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ROADWAY GEOTECHNICAL REPORT
US 41 AND STEARNS SCHOOL ROAD
16-00222-02-CH
GURNEE, LAKE COUNTY, ILLINOIS

1/10/2022

Prepared for:

Baxter & Woodman
8678 Ridgefield Road
Crystal Lake, IL 60012

Table of Contents

AAPPENDICES

ROADWAY GEOTECHNICAL REPORT
US 41 & STEARNS SCHOOL ROAD
GURNEE, LAKE COUNTY, ILLINOIS

1.0 INTRODUCTION

Baxter & Woodman Consulting Engineering (B&W) was tasked by Lake County Division of Transportation (LCDOT) to provide engineering services for the intersection improvements at Stearns School Road and US 41 in Gurnee, Lake County, Illinois. Interra, Inc. (INTERRA) was contracted as the Geotechnical Engineering sub-consultant to perform subsurface soil exploration, laboratory testing and prepare the Roadway Geotechnical Report (RGR).

This roadway geotechnical report presents the results of Interra Inc. (Interra) subsurface investigation, laboratory testing, groundwater conditions and geotechnical evaluations performed, recommendations and construction considerations.

Project Description

The project is located on Stearns School Road, US Highway 41 and Fuller Road within the Unincorporated Lake County near the Village of Gurnee. The purpose of the Phase I Engineering Study is to determine necessary safety improvements for the intersection. The following improvements are under study for the intersection:

1. Protected left turn phasing with dual left turn lanes on US Route 41 for the northbound to westbound movement.
2. Right turn lane on US Route 41 for the southbound to westbound movement.
3. Asymmetric widening of Stearns School road to the north to accommodate a receiving lane for the dual left turn lanes from US Route 41.

4. Left turn lane on Stearns School Road at Fuller Road for westbound to southbound movement.
5. Dual right turn lanes on Stearns School Road for the eastbound to southbound movement.

2.0 PROJECT SCOPE

Interra's scope of work included drilling of a total of seven (7) boreholes to a depth of 10.0 feet each from existing ground/pavement surface, two pavement cores (2) and three (3) hand auger borings. Two borings and the two pavement cores were located on shoulder of Southbound US 41, north of Stearns School Road. One boring is located on southbound US 41, south of Stearns School Road. The four remaining borings and hand auger locations are located on or adjacent to Stearns School road.

3.0 SITE DESCRIPTION

The project section is located within Unincorporated Lake County near the Village of Gurnee, Warren Township, Lake County and defined as Township T45N, Range 11E, Sections 24, Libertyville Quadrangle. The approximate coordinates at the west end of the project are 42.233433 N and 87.554390 W and the East end are 42.233474 N and 87.553665 W. The approximate coordinates at the North end of the project are 42.233662 N and 87.553813 W and the South end are 42.233344 N and 87.553559 W. The ground surface elevation ranges from approximately 677 feet and 696 feet.

4.0 GEOLOGY

The project area is located on the eastern flank of the southward plunging Wisconsin Arch. The area belongs to Valparaiso Morainic System. Majority of the area contains the quaternary deposits belonging to Henry, Oregon and Glasford Formations, from the Wisconsin and Illinois

Episodes. Thickness of the formations varies between 150 feet and 200 feet consisting of proglacial sands and gravels with interbedded diamictons underlain by loams, silty and sandy loams with interbedded sands and gravel. Bedrock surface is Ordovician dolomite with the upper surface fractured with crevices and solution cavities.

Pedological data from Natural Resource Conservation Services (NRCS) indicate that the top 5.0 feet of the site soils are mainly classified as SANDY LOAMS and CLAY LOAMS, belonging to various soil units. The soils presented in the subject project area are loamy sands, and clays belonging to the "urban land". The soils in the area are considered to be slowly permeable (clay loams, clay) to fairly permeable (sandy loams).

5.0 FIELD INVESTIGATION

A total of seven (7) boreholes to a depth of 10.0 feet each were drilled from existing ground/pavement surface. In addition, two (2) pavement cores and three (3) hand auger borings were performed. Two borings and the two pavement cores were located on shoulder of Southbound US 41, north of Stearns School Road. One boring is located on southbound US 41, south of Stearns School Road. The four remaining borings and hand auger locations are located on or adjacent to Stearns School road.

Field exploration was performed on October 2, 2018. Geocon Professional Services (GEOCON), a sub-contractor to INTERRA was tasked to drill the borings. Diedrick D-50 turbo truck drill rig were used for drilling. Drilling, sampling and field testing of the samples was performed in accordance with the IDOT's Geotechnical Manual (2015) and AGMU memoranda and AASHTO guidelines.

Soil sampling was performed as per AASHTO T-206, "Penetration Test and Split Barrel Sampling of Soils". In addition to the split spoon samples, one (1) bulk sample was collected from approximately 2.0 foot (below any crushed aggregate of sand fill sub-base) to 5.0 feet depth at

borehole location and B-06 (Stearns School Road) for performing Illinois Bearing Ratio and other laboratory tests.

Soil specimens from the borings were visually classified and logged in the field per IDOT textural classification system by INTERRA's professional geologist. Unconfined compressive strength tests were performed in the field using a RIMAC tester and/or a pocket penetrometer on the recovered cohesive samples. All soil samples were placed in glass jars, labelled and transported to INTERRA's laboratory for further testing. Groundwater levels were measured during and immediately after completion of the drilling.

6.0 LABORATORY TESTING

Laboratory testing included moisture content tests on all recovered split-spoon soil samples. Unconfined compressive strength tests using a pocket penetrometer were performed on all cohesive soil samples. Illinois Bearing Ratio (IBR) tests, Atterberg Limits, Grainsize Analysis and Standard Proctor tests were performed on the bulk soil sample. Summary of laboratory testing and laboratory test reports are presented in Appendix C.

The soil was identified by AASHTO as a Clay (A-6(14)) with a liquid limit of 37 and a plastic limit of 16. The grain size analysis was; 9.0% gravel, 19.2% sand, 34.3% silt and 37.5% clay.

The IBR results from the two prepared samples have a swell between 2.04 and 2.13%, and IBR value (at 0.2 inches in penetration) from 1.8% to 1.9% respectively.

The Subgrade Support Rating for the B-06 sample was FAIR. The Subgrade Support Rating chart is presented in Appendix C.

Pavement Cores

One pavement core was collected in the shoulder of Southbount US 41 (C-01) and the second

pavement core was collected in the center median of US 41. The pavement core thicknesses was determined to be 9 inches at C-01 and 7.5 inches for C-02.

7.0 SUMMARY OF CLIMATIC CONDITIONS

Table 1 indicates the total precipitation in the month of drilling along with two preceding months obtained for the City of Park City, IL. Monthly totals are obtained from Weather Underground and the monthly historic averages are obtained from Intellicast.

Table 1: Precipitation Data

Month	Monthly Total, inches	Historic Monthly Precipitation, inches
August 2018	3.31	4.22
September, 2018	2.65	3.4
October 2018	4.88	2.42

8.0 SUBSURFACE CONDITIONS

All the borings encountered either topsoil, sand fill (sub-base) or fill material near the surface. Topsoil was encountered at borings B-04, B-05 and B-07, and the thickness was noted to be between 3 and 4 inches. Sand or gravel fill (sub-base) was noted in borings B-01, B-02, B-03 and B-06, ranging from 2 to 15 inches. Fill material below the topsoil at B-05 was alternating sand and clay fill to a depth of 2 feet below grade. Clay fill was encountered below the asphalt pavement (9.5 inches) at boring B-02 to a depth of 2.0 feet below grade.

All borings below the fill material encountered very stiff to hard clay or clay loam to a final depth of 10.0 feet below grade. At boring B-05, a medium dense gravel layer was noted from

4.0 to 5.5 feet below grade.

Table 2.0 presents the thickness of materials encountered at the surface and fill depths from the existing ground surface. Please see individual boring logs in Appendix B for detailed soil stratification.

Table 2-Topsoil, Pavement and Fill Thickness

Boring	Surface Elevation (feet)	Depth (feet)	Topsoil (inches)	Asphalt (inches)	Crushed Aggregate (inches)	Fill Depth, ft. (Description)
B-01	---	10.0	---	9.0		1.25 (Sand Sub-base?)
B-02		10.0	---	9.5	-	1.21(Clay Loam)
B-03	---	10.0	--	8.0	4.0	1.0 (Clay Loam)
B-04	---	10.0	3.0	-	-	1.75 (Clay Loam)
B-05	---	10.0	3.0	--	--	1.75 (Clay Loam and Sand)
B-06	---	10.0	--	8.0	--	4.0 (Gravel Sub-base)
B-07	---	10.0	4.0	-	--	1.67 (Clay Loam)

Groundwater Conditions

Groundwater levels were recorded during drilling and immediately after completion of drilling at all the boring locations. None of the borings encountered groundwater during or immediately after completion of drilling, up to the depth of explo0ration of 10 feet from existing ground or pavement surface.

It should be noted that fluctuations in groundwater levels may occur due to seasonal variations, rainfall, or other climatic conditions. Hence, the water levels reported may not represent the

long-term groundwater levels.

9.0 CONCLUSIONS AND RECOMMENDATIONS

In general, below the surficial topsoil/asphalt/subbase, fill material is encountered to varying depths in all of the borings. All borings below the fill material encountered very stiff to hard clay or clay loam to the final depth of 10.0 feet below grade. At boring B-05, a medium dense layer of gravel was noted from 4.0 to 5.5 feet below grade.

9.1 *Subgrade Preparation - General*

Subgrade preparation should be performed in accordance with Article 301 of the IDOT Standard Specifications. All new pavements should be supported on 12 inches of improved subgrade, per the District One Aggregate Subgrade Improvement Special Provision.

Topsoil

All topsoil shall be completely stripped and removed from the proposed pavement areas. We recommend a topsoil stripping thicknesses of six (6) inches for estimating quantities. The actual need for topsoil removal should be determined in the field. We recommend that all of the topsoil that is stripped be stockpiled, sorted, and reused for the proposed landscaping improvements. We recommend that a plan note containing the stockpiling information be included in the contract documents.

Proofrolling

Proof rolling should be performed in accordance with section 3.3 of IDOT Subgrade Stability Manual to identify unstable/unsuitable subgrade soils. The top eight (8) inches of the subgrade should be air dried, disked and recompacted to achieve the required density and stability. After compaction, the subgrade should have a minimum dry density of 95 percent of standard laboratory dry density and a minimum IBV 3.0 as it is assumed plans include 12 inches of improved subgrade. A minimum IBV of 8.0 should be achieved if the plans do not include 12

inches of improved subgrade. Moisture sensitive soils such as silts were not encountered in the proposed roadway areas in the upper 3 feet.

9.2 *Removal and Replacement of Unstable Soils*

Based on the field investigation and laboratory test results, we do not anticipate undercuts in roadway areas. However, if unsuitable soils are encountered during construction, they should be removed and replaced with material meeting the requirements of the District One Aggregate Subgrade Improvement Special Provision. The actual need for removal and replacement with Aggregate Subgrade Improvement should be determined in the field at the time of construction by the Geotechnical Engineer or soils inspector. All potentially unstable soils should be tested with a cone penetrometer and treated in accordance with Article 301 .04 of the SSRBC and the undercut guidelines in the lDOT Subgrade Stability Manual. We recommend placing geotextile fabric at the base of undercut areas where low strength subgrade soils are encountered. The 12 inches of improved subgrade is not considered an undercut, and we do not recommend using it below the proposed 12 inch improved subgrade layer unless it is determined to be necessary to achieve stability by the Geotechnical Engineer or soils inspector at the time of construction. Fabric should meet the requirements of Article 210, Fabric for Ground Stabilization, of the SSRBC.

9.3 *Pavement Design*

In the Pavement design, both Illinois Bearing Ratio (IBR) and Subgrade Support Rating (SSR) values should be taken into consideration. Based on the general inconsistency of existing fill materials, we recommend using a maximum IBR value of 1.8. Although, the one bulk sample that was tested for grainsize analysis plotted as ‘FAIR’ on SSR chart, it was very close to the boundary delineating FAIR and POOR and the IBR value was determined to be low. Hence, we recommend an SSR of “POOR” for the design of the proposed pavement section.

Underdrains

To provide drainage for the proposed pavement areas, we recommend installing longitudinal

pipe underdrains under the edge of new pavement in widening areas and both longitudinal and transverse drains in full width pavement reconstruction areas. The drains should also be installed in low areas and at the base of any undercuts. The underdrains should tie into the existing storm water drainage system. The underdrains should be installed per Article 601 in the lDOT Standard Specifications and consist of Type 2 underdrains (Adopted April 1, 2016).

9.4 *Stability Analysis*

No embankments greater than 15 feet are proposed to be constructed. Hence, slope stability analyses were not performed.

9.5 Earthwork Quantity Calculations

A shrinkage factor of 15% should be used in calculating borrowed and furnished quantities.

10.0 CONSTRUCTION CONSIDERATIONS

- Temporary excavations should be sloped no greater than 1V:2H. Excavations steeper or deeper than 4 feet should be analyzed individually. Potential for ground movements due to excavation on open roadways and utilities should be considered. All excavations should be performed in accordance with local, state and federal regulations.
- Excavated materials free from debris can be reused upon approval by Engineer.
- Groundwater was not observed in any of the boreholes within 5 feet of the existing grade. If any water is accumulated during construction, it can be removed using sump pump method. To facilitate dewatering, surface runoff and ditches should be directed away from excavations.
- It is anticipated that the project will need to apply for a NPDES storm water permit for construction site activities. Soil erosion factors (K factors) and erosion hazard ratings for each of the soil types within the project limits were obtained from NRCS website and presented in Appendix D.

11.0 CONSTRUCTION MONITORING

Construction monitoring shall be in accordance with IDOT Standard Specifications, Special Provisions and Contract Plans. No special monitoring is anticipated. Construction monitoring shall be performed by an experienced geotechnical engineer or soils technician to monitor earthwork operations, soils compaction, and suitability of subgrade soils, location and depths of undercuts and to advise Engineer of actual soil conditions that differ from those in the geotechnical investigation report.

12.0 CLOSURE

The analysis and recommendations submitted in this report are based upon the data obtained from seven (7) soil boreholes performed at the locations indicated on the location plan. This report does not reflect any variations that may occur between these boreholes. In performing subsurface explorations, specific information is obtained at specific locations at specific times. It is a well-known fact that variations in soil and rock conditions exist on most sites between borehole locations. Also, groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, it will be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during construction period and noting the characteristics of any variations.

We appreciate the opportunity to be of service to you. Should you need additional information or clarifications, please call us at (630) 754-8700.

Yours truly,

Interra, Inc.

Ashok Guntaka, EI
Project Engineer

Eric Slusser, PG
Project Geologist

Sanjeev Bandi, Ph.D., PE 01/01/22
Principal Engineer

STATE OF ILLINOIS
SANJEEVAREDDY
BANDI
062-051187
LICENSED
PROFESSIONAL ENGINEER

REFERENCES

IDOT 2015. Geotechnical Manual, Illinois Department of Transportation.

IDOT 2012. Standard Specifications for Road and Bridge Construction. Illinois Department of Transportation.

Appendix A

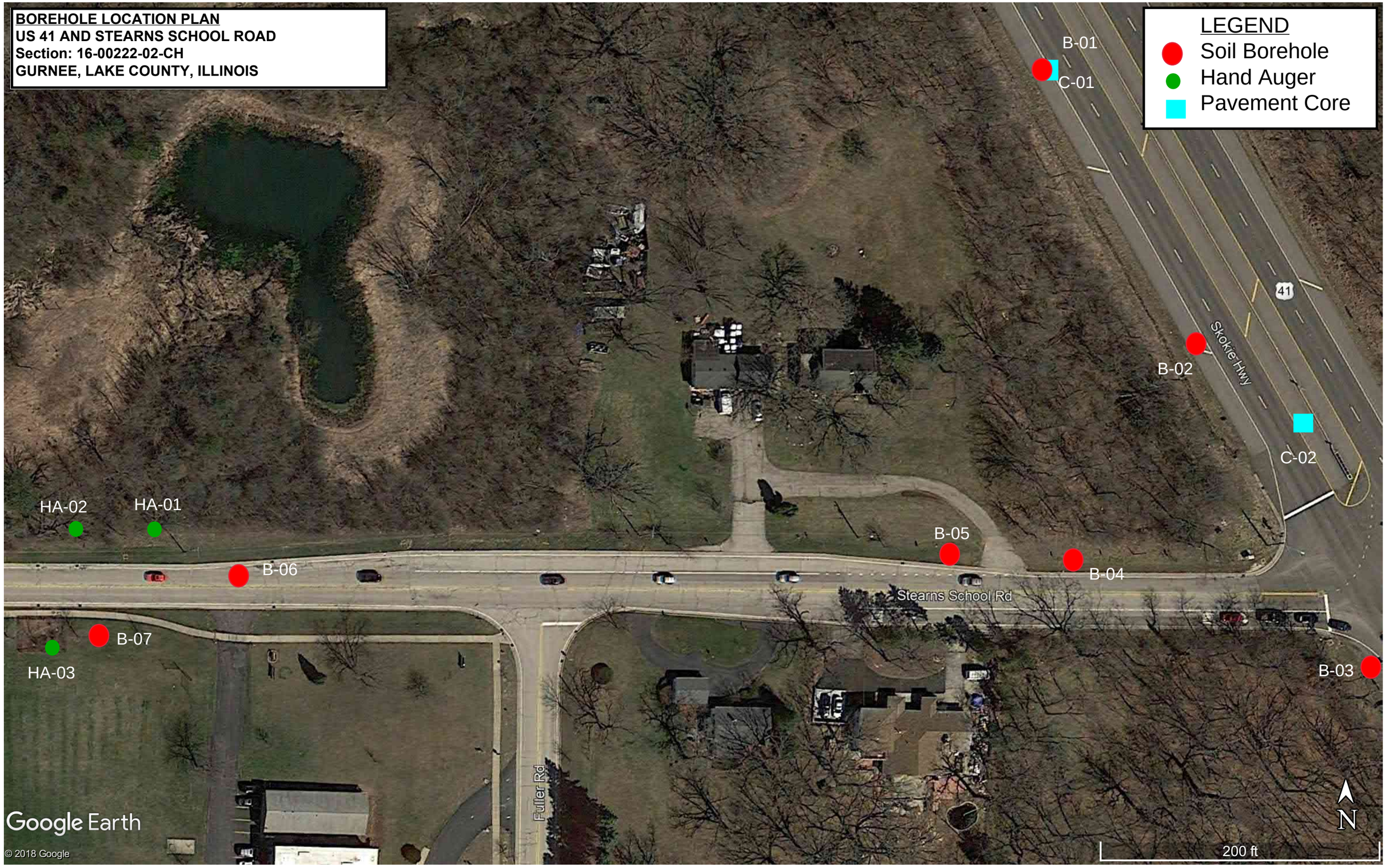
Site Location Map

Borehole Location Plan

Soil Profile Sheets

SITE LOCATION MAP
US 41 AND STEARNS SCHOOL ROAD
16-00222-02-CH
GURNEE, LAKE COUNTY, ILLINOIS

BOREHOLE LOCATION PLAN
US 41 AND STEARNS SCHOOL ROAD
Section: 16-00222-02-CH
GURNEE, LAKE COUNTY, ILLINOIS



LEGEND

BOREHOLE NUMBER — MI-J5

BLOW COUNTS — 4 6 10

MOISTURE CONTENT — 12.4

1.0 P — UNCONFINED STRENGTH (POCKET PENETROMETER)

BEGIN IMPROVEMENTS
STEARNS SCHOOL ROAD
STA 94+38

HMA RESURFACING

EX ROW

COMB CONC C&G TY B-6.24

TREE REMOVAL (TYP)

MAILBOX TURNOUT

HMA PAVEMENT WIDENING

TEMP ESMT

PR ROW

CULVERT EXTENSION

MATCH LINE STA 100+00
- SEE SHEET NO. 6

N

179°28'48"

EX PCC SIDEWALK TO REMAIN

BEGIN PCC SIDEWALK

COMB CONC C&G TY B-6.24

PR ℄ STEARNS SCHOOL ROAD

PR PCC SIDEWALK (5' WIDTH)

B-07, 695.20 FT
99+91.33, 31.79' RT

HA-3, 693.40 FT
99+41.69, 50.43' RT

STEARNS SCHOOL ROAD

EX ℄ PROFILE

PR ℄ PROFILE

220.00' V.C.
K=67

+40.00 EL. 697.97

+60.00 EL. 695.66

VPI STA. 98+50.00
ELEVATION 695.00

-2.70%

+0.60%

TOPSOIL
Very Stiff Black and Brown CLAY LOAM FILL, trace gravel, moist
Stiff Pale Brown and Light Gray CLAY, trace roots, moist
Haed Pale Brown and light Gray CLAY LOAM, trace gravel, trace roots, moist
Hard Yellowish Brown, Light gray, and Pale Brown CLAY, moist

NOTE:
THE PROPOSED PROFILE PROVIDES CENTERLINE ELEVATIONS ASSOCIATED WITH SHIFTING THE LOCATION OF THE EXISTING CENTERLINE CROWN. NO IMPROVEMENTS TO VERTICAL GEOMETRY ARE PROPOSED.

	EX ℄ ELEVATION	PR ℄ ELEVATION
94+00	707.15	707.15
94+50	705.83	705.80
95+00	704.52	704.45
95+50	703.10	703.10
96+00	701.81	701.75
96+50	700.48	700.40
97+00	698.95	699.05
97+50	697.37	697.71
98+00	696.38	696.62
98+50	695.73	695.91
99+00	695.41	695.57
99+50	695.23	695.61
100+00	695.45	695.90

BAXTER & WOODMAN Consulting Engineers

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	DRAWN - KAR	REVISED -
PLOT SCALE = 20.0000 ' / in.	CHECKED - JFM	REVISED -
PLOT DATE = 10/29/2018	DATE - 02-07-18	FILE - 161141_SHT-PlnPrf1.dgn

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STEARNS SCHOOL ROAD
PLAN AND PROFILE

SCALE: 1" = 20' | SHEET 1 OF SHEETS | STA. 94+00 | TO STA. 100+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	16-00222-02-CH	LAKE	24	5
	CONTRACT NO.			
	ILLINOIS FED. AID PROJECT			

HA-01, 691.97 FT
100+17.41, 33.56' LT

HMA PAVEMENT WIDENING

TREE REMOVAL (TYP)

COMB CONC C&G TY B-6.24

STEARNS SCHOOL ROAD ℄ STA 102+90
FULLER ROAD ℄ STA 305+60

HMA RESURFACING

50' LT TURN LN STORAGE

175' LT TURN LN TAPER
14.5:1 TAPER RATE

TEMP ESMT

PR ROW

EX ROW

MATCH LINE STA 100+00
- SEE SHEET NO. 5

MATCH LINE STA 105+00
- SEE SHEET NO. 7

18° 30'45"

89°20'26"

Sta 102+90.76

POT Sta 305+00.88

ONE WAY

PR PCC SIDEWALK (5' WIDTH)

PR ℄ STEARNS SCHOOL ROAD

EX PCC SIDEWALK

EX C&G TO REMAIN

175' TAPER
14.5:1 TAPER RATE

STEARNS SCHOOL ROAD

B-06, 696.12 FT
100+74.73, 2.50' LT

FULLER ROAD

EX ℄ PROFILE

PR ℄ PROFILE

+0.60%

+0.80%

-2.50%

VPI STA. 100+50.00
ELEVATION 696.20

VPI STA. 103+50.00
ELEVATION 698.60

+30.00 EL. 697.64

+70.00 EL. 695.60

K=73
SSD=322'
240.00' V.C.

B-06
ASPHALT
Medium Dense Brown GRAVEL FILL (sub-base), moist
Hard Black and Brown CLAY LOAM FILL, trace gravel, moist
Hard Pale Brown and Light Gray CLAY LOAM, trace gravel, moist, color change to pale Brown at 4.0 feet
50ft LT

NOTE:
THE PROPOSED PROFILE PROVIDES CENTERLINE ELEVATIONS ASSOCIATED WITH SHIFTING THE LOCATION OF THE EXISTING CENTERLINE CROWN. NO IMPROVEMENTS TO VERTICAL GEOMETRY ARE PROPOSED.

100+00	100+50	101+00	101+50	102+00	102+50	103+00	103+50	104+00	104+50	105+00
695.45 / 695.90	695.98 / 696.20	696.35 / 696.60	696.70 / 697.00	697.14 / 697.40	697.40 / 697.77	697.51 / 697.86	697.28 / 697.61	696.60 / 697.01	695.70 / 696.07	694.45 / 694.85

BAXTER & WOODMAN Consulting Engineers

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	DRAWN - KAR	REVISED -
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PLOT DATE = 10/29/2018	DATE - 02-07-18	FILE - 161141_SHT-PlnPrf2.dgn

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STEARNS SCHOOL ROAD
PLAN AND PROFILE

SCALE: 1" = 20' | SHEET 2 OF SHEETS | STA. 100+00 | TO STA. 105+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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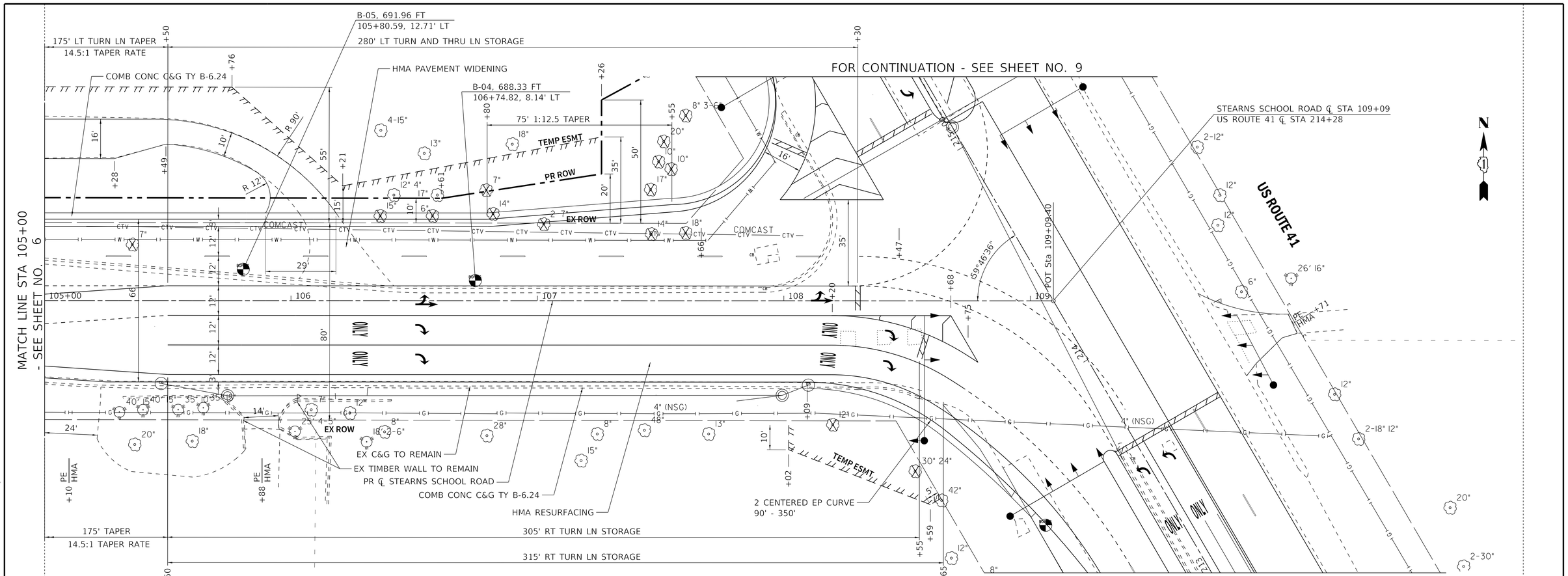
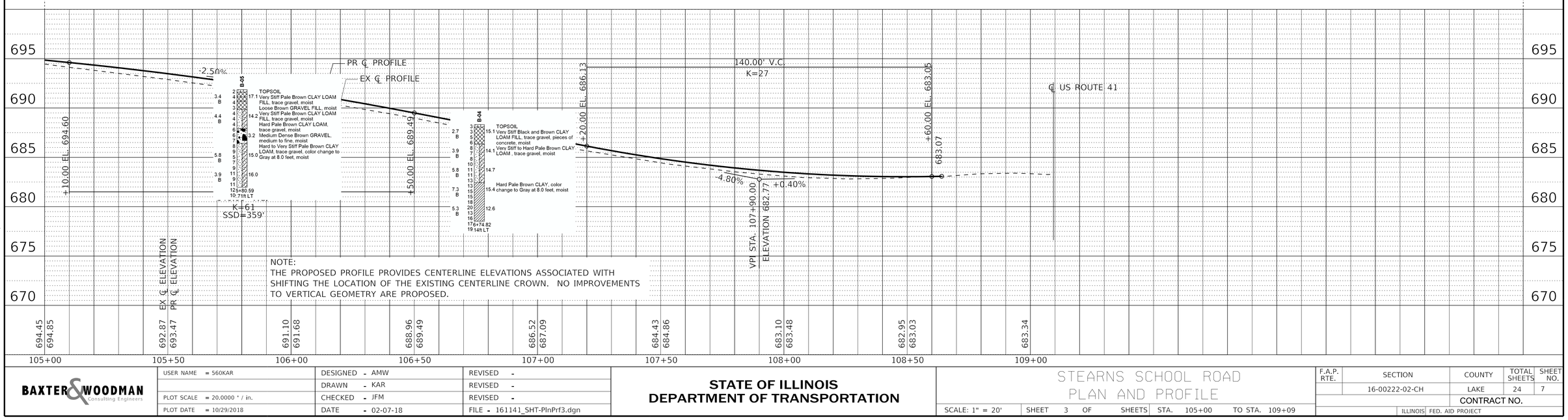
	ILLINOIS	FED. AID PROJECT		





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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STEARNS SCHOOL ROAD
PLAN AND PROFILE

SCALE: 1" = 20' | SHEET 3 OF SHEETS | STA. 105+00 | TO STA. 109+09

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	16-00222-02-CH	LAKE	24	7
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

FOR CONTINUATION - SEE SHEET NO. 7

MATCH LINE STA 211+00 - SEE SHEET NO. 8

MATCH LINE STA 217+00 - SEE SHEET NO. 10

B-03, 684.27 FT
213+50.55, 48.49' LT

B-02, 680.23 FT
216+42.11, 47.07' LT

C-02, 680.91 FT
215+83.78, 6.11' LT

EX HMA SHOULDER

PR HMA SHOULDER

EX ROW

EX SB PGL

PR 6' TY M-4 MEDIAN

EX NB PGL

EX HMA SHOULDER

HMA PAVEMENT WIDENING

EX ℄ US ROUTE 41

EX ROW

430' DUAL LT TURN LN STORAGE

250' RT TURN LN STORAGE

PR HMA SHOULDER

HMA PAVEMENT WIDENING

HMA RESURFACING

EX CONC BARRIER
DOUBLE FACE, 32 INCH

EX HMA SHOULDER

250' LT TURN LN STORAGE

POT Sta 109+09.40

US ROUTE 41

℄ US ROUTE 41 STA 214+28
℄ STEARNS SCHOOL ROAD STA 109+09

℄ STEARNS SCHOOL ROAD

+10.00 EL. 685.62

VPI STA. 215+10.00
ELEVATION 682.28

-1.67%

-1.18%

-1.18

B-03
ASPHALT
Loose Brown GRAVEL FILL (sub-base), dry
Very Stiff Pale Brown and Light Gray CLAY LOAM FILL, trace fine gravel, pieces of asphalt, moist
Hard Pale Brown CLAY LOAM, trace fine gravel, moist
Hard Gray CLAY, moist
3+50.55
48.49ft LT

B-02
ASPHALT
Stiff Brown and Black CLAY LOAM FILL, little gravel, moist
Hard to Very stiff Pale Brown CLAY LOAM , color change to Pale Brown and Light Gray at 6.0 feet, Gray at 8.0 feet, moist
4+42.11
47.07ft LT

	211+00	211+50	212+00	212+50	213+00	213+50	214+00	214+50	215+00	215+50	216+00	216+50	217+00
EX NB PGL ELEV		687.66	687.05	686.38	685.67	684.89	684.10	683.23	682.38	681.66	681.11	680.50	679.96
EX SB PGL ELEV	688.23	687.60	687.01	686.31	685.58	684.75	683.95	683.20	682.43	681.76	681.13	680.62	

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 41
PLAN AND PROFILE

SCALE: 1" = 20' | SHEET 5 OF SHEETS | STA. 211+00 | TO STA. 217+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	16-00222-02-CH	LAKE	24	9
	CONTRACT NO.			
	ILLINOIS FED. AID PROJECT			

250' RT TURN LN STORAGE

+69

200' RT TURN LN TAPER
16.7:1 TAPER RATE

+69

B-01/C-01, 677.31 FT
218+44.02, 47.65' LT

PR HMA SHOULDER

EX ROW

EX HMA SHOULDER

HMA PAVMENT WIDENING

EX SB PGL

HMA RESURFACING

+68

6'

12'

ONLY

12'

12'

12'

180'

+50

11'

ONLY

160'

217

218

219

220+00

221

222

19'

12'

12'

EX CONC BARRIER,
DOUBLE FACE, 32 INCH

EX HMA SHOULDER

END IMPROVEMENTS
US ROUTE 41
STA 219+69

MATCH LINE STA 217+00
- SEE SHEET NO. 9

EX NB PGL

4" (NSG)

EX ℄ US ROUTE 41

EX ROW

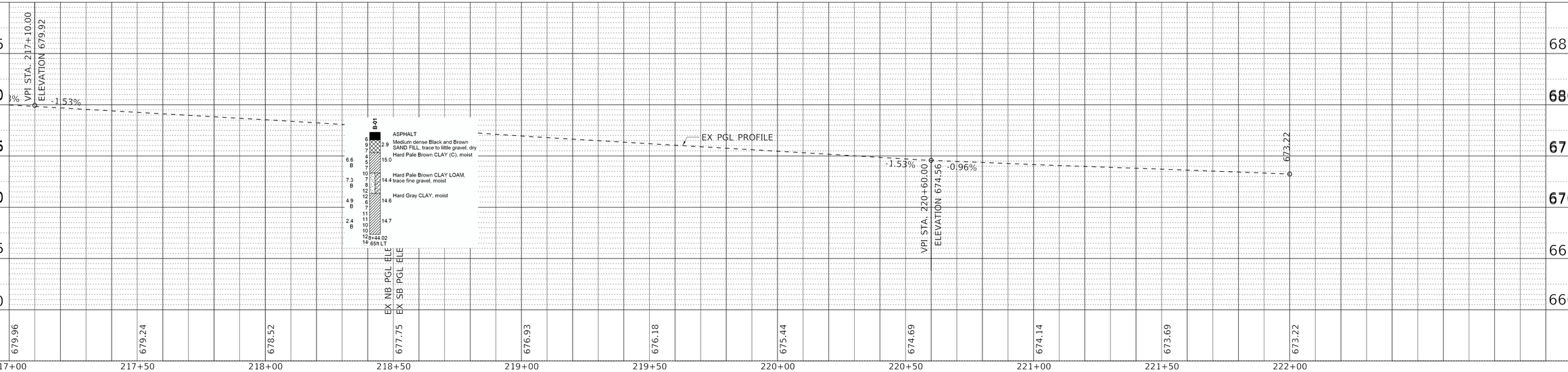
250' LT TURN LN STORAGE

+69

200' LT TURN LN TAPER
16.7:1 TAPER RATE

+69

US ROUTE 41



BAXTER & WOODMAN Consulting Engineers

USER NAME = 560KAR	DESIGNED - AMW	REVISED -	
	DRAWN - KAR	REVISED -	
PLOT SCALE = 20.0000 ' / in.	CHECKED - JFM	REVISED -	
PLOT DATE = 10/29/2018	DATE - 02-07-18	FILE - 161141_SHT-PlnPrf6.dgn	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 41
PLAN AND PROFILE

SCALE: 1" = 20' | SHEET 6 OF SHEETS | STA. 217+00 | TO STA. 223+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	16-00222-02-CH	LAKE	24	10
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			

Appendix B

Soil Boring Logs

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road DESCRIPTION Roadway LOGGED BY Eric Slusser

SECTION 16-00222-02-CH LOCATION On US41 North of NW corner US41 &Stearns School Road

COUNTY Lake County DRILLING METHOD Hollow Stem Auger HAMMER TYPE Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-01
Station 218+44.02
Offset 47.65ft LT
Ground Surface Elev. 677.31 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 676.56		6		
Medium dense Black and Brown SAND FILL, trace to little gravel, dry 675.31		9 7		2.9
Hard Pale Brown CLAY (C), moist		4		
		5 7 10	6.6 B	15.0
673.31				
Hard Pale Brown CLAY LOAM, trace fine gravel, moist	-5	7 8 12 12	7.3 B	14.4
671.31				
Hard Gray CLAY, moist		6		
		7 11 11	4.9 B	14.6
		10		
		10 12 14	2.4 B	14.7
667.31	-10			
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** On US41 South of B-01, north of NW corner US41 & Stearns School Road

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-02
Station 216+42.11
Offset 47.07ft LT
Ground Surface Elev. 680.23 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 679.44	8		
Stiff Brown and Black CLAY LOAM FLL, little gravel, moist 678.23	4 4	1.7	14.7
Hard to Very stiff Pale Brown CLAY LOAM , color change to Pale Brown and Light Gray at 6.0 feet, Gray at 8.0 feet, moist	4 6 6 8	B 4.9 B	15.7
-5	8 9 10 12	4.9 B	17.0
	13 14 14 16	7.8 B	16.8
670.23 -10	14 13 12 10	3.9 B	12.5
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** On US41, south of SW corner of US41 & Stearn School Road

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-03
Station 213+50.55
Offset 48.49ft LT
Ground Surface Elev. 684.27 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 683.60				
Loose Brown GRAVEL FILL (sub-base), dry 683.27		4		
Very Stiff Pale Brown and Light Gray CLAY LOAM FILL, trace fine gravel, pieces of asphalt, moist 682.27		4 4 4	 3.9 B	13.0
Hard Pale Brown CLAY LOAM, trace fine gravel, moist		6 7 9	 6.8 B	16.7
		10		
	-5	13 17 19	 5.8 B	17.8
Hard Gray CLAY, moist 678.47		12		
		16 18 22	 4.4 B	21.3
		12		
		13 13 13	 5.3 B	21.4
674.27	-10			
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** North side of Stearn ASchool road, east of driveway

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-04
Station 106+74.82
Offset 8.14ft LT
Ground Surface Elev. 688.33 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL 688.08		3		
Very Stiff Black and Brown CLAY LOAM FILL, trace gravel, pieces of concrete, moist		3 5 6	2.7 B	15.1
686.33				
Very Stiff to Hard Pale Brown CLAY LOAM , trace gravel, moist		8		
		7 8 10	3.9 B	14.1
		11		
	-5	11 13 13	5.8 B	14.7
682.33				
Hard Pale Brown CLAY, color change to Gray at 8.0 feet, moist		15		
		15 18 20	7.3 B	15.4
		13		
		16 17 19	5.3 B	12.6
678.33	-10			
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** North side of Stearn ASchool road, between two driveways

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-05
Station 105+80.59
Offset 12.71ft LT
Ground Surface Elev. 691.96 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL 691.71		2		
Very Stiff Pale Brown CLAY LOAM FILL, trace gravel, moist 691.21		4		17.1
Loose Brown GRAVEL FILL, moist 690.79		4	3.4	
		3	B	
Very Stiff Pale Brown CLAY LOAM FILL, trace gravel, moist 689.96		4		
Hard Pale Brown CLAY LOAM, trace gravel, moist		4		14.2
		4	4.4	
687.96		6	B	
Medium Dense Brown GRAVEL, medium to fine, moist		6		
	-5	7		3.2
686.46		8		
Hard to Very Stiff Pale Brown CLAY LOAM, trace gravel, color change to Gray at 8.0 feet, moist		9		
		5		
		7		15.0
		9	5.8	
		11	B	
		9		
		11		16.0
		12	3.9	
681.96	-10	10	B	
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** North side of Stearn School Road, in street, west of western driveway

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-06
Station 100+74.73
Offset 2.50ft LT
Ground Surface Elev. 696.12 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 695.45			
Medium Dense Brown GRAVEL FILL (sub-base), moist 695.12	8		
	10		11.8
Hard Black and Brown CLAY LOAM FILL, trace gravel, moist 694.12	10	4.0	
	6	P	
Hard Pale Brown and Light Gray CLAY LOAM, trace gravel, moist, color change to pale Brown at 4.0 feet	8		18.7
	12	6.6	
	16	B	
-5	12		
	16		15.9
	18	4.9	
	22	B	
	7		
	10		15.2
	12	7.8	
	14	B	
	18		
	21		18.4
	26	5.6	
686.12 -10	49	B	
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 10/2/18

ROUTE US 41 and Stearn School Road **DESCRIPTION** Roadway **LOGGED BY** Eric Slusser

SECTION 16-00222-02-CH **LOCATION** south side of Stearn School Road, south of sidewalk, eaast of storm sewer

COUNTY Lake County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-07
Station 99+91.33
Offset 31.79ft LT
Ground Surface Elev. 695.20 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL 694.87		2		
Very Stiff Black and Brown CLAY LOAM FILL. trace gravel, moist		2		29.3
		2	2.3	
693.20		4	P	
Stiff Pale Brown and Light Gray CLAY, trace roots, moist		3		
		4		30.8
		5	1.5	
691.20		8	B	
Haed Pale Brown and light Gray CLAY LOAM, trace gravel, trace roots, moist		9		
	-5	10		19.4
		11	6.3	
689.20		12	B	
Hard Yellowish Brown, Light gray, and Pale Brown CLAY, moist		14		
		17		16.8
		15	4.9	
		16	B	
		12		
		13		15.4
		13	4.9	
685.20	-10	17	B	
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Appendix C

Laboratory Test Reports

INTERRA
Engineering • Inspection • Testing

Interra File No.: 8076

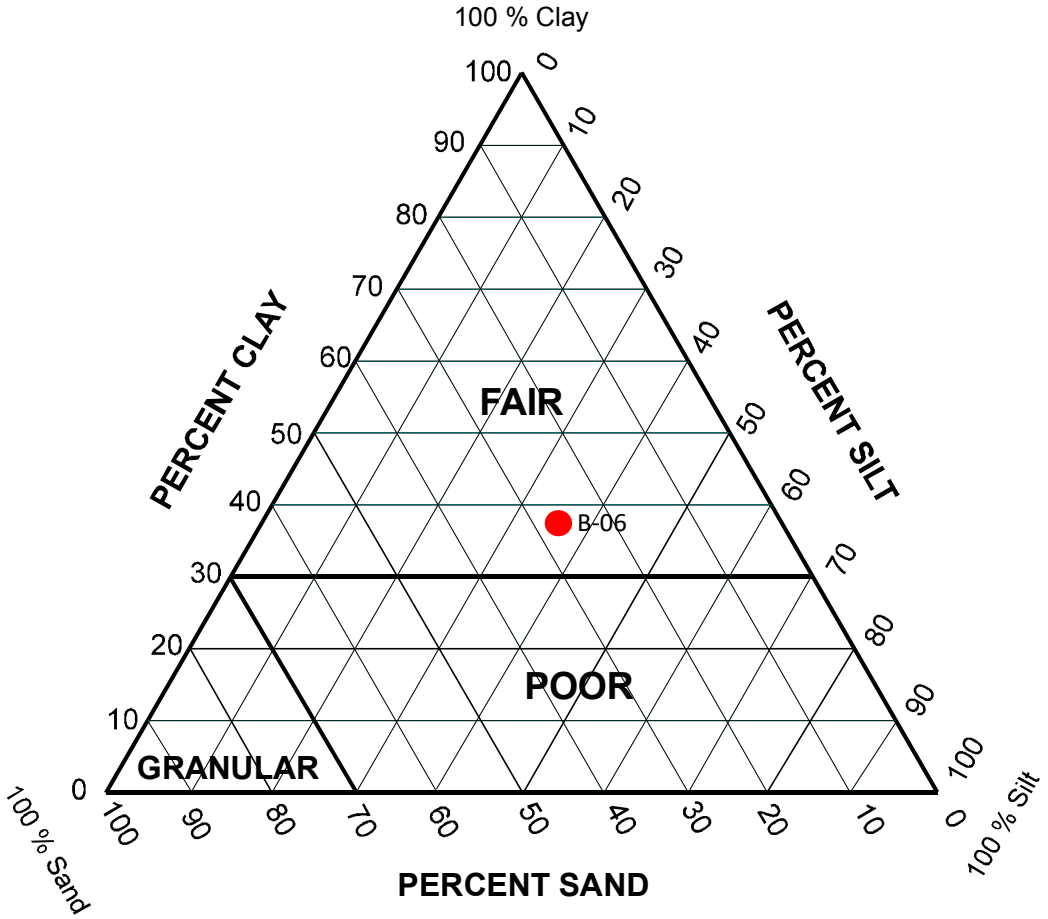
SOIL TEST RESULTS

PROJECT: US 41 and Stearns School Road
Section: 16-00222-02-CH
Route: US 41 and Stearns School Road
County: Lake, Illinois

BORING LOCATION	**B-06**
Depth	2.0'-5.0'
AASHTO CLASSIFICATION AND GROUP INDEX	A-6(14)
ILLINOIS TEXTURAL CLASSIFICATION	CLAY
GRADATION-PASSING 1" SIEVE %	100
" 3/4" " %	100
" 1/2" " %	99.4
" NO. 4 " %	95.1
" NO. 10 " %	91
" NO. 40 " F.S. %	80.2
" NO. 100 " %	74.3
" NO. 200 " %	71.8
GRAVEL %	9
SAND %	19.2
SILT %	34.3
CLAY %	37.5
LIQUID LIMIT	37
PLASTICITY INDEX	21
recoomendation)	
Sample 1 0.1 in. penetration	2.2
Sample 1 0.2 in. penetration	1.9
Sample 2 0.1 in. penetration	2.2
Sample 2 0.2 in. penetration	1.8
Sample 1 swell %	2.13
Sample 2 swell %	2.04
REMARKS	

US 41 AND STREANS SCHOOL ROAD
Section: 16-00222-02-CH
LAKE COUNTY, IL

INTERRA PROJ. NO. 8076



Subgrade Support Rating (SSR Chart)

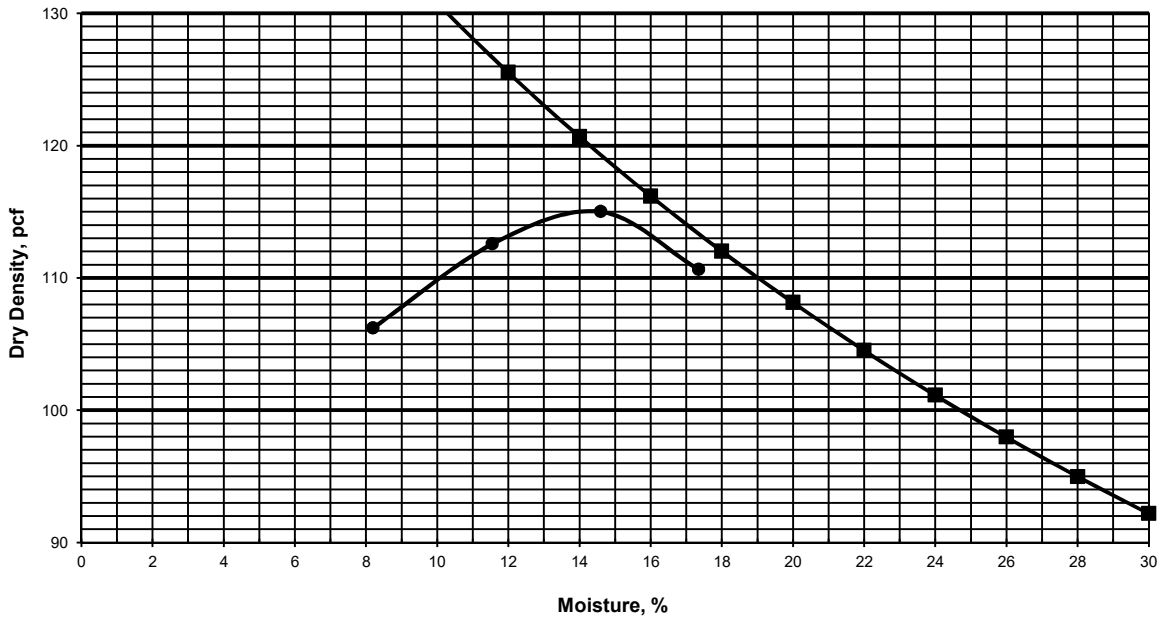
INTERRA
Engineering • Inspection • Testing

MOISTURE - DENSITY RELATIONSHIP CURVE

AASHTO T 99

Project	Stearns School Road at US 41 Geotechnical Borings - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	8076	**Sample #**	B-06	**Date Tested**	10/26/2018	**Tested By**	JBP
						Qc By	RC

Date Sample Recd.	10/3/18								
Sample Location	2-5'								
Sample Description	Brown silty clay								
Type of Proctor	Standard	**Method:**	C	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**			25				



Zero Air Void Curve Specific Gravity: 2.65

Results

Maximum Dry Density, pcf	**115.1**	**Optimum Moisture Content, %**	**14.3**	**Natural Moisture Content, %**	**14.2**
Corrected Max. Dry Density, pcf		**Corrected Optimum Moisture Content, %**			

Remarks

Test ID	61211

INTERRA
Engineering • Inspection • Testing

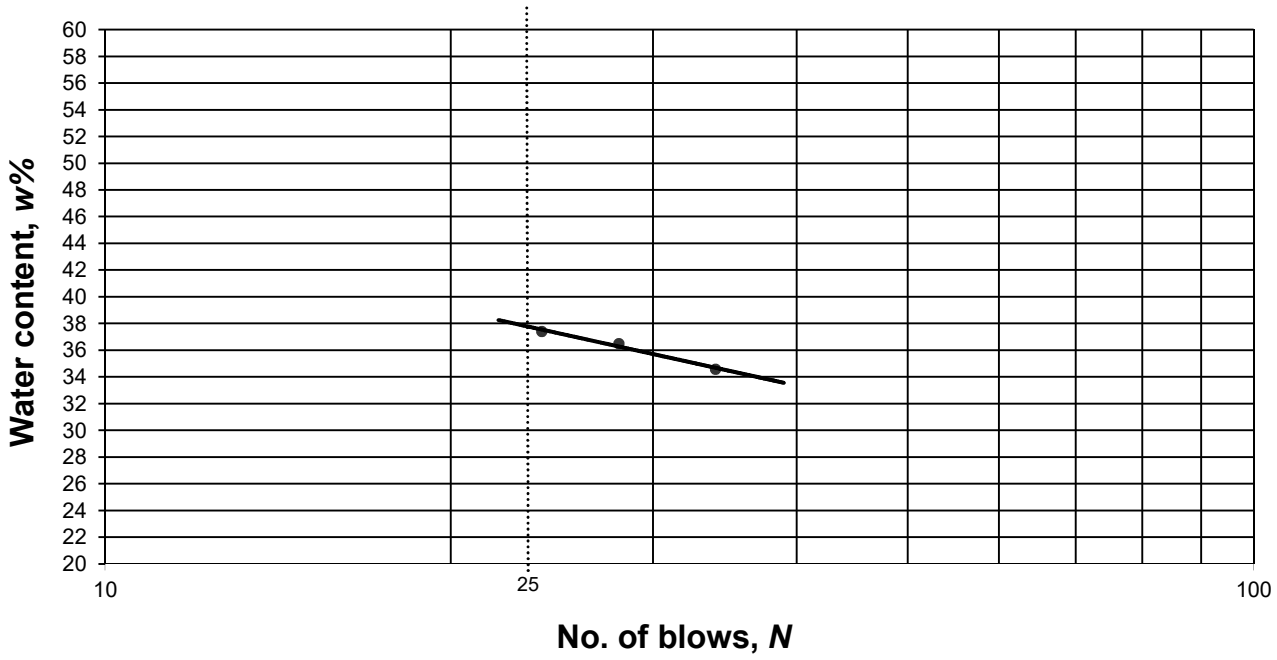
Atterberg Limits

AAASHTO T 89,90

Project	Stearns School Road at US 41 Geotechnical Borings - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	8076	**Sample #**	B-06	**Date Tested**	10/24/2018	**Tested By**	JBP
						Qc By	RC

Date Sample Recd.	10/3/2018
Sample Location	2-5'
Sample Description	Brown silty clay

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**37**	**Plastic Limit, PL**	**16**	**Plasticity Index, PI**	**21**

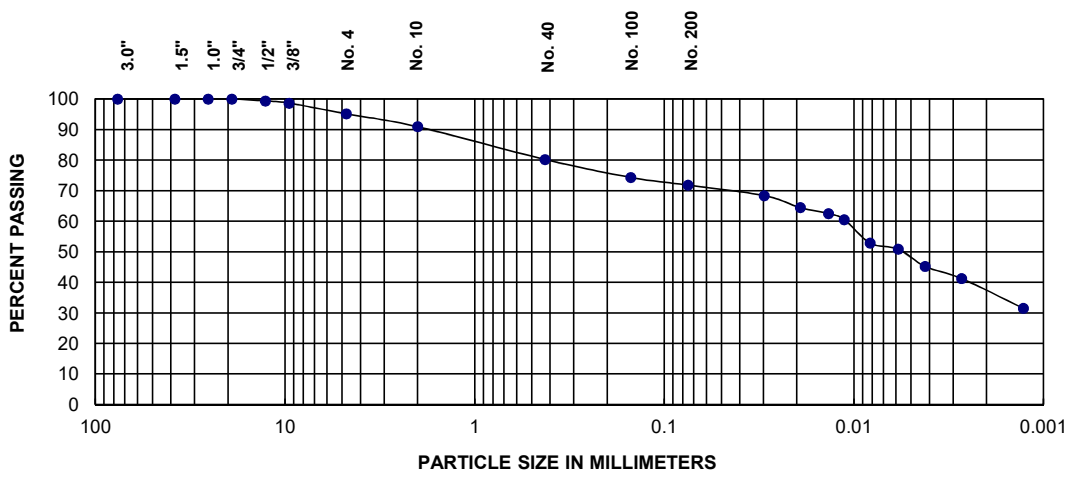
Remarks

INTERRA
Engineering • Inspection • Testing

GRAIN SIZE ANALYSIS
AASHTO T 88

Project	Stearns School Road at US 41 Geotechnical Borings - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	8076	**Sample #**	B-06	**Date Tested**	10/23/2018	**Tested by**	JBP
						Qc by	RC

Date Sample Received:	10/3/2018
Sample Location	2-5'
Sample Description	Brown silty clay



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	9.0	19.2	34.3	37.5

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	99.4
3/8"	98.7
No. 4	95.1
No. 10	91.0
No. 40	80.2
No. 100	74.3
No. 200	71.8

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
37	16	21

AASHTO Classification:	A-6(14)
IDH Classification:	Clay

Remarks:	

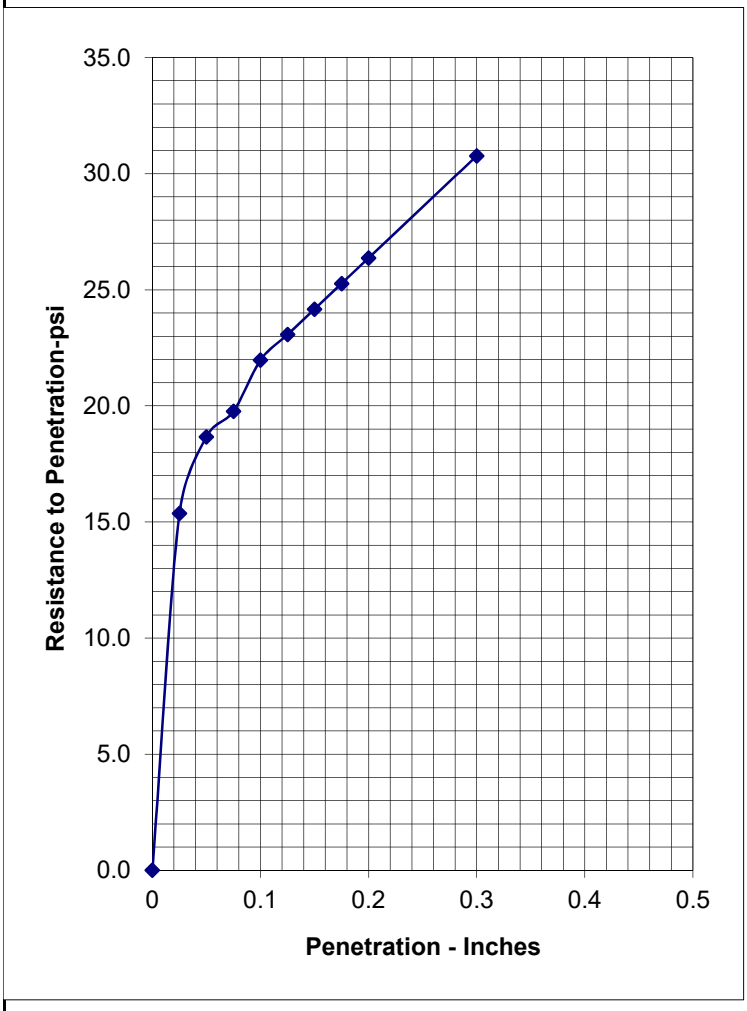
Test ID	61212

Interra, Inc.
600 Territorial Drive, Ste G, Bolingbrook, IL-60440
Ph: 630-754-8700 ; Fax 630-754-8705

ILLINOIS BEARING RATIO
AASHTO T-193

Project	Stearns School Road at US 41 Geotechnical Borings - Baxter Woodman							
Client	Baxter & Woodman-Crystal Lake, IL							
File No	8076	**Sample No**	B-06 (1)	**Date Tested**	10/30/18	**Tested By**	BKP	**QC By**	RC

Date Recvd.	10/3/18								
Location	2'-5'								
Description	Brown silty clay						**LL**	37	**PI** 21
Method	AASHTO T 193	**Opt. Moisture**	14.30%	**Hammer wt, lb**			**Drop, in**		
No. of Layers	1	**No. of Blows/Layer**	--	**Max. Dry Density**	115.1 pcf				



Condition of sample	Soaked
Dry Density (pcf), before soaking	114.5
Dry Density (pcf), after soaking	115.1

Moisture Content of sample(%)

Before compaction 14.3	After compaction 14.3
Top 1" After Test 22.2	Average After Test 16.9

Surcharge Weight, lbs	10

Swell (% of initial height)	**2.04**
IBR (at 0.1 in penetration)	2.2
IBR (at 0.2 in penetration)	**1.8**

Corrected IBR

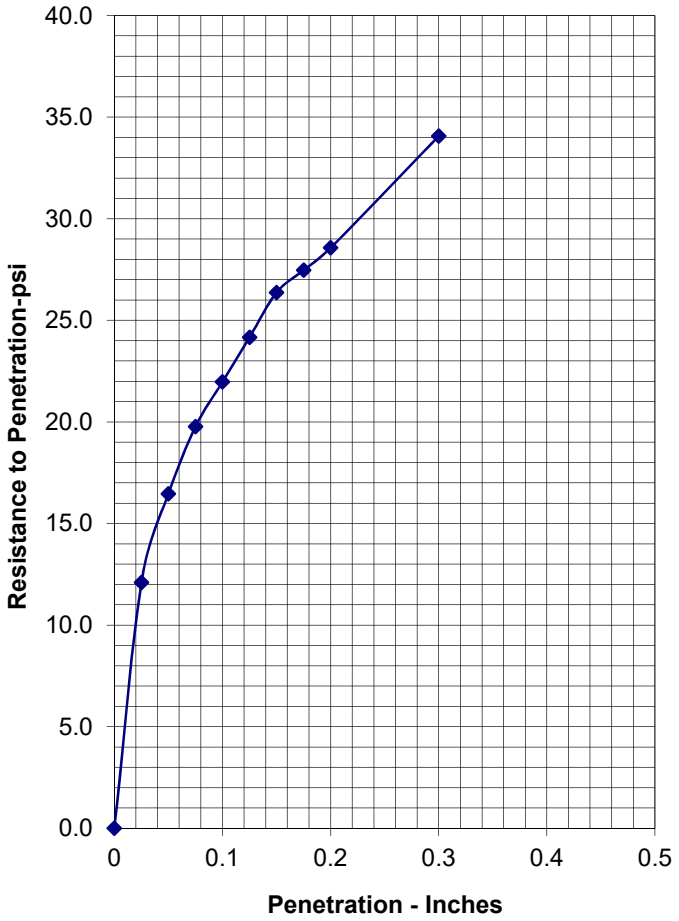
IBR (at 0.1 in penetration)	2.2
IBR (at 0.2 in penetration)	**1.8**

Remarks

Interra, Inc.	ILLINOIS BEARING RATIO
600 Territorial Drive, Ste G, Bolingbrook, IL-60440 Ph: 630-754-8700 ; Fax 630-754-8705	AASHTO T-193

Project	Stearns School Road at US 41 Geotechnical Borings - Baxter Woodman								
Client	Baxter & Woodman-Crystal Lake, IL								
File No	8076	**Sample No**	B-06 (2)	**Date Tested**	10/30/18	**Tested By**	BKP	**QC By**	RC

Date Recvd.	10/3/18								
Location	2'-5'								
Description	Brown silty clay						**LL**	37	**PI** 21
Method	AASHTO T 193	**Opt. Moisture**	14.30%	**Hammer wt, lb**			**Drop, in**		
No. of Layers	1	**No. of Blows/Layer**	--	**Max. Dry Density**	115.1 pcf				



Condition of sample	Soaked
Dry Density (pcf), before soaking	114.5
Dry Density (pcf), after soaking	114.6

Moisture Content of sample(%)

Before compaction	After compaction
14.5	14.5
Top 1" After Test	Average After Test
21.3	17.6

Surcharge Weight, lbs	10

Swell (% of initial height)	**2.13**
IBR (at 0.1 in penetration)	2.2
IBR (at 0.2 in penetration)	**1.9**

Corrected IBR

IBR (at 0.1 in penetration)	2.2
IBR (at 0.2 in penetration)	**1.9**

Remarks

Appendix D

Soil Erosion Factors and Hazard Ratings

Soil Types for Erosion Factors and Hazard Rating

US 41 & Stearns School Road, Lake County, IL

Soil Unit Map Symbol	Map Unit Name	Hazard Rating	Soil Erosion Factor, K
153A	Pella silty clay loam, 0 to 2 percent slopes	Slight	0.24
530C2	Ozaukee silt loam, 4 to 6 percent slopes, eroded	Moderate	0.43
521C2	Markham silt loam, 4 to 6 percent slopes, eroded	Moderate	0.37