Final Geotechnical Report

Florida Department of Transportation - District VII

County Line Road (C.R. 578)
Project Development and Environment Study
From U.S. 19 (S.R. 55) to U.S. 41 (S.R. 45)

Work Program Item Segment Number: 257298 1
Federal-Aid Program Number: 7822 001 S
Pasco and Hernando Counties, Florida

The proposed project involves improving County Line Road (C.R. 578) to a multi-lane facility from U.S. 19 (S.R. 55) to east of U.S. 41 (S.R. 45) in Pasco and Hernando Counties, a distance of approximately 12.0 miles (19.3 kilometers). The project includes a segment of roadway along a new alignment. This segment is referred to as the Ayers Road Extension and extends from the interchange of C.R. 578 and the Suncoast Parkway to east of U.S. 41, a distance of approximately 3.5 miles (5.6 kilometers).

October 2000
Revised May 2003

Final Geotechnical Report

Florida Department of Transportation - District VII

County Line Road (C.R. 578)
Project Development and Environment Study
From U.S. 19 (S.R. 55) to U.S. 41 (S.R. 45)

Work Program Item Segment Number: 257298 1
Federal-Aid Program Number: 7822 001 S
Pasco and Hernando Counties, Florida

The proposed project involves improving County Line Road (C.R. 578) to a multi-lane facility from U.S. 19 (S.R. 55) to east of U.S. 41 (S.R. 45) in Pasco and Hernando Counties, a distance of approximately 12.0 miles (19.3 kilometers). The project includes a segment of roadway along a new alignment. This segment is referred to as the Ayers Road Extension and extends from the interchange of C.R. 578 and the Suncoast Parkway to east of U.S. 41, a distance of approximately 3.5 miles (5.6 kilometers).

Prepared by:

Professional Service Industries, Inc.

October 2000
Revised May 2003

TABLE OF CONTENTS

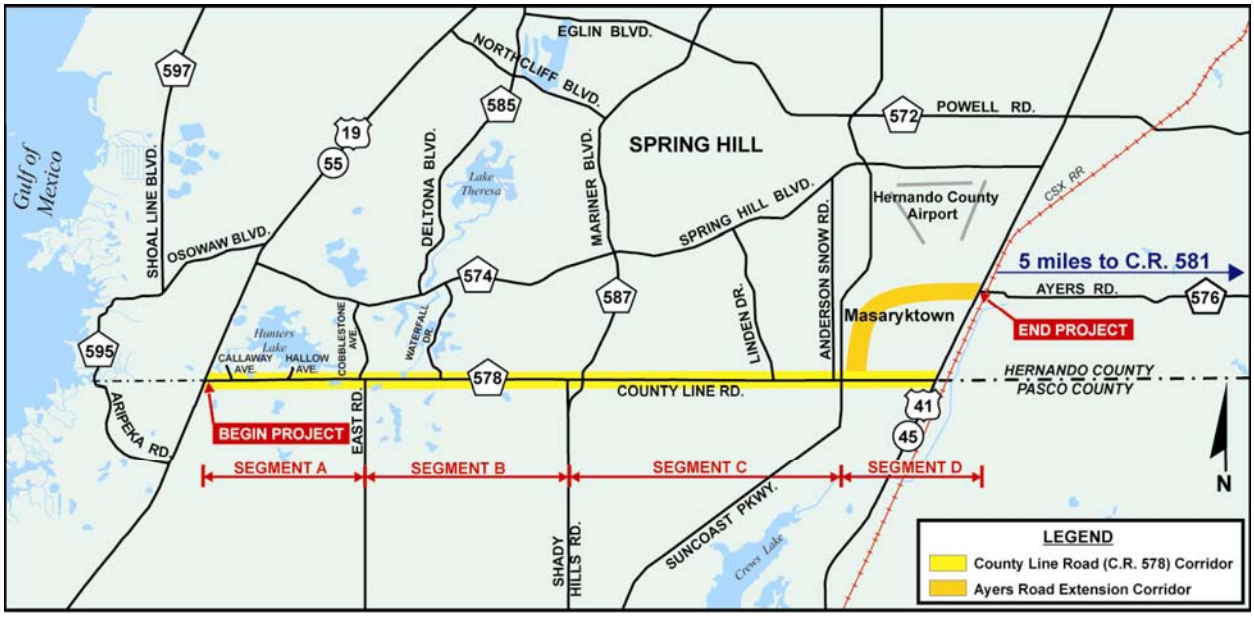
LIST OF TABLES

LIST OF FIGURES

Section 1.0
INTRODUCTION

The Florida Department of Transportation in partnership with Pasco and Hernando Counties has conducted a Project Development and Environment (PD&E) Study to evaluate capacity improvement alternatives for County Line Road (C.R. 578) in Pasco and Hernando Counties, as shown on Figure 1-1. The recommended project involves improving C.R. 578 to a four-lane suburban facility requiring approximately 155 ft of right-of-way from the vicinity of U.S. 19 to the vicinity of U.S. 41, a distance of approximately 12.0 mi (19.3 km). A segment of roadway on new alignment, referred to as the Ayers Road Extension, is also recommended from the C.R. 578/Suncoast Parkway interchange north then east to the vicinity of U.S. 41 and Ayers Road (C.R. 576). The recommended route extends northward through mostly undeveloped pasture then east for a distance of approximately 3.5 mi (5.6 km) terminating at the U.S. 41/Ayers Road intersection north of Masaryktown. The Ayers Road Extension will provide a continuous east-west travel route from U.S. 19 to west of I-75 and facilitate new access to the Hernando County Airport in accordance with the *Hernando County Airport Master Plan*.

FIGURE 1-1
PROJECT LOCATION MAP



1.1 PURPOSE

The objective of the PD&E Study is to provide documented environmental and engineering analyses that will assist the FDOT and the Federal Highway Administration (FHWA) in reaching a decision on the location and conceptual design for improvements to C.R. 578. This study will also comply with the requirements of the National Environmental Policy Act (NEPA) to qualify the transportation improvements for Federal-aid funding.

The PD&E Study report presented herein is intended to be used to support the feasibility and design of the roadway improvements. Evaluation of the stormwater management areas for this project will be addressed in a separate report.

This report focuses on providing a review of existing information and field reconnaissance to identify soils-related problem areas. Using aerial photography, available County and Natural Resource Conservation Services (NRCS) formerly known as United States Department of Agriculture (USDA) Soil Conservation Service (SCS) data, United States Geological Survey (USGS) quadrangle mapping, design engineering, and construction projects within the study area, an inventory of the anticipated soil conditions along the roadway are presented. Furthermore, preliminary geotechnical recommendations are provided.

1.2 PROJECT DESCRIPTION

The C.R. 578 corridor is an east/west facility with a functional classification of a major collector. The project is located within Sections 1 through 6 of Township 24 South, Range 17 East and Sections 1 through 6 of Township 24 South, Range 18 East in Pasco County, and Sections 31 through 36 of Township 23 south, Range 17 East; Sections 25, 26, 31 through 36 of Township 23 South, Range 18 East; and Section 30 of Township 23 South, Range 19 East in Hernando County.

C.R. 578 is currently a two-lane rural highway from U.S. 19 (S.R. 55) to Callaway Avenue and from Hallow Avenue to U.S. 41 (S.R. 45) and is functionally classified as a major collector. From the vicinity of Callaway Avenue to Hallow Avenue, C.R. 578 has been expanded to a four-lane divided suburban facility with an open drainage system. In addition, for 0.5 miles (mi) [0.8 kilometers (km)] west and east of the interchange at the Suncoast Parkway, C.R. 578 has been expanded to a four-lane divided facility. The existing right-of-way ranges from 50 feet (ft) [15.3 meters (m)] to 170 ft (51.9 m) except at the Suncoast Parkway interchange where the right-of-way is 254 ft (77.5 m) (see Figure 1-1). C.R. 578 is a designated evacuation route.

For the purpose of developing and evaluating project alternatives, C.R. 578 was divided into four study segments: Segment A from U.S. 19 to East Road, a distance of 2.4 mi (3.9 km); Segment B from East Road to Mariner Boulevard/Shady Hills Road, a distance of 3.2 mi (5.1 km); Segment C from Mariner Boulevard/Shady Hills Road to the Suncoast Parkway, a distance of 3.9 mi (6.3 km); and Segment D from the Suncoast Parkway to U.S. 41 (Ayers Road Extension), a distance of 3.5 mi (5.6 km).

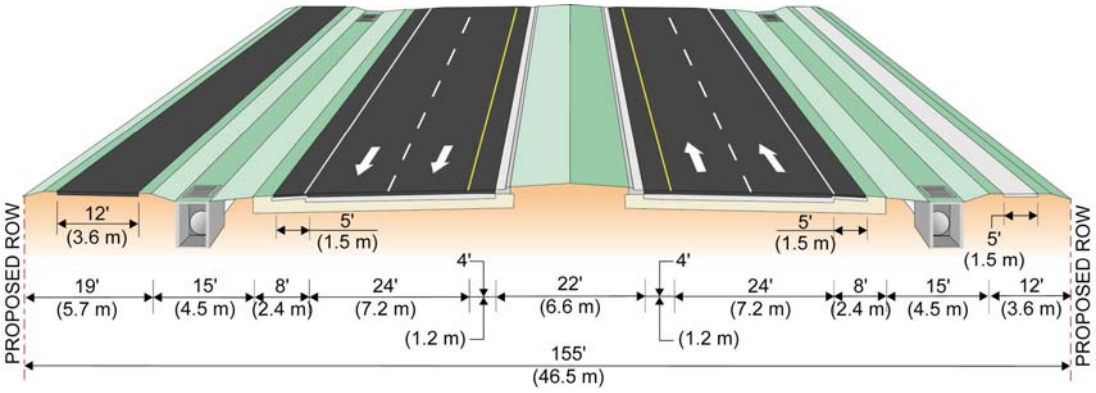
Primary land uses along C.R. 578 include numerous residential subdivisions, individual residences, commercial development, the Spring Hill Regional Hospital, the Suncoast Elementary School, the Hernando County Airport, and numerous religious facilities. The Pasco County and Hernando County *Comprehensive Plans* indicate that future land uses along the project corridor are expected to follow the established trends of the existing land uses.

1.3 RECOMMENDED ROADWAY IMPROVEMENTS

For the Ayers Road Extension, it was determined that because of the potentially adverse effects Alignment S-5 had on the Alexsuk Site (Site – 8HE426), further coordination with FHWA and SHPO was needed. Consequently, a new alignment, S-8, was developed. This alternative was developed in and effort to minimize or eliminate effects to the Alexsuk Site. Both alignments were presented at the Public Hearing. Alignment S-5 was the preferred alternative.

The typical section recommended in this study and approved by Pasco and Hernando Counties, is a four-lane divided suburban facility with a 30 ft (9.0 m) median of which 22 ft (6.6 m) is raised, two 12 ft (3.6 m) travel lanes in each direction, 8 ft (2.4 m) outside shoulders with 5 ft (1.5 m) of the shoulder paved, and 15 ft (4.5 m) drainage swales. A 12 ft (3.6 m) multi-use facility on the north side of the roadway and a 5 ft (1.5 m) sidewalk on the south side of the roadway are recommended. The recommended design speed for this typical section is 55 mph (90 km/h). See Figure 1-2.

FIGURE 1-2
SUBURBAN TYPICAL SECTION



Section 2.0
PROJECT APPROACH AND METHODOLOGY

The services for this project consisted of providing preliminary geotechnical engineering services in general accordance with the Project Development and Environmental Study Scope of Services as defined in Exhibit "A" issued by the FDOT. The services included performing a field reconnaissance and a review of published information that is related to the subsurface soil and groundwater conditions in the project area. This geotechnical study began with a review of available subsurface test data, such as the "Soil Survey of Pasco County, Florida" and "Soil survey of Hernando County, Florida" published by the USDA SCS and the USGS topographic maps for the project vicinity. A field reconnaissance was conducted and assessed conditions with respect to general topographic site conditions and geotechnical engineering issues able to be visually observed.

The purpose of this study was to obtain preliminary information concerning the general subsurface conditions along the roadway alignments in order to catalog the general subsurface stratigraphy and provide preliminary geotechnical recommendations to guide in the design and construction of the project. The following services were provided in order to achieve the preceding objectives:

1. Conducted a general visual reconnaissance of the project alignment.

2. Reviewed readily available published topographic and soils information. This published information was obtained from the "Aripeka, Florida" and the "Port Richey Northeast, Florida" Quadrangle Maps published by the USGS and the "Soil Survey of Pasco County, Florida" and the "Soil Survey of Hernando County, Florida" published by the USDA SCS.

3. Provided the seasonal high groundwater level (SHGWL) of the shallow soils as published by the USDA SCS.

4. Completed a preliminary sinkhole/ground subsidence evaluation for the project areas.

5. Prepared a preliminary geotechnical engineering report summarizing the study for the design and construction of the proposed roadway.

Section 3.0
SUBSURFACE SOIL CONDITIONS

3.1 UNITED STATES GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC SUR VEY

The site of the recommended improvements is located in Pasco County and Hernando County, Florida. The project is located within Sections 1 through 6 of Township 24 South. Range 17 East and Sections 1 through 6 of Township 24 South, Range 18 East in Pasco County and Sections 31 through 36 of Township 23 South, Range 17 East; Sections *25,* 26, 31 through 36 of Township 23 South, Range 18 East; and Section 30 of Township 23 South, Range 19 East in Hernando County.

The published USGS topographic survey maps entitled "Aripeka, Florida", and "Port Richey Northeast, Florida", were reviewed for ground surface features along the recommended project improvements. Based on this review, the natural ground surface elevations are generally within the range of lows near elevation 10 feet to elevation 20 feet near U.S. Highway 19 (S.R. *55)* and highs near elevation 80 feet to elevation 90 feet in the eastern Spring Hill area. Near the eastern terminus at U.S. Highway 41 (S.R. *45),* the ground surface is near elevation 70 feet based on the National Geodetic Vertical Datum (NGVD) of 1929. Several depressional features are also present in close proximity to the existing roadway alignment, particularly in the Spring Hill area. A reproduction of the quadrangle maps and USDA SCS map for the project vicinity is shown on Sheet 1 in the Appendix of this report.

3.2 REGIONAL GEOLOGY

Based on our review of the "Geohydrologic Reconnaissance of Pasco and Southern Hernando Counties, Florida", published in 1968 by the USGS, Pasco and Southern Hernando Counties are in the central or mid-peninsular physiographic zone of the Florida Peninsula. These Counties are characterized by discontinuous highlands in the form of ridges separated by broad valleys. The ridges are above the static level of the water in the aquifer, but the broad valleys are below it. Broad shallow lakes are common on the valley floors, and smaller deeper lakes are on the ridges. Based on the physiography, these Counties can be divided into five areas: the Coastal Swamps, the Gulf Coastal Lowlands, the Brooksville Ridge, the Tsala Apopka Plain, and the Western Valley.

Pasco and Hernando Counties are underlain by several thousand feet of sedimentary rock, principally various limestone formations. A very gently sloping, very flat limestone terrain extends inland from the Gulf of Mexico; this is the Coastal Swamps area. This area extends the length of the Counties and ranges up to about two miles in width. Inland, the terrain changes very gradually from shallow marine water to salt marshes to fresh water swamps. Much of the area has shallow limestone, and because there are no barrier formations, sands did not accumulate and beaches did not form. In some areas, the limestone has dissolved and pockets of organic materials have accumulated. As a result, some places have a mixture of organic and mineral soils.

The Gulf Coastal Lowlands lie between the Coastal Swamps and the Brooksville Ridge and the Western Valley. In the northern part of the Counties they conjoin the Brooksville Ridge, and in the southern part they conjoin the Western Valley area at Zephyrhills Gap. The area consists mainly of pine and saw-palmetto flatwoods and has numerous small ponds and broad grassy sloughs. The soils are predominantly nearly level, wet and sandy. Some areas have deep, well-drained and excessively drained sands, which are relict sand dunes. Much of the urban development in the Counties has occurred on the better-drained parts of the lowlands. Much of the wetter acreage is used as pastureland.

The drainage of the area has also been studied. Much of the water falling on the Counties is returned to the atmosphere by evaporation and transpiration, the remainder enters the ground. Ultimately, all of this groundwater flows into the Gulf of Mexico. It drains from the area through the underlying limestone and via a few surface streams. Streams are present only where material of slow permeability overlie the limestone or the water level in the limestone is near the ground surface. The Pithlachascotee and Anclote Rivers drain the area west of U.S. Highway 41 and south of Florida Highway *52.* The southeastern and south-central parts of Pasco County are drained by tributaries of the Hillsborough River. The Withlacoochee River drains the eastern part of Pasco County.

Some areas of both Counties appear to have sinkhole drainage patterns. Bear Creek, for example, reportedly drains into Bear Sink and when Bear Sink is full, it drains into a second sinkhole. In periods when both of these sinks cannot drain the full water flow, the excess appears to flow westward via a poorly developed channel across U.S. Highway 19 to the Gulf of Mexico. Several lakes east of Port Richey are drained by Rocky Sink.

Some parts of both Counties are drained by closed depressions. These are common in the drainage areas of streams. These closed depressions, which drain internally, generally provide adequate subsurface drainage during periods of normal rainfall. During very wet penods, the closed depressional drains may receive more water than they can release into the underlying limestone formation, allowing the closed depressions to become flowing springs.

3.3 PASCO/HERNANDO COUNTY SOIL SURVEY

The Soil Survey of Pasco County and Hernando County, Florida, published by the USDA SCS has been reviewed for the project vicinity. The soil survey map for the project vicinity is illustrated on Sheet 1 in the Appendix of this report. This soil survey map indicates that there are several mapping units along the roadway alignments in these counties. The map soil units encountered are as shown in Table 3-1.

TABLE 3-1
USDA SCS SOIL SURVEY INFORMATION

COUNTY LINE ROAD CR578 ALIGNMENT					
Pasco/Hernando County USDA Soil Series	**Seasonal High Groundwater Table**		**Soil Classifications**		
	Depth (inches)	**Duration (months)**	**Depth (inches)**	**Unified**	**AASHTO**
Candler (13,14 – Pasco)/ Candler (14,15 – Hernando)	>72	-	0-48 48-80	SP, SP-SM, SP, SP-SM	A-3 A-3, A-2-4
Paola (19— Pasco)/ Paola (39 — Hernando)	>72	-	0-80	SP	A-3
Millhopper (69 - Pasco)	40-60	1-4	0-60 60-80	SP-SM, SM SM, SM-SC, SC	A-3, A-2-4 A-2-4, A-4, A-2-6
Masaryk (32 — Hernando)	40-60	1-2	0-70 70-90	SM SM, SM-SC, SC	A-2-4 A-2-4, A-A
Tavares (6— Pasco)	40-60	6-12	0-86	SP, SP-SM	A-3
Basinger, depressional (23 - Pasco)	Ponded	6	0-10 10-80	SP SP,SP-SM	A-3 A-3, A-2-4
Pompano (44— Hernando)	<10	2-6	0-80	SP,SP-SM	A-3
Pits (28— Pasco)	N/A	N/A	N/A	N/A	N/A
AYERS ROAD EXTENSION					
Hernando County USDA Soil Series	**Seasonal High Groundwater Table**		**Soil Classifications**		
	Depth (inches)	**Duration (months)**	**Depth (inches)**	**Unified**	**AASHTO**
Kendrick (29)	>72	-	0-28 28-34 34-63 63-80	SP-SM, SC, SM-SC SC SC, SM-SC	A-3, A-2-4 A-2-6, A-2-4 A-2-6, A-6 A-2-6, A-2-4
Masaryk (32)	42-60	1-2	0-70 70-90	SM SM, SM-SC, SC	A-2-4 A-2-4, A-4
Blichton, loamy (12—Hernando)	<10	1-4	0-28 28-63 63-75	SP-SM, SM SC SC, CL, CH	A-2-4, A-3 A-2-4, A-6 A-6, A-7
Nobleton (36)	18-42	4	0-33 33-37 37-60 60-80	SP-SM, SM SC SC, CL, CH SC	A-2-4 A-2-6, A-6 A-6, A-7 A-2-6, A-6

In general, the surficial soils consist of poorly graded fine sands grading to silty and clayey fine sands as the roadway approaches Masaryktown. The Basinger, depressional; Blichton, loamy and Pompano fine sand soil series are generally located in low-lying areas surrounding ponds.

3.4 REVIEW OF PAST PROJECTS

Review of roadway and other geotechnical engineering projects completed within the project vicinity also revealed an upper mantle of predominantly fine sand deposits with variable silt fines content underlain by clayey fine sands and sandy clays generally between the 6 to 12 foot depth interval. The clayey soils commonly blanketed the underlying limestone formation, which may be evidenced at depths ranging from 25 to 35 feet below the existing ground surface. It has also been our experience that areas of higher ground surface elevations generally possess thicker deposits of surficial fine sands and therefore, greater depths to the clayey soils and limestone formation.

Section 4.0
PRELIMINARY EVALUATION OF ROADWAY AREAS

4.1 SOIL USAGE SUMMARY

The subsurface soil conditions along the project alignment, based on the review of published information and past project reports, generally consists of near-surface sandy soils. The existing subsurface soils should be acceptable for construction to support a typical embankment pavement section after proper subgrade preparation. Unsuitable soils including shallow plastic clayey soils, muck, or debris, if encountered within the right-of-way during construction, should be removed and replaced with compacted select sands in accordance with FDOT requirements.

A relatively shallow groundwater table may be a concern in the Nobleton (36 – Hernando) soil series. The Nobleton soil series is located along the Ayers Road Extension starting about 1 mile west of U.S. Highway 41 (S.R.45) and extending to the end of the project approximately 0.6 miles east of U.S. Highway 41 (S.R.45). Shallow groundwater table may also be of concern in the Basinger, depressional (23 – Pasco) and Pompano (44 – Hernando) soil series. These soil types are located in low-lying areas surrounding ponds in the western portion of the project. These areas do not appear to be within the immediate proposed roadway alignment. Roadway grades should be evaluated to make certain that minimum requirements are maintained for separation of roadway base materials and the seasonal high groundwater levels.

Material use and/or removal should be completed in accordance with FDOT Index Nos. 500 and 505. Materials directly beneath the base should be "SELECT" materials. The USDA Soil Conservation Service (SCS) indicates predominantly sandy soils throughout the roadway alignments, except when approaching U.S. Highway 41 (S.R. 45) along the Ayers Road Extension. Shallow plastic clayey soils may be encountered within 36 inches of the ground surface in the Kendrick (29 – Hernando) and Nobleton (36 – Hernando) soil series located within this area. If encountered within the right-of-way during construction, plastic soils should be removed and replaced with compacted select sands in accordance with FDOT requirements.

The removal of topsoil and other shallow surficial organic soil deposits should be accomplished in accordance with EDOT Standard Specifications for Road and Bridge Construction, Section 110. Organic soils are highly compressible and may cause excessive settlements if left in-place. This material is also susceptible to significant secondary compression settlements.

Backfill should consist of materials conforming to Standard Index No. 505 and compacted in accordance with the Standard Specifications for Road and Bridge Construction.

4.1.1 EARTH EMBANKMENTS

In general, sands can be moved and used for grading purposes, site leveling, general engineering fill, structural fill and backfill in other areas, provided the material is free of organic materials, clay, debris or any other material deemed unsuitable for construction. Clayey or silty soils may be used as embankment soils as described in FDOT Index 505.

4.1.2 PAVEMENT DESIGN CONSIDERATIONS

The design Limerock Bearing Ratio (LBR) value for pavements constructed on fill should be based on the earthfill material. Although the sources of the earthfill, the "borrow areas", have not yet been defined, we expect sources local to the proposed roadway alignment will be favorable. We recommend testing a suitable number of soil samples from the "borrow areas" for the LBR value and determining the design LBR value based on the FDOT 90-percentile method.

Based on published information and past experience in the project area, groundwater levels along much of the corridor should be greater than 4 feet all year. Approaching U.S. Highway 41 (S.R. *45),* starting about 2 miles west of this highway, groundwater levels may approach 1.5 to 3.5 feet below the existing ground surface. In the northern portion of the Ayers Road Extension from about 1 mile west of U.S. Highway 41 (S.R.45) and extending to the end of the project approximately 0.6 miles east of U.S. Highway 41 (S.R.45) seasonal high groundwater levels may be within 18 inches of the ground surface. The choice of base material would depend upon the relationship of final roadway improvement grades and the bottom of the base to the estimated seasonal high groundwater table levels. Shell base materials can be more resistant to wet conditions than limerock and the separation can be somewhat reduced. Crushed concrete is also less sensitive to moisture than limerock. It is generally more favorable to raise grades when shallow water tables are encountered, if possible, than to use less sensitive base materials such as black base.

4.2 ROADWAY CONSTRUCTION

Site preparation and roadway construction should be in accordance with the latest FDOT Standard Specifications for Road and Bridge Construction and the Roadway and Traffic Design Standards.

Section 5.0
PRELIMINARY CONSTRUCTION CONSIDERATIONS

5.1 GENERAL CONSTRUCTION RECOMMENDATIONS

Site preparation and construction should be in accordance with the latest FDOT Standard Specifications for Road and Bridge Construction and Roadway and the Traffic Design Standards.

Depending upon groundwater levels at the time of construction, some form of dewatering may be required in areas requiring excavation and compaction below the water table.

5.2 EXCAVATIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P'. This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractors "responsible person", as defined in 20 CFR part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety regulations.

5.3 GROUNDWATER CONTROL

Depending upon groundwater levels at the time of construction, some form of dewatering may be required for excavations and/or to achieve the required compaction. Groundwater can normally be controlled in shallow excavations with a sump pump. During subgrade soil preparation, any plastic soils below design grade could become disturbed by construction activities. The contractor may be directed by the Department's representative to remove the disturbed or pumping soils to a depth of 12 to 18 inches below design grade and backfill the area with structural fill in accordance with the latest FDOT Standard Specifications for Roads and Bridge Construction.

Surface water and groundwater control should be used to allow construction to occur in accordance with the Florida Department of Transportation Standard Specifications. The construction area should be maintained to prevent surface water from disturbing the construction area and water diverted through a temporary ditch or pumped around construction activities. If a pump is used, a standby pump is recommended.

Depending upon shallow groundwater levels at the time of construction, seepage may enter from the bottom and sides of excavated areas. Such seepage will act to loosen soils, and create difficult working conditions. Therefore, it may be necessary to wellpoint or sump pump and rim ditch excavation areas. Groundwater levels should be at least 2 feet below the lowest working area to facilitate proper material placement and compaction.

Section 6.0
SINKHOLE/GROUND SUBSIDENCE EVALUATION

6.1 VISUAL INSPECTION OF EXISTING DEPRESSIONS

Professional Service Industries, Inc. (PSI) conducted a visual inspection of existing surface depressions along the alignment of County Line Road and within the general area where the Ayers Road extension is planned. Unfortunately, due to denial of property access, we were unable to closely inspect and photograph the existing surface depressions along the Ayers Road extension corridor. The purpose of this study was to provide a visual reconnaissance of the surface depressions and form an opinion regarding the potential or likelihood for the depressions to be related to sinkhole activity, which could impact potential roadway alignments, particularly the selection of the Ayers Road extension alignment.

The majority of the surface depressions inspected along the alignment of County Line Road appear to be topographic lows, with the exception of the series of circular shaped depressions/ponds located between Cobblestone Drive and Waterfall Drive in Hernando County. The larger and deeper surface depression identified just east of Shady Hills Road in Pasco County may represent a previously formed sinkhole, but does not possess some of the typical characteristics for sinkholes in this area. This depression contains upland/sandy soil vegetation and does not contain water.

Along the corridor of the Ayers Road extension, there are three (3) surface depressions that might be related to sinkhole development. While two (2) of the depressions seasonally contain water, it is our understanding that the larger and steeper sloped depression contains water year round and may be hydraulically connected to the underlying surficial or Floridian aquifer. Photographs taken by IJRS Corporation also revealed that this depression has the more typical characteristics of a sinkhole, such as the steep sided slopes, leaning trees and contains water year round. These surface depressions may warrant additional geotechnical and geophysical studies during the design phase of the project, depending upon the roadway alignments.

6.2 PRELIMINARY E VALUATION OF SINKHOLE POTENTIAL

A preliminary sinkhole/ground subsidence evaluation which consisted of field reconnaissance of the recommended roadway alignment along County Line Road (C.R. 578) and a study of available published data and field investigation information was completed. Prior to the site visit, the available published data including topographic, soils and geological data was reviewed. In addition, project specific aerial topographic photographs were reviewed as well as past reports prepared for projects in the vicinity. Sinkhole frequency data developed by Subsurface Evaluations, Inc. was also reviewed to establish the potential for new sinkhole development along the roadway alignments. Attached, as Sheet 2 in the report Appendix, is a map depicting reported new sinkhole frequency in Central and West-Central Florida. As seen from this map, the

recommended roadway alignments are located in areas where the maximum reported new sinkhole frequency is between 0.001 and 0.05 new sinkholes per square mile per year. Accordingly, over a period of 100 years, on the order of 1 to 2 new sinkholes would be expected to form near the length of the 12-mile roadway alignment.

It should be recognized that while it may be prudent to conduct geophysical and geotechnical studies at the previously discussed and highlighted surface depressions, to evaluate their potential impacts to the performance of the roadway it would be necessary to complete detailed ground penetrating radar (GPR) or other geophysical testing along with deep test borings. Even with this type of testing it is difficult to accurately predict the time or extent of ground subsidence activities.

Based on past karst/sinkhole activity in the area the potential exists for new sinkholes to develop along the roadway alignments that are not visually apparent at this time. Geophysical and geotechnical studies could be performed along the proposed roadway alignments to provide guidance with respect to selecting the roadway alignment and sinkhole remediation, but in view of the length of the roadway, this program of investigation is not generally considered practical. The risk for sinkhole development along the alignment is generally considered low to moderate as seen by Sheet 2, which was generated based on current data. A higher potential for sinkhole development is present adjacent to existing sinkholes.

Based on the limited data available, there was no evidence of current sinkhole activity along the recommended roadway corridor. It is recognized that the geology and hydrogeologic conditions in this area of Pasco County and Hernando County is conducive for the formation and development of sinkholes. Published data by government and private agencies supports this opinion. Several news articles regarding sinkhole development within several miles of the project vicinity are included in the appendix.

Section 7.0
REPORT LIMITATIONS

Professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on this data.

The preliminary recommendations submitted in this report are based upon the anticipated location and type of construction proposed for this project. If any variations become evident during the course of the design of the project or during construction, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered.

The scope of the services presented herein does not include any field or laboratory testing or any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report are intended only as a guide for assessing the feasibility of the proposed project improvements.