**		
Source		C_C = 1 53	No Specs		
Project	Citrus County Transfer Station	C_U = 5 90	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= 28 7%	n/a	25 1%	
Boring #	B-11	Plastic Limit= 20 6%	Fineness Modulus		
Depth	2 1/2' - 4'	Plasticity Index= 8 1%	0 61		

Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 3%		
2 00"	50 00		100 0%			#20	0 850		99 0%		
1 75"	45 00		100 0%			#30	0 600		98 7%		
1 50"	37 50		100 0%			#40	0 425	98 6%	98 6%		
1 25"	31 50		100 0%			#50	0 300		91 1%		
1 00"	25 00		100 0%			#60	0 250	88 1%	88 1%		
7/8"	22 40		100 0%			#80	0 180		61 5%		
3/4"	19 00		100 0%			#100	0 150	50 0%	50 0%		
5/8"	16 00		100 0%			#140	0 106		35 4%		
1/2"	12 50		100 0%			#170	0 090		30 1%		
3/8"	9 50		100 0%			#200	0 075	25 1%	25 1%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date	08/07/07	D_{10} = 0 03	USCS Classification	% Gravel	% Sand
Sample #	3	D_{30} = 0 08	SM, Silty Sand	0 0%	70 5%
Sample ID		D_{60} = 0 18	Specifications		
Source		C_C = 1 26	No Specs		
Project	Citrus County Transfer Station	C_U = 7 23	Sample Meets Specs	% Silt & Clay	
Location		Liquid Limit= n/a	n/a	29 5%	
Boring #	B-12	Plastic Limit= n/a	Fineness Modulus		
Depth	4' - 5 1/2'	Plasticity Index= n/a	0 68		

Coarse Section		Actual Cumulative	Interpolated Cumulative			Fines Section		Actual Cumulative	Interpolated Cumulative		
Sieve Size		Percent	Percent	Specs	Specs	Sieve Size		Percent	Percent	Specs	Specs
US	Metric	Passing	Passing	Max	Min	US	Metric	Passing	Passing	Max	Min
6 00"	150 00		100 0%			#4	4 750	100 0%	100 0%		
4 00"	100 00		100 0%			#8	2 360		100 0%		
3 00"	75 00		100 0%			#10	2 000	100 0%	100 0%		
2 50"	63 00		100 0%			#16	1 180		99 0%		
2 00"	50 00		100 0%			#20	0 850		98 5%		
1 75"	45 00		100 0%			#30	0.600		98 2%		
1 50"	37 50		100 0%			#40	0 425	98 0%	98 0%		
1 25"	31 50		100 0%			#50	0 300		83 5%		
1 00"	25 00		100 0%			#60	0 250	77 6%	77 6%		
7/8"	22 40		100 0%			#80	0 180		59 0%		
3/4"	19 00		100 0%			#100	0 150	51 0%	51 0%		
5/8"	16 00		100 0%			#140	0 106		38 4%		
1/2"	12 50		100 0%			#170	0 090		33 8%		
3/8"	9 50		100 0%			#200	0 075	29 5%	29 5%		
1/4"	6 30		100 0%			#270	0 053				
#4	4 75	100 0%	100 0%								

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November 24, 2008

King Engineering Associates, Inc
4921 Memorial Highway, Suite 300
Tampa, Florida 33634

Attention: Mr Christopher Kuzler, P E
Vice President

Reference. Limited Geotechnical Exploration
Drainage Retention Areas (DRA) Soil & Groundwater Evaluation
Citrus County Solid Waste Transfer Station
Lecanto, Citrus County, Florida
UES Project No 1830 0800122 0000
UES Report No · 734008

Dear Mr Kuzler:

Universal Engineering Sciences, Inc (UES) has completed a limited geotechnical exploration for the proposed drainage retention areas (DRA) associated with this project The scope of our exploration was planned in conjunction with Ms Lara Daly, P E and Mr K R Chang, P E with CH2MHill authorized by you on November 6, 2008 This report summarizes the general subsurface soil and groundwater table conditions found during our exploration program and our recommendations for hydrogeologic parameters to facilitate with the civil engineering design of the project

PROJECT DESCRIPTION

This phase of the project consisted of performing a limited geotechnical exploration for the new storm water management areas associated with the Citrus County Solid Waste Transfer Station and associated projects We were provided with a proposed test boring location plan and permeability test depths prepared by King Engineering We used this information in preparing our exploration and performing our evaluations

We were requested to perform a geotechnical exploration within the proposed stormwater pond in order to evaluate the general subsurface conditions, groundwater table characteristics, and to develop recommendations for hydrogeologic parameters for the design of the proposed stormwater management facilities

FIELD EXPLORATION PROGRAM

The subsurface conditions on site were evaluated with a total of nine (9) Standard Penetration Test (SPT) borings advanced to depths between approximately 20 feet to 40 feet each, below the existing grades in accordance with the procedures described in ASTM D-1586 We performed the Standard Penetration Test according to the procedures of ASTM D-1586, however, we used continuous sampling to detect slight variations in the soil profile at shallow depths The basic procedure for the

Standard Penetration Test is as follows. A standard split-barrel sampler is driven into the soil by a 140-pound hammer falling 30 inches The number of blows required to drive the sampler 1-foot, after seating 6-inches, is designated the penetration resistance, or N-value, this value is an index to soil strength and consistency

Horizontal and vertical survey control was performed by others for the test boring locations prior to our field exploration program Our field crew located and drilled the staked test locations Therefore, the test locations and depths indicated on the Boring Location Plan and Boring Logs should be considered accurate

USDA SOIL SURVEY

The subject parcel is located on the south side of Gulf to Lake Highway West, East of the Central Landfill site and Southwest of Sand Cutter Terrace in within Section 01 of Township 19 South and Range 18 East

The USDA Soil Conservation Service Soil Survey for Citrus County identified two (2) potential surficial soil types on or immediately adjacent to the project site A summary of these soil types are outlined below in Table 1

Please note that the soil types noted by the USDA Soil Conservation Survey for Citrus County were the in situ soils in 1973 The soil properties and/or profile may be altered as a result of post survey development

TABLE 1: Summary of SCS Surficial Soil Type

Map Unit, Soil Series & Type	SCS Seasonal High Groundwater Level Estimate	Drainage Characteristics	SCS Hydrologic Group	Range of Permeability Rates (ft/day)	Shrink/ Swell potential	Typical depth to Bedrock
#14 Lake Fine Sand, 0 to 5% Slopes	Greater than 6 feet	Excessively Drained	A	Greater Than 12 feet per day for 0 to 6' Bls	Low	Greater than 5 feet below native grade
#29 Astatula Fine Sand, 0 to 5% Slopes	Greater than 6 feet	Excessively Drained	A	Greater Than 40 feet per day For 0 to 6' Bls	Low	Greater than 5 feet below native grade

SUBSURFACE CONDITIONS

The boring locations and detailed subsurface conditions are illustrated in Appendix B: Boring Location Plan and Boring Logs The classifications and descriptions shown on the logs are generally based upon visual characterizations of the recovered soil samples and a limited number of laboratory tests Also, see Appendix B. Soils Classification Chart, for further explanation of the symbols and placement of data on the Boring Logs. Table 2. General Soil Profile summarizes the soil conditions found

TABLE 2: GENERAL SOIL PROFILE

Strata No.	Typical Range of Depths (feet)	Soil Descriptions
Stratum 1	0 – 40	Loose to dense SAND [SP] to SAND with traces of clay [SP-SC]
Stratum 2	17-25	Medium dense, slightly clayey fine SAND [SC] (Borings P-8, P-10, & P-13 ONLY)
* Termination of Deepest Boring [ ] Bracketed Text Indicates: Unified Soil Classification		

In general, two (2) distinct soil strata were found on the subject site at the test boring locations as summarized in the Table above The findings at the test boring locations were fairly consistent with slight variations in layer interface depths and fines content A groundwater table was not found within the boring termination depth at the test boring locations at the time of our site exploration

GROUNDWATER CONDITIONS

The groundwater table will fluctuate seasonally depending upon local rainfall The typical wet season groundwater level is defined as the highest groundwater level sustained for a period of 2 to 4 weeks during the "wet" season of the year, for existing site conditions, in a year with average normal rainfall amounts Based on historical data, the rainy season in West Central Florida is typically between May and September of any given year In order to estimate the wet season water level at the boring locations, many factors may be considered, such as the following:

- Measured groundwater level
- Drainage characteristics of existing soil types
- Season of the year (wet/dry season)
- Current & historical rainfall data (recent and year-to-date)
- Natural relief points (such as lakes, rivers, swamp areas, etc)

- Man-made drainage systems (ditches, canals, etc)
- Distances to relief points and man-made drainage systems
- Vegetative indicators
- Area topography (ground surface elevations)
- Review of available published literature including USDA Soil Survey, Potentiometric Maps, etc
- Original land features (flatwood, slough, etc)
- Stratigraphy including the presence of hydraulically restrictive layers
- Redoximorphic features (i e soil mottling, color, etc.)
- Presence of "known" sinkhole activity on or adjacent to the subject site

Review of published literature suggests the wet season elevation of the potentiometric surface of the Upper Floridan Aquifer is estimated to be about elevation +8 feet +/- NGVD (1929) in the vicinity of the subject site (USGS, 2005) The water surface of the Floridan would be considered a "permanent" water table and we would anticipate the "stabilized" wet season water table to occur at or near this elevation

We did not find a stabilized or perched groundwater table within the boring location termination depths By definition the seasonal high groundwater level is defined as the highest groundwater level sustained for a period of 2 to 4 weeks during the "wet" season of the year For this site, we would anticipate the stabilized seasonal high groundwater table to at a depth greater than the boring termination depths

It should be noted that the indicated seasonal high groundwater level does not provide any assurance that the groundwater levels will not exceed the anticipated levels during any given year in the future Should impediments to surface water drainage exist on site or rainfall intensity, duration, and total quantities vary significantly, groundwater levels might exceed the approximate levels indicated within this report We recommend positive drainage be established and maintained on the site during construction. Further, we recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project All stormwater designs should incorporate the seasonal high and perched groundwater levels as appropriate

STORMWATER MANAGEMENT DESIGN PARAMETERS

A total of nine (9) laboratory constant-head permeability tests were performed on remolded representative samples obtained from the boring locations The test results indicate saturated coefficient of permeability rates of 5 feet per day to 28 feet per day depending upon the fines content We recommend that you consider the remolded values to be representative of the saturated horizontal coefficient of permeability (Kh) The saturated vertical coefficient of permeability may be estimated as 50% of the remolded value Unsaturated vertical permeability is generally less than saturated values due to the lack of laminar flow through the soil SWFWMD's 1989 publication titled "Stormwater Retention Pond Infiltration Analyses in Confined Aquifers" suggests that the unsaturated vertical permeability may be estimated as about 2/3 of the saturated values Appropriate

factors of safety should be used with any permeability data in accordance with software modeling, industry standards, and/or jurisdictional requirements For Infiltration analyses, we recommend the clayey soils (SC, CL, CH) not tested should be considered to have permeability rates of less than ½ foot per day The results of the individual laboratory permeability tests performed on samples recovered from the boring locations are presented on the boring logs included in the Appendix It should be noted that the coefficient of permeability indicated on the boring logs is not an infiltration rate The actual infiltration rate is influenced by the coefficient of permeability as well as several other factors, including the elevation of the pond bottom, the water level in the pond, the elevation of the wet season water table, and the confining layer These factors must be accounted for in an appropriate groundwater model to determine the infiltration rate of a given soil stratum

Based upon our visual-manual review of the site soils, the results of our laboratory testing and observation of the existing site conditions, we recommend that you consider the surficial sandy soils [SP, SP-SC] above the clayey soils to have a gross porosity of 25 percent The fillable porosity is the available porosity after accounting for the natural moisture content We recommend that you use an average fillable porosity of 20 percent for the sandy material [SP, SP-SC] above the watertable For consecutive storm events the fillable porosity for the second storm event should be assumed to be zero Presented below in Table 3 is a summary of our stormwater retention design parameters **A factor of safety (F.O.S) has <u>not</u> been applied to the values presented**

Table 3: Stormwater Design Parameters

Design Parameter	Recommended Design Values								
Test Boring Location	P-1	P-3	P-4	P-5	P-6	P-7	P-8	P-10	P-13
Ground Surface Elevations Provided By CH2MHill [feet]	120.70	118 10	131 0	122 95	128 90	128 90	125.95	122 95	118.64
Approximate Elevation that soil sample was obtained for Hydraulic Conductivity Test [feet]	115	115	108	116 5	112	120	117	116.5	115.5
Available Fillable Porosity (n) [%]	20	20	20	20	20	20	20	20	20
Saturated Horizontal Hydraulic Conductivity Value (K_H) [feet per day]	9	24	9	28	5	12	24	11	10
Saturated Vertical Hydraulic Conductivity Value (K_{VS}) [feet per day]	4 5	12	4 5	14	2 5	6	12	5 5	5
Unsaturated Vertical Hydraulic Conductivity Value (K_{VU}) [feet per day]	3	8	3	9 3	1 7	4	8	3.7	3.3

Please note that depending on the final site grading, geometry of the stormwater management areas, and the soil stratigraphy at each specific pond location, it may be prudent for the designer to determine a weighted equivalent horizontal and vertical permeability rate for a multi-layered system for use in the stormwater infiltration calculations (i e pond banks cut into sandy soils while pond bottom is cut into clayey soils)

The actual exfiltration rates from the pond may be influenced by pond geometry, natural soil variability, in-situ depositional characteristics and soil density, retention volume, and groundwater mounding effects Also, it is important to note that the upper in-situ soil zone is usually altered during the excavation and grading operations by heavy, vibrating earthwork equipment Due to these numerous factors cited above, published literature suggests that the permeability of a soil can only be estimated to within an order of magnitude Therefore, appropriate factors of safety should be incorporated into the design process

VARIABILITY OF LOCAL GEOLOGY

Our local experience has found that clayey soil deposits are often laterally discontinuous, which makes it more difficult to ascertain their presence on a give project site with limited soil data If clayey soils (SC, CL, CH) are encountered during construction that were not found during our geotechnical exploration, we recommend that you contact UES and the Civil Engineer immediately, so that we may evaluate the impact of soil conditions to the project

Variable limestone conditions are an inherent part of the geology of Citrus County To avoid claims during construction, the contractors have to be made aware prior to bidding that limestone and/or limestone boulders may be found randomly on site during earthwork and excavation operations Some of the rock may require rock breakers or ripping

It is important to understand that sinkholes are a characteristic feature of Citrus County's karst geology and can occur anywhere depending on the presence of cavernous voids in the limestone Karst is defined as a type of topography that is formed over limestone and dolomite by dissolution, and is characterized by sinkholes, caves, and underground drainage Typical sinkhole features in Citrus County are relatively small in diameter (most less than 20 feet) and are limited in extent and depth by the presence of shallow limestone and/or cohesive soils Additional Geotechnical considerations may be required on this project if sinkhole activity is identified or occurs during the design and construction of the project At this time, UES has not performed a detailed, site specific sinkhole study on the subject site We would be happy to prepare an additional scope of work to evaluate sinkhole potential on this project if desired

CONSTRUCTION RELATED SERVICES

An important aspect of the success of the construction process is the transfer of information between all concerned parties prior to start of any activities on-site As such, ***Universal Engineering Sciences strongly recommends that a pre-construction meeting be held with the following representatives in attendance at a minimum: owner, general contractor, site (earthwork) contractor, civil engineer,***

underground utility contractor, UES geotechnical engineer, materials testing technician, and other parties as appropriate. At this meeting, UES would describe in detail the geotechnical considerations that would impact the construction process and future serviceability of the improvements

We recommend the owner retain Universal Engineering Sciences to perform construction materials tests and observations on the project Field tests and observations include verification of foundation and pavement subgrades by monitoring proof-rolling operations, performing quality assurance tests on the placement of compacted structural fill, and deep foundation installation observation (if applicable)

The geotechnical engineering design does not end with the advertisement of the construction documents The design is an on-going process throughout construction Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner

LIMITATIONS

No site or project facilities/improvements, other than those described herein, should be designed using the soil information presented in this report Moreover, UES will not be responsible for the performance of any site improvement so designed and constructed

Borings for a typical geotechnical report are widely spaced and generally not sufficient for reliably detecting the presence of isolated, anomalous surface or subsurface conditions, or reliably estimating unsuitable or suitable material quantities Accordingly, UES does not recommend relying on our boring information to negate presence of anomalous materials or for estimation of material quantities unless our contracted services ***specifically*** include sufficient exploration for such purpose(s) and within the report we so state that the level of exploration provided should be sufficient to detect such anomalous conditions or estimate such quantities Therefore, UES will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended

The scope of services addressed in this report for this project did not include geotechnical evaluation nor recommendations for any site improvement other than the stipulated stormwater pond design parameters Therefore, UES does not recommend, and will not be responsible for any use of the information contained in this report for any purpose other than that intended and contracted

Please note that our exploration program was based upon a limited number of soil borings and laboratory tests The conclusions and recommendations made within this report are based solely upon the soil and groundwater conditions found within the exploratory soil boring depths at the specific boring locations Variations in the soil stratigraphy may exist below the exploratory depths or between the test boring locations and may require additional consideration in the stormwater management design recommendations contained within this report Further, our work did not address the potential for surface expression of deep geological conditions, such as sinkhole development

related to karst activity This evaluation requires a more extensive range of field services than performed in this study We will be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction, if you desire

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems An ASFE publication, "Important Information About Your Geotechnical Engineering Report" appears in the Appendix, and will help explain the nature of geotechnical issues

Further, we present documents in the Appendix: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report Also, attached is a copy of UES General Conditions

CLOSURE

We appreciate the opportunity to have worked with you on this project and look forward to a continued association as this project proceeds Please do not hesitate to contact the undersigned if you should have any questions, or if we may further assist you as your plans proceed

Sincerely,

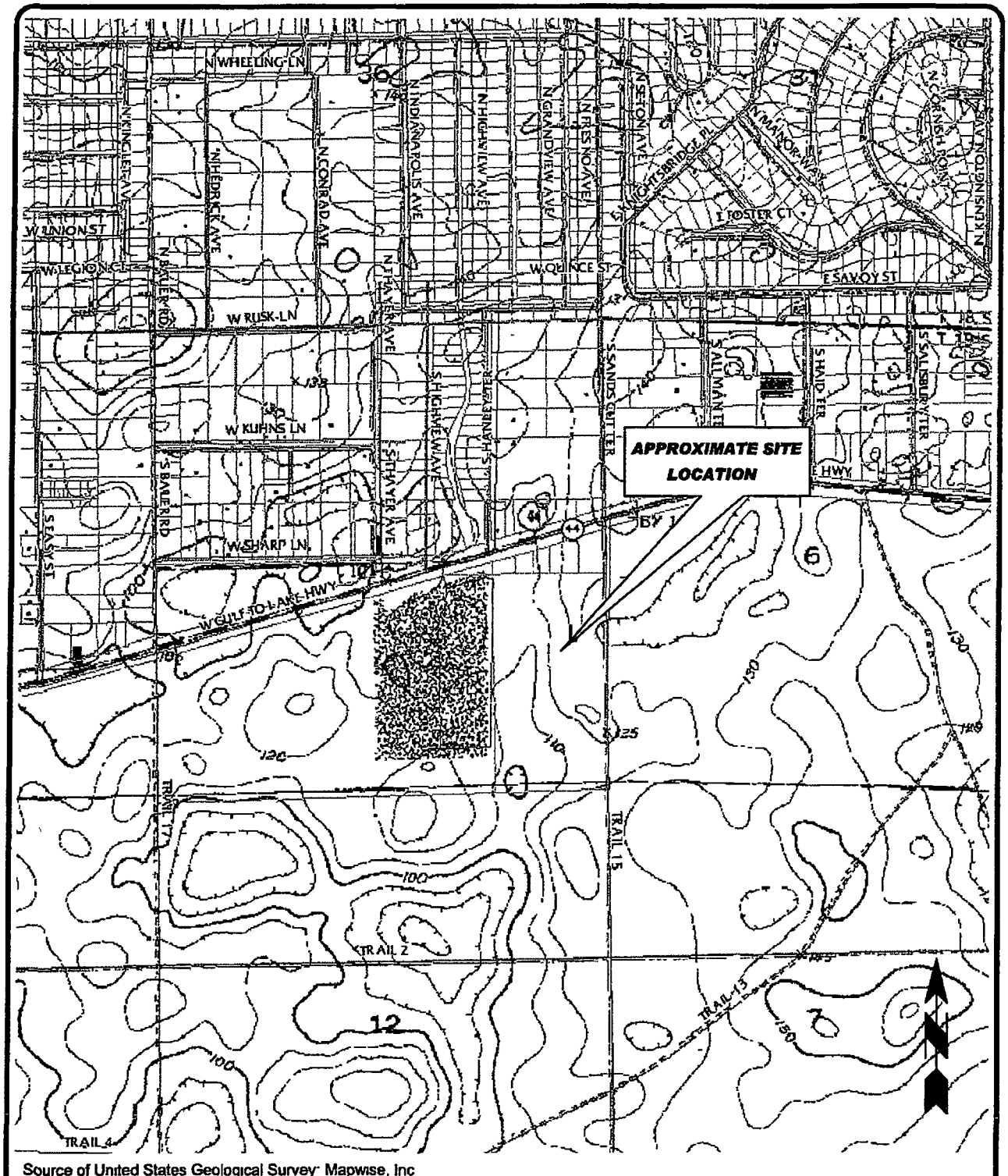
UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No 549

11/24/08

Guy H Rabens, M S , P E
Ocala Branch Manager
STATE OF FLORIDA
Professional Engineer No 60917

Appendix: USGS Map
Boring Location Plan
Boring Logs
Key to Boring Logs
Constraints and Restrictions
ASFE Import Information about Your Geotechnical Report
UES General Conditions
UES Office Location Map

cc. Client (6)
K R Chang, CH2MHill (via email)



Source of United States Geological Survey- Mapwise, Inc

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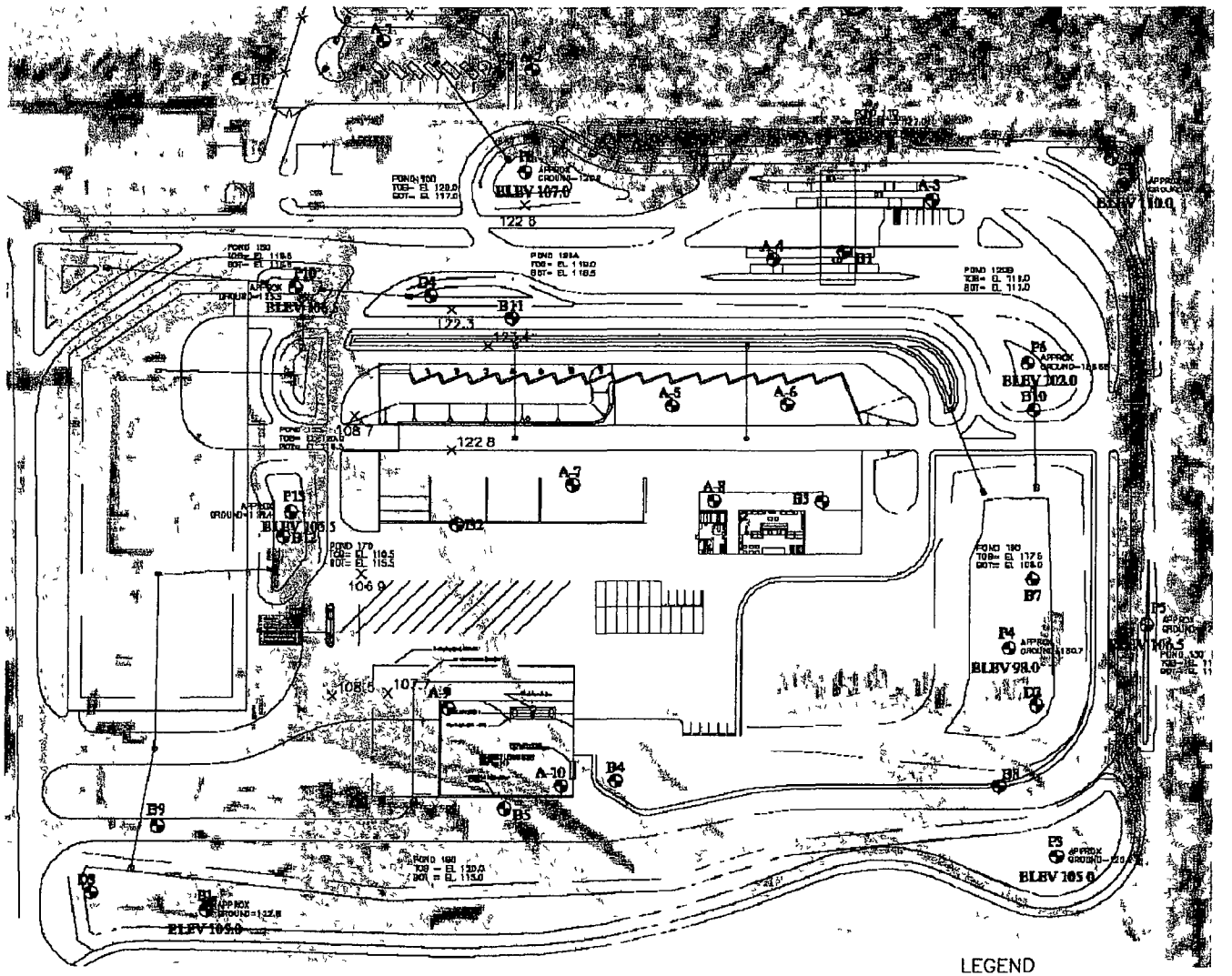
CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY, FLORIDA

USGS VICINITY MAP

DRAWN BY: KD	DATE: 11/18/08	CHECKED BY GR	DATE. 11/18/08
SCALE: NOT TO SCALE	PROJECT NO-1810 0800122.0000	REPORT NO: ----	PAGE NO- A - 1

1810.0800122-B



LEGEND

STANDARD PENETRATION TEST BORING LOCATION

NOTE ALL SOIL TEST BORING LOCATIONS SHOWN ARE APPROXIMATE

CLIENT: KING ENGINEERING

CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY: KD	DATE: 11/19/08		
CHECKED BY: GR	DATE: 11/19/08		
SCALE: 1"=120'	ACADFILE: 1830.0800122-A		
PROJECT NO: 1830 0800122.0000	REPORT NO: ----		

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 1** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 120 70 DATE STARTED 11/14/08

WATER TABLE (ft) NF DATE FINISHED 11/14/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >20 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG CONT (%)
0						Medium dense tan fine SAND [SP]						
	X	6-12-9	21									
	X	7-12-18	30									
5	X	10-12-18	30			Dense tan fine SAND [SP] with trace of clay	8	6			9	
	X	9-13-15	28									
	X	10-16-19	35			Dense						
10	X	16-25-30	55			Very dense						
	X	14-17-18	35			Dense						
15	X	13-12-12	24			Medium dense						
20	X	8-9-6	15									
						Boring Terminated at 20'						

UNIVERSAL ENGINEERING SCIENCES
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 3** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 118 10 DATE STARTED 11/17/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >20 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG CONT (%)
0						Loose orange fine SAND [SP]						
	X	2-2-2	4				3	5			24	
	X	2-3-4	7									
5	X	2-3-3	6									
	X	2-2-2	4									
	X	2-2-3	5			Loose tan fine SAND [SP]						
10	X	2-2-3	5									
15	X	3-4-5	9									
20	X	9-5-5	10			Boring Terminated at 20'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 4** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 131 00 DATE STARTED 11/17/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >35 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG CONT (%)
0						Medium dense orange clayey SAND [SC]						
	X	5-5-5	10			Medium dense orange slightly clayey SAND [SC]						
	X	5-6-11	17									
5	X	10-16-12	28			Medium dense to dense orange clayey SAND [SC]						
	X	10-15-18	33			Dense tan fine SAND [SP]						
	X	10-14-15	29			Medium dense dark brown SAND with trace of roots [SP]						
10	X	10-9-8	17									
						Medium dense orange fine SAND [SP]						
15	X	4-4-6	10									
						Medium dense tan fine SAND to fine SAND with traces of clay [SP-SC]						
20	X	3-4-6	10									
25	X	5-5-6	11			with traces of clay	8	15			9	
30	X	5-6-6	12									
35	X	4-5-5	10									
40	X	5-6-8	14									
						Boring Terminated at 40'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 5** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 122 95 DATE STARTED 11/14/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >20 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense orange fine SAND [SP]						
	X	2-4-6	10									
	X	4-6-6	12									
5	X	4-8-9	17			Medium dense brown fine SAND [SP]						
	X	8-5-6	11			Medium dense to loose orange fine SAND [SP]	2	6			28	
	X	2-3-3	6			Loose						
10	X	2-3-3	6									
15	X	2-3-3	6									
	X	2-3-3	6			Loose tan fine SAND [SP]						
20	X	2-2-3	5			Boring Terminated at 20'						

UNIVERSAL ENGINEERING SCIENCES
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

BORING DESIGNATION **P - 6** SHEET 1 of 1

LECANTO CITRUS COUNTY, FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 128 90 DATE STARTED 11/17/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >30 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense brown fine SAND [SP]						
	X	4-5-8	13									
	X	4-6-8	14			Medium dense orange fine SAND [SP]						
5	X	5-6-8	14									
	X	3-3-3	6			Loose						
	X	3-3-3	6									
10	X	3-3-3	6									
15	X	3-4-5	9									
	X	4-5-6	11			with traces of clay	12	7			5	
20	X	7-5-5	10			Medium dense tan fine SAND, with traces of clay [SP-SC]						
25	X	6-7-7	14									
30	X	8-7-6	13			Medium dense tan and orange fine SAND, with traces of clay [SP-SC]						
						Boring Terminated at 30'						

UNIVERSAL ENGINEERING SCIENCES
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 7** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 128 90 DATE STARTED 11/17/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >25 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Loose orange fine SAND [SP]						
	X	3-3-4	7									
	X	3-4-5	9									
5	X	2-2-4	6									
	X	2-2-2	4									
	X	2-2-3	5									
	X	2-2-2	4			Loose orange fine SAND with traces of clay [SP-SC]	7	5			12	
10												
	X	2-2-3	5									
15												
						Loose tan fine SAND [SP]						
	X	3-3-4	7									
20												
						Loose white fine SAND [SP]						
	X	4-4-4	8									
25						Boring Terminated at 25'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 8** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 125 95 DATE STARTED 11/14/08

WATER TABLE (ft) NF DATE FINISHED 11/14/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >25 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Loose orange slightly clayey SAND [SC]						
	X	3-3-2	5									
	X	3-3-2	5									
5	X	5-10-12	22			Medium dense to loose tan fine SAND [SP]						
	X	8-9-10	19									
	X	3-3-3	6			Loose						
10	X	3-3-3	6				3	4			24	
15	X	2-2-4	6									
						Medium dense orange slightly clayey SAND [SC]						
20	X	4-5-6	11				21	15				
25	X	12-12-12	24			Boring Terminated at 25'						

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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

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LECANTO CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 122 95 DATE STARTED 11/14/08

WATER TABLE (ft) NF DATE FINISHED 11/14/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >20 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Recyled Asphalt						
						Medium dense orange clayey SAND [SC]						
	X	8-12-8	20			Medium dense tan fine SAND with traces of clay [SP-SC]						
	X	10-15-16	31									
5	X	15-17-18	35			Dense	8	5			11	
	X	12-14-15	29			Medium dense						
	X	4-10-10	20									
10	X	10-14-15	29									
						Loose orange fine SAND with traces of clay [SP-SC]						
15	X	3-3-3	6									
						Loose orange fine slightly clayey SAND [SC]						
	X	3-3-3	6									
20	X	3-3-6	9									
						Boring Terminated at 20'						

UNIVERSAL ENGINEERING SCIENCES
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PROJECT CITRUS COUNTY SOLID WASTE TRANSFER STATION

LECANTO, CITRUS COUNTY FLORIDA

CLIENT KING ENGINEERING

LOCATION SEE BORING LOCATION PLAN

REMARKS NF=NOT FOUND
GS ELEVATION PROVIDED BY CH2M HILL

BORING DESIGNATION **P - 13** SHEET 1 of 1

SECTION 01 TOWNSHIP 19S RANGE 18E

GS ELEVATION(ft) 118 64 DATE STARTED 11/17/08

WATER TABLE (ft) NF DATE FINISHED 11/17/08

DATE OF READING NA DRILLED BY J STILLSON

EST WSWT (ft) >20 TYPE OF SAMPLING ASTM D-1586

DEPTH (FT)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	WT	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT / DAY)	ORG CONT (%)
0						Medium dense brown fine SAND [SP]						
	X	6-10-8	18			Medium dense to loose tan fine SAND with traces of clay [SP-SC]						
	X	4-10-15	25				8	5			10	
5	X	6-10-10	20									
	X	8-8-8	16									
	X	4-3-3	6			Loose						
10	X	3-3-3	6									
15	X	4-5-6	11									
						Medium dense orange slightly clayey SAND [SC]						
20	X	6-8-11	19			Boring Terminated at 20'						

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KEY TO BORING LOGS

SYMBOLS

22	Number of Blows of a 140-lb Weight Falling 30 in Required to Drive Standard Spoon One Foot
WOR	Weight of Drill Rods
S	Thin-Wall Shelby Tube Undisturbed Sampler Used
90% Rec	Percent Core Recovery from Rock Core-Drilling Operations
■	Sample Taken at this Level
□	Sample Not Taken at this Level
	Change in Soil Strata
▼	Free Ground Water Level
▽	Seasonal High Ground Water Level

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts very fine sands rock flour silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity gravelly clays sandy clays silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts micaceous or diatomaceous fine sands or silts elastic silts
			CH	Inorganic clays or high plasticity fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat muck and other highly organic soils

* Based on the material passing the 3-in. (75-mm) sieve.

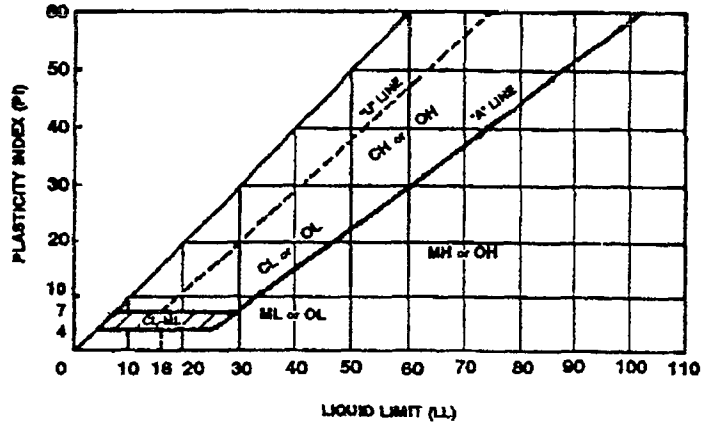
RELATIVE DENSITY (sand-silt)

Very Loose - Less Than 4 Blows/Ft.
Loose - 4 - 10 Blows/Ft
Medium 10 to 30 Blows/Ft
Dense - 30 to 50 Blows/Ft
Very Dense More Than 50 Blows/Ft.

CONSISTENCY (clay)

Very Soft - Less Than 2 Blows/Ft
Soft - 2 to 4 Blows/Ft.
Medium - 4 to 8 Blows/Ft
Stiff - 8 to 15 Blows/Ft.
Very Stiff - 15 to 30 Blows/Ft.
Hard - More Than 30 Blows/Ft

PLASTICITY CHART



CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan This report does not reflect any variations which may occur between these borings

The nature and extent of variations between borings may not become known until excavation begins If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report However, the actual change in the ground may be more gradual Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as· water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc ; however, lack of mention does not preclude their presence

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions Water levels may not have been stabilized at the last reading This data has been reviewed and interpretations made in this report However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report

TIME

This report reflects the soil conditions at the time of investigation If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required

Appendix B
Laboratory Test Results

DESCRIPTION OF LABORATORY TESTING PROCEDURES

WASH 200 TEST (ASTM D-1140 or FM 1-T 88)

The Wash 200 test is performed by passing a representative soil sample over a No 200 sieve and rinsing with water The percentage of the soil grains passing this sieve is then calculated

MOISTURE CONTENT DETERMINATION (ASTM D-4959 or FM 1-T265)

Moisture content is the ratio of the weight of water to the dry weight of soil Moisture content is measured by drying a sample at 105 degrees Celsius The moisture content is expressed as a percent of the oven dried soil mass

LABORATORY PERMEABILITY TEST, CONSTANT-HEAD (ASTM D-2434)

The constant-head laboratory permeability test is performed by placing the soil sample in a tube and sealing the soil sample on both ends with a porous disk The tube and soil sample are then sealed and the soil sample is saturated Once the soil sample has been saturated, a constant-head water supply is run through the sealed soil sample A pair of manometer tubes is used to measure the pressure head change through the soil Once the manometer tubes indicate steady-state flow, test measurements of pressure head difference, quantity of flow and time of flow are made The data recovered from this test are then used to calculate Darcy's Coefficient of Permeability (k) of the soil

FULL SIEVE GRADATION ANALYSIS (ASTM D-422 or FM 1-T088)

The grain size analysis test measures the percentage by weight of a dry soil sample passing a series of U S standard sieves, including the No 200 sieve By sieving the soil sample through a series of successively smaller wire meshes, the distribution of the grain sizes within the soil is measured The fines content (silt and clay) is the percentage by weight passing the smallest (No 200) sieve The gradation of a soil sample, especially the fines content, indicates anticipated engineering properties, including permeability, suitability as roadway subgrade and/or general fill material

ATTERBERG LIMITS TEST (ASTM D-4318 or FM1-T90)

The Atterberg limits are the upper and lower limits of the range of water content over which a soil exhibits plastic behavior, and are defined as the liquid limit and plastic limit, respectively

The liquid limit is estimated as follows The soil is mixed with distilled water to form a thick paste, which is then placed in a brass cup mounted on an edge pivot and rests initially on a rubber base, The base is then leveled off horizontally and divided by cutting a groove with a standard tool, The two halves of the soil gradually flow together as the cup is repeatedly dropped onto its base at a specified

rate The liquid limit is defined as the water content at which 25 blows are required to close the grove over a distance of ½ inch

The plastic limit is estimated as follows: The soil is mixed with distilled water until it can be molded A ball of soil is then rolled into a thread 1/8 inch in diameter between the hand and a glass plate The soil is molded together again and the process repeated until the thread cracks when its diameter is 1/8 inch The water content of the soil at this state is determined and defined as the plastic limit

ORGANIC CONTENT DETERMINATION [FM 1-T267]

This test method evaluates the moisture content, ash content, and organic matter in peats and other organic soils, such as organic clay, silt, sand, and "muck"

The organic content measurement was performed by placing a sample of soil in a low temperature oven The soil is then dried (as described above) to measure the initial moisture content The soil is then transferred to a high temperature kiln which burns off the organic materials The organic content is then calculated as the ratio of the weight loss to the dry weight of the soil measured from the low temperature oven, it is expressed as a percent

LIMEROCK BEARING RATIO (LBR) [FM 5-515]

The LBR test is a measure of the bearing capacity of the soil, providing a strength value to be used in pavement design The LBR test, in conjunction with a Modified Proctor test, consists of measuring the load required to cause a standard cylindrical plunger to penetrate a column of soil at a specified rate The LBR is expressed as the percentage of the load required to force the plunger into the soil one inch compared to the load required to force the same plunger an equivalent depth into an equivalent sample of crushed limerock

RESISTIVITY TESTING (FM 5-551)

The resistivity test is performed by preparing a sample with soil passing the No 8 sieve, adding distilled water, and mixing The sample is then placed in a soil box with electrodes, where it is connected to a resistivity meter The resistivity is measured passing through the soil The sample is removed from the box and further diluted with distilled water, and the procedure is repeated until a minimum resistivity is obtained

pH (FM 5-550)

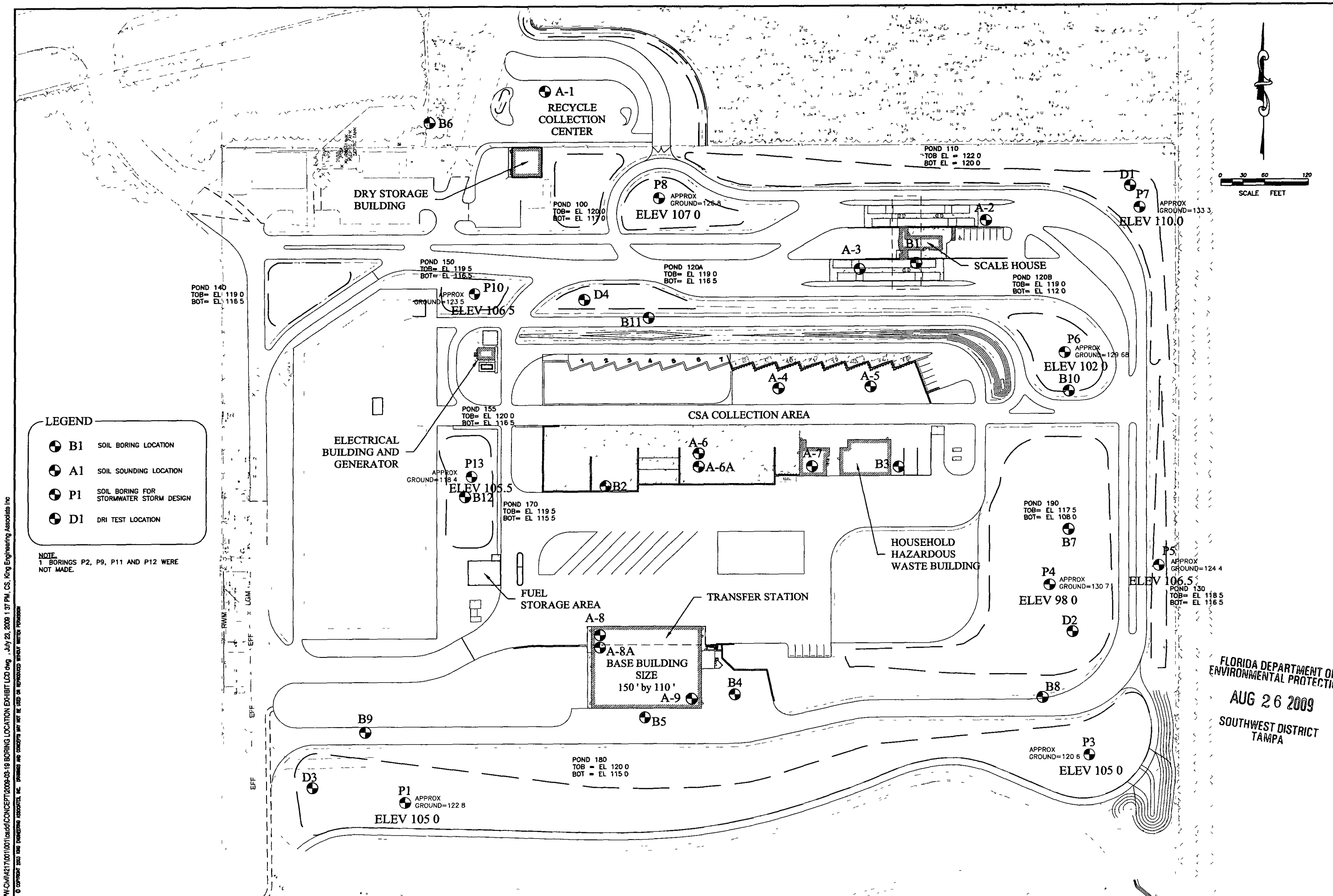
The pH is measured by mixing distilled water with a soil sample until the soil particles are dispersed Then the sample is checked for pH, using a pH meter

SULFATE (FM 5-553)

A representative sample is saturated with distilled water, agitated thoroughly and aspirated over a qualitative filter A reagent is added to the retrieved liquid The liquid is then placed in a nephelometer to measure concentration of sulfate

CHLORIDE (FM 5-552)

A representative sample is saturated with distilled water, agitated thoroughly and aspirated over a qualitative filter The retrieved liquid is mixed with an indicator liquid Change in color of the sample is monitored and converted to concentration of chlorides



FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUG 26 2009
SOUTHWEST DISTRICT TAMPA

JOB NO. 4217/001/001
DATE 09-16-2008
SCALE

FIGURE 2
SITE PLAN & BORING LOCATION

CITRUS COUNTY SOLID WASTE TRANSFER STATION & ASSOCIATED SITE IMPROVEMENTS

King
ENGINEERING ASSOCIATES, INC
4921 Memorial Highway
One Memorial Center, Suite 300
Tampa, Florida 33634
Phone 813 880-8881
Fax 813 880-8882
www.kingengineering.com
Engineering License #2610

O:\PW-Civil\4217\001\001\cad\CONCEPT\2009-03-19 BORING LOCATION EXHIBIT LCD.dwg , July 23, 2009 1:37 PM, CS, King Engineering Associates Inc
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