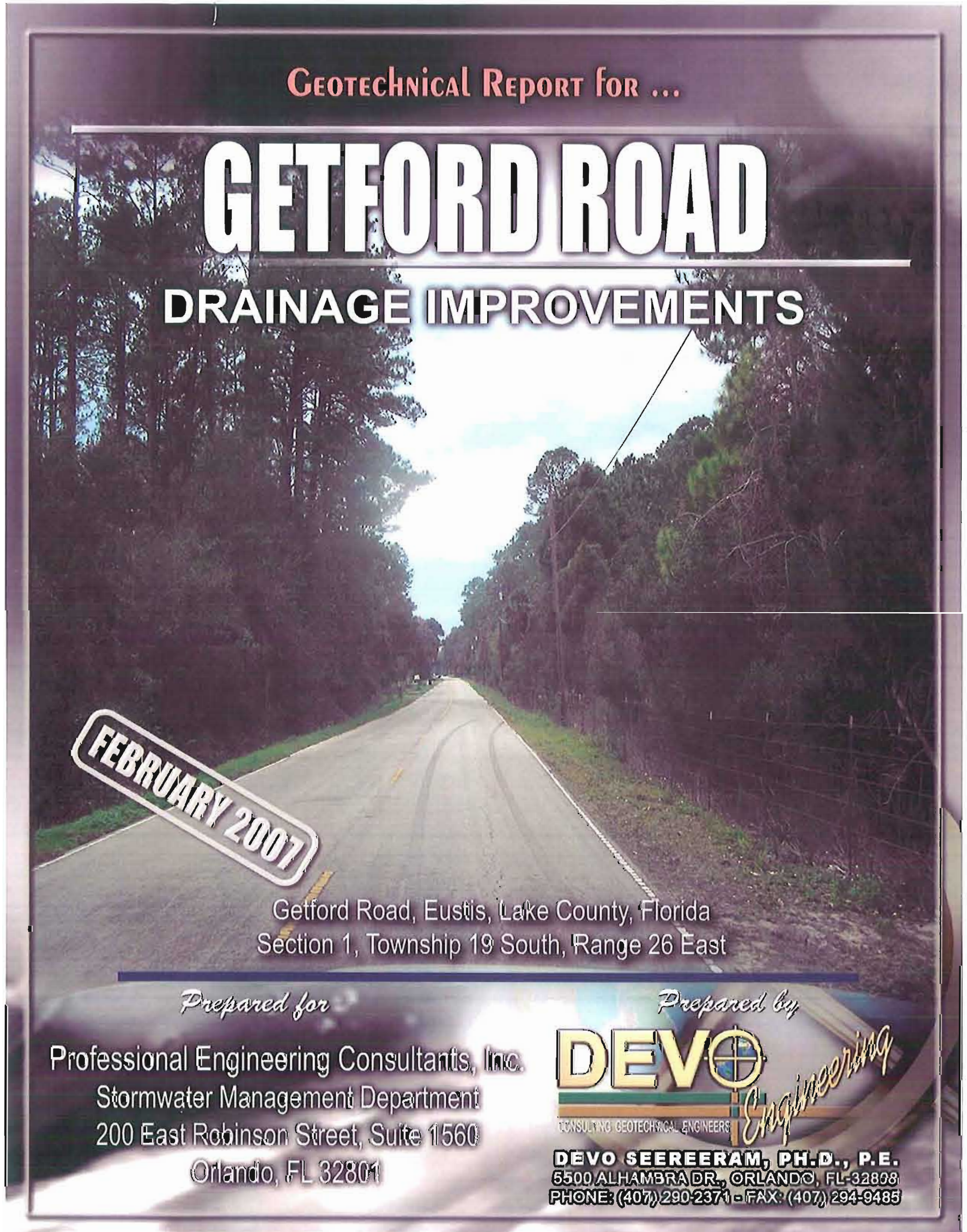

Geotechnical Report for ...

GETFORD ROAD

DRAINAGE IMPROVEMENTS

FEBRUARY 2007

Getford Road, Eustis, Lake County, Florida
Section 1, Township 19 South, Range 26 East

Prepared for

Professional Engineering Consultants, Inc.
Stormwater Management Department
200 East Robinson Street, Suite 1560
Orlando, FL 32801

Prepared by

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

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Geotechnical Engineering • Ground Water Modeling • Hydrogeologic/Geo-Environmental Engineering

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e-mail: devo@devoeng.com | www.devoeng.com

Date: March 23 2007 *(draft)*	*Devo's Project No:* 07-121.212
To: **PROFESSIONAL ENGINEERING CONSULTANTS, INC.** Stormwater Management Department 200 East Robinson Street, Suite 1560 Orlando, FL 32801 phone: 407-422-8062 fax: 407-849-9401 attention: **DAVID HAMSTRA, P.E.**	*To:* **LAKE COUNTY BOARD OF COUNTY COMMISSIONERS** Department of Public Works, Road Operations 437 Ardice Avenue Eustis, FL 32726 phone: 352-483-9040 fax: 352-483-9015 attention: **KRISTIAN SWENSON**

Ref:
Geotechnical Report for ....

GETFORD ROAD - DRAINAGE IMPROVEMENTS

Getford Road, Eustis, Lake County, Florida [Section 1, Township 19 South, Range 26 East]

Dear Mr. Hamstra:

The attached report documents the results of our geotechnical engineering investigation and recommendations for the proposed box culvert and stormwater management pond for the Getford Road - Drainage Improvements project located at Getford Road in Eustis, Lake County, Florida. In summary, our investigation disclosed that there are no geotechnical constraints to the construction of the proposed box culvert and stormwater pond. The underlying soils will adequately support the proposed box culvert.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

List of Tables

List of Attached Figures

1.0 BACKGROUND INFORMATION

Professional Engineering Consultants, Inc. (PEC), are designing the Getford Road Drainage Improvements project for Lake County. The regional stormwater pond, enclosure of the existing ditch and driveway culvert system with a large box culvert from just east of Coolidge Street to Jules Court along the south side of Getford Road are relevant to the geotechnical study as shown in Exhibit 1.

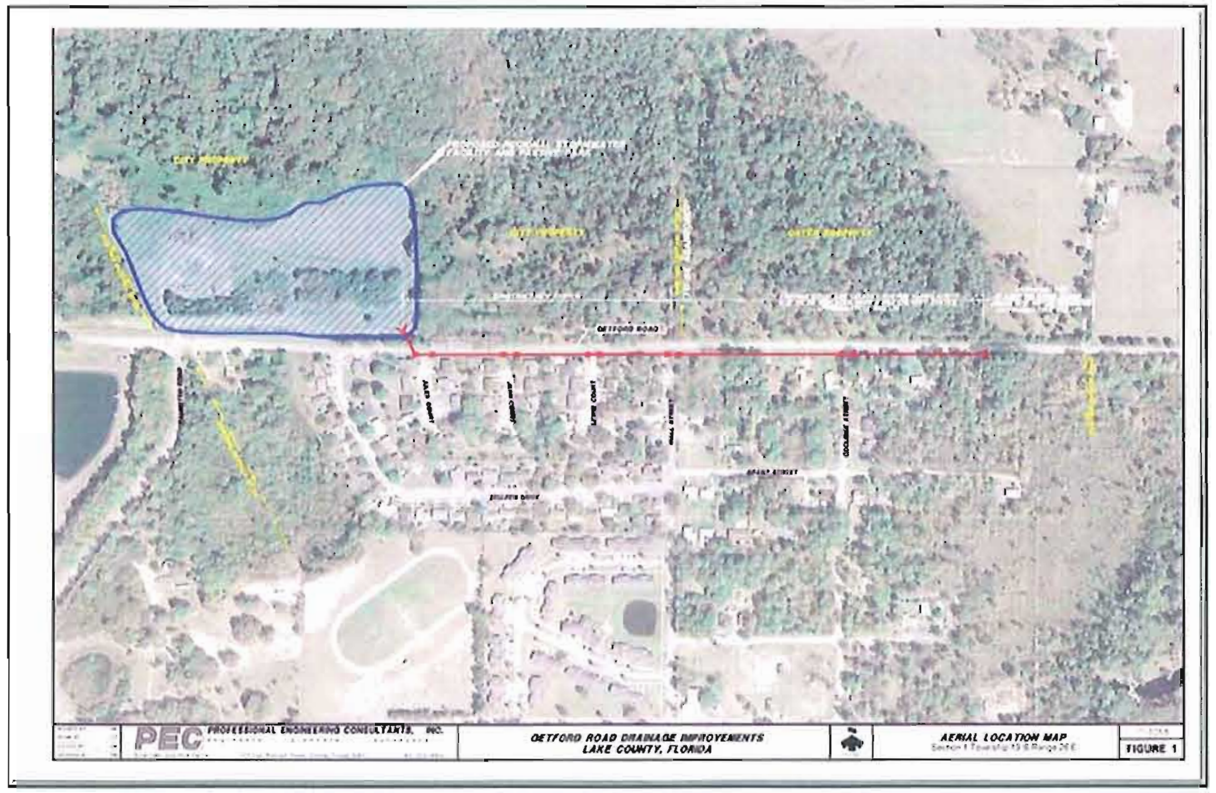


Exhibit 1. Shows the Approximate Layout of the Proposed Drainage Improvements

Figure 1.1 (attached) shows the site location on a scanned image of the USGS 7.5 minute series quadrangle map for Eustis, Florida. As noted in Figure 1.1, the project area lies within Section 1 of Township 19 South, Range 26 East. Figure 1.2, a March 2006 site aerial image shows a residential subdivision along the southern side of the portion of Getford Road under investigation. A site topography map prepared by Southeastern Surveying and Mapping Corp. shows the area to be gently sloping towards the northwest with ground surface elevations generally in the range of +84 ft to about +100 ft NAVD.

2.0 OBJECTIVES

The objectives of this geotechnical investigation are as follows:

- Geotechnical recommendations for the large box culvert running on the southern side of Getford Road to the proposed stormwater pond. Provide recommendations for excavation/dewatering of the trench, preparation of the foundation subgrade and backfill material and compaction requirements. Other design inputs include lateral earth pressures acting on the structure, uplift forces due to hydrostatic pressure and allowable bearing pressure.

- Selective sampling, testing and recommendations for engineering uses of the soils within the excavation envelope of the proposed stormwater pond.

3.0 NRCS SOIL MAP UNITS

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has mapped and published descriptions of the shallow soils (i.e., within 80 inches of land surface) in Lake County, Florida. In undeveloped areas, the NRCS soil mapping is usually fairly reliable and it is good practice to compare the site-specific soil and ground water conditions with the published characterization data.

Figure 1.3 shows the site location on the NRCS Soils Map for the area. As noted in this figure, the project area is mapped with five (5) NRCS soil units and these mapped according to their drainage characteristics as follows:

MODERATELY WELL DRAINED SOILS

- Tavares sand (Ta).

SOMEWHAT POORLY DRAINED SOILS

- Albany sand, 0 to 5% slopes (AbB).

POORLY DRAINED SOILS

- Pompano sand, acid (Po).
- Immokalee sand (Is).
- Myakka sand (Mk).

Tavares sand (Ta), a nearly level to gently sloping, moderately well drained soil, is mapped over about the southeastern half of the proposed pond and along the western portion of culvert alignment, i.e the portion closest to the pond. In undeveloped areas this soil has a seasonal high water table at a depth of 40 to 60 inches below the ground surface.

Albany sand, 0 to 5% slopes (AbB), a nearly level to gently sloping, somewhat poorly drained soil, is mapped over the northwestern portion of the proposed pond. In undeveloped areas this soil also has a seasonal high water table at a depth of 40 to 60 inches below the ground surface.

Pompano sand, acid (Po), a nearly level to gently sloping, poorly drained soil, is mapped over the central portion of the culvert alignment. In undeveloped areas this soil also has a seasonal high water table at a depth of 10 inches below the ground surface.

Immokalee sand (Is), a nearly level to gently sloping, poorly drained soil, is mapped in a very small area just east of the midway point along the culvert alignment. In undeveloped areas the seasonal high water table in this soil can be less than 10 inches below the ground surface.

Myakka sand (Mk), also a nearly level to gently sloping, poorly drained soil, is mapped over the eastern portion of the culvert alignment. In undeveloped areas the seasonal high water table in this soil can also be less than 10 inches below the ground surface.

Key characteristics of these five (5) NRCS soil map units are summarized in Tables 1 to 5.

Table 1. Key NRCS Data for Albany sand, 0 to 5% slopes (AbB)

This is a nearly level to sloping, somewhat poorly drained sandy soil that has a sandy clay loam subsoil. The water table is at a depth of 40 to 60 inches for more than 6 months each year, and during the west season, it is at a depth of 15 to 40 inches for 1 to 2 months.		
Hydrologic Soil Group		
Typical Soil Profile		
Depth	Soil Color & Texture	Permeability
0 - 7 in	very dark gray sand	12 - 40 ft/day
7 - 11 in	gray sand	
11 - 31 in	very pale brown sand	
31 - 52 in	very pale brown sand	
52 - 62 in	very pale brown sandy clay loam	1.2 - 4.0 ft/day
62 - 85 in	white sandy clay loam	

Table 2. Key NRCS Data for Tavares sand (Ta)

This is a nearly level to gently sloping, moderately well drained soil. The water table is at a depth of 40 to 60 inches for more than 6 months of the year. During periods of drought, it is below 60 inches.		
Hydrologic Soil Group		A
Typical Soil Profile		
Depth	Soil Color & Texture	Permeability
0 - 7 in	very dark grayish-brown sand	> 40 ft/day
7 - 25 in	very pale brown sand	
25 - 34 in	light yellowish-brown sand	
34 - 61 in	very pale brown sand	
61 - 99 in	white sand	

Table 3. Key NRCS Data for Pompano sand, acid (Po)

This is a nearly level, poorly drained soil. The water table is within a depth of 10 inches for 2 to 6 months of the year and at a depth of 10 to 40 inches during the rest of the year.		
Hydrologic Soil Group		
Typical Soil Profile		
Depth	Soil Color & Texture	Permeability
0 - 5 in	black sand	12.6 to 40 ft/day
5 - 9 in	dark grayish-brown sand	
9 - 30 in	gray sand	
30 - 61 in	white sand	
61 - 80 in	pale-brown sand	

Table 4. Key NRCS Data for Immokalee sand (Is)

This is a nearly level, poorly drained soil that has a layer at a depth of 30 inches or more that is stained by organic matter. The water table is normally at a depth of 10 to 40 inches. It is within a depth of 10 inches for 1 to 2 months during rainy seasons and falls below 40 inches during prolonged drought.		
Hydrologic Soil Group		
Typical Soil Profile		
Depth	Soil Color & Texture	Permeability
0 - 4 in	black sand	12.6 to 40 ft/day
4 - 12 in	light brownish gray sand	
12 - 38 in	white sand	
38 - 45 in	black sand	1.26 to 4 ft/day
45 - 56 in	dark reddish brown sand	
56 - 68 in	dark yellowish brown sand	12.6 to 40 ft/day

Table 5. Key NRCS Data for Myakka sand (Mk)

This is a nearly level, poorly drained soil that has a layer stained by organic material at a depth of less than 30 inches. The water table is normally at a depth of 10 to 40 inches, but the depth is less than 10 inches in wet seasons, and more than 40 inches during extended dry periods.		
Hydrologic Soil Group		B/D
Typical Soil Profile		
Depth	Soil Color & Texture	Permeability
0 - 6 in	black sand	12 to 40 ft/day
6 - 20 in	white sand	
20 - 24 in	black sand	1.2 to 4 ft/day
24 - 36 in	dark reddish brown sand	
36 - 56 in	dark brown sand	
56 - 85 in	dark grayish brown sand	1.2 to 40 ft/day

4.0 FIELD AND LABORATORY TEST PROGRAMS

The following field and laboratory programs were performed to provide data for this assessment:

❶ Site reconnaissance and stakeout of borings.

❷ Obtaining utility clearance.

❸ Drilling of eight (8) Standard Penetration Test (SPT) borings to depths of 15 ft along the alignment of the proposed box culvert. These borings are labeled, SPT-1 through SPT-8, in Figure 1.4.

❹ Drilling of six (6) Standard Penetration Test (SPT) borings to depths of 20 ft within the footprints of the proposed stormwater pond. These borings are labeled, PB-1 through PB-6, in Figure 1.4.

❺ Installation of piezometers and measurements to the ground water table.

❻ Visual & tactile examination and classification of soil samples.

❼ Performing of twelve (12) fines fraction and natural field moisture content tests.

Borings were staked in the field by our site staff using aerial maps and land features. The boring locations and elevations were subsequently surveyed by the project surveyor, Southeastern Surveying and Mapping Corp.

5.0 GEOTECHNICAL DATA

5.1 General

Boring locations are shown on Figure 1.4 attached.

Soil profiles for the eight (8) SPT borings, SPT-1 through SPT-8, drilled along the proposed culvert alignment are presented in Figures 2.1 and 2.2 (attached).

Soil profiles for the six (6) SPT borings, PB-1 through PB-6, drilled within the proposed pond footprint are presented in Figures 3.1 and 3.2 (attached).

Water table measurements and laboratory test data are annotated to the soil profiles in Figures 2.1, 2.2, 3.1 and 3.2.

Note that in reviewing the soil profiles for the SPT borings in Figures 2.1, 2.2, 3.1 and 3.2 the reader should refer to the typical correlations between degree of compactness and SPT "N" values for sand and clay presented in Table 6.

Table 6. Typical Correlations between SPT "N" Values & Soil Properties

Sandy (granular) Soils					Clayey (cohesive) soils			
N	φ°	γ_m (lb/ft³)	γ'_{sat} (lb/ft³)	Compactness	N	q_u (lb/ft²)	γ_{sat} (lb/ft³)	Consistency
0-4	28	< 100	< 60	very loose	0-2	500	100-120	very soft
4-10	30	95-125	55-65	loose	2-4	1,000		soft
10-30	36	110-130	60-70	medium	4-8	2,000	110-130	medium
30-50	41	110-140	65-85	dense	8-16	4,000		stiff
					16-32	8,000	120-140	very stiff

Key to Symbols
N = Standard Penetration Resistance in blows/ft
φ° = Friction angle in degrees
γ_m = moist unit weight in lb/ft³
γ_{sat} = saturated unit weight in lb/ft³
q_u = unconfined compressive strength in lb/ft²

5.2 Surficial and Buried Organics

Apart from the odd traces of fine roots in the surficial layers at some locations the borings did not disclose any surficial or buried organic layers of soil.

5.3 Soil Stratigraphy

Box Culvert Borings [Borings SPT-1 to SPT-8, Figures 2.1 & 2.2]

The eight (8) 15-ft SPT borings, SPT-1 through SPT-8, drilled along the alignment of the proposed box culvert generally disclosed a surficial layers of very loose to loose fine sand 3 to 6 ft thick followed by layers of loose and some medium dense slightly silty and silty fine sands to about 10 to 14 ft depth and thereafter the borings disclosed dense and very dense silty sands (hard pan) through to the termination of the borings at 15 ft depth. Note however, Boring SPT-2 disclosed an extremely loose soil layer between 2.5 and 3.5 ft depth. This occurrence appears to be isolated.

Pond Borings [Borings PB-1 to PB-6, Figures 3.1 & 3.2]

The six (6) 20-ft SPT borings drilled within the pond footprint of the proposed stormwater pond disclosed somewhat similar soil stratigraphy. Generally the profiles show surficial layers of mainly very loose free draining fine sands and slightly fine sands 2 to 6 ft thick underlain by more hydraulically restrictive medium dense and some dense silty fine sands and clayey fine sands to about 14 ft depth and then medium dense slightly silty and silty fine sands through to the termination of the borings at 20 ft depth.

5.4 Water Table

The measured depths to the ground water table are presented in Table 7. The depths to the water table ranged from 5.4 to 13.8 ft below the ground surface. These measured depths at some locations were significantly deeper than expected when compared to published NRCS water table data even with the prevailing dry weather considered. The NRCS soil mapping may not have been quite up to date as evidenced by the differences in soil stratifications observed between the soil profiles and the NRCS tables.

The ground water table generally follows the general land slope to the northwest with ground water elevations ranging from +93.5 ft in the east to +74.1 ft NAVD at the northwestern portion of the pond footprint.

The water table altitude fluctuates seasonally primarily due to short-term and long-term differences in rainfall and evapotranspiration. Since the evapotranspiration does not vary much from year to year, variation in the rainfall amounts are the primary cause of the fluctuation. Our field investigation was conducted February 12 to 22, 2007 which was into the dry season and after a year of below average rainfall. The water table would therefore be below seasonal high levels.

The estimated seasonal high water table (SHWT) elevation at each boring location is included in Table 7. These estimated seasonal high water table elevations were made by reviewing the antecedent rainfall, the NRCS soil map units, site topography, the soil stratigraphy at the borehole locations. Note that The measured depths to the ground water table was generally lower than the depth indicated published NRCS data for undeveloped areas.

Table 7. Water Table Values in On-Site Piezometers

Boring No.	Ground surface elevation (ft NAVD)	Depth to water table (ft)	Ground water elevation (ft NAVD)	Estimated SHWT elevation (ft NAVD)
BOX CULVERT BORINGS				
SPT-1	96.0	9.1	86.9	89.4
SPT-2	96.1	7.3	88.8	91.7
SPT-3	96.7	8.7	88.0	90.5
SPT-4	97.7	9.1	88.6	91.2
SPT-5	97.5	7.9	89.6	92.2
SPT-6	97.9	7.1	90.8	93.3
SPT-7	98.9	6.1	92.8	95.3
SPT-8	98.9	5.4	93.5	96.0
POND BORINGS				
PB-1	87.4	11.9	75.5	78.0
PB-2	84.9	10.8	74.1	76.5
PB-3	86.8	8.7	78.1	80.5
PB-4	89.8	8.5	81.3	83.8
PB-5	92.6	12.8	79.8	82.3
PB-6	94.1	13.8	80.3	82.8

6.0 EVALUATION AND ASSESSMENT

6.1 GENERAL

The 15-ft deep SPT borings drilled along the alignment of the proposed box culvert generally disclosed surficial layers of very loose to loose fine sand 3 to 6 ft thick, followed by layers of loose and some medium dense slightly silty and silty fine sands to about 10 to 14 ft depth and thereafter the borings disclosed dense and very dense silty sands (hard pan) through to the termination of the borings at 15 ft depth.

The 20-ft deep SPT pond borings disclosed a surficial mainly of very loose free draining fine sands and slightly fine sands 2 to 6 ft thick underlain by more hydraulically restrictive medium dense and some dense silty fine sands and clayey fine sands to about 14 ft depth and then medium dense slightly silty and silty fine sands through to the termination of the borings at 20 ft depth.

The ground water table was encountered in the 5.4 to 9.1 ft depth range in the borings along the box culvert alignment while in the pond borings the groundwater table was somewhat deeper, being in the depth range of 8.5 to 13.8 ft. The estimated seasonal high water table elevations at the boring locations are shown in Table 7. Dewatering will be required in the lower portions of the site and depending on the final design inverts, dewatering may also be required in the higher portions of the site.

Although no organic layers of soil were disclosed at the boring locations, organic soils, if present beneath the excavation grades, should be demucked and backfilled with clean compacted sand in accordance with our demucking and backfilling recommendations in Table 8.

The soil conditions pose no constraints to the construction of the box culvert along the proposed alignment. Geotechnical recommendations for the design of the box culvert are provided in Section 6.4.

6.2 Stormwater Management Pond - Control Level

The average seasonal high water table elevation at the proposed pond location is estimated to be about +80.6 ft NAVD when the values at the boring locations in Table 7 are considered. The estimated seasonal low water table is estimated to be about 4 ft below the seasonal high water table. The St. Johns River Water Management District (SJRWMD) requires that the control elevation of wet detention ponds be set at or above the normal on-site ground water table elevation. A pond control elevation of about +80.6 NAVD is recommended. Ground water baseflow must be considered if the control elevation the pond is set below the anticipated normal water table elevation. Note also that the somewhat deep water table in the area a dry bottom pond is also feasible.

6.3 Borrow Suitability

The soil profiles for the pond borings are shown in Figures 3.1 and 3.2. As noted in the profiles, the uppermost 4 to 6 ft of soils are generally fine sands and slightly silty fine sands which are quite suitable for use as structural and general purpose backfill. Beneath this formation to about 16 ft depth the soils are mostly silty fine sands which are somewhat suitable and some clayey fine sands which are less suitable for use as general purpose backfill as compaction of these material pose serious problems when wet. However, from 16 ft through to 20 ft depth, the soils are slightly silty and silty fine sands which are suitable for use as general purpose backfill.

The distinction between the soil textural classifications is based on the percent by weight passing the U.S. No. 200 sieve (i.e., the *fines fraction*). This distinction and the engineering uses of the various soils that may be encountered on this site are articulated in Table 9.

Table 8. Recommendations for Demucking & Backfill

ITEM	DISCUSSION & RECOMMENDATIONS
A.1 Removal of Surficial &/or Buried Organics & Backfill	Organic soils, if present below the trench bottom, would have to be completely removed and backfilled with clean compacted sand. Demucking and backfilling should be performed as follows: 1. The areas which contains organic deposits shall be demucked and backfilled with clean fine sand or slightly silty fine sand relatively free of organics and debris. The surficial organic material shall be excavated to expose the underlying mineral soil. 2. Dewatering during excavating and backfilling may be required and may be accomplished by rim ditching and the use of sump pumps and/or other methods such as sanded well points, and vertical or horizontal suction wells. The water table shall be maintained a minimum of 2 feet below the excavated surface. A sheetpile cofferdam may have to be constructed depending on the prevailing groundwater table. In any event, the design, operation, and permitting of the dewatering system shall be the sole responsibility of the contractor. 3. Upon approval of the project geotechnical engineer, the excavated area may be backfilled with clean fine sand free of unsuitable or deleterious material. The fill should not be placed in standing water. 4. The backfill material shall consist of relatively clean fine sand with less than 10 percent passing the U.S. No. 200 sieve and be free of roots and/or other deleterious material. The material shall be compacted to a minimum density equal to at least 95 percent of the soil's Modified Proctor Density value (AASHTO T-180). The fill shall be placed in loose lift thicknesses not exceeding 12 inches. 5. A representative of the project geotechnical engineer should be retained to provide onsite inspection during the demucking operation and testing of the compacted fill to ensure compliance with the recommendations above.

Table 9. Engineering Uses of Soils	
Textural Description	Engineering Uses
fine sand with roots (topsoil) fines fraction < 5%	Suitable as non-structural landscape and bulk fill outside structural areas
fine sand fines fraction: ≤ 5%	Suitable for use as structural backfill, pavement subgrade, or general purpose fill. This material is easy to work in the wet season as it is free-draining and dries fairly rapidly. When compacted, its permeability is not reduced to a degree which causes ponding.
slightly silty fine sand fines fraction: > 5%, ≤ 12%	Suitable for use as structural backfill or general purpose fill. This material can be difficult to work if its fines fraction exceeds 10%. At the higher fines fractions, it tends to become hydraulically restrictive when compacted resulting in slow subsurface drainage and "wetness" during periods of heavy rainfall.
silty fine sands fines fraction: > 12%	Suitable for use as structural backfill or general purpose fill. However, if excavated from below the water table, it will be difficult to handle and compact for the following reason: *The moisture content of the silty sands below the water table is generally 19 to 25% and its optimum moisture content for compaction is generally in the range 10 to 14%. Since the material is not free-draining, the drying process can be protracted and involve spreading of the material in thin lifts during dry spells, etc.* The material is not free-draining when compacted and can cause a perched water table. Within lots and roads, it is better to place this material 2 ft below the final grade and not in the uppermost zone of fill.
clayey sands	Marginally suitable for structural or general purpose fill. May be difficult to compact. Should be capped with a minimum of 24 inches of fine sand. Home builders also generally have problems excavating shallow footings in compacted fill material comprising stiff clayey sands.

6.4 Box Culverts & Wing Walls

Where box culverts are located within existing canals, the loose silty and clayey soils which exist in the canal shall be removed and disposed of as required by the Contract Documents. Backfill and compaction shall be accomplished as discussed previously in this report.

The soil conditions are generally suitable for the construction and support of a box culvert or similar structure. A maximum bearing pressure of 2,000 lb/ft^2 is recommended to limit both the total and differential settlement of the foundation soils. Unlike a retaining wall, the side walls of the box culvert are relatively rigid and are restrained at the top. These walls should be designed to resist the "At Rest" earth pressure exerted by the backfill. In this case, *the 'At Rest' earth pressure should be taken as equivalent to the pressure exerted by a fluid weighing 52 lb/ft^3*. This equivalent fluid pressure does not include unbalanced hydrostatic forces. Hydrostatic forces should be included in all stability calculations.

For wing walls, the active earth pressure should be used for design and should be taken as equivalent to the pressure exerted by a fluid weighing 36 lb/ft^3. Again, this recommendation assumes that adequate drainage is provided to prevent the buildup of hydrostatic pressure behind the wall. Free-draining sand or a prefabricated drainage composite such as Miradrain™ 6000 (with weep holes) can be used to prevent a buildup of hydrostatic pressure. If this is not possible or practical, hydrostatic forces must be included in the stability calculations.

Lateral loads may be resisted by the passive pressure of the soil acting against the sides of the footing and/or friction developed between the base of the footing and the underlying soil. For compacted granular backfill above the water table, the passive pressure may be taken as equivalent to the pressure exerted by a fluid weighing 350 lb/ft^3. Below the water table, an equivalent fluid pressure of 185 lb/ft^3 should be used. A coefficient of friction of 0.5 may be used for calculating the frictional resistance on the base of poured-in-place concrete footings. When both passive and frictional resistance are used in the design, one value should be reduced by 50%.

These equivalent fluid densities discussed above do not include a factor of safety; they also do not include lateral pressures from any surcharge loads (i.e., traffic, construction equipment, etc.). The vertical soil pressure on top of the box culvert can be estimated by multiplying the unsaturated unit weight (115 lb/ft^3) by the height of fill over the box and adding any appropriate surcharge loads. Surcharge loads must also be considered for the design of the wing walls.

Dewatering is anticipated for this construction activity. The water table may be lowered using a suitable dewatering system and should be lowered to a minimum level of 2 ft below the working grade during excavation and backfilling. Surface flows within the construction area should be diverted using bypass canals, isolation by dyking or other suitable means to keep water away from the work area. The design of both the surface and subsurface dewatering systems are the sole responsibility of the Contractor. The Contractor(s) performing the excavation for the construction of the box culverts shall comply with the Occupational Safety and Health Administration's (OSHA) trench excavation safety standards, 29 C.F.R., s. 1926.650, Subpart P, including all subsequent revisions or updates to these standards as adopted by the Department of Labor and Employment Security (DLES). The Contractor shall consider all available geotechnical information in his design of the trench excavation safety system. No material or excessive loads shall be applied at the surface within a distance from the edge of the trench equal to the depth of the trench.

7.0 REPORT CERTIFICATION

This report was prepared under the direction of the undersigned Florida-registered professional engineer. Please do not hesitate to contact the undersigned if there are any questions.

Sincerely,

Vijay Boodhoo Vijay Boodhoo Project Geotechnical Engineer	Devo Seereeram Devo Seereeram, Ph.D., P.E. Florida Registration No. 48303 Date: March 23, 2007

FIGURES

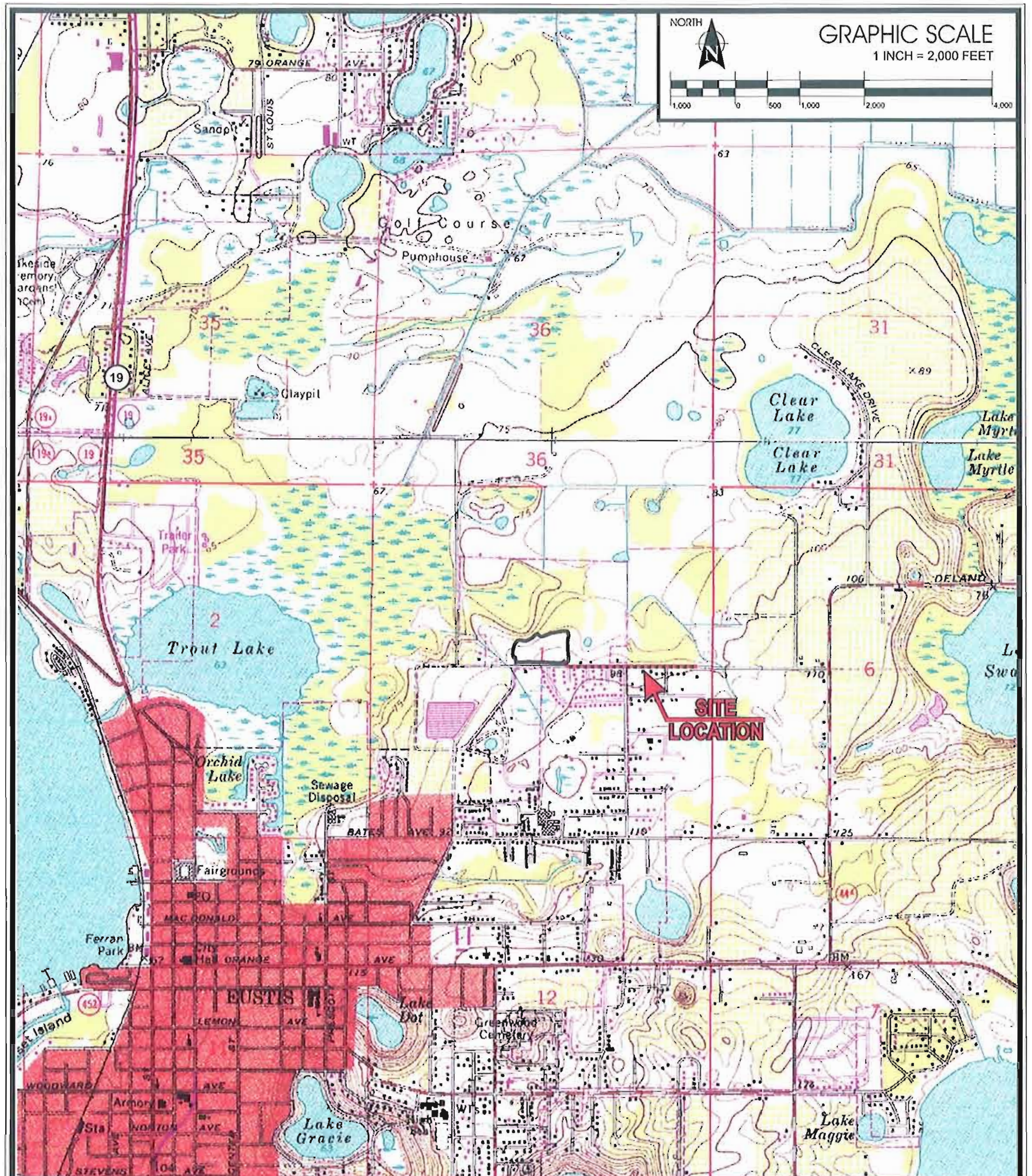
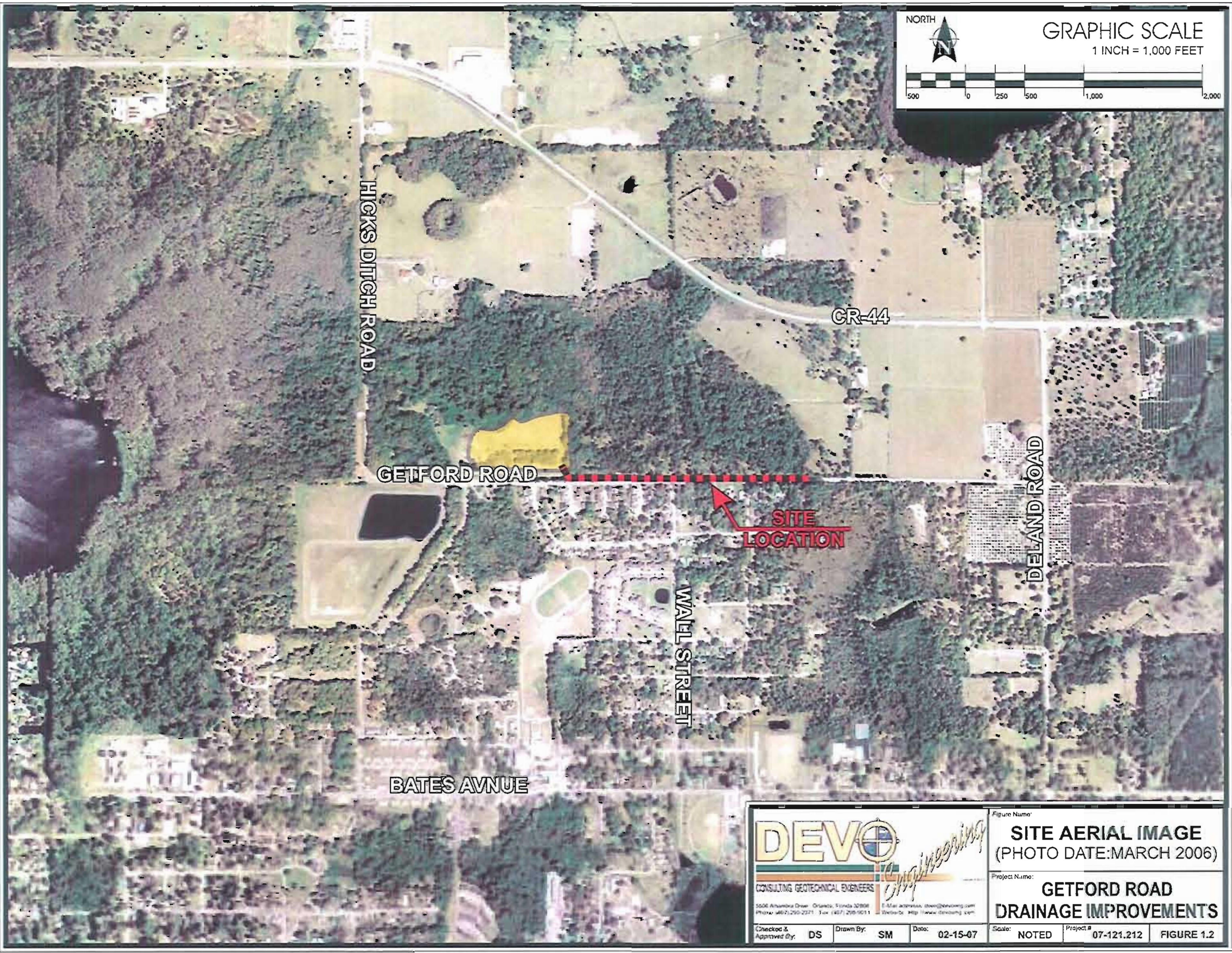


Figure Name:	SITE VICINITY MAP Source: Eustis, FL. Photo revised 1980, Section 1 Township 19 S, Range 26 E
Project Name:	GETFORD ROAD DRAINAGE IMPROVEMENTS

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	02-15-07	NOTED	07-121.212	Figure 1.1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1 INCH = 1,000 FEET
NORTH
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250
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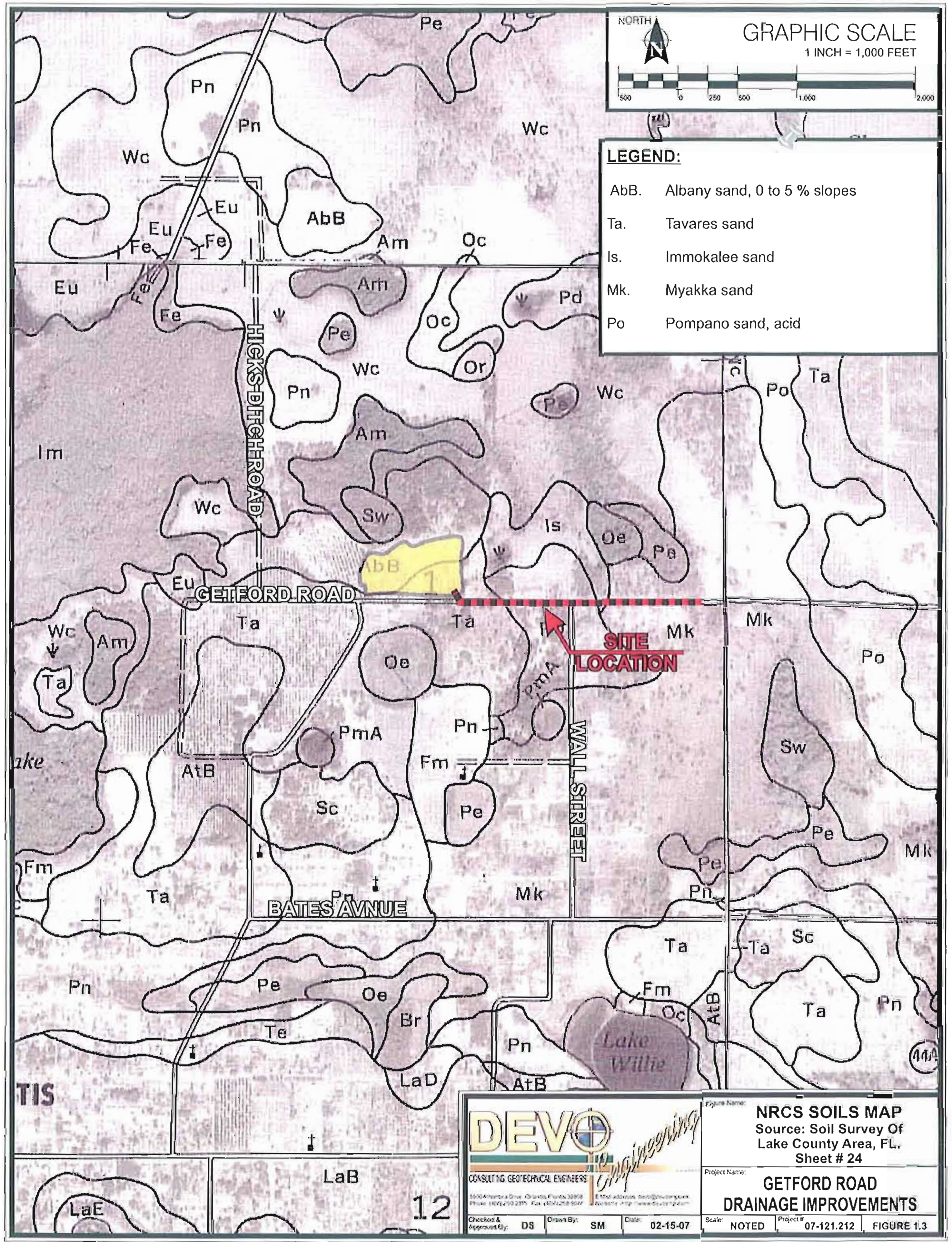
GETFORD ROAD
SITE LOCATION
DELAND ROAD
WALL STREET
BATES AVNUE
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
Figure Name:
SITE AERIAL IMAGE
(PHOTO DATE:MARCH 2006)
Project Name:
GETFORD ROAD
DRAINAGE IMPROVEMENTS
Checked & Approved By: DS
Drawn By: SM
Date: 02-15-07
Scale: NOTED
Project # 07-121.212
FIGURE 1.2



NORTH
GRAPHIC SCALE
1 INCH = 1,000 FEET
500
0
250
500
1,000
2,000
LEGEND:
AbB. Albany sand, 0 to 5 % slopes
Ta. Tavares sand
Is. Immokalee sand
Mk. Myakka sand
Po Pompano sand, acid
HICKS DITCH ROAD
GETFORD ROAD
WALL STREET
BATES AVNUE
SITE LOCATION
Lake Willie
NRCS SOILS MAP
Source: Soil Survey Of Lake County Area, FL. Sheet # 24
GETFORD ROAD DRAINAGE IMPROVEMENTS
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
DS
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FIGURE 1.3


NORTH
N
GRAPHIC SCALE
1 INCH = 200 FEET
100
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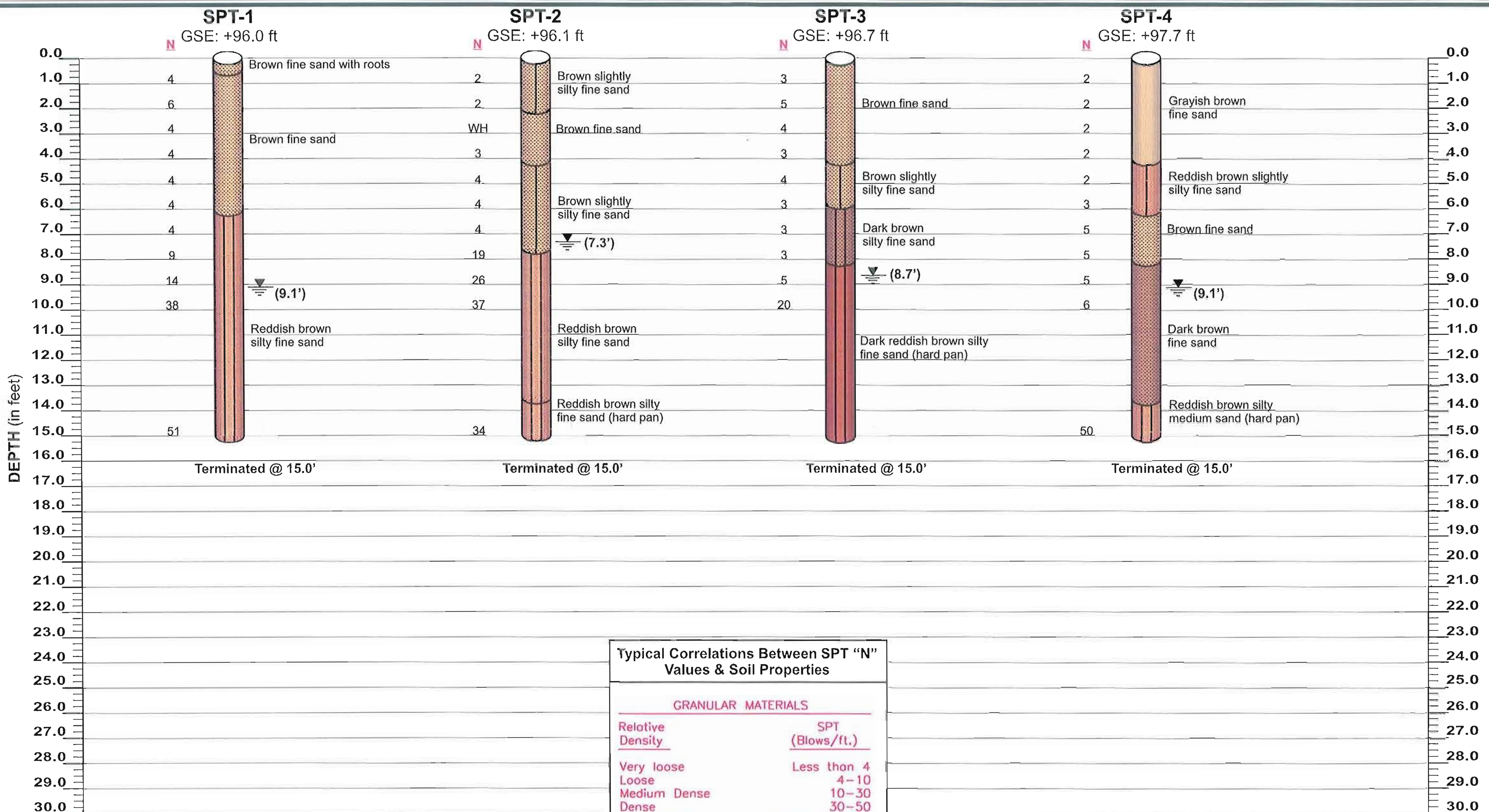
50
100
200
400
LEGEND:
PB-6
20' deep SPT Pond borings
SPT-8
15' deep SPT borings
PB-1
PB-2
PB-3
PB-4
PB-5
PB-6
SPT-1
SPT-2
SPT-3
SPT-4
SPT-5
SPT-6
SPT-7
SPT-8
GETFORD ROAD
JULES COURT
JEAN COURT
LOUIS COURT
GRANT AVENUE
SELLEEN DRIVE
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
Figure Name:
BORING LOCATION PLAN
Project Name:
GETFORD ROAD
DRAINAGE IMPROVEMENTS
Checked & Approved by: DS
Drawn By: MZ
Date: 02-16-07
Scale: Noted
Proj. # 07-121.212
Figure 1.4



Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS

Relative Density	SPT (Blows/ft.)
Very loose	Less than 4
Loose	4–10
Medium Dense	10–30
Dense	30–50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	SPT (Blows/ft.)
Very soft	Less than 2
Soft	2–4
Firm	4–8
Stiff	8–15
Very stiff	15–30
Hard	Greater than 30

NOTES:

Borings drilled on February 12, 2007

(water level symbol) Water level measured on February 22, 2007

WH Sampler advanced under weight of rod and hammer

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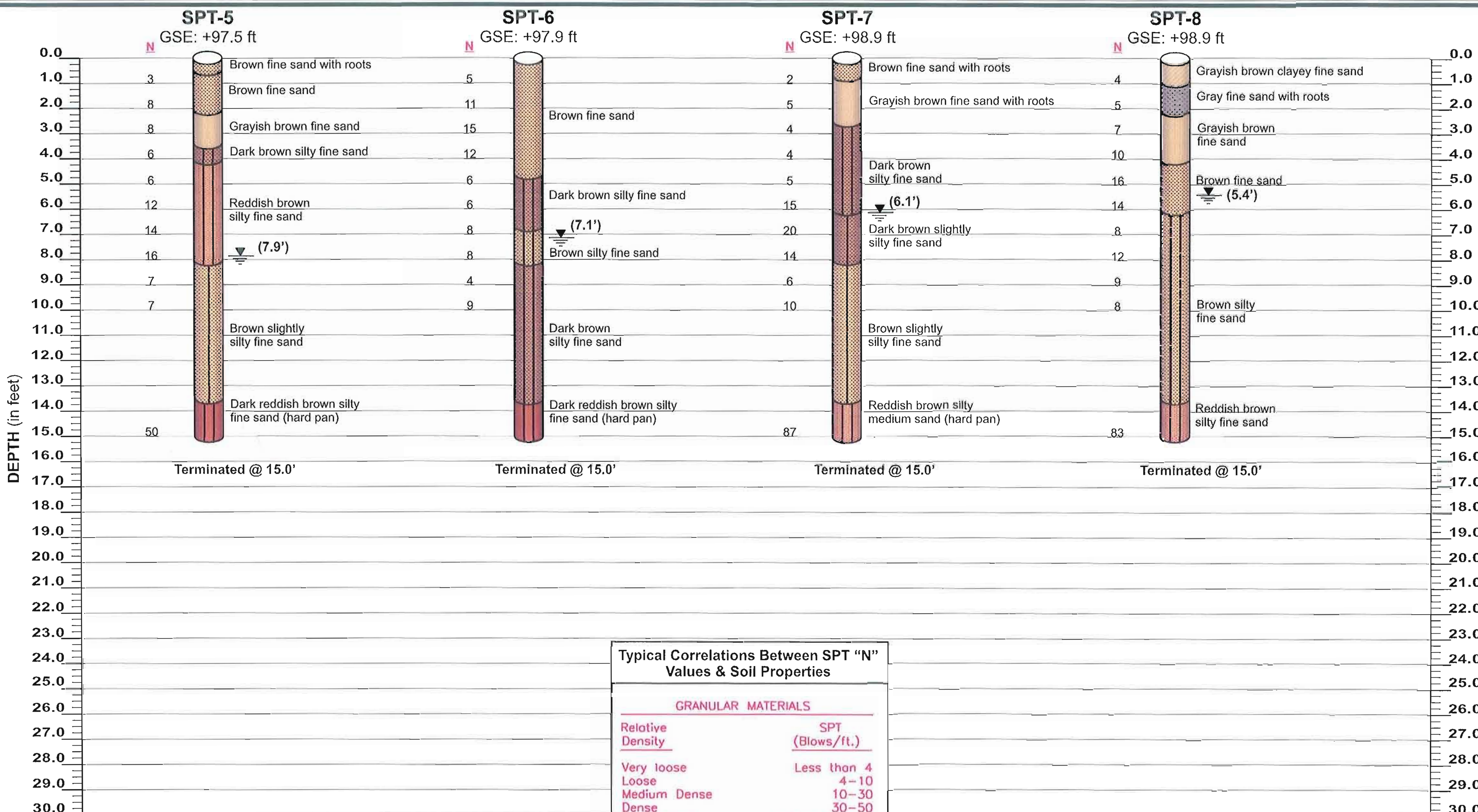
Figure Name:	SOIL PROFILES FOR SPT-1 TO SPT-4
Project Name:	GETFORD ROAD DRAINAGE IMPROVEMENTS
Checked & Approved By: DS	Drawn By: MZ
Date: 02-23-07	Scale: NOTED
Project #: 07-121.212	Figure 2.1



Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS

Relative Density	SPT (Blows/ft.)
Very loose	Less than 4
Loose	4–10
Medium Dense	10–30
Dense	30–50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	SPT (Blows/ft.)
Very soft	Less than 2
Soft	2–4
Firm	4–8
Stiff	8–15
Very stiff	15–30
Hard	Greater than 30

NOTES:

Borings drilled on February 12, 2007

Water level measured on February 22, 2007

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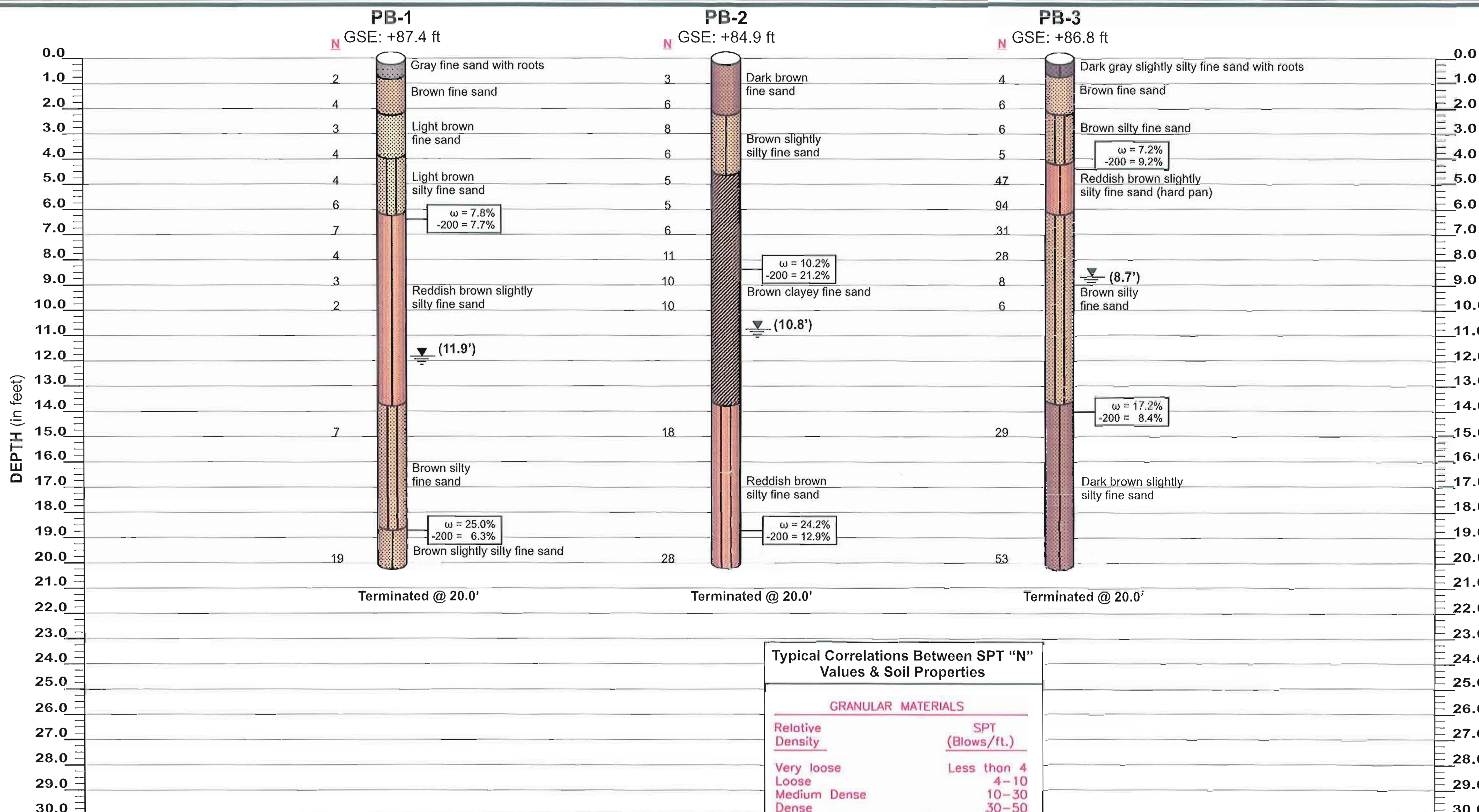
Figure Name: **SOIL PROFILES FOR SPT-5 TO SPT-8**

Project Name: **GETFORD ROAD DRAINAGE IMPROVEMENTS**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #:	
DS	MZ	02-23-07	NOTED	07-121.212	Figure 2.2



Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS

Relative Density	SPT (Blows/ft.)
Very loose	Less than 4
Loose	4–10
Medium Dense	10–30
Dense	30–50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	SPT (Blows/ft.)
Very soft	Less than 2
Soft	2–4
Firm	4–8
Stiff	8–15
Very stiff	15–30
Hard	Greater than 30

NOTES:

Borings drilled on February 12, 2007

(water level symbol) Water level measured on February 22, 2007

NOTES:

ω = Field moisture content (%)

-200 = Percent passing US #200 Sieve

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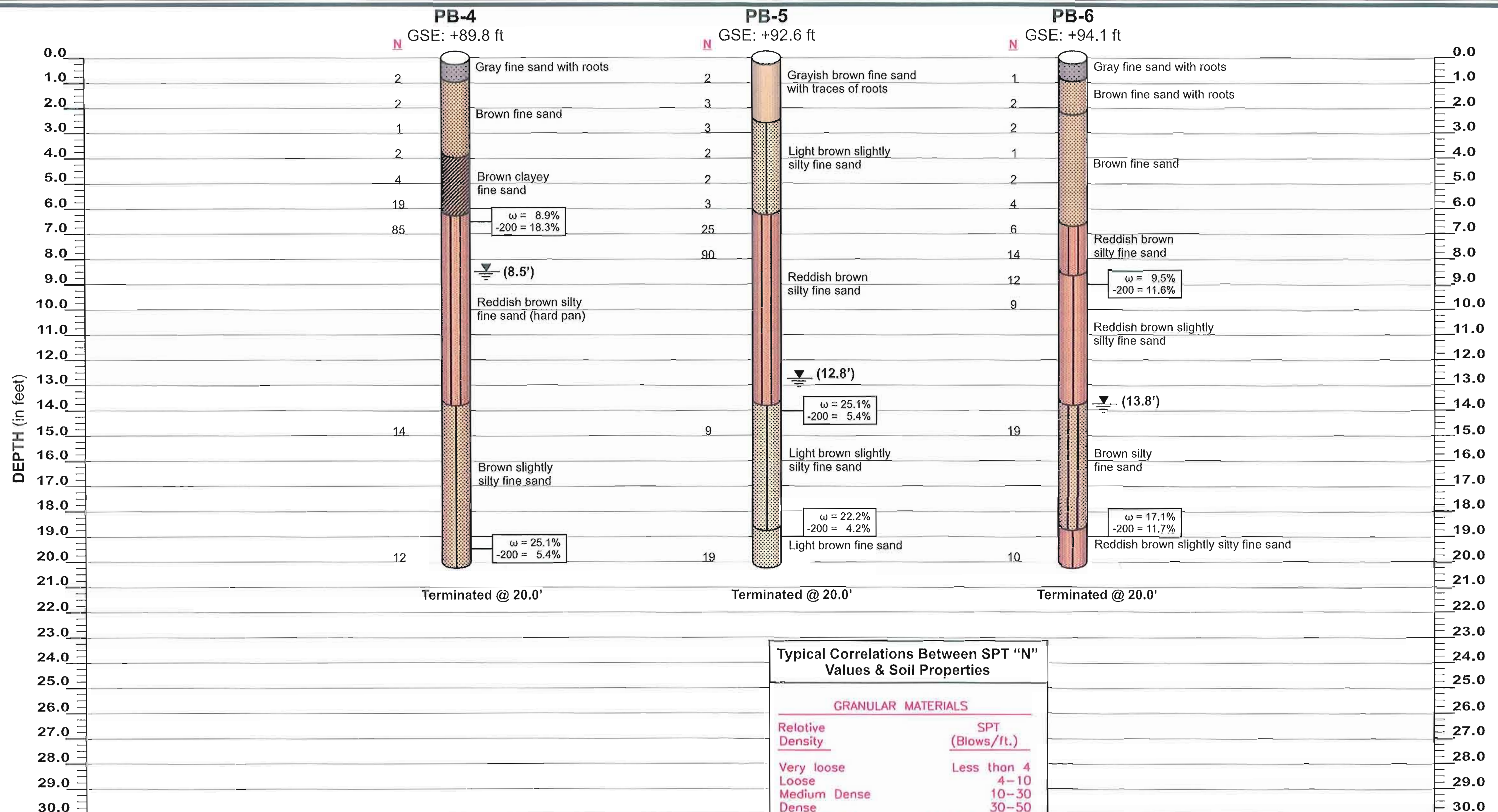
SOIL PROFILES FOR PB-1 TO PB-3

GETFORD ROAD DRAINAGE IMPROVEMENTS

Checked & Approved By: DS | Drawn By: MZ | Date: 02-23-07 | Scale: NOTED | Project #: 07-121.212 | Figure 3.1



Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS	
Relative Density	SPT (Blows/ft.)
Very loose	Less than 4
Loose	4–10
Medium Dense	10–30
Dense	30–50
Very Dense	Greater than 50
SILTS AND CLAYS	
Consistency	SPT (Blows/ft.)
Very soft	Less than 2
Soft	2–4
Firm	4–8
Stiff	8–15
Very stiff	15–30
Hard	Greater than 30

NOTES:

Borings drilled on February 12, 2007

Water level measured on February 22, 2007

NOTES:

ω = Field moisture content (%)

-200 = Percent passing US #200 Sieve

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SOIL PROFILES FOR PB-4 TO PB-6

GETFORD ROAD DRAINAGE IMPROVEMENTS

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #:	
DS	MZ	02-23-07	NOTED	07-121.212	Figure 3.2