Structural Geotechnical Report

IDOT PTB 206-003
Keeler Avenue over FAI 290
Structure Number: 016-2093
Cook County, Illinois

Prepared for

Illinois Department of Transportation (IDOT)
Job Number: D-91-036-23

Project Design Engineer Team
Civiltech Engineering, Inc.

Geotechnical Consultant:

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

July 18, 2025

GSG CONSULTANTS, INC.

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

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Mr. David Kreeger, PE
Senior Project Manager
Civiltech Engineering, Inc.
Two Pierce Place, Suite 1400
Itasca, IL 60143

Structural Geotechnical Report
Keeler Avenue over FAI 290 (Eisenhower Expressway)
Structure Number: 016-2093
IDOT PTB 206-003

Dear Mr. Kreeger:

Attached is a copy of the Structural Geotechnical Report for the above referenced project. This report provides a brief description of the site investigation, site conditions, and foundation and construction recommendations for the above referenced project. The overall site investigation for the proposed bridge replacement included advancing eight (8) bridge borings and eight (8) retaining wall borings to depths of 35 to 70 feet.

The foundation recommendations for the bridge include supporting the proposed abutments and piers on drilled shafts. Wingwalls will also be constructed along the sides of each of the abutments.

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

Sincerely,

Matthew J Heron, P.E.
Project Engineer

Dawn Edgell, P.E.
Sr. Project Engineer

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1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the proposed bridge replacement of Keeler Avenue over FAI 290 (Eisenhower Expressway) in Cook County, Illinois. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and to develop design and construction recommendations for the project. The general project limits are shown in **Exhibit 1**.

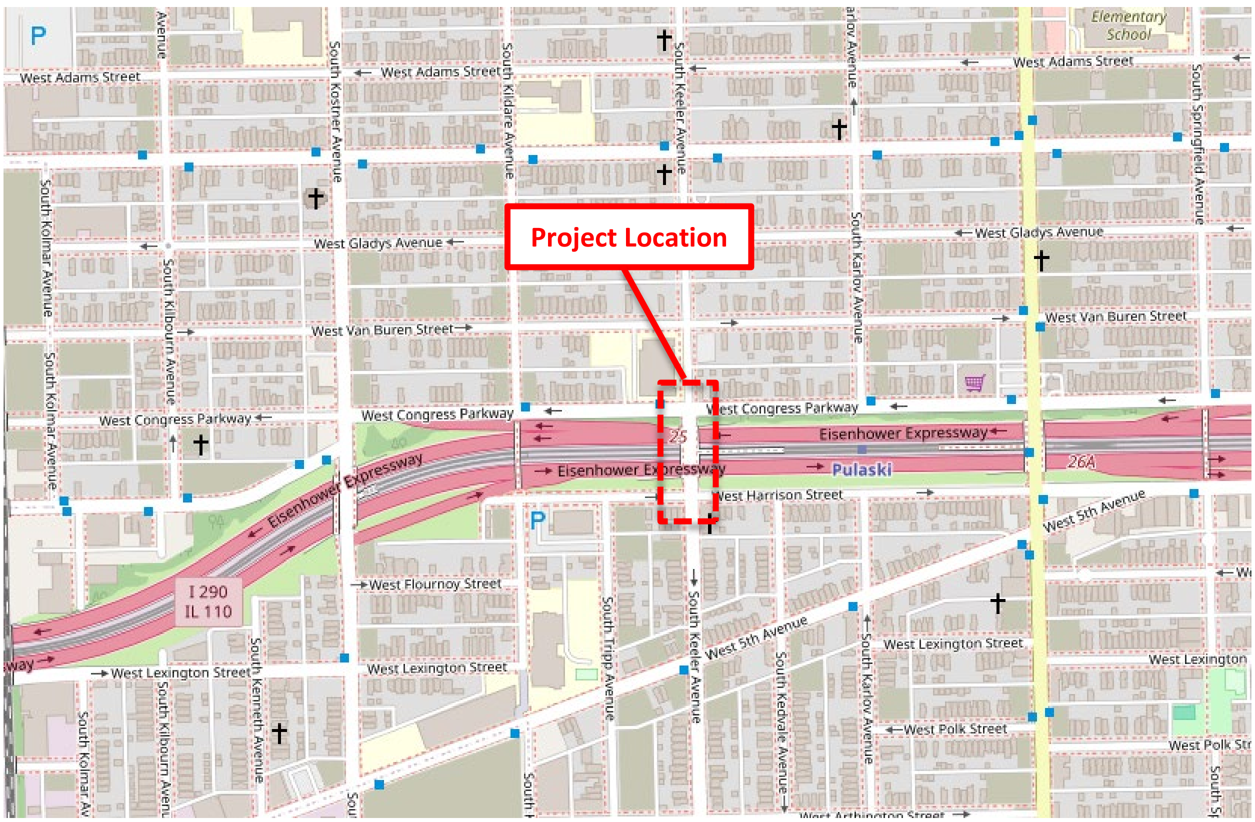


Exhibit 1 – Project Location Map
(Source: USGS Topographic Maps, usgs.gov)

1.1 Existing Bridge Information

The existing Keeler Avenue bridge (SN: 016-2093) over FAI 290 and the CTA railroad consists of a three-span continuous non-composite steel bridge carrying one lane of traffic and sidewalk in both the northbound and southbound directions. The structure has a total length of approximately 204 feet back-to-back of the abutments, a roadway width of approximately 44 feet, and a total deck width of approximately 61 feet. Multiple light poles, sign structures, and underdeck utilities are presently attached to the bridge. The entire superstructure is proposed to be removed and replaced. **Exhibits 2a and 2b** show the existing Keeler Avenue bridge.

Exhibit 2a – Existing Site Conditions at Proposed Bridge Location Looking West

Exhibit 2b – Existing Site Conditions at Proposed Bridge Location Looking East

1.2 Proposed Bridge Information

Based on the design information provided by Civiltech and the General Plan and Elevation (dated 7/9/2025, **Appendix A**), the existing bridge carrying Keeler Avenue over FAI 290 (Eisenhower Expressway) will be completely removed and replaced as part of the FAI 290 reconstruction; traffic will be detoured during construction. The replacement will be a three-span bridge with a 38 feet curb to curb width and an out-to-out deck width of 61'-4". The new structure will include two 11-foot-wide lanes for motorists, two 6-foot-wide lanes for bicyclists, and two 11-foot sidewalks. The proposed north and south bridge spans will be extended, with the abutments being moved into the existing embankment slope to allow for widening of I-290 pavement. The abutments will be reconstructed as semi-integral abutments. The vertical clearance over the expressway and CTA railroad is proposed to be approximately 15.5 feet. It is anticipated that the new abutments and piers will be supported on drilled shafts. As part of the embankment reconstruction, new retaining walls/wing walls will be constructed below each abutment on either side of the bridge. It is assumed that the walls will be cast-in-place T-type retaining walls supported on drilled shafts. Temporary soil retention will be necessary for reconstruction of the abutments.

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

2.1 Subsurface Exploration Program

The initial subsurface exploration program for the abutment and retaining wall borings was conducted between February 4 and February 15, 2024, and included advancing a total of twelve (12) standard penetration test (SPT) borings at the project location. On March 2 and March 3, 2025, an additional four (4) SPT borings were completed for the bridge piers. Two (2) borings were drilled at each pier and abutment location, to depths of 34 to 70 feet, including 15-foot bedrock cores; eight (8) retaining wall borings were drilled along the length of the proposed wingwalls to depths of 33 to 38.5 feet.

The coordinates and existing ground surface elevations shown on the soil boring logs were obtained by GSG's field crew using GPS surveying equipment and available online resources. The as-drilled locations of the soil borings are shown on the Soil Boring Location Map and Subsurface Profile (**Appendix B**). **Tables 1a and 1b** present lists of the soil borings completed. Copies of the Soil Boring Logs are provided in **Appendix C**.

Table 1a – Summary of Bridge Borings

Boring ID	Location	Station[1]	Offset (ft)/ Direction	Depth (ft)	Surface Elevation (CCD/NAVD 88)[4]
BSB-01	South Abutment	15+23.49[1]	76.56 RT[1]	69.5[3]	23.45 / 603.30
BSB-02	South Abutment	14+91.64[1]	76.68 RT[1]	70.0[3]	23.30 / 603.18
BSB-03	North Abutment	15+56.27[2]	87.21 LT[2]	67.0[3]	23.52 / 603.40
BSB-04	North Abutment	15+92.61[2]	79.35 LT[2]	68.0[3]	23.54 / 603.42
BSB-05	North Pier	15+31.74[2]	23.26 RT[2]	34.0	7.12 / 587.00
BSB-06	North Pier	16+05.14[2]	22.48 RT[2]	49.5[3]	6.62 / 586.50
BSB-07	South Pier	14+66.76[1]	28.17 LT[1]	52.0[3]	7.12 / 587.00
BSB-08	South Pier	15+40.88[1]	26.93 LT[1]	38.5	6.12 / 586.00

[1] Based on proposed FAI 290 Eastbound Stationing
[2] Based on proposed FAI 290 Westbound Stationing
[3] Depth includes a 15-foot bedrock core
[4] CCD – Chicago City Datum, +0.0 CCD = 579.88

Table 1b – Summary of Retaining Wall Borings

Boring ID	Location	Station[1]	Offset (ft)/ Direction	Depth (ft)	Surface Elevation (CCD/NAVD 88)[3]
RWB-01	Southwest Wingwall	12+74.20[1]	39.48 RT[1]	38.5	8.00 / 587.88
RWB-02	Southwest Wingwall	13+86.29[1]	33.25 RT[1]	35.0	7.50 / 587.38
RWB-03	Southeast Wingwall	16+37.61[1]	26.32 RT[1]	36.0	7.00 / 586.88
RWB-04	Southeast Wingwall	17+49.55[1]	29.21 RT[1]	37.5	7.00 / 586.88
RWB-05	Northwest Wingwall	13+34.65[2]	45.84 LT[2]	36.0	9.00 / 588.88
RWB-06	Northwest Wingwall	14+44.10[2]	39.34 LT[2]	38.0	8.00 / 587.88
RWB-07	Northeast Wingwall	17+02.09[2]	28.55 LT[2]	33.0	7.00 / 586.88
RWB-08	Northeast Wingwall	18+06.53[2]	29.84 LT[2]	38.5	7.00 / 586.88

[1] Based on proposed FAI 290 Eastbound Stationing
[2] Based on proposed FAI 290 Westbound Stationing
[3] CCD – Chicago City Datum, +0.0 CCD = 579.88

The soil borings were drilled using truck-mounted Diedrich D50 (hammer efficiency 99.5%) and B-57 Mobile (hammer efficiency 89.0%) 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 below the existing grade, and at 5-foot intervals thereafter until reaching auger refusal. 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.

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 collected from each sample interval were placed in jars and returned to the laboratory for further testing and evaluation.

GSG also collected rock core runs from the bridge 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 greater than 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. The following laboratory tests were performed on representative soil samples:

- Moisture Content – ASTM D2216 / AASHTO T-265
- Atterberg Limits – ASTM D4318 / AASHTO T-89 / AASHTO T-90
- Unit Weight – ASTM D7263 / 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. Detailed descriptions of the subsurface soils are provided in the Soil Boring Logs (**Appendix C**). The soil boring logs provide specific conditions encountered at each boring location, including soil descriptions, stratifications, penetration resistance, elevations, location of the samples, water levels (when encountered), and laboratory test data. Variations in the general subsurface soil profile were noted during the drilling activities. 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.

<u>Bridge Abutment Borings</u>

The bridge abutment borings were drilled along Keeler Avenue at ground surface elevations of 23.3 to 23.5 CCD (603.2 to 603.4 feet). The bridge borings initially noted 2 to 7 inches of asphalt, followed by 6.5 to 10 inches of reinforced concrete. The borings generally encountered 3 to 15.5 inches of aggregate base materials, while boring BSB-04 noted brown sand fill to a depth of 3.5 feet.

Below the pavement sections, the borings encountered brown and gray silty clay fill materials; native, brown and gray, very stiff silty clay; followed by gray, stiff to very stiff silty clay and stiff to very hard, gray silty clay and silty clay loam; before reaching highly weathered limestone and auger refusal on bedrock. Sand and silt seams were noted within or below the gray silty clay layers at various depths.

The native brown and gray silty clay had unconfined compressive strengths ranging from 2.0 to 3.3 tsf, with an average strength of 2.5 tsf. The upper gray silty clay in the bridge borings had unconfined compressive strengths ranging from 1.9 to 3.5 tsf, with an average strength of 2.7 tsf. The lower gray silty clay had unconfined compressive strengths ranging from 2.1 to 7.3 tsf, with most strengths ranging from 3.0 and 5.5 tsf, and an average strength of 4.9 tsf. The gray silty sand had an SPT blow count (N) value of 83 blows before encountering spoon refusal after 10 inches.

Rock core samples were collected from each of the bridge abutment borings. The bedrock cores generally consisted of gray limestone, with moderate weathering. 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 C**.

Bridge Pier Borings

The bridge pier borings were drilled along FAI 290 (Eisenhower Expressway) with ground surface elevations of 6.1 to 7.1 CCD (586.0 to 587.0 feet). The bridge borings initially noted 8 to 10 inches of concrete, followed by 32 to 34 inches of aggregate base materials. Below the pavement section, boring BSB-08 encountered a layer of gray sand and gravel fill materials to a depth of 6 feet. All borings then encountered native, gray, very stiff to very hard silty clay before reaching highly weathered limestone and auger refusal on bedrock. Silt and gravel seams were noted within or below the gray silty clay layers at various depths.

The native gray silty clay had unconfined compressive strengths ranging from 2.5 to 9.0 tsf, with most strengths ranging from 4.0 and 6.0 tsf, and an average strength of 4.8 tsf. The gray silt within the silty clay had SPT blow count (N) values between 25 and 27 blows per foot (bpf), with an average value of 26 bpf. The gray gravel in BSB-05 had an SPT blow count (N) value of 18 bpf. The gray silt above the weathered limestone had SPT blow count (N) values between 35 and 69 bpf, with an average value of 57 bpf.

Rock core samples were collected from two (2) of the bridge pier borings. The bedrock cores generally consisted of gray limestone, with moderate weathering. 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 C**.

Table 3 – Rock Core Summary and Classification

Boring Number	Core Run / Length (ft)	Core Depth (feet)	Type of Rock	RQD (%)	RQD Description	Depth (ft)/ Compressive Strength (psi)
BSB-01	1 / 10	54.5 - 64.5	Limestone	78.3	Fair	61.0 / 8,828
	2 / 5	64.5 - 69.5	Limestone	73.3	Poor	
BSB-02	1 / 10	55.0 - 65.0	Limestone	95.0	Excellent	59.0 / 12,546
	2 / 5	65.0 - 70.0	Limestone	96.7	Excellent	
BSB-03	1 / 3.5	52.5 - 56.0	Limestone	9.5	Very Poor	63.0 / 6,292
	2 / 10	56.0 - 66.0	Limestone	67.1	Fair	
	3 / 1	66.0 - 67.0	Limestone	62.5	Fair	
BSB-04	1 / 10	52.0 - 62.0	Limestone	80.8	Fair	52.5 / 5,946
	2 / 6	62.0 - 68.0	Limestone	93.8	Excellent	
BSB-06	1 / 10	34.5 - 44.5	Limestone	72.9	Fair	42.5 / 6,900
	1 / 5	44.5 - 49.5	Limestone	100	Excellent	
BSB-07	1 / 10	37.0 - 47.0	Limestone	84.2	Good	41.0 / 10,733
	1 / 5	47.0 - 52.0	Limestone	67.5	Fair	

<u>Retaining Wall Borings</u>

The retaining wall borings were drilled on the shoulders or grass area outside the shoulder of FAI 290 and had surface elevations ranging between 7.0 and 9.0 CCD (586.9 to 588.9 feet). Five borings drilled on the pavement noted 8 to 12 inches of asphalt, followed by 3 to 12 inches of aggregate base materials. Three borings noted 6 inches of topsoil.

Below the pavement sections, the borings encountered gray silty clay fill materials; followed by stiff to very hard, gray silty clay and silty clay loam; and auger refusal on bedrock. Sand and silt seams were noted within or below the gray silty clay layers at various depths. Cobbles and limestone fragments were noted below depths of 28 feet in the borings.

The gray silty clay had unconfined compressive strengths ranging from 1.3 to 8.1 tsf, with most strengths ranging from 3.0 and 5.5 tsf, and an average strength of 4.6 tsf. The gray silty sand had an SPT blow count (N) values of ranging from 88 bpf to 50 blows before encountering spoon refusal after 6 inches.

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. Mud rotary drilling techniques were utilized in the bridge borings beginning at depths of 10 to 15 feet below grade. Groundwater was not encountered prior to beginning mud rotary drilling and was obscured below these depths for the bridge borings. Groundwater was encountered in the majority of the retaining wall borings at elevations of -25.0 to -31.0 CCD (548.9 to 554.9 feet), generally in granular soils above the bedrock. Borings RWB-01 and RWB-05 did not encounter any groundwater during drilling activities. The borings were not left open for delayed readings and were backfilled upon completion.

Based on the color change from brown to gray and the development in the area, it is anticipated that the long-term groundwater level is below the I-290 Roadway, with an approximate elevation of 5.0 CCD (584 feet). Perched water may be present within the existing fill materials. 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 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 in unexplored locations 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 structure carrying Keeler Avenue over I-290 has no waterways in the vicinity; therefore, scour will not be a concern for this project.

3.2 Abutment Settlement

It is understood that the approach elevations will remain largely consistent with the existing roadway elevation, and minimal fill will be required. Therefore, settlement is not expected to be an issue.

3.3 Seismic Parameters

The seismic hazard for the site was analyzed per the current versions of the IDOT Seismic Manual, IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design Specifications.

The Seismic Soil Site Class was determined per the requirements of the Seismic Manual, Section 3.2. Shear wave velocities for soil layers at each boring location were estimated based on the correlations between the blow counts, overburden stresses and the shear wave velocities in the Manual. For each boring, an average shear wave velocity was calculated for the top 100 feet of soil in the boring. The shear wave velocities at all borings were then averaged to determine a global site class for the structure, which was found to be Soil Site Class D.

The AASHTO 2023 Seismic Hazard tool was then used to obtain spectral accelerations for the bridge location (**Appendix I**) for the spectral acceleration data. The calculated seismic parameters are presented in **Table 4**. For Seismic Design Category (SDC) of A, no geoseismic hazard, such as liquefaction potential, seismic induced settlement, lateral spreading, slope stability or an increase in lateral earth pressure needs to be investigated per IDOT Seismic Manual Section 3.7.1.

Table 4 – Seismic Parameters

Code Reference	S_{D1}	S_{DS}	Seismic Design Category (SDC)	Vertical Acceleration
IDOT Seismic Manual	0.096g	0.146g	A	2/3 Horizontal Acceleration

4.0 GEOTECHNICAL BRIDGE DESIGN RECOMMENDATIONS

The foundations for the proposed bridge must provide sufficient support to resist 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.

4.1 Bridge Foundation Recommendations

GSG evaluated potential foundation systems for the proposed bridge. GSG's evaluation included shallow foundations, spread footings on driven piles, and drilled shafts. The results of the evaluation are presented below. Based on design information provided by Civiltech, shallow spread footings, spread footings on driven piles or drilled shafts are anticipated to be considered to support the piers; spread footings on drilled shafts are anticipated to be used to support the bridge abutments.

Driven piles can be used to support the abutments and piers. However, construction-related issues may occur based on the proximity of the site to the existing CTA railroad tracks near the pier locations. These issues can include damage to the significant utilities along the project corridor and the adjacent tracks, in addition to the noise and vibration anticipated during installation.

4.1.1 Shallow Foundations

The existing bridge pier foundations are supported on shallow foundations. Based on design information provided by Civiltech and the soil conditions at the site, the new piers could be supported on shallow spread footings. The results of the evaluation are discussed in *Section 4.2*.

4.1.2 Drilled Shafts

Drilled shafts are considered a feasible foundation option for the proposed bridge abutments and piers. The drilled shafts for the piers could be supported on limestone bedrock encountered at elevations of -25.9 to -31.4 CCD (548.5 to 554.0 feet). If drilled shafts are to be used for the abutments, the drilled shafts could be supported on the limestone bedrock at elevations of -27.0 to -30.7 CCD (549.2 to 552.9 feet). Design recommendations for drilled shafts are provided in *Section 4.3* of this report.

4.1.3 Driven Pile Foundations

Alternatively, driven piles can be used to support the abutments and piers. However, construction-related issues may occur based on the proximity of the site to adjacent business centers, and residential homes. These issues can include the significant utilities along the project corridor and the noise and vibration anticipated during installation. Design recommendations for driven piles are provided in *Section 4.4* of this report.

4.2 Shallow Foundations – Bearing Resistance

Bearing resistance for the pier spread footings shall be evaluated at the strength limit state using load factors, and factored bearing resistance. The bearing resistance factor, ϕ_b, for shallow foundations in clay soils is 0.50 per AASHTO Table 10.5.5.2.2-1. The bearing resistance shall be checked for the extreme limit state with a resistance factor of 1.0. **Table 5** presents the proposed bearing elevation and recommended bearing resistances of suitable materials to support the spread footings.

Table 5 – Recommended Bearing Resistance

Location	Anticipated Bearing Elevation CCD / NAVD 88	Nominal Resistance (ksf)	Factored Bearing Resistance (ksf)	Bearing Resistance for 1-inch Settlement Service Limit (ksf)	Anticipated Bearing Soil
North Pier	3.12 / 583	23.4	11.7	4.4	Native Hard Silty Clay
South Pier	2.62 / 582.5	18.5	9.3	4.4	Native Very Stiff Silty Clay

The minimum depth of the approach pier foundations 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, such as topsoil or low-strength materials. Based on the results of the subsurface exploration, we anticipate the pier foundations would be supported upon the soil types as noted in **Table 5.**

4.3 Drilled Shaft Design Recommendations

Drilled shafts are considered a feasible foundation option for the proposed bridge abutments and piers. The drilled shafts could be supported upon the very stiff to hard silty clay / silty clay loam soils, or on top of competent limestone bedrock. It is recommended that the drilled shafts be extended to competent bedrock and that the base of the drilled shafts bear on the solid rock surface. Drilled shafts bearing on bedrock should be straight shaft, with no bell, and should be placed on the top of solid bedrock.

If the bridge loads do not allow for drilled shafts to be designed within the soils or on top of bedrock, rock socketed caissons may be considered. **Tables 6a through 6d** present the drilled shaft end bearing and side resistance values for the abutments and piers. Resistance factors are based on AASHTO LRFD Table 10.5.5.2.4-1—Resistance Factors for Geotechnical Resistance of Drilled Shafts.

Table 6a – Drilled Shaft End Bearing Parameters for the Abutments

Bearing Elevation (CCD/NAVD 88)	Soil Description	Nominal Tip Resistance (ksf)	Resistance Factor ϕ	Factored Tip Resistance (ksf)
(-6.5) – (-21.5) 573.4 – 558.4	Gray Very Stiff to Hard Silty Clay / Silty Clay Loam	33.3	0.40	13.3
(-30.4) / 549.5	Limestone Bedrock	190.9	0.50	95.5

Table 6b – Drilled Shaft End Bearing Parameters for the Piers

Bearing Elevation CCD / NAVD 88	Soil Description	Nominal Tip Resistance (ksf)	Resistance Factor ϕ	Factored Tip Resistance (ksf)
(-6.5) – (-21.5) 573.4 – 558.4	Gray Hard to Very Hard Silty Clay	34.2	0.40	13.7
(-28.4) / 551.5	Limestone Bedrock	190.9	0.50	95.5

Table 6c – Drilled Shaft Side Resistance Parameters for the Abutments

Elevation CCD / NAVD 88	Soil Description	Nominal Side Resistance (ksf)	Resistance Factor ϕ	Factored Side Resistance (ksf)
(-4.3) – (-30.4) 575.6 – 549.5	Gray, Very Stiff to Hard Silty Clay	2.19	0.45	0.99
(-5.2) – (-10.2) 574.7 – 569.7 ***BSB-02 Only**	Gray, Dense Gravel	3.53	0.55	1.94
(-25.0) – (-27.5) 554.9 – 552.4 ***BSB-03 Only**	Gray, Extremely Dense Silty Sand	6.51	0.55	3.58

Table 6d – Drilled Shaft Side Resistance Parameters for the Piers

Elevation CCD / NAVD 88	Soil Description	Nominal Side Resistance (ksf)	Resistance Factor ϕ	Factored Side Resistance (ksf)
1.6 – (-25.2) 581.5 – 554.7	Gray Very Stiff to Very Hard Silty Clay	2.08	0.45	0.93
(-25.2) – (-28.4) 554.7 – 551.5	Gray Dense to Extremely Dense Silt and Gravel	4.04	0.55	2.22
(-3.0) – (-6.9) 576.9 – 573.0 ***BSB-7 and BSB-8 Only**	Gray Medium Dense Silt	1.86	0.55	1.02
(-6.4) – (-8.9) 573.5 – 576 ***BSB-05 Only**	Gray Medium Dense Gravel	1.64	0.55	0.90

The top 5 feet of the shaft should not be included in drilled shaft side resistance. Geotechnical losses due to downdrag were not included in the drilled shaft calculations as we do not anticipate any settlement because no additional embankment load is anticipated. A protective casing will be required for any shafts extending through the silty sand and gravel materials. Construction of drilled shafts should be following the recommendations in *Section 6.4*.

We recommend that the minimum shaft diameter be at least 3 feet. Drilled shafts be installed with a minimum center-to-center spacing of at least 4 shaft diameters (4D) for the vertical loads and 5D for the lateral load analyses, as drilling the shafts at close spacing can reduce the total capacity of the drilled shafts and the group effect must then be considered. As it can be expected that the shafts will penetrate through very hard clay soils, very dense granular soils and cobbles, 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.

4.4 Driven Pile Design Recommendations

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. The geotechnical losses due to downdrag or liquefaction were not included in the axial pile resistance calculations.

Tables 7a through 7h summarize the estimated maximum pile lengths for representative pile sections along with the factored resistance available for the piles that are feasible for the proposed substructures. The complete IDOT Pile Design Tables, including factored resistance available (RF) and nominal required bearing (RN), are included in **Appendix F**.

The estimated pile lengths shown in **Tables 7a through 7h** and in **Appendix F** are based on the assumed 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 (2023), 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, not to exceed a total of 8 feet.

Table 7a – South Abutment Pile Design (BSB-01)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	264	145	22.0
	459	252	27.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	308	170	22.0
	654	360	27.0
HP10x42 (Max. R_N = 335 Kips)	213	117	27.0
	335	184	34.0
HP12x53 (Max. R_N = 418 Kips)	255	140	27.0
	418	230	34.0
HP14x73 (Max. R_N = 578 Kips)	309	170	27.0
	578	318	34.0

NOTES: Pile cut off elevation = 1.7 CCD / 581.6 feet
Ground surface elevation against pile during driving = 0.7 CCD / 580.6 feet bottom of footing

Table 7b – South Abutment Pile Design (BSB-02)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	360	198	22.0
	459	252	27.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	422	232	22.0
	654	360	27.0
HP10x42 (Max. R_N = 335 Kips)	231	127	32.0
	335	184	34.0
HP12x53 (Max. R_N = 418 Kips)	276	152	32.0
	418	230	34.0
HP14x73 (Max. R_N = 578 Kips)	334	184	32.0
	578	318	35.0

NOTES: Pile cut off elevation = 1.7 CCD / 581.6 feet
Ground surface elevation against pile during driving = 0.7 CCD / 580.6 feet bottom of footing

Table 7c – North Abutment Pile Design (BSB-03)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	276	152	21.0
	459	252	26.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	324	178	21.0
	654	360	26.0
HP10x42 (Max. R_N = 335 Kips)	227	125	26.0
	335	184	31.0
HP12x53 (Max. R_N = 418 Kips)	288	159	26.0
	418	230	31.0
HP14x73 (Max. R_N = 578 Kips)	359	197	26.0
	578	318	31.0

NOTES: Pile cut off elevation = 1.5 CCD / 581.4 feet
Ground surface elevation against pile during driving = 0.5 CCD / 580.4 feet bottom of footing

Table 7d – North Abutment Pile Design (BSB-04)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	300	165	21.0
	459	252	28.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	354	194	21.0
	654	360	28.0
HP10x42 (Max. R_N = 335 Kips)	256	141	28.0
	335	184	30.0
HP12x53 (Max. R_N = 418 Kips)	314	173	28.0
	418	230	30.0
HP14x73 (Max. R_N = 578 Kips)	380	209	28.0
	578	318	30.0

NOTES: Pile cut off elevation = 1.5 CCD / 581.4 feet
Ground surface elevation against pile during driving = 0.5 CCD / 580.4 feet bottom of footing

Table 7e – North Pier Pile Design (BSB-05)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	298	164	26.0
	459	252	31.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	347	191	26.0
	654	359	31.0
HP10x42 (Max. R_N = 335 Kips)	173	95	26.0
	335	184	31.0
HP12x53 (Max. R_N = 418 Kips)	217	119	26.0
	418	230	31.0
HP14x73 (Max. R_N = 578 Kips)	267	147	26.0
	578	318	32.0

NOTES: Pile cut off elevation = 4.1 CCD / 584.0 feet (assume)
Ground surface elevation against pile during driving = 3.1 CCD / 583.0 feet bottom of footing

Table 7f – North Pier Pile Design (BSB-06)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	324	178	24.0
	459	252	27.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	546	300	26.0
	654	359	31.0
HP10x42 (Max. R_N = 335 Kips)	203	112	26.0
	335	184	32.0
HP12x53 (Max. R_N = 418 Kips)	255	140	26.0
	418	230	32.0
HP14x73 (Max. R_N = 578 Kips)	316	174	26.0
	578	318	33.0

NOTES: Pile cut off elevation = 4.1 CCD / 584.0 feet (assume)
Ground surface elevation against pile during driving = 3.1 CCD / 583.0 feet bottom of footing

Table 7g – South Pier Pile Design (BSB-07)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	263	144	23.0
	459	252	28.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	546	301	26.0
	654	359	31.0
HP10x42 (Max. R_N = 335 Kips)	194	107	30.0
	335	184	35.0
HP12x53 (Max. R_N = 418 Kips)	245	135	30.0
	418	230	35.0
HP14x73 (Max. R_N = 578 Kips)	307	169	26.0
	578	318	36.0

NOTES: Pile cut off elevation = 4.2 CCD / 584.1 feet (assume)
Ground surface elevation against pile during driving = 3.2 CCD / 583.1 feet bottom of footing

Table 7h – South Pier Pile Design (BSB-08)

Pile Section	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (FT)
Metal Shell 14'' Φ w/0.25'' walls (Max. R_N = 459 Kips)	408	225	27.0
	459	252	32.0
Metal Shell 16'' Φ w/0.312'' walls (Max. R_N = 654 Kips)	494	272	27.0
	654	359	32.0
HP10x42 (Max. R_N = 335 Kips)	202	111	32.0
	335	184	37.0
HP12x53 (Max. R_N = 418 Kips)	242	133	32.0
	418	230	37.0
HP14x73 (Max. R_N = 578 Kips)	294	162	32.0
	578	318	37.0

NOTES: Pile cut off elevation = 4.2 CCD / 584.1 feet (assume)
Ground surface elevation against pile during driving = 3.2 CCD / 583.1 feet bottom of footing

Although all of the above pile types are considerable options for foundation support, the structural engineer is responsible to determine what pile best suits the design. Some of the pile options may not be suitable alternatives due to spacing requirements or constructability concerns.

4.5 Pile Driving Considerations

IDOT standard practice includes driving one (1) indicator pile for each sub structural element to determine the actual pile length. A test pile shall be performed at each abutment prior to production driving so that actual, on-site, field data can be gathered to determine pile driving requirements for the project. Driving shoes or conical tips, depending on the selected piles, in accordance with Section 1006.05 (e) of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC), should be considered to protect piles from damage during driving.

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 due to the presence of medium dense to dense gravel. For metal shell piles, a wall thickness of 0.25" or greater is recommended to minimize potential damage during driving with a conical tip welded to the pile to avoid abrupt overstress.

Pile setup is a consideration that can contribute to an increase to long-term pile resistance of displacement piles (i.e. driven pile). This increase in resistance is referred to as pile setup which is the gain in pile resistance over time that occurs mainly due to dissipation of pore water pressures and healing of the distorted and remolded soils immediately surrounding the pile. The magnitude of soil setup is function of pile type as well as soil type and consistency. A greater magnitude of soil setup is generally expected for soft clays, dense granular deposits, and displacement type piles than for stiff clays, loose granular deposits, and non-displacement type piles. However, pile setup consideration should not be included in the pile resistance during the design phase of the project, but this may be considered during the construction phase if a pile does not achieve the required bearing during installation. Based on the subsurface soil conditions, we do not anticipate any setup for the driven piles.

4.6 Pile Driving Vibrations Effect on Nearby CTA Tracks

Due to the presence of the CTA tracks located approximately 20 feet north and south of the piers, noise and vibrations may be a concern for the existing infrastructure during pile driving activities.

The effect of pile driving vibrations was analyzed to determine whether pile driving activities may cause damage to these nearby structures.

When the pile is driven by a hammer, the impact on the top of the pile will generate vibrations. The wave generated by vibrations propagates in the soil and may interact with the embedded structures. The propagating waves around the pile include (1) a Rayleigh wave on the surface; (2) a body wave around the pile toe; and (3) a vertical shear wave around the pile. The energy intensity decreases with the distance from the source. Based on the paper "Construction Vibrations: State-of-the-Art", a correlation between the vibration source distance and the peak particle velocity (**Appendix H**) was used to estimate the Particle Velocities at the locations of the CTA tracks generated by the vibration due to pile driving. The distance from the CTA tracks to vibration source (pile driving location) is approximately 20 feet, which is associated with a peak particle velocity of 0.9 in/s. Based on the analysis, the particle velocity induced by pile driving on the CTA tracks is within the established limits and will likely not damage the tracks.

The findings and recommendations included herein are based on simplified analysis methods, assumed pile driving method and parameters and empirical correlations with the anticipated site conditions. For different conditions and/or driving methods, please consult the geotechnical engineer for review.

4.7 Pile Driving Noise Effect on Nearby Residences

Due to the proximity of buildings to the pile driving operations, an analysis was completed to determine the potential noise levels produced and their effect on the nearby buildings. It is estimated that the nearest buildings are approximately 80 to 100 feet away from the bridge abutment locations. Based on the publication created by the Pile Driving Contractors Association (**Appendix H**), the anticipated noise levels generated to the nearby buildings could range from approximately 75 to 115 dB, depending on the type of pile driving occurring. The upper range would be above the 8-hour OSHA exposure limit of 90 dB which may cause some noise disturbances for nearby business owners and residents.

4.8 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 2023 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. **Table E-1 (Appendix E)** provides 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.

5.0 GEOTECHNICAL WALL DESIGN RECOMMENDATIONS

This section provides retaining wall design parameters including recommendations on foundation type, bearing capacity, settlement, and lateral earth pressures. The foundations for the proposed abutment walls 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).

5.1 Retaining Wall Type Recommendations

The proposed wing walls are anticipated to be constructed along the east and west sides of each of the abutments. It is anticipated that the wingwalls will have a maximum exposed height of approximately 15 feet. It is anticipated that the walls will be in line with the proposed abutments and cut into the existing slopes to allow the widening of the bridge opening and to accommodate the potential future widening of I-290. The ground elevations in front of the walls are anticipated to be about 6.0 to 6.6 CCD (585.9 to 586.5 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 deep foundation systems for the proposed retaining walls. Based on the existing site conditions and the design information, a cast-in-place (CIP) T-type retaining walls supported on drilled shafts. However, construction of this wall type will require installation of a temporary earth retention system for the existing embankment.

5.1.1 CIP Concrete T-Type Walls

Cast-In-Place (CIP) concrete T-type retaining walls are typically used in fill areas. They are constructed with a footing that extends laterally both in front of and behind the wall. They can be designed to resist horizontal loading with or without tie-backs by changing the geometry of the foundation. This type of wall typically requires that the area behind the wall be excavated to facilitate construction or are constructed where new fill embankments are necessary.

The advantages of a CIP wall include that it is a conventional system with well-established design procedures and performance characteristics; it is durable; and can easily be formed, textured, or colored to meet aesthetic requirements. Disadvantages include a relatively long construction period due to undercutting, excavation, formwork, steel placement, and curing of the concrete. This wall system is also sensitive to total and differential settlements.

5.2 Retaining Wall Design Recommendations

The engineering analyses performed for evaluation of the retaining wall options followed the current AASHTO Load and Resistance Factor Design (LRFD) Methodology as required by IDOT. LRFD methodology incorporates the use of load factors and resistance factors to account for uncertainty in applied loads and load resistance of structure elements separately. The AASHTO LRFD Bridge Design Specifications outline load factors and combinations for various strength, extreme event, service, and fatigue limit states. Section 11, which outlines geotechnical criteria for retaining walls, of the AASHTO Specifications requires the evaluation of bearing resistance failure, lateral sliding, and overturning at the strength limit state and excessive vertical displacement, excessive lateral displacement, and overall stability at the service limit state. **Table 8** outlines the load factors used in the evaluation of the retaining walls in accordance with AASHTO Specification Tables 3.4.1-1 and 3.4.1-2.

Table 8 – LRFD Load Factors for Retaining Wall Analyses

	Type of Load	Sliding and Eccentricity Strength Ia	Bearing Resistance Strength Ib	Sliding and Eccentricity Extreme IIa	Bearing Resistance Extreme IIb	Settlement Service I
Load Factors for Vertical Loads	Dead Load of Structural Components (DC)	0.90	1.25	0.90	1.25	1.00
	Vertical Earth Pressure Load (EV)	1.00	1.35	1.00	1.35	1.00
	Earth Surcharge Load (ES)		1.50			
	Live Load Surcharge (LS)		1.75			1.00
Load Factors for Horizontal Loads	Horizontal Earth Pressure Load (EH) Active At-Rest AEP for anchored walls	1.50	 1.50 1.35 1.35	1.00	1.00	1.00
	Earth Surcharge (ES)		1.50			
	Live Load Surcharge (LS)	1.75	1.75			1.00
Load Factor for Vehicular Collision				1.00	1.00	

5.2.1 Lateral Earth Pressures and Loading

The walls shall be designed to withstand earth and live lateral earth pressures. The lateral earth pressures on the abutment walls depend on the type of wall (i.e. restrained or unrestrained), the type of backfill and the method of placement against the wall, and the magnitude of surcharge weight on the ground surface adjacent to the wall. The active earth pressure coefficients (Ka), and the passive earth pressure coefficients (Kp) were determined in accordance with AASHTO Section 3.11.5.3 and 3.11.5.4. **Appendix E** presents the soil design properties for the retaining walls at the north and south abutments for the anticipated soil types at the site.

Traffic and other surcharge loads should be included in the design of the retaining walls. 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 live load surcharge may be estimated as a uniform horizontal earth pressure due to an equivalent height (H_{eq}) as shown in **Table 9** for vehicular loadings perpendicular to traffic.

Table 9 - Equivalent Height of Soil for Vehicular Loading on Abutments Perpendicular to Traffic

Abutment Height (feet)	H_{eq} (feet)
5	4.0
10	3.0
≥20	2.0

Reference: AASHTO LRFD Table 3.11.6.4-1

The retaining wall design should include a drainage system to allow movement of any water behind the wall, and not allowing hydrostatic (seepage) 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 perforated drainpipe 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 3.5 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 3.5 feet of soil for a descending slope at the wall toe should also be neglected, regardless of any surface protection.

5.3 Retaining Wall Drilled Shaft Design Recommendations

Drilled shafts are considered a feasible foundation option to support the CIP walls. The drilled shafts could be supported on top of competent limestone bedrock. It is recommended that the drilled shafts be extended to competent bedrock and that the base of the drilled shafts bear on the solid rock surface. Drilled shafts bearing on bedrock should be straight shaft, with no bell, and should be placed on the top of solid bedrock.

The anticipated loads for each drilled shaft, for the CIP retaining wall provided by Civiltech are shown in **Table 10**.

Table 10 – Retaining Wall Structural Loads (per shaft)

	Service Load (kips)	Factored Load (kips)
Vertical Load	197.46	272.16
Horizontal Load	5.39	8.09

If the wall loads do not allow for drilled shafts to be designed within the soils or on top of bedrock, rock socketed caissons may be considered. **Tables 11a and 11b** present the drilled shaft end bearing and side resistance values for the CIP walls. Resistance factors are based on AASHTO LRFD Table 10.5.5.2.4-1—Resistance Factors for Geotechnical Resistance of Drilled Shafts.

Table 11a – Drilled Shaft End Bearing Parameters for the CIP Wall

Bearing Elevation (CCD/NAVD 88)	Soil Description	Nominal Tip Resistance (ksf)	Resistance Factor ϕ	Factored Tip Resistance (ksf)
(-31.0) / 549.0	Limestone Bedrock	190.9	0.50	95.5

Table 11b – Drilled Shaft Side Resistance Parameters for the CIP Wall

Elevation CCD / NAVD 88	Soil Description	Nominal Side Resistance (ksf)	Resistance Factor ϕ	Factored Side Resistance (ksf)
(-4.3) – (-30.4) 575.6 – 549.5	Gray, Very Stiff to Hard Silty Clay	2.19	0.45	0.99
(-4.3) to (-6.0) 575. 6 to 573.9 ***RWB-02 Only**	Gray, Dense Silty Sand	2.38	0.55	1.31
(-26.0) to (-28.5) 553.2 to 550.7 ***RWB-01,05,08 Only**	Gray, Extremely Dense Silty Sand	6.51	0.55	3.58

The top 5 feet of the shaft should not be included in drilled shaft side resistance. Geotechnical losses due to downdrag were not included in the drilled shaft calculations as we do not anticipate any settlement because no additional embankment load is anticipated. A protective casing will be required for any shafts extending through the silty sand and gravel materials. Construction of drilled shafts should be following the recommendations in *Section 6.4*.

We recommend that the minimum shaft diameter be at least 3 feet. Drilled shafts be installed with a minimum center-to-center spacing of at least 4 shaft diameters (4D) for the vertical loads and 5D for the lateral load analyses, as drilling the shafts at close spacing can reduce the total capacity of the drilled shafts and the group effect must then be considered. As it can be expected that the shafts will penetrate through very hard clay soils, very dense granular soils and cobbles, 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.

5.4 Global Slope Stability

Based on the information provided by Civiltech, the retaining walls should be designed for external stability of the wall system. The design information in **Table 12** was used to evaluate the overall stability of the walls.

Table 12 – Wall Description

Description	Value
Maximum exposed height of the retaining wall (H)*	15 feet
Unit weight of the existing retained soil (embankment)	138 pcf
CIP Wall Design	
Anticipated width of shallow footing base (CIP Wall)*	14.5 feet
Estimated drilled shaft tip elevation upon limestone bedrock	-31.0 CCD / 549.0 feet

* Based on TSL (dated 7/9/2025)

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.

5.5 Global Slope Stability Results

Slide2 is a comprehensive slope stability analysis software used to evaluate the proposed walls for the project based on the limit equilibrium method. Circular failure analyses were evaluated for both a short-term (undrained) and long-term (drained) condition based on the proposed geometry (**Table 12**) for the proposed CIP retaining wall. The analyses were performed at the sections of the assumed maximum wall heights for the abutments. The results of the analyses are shown in **Table 13**.

Table 13 – Retaining Wall Global Slope Stability Analyses Results

Analysis Exhibit	Wall Type	Analysis Type	Factor of Safety	Minimum Factor of Safety
Exhibit 1	CIP Wall	Circular – Short Term	8.2	1.5
Exhibit 2		Circular – Long Term	4.8	1.5

Based on the analyses performed, the proposed retaining walls meet the minimum factor of safety of 1.5. Copies of the Slope Stability analyses exhibits are included in **Appendix G**.

5.6 Drainage Recommendations

The wall design should include drainage system to prevent the buildup of hydrostatic forces behind the wall. This could be accomplished with the installation of drainage blankets, geocomposite drainage panels, or gravel drains behind the facing of the wall with outlet pipes below the facing to collect and remove surface water away from the face of the retaining wall. If weep holes are to be used, it is recommended that a geocomposite wall drain be placed over the interlocks and area of the weep holes. If drainage is not provided, hydrostatic pressure should be included in the wall design and the horizontal earth pressure should be determined in accordance with AASHTO Article 3.11.3.

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

Based on the existing site conditions, utilities along the project corridor. Before proceeding with construction, all existing utility lines 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 cement grout. All excavations resulting from underground utilities 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

Site excavations are expected to encounter various types of soils as described in the Subsurface Exploration section of this report. The contractor will be responsible for providing safe excavation during the construction activities of the project. All excavations should be conducted in accordance with applicable federal, state, and local safety regulations, including, but not limited to the Occupational Safety and Health Administration (OSHA) excavation safety standards. Excavation stability and soil pressures on temporary shoring are dependent on soil conditions, depth of excavations, installation procedures, and the magnitude of any surcharge loads on the ground surface adjacent to the excavation. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures. Excavations should not extend below the level of adjacent existing foundations or utilities unless underpinning or other support is installed. It is the responsibility of the contractor for field determinations of applicable conditions and providing adequate shoring for all excavation activities.

6.3 Borrow Material and Compaction Requirements

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.

6.4 Drilled Shafts Construction

The drilled shaft construction should be completed in accordance with Section 516, Drilled Shafts, in the IDOT SSRBC. A wet construction method may be necessary for the drilled shafts installation. Temporary casing may be required due to the observed water table elevation and the non-cohesive soil layers encountered in the soil borings. 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 in an effort to displace the water to the surface for removal.

6.5 Pile Installation

IDOT standard practice requires driving one (1) test pile for each substructure element. The test piles are installed based on the preliminary driving criteria to evaluate site conditions and are inspected per the IDOT Standard for Road and Bridge Construction. All pile installation should be completed per the IDOT SSRBC Section 512.15.

6.6 Groundwater Management

Based on the site conditions, it is anticipated that the long-term groundwater level is at an approximate elevation of 5.0 CCD (584 feet). Due to the cohesive nature of the soil, GSG does not anticipate any significant groundwater-related issues to occur during construction activity. However, perched water may be encountered within the existing fill materials. 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 the removal of any collected rainwater or surface run-off. Grades should be sloped away from the excavations to minimize runoff from entering.

6.7 Temporary Earth Retention Systems

Temporary soil retention systems (TSRS) will be required for the installation of drilled shafts for the abutments and the retaining walls. Based on the soil profile, a cantilevered sheet pile system could be used. The sheet pile retaining system should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, Temporary Sheet Piling Design, Temporary Soil Retention Systems. The design of the TSRS is the responsibility of the contractor.

The IDOT Temporary Sheet Piling Design procedures include limitations if the required embedment depths fall below soil layers with a Qu value larger than 4.5 tsf or N-values larger than 45 blows or rock, because the sheet piling may not penetrate these layers. Refer to the soil boring logs for the elevations to the hard stratum. If adequate retained heights cannot be obtained using the IDOT Temporary Sheet Piling Design Guide, then a Temporary Soil Retention System shall be designed by the Contractor. The Temporary Soil Retention Systems should include surcharge loads from the excavated materials, construction equipment, and truck traffic as necessary. The retention system should extend to a sufficient depth below the excavation bottom to provide the required lateral passive resistance if the active case is used for the design. Embedment depths should be determined based on the principles of force and moment equilibrium.

The 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 (TSRS) 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. The analyses have been performed, and the recommendations have been provided 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 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

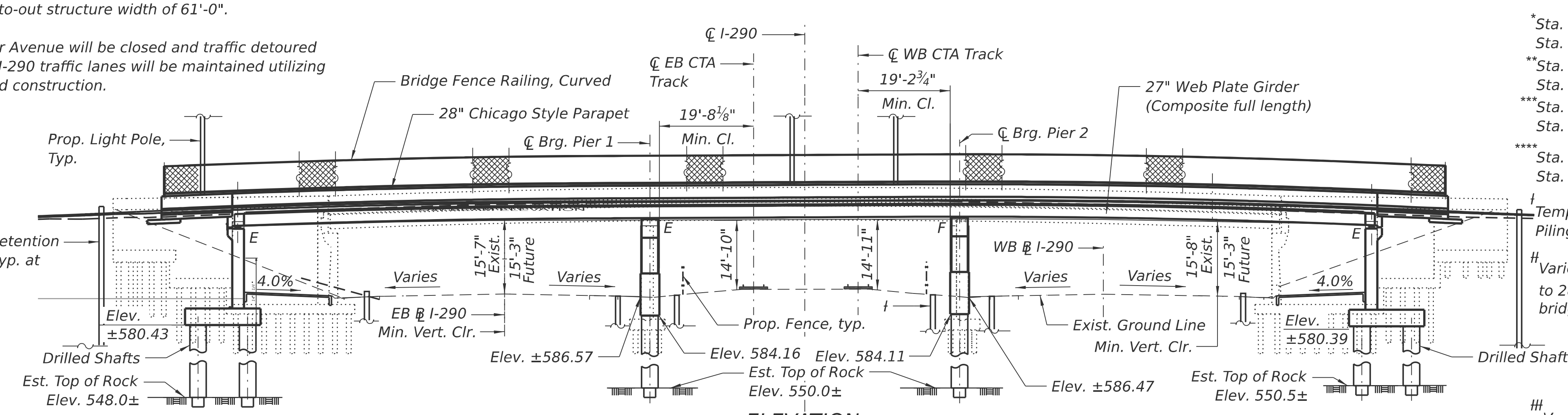
TSL

Benchmark: TBM C Elev. 604.14 West flange bolt of hydrant - 25.16' Rt. of Sta. 201+69.19 at Keeler Ave., TBM D Elev. 604.07 East flange bolt of hydrant - 38.96' Rt. of Sta. 205+65.79 at Keeler Ave.

Existing Structure: S.N. 016-2068 carrying Keeler Avenue over I-290 was originally constructed in 1953 as F.A. Route 131; Section 062-2929.1 - M.F.T. In 1990 the bridge was rehabilitated including replacement of bridge deck, bearings and expansion joints, and the repair of both piers and both abutments. Steel beams were repainted in 2000. The structure consists of a continuous 3-span steel beam bridge supported on closed abutments and concrete wall piers, all founded on timber piles. The bridge has an overall length of 204'-0" back-to-back abutments with a 0° skew (relative to I-290 skew of 0°-30'-58"), and an out-to-out structure width of 61'-0".

Traffic Control: Keeler Avenue will be closed and traffic detoured during construction. I-290 traffic lanes will be maintained utilizing lane shifts and staged construction.

No Salvage.



ELEVATION
(Looking West)

DESIGN SPECIFICATIONS

2024 AASHTO LRFD Bridge Design Specifications, 10th Edition

*Sta. 984+08.17 (EB PGL I-290) = Sta. 203+13.00 (℄ Keeler Ave.)

**Sta. 511+40.37 (℄ EB CTA Track) = Sta. 203+65.77 (℄ Keeler Ave.)

***Sta. 561+40.39 (℄ WB CTA Track) = Sta. 203+87.94 (℄ Keeler Ave.)

****Sta. 984+72.19 (WB PGL I-290) = Sta. 204+39.90 (℄ Keeler Ave.)

Varies from 28'-6" to 28'-11¼" within bridge limits

Varies from 24'-9½" to 28'-5¾" within bridge limits

LOADING HL-93

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

Live Load Deflection < L/1000

DESIGN STRESSES

FIELD UNITS

f 'c = 4,000 psi (Superstructure)
f 'c = 3,500 psi (Substructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

HIGHWAY CLASSIFICATION

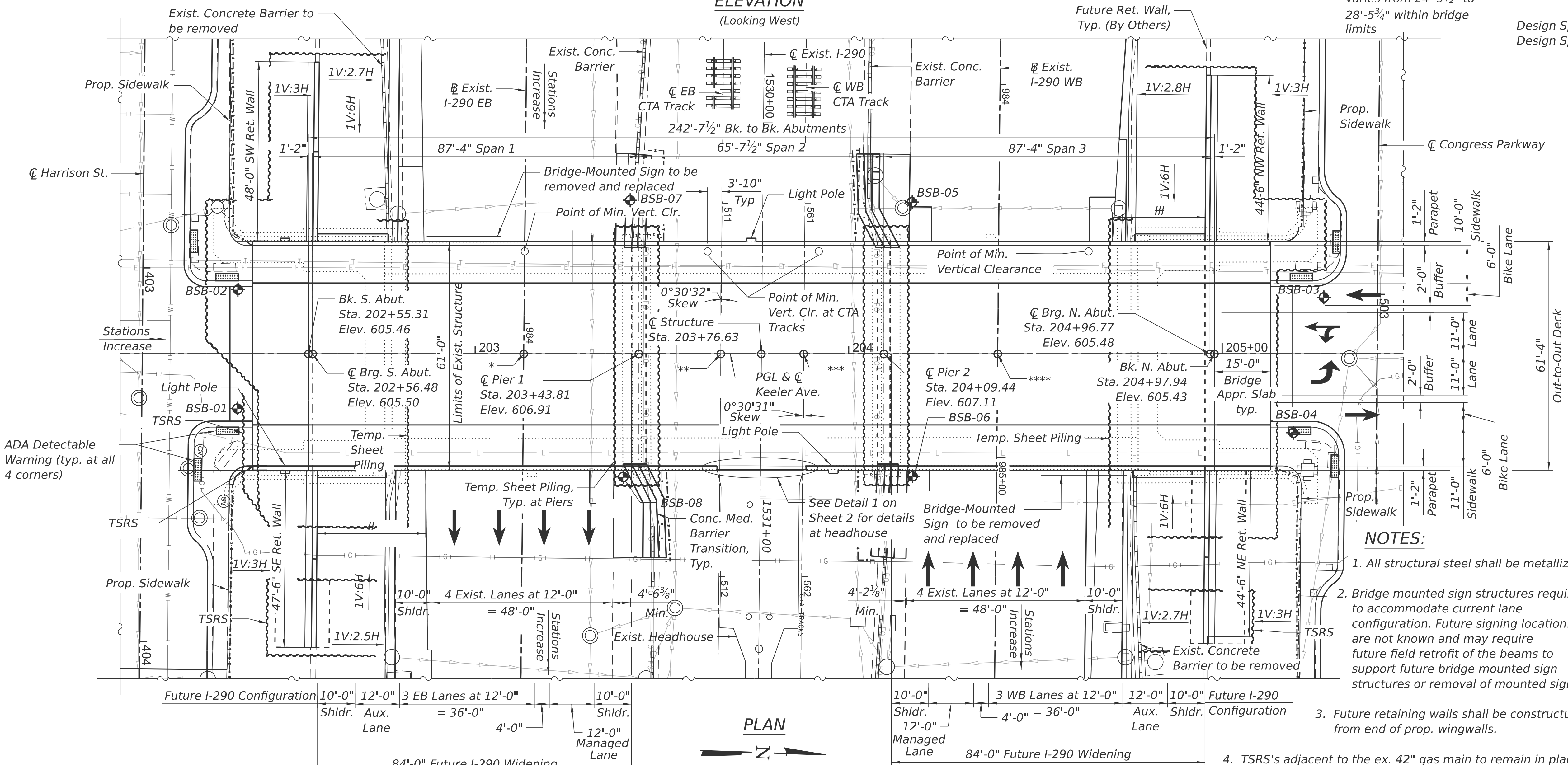
FAU Rte 2420 - Keeler Ave.	FAI Rte. 290
Functional Class: Local Street	Functional Class: Interstate
ADT: 1,400 (2014); 1,700 (2040)	ADT: 205,000 (2023); 197,152 (2046)
ADTT: 252 (2014); 306 (2040)	ADTT: 8,200 (2023); 7886 (2046)
DHV: 152 (2040)	DHV: N/A
Design Speed: 30 m.p.h.	Design Speed: 60 m.p.h.
Posted Speed: 30 m.p.h.	Posted Speed: 55 m.p.h.
2-Way Traffic	2-Way Traffic
Directional Distribution: 90% SB-10% NB	Directional Distribution: 50-50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec (SD1) = 0.096 g
Design Spectral Acceleration at 0.2 sec (SDS) = 0.146 g
Soil Site Class = D

LEGEND

- Exist. Underground Electric
- Exist. Underground Gasline
- Exist. Storm Sewer
- Exist. Underground Water Main
- Exist. Underground Lighting
- Exist. Fence
- Exist. Gas Valve
- Exist. Manhole

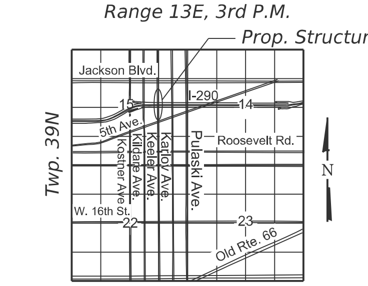


PLAN

NOTES:

1. All structural steel shall be metallized.
2. Bridge mounted sign structures required to accommodate current lane configuration. Future signing locations are not known and may require future field retrofit of the beams to support future bridge mounted sign structures or removal of mounted signs.
3. Future retaining walls shall be constructed from end of prop. wingwalls.
4. TSRS's adjacent to the ex. 42" gas main to remain in place shall not be vibrated or driven in place to avoid vibrating the utility.

Range 13E, 3rd P.M.



LOCATION SKETCH

GENERAL PLAN AND ELEVATION
KEELER AVE. OVER I-290 AND CTA
F.A.U. ROUTE 2420
SECTION - F.A.I. 290 22 KEELER BR
COOK COUNTY
STA. 203+76.63
STRUCTURE NO. 016-2093

CIVILTECH	Two Pierce Place, Suite 1400, Itasca, Illinois 60143, Tel: 630.773.3900, Fax: 630.773.3975, www.civiltechinc.com
USER NAME =	DESIGNED - JMI	REVISED -
	CHECKED - GJH	REVISED -
PLOT SCALE =	DRAWN - JMI	REVISED -
PLOT DATE =	CHECKED - GJH	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STRUCTURE NO. 016-2093

SHEET 1 OF 5 SHEETS

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
2420	FAI 290 22 KEELER BR	COOK	1	5
		CONTRACT NO. 62U41		
	ILLINOIS	FED. AID PROJECT		

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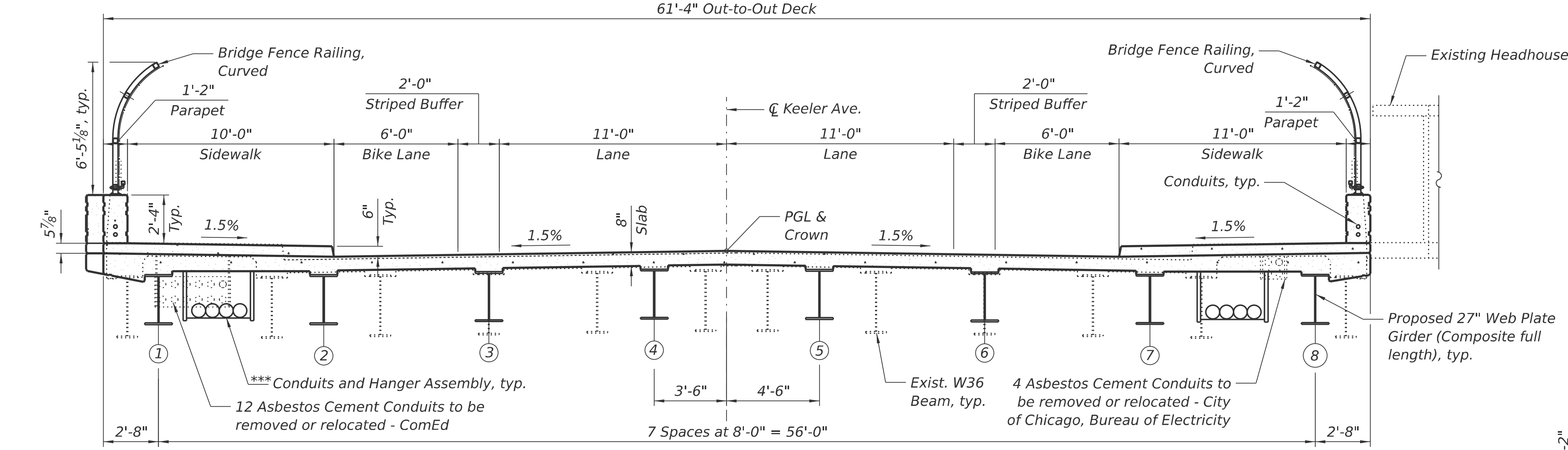
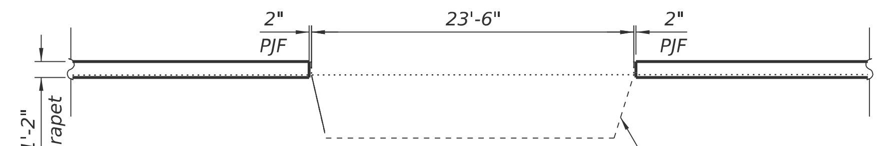


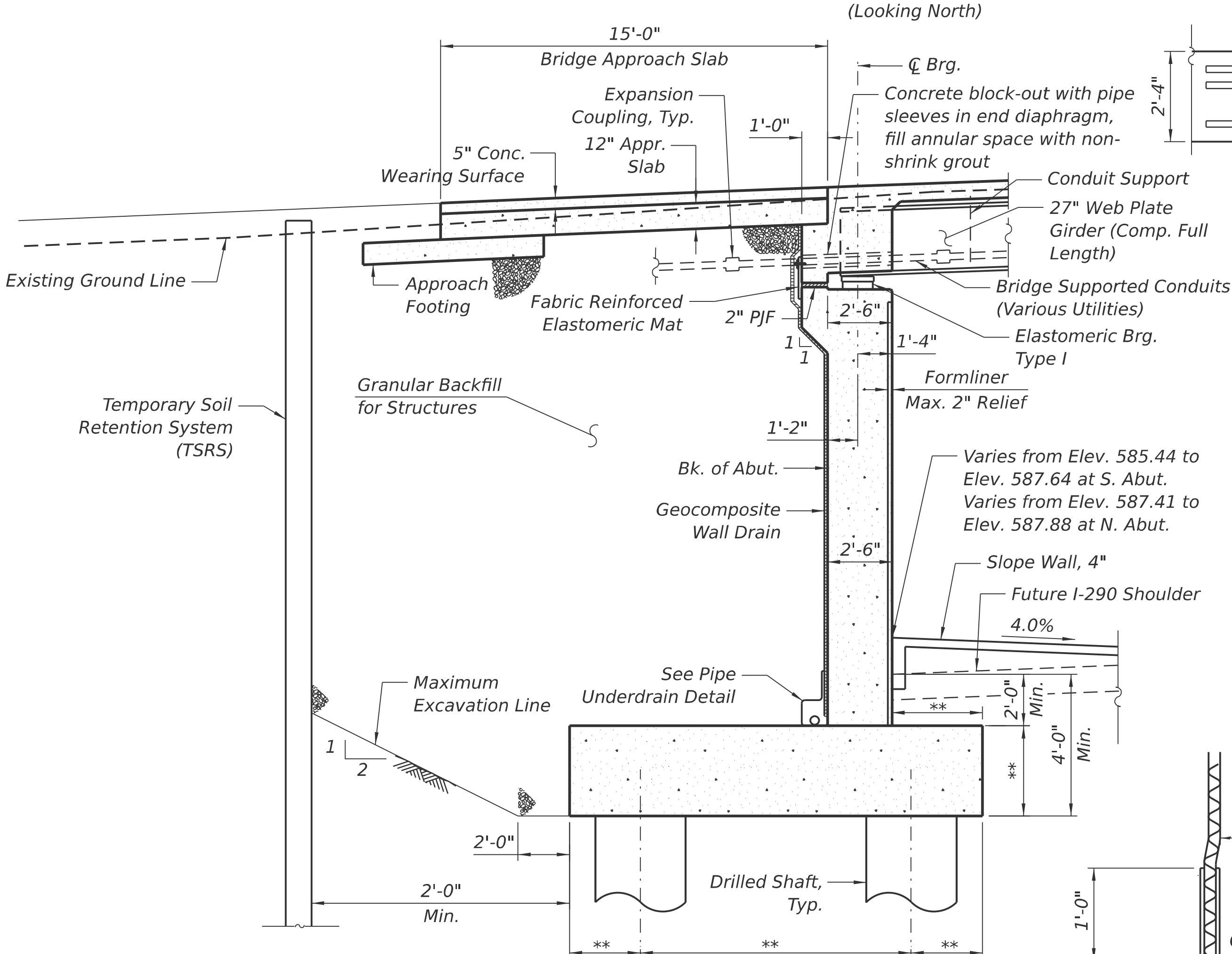
CROSS SECTION
(Looking North)

NOTES:

1. Underpass lighting locations to be determined in final plans.
2. The CTA headhouse is not in use. The proposed profile was set to approximately meet the existing headhouse. The headhouse will be reconstructed in a future contract.
3. No freefall drains will be permitted in the span over the tracks or within 10 ft. of cross arms of a railroad pole line.
4. Existing bridge mounted signs to be removed and replaced or reattached. Future signing locations are not known and may require future field retrofit of the beams to support future bridge mounted sign structures or removal of mounted signs.
5. Future retaining walls shall be constructed from end of proposed wingwalls.
6. Existing utilities to be temporarily supported and incorporated in proposed structure.
7. Architectural treatment/texturing subject to refinement during final plan phase.



DETAIL 1

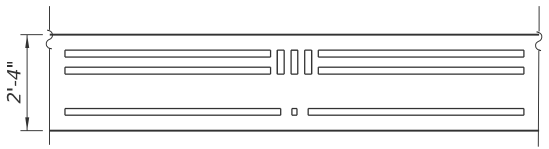


SECTION THRU SEMI-INTEGRAL ABUTMENT

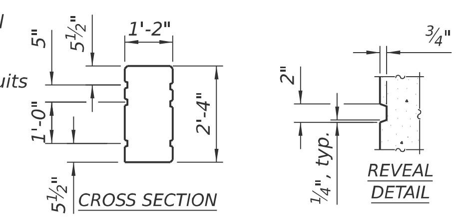
** To be determined in final design

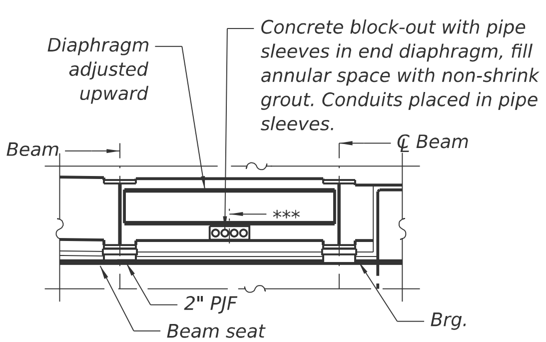
Station	Offset:
Sta. 202+49.06	29.00' Lt.
Sta. 202+49.11	30.00' Rt.
Sta. 203+73.88	29.00' Lt.
Sta. 203+95.90	30.00' Rt.

LIGHT POLE LOCATIONS
(Offsets measured to inside face of parapet)



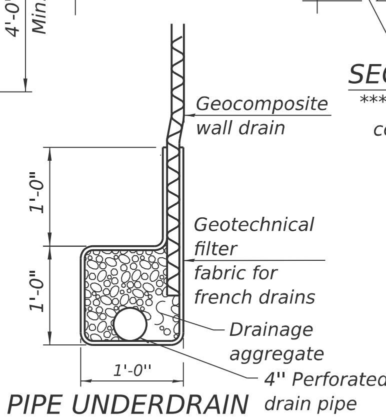
PARAPET ELEVATION



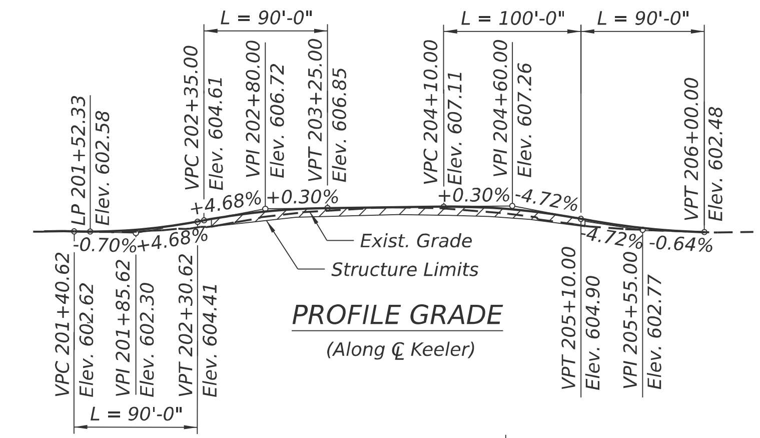


SECTION THRU UTILITIES

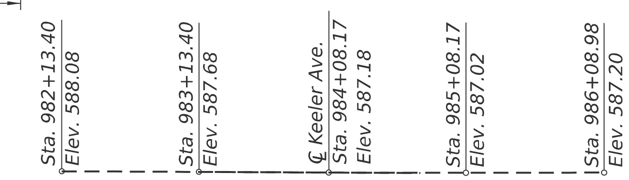
***Number, size, and type of conduits to be determined by Owner in final design



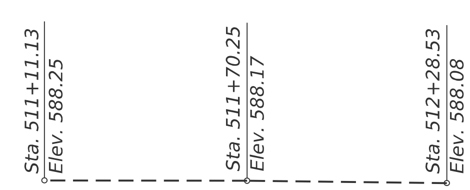
PIPE UNDERDRAIN DETAIL



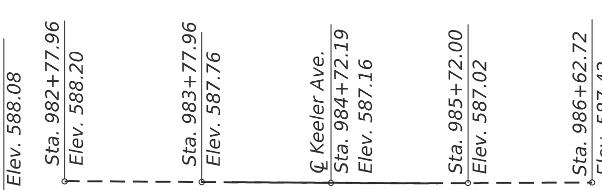
PROFILE GRADE
(Along ℄ Keeler)



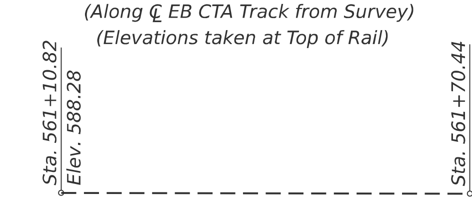
EXISTING PROFILE GRADE
(Along ℄ EB I-290 from Survey)



EXISTING PROFILE GRADE
(Along ℄ EB CTA Track from Survey)
(Elevations taken at Top of Rail)

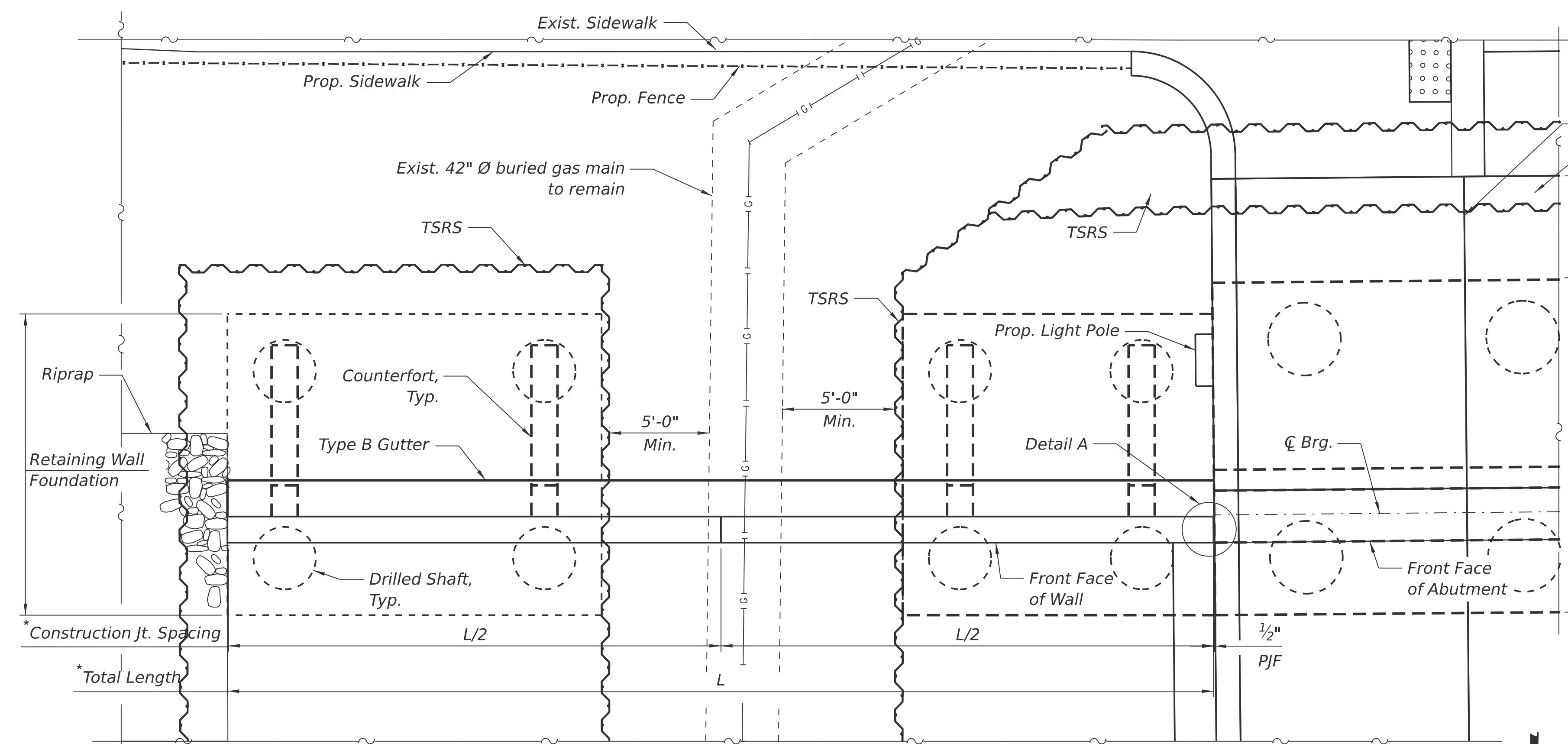


EXISTING PROFILE GRADE
(Along ℄ WB I-290 from Survey)



EXISTING PROFILE GRADE
(Along ℄ WB CTA Track from Survey)
(Elevations taken at Top of Rail)

CROSS SECTION & GENERAL DATA
KEELER AVE. OVER I-290 AND CTA
F.A.U. RTE. 2420
SECTION FAI 290 22 KEELER BR
COOK COUNTY
STATION 203+76.63
STRUCTURE NO. 016-2093

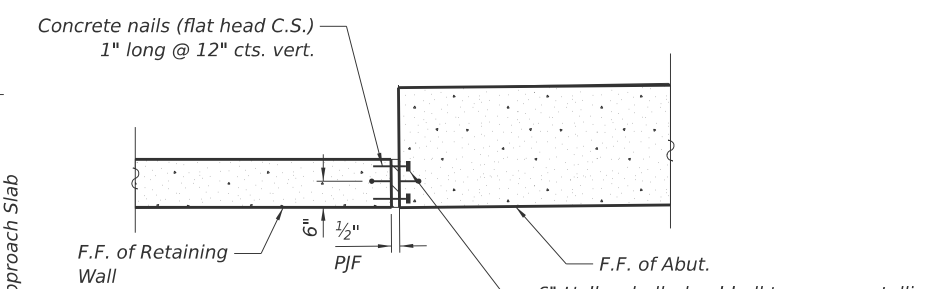


TYPICAL RETAINING WALL PLAN

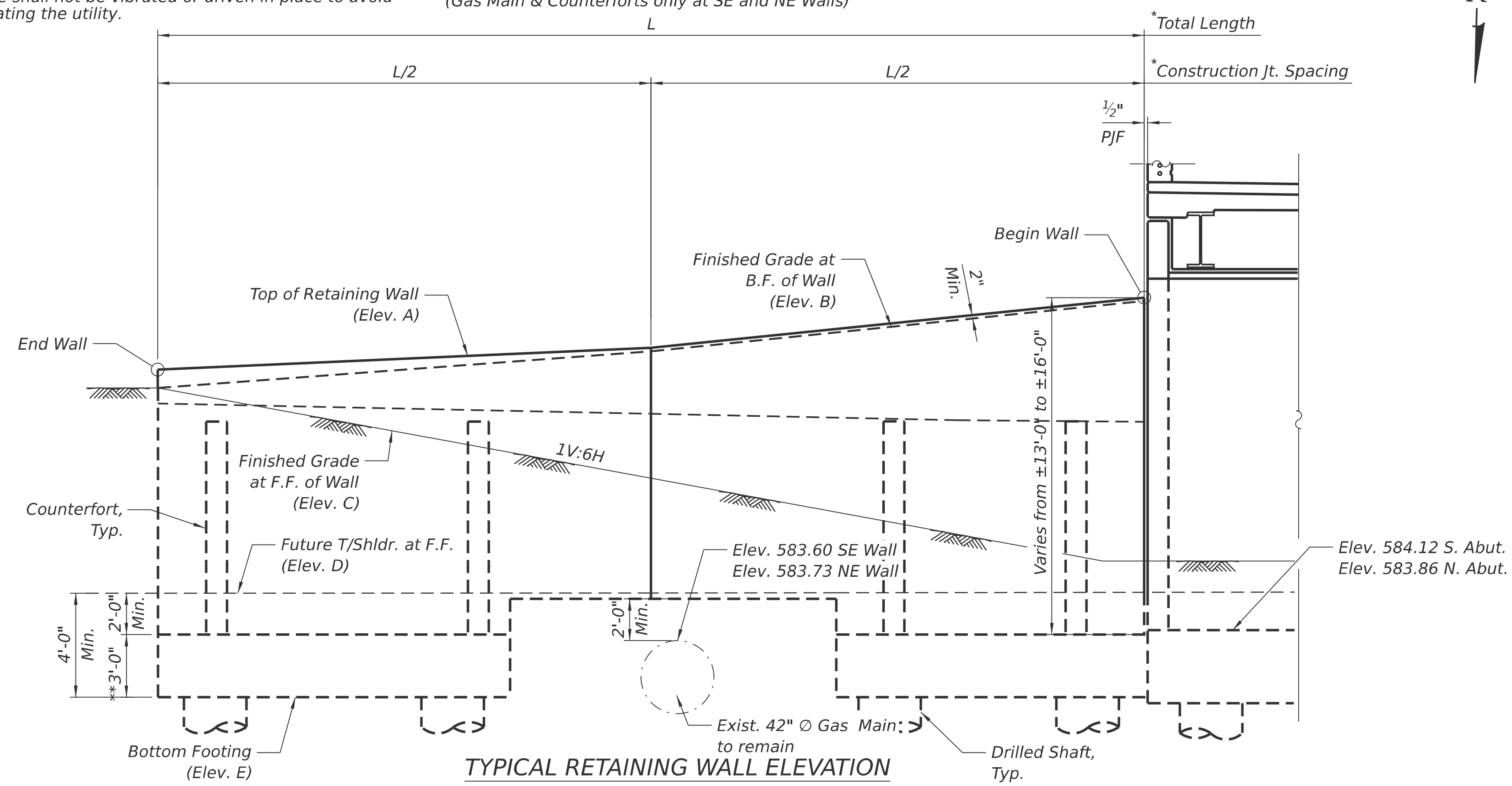
(Southeast Retaining Wall shown, others similar)
(Gas Main & Counterforts only at SE and NE Walls)

NOTE:

1. TSRS's adjacent to the exist. 42" gas main to remain in place shall not be vibrated or driven in place to avoid vibrating the utility.



DETAIL A



TYPICAL RETAINING WALL ELEVATION

(Southeast Retaining Wall shown, others similar)
(Gas Main & Counterforts only at SE and NE Walls)

** Dimension subject to refinement during final design.

SOUTHEAST WALL ELEVATION TABLE

Location	EB I-290		Elevation A	Elevation B	Elevation C	Elevation D
	Station	Offset				
Begin Wall	984+39.83	54.91' Rt.	599.95	599.79	587.44	585.93
Const. Jt.	984+63.58	54.91' Rt.	597.54	597.37	591.06	585.90
End of Wall	984+87.33	54.91' Rt.	596.85	596.41	595.00	585.89

SOUTHWEST WALL ELEVATION TABLE

Location	EB I-290		Elevation A	Elevation B	Elevation C	Elevation D
	Station	Offset				
Begin Wall	983+78.50	55.46' Rt.	599.94	599.78	587.64	586.21
Const. Jt.	983+54.50	55.46' Rt.	597.63	597.47	591.08	586.34
End of Wall	983+30.50	55.46' Rt.	597.05	595.63	595.02	586.47

NORTHEAST WALL ELEVATION TABLE

Location	WB I-290		Elevation A	Elevation B	Elevation C	Elevation D
	Station	Offset				
Begin Wall	985+02.86	55.82' Rt.	600.00	599.84	587.41	585.89
Const. Jt.	985+26.11	55.82' Rt.	597.03	596.86	590.94	585.86
End of Wall	985+49.36	55.82' Rt.	596.58	595.49	594.64	585.86

NORTHWEST WALL ELEVATION TABLE

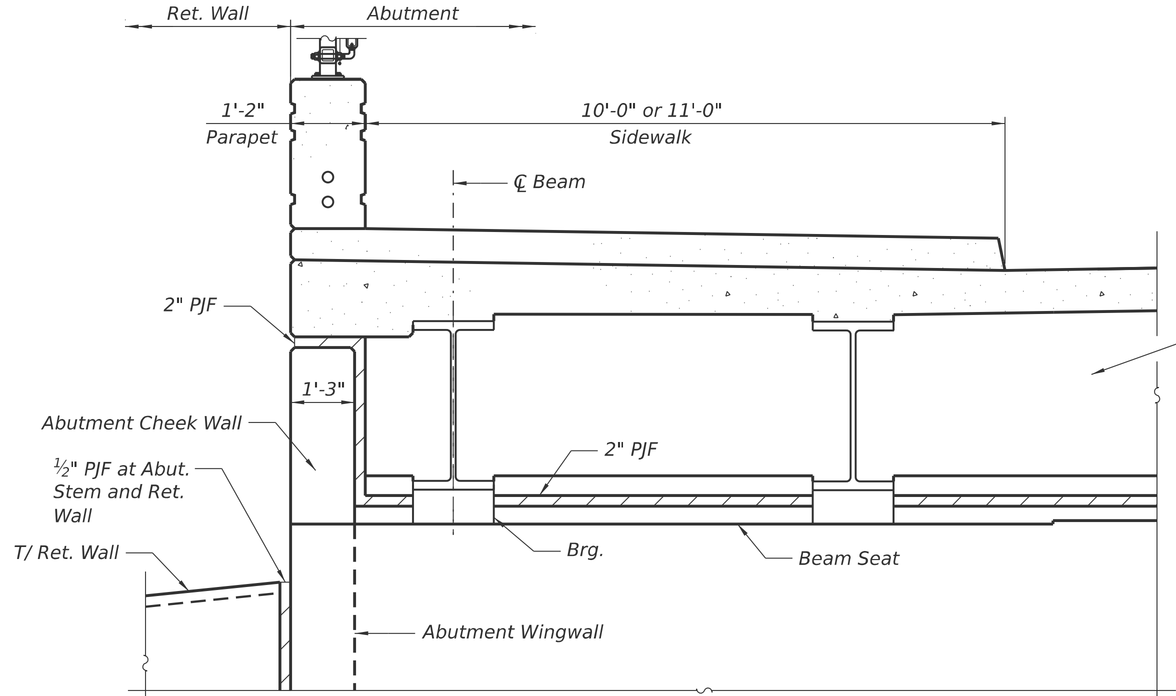
Location	WB I-290		Elevation A	Elevation B	Elevation C	Elevation D
	Station	Offset				
Begin Wall	984+41.53	55.26' Rt.	600.07	599.91	587.88	586.18
Const. Jt.	984+19.28	55.26' Rt.	596.95	596.79	591.26	586.34
End of Wall	983+97.03	55.26' Rt.	596.65	595.33	594.82	586.51

Elevation A = Top of Retaining Wall
Elevation B = Finished Grade at B.F. of Wall
Elevation C = Finished Grade at F.F. of Wall
Elevation D = Future Shoulder at F.F. of Wall

Wall	Elevation E
Southeast	580.89
Southwest	581.21
Northeast	580.86
Northwest	581.18

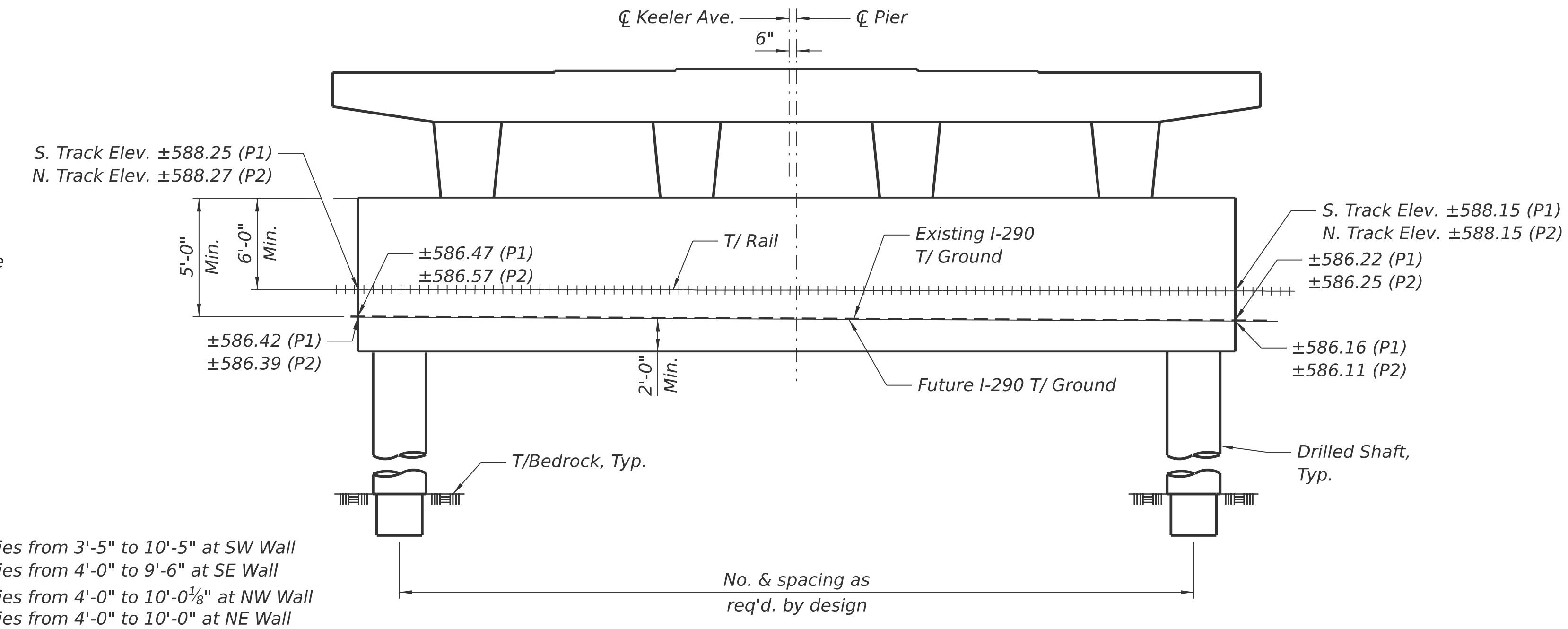
Wall	Length "L" (ft)
Southeast	47'-6"
Southwest	48'-0"
Northeast	46'-6"
Northwest	44'-6"

GENERAL RETAINING WALL DETAILS
KEELER AVE. OVER I-290 AND CTA
F.A.U. RTE. 2420
SECTION FAI 290 22 KEELER BR
COOK COUNTY
STATION 203+76.63
STRUCTURE NO. 016-2093



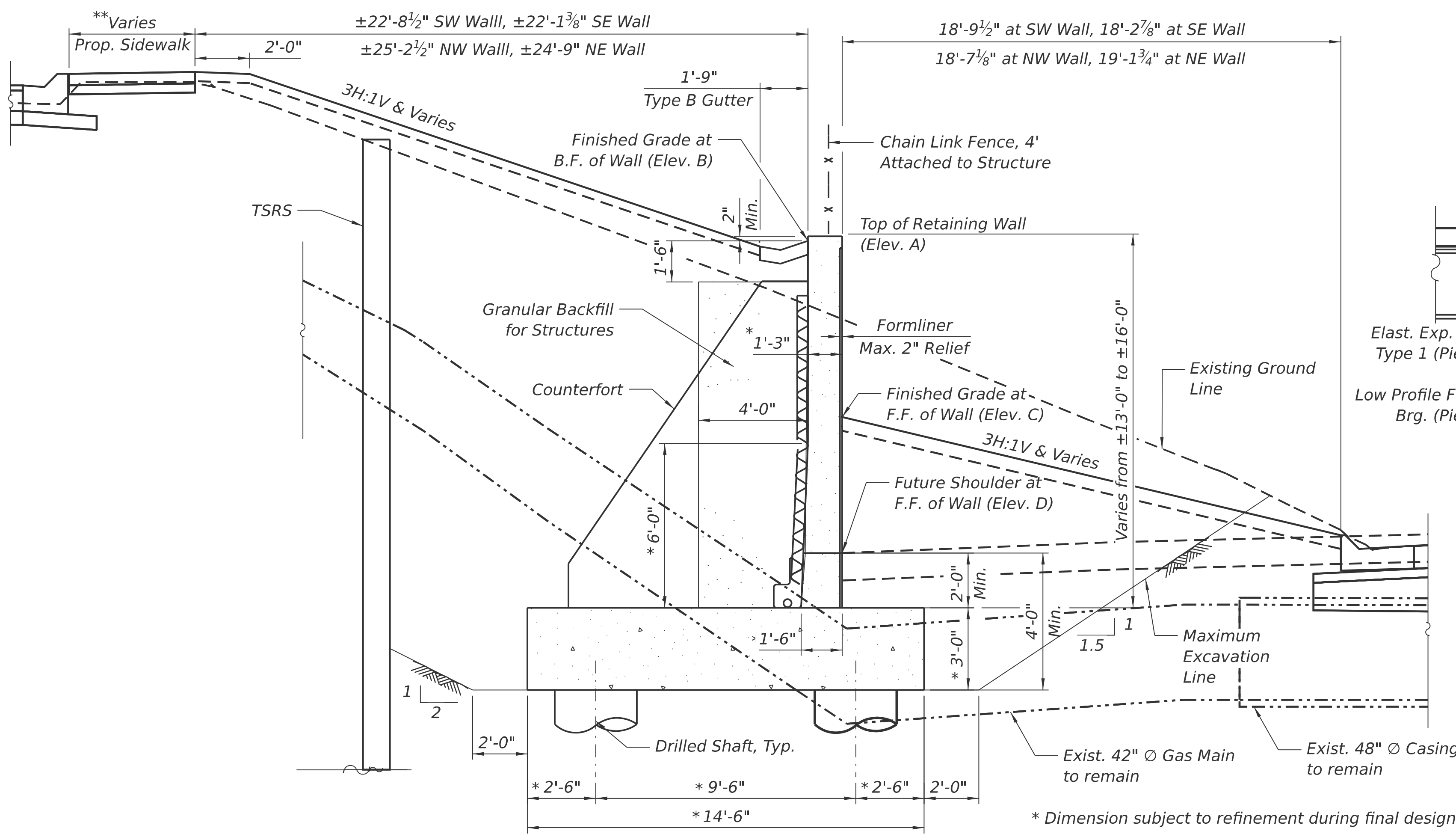
ABUTMENT CHEEK WALL & END DIAPHRAGM

** Varies from 3'-5" to 10'-5" at SW Wall
Varies from 4'-0" to 9'-6" at SE Wall
Varies from 4'-0" to 10'-0⅛" at NW Wall
Varies from 4'-0" to 10'-0" at NE Wall



PIER SKETCH

(Looking North)



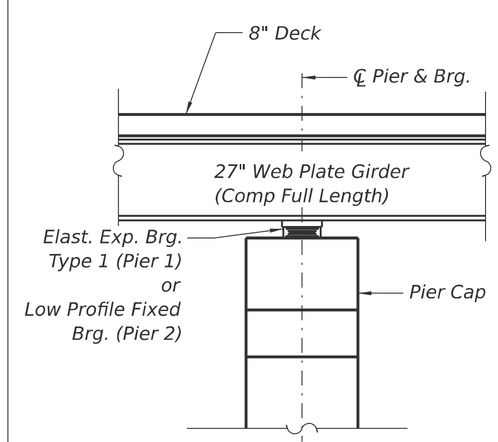
* Dimension subject to refinement during final design.

SECTION THRU RETAINING WALL

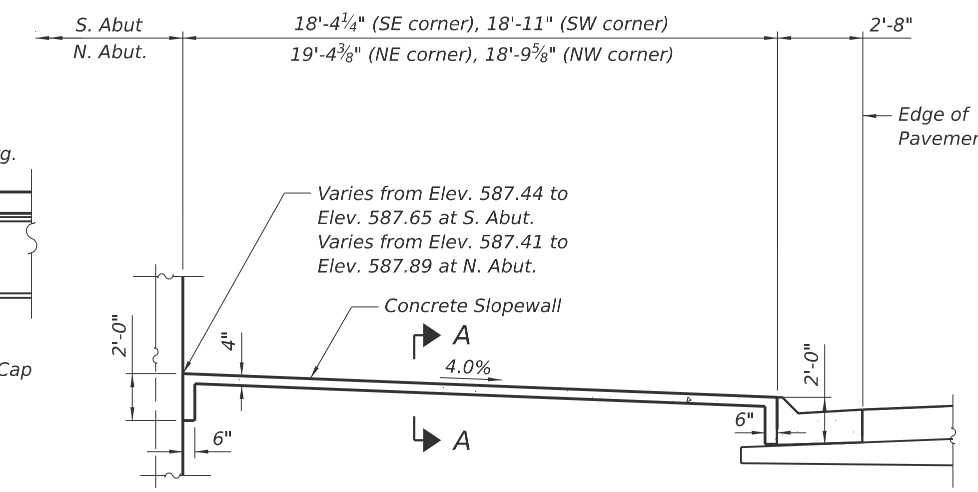
(Gas Main and Counterforts are only at the SE and NE Walls. Thickening of the wall stem at the top of the foundation only at the SW and NW Walls.)

NOTE:

1. See Sheet 3 for Elevations A, B, C and D.

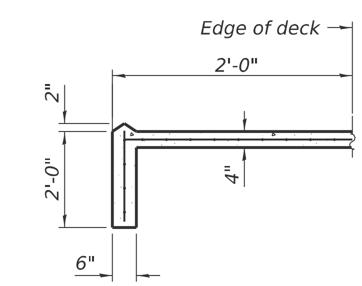


SECTION THRU PIER



SECTION THRU CONCRETE SLOPEWALL

(Looking West at S. Abut.)
(Looking East at N. Abut.)



SECTION A-A

DETAILS I
KEELER AVE. OVER I-290 AND CTA
F.A.U. RTE. 2420
SECTION FAI 290 22 KEELER BR
COOK COUNTY
STA. 203+76.63
STRUCTURE NO. 016-2093

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CIVILTECH
Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

USER NAME =	DESIGNED - JMI	REVISED -	
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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STRUCTURE NO. 016-2093

SHEET 4 OF 5 SHEETS

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
2420	FAI 290 22 KEELER BR	COOK	4	5

CONTRACT NO. 62U41

ILLINOIS | FED. AID PROJECT

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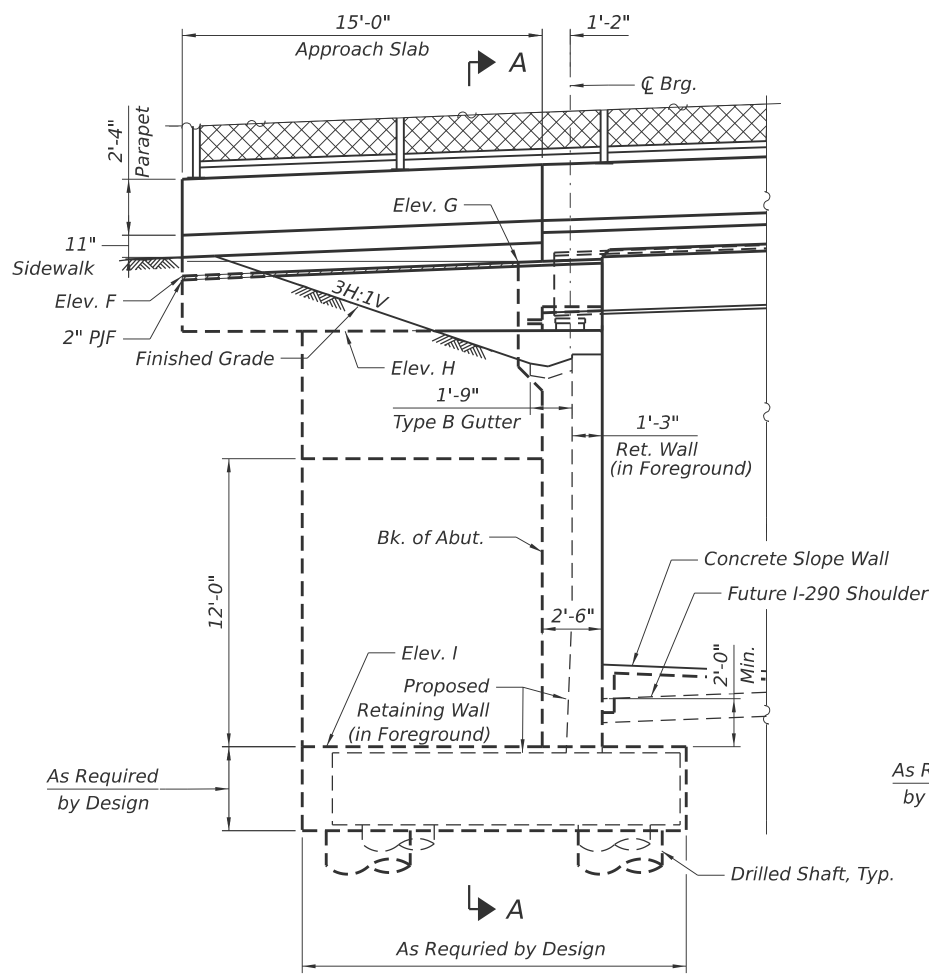
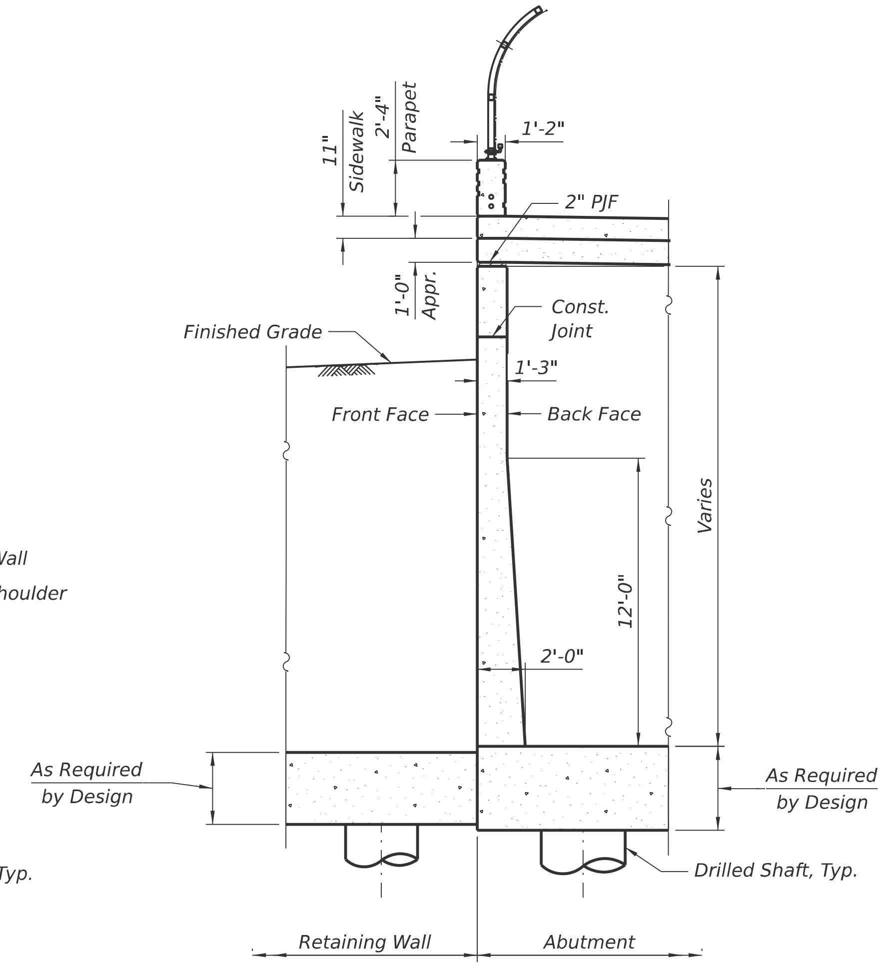


TYPICAL WINGWALL ELEVATION



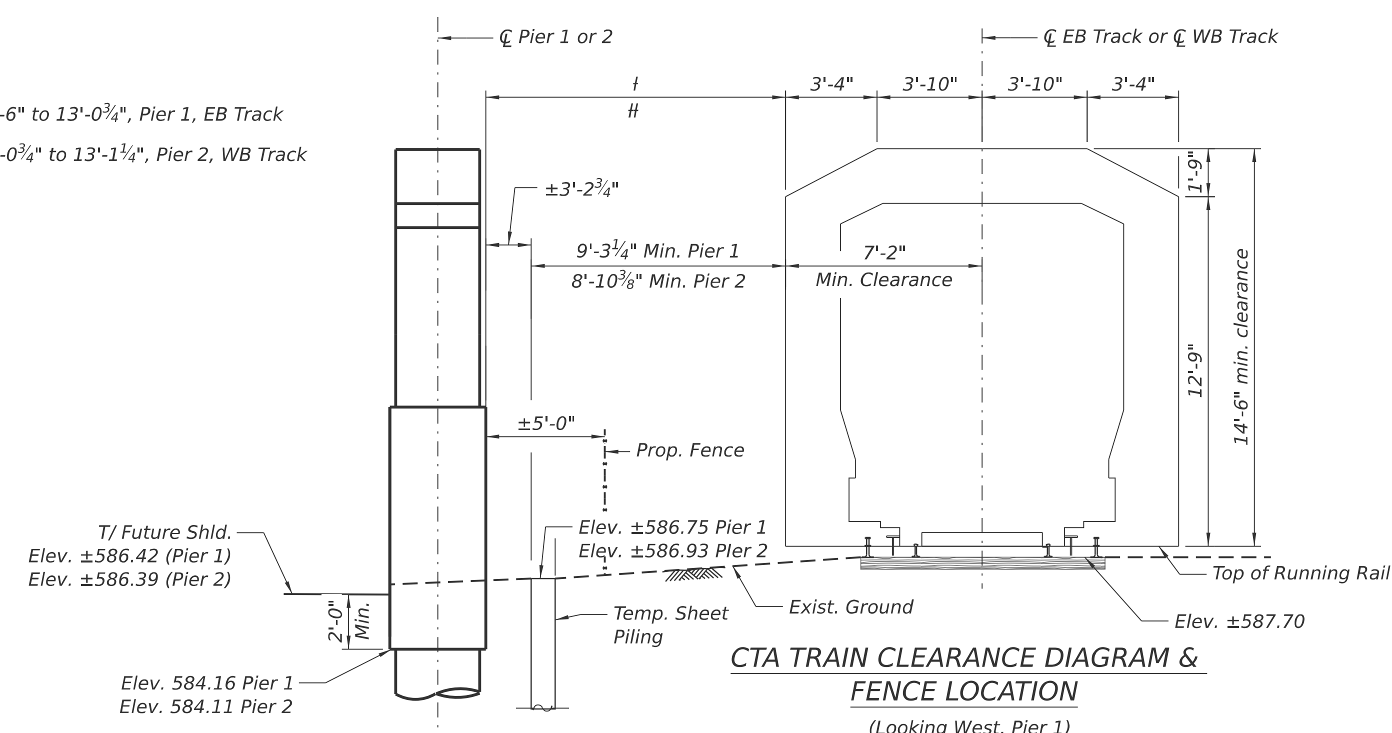
SECTION A-A

WINGWALL ELEVATIONS

Location	Elev. F	Elev. G	Elev. H	Elev. I
Southeast Wingwall	602.80	603.77	601.50	583.93
Southwest Wingwall	602.82	603.76	601.51	583.93
Northeast Wingwall	602.71	603.74	601.57	583.89
Northwest Wingwall	602.72	603.73	601.59	583.89

ƚ Varies from 12'-6" to 13'-0¾", Pier 1, EB Track

ƚƚ Varies from 12'-0¾" to 13'-1¼", Pier 2, WB Track



CTA TRAIN CLEARANCE DIAGRAM & FENCE LOCATION

(Looking West, Pier 1)
(Looking East, Pier 2)

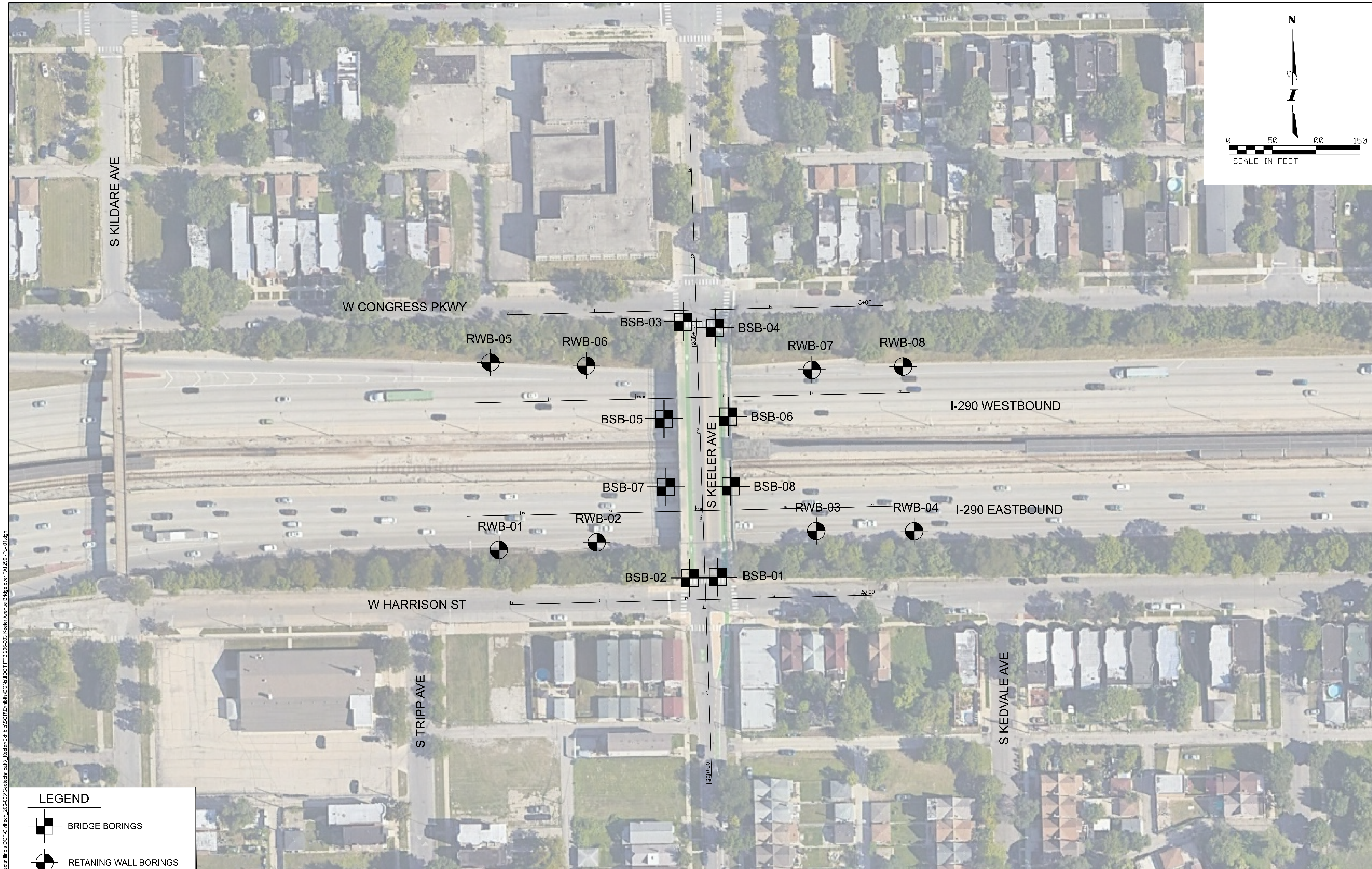
DETAILS II
KEELER AVE. OVER I-290 AND CTA
F.A.U. RTE. 2420
SECTION FAI 290 22 KEELER BR
COOK COUNTY
STATION 203+76.63
STRUCTURE NO. 016-2093

APPENDIX B

SOIL BORING LOCATION

PLAN AND

SUBSURFACE PROFILES



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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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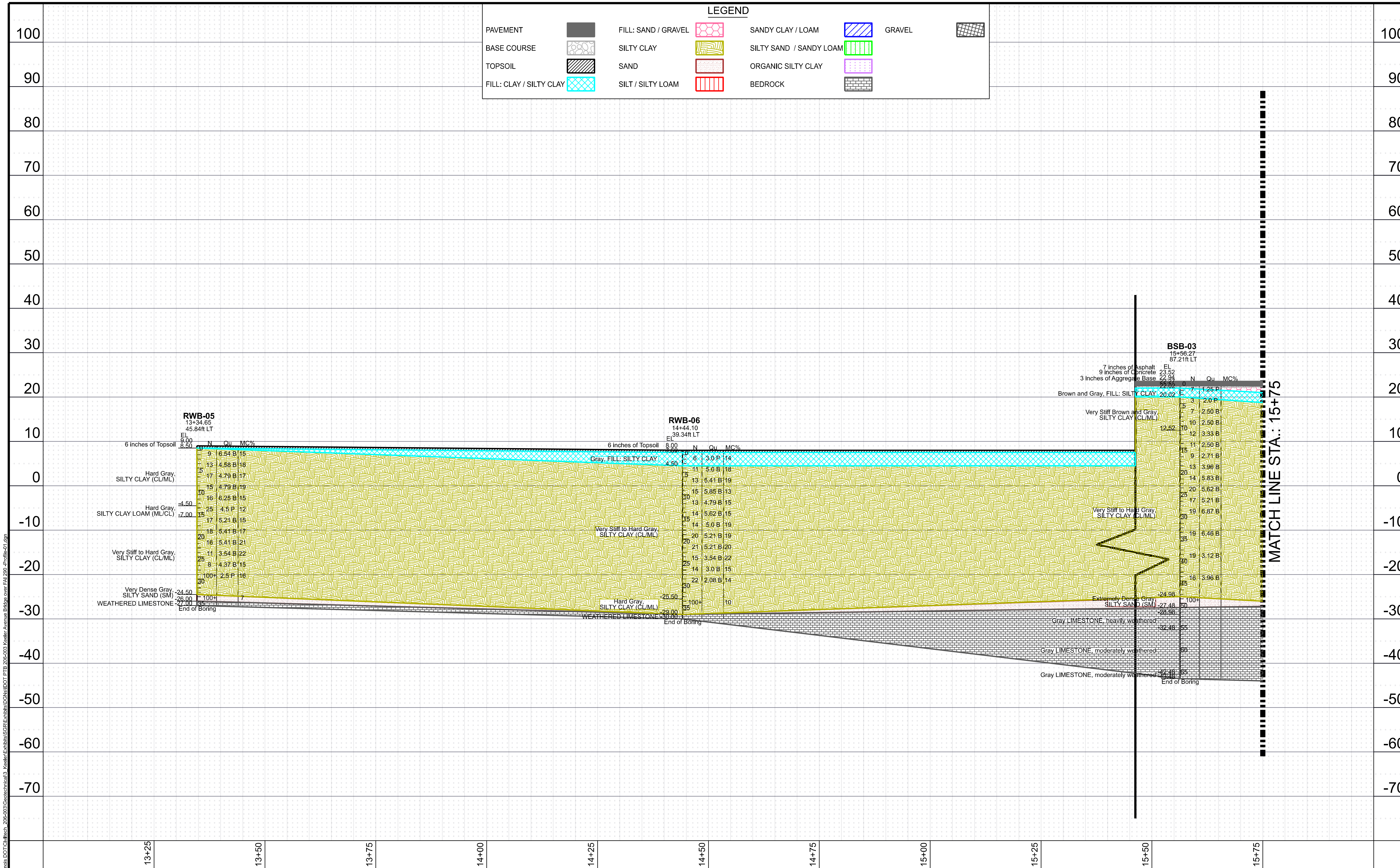
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206–003
KEELER AVENUE BRIDGE OVER I–290
BORING LOCATION PLAN

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

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	1
		CONTRACT NO. PTB 206-003		
	ILLINOIS	FED. AID PROJECT		



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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206-003
KEELER AVENUE BRIDGE OVER I-290 WEST
BORING PROFILE

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 13+25 TO STA. 15+75

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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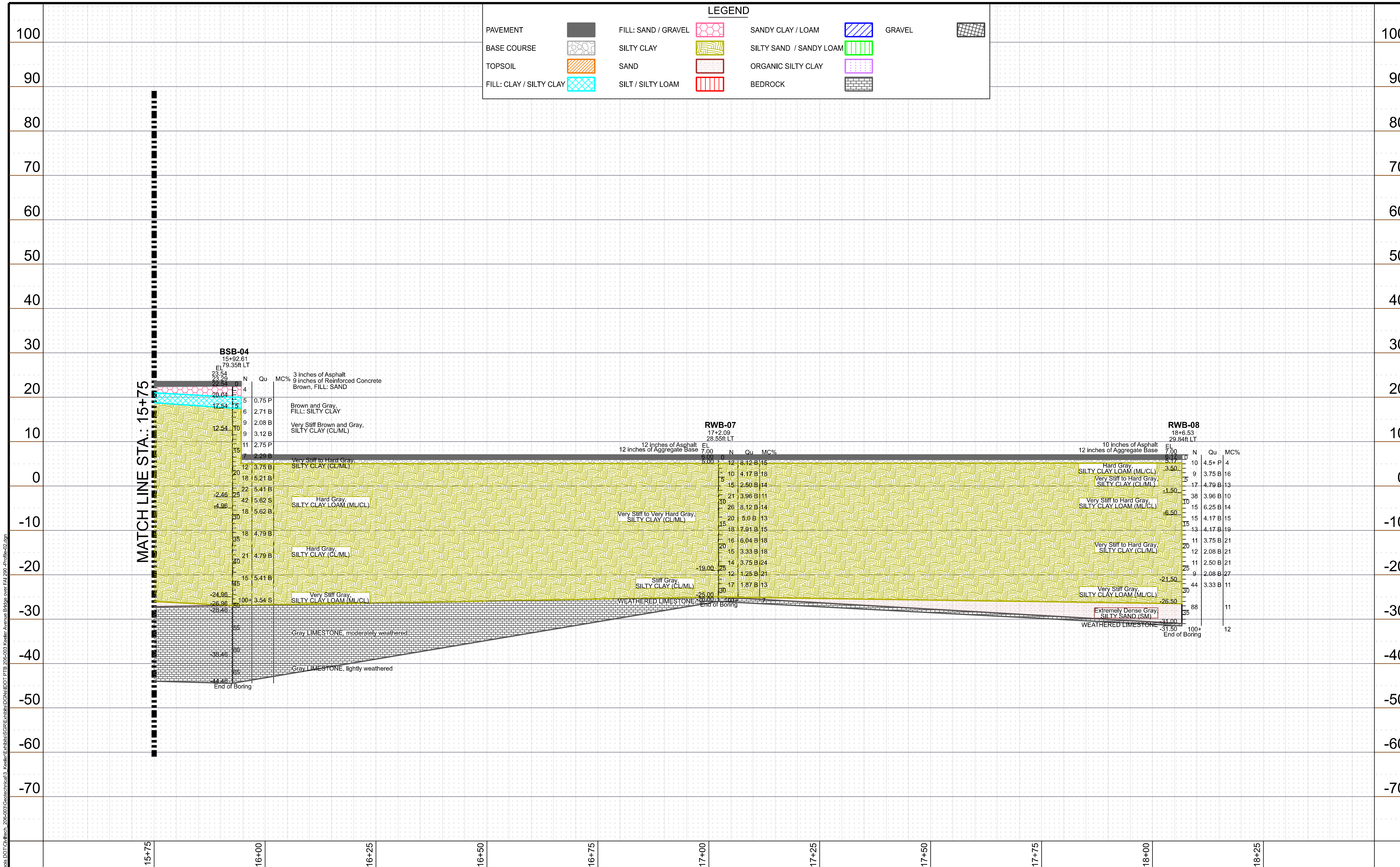

GSG CONSULTANTS, INC.
735 E. REMINGTON RD, SCHAUMBURG, IL 60173
TEL: +1630.994.2600 | WWW.GSG-CONSULTANTS.COM

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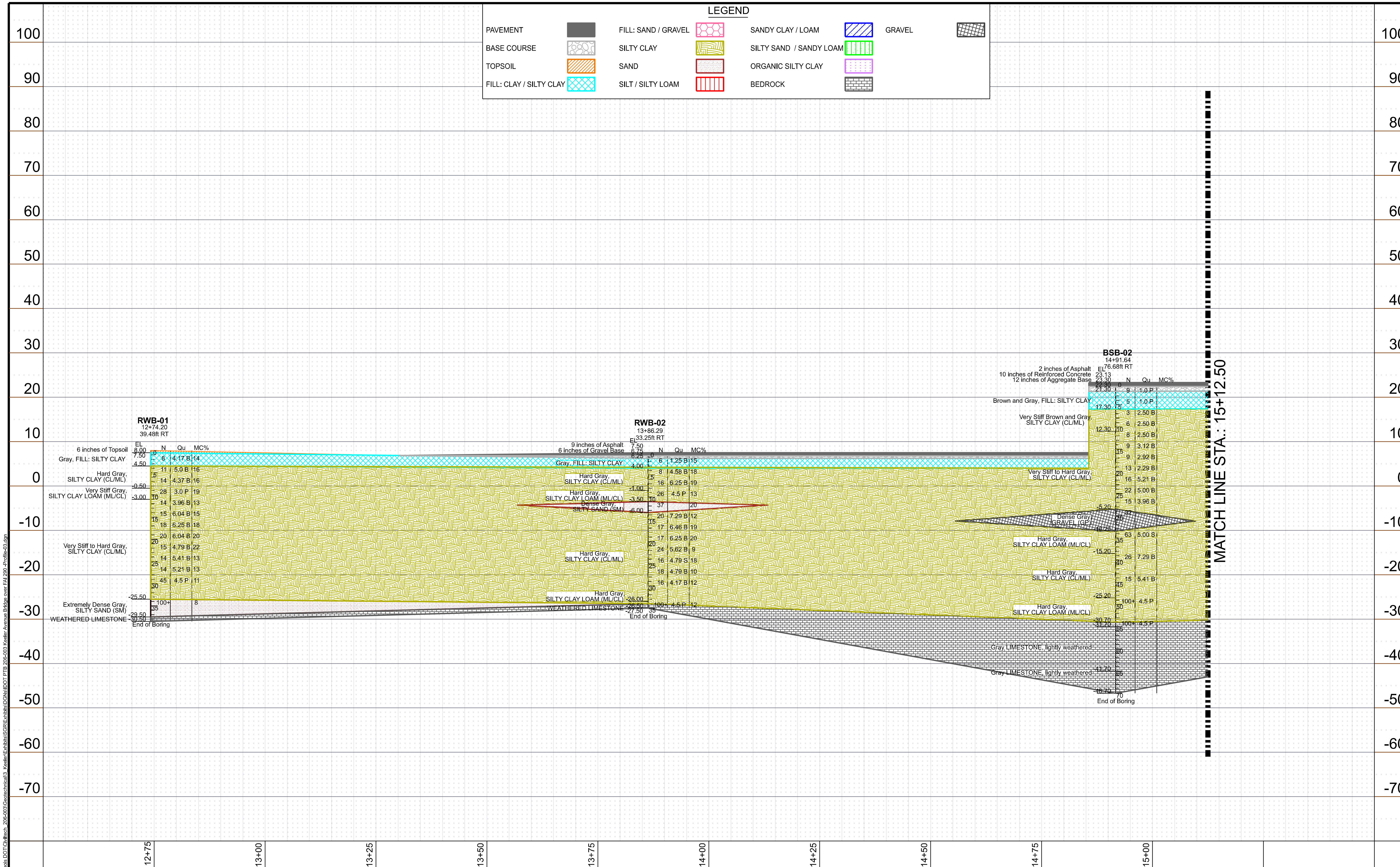
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206-003
KEELER AVENUE BRIDGE OVER I-290 WEST
BORING PROFILE

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 15+75 TO STA. 18+25

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	3
		CONTRACT NO. PTB 206-003		
		ILLINOIS	FED. AID PROJECT	



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	DRAWN - NN	REVISED -	
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PLOT DATE = 3/12/2025	DATE - 02/21/2024	REVISED -	

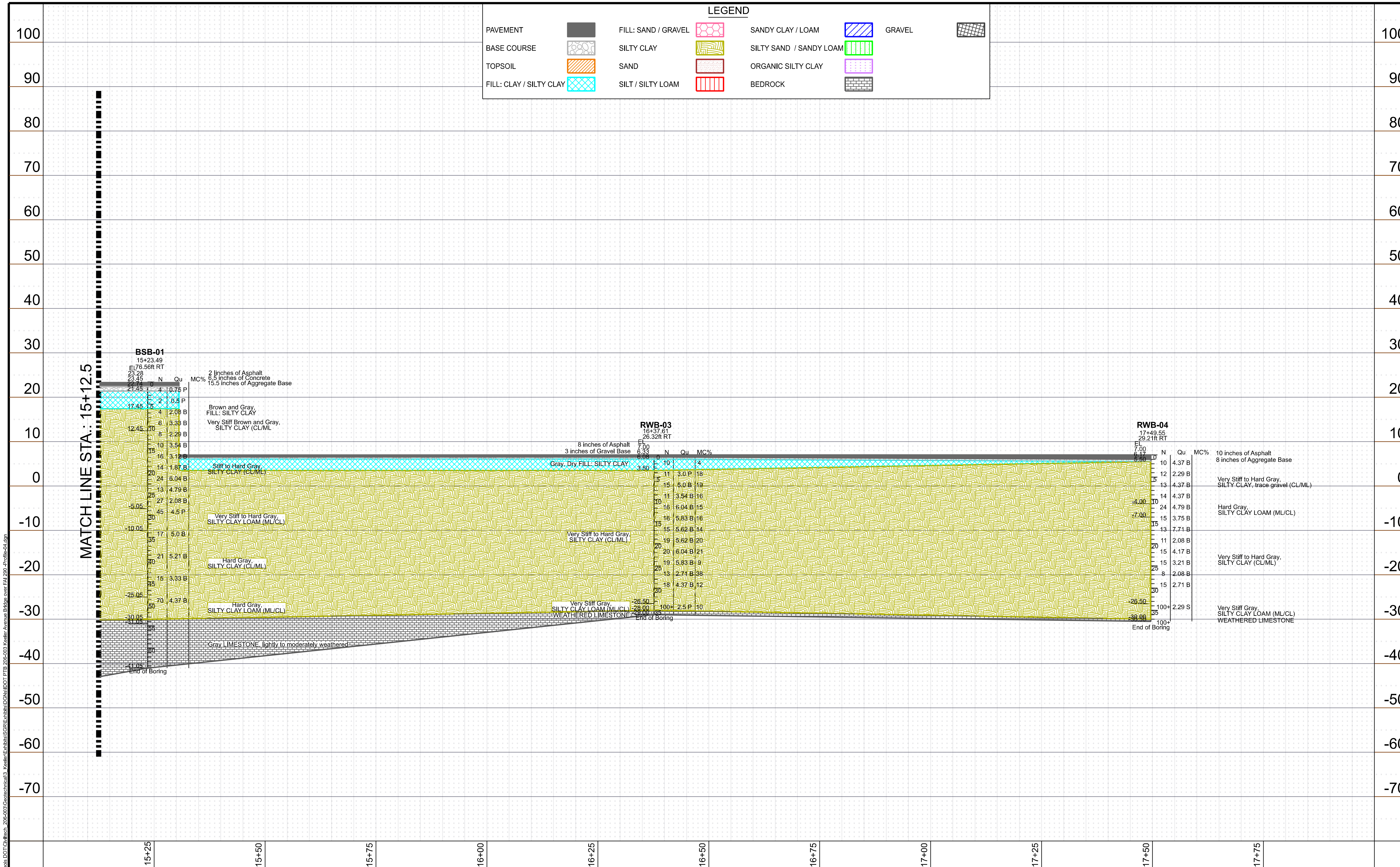
GSG CONSULTANTS, INC.

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206–003
KEELER AVENUE BRIDGE OVER I–290 EAST
BORING PROFILE

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 12+50 TO STA. 15+12.5

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	4
		CONTRACT NO. PTB 206-003		
		ILLINOIS	FED. AID PROJECT	



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

USER NAME = nnano	DESIGNED - MH	REVISED -	
	DRAWN - NN	REVISED -	
PLOT SCALE = $SCALE$	CHECKED - DE	REVISED -	
PLOT DATE = 3/12/2025	DATE - 02/21/2024	REVISED -	

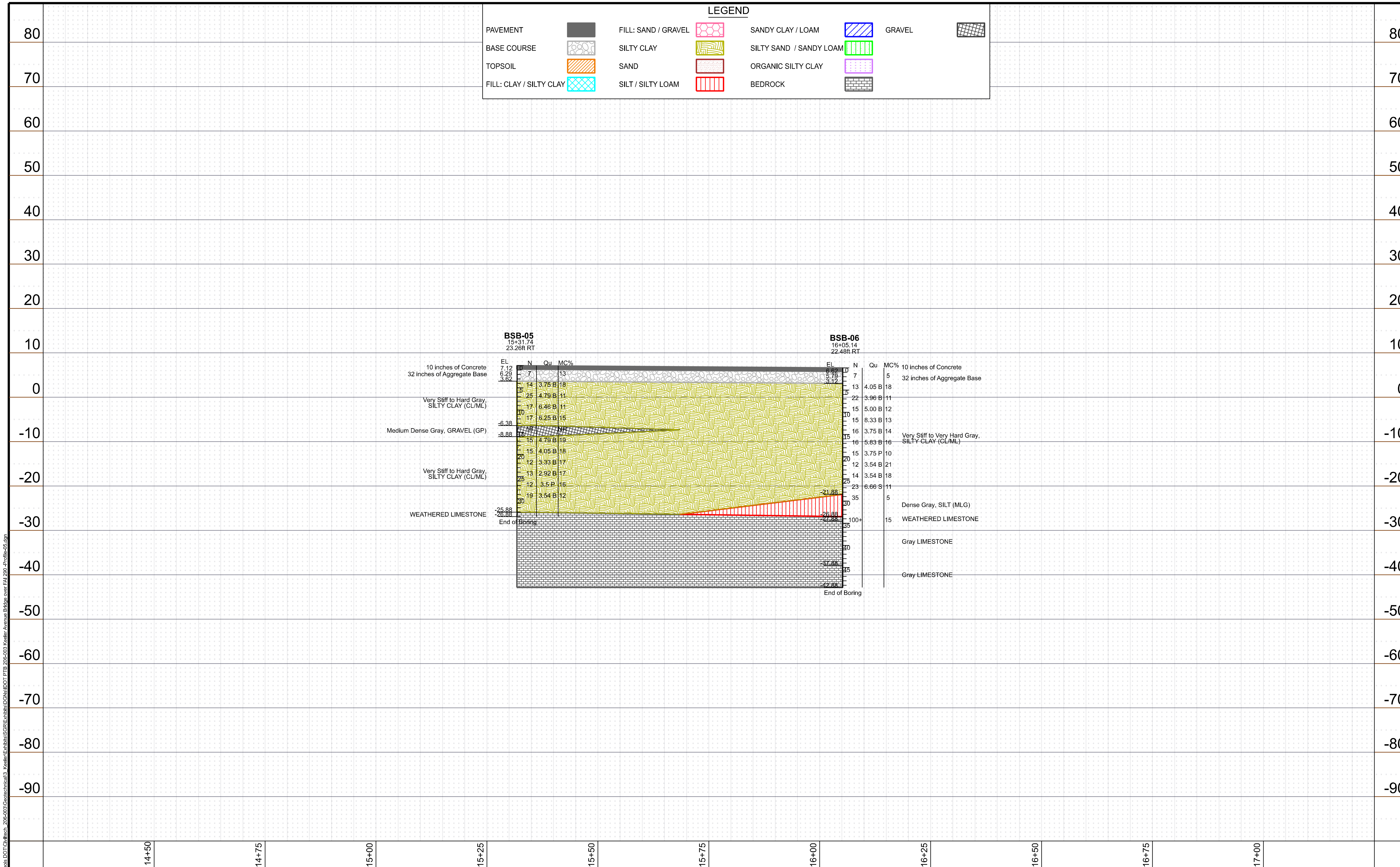
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206-003
KEELER AVENUE BRIDGE OVER I-290 EAST
BORING PROFILE

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 15+12.5 TO STA. 17+75

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	5
		CONTRACT NO. PTB 206-003		
		ILLINOIS	FED. AID PROJECT	

MODEL: Default
FILE NAME: Z:\Projects\Illinois DOT\Civil\Tech 206-003\Geotechnical\3_Keeler\Exhibits\SGR\Exhibits\DGN\IDOT PTB 206-003 Keeler Avenue Bridge over FAI 290 -Profile-04.dgn



GSG CONSULTANTS, INC. 735 E. REMINGTON RD, SCHAUMBURG, IL 60173 TEL: +1630.994.2600 | WWW.GSG-CONSULTANTS.COM	USER NAME = nnano	DESIGNED - MH	REVISED -
		DRAWN - NN	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - DE	REVISED -
	PLOT DATE = 4/2/2025	DATE - 02/21/2024	REVISED -

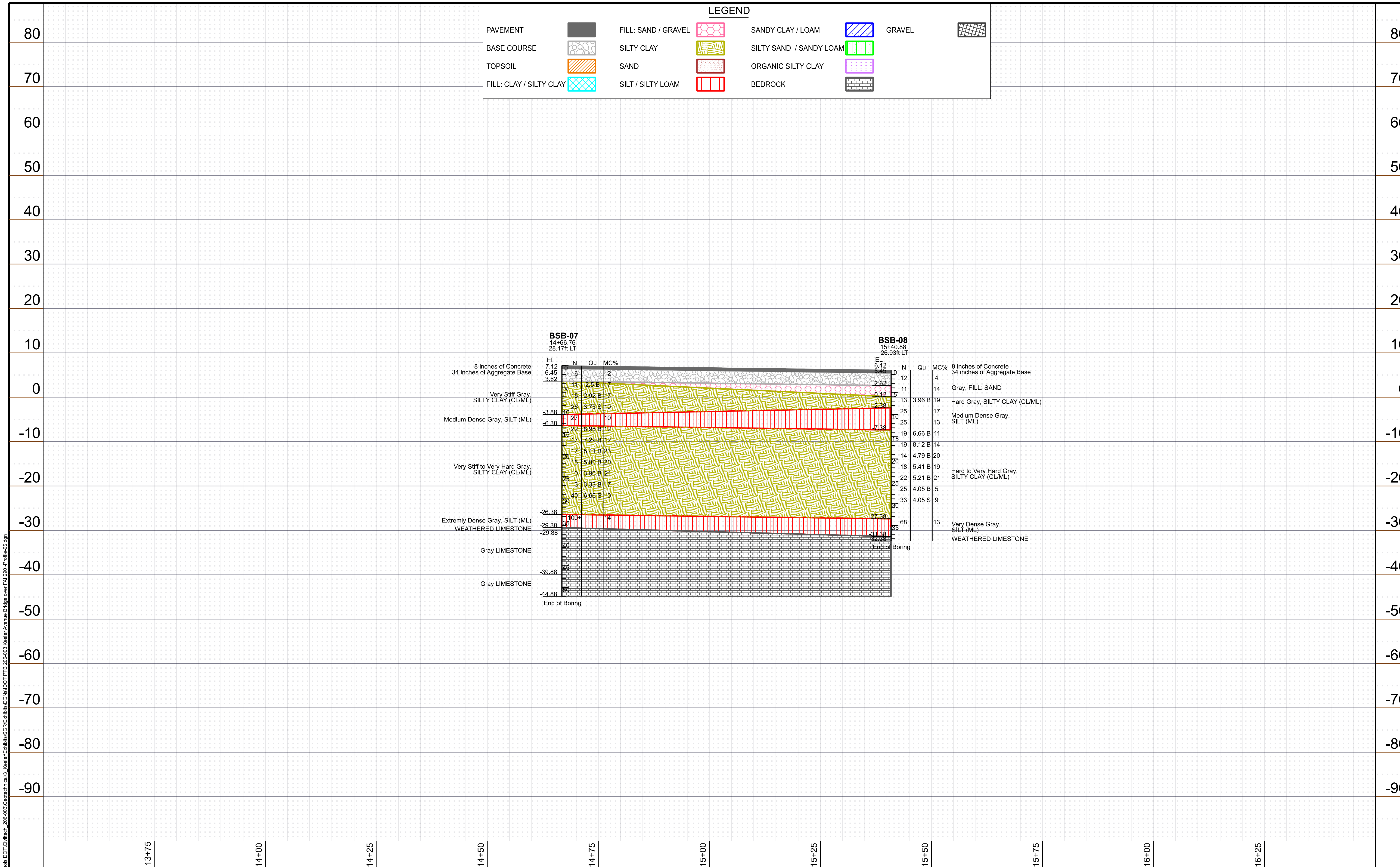
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206-003
KEELER AVENUE BRIDGE OVER I-290 WEST
BORING PROFILE

SCALE: AS NOTED | SHEET 1 OF 2 SHEETS | STA. 14+50 TO STA. 17+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	6
		CONTRACT NO. PTB 206-003		
		ILLINOIS	FED. AID PROJECT	

MODEL: Default
FILE NAME: Z:\Projects\Illinois DOT\Chi\Tech 206-003\Geotechnical\3_Keeler\Exhibits\SGR\Exhibits\DGN\IDOT PTB 206-003 Keeler Avenue Bridge over FAI 290 -Profile-05.dgn



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

USER NAME = nnano	DESIGNED - MH	REVISED -	
	DRAWN - NN	REVISED -	
PLOT SCALE = $SCALE$	CHECKED - DE	REVISED -	
PLOT DATE = 4/2/2025	DATE - 02/21/2024	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 206–003
KEELER AVENUE BRIDGE OVER I–290 EAST
BORING PROFILE

SCALE: AS NOTED | SHEET 2 OF 2 SHEETS | STA. 13+75 TO STA. 16+25

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	7	7
		CONTRACT NO. PTB 206-003		
		ILLINOIS	FED. AID PROJECT	

APPENDIX B

SOIL BORING LOGS

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

SOIL BORING LOG

Date 2/12/24

ROUTE	FAI 290	**DESCRIPTION**	Bridge Boring	**LOGGED BY**	MA
SECTION	Keeler Avenue over FAI 290	**LOCATION**	, **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8734541, **Longitude** -87.7302631		
COUNTY	COOK	**DRILLING RIG**	Diedrich D50	**HAMMER TYPE**	AUTO
		DRILLING METHOD	HSA	**HAMMER EFF (%)**	99.5

STRUCT. NO.	016-2093	**Surface Water Elev.**	N/A ft
Station	203+76.63	**Stream Bed Elev.**	N/A ft
BORING NO.	BSB-01	**Groundwater Elev.:**	
Station	15+23.49	**First Encounter**	None ft
Offset	76.56ft RT	**Upon Completion**	N/A ft
Ground Surface Elev.	23.45 ft	**After** N/A **Hrs.**	N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
2 Iinches of Asphalt	23.28				
6.5 inches of Concrete	22.74				
15.5 inches of Aggregate Base	21.45		2 3 1	0.8 P	24
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel	17.45		2 1 1	0.5 P	23
		-5			
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML	12.45		2 2 2	2.1 B	23
			2 3 3	3.3 B	23
		-10			
Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 3 5	2.3 B	21
			2 4 6	3.5 B	23
		-15			
			8 9 7	3.1 B	15
			3 4 10	1.9 B	18
		-20			
Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			6 10 14	6.0 B	19
			6 2 11	4.8 B	20
		-25			
	-5.05		14 12 15	2.1 B	13
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)	-10.05		13 18 27	4.5 P	21
		-30			
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			5 7 10	5.0 B	15
		-35			
			6 9 12	5.2 B	22
		-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 2/12/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8734541, **Longitude** -87.7302631

COUNTY COOK **DRILLING RIG** Diedrich D50 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 99.5

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-01
Station 15+23.49
Offset 76.56ft RT
Ground Surface Elev. 23.45 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			5 7 8	3.3 B	13
		-45			
	-25.05				
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)			20 26 44	4.4 B	16
		-50			
	-30.05				
HIGHLY WEATHERED LIMESTONE	-31.05				
Gray LIMESTONE, lightly to moderately weathered, lightly to moderately fractured, vugs RUN 1: 54.5' - 64.5' Recovery: 100% RQD: 78.3% (Good)		-55			
		-60			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray LIMESTONE, lightly to moderately weathered, lightly to moderately fractured, vugs RUN 1: 54.5' - 64.5' Recovery: 100% RQD: 78.3% (Good) *(continued)*	-41.05				
		-65			
Gray LIMESTONE, moderately to highly weathered, moderately to highly fractured, vugs RUN 2: 64.5' - 69.5' Recovery: 100% RQD: 73.3% (Fair)	-46.05				
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)

Keeler Avenue over FAI 290
Boring Number: BSB-01
Chicago, IL

Top

Depth = 54.5 ft
Elev. = -31.05 CCD

Depth = 64.5 ft
Elev. = -41.05 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-01	1	54.5' – 64.5'	100.0	78.3	Good	61.0 / 8,828	Gray Limestone Lightly to Moderately Weathered, Lightly to Moderately Fractured, Some Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-01
Chicago, IL

Top

Depth = 64.5 ft
Elev. = -41.05 CCD

Depth = 69.5 ft
Elev. = -46.05 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-01	2	64.5' – 69.5'	100.0	73.3	Fair	Gray Limestone Moderately to Highly Weathered, Moderately to Highly Fractured, Some Vugs

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

SOIL BORING LOG

Date 2/14/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8734523, **Longitude** -87.7303800

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-02
Station 14+91.64
Offset 76.68ft RT
Ground Surface Elev. 23.30 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
2 inches of Asphalt	23.13				
10 inches of Reinforced Concrete	22.30				
12 inches of Aggregate Base	21.30		2 4 5	1.0 P	19
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel		-5	2 3 2	1.0 P	16
	17.30				
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 2 1	2.5 B	25
		-10	3 2 4	2.5 B	22
	12.30				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 4 4	2.5 B	22
		-15	2 3 6	3.1 B	21
			4 3 6	2.9 B	16
		-20	2 6 7	2.3 B	17

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			4 5 11	5.2 B	16
		-25	6 8 14	5.0 B	20
			3 5 10	4.0 B	17
	-5.20				
Dense Gray, Wet GRAVEL, with clay (GP)		-30	9 9 23		26
	-10.20				
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL) Sand seam at 34.5 feet		-35	18 27 36	5.0 S	17
	-15.20				
		-40	7 8 18	7.3 B	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 2/14/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E,
Latitude 41.8734523, **Longitude** -87.7303800

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-02
Station 14+91.64
Offset 76.68ft RT
Ground Surface Elev. 23.30 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			5 5 10	5.4 B	12
		-45			
	-25.20				
Hard Gray, Moist SILTY CLAY LOAM, with gravel (ML/CL)			11 50/5"	4.5 P	10
		-50			
	-30.70		50/6"		
HIGHLY WEATHERED LIMESTONE	-31.70	-55			
Gray LIMESTONE, lightly weathered, lightly fractured, few vugs RUN 1: 55' - 65' Recovery: 100% RQD: 95% (Excellent)					
		-60			

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray LIMESTONE, lightly weathered, lightly fractured, few vugs RUN 1: 55' - 65' Recovery: 100% RQD: 95% (Excellent) *(continued)*	-41.70	-65			
Gray LIMESTONE, lightly weathered, lightly fractured, some vugs RUN 2: 65' - 70' Recovery: 100% RQD: 96.7% (Excellent)	-46.70	-70			
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)

Keeler Avenue over FAI 290
Boring Number: BSB-02
Chicago, IL

Top

Depth = 55.0 ft
Elev. = -31.70 CCD

Depth = 65.0 ft
Elev. = -41.70 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-02	1	55.0’ – 65.0’	100.0	95.0	Excellent	59.0 / 12,546	Gray Limestone Lightly Weathered, Lightly Fractured, Few Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-02
Chicago, IL

Top

Depth = 65.0 ft
Elev. = -41.70 CCD

Depth = 70.0 ft
Elev. = -46.70 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-02	2	65.0' – 70.0'	100.0	96.7	Excellent	Gray Limestone Lightly Weathered, Lightly Fractured, Some Vugs

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

SOIL BORING LOG

Date 2/15/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E,
Latitude 41.8742570, **Longitude** -87.7304001

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-03
Station 15+56.27
Offset 87.21ft LT
Ground Surface Elev. 23.52 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
7 inches of Asphalt	22.94				
9 inches of Concrete	22.27				
3 inches of Aggregate Base	22.02		3		
Brown and Gray, Moist FILL: SILTY CLAY, trace sand and gravel			2 5	1.3 P	25
	20.02				
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2		
		-5	1 2	2.0 P	22
			2		
			2 5	2.5 B	23
			3		
		-10	4 6	2.5 B	21
	12.52				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			3		
			5 7	3.3 B	14
			5		
		-15	5 6	2.5 B	16
			2		
			3 6	2.7 B	16
			3		
		-20	5 8	4.0 B	16

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*		4		
		6 8	5.8 B	18
		4		
	-25	8 12	5.6 B	20
		3		
		8 9	5.2 B	14
		6		
	-30	8 11	6.9 B	15
		5		
	-35	8 11	6.5 B	17
		5		
	-40	8 11	3.1 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 2/15/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8742570, **Longitude** -87.7304001

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-03
Station 15+56.27
Offset 87.21ft LT
Ground Surface Elev. 23.52 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			6 6 10	4.0 B	12
		-45			
	-24.98				
Extremely Dense Gray, Moist SILTY SAND, trace gravel (SM)			28 33 50/4"		11
		-50			
	-27.48				
HIGHLY WEATHERED LIMESTONE					
	-28.98				
Gray LIMESTONE, heavily weathered, heavily fractured RUN 1: 52.5' - 56' Recovery: 57.1% RQD: 9.5% (Very Poor)		-55			
	-32.48				
Gray LIMESTONE, moderately weathered, heavily fractured, few vugs RUN 2: 56' - 66' Recovery: 100% RQD: 67.1% (Fair)		-60			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray LIMESTONE, moderately weathered, heavily fractured, few vugs RUN 2: 56' - 66' Recovery: 100% RQD: 67.1% (Fair) *(continued)*		-65			
	-42.48				
Gray LIMESTONE, moderately weathered, moderately fractured, few vugs RUN 3: 66' - 67' Recovery: 83% RQD: 62.5% (Fair)	-43.48				
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)

Keeler Avenue over FAI 290
Boring Number: BSB-03
Chicago, IL

Top

Depth = 52.5 ft
Elev. = -28.98 CCD

Depth = 56.0 ft
Elev. = -32.48 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-03	1	52.5' – 56.0'	57.1	9.5	Very Poor	Gray Limestone Heavily Weathered, Heavily Fractured

Keeler Avenue over FAI 290
Boring Number: BSB-03
Chicago, IL

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-03	2	56.0' – 66.0'	100.0	67.1	Fair	63.0 / 6,292	Gray Limestone Moderately Weathered, Heavily Fractured, Few Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-03
Chicago, IL

Top

Depth = 66.0 ft
Elev. = -42.48 CCD

Depth = 67.0 ft
Elev. = -43.48 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-03	3	66.0' – 67.0'	83.0	62.5	Fair	Gray Limestone Moderately Weathered, Moderately Fractured, Few Vugs

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

SOIL BORING LOG

Date 2/13/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8742371, **Longitude** -87.7302661

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-04
Station 15+92.61
Offset 79.35ft LT
Ground Surface Elev. 23.54 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3 inches of Asphalt	23.29				
9 inches of Reinforced Concrete	22.54				
Brown, Wet FILL: SAND	20.04		2 2 2		21
Brown and Gray, Very Moist FILL: SILTY CLAY, trace gravel	17.54	-5	WH 2 3	0.8 P	27
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)			1 3 3	2.7 B	22
	12.54	-10	1 3 6	2.1 B	22
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 4 5	3.1 B	20
		-15	2 5 6	2.8 P	22
			2 3 4	2.3 B	17
		-20	4 4 8	3.8 B	17
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			5 8 10	5.2 B	19
	-2.46	-25	5 9 13	5.4 B	17
Hard Gray, Moist SILTY CLAY LOAM (ML/CL)	-4.96		13 20 22	4.5 P	20
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-30	7 7 11	5.6 B	17
		-35	5 7 11	4.8 B	15
		-40	6 8 13	4.8 B	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 2/13/24

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8742371, **Longitude** -87.7302661

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-04
Station 15+92.61
Offset 79.35ft LT
Ground Surface Elev. 23.54 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*					
Sand seam at 44 feet		-45	8 7 8	5.4 B	24
	-24.96				
Very Stiff Gray, Moist SILTY CLAY LOAM (ML/CL)		-50	37 50/5"	2.8 P	11
	-26.96				
HIGHLY WEATHERED LIMESTONE					
	-28.46				
Gray LIMESTONE, moderately weathered, moderately fractured, some vugs RUN 1: 52' - 62' Recovery: 99.2% RQD: 80.8% (Good)		-55			
		-60			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	-38.46				
Gray LIMESTONE, lightly weathered, lightly fractured, few vugs RUN 2: 62' - 68' Recovery: 100% RQD: 93.8% (Excellent)		-65			
	-44.46				
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)

Keeler Avenue over FAI 290
Boring Number: BSB-04
Chicago, IL

Top

Depth = 52.0 ft
Elev. = -28.46 CCD

Depth = 62.0 ft
Elev. = -38.46 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-04	1	52.0' – 62.0'	99.2	80.8	Good	52.5 / 5,946	Gray Limestone Moderately Weathered, Moderately Fractured, Some Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-04
Chicago, IL

Top

Depth = 62.0 ft
Elev. = -38.46 CCD

Depth = 68.0 ft
Elev. = -44.46 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-04	2	62.0’ – 68.0’	100.0	93.8	Excellent	Gray Limestone Lightly Weathered, Lightly Fractured, Few Vugs

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

SOIL BORING LOG

Date 3/3/25

ROUTE FAI 290 DESCRIPTION Bridge Boring LOGGED BY DV

SECTION Keeler Avenue over FAI 290 LOCATION , SEC. 15, TWP. 39N, RNG. 13E, Latitude 41.8739528, Longitude -87.7304833

COUNTY COOK DRILLING RIG Mobile B-57 HAMMER TYPE AUTO
DRILLING METHOD HSA HAMMER EFF (%) 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-05
Station 15+31.74
Offset 23.26ft RT
Ground Surface Elev. 7.12 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A Hrs. N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Concrete 32 inches of Aggregate Base	6.29				
			8 4 3		13
	3.62				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-5	8 6 8	3.8 B	18
			5 8 17	4.8 B	11
		-10	7 8 9	6.5 B	11
			7 8 9	6.3 B	15
	-6.38				
Medium Dense Gray, Moist GRAVEL (GP)		-15	7 9 9		NR
	-8.88				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			4 7 8	4.8 B	19
		-20	5 6 9	4.1 B	18

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			4 5 7	3.3 B	17
		-25	3 6 7	2.9 B	17
			4 5 7	3.5 P	16
		-30	3 9 10	3.5 B	12
	-25.88				
WEATHERED LIMESTONE					
	-26.88				
Auger refusal at 34 feet End of Boring		-35			
		-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)

BBS, form 137 (Rev. 8-99)

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

SOIL BORING LOG

Date 3/3/25

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** DV

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8739583, **Longitude** -87.7302139

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-06
Station 16+05.14
Offset 22.48ft RT
Ground Surface Elev. 6.62 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Concrete 32 inches of Aggregate Base	5.79		5 4 3		5
	3.12				
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-5	3 6 7	4.1 B	18
			3 7 15	4.0 B	11
		-10	4 8 7	5.0 B	12
			4 7 8	8.3 B	13
		-15	5 7 9	3.8 B	14
			3 6 10	5.8 B	16
		-20	3 6 9	3.8 P	10
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			3 5 7	3.5 B	21
		-25	4 6 8	3.5 B	18
			6 8 15	6.7 S	11
	-21.88				
Dense Gray, Moist SILT, with gravel (MLG)		-30	13 20 15		5
	-26.88				
WEATHERED LIMESTONE			50/2"		15
	-27.88	-35			
Gray LIMESTONE, slightly weathered, moderately fractured, some vugs RUN 1: 34.5' - 44.5' Recovery: 100% RQD: 72.9% (Fair)		-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 3/3/25

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** DV

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8739583, **Longitude** -87.7302139

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-06
Station 16+05.14
Offset 22.48ft RT
Ground Surface Elev. 6.62 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray LIMESTONE, slightly weathered, moderately fractured, some vugs RUN 1: 34.5' - 44.5' Recovery: 100% RQD: 72.9% (Fair) *(continued)*	-37.88				
Gray LIMESTONE, slightly weathered RUN 2: 44.5' - 49.5' Recovery: 100% RQD: 100% (Excellent)	-42.88	-45			
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)

Keeler Avenue over FAI 290
Boring Number: BSB-06
Chicago, IL

Top

Depth = 34.5 ft
Elev. = -27.88 CCD

Depth = 44.5 ft
Elev. = -37.88 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-06	1	34.5' – 44.5'	100.0	72.9	Fair	42.5 / 6,900	Gray Limestone Slightly Weathered, Moderately Fractured, Some Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-06
Chicago, IL

Top

Depth = 44.5 ft
Elev. = -37.88 CCD

Depth = 49.5 ft
Elev. = -42.88 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-06	2	44.5' – 49.5'	100.0	100.0	Excellent	Gray Limestone Slightly Weathered

Illinois Department of Transportation

Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/2/25

ROUTE FAI 290 DESCRIPTION Bridge Boring LOGGED BY DV

SECTION Keeler Avenue over FAI 290 LOCATION , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8737389, **Longitude** -87.7304778

COUNTY COOK DRILLING RIG Mobile B-57 HAMMER TYPE AUTO

DRILLING METHOD HSA HAMMER EFF (%) 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-07
Station 14+66.76
Offset 28.17ft LT
Ground Surface Elev. 7.12 ft

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

Groundwater Elev.:
First Encounter -26.4 ft ▼
Upon Completion N/A ft
After N/A Hrs. N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Concrete 34 inches of Aggregate Base	6.45		12 7 9		12
Very Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML)	3.62	-5	2 6 5	2.5 B	17
			3 6 9	2.9 B	17
		-10	5 11 15	3.8 S	10
Medium Dense Gray, Moist SILT, trace gravel (ML)	-3.88		5 13 14		10
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)	-6.38	-15	7 10 12	9.0 B	12
			4 7 10	7.3 B	12
		-20	4 7 10	5.4 B	23
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			2 6 9	5.0 B	20
		-25	2 4 6	4.0 B	21
			3 5 8	3.3 B	17
		-30	5 13 27	6.7 S	10
Extremly Dense Gray, Moist SILT, trace gravel (ML)	-26.38 ▼	-35	11 19 50/3"		14
WEATHERED LIMESTONE	-29.38				
Gray LIMESTONE, slightly weathered, moderately fractured, some vugs RUN 1: 37' - 47' Recovery: 100% RQD: 84.2% (Good)	-29.88	-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 3/2/25

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** DV

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E,
Latitude 41.8737389, **Longitude** -87.7304778

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-07
Station 14+66.76
Offset 28.17ft LT
Ground Surface Elev. 7.12 ft

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

Groundwater Elev.:
First Encounter -26.4 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray LIMESTONE, slightly weathered, moderately fractured, some vugs RUN 1: 37' - 47' Recovery: 100% RQD: 84.2% (Good) *(continued)*	-39.88	-45			
Gray LIMESTONE, slightly weathered, moderately fractured RUN 2: 47' - 52' Recovery: 77.3% RQD: 67.5% (Fair)	-44.88	-50			
End of Boring		-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)

BBS, form 137 (Rev. 8-99)

Keeler Avenue over FAI 290
Boring Number: BSB-07
Chicago, IL

Top

Depth = 37.0 ft
Elev. = -29.88 CCD

Depth = 47.0 ft
Elev. = -39.88 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Depth (ft) / Compressive Strength (psi)	Description
BSB-07	1	37.0' – 47.0'	100.0	84.2	Good	41.0 / 10,733	Gray Limestone Lightly Weathered, Moderately Fractured, Some Vugs

Keeler Avenue over FAI 290
Boring Number: BSB-07
Chicago, IL

Top

Depth = 47.0 ft
Elev. = -39.88 CCD

Depth = 52.0 ft
Elev. = -44.88 CCD

Bottom

Boring No.	Run	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description
BSB-07	2	47.0' – 52.0'	77.3	67.5	Fair	Gray Limestone Slightly Weathered, Moderately Fractured

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

SOIL BORING LOG

Date 3/2/25

ROUTE FAI 290 **DESCRIPTION** Bridge Boring **LOGGED BY** DV

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8737389, **Longitude** -87.7302056

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 92.1

STRUCT. NO. 016-2093
Station 203+76.63

BORING NO. BSB-08
Station 15+40.88
Offset 26.93ft LT
Ground Surface Elev. 6.12 ft

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

Groundwater Elev.:
First Encounter -27.4 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Concrete; 34 inches of Aggregate Base	5.45		7 / 7 / 5		4
Gray, Dry FILL: SAND, with gravel	2.62	-5	3 / 5 / 6		14
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)	0.12		3 / 6 / 7	4.0 B	19
Medium Dense Gray, Moist SILT, trace gravel (ML)	-2.38	-10	8 / 13 / 12		17
			9 / 13 / 12		13
Hard to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)	-7.38	-15	4 / 8 / 11	6.7 B	11
			5 / 8 / 11	8.1 B	14
		-20	4 / 5 / 9	4.8 B	20
Hard to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			4 / 7 / 11	5.4 B	19
		-25	5 / 9 / 13	5.2 B	21
			4 / 10 / 15	4.1 B	5
		-30	14 / 19 / 14	4.1 S	9
Very Dense Gray, Moist SILT, with limestone fragments (ML)	-27.38 ▼	-35	24 / 30 / 38		13
WEATHERED LIMESTONE	-31.38				
Auger refusal at 38.5 feet End of Boring	-32.38	-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 2/5/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8735444, **Longitude** -87.7311806

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-01
Station 12+74.20
Offset 39.48ft RT
Ground Surface Elev. 8.00 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Topsoil	7.50				
Gray, Moist FILL: SILTY CLAY, trace gravel			5, 3, 5	4.2 B	14
	4.50				
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-5	3, 5, 6	5.0 B	16
			4, 5, 9	4.4 B	16
	-0.50				
Very Stiff Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)		-10	5, 12, 16	3.0 P	19
	-3.00				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			4, 7, 7	4.0 B	13
		-15	4, 7, 8	6.0 B	15
			3, 7, 11	6.3 B	18
		-20	4, 9, 11	6.0 B	20
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			3, 6, 9	4.8 B	22
		-25	4, 7, 7	5.4 B	13
Silt seams from 26 to 27.5 feet			3, 7, 7	5.2 B	13
Limestone fragments at 29 feet		-30	6, 26, 19	4.5 P	11
	-25.50				
Extremely Dense Gray, Moist SILTY SAND, with gravel (SM)		-35	9, 43, 50/2"		8
	-29.50				
WEATHERED LIMESTONE					
	-30.50				
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 2/5/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E,
Latitude 41.8735667, **Longitude** -87.7307694

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-02
Station 13+86.29
Offset 33.25ft RT
Ground Surface Elev. 7.50 ft

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

Groundwater Elev.:
First Encounter -26.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
9 inches of Asphalt	6.75				
6 inches of Gravel Base	6.25		2 4 2	1.3 B	15
Gray, Moist FILL: SILTY CLAY, trace gravel	4.00				
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-5	3 4 4	4.6 B	18
			4 5 11	6.3 B	19
	-1.00				
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)		-10	5 13 13	4.5 P	13
	-3.50				
Dense Gray, Wet SILTY SAND, trace gravel (SM)			8 15 22		20
	-6.00				
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-15	6 9 11	7.3 B	12
			6 6 11	6.5 B	19
		-20	4 6 11	6.3 B	20

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			5 8 16	5.6 B	9
Silt seam at 24.5 feet		-25	4 7 9	4.5 P	18
			6 6 12	4.8 B	10
		-30	9 7 9	4.2 B	12
	-26.00 ▼				
Hard Gray, Moist SILTY CLAY LOAM, with gravel (ML/CL)	-26.50		50/4"		12
WEATHERED LIMESTONE	-27.50	-35			
Auger refusal at 35 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)

BBS, form 137 (Rev. 8-99)

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

SOIL BORING LOG

Date 2/5/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8735972, **Longitude** -87.7298472

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-03
Station 16+37.61
Offset 26.32ft RT
Ground Surface Elev. 7.00 ft

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

Groundwater Elev.:
First Encounter -26.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Asphalt 3 inches of Gravel Base	6.33 6.08				
Gray, Dry FILL: SILTY SAND, with gravel	3.50		6 5 5		4
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL)		-5	3 5 6	3.0 P	18
			3 6 9	5.0 B	19
		-10	3 5 6	3.5 B	16
			3 7 9	6.0 B	15
		-15	5 7 9	5.8 B	16
Sand seam at 16.5 feet			5 7 8	5.6 B	14
		-20	4 8 11	5.6 B	20

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL) *(continued)*			5 8 12	6.0 B	21
		-25	4 10 9	5.8 B	9
			3 6 7	2.7 B	38
	-26.50 ▼	-30	3 7 11	4.4 B	12
Very Stiff Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)	-28.00	-35	40 50/4"	2.5 P	10
WEATHERED LIMESTONE	-29.00				
Auger refusal at 36 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)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation

Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 2/9/24

ROUTE	FAI 290	**DESCRIPTION**	Retaining Wall Boring	**LOGGED BY**	DV
SECTION	Keeler Avenue over FAI 290	**LOCATION**	, **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8735944, **Longitude** -87.7294361		
COUNTY	COOK	**DRILLING RIG**	Mobile B-57	**HAMMER TYPE**	AUTO
		DRILLING METHOD	HSA	**HAMMER EFF (%)**	89.0

STRUCT. NO.	N/A	**Surface Water Elev.**	N/A ft
Station	N/A	**Stream Bed Elev.**	N/A ft
BORING NO.	RWB-04	**Groundwater Elev.:**	
Station	17+49.55	**First Encounter**	-30.0 ft ▼
Offset	29.21ft RT	**Upon Completion**	N/A ft
Ground Surface Elev.	7.00 ft	**After** N/A **Hrs.**	N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Asphalt 8 inches of Aggregate Base	6.17 5.50		4		
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			4 6	4.4 B	7
			3		
		-5	4 8	2.3 B	17
			4		
			6 7	4.4 B	18
			4		
	-4.00	-10	6 8	4.4 B	19
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)			5		
			10 14	4.8 B	15
	-7.00		10		
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL/ML)		-15	7 8	3.8 B	14
			4		
			5 8	7.7 B	15
			3		
		-20	4 7	2.1 B	17

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			3		
			5 10	4.2 B	22
			14		
		-25	7 8	3.2 B	24
			2		
			3 5	2.1 B	27
			3		
		-30	4 11	2.7 B	11
	-26.50		13		
Stiff Gray, Moist SILTY CLAY LOAM, with sand, trace gravel (ML/CL)		-35	50/5"	1.3 B	11
	-30.00 ▼				
WEATHERED LIMESTONE	-30.50				
Auger refusal at 37.5 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)

BBS, form 137 (Rev. 8-99)

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

SOIL BORING LOG

Date 2/4/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8741333, **Longitude** -87.7312111

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-05
Station 13+34.65
Offset 45.84ft LT
Ground Surface Elev. 9.00 ft

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

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Topsoil	8.50				
Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			3 4 5	6.5 B	15
		-5	3 4 9	4.6 B	18
			3 6 11	4.8 B	17
Silt seams at 9 feet		-10	2 6 9	4.8 B	19
			4 6 10	6.3 B	15
	-4.50				
Hard Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)		-15	6 12 13	4.5 P	12
	-7.00				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			4 6 11	5.2 B	15
		-20	4 7 11	5.4 B	17

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			4 5 11	5.4 B	21
		-25	3 5 6	3.5 B	22
			3 3 5	4.4 B	15
Cobbles at 28.5 feet		-30	6 50/5"	2.5 P	16
	-24.50				
Very Dense Gray, Moist SILTY SAND, trace gravel and limestone fragments (SM)	-26.00	-35	16 50/6"		7
WEATHERED LIMESTONE	-27.00				
Auger refusal at 36 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 2/4/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** MA

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8741205, **Longitude** -87.7308089

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** AUTO
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-06
Station 14+44.10
Offset 39.34ft LT
Ground Surface Elev. 8.00 ft

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

Groundwater Elev.:
First Encounter -25.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Topsoil	7.50				
Gray, Moist FILL: SILTY CLAY, trace gravel			4 3 3	3.0 P	14
	4.50				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL)		-5	1 5 6	5.0 B	18
			1 5 8	5.4 B	19
		-10	4 5 10	5.9 B	13
			4 5 8	4.8 B	15
		-15	3 5 9	5.6 B	15
			4 5 9	5.0 B	19
		-20	4 7 13	5.2 B	19

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL) *(continued)*			6 8 13	5.2 B	20
		-25	4 6 9	3.5 B	22
			4 9 5	3.0 B	15
Silt seam at 29 feet		-30	3 9 13	2.1 B	14
	-25.50 ▼				
Hard Gray, Moist SILTY CLAY, with gravel (CL/ML)		-35	18 50/5"		10
	-29.00				
WEATHERED LIMESTONE					
	-30.00				
Auger refusal at 38 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 2/8/24

ROUTE FAI 290 | DESCRIPTION Retaining Wall Boring | LOGGED BY DV

SECTION Keeler Avenue over FAI 290 | LOCATION , SEC. 15, TWP. 39N, RNG. 13E, Latitude 41.8741028, Longitude -87.7298611

COUNTY COOK | DRILLING RIG Mobile B-57 | HAMMER TYPE AUTO
DRILLING METHOD HSA | HAMMER EFF (%) 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-07
Station 17+2.09
Offset 28.55ft LT
Ground Surface Elev. 7.00 ft

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

Groundwater Elev.:
First Encounter -25.0 ft ▼
Upon Completion N/A ft
After N/A Hrs. N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
12 inches of Asphalt 12 inches of Aggregate Base	6.00		6		
	5.00		5 7	8.1 B	15
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) Sand seam at 2.5 feet			5		
		-5	4 6	4.2 B	18
			5		
			7 8	2.5 B	14
			3		
		-10	9 12	4.0 B	11
			7		
			12 14	8.1 B	14
			5		
		-15	10 10	5.0 B	13
			5		
			7 11	7.9 B	15
			3		
		-20	8 8	6.0 B	18
Very Stiff to Very Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			6		
			6 9	3.3 B	18
			4		
		-25	6 8	3.8 B	24
	-19.00		2		
Stiff Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML)			4 8	1.3 B	21
			3		
		-30	8 9	1.9 B	13
	-25.00 ▼				
WEATHERED LIMESTONE			16 50/2"		6
	-26.00				
Auger refusal at 33 feet End of Boring		-35			
		-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 2/8/24

ROUTE FAI 290 **DESCRIPTION** Retaining Wall Boring **LOGGED BY** DV

SECTION Keeler Avenue over FAI 290 **LOCATION** , **SEC.** 15, **TWP.** 39N, **RNG.** 13E, **Latitude** 41.8741111, **Longitude** -87.7294778

COUNTY COOK **DRILLING RIG** Mobile B-57 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. RWB-08
Station 18+6.53
Offset 29.84ft LT
Ground Surface Elev. 7.00 ft

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

Groundwater Elev.:
First Encounter -31.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Asphalt 12 inches of Aggregate Base	6.17				
	5.17		6 4 6	4.5 P	4
Hard Gray, Dry SILTY CLAY LOAM, trace gravel (ML/CL)	3.50				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel, (CL/ML)		-5	2 3 6	3.8 B	16
Sand seam at 7 feet			3 7 10	4.8 B	13
	-1.50				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL)		-10	5 12 26	4.0 B	10
			4 8 7	6.3 B	14
	-6.50				
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL/ML)		-15	4 7 8	4.2 B	15
			4 5 8	4.2 B	19
		-20	3 4 7	3.8 B	21
Very Stiff to Hard Gray, Moist to Very Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			4 6 6	2.1 B	21
		-25	2 5 6	2.5 B	21
			2 4 5	2.1 B	27
	-21.50				
Very Stiff Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)		-30	8 18 26	3.3 B	11
	-26.50				
Extremely Dense Gray, Moist SILTY SAND, with gravel and limestone fragments (SM)		-35	22 41 47		11
	-31.00 ▼				
WEATHERED LIMESTONE	-31.50				
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)

APPENDIX C

LABORATORY TEST RESULTS

GSG CONSULTANTS, INC.

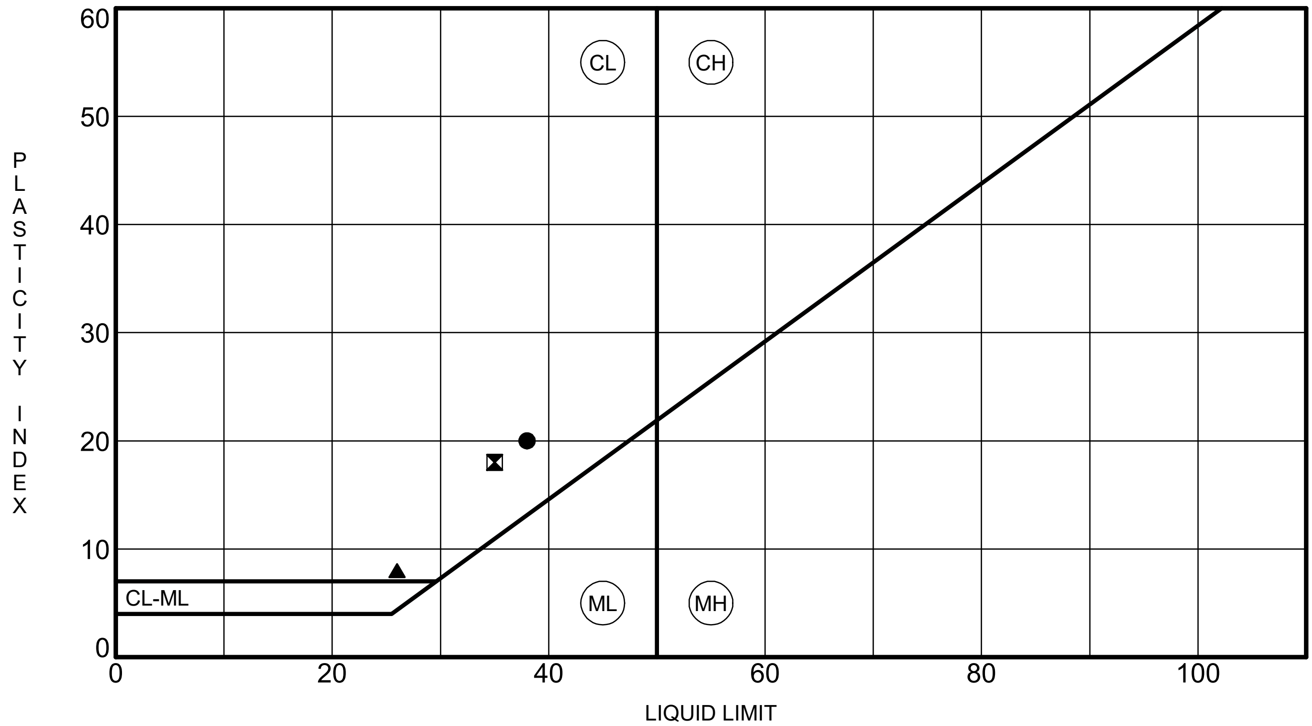
735 Remington Road
Schaumburg, IL 60173
Tel: 630.994.2600
www.gsg-consultants.com

Table D-1 – Atterberg Limits

Boring ID	Sample Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Soil Classification
RWB-03	6.0-8.5	38.0	18.0	20.0	CL
RWB-06	3.5-5.0	35.0	17.0	18.0	CL
RWB-08	8.5-10.0	26.0	18.0	8.0	CL

Table D-2 – Dry Unit Weight

Boring ID	Sample Depth (ft)	Dry Unit Weight (pcf)	Wet Unit Weight (pcf)
RWB-03	6.0-8.5	111.9	132.8
RWB-06	3.5-5.0	114.1	135.1



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**RWB-03**	**6.00**	**38.0**	**18.0**	**20.0**		
⧗	**RWB-06**	**3.50**	**35.0**	**17.0**	**18.0**		
▲	**RWB-08**	**8.50**	**26.0**	**18.0**	**8.0**		

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

ATTERBERG LIMITS' RESULTS

Route: FAI 290

Section: Keeler Avenue over FAI 290

County: COOK

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:	PTB-206-003(Keeler Bridge)	Project No:	23-2004
Boring ID:	BSB-1	Bulk/Prep	MC/CS
Sample Depth (ft):	61-61.5	Tester: RM/SM	Tester: RM/SM
Lithological Description:	Limestone	Date: 02/16/24	Date: 02/16/24
Formation Name:		Load Direction: Vertical	Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):	Cracks		

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.4735	4.4730	4.4790	4.4752
Diameter, *in.*	1.9860	1.9865	1.9860	1.9862

Specimen Mass, *g*	589.8	Ratio (2.0-2.5)	
Bulk Density, *pcf*	162.1		2.25

Moisture Condition - D2216

container, *g*	226.5
container + wet rock, *g*	801.1
container + dry soil, *g*	791.8
moisture content, *w%*	1.6

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

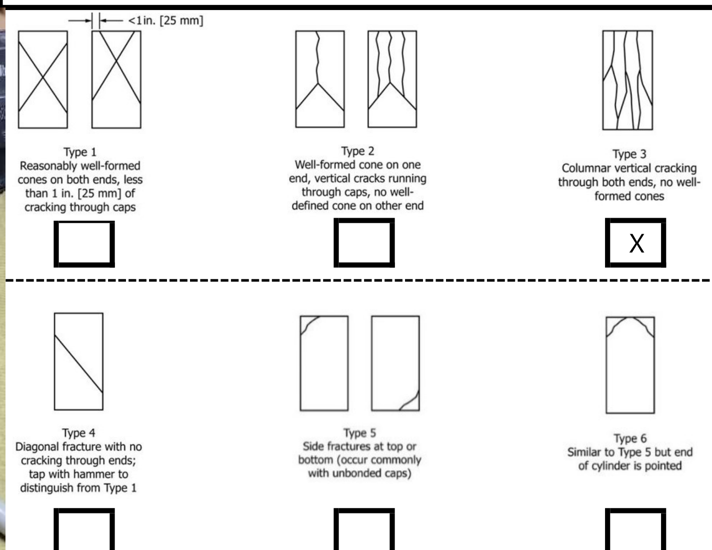
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	1 min 52 sec
Load @ Failure, *lbf*	27,353
Uniaxial Compressive Strength, *psi*	8,828

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)



Sketch if Other:

Form ID	TF-RCS	Reviewed By	SL
Revision Date		Review Date	03/05/24

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:	PTB-206-003(Keeler Bridge)	Project No:	23-2004
Boring ID:	BSB-2	Bulk/Prep	MC/CS
Sample Depth (ft):	59-59.5	Tester: RM/SM	Tester: RM/SM
Lithological Description:	Limestone	Date: 02/16/24	Date: 02/16/24
Formation Name:		Load Direction: Vertical	Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):	Cracke,holes		

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.3595	4.3575	4.3585	4.3585
Diameter, *in.*	1.9890	1.9890	1.9885	1.9888
Specimen Mass, *g*	591.6		Ratio (2.0-2.5)	
Bulk Density, *pcf*	166.5		2.19	

Moisture Condition - D2216

container, *g*	226.6
container + wet rock, *g*	823.6
container + dry soil, *g*	811.3
moisture content, *w%*	2.1

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

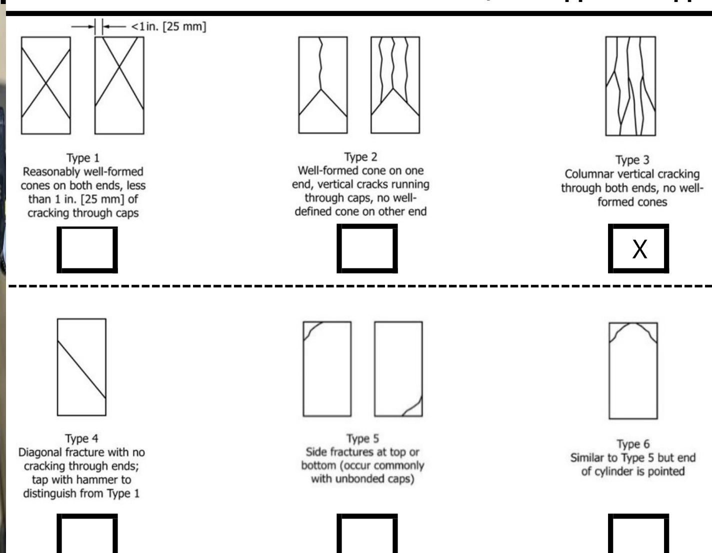
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	2 min 40 sec
Load @ Failure, *lbf*	38,975
Uniaxial Compressive Strength, *psi*	12,546

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)



Sketch if Other:

Form ID	TF-RCS	Reviewed By	SL
Revision Date		Review Date	03/05/24

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:	PTB-206-003(Keeler Bridge)	Project No:	23-2004	
Boring ID:	BSB-3	Bulk/Prep		MC/CS
Sample Depth (ft):	63-63.5	Tester: RM/SM		Tester: RM/SM
Lithological Description:	Limestone	Date: 02/16/24		Date: 02/16/24
Formation Name:		Load Direction: Vertical		Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):	Cracke,holes			

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.5375	4.5370	4.5380	4.5375
Diameter, *in.*	1.9880	1.9885	1.9885	1.9883

Specimen Mass, *g*	615.9	Ratio (2.0-2.5)	
Bulk Density, *pcf*	166.6		2.28

Moisture Condition - D2216

container, *g*	226.9
container + wet rock, *g*	837.5
container + dry soil, *g*	831.2
moisture content, *w%*	1.0

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

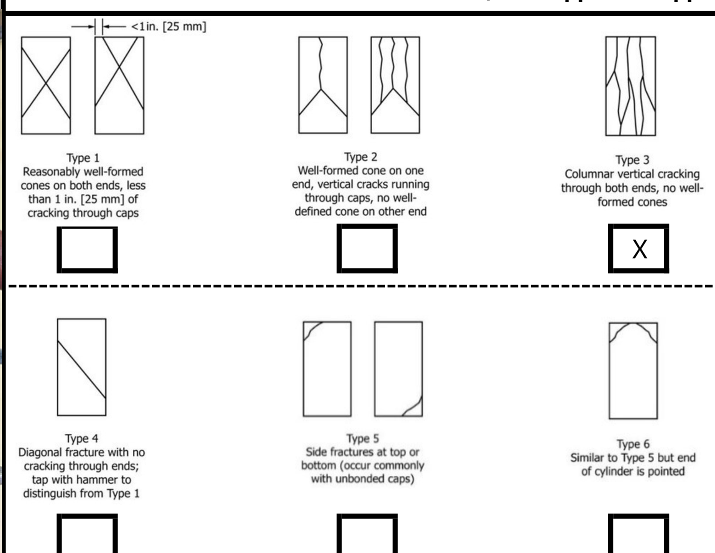
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	1 min 13 sec
Load @ Failure, *lbf*	19,536
Uniaxial Compressive Strength, *psi*	6,292

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)



Sketch if Other:

Form ID	TF-RCS	Reviewed By	SL
Revision Date		Review Date	03/05/24

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:	PTB-206-003(Keeler Bridge)	Project No:	23-2004
Boring ID:	BSB-4	Bulk/Prep	MC/CS
Sample Depth (ft):	52.5-53	Tester: RM/SM	Tester: RM/SM
Lithological Description:	Limestone	Date: 02/16/24	Date: 02/16/24
Formation Name:		Load Direction: Vertical	Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):	Cracke,holes		

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.1990	4.1920	4.1920	4.1943
Diameter, *in.*	1.9870	1.9885	1.9880	1.9878
Specimen Mass, *g*	564.4		Ratio (2.0-2.5)	
Bulk Density, *pcf*	165.2		2.11	

Moisture Condition - D2216

container, *g*	226.9
container + wet rock, *g*	790.2
container + dry soil, *g*	782.8
moisture content, *w%*	1.3

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

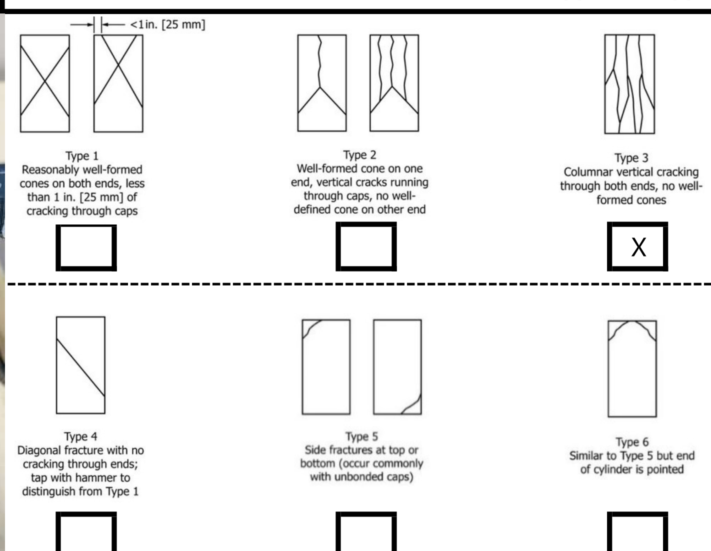
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	1 min 13 sec
Load @ Failure, *lbf*	18,452
Uniaxial Compressive Strength, *psi*	5,946

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)



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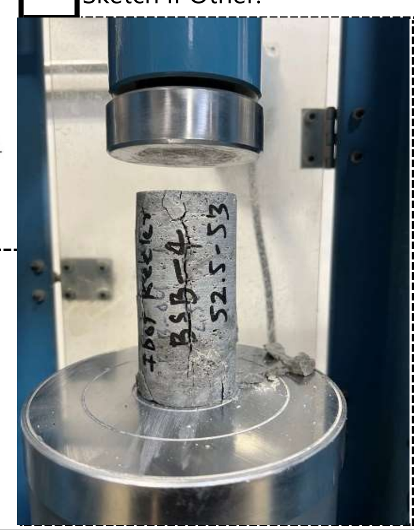


Form ID	TF-RCS	Reviewed By	SL
Revision Date		Review Date	03/05/24

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:	PTB 206-003	Project No:	23-2004
Boring ID:	BSB-06	Bulk/Prep	MC/CS
Sample Depth (ft):	42.5	Tester: TH	ID
Lithological Description:	Limestone	Date: 03/17/25	Date:
Formation Name:		Load Direction: Vertical	Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):			

Bulk Density Determination

	1	2	3	Average
Height, *in.*	3.8610	3.8520	3.8490	3.854
Diameter, *in.*	1.9970	2.0000	1.9930	1.997

Specimen Mass, *g*	516.8	Ratio (2.0-2.5)
Bulk Density, *pcf*	163.2	1.93

Moisture Condition - D2216

container, *g*	470.2
container + wet rock, *g*	986.1
container + dry soil, *g*	984.7
moisture content, *w%*	0.3

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

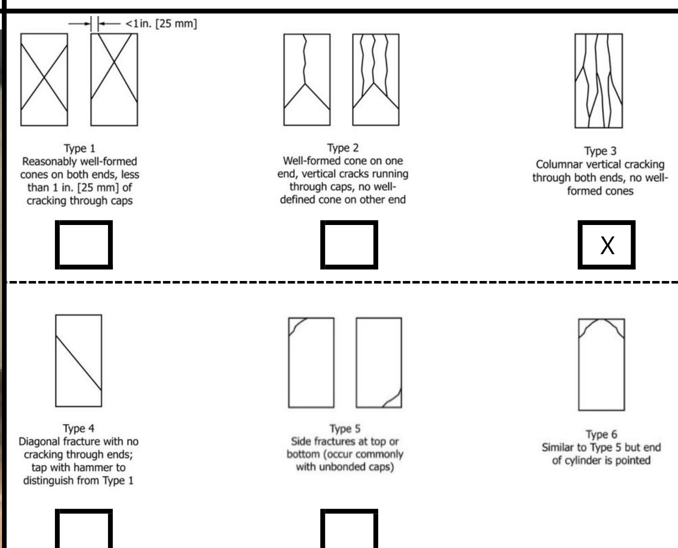
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	0 min 59 sec
Load @ Failure, *lbf*	21,604
Uniaxial Compressive Strength, *psi*	6,900

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)



Sketch if Other:

Form ID	TF-RCS	Reviewed By	Sam
Revision Date	8/25/2024	Review Date	10/29/24

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:	PTB 206-003	Project No:	23-2004
Boring ID:	BSB-07	Bulk/Prep	MC/CS
Sample Depth (ft):	41	Tester: TH	ID
Lithological Description:	Limestone	Date: 03/17/25	Date:
Formation Name:		Load Direction: Vertical	Angle Drilled: Vertical
Appearance (e.g. cracks, shearing, spalling):			

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.2200	4.1800	4.1720	4.191
Diameter, *in.*	1.9950	1.9925	1.9940	1.994

Specimen Mass, *g*	568.8	Ratio (2.0-2.5)	
Bulk Density, *pcf*	165.6	2.10	

Moisture Condition - D2216

container, *g*	471.7
container + wet rock, *g*	1032.5
container + dry soil, *g*	1030.8
moisture content, *w%*	0.3

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

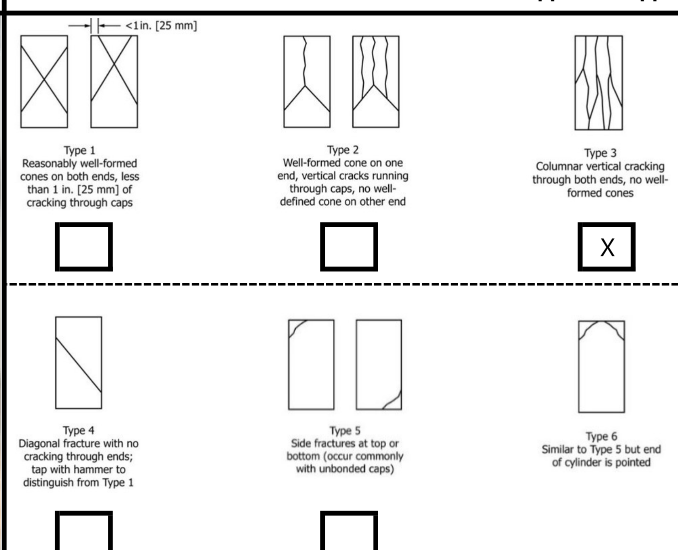
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	2 min 1 sec
Load @ Failure, *lbf*	33,511
Uniaxial Compressive Strength, *psi*	10,733

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)



Sketch if Other:

Form ID	TF-RCS	Reviewed By	Sam
Revision Date	8/25/2024	Review Date	10/29/24

APPENDIX E

SOIL PARAMETERS

TABLE

Table E1: Summary of Soil Parameters

Elevation Range (CCD/NAVD 88)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained		Lateral Earth Pressure Parameters (Drained)			LPILE Model and Parameters		
			Cohesion c (psf)	Friction Angle ϕ (°)	Cohesion c (psf)	Friction Angle ϕ (°)	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At Rest Earth Pressure Coefficient (K_o)	Lateral Modulus of Subgrade Reaction (pci)	Soil Strain (ε_{50})	Soil Type
	New Engineered Clay Fill	125	1,000	0	100	25	0.41	2.46	0.58	100	0.01	Stiff Clay w/o free water (Reese)
	New Engineered Granular Fill	125	0	32	0	32	0.33	3.00	0.50	90	N/A	Sand (Reese)
23.5 to 17.5 602.7 to 596.7	Brown and Gray Silty Clay Fill	134	1,500	0	150	26	0.39	2.56	0.56	500	0.007	Stiff Clay w/o free water (Reese)
17.5 to 12.5 596.7 to 591.7	Brown and Gray Very Stiff Silty Clay	138	2,500	0	250	28	0.36	2.77	0.53	1,000	0.005	Stiff Clay w/o free water (Reese)
12.5 to 3.5 591.7 to 582.7	Gray Stiff to Very Stiff Silty Clay	138	2,700	0	270	28	0.36	2.77	0.53	1,000	0.005	Stiff Clay w/o free water (Reese)
3.5 to (-27.5) 582.7 to 551.7	Gray Stiff to Very Hard Silty Clay	138	4,500	0	450	28	0.36	2.77	0.53	2,000	0.004	Stiff Clay w/o free water (Reese)
7.5 to 4.0 586.7 to 583.2 ***RWB Borings**	Brown and Gray Silty Clay Fill	134	1,500	0	150	26	0.39	2.56	0.56	500	0.007	Stiff Clay w/o free water (Reese)
(-3.5) to (-6.0) 575.7 to 573.2 ***RWB-02 Only**	Gray Dense Silty Sand	133	0	42	0	42	0.20	5.04	0.33	125	N/A	Sand (Reese)
(-5.2) to (-10.2) 574.0 to 569.0 ***BSB-02 Only**	Gray Dense Gravel with Clay	132	0	39	0	39	0.23	4.39	0.37	125	N/A	Sand (Reese)
(-26.0) to (-28.5) 553.2 to 550.7 ***BSB-03, RWB-01,05,08 Only**	Gray Very Dense to Extremely Dense Silty Sand	138	0	42	0	42	0.20	5.04	0.33	125	N/A	Sand (Reese)

Elevation Range (CCD/NAVD 88)	Soil Description	Moist Unit Weight γ (pcf)	Effective Unit Weight γ' (pcf)	Uniaxial Compressive Strength q_u (psi)	LPILE p-y Soil Model
(-28.5) to (-43.5) 550.7 to 535.7	Gray Moderately Fractured Limestone	165	102.6	8,400	Strong Rock (Vuggy Limestone)

APPENDIX F

IDOT DRIVEN

PILE TABLES

Pile Design Table for South Abutment utilizing Boring #BSB-01

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	51	28	4
	134	74	12
	187	103	17
	222	122	22
	258	142	26
Metal Shell 14"Φ w/.25" walls			
	63	35	4
	165	91	12
	227	125	17
	264	145	22
	307	169	26
Metal Shell 14"Φ w/.312" walls			
	63	35	4
	165	91	12
	227	125	17
	264	145	22
	307	169	26
Metal Shell 16"Φ w/.312" walls			
	76	42	4
	198	109	12
	269	148	17
	308	170	22
	357	196	26
Metal Shell 16"Φ w/.375" walls			
	76	42	4
	198	109	12
	269	148	17
	308	170	22
	357	196	26
	773	425	27
Steel HP 8 X 36			
	54	30	12
	94	52	17
	111	61	22
	131	72	26
	171	94	27
	206	113	33
	286	157	34

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	67	37	12
	117	65	17
	141	78	22
	166	91	26
	213	117	27
	255	140	33
	335	184	34
Steel HP 10 X 57			
	69	38	12
	120	66	17
	145	80	22
	169	93	26
	218	120	27
	264	145	33
	454	250	35
Steel HP 12 X 53			
	80	44	12
	140	77	17
	177	98	22
	207	114	26
	255	140	27
	306	168	33
	418	230	34
Steel HP 12 X 63			
	68	37	7
	82	45	12
	144	79	17
	179	99	22
	209	115	26
	261	143	27
	315	173	33
	497	273	34
Steel HP 12 X 74			
	70	39	7
	84	46	12
	146	80	17
	182	100	22
	212	117	26
	265	146	27
	322	177	33
	589	324	35

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	72	40	7
	86	47	12
	148	82	17
	185	102	22
	215	118	26
	269	148	27
	329	181	33
	664	365	35
Steel HP 14 X 73			
	51	28	4
	81	44	7
	97	54	12
	170	94	17
	220	121	22
	255	140	26
	309	170	27
	373	205	33
	578	318	34
Steel HP 14 X 89			
	53	29	4
	84	46	7
	100	55	12
	174	96	17
	223	123	22
	258	142	26
	315	173	27
	384	211	33
	705	388	35
Steel HP 14 X 102			
	54	30	4
	86	48	7
	103	56	12
	177	97	17
	226	124	22
	262	144	26
	320	176	27
	392	215	33
	810	445	35
Steel HP 14 X 117			
	55	30	4
	90	49	7
	105	58	12
	180	99	17
	229	126	22
	265	146	26
	326	179	27
	402	221	33
	929	511	36
Precast 14"x 14"			
	81	44	4

Pile Design Table for South Abutment utilizing Boring #BSB-02

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	69	38	4
	216	119	7
	266	146	17
	301	166	22
	342	188	26
Metal Shell 14"Φ w/.25" walls			
	69	38	2
	87	48	4
	269	148	7
Metal Shell 14"Φ w/.312" walls			
	69	38	2
	87	48	4
	269	148	7
	323	178	17
	360	198	22
	408	224	26
Metal Shell 16"Φ w/.312" walls			
	69	38	2
	87	48	4
	269	148	7
	323	178	17
	360	198	22
	408	224	26
Metal Shell 16"Φ w/.375" walls			
	69	38	2
	87	48	4
	269	148	7
	323	178	17
	360	198	22
	408	224	26
Steel HP 8 X 36			
	72	40	12
	89	49	17
	119	65	22
	141	78	26
	155	85	27
	178	98	32
	204	112	33
	286	157	34

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	64	35	7
	89	49	12
	111	61	17
	155	85	22
	182	100	26
	201	111	27
	231	127	32
	253	139	33
	335	184	34
Steel HP 10 X 57			
	67	37	7
	93	51	12
	114	63	17
	159	87	22
	187	103	26
	207	114	27
	235	130	32
	261	144	33
	454	250	35
Steel HP 12 X 53			
	77	42	7
	107	59	12
	133	73	17
	190	104	22
	232	127	26
	252	139	27
	276	152	32
	303	167	33
	418	230	34
Steel HP 12 X 63			
	80	44	7
	111	61	12
	136	75	17
	194	107	22
	234	129	26
	258	142	27
	282	155	32
	312	171	33
	497	273	35
Steel HP 12 X 74			
	50	28	4
	82	45	7
	114	63	12
	139	77	17
	197	108	22
	238	131	26
	261	143	27
	286	157	32
	319	175	33
	589	324	35

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	52	28	4
	84	46	7
	117	64	12
	142	78	17
	199	110	22
	242	133	26
	264	145	27
	290	160	32
	325	179	33
	664	365	36
Steel HP 14 X 73			
	58	32	4
	93	51	7
	131	72	12
	161	89	17
	230	126	22
	288	158	26
	305	168	27
	334	184	32
	369	203	33
	578	318	35
Steel HP 14 X 89			
	60	33	4
	97	53	7
	136	75	12
	166	91	17
	234	129	22
	293	161	26
	311	171	27
	341	187	32
	380	209	33
	705	388	35
Steel HP 14 X 102			
	62	34	4
	99	54	7
	140	77	12
	169	93	17
	237	130	22
	296	163	26
	314	173	27
	345	190	32
	388	213	33
	810	445	36
Steel HP 14 X 117			
	64	35	4
	102	56	7
	144	79	12
	174	95	17
	241	133	22
	300	165	26
	319	176	27
	352	193	32
	398	219	33
	929	511	36
Precast 14"x 14"			
	64	35	4
	102	56	7
	144	79	12
	174	95	17
	241	133	22
	300	165	26
	319	176	27
	352	193	32
	398	219	33

Pile Design Table for North Abutment utilizing Boring #BSB-03

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	75	41	4
	115	64	6
	163	90	11
	185	102	16
	231	127	21
	269	148	25
Metal Shell 14"Φ w/.25" walls			
	71	39	1
	97	53	4
	146	80	6
	201	111	11
	221	122	16
	276	152	21
	320	176	25
Metal Shell 14"Φ w/.312" walls			
	71	39	1
	97	53	4
	146	80	6
	201	111	11
	221	122	16
	276	152	21
	320	176	25
	536	295	26
Metal Shell 16"Φ w/.312" walls			
	71	39	1
	97	53	4
	146	80	6
	201	111	11
	221	122	16
	276	152	21
	320	176	25
	536	295	26
Metal Shell 16"Φ w/.375" walls			
	71	39	1
	97	53	4
	146	80	6
	201	111	11
	221	122	16
	276	152	21
	320	176	25
	536	295	26
Steel HP 8 X 36			
	51	28	6
	91	50	11
	106	59	16
	133	73	21
	154	85	25
	176	97	26
	225	124	30
	286	157	31

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	64	35	6
	114	63	11
	136	75	16
	170	94	21
	195	107	25
	227	125	26
	280	154	30
	335	184	31
Steel HP 10 X 57			
	67	37	6
	117	64	11
	139	76	16
	174	96	21
	200	110	25
	233	128	26
	289	159	30
	454	250	32
Steel HP 12 X 53			
	76	42	6
	136	75	11
	170	94	16
	214	118	21
	244	134	25
	288	159	26
	335	184	30
	418	230	31
Steel HP 12 X 63			
	79	44	6
	140	77	11
	172	95	16
	216	119	21
	246	136	25
	291	160	26
	345	190	30
	497	273	32
Steel HP 12 X 74			
	48	26	4
	82	45	6
	143	78	11
	175	96	16
	220	121	21
	250	138	25
	296	163	26
	352	194	30
	589	324	32

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	49	27	4
	84	46	6
	145	80	11
	178	98	16
	223	123	21
	254	140	25
	301	166	26
	359	197	30
	664	365	33
Steel HP 14 X 73			
	54	30	4
	94	52	6
	165	91	11
	211	116	16
	265	146	21
	301	166	25
	359	197	26
	408	224	30
	578	318	31
Steel HP 14 X 89			
	57	31	4
	98	54	6
	170	93	11
	214	118	16
	269	148	21
	305	168	25
	365	201	26
	419	231	30
	705	388	32
Steel HP 14 X 102			
	59	32	4
	101	55	6
	173	95	11
	217	119	16
	273	150	21
	309	170	25
	369	203	26
	427	235	30
	810	445	33
Steel HP 14 X 117			
	61	34	4
	104	57	6
	177	97	11
	220	121	16
	276	152	21
	313	172	25
	375	206	26
	438	241	30
	929	511	33
Precast 14"x 14"			
	61	34	4
	104	57	6
	177	97	11
	220	121	16
	276	152	21
	313	172	25
	375	206	26
	438	241	30

Pile Design Table for North Abutment utilizing Boring #BSB-04

	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**			
	51	28	1		43	23	6		57	31	6
	98	54	6		92	51	11		117	64	11
	142	78	11		139	76	16		179	98	16
	193	106	16		179	98	21		238	131	21
	250	137	21		188	104	26		242	133	26
	278	153	26		193	106	27		248	136	27
	286	157	27		256	141	28		329	181	28
Metal Shell 14"Φ w/.25" walls					285	157	29		365	201	29
	69	38	1		335	184	30		664	365	32
	124	68	6	**Steel HP 10 X 57**				**Steel HP 14 X 73**			
	174	96	11		45	25	6		63	35	6
	234	128	16		95	52	11		134	74	11
	300	165	21		142	78	16		206	114	16
	329	181	26		183	101	21		280	154	21
	338	186	27		193	106	26		284	156	26
Metal Shell 14"Φ w/.312" walls					197	109	27		291	160	27
	69	38	1		263	144	28		380	209	28
	124	68	6		294	162	29		415	228	29
	174	96	11		454	250	31		578	318	30
	234	128	16	**Steel HP 12 X 53**				**Steel HP 14 X 89**			
	300	165	21		51	28	6		66	36	6
	329	181	26		110	61	11		137	75	11
	338	186	27		171	94	16		210	116	16
Metal Shell 16"Φ w/.312" walls					227	125	21		285	157	21
	69	38	1		233	128	26		288	158	26
	124	68	6		239	131	27		295	162	27
	174	96	11		314	173	28		387	213	28
	234	128	16		341	188	29		426	235	29
	300	165	21		418	230	30		705	388	31
	329	181	26	**Steel HP 12 X 63**				**Steel HP 14 X 102**			
	338	186	27		53	29	6		68	38	6
Metal Shell 16"Φ w/.375" walls					113	62	11		139	77	11
	69	38	1		174	96	16		213	117	16
	124	68	6		230	126	21		288	158	21
	174	96	11		235	129	26		291	160	26
	234	128	16		241	132	27		298	164	27
	300	165	21		321	177	28		392	216	28
	329	181	26		351	193	29		435	239	29
	338	186	27		497	273	30		810	445	32
Steel HP 8 X 36				**Steel HP 12 X 74**				**Steel HP 14 X 117**			
	74	41	11		55	31	6		71	39	6
	106	59	16		115	63	11		143	78	11
	138	76	21		177	97	16		217	119	16
	150	82	26		234	129	21		293	161	21
	154	85	27		239	131	26		295	162	26
	196	108	28		244	134	27		302	166	27
	229	126	29		325	179	28		399	219	28
	286	157	30		358	197	29		445	245	29
					589	324	31		929	511	32
								Precast 14"x 14"			
									71	39	6
									143	78	11
									217	119	16
									293	161	21
									295	162	26
									302	166	27
									399	219	28
									445	245	29

Pile Design Table for North Pier utilizing Boring #BSB-05

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	59	33	3
	99	55	6
	123	68	8
	153	84	13
	172	95	16
	189	104	18
	206	113	21
	229	126	23
	250	138	26
	284	156	30
Metal Shell 14"Φ w/.25" walls			
	77	42	3
	127	70	6
	154	85	8
	186	102	13
	208	114	16
	226	124	18
	245	135	21
	273	150	23
	298	164	26
	337	185	30
Metal Shell 14"Φ w/.312" walls			
	77	42	3
	127	70	6
	154	85	8
	186	102	13
	208	114	16
	226	124	18
	245	135	21
	273	150	23
	298	164	26
	337	185	30
Metal Shell 16"Φ w/.312" walls			
	77	42	3
	127	70	6
	154	85	8
	186	102	13
	208	114	16
	226	124	18
	245	135	21
	273	150	23
	298	164	26
	337	185	30
Metal Shell 16"Φ w/.375" walls			
	77	42	3
	127	70	6
	154	85	8
	186	102	13
	208	114	16
	226	124	18
	245	135	21
	273	150	23
	298	164	26
	337	185	30
Steel HP 8 X 36			
	72	40	11
	84	46	13
	95	52	16
	103	56	18
	111	61	21
	125	69	23
	137	75	26
	155	85	30
	213	117	30
	286	157	31

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	76	42	8
	94	52	11
	104	57	13
	123	68	16
	132	72	18
	141	78	21
	159	88	23
	173	95	26
	196	108	30
	265	146	30
	335	184	31
Steel HP 10 X 57			
	79	43	8
	96	53	11
	107	59	13
	126	70	16
	135	74	18
	145	80	21
	163	90	23
	177	98	26
	201	110	30
	274	151	30
	454	250	32
Steel HP 12 X 53			
	61	34	6
	91	50	8
	116	64	11
	125	69	13
	154	85	16
	166	91	18
	176	97	21
	200	110	23
	217	119	26
	244	134	30
	318	175	30
	418	230	31
Steel HP 12 X 63			
	64	35	6
	94	52	8
	119	65	11
	128	70	13
	157	87	16
	168	92	18
	178	98	21
	202	111	23
	219	120	26
	246	135	30
	327	180	30
	497	273	32
Steel HP 12 X 74			
	66	36	6
	96	53	8
	120	66	11
	130	72	13
	159	88	16
	170	94	18
	181	100	21
	205	113	23
	222	122	26
	250	137	30
	334	184	30
	589	324	32

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	68	37	6
	98	54	8
	122	67	11
	132	73	13
	161	89	16
	173	95	18
	184	101	21
	208	114	23
	225	124	26
	254	139	30
	340	187	30
	664	365	33
Steel HP 14 X 73			
	75	41	6
	111	61	8
	141	77	11
	151	83	13
	186	102	16
	206	113	18
	218	120	21
	247	136	23
	267	147	26
	299	165	30
	387	213	30
	578	318	32
Steel HP 14 X 89			
	79	43	6
	115	63	8
	143	79	11
	155	85	13
	190	104	16
	209	115	18
	221	121	21
	250	138	23
	271	149	26
	303	167	30
	398	219	30
	705	388	32
Steel HP 14 X 102			
	40	22	3
	81	45	6
	117	65	8
	145	80	11
	157	86	13
	192	106	16
	212	117	18
	224	123	21
	254	140	23
	274	151	26
	307	169	30
	406	223	30
	810	445	33
Steel HP 14 X 117			
	42	23	3
	85	47	6
	121	67	8
	148	81	11
	160	88	13
	195	107	16
	215	118	18
	227	125	21
	257	141	23
	278	153	26
	311	171	30
	416	229	30
	929	511	33
Precast 14"x 14"			
	42	23	3
	85	47	6
	121	67	8
	148	81	11
	160	88	13
	195	107	16
	215	118	18
	227	125	21
	257	141	23
	278	153	26
	311	171	30
	416	229	30

Pile Design Table for North Pier utilizing Boring #BSB-06

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	58	32	4
	90	50	6
	131	72	11
	171	94	14
	179	98	16
	199	109	19
	220	121	21
	268	148	24
	366	201	26
	372	205	27
Metal Shell 14"Φ w/.25" walls			
	75	41	4
	114	62	6
	159	88	11
	209	115	14
	215	118	16
	238	131	19
	262	144	21
	324	178	24
	452	249	26
Metal Shell 14"Φ w/.312" walls			
	75	41	4
	114	62	6
	159	88	11
	209	115	14
	215	118	16
	238	131	19
	262	144	21
	324	178	24
	452	249	26
	459	253	27
Metal Shell 16"Φ w/.312" walls			
	75	41	4
	114	62	6
	159	88	11
	209	115	14
	215	118	16
	238	131	19
	262	144	21
	324	178	24
	452	249	26
	459	253	27
Metal Shell 16"Φ w/.375" walls			
	75	41	4
	114	62	6
	159	88	11
	209	115	14
	215	118	16
	238	131	19
	262	144	21
	324	178	24
	452	249	26
	459	253	27
Steel HP 8 X 36			
	78	43	11
	101	56	14
	104	57	16
	115	63	19
	126	69	21
	158	87	24
	159	88	26
	160	88	27
	213	117	31
	286	157	32

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	53	29	6
	82	45	9
	102	56	11
	126	69	14
	134	74	16
	146	81	19
	161	88	21
	203	112	26
	204	112	27
	264	145	31
	335	184	32
Steel HP 10 X 57			
	55	30	6
	86	47	9
	104	57	11
	129	71	14
	138	76	16
	150	83	19
	164	90	21
	208	114	26
	209	115	27
	273	150	31
	454	250	33
Steel HP 12 X 53			
	63	35	6
	98	54	9
	122	67	11
	151	83	14
	170	94	16
	184	101	19
	201	111	21
	255	140	26
	256	141	27
	317	174	31
	418	230	32
Steel HP 12 X 63			
	65	36	6
	102	56	9
	124	68	11
	155	85	14
	172	95	16
	186	102	19
	203	112	21
	258	142	26
	259	142	27
	326	179	31
	497	273	33
Steel HP 12 X 74			
	67	37	6
	105	58	9
	126	69	11
	157	86	14
	175	96	16
	189	104	19
	206	114	21
	262	144	26
	263	145	27
	333	183	31
	589	324	33

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	69	38	6
	108	59	9
	128	70	11
	160	88	14
	178	98	16
	192	106	19
	210	115	21
	266	146	26
	267	147	27
	339	187	31
	664	365	34
Steel HP 14 X 73			
	77	42	6
	120	66	9
	147	81	11
	183	101	14
	213	117	16
	229	126	19
	249	137	21
	313	172	24
	316	174	26
	318	175	27
	386	212	31
	578	318	33
Steel HP 14 X 89			
	80	44	6
	125	69	9
	150	83	11
	187	103	14
	216	119	16
	232	128	19
	252	139	21
	318	175	24
	320	176	26
	322	177	27
	397	218	31
	705	388	33
Steel HP 14 X 102			
	46	25	4
	82	45	6
	128	71	9
	152	84	11
	190	105	14
	219	121	16
	235	129	19
	256	141	21
	322	177	24
	325	179	26
	327	180	27
	405	223	31
	810	445	34
Steel HP 14 X 117			
	48	26	4
	85	47	6
	133	73	9
	155	85	11
	194	107	14
	222	122	16
	238	131	19
	259	142	21
	327	180	24
	329	181	26
	331	182	27
	415	228	31
	929	511	34
Precast 14"x 14"			
	48	26	4
	85	47	6
	133	73	9
	155	85	11
	194	107	14
	222	122	16
	238	131	19
	259	142	21
	327	180	24
	329	181	26
	331	182	27
	415	228	31

Pile Design Table for South Pier utilizing Boring #BSB-07

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	65	36	6
	144	79	11
	155	85	13
	164	90	16
	186	102	18
	203	112	21
	220	121	23
	360	198	26
	390	214	30
Metal Shell 14"Φ w/.25" walls			
	50	28	3
	82	45	6
	183	101	11
	193	106	13
	200	110	16
	225	124	18
	244	134	21
	263	144	23
	449	247	26
Metal Shell 14"Φ w/.312" walls			
	50	28	3
	82	45	6
	183	101	11
	193	106	13
	200	110	16
	225	124	18
	244	134	21
	263	144	23
	449	247	26
	483	266	30
Metal Shell 16"Φ w/.312" walls			
	63	35	3
	101	56	6
	226	124	11
	234	129	13
	239	132	16
	267	147	18
	286	157	21
	306	169	23
	546	301	26
	585	322	30
Metal Shell 16"Φ w/.375" walls			
	63	35	3
	101	56	6
	226	124	11
	234	129	13
	239	132	16
	267	147	18
	286	157	21
	306	169	23
	546	301	26
	585	322	30
Steel HP 8 X 36			
	74	41	13
	92	51	16
	106	58	18
	113	62	21
	122	67	23
	146	80	26
	151	83	30
	177	97	31
	201	111	34
	286	157	35

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	68	38	11
	92	50	13
	115	63	16
	138	76	18
	146	80	21
	155	85	23
	188	103	26
	194	107	30
	224	123	31
	250	138	34
	335	184	35
Steel HP 10 X 57			
	73	40	11
	95	52	13
	117	65	16
	142	78	18
	150	82	21
	159	87	23
	192	106	26
	199	109	30
	229	126	31
	259	142	34
	454	250	36
Steel HP 12 X 53			
	70	38	8
	82	45	11
	110	60	13
	137	75	16
	167	92	18
	185	102	21
	194	107	23
	238	131	26
	245	135	30
	268	147	31
	300	165	34
	418	230	35
Steel HP 12 X 63			
	72	40	8
	86	47	11
	113	62	13
	141	77	16
	170	94	18
	187	103	21
	196	108	23
	241	132	26
	248	136	30
	274	151	31
	309	170	34
	497	273	35
Steel HP 12 X 74			
	73	40	8
	89	49	11
	116	64	13
	143	79	16
	173	95	18
	190	104	21
	199	109	23
	245	135	26
	252	139	30
	278	153	31
	316	174	34
	589	324	36

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	75	41	8
	92	51	11
	119	65	13
	145	80	16
	175	96	18
	193	106	21
	202	111	23
	249	137	26
	256	141	30
	282	155	31
	322	177	34
	664	365	36
Steel HP 14 X 73			
	54	30	6
	85	47	8
	101	56	11
	134	74	13
	166	92	16
	202	111	18
	231	127	21
	239	132	23
	298	164	26
	307	169	30
	325	178	31
	365	201	34
	578	318	35
Steel HP 14 X 89			
	56	31	6
	87	48	8
	106	58	11
	138	76	13
	170	94	16
	206	113	18
	234	129	21
	243	133	23
	302	166	26
	311	171	30
	331	182	31
	376	207	34
	705	388	36
Steel HP 14 X 102			
	57	32	6
	89	49	8
	110	60	11
	142	78	13
	173	95	16
	208	115	18
	237	131	21
	246	135	23
	307	169	26
	315	174	30
	336	185	31
	384	211	34
	810	445	36
Steel HP 14 X 117			
	59	33	6
	91	50	8
	114	63	11
	146	80	13
	176	97	16
	212	117	18
	241	132	21
	249	137	23
	311	171	26
	320	176	30
	342	188	31
	394	217	34
	929	511	37
Precast 14"x 14"			
	64	35	3
	105	58	6
	233	128	11
	246	135	13
	255	140	16

Pile Design Table for South Pier utilizing Boring #BSB-08

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	45	25	4
	113	62	12
	148	82	17
	179	98	19
	203	112	22
	219	120	24
	330	181	27
	353	194	31
Metal Shell 14"Φ w/.25" walls			
	59	33	4
	144	79	12
	181	100	17
	218	120	19
	245	135	22
	262	144	24
	408	225	27
	435	239	31
Metal Shell 14"Φ w/.312" walls			
	59	33	4
	144	79	12
	181	100	17
	218	120	19
	245	135	22
	262	144	24
	408	225	27
	435	239	31
Metal Shell 16"Φ w/.312" walls			
	76	42	4
	177	97	12
	216	119	17
	259	143	19
	290	160	22
	307	169	24
	494	272	27
	524	288	31
Metal Shell 16"Φ w/.375" walls			
	76	42	4
	177	97	12
	216	119	17
	259	143	19
	290	160	22
	307	169	24
	494	272	27
	524	288	31
	763	420	32
Steel HP 8 X 36			
	72	39	17
	93	51	19
	107	59	22
	114	63	24
	129	71	27
	133	73	31
	163	89	32
	188	104	36
	286	157	37

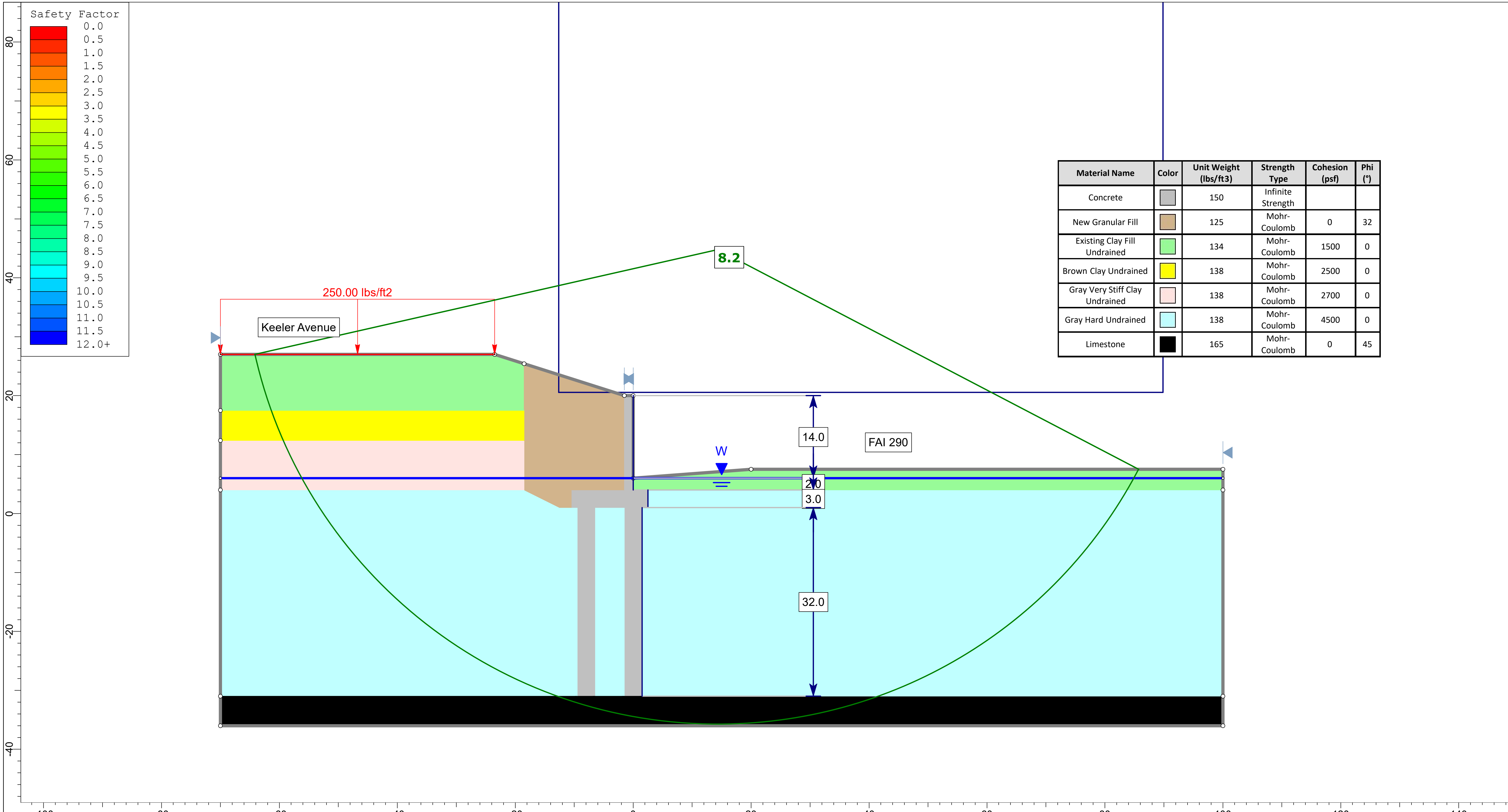
	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	68	37	14
	89	49	17
	115	63	19
	140	77	22
	147	81	24
	166	91	27
	171	94	31
	202	111	32
	234	128	36
	335	184	37
Steel HP 10 X 57			
	72	39	14
	92	50	17
	118	65	19
	143	79	22
	151	83	24
	170	94	27
	175	96	31
	207	114	32
	242	133	36
	454	250	38
Steel HP 12 X 53			
	49	27	12
	82	45	14
	107	59	17
	138	76	19
	168	92	22
	186	103	24
	210	115	27
	215	119	31
	242	133	32
	280	154	36
	418	230	37
Steel HP 12 X 63			
	52	29	12
	85	47	14
	110	60	17
	141	78	19
	172	94	22
	189	104	24
	212	117	27
	218	120	31
	248	136	32
	289	159	36
	497	273	37
Steel HP 12 X 74			
	54	30	12
	88	48	14
	112	61	17
	144	79	19
	174	96	22
	192	105	24
	215	119	27
	221	122	31
	252	139	32
	296	163	36
	589	324	38

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84			
	56	31	12
	91	50	14
	114	62	17
	146	80	19
	176	97	22
	195	107	24
	219	120	27
	225	124	31
	256	141	32
	302	166	36
	664	365	38
Steel HP 14 X 73			
	61	34	12
	100	55	14
	130	71	17
	167	92	19
	203	112	22
	233	128	24
	262	144	27
	269	148	31
	294	162	32
	341	188	36
	578	318	37
Steel HP 14 X 89			
	65	36	12
	105	58	14
	133	73	17
	171	94	19
	207	114	22
	237	130	24
	265	146	27
	272	150	31
	300	165	32
	352	194	36
	705	388	38
Steel HP 14 X 102			
	67	37	12
	108	60	14
	135	74	17
	174	96	19
	210	115	22
	240	132	24
	269	148	27
	276	152	31
	305	168	32
	360	198	36
	810	445	39
Steel HP 14 X 117			
	71	39	12
	112	62	14
	138	76	17
	177	98	19
	214	117	22
	243	134	24
	273	150	27
	280	154	31
	311	171	32
	370	204	36
	929	511	39
Precast 14"x 14"			
	76	42	4
	183	101	12
	230	127	17

APPENDIX G

SLOPE STABILITY

ANALYSIS EXHIBITS

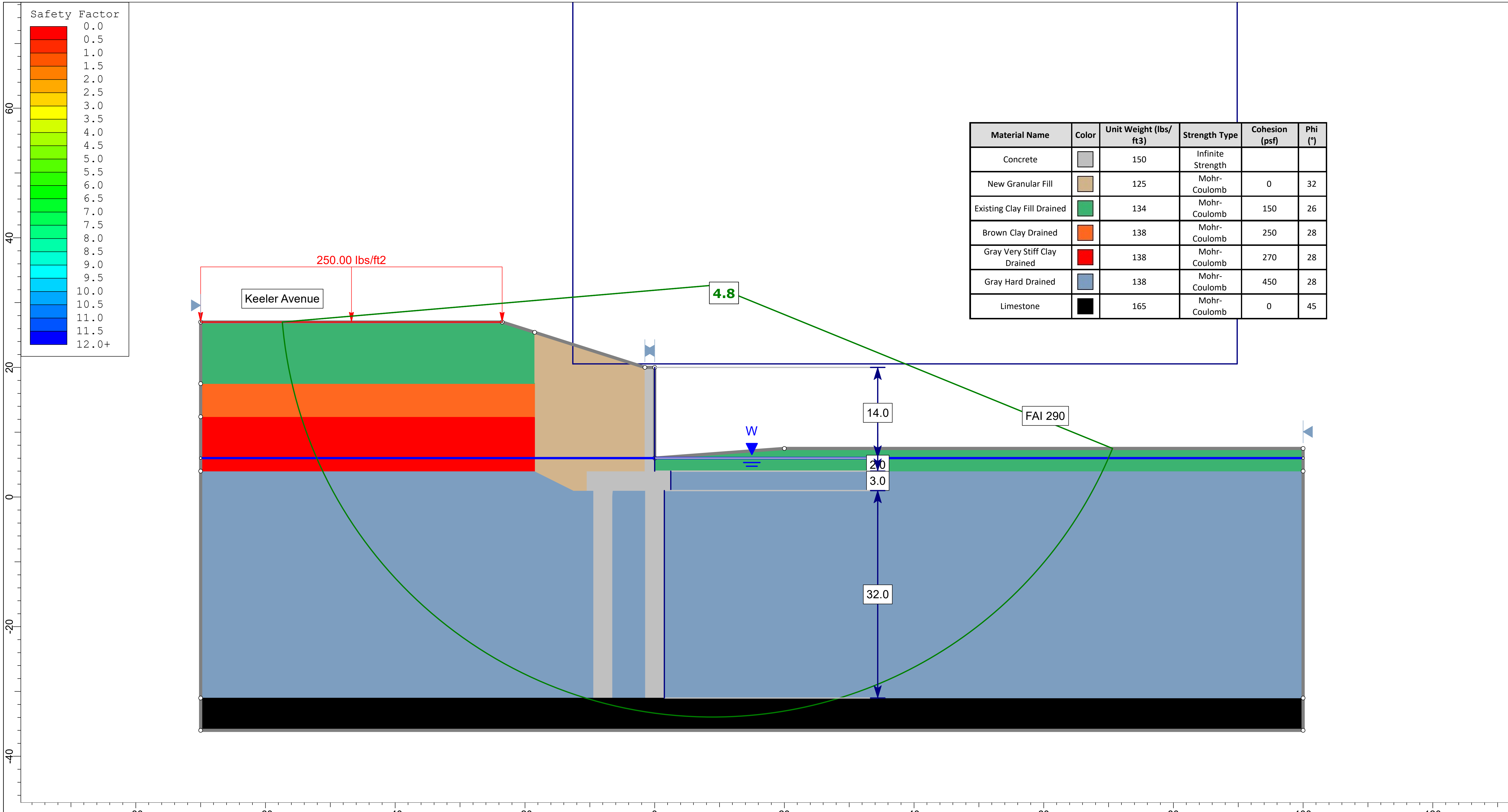


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Concrete		150	Infinite Strength		
New Granular Fill		125	Mohr-Coulomb	0	32
Existing Clay Fill Undrained		134	Mohr-Coulomb	1500	0
Brown Clay Undrained		138	Mohr-Coulomb	2500	0
Gray Very Stiff Clay Undrained		138	Mohr-Coulomb	2700	0
Gray Hard Undrained		138	Mohr-Coulomb	4500	0
Limestone		165	Mohr-Coulomb	0	45

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

SLIDEINTERPRET 9.034

Project	PTB 206-003 SN 016-2093: Keeler Avenue over FAI 290
Analysis Description	Exhibit 1 - CIP Wall with Drilled Shafts - Circular Failure Short Term
Drawn By	MH
Company	GSG Consultants, Inc.
Date	3/12/2024, 12:04:57 PM
File Name	keeler sgr_CIP.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Concrete		150	Infinite Strength		
New Granular Fill		125	Mohr-Coulomb	0	32
Existing Clay Fill Drained		134	Mohr-Coulomb	150	26
Brown Clay Drained		138	Mohr-Coulomb	250	28
Gray Very Stiff Clay Drained		138	Mohr-Coulomb	270	28
Gray Hard Drained		138	Mohr-Coulomb	450	28
Limestone		165	Mohr-Coulomb	0	45

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

SLIDEINTERPRET 9.034

Project	PTB 206-003 SN 016-2093: Keeler Avenue over FAI 290
Analysis Description	Exhibit 2 - CIP Wall with Drilled Shafts - Circular Failure Long Term
Drawn By	MH
Company	GSG Consultants, Inc.
Date	3/12/2024, 12:04:57 PM
File Name	keeler sgr_CIP.slmd

APPENDIX H

PILE DRIVING NOISE AND

VIBRATION EFFECTS EXHIBITS

D = distance, in feet; E = energy in foot-pounds for impacts or charge weight per delay for explosives-pounds; n = slope or attenuation rate; and $D/\sqrt{E}$ = scaled distance. The value of n in this expression generally lies between 1.0 and 2.0 with a relatively common value of 1.5.

Construction Vibration Intensities

Typical intensities of vibration from the operation of construction equipment are presented graphically in Fig. 5. All of the data used to prepare Fig. 5

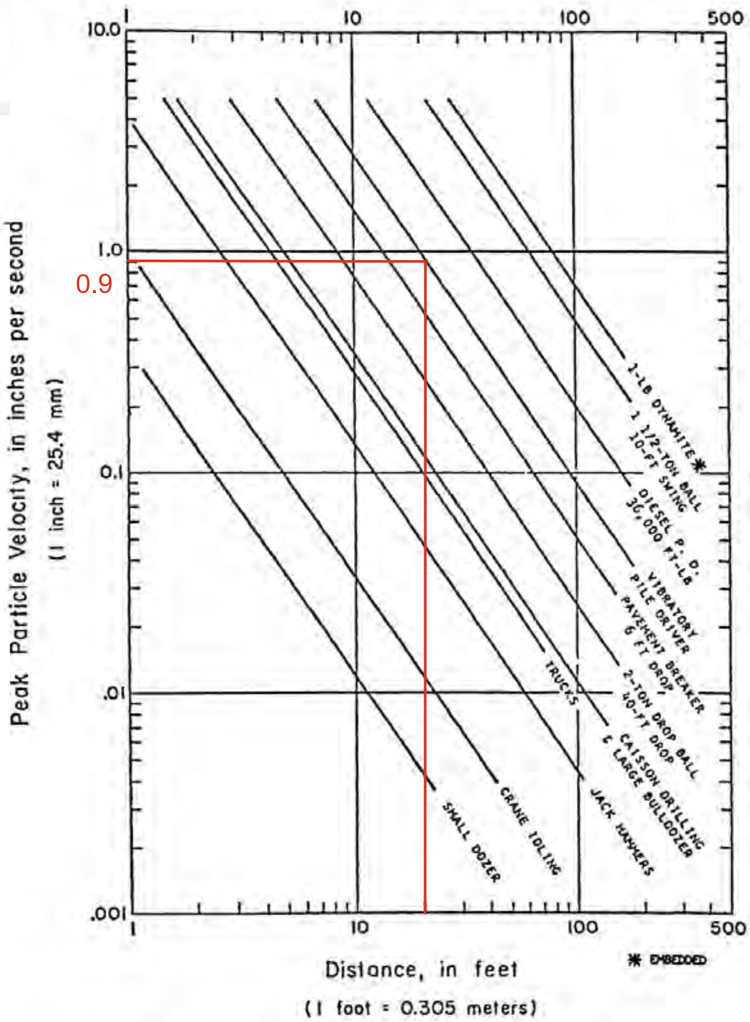
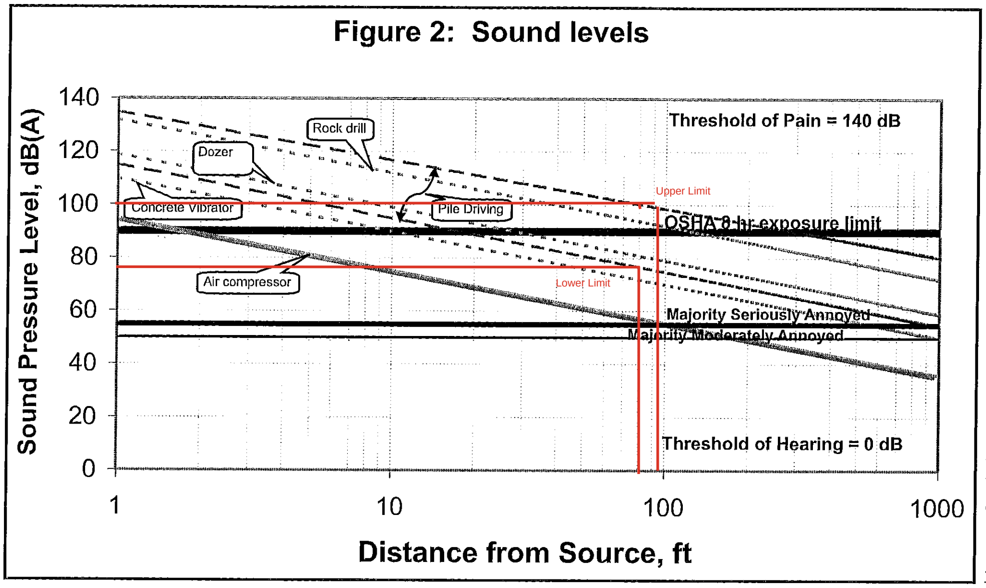


FIG. 5.—Relative Intensities of Construction Vibrations

were obtained by field measurements during actual construction operations (29). The vibration intensities reported in this figure are based on data recorded on the surface of the earth or in residential or relatively small commercial buildings. The response of more massive or subsurface structures may be different, depending on frequency of input and natural frequency of the structure.

It is of interest to note that the intensities involved in these construction activities are spread over a range of three orders of magnitude. It should be

Vibration (Continued From Page 17)



to structures. They can feel and become concerned about vibrations that are 1/10th of the levels that become troublesome to most people. People complain about pile driving effects because they are much more sensitive to vibrations than are buildings. They tend to extrapolate their personal sensitivity to vibrations to a concern about the safety of their building.

Noise from pile driving rarely if ever produces structural damage, but it causes annoyance that may reach a long distance. Figure 2 summarizes some typical data on noise levels for various construction activities. It also shows some of the criteria used to limit noise. The measurement of sound level used in Figure 2 is dB(A). Humans perceive a 10 dB increase in sound level as a doubling of loudness. Sound level decreases approximately 6 dB(A) for every doubling of the distance from the source. Noise below 80 dB(A) is considered not to cause hearing loss.

OSHA set the eight-hour exposure limit to noise at 90 dB(A). Studies by the World Health Organization have shown that the majority of people become moderately annoyed by steady, continuous sound levels above 50 dB(A) and seriously annoyed at continuous sound levels above 55 dB(A).

Pile driving is one of the noisiest construction operations. Figure 2 shows a range of sound levels reported for pile driving for a variety of hammer types and sizes. For the noisiest hammer, one would have to go approximately 300 feet away from the hammer to get below the OSHA eight-hour exposure limit. One would have to get several miles from the noisiest hammer for the sound level to drop below that causing moderate annoyance to most people.

Clearly, pile driving in urban areas has the potential to annoy a lot of people. When people become annoyed, they also become concerned. They start looking for evidence of damage to their property from the construction work and complaining to their elected officials. Some engage lawyers to pursue compensation for their grief. When people look for evidence to confirm their suspicions, they will usually find something. Politicians don't like receiving complaints. Lawyers love opportunity.

Noise may be the most serious threat to the pile driving industry today – not because it is causing damage but because it creates a perceived problem to those impacted.

Vibration and noise from pile driving have some common elements. The intensity of both decreases with the log of distance away from the source. Both are unlikely to cause structural damage as long as the structure is several feet from the driving activity. For both, the real problem is the annoyance to people caused by the vibrations and the noise and not physical damage.

In today's urban world, people demand a secure environment, free from annoyance. Contractors must develop ways to manage the vibration and noise problems produced by pile driving. The following approaches are recommended for every project that involves pile driving:

✓ **Education** - People who might be impacted by pile driving need to be informed in advance of the planned activities and what the impact to them might be. Informed (Continued On Page 20)

APPENDIX I

SEISMIC PARAMETERS

AASHTO-2023 Web Services

Project: Keeler Ave over I 290

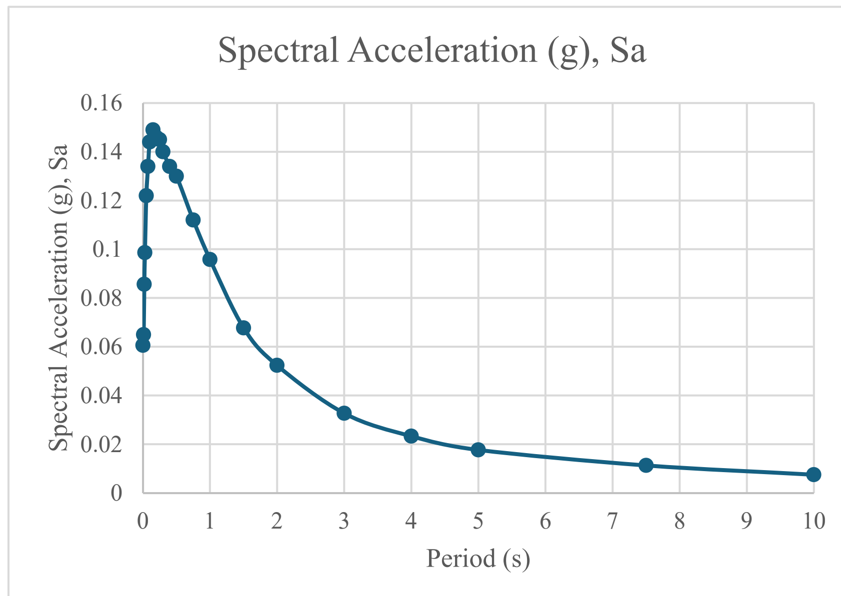
Latitude 41.873843

Longitude -87.730356

SiteClass D

Period (s), T	Spectral Acceleration (g), Sa	Tsa (gs)
0	0.0606	0
0.01	0.065	0.00065
0.02	0.0856	0.001712
0.03	0.0986	0.002958
0.05	0.122	0.0061
0.075	0.134	0.01005
0.1	0.144	0.0144
0.15	0.149	0.02235
0.2	0.146	0.0292
0.25	0.145	0.03625
0.3	0.14	0.042
0.4	0.134	0.0536
0.5	0.13	0.065
0.75	0.112	0.084
1	0.0958	0.0958
1.5	0.0677	0.10155
2	0.0524	0.1048
3	0.0327	0.0981
4	0.0233	0.0932
5	0.0177	0.0885
7.5	0.0113	0.08475
10	0.00754	0.0754

S1		0.0958 g	
Max (Tsa) (T:1-2)		0.1048 g	VS30< 1450 ft/s
0.9Max(Tsa)		0.08384 g	
SD1 = Max(S1, 0.9 Max(Tsa))		0.0958 g	
Seismic Design Category	A		Sd1<0.15



SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE==== Keeler over I-290

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	20.45	ft.
Pile or Shaft Dia.	12	inches
Boring Number	BSB-01	
Top of Boring Elev.	23.45	ft.
Approximate Fixity Elev.	14.45	ft.
Ground Water Elevation	12.5	ft
Hammer Efficiency	90	%
Vs30	951.4	ft/s
Class	D	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	SPT N	Qu (tsf)	Layer Description	Shear Wave Velocity (ft/s)
	23.45					
	20.95	2.50	4	0.75	Clay	221.0
	18.45	2.50	2	0.50	Clay	278.0
	15.95	2.50	4	2.08	Clay	368.8
1	13.45	2.50	6	3.33	Clay	442.6
3.5	10.95	2.50	8	2.29	Clay	503.4
6	8.45	2.50	10	3.54	Clay	543.0
8.5	5.95	2.50	16	3.12	Clay	608.9
11	3.45	2.50	14	1.87	Clay	614.3
13.5	0.95	2.50	24	6.04	Clay	693.4
16	-1.55	2.50	13	4.79	Clay	642.1
18.5	-4.05	2.50	27	2.08	Clay	744.4
21	-6.55	2.50	45	4.50	Clay	830.1
26	-11.55	5.00	17	5.00	Clay	726.7
31	-16.55	5.00	21	5.21	Clay	783.0
36	-21.55	5.00	15	3.33	Clay	764.8
41	-26.55	5.00	70	4.37	Clay	1024.4
44.5	-30.05	3.50	70	4.37	Clay	1049.6
100	-85.55	55.50			Rock	2500.0

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	20.45	ft.
Pile or Shaft Dia.	12	inches
Boring Number	BSB-02	
Top of Boring Elev.	23.3	ft.
Approximate Fixity Elev.	14.45	ft.
Ground Water Elevat	12.5	ft
Hammer Efficiency	90	%
Vs30	991.2	ft/s
Class	D	

Seismic Soil Colum Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	SPT N	Qu (tsf)	Layer Descriptio	Shear Wave Velocity (ft/s)
	23.3					
	20.8	2.50	9	1.00	Clay	255.9
	18.3	2.50	5.00	1.00	Clay	329.1
	15.8	2.50	3.00	2.50	Clay	355.8
1.15	13.3	2.50	6.00	2.50	Clay	446.4
3.65	10.8	2.50	8.00	2.50	Clay	505.4
6.15	8.3	2.50	9.00	3.12	Clay	535.2
8.65	5.8	2.50	9.00	2.92	Clay	553.6
11.15	3.3	2.50	13.00	2.29	Clay	607.1
13.65	0.8	2.50	16.00	5.21	Clay	646.9
16.15	-1.7	2.50	22.00	5.00	Clay	701.9
18.65	-4.2	2.50	15.00	3.96	Clay	674.3
21.15	-6.7	2.50	32.00	0.00	Clay	783.3
26.15	-11.7	5.00	63.00	5.00	Clay	906.1
31.15	-16.7	5.00	26.00	7.29	Clay	810.4
36.15	-21.7	5.00	15.00	5.41	Clay	764.1
41.15	-26.7	5.00	50.00	4.50	Clay	967.5
41.65	-27.2	0.50	50.00	4.50	Clay	983.1
100	-85.55	58.35			Rock	2500.0

Substructure 3

Base of Substruct. Elev. (or ground surf for bents)	20.45	ft.
Pile or Shaft Dia.	12	inches
Boring Number	BSB-03	
Top of Boring Elev.	23.52	ft.
Approximate Fixity Elev.	14.45	ft.
Ground Water Elevation	12.5	ft
Hammer Efficiency	90	%
Vs30	984.1	ft/s
Class	D	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	SPT N	Qu (tsf)	Layer Descriptio	Shear Wave Velocity (ft/s)
	23.52					
	21.02	2.50	7	1.25	Clay	246.8
	18.52	2.50	3.00	2.00	Clay	303.1
	16.02	2.50	7.00	2.50	Clay	412.0
0.93	13.52	2.50	10.00	2.50	Clay	487.9
3.43	11.02	2.50	12.00	3.33	Clay	544.5
5.93	8.52	2.50	11.00	2.50	Clay	556.6
8.43	6.02	2.50	9.00	2.71	Clay	555.7
10.93	3.52	2.50	13.00	3.96	Clay	609.9
13.43	1.02	2.50	14.00	5.83	Clay	635.9
15.93	-1.48	2.50	20.00	5.62	Clay	694.2
18.43	-3.98	2.50	17.00	5.21	Clay	692.2
20.93	-6.48	2.50	19.00	6.87	Clay	721.9
25.93	-11.48	5.00	19.00	6.46	Clay	745.2
30.93	-16.48	5.00	19.00	3.12	Clay	773.2
35.93	-21.48	5.00	16.00	3.96	Clay	776.0
39.43	-24.98	3.50	16.00	3.96	Clay	796.4
41.93	-27.48	2.50	50.00	0.00	Sand	907.8
100	-85.55	58.07			Rock	2500.0

Substructure 4

Base of Substruct. Elev. (or ground surf for bents)	20.45	ft.
Pile or Shaft Dia.	12	inches
Boring Number	BSB-04	
Top of Boring Elev.	23.45	ft.
Approximate Fixity Elev.	14.45	ft.
Ground Water Elevat	12.5	ft
Hammer Efficiency	90	%
Vs30	987.6	ft/s
Class	D	

Seismic Soil Colum Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	SPT N	Qu (tsf)	Layer Descriptio	Shear Wave Velocity (ft/s)
	23.45					
	19.95	3.50	4.00	0.00	Sand	255.1
	18.45	1.50	5.00	0.75	Clay	338.6
	15.95	2.50	6.00	2.71	Clay	397.0
1	13.45	2.50	9.00	2.08	Clay	475.3
3.5	10.95	2.50	9.00	3.12	Clay	514.2
6	8.45	2.50	11.00	2.75	Clay	552.6
8.5	5.95	2.50	7.00	2.29	Clay	528.9
11	3.45	2.50	12.00	3.75	Clay	597.7
13.5	0.95	2.50	18.00	5.21	Clay	659.6
16	-1.55	2.50	22.00	5.41	Clay	701.5
18.5	-4.05	2.50	42.00	4.50	Clay	803.0
21	-6.55	2.50	18.00	5.62	Clay	711.8
26	-11.55	5.00	18.00	4.79	Clay	735.1
31	-16.55	5.00	21.00	4.79	Clay	784.2
36	-21.55	5.00	15.00	5.41	Clay	766.5
39.5	-25.05	3.50	15.00	5.41	Clay	787.1
41.5	-27.05	2.00	50.00	2.80	Clay	981.1
100	-85.55	58.50			Rock	2500.0