Geotechnical Engineering Report

Potter Road and Pleasant Plains Road Intersection
Stallings, North Carolina

December 9, 2013
Terracon Project No. 71135046

Prepared for:
Kimley-Horn & Associates
Charlotte, North Carolina

Prepared by:
Terracon Consultants, Inc.
Charlotte, North Carolina

December 9, 2013

Terracon

Kimley-Horn & Associates
2000 South Boulevard
Charlotte, North Carolina 28203

Attn: Mr. Benjamin Taylor, P.E.
P: [704] 319 5694
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E: ben.taylor@kimley-horn.com

Re: Geotechnical Engineering Report
Potter Road and Pleasant Plains Road Intersection
Stallings, North Carolina
Terracon Project No. 71135046

Dear Mr. Taylor:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our Individual Project Order Number 10-11-2013, dated October 11, 2013. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of pavement sections 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.

Christopher R. Briggs, P.E.
Project Geotechnical Engineer

Scott A. Saunders, P.E.
Senior Geotechnical Engineer

NORTH CAROLINA PROFESSIONAL SEAL 033901 ENGINEER SCOTT A. SAUNDERS

12-9-13

Enclosures
1xc: Above
1xc: Above via email (PDF)
1xc: File

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EXECUTIVE SUMMARY

This report presents the results of our geotechnical engineering services performed for the proposed intersection improvements at Potter Road and Pleasant Ridge Road located in Stallings, North Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to subsurface soil conditions, earthwork recommendations, and pavement design and construction. Based on the findings of our exploration, the following geotechnical considerations were identified:

- Based on the data obtained from our subsurface exploration, the major geotechnical concern for this site is the undocumented fill up to 3.0 feet deep encountered in Borings B-01 through B-05. Based on our borings, the undocumented fill contains suitable materials in Borings B-02 through B-05. As such, we believe removing the existing fill materials and replacing with common borrow will not be necessary in the vicinity of these borings.

- Undocumented fill soils consisting of fat clays (CH) were encountered in Boring B-01. To reduce the potential for degradation of the pavement subgrade over time, we recommend undercutting these CH soils to a depth of 2 feet below the proposed pavement subgrade elevation beneath proposed new pavement sections. Additionally, the CH soils encountered should not be used as fill soils within 2 feet of proposed embankments or pavement subgrade elevations.

- Lean clays (CL) were encountered in Boring B-03. These soils may be difficult to work as they are moisture sensitive. Some undercutting should be anticipated if site work is performed during seasons of high precipitation. These soils may be encountered also in areas not explored in this investigation. We recommend that the contractor be requested to submit a unit rate cost for undercutting as part of the bidding process.

- For most of the existing pavement sections along Potter Road and Pleasant Plains Road, we understand that the proposed grades will be increased approximately 5 inches or more. We recommend extending the life of the pavement in these areas by overlaying with new asphalt concrete. The existing surface areas should be examined and repaired as necessary prior to applying a new surface course. In addition, we recommend placing a reflective crack control layer, consisting of a chip seal or paving fabric, on the repaired surface along Pleasant Plains Road prior to placing the surface course.

- In areas where the proposed pavement grades will be raised by less than 3 inches, we recommend extending the life of the pavement by milling and overlaying. These pavement areas should include milling the existing asphalt concrete surface to a depth of 1 inch and replacing with 3 inches of new asphalt concrete surface course material.

The milled surface areas should be examined and repaired as necessary prior to applying a new surface course. In addition, we recommend placing a reflective crack control layer, consisting of a chip seal or paving fabric, on the milled and repaired surface along Pleasant Plains Road prior to placing the surface course.

- New and overlay flexible pavement recommendations are provided in the Pavement Recommendations section of this report.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
POTTER ROAD AND PLEASANT PLAINS ROAD INTERSECTION
STALLINGS, NORTH CAROLINA

Terracon Project No. 71135046
December 9, 2013

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed intersection improvements at Potter Road and Pleasant Plains Road located in Stallings, North Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Earthwork recommendations
- Pavement design and construction

Our geotechnical engineering scope of work for this project included the advancement of 5 borings (B-1 through B-5) to depths of 14.8 to 18.9 feet below existing grades, and 5 asphalt cores (C-1 through C-5) taken in the existing pavement. A log of the borings along with a *Site Vicinity Map* and *Boring Location Diagram* are included in Appendix A of this report. A description of the field exploration is also included in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Description

Item	Description
Location	This project is located at the intersection of Potter Rd. and Pleasant Plains Road in Stallings, North Carolina.
Existing conditions	Existing roadway intersection, with adjacent developed and undeveloped properties
Current ground cover	Existing asphalt roads, drives and parking areas, and some grass areas.
Existing topography	In general, the project site topography ranges from relatively flat areas along existing roadway.

2.2 Project Description

Item	Description
Site layout	Refer to the Boring Location Diagrams (Exhibits A-2 through A-7, Appendix A).
Proposed Development	The project consists of the widening of Potter Road northbound and southbound and the widening of Pleasant Road eastbound and westbound.
Grading	Site grading is assumed to range from 1 to 3 feet of fill. Existing pavement sections are planned to be raised about 5 inches or more.
Traffic Data	Annual Average Daily Traffic (AADT) 2012 Potter Road = 11,000 Pleasant Plains Road = 4,200 % Duals = 1.5 (assumed) % TTST = 1.5 (assumed) Growth (%) = 1.5 (assumed)

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The project site is located in the Piedmont Physiographic Province, an area underlain by ancient igneous and metamorphic rocks. The residual soils in this area are the product of in-place chemical weathering of rock. The typical residual soil profile consists of clayey and silty soils near the surface where soil weathering is more advanced, underlain by sandy silts and silty sands that generally become harder with depth to the top of parent bedrock. Alluvial soils are typically present within floodplain areas along creeks and rivers in the Piedmont. According to the 1985 Geologic Map of North Carolina, the site is within the Charlotte Belt. The bedrock underlying the site generally appears to consist of granodiorite and related granitoids.

The boundary between soil and rock in the Piedmont is not sharply defined. A transitional zone termed "partially weathered rock" is normally found overlying the parent bedrock. Partially weathered rock is defined for engineering purposes as residual material with standard penetration test resistance's exceeding 100 blows per foot. The transition between hard/dense residual soils and partially weathered rock occurs at irregular depths due to variations in degree of weathering.

Groundwater is typically present in fractures within the partially weathered rock or underlying bedrock in the Piedmont. Fluctuations in groundwater levels on the order of 2 to 4 feet are typical in residual soils and partially weathered rock in the Piedmont, depending on variations in precipitation, evaporation, and surface water runoff. However, the magnitude of seasonal fluctuations and the high groundwater table have not been determined for this site. Seasonal high groundwater levels are expected to occur during or just after the typically cooler months of the year (November through April).

3.2 Subsurface Conditions

A generalized description of the soils encountered in the borings is provided in the following paragraphs. Specific conditions encountered at the boring locations are indicated on the boring logs in Appendix A. Stratification boundaries on the boring log represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

Undocumented fill materials were encountered in Borings B-01 through B-05. The fill material extends to depths of approximately 1 to 3 feet below the existing ground surface. The fill materials generally consisted of sandy fat clay, silty sand and clayey sand, which generally classify as CH, SM and SC, respectively, in accordance with the Unified Soils Classification System (USCS). Standard Penetration Resistances values (N-values) in the sands ranged from 5 to 15 blows per foot (bpf), indicating a loose to medium dense relative density. N-values in the clays were 11 bpf, indicating a stiff consistency.

Residual soils were encountered below the fill in each of the borings. The residual soils generally consist of sandy lean clay and silty sand, which classify as CL and SM, respectively, in accordance with the USCS. N-values in the clays ranged from 15 to 19 bpf, indicating a very stiff consistency. N-values in the sands ranged from 3 to 21 bpf, indicating a very loose to medium dense relative density.

Partially weathered rock (PWR) was encountered below the residual soils in Borings B-01 and B-04 at depths of approximately 14.5 and 18.5 feet below existing grade, respectively. PWR is defined, for engineering purposes, as decomposed to highly weathered rock with N-values in excess of 100 bpf. Auger refusal was not encountered in the borings.

3.3 Pavement Conditions

The following table is a summary of the information with respect to the cores performed for this project.

Core Number	Asphalt Thickness (in)	Concrete Thickness (in)	ABC Stone Thickness (in)	Approximate Location [1]
HA-01	6	--	--	Potter Rd. Sta. 101+50, 9 ft right
HA-02	6	--	--	Potter Rd. Sta. 111+80, 15 ft left

Core Number	Asphalt Thickness (in)	Concrete Thickness (in)	ABC Stone Thickness (in)	Approximate Location [1]
HA-03	7	6	--	Pleasant Plains Rd. Sta. 203+00, 6 ft right
HA-04	6	6	--	Pleasant Plains Rd. Sta. 207+10, 11 ft left
HA-05	5	6	--	Pleasant Plains Rd. Sta. 214+00, 5 ft left

1. Stations and offsets are based on the proposed alignment, shown on plans provided by Kimley Horn and Associates.

Although an aggregate base material (ABC Stone) was not encountered beneath the existing pavement sections, a sandy subgrade material was encountered beneath the existing pavement sections along Potter Road (HA-01 and HA-02). This sandy material typically provides an improved pavement subgrade when compared to fine-grained soils (silts and clays) that are typical in the Piedmont region.

Terracon performed a general visual pavement condition survey at coring locations using distress descriptions as provide in the “NCDOT 2010 Pavement Condition Survey Manual”. The purpose of the pavement condition survey was to make a preliminary determination of the types, severity and limits of distress in order to establish the existing condition of the pavement and to determine appropriate recommendations for pavement rehabilitation or reconstruction.

In general, the pavement appeared to be in relatively fair to good condition. Significant rutting was present in the northbound and southbound lanes of Potter Road leading up to the intersection. Minor rutting and light to moderate transverse cracking was present along Pleasant Plains Road. Suspected reflective cracking is also present along Pleasant Plains Road due to the existing concrete pavement section underlying the asphalt section. Light alligator cracking was present along the outside wheel path of the westbound lane of Pleasant Plains Road, which may indicate the horizontal limits of the existing concrete pavement underlying the asphalt pavement along this road.

The following table provides a summary of the general visual pavement distress survey at each boring location.

Core Number	Approximate Location [1]	General Description – Type and Severity of Distress
HA-01	Potter Rd. Sta. 101+50, 9 ft. right	Some light transverse cracking. Light patching along the southbound lane in this area. Moderate to severe rutting observed within 200 feet of the intersection.
HA-02	Potter Rd. Sta. 111+80, 15 ft left	Some light transverse cracking. Moderate to severe rutting observed within 200 feet of the intersection.

Core Number	Approximate Location [1]	General Description – Type and Severity of Distress
HA-03	Pleasant Plains Rd. Sta. 203+00, 6 ft right	Some light alligator and transverse cracking. Suspected reflective cracking due to existing Portland Cement Concrete (PCC) pavement below asphalt concrete surface.
HA-04	Pleasant Plains Rd. Sta. 207+10, 11 ft left	Some light alligator cracking and light to moderate transverse cracking. Suspected reflective cracking due to existing PCC pavement below asphalt concrete surface. Moderate to severe alligator cracking (edge) along the corners of the intersection.
HA-05	Pleasant Plains Rd. Sta. 214+00, 5 ft left	Some light alligator cracking and light to moderate transverse cracking. Suspected reflective cracking due to existing PCC pavement below asphalt concrete surface. Moderate to severe alligator cracking (edge) along the corners of the intersection.

1. Stations and offsets are based on the proposed alignment, shown on plans provided by Kimley Horn and Associates.

Photographs of typical conditions observed are provided in Appendix A.

3.4 Groundwater Conditions

Groundwater was observed in Borings B-01 and B-04 at depths of 12.5 and 16 feet below existing grades, respectively. The boreholes were backfilled at the termination of exploration, making subsequent water level readings unobtainable.

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 boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS

4.1 Geotechnical Considerations

Based on the data obtained from our subsurface exploration, a major geotechnical concern for this site is the undocumented fill up to 3 feet deep encountered in Borings B-01 through B-05. Based on our borings, the undocumented fill contains suitable materials. As such, we believe removing the existing fill materials and replacing with common borrow will not be necessary. However, we do recommend bench cutting the existing embankment side slopes to reduce the potential for slippage between existing slopes and newly placed fill. Benches should be wide enough to accommodate compaction and earth moving equipment and to allow placement of horizontal lifts of fill.

Fat clays (CH) were encountered in Boring B-01. To reduce the potential for degradation of the pavement subgrade over time, we recommend undercutting these CH soils to a depth of 2 feet below the proposed pavement subgrade elevation beneath proposed new pavement sections. The approximate limits of the recommended undercut are approximately from Potter Road Sta. 101+50 to 103+50, and should extend at least 3 feet outside the horizontal limits of the pavement structure. Additionally, the CH soils encountered should not be used as fill soils within 2 feet of proposed embankments or pavement subgrade elevations.

Lean clays (CL) were encountered in Boring B-03. These soils may be difficult to work as they are moisture sensitive. Some undercutting should be anticipated if site work is performed during seasons of high precipitation; however, undercutting of the existing in situ CL soils does not appear necessary if these soils are prepared and appear stable during construction as described in the Earthwork section of this report. These soils may be encountered also in areas not explored in this investigation. We recommend that the contractor be requested to submit a unit rate cost for undercutting as part of the bidding process.

4.2 Earthwork

4.2.1 Site Preparation

Prepare existing ground for embankment construction according to Section 235 of the 2012 North Carolina Department Of Transportation (NCDOT) Standard Specifications. Site preparation should begin with the demolition of existing structures, pavements, sidewalks, curb and gutter, and other items proposed for removal. Existing utilities that are to be abandoned should be removed or filled with grout. The excavations resulting from utility removal and foundation demolition should be properly backfilled with compacted structural fill as described in the Earthwork section of this report. Utilities that are to remain in service should be accurately located horizontally and vertically to minimize conflict with new roadway construction.

Existing pavement, vegetation, topsoil, demolition debris, and any otherwise unsuitable material should be removed from the construction areas prior to placing fill. Based on borings B-01 through B-05, up to 3 feet of existing fill material was encountered. Based on our borings, the undocumented fill contains suitable materials, with the exception of the fat clays (CH soils) encountered in Boring B-01. As such, we believe removing the existing fill materials and replacing with common borrow will not be necessary in Borings B-02 through B-05. The fat clays encountered in Boring B-01 should be undercut to a depth of 2 feet below the proposed pavement subgrade elevation. Additionally, we do recommend bench cutting the existing embankment side slopes to reduce the potential for slippage between existing slopes and newly placed fill. Benches should be wide enough to accommodate compaction and earth moving equipment and to allow placement of horizontal lifts of fill.

Based on the borings, moisture condition of the samples, and estimated final subgrade elevation, with the exception of the fat clays encountered in Boring B-01, we do not anticipate that significant undercutting of near-surface soils will be required.

4.2.2 Fill Materials

Common borrow for embankment construction to subgrade shall meet the Statewide Criteria outlined in the 2012 NCDOT Standard Specifications, Section 1018. With the exception of the topsoil and rootmat, the natural soils encountered in our borings can generally be reused as common borrow; however, the fat clays (CH soils) encountered in Boring B-01 are not acceptable as common borrow within the top two feet of embankments or backfill.

4.2.3 Fill Placement

Embankments should be constructed in accordance with 2012 NCDOT Standard Specifications, Section 235. In addition, the exposed subgrade soils in areas to receive fill or at the subgrade elevation in cut areas should be proofrolled to detect soft or loose soils and identify unsuitable or poorly compacted fill. Proofrolling should be performed with a fully-loaded, tandem-axle dump truck or similar pneumatic-tired construction equipment. A Terracon geotechnical engineer or their representative should observe this operation to aid in delineating unstable soil areas. Proofrolling should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade. Soils which continue to rut or deflect excessively under the proofrolling operations should be remediated as recommended by the geotechnical engineer.

We recommend that embankment materials be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Compact each layer in accordance with 2012 NCDOT Standard Specifications, Subarticle 235-3(C). In addition, embankment materials should meet the following compaction requirements:

Item	Description
Fill Lift Thickness	8 to 10 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose thickness when hand-guided equipment (e.g. jumping jack or plate compactor) is used.
Minimum Compaction Requirements	Minimum 95% of the materials maximum Standard Proctor dry density (AASHTO T99)

Item	Description
Moisture Content Requirements	Within 3% of the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction

4.2.4 Construction Considerations

The on-site soils exposed at the subgrade elevation are anticipated to be relatively stable upon initial exposure; however, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. Should unstable subgrade conditions develop, stabilization measures will need to be employed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to pavement construction.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation and just prior to construction of pavements.

4.2.5 Excavations

The upper 14.5 to 18.5 feet of soils encountered at the boring locations may be excavated with conventional construction equipment, such as bulldozers, backhoes, and trackhoes. All excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations may be required during grading operations. The grading contractor is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

4.3 Pavement Recommendations

The design analyses for new and existing pavements were conducted in accordance with the "NCDOT Interim Pavement Design Procedure", dated April 1, 2000 and modifications dated November 2007. The following sections detail the information utilized in our analyses and provides recommendations for construction of new pavements and rehabilitation of existing pavements.

4.3.1 Traffic Loads

Location	Design	ADT[1] (2012)	Analysis Period (years)	Traffic Data[2]			
				% Growth	% Dir	% Dual	% TTST
Potter Road	New	11,000	20	1.5	50	1.5	1.5
Potter Road	Rehabilitation	11,000	10	1.5	50	1.5	1.5
Pleasant Plains Road	New	4,200	20	1.5	50	1.5	1.5
Pleasant Plains Road	Rehabilitation	4,200	10	1.5	50	1.5	1.5

1. ADT obtained from the NCDOT 2012 County Annual Average Daily Traffic Maps for Union County.
2. Growth rate, %Dual and %TTST not available. Values were estimated based on our experience with similar projects.

4.3.2 Subgrade Support

Laboratory test results indicate a California Bearing Ratio (CBR) value of about 4, which was used to determine the required structural numbers for new pavement design in the areas of the road widening. Dynamic Cone Penetrometer (DCP) test results generally indicate in situ CBR values of 3 to greater than 20. Based on the DCP data and soils encountered beneath the pavement sections, CBR values of 9 and 6 were chosen to determine the required structural numbers for overlay design of existing pavements along Potter Road and Pleasant Plains Road, respectively. We recommend conducting Dynamic Cone Penetrometer (DCP) testing or additional CBR tests on the finished subgrade materials to verify the design CBR values.

Site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction and corrective action will be required. The subgrade should be carefully evaluated at the time of pavement construction for signs of disturbance or excessive rutting. If disturbance has occurred, pavement subgrade areas should be reworked, moisture conditioned, and properly compacted to the recommendations in this report immediately prior to paving.

4.3.3 New Pavement Design

Following the stripping of deleterious materials, we recommend the proposed pavement subgrade for new pavement construction be prepared and compacted in accordance with the recommendations provided in the Earthwork section of this report. Proofrolling and recompacting of the upper 1-foot of subgrade is recommended immediately prior to stone base placement. Soft or unstable areas delineated by the proofrolling operations should be undercut or stabilized in-place to achieve the appropriate subgrade support. Potential areas for encountering unsuitable or unstable soils are the in the vicinity of drainage features and in the low lying areas of the site.

The following table presents the recommended minimum thicknesses for new flexible pavement for the widening areas at Potter Road and Pleasant Plains Road.

Material	NCDOT Grading	Pavement Section Potter Road (inches)		Pavement Section Pleasant Plains Road (inches)	
		Alternative 1	Alternative 2	Alternative 1	Alternative 2
Asphalt Concrete Surface	S-9.5B	3	3	3	3
Asphalt Concrete Base	I-19.0B	4	4	4	4
Asphalt Base Course	B-25.0B	5	--	3	--
Aggregate Base Course	ABC	--	10	--	6

4.3.4 Rehabilitation Design

We understand that the existing portions of Potter Road and Pleasant Plains Road will be overlaid to tie into the existing and proposed pavement. Based on our visual observation of the pavement, roadway cores, test results and our analyses, it is our opinion that the existing Potter Road pavement is in relatively good condition, and the existing Pleasant Plains Road pavement is in fair condition. Layer coefficients of 0.35 and 0.30 were estimated for the existing Potter Road and Pleasant Plains Road asphalt concrete, respectively, to develop an effective structural number for rehabilitation design. A layer coefficient of 0.30 was estimated for the existing Pleasant Plains Road concrete pavement section based on the approximate age of the concrete.

In areas where the existing pavement grades will be raised by less than 3 inches, we recommend milling 1 inch of existing asphalt pavement and overlaying Potter Road and Pleasant Plains Road with 3 inches of asphalt concrete surface course type S9.5B. In addition, we recommend the placement of a reflective crack control layer, consisting of either a chip seal or a paving fabric (Tensar Glaspave 50 or equivalent), on the milled and repaired surface of Pleasant Plains Road prior to placing the surface course. Chip sealing and paving fabrics will not completely stop reflective cracking from reaching the overlay surface, but should slow the rate that cracks progress. We understand that most of the existing pavement grades along Potter Road and Pleasant Plains Road will be raised by about 5 inches or more. In areas that will include a rise in pavement grades of at least 3 inches or more, milling is not necessary prior to adding a reflective crack control layer and new asphalt concrete.

Additional pre-overlay repairs should include spot reconstructing severely distressed areas and crack sealing. Areas of sever alligator and block cracking should be reconstructed by removing the distressed asphalt concrete and a portion of the subgrade, as necessary, and replacing with the new pavement design section provided in Section 4.3.3. We recommend sealing linear cracks in the existing pavement surface that have an average width of ¼-inch or more with a sand-asphalt mixture or hot-poured elastic sealant. A tack coat should be applied to the entire surface prior to applying the overlay. A chip seal can be applied to the entire surface in lieu of crack sealing and application of a tack coat. Paving fabric should be placed according to the manufacturer's specifications.

4.3.5 Construction Considerations

Materials and construction of pavements should be in accordance with the requirements and specifications of the NCDOT "Standard Specifications for Roads and Structures".

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

Prevention of infiltration of water into the subgrade is essential for the successful performance of any pavement. Both the subgrade and the pavement surface should be sloped to promote surface drainage away from the pavement structure.

Maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, and other construction phases of the project.

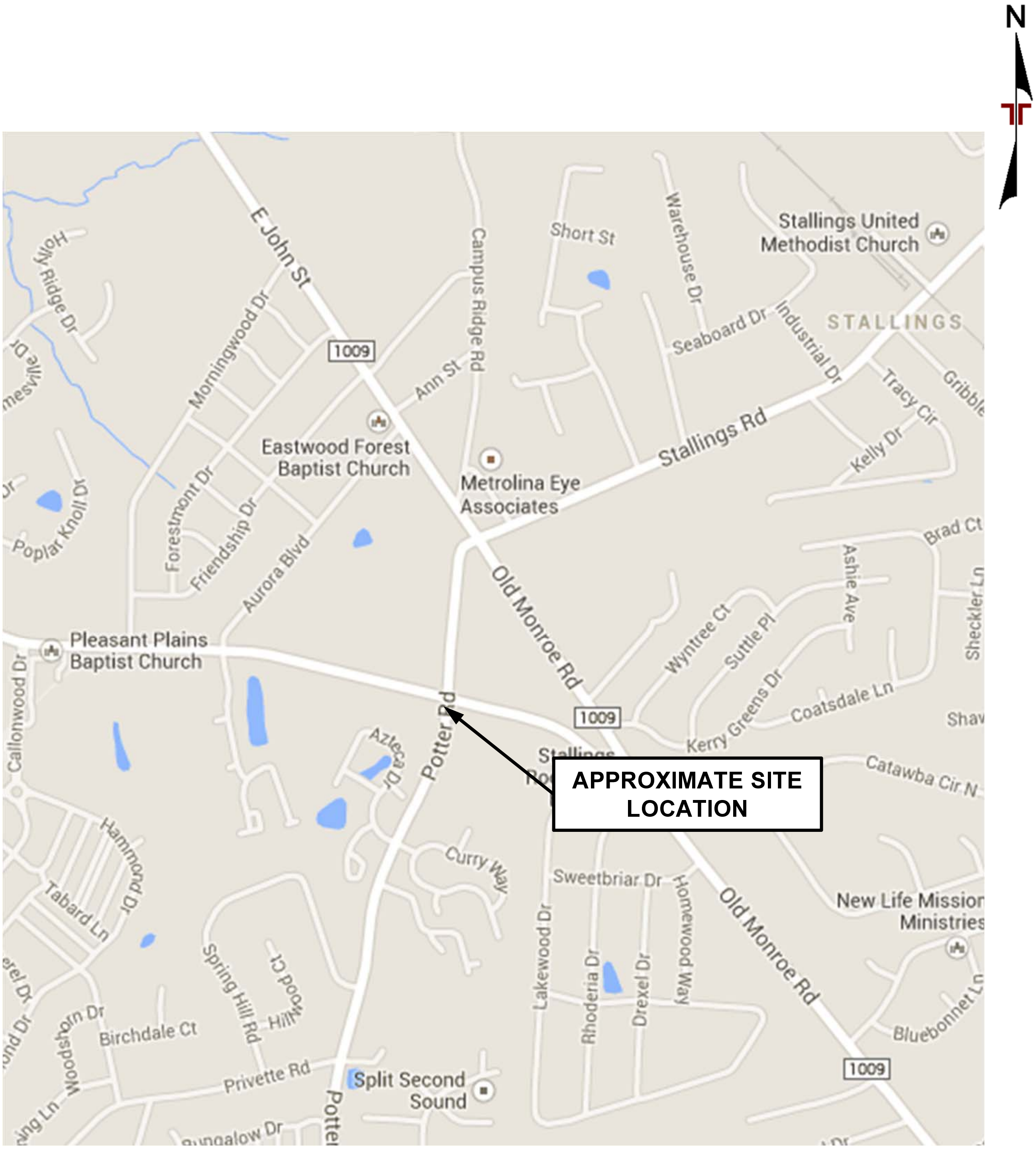
The analysis and recommendations presented in this report are based upon the data obtained from the boring performed at the indicated location and from other information discussed in this report. This report does not reflect variations that may occur across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project 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.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

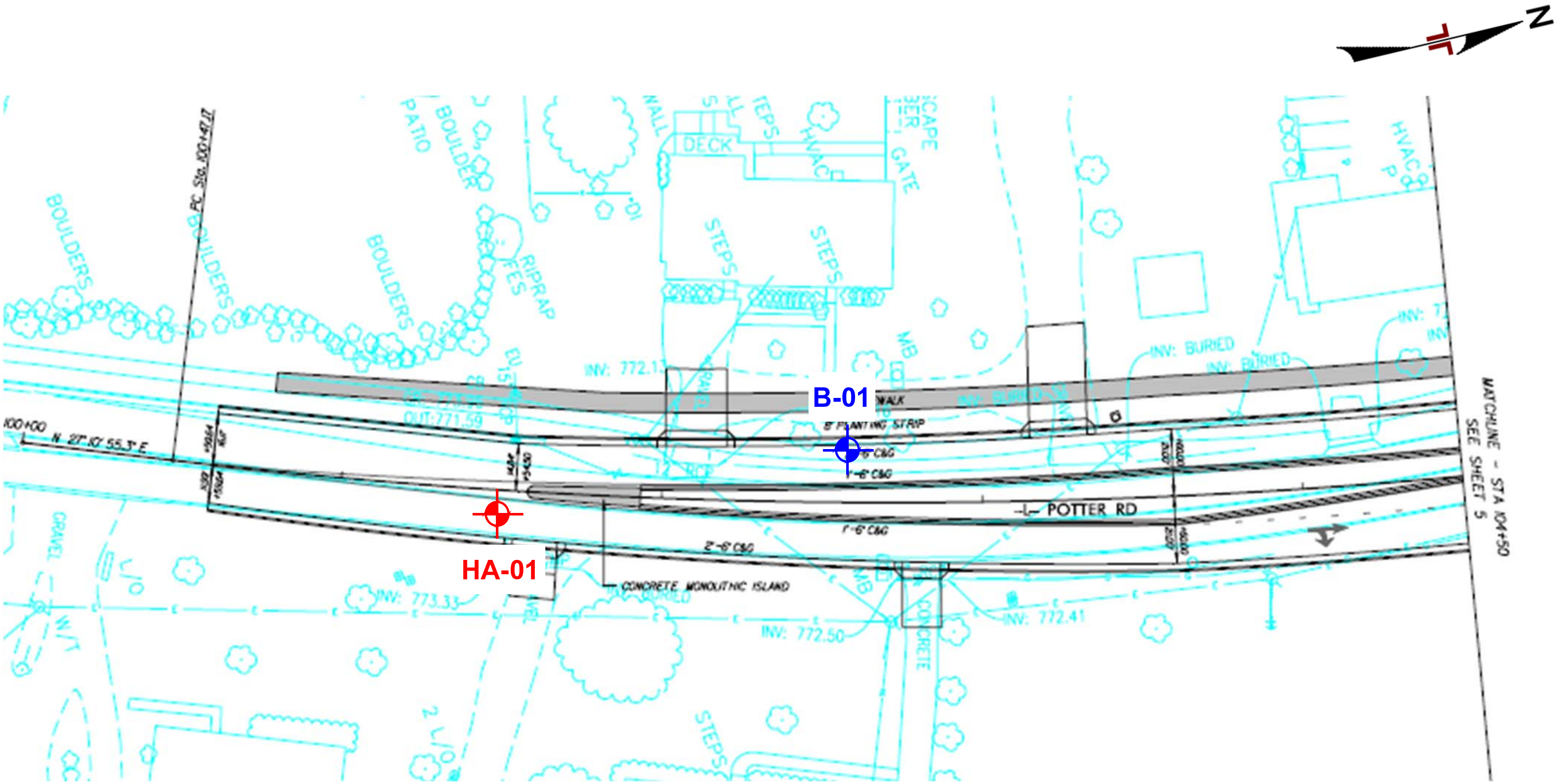
APPENDIX A

FIELD EXPLORATION



MAP IS FOR GENERAL LOCATION ONLY

Project Manager: CRB	Project No. 71135046	Terracon Consulting Engineers & Scientists	SITE VICINITY PLAN	EXB No.
Drawn by: CJH	Scale: N.T.S	2020 Starita Road, Suite E Charlotte, North Carolina 28206	POTTER RD. AND PLEASANT PLAINS RD. IMPROVEMENTS	A-1
Checked by: CRB	File Name: A-1 SVM	PH. (704) 509-1777 FAX. (704) 509-1888	STALLINGS, NORTH CAROLINA	
Approved by: SAS	Date: 12/9/2013			



LEGEND:

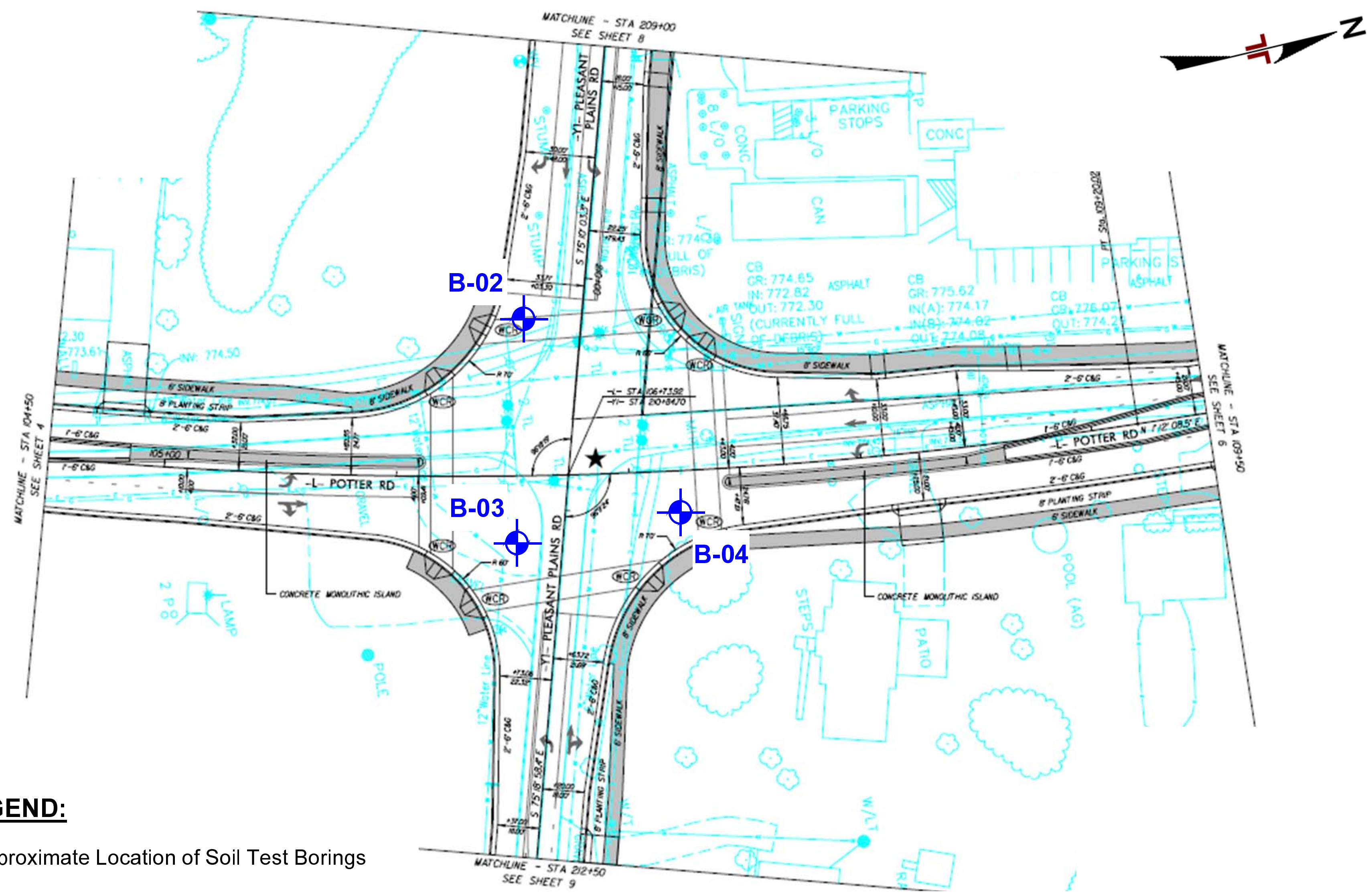
= Approximate Location of Soil Test Borings

= Approximate Location of Asphalt Cores

REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager: CRB	Project No. 71135046	Terracon Consulting Engineers & Scientists	BORING LOCATION PLAN
Drawn by: CRB	Scale: N.T.S.	2020 Starita Road, Suite E Charlotte, North Carolina 28206	POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION
Checked by: SAS	File Name: A-2 BLD	PH. (704) 509-1777 FAX. (704) 509-1888	STALLINGS, NORTH CAROLINA
Approved by: SAS	Date: 12/9/2013		Exhibit A-2



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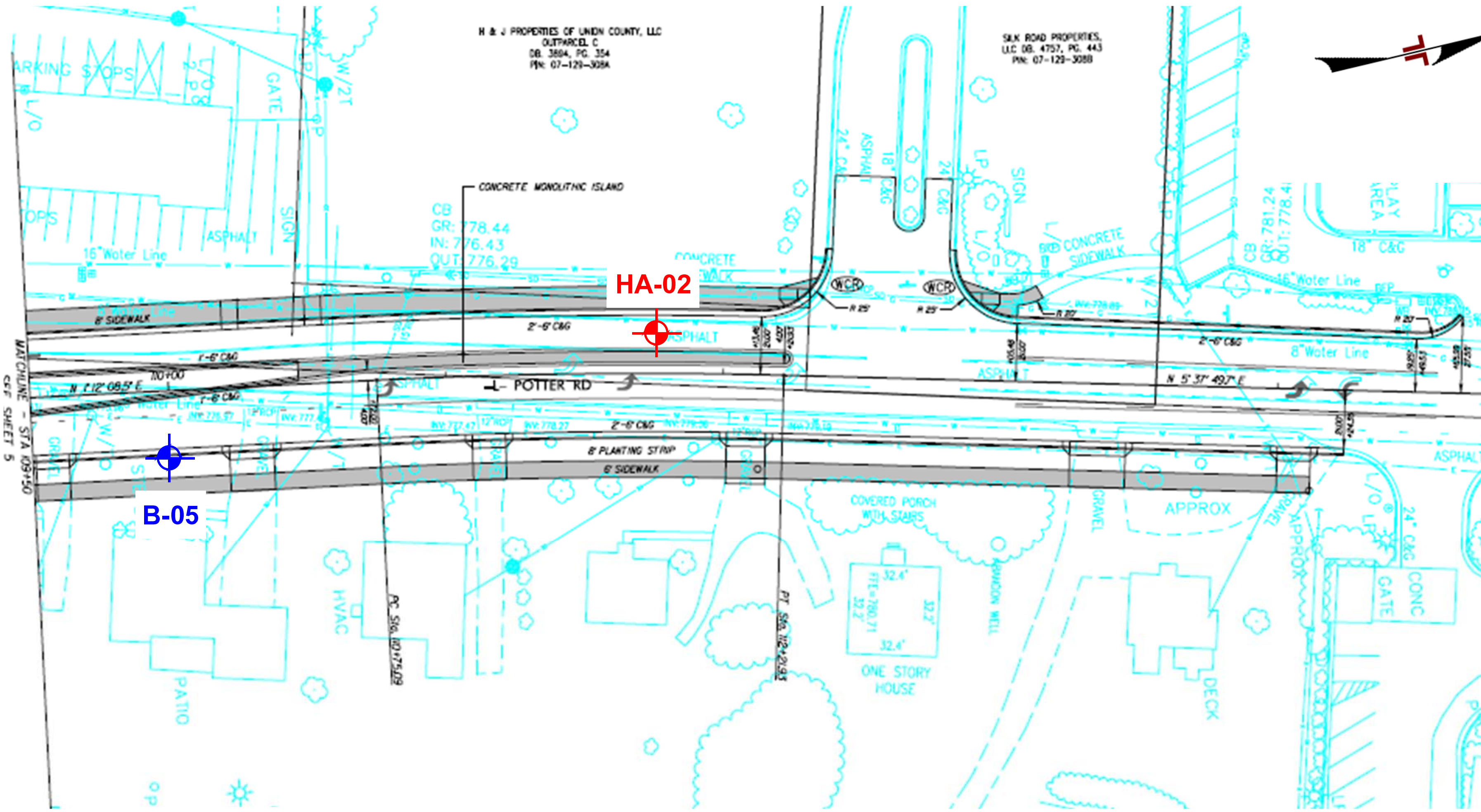
REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager: CRB	Project No. 71135046	Terracon Consulting Engineers & Scientists	BORING LOCATION PLAN
Drawn by: CRB	Scale: N.T.S.	2020 Starita Road, Suite E, Charlotte, North Carolina 28206	POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION
Checked by: SAS	File Name: A-2 BLD	PH. (704) 509-1777 FAX. (704) 509-1888	STALLINGS, NORTH CAROLINA
Approved by: SAS	Date: 12/9/2013		Exhibit A-3



LEGEND:

= Approximate Location of Soil Test Borings

= Approximate Location of Asphalt Cores

REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager: CRB	Project No. 71135046
Drawn by: CRB	Scale: N.T.S.
Checked by: SAS	File Name: A-2 BLD
Approved by: SAS	Date: 12/9/2013

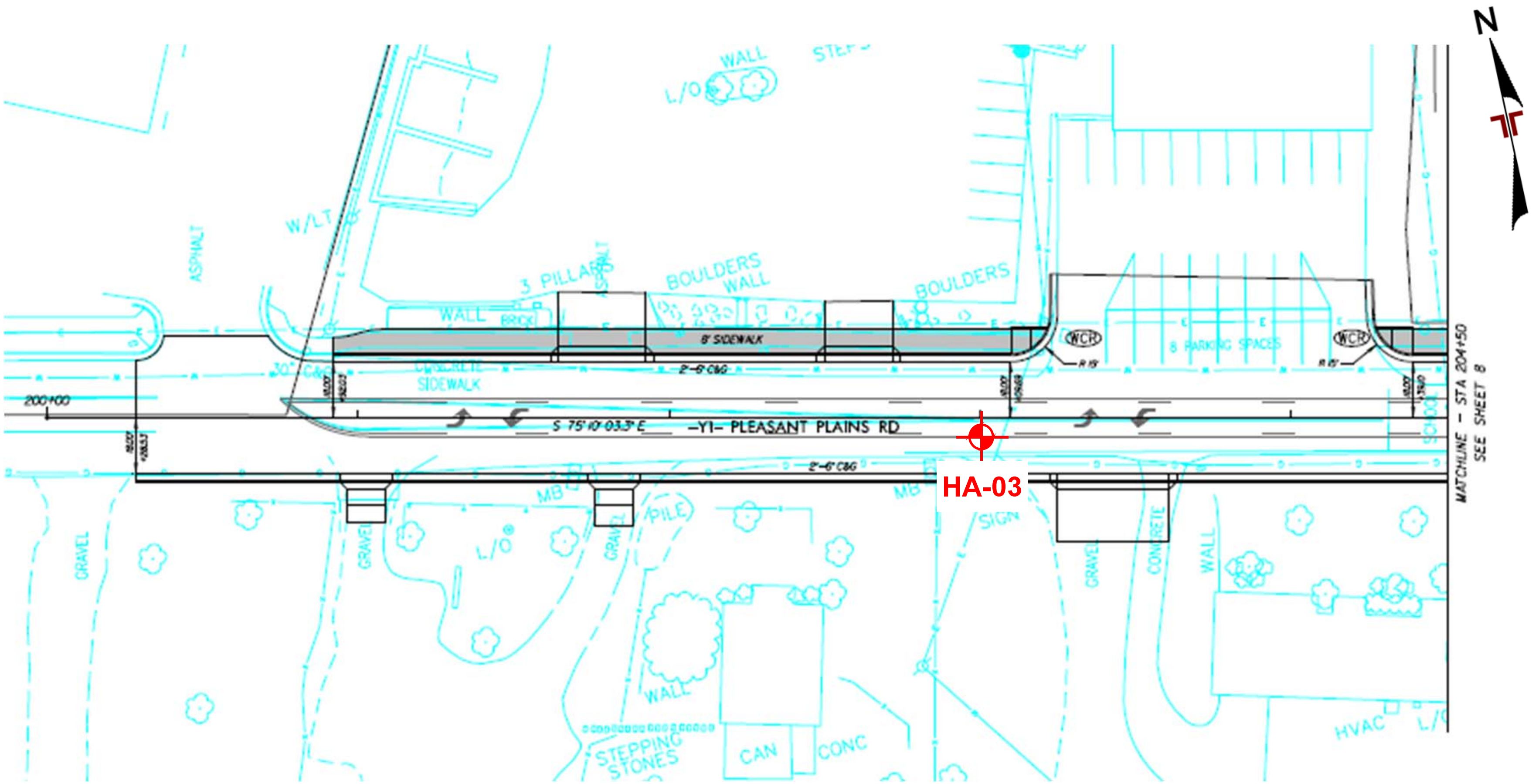
Terracon
Consulting Engineers & Scientists

2020 Starita Road, Suite E Charlotte, North Carolina 28206
PH. (704) 509-1777 FAX. (704) 509-1888

BORING LOCATION PLAN

POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION
STALLINGS, NORTH CAROLINA

Exhibit
A-4



LEGEND:

= Approximate Location of Asphalt Cores

REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager:	CRB	Project No.	71135046
Drawn by:	CRB	Scale:	N.T.S.
Checked by:	SAS	File Name:	A-2 BLD
Approved by:	SAS	Date:	12/9/2013

Terracon
Consulting Engineers & Scientists

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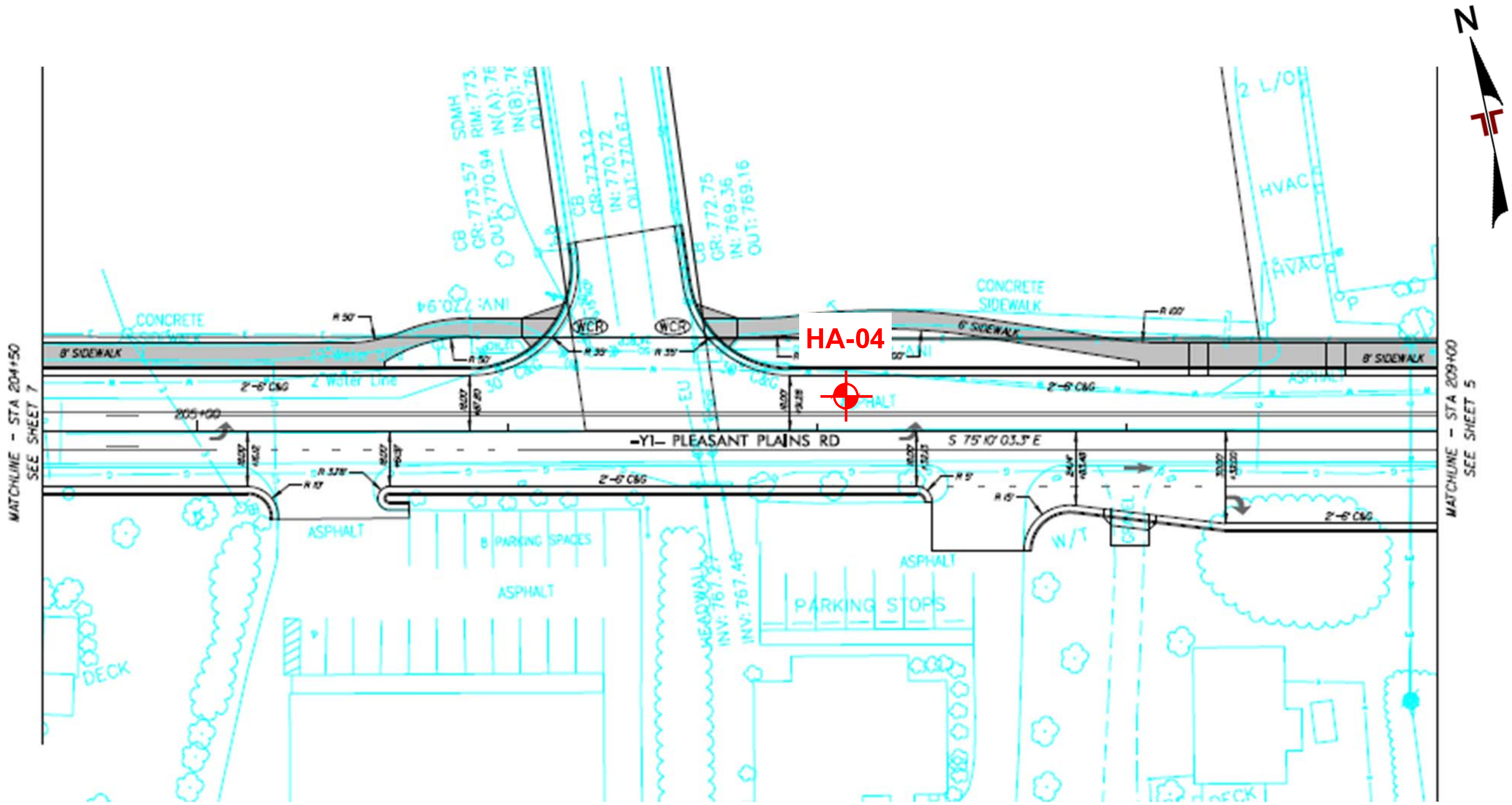
PH. (704) 509-1777 FAX. (704) 509-1888

BORING LOCATION PLAN

POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION
STALLINGS, NORTH CAROLINA

Exhibit
A-5



LEGEND:

= Approximate Location of Asphalt Cores

REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager: CRB	Project No. 71135046	BORING LOCATION PLAN	Exhibit
Drawn by: CRB	Scale: N.T.S.	POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION	A-6
Checked by: SAS	File Name: A-2 BLD	STALLINGS, NORTH CAROLINA	
Approved by: SAS	Date: 12/9/2013		

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Consulting Engineers & Scientists
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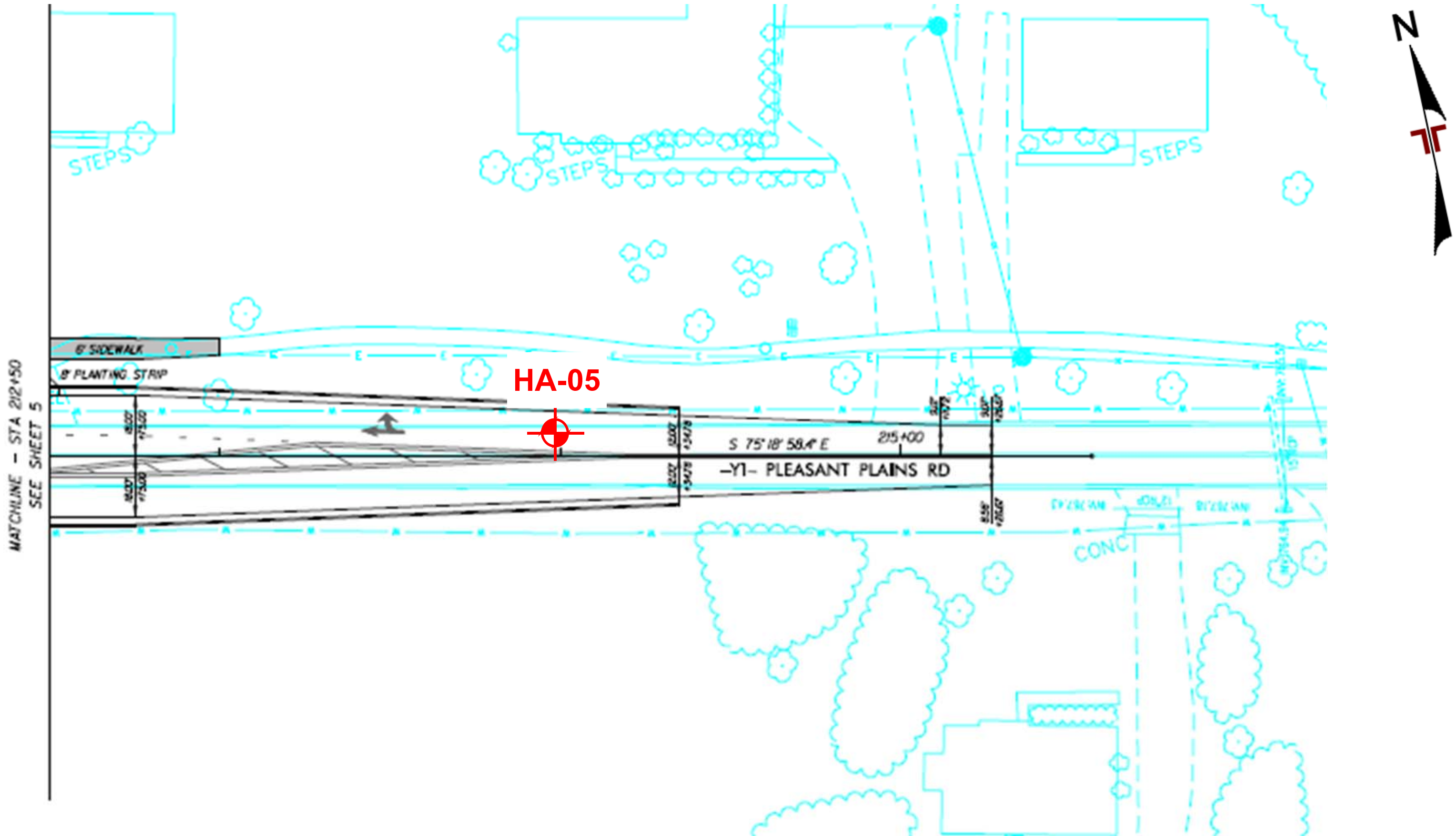
PH. (704) 509-1777 FAX. (704) 509-1888



LEGEND:

= Approximate Location of Asphalt Cores

REFERENCE: Roadway plan sheets 4 through 9, provided by Kimley Horn and Associates.

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

Project Manager: CRB	Project No. 71135046	Terracon Consulting Engineers & Scientists	BORING LOCATION PLAN	Exhibit
Drawn by: CRB	Scale: N.T.S.	2020 Starita Road, Suite E, Charlotte, North Carolina 28206	POTTER RD. AND PLEASANT PLAINS RD. INTERSECTION	A-7
Checked by: SAS	File Name: A-2 BLD	PH. (704) 509-1777 FAX. (704) 509-1888	STALLINGS, NORTH CAROLINA	
Approved by: SAS	Date: 12/9/2013			

Field Exploration Description

The boring locations were located in the field by measuring distances and estimating right angles from site features. The borings were drilled with a truck-mounted rotary drill rig using hollow stem augers to advance the borehole. Samples of the soil encountered in the borings were obtained using the split-barrel sampling procedure.

In the split barrel sampling procedure, the number of blows required to advance a standard 2 inch O.D. split barrel sampler the last 12 inches of the typical total 18 inch penetration by means of a 140 pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the boring performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value.

The soil samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring log attached to this report includes soil descriptions, consistency evaluations, boring depth, sampling intervals, and groundwater conditions. The boring was backfilled with auger cuttings prior to the drill crew leaving the site.

A field log of the boring was prepared by the drill crew. This log included visual classifications of the materials encountered during drilling as well as the driller’s interpretation of the subsurface conditions between samples. The final boring log included with this report represents the engineer's interpretation of the field log and includes modifications based on laboratory observation and tests of the samples.

Our exploration services include storing the collected soil samples and making them available for inspection for 60 days from the report date. The samples will then be discarded unless requested otherwise.

BORING LOG NO. B-1

PROJECT: Potter Road and Pleasant Ridge Road Intersection

CLIENT: Kimley Horn and Associattes Charlotte, North Carolina

SITE: Potter and Pleasant Ridge Roads Stallings, North Carolina

LOCATION -L- Station 102+60 (15' left)

GRAPHIC LOG	DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - SANDY FAT CLAY (CH), fine to medium grained, Tan and Light Brown, stiff			X	4-5-6 N=11	24		54-26-28	66
	3.0	**SILTY SAND (SM)**, fine to medium grained, Tan Orange and Gray, very loose to medium dense			X	4-4-6 N=10				
			5		X	2-1-2 N=3				
					X	2-1-2 N=3				
			10	▽						
	14.5				X	8-12-50/4" N=50/4"				
	14.8	**PARTIALLY WEATHERED ROCK**								
		Boring Terminated at 14.8 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:
Cave In at 13.5'

WATER LEVEL OBSERVATIONS

▽ *@ 12.5' below ground*

Terracon
2020-E Starita Road
Charlotte, North Carolina

Boring Started: 10/25/2013	Boring Completed: 10/25/2013
Drill Rig: CME-55	Driller: Ameridrill
Project No.: 71135046	Exhibit: A-9

BORING LOG NO. B-2

PROJECT: Potter Road and Pleasant Ridge Road Intersection

CLIENT: Kimley Horn and Associattes Charlotte, North Carolina

SITE: Potter and Pleasant Ridge Roads Stallings, North Carolina

GRAPHIC LOG	LOCATION -Y1- Station 210+20 (~24' right) DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SILTY SAND (SM), fine to medium grained, tan and light brown, Medium Dense								
	1.0 **SILTY SAND (SM)**, fine to medium grained, tan, orange and gray, Very Loose to to Medium Dense			X	4-5-6 N=11	25			
		5		X	5-5-8 N=13	25			
				X	2-3-4 N=7				
		10		X	2-1-2 N=3				
				X	2-2-4 N=6				
	15.0 ***Boring Terminated at 15 Feet***	15							

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:
Dry Cave In at 13'

WATER LEVEL OBSERVATIONS

Not Encountered

Terracon
2020-E Starita Road
Charlotte, North Carolina

Boring Started: 10/25/2013	Boring Completed: 10/25/2013
Drill Rig: CME-55	Driller: Ameridrill
Project No.: 71135046	Exhibit: A-10

BORING LOG NO. B-3

PROJECT: Potter Road and Pleasant Ridge Road Intersection

CLIENT: Kimley Horn and Associattes
Charlotte, North Carolina

SITE: Potter and Pleasant Ridge Roads
Stallings, North Carolina

LOCATION -Y1- Station 211+10 (22' right)

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**FILL - SILTY SAND (SM)**, fine to medium grained, tan and light brown, Medium Dense								
	SANDY LEAN CLAY (CL), fine to medium grained, tan, very stiff			X	5-8-7 N=15	12			
5.0	Bulk Sample collected from 0'-5' deep.	5		X	7-8-11 N=19	9		35-19-16	81
	SILTY SAND (SM), fine to medium grained, tan, orange and gray, Medium Dense			X	4-5-9 N=14				
		10		X	4-8-9 N=17				
15.0		15		X	7-10-10 N=20				
	Boring Terminated at 15 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:
Dry Cave In at 11.5'

WATER LEVEL OBSERVATIONS
Not Encountered

Terracon
2020-E Starita Road
Charlotte, North Carolina

Boring Started: 10/25/2013	Boring Completed: 10/25/2013
Drill Rig: CME-55	Driller: Ameridrill
Project No.: 71135046	Exhibit: A-11

BORING LOG NO. B-4

PROJECT: Potter Road and Pleasant Ridge Road Intersection

CLIENT: Kimley Horn and Associattes Charlotte, North Carolina

SITE: Potter and Pleasant Ridge Roads Stallings, North Carolina

LOCATION -L- Station 107+20 (~20' right)

GRAPHIC LOG	DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - SILTY SAND (SM), fine to medium grained, tan and light brown, Medium Dense, with crushed stone			X	5-6-6 N=12				
	3.0	**SILTY SAND (SM)**, fine to medium grained, tan, orange and gray, Very Loose to to Medium Dense			X	5-8-12 N=20	20			
			5		X	6-8-8 N=16				
			10		X	4-4-6 N=10				
			15	▽	X	2-1-2 N=3				
	18.5	**PARTIALLY WEATHERED ROCK**			X	50/5" N=50/5"				
	18.9	***Boring Terminated at 18.9 Feet***								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:
Cave In at 17'

WATER LEVEL OBSERVATIONS

▽ *@16' below ground*

Terracon
2020-E Starita Road
Charlotte, North Carolina

Boring Started: 10/25/2013	Boring Completed: 10/25/2013
Drill Rig: CME-55	Driller: Ameridrill
Project No.: 71135046	Exhibit: A-12

BORING LOG NO. B-5

PROJECT: Potter Road and Pleasant Ridge Road Intersection

CLIENT: Kimley Horn and Associattes Charlotte, North Carolina

SITE: Potter and Pleasant Ridge Roads Stallings, North Carolina

LOCATION -L- Station 110+00 (24' right)

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - CLAYEY SAND (SC), fine to medium grained, tan and light brown, Loose			X	3-2-3 N=5	18		48-23-25	49
	3.0	**SILTY SAND (SM)**, fine to medium grained, tan, orange and gray, Loose to Medium Dense			X	3-4-5 N=9				
			5		X	11-10-11 N=21				
					X	4-7-10 N=17				
			10							
					X	2-2-4 N=6				
	15.0	***Boring Terminated at 15 Feet***	15							

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:
Dry Cave In at 13'

WATER LEVEL OBSERVATIONS

Not Encountered

Terracon
2020-E Starita Road
Charlotte, North Carolina

Boring Started: 10/25/2013	Boring Completed: 10/25/2013
Drill Rig: CME-55	Driller: Ameridrill
Project No.: 71135046	Exhibit: A-13

Exhibit A-14: Photographs of Potter Road near pavement core HA-01

Exhibit A-15: Photographs of Potter Road near pavement core HA-02

Exhibit A-16: Photograph of Pleasant Plains Road near pavement core HA-04

Exhibit A-17: Photograph of Moderate Rutting along Potter Road south of the Intersection

Exhibit A-18: Photograph of Moderate Rutting along Potter Road north of the Intersection

Exhibit A-19: Photograph of Moderate Rutting and Alligator Cracking (Edge) along Potter Road near the Intersection

Exhibit A-20: Photograph of pavement core HA-01. Core HA-02 similar in condition and thickness.

Exhibit A-21: Photograph of pavement core HA-03. Core HA-04 similar in condition and thickness.

Exhibit A-22: Photograph of pavement core HA-05

APPENDIX B

LABORATORY TESTING

Laboratory Testing Description and Results

The following laboratory tests were performed on select soil samples for this project: in-situ moisture content, Atterberg Limits, wash no. 200 sieve tests, standard Proctor, and California Bearing Ratio (CBR) tests. The results of most of these tests are summarized in the following tables. Some of the laboratory test results are shown on the boring logs at the sample depths.

The following table summarizes the in-situ moisture content, wash No. 200 sieve tests, and Atterberg Limits test results. These results are also shown on the boring logs in Appendix A.

Sample Location, Depth	In-situ Moisture Content (%)	% Passing the No. 200 Sieve	Liquid Limit, (%)	Plastic Limit, (%)	Plasticity Index, (%)
B-01, 1'-2.5'	23.5	65.6	54	26	28
B-02, 1'-2.5'	25.3	-	-	-	-
B-02, 3.5'-5'	25.1	-	-	-	-
B-03, 0'-5'	8.5	80.5	35	19	16
B-03, 1'-2.5'	12.0	-	-	-	-
B-04, 3.5'-5'	19.9	-	-	-	-
B-05, 1'-2.5'	17.6	48.8	48	23	25
HA-02, 1'-2'	9.1	28.7	NP [1]	NP	NP
HA-03, 1.1'-2.1'	11.5	46.5	NP	NP	NP
HA-04, 2'-3'	16.6	-	-	-	-
HA-05, 0.9'-1.5'	15.2	-	-	-	-

1. NP = Not Plastic

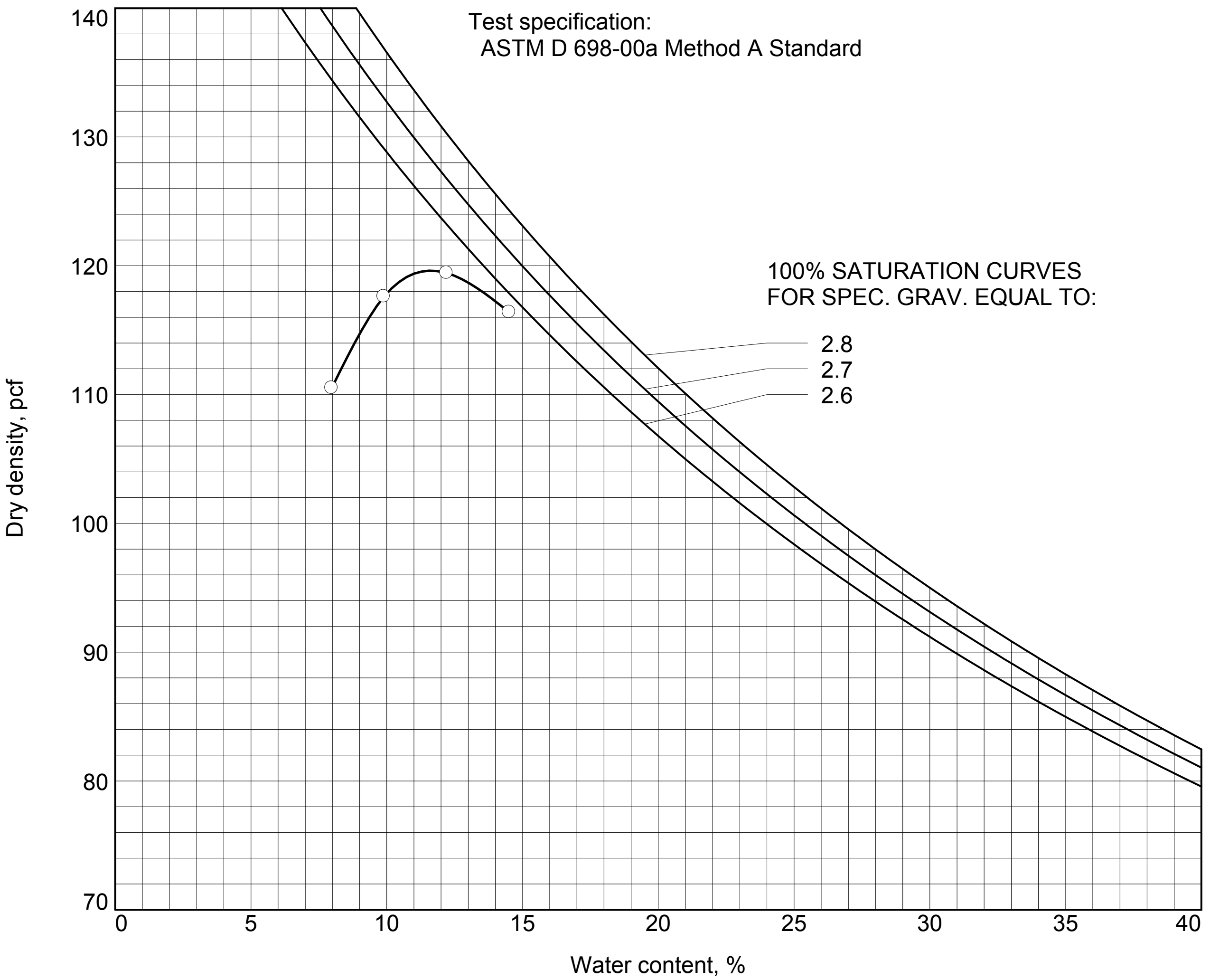
The following table summarizes the standard Proctor test results. The plots of the standard Proctor tests are included in Appendix B.

Sample Location, Depth	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
Boring B-03, 0'-5'	119.6	11.6

The following table summarizes the California Bearing Ratio test results. The plots of these test results are included in Appendix B.

Sample Location, Depth	Compaction %	CBR
Boring B-03, 0'-5'	98.2	4.3

COMPACTION TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	ELEV./ DEPTH	USCS	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	MAXIMUM DRY DENSITY pcf	OPTIMUM MOISTURE CONTENT (%)
○		B-3	0' to 5'	CL	8.5	19	35	119.6	11.6

WPC A Terracon COMPANY

Client: Kimley-Horn and Associates, Inc.

Project: Potter Rd.

Project No.: 71135046 **Exhibit:** B-02

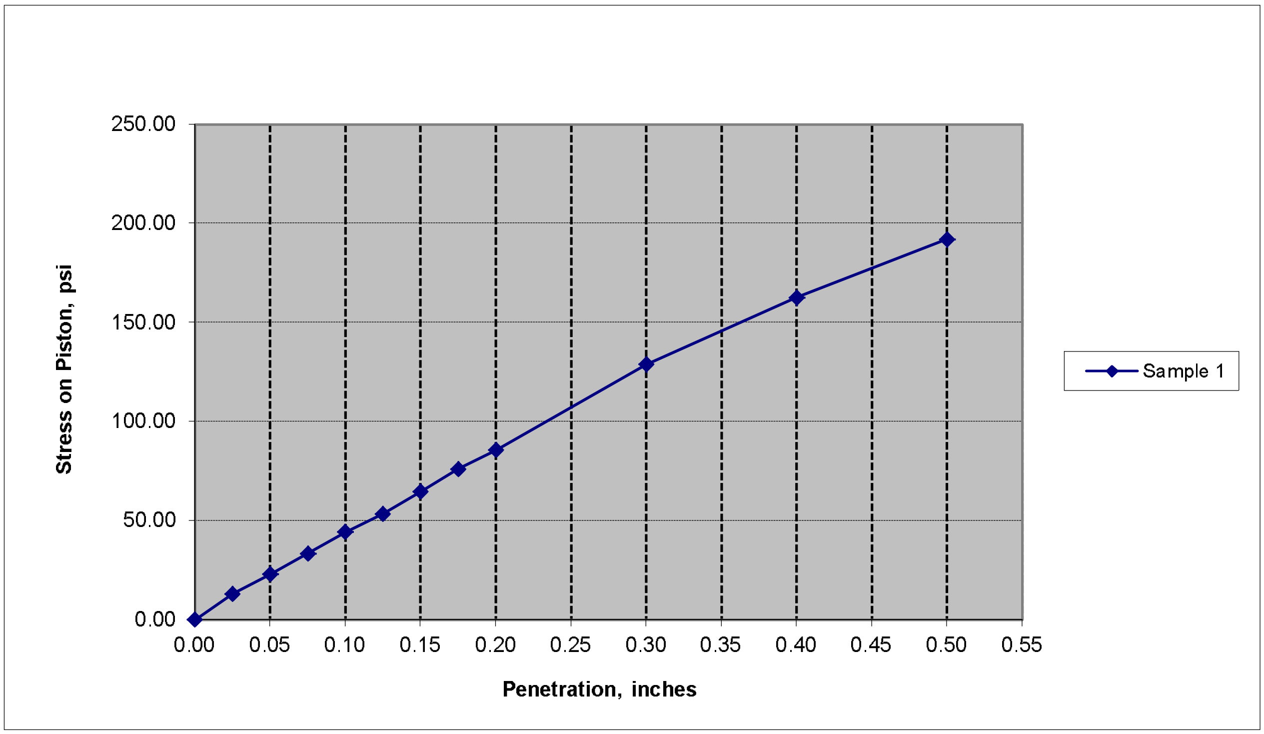
California Bearing Ratio (CBR) Test

ASTM D 1883

Project:	Potter Rd - Pleasant Plains Rd Int.	Project No.:	71135046
Sample:	Boring B-03 at 0'-5'	Date:	11/22/2013
Client:	Kimley-Horn and Associates, Inc.	Engineer:	CRB

Sample Description: Tan fine to medium sandy clay — Soaked

LAB ID#: B-56



Sample No.		1	
Maximum Dry Density, (pcf)		119.6	
Optimum Moisture Content, (%)		11.6	
Dry Density before Soaking, (pcf)		117.5	
Degree of Compaction, (%)		98.2	
Dry Density after Soaking, (pcf)		120.8	
Moisture Content, (%)			
Before Compaction		-	
After Compaction		11.8	
Top 1" After Soaking		-	
Average After Soaking		13.0	
Surcharge, (lbs)		10	
Swell, (%)		2.2	
Bearing Ratio (%)		4.4	
Corrected Bearing Ratio, (%)		4.3	

EXHIBIT B-3

APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	Split Spoon
Shelby Tube	Macro Core
Ring Sampler	Rock Core
Grab Sample	No Recovery

WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: 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]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [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]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [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" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K,L,M,N]
					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 / Liquid limit - not dried < 0.75	OH	Organic clay [K,L,M,P]
					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] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.

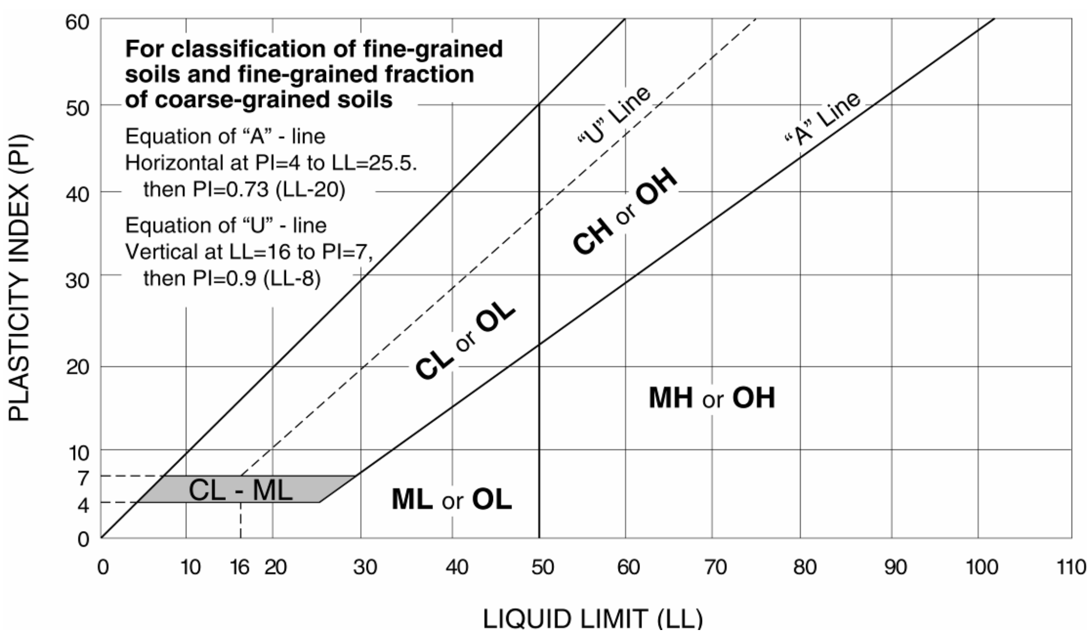
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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.



Terracon

Exhibit C-2

APPENDIX D

DESIGN DOCUMENTS

DCP TEST DATA

File Name: 71135046 - DCP HA-01

Project: *Potter Rd. - Pleasant Plains Rd.*
Location: HA-01 (Potter Rd. Sta. 101+50)

Date: 27-Nov-13
Soil Type(s): SP-SM

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	37	1
1	62	1
1	78	1
1	97	1
1	106	1
1	119	1
1	129	1
3	154	1
3	179	1
3	205	1
3	230	1
4	256	1
5	281	1
5	306	1
6	335	1
4	360	1
3	386	1
2	408	1
2	437	1
1	456	1
1	481	1
1	510	1
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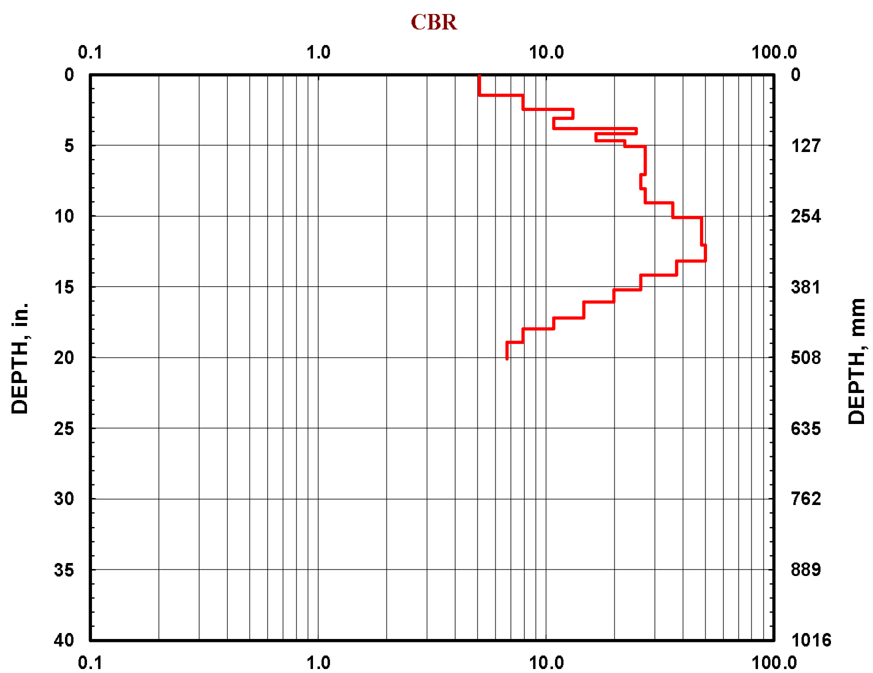

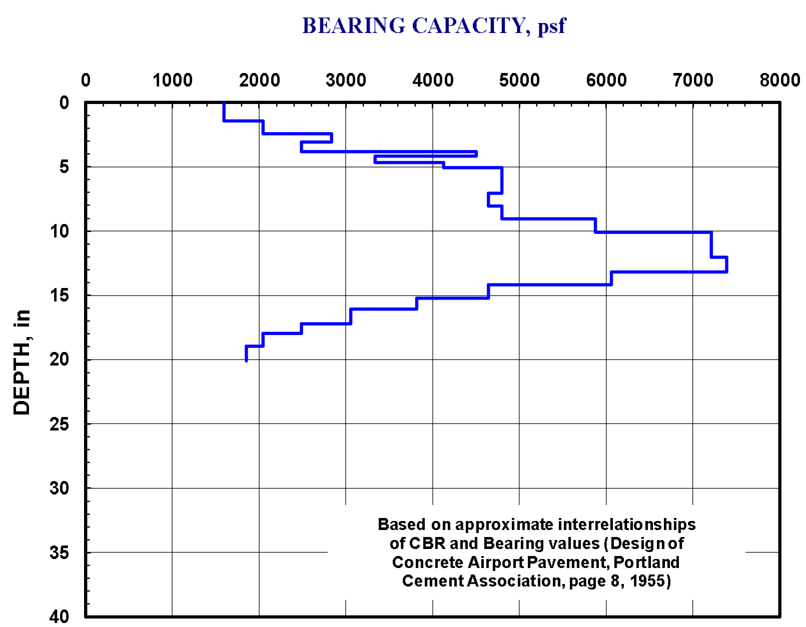

DCP TEST DATA

File Name: 71135046 - DCP HA-02

Project: *Potter Rd. - Pleasant Plains Rd.*
Date: 27-Nov-13
Location: HA-02 (Potter Rd. Sta. 111+80)
Soil Type(s): SP-SM

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	25	1
5	51	1
9	76	1
16	102	1
9	127	1
10	152	1
8	178	1
7	203	1
5	229	1
2	254	1
2	318	1
2	349	1
2	381	1
2	406	1
2	432	1
2	457	1
2	483	1
3	508	1
3	533	1
3	559	1
2	591	1
2	610	1
2	635	1
2	660	1
2	692	1
2	718	1
2	743	1
2	772	1
2	797	1
2	822	1
2	848	1
2	876	1
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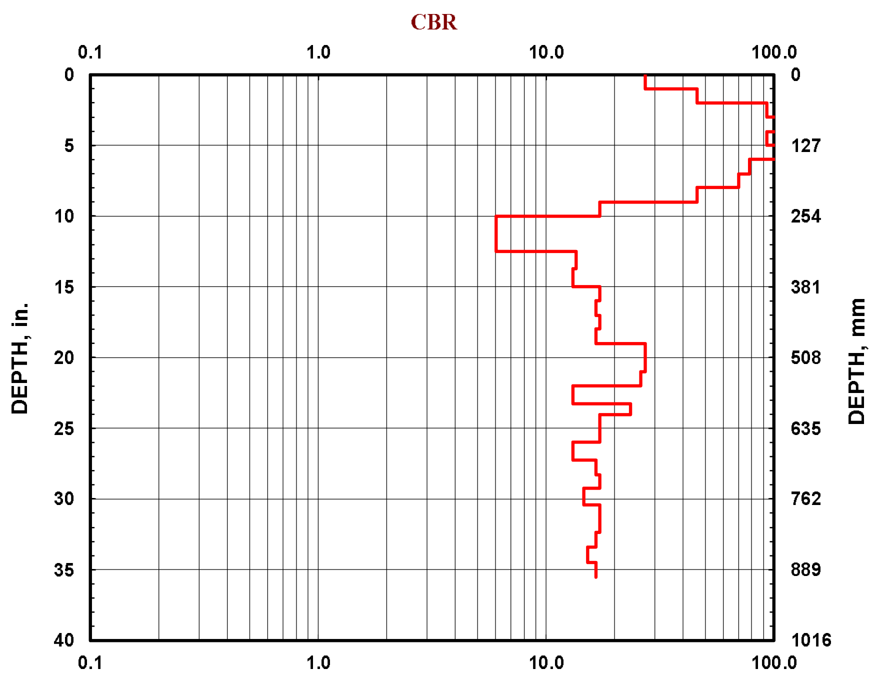

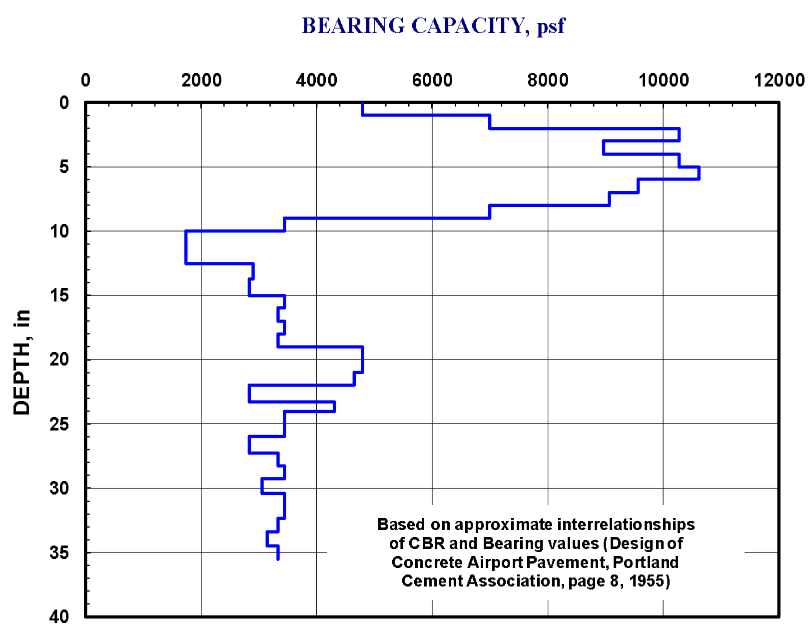

DCP TEST DATA

File Name: 71135046 - DCP HA-03

Project: *Potter Rd. - Pleasant Plains Rd.*
Date: 27-Nov-13
Location: HA-03 (Pleasant Rd. Sta. 203+00)
Soil Type(s): SC

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	25	1
2	29	1
2	54	1
2	114	1
2	152	1
1	168	1
2	197	1
2	225	1
2	257	1
2	283	1
2	314	1
2	340	1
2	365	1
2	391	1
2	413	1
2	435	1
3	460	1
4	486	1
5	514	1
7	537	1
3	543	1
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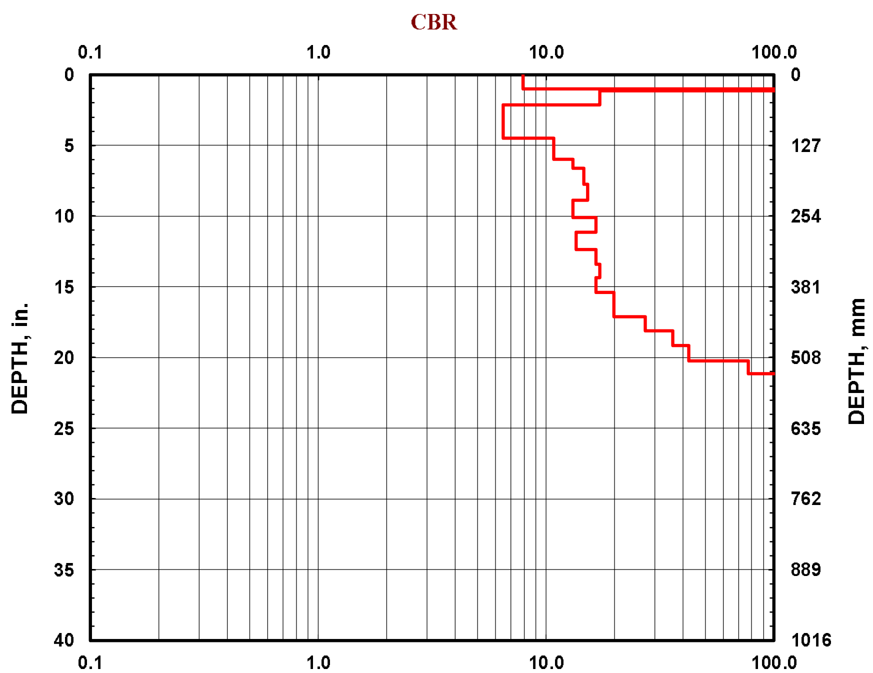

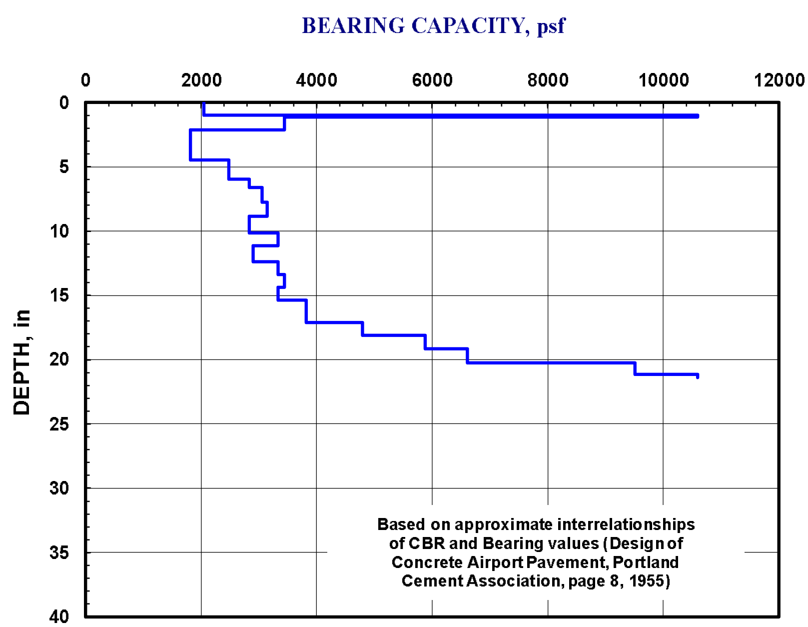

DCP TEST DATA

File Name: 71135046 - DCP HA-04

Project: *Potter Rd. - Pleasant Plains Rd.*
Date: 27-Nov-13
Location: HA-04 (Pleasant Rd. Sta. 207+10)
Soil Type(s): CL

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ● CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
2	32	1
2	70	1
1	95	1
3	124	1
4	146	1
4	171	1
4	200	1
2	222	1
1	241	1
1	267	1
1	302	1
1	337	1
1	365	1
1	406	1
1	435	1
1	470	1
1	508	1
1	568	1
1	629	1
1	683	1
1	730	1
1	775	1
1	813	1
1	854	1
1	899	1
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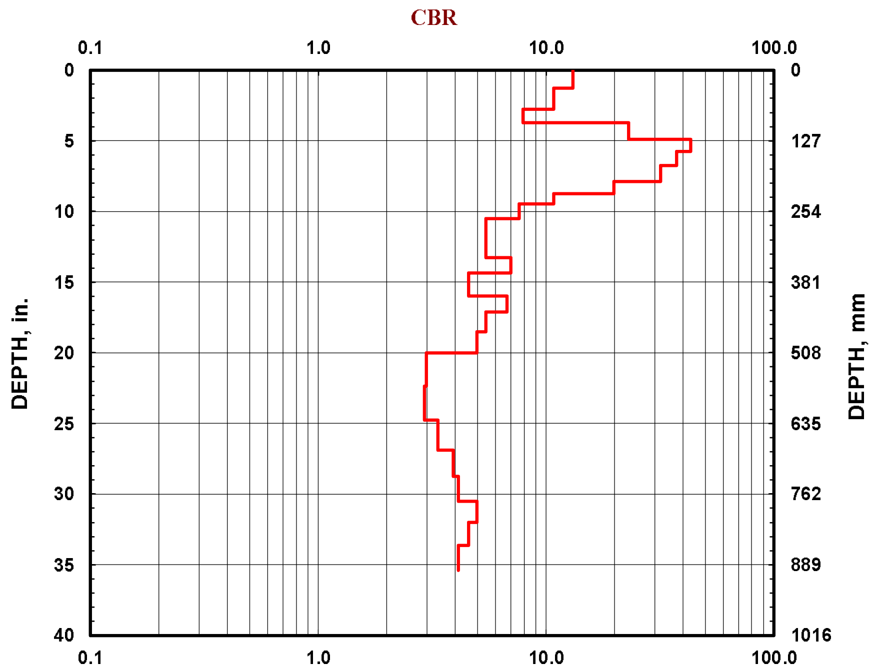

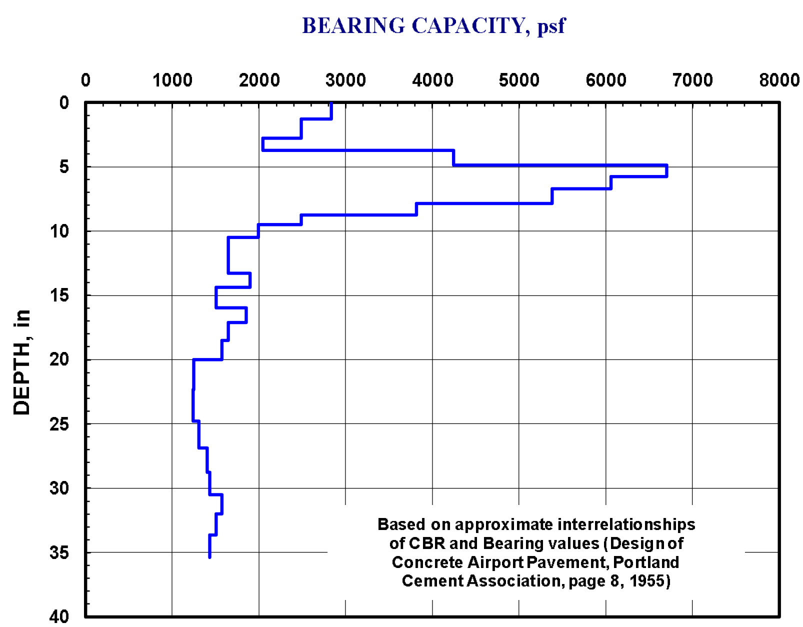

DCP TEST DATA

File Name: 71135046 - DCP HA-05A

Project: *Potter Rd. - Pleasant Plains Rd.*
Location: HA-05 (Pleasant Rd. Sta. 214+00)

Date: 27-Nov-13
Soil Type(s): ML

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	25	1
3	51	1
8	76	1
10	102	1
9	127	1
8	152	1
13	178	1
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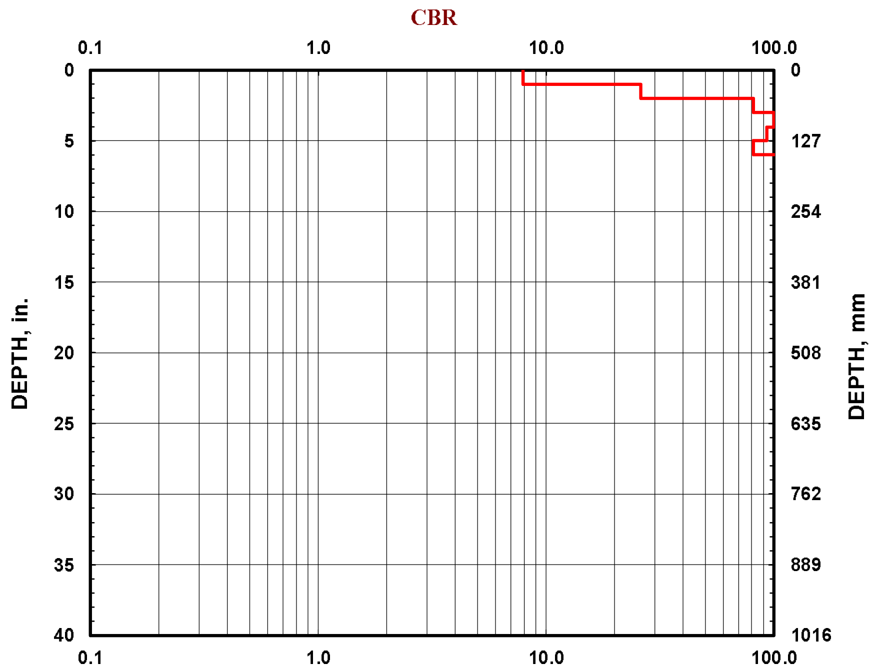

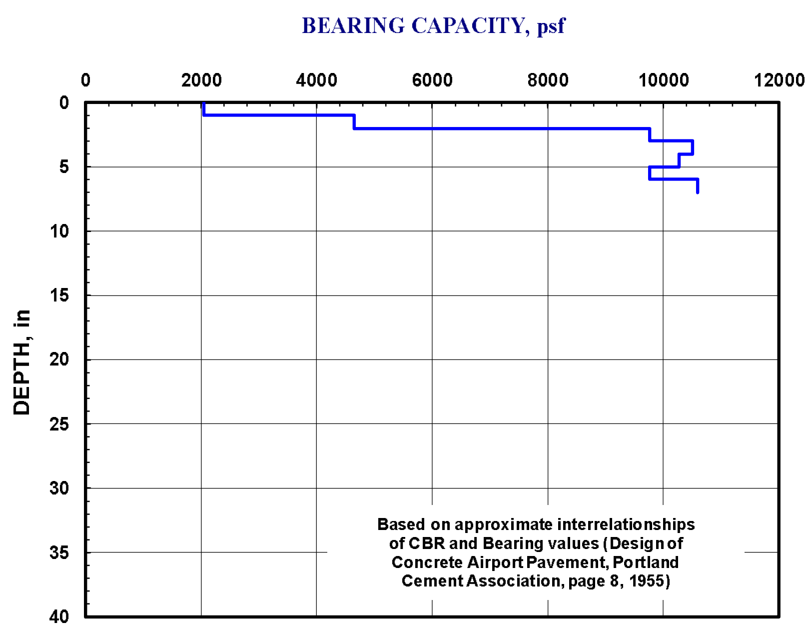

DCP TEST DATA

File Name: 71135046 - DCP HA-05B

Project: *Potter Rd. - Pleasant Plains Rd.*
Date: 27-Nov-13
Location: HA-05 (Pleasant Rd. Sta. 214+00)
Soil Type(s): ML

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	25	1
4	51	1
7	76	1
8	102	1
7	127	1
7	152	1
7	178	1
8	200	1
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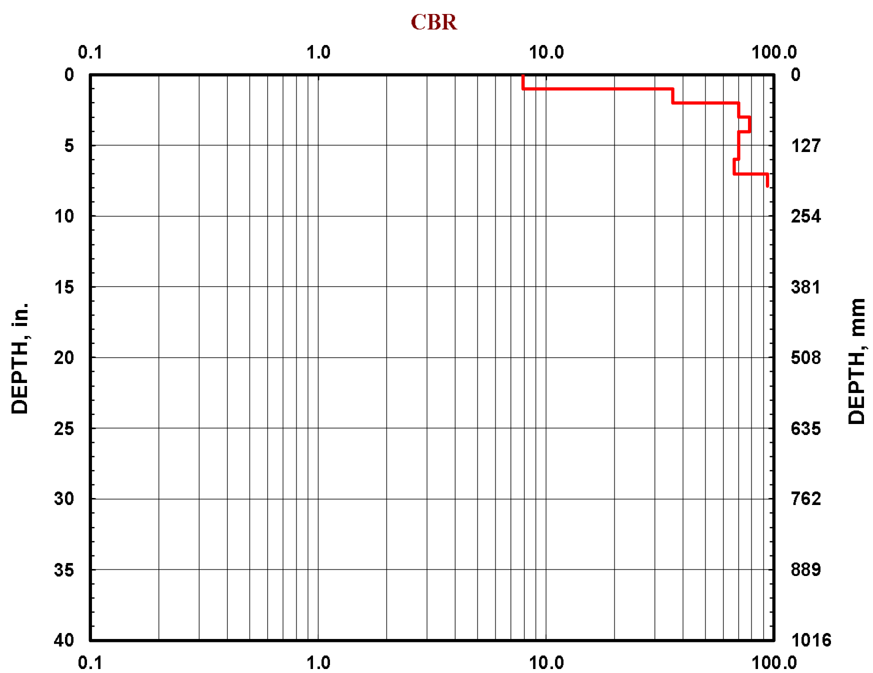

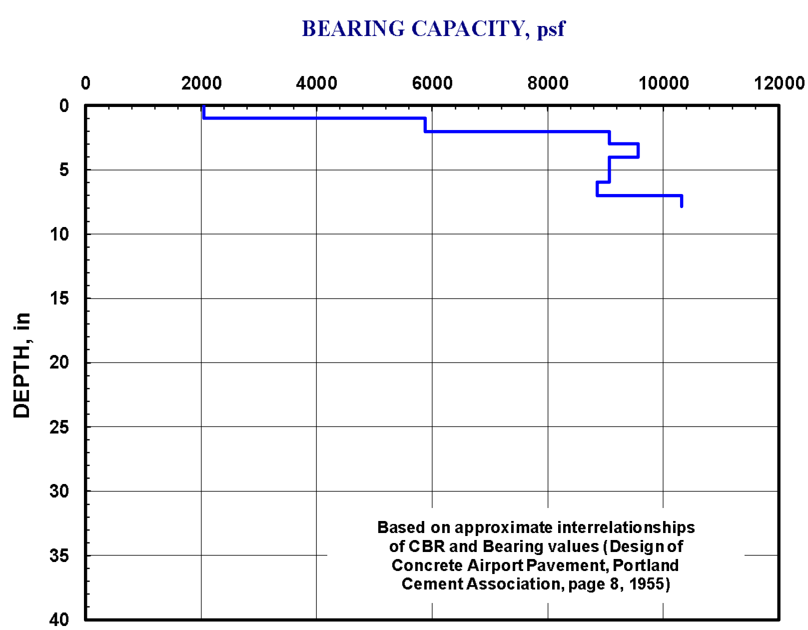

Project Description:	Potter Road and Pleasant Plains Road Intersection
	Route: Potter Road from Jody Drive to Old Monroe Road
	County: Union — Division: 10
	Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	11,000	Proj. Yr. ADT:	17,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	20
Constr. Year ADT:	11,346	20 YEAR ADT=	15,462
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	105	TOTAL 18K:	**764,987**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	20	Years	20
Total TTST ESALs	0	Total Dual ESALs	0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	1.71	CBR:	4
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	105	Total 18K:	764,987
Required SN:	4.49	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
4	I19.0B	0.44	1.76
5	B25.0B	0.30	1.5
		SN =	4.58
		Req'd =	4.49

Project Description:	Potter Road and Pleasant Plains Road Intersection		
	Route: Potter Road from Jody Drive to Old Monroe Road		
	County: Union		Division: 10
	Date: 12/9/2013		

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	11,000	Proj. Yr. ADT:	17,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	20
Constr. Year ADT:	11,346	20 YEAR ADT=	15,462
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	105	TOTAL 18K:	**764,987**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	20	Years	20
Total TTST ESALs	0	Total Dual ESALs	0
	0		0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	1.71	CBR:	4
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	105	Total 18K:	764,987
Required SN:	4.48	Seed Check:	OK

Alternative 2

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
4	I19.0B	0.44	1.76
10	ABC	0.14	1.4
		SN =	4.48
		Req'd =	4.48

Project Description: Potter Road and Pleasant Plains Road Intersection
Route: Potter Road from Jody Drive to Old Monroe Road - Overlay (< 3")
County: Union Division: 10
Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	11,000	Proj. Yr. ADT:	17,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	10
Constr. Year ADT:	11,346	10 YEAR ADT=	13,245
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	97	TOTAL 18K:	**352,953**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	10	Years	10
Total TTST ESALs	0	Total Dual ESALs	0
	0		0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	3.59	CBR:	9
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	97	Total 18K:	352,953
Required SN:	3.07	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
0	I19.0B	0.44	0
1	Milled Layer	-0.35	-0.35
6	Existing AC	0.35	2.1
		SN =	3.07
		Req'd =	3.07

Project Description: Potter Road and Pleasant Plains Road Intersection
Route: Potter Road from Jody Drive to Old Monroe Road - Overlay (> 3")
County: Union Division: 10
Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	11,000	Proj. Yr. ADT:	17,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	10
Constr. Year ADT:	11,346	10 YEAR ADT=	13,245
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	97	TOTAL 18K:	**352,953**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	10	Years	10
Total TTST ESALs	0	Total Dual ESALs	0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	3.59	CBR:	9
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	97	Total 18K:	352,953
Required SN:	3.07	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
2.5	S9.5B	0.44	1.1
2.5	I19.0B	0.44	1.1
0	Milled Layer	-0.35	0
6	Existing AC	0.35	2.1
		SN =	4.30
		Req'd =	3.07

Project Description: Potter Road and Pleasant Plains Road Intersection
Route: Pleasant Plains Rd. from West of Aurora Blvd. to East of Lakewood Dr.
County: Union Division: 10
Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	4,200	Proj. Yr. ADT:	6,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	20
Constr. Year ADT:	4,324	20 YEAR ADT=	5,785
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	40	TOTAL 18K:	**288,748**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	20	Years	20
Total TTST ESALs	0	Total Dual ESALs	0
	0		0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	1.71	CBR:	4
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	40	Total 18K:	288,748
Required SN:	3.86	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
4	I19.0B	0.44	1.76
3	B25.0B	0.30	0.9
		SN =	3.98
		Req'd =	3.86

Project Description:	Potter Road and Pleasant Plains Road Intersection
	Route: Pleasant Plains Rd. from West of Aurora Blvd. to East of Lakewood Dr.
	County: Union Division: 10
	Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	4,200	Proj. Yr. ADT:	6,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	20
Constr. Year ADT:	4,324	20 YEAR ADT=	5,785
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	40	TOTAL 18K:	**288,748**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	20	Years	20
Total TTST ESALs	0	Total Dual ESALs	0
	0		0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	1.71	CBR:	4
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	40	Total 18K:	288,748
Required SN:	3.86	Seed Check:	OK

Alternative 2

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
4	I19.0B	0.44	1.76
6	ABC	0.14	0.84
		SN =	3.92
		Req'd =	3.86

Project Description:	Potter Road and Pleasant Plains Road Intersection
	Route: Pleasant Plains Rd. from Aurora Blvd. to Lakewood Dr. - Overlay (< 3")
	County: Union Division: 10
	Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	4,200	Proj. Yr. ADT:	6,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	10
Constr. Year ADT:	4,324	10 YEAR ADT=	5,002
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	37	TOTAL 18K:	**133,884**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	10	Years	10
Total TTST ESALs	0	Total Dual ESALs	0
	0		0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	2.65	CBR:	6
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	37	Total 18K:	133,884
Required SN:	2.99	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
3	S9.5B	0.44	1.32
1	Milled Layer	-0.30	-0.3
5	Existing AC	0.30	1.5
6	Existing Concrete	0.30	1.8
		SN =	4.32
		Req'd =	2.99

Project Description:	Potter Road and Pleasant Plains Road Intersection Route: Pleasant Plains Rd. from Aurora Blvd. to Lakewood Dr. - Overlay (> 3") County: Union Division: 10 Date: 12/9/2013

TRAFFIC DATA

Initial Year:	2012	Projection Year:	2042
Initial Year ADT:	4,200	Proj. Yr. ADT:	6,500
% DUALS:	1.5	% TTST:	1.5
		Growth (%):	1.5

DESIGN PARAMETERS

Construction Year:	2014	Des. Life (Years):	10
Constr. Year ADT:	4,324	10 YEAR ADT=	5,002
DIR %:	50	TERM. SI:	2.5
LANES/DIRECT:	1	LANE DIST:	1
Rural/Urban:	U	Freeway/Other:	O
DUAL FACT.:	0.25	TTST FACT:	0.8
		ADDITIONAL 18K:	0
DAILY 18K:	37	TOTAL 18K:	**133,884**

ADDITIONAL ESAL CALCULATIONS**

TTST		Duals	
Trucks Per Day	0	Trucks Per Day	0
Trucks Per Year	0	Trucks Per Year	0
Years	10	Years	10
Total TTST	0	Total Dual	0
ESALs	0	ESALs	0

** (Useful if you expect additional trucks to enter the system that are not accounted for in traffic counts, but for which you can obtain an estimate of the additional trucks per day generated by the facility. For instance, a new quarry or distribution center would dramatically increase the ESAL count)

SOILS & REGIONAL DATA

Soil Support Value:	2.65	CBR:	6
Regional Factor	1.0	Additional 18K:	0
Daily 18K ESALs:	37	Total 18K:	133,884
Required SN:	2.99	Seed Check:	OK

Alternative 1

Depth (in.)	Material	Layer Coeff.	Layer SN
2.5	S9.5B	0.44	1.1
2.5	I19.0B	0.44	1.1
0	Milled Layer	-0.30	0
5	Existing AC	0.30	1.5
6	Existing Concrete	0.30	1.8
		SN =	5.50
		Req'd =	2.99