ST. TAMMANY PARISH

MICHAEL B. COOPER
PARISH PRESIDENT

November 6, 2024

Please find the following addendum to the below-mentioned BID.

Addendum No.: **1**

Bid#: **24-57-2**

Project Name: **Sharp Rd., PH2**

Bid Due Date: **Thursday, November 14, 2024**

GENERAL INFORMATION:

1. Two (2) message boards will be required during road closures for crossings and will be paid for under REF NO: 713-01-00100- Temporary Signs and Barricades.

2. Stored materials will only be allowed with the approval of the parish. Stored Materials will be required to be stored in a secured locked site with the right of entry granted to the Parish. Reference, Louisiana standard specifications for roads and bridges 2016 section 109.06 Payment for stockpiled or stored materials for additional requirements.

QUESTIONS & ANSWERS:

Question 1: What is the anticipated duration of the utility relocation period (as noted in supplemental specs section 740.02)

Answer: We do not have an estimate for the duration of utility relocation. Relocation coordination is the responsibility of the contractor.

Question 2: What utilities are being relocated? Will the overhead power line on the south side of Sharp Rd be moved?

Answer: Water, sewer, and gas will potentially need to be relocated depending on site conditions and construction activity. Some power lines on the south side of Sharp will be moved in areas requiring subsurface drainage.

Question 3: Is there a geotechnical report available for review?
Answer: Yes. See attached.

Question 4: Will there be a pre-bid meeting and a scheduled site visit?
Answer: No.

Question 5: Clearing and grubbing – Is the intent to remove trees from ROW to ROW or from Limits of Construction to Limits of Construction?
Answer: Clearing and Grubbing is from ROW to ROW line, but will only be required with anything in conflict of the work

Question 6: Would CMPA (corrugated metal arch pipe) be an acceptable alternate material to use in lieu of the RCPA for storm drainage?
Answer: No.

Question 7: Are there any lane closure restrictions?
Answer: Contractor must maintain two way traffic, flagging operations will be required. Road closure will be allowed for the crossings. 72 hr notice is required for the crossing closing.

Question 8: Page E-7 of the supplemental specifications refers to Section 301 – Class 1 Base Course. The base course pay item is listed as 302 – Class II base course. Will Class 1 Base Course be allowed?
Answer: No. Contractor is to use the base course specified in the construction plans.

Question 9: What is the engineer's estimate?
Answer: $8,848,478.75.

Question 10: Plan sheet 6, Pipe Run # I-118 and #I-120 call for 'Req'd 2-30" EQ x 116'', however the plan view only appears to show a single run of pipe. Is this pipe intended to be a single or double barrel run of pipe?

Answer: Structures 1-118 and 1-120 are intended to be double barrel runs of pipe, per callouts on plan sheet.

ATTACHMENTS:

1. Geotechnical Report

<< End of Addendum # 1>>

APS Engineering and Testing

Geotechnical Engineering Services Report

Sharp Road Improvements
Mandeville, Louisiana
A P S File No.: A P S2112-G117

Presented to:
G.E.C., Inc.
8282 Goodwood Blvd
Baton Rouge, LA 70806

Prepared by:
A P S Engineering and Testing, LLC
1645 Nicholson Dr.
Baton Rouge, LA 70802

April 20, 2023

Table of Contents

G.E.C., Inc.
8282 Goodwood Blvd
Baton Rouge, LA 70806

Attention: Jerome Lohmann, P.E.
Senior Civil Engineer

Re: Geotechnical Engineering Report
Sharp Road Improvements
Mandeville, Louisiana

Dear Mr. Lohmann:

A P S Engineering and Testing, LLC is pleased to submit our Geotechnical Engineering Report for the above referenced project. The report includes the results of field and laboratory testing, recommendations for pavement rehabilitation and general site preparation as related to soils.

We appreciate the given opportunity to perform this Geotechnical study and look forward to continuing to participate during the construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
A P S ENGINEERING AND TESTING, LLC

STATE OF LOUISIANA
SAIRAM EDDANAPUDI
License No. 35129
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

4/20/23

Sairam Eddanapudi, M.E., P.E.
Chief Engineer

Sergio Aviles, P.E., M. ASCE
President

Cassidy Mason
Engineer Intern

1.0 PROJECT INFORMATION

1.1 Project Authorization

A P S Engineering and Testing has completed a subsurface exploration for the proposed Sharp Road Improvements project in Mandeville, Louisiana. Authorization to proceed with the work was received from Jerome Lohmann, dated March 8th, 2022.

1.2 Project Description

Based upon the information provided, we understand that the project site is located at Sharp Road in Mandeville, Louisiana. The project will consist of roadway improvements, subsurface drainage installation, and sidewalk construction along Sharp Road in Mandeville, Louisiana. Traffic data provided by the client are shown in Table 1.0.

TABLE 1.0

AADT Location	Average Annual Daily Traffic (AADT)	% Truck	Directional Distribution
Sharp Road West Bound @ LA Highway 59 2017	2043	5	49%
Sharp Road East Bound @ LA Highway 59 2017	2133	2	51%
Sharp Road East Bound @ Asbury 2017	3194	2	70%
Sharp Road West Bound @ Asbury 2017	1393	N/A	30%
Sharp Road East Bound @ Asbury 2018	344	4	13.5%
Sharp Road West Bound @ Asbury 2018	2205	4	86.5%

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore the subsurface conditions at the site to enable an evaluation of an acceptable foundation for the proposed pavement. Drilling consisted of a total of 15 soil borings that are at various depths along Sharp Road between Asbury Drive and LA Highway 59 in Mandeville, Louisiana. The Pavement soil borings are six (6) feet deep and the Drainage pipe soil borings are ten (10) feet deep. Additional boring B-15 was drilled at a later date to a depth of four (4) feet per client request via email dated 04/05/2022.

The scope of services included conducting laboratory tests on selected samples recovered from the soil borings. These tests included visual description and classification, moisture content, liquid limit, plastic limit, organic content, and hydrometer tests. Both field and laboratory testing procedures are briefly discussed in this report.

This report discusses the conditions of the existing subsoil materials at the site, and presents recommendations on the following:

- Site preparation Recommendations;
- General Construction Recommendations;
- Soil Classification according to USCS and AASHTO;
- Asphalt and Concrete Pavement Recommendations;
- Comments regarding factors that will impact construction and performance of the proposed project.

The scope of geotechnical services did not include an environmental site assessment for determining the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or around the site. Any statements in this report or on the boring test results regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

3.0 SITE LOCATION AND DESCRIPTION

The project site is located on Sharp Road between Asbury Drive and LA Highway 59 in Mandeville, Louisiana. The pavement is approximately 13,600 feet in length on Sharp Road between Asbury Drive and LA Highway 59. Soil borings were performed in the proposed improvement areas and are approximately six (6) and ten (10) feet deep. The existing Asphalt pavement is cracked throughout Sharp Road between Asbury Drive and LA Highway 59 in Mandeville, Louisiana.

4.0 SITE GEOLOGY

The site is situated in an outcrop area of the Prairie and Intermediate Terrace deposits. This formation is a Pleistocene Age deposit that is present throughout St. Tammany Parish. It is characteristically described as stiff tan and gray lean clays and fat clays with silt and sand layering. The soils within the Prairie Terrace typically provide good foundation support, are over consolidated and normally only marginally compressible.

5.0 FIELD EXPLORATION

The field exploration, performed to evaluate the engineering characteristics of the foundation materials, included a reconnaissance visit to the project site by an A P S representative, drilling the soil borings and recovering soil samples.

As previously mentioned, a total of 15 soil borings that are at various depths along Sharp Road between Asbury Drive and LA Highway 59 in Mandeville, Louisiana. The Pavement soil borings are six (6) feet deep and the Drainage pipe soil borings are ten (10) feet deep were drilled in selected boring locations. Additional boring B-15 was drilled at a later date to a depth of four (4) feet as requested by client. These soil borings were located in the field using GPS coordinates and/or using tape measurements. The exact location for each boring can be found in Table 2.0 below. The Boring Location Map, included in the Appendix, presents the approximate location of the borings.

TABLE 2.0

SOIL BORING NUMBER	Soil Borings	DEPTH	LATITUDE	LONGITUDE
B-1	Drainage Pipe	10	30°23'47.91"N	90° 5'4.07"W
B-2	Pavement	6	30°23'51.00"N	90° 4'52.94"W
B-3	Drainage Pipe	10	30°23'52.57"N	90° 4'43.11"W
B-4	Pavement	6	30°23'52.79"N	90° 4'31.62"W
B-5	Drainage Pipe	10	30°23'52.97"N	90° 4'20.37"W
B-6	Pavement	6	30°23'53.18"N	90° 4'8.72"W
B-7	Drainage Pipe	10	30°23'51.62"N	90° 4'1.49"W
B-8	Pavement	6	30°23'48.67"N	90° 3'53.38"W
B-9	Drainage Pipe	10	30°23'45.04"N	90° 3'43.40"W
B-10	Pavement	6	30°23'47.86"N	90° 3'36.44"W
B-11	Drainage Pipe	10	30°23'48.06"N	90° 3'24.89"W
B-12	Pavement	6	30°23'47.91"N	90° 3'13.46"W
B-13	Drainage Pipe	10	30°23'47.76"N	90° 2'55.25"W
B-14	Pavement	6	30°23'47.60"N	90° 2'38.00"W
B-15(Additional Boring)		4	30°23'48.38"N	90° 3'31.48"W

6.0 DRILLING AND SAMPLING PROCEDURES

The pavement soil borings were drilled with an auger as per ASTM D 1452 drilling techniques to advance the boreholes. The Drainage pipe soil borings were drilled with a SIMCO 2400 drill rig; using auger and wet rotary drilling techniques to advance the boreholes. The Pavement soil borings are six (6) feet deep and the Drainage pipe soil borings are ten (10) feet deep were drilled in selected boring locations. Additional boring B-15 was drilled at a later date to a depth of four (4) feet.

7.0 TESTING PROGRAM

A laboratory testing program was conducted to determine pertinent engineering characteristics of the subsurface materials. This program included visual description and classification and determination of the moisture content (ASTM D2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass) on all soil samples. Selected samples were subjected to:

- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils;
- ASTM D2216 Standard Test Method for Laboratory Determination of Water (Moisture Content of Soil and Rock by Mass) on all soil samples.
- AASHTO T 88 Particle Size Analysis of Soils; and
- ASTM D1140 Standard Test Method for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing.

The results of these tests are found in the boring test results in the Appendix.

8.0 SUBSURFACE CONDITIONS

8.1 Subsurface Materials

Soil Borings

In the Pavement soil borings, Tan Fat Clay (CH) and Tan Lean Clay (CL) materials with intermittent layers of Gray Lean Clay with Sand (CL) and Gray Fat Clay with Sand (CH) were encountered to the termination depth of the borings.

In the Drainage pipe soil borings, Tan Fat Clay (CH) and Tan Lean Clay (CL) materials with intermittent layers of Tan Sandy Lean Clay (CL) and Tan Fat Clay with Sand (CH) were encountered to the termination depth of the borings. In B-11 Tan Silty Sand (SM) was encountered in the top six (6) feet.

The above subsurface description is a generalized nature to highlight the major subsurface materials features and characteristics. The boring test results, included in the Appendix, present specific information at individual boring location including: soil description, stratification, ground water level, unconfined compressive strength, sample's location, and laboratory tests results. This information represents the actual conditions at the boring locations. Variations may occur and should be expected between boring locations. The stratification represents the approximate boundary between subsurface materials and the actual transition may be gradual.

8.2 Groundwater

Groundwater was not encountered in any of our soil borings to the termination depth of 10 feet. It should be noted that the groundwater conditions are likely to change due to topography, permeability, weather, and other soil and terrain properties. Therefore, we recommend that the contractor determine the actual groundwater levels at the site at the time of the construction activities.

9.0 DISCUSSION

Upon review of the existing subsoil conditions and laboratory tests results, we consider that the proposed project is feasible from a geotechnical point of view, provided that the included recommendations are correctly interpreted and applied. Generally, the subsoil materials present below the pavement were Fat Clay (CH) and Lean Clay (CL) materials except for few areas.

Generally, Fat Clay (CH) and Lean Clay (CL) materials were encountered except for few areas below the subgrade provide good pavement foundation. Any free-standing water from recent precipitation should be drained away from the pavement. Therefore, construction is recommended during dry weather periods.

Due to the lack of base material, the existing roadway is not supporting the traffic load causing it to fracture. A P S recommends an adequate base material be added to support current traffic loads and conditions.

10.0 RECOMMENDATIONS

10.1 Site Development Recommendations

10.1.1 Site Preparation

Prior to the development of any structure or fill deposit, the complete earthwork area must be properly cleaned. The cleaning activities shall include the removal of all concrete and/or asphalt, sand, debris and any foreign matter present on the site until a firm subgrade is reached.

10.1.2 Proof Rolling

Upon completion of the stripping activities, the exposed subgrade shall be properly proof rolled in order to prepare the natural terrain. The proof roll consists of compacting the exposed surface with a 20 to 25-ton loaded dump truck. Surface soils that are observed to rut or deflect excessively under the truck load should be undercut and replaced with the proper structural fill. These activities should be performed during a period of dry weather and should be supervised by a Geotechnical Engineer or a representative.

10.1.3 Structural Fill Materials

After subgrade preparation and observation has been completed, structural fill placement shall begin in the pavement area. The first layer of structural fill should be placed in a relatively uniform horizontal lift and be adequately keyed into the properly prepared subgrade soils. The structural fill specifications are as follows:

- Plasticity Index (PI) > 25 will not be allowed.
- Liquid Limit: 45 maximum
- Percent Organics > 5 will not be allowed.
- Silt Content >=50 and PI <=10 will not be allowed.

This material must be certified and approved by the Geotechnical Engineer prior to its use. In case this material is not available locally or economical for project, it is recommended to consider the following material as an alternative.

As an alternative, structural fill material could consist of "clean" sand or pumped sand having less than 10 percent fines passing the No. 200 Sieve. It should be compacted to at least 95 percent of Maximum Dry Density at Optimum Moisture Content according to ASTM D-698. In-place density measurements should be taken to assure that this degree of compaction is achieved. This material must be certified and approved by the Geotechnical Engineer prior to its use. These activities shall be accomplished following the Louisiana Department of Transportation and Development Standard Specifications for Road and Bridge Construction guidelines and should be in accordance with City/Parish specifications.

10.1.4 Structural Fill Deposit Construction

After all surface preparation and observation has been completed, the structural fill activities may begin. These activities must be performed in a sequential order where lower elevations must be worked before higher ones. The structural fill shall be deposited in lifts of eight (8) inches of loose material. Each lift shall be compacted and certified by the Geotechnical Engineer or a representative prior to placement of other lifts. The passing criteria shall be a 95% of the maximum dry density as determined by ASTM D-698, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)),* and a moisture content between one (1) below and three (3) above percentages of the optimum moisture content. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. As a guideline, it is recommended that field density tests be performed at a frequency of not less than one test per 100 linear feet.

It is important to maintain the structural fill thickness as uniform as possible. Uneven fill thicknesses under a structure may cause differential soil responses to the applied loads which can produce cracking, settling, or tilting of the structure.

10.2 Pavement Recommendations

10.2.1 Pavement Sections

The pavement subgrade should be prepared as discussed in Section 10.1. A P S attempted to take a core sample but the material crumbled once extracted. The average pavement thickness on Sharp Road was roughly 5 to 5.5 inches. The recommended pavement thicknesses presented below are considered typical and minimum for the assumed parameters at the site. We understand that budgetary considerations sometimes warrant thinner pavement sections than those presented. However, the client, the owner and the project designers should be aware that thinner pavement sections may result in increased maintenance costs and lower than anticipated pavement life. Table 3.0 shows the traffic details used for pavement design.

TABLE 3.0

Average Annual Daily Traffic_Sharp Road @ 59 EB&WB – 2017	4176
% Trucks	5
% Growth	2
Design Life	20 years
Directional Distribution	51%

A CBR of 2.5 and a Modulus of Subgrade Reaction (k) of 85 psi/in should be assigned to existing subgrade soils. It is also very critical to perform construction activities as quickly as possible to minimize prolonged exposure of subgrade to wet weather conditions. With these, the pavement sections shall consist of the following:

RIGID PAVEMENT

After compacting of subgrade, one layer of geotextile fabric will be placed followed by 8 inches of well compacted stone aggregate base course material followed by 6 inches of Portland Cement Concrete on top as shown in Table 4.0.

TABLE 4.0

RIGID CONCRETE PAVEMENT	
Pavement Materials	Minimum Thickness (Inches)
Portland Cement Concrete	6
Aggregate Base Course	8
Geotextile Fabric on top of Well Compacted Stable Subgrade with CBR = 2.5	One Layer

Following are the design parameters for rigid pavement design as per latest AASHTO Method and 2013 LADOTD Pavement Design Guide as shown in Table 5.0:

TABLE 5.0

RIGID PAVEMENT DESIGN PARAMETERS	
Concrete Elastic Modulus, E_c (10^6 ,psi)	4.38
Mean Concrete Modulus of Rupture, S_c (psi)	650
Load Transfer Coefficient, J	3.2
Rigid ESALs, W_{18} (10^6)	0.3
Drainage Coefficient, C_d	1.0
Cumulative Modulus of Subgrade Reaction, K (psi/in)	241
Initial Serviceability Index (P_i)	4.50
Terminal Serviceability Index (P_t)	2.00
Reliability, R (%)	80
Overall Standard Deviation, S_0	0.35
Subgrade California Bearing Ratio (CBR)	2.5

Proper finishing of concrete pavement requires the use of appropriate construction joints to reduce cracking. Joints shall be in accordance with City/Parish Standards. Joints should be sealed to reduce the potential for water infiltration into the supporting soils.

These thicknesses should provide better distribution of surface loads to the subgrade without causing deformation of the surface. The aggregate base course should meet the requirements of Sub-Section 1003 of the latest edition of the Louisiana Standard Specifications for Roads and Bridges Manual (LSSRB), and should be compacted to at least 95 percent of maximum dry density near the optimum moisture content in accordance with ASTM D 698*, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).*

Pavement materials may be placed after the subgrade or structural fill has been properly proof rolled or compacted and fine-graded. These activities shall be accomplished following the Louisiana Department of Transportation and Development Standard Specifications for Road and Bridge Construction guidelines.

Proper finishing of concrete pavement requires the use of appropriate construction joints to reduce cracking. Construction joints shall be designed in accordance with the current Portland Cement Association and the American Concrete Institute guidelines. Joints should be sealed to reduce the potential for water infiltration into the supporting soils. The design of steel reinforcement should be in accordance with current accepted codes.

The base should be compacted to at least 95 percent of the maximum dry density near the optimum moisture content in accordance with ASTM D 698. Water should not be allowed to pond behind curbs and saturate the base. In down grade areas, the base material shall extend through the slope to provide an exit path for any water accumulating under the pavement.

FLEXIBLE PAVEMENT

After compacting of subgrade, one layer of geotextile fabric will be placed followed by 8 inches of well compacted stone aggregate base course material followed by 6 inches of Asphaltic Concrete as shown in Table 6.0.

TABLE 6.0

FLEXIBLE ASPHALT PAVEMENT	
Pavement Materials	**Minimum Thickness (Inches)**
Asphaltic Concrete	6
Aggregate Base Course	8
Geotextile Fabric on top of Well Compacted Stable Subgrade with CBR = 2.5	One (1) Layer

Following are the design parameters for flexible pavement design as per latest AASHTO Method and 2013 LADOTD Pavement Design Guide as shown in Table 7.0:

TABLE 7.0

FLEXIBLE ASPHALT PAVEMENT DESIGN PARAMETERS	
Reliability, R (%)	80
Regional Factor (R)	1.30
Initial Serviceability Index (P_i)	4.00
Terminal Serviceability Index (P_t)	2.00
Effective Roadbed Soil Resilient Modulus, M_R (ksi)	3.75
Standard Deviation	0.35
Layer Strength Coefficient, Asphaltic Concrete (a_1)	0.44
Layer Strength Coefficient, Aggregate Base Course (a_2)	0.14
Drainage Coefficient (m_2)	1.00
Subgrade California Bearing Ratio (CBR)	2.5

Asphaltic concrete should meet the requirements of Part V of the latest edition of the LSSRB. The aggregate base should meet the requirements of Sub-Section 1003 of the LSSRB. The base and structural fill should be compacted to at least 95 percent of the maximum dry density near the optimum moisture content in accordance with ASTM D 698.

Water should not be allowed to pond behind curbs and saturate the base. In down grade areas, the base material shall extend through the slope to provide an exit path for any water accumulating under the pavement.

Soil Cement Alternative

As an alternative to aggregate base course, soil-cement base course with strength coefficient 0.16 and minimum thickness of 10 inches is recommended. A minimum of 10% by volume of cement is recommended to use for soil-cement base course. However, if fat clay subgrade soils are present, then they should be lime treated prior to mixing with soil cement to bring the plasticity index to allowable range (between 10 and 25). Minimum 3.0 % lime by volume is recommended to bring Plasticity Index (PI) down within the allowable range. However, percent lime by volume should be determined at the time of construction before cement stabilization.

This applies where Fat Clay (CH) materials were encountered, lime is required. Soil cement base course should be in accordance with City/Parish specifications.

Prior to mixing, it should be verified that the clay subgrade material is stable and within planned grade tolerances. Also, prior to mixing the cement, all subsurface utilities should be installed so that no subsequent excavation through the constructed base will occur.

The subgrade should be scarified to the depth necessary to retain the cement material. After uniformly spreading the cement at the prescribed rate, it should be mixed into the soil with a minimum of two passes with a rotary stabilizer to achieve pulverization and should be mixed immediately to achieve the required stable section. Water should be added during the passes to achieve uniform moisture within +2% of optimum moisture content.

11.0 CONSTRUCTION CONSIDERATIONS

11.1 Observation and Testing

The preceding recommendations require a close supervision of the Geotechnical Engineer or representative; therefore, it is recommended that A P S be retained to provide observation and testing for the complete duration of all earthwork and pavement reconstruction activities for this project. A P S cannot accept responsibility for any conditions deviated from those described in this report, nor for the performance of the foundation if not engaged to provide construction observation and testing.

11.2 Moisture Sensitive Soils/Weather Related Concerns

Most of the subsurface materials encountered at this site are expected to be sensitive to disturbances caused by changes in moisture content. During wet weather periods, the increment of the moisture content of the soil may cause a significant reduction of the soil strength and support capabilities. Furthermore, soils that become wet may be slow to dry, thus significantly retarding the progress of grading and compaction activities. For these reasons, it will be advantageous to perform earthwork and foundation construction activities during dry weather.

11.3 Excavations Regulations

In the 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 ensure 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.

The contractor is solely responsible for designing and constructing stable, temporary excavations and shall shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 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 local, state, and federal safety regulations.

We are providing this information solely as a service to our client. A P S does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

12.0 REPORT LIMITATIONS

The analyses and recommendations presented in this report are based on the existing field conditions at the time of the investigation. Furthermore, they are based on the assumption that the exploratory borings are a representation of the subsoil conditions throughout the site. Please note that variations in the subsoil conditions may occur between and beyond borings. If variations in those conditions are encountered during construction, A P S shall be notified immediately in order to assess the situation, confirm the recommendations included in this report, or modify them according to their own judgment. If A P S is not notified of such variations, A P S will not be responsible for the impact of those variations on the project.

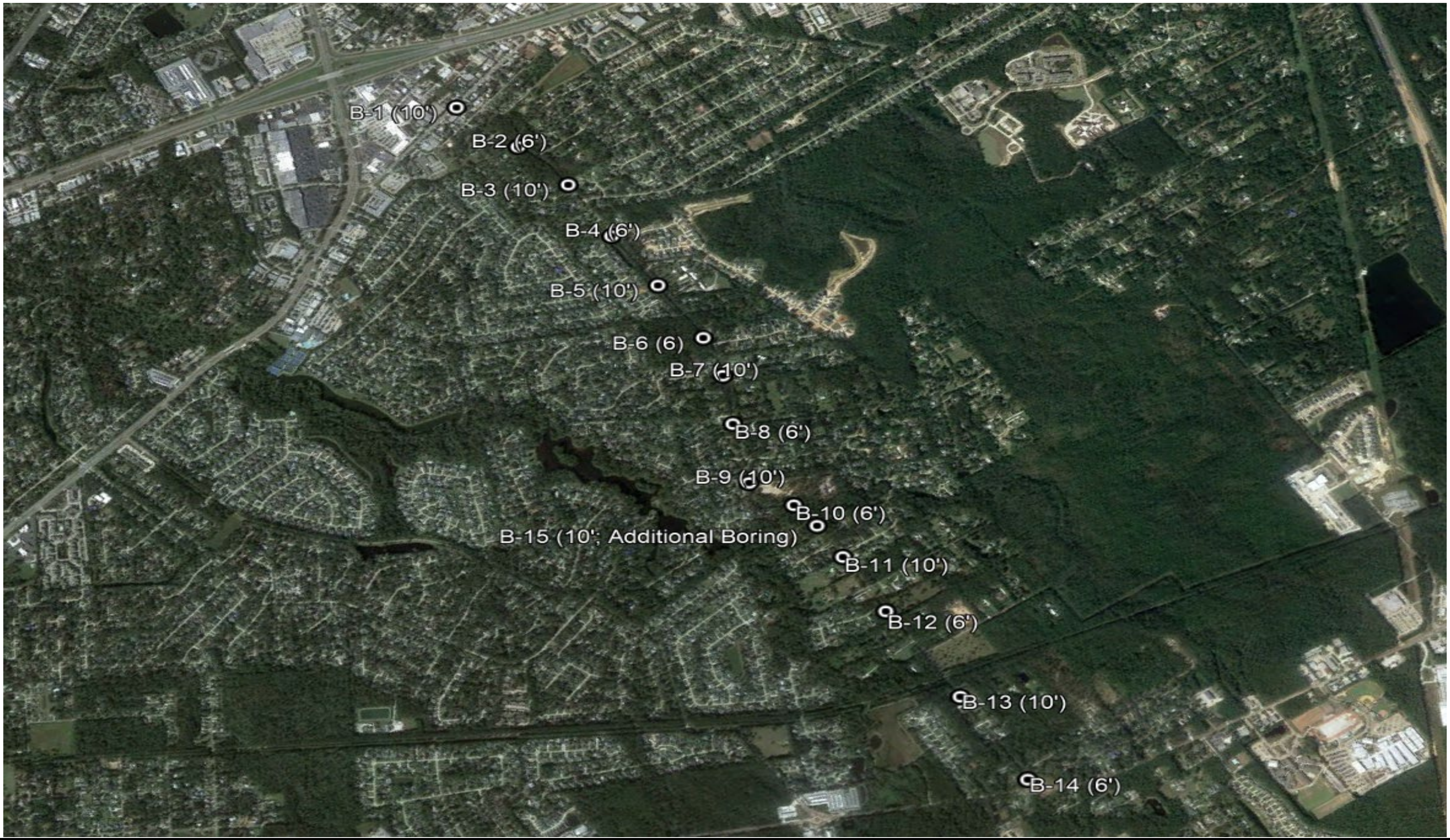
Furthermore, this report is based on the design considerations presently known to us. Project designers must be aware of this situation to check if any important design parameter has been overlooked or requires additional clarification. If the nature of the project should change, the recommendations given in this report shall be re-evaluated. If A P S is not notified of such changes, A P S will not be responsible for the impact of those changes on the project.

A P S shall be retained for the review of final design drawings and specifications in order to ascertain whether their recommendations have been correctly interpreted and implemented and to confirm or modify them. A P S is not responsible for the adequacy of recommendations if they do not inspect the construction. The only warranty regarding our services is that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with the generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

This report has been prepared for the exclusive use of **G.E.C. Inc,** and their design/construction team associated to this specific project.

APPENDICES:
-Boring Location Map
-Boring Test Results
-Pavement Analysis

Boring Location Map



Sharp Road Improvements **Mandeville, Louisiana**	**APS Engineering and Testing, LLC** ***Geotechnical, Environmental, & Construction Materials Testing***	**Boring Location Plan**

Boring Test Results

APS Engineering and Testing

APS2112 - G117 Sharp Road Improvements

Boring	Latitude: 30°23'47.91"N		Longitude: 90° 5'4.07"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-1	0-2	25.9	38	18	20	29.9	47.5	22.6	A-6(12)	Percent Organics = 4.2%	Gray Sandy Lean Clay (CL)
	2-4	26.0	52	16	36	4.0	57.4	38.6	A-7-6(37)	Percent Organics = 2.2%	Tan Fat Clay (CH)
	4-6	34.8	59	16	43	4.1	53.2	42.7	A-7-6(45)	Percent Organics = 2.2%	Tan Fat Clay (CH)
	6-8	29.7	39	19	20	4.5	68.6	26.9	A-6(20)	Percent Organics = 1.9%	Tan Lean Clay (CL)
	8-10	33.0	40	20	20	3.4	65.6	31.0	A-6(21)	Percent Organics = 1.5%	Tan Lean Clay (CL)

Boring	Latitude: 30°23'51.00"N		Longitude: 90° 4'52.94"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-2	0-2	23.2	57	18	39	7.2	58.8	34.0	A-7-6(39)	Percent Organics = 2.6%	Tan Fat Clay (CH)
	2-4	23.4	61	18	43	6.0	54.6	39.4	A-7-6(27)	Percent Organics = 2.0%	Tan Fat Clay (CL)
	4-6	26.3	48	18	30	3.4	59.6	37.0	A-7-6(31)	Percent Organics = 2.2%	Tan Lean Clay (CL)

Boring	Latitude: 30°23'52.57"N		Longitude: 90° 4'43.11"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-3	0-2	27.6	50	16	34	7.5	54.5	38.0	A-7-6(33)	Percent Organics = 2.7%	Tan Fat Clay (CH)
	2-4	28.2	48	17	31	3.2	58.8	38.0	A-7-6(32)	Percent Organics = 2.0%	Gray Lean Clay (CL)
	4-6	27.0	39	17	22	2.0	69.1	28.9	A-6(22)	Percent Organics = 1.7%	Tan Lean Clay (CL)
	6-8	31.5	51	18	33	4.6	60.5	34.9	A-7-6(34)	Percent Organics = 2.8%	Tan Fat Clay (CH)
	8-10	35.6	43	19	24	2.3	48.5	49.1	A-7-6(27)	Percent Organics = 2.1%	Tan Lean Clay (CL)

Boring	Latitude: 30°23'52.79"N		Longitude: 90° 4'31.62"W								
B-4	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0-2	23.3	27	19	8	5.9	76.7	17.4	A-4(6)	Percent Organics = 1.6%	Tan Lean Clay (CL)
	2-4	20.2	45	16	29	5.3	59.9	34.8	A-7-6(29)	Percent Organics = 2.0%	Tan Lean Clay (CL)
	4-6	24.4	53	20	33	6.8	57.3	35.9	A-7-6(34)	Percent Organics = 2.7%	Tan Fat Clay (CH)

Boring	Latitude: 30°23'52.97"N		Longitude: 90° 4'20.37"W								
B-5	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0-2	27.6	36	17	19	18	59.9	22.1	A-6(14)	Percent Organics = 1.6%	Tan Lean Clay (CL)-with Sand
	2-4	18.9	36	19	17	14.8	60.7	24.5	A-6(14)	Percent Organics = 1.3%	Tan Lean Clay (CL)
	4-6	19.3	49	15	34	14.7	52.7	32.6	A-7-6(29)	Percent Organics = 1.3%	Tan Lean Clay (CL)
	6-8	24.5	34	17	17	32.1	47.3	20.6	A-6(9)	Percent Organics = 1.6%	Tan Sandy Lean Clay (CL)
	8-10	26.1	31	19	12	27.3	50.1	22.6	A-6(7)	Percent Organics = 1.4%	Tan Lean Clay (CL)- with Sand

Boring	Latitude: 30°23'53.18"N		Longitude: 90° 4'8.72"W								
B-6	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0-2	25.5	36	16	20	25.2	43.7	31.1	A-6(14)	Percent Organics = 2.3%	Gray Lean Clay (CL)- with Sand
	2-4	25.5	43	16	27	40.3	34.6	25.1	A-7-6(13)	Percent Organics = 2.4%	Tan Sandy Lean Clay (CL)
	4-6	25.3	41	16	25	14.4	66.7	18.9	A-7-6(21)	Percent Organics = 1.9%	Tan Lean Clay (CL)

Boring	Latitude: 30°23'51.62"N		Longitude: 90° 4'1.49"W								
B-7	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0	19.4	35	16	19	37.8	39.6	22.6	A-6(9)	Percent Organics = 1.8%	Tan Sandy Lean Clay (CL)
	2	18.6	43	16	27	46.9	28.4	24.7	A-7-6(10)	Percent Organics = 2.0%	Tan Sandy Lean Clay (CL)
	4	17.9	32	15	17	55.3	24.0	20.7	A-6(4)	Percent Organics = 1.2%	Tan Clayey Sand (SC)
	6	23.4	53	19	34	10.2	45.1	44.7	A-7-6(33)	Percent Organics = 2.8%	Gray Fat Clay (CH)
	8	26.0	50	18	32	7.1	50.2	42.7	A-7-6(32)	Percent Organics = 2.0%	Tan Fat Clay (CH)

Boring	Latitude: 30°23'48.67"N		Longitude: 90° 3'53.38"W								
B-8	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0-2	23.0	35	16	19	5.1	63.2	31.7	A-6(18)	Percent Organics = 1.8%	Gray Lean Clay (CL)
	2-4	21.2	40	15	25	5.1	72.1	22.8	A-6(24)	Percent Organics = 2.0%	Gray Lean Clay (CL)
	4-6	18.1	34	14	20	5.2	65.1	29.7	A-6(18)	Percent Organics = 1.4%	Gray Lean Clay (CL)

Boring	Latitude: 30°23'45.04"N		Longitude: 90° 3'43.40"W								
B-9	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
	0-2	26.2	54	18	36	15.9	43.9	40.2	A-7-6(31)	Percent Organics = 2.5%	Tan Fat Clay (CH)- with Sand
	2-4	21.8	50	18	32	18.2	52.3	29.5	A-7-6(26)	Percent Organics = 2.5%	Tan Fat Clay (CH)- with Sand
	4-6	23.9	58	18	40	13.5	38.0	48.5	A-7-6(36)	Percent Organics = 2.1%	Tan Fat Clay (CH)
	6-8	28.0	62	21	41	16.5	26.7	56.8	A-7-6(37)	Percent Organics = 2.4%	Gray Fat Clay (CH)- with Sand
	8-10	30.0	66	17	49	12.6	24.4	63.0	A-7-6(45)	Percent Organics = 2.4%	Gray Fat Clay (CH)

APS Engineering and Testing

Boring	Latitude: 30°23'47.86"N		Longitude: 90° 3'36.44"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-10	0-2	18.2	30	18	12	26.0	55.0	19.0	A-6(7)	Percent Organics = 1.9%	Gray Lean Clay (CL)- with Sand
	2-4	19.7	52	17	35	16.9	59.4	23.7	A-7-6(29)	Percent Organics = 2.7%	Gray Fat Clay (CH)- with Sand
	4-6	22.2	60	19	41	19.0	56.0	25.0	A-7-6(34)	Percent Organics = 2.0%	Gray Fat Clay (CH)- with Sand

Boring	Latitude: 30°23'48.06"N		Longitude: 90° 3'24.89"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-11	0-2	17.6	NV	NP	NP	53.1	35.7	11.2	A-4(0)	Percent Organics = 1.4%	Tan Silty Sand (SM)
	2-4	17.2	NV	NP	NP	59.5	27.3	13.2	A-4(0)	Percent Organics = 1.1%	Tan Silty Sand (SM)
	4-6	16.5	NV	NP	NP	68.6	16.1	15.3	A-2-4(0)	Percent Organics = 1.5%	Tan Silty Sand (SM)
	6-8	21.3	48	17	31	7.7	55.1	37.2	A-7-6(30)	Percent Organics = 2.3%	Tan Lean Clay (CL)
	8-10	24.9	52	17	35	18.6	48.2	33.2	A-7-6(28)	Percent Organics = 2.8%	Tan Fat Clay (CH)- with Sand

Boring	Latitude: 30°23'47.91"N		Longitude: 90° 3'13.46"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-12	0-2	20.6	27	18	9	13.5	62.2	24.3	A-4(6)	Percent Organics = 1.6%	Gray Lean Clay (CL)
	2-4	21.5	45	17	28	9.9	53.2	36.9	A-7-6(26)	Percent Organics = 2.8%	Gray Lean Clay (CL)
	4-6	20.2	57	18	39	6.0	59.2	34.8	A-7-6(40)	Percent Organics = 1.9%	Gray Fat Clay (CH)

Boring	Latitude: 30°23'47.76"N		Longitude: 90° 2'55.25"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-13	0-2	24.2	30	15	15	31.4	44.6	24.0	A-6(8)	Percent Organics = 1.8%	Tan Sandy Lean Clay (CL)
	2-4	19.9	38	13	25	34.5	46.3	19.2	A-6(14)	Percent Organics = 1.4%	Gray Sandy Lean Clay (CL)
	4-6	15.9	39	13	26	57.8	32.0	30.2	A-6(13)	Percent Organics = 1.8%	Tan Sandy Lean Clay (CL)
	6-8	25.9	60	17	43	17.7	32.3	50.0	A-7-6(38)	Percent Organics = 3.0%	Tan Fat Clay (CH)- with Sand
	8-10	29.8	57	20	37	35.1	24.7	40.2	A-7-6(22)	Percent Organics = 2.2%	Gray Sandy Fat Clay (CH)

Boring	Latitude: 30°23'47.60"N		Longitude: 90° 2'38.00"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-14	0-2	11.6	26	13	13	57.0	32.1	10.9	A-6(2)	Percent Organics = 1.6%	Tan Clayey Sand (SC)
	2-4	21.0	26	15	11	42.5	36.6	20.9	A-6(3)	Percent Organics = 1.8%	Tan Sandy Lean Clay (CL)
	4-6	21.1	25	14	11	48.6	27.8	23.6	A-6(2)	Percent Organics = 1.9%	Tan Sandy Lean Clay (CL)

Boring	Latitude: 30°23'48.38"N		Longitude: 90° 3'31.48"W								
	Depth (Feet)	ASTM D 2216 Moisture Content	ASTM D 4318 Atterberg Limits			Hydrometer Test (DOTD TR 407 M/407-99)			AASHTO Classification	Percent Organics	Description
		w %	LL	PL	PI	% Sand	% Silt	% Clay			
B-15	0-2	14.9	24	13	11	49.6	41.1	9.3	A-6(2)	Percent Organics = 1.5%	Tan Sandy Lean Clay (CL)
	2-4	12.2	NV	NP	NP	65.7	29.6	4.7	A-2-4(0)	Percent Organics = 0.7%	Tan Silty Sand (SM)

Pavement Analysis

StreetPave 12

Report for Concrete Pavement Design

Project Name: Sharp Road Improvements
Route: Sharp Road @ Asbury
Location: Mandiville, LA
Project Description:
Owner/Agency: G.E.C.
Design Engineer: CM/SE

Recommended Concrete Pavement Design

Min. Required Thickness = 5.74 in
Design Thickness = 6.00 in
Max. Joint Spacing = 12 ft
Failure Controlled By = Cracking

*Because the doweled thickness is less than 8 in. and cracking is the predicted cause of failure, dowel bars typically would not be recommended for the design details you provided.

Rounding Considerations:

Thickness Adjustment	Thickness (in.)	Reliability at Specified Design Life (%)	Theoretical Life at Specified Reliability (yrs)
Rounded-Down	5.50	99.9	8
None (As-Designed)	5.74	80	20
Rounded-Up (Recommended)	6.00	99.9	46

Inputs

Design Life: 20 years

Reliability

Reliability: 80 %
Percent of Slabs Cracked at End of Design Life: 5 %

Traffic

Traffic Category: Collector
Direction Distribution: 51
Design Lane Distribution: 100
Trucks per Day (two-way, at time of construction): 209 per day

Truck Traffic Growth: 2 % per year
Rigid ESALs = 325,808

Support Conditions

Subgrade

CBR (California Bearing Ratio):	2.5	
Calculated Resilient Modulus of the Subgrade:	3,635	psi

Subbase

Top Layer:	Unstabilized Subbase			
		Modulus:	30,000	psi
		Thickness :	8	in
Layer 2:	Not Selected			
		Modulus:	0	psi
		Thickness:	0	in
Layer 3:	Not Selected			
		Modulus:	0	psi
		Thickness:	0	in

Composite Modulus of Subgrade Reaction (k-Value):

k = 241 psi/in

Concrete Properties

28-Day Flexural Strength (MR):	650	psi
Macrofibers in Concrete?	No	
Residual Strength:	N/A	%
Modulus of Elasticity (E):	4,387,500	psi

Modulus of Elasticity (E) = 6750 x MR

Design Features

Load Transfer Devices (Dowel Bars)? Yes

Diameter = Not Recommended

Edge Support Provided? Yes

(e.g., tied concrete shoulder, curb and gutter, or widened lane)

Fatigue & Erosion Calculations

Traffic Category: Collector			Cracking Analysis			Faulting Analysis		
Axle Load, kips	Axles per 1000 Trucks	Expected Repetitions	Stress Ratio	Allowable Repetitions	Fatigue Consumed	Power	Allowable Repetitions	Erosion Consumed
Single Axles								
26	0.07	66	0.659	741	8.94	26.807	277963	0.02
24	1.6	1514	0.611	2465	61.39	22.842	476624	0.32
22	2.6	2459	0.563	11692	21.04	19.194	901288	0.27
20	6.63	6272	0.515	92023	6.82	15.863	1998634	0.31
18	16.61	15712	0.467	1533809	1.02	12.849	6077129	0.26
16	23.88	22589	0.418	81474803	0.03	10.152	52403354	0.04
14	47.76	45178	0.368	unlimited	0	7.773	unlimited	0
12	116.76	110449	0.319	unlimited	0	5.711	unlimited	0
10	142.7	134986	0.268	unlimited	0	3.966	unlimited	0
8	233.6	220973	0.218	unlimited	0	2.538	unlimited	0
Tandem Axles								
44	1.16	1097	0.47	1221600	0.09	18.476	1046415	0.1
40	7.76	7341	0.43	26776403	0.03	15.269	2387738	0.31
36	38.79	36693	0.389	unlimited	0	12.368	7791837	0.47
32	54.76	51800	0.348	unlimited	0	9.772	103517150	0.05
28	44.43	42028	0.307	unlimited	0	7.482	unlimited	0
24	30.74	29078	0.266	unlimited	0	5.497	unlimited	0
20	45	42568	0.224	unlimited	0	3.817	unlimited	0
16	59.25	56047	0.182	unlimited	0	2.443	unlimited	0
12	91.15	86223	0.139	unlimited	0	1.374	unlimited	0
8	47.01	44469	0.095	unlimited	0	0.611	unlimited	0
Tridem Axles								
62	0	0	0.439	12514800	0	18.875	961930	0
56	0	0	0.399	600790810	0	15.398	2294201	0
50	0	0	0.358	unlimited	0	12.275	8204101	0
44	0	0	0.318	unlimited	0	9.506	211175373	0
38	0	0	0.277	unlimited	0	7.09	unlimited	0
32	0	0	0.236	unlimited	0	5.028	unlimited	0
26	0	0	0.194	unlimited	0	3.319	unlimited	0
20	0	0	0.151	unlimited	0	1.964	unlimited	0
14	0	0	0.108	unlimited	0	0.962	unlimited	0
8	0	0	0.064	unlimited	0	0.314	unlimited	0
			Total Fatigue Used %:		**99.35**	**Total Erosion Used %:**		**2.17**

Report for Asphalt Pavement Design

Project Name: Sharp Road Improvements
Route: Sharp Road @ Asbury
Location: Mandiville, LA
Project Description:
Owner/Agency: G.E.C.
Design Engineer: CM/SE

Recommended Asphalt Pavement Design

Min. Required Asphalt Thickness = 10.28 in

Inputs

Design Life: 20 years

Traffic

Traffic Category: Collector

Direction Distribution: 51

Design Lane Distribution: 100

ADTT: 209 per day
(average daily truck traffic, two-way, all lanes)

Truck Traffic Growth: 2 % per year

Flexible ESALs = 280,356

Axle Load, kips	Axles per 1000 Trucks
Single Axles	
26	0.07
24	1.6
22	2.6
20	6.63
18	16.61
16	23.88
14	47.76
12	116.76
10	142.7
8	233.6
Tandem Axles	
44	1.16
40	7.76
36	38.79
32	54.76
28	44.43
24	30.74
20	45
16	59.25
12	91.15
8	47.01
Tridem Axles	
62	0
56	0
50	0
44	0
38	0
32	0
26	0
20	0
14	0
8	0

Support Conditions

Subgrade:

M_{RSG} [user-entered] = 4,118.00 psi M_{RSG} [design] = 2,472.47 psi

M_{RSG} [design] = M_{RSG} [user-entered] * (1-ZR*COV)

Where:

ZR = standard normal variate, calculated from user-entered reliability (R)

COV = coefficient of variation typical of the project type and soils for the project

Coefficient of Variation = 38 %

Subbase: 6 inch Granular Base

Reliability

Specified Reliability = 80 %

AASHTO Pavement Design Method

Sharp Road Improvements, Mandeville,LA_Flexible Pavement

EAL ESTIMATION METHOD

TYPE OF VEHICLE	NO. VEHICLES PER DAY	LOAD FACTOR	EQUIVALENT EALS	
CARS	4,026	0.01	40.26	
LT. TRUCKS	100	0.49	49	
HVY. TRUCKS	5	2.39	11.95	20 YR EALS
	INPUT	DAILY HVY EALS	101	737300
		DAILY LT EALS	89	649700

HEAVY DUTY

THIS TABLE CALCULATES THE STRUCTURAL NO. USING Wt AS THE FORMULA, THE EQUIVALENT 20 YR EALS AS A TARGET, AND SN AS THE VARIABLE. INPUT pt, R, AND CBR VALUE.

DAILY EQUIVALENT AXLES	20 YR. TOTAL AXLES Wt(18)	STRUCTURAL NUMBER SN	SERVICEABILITY FACTOR pt	REGIONAL FACTOR R	SOIL SUPPORT Si	CBR ESTIMATED OR LAB TEST
CALCULATED	SET CELL	CHANGE CELL	INPUT	INPUT	CALCULATED	INPUT
101	739,505	3.70	2.00	1.30	3.03	2.5
	737,300					

				HEAVY DUTY ASPHALTIC PAVEMENT					
				UNTREATED SUBGRADE			TREATED SUBGRADE		
				BASE	BASE (2)	FULL DEPTH	BASE	BASE (2)	FULL DEPTH
CBR				2.5	2.5	2.5	2.5	2.5	2.5
S, SOIL SUPPORT NO.				3.03	3.03	3.03	3.03	3.03	3.03
AVG. DAILY TRUCK TRAFFIC				101	101	101	101	101	101
REQUIRED STRUCTURAL NO.				3.7	3.7	3.7	3.7	3.7	3.7
HMAC, 2" MINIMUM		/in/SY	0.44	6					
BASE, 6" MINIMUM		/in/SY	0.14	8					
HMAC BASE, 4" MINIMUM		/in/SY	0.34						
CEMENT TREATED SUBGRADE		/in/SY	0.11						
LIME TREATED SUBGRADE		/in/SY	0.1				8	8	8
UNTREATED SUBGRADE		/in/SY	0.01	8	8	8			
RESULTING STRUCTURAL NO.				3.8	0	0	0.8	0.8	0.8

*AASHTO recommends that cohesionless subgrades (sands) be compacted to a minimum of 100% of ASTM 1557.

LIGHT DUTY

THIS TABLE CALCULATES THE STRUCTURAL NO. USING Wt AS THE FORMULA, THE EQUIVALENT 20 YR EALS AS A TARGET, AND SN AS THE VARIABLE. INPUT pt, R, AND CBR VALUE.

DAILY EQUIVALENT AXLES	20 YR. TOTAL AXLES Wt(18)	STRUCTURAL NUMBER SN	SERVICEABILITY FACTOR pt	REGIONAL FACTOR R	SOIL SUPPORT Si	CBR ESTIMATED OR LAB TEST
CALCULATED	SET CELL	CHANGE CELL	INPUT	INPUT	CALCULATED	INPUT
101	739,505	3.70	2.00	1.30	3.03	2.5
	649,700					

				LIGHT DUTY ASPHALTIC PAVEMENT					
				UNTREATED SUBGRADE			TREATED SUBGRADE		
				BASE	BASE (2)	FULL DEPTH	BASE	BASE (2)	FULL DEPTH
CBR				2.5	2.5	2.5	2.5	2.5	2.5
S, SOIL SUPPORT NO.				3.03	3.03	3.03	3.03	3.03	3.03
AVG. DAILY TRUCK TRAFFIC				101	101	101	101	101	101
REQUIRED STRUCTURAL NO.				3.7	3.7	3.7	3.7	3.7	3.7
HMAC, 2" MINIMUM		/in/SY	0.44	6					
BASE, 6" MINIMUM		/in/SY	0.14	8					
HMAC BASE, 4" MINIMUM		/in/SY	0.34						
CEMENT TREATED SUBGRADE		/in/SY	0.11						
LIME TREATED SUBGRADE		/in/SY	0.1				8	8	8
UNTREATED SUBGRADE		/in/SY	0	8	8	8		8	
RESULTING STRUCTURAL NO.				3.8	0	0	0.8	0.8	0.8

*AASHTO recommends that cohesionless subgrades (sands) be compacted to a minimum of 100% of ASTM 1557.