ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical ◆ Construction Materials ◆ Environmental

July 23, 2002

Mr. Michael Holt, P.E.
Gresham Smith and Partners
2325 Lakeview Parkway
Suite 400
Alpharetta, GA 30004-1976

Project: Final Soil Survey Report
S.R. 21 Improvements
Project No.: STP-0001-00(667)
P.I. No.: 0001667
Chatham County, GA
ECS Project No. 10:1939

Dear Mr. Holt:

Engineering Consulting Services, Ltd. (ECS, Ltd.) is pleased to submit this Final Soil Survey Report for the site referenced above. This report includes a review of the scope of work, a description of site conditions, a discussion of subsurface conditions, a new pavement design and our evaluations of geotechnical related issues in accordance with Georgia Department of Transportation (GDOT) Guidelines for Soil Surveys.

PURPOSE AND SCOPE

The purpose of this exploration was to determine the general type and condition of the subsurface materials at the Project Site, and to provide evaluations of soil and groundwater conditions at the site.

The scope of our services included the following items:

1. Conducting twenty-three (23) hand auger borings along the sides and in the median of State Route 21 and State Route 30 in the sections to be improved. A total of 140 lineal feet of drilling was conducted. Sets of three (3) borings were performed at approximately 400-foot intervals along State Route 21 to depths of 5 feet each to determine the general soil and groundwater conditions. Field notes were recorded pertaining to the surface features and subsurface conditions at each boring location. The field notes from the field exploration are attached in the Appendix of this report.

2. Collecting eight (8) soil samples during our field exploration program and performing laboratory tests in accordance with GDOT 810.01 test methods. Three (3) extra samples were collected and two (2) California Bearing Ratio, pH, and resistivity tests were also performed. Results of the 810.01 testing program are attached in the Appendix.

3. Evaluating the existing soil conditions with respect to the proposed construction and providing design data and construction recommendations in accordance with GDOT requirements.

4. Preparing this report to document the results of our field exploration program and engineering evaluations.

SITE AND PROJECT INFORMATION

The information presented in this section is based on site data and preliminary plans provided by Gresham Smith and Partners and our site reconnaissance. The Project Site is located along State Route 21, from State Route 30 to I-95 and is approximately 3,280 feet long. The project is located within the city limits of Port Wentworth in Chatham County, GA. A Site Vicinity Map is presented on Figure 1 in the Appendix.

We understand that the project will consist of safety improvements including the partial widening of State Route 21. Medians, islands, and various curb cuts and frontage on SR 21 will also be modified.

SITE CONDITIONS & EVALUATIONS

The following information on the surveyed site conditions and our engineering evaluations are based on an understanding of the proposed construction, the data obtained in our soil test borings, the site reconnaissance, laboratory test results, and our experience with soils and subsurface conditions similar to those encountered at this site. In general, it is our opinion that the subsurface soils on the Project Site are suitable for construction per the GDOT Standard Specification Section 810 – Roadway Materials.

Geology

The project site is generally located in Georgia's Coastal Plain and more specifically in the Pamlico Shoreline Complex. The Pamlico Shoreline Complex usually consists of sedimentary layers of sand and clay. The general area is relatively low and flat.

The soils of the Southern Coastal Plain Physiographic Province of Georgia are composed of Cretaceous to Tertaceous deposits. The soil in the coastal plain is the result of sediment deposition in a former marine environment, during a time when sea levels were much higher than they are at the present. The Cretaceous-Tertaceous deposits are composed of sand and silt near the surface and sandy clay in lower levels.

The shallow groundwater table can fluctuate several feet with seasonal rainfall. Seasonal high groundwater levels are typically found at depth of 0.5 to 2.5 feet in the flood plains with a reasonable probability of flooding in winter and spring. Seasonal high groundwater levels are typically found at depths greater than 5 feet below the ground surface in the gently rolling areas. The groundwater table can exhibit some distortions due to differences in vertical and horizontal permeability.

Rock

No rock was observed on the surface of the site in the close vicinity of the proposed construction. Auger refusal indicating possible bedrock or boulders was not encountered in any of the auger borings.

Removal

Approximately 0 to 12 inches of topsoil material containing organically stained sandy silts and roots was found in most borings. This material should be stripped from the area of new construction to a minimum design average depth of 6 inches prior to construction. The stripped topsoil material may be used in thin layers to flatten the slopes or may be wasted outside the construction limits of the project. No other highly organic, deleterious or otherwise unsuitable material was observed or encountered in the auger borings.

Waste Soil

None of the soil encountered in the borings should require wasting.

Subgrade Materials

A 12-inch blanket of GDOT Class IIB2 or better subgrade materials are recommended for this entire project (including ramps and crossroads) in accordance with Special Provision 209 (attached). All imported fill should meet with GDOT Class IIB2 or better requirements as described in section 810-Roadway Materials (attached).

The existing materials at grade meet this requirement with the exception of the material from the approximate areas listed below:

Station to Station	Location
47+00 to 52+00	Existing right embankment
36+00 to 42+00	Existing median

Pavement Design Values

Two (2) California Bearing Ratio Tests were performed from soils collected on this site. The test results were as follows:

Test #	Location	Soaked CBR Value
1	Station 55+00, 81'RT	6
2	Station 52+00, 83'RT	8

Based on this information and the results of the survey and testing program we recommend the following values for use in the pavement design calculations for this project:

Soil Support Value = 3.5
Regional Factor = 1.7
Subgrade Reaction = 175 pci
Erosion Index = 7.6

Acceptable base materials for use on this project are graded aggregate base (GAB), limerock base, and soil-cement base from any approved GDOT source. A minimum thickness of 8 inches is recommended.

Slopes

Maximum 2H:1V slopes are acceptable for this project.

Groundwater

Groundwater was encountered at depths of 3.75 to 4.5 feet below grade in four boring locations. Unless cuts greater than 18 inches are planned, the shallow groundwater in these locations should not affect the road design (which appears to be in fill). Note that groundwater levels are subject to change due to seasonal rainfall conditions and man made improvements such as culverts and ditches, etc.

Shrinkage

We recommend an average shrinkage factor of 30 percent for use in the earthwork calculations for this project.

Stripping

Stripping of vegetation within project limits normally results in soil loss and this loss can affect earthwork quantities. An estimated average topsoil depth of 6 inches should be used for stripping calculations.

Culverts

We recommend that a 12-inch blanket of Type II Foundation Backfill material be placed under the barrel of all culverts and 46-inch diameter and larger cross-drains on this project.

Corrosion

Reference should be made to the attached "Pipe Culvert Materials Recommendations" for materials allowable for use on this project.

Bench Detail

Where new fills are to be placed on existing slopes steeper than 3H:1V, the existing slope should be benched in accordance with the detail attached to this report in the Appendix.

Existing Pavements

An existing pavement evaluation was not within our scope for this project. We understand that effort will be provided by GDOT.

New Pavement Design

A pavement design was performed for the new sections of the roadway. Gresham Smith and Partners provided ECS, Ltd. with the following design information:

AADT = 16,850 vehicles per day (vpd) the design year 2003
AADT = 30,375 vpd for the design year 2023
24 hr. Trucks = 12 percent
S.U. = 6 percent
Comb. = 6 percent

Based on this information and using GDOT "Asphalt Pavement Design Program" dated September 4, 1998, we recommend the following pavement design options for the new sections of the roadway.

Limerock Base

PAVEMENT SECTION	THICKNESS	MATERIAL
Surface Course	40 mm (1 ½ in)	12.5 mm Superpave
Intermediate Course	50 mm (2 in)	19 mm Superpave
Binder Course	130 mm (5 in)	25 mm Superpave
Base Course	300 mm (12 in)	Limerock Base

Soil Cement Base

PAVEMENT SECTION	THICKNESS	MATERIAL
Surface Course	40 mm (1 ½ in)	12.5 mm Superpave
Intermediate Course	50 mm (2 in)	19 mm Superpave
Binder Course	150 mm (6 in)	25 mm Superpave
Base Course	200 mm (8 in)	Soil Cement Base

At the time of this report, we had not been provided existing pavement information to design an overlay for the existing roadway. Typically 40 mm of 12.5 mm Superpave should be sufficient for an overlay on this type of roadway.

Serrated Slopes

Serrated slopes should not be required on this project.

Special Problems

No special problems concerning roadway design and construction are anticipated for this project.

CLOSURE

This Final Soil Survey Report has been prepared in accordance with generally accepted geotechnical engineering practice and GDOT requirements for Soil Surveys. No other warranty is expressed or implied. The evaluations presented in this report are based on the available project information, as well as on the results of the exploration. Should a change in the project criteria be made such as the location of the new construction, ECS, Ltd. should be notified to evaluate the changes and make new recommendations if warranted.

Thank you for the opportunity to provide geotechnical engineering services on this project. Should you have questions regarding our findings or need additional consultations, please do not hesitate to contact our office.

Sincerely,

ENGINEERING CONSULTING SERVICES, LTD.

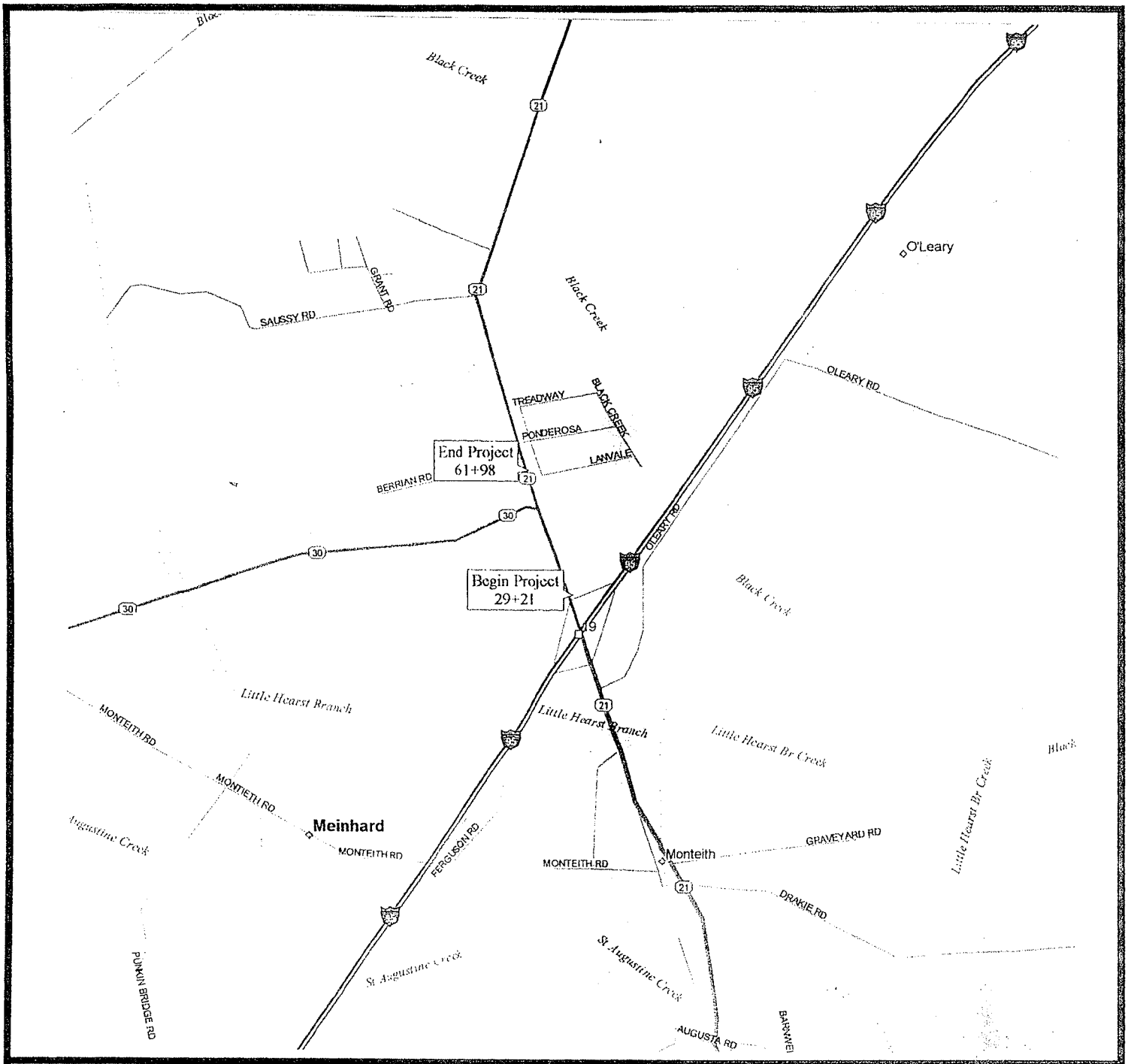
Richard E. Hoaglin, P.E.
Senior Project Engineer
GA Registration No. 24920

Robert L. Goehring, P.E.
Principal Engineer
GA Registration No. 16733

Appendix:

- Site Vicinity Plan
- Sample Classification
- Auger Boring Log / Field Notes
- Laboratory Data
- GDOT Standard Design Criteria
- Special Provision – Section 209
- Pavement Designs

APPENDIX



SITE VICINITY PLAN

Soil Survey Report
SR 21 Improvements
Chatham County, Georgia
P.I. No.: 0001667

ECS, Ltd.

ENGINEERING CONSULTING SERVICES, LTD.

Reference; Streetfinder Map, 2001

Project No.: 10:1939
Date: 1/22/2002
Figure No.: 1

Project No.: 10:1939

Date: 1/21/02

Table 1 - Sample Classification

SR21 Improvements, Chatham County, GA
STP-0001-00(667)
P.I. No. 0001667

Test No.	Test Location	Station	Offset from baseline	Depth (ft)	Description	Class	Sub-Class
1	SR 21	59+00	35'L	2-5	Brown sandy Clay	II	B4
2	SR 21	54+75	15'R	0-3	Gray Sand w/ clay and silt	I	A1
3	SR 21	50+00	91'R	0-5	Gray sandy Clay	II	B4
4	SR 21	45+00	12'R	3-5	Dark brown clayey Sand	II	B3
5	SR 21	40+00	38'L	0-5	Dark brown sandy Clay	II	B4
6	SR 21	36+00	23'R	0-2	Dark gray Sand w/ silt and clay	I	A1
7	SR 21	31+50	126'R	2-5	Reddish brown clayey Sand	II	B3
8	SR 30	49+30	38'R	1-5	Dark brown clayey Sand	II	B4

SR 21 Improvements, Chatham County
P.I. No. 0001667
Auger Boring Log
ECS Project No. 10:1939

Boring	Station	Offset	Auger Depth	Description	Groundwater Depth	Sample
B-1	SR21 59+00	35' L	5'	0-2' silty Sand (SM); 2-5' clayey Sand (SC)	-	S1
B-2	SR21 59+00	3' R	5'	0-2' silty Sand (SM), 2-3' clayey Sand (SC), 3-5' sandy Clay (CL)	-	-
B-3	SR21 59+00	63' R	5'	0-0.5' silty Sand (SM), 0.5-1' clayey Sand (SC), 1-5' sandy Clay (CL)	-	-
B-4	SR21 54+75	38' L	5'	0-1' silty Sand (SM), 1-3' sandy Clay (CL), 3-5' wet silty Clay (CL)	4.5'	-
B-5	SR21 54+75	15' R	5'	0-3' silty Sand (SM), 3-5' wet clayey Sand (SC)	4.25'	S2
B-6	SR21 54+75	80' R	5'	0-0.5' silty Sand (SM), 0.5-3.5' silty Clay (CL), 3.5-4.5' sandy Clay (CL), 4.5-5' silty Clay (CL)	-	-
B-7	SR21 50+00	47' L	5'	0-2' silty Clay (CL), 2-5' wet sandy Clay (CL)	3.75'	-
B-8	SR21 50+00	8' R	5'	0-2' clayey Silt (ML), 2-4' sandy Clay (CL), 4-5' silty Clay (CH)	-	-
B-9	SR21 50+00	91' R	5'	0-2' sandy Clay (CL), 2-5' silty Clay (CL)	-	S3
B-10	SR21 45+00	43' L	5'	0-0.5' sandy Silt (ML), 0.5-2' clayey Sand (SC), 2-4' sandy Clay (CL), 4-5' clayey Sand (SC)	-	-
B-11	SR21 45+00	12' R	5'	0-3' silty Sand (SM), 3-5' sandy Clay (CL)	-	S4
B-12	SR21 45+00	102' R	5'	0-2.5' clayey Sand (SC), 2.5-5' silty Clay (CL)	-	-
B-13	SR21 40+00	38' L	5'	0-0.5' silty Sand (SM), 0.5-2' sandy Clay (CL), 2-3.5' silty Clay (CL), 3.5-5' wet sandy Clay (CL)	4.0'	S5
B-14	SR21 40+00	14' R	5'	0-4.25' clayey Sand (SC), 4.25-5' sandy Clay (CL)	-	-
B-15	SR21 40+00	103' R	5'	0-4.5' sandy Clay (CL), 4.5-5' silty Clay (CH)	-	-
B-16	SR21 36+00	43' L	5'	0-0.5' sandy Silt (ML), 0.5-3' sandy Clay (CL), 3-5' silty Clay (CL)	-	-
B-17	SR21 36+00	23' R	5'	0-2' clayey Sand (SC), 2-5' sandy Clay (CL)	-	S6
B-18	SR21 36+00	100' R	AR* at 1'	0-1' silty Sand with asphalt fragments (SM)	-	-
B-19	SR21 31+50	44' L	AR* at 1'	0-1' silty Sand with asphalt fragments (SM)	-	-
B-20	SR21 31+50	20' R	5'	0-2' clayey Sand (SC), 2-4.5' sandy Clay (CL), 4.5-5' silty Clay (CL)	-	-
B-21	SR21 31+50	126' R	5'	0-0.5' silty Sand (SM), 0.5-2' sandy Clay (CL), 2-5' clayey Sand (SC)	-	S7
B-22	SR30 49+50	27' L	5'	0-2' sandy Clay (CL), 2-5' silty Clay (CH)	-	-
B-23	SR30 49+30	38' R	5'	0-0.25' sandy Silt (ML), 0.25-1' clayey Sand (SC), 1-5' silty Clay (CL)	-	S8
CBR-1	SR21 54+25	81' R	-	clayey Sand (SC)	-	CBR-1
CBR-2	SR21 52+00	83' R	-	sandy Clay (CL)	-	CBR-2

* AR is auger refusal

SR 21 IMPROVEMENTS PI NO 0000166

ECS #1939
2/13

conditions - cloudy/foggy 70°

Station	B	Offset	Description
59+00	1	3' T.O.P.	0-4" topsoil, 4"-1'4" gray silty Sand 2'-5' gray-orange clayey Sand no GW (S1)
59+00	2	3' from top lane	0-2' gray silty Sand 2-3' gray/orange clayey Sand 3-5' gray/orange sandy Clay
59+00	3	10' down from bottom lane	0-.5' gray silty Sand, .5-1' gray clayey Sand 1-5' gray/orange sandy Clay
54+75	4	6' + from top lane	0-1' gray silty Sand, 1-3' moist brown/gray sandy Clay, 3-5' wet orange/tan silty Clay GW @ 4.5'
54+75	5	2' from top lane	0-3' gray silty Sand, 3-5' wet tan/gray clayey Sand GW @ 4.25' (S2)
54+75	6	20' down from bottom lane	0-.5' gray silty Sand; .5-3.5' gray/orange silty Clay; 3.5-4.5' gray/orange sandy Clay 4.5-5' gray/orange silty Clay
50+00	7	15' up from top lane	0-2' gray/orange silty Clay, 2-5' wet gray/tan sandy Clay GW @ 3.75'

ECS #1939
12-14

conditions - cloudy/foggy 70°

Station	B	Offset	Description
50+00	8	6.5' from bottom of top lane	0-2' dk brown clayey Silt; 2-4' brown gray sandy Clay; 4-5' brown/gray silty Clay
50+00	9	11' below bottom lane	0-2' brown/gray sandy Clay 2-5' brown/orange silty Clay (S3)
45+00	10	10' above top lane	0-.5' gray sandy ML, .5-2' gray/orange SC, 2-4' gray/orange sandy CL; 4-5' gray/orange SC
45+00	11	10' below top lane	0-3' gray/orange SM 3-5' gray/orange sandy CL (S4)
45+00	12	5' below bottom lane	0-2.5' gray/tan SC, 2.5-5' orange/gray/brown silty CL
40+00	13	10' above top lane	0-.5' gray SM; .5-2' gray/orange sandy CL; 2-3.5' gray/orange silty CL 3.5-5' wet sandy CL GW @ 4' (S5)
40+00	14	11' below top lane	0-4.25' orange/brown SC 4.25-5' gray sandy CL

SR 21 IMPROVEMENTS PI NO. 0006667

ECS # 1939 12-14 | conditions: overcast/foggy 70°

Page 3

Station	B	Offset	Description
~~40+00~~	15	6' below bottom lane	0-4.5' brown/gray/orange sandy CL; 4.5-5' gray/brown/orange silty CH
36+00	16	10' up from top lane	0-.5' gray SM; .5-3' gray/orange sandy CL; 3'-5' gray/orange silty CL
36+00	17	6' below top lane	0-2' brown/gray SC; 2-5' gray/brown sandy CL (S6)
36+00	18	5' from ~~bottom~~	35+60 offset 5', 10', 20'; 35+30 offset 5', 15'; 5 AR's @ .25-1' gray SM w/ asphalt/rock fragments (fill)
31+50 31+65	19	5', 10' 5', 10', 15' above top lane	5 ARs .25-.75' gray SM (Fill) w/ asphalt/ rock fragments
31+50	20	16' below top lane	0-2' tan/white SC; 2-4.5' orange/gray/tan sandy CL; 4.5-5' gray/brown silty CL
31+50	21	20' below bottom lane	0-.5' gray SM; .5-2' gray/orange sandy CL; 2-5' gray/orange SC (S7)

ECS #1939 12/14-12/15 | cond - overcast, foggy, 70°

Page 4

Station	B	Offset	Description
SR30 49+50	22	5' L from EOP	0-2' brown/gray sandy CL; 2-5' gray/tan orange silty CH
SR30 49+30	23	5' R from EOP	0-.25' gray sandy ML; .25-1' gray/orange SC; 1-5' gray/orange silty CL (S8)
~~SR~~ 54+25	CBR1	15' below bottom lane	gray clayey Sand (SC)
52+00	CBR2	20' below bottom lane	~~gray clayey Sand~~ gray sandy clay (CL)

ECS, Ltd.

Marietta, Georgia

Physical Properties

Material Passing No. 10 Sieve

Project Name:	SR 21 Improvements, Chatham County, GA
Project No:	STP-0001-00(667)
P.I.No.:	0001667
ECS Project No.:	1939
Date:	1/21/02

Test No.	Sample Location	No. 60 Sieve % Passing	No. 200 Sieve % Passing	Clay %	Volume Change	Maximum Dry Density	Class	Sub-Class
1	59+00	94.8	67.1	53.0	24.3	104.0	CLASS II	B4
2	54+75	48.1	13.8	7.1	2.5	118.8	CLASS I	A1
3	50+00	95.1	65.4	48.9	21.5	105.0	CLASS II	B4
4	45+00	75.5	36.8	26.4	18.7	105.0	CLASS II	B3
5	40+00	87.6	57.5	45.2	18.4	103.2	CLASS II	B4
6	36+00	64.6	20.0	9.6	4.2	120.6	CLASS I	A1
7	31+50	70.8	33.1	26.8	5.0	108.1	CLASS II	B3
8	49+30	70.9	47.5	32.6	21.1	104.6	CLASS II	B4

Other Tests

Test No.	Station	CBR	pH	Resistivity
9	54+25	6	6.5	5,700 o/cm
10	52+00	8	5.1	3,450 o/cm

TABLE 810-1
PHYSICAL PROPERTIES
(Material Passing No. 10 Sieve)

CLASS	SUB-CLASS	NO. 60 SIEVE % PASSING	No. 200 SIEVE % PASSING	CLAY %	VOLUME CHANGE %	MAXIMUM DRY DENSITY LB/FT³
I	A1	15-65	0-25	0-12	0-10	115+
	A2	15-85	0-35	0-16	0-12	100+
	A3	15-100	0-25	0-12	0-18	98+
II	B1		0-30	0-20	0-10	120+
	B2		0-45	0-30	0-15	110+
	B3		0-60	0-50	0-20	105+
	B4		0-75		0-25	90+
III	C1		0-75		0-30	90+
	C2				0-35	80+
	C3				0-60	80+
	C4*					80-

*Chert clay soils in District 6 having less than 55% passing the number 10 sieve may be considered suitable for subgrade material.

B. TESTS: Methods of tests shall be in accordance with the following:

Soil Gradation	GDT: 4
Volume Change	GDT: 6
Maximum Density	GDT: 7 or GDT 67

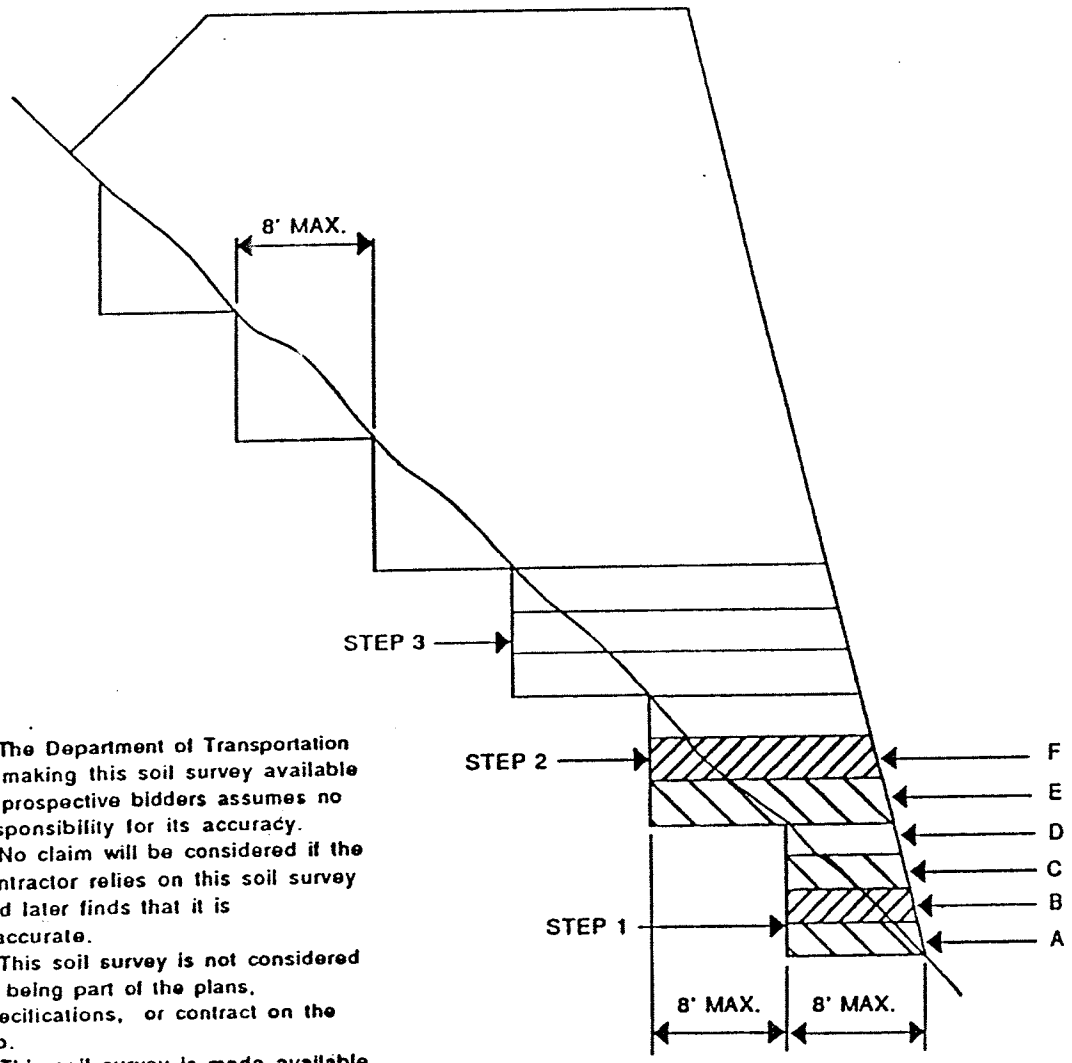
SECTION 811
ROCK EMBANKMENT

811.01 ROCK EMBANKMENT MATERIAL: The material shall be of unweathered quarry run stone sizes, but fragments larger than 4 feet in any dimension shall be broken up. All other quarry stone sizes, including rock fines, shall be included in the embankment, except that the rock fines will be limited to a maximum of 25 percent passing a 2" sieve and to 10 percent passing a No. 4 sieve. The rock shall contain not more than 5 percent shaly or flaky particles. The rock shall meet the abrasion requirements for a Class A or B coarse aggregate, shall not have more than a 15% loss in the magnesium sulfate soundness test, and shall be approved by a petrographic rock analysis.

TESTS: Methods of tests shall be in accordance with the following:

Abrasion	AASHTO: T 96
Soundness (Magnesium Sulfate)	AASHTO: T 104
Petrographic Analysis	ASTM: C 295

BENCHING DETAIL



NO SCALE

1. WHERE THE EMBANKMENT IS TO BE PLACED ON A HILLSIDE OR ANOTHER EXISTING EMBANKMENT HAVING A SLOPE 0F 3 TO 1 OR STEEPER, THE FOUNDATION MUST BE BENCHED WHILE THE EMBANKMENT IS BEING MADE.
(SEE DIAGRAM AT LEFT.)

2. THE DIAGRAM SHOWS THAT BEFORE LAYER "A" IS PLACED THE FIRST STEP (1) IS CUT INTO THE SLOPE A MAXIMUM DISTANCE OF ABOUT 8' (ABOUT 3/4 THE WIDTH OF THE USUAL D-8 BULLDOZER BLADE). SUCCESSIVE LAYERS B, C, AND D ARE THEN PLACED. BEFORE LAYER "E" IS PLACED, THE SECOND STEP IS CUT 8' INTO THE SLOPE AND SUCCESSIVE LAYERS ARE AGAIN PLACED. IF IT IS ANTICIPATED THAT THE VERTICAL PART OF THE STEP WILL EXCEED 4' IF AN 8' HORIZONTAL CUT IS MADE, THEN THE ACTUAL CUT STOPS WHEN THE VERTICAL PART REACHES A MAXIMUM OF 4' ALLOWING THE HORIZONTAL DISTANCE TO VARY.

3. THE PROCESS OF BENCHING IS CONSIDERED INCIDENTAL TO THE ITEM OF UNCLASSIFIED EXCAVATION AND BORROW IN CONSTRUCTION OF THE EMBANKMENT AND NO ADDITIONAL MEASUREMENT OF QUANTITY OR PAYMENT WILL BE MADE FOR BENCHING.

Pipe Culvert Material Alternates

For Coastal Plain Region

TYPE OF PIPE INSTALLATION				CONCRETE	CORRUGATED STEEL AASHTO M-36		CORRUGATED ALUMINUM AASHTO M-196	PLASTIC		
					ALUMINUM COATED (TYPE 2) CORR. STEEL	PLAIN ZINC COATED	PLAIN UNCOATED ALUMINUM	CORR. POLY-ETHYLENE AASHTO M-252	CORR. POLY-ETHYLENE SMOOTHED LINED AASHTO M-294 TYPE "S"	POLY VINYL CHLORIDE (PVC) PROFILE WALL AASHTO M-304
STORM DRAIN	LONGITUDINAL INTERSTATE AND TRAVEL BEARING			X						
	LONGITUDINAL NON-INTERSTATE AND NON-TRAVEL BEARING			X	X		X		X	X
	CROSS DRAIN	GRADE ≤ 10%	ADT < 250		X		X		X	X
			250 < ADT < 1500	X			X			
			ADT > 1500	X						
		GRADE > 10%	ADT < 250		X		X		X	X
			ADT > 250				X			
SIDE DRAIN				X	X		X		X	X
PERMANENT SLOPE DRAIN					X	X	X		X	X
PERFORATED UNDERDRAIN					X	X	X	X	X	

NOTE:

Structural requirements of storm drain pipe will be in accordance with Georgia Standard 1030-D or 1030-P, whichever is applicable, and the Standard Specifications.

January 22, 2002

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION
PROJECT NO. STP-0001-00 (667), Chatham County
P.I. No. 0001667

SECTION 209-SUBGRADE CONSTRUCTION

Delete sub-section 209.02A and substitute the following:

209.02A SUBGRADE MATERIALS: The top 12 inches of subgrade on this project, including crossroads and ramps, shall be Class IIB2 or better materials. If the existing soils at grade do not meet this requirement, they shall be undercut and replaced to provide 12 inches of Class IIB2 or better material at subgrade. This material shall be provided by the Contractor. No separate payment will be made for providing this material.

Office of Materials and Research

FLEXIBLE PAVEMENT DESIGN ANALYSIS

Project: BRST-036-2(16) **County:** Chatham
P.I. no.: 0001667
Description: S.R. 21 Improvements

Traffic Data (NOTE: AADTs are one-way)
24-hour Truck Percentage: 12.00%
AADT initial year of design period: 16,850 vpd (2003)
AADT final year of design period: 30,375 vpd (2023)
Mean AADT (one-way): 23,612 vpd

Design Loading

Mean AADT		LDF		Trucks		18-K ESAL		Total Daily Loads
23,612	*	0.70	*	0.120	*	1.06	=	2,103

Total predicted design period loading = 2103 * 20 * 365 = 15,351,900

Design Data
Terminal Serviceability Index: 2.50
Soil Support: 3.50
Regional Factor: 1.70

PROPOSED FLEXIBLE PAVEMENT STRUCTURE

Material	Thickness mm	Thickness (in.)	Structural Coefficient	Structural Value
12.5 mm Superpave	40	(1.57)	0.0173	0.69
19 mm Superpave	50	(1.97)	0.0173	0.86
25 mm Superpave	24	(0.94)	0.0173	0.42
	106	(4.17)	0.0118	1.25
Graded Aggregate Base	300	(11.81)	0.0063	1.89

Required SN = 5.94 Proposed SN = 5.11

>>> Proposed pavement is 14.0% Underdesign <<<

Remarks: New Pavement Design

Prepared by ECS, Ltd. January 22, 2002
Date

Recommended _____
State Materials & Research Engineer **Date**

Approved _____
State Consultant Design Engineer **Date**

FLEXIBLE PAVEMENT DESIGN ANALYSIS

Project: BRST-036-2(16) **County:** Chatham
P.I. no.: 0001667
Description: S.R. 21 Improvements

Traffic Data (NOTE: AADTs are one-way)
24-hour Truck Percentage: 12.00%
AADT initial year of design period: 16,850 vpd (2003)
AADT final year of design period: 30,375 vpd (2023)
Mean AADT (one-way): 23,612 vpd

Design Loading

Mean AADT		LDF		Trucks		18-K ESAL		Total Daily Loads
23,612	*	0.70	*	0.120	*	1.06	=	2,103

Total predicted design period loading = 2103 * 20 * 365 = 15,351,900

Design Data
Terminal Serviceability Index: 2.50
Soil Support: 3.50
Regional Factor: 1.70

PROPOSED FLEXIBLE PAVEMENT STRUCTURE

Material	Thickness mm	Thickness (in.)	Structural Coefficient	Structural Value
12.5 mm Superpave	40	(1.57)	0.0173	0.69
19 mm Superpave	50	(1.97)	0.0173	0.86
25 mm Superpave	24	(0.94)	0.0173	0.42
	126	(4.96)	0.0118	1.49
Soil-Cement Base	200	(7.87)	0.0079	1.58

Required SN = 5.94 Proposed SN = 5.04

>>> Proposed pavement is 15.2% Underdesign <<<

Remarks: New Pavement Design

Prepared by ECS, Ltd. January 22, 2002
Date

Recommended _____
State Materials & Research Engineer **Date**

Approved _____
State Consultant Design Engineer **Date**