Geotechnical Engineering Report

Midland Parkway Pavement
Summerville, South Carolina
October 7, 2022
Terracon Project No. EN225127

Prepared for:
Town of Summerville
Summerville, SC

Prepared by:
Terracon Consultants, Inc.
North Charleston, SC

October 7, 2022

Town of Summerville
200 S Main St
Summerville, SC 29483

Attn: Mr. Russell W. Cornette, Jr., PE
P: (843) 851-4226
E: RCornette@summervillesc.gov

Re: Geotechnical Engineering Report
Midland Parkway Pavement
Midland Parkway
Summerville, South Carolina
Terracon Project No. EN225127

Dear Mr. Cornette:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PEN225127 dated June 28, 2022, and Agreement for Services signed on August 8, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning pavement design for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Abdul Q. Fekrat, PhD, P.E.
Senior Staff Engineer
SC Registration No. 38531

Thomas C. Smoak, III, P.E.
Geotechnical Department Manager
SC Registration No. 30792

REPORT TOPICS

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

Midland Parkway Pavement
Midland Parkway
Summerville, South Carolina

Terracon Project No. EN225127
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INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed pavement improvements to be located at Midland Parkway in Summerville, South Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of eight pavement cores and 8 Hand Auger Borings (HAB) along with Kessler Dynamic Cone Penetrometer (DCP) tests to depths of approximately 5 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively, and logs of the soundings/borings are included in the **Exploration Results** section in the appendix of this ***GeoReport***.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located on Midland Parkway in Summerville, South Carolina. See **Site Location**
Existing Improvements	The existing Midland Parkway is a 4-lane roadway (2 lanes in each direction) with a middle lane, which extends from Old Trolley Road to Ladson Road. The existing pavement is exhibiting several types of distress, as seen in the **Photography Log**.
Current Ground Cover	Existing asphalt pavement

PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Information about the project, including results of pavement cores previously done by the SCDOT and traffic data, were provided by Russell Cornette with the Town of Summerville.
Project Description	Terracon was asked to evaluate the existing pavement thicknesses and subgrade conditions to provide recommendations and repair options for the currently distressed pavement. Terracon was not provided any existing plans, so the original pavement section design is unknown. In-situ pavement thicknesses are provided under **Exploration Findings**.
Pavements	The following traffic data was provided by Russell Cornette.

Year	ADT	Percent Truck
2015	14,400	N.P.[1]
2016	16,000	N.P. [1]
2017	14,900	N.P. [1]
2018	16,100	N.P. [1]
2019	15,700	6%
2020	13,400	2%
2021	13,100	2%

1. N.P. – Not Provided

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization forms the basis of our geotechnical calculations and subgrade evaluation. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section.

Subsurface Profile

The geotechnical characterization forms the basis of our geotechnical calculations and subgrade evaluation. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are possible.

Description	Approximate Depth to Bottom of Stratum	Material Encountered [1]
Surface	10 to 13 inches	Asphalt pavement and Graded Aggregate Base Course (GABC)
Stratum 1	5 feet	Clayey sand to silty sand (fines content ranging from 12.7% to 33.5%)

1. Material descriptions are based on visual classification from HAB samples and selected laboratory tests.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

At the time of our exploration, groundwater was not encountered. The ground water depths were attempted by physical observation and measurement within Hand Auger Boring (HAB) testing depth.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. The groundwater surface should be checked prior to construction to assess its effect on site work and other construction activities.

The water levels as observed during field exploration are noted on the attached boring logs, in **Exploration Results**.

EXPLORATION PROCEDURES

Drilled Asphalt Cores

Our exploration consisted of drilled asphalt cores coupled with Kessler Dynamic Cone Penetrometer (DCP) Tests. Eight (8) asphalt cores, designated as PC-1 thru PC-8, were extracted from the asphalt pavement. These drilled cores were used to determine asphalt pavement thickness, base course thickness, and to provide access to subgrade soils.

Kessler Dynamic Cone Penetrometer Testing

The Kessler DCP tests were used to evaluate the condition of subgrade soils. Tests were performed at each of the eight core locations starting at the interface between the base course material and the subgrade soil. Kessler DCP tests were continuously advanced in 2-inch increments to a termination depth of approximately 5 feet below existing grade. Thereafter, Hand Auger Borings were advanced approximately five (5) feet below the existing grade for a visual examination of the soils. Blow counts from the DCP tests and visual classification of subgrade soils were analyzed to determine subgrade conditions.

Laboratory Testing

Per our scope, we performed the following laboratory tests:

- Eight (8) Moisture Content Tests: ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- Eight (8) Atterberg Limits Tests: ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- Eight (8) Wash 200 Tests: ASTM D1140 - Standard Test Methods for Determining the Amount of Material Finer than 75-um (No. 200) Sieve in Soils by Washing

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System

EXPLORATION FINDINGS

Based on the pavement cores we performed, the asphalt thickness ranged from 2 ½ inches to 5 ½ inches. The pavement cores performed previously by SCDOT showed a range of thicknesses 3 inches to 7 inches. The average thickness of asphalt using the provided and obtained core thicknesses would be approximately 4.3 inches. Graded Aggregate Base Course thickness ranged from 5 inches up to 10 ½ inches, with an average of approximately 7.7 inches. A summary of the asphalt and base course thicknesses is shown in the Table below. Photos of test locations can be found in the **Photography Log**.

Test Location	Asphalt Thickness (in.)[1]	Base Course Thickness (in.)
PC-1	3	10
PC-2	2.5	10.5
PC-3	3.75	6.75
PC-4	3.5	7
PC-5	5.5	5.25
PC-6	2.75	10.25
PC-7	5.5	5
PC-8	4	7

1. Eight pavement cores were previously obtained by SCDOT. Asphalt thickness were reported to range between 3 to 7 inches. Information about base course thickness were not provided to Terracon.

The near surface soils encountered were generally clayey to silty sands classified as SC and SM in accordance with the Unified Soils Classification System (USCS), having a fines content (percent passing the #200 sieve) ranging from 12 percent to 33 percent in the selected laboratory samples. In-situ moistures of the laboratory samples ranged from 13 to 28 percent.

The soils in-place CBR values determined in the field from DCP test data averaged 9 to over 25 in the upper bearing materials. However, for design purposes a CBR value of 10.0 was used. HAB logs with DCP blow counts can be found in **Exploration Results**.

Pavement Observation/Evaluation

In general, the existing pavements along the alignment are in fair to poor condition. The most common distresses observed were minor to moderate fatigue, edge, alligator and longitudinal cracking as well as potholes and patching. These distresses are listed below. Refer to the **Photography Log**.

- Near PC-1: Low severity fatigue cracking and patching
- Near PC-2: Low severity fatigue cracking, moderate edge cracking and patching
- Near PC-3: Rutting, patching, alligator cracking and moderate severity fatigue cracking
- Near PC-4: Low severity fatigue cracking
- Near PC-5: Moderate severity fatigue cracking and patching
- Near PC-6: Low to moderate severity fatigue cracking and low longitudinal cracking
- Near PC-7: Alligator cracking, moderate fatigue cracking and patching
- Additionally, potholes, and edge cracks were also observed at a few other locations along the roadway.

PAVEMENT RECOMMENDATIONS

Pavement Design Parameters

The SCDOT Pavement Design Guidelines 2008 edition was used for evaluating the existing pavements and for designing new pavement sections. The process for determining the new pavement section involves first determining the amount of traffic the roadway will service daily. Then the design life, percent of heavy trucks, classification of roadway, and other statistical measures are used to calculate equivalent 18-kip axle loads for the entire design life of the pavement. From this, a required Structural Number (S_N) is calculated for the pavement design.

The S_N is used by the designer to determine the necessary layer thickness of each of the pavement components. This is done by multiplying a structural layer coefficient by the thickness of the component. Each typical component has a different structural layer coefficient (i.e. GABC = 0.18, asphalt surface course = 0.44). Per DCP test results, the existing subgrade soils have a correlated CBR value ranging from 9.0 to over 20. Based on experience with similar soils in the area, we have considered a design CBR value of 10.0. The pavement design parameters are presented in Table below.

Design Parameter	Design Value
Initial Serviceability Index	4.2
Terminal Serviceability Index	2.0
Regional Factor, R	1
CBR / SSV[1]	10.0 / 3.80
2022 ADT[2]	16,770
Number of Lanes Each Way	2
Analysis Period (years) (2022 to 2032, 2022 to 2042)	10, 20
Growth Rate (%)	2%
Percent Trucks (%)[3]	6%
Estimated 10-Year ADT[2]	19,470
Estimated 20-Year ADT[2]	22,170

Design Parameter	Design Value
10-Year Design ESAL[4] Count	1,689,981
20-Year Design ESAL Count	3,841,846
Road Group[5]	P
S_{Nreq}	3.6 (10-Year), 4.1 (20-Year)

1. California Bearing Ration / Soil Support Value
2. ADT = Average Daily Traffic (Vehicles per Day) in both directions (see **Project Descriptions**). The estimated 10-year and 20-year were projected based on the best fit trendline with annual growth rate of 2%.
3. Percent truck was conservatively assumed at 6% per coordination with Russ Cornette.
4. ESAL = Equivalent 18-kip Single Axle Loads in SCDOT "Critical Lane".
5. Road Group was conservatively assumed P per coordination with Russ Cornette.

Existing Pavement Section

The existing asphalt has an average thickness of 4.3 inches and the existing base course has an average thickness of 7.7 inches. Observations of the asphalt surface course reveal proper aggregate distribution and no significant voids. The base course generally appeared clean with no evidence of unsuitable material.

Using these average thicknesses for the existing pavement sections and the design parameters listed above, we have evaluated the existing pavement section. Results are in the table below.

Description	Thickness (inches)	Structural Number
Evaluation of Existing Pavement Section		
Old HMA Surface Course	2.0	0.52
Old HMA Intermediate Course	2.3	0.598
Graded Aggregate Base Course	7.7	1.39
Section Structural Number	2.50	

As seen in the previous Table, the existing section does not provide a sufficient structural number to support the projected 10-year or 20-year traffic loading.

While the existing pavement section is insufficient for the projected traffic volumes, if the cost of improving the roadway exceeds the available funding, efforts can be made to maintain the existing pavement. This can be accomplished by milling 2 inches of existing asphalt, full depth patching the severely distressed areas identified visually and by proofrolling of the milled surface, and applying 2 inches of new asphalt. Full depth patching involves removal of asphalt and base course followed by full depth replacement with asphalt as described in Section 401 of the SCDOT 2007 Specifications for Highway Construction.

New Pavement Design Recommendation

Based on the pavement core data and the condition of existing pavements as seen in the **Photography Log**, the Coefficient of Depreciation Method and the SCDOT Pavement Design Guide 2008, the existing roadway section of Midland Parkway will require a complete repair to meet future traffic demands. Midland Parkway serves access to several essential facilities including hospitals and care centers. Speedy opening to traffic plays an important role in selecting a pavement improvement option. Due to this and per coordination with Mr. Russ Cornette, full depth reclamation using Cement Modified Recycled Base has been selected for this project. This type of construction is commonly used on SCDOT primary and secondary roads. Refer to the SCDOT Supplemental Specifications, Section 306 – *Cement Modified Recycled Base*.

The cement modification process should be accomplished with a specialty mixing machine or reclaimer. The cement is spread uniformly onto the area to be treated at the determined application rate. After spreading, the mixing machine is used to uniformly blend the soil, cement, and mixing water to the required depth. Paving operations should occur as soon as possible after reclamation. During the interim period, the reclaimed material should be treated or wet cured.

For CMRB options, to maintain the existing grades along the curb, mill to the depths shown below of the existing pavement along the curb and angle the milling machine to zero out towards the middle lane. This would increase the cross slope and minimize milling the existing pavement sections along the inside lanes and the middle lane.

Description	Thickness (inches)[1]	Rate (lbs/SY)	Structural Number
New Pavement Section – CMRB: 10-Year Design Period			
Existing Pavement Milling Depth along the Curb into the Outer Lane	2.0	--	--
New HMA Surface Course (Type B)	1.9	200	0.836
Cement Modified Recycled Base (CMRB)	12.0	--	3.12

Description	Thickness (inches)[1]	Rate (lbs/SY)	Structural Number
Section Structural Number	3.96		
New Pavement Section – CMRB: 20-Year Design Period			
Existing Pavement Milling Depth along the Curb into the Outer Lane	4.0	--	--
HMA Surface Course (Type B)	1.9	200	0.836
HMA Intermediate Course (Type B)	1.9	200	0.836
Cement Modified Recycled Base (CMRB)	10.0	--	2.60
Section Structural Number	4.27		
New Pavement Section – Asphalt Base: 10-Year Design Period			
Existing Pavement Milling/Removal Depth	9.5	--	--
HMA Surface Course (Type B)	1.9	200	0.836
HMA Intermediate Course (Type B)	1.9	200	0.836
Asphalt Base (Type A)	5.7	600	1.938
Section Structural Number	3.61		
New Pavement Section – Asphalt Base: 20-Year Design Period			
Existing Pavement Milling/Removal Depth	11.4	--	--
HMA Surface Course (Type B)	1.9	200	0.836
HMA Intermediate Course (Type B)	1.9	200	0.836
HMA Intermediate Course (Type B)	1.9	200	0.646
Asphalt Base (Type A)	5.7	600	1.938
Section Structural Number	4.26		

1. Thicknesses of the asphalt courses are governed by the minimum and maximum SCDOT lift thicknesses published in the 2008 SCDOT Guidelines for Hot Mix Asphalt Selection provided in the report Appendix and the 2007 SCDOT Standard Specifications for Highway Construction.

Pavement Construction Considerations for CMRB

Construction methods and materials used in the development of the overlay should meet the minimum requirements as directed by *SCDOT 2007 Standard Specifications for Highway Construction*. Subsections of the Standard Specifications are referred to in the following paragraphs.

Regulate the sequence of work to process the necessary quantity of material to provide the full depth of modification as shown in the report:

- Use the proper amount of Portland cement
- Maintain the work
- Rework the courses as necessary to meet the requirements of this specification
- Incorporate appropriate material as specified in the plans for drainage correction, cross slope correction or roadway strengthening.

Pulverization and Scarification: Pulverize the pavement so that at the completion of moist-mixing 100% (by weight) passes a 1½ - inch sieve. Carefully control the depth of scarification and conduct blading operations in a manner to ensure that the surface of the roadbed below the scarified and pulverized material remains undisturbed and conforms to the required cross-section.

Application of Cement:

The rate of cement will be determined by the Geotechnical Materials Engineer (GME) based on test results supplied by the Contractor to the GME. Obtain material from the roadway necessary for the mix design process taking care to sample no deeper than the depth of reclamation and to keep the ratio of asphalt to soil representative. Do not obtain materials for mix design testing from areas of the roadway that have been full-depth patched. The roadway sampling and mix design testing will be conducted according to SC-T-26 by an AASHTO-accredited laboratory. Allow four to six weeks for these results. Submit the mix design test results in writing and obtain the cement spread rate from the GME before starting reclaiming work. Allow two weeks for review of test results and selection of appropriate cement spread rate.

Spread Portland cement uniformly on the roadway at the rate (in pounds per square yard) established by the GME. Spread the cement with equipment that can be calibrated and adjusted so that the established rate is attained uniformly throughout the length and width of the roadway. Use spreading equipment that has adjustable openings or gate headers and that is not solely dependent on vehicle speed to obtain the required spread rate. A tolerance of 5% will be allowed in the spread rate for individual sections of roadway; however, adjustments should be made in order to keep the actual spread rate as close to that established by the GME. Only apply cement to such an area that all the operations can be continuous and completed in daylight, unless adequate artificial light is provided, within 6 hours of such application.

Do not allow the percentage of moisture in the soil at the time of cement application to exceed the quantity that permits uniform and thorough mixture of soil and cement during dry mixing operations and do not exceed the specified optimum moisture content for the soil-cement mixture. Do not allow equipment, except that used in spreading and mixing, to pass over the freshly spread cement until it is mixed with the soil.

Apply cement only when the temperature is above 40°F in the shade and rising. Do not perform work on a frozen or excessively wet roadway.

Mixing and Processing: Unless otherwise provided in the Special Provisions or shown on the Plans, mix and process the soil-pavement material as specified in Subsection 301.4.5. Select the single pass or multiple pass method based on the required depth of reclamation and the equipment capabilities. Excess material generated from the mixing process after final grading operations have been completed shall be removed from the roadway.

Compaction: Compact the base as specified in Subsection 307.4.5. The moisture content of the reclaimed roadway must be verified within 30 minutes of the initial watering application to ensure that the moisture is within 2% of optimum moisture prior to beginning grading and compaction efforts.

Construction Limitations

Perform work in daylight hours unless adequate artificial light is provided. Limit the area over which the cement-pavement mixture is spread so that all operations specified in Subsections 306.4.3 and 306.4.4 are performed continuously until completion of a section. Complete all work on a section within 2 hours after the application of water to the aggregate and cement mixture.

If operations are interrupted for a continuous period of greater than 1 hour after the cement has been mixed with the aggregate, reconstruct the entire affected section in accordance with these specifications. When the un-compacted mixture of aggregate and cement is wetted so that the moisture content exceeds that specified, manipulate and aerate the mixture to reduce the moisture to the specified content provided the base course is completed within the time limits of these specifications.

Weather Limitations: Apply cement only when the temperature is 40ºF in the shade and rising. Do not perform work on frozen or excessively wet subgrade. The temperature restrictions for single treatment, when used as a curing option, shall meet the requirements of the successive HMA course to be placed. If the successive course is a surface course, the seasonal restrictions of December, January and February apply.

Curing:

After the cement modified recycled base has been finished as specified, cure the surface using the following methods as specified in the plans or contract.

Curing Method 1 – Wet Cure: After the cement modified recycled base has been finished as specified, protect the surface from rapid drying by keeping the base continuously moist for 3 days. This cost is to be included in the Cement Modified Recycled Base price.

Curing Method 2 – Surface Treatment: After the cement modified recycled base has been finished as specified, protect the base from rapid drying and traffic by placing Asphalt Surface Treatment (Single Treatment) as specified in section 406, with the exception that lightweight aggregate is not required, on the recycled base. This operation must be performed daily to protect the newly recycled base, unless otherwise directed by the Engineer. This cost is to be included in the Cement Modified Recycled Base price.

Curing Method 3 – Wet Cure and Surface Planing: After the cement modified recycled base has been finished as specified, protect the surface from rapid drying by keeping the base continuously moist for 3 days. Prior to placement of the HMA course, the recycled base course surface shall be milled to obtain a true and level finish for the asphalt placement. This cost is to be included in the Cement Modified Recycled Base price.

Curing Method 4 – Surface Treatment and Surface Planing: After the cement modified recycled base has been finished as specified, protect the base from rapid drying and traffic by placing Asphalt Surface Treatment (Single Treatment) as specified in section 406, with the exception that lightweight aggregate is not required, on the recycled base. This operation must be performed daily to protect the newly recycled base, unless otherwise directed by the Engineer. Prior to placement of the HMA course, the recycled base course surface shall be milled to obtain a true and level finish for the asphalt placement. This cost is to be included in the Cement Modified Recycled Base price

Construction Joints: At the end of each day's construction, form a straight construction joint as specified in Subsection 301.4.9.

Surface Smoothness: Ensure that the finished surface of the recycled base meets the requirements of Subsection 301.4.10. The grade of the road will be based on existing conditions of the roadway. The cross slope will be graded to obtain positive drainage as well as smooth transitions from crown to superelevated sections of the roadway. Roads with a pre-existing cross slope of 2% or greater shall be re-graded to the same cross slope. On roads with a pre-existing cross slope of less than 2%, the Contractor and RCE shall determine the measures required to obtain positive drainage and the final cross slope.

Rideability: The final asphalt surface placed on cement modified recycled base course shall meet the Rideability requirements of SC-M 403 for either New Construction or Resurfacing, whichever is applicable based on the specified pavement structure.

Thickness Tolerance of Base Course: Measure and calculate the thickness of the recycled base in accordance with Subsection 301.4.11.

Opening to Traffic: Local traffic may use completed portions of the recycled base provided the base has hardened sufficiently to prevent marring or damaging of the surface by such usage. Ensure that no damage occurs to the curing coat. With approval of the District Office, temporary detours may be utilized during the reclamation process to reduce the traffic on the reclaimed roadway. Use the subgrade shoulders or completed pavement, when available, for transporting materials, workers, and equipment throughout the project. Do not place construction equipment on the base without the approval of the RCE unless it is being used in the subsequent construction operation.

Maintenance: Maintain the cement modified recycled base in accordance with Subsection 301.4.13.

Pavement Construction Considerations for Asphalt Courses

Asphalt Preparation: The existing or milled pavement surfaces should be thoroughly swept and scraped clean of loose asphalt, deleterious materials and maintained until new asphalt mixture is placed. Irregular pavement surfaces shall be brought to a uniform surface matching the surrounding pavement. Leveling may be accomplished by placing and compacting an SCDOT approved HMA mixture. Conditioning of the existing pavement surface should conform to requirements as directed by SCDOT Standard Specification 401.

Asphalt Drop-off during Construction: The SCDOT does not allow more than a 2 inch drop off between lifts to be exposed to traffic during construction of overlays and new pavement sections. Therefore, provisions should be made in construction sequencing to ensure that exposed drop-offs do not exceed the allowable limit.

Contact Surfaces: Paint all surfaces that will come in contact with new asphalt with a thin coating of bitumen prior to placing the overlay/surface course. For contact surfaces, the requirements of Section 401.1.18 of SCDOT Standard Specifications for Highway Construction 2007 shall be followed. As a minimum the following need to be followed.

The rate of application of tack coat should be a uniform rate of 0.015 to 0.15 gallons per square yard as measured by SC-T-86. Ensure that all nozzles in the distributor are fully open and operational and are turned at the same angle to the spray bar, which is approximately 30 degrees. Place the spray bar at the proper height above the pavement and apply proper pressure to provide a uniform double or triple lap of the liquid asphalt material. Ensure that the existing pavement or unsealed asphalt surface treatment course is dry and thoroughly cleaned before applying the tack material

Rideability Requirements: At completion of project, the rideability of the finished surface should be determined by approved methods as discussed in SCDOT's specifications. Ensure that pavement rideability meets the requirements of SC-M-403.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

PHOTOGRAPHY LOG

Roadway near PC-1

Roadway near PC-2

Roadway near PC-3

Roadway near PC-4

Roadway near PC-5

Roadway near PC-6

Roadway near PC-7

Roadway near PC-8

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Midland Parkway Pavement ■ Summerville, South Carolina
October 7, 2022 ■ Terracon Project No. EN225127

Terracon GeoReport

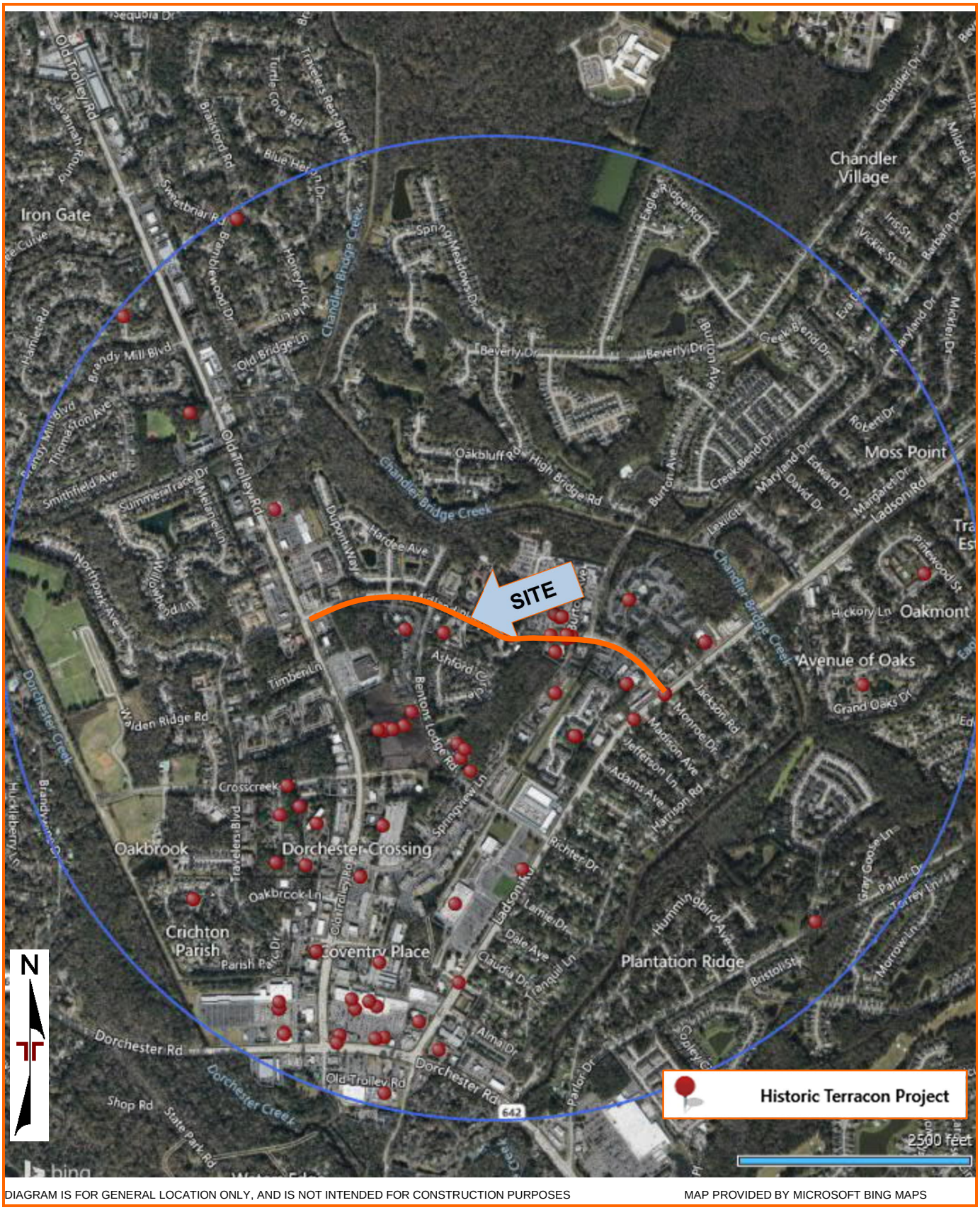


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

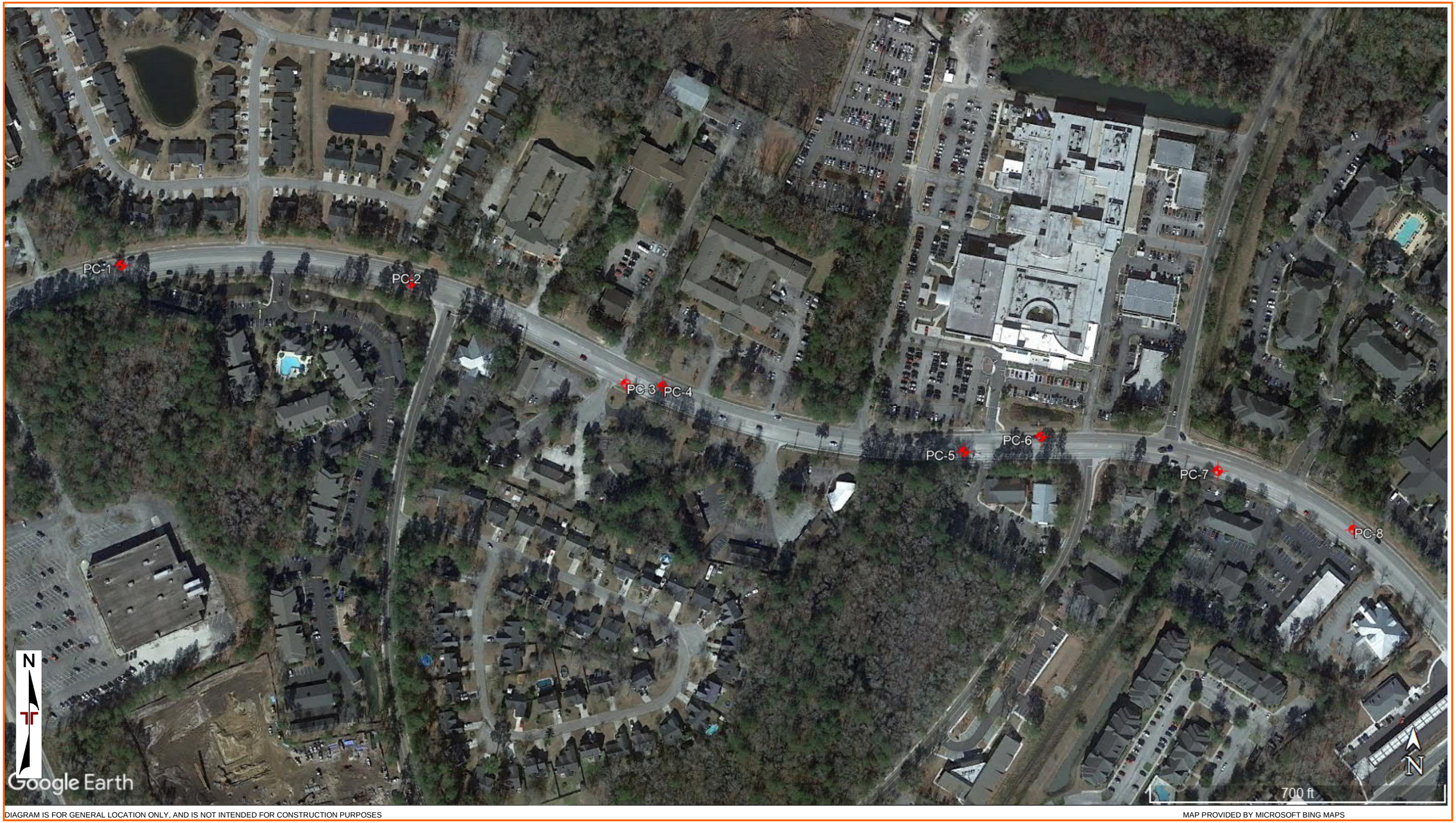


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. PC-1

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9659° Longitude: -80.1648°

DEPTH	GRAPHIC LOG		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3		**ASPHALT**, 3 inches Asphalt							
1.1		**AGGREGATE BASE COURSE**, 10 inches Aggregate Base Course	1						
		CLAYEY SAND (SC), gray to reddish brown				7	22.0	29-16-13	30
						4			
						5			
						6			
						6			
			2			6			
						10			
						14			
						17			
						17			
						16			
			3			14			
						12			
3.3						10			
		SILTY SAND (SM), gray				15			
						18			
						13			
			4			18			
						15			
						14			
						13			
						12			
						14			
5.1			5			15			
		Boring Terminated at 5.1 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-2

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9658° Longitude: -80.1625°

DEPTH	GRAPHIC LOG		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2		2.5 inches Asphalt							
		AGGREGATE BASE COURSE, 10.5 inches Aggregate Base Course							
1.1		**CLAYEY SAND (SC)**, gray to reddish brown	1			4			
						2			
						4			
						4			
						4			
			2			9			
						5			
						9			
						9			
						10			
						7			
			3			3			
						7			
						8			
						10			
						8	27.8	31-18-13	22
						9			
			4			9			
						8			
						8			
						9			
						9			
						8			
5.1			5			8			
		Boring Terminated at 5.1 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-3

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9651° Longitude: -80.1609°

GRAPHIC LOG	DEPTH	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	ASPHALT, 3.75 inches Asphalt							
	0.3 **AGGREGATE BASE COURSE**, 6.75 inches Aggregate Base Course							
	0.9 **CLAYEY SAND (SC)**, gray to reddish brown	1			1	23.2	37-16-21	32
					1			
					3			
					2			
					2			
					3			
		2			4			
					6			
					8			
					9			
					12			
					13			
		3			11			
					18			
					30			
					34			
					30			
					28			
		4			27			
					30			
					21			
					20			
					18			
	4.9				18			
	Boring Terminated at 4.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-4

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9651° Longitude: -80.1606°

DEPTH	GRAPHIC LOG		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3		**ASPHALT**, 3.5 inches Asphalt							
0.9		**AGGREGATE BASE COURSE**, 7 inches Aggregate Base Course							
		CLAYEY SAND, gray to reddish brown	1			2			
						3			
						4			
						6			
						6			
			2			8			
						9			
						12			
						9			
						10			
						11			
			3			13			
						12			
						14			
						14			
						12	24.5	35-19-16	34
						14			
			4			15			
						14			
						17			
						13			
						12			
4.9						13			
		Boring Terminated at 4.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-5

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9647° Longitude: -80.1583°

DEPTH	GRAPHIC LOG		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		ASPHALT, 5.5 inches Asphalt							
0.5		**AGGREGATE BASE COURSE**, 5.25 inches Aggregate Base Course							
0.9		**CLAYEY SAND**, gray to brown and reddish brown	1			5			
						8			
						6			
						8			
						3			
						5			
			2			11			
						12			
						15			
						12			
						10			
						14			
			3			17			
						20			
						14			
						14			
						16	22.5	21-12-9	20
						14			
			4			12			
						13			
						12			
						10			
						10			
4.9						10			
		Boring Terminated at 4.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-6

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9648° Longitude: -80.1577°

GRAPHIC LOG	DEPTH	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.2 **ASPHALT**, 2.75 inches Asphalt							
	AGGREGATE BASE COURSE, 10.25 inches Aggregate Base Course							
	1.1 **SILTY SAND (SM)**, brown to gray	1			7			
					15			
					18			
					27			
					33			
		2			23			
					16			
					22			
					24			
					22			
					21			
		3			18			
					15			
					14			
					10	19.4	NP	13
					11			
					10			
		4			9			
					10			
					10			
					9			
					8			
					6			
	5.1	5			8			
	Boring Terminated at 5.1 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-13-2022 | Boring Completed: 09-13-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-7

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9645° Longitude: -80.1563°

GRAPHIC LOG	DEPTH		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		ASPHALT, 5.5 inches Asphalt							
	0.5	**AGGREGATE BASE COURSE**, 5 inches Aggregate Base Course							
	0.9	**CLAYEY SAND**, gray to reddish brown	1			9			
						7			
						6			
						6			
						8			
						11			
			2			7	22.1	27-13-14	30
						9			
						7			
						7			
						9			
	3.0					9			
		SILTY SAND, gray to reddish brown	3			10			
						10			
						11			
						14			
						16			
						16			
			4			14			
						12			
						10			
						10			
						8			
	4.9					10			
		Boring Terminated at 4.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: | Driller:

Project No.: EN225127

BORING LOG NO. PC-8

PROJECT: Midland Parkway Pavement

CLIENT: Town of Summerville SC
Summerville, SC

SITE: Midland Parkway
Summerville, SC

LOCATION See Exploration Plan

Latitude: 32.9642° Longitude: -80.1553°

DEPTH	GRAPHIC LOG		DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	DCP BLOWS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		ASPHALT, 4 inches Asphalt							
0.3									
		AGGREGATE BASE COURSE, 7 inches Aggregate Base Course							
0.9									
		CLAYEY SAND, gray to dark reddish brown	1			3			
						4			
						5			
						5			
						5			
						3			
			2			4			
						3			
						5			
						4			
						8			
						5			
			3			9			
						12			
						13			
						14	13.5	24-16-8	20
						10			
						10			
			4			11			
						12			
						15			
						13			
						7			
4.9						6			
		Boring Terminated at 4.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:

Abandonment Method:
Boring was grouted with cement and bentonite. Surface capped with asphalt.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1800 Reynolds Ave
North Charleston, SC

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: | Driller:

Project No.: EN225127

SUMMARY OF LABORATORY RESULTS

BORING ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
PC-1	1.1-1.7	CLAYEY SAND(SC) / A-2-6 (0)	29	16	13	29.5	22.0
PC-2	3-4.3	CLAYEY SAND(SC) / A-2-6 (0)	31	18	13	22.1	27.8
PC-3	0.9-4.3	CLAYEY SAND(SC) / A-2-6 (2)	37	16	21	32.3	23.2
PC-4	3-4.4	CLAYEY SAND(SC) / A-2-6 (1)	35	19	16	33.5	24.5
PC-5	2.7-4.5	CLAYEY SAND(SC) / A-2-4 (0)	21	12	9	20.3	22.5
PC-6	2.5-4.5	SILTY SAND(SM) / A-2-4 (0)	NP	NP	NP	12.7	19.4
PC-7	0.9-3	CLAYEY SAND(SC) / A-2-6 (1)	27	13	14	30.5	22.1
PC-8	2.7-4.3	CLAYEY SAND(SC) / A-2-4 (0)	24	16	8	19.8	13.5

PROJECT: Midland Parkway Pavement

SITE: Midland Parkway
Summerville, SC

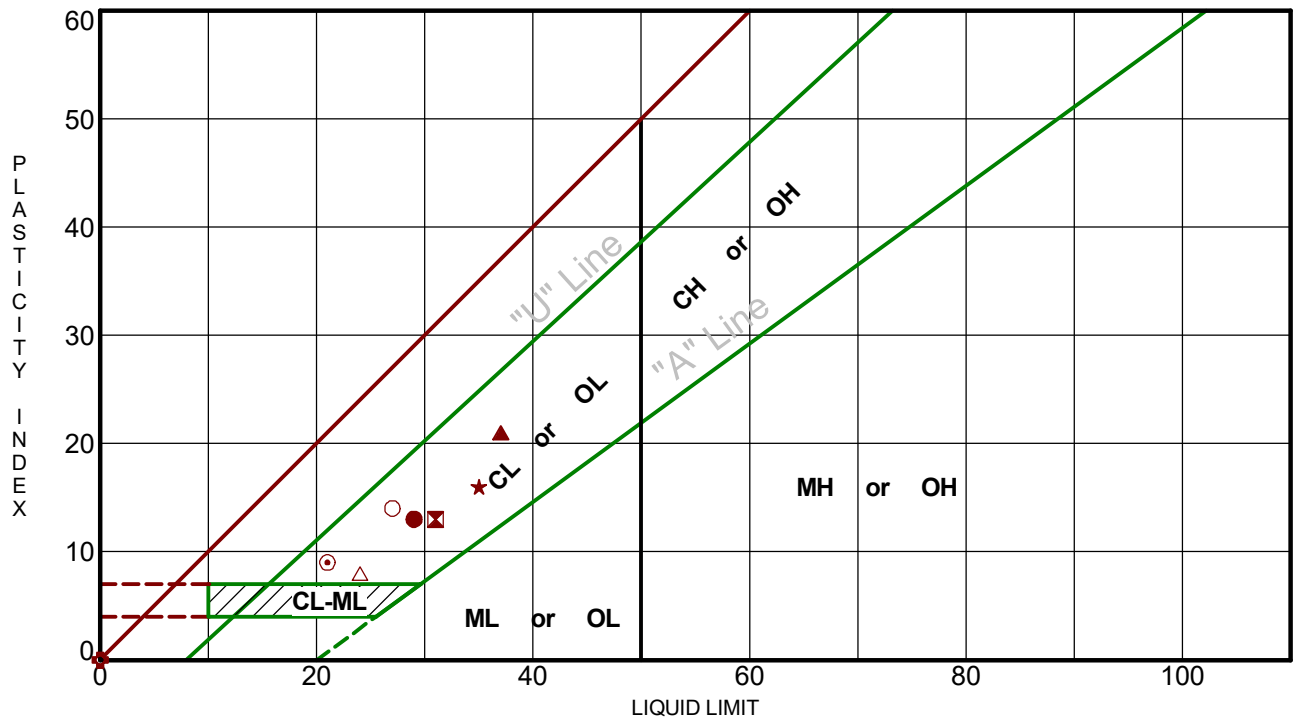
Terracon
1800 Reynolds Ave
North Charleston, SC
PH. 843-884-1234 FAX. 843-884-9234

PROJECT NUMBER: EN225127

CLIENT: Town of Summerville SC
Summerville, SC

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	PC-1	1.1 - 1.7	29	16	13	29.5	SC	CLAYEY SAND
⊠	PC-2	3 - 4.3	31	18	13	22.1	SC	CLAYEY SAND
▲	PC-3	0.9 - 4.3	37	16	21	32.3	SC	CLAYEY SAND
★	PC-4	3 - 4.4	35	19	16	33.5	SC	CLAYEY SAND
⊙	PC-5	2.7 - 4.5	21	12	9	20.3	SC	CLAYEY SAND
✿	PC-6	2.5 - 4.5	NP	NP	NP	12.7	SM	SILTY SAND
○	PC-7	0.9 - 3	27	13	14	30.5	SC	CLAYEY SAND
△	PC-8	2.7 - 4.3	24	16	8	19.8	SC	CLAYEY SAND

PROJECT: Midland Parkway Pavement

PROJECT NUMBER: EN225127

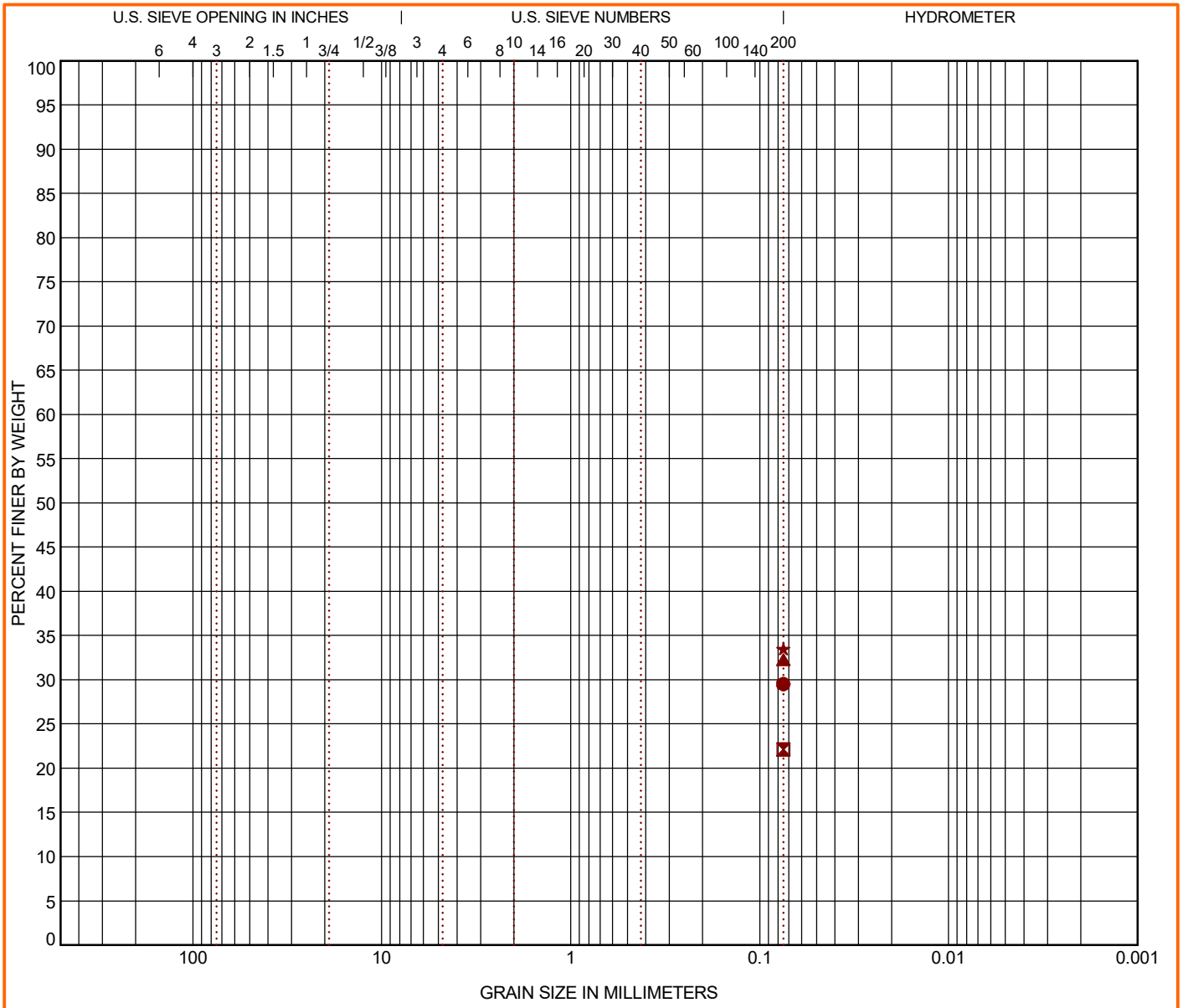
SITE: Midland Parkway
Summerville, SC

Terracon
1800 Reynolds Ave
North Charleston, SC

CLIENT: Town of Summerville SC
Summerville, SC

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	WC (%)	LL	PL	PI	Cc	Cu
●	PC-1	1.1 - 1.7	CLAYEY SAND (SC)	A-2-6 (0)	22.0	29	16	13		
⊠	PC-2	3 - 4.3	CLAYEY SAND (SC)	A-2-6 (0)	27.8	31	18	13		
▲	PC-3	0.9 - 4.3	CLAYEY SAND (SC)	A-2-6 (2)	23.2	37	16	21		
★	PC-4	3 - 4.4	CLAYEY SAND (SC)	A-2-6 (1)	24.5	35	19	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	PC-1	1.1 - 1.7	0.075							29.5	
⊠	PC-2	3 - 4.3	0.075							22.1	
▲	PC-3	0.9 - 4.3	0.075							32.3	
★	PC-4	3 - 4.4	0.075							33.5	

PROJECT: Midland Parkway Pavement

PROJECT NUMBER: EN225127

SITE: Midland Parkway
Summerville, SC

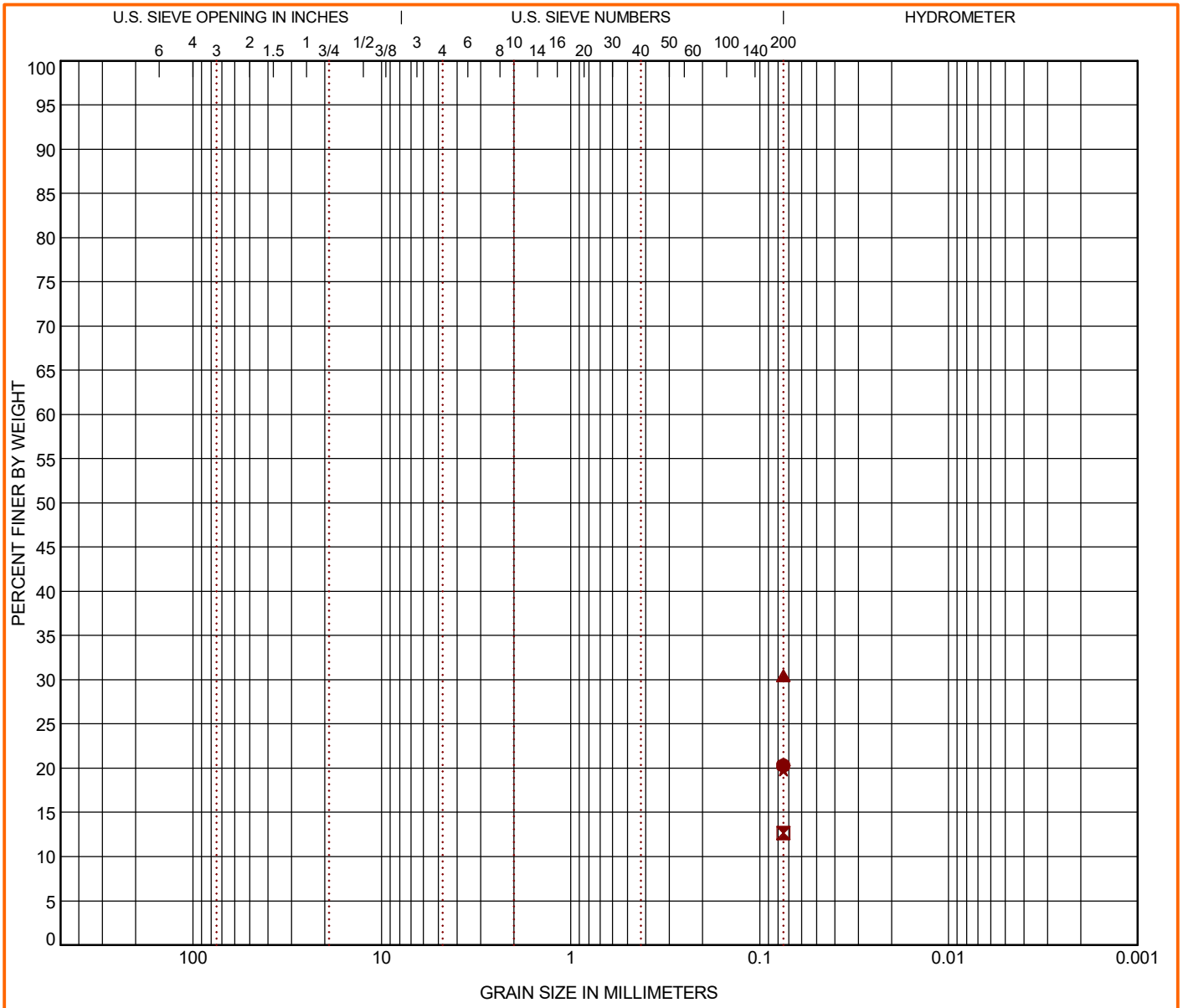
Terracon
1800 Reynolds Ave
North Charleston, SC

CLIENT: Town of Summerville SC
Summerville, SC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED EN225127 MIDLAND PARKWAY P.GPJ TERRACON_DATATEMPLATE.GDT 9/29/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	WC (%)	LL	PL	PI	Cc	Cu
●	PC-5	2.7 - 4.5	CLAYEY SAND (SC)	A-2-4 (0)	22.5	21	12	9		
⊠	PC-6	2.5 - 4.5	SILTY SAND (SM)	A-2-4 (0)	19.4	NP	NP	NP		
▲	PC-7	0.9 - 3	CLAYEY SAND (SC)	A-2-6 (1)	22.1	27	13	14		
★	PC-8	2.7 - 4.3	CLAYEY SAND (SC)	A-2-4 (0)	13.5	24	16	8		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	PC-5	2.7 - 4.5	0.075							20.3	
⊠	PC-6	2.5 - 4.5	0.075							12.7	
▲	PC-7	0.9 - 3	0.075							30.5	
★	PC-8	2.7 - 4.3	0.075							19.8	

PROJECT: Midland Parkway Pavement

PROJECT NUMBER: EN225127

SITE: Midland Parkway
Summerville, SC

Terracon
1800 Reynolds Ave
North Charleston, SC

CLIENT: Town of Summerville SC
Summerville, SC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED EN225127 MIDLAND PARKWAY P.GPJ TERRACON_DATATEMPLATE.GDT 9/29/22

SUPPORTING INFORMATION

Contents:

Unified Soil Classification System
Pavement Design Calculations (3 Pages)

Note: All attachments are one page unless noted above.

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

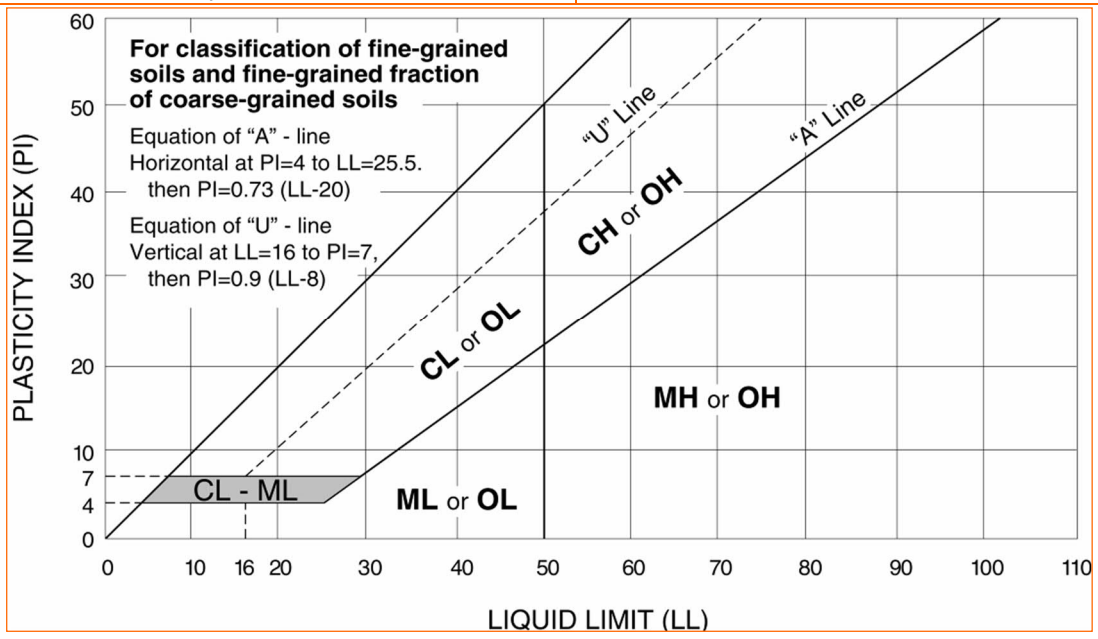
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



SCDOT PAVEMENT DESIGN

Terracon

PROJECT INFORMATION	
Road	Midland Parkway
County	Dorchester
City, State	Summerville, SC
Terracon Project #	EN225127

DESIGN INPUTS		
Region	Coastal Plain	
Design Period (yr)	10	
Present Serviceability Index (PSI)	4.2	
Terminal Serviceability (pt)	other	2.0
CBR	10.0	
Soil Support Values (SSV)	3.8	
Regional Factor	1	
Percent Trucks	6%	
Number of Lanes Each Way	2	80%
Road Group	P	0.9891

TRAFFIC DATA			
Design Period	Year	Years in Period	Estimated ADT
Begin	2022	0	16,770
End Intermediate	2032	10	19,470
End Ultimate	2042	20	22,170
		Estimated ADT Increase per Year	270
		Estimated Growth Rate	2%
		10 Year Truck ADT	1,168
		20 Year Truck ADT	1,330
		10 Year Design ESAL	1,686,981
		20 Year Design ESAL	3,841,846

REQUIRED STRUCTURAL NUMBER			
Design Period	LOG(Design ESAL)	LOG(Calculated ESAL)	Required S_N
10	6.23	6.23	3.6
20	6.58	6.58	4.1

PAVEMENT SECTIONS			
Existing Pavement, Average	a_1	Thickness (in)	Calculated S_N
Old Surface	0.26	2.00	0.52
Old Intermediate	0.26	2.30	0.598
None			0
GAB	0.18	7.7	1.39
None	0	0	0
		Design Structural Number	2.50
		10 year check	too thin
		20 year check	too thin

COMMENTS

Prepared by	AQF		
Checked by	TCS		
Date	09/29/22	Sheet Rev	Nov-16

SCDOT PAVEMENT DESIGN

Terracon

PROJECT INFORMATION	
Road	Midland Parkway
County	Dorchester
City, State	Summerville, SC
Terracon Project #	EN225127

DESIGN INPUTS		
Region	Coastal Plain	
Design Period (yr)	10	
Present Serviceability Index (PSI)	4.2	
Terminal Serviceability (pt)	other	2.0
CBR	10.0	
Soil Support Values (SSV)	3.8	
Regional Factor	1	
Percent Trucks	6%	
Number of Lanes Each Way	2	80%
Road Group	P	0.9891

TRAFFIC DATA			
Design Period	Year	Years in Period	Estimated ADT
Begin	2022	0	16,770
End Intermediate	2032	10	19,470
End Ultimate	2042	20	22,170
		Estimated ADT Increase per Year	270
		Estimated Growth Rate	2%
		10 Year Truck ADT	1,168
		20 Year Truck ADT	1,330
		10 Year Design ESAL	1,686,981
		20 Year Design ESAL	3,841,846

REQUIRED STRUCTURAL NUMBER			
Design Period	LOG(Design ESAL)	LOG(Calculated ESAL)	Required S_N
10	6.23	6.23	3.6
20	6.58	6.58	4.1

PAVEMENT SECTIONS			
CMRB: 10-Year Design Life	a_1	Thickness (in)	Calculated S_N
Surface	0.44	1.90	0.836
Cement Modifed Recycled Base	0.26	12.00	3.12
None	0	0.0	0
None	0	0.0	0.00
None	0	0	0
		Design Structural Number	3.96
		10 year check	ok
		20 year check	too thin
CMRB: 20-Year Design Life	a_1	Thickness (in)	Calculated S_N
Surface	0.44	1.90	0.836
Intermediate	0.44	1.90	0.836
Cement Modifed Recycled Base	0.26	10.0	2.6
None	0	0	0
None	0	0	0
		Design Structural Number	4.27
		10 year check	ok
		20 year check	ok

COMMENTS

Prepared by	AQF		
Checked by	TCS		
Date	10/03/22	Sheet Rev	Nov-16

SCDOT PAVEMENT DESIGN

Terracon

PROJECT INFORMATION	
Road	Midland Parkway
County	Dorchester
City, State	Summerville, SC
Terracon Project #	EN225127

DESIGN INPUTS		
Region	Coastal Plain	
Design Period (yr)	10	
Present Serviceability Index (PSI)	4.2	
Terminal Serviceability (pt)	other	2.0
CBR	10.0	
Soil Support Values (SSV)	3.8	
Regional Factor	1	
Percent Trucks	6%	
Number of Lanes Each Way	2	80%
Road Group	P	0.9891

TRAFFIC DATA			
Design Period	Year	Years in Period	Estimated ADT
Begin	2022	0	16,770
End Intermediate	2032	10	19,470
End Ultimate	2042	20	22,170
		Estimated ADT Increase per Year	270
		Estimated Growth Rate	2%
		10 Year Truck ADT	1,168
		20 Year Truck ADT	1,330
		10 Year Design ESAL	1,686,981
		20 Year Design ESAL	3,841,846

REQUIRED STRUCTURAL NUMBER			
Design Period	LOG(Design ESAL)	LOG(Calculated ESAL)	Required S_N
10	6.23	6.23	3.6
20	6.58	6.58	4.1

PAVEMENT SECTIONS			
Asphalt Base: 10-Year Design Life	a_1	Thickness (in)	Calculated S_N
Surface	0.44	1.90	0.836
Intermediate	0.44	1.90	0.836
Asphalt Base, Type A, B, C	0.34	5.7	1.938
None	0	0.0	0.00
None	0	0	0
		Design Structural Number	3.61
		10 year check	ok
		20 year check	too thin
Asphalt Base: 20-Year Design Life	a_1	Thickness (in)	Calculated S_N
Surface	0.44	1.90	0.836
Intermediate	0.44	1.90	0.836
Surface/Intermediate over 4 inches	0.34	1.9	0.646
Asphalt Base, Type A, B, C	0.34	5.7	1.938
None	0	0	0
		Design Structural Number	4.26
		10 year check	ok
		20 year check	ok

COMMENTS

Prepared by	AQF		
Checked by	TCS		
Date	10/06/22	Sheet Rev	Nov-16