Structural Geotechnical Report

Proposed Bridge Carrying I-80 over IL 53/US 52 (Chicago Street)
SN: 099-8310
IDOT PTB 198-003
Will County, Illinois

Prepared for

Illinois Department of Transportation
Contract Number: D-91-204-19

Project Design Engineer Team
WSP USA

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Structural Geotechnical Report
Proposed Bridge Carrying I-80 over IL 53/US 52 (Chicago Street)
Will County, IL
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Dear Mr. Skaleski:

Attached is a copy of the Structural Geotechnical Report for the above referenced project. The report provides a description of the site investigation, site conditions and foundation and construction recommendations. The site investigation for the proposed bridge construction included advancing twelve (12) soil borings to depths ranging from 38.5 to 73 feet.

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

Sincerely,

Rachel Miller, P.E.
Project Engineer

Ala E Sassila, Ph.D., P.E.
Principal

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1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the proposed eastbound and westbound bridge carrying I-80 over IL 53/US 52 (Chicago Street) in the City of Joliet in Will County, Illinois. 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 bridge. **Exhibit 1** shows the general project location.

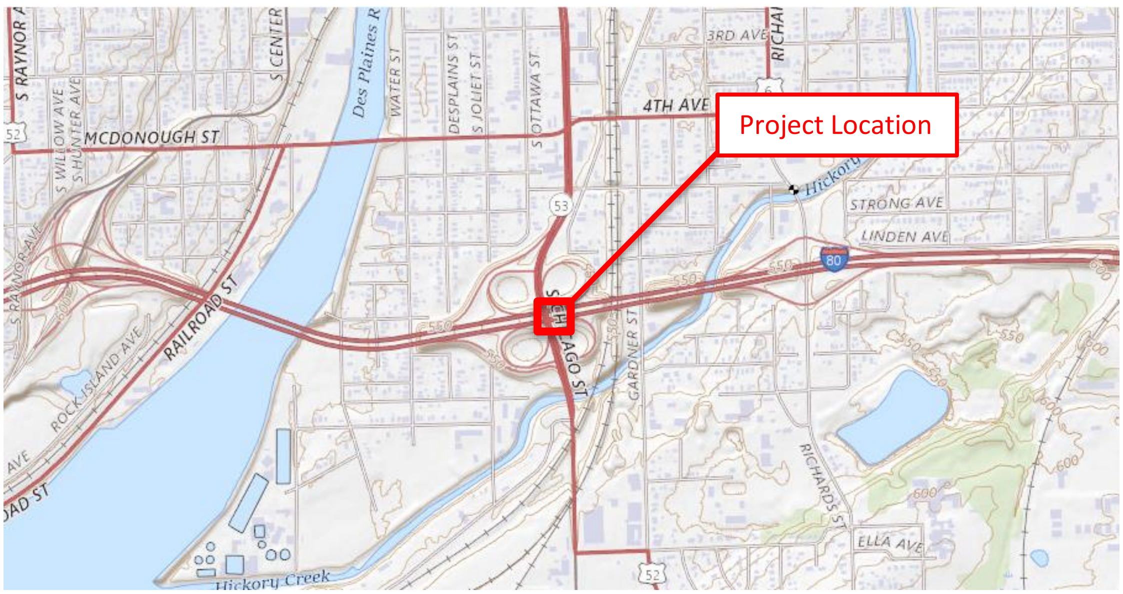


Exhibit 1 – Project Location Map
(Source: USGS Topographic Maps, usgs.gov)

1.1 Existing Bridge Information

The I-80 intersection with IL 53/US 52 currently consists of a roadway underpass. The existing bridge structures SN: 099-0059 (EB) and SN: 099-0058 (WB) each consist of 3-span structures over Chicago Street. Each bridge has 4 lanes of traffic with minimal shoulders. The bridges are separated by a grass median approximately 30 feet wide. The bridges are 179’7” back to back between abutments, supported on concrete stub abutments and trapezoidal column piers. Below each abutment, the side slopes from Chicago Street to the abutment are at a 2H:1V slope and are covered with concrete slabs.

Exhibits 2a and 2b show the existing conditions of the bridges to be replaced. **Exhibit 2c** shows the location of the proposed bridge – shifted east from their current locations.

Exhibit 2a – Existing Westbound Bridge, Looking West

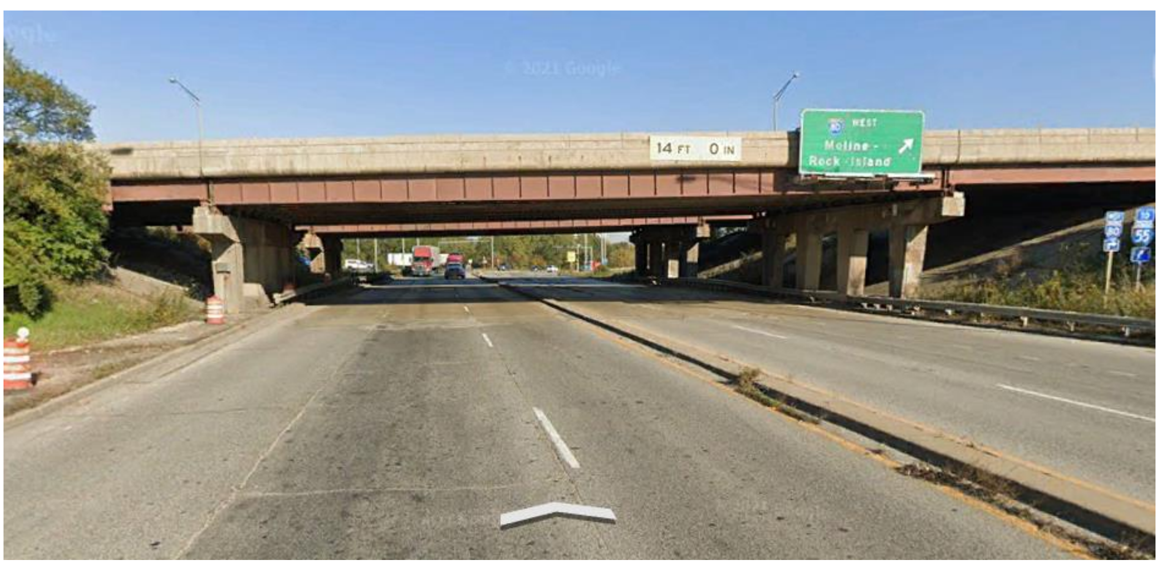


Exhibit 2b – Existing Bridges, Looking North

Exhibit 2c – Area of Proposed Bridge: Eastbound I-80, Looking West

1.2 Proposed Bridge Information

Based on GPE Plans, dated May 7, 2024, (**Appendix A**) provided by WSP, the I-80 Eastbound and Westbound bridges will be removed and replaced. Staged construction will be used to maintain I-80 traffic. Chicago Street traffic will be detoured to the newly constructed Ramp B.

A new dual bridge, SN: 099-8310 will be constructed for I-80 over US 52/IL 53. The bridge is planned to be a single span structure with a total length of 138’8” back-to-back of abutments. The out-to-out width of the eastbound bridge will be about 75’6$^{3}/_{8}$”, and the out-to-out width of the westbound bridge will vary from about 75’3” to 84’11$^{3}/_{8}$”. The new bridge will provide a minimum clearance over Chicago Street of 20’-3”. Due to the realignment of I-80 and Chicago Street, the interchange will be moved approximately 130 feet to the east of the existing structures. This will require the existing Chicago Street alignment to be filled in and a new roadway alignment/bridge location to be excavated. Based on the GPE, a maximum of about 23 feet of new fill is assumed. The most recent GPE drawings show MSE retaining walls will be constructed below the abutments in lieu of slopes. The east and west MSE retaining walls will have maximum design heights of about 24’5$^{1}/_{8}$” and 20’6$^{1}/_{4}$” and will be about 260 to 264 feet long, respectively. The ground elevations adjacent to the MSE walls are anticipated to be about El. 545.7 to El. 543.1 feet +/-, and the base of the MSE wall levelling pads are anticipated to be about 3.5 feet below the ground surface, at about El. 542.2 to El. 539.6 feet.

2.0 SITE SUBSURFACE CONDITIONS

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 and reviewed with WSP. The borings were completed in the field based on field conditions and accessibility.

2.1 Subsurface Exploration and Laboratory Testing

The site subsurface exploration for the proposed bridge structures was conducted between April 5 and April 25, 2022. The investigation included advancing twelve (12) borings to depths between 38.5 and 73 feet. The locations of these soil borings were reviewed and approved by WSP and adjusted in the field as necessary based on utilities and access. Elevations and as-drilled locations for the borings were gathered by GSG's field crew using GPS surveying equipment. The approximate as-drilled locations of the soil borings are shown on the Soil Boring Location Plan & Subsurface Profiles **(Appendix B)**. **Table 1** presents a summary of the borings used for the proposed bridge analyses.

Table 1 – Summary of Subsurface Exploration Borings

Associated Bridge	Abutment/Pier Location	Boring ID	Station *	Offset (ft)/ Direction	Depth (ft)	Surface Elevation (ft)
I-80 Westbound	West Abutment	BSB-53	705+82.9618	91.2 LT	47.0	547.3**
	West Pier (N/A)	BSB-54	706+61.3187	82.0 LT	56.0	570.2
	East Pier (N/A)	BSB-55	707+9.3039	85.4 LT	66.0	570.7
	East Abutment	BSB-56	707+58.1383	88.3 LT	58.0	571.4
Both I-80 Eastbound and Westbound	West Abutment	BSB-57	705+91.5770	3.1 LT	38.5	547.6**
	West Pier (N/A)	BSB-58	706+66.4994	12.5 LT	56.5	570.9
	East Pier (N/A)	BSB-59	707+18.8792	6.2 LT	40.5	571.2
	East Abutment	BSB-60	707+64.3590	8.7 LT	73.0	572.5
I-80 Eastbound	West Abutment	BSB-61	706+5.9104	87.7 RT	56.5	547.9**
	West Pier (N/A)	BSB-62	706+79.3245	78.2 RT	58.5	570.7
	East Pier (N/A)	BSB-63	707+32.8082	77.9 RT	73.0	571.7
	East Abutment	BSB-64	707+75.0249	80.2 RT	58.5	572.1

* Based on proposed I-80 Eastbound Stationing

**Completed along the shoulder of Chicago Street below I-80

The soil borings were drilled using truck mounted Diedrich D-50 (hammer efficiency 97%), B-57 Mobile (hammer efficiency 89%) and CME-75 (hammer efficiency 91%) drill rigs, each equipped with 3¼-inch I.D. hollow stem augers and an automatic hammer. 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 a depth of 30 feet, then at 5-foot intervals to the boring termination depths or upon encountering auger refusal on apparent bedrock. Water level measurements were made in each boring when evidence of free groundwater was detected on the drill rods or in the samples. The boreholes were also checked for free water immediately after auger removal, and before filling the open boreholes with soil cuttings and surface patching with asphalt where necessary to match the existing pavement. Copies of the Soil Boring Logs are provided in **Appendix C**.

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 compression tester and a calibrated hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval and were placed in jars and returned to the laboratory for further testing and evaluation.

GSG also collected rock core runs from five of the soil boring locations with the use of a ten-foot or and/or a five-foot, diamond bit, NX-5 split core barrel during the investigation. The bedrock cores were evaluated in the field for texture, physical condition, recovery percentage, and Rock Quality Designation (RQD). The extracted samples were visually inspected and classified, and the Rock Quality Designation (RQD) was determined according to ASTM D 6032, "Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core" by totaling all sections with a length in excess of four (4) inches and dividing it by the total length of the core run. The RQD is given a classification based upon the numeric value as indicated in **Table 2**.

Table 2 – Rock Quality Designation Summary

Rock Quality Designation	Descriptions
< 25%	Very Poor
25 – 50%	Poor
51 – 75%	Fair
76 – 90%	Good
91 – 100%	Excellent

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 in the area of the proposed bridge.

The following laboratory tests were performed on representative soil and rock samples:

- Moisture content ASTM D2216 / AASHTO T-265
- Unconfined Compression Strength on Rock – ASTM D2938

The laboratory tests were performed in accordance with test procedures outlined in the most current IDOT Geotechnical Manual, and per ASTM and AASHTO 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 included in the Laboratory Test Results **(Appendix D)** and are also shown along with the field test results in the Soil Boring Logs **(Appendix C)**.

2.3 Subsurface Soil Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed bridge. 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 logs and are shown graphically in the Boring Location Plan & Subsurface Profiles. The soil boring logs provide specific conditions encountered at each boring location and include soil descriptions, stratifications, penetration resistance, elevations, location of the samples, and laboratory test data. Unless otherwise noted, soil descriptions indicated on boring logs are visual identifications. The stratifications shown on the boring logs represent the conditions only at the actual boring locations and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

The surface elevations of the borings completed along Chicago Street ranged between 547.3 and 547.9 feet; the elevation of the borings completed along I-80 ranged between 570.2 and 572.1 feet. The borings along Chicago Street noted up to 3.5 inches asphalt over 3 to 11.5 inches of concrete. Boring BSB-61 also noted 4.5 inches of CA-6 type gravel aggregate. Below the pavement materials, the borings encountered various fill soils ranging to depths between 4.5 and 40 feet (El. 530 to 547 feet). The fill materials were predominantly silty clay, with unconfined compressive strengths ranging from 1.0 to 4.5 tons per square foot (tsf), with most values between 2.0 and 3.0 tsf. Several borings also encountered pockets of sand and gravel fill.

Underlying the fill layers, most of the borings encountered brown and gray stiff to very stiff silty clay and silty clay load to depths of 12.0 to 40.0 feet. This layer generally had unconfined compressive strength values ranging between 1.25 and 4.68 tsf. Below the cohesive layer, the borings encountered medium dense to dense sand before encountering weathered limestone bedrock. Limestone fragments and gravel were noted at various depths within the sand layer. The sand and gravel had SPT blow counts 'N' values ranging between 7 to greater than 100, with most values between 20 and 30 blows per foot (bpf). The borings were terminated upon encountering practical auger refusal on limestone bedrock at depths between 32.0 to 58.5 feet (El. 507 to 515 feet).

Boring BSB-60 encountered 6 inches of concrete below the fill at a depth of about 41 feet (El. 532 feet) that may have been an old structure. Boring BSB-59 was terminated within the existing fill materials upon encountering auger refusal at a depth of 40.5 feet (El. 530) similar to BSB-60.

Rock core samples were collected at several soil boring locations. The bedrock cores generally consisted of light gray limestone, with slight to moderate weathering and slight to high levels of fracturing. A vertical clay seam was encountered at about 63.5 feet at soil boring location BSB-63. Vertical fracturing was observed at a depth of 68 to 70 feet within the BSB-63 rock core sample. Some chert and vugs were observed. Unconfined compressive strength tests were completed on representative samples of the rock cores. **Table 3** provides the RQD values and unconfined compression strength values of the rock cores extracted during the site investigation. Photographs of the cores are included with each boring log in **Appendix B**.

Table 3 – Rock Core Summary and Classification

Boring Number	Core Run / Length (ft)	Core Depth (feet)	Type of Rock	RQD (%)	RQD Classification	Depth (ft)/ Compressive Strength (psi)
BSB-53	1 / 10	32.0-42.0	Limestone	84.2	Good	37.5-38.0 / 16,071
	2 / 5	42.0-47.0	Limestone	76.7	Good	N/A
BSB-55	1 / 10	56.0-66.0	Limestone	59.2	Fair	58.0-58.5 / 10,017
BSB-60	1 / 10	58.0-68.0	Limestone	94.2	Excellent	N/A
	2 / 5	68.0-73.0	Limestone	81.7	Good	N/A
BSB-61	1 / 8.25	40.5-48.75	Limestone	79.0	Good	N/A
	2 / 8	48.75-56.75	Limestone	71.3	Fair	N/A
BSB-63	1 / 10	58.0-68.0	Limestone	78.3	Good	N/A
	2 / 5	68.0-73.0	Limestone	79.2	Good	N/A

2.4 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was observed during drilling at boring location BSB-53, BSB-54, BSB-59, BSB-60 and BSB-64 at depths of 1 to 54 feet (El. 562.7 to 516.7 feet). Groundwater was not encountered during or immediately after drilling at the remaining seven soil boring locations. None of the borings were left open after leaving the site due to safety concerns.

Based on the observed water levels and soil color change from brown to gray, it is anticipated that the long-term groundwater level is near 50 to 54 feet below existing grade (approx. El. 517 feet), near the bedrock interface. The level of the Des Plaines River, typically about 539 feet, may also affect the onsite water levels during construction and should be taken into consideration. Perched water may also be present within the fill materials observed in the borings, such as the water encountered at about 14.5 inches below grade, below the surface asphalt and concrete, at boring location BSB-53. Water level readings were made in the boreholes at times and under conditions shown on the boring logs and stated in the text of this report. However, it should be noted that fluctuations in groundwater level may occur due to variations in the rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

3.0 GEOTECHNICAL ANALYSES

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

3.1 Scour

The bridge structures carrying I-80 over IL 53/US 52 (Chicago Street) have no waterways in the vicinity; therefore, scour will not be a concern for this project.

3.2 Settlement

It is understood that the existing IL 53/US 52 (Chicago Street) roadway area will be filled, and a new road alignment will be excavated to the east. The newly filled IL 53/US 52 area will overlap with the new, western bridge abutments. Based on the existing site grades and GPE drawings it is assumed that a maximum of about 23 feet of new engineered fill will be necessary to fill the existing roadway. A preliminary analysis was performed to evaluate the anticipated total settlement due to the new fill. Immediate settlement for cohesionless soils can typically occur during the filling operations, while the consolidation settlement for cohesive soils generally occurs over a longer period of time. The maximum estimated total settlements within the new fill soils and native cohesive soils were calculated as shown in **Table 4** where 90% of the total settlement is estimated to be completed within 12 months. Settlement estimates were calculated for the three, western-most soil boring locations that were completed along Chicago Street, in the area of the proposed fill.

Table 4 – Anticipated IL 53/US 52 Fill Settlement – Preliminary Calculations

Boring Location	Roadway Fill Area		Assumed New Fill Height (feet)	Anticipated Total Settlement (inches)
	Assumed Width (feet)	Assumed Length (feet)		
BSB-53	50	170	23	1.4
BSB-57	50	170	23	1.4
BSB-61	50	170	23	1.5

Based on the general nature of the existing cohesive soils, underlain by sand and gravel, encountered within the area to be filled, the estimated settlement of the expanded roadway fill could range from about 1.4 to 1.5 inches. Accordingly, downdrag should be anticipated to be an issue in areas where deep foundations are to be constructed within the new western embankment.

3.3 Roadway Fill Settlement Treatment and Recommendations

If the anticipated settlement is excessive for the proposed improvement, special design recommendations may be considered to mitigate the impact to the bridge construction. Some areas of the subgrade soils beneath the new roadway fill may require in-situ ground improvement in order to mitigate the anticipated settlement after the anticipated filling operations. The recommended ground improvement techniques and the impacts on the estimated time rate of settlement are discussed below. The treatment alternative that is selected must also consider the proposed bridge foundation construction schedule.

3.3.1 Ground Improvement

Based on the anticipated settlements noted in **Table 4** for the area of new fill in the vicinity of borings BSB-53, BSB-57 and BSB-61, additional ground modification should also be considered. The installation of rammed aggregate piers, stone columns or rigid inclusions could be considered to stabilize the site and minimize long term settlement. Ground improvements may also be constructed below MSE wall levelling pads to provide a higher allowable bearing capacity.

Aggregate columns can act as wick drains in accelerating drainage at the site and decreasing the time frame for consolidation settlement. Typical column diameters range from 18 to 36 inches and, in general, are most economical for sites requiring column lengths less than 35 feet deep and preferably about 20 feet deep below the surface, such as this site.

Rigid inclusions (RIs) are columns of grout used to reinforce the ground to increase bearing resistance and reduce settlement of a structure or embankment. Rigid Inclusions are constructed with an auger displacement tool or vibrated pipe tool that displaces soil laterally, producing very little spoils. Grout mixes for rigid inclusions shall consist of Portland cement, sand, and water, and may also contain coarse aggregate, a mineral admixture and/or approved fluidifier. Geogrid or geotextile and reinforcing steel can also be used to increase the strength of the inclusions. Typical inclusion diameters range from 12 to 18 inches. The rigid inclusions reinforce the soil rather than function as distinct structural elements or piles. The improved ground has increased stiffness and therefore improved settlement and bearing characteristics.

In addition to the stone columns or rigid inclusions, a load transfer layer consisting of compacted material with geogrid reinforcement would be necessary to transfer the embankment load to the columns. The embankment construction and fill placement could then be completed after the installation of the columns and the load transfer layer.

This site improvement technique would provide a stable platform for construction of the embankment by transferring the embankment and MSE wall loads to the lower stiff to hard clay and medium dense to very dense granular materials and limit the influence on the compressible materials. Based on the subsurface conditions the stone columns should be designed to bear within the stiff to hard silty clay/silty clay loam and medium dense to very dense sand, typically about 10 to 23 feet below the existing native grade, in accordance with *GBSP 71-Aggregate Column Ground Improvement* provided within the IDOT guidelines.

The installation of this ground improvement method could have significant initial costs for the project; however, there would be limited impact on the construction schedule, and little to no long-term maintenance costs.

3.3.2 Light Weight Cellular Concrete Embankment

Alternatively, constructing the new west embankment and MSE walls with light weight material, such as lightweight cellular concrete fill (LCCF), may be considered. This can largely reduce the load transferred down to the bottom of the embankment and the walls, so to reduce the settlement and consolidation of the underlying soils. Assuming the full height of the embankment is constructed with LCCF (unit weight = 45 pcf), the consolidation settlement could be reduced to 0.7 to 0.8 inches.

3.3.3 Staged Construction

For staged construction, the existing alignment of Chicago Street may be partially filled, allowing low strength subgrade soils within the zone of influence to gain strength during the loading and consolidation process and dissipate the excess pore water pressure prior to completion of the full fill placement. For the initial construction, allowing the partially filled IL 53/US 52 roadbed to remain in place for varying amounts of time, prior to the final stage construction will result in different amounts of settlement after construction. The longer the initial stage construction remains in place as a surcharge over the underlying soils, the less settlement is anticipated to occur post-construction. If the embankment is fully filled and left to settle, about 90% of the total settlement is estimated to be completed within 12 months. Following the initial 12 months, the MSE wall facing may be placed.

Proper instrumentation, as outlined in IDOT Geotechnical Manual in Section 6.4.4.6-Instrumentation and Control of Embankment Construction, will be required to monitor the state of stress in the soil during the loading period, to ensure that loading does not proceed so rapidly as to cause a shear failure.

3.3.4 Maintenance

A maintenance program will likely be necessary throughout the construction stage to account for settlement of the new fill. This will require additional quantities of fill materials to be placed during construction, which should be accounted for when estimating earthwork quantities. The site improvement alternative selected will determine how long and how much maintenance may be necessary.

3.4 Seismic Parameters

The seismic hazard for the site was evaluated per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design Specifications. The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the “Seismic Site Class Determination” Excel spreadsheet provided by IDOT. A global Site Class Definition was determined for this project, and was found to be Soil Site Class D. The Seismic Performance Zone (SPZ) was determined using Figure 2.3.10-2 in the IDOT Bridge Manual and was found to be Seismic Performance Zone 1.

The AASHTO Seismic Design Parameters program was used to determine the peak ground acceleration coefficient (PGA), and the short (S_{DS}) and long (S_{D1}) period design spectral acceleration coefficients for each of the proposed structures. For this section of the project, the S_{DS} and the S_{D1} were determined using 2020 AASHTO Guide Specifications as shown in **Table 5**. Given the site location and materials encountered, the potential for liquefaction is minimal.

Table 5 – Seismic Parameters

Building Code Reference	PGA	S_{DS}	S_{D1}
2020 AASHTO Guide for LRFD Seismic Bridge Design	0.049g	0.167g	0.095g

4.0 GEOTECHNICAL BRIDGE DESIGN RECOMMENDATIONS

The foundations for the proposed bridge must provide sufficient support to resist the dead and live loads, as well as seismic loading. The foundation design recommendations presented within this section were completed per the AASHTO LRFD 9th Edition (2020). The proposed bridge loads were not available at the time of this report. The preliminary maximum pile loading is anticipated to be 333 kips.

4.1 Bridge Foundation Recommendations

GSG evaluated potential foundation systems for the proposed bridge. GSG's evaluation included shallow foundations, drilled shafts, and driven piles. The results of the evaluation are presented below.

4.1.1 Shallow Foundations

Based on the fill soils encountered, the new span length and the anticipated loads, excessive settlement is anticipated for shallow foundations. Therefore, shallow foundations are not anticipated to be a feasible option for the proposed bridge substructures and will not be discussed further in the report.

4.1.2 Drilled Shaft Foundations

Drilled shafts are considered a viable option for the bridge abutments. Based on the anticipated loading, drilled shafts could be extended to depths of 40 to 50 feet, elevations 507 to 513 feet, to bear on limestone bedrock. Design recommendations for drilled shafts are provided in *Section 4.2* of this report.

4.1.3 Driven Pile Foundations

Driven piles could be considered to support the bridge abutments. Piles considered for this site include metal shell piles and H-piles. Concrete piles are not recommended for this site because the pile lengths cannot be readily adjusted to accommodate variability in soil conditions. Metal shell piles and H-piles are a feasible option for the construction of the abutments for the proposed bridge structures.

Driving shoes for the piles, in accordance with Section 1006.05 (e) of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC), should be considered to guard against the very dense granular soils.

For metal shell piles, a wall thickness of 0.25” or greater is recommended to minimize potential damage during driving. Design recommendations for driven piles are provided in Section 4.3 of this report.

4.2 Drilled Shaft Foundation Design Recommendation

Drilled shafts are considered a feasible foundation option for the proposed bridge abutments. The drilled shafts could be supported on top of limestone bedrock encountered at depths between 40 to 50 feet below existing grade (El. 507 to 514 feet).

Table 6a – Drilled Shaft End Bearing Parameters

Bearing Elevation Depth (ft)	Soil Description	Nominal Tip Resistance (ksf)	Resistance Factor φ	Factored Tip Resistance (ksf)
530.0-514.0	Medium Dense to Very Dense Sand with Gravel/Gravel with Sand	36.0	0.5	18.0
514.0	Weathered Limestone	344.0	0.5	172.0

Table 6b – Drilled Shaft Side Resistance Parameters

Elevation Range Depth (ft)	Soil Description	Nominal Side Resistance (ksf)	Side Resistance Factor φ	Factored Side Resistance (ksf)
542.5-530.0	Stiff to Hard Silty Clay/Silty Clay Loam	1.0	0.45	0.45
530.0-514.0	Medium Dense to Very Dense Sand with Gravel/Gravel with Sand	3.8	0.55	2.1
514.0-511.5	Weathered Limestone	29.2	0.55	16.0

We recommend that the minimum shaft diameter shall be at least 36”, and that the drilled shafts be installed with a minimum center-to-center spacing of at least 3 shaft diameters, because drilling the shafts at close spacing can reduce the total capacity of the drilled shafts. As it can be expected that the shafts will penetrate through the hard clay soils, very dense granular soils, or bedrock, the contractor should be prepared for hard drilling and be prepared with techniques to properly clean the bottom of the shaft before any concrete is placed.

Geotechnical losses due to downdrag were not included in the drilled shaft calculations. Downdrag should be considered where drilled shafts will be constructed within the area of new roadway fill in the west abutment. Settlement values and differential settlement values due to soil compression under drilled shafts cannot be provided until design loads on each shaft are provided.

4.3 Driven Pile Foundation Design Recommendation

Depending on the construction sequences, driven piles within the west abutment, in the area of borings B-53, B-57 and B-61, may be subjected to downdrag effects. If the new IL 53/US 52 roadway fill is constructed and preloaded to allow settlement to occur before the west abutment pile installation, there will be no downward movement of the soil relative to piles and downdrag influence is eliminated. Pile design recommendations with no downdrag are provided in *Section 4.3.1*. If the west abutment piles are installed before the filling operations, downdrag effects should be considered in the pile design or should be mitigated. Pile design recommendations with downdrag mitigation (precoring) for the west abutment location are provided in *Section 4.3.2*.

4.3.1 Pile Design with No Downdrag

The Modified IDOT static method-excel spreadsheet was used to estimate the pile lengths at various axial geotechnical resistances for driven piles per IDOT AGMU Memo 10.2. The factored resistance includes a reduction of 0.55 for the geotechnical resistance for the pile installation. No geotechnical losses due to scour or liquefaction were included in the axial pile resistance calculations.

Tables 7a and 7b summarize the estimated maximum pile lengths for representative pile sections along with the factored resistance available for several pile types could be feasible for the proposed substructures. The complete IDOT Pile Design Tables for each substructure, including factored resistance available (R_F) and nominal required bearing (R_N), are included in **Appendix E**.

The estimated pile lengths shown in **Tables 7a and 7b** and in **Appendix E** are based on the pile cut off elevations and noted below each table. The actual pile length and resistance should be evaluated based on test piles installed in accordance with the specifications provided in Section 512.15 of IDOT Standard Specifications for Road and Bridge Construction. Per section 3.10.1.11 of the IDOT Bridge Manual, the minimum pile spacing should be 3 pile diameters.

Table 7a – West Abutments Pile Design (BSB-53, BSB-57, BSB-61)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)*
HP12x53 (Max. R_N = 418 Kips)	418	230	54.4
HP12x74 (Max. R_N = 589 Kips)	589	324	55.4
HP14x73 (Max. R_N = 578 Kips)	578	318	54.9
HP14x89 (Max. R_N = 705 Kips)	705	388	55.4

* Estimated pile length is based on assuming the pile cut off elevation: 560.9 ft., and ground elevation at beginning of pile driving: 559.9 ft.

Table 7b – East Abutment Pile Design (BSB-56, BSB-60, BSB-64)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)*
HP12x53 (Max. R_N = 418 Kips)	418	230	52.1
HP12x74 (Max. R_N = 589 Kips)	589	324	53.1
HP14x73 (Max. R_N = 578 Kips)	578	318	52.6
HP14x89 (Max. R_N = 705 Kips)	705	388	53.1

* Estimated pile length is based on assuming the pile cut off elevation: 564.5 ft., and ground elevation at beginning of pile driving: 563.5 ft.

4.3.2 West Abutment - Pile Design with Downdrag Mitigation (Precore)

This section presents pile design recommendations including the effect of downdrag induced due to the downward movement of the soil relative to the piles for the western abutment foundations. According to AASHTO Section 3.11.8-Downdrag, the pile should be designed to resist the downdrag if the ground settlement is 0.4 inches or greater. Based on section **3.2 Settlement**, 1.4 to 1.5 inches of ground settlement is anticipated. The nominal geotechnical resistance available to resist the structure load plus the downdrag load is estimated by considering only the positive side resistance and tip resistance below the lowest layer contributing to the downdrag.

There are several mitigation measures to resist the downdrag forces. This includes soil surcharging and preloading, ground improvement, increasing the pile section, using larger pile diameter, increasing the number of piles, and precoring. This section considers the option of precoring the pile locations to the depth where settlement will be less than 0.4 inches to eliminate the downdrag effects. Considering potential caving at depths encountering granular soil, pile sleeves or permanent casing should be used to keep the precored hole open. Approximate permanent casing elevations have been provided in the notes below **Table 8a**. The advantage of the precoring process includes the reduction or elimination of downdrag forces; disadvantages include increased cost, construction time and longer pile lengths.

GSG utilized the Modified IDOT static method-excel spreadsheet to estimate the pile lengths at various axial geotechnical resistances for driven piles with precoring per IDOT AGMU Memo 10.2. Precoring was simulated in the design by removing the soil within the precored depth in the spreadsheet. No additional geotechnical losses due to downdrag or liquefaction were included in the axial pile resistance calculations.

Table 8 summarizes the estimated maximum pile lengths for representative pile sections along with the factored resistance available for H-piles and metal shell piles that are feasible for the proposed substructures. The complete IDOT Pile Design Table including factored resistance available (RF) and nominal required bearing (RN), is included in **Appendix F**.

The estimated pile lengths shown in **Table 8** and in **Appendix F** are based on the estimated pile cut off elevations noted below the table. The actual pile length and resistance should be evaluated based on test piles installed in accordance with the specifications provided in Section 512.15 of IDOT Standard Specifications for Road and Bridge Construction. Per section 3.10.1.11 of the IDOT Bridge Manual, the minimum pile spacing should be 3 pile diameters, and the maximum pile spacing should not be more than 3.5 times the effective footing thickness plus one foot.

Table 8 – West Abutments Pile Design (BSB-53, BSB-57, BSB-61) with Precore to 536.5 ft**

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)*
HP12x53 (Max. R_N = 418 Kips)	418	230	55.4
HP12x74 (Max. R_N = 589 Kips)	589	324	56.4
HP14x73 (Max. R_N = 578 Kips)	578	318	55.9
HP14x89 (Max. R_N = 705 Kips)	705	388	56.4

***** Estimated pile length is based on assuming the pile cut off elevation: 560.9 ft., and ground elevation at beginning of pile driving: 559.9 ft and precoring to 536.5 ft.

**Permanent casing should be extended to the top of bedrock, at about elevation 507 to 515 ft.

4.4 Lateral Load Resistance

Lateral loadings applied to deep foundations are typically resisted by the soil/structure interaction, pile flexure, or a combination of these factors. Section 3.10.1.10 of the 2012 IDOT Bridge Manual requires performing detailed structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The analysis shall determine actual pile moment and deflection to determine the selected pile adequacy for the existing loadings. **Tables 9a and 9b** provide generalized soil parameters for the entire site and includes recommended lateral soil modulus and soil strain parameters that can be used for deep foundation analysis via the p-y curve method based on the encountered subsurface conditions.

Table 9a – Lateral Load Resistance Soil Parameters West Abutments (BSB-53, BSB-57, BSB-61)

Depth / Elevation Range (feet)	Soil Description	Lateral Modulus of Subgrade Reaction (pci)	Soil Strain (ε_{50})
	New Engineered Clay Fill	500	0.007
	New Engineered Granular Fill	90	N/A
0-10.5 (547.5-537)	Fill Brown, Gray and Black Silty Clay	1,000	0.005
4.5-14 (543-533.5) **BSB-53, BSB-61 only**	Gray Stiff to Hard Silty Clay Loam	1,000	0.005
8.5-10.5 (539-537) **BSB-53 only**	Gray and Black Medium Stiff Silty Clay	100	0.01
13.5-16 (534-531.5) **BSB-57 only**	Fill Brown Sand	60	N/A
16-20.5 (531.5-527) **BSB-57 only**	Fill Red and Brown Gravel	60	N/A
17-34.5 (530.5-513)	Brown Medium Dense to Very Dense Sand with Gravel	125	N/A
33-40 (514.5-507.5) **BSB-61 only**	Brown Medium Dense to Very Dense Gravel with Sand	125	N/A

*The initial p-y modulus, E_{py} , varies linearly with depth. To obtain E_{py} use the equation $E_{py} = k_{py} * z$, where k_{py} is the subgrade modulus given in the table and z is the distance from the surface to the center point of the layer in inches.

Table 9b – Lateral Load Resistance Soil Parameters East Abutments (BSB-56, BSB-60, BSB-64)

Depth / Elevation Range (feet)	Soil Description	Lateral Modulus of Subgrade Reaction (pci)	Soil Strain (ε_{50})
	New Engineered Clay Fill	500	0.007
	New Engineered Granular Fill	90	N/A
0-29 (572-543)	Fill Brown and Gray Silty Clay/Silty Clay Loam	1,000	0.005
4-13 (568-559) **BSB-60, BSB-64 only**	Fill Brown and Gray Sand with Gravel	90	N/A
29-45 (543-527) **BSB-56, BSB-64 only**	Brown and Gray Stiff to Hard Silty Clay/Silty Clay Loam	1,000	0.005
45-58 (527-514)	Brown Medium Dense to Dense Sand	60	N/A

GSG recommends designing the abutments using the drained condition for the long-term, permanent design.

5.0 GEOTECHNICAL RETAINING WALL DESIGN RECOMMENDATIONS

This section provides retaining walls design parameters, foundation type, bearing capacity, settlement, and lateral earth pressures. The magnitude of the anticipated loads for the retaining walls were not provided to GSG. The foundations for the proposed retaining walls must provide sufficient support to resist the dead and live loads. The foundation design recommendations presented within this section were completed per the AASHTO LRFD 9th Edition (2020).

5.1 Retaining Wall Foundation Recommendations

Based on the GPE drawings dated May 7, 2024, provided by WSP, MSE retaining walls are anticipated to be constructed below the east and west abutments in lieu of slopes. The east and west MSE retaining walls will have a maximum height of about 24.5 feet from the top of levelling pad to the top of wall and will be about 264 feet long. The western retaining walls will be constructed in a newly filled area (the existing IL 53/US 52 roadway area), and the eastern walls will be in a cut area. The ground elevations adjacent to the MSE walls are anticipated to be about El. 545.7 to El. 543.1 feet +/-, and the base of the MSE wall levelling pads are anticipated to be about 3.5 feet below the ground surface, at about El. 542.2 to El. 539.6 feet (average of about El. 541 feet).

The actual wall width and total height of the walls should be based on structural analysis performed by a Licensed Structural Engineer in the State of Illinois.

GSG evaluated shallow and deep foundation system for the proposed retaining walls. GSG's evaluation included the MSE wall supported on a levelling pad and driven piles. The results of the evaluation are presented below.

5.2 Levelling Pad Design Recommendations

Bearing resistance for the base of MSE walls shall be evaluated at the strength limit state using load factors in accordance with AASHTO Tables 3.4.1-1 and 3.4.1-2, and factored bearing resistance. The bearing resistance factor, ϕ_b, for levelling pad for MSE walls in clay soils is 0.65 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 10** presents the proposed bearing elevation and recommended bearing resistances of suitable materials to support the MSE walls.

Table 10 – Recommended Bearing Resistance for MSE Wall

MSE Wall Location	Anticipated Bearing Elevation (feet)*	Assumed Bearing Width**	Nominal Resistance (ksf)	Factored Bearing Resistance (ksf)	Bearing Resistance for 1-inch Service Limit (ksf)	Anticipated Bearing Soil
West Abutments	541	12.0	8.2	5.3	2.8	Stiff to Hard Silty Clay Loam
East Abutments	541	12.0	9.2	6.0	5.6	Stiff to Hard Silty Clay/Silty Clay Loam
Area of Borings BSB-57, B-60 only	541	12.0	3.0	2.0	2.0	Silty Clay/Silty Clay Loam Fill

*Anticipated MSE wall type bearing elevation is assumed to be about 3.5 feet below the average new IL 53/US 52 roadway elevation of El. 544.5 feet, at El. 541 feet.

**Bearing width assumed as half of the anticipated wall height.

The minimum depth of the MSE walls should be 3.5 feet below the final exterior grade to alleviate the effects of frost. The subgrade soils encountered at the bearing elevations should be cleared of any unsuitable material. Based on the results of the subsurface exploration, we anticipate the MSE walls would be supported upon the soil types as noted in **Table 10.**

Silty clay/silty clay loam fill soils were observed at the assumed bearing depth in the area of borings BSB-57 and BSB-60. Undercutting of fill soils below the MSE Walls in the area of BSB-57 and BSB-60 would require undercuts of about 16.5 and 9 feet, respectively, and is considered impractical. Deep pile foundations could be considered in these areas. Ground improvement techniques such as rammed aggregate piers, rigid inclusions, and helical piles may also be considered to provide a stable base for the MSE wall construction. Recommendations for rammed aggregate pier and rigid inclusions are provided in Section 3.3.1.

5.3 Driven Pile Foundation Design Recommendations

Although not typical, driven piles may be considered as an option for support of the MSE walls. The Modified IDOT static method-excel spreadsheet was used to estimate the pile lengths at various axial geotechnical resistances for driven piles per IDOT AGMU Memo 10.2. The factored resistance includes a reduction of 0.55 for the geotechnical resistance for the pile installation. No geotechnical losses due to scour or liquefaction were included in the axial pile resistance calculations.

Tables 11a and 11b summarize the estimated maximum pile lengths for representative pile sections along with the factored resistance available for several pile types could be feasible for the proposed walls. The complete IDOT Pile Design Tables for each substructure, including factored resistance available (R_F) and nominal required bearing (R_N), are included in **Appendix G**.

The estimated pile lengths shown in **Tables 11a and 11b** and in **Appendix G** are based on the pile cut off estimated elevations and noted below each table. The actual pile length and resistance should be evaluated based on test piles installed in accordance with the specifications provided in Section 512.15 of IDOT Standard Specifications for Road and Bridge Construction. Per section 3.10.1.11 of the IDOT Bridge Manual, the minimum pile spacing should be 3 pile diameters.

Table 11a – East Abutment MSE Wall Pile Design (BSB-56, BSB-60, BSB-64)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)*
HP12x53 (Max. R_N = 418 Kips)	418	230	30.5
HP12x74 (Max. R_N = 589 Kips)	589	324	31.5
HP14x73 (Max. R_N = 578 Kips)	578	318	31.0
HP14x89 (Max. R_N = 705 Kips)	705	388	31.5

***** Estimated pile length is based on assuming the pile cut off elevation: 542 ft., and ground elevation at beginning of pile driving: 541 ft.

Due to the anticipated new embankment fill and associated settlement in the area of the west abutment, precoring will be required for the west abutment foundation piles. However, the precore elevation of El. 536.5 feet is above the assumed pile driving elevation of the MSE walls, so precore was not included in the retaining wall pile analysis.

Table 11b – West Abutment MSE Wall Pile Design (BSB-53, BSB-57, BSB-61)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)*
HP12x53 (Max. R_N = 418 Kips)	418	230	36.5
HP12x74 (Max. R_N = 589 Kips)	589	324	37.5
HP14x73 (Max. R_N = 578 Kips)	578	318	36.5
HP14x89 (Max. R_N = 705 Kips)	705	388	37.5

***** Estimated pile length is based on assuming the pile cut off elevation: 542 ft., and ground elevation at beginning of pile driving: 541 ft.

5.4 Lateral Load Resistance for Pile Design

Tables 9a through 9d provide generalized soil parameters for each of the abutment/proposed retaining wall locations and include recommended lateral soil modulus and soil strain parameters that can be used for laterally loaded pile analysis via the p-y curve method based on the encountered subsurface conditions.

It is recommended that new fill material soil parameters should be used behind the walls due to construction excavation and drainage system installation. Roadway traffic and other surcharge loads should be included in the design. A live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall in accordance with AASHTO 3.11.6.4. The simplified earth pressure distributions shown in the AASHTO Standard Specifications for Highway Bridges should be used.

For the deep foundation system, lateral loadings applied to pile foundations are typically resisted by battering selected piles, the soil/structure interaction, pile flexure, or a combination of these factors. Section 3.10.1.10 of the IDOT Bridge Manual (2023) requires performing detailed structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The analysis shall determine actual pile moment and deflection to determine the selected pile adequacy for the existing loadings.

The retaining wall design should include a drainage system to allow movement of any water behind the wall, and not allowing hydrostatic pressures to develop in the active soil wedge behind the wall. This could be accomplished by placing a Geocomposite Wall Drain over the entire length of the back face of the wall connected to 6-inch diameter perforated drain pipe and backfilling a minimum of 2 feet of free draining materials, Porous Granular Embankment, as measured laterally from the back of the wall. The backfill should be placed in accordance with the IDOT SSRBC. Heavy compaction equipment should not be allowed closer than five (5) feet to the retaining wall to prevent inducing high lateral earth pressures and causing wall yielding and/or other damage. The passive lateral earth pressure coefficient (K_p) from the upper 3 feet of level backfill at the toe of the wall should be neglected, unless the soil is confined or protected by a concrete slab or well drained pavement. The passive lateral earth pressure coefficient from the upper 3 feet of soil for a descending slope at the wall toe should also be neglected, regardless of any surface protection.

5.5 Global Slope Stability

The retaining walls should be designed for external stability of the wall systems. A minimum reinforcement length of 0.7H is recommended and the final length should be determined based on the external and internal stability analysis of the wall. The wall and reinforcement design should be completed by a licensed structural engineer. If the MSE retaining walls will be supported on piles, the pile foundations will be designed to support the substructure against lateral and slope failure. If the walls will be supported at grade with a levelling pad, there may be slope stability concerns. The results of the slope stability analysis for the east and west MSE retaining walls supported on levelling pads are presented in **Tables 12a and 12b**.

Based on the May 7, 2024 GPE, an analysis was conducted for the east abutment MSE retaining wall. It was assumed that the east abutment retaining wall would have a maximum design height of 24.5 feet below the bridge abutment, extending from about 565 feet, to approximately 3.5 feet below Chicago Street, at about El. 540.5 feet. Traffic loads of about 250 psf were assumed along the new I-80 bridge. The results are presented in **Table 12a**.

Table 12a – Stability Analysis Results – East Retaining Wall

Cross Section	Reinforcement Length	Water Elevation (feet)	Failure Type	Factor of Safety	Required Minimum Factor of Safety
BSB-56, BSB-60, BSB-64	Minimum 0.7H or 17 feet	El. 517	Circular – Short Term	3.1	1.5
			Circular – Long Term	1.6	

Based on the analysis performed, a new, 24.5-foot retaining wall with reinforcement length of 0.7H will provide adequate stability to meet the minimum factor of safety of 1.5 for the long-term and short-term conditions. Copies of the Slope Stability analysis exhibits are included in **Appendix H**.

For the purpose of analysis, it was assumed that the west abutment retaining wall would have a maximum design height of 20.5 feet below the bridge abutment, extending from about El. 561.5 feet, to approximately 3.5 feet below the Chicago Street elevation, at El. 541 feet. The results are presented in **Table 12b**.

Table 12b – Stability Analysis Results - West Retaining Wall

Cross Section	Reinforcement Length	Water Elevation (feet)	Failure Type	Factor of Safety	Required Minimum Factor of Safety
BSB-53, BSB-57, BSB-61	Minimum 0.7H or 15 feet	El. 517	Circular – Short Term	3.0	1.5
			Circular – Long Term	1.5	

Based on the analysis performed, a new, 20.5-foot retaining wall with reinforcement length of 0.7H will provide adequate stability to meet the minimum factor of safety of 1.5 for the long-term and short-term conditions. Copies of the Slope Stability analysis exhibits are included in **Appendix H.**

If LCCF backfill is considered to fill the old roadway behind the western abutment, additional slope stability analysis should be completed.

6.0 CONSTRUCTION CONSIDERATIONS

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

6.1 Existing Utilities and Structures

Based on the existing site conditions, utilities exist along the project corridor. Before proceeding with construction, all existing underground utility lines or structures that will interfere with construction should be completely relocated from the proposed construction areas. Where possible, existing utility lines that are to be abandoned in place should be removed and/or plugged with a minimum of 2 feet of cement grout. All excavations resulting from underground utilities or structure removal activities should be cleaned of loose and disturbed materials, including all previously placed backfill, and backfilled with suitable fill materials in accordance with the requirements of this section. During the clearing and stripping operations, positive surface drainage should be maintained to prevent the accumulation of water.

6.2 Site Excavation

If borrow material is to be used for onsite construction, it should conform to Section 204 “Borrow and Furnished Excavation” of the IDOT Construction Manual (2021). The fill material should be free of organic matter and debris. Earth-moving operations should be avoided during excessively cold or wet weather to avoid freezing of softening subgrade soils.

Structural fill shall consist of crushed limestone or recycled concrete consistent with IDOT CA-6 gradation or medium plasticity silty clays. Structural fill should be placed in lifts not to exceed 8 inches in loose thickness and compacted to a minimum of 95% of the material’s standard proctor maximum dry density obtained according to the ASTM D698/AASHTO T 99 method.

Materials unsatisfactory for use as structural fill include soils classified as silt or organic silt (ML, MH, PT, OL, and OH) in the Unified Classification System (ASTM D2487). Soils with these classifications may be used for general purpose landscaping and in areas where uncontrolled settlement is acceptable.

Should fill be placed during cool, wet seasons, the use of granular fill may be necessary since weather conditions will make compaction of cohesive soils more difficult. If water seepage while excavating and backfilling procedures, or where wet conditions are encountered such that the water cannot be removed with conventional sump and pump procedures, GSG recommends placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation. The CA-7 stone should be placed 12 inches above the water level, 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 should be backfilled using approved engineered fill.

GSG recommends that foundation excavations, subgrade preparation, and structural fill placement and compaction be inspected by a GSG geotechnical engineer to verify the type and strength of soil materials present at the site and their conformance with the geotechnical recommendations in this report.

6.3 Groundwater Management

It is anticipated that the long-term groundwater level is between 50 and 54 feet below existing grade (approx. elevations 516.7 feet). Perched water may also be present within the fill materials observed in the borings, such as the water encountered at about 14.5 inches below grade, below the surface asphalt and concrete, at boring location BSB-53. GSG anticipates the groundwater/nearby river may be an issue for drilled shaft construction activity due to the extent of the proposed improvements and the anticipated time frame for the excavation construction. 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. Undercut and 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 excavations or 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 foundations should be backfilled using approved structural fill.

6.4 Drilled Shafts Construction

Any drilled shaft construction should be completed in accordance according to Section 516, Drilled Shafts, in the IDOT SSRBC (2022). Permanent casing will be required to extend to the bottom of the granular layers encountered in the soil borings (i.e. to top of bedrock). Water should be removed from the base of the drilled shaft base prior to placing any concrete. The placement method of concrete for the drilled shaft foundation should be based on the amount of water present at the base of the shaft just prior to placing the concrete. Concrete may be placed using the free fall method, provided less than 2 inches of water is present at the base of the shaft at the time the concrete is being placed. If more than 2 inches of water is present, a tremie should be used to displace the water to the surface for removal.

GSG recommends that the caisson concrete be ready on site as the drilled shaft excavation is completed, so that the concrete can be placed immediately after completing the excavation. This will reduce the potential of water accumulation in the bottom of the shaft. Bottom cleanliness of the drilled shaft excavation should be observed from the ground surface with the use of flood light or down-hole camera. Workers should not enter the shaft to manually clean the base of the shaft due to safety reasons.

6.5 Pile Installation

Based on the variance in top-of-rock elevations (between about El. 507 feet and 515 feet) it is recommended test piles be utilized at the site. The test-piles are installed based on the preliminary driving criteria in order to evaluate site conditions and are inspected in accordance with the IDOT Standard for Road and Bridge Construction. All test pile installation should be completed in accordance with the IDOT SSRBC Section 512.15.

6.6 Temporary Earth Structure Lateral Earth Pressures

If staged construction is utilized for the proposed bridge, a temporary soil retention system (TSRS) will likely be required. Based on the soil profile, a cantilevered sheet pile system is likely not feasible due to the presence of layers of hard clay and dense granular soils. The Temporary Soil Retention System shall be designed by an Illinois licensed structural engineer in accordance with the IDOT Bridge Design Manual. The design of the Temporary Soil Retention System is the responsibility of the contractor. The contractor should submit the TSRS plans to the structural design team for review prior to commencing construction of the TSRS.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of the Illinois Department of Transportation (IDOT) and its Design Section Engineer consultant. The recommendations provided in the report are specific to the project described herein and are based on the information obtained at the soil boring locations within the proposed bridge area. The analyses have been performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the borings. This report may not reflect all variations that may occur between boring locations 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

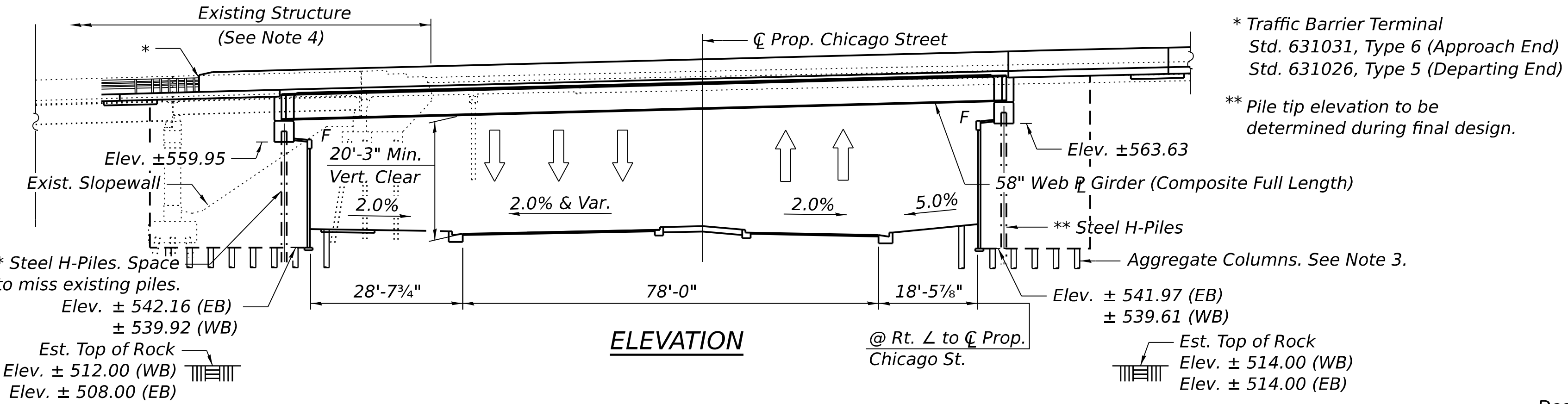
PRELIMINARY GPE PLAN – I-80 OVER CHICAGO ST.

Benchmark: Chiseled 'X' on top of east bolt of fire hydrant at east ROW of S. Eastern Ave. and WB ramp to I-80. Elev. 538.265

Existing Structures: S.N 099-0059 (EB) and 099-0058 (WB) were originally constructed in 1967 under F.I.A. Route 80 Project I-80-4(31)134 Section 99-4HB. Various repairs were made to the structure in 1987, 1988, and 2003. The existing structures are 3 spans, of length 34'-7", 97'-10¼", and 43'-6" respectively, measuring 179'-7¼" from back to back of abutments with a skew of 7°46'20" right forward. The WB deck tapers from 65'-4" to 61'-9" while the EB deck tapers from 65'-0" to 61'-6". The structure is a concrete deck on steel girders and is supported on concrete stub abutments and trapezoidal column piers. The structure will be removed and replaced.

Traffic on I-80 shall be maintained utilizing median crossover for staged construction. Traffic on existing Chicago St. shall be detoured to newly constructed Ramp B.

Salvage: None



ELEVATION

* Traffic Barrier Terminal
Std. 631031, Type 6 (Approach End)
Std. 631026, Type 5 (Departing End)

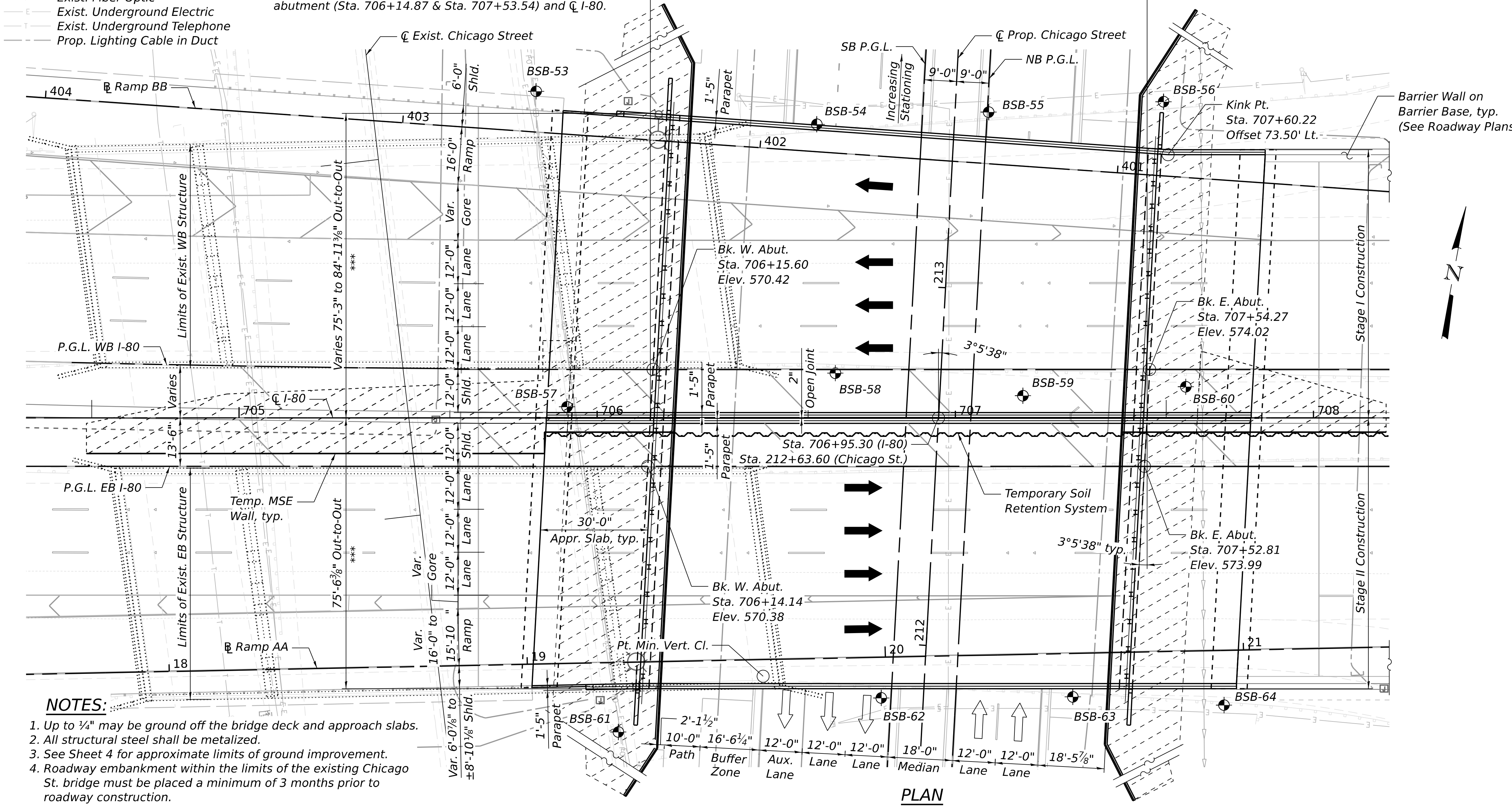
** Pile tip elevation to be determined during final design.

LEGEND

- Soil Borings
- Exist. Storm Sewer
- Exist. Fiber Optic
- Exist. Underground Electric
- Exist. Underground Telephone
- Prop. Lighting Cable in Duct

Approximate Limits of Reinforced Soil Mass

*** Out-to-Out dimensions are taken at intersection of back of abutment (Sta. 706+14.87 & Sta. 707+53.54) and ℄ I-80.



PLAN

NOTES:

1. Up to ¼" may be ground off the bridge deck and approach slabs.
2. All structural steel shall be metalized.
3. See Sheet 4 for approximate limits of ground improvement.
4. Roadway embankment within the limits of the existing Chicago St. bridge must be placed a minimum of 3 months prior to roadway construction.

HIGHWAY CLASSIFICATION

IL-53 / US-52 / CHICAGO ST.
Functional Class: Other Principal Arterial
ADT: 31,500 (2019); 47,700 (2040)
ADTT: 8,253 (2019); 12,498 (2040)
Design Speed: 30/40 m.p.h.
Posted Speed: 30/40 m.p.h.
Two-Way Traffic
Directional Distribution: 60:40

I-80 (FIA Rte. 80)
Functional Class: Interstate
ADT: 91,100 (2017); 133,500 (2040)
ADTT: 19,241 (2017); 28,196 (2040)
Design Speed: 70 m.p.h.
Posted Speed: 65 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.095 g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.167 g
Soil Site Class = D

DESIGN STRESSES

FIELD UNITS
f'c = 4,000 psi (Superstructure & Moment Slab)
f'c = 3,500 psi (Substructure)
fy = 50,000 psi - M270 Gr. 50 (PL Girders)
fy = 60,000 psi (Reinforcement)

PRECAST UNITS
f'c = 4,500 psi (Precast Panels)

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

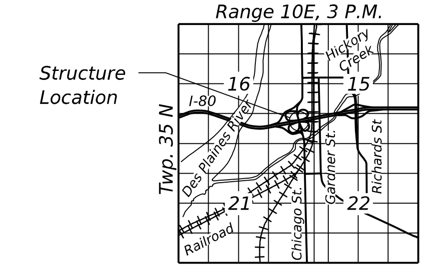
LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

SEQUENCE OF CONSTRUCTION

1. Move all traffic to existing EB lanes.
2. Install TSRS and remove existing WB structure.
3. Install temporary MSE wall, fill existing WB structure and construct pavement to proposed grade.
4. Install remainder of TSRS, excavate, and construct proposed WB structure.
5. Move traffic over to newly constructed WB lanes.
6. Remove and fill existing EB structure.
7. Excavate and construct proposed EB structure.

Range 10E, 3 P.M.



LOCATION SKETCH

GENERAL PLAN AND ELEVATION
I-80 EB/WB OVER CHICAGO ST.
F.A.I. RTE. 80 - SEC 2017-057F
WILL COUNTY
STATION 706+95.30
STRUCTURE NO. 099-8310

BURNS McDONNELL

USER NAME =	DESIGNED -	REVISED -
	CHECKED -	REVISED -
PLOT SCALE =	DRAWN -	REVISED -
PLOT DATE =	CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2017-057F	WILL	4	1

CONTRACT NO. 62F94
ILLINOIS FED. AID PROJECT

MODEL: Default
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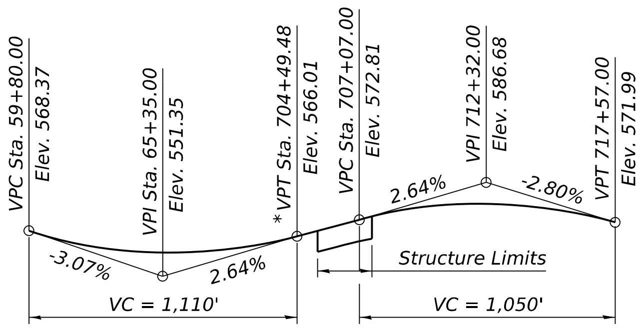
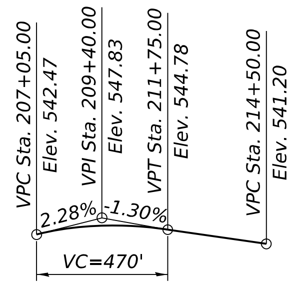


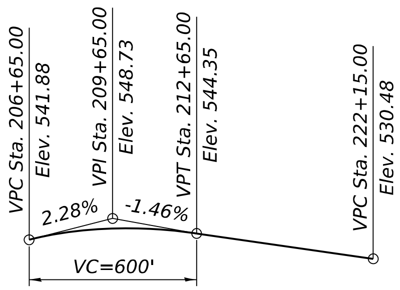
PROFILE GRADE

(Along Prop. PGL EB & WB I-80)
(The profile grade shows final elevations after grinding.)
*Station Equation:
Back: 70+35.01
Ahead: 703+94.49



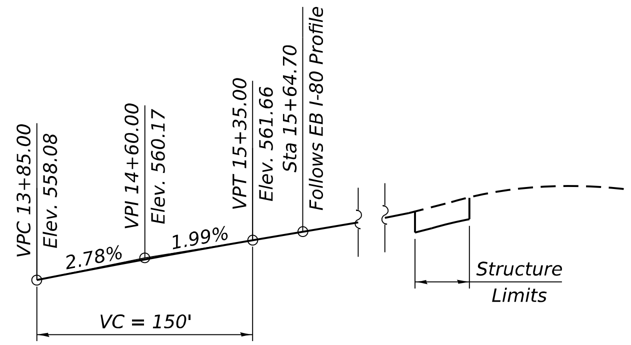
PROFILE GRADE

(Along Prop. NB PGL Chicago St.)



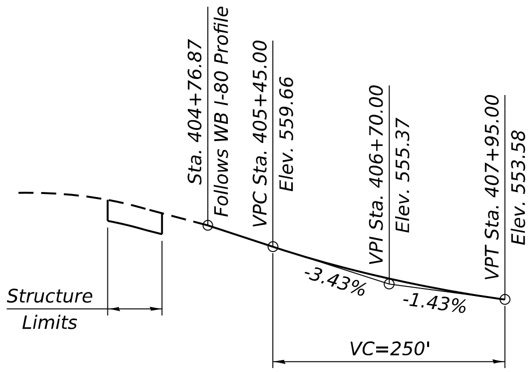
PROFILE GRADE

(Along Prop. SB PGL Chicago St.)



PROFILE GRADE

(Along ℞ Prop. Ramp AA)



PROFILE GRADE

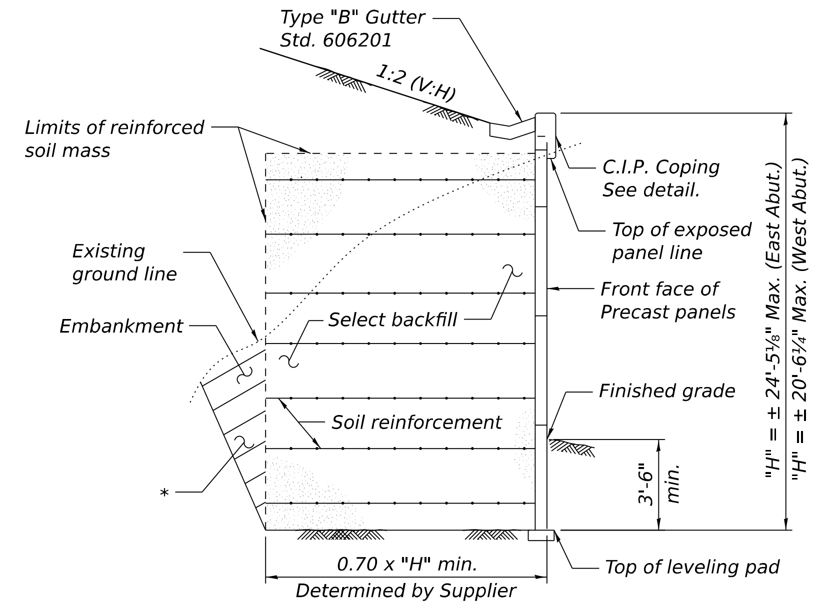
(Along ℞ Prop. Ramp BB)

CURVE DATA - I-80

P.I. Sta. = 64+27.70
Δ = 22°01'22" (LT)
D = 1°47'26"
R = 3,200.00'
T = 622.68'
L = 1,229.99'
E = 60.02'
e = 5.2%
P.C. Sta. = 58+05.02 (West of Project Limits)
P.T. Sta. = 703+94.49
EB. S.E. Run = 312'
EB T.R. = 38.68'
EB S.E. Attained West of Project Limits
EB S.E. Removed from Sta. 69+02.77 to Sta. 706+12.93
WB. S.E. Run = 63.5'
WB T.R. = 74.09'
WB S.E. Attained West of Project Limits
WB S.E. Transition from Sta. 68+69.48 (5.2%)
to Sta. 704+74.58 (1.5%)
WB S.E. Held (1.5%) from Sta. 704+74.58 to Sta. 708+01.51
WB S.E. Removed from Sta. 708+01.51 to Sta. 709+39.10

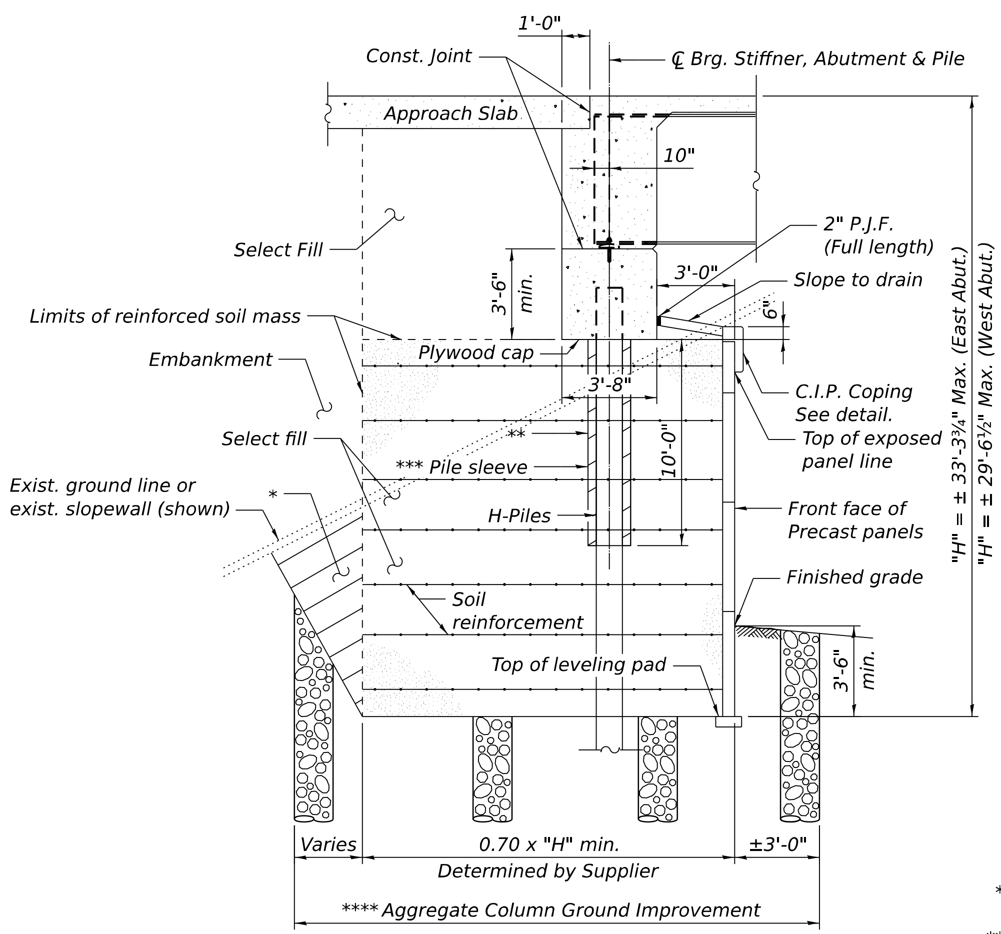
CURVE DATA - CHICAGO ST.

P.I. Sta. = 217+34.18
Δ = 17°44'42" (RT)
D = 03°15'00"
R = 1,763.00
T = 275.21'
L = 546.02'
E = 21.35'
e = 2.20%
T.R. = 72.70'
S.E. Run = 80.00'
P.C. Sta. = 214+58.97
P.T. Sta. = 220+04.99
S.E. Attained from Sta. 213+32.93 to Sta. 214+85.63
S.E. Removed from Sta. 219+78.33 to Sta. 221+31.03



SECTION THRU M.S.E. WALL

(Horiz. dim. @ ∠'s)



SECTION THRU ABUTMENT

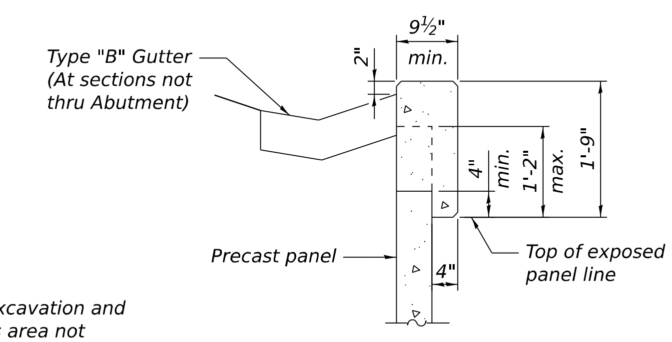
(Horiz. dim. @ ∠'s)

* Overexcavation beyond structure excavation and removal of unsuitable material. This area not measured for payment. Backfill overexcavation with same material used for select fill used in MSE wall.

** Sleeve to remain empty in hatched region.

*** Piles to sleeved full length at West Abutment.

**** Number & spacing to be finalized in design and spaced to miss proposed H-Piles.



CAST IN PLACE COPING FOR M.S.E. WALL PANELS

DETAILS
I-80 EB/WB OVER CHICAGO ST.
F.A.I. RTE. 80 - SEC 2017-057F
WILL COUNTY
STATION 706+95.30
STRUCTURE NO. 099-8310

MODEL: Default
FILE NAME: 0998310_62F94_002_TSL2.dgn

BURNS McDONNELL

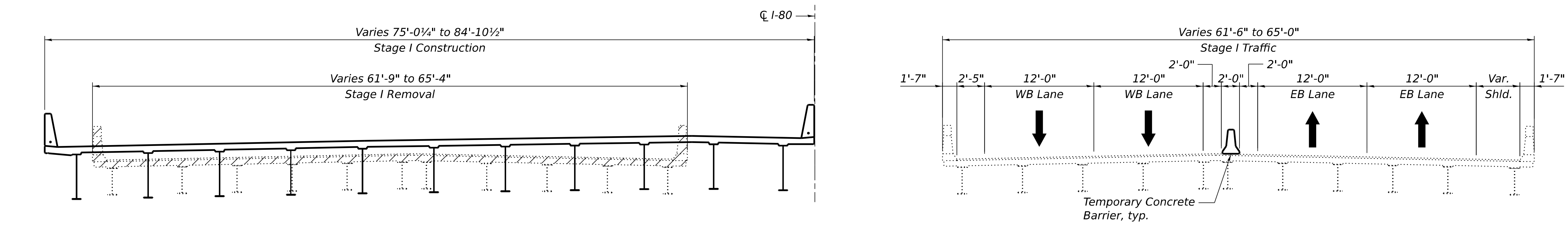
USER NAME =		DESIGNED -	REVISED -
		CHECKED -	REVISED -
PLOT SCALE =		DRAWN -	REVISED -
PLOT DATE =		CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 4 SHEETS

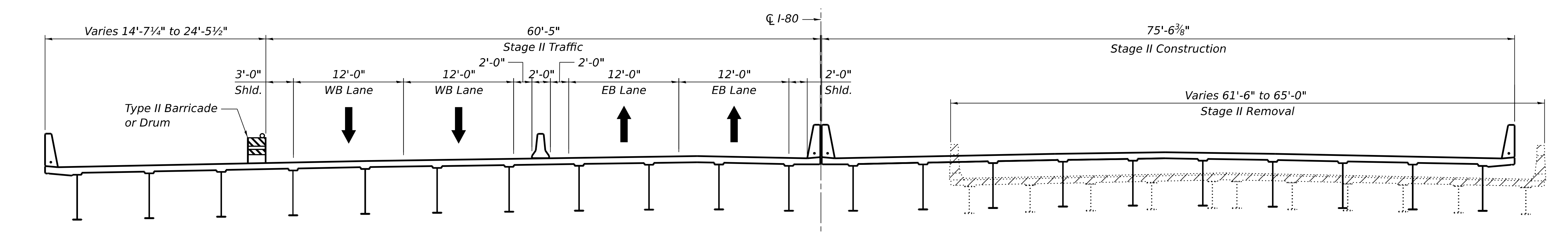
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2017-057F	WILL	4	2
		CONTRACT NO. 62F94		
	ILLINOIS	FED. AID PROJECT		

5/7/2024 11:08:25 AM



STAGE I CROSS SECTION

(Looking East)

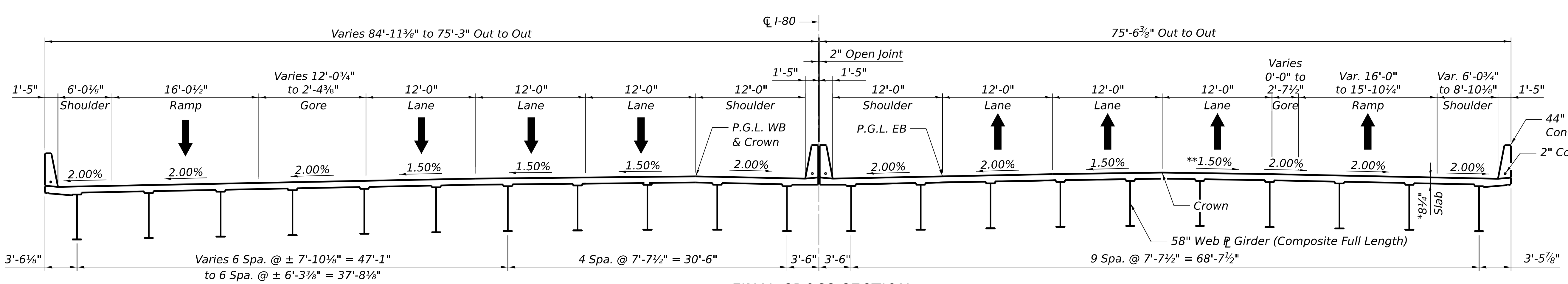


STAGE II CROSS SECTION

(Looking East)

LEGEND

Removal of Existing Structure



FINAL CROSS SECTION

(Looking East)

* Prior to Grinding. Subject to refinement during the design phase.
** Varies from 0.29% to 1.50% on West Approach

NOTE:

1. Out-to-Out dimensions are taken at intersection of back of abutment (Sta. 706+14.87 & Sta. 707+53.54) and ℄ I-80.
2. Dimensions are measured at Rt. ∠s to ℄ I-80.

BRIDGE CROSS SECTION
I-80 EB/WB OVER CHICAGO ST.
F.A.I. RTE. 80 - SEC 2017-057F
WILL COUNTY
STATION 706+95.30
STRUCTURE NO. 099-8310

MODEL: Default
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BURNS McDONNELL

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	CHECKED -	REVISED -
PLOT SCALE =	DRAWN -	REVISED -
PLOT DATE =	CHECKED -	REVISED -

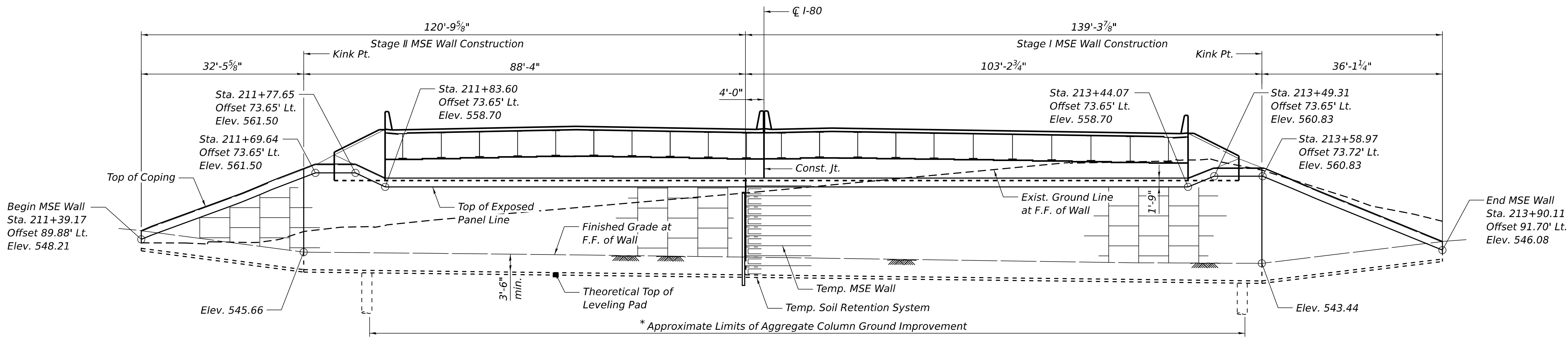
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2017-057F	WILL	4	3

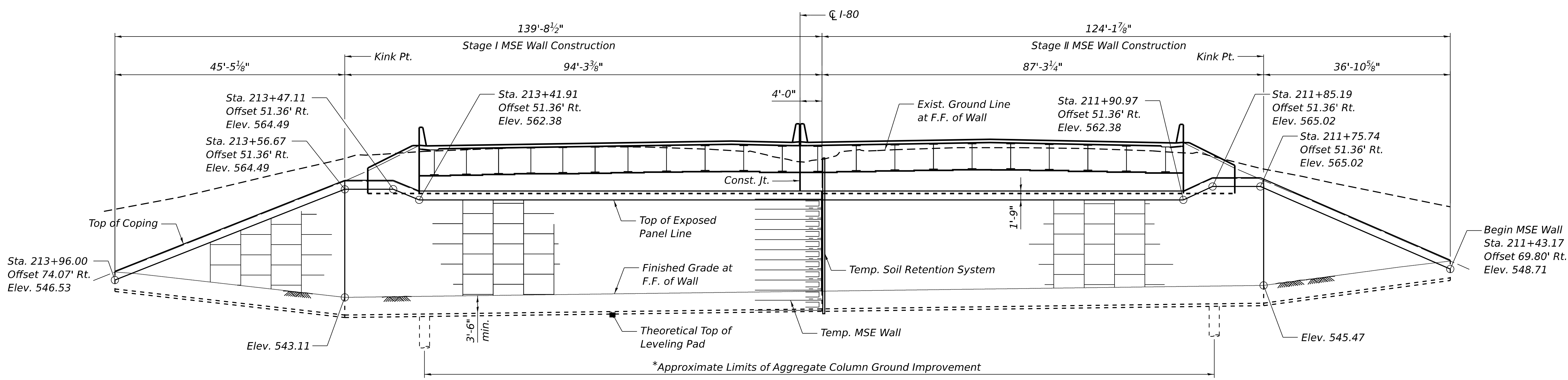
CONTRACT NO. 62F94

ILLINOIS FED. AID PROJECT



WEST MSE WALL ELEVATION

(Looking West)



EAST MSE WALL ELEVATION

(Looking East)

* Limits to be determined during final design.

NOTES:

1. Stations and offsets are measured from ℄ Chicago Street to the front face of wall.
2. Dimensions are measured along the front face of wall.

RETAINING WALLS
I-80 EB/WB OVER CHICAGO ST.
F.A.I. RTE. 80 - SEC 2017-057F
WILL COUNTY
STATION 706+95.30
STRUCTURE NO. 099-8310

MODEL: Default
FILE NAME: 0998310_62F94_004_TSL4.dgn

BURNS McDONNELL

USER NAME =	DESIGNED -	REVISED -
	CHECKED -	REVISED -
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PLOT DATE =	CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2017-057F	WILL	4	4

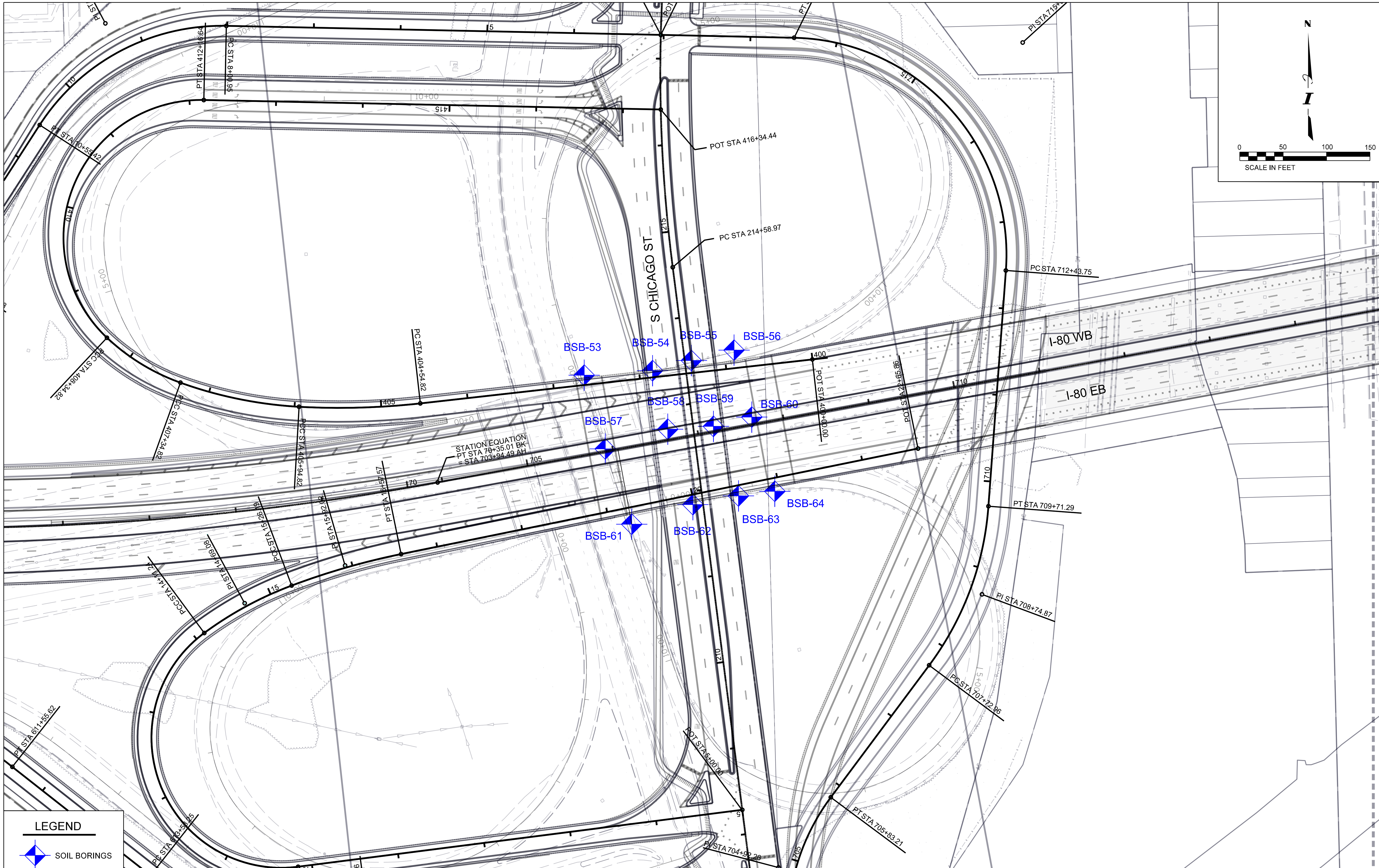
CONTRACT NO. 62F94

ILLINOIS FED. AID PROJECT

5/7/2024 11:08:46 AM

APPENDIX B

SOIL BORING LOCATION PLAN AND SUBSURFACE PROFILES



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

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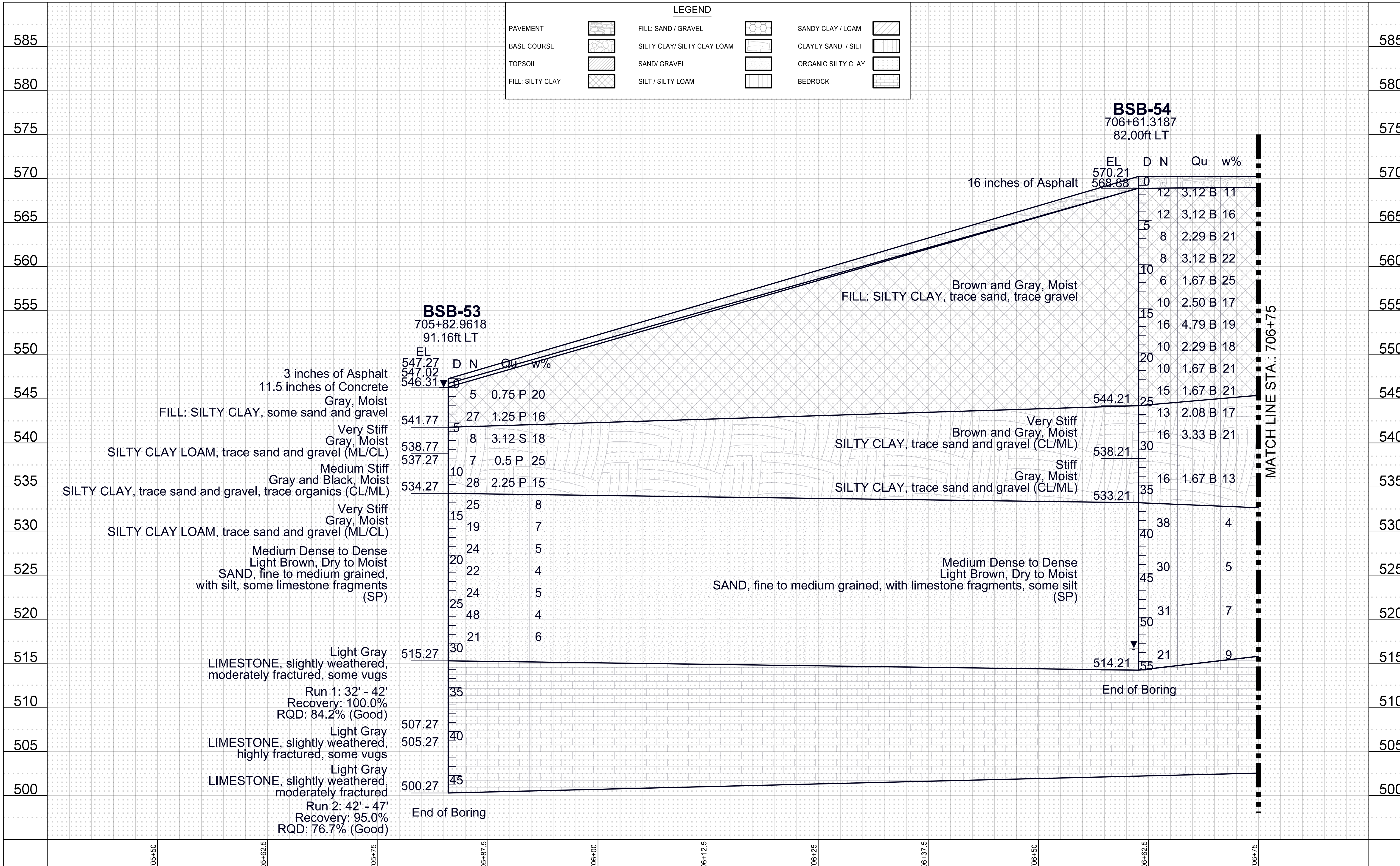
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PLAN
JOLIET, ILLINOIS

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

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	1
		CONTRACT NO. PTB 198-003		

ILLINOIS | FED. AID PROJECT



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

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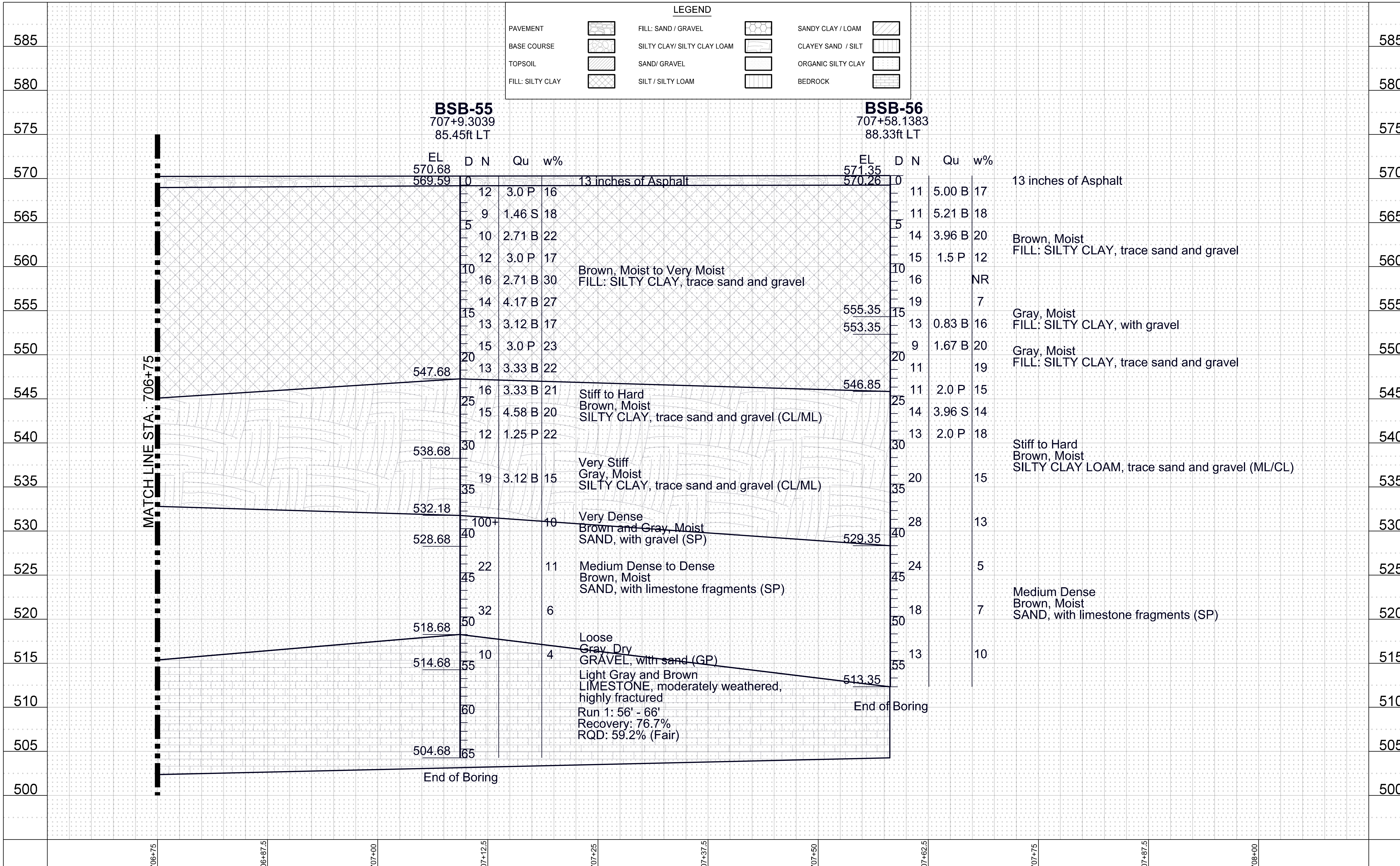
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 705+50 TO STA. 706+75

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	2
		CONTRACT NO. PTB 198-003		

ILLINOIS | FED. AID PROJECT



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

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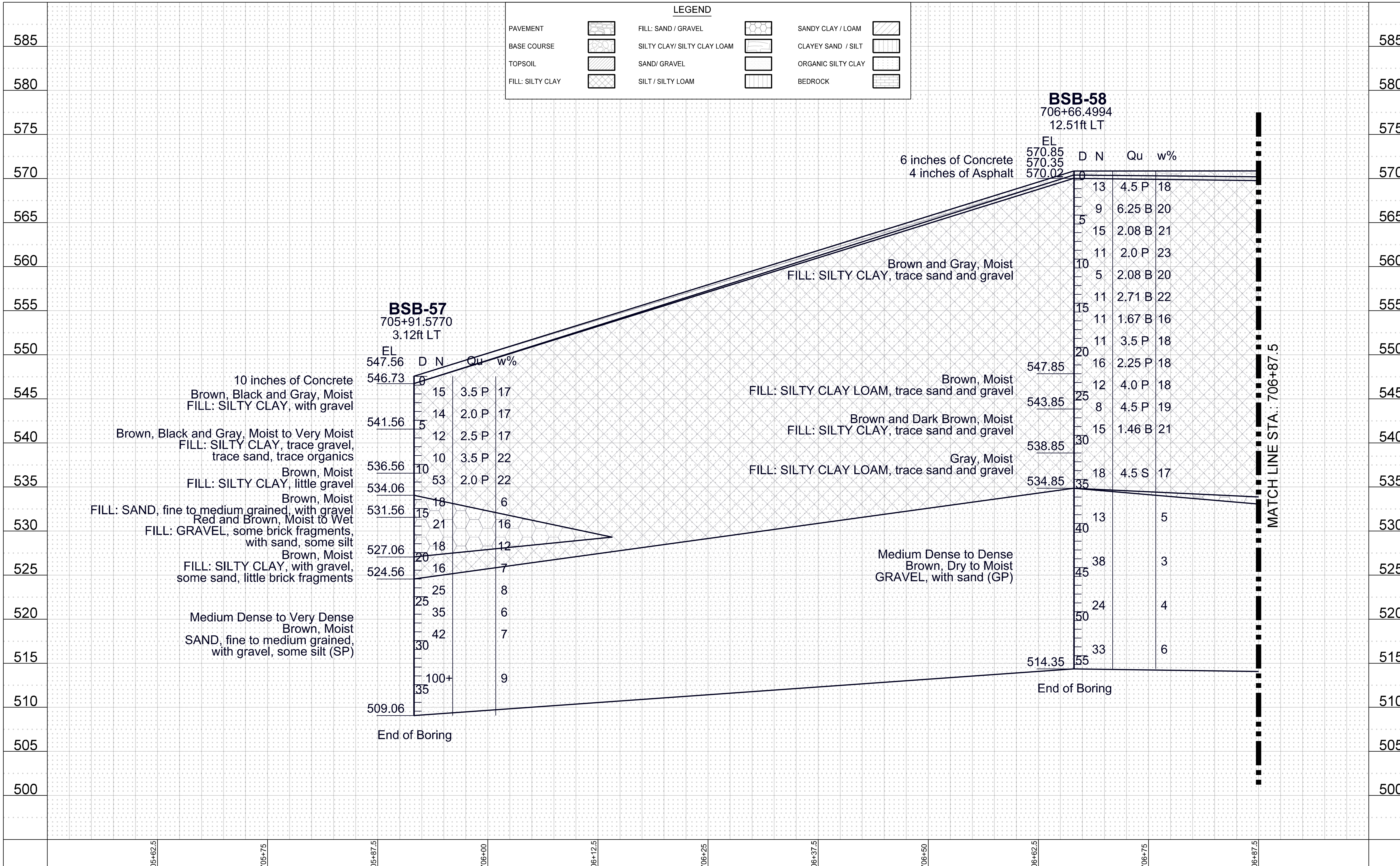
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 706+75 | TO STA. 708+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	3

CONTRACT NO. PTB 198-003
ILLINOIS | FED. AID PROJECT



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

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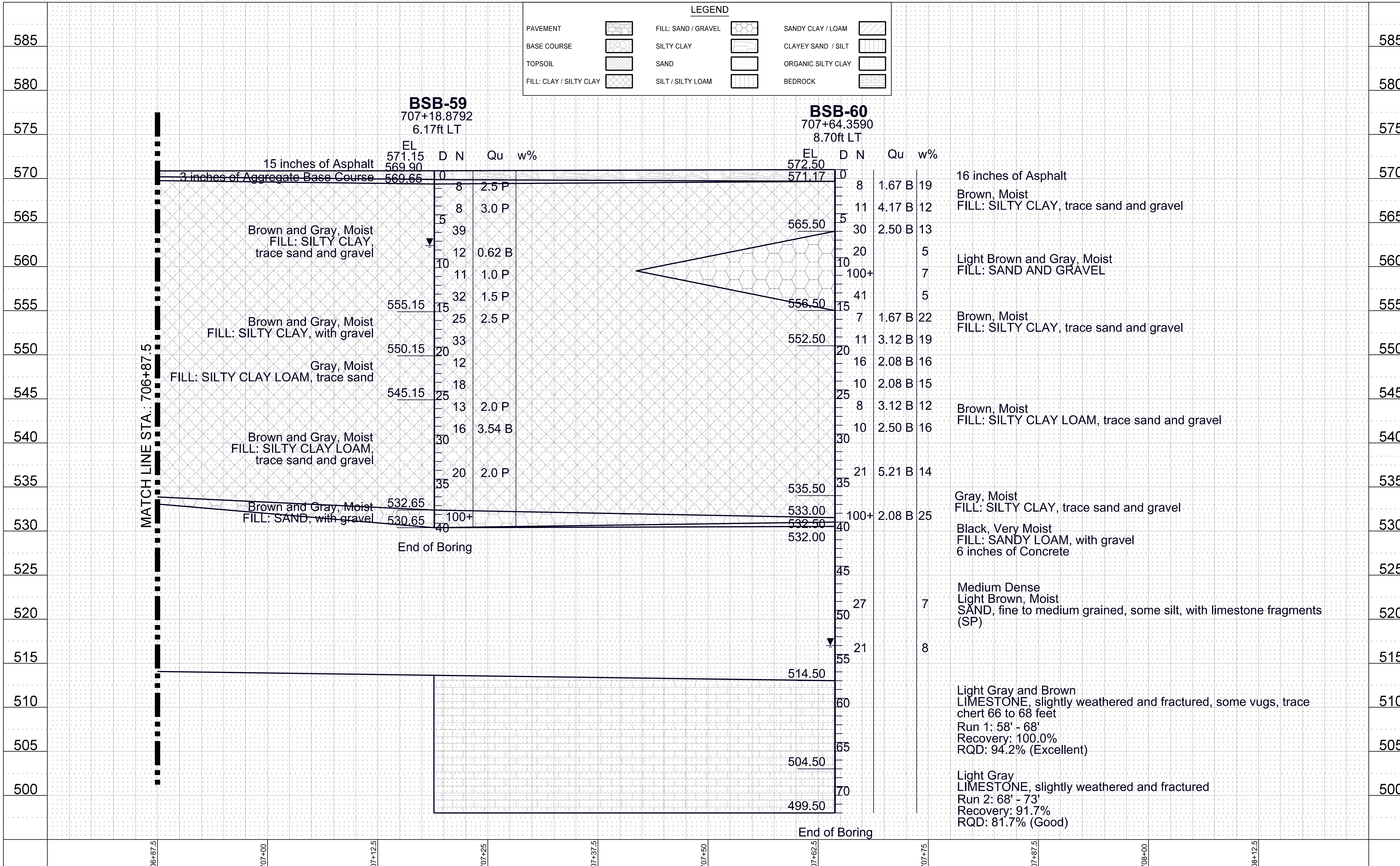
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 705+62.5 TO STA. 706+87.5

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	4

CONTRACT NO. PTB 198-003
ILLINOIS | FED. AID PROJECT



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

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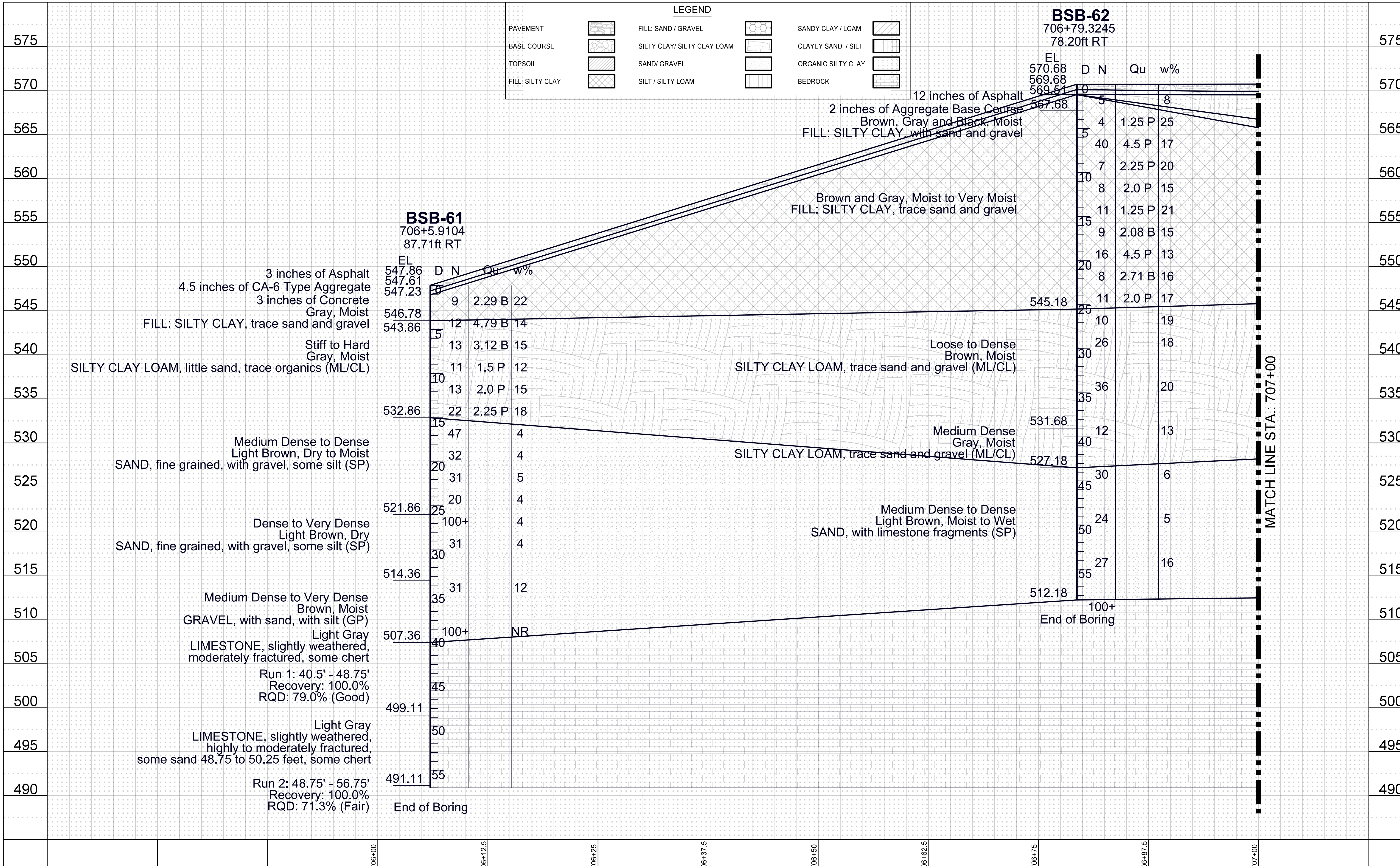
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 706+87.5 | TO STA. 708+12.5

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	5

CONTRACT NO. PTB 198-003
ILLINOIS | FED. AID PROJECT



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

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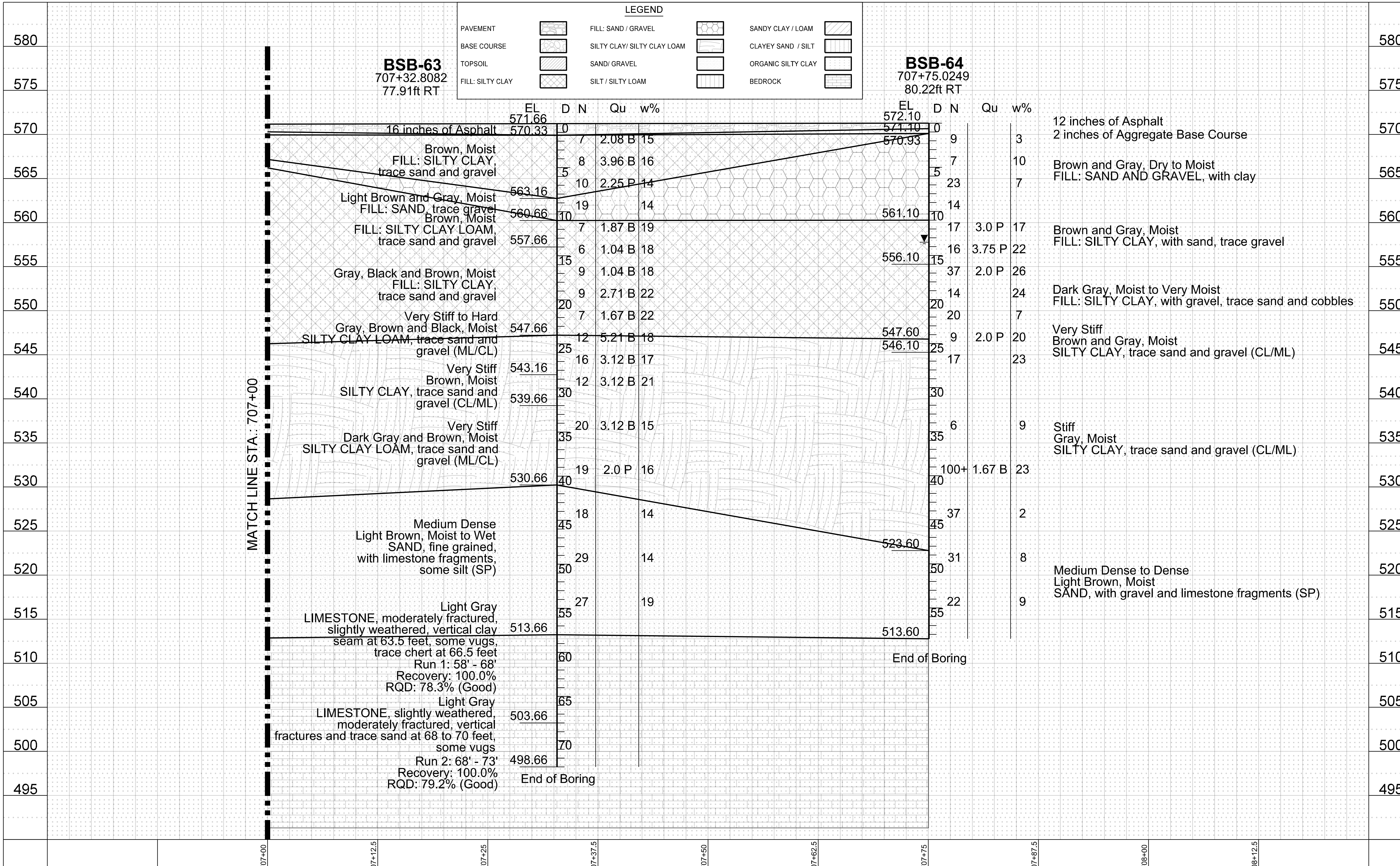
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 706+00 TO STA. 707+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	6
		CONTRACT NO. PTB 198-003		

ILLINOIS | FED. AID PROJECT



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

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CHICAGO STREET BRIDGE
SOIL BORING LOCATION PROFILE
JOLIET, ILLINOIS

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 707+00 | TO STA. 708+12.5

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	7	7
		CONTRACT NO. PTB 198-003		

ILLINOIS | FED. AID PROJECT

APPENDIX C

SOIL BORING LOGS

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

SOIL BORING LOG

Date 4/12/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** B-57 Mobile **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 89

- **STRUCT. NO.** 099-8310
- **Station**
- **BORING NO.** BSB-53
- **Station** 705+82.9618
- **Offset** 91.16ft LT
- **Ground Surface Elev.** 547.27 ft
- **Surface Water Elev.** N/A ft
- **Stream Bed Elev.** N/A ft
- **Groundwater Elev.:**
  - **First Encounter** 546.3 ft ▼
  - **Upon Completion** N/A ft
  - **After** ___ **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3 inches of Asphalt	547.02				
11.5 inches of Concrete	546.31 ▼				
Gray, Moist FILL: SILTY CLAY, some sand and gravel			2 2 3	0.8 P	20
		-5	7 15 12	1.3 P	16
	541.77				
Very Stiff Gray, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)			2 5 3	3.1 S	18
	538.77				
Medium Stiff Gray and Black, Moist SILTY CLAY, trace sand and gravel, trace organics (CL/ML)	537.27	-10	2 3 4	0.5 P	25
Very Stiff Gray, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)			3 20 8	2.3 P	15
	534.27				
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine to medium grained, with silt, some limestone fragments (SP)		-15	8 9 16		8
			9 9 10		7
		-20	16 12 12		5

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine to medium grained, with silt, some limestone fragments (SP) *(continued)*			18 14 8		4
		-25	4 9 15		5
			18 27 21		4
		-30	14 13 8		6
Auger refusal at 32 feet	515.27				
Light Gray LIMESTONE, slightly weathered, moderately fractured, some vugs Run 1: 32' - 42' Recovery: 100.0% RQD: 84.2% (Good)		-35			
	507.27	-40			

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)

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

SOIL BORING LOG

Date 4/12/22

ROUTE I-80 DESCRIPTION I-80 WB over IL 53/US 52 (Chicago Street) LOGGED BY DD

SECTION I-80 over Des Plaines River LOCATION , SEC. 16, TWP. 35 N, RNG. 10 E, Latitude , Longitude

COUNTY Will DRILLING RIG B-57 Mobile HAMMER TYPE Auto
DRILLING METHOD HSA HAMMER EFF (%) 89

STRUCT. NO. 099-8310
Station

BORING NO. BSB-53
Station 705+82.9618
Offset 91.16ft LT
Ground Surface Elev. 547.27 ft

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

Groundwater Elev.:
First Encounter 546.3 ft ▼
Upon Completion N/A ft
After ____ Hrs. N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Light Gray LIMESTONE, slightly weathered, highly fractured, some vugs — 505.27				
Light Gray LIMESTONE, slightly weathered, moderately fractured Run 2: 42' - 47' Recovery: 95.0% RQD: 76.7% (Good)	-45			
500.27				
End of Boring	-50			
	-55			
	-60			

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)

Chicago Street Bridge
Boring Number: BSB-53
Will County, IL

Top

Bottom

Top

Depth = 32.0 ft
Elev. = 515.3 ft

Depth = 42.0 ft
Elev. = 505.3 ft

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Compressive Strength (psi)	Description
BSB-53	1	32.0’ – 42.0’	100.0	84.2	Good	16,071	Light Gray Limestone Slightly Weathered, Moderately Fractured, Some Vugs, Highly Fractured from 40 to 42 feet

Chicago Street Bridge
Boring Number: BSB-53
Will County, IL

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-53	2	42.0’ – 47.0’	95.0	76.7	Good	Light Gray Limestone Slightly Weathered, Moderately Fractured, Some Vugs

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

SOIL BORING LOG

Date 4/7/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-54
Station 706+61.3187
Offset 82.00ft LT
Ground Surface Elev. 570.21 ft

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

Groundwater Elev.:
First Encounter 516.7 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
16 inches of Asphalt				
568.88				
Brown and Gray, Moist FILL: SILTY CLAY, trace sand, trace gravel		11 5 7	3.1 B	11
	-5	3 5 7	3.1 B	16
		3 4 4	2.3 B	21
	-10	2 2 6	3.1 B	22
		2 2 4	1.7 B	25
	-15	2 5 5	2.5 B	17
		4 6 10	4.8 B	19
	-20	2 4 6	2.3 B	18

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown and Gray, Moist FILL: SILTY CLAY, trace sand, trace gravel *(continued)* Trace organics at 21 feet		3 5 5	1.7 B	21
	-25	3 6 9	1.7 B	21
544.21				
Very Stiff Brown and Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML) Sand seam at 26 feet		5 5 8	2.1 B	17
	-30	3 7 9	3.3 B	21
538.21				
Stiff Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML)	-35	4 6 10	1.7 B	13
533.21				
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine to medium grained, with limestone fragments, some silt (SP)	-40	21 24 14		4

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)

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

SOIL BORING LOG

Date 4/7/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-54
Station 706+61.3187
Offset 82.00ft LT
Ground Surface Elev. 570.21 ft

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

Groundwater Elev.:
First Encounter 516.7 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine to medium grained, with limestone fragments, some silt (SP) *(continued)*				
		21		
		17		5
	-45	13		
		14		
		15		7
	-50	16		
	▼	12		
		12		9
	-55	9		
514.21				
Auger refusal at 56 feet End of Boring				
	-60			

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)

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

SOIL BORING LOG

Date 4/5/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-55
Station 707+9.3039
Offset 85.45ft LT
Ground Surface Elev. 570.68 ft

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

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

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
13 inches of Asphalt 569.59				
Brown, Moist to Very Moist FILL: SILTY CLAY, trace sand and gravel		5 6 6	3.0 P	16
	-5	4 4 5	1.5 S	18
		3 4 6	2.7 B	22
Cobbles at 9 feet	-10	5 7 5	3.0 P	17
		4 6 10	2.7 B	30
	-15	5 5 9	4.2 B	27
		5 4 9	3.1 B	17
	-20	7 8 7	3.0 P	23
Brown, Moist to Very Moist FILL: SILTY CLAY, trace sand and gravel *(continued)*		3 5 8	3.3 B	22
547.68 Stiff to Hard Brown, Moist SILTY CLAY, trace sand and gravel (CL/ML)	-25	6 8 8	3.3 B	21
		3 7 8	4.6 B	20
	-30	5 6 6	1.3 P	22
538.68 Very Stiff Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML)	-35	4 8 11	3.1 B	15
532.18 Very Dense Brown and Gray, Moist SAND, with gravel (SP)	-40	22 50/4"		10

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)

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

SOIL BORING LOG

Date 4/5/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD MUD ROTARY **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-55
Station 707+9.3039
Offset 85.45ft LT
Ground Surface Elev. 570.68 ft

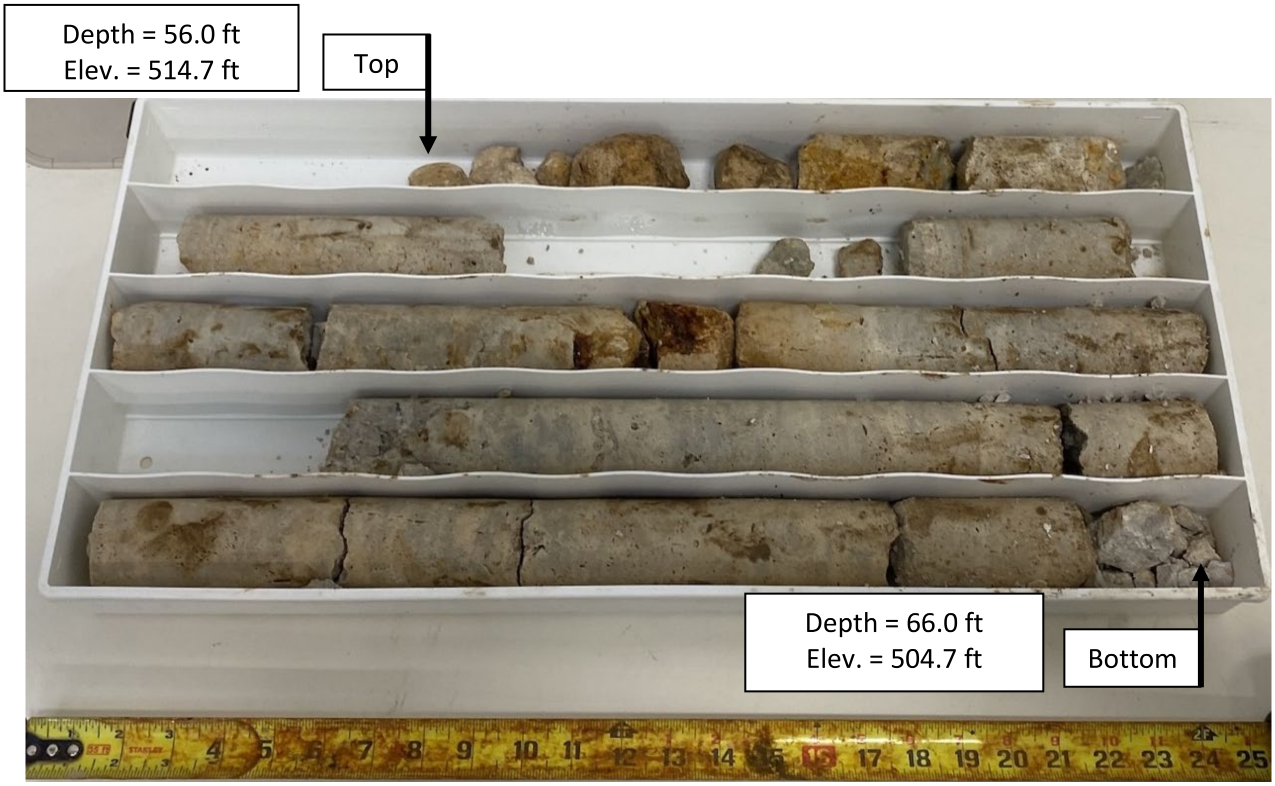
Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Dense Brown and Gray, Moist SAND, with gravel (SP) *(continued)*	528.68				
Medium Dense to Dense Brown, Moist SAND, with limestone fragments (SP)			11		
			9		11
		-45	13		
			15		
			17		6
		-50	15		
	518.68				
Loose Gray, Dry GRAVEL, with sand (GP)			4		
			4		4
		-55	6		
Auger refusal at 56 feet	514.68				
Light Gray and Brown LIMESTONE, moderately weathered, highly fractured Run 1: 56' - 66' Recovery: 76.7% RQD: 59.2% (Fair)		-60			
Light Gray and Brown LIMESTONE, moderately weathered, highly fractured Run 1: 56' - 66' Recovery: 76.7% RQD: 59.2% (Fair) *(continued)*		-65			
	504.68				
End of Boring		-70			
		-75			
		-80			

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)

Chicago Street Bridge
Boring Number: BSB-55
Will County, IL



Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Compressive Strength (psi)	Description
BSB-55	1	56.0' – 66.0'	76.7	59.2	Fair	10,017	Light Gray and Brown Limestone Moderately Weathered, Highly Fractured, Some Vugs

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

SOIL BORING LOG

Date 4/6/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-56
Station 707+58.1383
Offset 88.33ft LT
Ground Surface Elev. 571.35 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
13 inches of Asphalt	570.26				
Brown, Moist FILL: SILTY CLAY, trace sand and gravel			3 5 6	5.0 B	17
		-5	2 5 6	5.2 B	18
			3 8 6	4.0 B	20
Cobbles at 8.5 feet		-10	26 9 6	1.5 P	12
Cobbles at 11 feet			4 5 11		NR
Cobbles at 13.5 feet	555.35	-15	15 10 9		7
Gray, Moist FILL: SILTY CLAY, with gravel	553.35		5 6 7	0.8 B	16
Gray, Moist FILL: SILTY CLAY, trace sand and gravel		-20	2 4 5	1.7 B	20

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray, Moist FILL: SILTY CLAY, trace sand and gravel *(continued)* Cobbles at 21 feet			4 5 6		19
	546.85	-25	3 5 6	2.0 P	15
Stiff to Hard Brown, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)			6 6 8	4.0 S	14
		-30	5 6 7	2.0 P	18
Cobbles at 33.5 feet		-35	12 9 11		15
Limestone fragments from 38 to 42 feet		-40	6 5 23		13

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)

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

SOIL BORING LOG

Date 4/6/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-56
Station 707+58.1383
Offset 88.33ft LT
Ground Surface Elev. 571.35 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Hard Brown, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL) *(continued)*	529.35				
Medium Dense Brown, Moist SAND, with limestone fragments (SP)			14		
			13		5
		-45	11		
			11		
			11		7
		-50	7		
			9		
			7		10
		-55	6		
	513.35				
Auger refusal at 58 feet End of Boring		-60			

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)

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

SOIL BORING LOG

Date 4/6/22

ROUTE I-80	**DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street)		**LOGGED BY** EH
SECTION I-80 over Des Plaines River	**LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**		
COUNTY Will	**DRILLING RIG** Diedrich D-50	**HAMMER TYPE** Auto	
	DRILLING METHOD HSA	**HAMMER EFF (%)** 98	

STRUCT. NO. 099-8310	**Surface Water Elev.** N/A ft
Station	**Stream Bed Elev.** N/A ft
BORING NO. BSB-57	**Groundwater Elev.:**
Station 705+91.5770	**First Encounter** Dry ft
Offset 3.12ft LT	**Upon Completion** N/A ft
Ground Surface Elev. 547.56 ft	**After** Hrs. N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Concrete	546.73				
Brown, Black and Gray, Moist FILL: SILTY CLAY, with gravel			3 6 9	3.5 P	17
		-5	5 6 8	2.0 P	17
	541.56				
Brown, Black and Gray, Moist to Very Moist FILL: SILTY CLAY, trace gravel, trace sand, trace organics			4 5 7	2.5 P	17
		-10	3 4 6	3.5 P	22
	536.56				
Brown, Moist FILL: SILTY CLAY, little gravel Cobbles at 12 feet			3 15 38	2.0 P	22
	534.06				
Brown, Moist FILL: SAND, fine to medium grained, with gravel		-15	8 8 10		6
	531.56				
Red and Brown, Moist to Wet FILL: GRAVEL, some brick fragments, with sand, some silt			10 9 12		16
		-20	10 10 8		12
	527.06				
Brown, Moist FILL: SILTY CLAY, with gravel, some sand, little brick fragments			9 7 9		7
	524.56				
Medium Dense to Very Dense Brown, Moist SAND, fine to medium grained, with gravel, some silt (SP) Some Clay at 23.5 feet		-25	6 15 10		8
			10 19 16		6
		-30	10 22 20		7
		-35	50/3"		9
	509.06				
Auger refusal at 38.5 feet End of Boring		-40			

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)

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

SOIL BORING LOG

Date 4/25/22

ROUTE I-80 DESCRIPTION I-80 WB over IL 53/US 52 (Chicago Street) LOGGED BY DM

SECTION I-80 over Des Plaines River LOCATION , SEC. 16, TWP. 35 N, RNG. 10 E, Latitude , Longitude

COUNTY Will DRILLING RIG CME-75 HAMMER TYPE Auto
DRILLING METHOD HSA HAMMER EFF (%) 91

STRUCT. NO. 099-8310
Station

BORING NO. BSB-58
Station 706+66.4994
Offset 12.51ft LT
Ground Surface Elev. 570.85 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Concrete	570.35				
4 inches of Asphalt	570.02				
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel			6 5 8	4.5 P	18
		-5	3 3 6	6.3 B	20
			3 4 11	2.1 B	21
		-10	11 5 6	2.0 P	23
			6 2 3	2.1 B	20
		-15	3 5 6	2.7 B	22
			4 4 7	1.7 B	16
		-20	4 5 6	3.5 P	18

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel *(continued)*			5 6 10	2.3 P	18
	547.85				
Brown, Moist FILL: SILTY CLAY LOAM, trace sand and gravel		-25	4 5 7	4.0 P	18
	543.85		3 3 5	4.5 P	19
Brown and Dark Brown, Moist FILL: SILTY CLAY, trace sand and gravel		-30	3 6 9	1.5 B	21
	538.85				
Gray, Moist FILL: SILTY CLAY LOAM, trace sand and gravel		-35	4 9 9	4.5 S	17
	534.85				
Medium Dense to Dense Brown, Dry to Moist GRAVEL, with sand (GP)		-40	7 7 6		5

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)

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

SOIL BORING LOG

Date 4/25/22

ROUTE I-80 **DESCRIPTION** I-80 WB over IL 53/US 52 (Chicago Street) **LOGGED BY** DM

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, Latitude , Longitude

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO. 099-8310
Station

BORING NO. BSB-58
Station 706+66.4994
Offset 12.51ft LT
Ground Surface Elev. 570.85 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium Dense to Dense Brown, Dry to Moist GRAVEL, with sand (GP) *(continued)* Limestone fragments from 41 to 56.5 feet					
			13		
			22		3
		-45	16		
			6		
			6		4
		-50	18		
			23		
			17		6
		-55	16		
	514.35				
Auger refusal at 56.5 feet End of Boring					
		-60			

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)

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

SOIL BORING LOG

Date 4/19/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , Longitude

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-59
Station 707+18.8792
Offset 6.17ft LT
Ground Surface Elev. 571.15 ft

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

Groundwater Elev.:
First Encounter 562.7 ft ▼
Upon Completion N/A ft
After ___ Hrs. N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
15 inches of Asphalt 3 inches of Aggregate Base Course	569.90 569.65		3 3 5	2.5 P	20
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel		-5	2 2 6	3.0 P	19
Cobbles at 6 feet			12 21 18		13
▼		-10	3 5 7	0.6 B	19
			3 4 7	1.0 P	19
Cobbles at 14 feet		-15	3 26 6	1.5 P	16
Brown and Gray, Moist FILL: SILTY CLAY, with gravel	555.15		19 11 14	2.5 P	21
		-20	24 13 20		17
Brown and Gray, Moist FILL: SILTY CLAY, with gravel *(continued)*	550.15		5 6 6		17
Gray, Moist FILL: SILTY CLAY LOAM, trace sand		-25	4 8 10		16
Brown and Gray, Moist FILL: SILTY CLAY LOAM, trace sand and gravel	545.15		4 6 7	2.0 P	16
		-30	4 5 11	3.5 B	20
		-35	32 10 10	2.0 P	17
Brown and Gray, Moist FILL: SAND, with gravel	532.65	-40	16 34 50/3"		9

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)

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

SOIL BORING LOG

Date 4/19/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-59
Station 707+18.8792
Offset 6.17ft LT
Ground Surface Elev. 571.15 ft

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

Groundwater Elev.:
First Encounter 562.7 ft ▼
Upon Completion N/A ft
After ___ **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
530.65				
Auger refusal at 40.5 feet End of Boring				
	-45			
	-50			
	-55			
	-60			

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)

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

SOIL BORING LOG

Date 4/18/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO. 099-8310
Station

BORING NO. BSB-60
Station 707+64.3590
Offset 8.70ft LT
Ground Surface Elev. 572.50 ft

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

Groundwater Elev.:
First Encounter 518.5 ft ▼
Upon Completion N/A ft
After ___ Hrs. N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
16 inches of Asphalt	571.17		4		
Brown, Moist FILL: SILTY CLAY, trace sand and gravel			4 4	1.7 B	19
			4 3 8	4.2 B	12
		-5			
	565.50		5 13 17	2.5 B	13
Light Brown and Gray, Moist FILL: SAND AND GRAVEL			7 11 9		5
		-10			
			10 50/4"		7
			14 22 19		5
		-15			
	556.50				
Brown, Moist FILL: SILTY CLAY, trace sand and gravel			5 3 4	1.7 B	22
			4 5 6	3.1 B	19
	552.50	-20			

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown, Moist FILL: SILTY CLAY LOAM, trace sand and gravel			5 7 9	2.1 B	16
			3 3 7	2.1 B	15
		-25			
			5 4 4	3.1 B	12
			3 4 6	2.5 B	16
		-30			
			7 10 11	5.2 B	14
		-35			
	535.50				
Gray, Moist FILL: SILTY CLAY, trace sand and gravel			3 33 50/2"	2.1 B	25
	533.00				
Black, Very Moist	532.50	-40			

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)

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

SOIL BORING LOG

Date 4/18/22

ROUTE I-80	**DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street)		**LOGGED BY** DD
SECTION I-80 over Des Plaines River	**LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**		
COUNTY Will	**DRILLING RIG** CME-75	**HAMMER TYPE** Auto	
	DRILLING METHOD HSA	**HAMMER EFF (%)** 91	

STRUCT. NO. 099-8310	**Surface Water Elev.** N/A ft
Station	**Stream Bed Elev.** N/A ft
BORING NO. BSB-60	**Groundwater Elev.:**
Station 707+64.3590	**First Encounter** 518.5 ft ▼
Offset 8.70ft LT	**Upon Completion** N/A ft
Ground Surface Elev. 572.50 ft	**After** ___ **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
FILL: SANDY LOAM, with gravel	532.00				
6 inches of Concrete					
Medium Dense Light Brown, Moist SAND, fine to medium grained, some silt, with limestone fragments (SP) No recovery at 43.5-45 feet					
		-45			
			17		
			12		7
		-50	15		
		▼	13		
			10		8
		-55	11		
	514.50				
Auger refusal at 58 feet					
		-60			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Light Gray and Brown LIMESTONE, slightly weathered and fractured, some vugs, trace chert 66 to 68 feet Run 1: 58' - 68' Recovery: 100.0% RQD: 94.2% (Excellent) *(continued)*					
		-65			
	504.50				
Light Gray LIMESTONE, slightly weathered and fractured Run 2: 68' - 73' Recovery: 91.7% RQD: 81.7% (Good)					
		-70			
	499.50				
End of Boring					
		-75			
		-80			

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)

Chicago Street Bridge
Boring Number: BSB-60
Chicago, IL

Top

Bottom

Depth = 58.0 ft
Elev. = 514.5 ft

Top

Depth = 68.0 ft
Elev. = 504.5 ft

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-60	1	58.0’ - 68.0’	100.0	94.2	Excellent	Light Gray and Brown Limestone Slightly Weathered and Fractured, Some Vugs, Trace Chert 66 to 68 feet

Chicago Street Bridge
Boring Number: BSB-60
Will County, IL

Top

Bottom

Top

Depth = 68.0 ft
Elev. = 504.5 ft

Depth = 73.0 ft
Elev. = 499.5 ft

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-60	2	68.0' – 73.0'	91.7	81.7	Good	Light Gray Limestone Slightly Weathered and Fractured

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

SOIL BORING LOG

Date 4/5/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** EH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-61
Station 706+5.9104
Offset 87.71ft RT
Ground Surface Elev. 547.86 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3 inches of Asphalt	547.61				
4.5 inches of CA-6 Type Aggregate	547.23				
3 inches of Concrete	546.78		3		
Gray, Moist FILL: SILTY CLAY, trace sand and gravel			3 6	2.3 B	22
	543.86		4		
Stiff to Hard Gray, Moist SILTY CLAY LOAM, little sand, trace organics (ML/CL)		-5	6 6	4.8 B	14
			4		
			6 7	3.1 B	15
			6		
		-10	5 6	1.5 P	12
			7		
			3 10	2.0 P	15
			5		
	532.86	-15	9 13	2.3 P	18
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine grained, with gravel, some silt (SP)			13		
			23 24		4
			11		
		-20	17 15		4

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium Dense to Dense Light Brown, Dry to Moist SAND, fine grained, with gravel, some silt (SP) *(continued)*			13		
			16 15		5
			12		
		-25	12 8		4
	521.86		32		
Dense to Very Dense Light Brown, Dry SAND, fine grained, with gravel, some silt (SP) Cobbles at 26 feet			50/6"		4
			12		
		-30	16 15		4
	514.36		10		
Medium Dense to Very Dense Brown, Moist GRAVEL, with sand, with silt (GP)		-35	11 20		12
			50/6"		
		-40			NR

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)

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

SOIL BORING LOG

Date 4/5/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** EH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, Latitude , Longitude

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto

DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-61
Station 706+5.9104
Offset 87.71ft RT
Ground Surface Elev. 547.86 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Auger refusal at 40.5 feet	507.36				
Light Gray LIMESTONE, slightly weathered, moderately fractured, some chert Run 1: 40.5' - 48.75' Recovery: 100.0% RQD: 79.0% (Good)		-45			
	499.11				
Light Gray LIMESTONE, slightly weathered, highly to moderately fractured, some sand 48.75 to 50.25 feet, some chert Run 2: 48.75' - 56.75' Recovery: 100.0% RQD: 71.3% (Fair)		-50 -55			
	491.11				
End of Boring		-60			

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)

Chicago Street Bridge
Boring Number: BSB-61
Will County, IL

Top

Bottom

Top

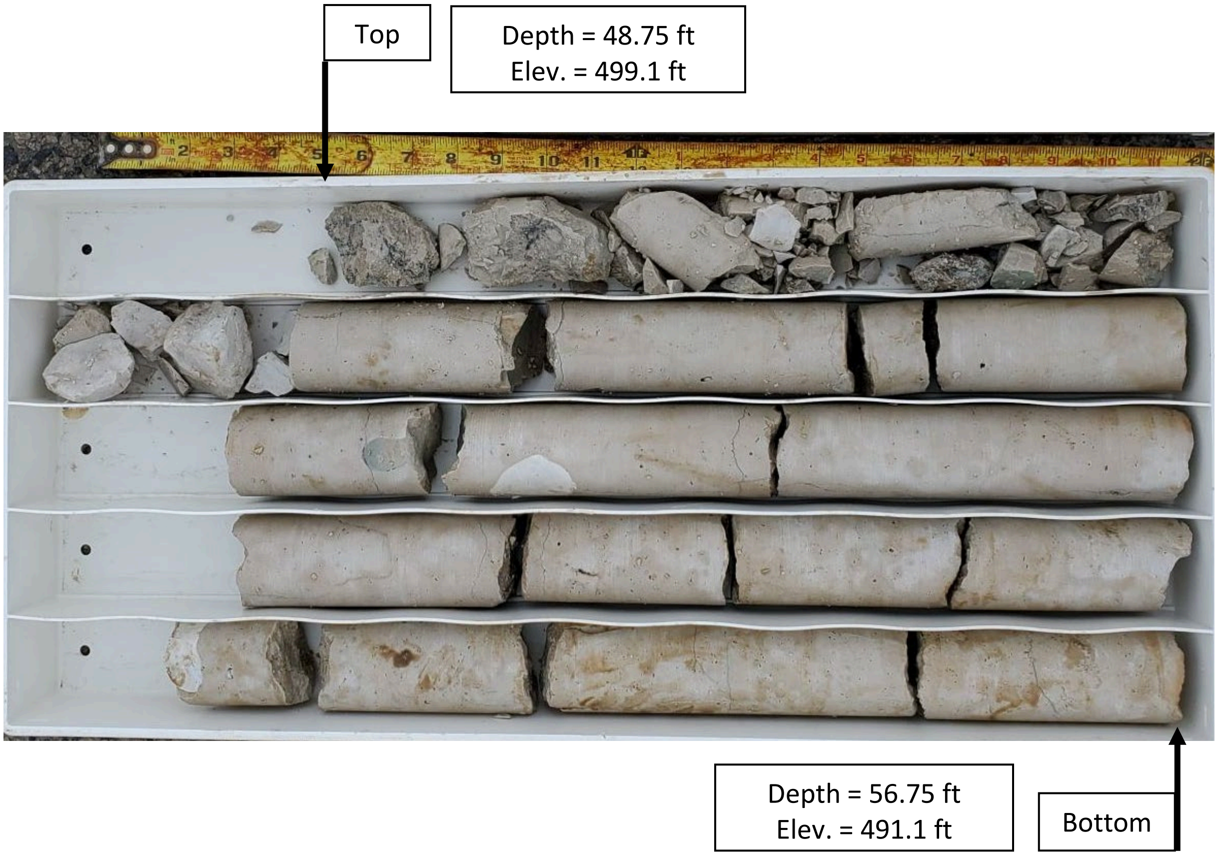
Depth = 40.5 ft
Elev. = 507.4 ft

Depth = 48.75 ft
Elev. = 499.1 ft

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-61	1	40.5' – 48.75'	100.0	79.0	Good	Light Gray Limestone, Slightly Weathered, Moderately Fractured, Some Chert

Chicago Street Bridge
Boring Number: BSB-61
Will County, IL



Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-61	2	48.75' – 56.75'	100.0	71.3	Fair	Light Gray Limestone Slightly Weathered, Highly to Moderately Fractured, Some Sand 48.75 to 50.25 feet, Some Chert

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

SOIL BORING LOG

Date 4/18/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-62
Station 706+79.3245
Offset 78.20ft RT
Ground Surface Elev. 570.68 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
12 inches of Asphalt 2 inches of Aggregate Base Course	569.68 569.51		4		
Brown, Gray and Black, Moist FILL: SILTY CLAY, with sand and gravel	567.68		2 3		8
Brown and Gray, Moist to Very Moist FILL: SILTY CLAY, trace sand and gravel		-5	2 2 2	1.3 P	25
			5 14 26	4.5 P	17
		-10	2 3 4	2.3 P	20
			2 3 5	2.0 P	15
		-15	3 4 7	1.3 P	21
			3 4 5	2.1 B	15
		-20	4 5 11	4.5 P	13
Brown and Gray, Moist to Very Moist FILL: SILTY CLAY, trace sand and gravel *(continued)*			6 3 5	2.7 B	16
	545.18	-25	4 5 6	2.0 P	17
Loose to Dense Brown, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)			4 5 5		19
Limestone fragments at 29.5 feet		-30	3 7 19		18
Cobbles at 33.5 feet		-35	11 15 21		20
	531.68	-40	8 6 6		13

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)

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

SOIL BORING LOG

Date 4/18/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-62
Station 706+79.3245
Offset 78.20ft RT
Ground Surface Elev. 570.68 ft

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

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium Dense Gray, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL) *(continued)*	527.18				
Medium Dense to Dense Light Brown, Moist to Wet SAND, with limestone fragments (SP)		-45	16 17 13		6
		-50	9 12 12		5
		-55	10 14 13		16
	512.18				
Split spoon refusal at 58.5 feet End of Boring			50/0.5"		
		-60			

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)

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

SOIL BORING LOG

Date 4/19/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO. 099-8310
Station

BORING NO. BSB-63
Station 707+32.8082
Offset 77.91ft RT
Ground Surface Elev. 571.66 ft

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

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

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
16 inches of Asphalt (bottom elev. 570.33)		4		
Brown, Moist FILL: SILTY CLAY, trace sand and gravel		3 4	2.1 B	15
		3		
	-5	3 5	4.0 B	16
		11		
Gravel seam at 6.5 feet (bottom elev. 563.16)		7 3	2.3 P	14
Light Brown and Gray, Moist FILL: SAND, trace gravel (bottom elev. 560.66)		11		
	-10	9 10		14
Brown, Moist FILL: SILTY CLAY LOAM, trace sand and gravel (bottom elev. 557.66)		3		
		3 4	1.9 B	19
		3		
Gray, Black and Brown, Moist FILL: SILTY CLAY, trace sand and gravel	-15	3 3	1.0 B	18
		3		
		4 5	1.0 B	18
		3		
	-20	4 5	2.7 B	22

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray, Black and Brown, Moist FILL: SILTY CLAY, trace sand and gravel *(continued)*		2		
		3 4	1.7 B	22
(bottom elev. 547.66)		3		
Very Stiff to Hard Gray, Brown and Black, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)	-25	5 7	5.2 B	18
		4		
(bottom elev. 543.16)		6 10	3.1 B	17
Very Stiff Brown, Moist SILTY CLAY, trace sand and gravel (CL/ML)		4		
(bottom elev. 539.66)	-30	6 6	3.1 B	21
Very Stiff Dark Gray and Brown, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)		5		
	-35	8 12	3.1 B	17
		4		
	-40	8 11	2.0 P	17

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)

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

SOIL BORING LOG

Date 4/19/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, **Latitude** , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO. 099-8310
Station

BORING NO. BSB-63
Station 707+32.8082
Offset 77.91ft RT
Ground Surface Elev. 571.66 ft

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

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

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
530.66				
Medium Dense Light Brown, Dry to Moist SAND, fine grained, with limestone fragments, some silt (SP)		13		
		12		5
	-45	6		
		14		
		16		4
	-50	13		
		5		
		10		7
	-55	17		
513.66				
Auger refusal at 58 feet				
	-60			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Light Gray LIMESTONE, moderately fractured, slightly weathered, vertical clay seam at 63.5 feet, some vugs, trace chert at 66.5 feet Run 1: 58' - 68' Recovery: 100.0% RQD: 78.3% (Good) *(continued)*				
	-65			
503.66				
Light Gray LIMESTONE, slightly weathered, moderately fractured, vertical fractures and trace sand at 68 to 70 feet, some vugs				
	-70			
Run 2: 68' - 73' Recovery: 100.0% RQD: 79.2% (Good)				
498.66				
End of Boring				
	-75			
	-80			

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)

Chicago Street Bridge
Boring Number: BSB-63
Will County, IL

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-63	1	58.0' – 68.0'	100.0	78.3	Good	Light Gray Limestone, Moderately Fractured, Slightly Weathered, Vertical Clay seam at 63.5 feet, Some Vugs, Trace Chert at 66.5 feet

Chicago Street Bridge
Boring Number: BSB-63
Will County, IL

Depth = 68.0 ft
Elev. = 503.7 ft

Top

Depth = 73.0 ft
Elev. = 498.7 ft

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-63	2	68.0' – 73.0'	100.0	79.2	Good	Light Gray Limestone Slightly Weathered, Moderately Fractured, Vertical Fractures and Trace Sand at 68 to 70 feet, Some Vugs

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

SOIL BORING LOG

Date 4/20/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-64
Station 707+75.0249
Offset 80.22ft RT
Ground Surface Elev. 572.10 ft

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

Groundwater Elev.:
First Encounter 558.6 ft ▼
Upon Completion N/A ft
After ____ Hrs. N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
12 inches of Asphalt 2 inches of Aggregate Base Course	571.10 570.93		7		
Brown and Gray, Dry to Moist FILL: SAND AND GRAVEL, with clay			4 5		3
			4		
		-5	3 4		10
			3		
			8 15		7
Cobbles at 8.5 feet			4		
		-10	7 7		
	561.10		9		
Brown and Gray, Moist FILL: SILTY CLAY, with sand, trace gravel			10 7	3.0 P	17
▼			44		
		-15	8 8	3.8 P	22
	556.10		24		
Dark Gray, Moist to Very Moist FILL: SILTY CLAY, with gravel, trace sand and cobbles			29 8	2.0 P	26
			6		
		-20	6 8		24
Dark Gray, Moist to Very Moist FILL: SILTY CLAY, with gravel, trace sand and cobbles *(continued)*			19		
Gravel seam at 21 feet			13 7		7
			5		
	547.60		4	2.0	20
Very Stiff Brown and Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML)		-25	5	P	
	546.10		7		
Stiff Gray, Dry to Moist SILTY CLAY, trace sand and gravel (CL/ML)			9 8		23
No sample at 28.5 to 30 feet - boring re-drilled starting at 33.5 feet		-30			
Cobbles at 33.5 feet			7		
		-35	3 3		9
			9		
		-40	4 50/3"	1.7 B	23

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)

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

SOIL BORING LOG

Date 4/20/22

ROUTE I-80 **DESCRIPTION** I-80 EB over IL 53/US 52 (Chicago Street) **LOGGED BY** MH

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E, Latitude , Longitude

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 099-8310
Station

BORING NO. BSB-64
Station 707+75.0249
Offset 80.22ft RT
Ground Surface Elev. 572.10 ft

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

Groundwater Elev.:
First Encounter 558.6 ft ▼
Upon Completion N/A ft
After ___ **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff Gray, Dry to Moist SILTY CLAY, trace sand and gravel (CL/ML) *(continued)*				
Limestone cobbles at 43.5 feet		19		
		18		2
	-45	19		
523.60				
Medium Dense to Dense Light Brown, Moist SAND, with gravel and limestone fragments (SP)		14		
		14		8
	-50	17		
		14		
		15		9
	-55	7		
513.60				
Auger refusal at 58.5 feet End of Boring				
	-60			

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)

APPENDIX D

LABORATORY TEST RESULTS

Compressive Strength of Rock by ASTM D7012 - Method C

GSG CONSULTANTS, INC.
735 Remington Road, Schaumburg, IL 60173
Tel: 630.994.2600, www.gsg-consultants.com

Project Name:	WSP 198-003 I-80	Project No:	21-2007		
Boring ID:	BSB-53	Bulk/Prep		MC/CS	
Sample Depth (ft):	37.5-38	Tester:	AJ	Tester:	AJ
Lithological Description:	Limestone	Date:	4/18/22	Date:	4/20/22
Formation Name:	Silurian, Undivided	Load Direction:	vertical	Angle Drilled:	vertical
Appearance (e.g. cracks, shearing, spalling):	~5% <1mm vugs				

Bulk Density Determination

	1	2	3	Average
Height, *in.*	3.0860	3.0880	3.0870	3.0870
Diameter, *in.*	1.9960	1.9985	1.9890	1.9945

Specimen Mass, *g*	417.4	Ratio (2.0-2.5)	
Bulk Density, *pcf*	164.9		1.55

Moisture Condition - D2216

Container ID	GUSHERS
container, *g*	226.5
container + wet rock, *g*	448.1
container + dry soil, *g*	446.5
moisture content, *w%*	0.7

Preparation Check	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

Axial Loading

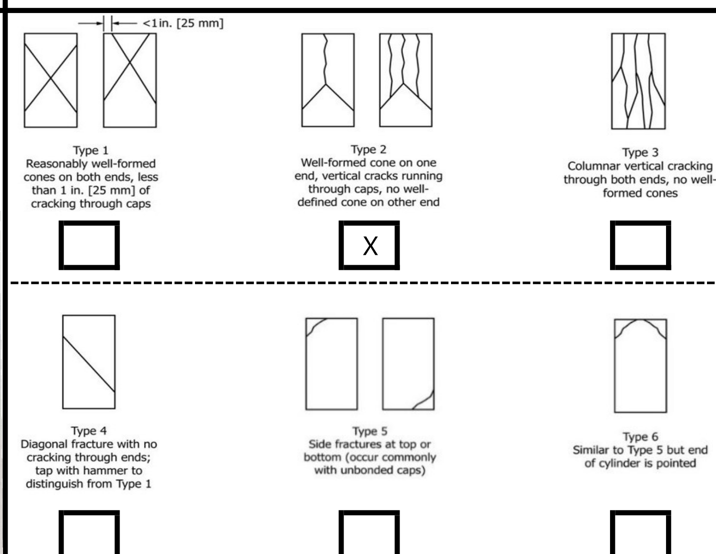
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	3 min 30 sec
Load @ Failure, *lbf*	50,211
Uniaxial Compressive Strength, *psi*	16,071

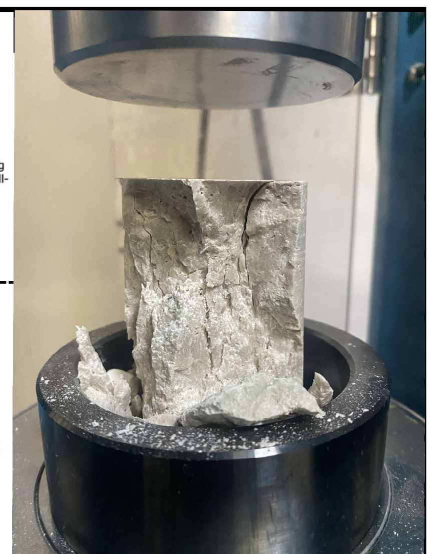
Remarks

Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation

After Break (check applicable appearance)





Form ID	TF-RCS	Reviewed By	DE
Revision Date	10/21/2021	Review Date	04/22/22

Compressive Strength of Rock by ASTM D7012 - Method C

GSG CONSULTANTS, INC.
735 Remington Road, Schaumburg, IL 60173
Tel: 630.994.2600, www.gsg-consultants.com

Project Name:	WSP 198-003 I-80	Project No:	21-2007		
Boring ID:	BSB-55		Bulk/Prep		MC/CS
Sample Depth (ft):	58-58.5	Tester:	AJ	Tester:	AJ
Lithological Description:	Limestone	Date:	4/13/2022	Date:	4/19/2022
Formation Name:	Silurian, Unidivided	Load Direction:	vertical	Angle Drilled:	vertical
Appearance (e.g. cracks, shearing, spalling):	5-10% surface has vugs				

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.6960	4.6900	4.7025	4.6962
Diameter, *in.*	1.9825	1.9795	1.9820	1.9813
Specimen Mass, *g*	615.5		Ratio (2.0-2.5)	
Bulk Density, *pcf*	162.0		2.37	

Moisture Condition - D2216

Container ID	M&M
container, *g*	226.0
container + wet rock, *g*	502.8
container + dry soil, *g*	502.6
moisture content, *w%*	0.1

Preparation Check	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

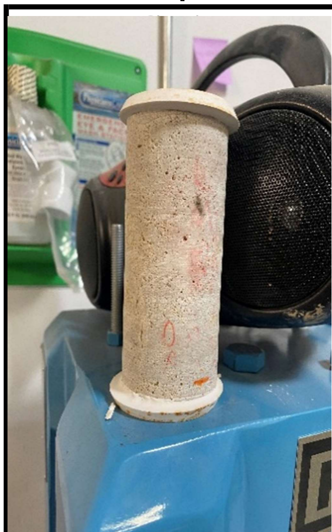
Axial Loading

Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	5 min 45 sec
Load @ Failure, *lbf*	30,885
Uniaxial Compressive Strength, *psi*	10,017

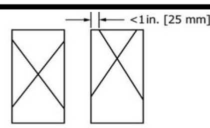
Remarks

Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation

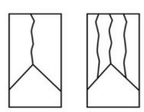


After Break (check applicable appearance)



Type 1
Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

☐

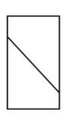


Type 2
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

☐

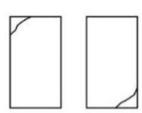
Type 3
Columnar vertical cracking through both ends, no well-formed cones

☐



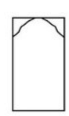
Type 4
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

X



Type 5
Side fractures at top or bottom (occur commonly with unbonded caps)

☐



Type 6
Similar to Type 5 but end of cylinder is pointed

☐

☐ Sketch if Other:

Form ID	TF-RCS	Reviewed By	DE
Revision Date	10/21/2021	Review Date	04/20/22

APPENDIX E

IDOT PILE DESIGN TABLES WITH NO DOWNDRAG

Pile Design Table for West Abutments utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls				**Steel HP 10 X 42**				**Steel HP 12 X 84**			
	15	8	2.9		8	4	2.9		10	6	2.9
	24	13	5.4		16	9	5.4		21	12	5.4
	33	18	7.9		25	14	7.9		32	17	7.9
	41	23	10.4		32	17	10.4		42	23	10.4
	61	33	12.9		44	24	12.9		56	31	12.9
	80	44	15.4		59	33	15.4		75	41	15.4
	99	55	17.9		77	42	17.9		97	53	17.9
	108	60	20.4		80	44	20.4		104	57	20.4
	124	68	22.9		91	50	22.9		119	66	22.9
	141	77	25.4		103	57	25.4		135	74	25.4
	280	154	27.9		138	76	30.4		177	98	27.9
	280	154	30.4		139	76	32.9		184	101	30.4
	290	159	32.9		142	78	35.4		184	101	32.9
	306	169	35.4		167	92	37.9		189	104	35.4
Metal Shell 14"Φ w/.25" walls					169	93	40.4		211	116	37.9
	19	11	2.9		196	108	45.4		222	122	40.4
	30	16	5.4		260	143	53.4		248	136	45.4
	40	22	7.9		320	176	53.9		334	184	53.4
	50	28	10.4		335	184	54.4		408	224	53.9
	74	41	12.9	**Steel HP 10 X 57**					482	265	54.4
	98	54	15.4		8	5	2.9		556	306	54.9
	121	66	17.9		17	9	5.4		630	346	55.4
	130	71	20.4		26	14	7.9		664	365	55.9
	148	82	22.9		32	18	10.4	**Steel HP 14 X 73**			
	168	92	25.4		45	25	12.9		11	6	2.9
	351	193	30.4		61	33	15.4		24	13	5.4
	360	198	32.9		78	43	17.9		36	20	7.9
	380	209	35.4		82	45	20.4		49	27	10.4
Metal Shell 14"Φ w/.312" walls					93	51	22.9		64	35	12.9
	19	11	2.9		106	58	25.4		86	47	15.4
	30	16	5.4		142	78	30.4		111	61	17.9
	40	22	7.9		142	78	32.9		124	68	20.4
	50	28	10.4		146	80	35.4		142	78	22.9
	74	41	12.9		171	94	37.9		160	88	25.4
	98	54	15.4		173	95	40.4		204	112	27.9
	121	66	17.9		201	110	45.4		212	117	30.4
	130	71	20.4		268	148	53.4		220	121	32.9
	148	82	22.9		329	181	53.9		226	124	35.4
	168	92	25.4		390	215	54.4		242	133	37.9
	351	193	30.4		451	248	54.9		256	141	40.4
	360	198	32.9		454	250	55.4		284	156	45.4
	380	209	35.4	**Steel HP 12 X 53**					379	208	53.4
	505	278	40.4		9	5	2.9		466	256	53.9
Metal Shell 16"Φ w/.312" walls					20	11	5.4		553	304	54.4
	24	13	2.9		30	16	7.9		578	318	54.9
	36	20	5.4		40	22	10.4	**Steel HP 14 X 89**			
	47	26	7.9		52	29	12.9		12	7	2.9
	59	33	10.4		71	39	15.4		25	13	5.4
	89	49	12.9		92	51	17.9		37	20	7.9
	117	64	15.4		100	55	20.4		50	27	10.4
	143	79	17.9		115	63	22.9		65	36	12.9
	152	83	20.4		129	71	25.4		88	48	15.4
	174	96	22.9		169	93	27.9		114	62	17.9

Pile Design Table for West Abutments utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	196	108	25.4
	428	235	30.4
	437	240	32.9
	459	252	35.4
Metal Shell 16"Φ w/.375" walls			
	24	13	2.9
	36	20	5.4
	47	26	7.9
	59	33	10.4
	89	49	12.9
	117	64	15.4
	143	79	17.9
	152	83	20.4
	174	96	22.9
	196	108	25.4
	428	235	30.4
	437	240	32.9
	459	252	35.4
	612	337	40.4
Steel HP 8 X 36			
	6	3	2.9
	13	7	5.4
	20	11	7.9
	24	13	10.4
	35	19	12.9
	48	26	15.4
	59	33	17.9
	62	34	20.4
	72	39	22.9
	81	44	25.4
	106	59	30.4
	108	59	32.9
	110	61	35.4
	130	71	40.4
	158	87	45.4
	209	115	53.4
	258	142	53.9
	286	157	54.4

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	176	97	30.4
	176	97	32.9
	181	99	35.4
	200	110	37.9
	212	116	40.4
	234	129	45.4
	311	171	53.4
	383	211	53.9
	418	230	54.4
Steel HP 12 X 63			
	10	5	2.9
	20	11	5.4
	31	17	7.9
	41	22	10.4
	54	30	12.9
	73	40	15.4
	94	52	17.9
	101	56	20.4
	116	64	22.9
	131	72	25.4
	173	95	27.9
	178	98	30.4
	178	98	32.9
	183	100	35.4
	204	112	37.9
	216	119	40.4
	240	132	45.4
	320	176	53.4
	393	216	53.9
	467	257	54.4
	497	273	54.9
Steel HP 12 X 74			
	10	6	2.9
	21	11	5.4
	31	17	7.9
	41	23	10.4
	55	30	12.9
	74	41	15.4
	95	52	17.9
	103	56	20.4
	118	65	22.9
	133	73	25.4
	175	96	27.9
	181	100	30.4
	181	100	32.9
	186	102	35.4
	208	114	37.9
	219	120	40.4
	244	134	45.4
	327	180	53.4
	401	220	53.9
	474	261	54.4
	548	301	54.9
	589	324	55.4

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	126	69	20.4
	144	79	22.9
	162	89	25.4
	208	115	27.9
	216	119	30.4
	223	123	32.9
	229	126	35.4
	248	136	37.9
	261	143	40.4
	291	160	45.4
	390	214	53.4
	477	263	53.9
	565	311	54.4
	653	359	54.9
	705	388	55.4
Steel HP 14 X 102			
	12	7	2.9
	25	14	5.4
	38	21	7.9
	50	28	10.4
	66	36	12.9
	89	49	15.4
	115	63	17.9
	127	70	20.4
	146	80	22.9
	164	90	25.4
	211	116	27.9
	218	120	30.4
	226	124	32.9
	233	128	35.4
	251	138	37.9
	264	145	40.4
	295	162	45.4
	398	219	53.4
	486	267	53.9
	574	316	54.4
	662	364	54.9
	750	412	55.4
	810	445	55.9
Steel HP 14 X 117			
	13	7	2.9
	26	14	5.4
	38	21	7.9
	51	28	10.4
	68	37	12.9
	91	50	15.4
	117	64	17.9
	129	71	20.4
	148	81	22.9
	167	92	25.4
	215	118	27.9
	222	122	30.4
	229	126	32.9
	236	130	35.4

Pile Design Table for West Abutments utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
									257	141	37.9
									268	148	40.4
									301	166	45.4
									408	225	53.4
									497	273	53.9
									586	322	54.4
									674	371	54.9
									763	420	55.4
									852	468	55.9
									929	511	56.4
								Precast 14"x 14"			
									25	14	2.9
									38	21	5.4
									51	28	7.9
									64	35	10.4
									95	52	12.9
									125	69	15.4
									154	84	17.9
									165	91	20.4
									189	104	22.9
									214	118	25.4

Pile Design Table for East Abutments utilizing Boring #BSB-56, BSB-60, BSB-64

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls				**Steel HP 10 X 42**				**Steel HP 12 X 84**			
	63	35	8.5		7	4	3.5		10	6	3.5
	83	46	11.0		15	8	6.0		20	11	6.0
	110	61	16.0		17	9	8.5		22	12	8.5
	138	76	18.5		30	17	11.0		39	21	11.0
	148	81	21.0		46	26	13.5		59	33	13.5
	189	104	23.5		50	27	16.0		63	35	16.0
	212	116	28.5		66	36	18.5		84	46	18.5
	374	206	33.5		78	43	21.0		103	57	21.0
Metal Shell 14"Φ w/.25" walls					104	57	23.5		132	73	23.5
	76	42	8.5		119	65	28.5		153	84	28.5
	101	55	11.0		168	93	43.5		219	120	43.5
	132	73	16.0		235	129	51.1		304	167	51.1
	167	92	18.5		335	184	52.1		664	365	53.6
	177	97	21.0	**Steel HP 10 X 57**				**Steel HP 14 X 73**			
	229	126	23.5		8	5	3.5		10	5	3.5
	250	138	28.5		17	9	6.0		20	11	6.0
Metal Shell 14"Φ w/.312" walls					18	10	8.5		25	14	8.5
	76	42	8.5		31	17	11.0		44	24	11.0
	101	55	11.0		48	26	13.5		68	37	13.5
	132	73	16.0		51	28	16.0		72	40	16.0
	167	92	18.5		68	37	18.5		96	53	18.5
	177	97	21.0		80	44	21.0		124	68	21.0
	229	126	23.5		107	59	23.5		152	83	23.5
	250	138	28.5		122	67	28.5		180	99	28.5
	465	256	33.5		172	95	43.5		259	142	43.5
	483	265	43.5		244	134	51.1		344	189	51.1
Metal Shell 16"Φ w/.312" walls					454	250	53.1		578	318	52.6
	90	50	8.5	**Steel HP 12 X 53**				**Steel HP 14 X 89**			
	120	66	11.0		8	4	3.5		11	6	3.5
	155	85	16.0		17	9	6.0		22	12	6.0
	198	109	18.5		21	11	8.5		26	14	8.5
	206	113	21.0		36	20	11.0		45	25	11.0
	272	149	23.5		56	31	13.5		69	38	13.5
	289	159	28.5		60	33	16.0		74	41	16.0
	565	311	33.5		79	44	18.5		98	54	18.5
	572	315	43.5		99	54	21.0		125	69	21.0
Metal Shell 16"Φ w/.375" walls					125	69	23.5		155	85	23.5
	90	50	8.5		147	81	28.5		183	101	28.5
	120	66	11.0		210	116	43.5		262	144	43.5
	155	85	16.0		282	155	51.1		355	195	51.1
	198	109	18.5		418	230	52.1		705	388	53.1
	206	113	21.0	**Steel HP 12 X 63**				**Steel HP 14 X 102**			
	272	149	23.5		9	5	3.5		11	6	3.5
	289	159	28.5		18	10	6.0		23	13	6.0
	565	311	33.5		21	12	8.5		27	15	8.5
	572	315	43.5		37	20	11.0		46	26	11.0
Steel HP 8 X 36					57	31	13.5		71	39	13.5
	7	4	3.5		61	34	16.0		75	41	16.0
	13	7	6.0		81	45	18.5		100	55	18.5
	14	8	8.5		100	55	21.0		127	70	21.0
	24	13	11.0		128	70	23.5		158	87	23.5
	37	21	13.5		149	82	28.5		185	102	28.5

Pile Design Table for East Abutments utilizing Boring #BSB-56, BSB-60, BSB-64

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	39	22	16.0
	53	29	18.5
	60	33	21.0
	84	46	23.5
	94	52	28.5
	132	73	33.5
	133	73	43.5
	190	104	51.1
	286	157	52.1

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	212	117	43.5
	291	160	51.1
	497	273	52.6
Steel HP 12 X 74			
	10	5	3.5
	19	11	6.0
	22	12	8.5
	38	21	11.0
	58	32	13.5
	62	34	16.0
	83	45	18.5
	101	56	21.0
	130	72	23.5
	151	83	28.5
	216	119	43.5
	298	164	51.1
	589	324	53.1

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	266	146	43.5
	363	199	51.1
	802	441	53.6
	810	445	54.1
Steel HP 14 X 117			
	12	7	3.5
	24	13	6.0
	28	15	8.5
	48	26	11.0
	72	40	13.5
	76	42	16.0
	102	56	18.5
	129	71	21.0
	161	89	23.5
	187	103	28.5
	269	148	43.5
	373	205	51.1
	816	449	53.6
	905	498	54.1
	929	511	54.6
Precast 14"x 14"			
	97	54	8.5
	128	71	11.0
	168	93	16.0
	213	117	18.5
	225	124	21.0

APPENDIX F

IDOT PILE DESIGN TABLES WITH PRECORE – WEST ABUTMENT

Pile Design Table for West Abutments with Precore utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	20	11	25.4
	159	87	27.9
	159	88	30.4
	169	93	32.9
	186	102	35.4
	286	158	40.4
Metal Shell 14"Φ w/.25" walls			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	27	15	25.4
	210	115	30.4
	219	121	32.9
	239	131	35.4
	364	200	40.4
Metal Shell 14"Φ w/.312" walls			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	27	15	25.4
	210	115	30.4
	219	121	32.9
	239	131	35.4
	364	200	40.4
	546	301	45.4
Metal Shell 16"Φ w/.312" walls			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	3	2	25.4
	22	12	27.9
	27	15	30.4
	32	18	32.9
	38	21	35.4
	47	26	37.9
	58	32	40.4
	76	42	45.4
	140	77	53.4
	201	110	53.9
	261	144	54.4
	322	177	54.9
	335	184	55.4
Steel HP 10 X 57			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	4	2	25.4
	24	13	27.9
	29	16	30.4
	34	19	32.9
	40	22	35.4
	51	28	37.9
	60	33	40.4
	81	44	45.4
	148	82	53.4
	209	115	53.9
	270	149	54.4
	331	182	54.9
	392	215	55.4
	453	249	55.9
	454	250	56.4
Steel HP 12 X 53			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	6	3	25.4
	31	17	27.9
	38	21	30.4
	43	24	32.9
	50	27	35.4
	65	36	37.9
	76	42	40.4
	102	56	45.4
	188	103	53.4
	262	144	53.9
	336	185	54.4
	410	225	54.9
	484	266	55.4
	558	307	55.9
	632	347	56.4
	664	365	56.9
Steel HP 14 X 73			
	0	0	2.9
	0	0	5.4
	0	0	7.9
	0	0	10.4
	0	0	12.9
	0	0	15.4
	0	0	17.9
	0	0	20.4
	0	0	22.9
	5	3	25.4
	33	18	27.9
	41	22	30.4
	48	26	32.9
	55	30	35.4
	71	39	37.9
	85	47	40.4
	113	62	45.4
	207	114	53.4
	294	162	53.9
	381	210	54.4
	468	257	54.9
	555	305	55.4
	578	318	55.9
Steel HP 14 X 89			
	0	0	2.9
	0	0	5.4
	0	0	7.9

Pile Design Table for West Abutments with Precore utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
	0	0	17.9		0	0	15.4		0	0	10.4
	0	0	20.4		0	0	17.9		0	0	12.9
	0	0	22.9		0	0	20.4		0	0	15.4
	35	19	25.4		0	0	22.9		0	0	17.9
	267	147	30.4		3	2	25.4		0	0	20.4
	276	152	32.9		26	14	27.9		0	0	22.9
	298	164	35.4		33	18	30.4		6	3	25.4
	451	248	40.4		39	21	32.9		35	20	27.9
Metal Shell 16"Φ w/.375" walls					45	25	35.4		43	24	30.4
	0	0	2.9		57	31	37.9		50	28	32.9
	0	0	5.4		69	38	40.4		58	32	35.4
	0	0	7.9		92	51	45.4		75	41	37.9
	0	0	10.4		168	93	53.4		88	48	40.4
	0	0	12.9		241	132	53.9		118	65	45.4
	0	0	15.4		313	172	54.4		217	119	53.4
	0	0	17.9		385	212	54.9		305	168	53.9
	0	0	20.4		418	230	55.4		392	216	54.4
	0	0	22.9	**Steel HP 12 X 63**					480	264	54.9
	35	19	25.4		0	0	2.9		567	312	55.4
	267	147	30.4		0	0	5.4		655	360	55.9
	276	152	32.9		0	0	7.9		705	388	56.4
	298	164	35.4		0	0	10.4	**Steel HP 14 X 102**			
	451	248	40.4		0	0	12.9		0	0	2.9
	679	374	45.4		0	0	15.4		0	0	5.4
Steel HP 8 X 36					0	0	17.9		0	0	7.9
	0	0	2.9		0	0	20.4		0	0	10.4
	0	0	5.4		0	0	22.9		0	0	12.9
	0	0	7.9		4	2	25.4		0	0	15.4
	0	0	10.4		28	15	27.9		0	0	17.9
	0	0	12.9		35	19	30.4		0	0	20.4
	0	0	15.4		41	22	32.9		0	0	22.9
	0	0	17.9		47	26	35.4		7	4	25.4
	0	0	20.4		60	33	37.9		38	21	27.9
	0	0	22.9		72	39	40.4		45	25	30.4
	2	1	25.4		96	53	45.4		52	29	32.9
	18	10	27.9		176	97	53.4		59	33	35.4
	22	12	30.4		249	137	53.9		78	43	37.9
	26	14	32.9		322	177	54.4		90	50	40.4
	30	17	35.4		395	217	54.9		121	67	45.4
	38	21	37.9		469	258	55.4		224	123	53.4
	47	26	40.4		497	273	55.9		312	172	53.9
	62	34	45.4	**Steel HP 12 X 74**					400	220	54.4
	113	62	53.4		0	0	2.9		488	268	54.9
	162	89	53.9		0	0	5.4		576	317	55.4
	210	116	54.4		0	0	7.9		664	365	55.9
	259	142	54.9		0	0	10.4		752	414	56.4
	286	157	55.4		0	0	12.9		810	445	56.9
					0	0	15.4	**Steel HP 14 X 117**			
					0	0	17.9		0	0	2.9
					0	0	20.4		0	0	5.4
					0	0	22.9		0	0	7.9
					5	3	25.4		0	0	10.4
					30	16	27.9		0	0	12.9
					36	20	30.4		0	0	15.4

Pile Design Table for West Abutments with Precore utilizing Boring #BSB-53, BSB-57, BSB-61

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
			42	23	32.9		0	0	17.9
			48	27	35.4		0	0	20.4
			63	34	37.9		0	0	22.9
			74	41	40.4		8	4	25.4
			99	54	45.4		40	22	27.9
			182	100	53.4		47	26	30.4
			256	141	53.9		54	30	32.9
			329	181	54.4		62	34	35.4
			403	222	54.9		82	45	37.9
			476	262	55.4		93	51	40.4
			550	303	55.9		126	69	45.4
			589	324	56.4		233	128	53.4
							322	177	53.9
							411	226	54.4
							499	275	54.9
							588	323	55.4
							677	372	55.9
							765	421	56.4
							854	470	56.9
							929	511	57.4
						Precast 14"x 14"			
							0	0	2.9
							0	0	5.4
							0	0	7.9
							0	0	10.4
							0	0	12.9
							0	0	15.4
							0	0	17.9
							0	0	20
							0	0	23
							34	19	25

APPENDIX G

IDOT PILE DESIGN TABLES FOR MSE WALLS

Pile Design Table for East Abutment MSE Walls utilizing Boring #BSB-56, BSB-60, BSB-64

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	37	20	2.0
	72	40	4.5
	75	41	7.5
	229	126	11.0
	249	137	16.0
	253	139	21.0
Metal Shell 14"Φ w/.25" walls			
	49	27	2.0
	90	50	7.5
	296	163	11.0
	313	172	21.0
Metal Shell 14"Φ w/.312" walls			
	49	27	2.0
	90	50	7.5
	296	163	11.0
	313	172	21.0
Metal Shell 16"Φ w/.312" walls			
	63	35	2.0
	107	59	7.5
	372	204	11.0
	379	208	21.0
Metal Shell 16"Φ w/.375" walls			
	63	35	2.0
	107	59	7.5
	372	204	11.0
	379	208	21.0
Steel HP 8 X 36			
	9	5	2.0
	27	15	4.5
	44	24	7.5
	67	37	11.0
	78	43	16.0
	78	43	21.0
	110	61	28.5
	286	157	30.5

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	10	6	2.0
	34	18	4.5
	57	31	7.5
	83	46	11.0
	96	53	16.0
	101	56	21.0
	136	75	28.5
	335	184	30.5
Steel HP 10 X 57			
	12	7	2.0
	36	20	4.5
	59	32	7.5
	86	47	11.0
	99	54	16.0
	104	57	21.0
	144	79	28.5
	454	250	31.5
Steel HP 12 X 53			
	13	7	2.0
	40	22	4.5
	72	39	7.5
	100	55	11.0
	115	64	16.0
	127	70	21.0
	164	90	28.5
	418	230	30.5
Steel HP 12 X 63			
	14	8	2.0
	42	23	4.5
	73	40	7.5
	103	56	11.0
	118	65	16.0
	130	71	21.0
	171	94	28.5
	497	273	31.0
Steel HP 12 X 74			
	15	8	2.0
	44	24	4.5
	74	41	7.5
	105	58	11.0
	120	66	16.0
	131	72	21.0
	177	97	28.5
	589	324	31.5

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	16	9	2.0
	46	25	4.5
	75	41	7.5
	107	59	11.0
	122	67	16.0
	133	73	21.0
	183	101	28.5
	664	365	32.0
Steel HP 14 X 73			
	16	9	2.0
	50	28	4.5
	87	48	7.5
	122	67	11.0
	140	77	16.0
	154	85	21.0
	202	111	28.5
	578	318	31.0
Steel HP 14 X 89			
	18	10	2.0
	53	29	4.5
	88	49	7.5
	125	69	11.0
	143	79	16.0
	156	86	21.0
	211	116	28.5
	705	388	31.5
Steel HP 14 X 102			
	19	11	2.0
	55	30	4.5
	89	49	7.5
	127	70	11.0
	145	80	16.0
	158	87	21.0
	218	120	28.5
	810	445	32.0
Steel HP 14 X 117			
	21	12	2.0
	57	32	4.5
	91	50	7.5
	131	72	11.0
	148	82	16.0
	161	88	21.0
	227	125	28.5
	929	511	32.5
Precast 14"x 14"			
	63	35	2.0
	115	63	7.5

Pile Design Table for West Abutment MSE Walls utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls				**Steel HP 10 X 42**				**Steel HP 12 X 84**			
	27	15	2.5		13	7	2.5		18	10	2.5
	43	23	5.0		27	15	5.0		35	19	5.0
	183	100	7.5		45	25	7.5		60	33	7.5
	196	108	11.5		55	30	11.5		71	39	11.5
	206	113	14.0		60	33	14.0		77	42	14.0
	222	122	16.5		65	36	16.5		83	46	16.5
	323	178	21.5		75	41	19.0		98	54	19.0
Metal Shell 14"Φ w/.25" walls					85	47	21.5		109	60	21.5
	34	19	2.5		104	57	26.5		135	74	26.5
	53	29	5.0		167	92	34.5		221	122	34.5
	221	122	7.5		335	184	36.0		664	365	37.5
	252	139	11.5	**Steel HP 10 X 57**				**Steel HP 14 X 73**			
	262	144	14.0		14	8	2.5		19	11	2.5
	281	155	16.5		28	15	5.0		39	22	5.0
	407	224	21.5		47	26	7.5		65	36	7.5
Metal Shell 14"Φ w/.312" walls					57	31	11.5		80	44	11.5
	34	19	2.5		62	34	14.0		87	48	14.0
	53	29	5.0		67	37	16.5		95	52	16.5
	221	122	7.5		78	43	19.0		110	60	19.0
	252	139	11.5		88	48	21.5		124	68	21.5
	262	144	14.0		108	59	26.5		152	84	26.5
	281	155	16.5		176	97	34.5		247	136	34.5
	407	224	21.5		454	250	37.0		578	318	36.5
Metal Shell 16"Φ w/.312" walls				**Steel HP 12 X 53**				**Steel HP 14 X 89**			
	43	24	2.5		16	9	2.5		20	11	2.5
	65	36	5.0		32	18	5.0		40	22	5.0
	282	155	7.5		54	30	7.5		68	37	7.5
	315	173	11.5		66	36	11.5		83	45	11.5
	325	179	14.0		72	39	14.0		90	49	14.0
	347	191	16.5		78	43	16.5		97	53	16.5
	500	275	21.5		90	49	19.0		114	63	19.0
Metal Shell 16"Φ w/.375" walls					102	56	21.5		127	70	21.5
	43	24	2.5		125	68	26.5		157	87	26.5
	65	36	5.0		201	111	34.5		257	141	34.5
	282	155	7.5		418	230	36.5		705	388	37.5
	315	173	11.5	**Steel HP 12 X 63**				**Steel HP 14 X 102**			
	325	179	14.0		16	9	2.5		21	12	2.5
	347	191	16.5		33	18	5.0		41	23	5.0
	500	275	21.5		56	31	7.5		70	38	7.5
	728	401	26.5		68	37	11.5		85	47	11.5
Steel HP 8 X 36					74	41	14.0		92	50	14.0
	11	6	2.5		80	44	16.5		99	55	16.5
	22	12	5.0		93	51	19.0		118	65	19.0
	36	20	7.5		105	58	21.5		130	71	21.5
	44	24	11.5		129	71	26.5		161	89	26.5
	48	27	14.0		209	115	34.5		264	145	34.5
	52	29	16.5		497	273	36.5		810	445	38.0
	60	33	19.0	**Steel HP 12 X 74**				**Steel HP 14 X 117**			
	68	38	21.5		17	9	2.5		22	12	2.5
	84	46	26.5		34	19	5.0		43	23	5.0
	135	74	34.5		58	32	7.5		72	40	7.5
	286	157	36.5		69	38	11.5		87	48	11.5
					75	41	14.0		94	52	14.0

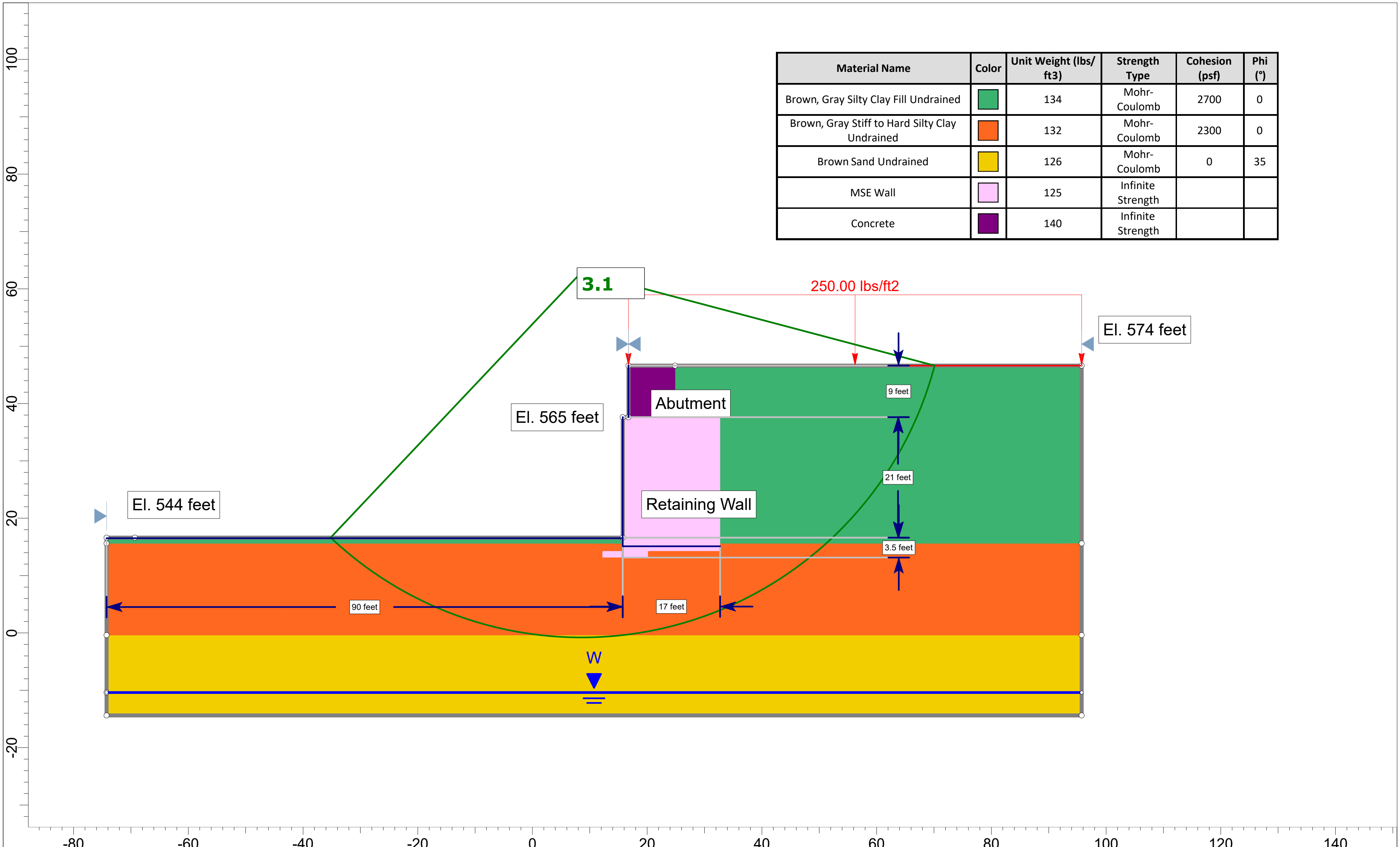
Pile Design Table for West Abutment MSE Walls utilizing Boring #BSB-53, BSB-57, BSB-61

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)		Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
					82	45	16.5		102	56	16.5
					96	53	19.0		122	67	19.0
					107	59	21.5		133	73	21.5
					132	73	26.5		166	91	26.5
					215	118	34.5		273	150	34.5
					589	324	37.5		929	511	38.5
								Precast 14"x 14"			
									44	24	2.5
									68	37	5.0

APPENDIX H

SLOPE STABILITY ANALYSIS EXHIBITS - MSE WALLS

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Brown, Gray Silty Clay Fill Undrained		134	Mohr-Coulomb	2700	0
Brown, Gray Stiff to Hard Silty Clay Undrained		132	Mohr-Coulomb	2300	0
Brown Sand Undrained		126	Mohr-Coulomb	0	35
MSE Wall		125	Infinite Strength		
Concrete		140	Infinite Strength		



GSG CONSULTANTS, INC.
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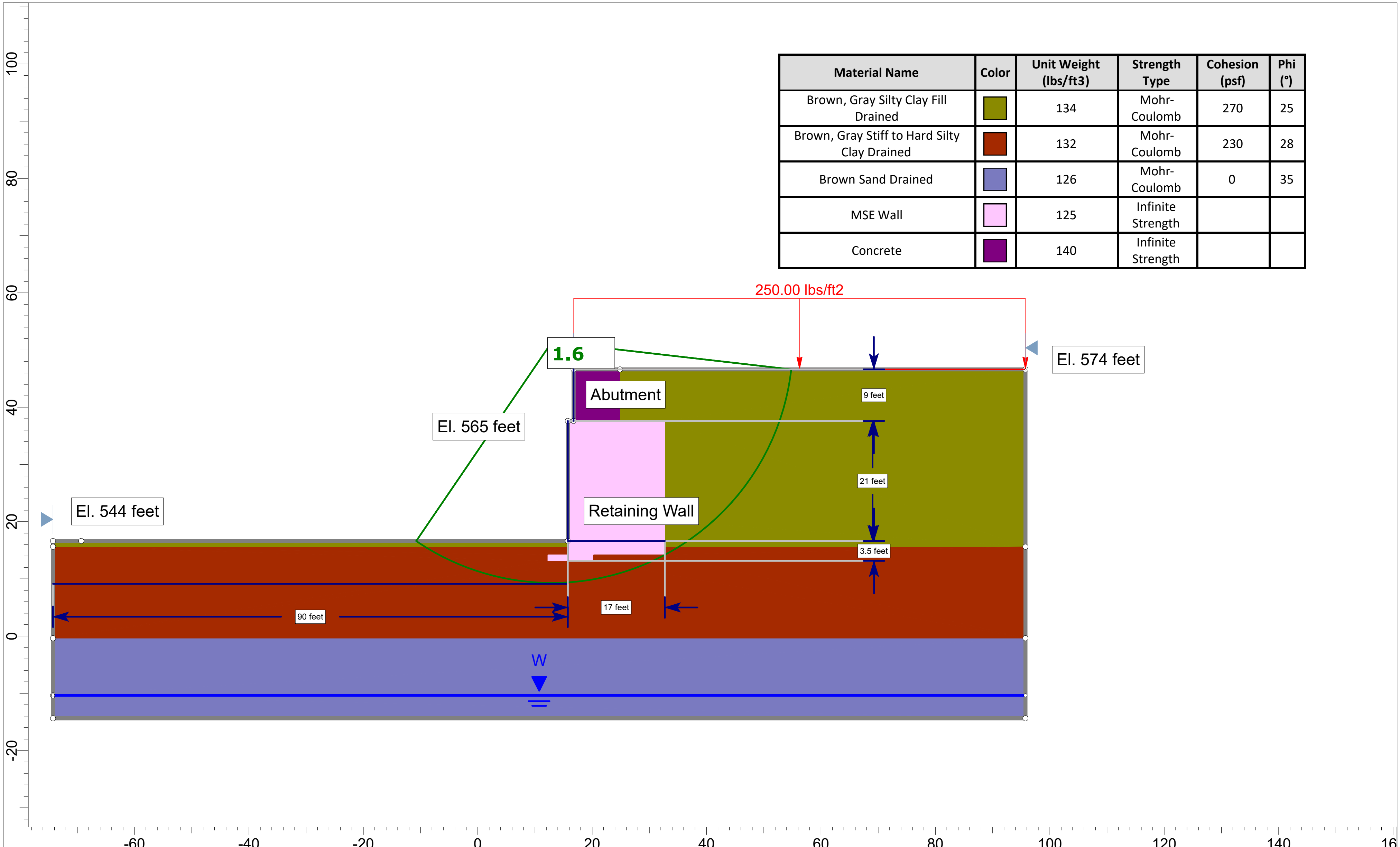
SLIDEINTERPRET 9.031

Project	I-80 over IL 53/US 52 (Chicago Street) - East Abutment 0.7H		
Group	Group 1	*Scenario*	Short Term Stability - Water El. 517
Drawn By	RM	*Company*	GSG Consultants, Inc.
Date	7/15/2021, 12:22:18 PM	*File Name*	east BSB-56, BSB-60, BSB-64 with MSE wall v1.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Brown, Gray Silty Clay Fill Drained		134	Mohr-Coulomb	270	25
Brown, Gray Stiff to Hard Silty Clay Drained		132	Mohr-Coulomb	230	28
Brown Sand Drained		126	Mohr-Coulomb	0	35
MSE Wall		125	Infinite Strength		
Concrete		140	Infinite Strength		

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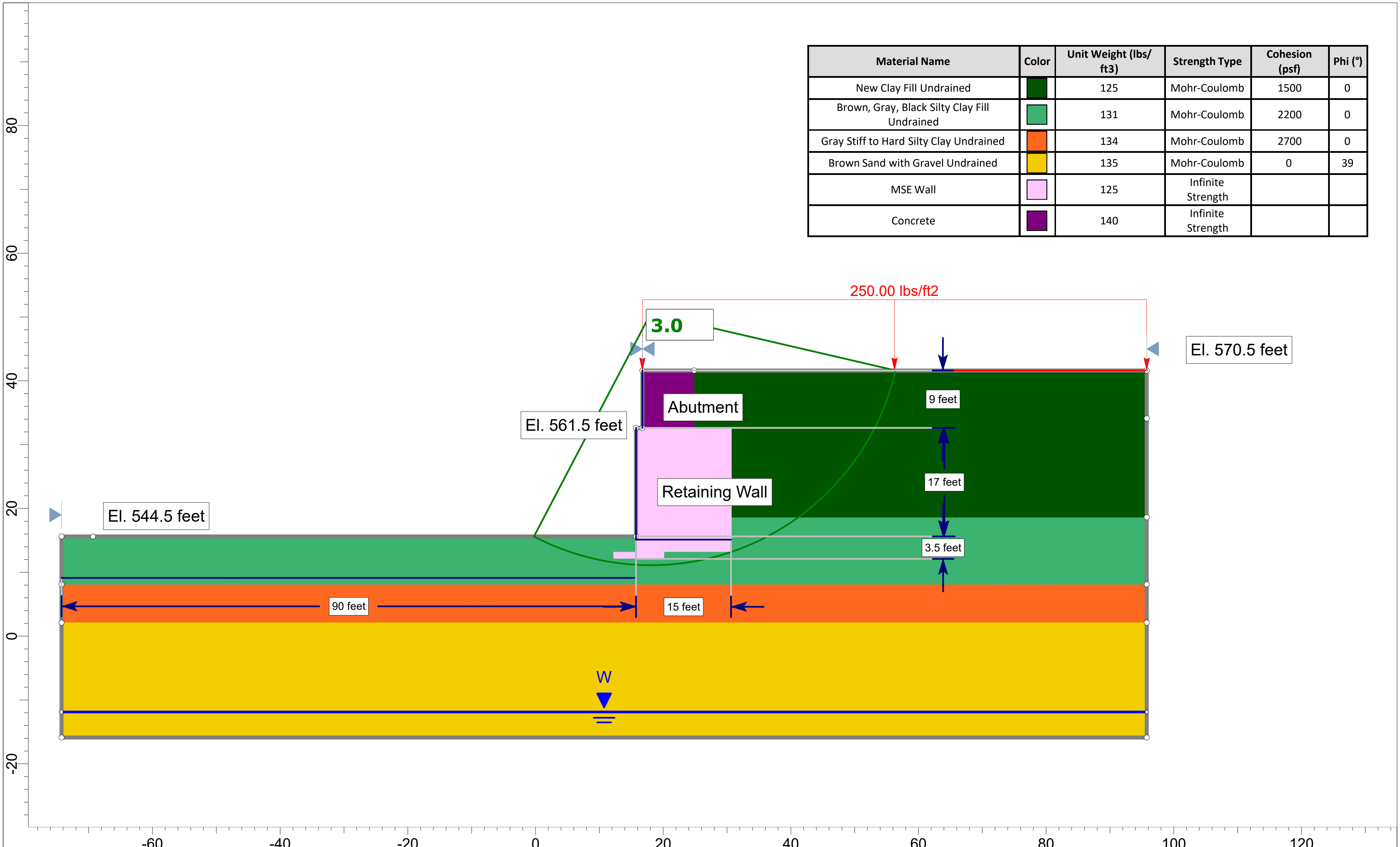
SLIDEINTERPRET 9.031

Project	I-80 over IL 53/US 52 (Chicago Street) - East Abutment 0.7H		
Group	Group 1	*Scenario*	Long Term Stability - Water El. 517
Drawn By	RM	*Company*	GSG Consultants, Inc.
Date	7/15/2021, 12:22:18 PM	*File Name*	east BSB-56, BSB-60, BSB-64 with MSE wall v1.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
New Clay Fill Undrained		125	Mohr-Coulomb	1500	0
Brown, Gray, Black Silty Clay Fill Undrained		131	Mohr-Coulomb	2200	0
Gray Stiff to Hard Silty Clay Undrained		134	Mohr-Coulomb	2700	0
Brown Sand with Gravel Undrained		135	Mohr-Coulomb	0	39
MSE Wall		125	Infinite Strength		
Concrete		140	Infinite Strength		

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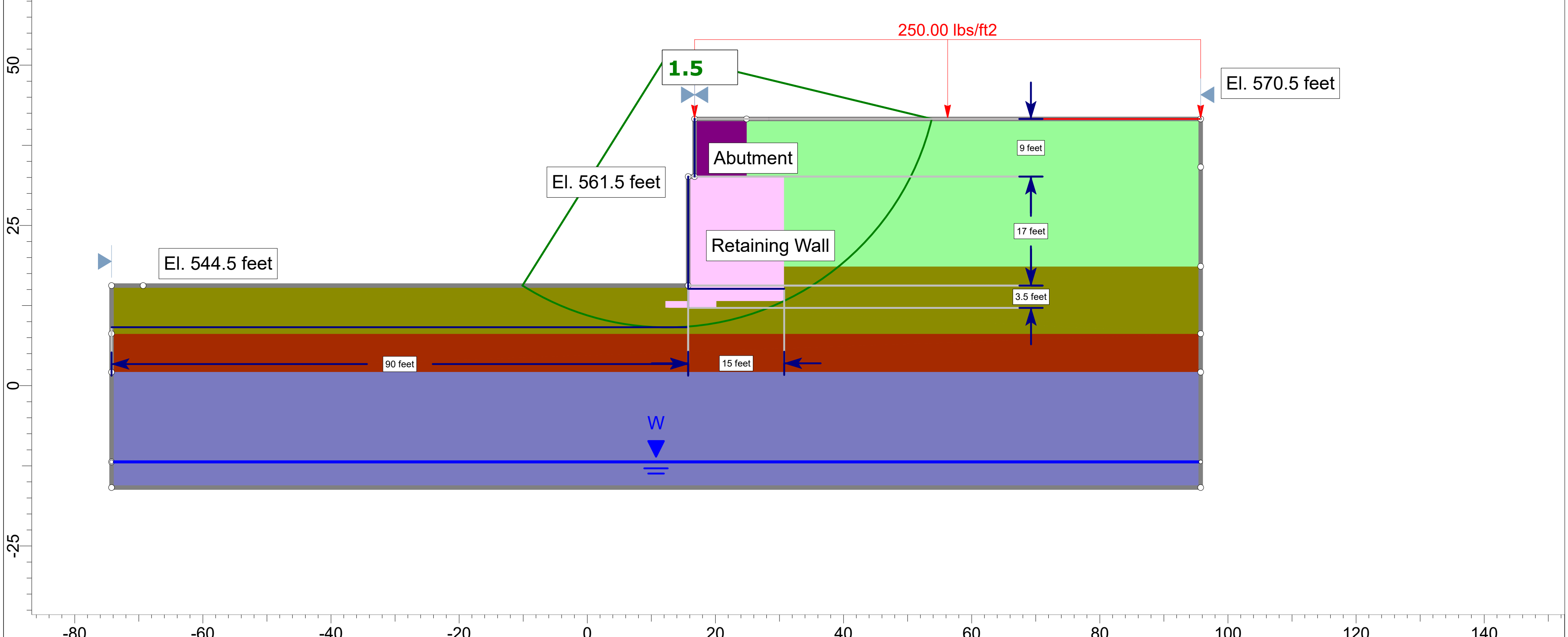
Project	I-80 over IL 53/US 52 (Chicago Street) - West Abutment 0.7H		
Group	Group 1	*Scenario*	Short Term Stability - Water El. 517
Drawn By	RM	*Company*	GSG Consultants, Inc.
Date	7/15/2021, 12:22:18 PM	*File Name*	west BSB-53, BSB-57, BSB-61 with MSE wall.slmd

SLIDEINTERPRET 9.031

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
New Clay Fill Drained		125	Mohr-Coulomb	0	25
Brown, Gray, Black Silty Clay Fill Drained		131	Mohr-Coulomb	220	25
Gray Stiff to Hard Silty Clay Drained		134	Mohr-Coulomb	270	28
Brown Sand with Gravel Drained		135	Mohr-Coulomb	0	39
MSE Wall		125	Infinite Strength		
Concrete		140	Infinite Strength		



GSG CONSULTANTS, INC. 735 Remington Road, Schaumburg, IL 60173 Tel: 630.994.2600, www.gsg-consultants.com	*Project* I-80 over IL 53/US 52 (Chicago Street) - West Abutment 0.7H		
	Group Group 1	*Scenario* Long Term Stability - Water El. 517	
	Drawn By RM	*Company* GSG Consultants, Inc.	
SLIDEINTERPRET 9.031	*Date* 7/15/2021, 12:22:18 PM	*File Name* west BSB-53, BSB-57, BSB-61 with MSE wall.slmd	