Structural Geotechnical Report

Proposed Culvert Replacement
Existing Culvert SN: 099-0536
Proposed Culvert SN: 099-8302
FAP 846 (IL Route 53)
0.6 mil South of Hoff Road
Will County

Prepared for:

Illinois Department of Transportation
PTB 205-003
Work Order #4
Contract No: 62P01

Project Design Engineer:
Ardmore Roderick

Prepared by:

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August 19, 2024

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August 19, 2024

Mr. Shawn Brodaski, P.E.
Structural Department Head
Ardmore Roderick.
1500 W Carrol Ave, Suite 300
Chicago, IL 60607

Structural Geotechnical Report
IDOT PTB 205-003 Work Order #4
IL Route 53 Culvert Replacement
Will County, IL
Job No. D-91-319-22

Dear Mr. Brodaski:

Attached is a copy of the Geotechnical Report for the above referenced project. The report provides a brief description of the site investigation, site conditions, and geotechnical recommendations for the proposed improvements. The site investigation included advancing three (3) boring to a depth of 40 feet each.

Should you have any questions or require additional information, please call us at 630-994-2600.

Sincerely,

Ahmet Can Korkusuz

Ahmet Can Korkusuz, E.I.T.
Project Engineer

Dawn Edgell.

Dawn Edgell, P.E.
Sr. Project Engineer

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1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the proposed IL Route 53 culvert replacement project. The structure is located along IL Route 53 at Grant Creek approximately 0.6 miles south of Hoff Road near the Village of Elwood in Will County. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and develop design and construction recommendations for the proposed culvert replacement. **Exhibit 1** shows the general project location.

Exhibit 1: Project Location Map

1.1 Existing Structure Information

The existing box culvert (SN 099-0536) underneath IL 53 at Grant Creek is 8'W x 8'H at 14° skew. The box culvert crosses from southeast to northwest under IL 53 with a total length of 153 feet. The Phase 1 design report indicated that the culvert was severely deteriorated, particularly the downstream face, and requires full replacement.

1.2 Proposed Structure Information

Based on Phase 1 design report provided by Ardmore Roderick, the existing culvert will be removed and replaced. The proposed structure (SN:099-8302) will be a double 12'W x 9'H box culvert with the same approximate length of 153 feet. The existing embankment for the roadway over the culvert will also be improved where erosion has been noted near the downstream section of the culvert.

Table 1 presents a summary of the proposed culvert. It is anticipated that soil sloping, or temporary soil retention will be required for construction. Traffic will be staged during construction.

Table 1 – Summary of Proposed Culvert

Existing Structure	Proposed Structure	Proposed Stationing at Structure Center[1]	U.S. Inv. Elevation (ft.)	D.S. Inv. Elevation (ft.)	Slope (%)	Total Length
SN: 099-0536 (153'Lx8'Wx8'H single cell concrete box)	SN: 099-8302 (153'Lx12'Wx9'H double box culvert)	Sta. 307+44.30	599.2	598.1	0.719	153'-0"

[1] Based on existing IL Route 53 Stationing

1.3 Proposed Scope of Services

The objective of this study was to explore and characterize the subsurface soil conditions to provide recommendations regarding the proposed improvements. The scope of this study includes the following:

1. Advance three (3) soil borings to a depth of 40 feet each.
2. Perform a geotechnical laboratory testing program on selected representative soil samples obtained during the field investigation to evaluate relevant engineering parameters of the subsurface soils.
3. Perform engineering analysis and evaluation of the data collected during the field investigation and laboratory testing to develop geotechnical engineering design recommendations for the proposed improvements.

2.0 SITE SUBSURFACE EXPLORATION PROGRAM

This section describes the subsurface exploration program and laboratory testing program completed as part of this project. The proposed locations and depths of the soil borings were selected in accordance with IDOT requirements. The borings were completed in the field based on field conditions and accessibility.

2.1 Subsurface Exploration Program

The subsurface soil investigation was conducted on July 24 and 25, 2024, and included advancing three (3) soil borings near the existing culvert to a depth of 40 feet. **Table 2** presents a summary of the boring locations.

Table 2 – Summary of Subsurface Exploration Borings

Boring	Northing	Easting	Location	Existing Ground Elevation (ft)	Depth (ft)
CB-01	1718551.1023	1042023.1396	Southbound Right Shoulder	612.5	40.0
CB-02	1718501.5887	1042059.8426	Westbound Shoulder	613.6	40.0
CB-03	1718397.0099	1042071.1869	Northbound Right Shoulder	618.2	40.0

The existing ground surface elevations for the borings were based on the field survey performed by GSG using hand-held GPS equipment. The approximate locations of the soil borings are shown on the **Boring Location Plan (Appendix A)**.

The soil boring was drilled using a truck mounted Geoprobe drill rig (hammer efficiency 103%) using 3¼-inch I.D. hollow stem augers and automatic hammers. Soil sampling was performed according to AASHTO T 206, "Penetration Test and Split Barrel Sampling of Soils." Soil samples were obtained at 2.5-foot intervals to the boring termination depth. GSG's field representative inspected, visually classified and logged the soil samples during the subsurface exploration activities and performed unconfined compressive strength tests on cohesive soil samples using a calibrated RIMAC and hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval, were placed in jars, and returned to the laboratory for further testing and evaluation.

2.2 Laboratory Testing Program

All samples were inspected in the laboratory to verify the field classifications. A laboratory testing program was undertaken to characterize and determine engineering properties of the subsurface soils encountered. Moisture content laboratory tests (ASTM D2216) were performed on representative samples.

The laboratory tests were performed in accordance with test procedures outlined in the IDOT Geotechnical Manual (2020), and per ASTM requirements. Based on the laboratory test results, the soils encountered were classified according to the AASHTO and the Illinois Division of Highways (IDH) classification systems. The results of the laboratory testing program are shown along with the field test results in the Soil Boring Log **(Appendix B)**.

2.3 Subsurface Soil Conditions

This section provides a brief description of the soils encountered in the boring performed. Variations in the general subsurface soil profile were noted during the drilling activities. Detailed descriptions of the subsurface soils are provided in the soil boring log. The soil boring log provides specific conditions encountered at the boring location. The soil boring log includes soil descriptions, stratifications, penetration resistance, elevations, location of the samples, and laboratory test data. Unless otherwise noted, soil descriptions indicated on the boring log are visual identifications. The stratifications shown on the boring log represent the conditions only at the actual boring location and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

The borings were completed in the shoulder of the existing roadway and encountered 6 to 8 inches of asphalt and concrete pavement. The borings the noted dark gray silty clay fill up to 6.0 feet, corresponding to an elevation of approximately 607 feet. The fill materials included varying amounts of broken concrete, asphalt and organic material. Beneath the fill material, stiff to very stiff brown silty clay was encountered from 6.0 to 13.0 feet and very stiff gray silty clay from 13.0 to 20.0 feet. Between depths of 20.0 to 34.0 feet, medium dense to dense gray sand and gravel was encountered in each of the borings. Below the granular layers, the borings encountered stiff to very stiff gray silty clay, extending to the termination depth of 40.0 feet.

The unconfined compressive strength values of the stiff to very stiff, brown silty clay had unconfined compressive strength values that ranged between 1.0 tsf and 4.17 tsf. The unconfined compressive strength values for the very stiff gray silty clay ranged between 1.0 tsf and 4.17 tsf. The medium dense to dense gray sand and gravel had an average blow count value of 18 bpf. The unconfined compressive strength values for the lower stiff to very stiff gray silty clay ranged between 1.46 tsf and 6.25 tsf.

2.4 Groundwater Conditions

Water levels were checked in the boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was encountered during drilling at the depth of 21.0 feet below grade (around elevation 593 feet) in each boring, within the confined granular layers. Groundwater was not noted after drilling was completed.

Based on the color change from brown to gray, it is anticipated that the long- groundwater level could range between depths of 12 to 13.5 feet below grade (elevations 602 to 600.5 feet). Perched water may also be present within the existing fill materials or any confined silt or sand seams and layers. Water level readings were made in the borehole at times and under conditions shown on the boring log and stated in the text of this report. However, it should be noted that fluctuations in groundwater level may occur due to variations in rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

3.0 GEOTECHNICAL ANALYSIS

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed improvements based on the results of the field exploration, laboratory testing, and geotechnical analysis. Subsurface conditions in unexplored locations may vary from those encountered at the boring location. If the structure location, loadings, or elevations are changed, we request that GSG be contacted so that we may re-evaluate our recommendations.

3.1 Soil Parameters for Design

GSG determined the geotechnical parameters to be used for the project design based on the results of the field and laboratory test data on individual boring logs as well as our experience. Unit weights, friction angles and shear strength parameters were estimated using standard penetration test (SPT) results for the fill and cohesionless soils and in-situ and laboratory test results for cohesive soils. The SPT values were corrected for hammer efficiency and overburden weight. The hammer efficiency correction factor considers the use of a safety hammer/rope/cat-head system, generally estimated to be 60% efficient. Thus, correlations should be based upon what is currently termed as N_{60} data. The efficiency of the automatic hammer for Geoprobe drill rig was estimated to be approximately 103% based on GSG's most recent calibrations records. The correction for hammer efficiency is a direct ratio of relative efficiencies. The following equation should be used in calculating the corrected blow counts for the purposes of design and analysis:

$$N_{60} = N_{Field}^{*}(103/60) \text{ (Geoprobe)}$$

*Where the N_{Field} value is the field recorded blow counts during drilling activities.

Based on the field investigation data collected, generalized soil parameters for the soils for use in design at the culvert location are presented in **Table 3.**

Table 3 – Summary of Soil Parameters

Depth / Elevation Range (feet)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained	
			Cohesion c (psf)	Friction Angle ϕ (°)	Cohesion c (psf)	Friction Angle ϕ (°)
	New Engineered Clay Fill	125	1,000	0	50	25
	New Engineered Granular Fill	125	0	30	0	30
1.0 – 6.0 (612-607)	Dark Gray Silty Clay FILL	138	3,300	0	330	28
6.0 – 13.0 (607-600)	Stiff to Very Stiff Brown Silty Clay	138	5,100	0	510	28
13.0 – 20.0 (600-593)	Very Stiff Gray Silty Clay	138	4,800	0	480	28
20.0 – 25.0 (593-588)	Medium Dense to Dense Gray Sand and Gravel	125	0	38	0	38
25.0 – 40.0 (588-573)	Stiff to Very Stiff Gray Silty Clay	138	5,300	0	530	28

3.2 Slope Stability

IDOT requires that slope stability analysis be performed in areas where the cut or fill heights will exceed 15 feet in height. Based on the preliminary design plan, the maximum cut height will be less than 15 feet; therefore, no slope stability analysis was required for this report.

3.3 Settlement

The most common issues affecting the box portion of a culvert structure are mitigating differential settlement and ensuring constructability of the bottom slab. Box culverts are often located in existing stream channels where the new loading from a culvert and fill above will likely generate some settlement. It should be noted that the theoretical new loading at the base of the box is not as large as the new full height of soil fill loading adjacent to the box which can result in differential settlement along the roadway alignment.

Table 4 presents the estimated settlement of the proposed culvert based on the anticipated bearing elevation.

Table 4 – Estimated Settlement of Proposed Culvert

Proposed Structure	Anticipated Bearing Elevation* (feet)	Estimated Settlement at Culvert Inlet (inches)	Estimated Settlement at Culvert Outlet (inches)	Differential Settlement (inches)
SN:099-8302 (12'x9') double box culvert	597	<1.0	<1.0	<0.5

*Estimated 1 foot below invert elevation

3.4 Seismic Considerations

The seismic hazard for the site was analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design Specifications. As per the Bridge Manual, seismic data is not typically needed for buried structures. Therefore, no additional analysis is warranted.

3.5 Scour Analysis

Scour analysis is not warranted for closed bottom box culvert per All Bridge Designers memo 14.2, dated November 7, 2014. Therefore, no additional scour analysis is warranted.

4.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

This section provides the results of GSG's geotechnical evaluation of the existing foundation system and design recommendations in accordance with the most current AASHTO LRFD 9th Edition (2020) and IDOT Geotechnical Manual (2020). The foundations for the proposed culvert must provide sufficient support to resist the dead and live loads.

4.1 Culvert Foundation Recommendations

GSG evaluated the soils for the proposed culvert replacement. The recommendations in this report are based on the Phase 1 design report. For the design of the foundations, the total live load, impact loads, and dead loads, including the load of the overburden soils, should be considered. Design should be completed in accordance with the IDOT Culvert Manual (2017).

GSG evaluated the soils at bearing grade (1-foot below the invert) for the base of the proposed culvert. The soils observed in the borings generally consisted of very stiff silty to hard clay at the bearing grade of 597 feet. Therefore, undercuts are not anticipated at the proposed culvert location. Based on minimal remediation required for the bearing soils, either a cast-in-place or precast concrete box culvert may be considered for the site.

The wingwalls are anticipated to be constructed as cantilever walls attached to the culvert walls. Wingwalls should be designed based on the information and typical sections shown in Section 4.2 of the IDOT Culvert Manual (IDOT 2017). Headwalls should be designed based on the information provided in Section 4.1.5 of the IDOT Culvert Manual (IDOT 2017).

4.2 Bearing Resistance

GSG evaluated the soils at bearing grade for the base of the proposed culvert. Bearing resistance shall be evaluated at the strength limit state using load factors and factored bearing resistance. The bearing resistance factor, ϕ_b, for shallow foundations in clay is 0.50 per AASHTO Table 10.5.5.2.2.1. The bearing resistance shall be checked for the extreme limit state with a resistance factor of 1.0. **Table 6** presents the proposed bearing elevation and recommended bearing resistance of suitable materials to support the proposed culvert.

A foundation system consisting of shallow spread footings could be used to support the proposed culvert and headwall and should be placed at a minimum depth of 3 feet below grade for Type L walls or 4 feet below finished grade for Type T Walls (in accordance with IDOT Culvert manual), for frost protection.

Table 6 – Recommended Bearing Resistance

Proposed Structure	Approximate Bearing Elevation (feet)*	Nominal Resistance (ksf)	Factored Bearing Resistance (ksf)	Bearing Resistance for 1-inch Settlement Service Limit (ksf)	Anticipated Bearing Soil
Culvert	597.0	27.3	13.65	3.5	Very Stiff Silty Clay

*Elevations estimated as 1-foot below proposed invert elevations

4.3 Lateral Load Resistance

The culvert headwall and wingwalls will be subject to uneven loading and should be evaluated for anticipated lateral loads. Lateral earth pressures for permanent underground structures will be dependent on the type of backfill used, whether it is in a drained or undrained state, as well as loading conditions. The proposed culvert should be designed using the at-rest earth pressure coefficients provided in **Table 7.**

The lateral earth pressures for the headwalls should be designed per the guidance provided in Section 4 of the IDOT Culvert Manual (2017). Wall sections that are independent of the culvert should be designed using the Rankine active earth pressure coefficient, K_a. Headwalls that are fixed to the culvert to resist movement should be designed using an at-rest earth pressure coefficient. Lateral design parameters for use in design are provided in **Table 7**.

Table 7 – Lateral Load Resistance Soil Parameters

Depth / Elevation Range (feet)	Soil Description	Unit Weight γ	Friction Angle ϕ	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At-Rest Earth Pressure Coefficient (K_o)
	New Engineered Clay Fill	125	25	0.41	2.46	0.58
	New Engineered Granular Fill	125	30	0.33	3.00	0.50
1.0 – 6.0 (612-607)	Dark Gray Silty Clay FILL	138	28	0.36	2.77	0.53

6.0 – 13.0 (607-600)	Stiff to Very Stiff Brown Silty Clay	138	28	0.36	2.77	0.53
13.0 – 20.0 (600-593)	Very Stiff Gray Silty Clay	138	28	0.36	2.77	0.53
20.0 – 25.0 (593-588)	Medium Dense to Dense Gray Sand and Gravel	125	38	0.23	4.40	0.37
25.0 – 40.0 (588-573)	Stiff to Very Stiff Gray Silty Clay	138	28	0.36	2.77	0.53

4.4 Drainage Recommendations

The retaining walls should be designed to prevent the buildup of hydrostatic forces. This can be done with the construction of a base drain and back drain to collect and remove surface water away from the face of the retaining wall. Geocomposite Wall Drain or open grade stone with a geotextile fabric system should be placed over the entire length of the back face of the wall. If a drain cannot be installed behind the wall, hydrostatic pressures should be accounted for with the lateral design of the wingwall.

5.0 CONSTRUCTION CONSIDERATIONS

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction (SSRBC) (2022) and the IDOT Subgrade Stability Manual (2005). Any deviation from the requirements in the manuals above should be approved by the design engineer.

5.1 Site Preparation

Any pavement materials or topsoil encountered during construction should be stripped and stockpiled as per Section 211.03 of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC). The topsoil should be separated from other materials being stockpiled onsite for reuse or haul off. Base coarse aggregate encountered at the site should be evaluated to determine suitability for reuse as general fill. The contractor should not mix the existing base course materials, if any, with existing subgrade soils during the stripping and stockpiling activities. Stripping of any trees, brush, vegetation, and topsoil may be necessary at the proposed improvement location.

5.2 Scour Considerations

For the proposed improvements, the design scour elevations should be taken as the bottom of the wingwalls. To help prevent local erosion, it is recommended to place stone riprap at the end of the culvert. This will help prevent sediments from entering and accumulating in the culvert, reduce long term maintenance, and provide protection to the streambed at the interface.

5.3 Site Excavation

Site excavations are expected to encounter various types of soils as described in the Subsurface Exploration section of this report. The contractor will be responsible for providing safe excavation during the construction activities of the project. All excavations should be conducted in accordance with applicable federal, state, and local safety regulations, including, but not limited to the Occupational Safety and Health Administration (OSHA) excavation safety standards. In accordance with OSHA Regulation 29 CFR 1926 Subpart P Appendix B, the maximum allowable slopes for excavations less than 20 feet should be completed per the OSHA Excavation Slopes shown in **Table 8**. Excavations made in layered soil systems shall use the maximum allowable slope for each layer as prescribed in the OSHA Regulation. Excavations greater than 20 feet deep should be designed by a registered professional engineer; any shoring or bracing systems should be designed by a licensed structural engineer.

Table 8 – OSHA Excavation Slopes

Soil or Rock Type	Maximum Allowable Slope (H:V) for less than 20 feet
Stable Rock	Vertical (90°)
Type A	¾:1 (53 °)
Type B	1:1 (45 °)
Type C	1 ½:1 (34 °)

Excavation stability and soil pressures on temporary shoring are dependent on soil conditions, depth of excavations, installation procedures, and the magnitude of any surcharge loads on the ground surface adjacent to the excavation. Surcharge loads from the excavated materials, construction equipment, and vehicles should be included in the design of the excavation system. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures.

If water seepage occurs during excavation or where wet conditions are encountered such that the water cannot be removed with conventional sumping, GSG recommends placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation below the water table. The CA-7 stone should be placed 12 inches above the water table, in 12-inch lifts, and should be compacted with the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable. The remaining portion of the excavation beneath the footings should be backfilled using approved structural fill consisting of granular materials such as IDOT CA-6.

5.4 Borrow Material and Compaction Requirements

If borrow material is to be used for onsite construction, it should conform to Section 204 “Borrow and Furnish Excavations” of the IDOT SSRBC (2022). The fill material should be free of organic matter and debris and should be placed and compacted in accordance with Section 205, Embankment, of the IDOT Construction Manual. Earth-moving operations should be avoided during excessively cold or wet weather to avoid freezing of softening subgrade soils. All backfill materials around the culvert must be pre-approved by the site engineer. Backfill materials for undercut areas beneath the culvert should be placed in 8 inches loose lifts and should be compacted to 95% of the maximum dry density as determined by AASTHO T-180, Modified Proctor Method.

5.5 Groundwater Management

The long-term groundwater is anticipated to be 12 feet below grade (approx. elevation 602 feet). GSG does not anticipate significant groundwater related issues during construction, however excavations may be impacted by the creek level at time of construction. Perched water may be encountered in the existing fill materials or any confined granular layers. If rainwater run-off or groundwater is accumulated at the base of excavations, the contractor should remove accumulated water using conventional sump pit and pump procedures and maintain a dry and stable excavation. The location of the sump should be determined by the contractor based on field conditions. During earthmoving activities at the site, grading should be performed to ensure that drainage is maintained throughout the construction period. Water should not be allowed to accumulate in the foundation area either during or after construction. Excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater or surface run-off. Grades should be sloped away from the excavations to minimize runoff from entering.

If water seepage occurs during the excavations where wet conditions are encountered such that the water cannot be removed with conventional sumping, we recommend placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation below the water table. The CA-7 stone should be placed 12 inches above the water table, in 12-inch lifts, and should be compacted with the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable. The remaining portion of the excavation beneath the footings should be backfilled using approved structural fill.

5.6 Temporary Soil Retention

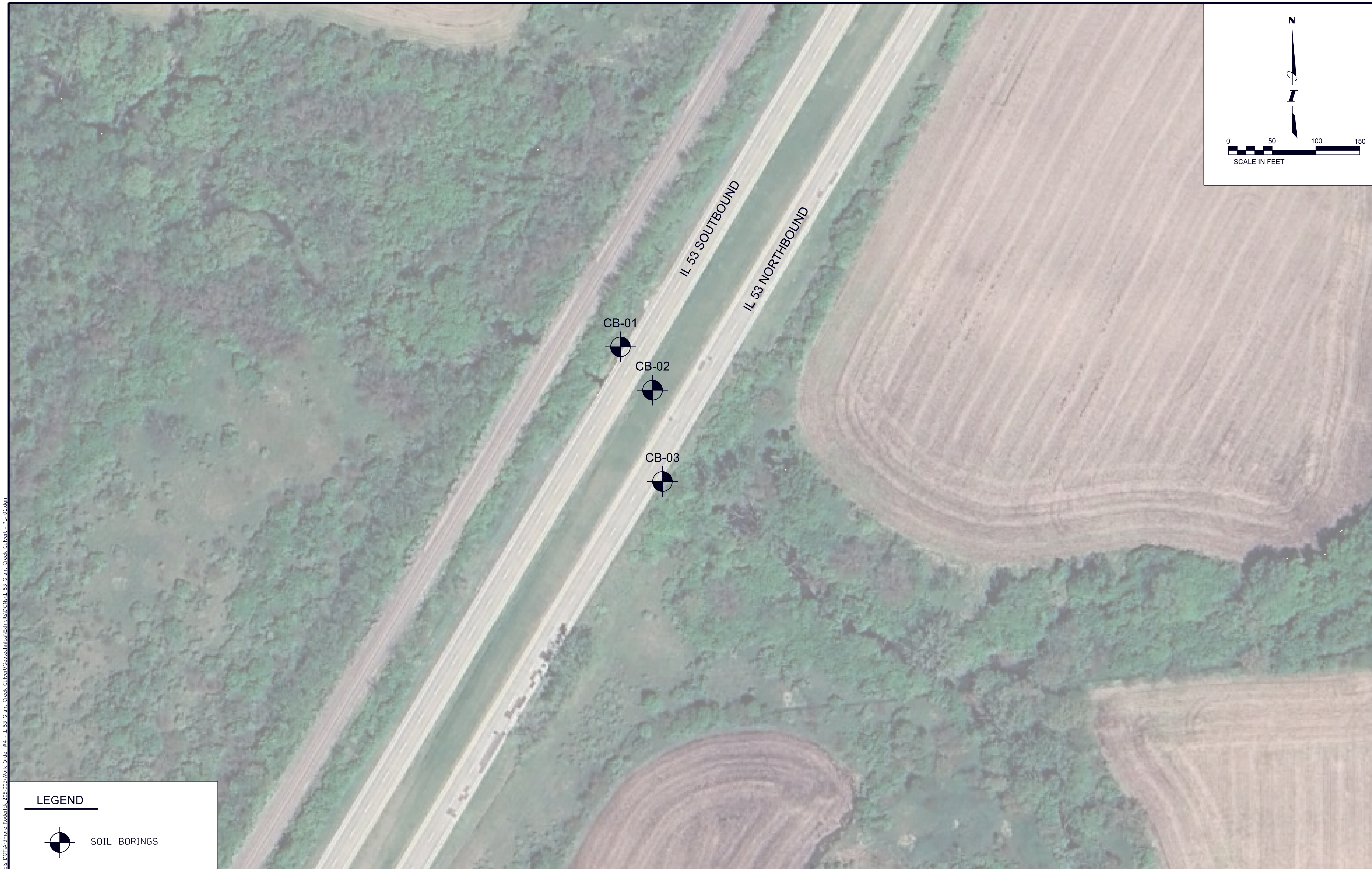
Temporary sheet piling is feasible because the existing soils strengths are generally less than 4.5 tsf. The Temporary Soil Retention System (TSRS) should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, Temporary Sheet Piling Design, Temporary Soil Retention Systems and Braced Excavations and the IDOT Design Guide.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of the Illinois Department of Transportation and its consultant team. The recommendations provided in the report are specific to the project described herein and are based on the information obtained from the soil boring location within the proposed project limits. The analyses have been performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the boring. This report may not reflect all variations that may occur outside the boring location or at some other time, the nature and extent of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations presented herein.

APPENDIX A

SOIL BORING LOCATION PLAN



MODEL: Default

GSG CONSULTANTS, INC.
735 E. REMINGTON RD, SCHAUMBURG, IL 60173
TEL: +1630.994.2600 | WWW.GSG-CONSULTANTS.COM

USER NAME = nnano	DESIGNED - AK	REVISED -	
	DRAWN - NN	REVISED -	
PLOT SCALE = 1200.0000 ' / ft.	CHECKED - DE	REVISED -	
PLOT DATE = 8/6/2024	DATE - 08/06/2024	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 205–003
IL 53 GRANT CREEK CULVERT
BORING LOCATION PLAN

SCALE: 1:50 | SHEET 1 OF 1 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	1	1
		CONTRACT NO. PTB 195-017		
	ILLINOIS	FED. AID PROJECT		

APPENDIX B

SOIL BORING LOGS

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 7/24/24

ROUTE FAP 846/IL 53 **DESCRIPTION** Culvert Boring **LOGGED BY** DV

SECTION 2021-064-CR **LOCATION** IL 53, **SEC.** , **TWP.** , **RNG.** ,
Latitude 41.3849650, **Longitude** -88.1228009

COUNTY WILL **DRILLING RIG** GEOPROBE **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 103

STRUCT. NO. 099-8302
Station 307+44.30

BORING NO. CB-01
Station
Offset
Ground Surface Elev. 612.50 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 591.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
5.0 inches of Concrete	612.08				
3.0 inches of Asphalt Subbase	611.83				
FILL: Broken Concrete			50/0		7
	610.00				
FILL: SANDY SILT (MLS), trace gravel, Dark Gray, Very Moist			5 4 3		25
	607.50	-5			
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Brown, Moist			WH 1 1	1.3 B	26
		-10	2 2 5	3.3 B	20
			3 4 6	3.1 B	19
	599.00				
SILTY CLAY (CL/ML), trace gravel, Very Stiff, Gray, Moist		-15	2 4 5	2.7 B	16
			3 4 6	2.5 B	18
		-20	3 4 6	2.5 B	18

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY (CL/ML), trace gravel, Very Stiff, Gray, Moist *(continued)*	591.50 ▼				
SAND (SP), trace gravel, Loose, Gray, Moist			2 3 6		18
	589.00				
GRAVEL (GP), with sand, Medium Dense, Gray, Wet		-25	7 11 14		11
	586.50				
SILTY CLAY (CL/ML), trace gravel, trace sand, Stiff to Very Stiff, Gray, Very Moist			4 3 6	3.1 B	27
		-30	3 4 7	2.9 B	24
			2 3 4	3.3 B	30
		-35	2 2 5	2.9 B	34
			2 2 3	1.7 B	35
	572.50	-40	1 2 1	2.1 B	30

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 7/25/24

ROUTE FAP 846/IL 53 **DESCRIPTION** Culvert Boring **LOGGED BY** DV

SECTION 2021-064-CR **LOCATION** IL 53, **SEC.** , **TWP.** , **RNG.** ,
Latitude 41.3848289, **Longitude** -088.1226676

COUNTY WILL **DRILLING RIG** GEOPROBE **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 103

STRUCT. NO. 099-8302
Station 307+44.30

BORING NO. CB-02
Station
Offset
Ground Surface Elev. 613.61 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 592.6 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6.0 inches of Asphalt	613.11				
FILL: SILTY CLAY (CL/ML), trace gravel, trace asphalt, organics/topsoil, Stiff, Dark Gray, Moist			3 3 3	2.5 B	19
		-5	2 1 2	1.7 B	23
	607.61				
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Brown, Moist			1 1 1	1.7 B	24
		-10	2 2 4	2.7 B	21
	601.61		4 6 9	4.2 B	18
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Gray, Moist		-15	4 5 7	3.1 B	18
			2 2 3	1.7 B	21
	593.61	-20	WH 3 10	1.5 B	17
SAND (SP), with gravel, Medium Dense, Gray, Moist	592.61 ▼				
GRAVEL (GP), with sand, Medium Dense, Gray, Wet			14 10 8		14
		-25	5 7 6		11
	586.11		6 27 16		32
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Gray, Very Moist		-30	9 4 7	4.0 B	17
			3 4 6	3.3 B	29
		-35	3 4 5	2.1 B	33
			2 1 3	1.5 B	34
	573.61	-40	1 1 2	1.5 B	31

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 7/24/24

ROUTE FAP 846/IL 53 **DESCRIPTION** Culvert Boring **LOGGED BY** EH

SECTION 2021-064-CR **LOCATION** IL 53, **SEC.** , **TWP.** , **RNG.** ,
Latitude 41.3845418, **Longitude** -088.1226272

COUNTY WILL **DRILLING RIG** GEOPROBE **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 103

STRUCT. NO. 099-8302
Station 307+44.30

BORING NO. CB-03
Station
Offset
Ground Surface Elev. 618.24 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (bottom of stratum)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6.0 inches of Reinforced Concrete	617.74				
FILL: SILTY CLAY, trace gravel, Brown to Gray, Very Moist			3 2 2	2.1 B	23
	612.24	-5	1 2 1	2.1 B	27
FILL: SILTY CLAY, trace gravel, Gray, Black and Brown, Very Moist			2 3 2	2.9 B	28
	607.24	-10	WH 2 2	0.5	33
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Brown, Very Moist	604.74		3 1 2	1.0 B	26
SILTY CLAY (CL/ML), trace gravel, Stiff to Very Stiff, Gray and Dark Brown, Very Moist		-15	2 2 3	2.1 B	33
	599.74		2 3 3	1.7 B	29
SILTY CLAY (CL/ML), trace gravel, Hard to Very Hard, Gray, Moist		-20	4 5 4	4.2 B	19

Description	Elev. (bottom of stratum)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY (CL/ML), trace gravel, Hard to Very Hard, Gray, Moist *(continued)*			5 8 11	8.3 B	16
	592.24	-25	6 9 11	6.3 B	17
GRAVEL (GP), with sand, trace clay, Medium Dense to Dense, Gray, Moist			18 13 13		11
		-30	10 24 13		8
	584.74		8 6 5		15
SILTY CLAY (CL/ML), trace gravel, Very Stiff, Gray, Very Moist		-35	4 4 6	3.3 B	27
			2 2 4	2.5 B	31
	578.24	-40	2 3 5	2.9 B	29

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

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