



REPORT TRANSMITTAL

September 18, 2023

To: Jeremy Brown
IDOT District 3
700 E. Norris Drive
Ottawa, Illinois 61350

Re: **Structure Geotechnical Report**
PTB 197-022 WO14
Proposed SN 006-0051 and SN 006-052
Removal and Replacement
I-180 over Bureau Creek
Bureau County, Illinois

Rubino Report No. G22.097_REV1

Via email: Jeremy.Brown@illinois.gov

Dear Mr. Brown,

Rubino Engineering, Inc. (Rubino) is pleased to submit our Structure Geotechnical Report for the proposed SN 006-0051 and SN 006-052 removal and replacement on I-180 over Bureau Creek in Bureau County, Illinois.

Report Description

Enclosed is the Structure Geotechnical Report including recommendations for foundation design and construction considerations.

Authorization History

- PTB 197/22 P-93-030-20 Work Order #14 Dated May 9, 2022 signed by Masood Ahmad, P.E.

Closing

Rubino appreciates the opportunity to provide geotechnical services for this project and we look forward to continued participation during the design and in future construction phases of this project.

If you have questions pertaining to this report, or if Rubino may be of further service, please contact our office at (847) 931-1555.

Respectfully submitted,
RUBINO ENGINEERING, INC.

Michelle A. Lipinski, PE
President

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MAL/file/ Enclosures

PTB 197-022 WO14

**PROPOSED SN 006-0051 AND SN
006-052 REMOVAL AND
REPLACEMENT**

FAI 180 (I-180 OVER BUREAU CREEK)

CONTRACT # 66K66

BUREAU COUNTY, ILLINOIS

**RUBINO PROJECT NO.
G22.097_REV1**

***Structure
Geotechnical
Report
(SGR)***

*Drilling
Laboratory Testing
Geotechnical Analysis*

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PREPARED FOR:

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OTTAWA, ILLINOIS 61350**

SEPTEMBER 18, 2023

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- Appendix A – Soil Borings by IDOT and Consultants and Boring Location Plan
- Appendix B – Preliminary TSL
- Appendix C – Subsurface Soil Profile
- Appendix D – Slope Stability
- Appendix E – IDOT Scour Memorandum
- Appendix F – Seismic Site Class Determination

PROJECT DESCRIPTION AND SCOPE

Rubino understands that IDOT District 3 is planning to remove and replace SN 006-0051 and SN 006-052.

The existing structures (built in 1967) are non-composite, six (6) span 48" concrete I-beams with 7 1/2" super-elevated concrete deck with micro-silica overlay. The span lengths are 60'-6", 61'-4", 61'-5", 61'-4", and 60'-6". The decks are curved, and substructures are parallel. The superstructures are supported by open, reinforced concrete abutments supported by concrete piles and solid wall, five (5) hammer head piers on spread footings supported by timber piles. The back-to-back abutment length is 371'-6", face to face of curb width is 40'-6", and out to out deck width is 42'-6". The structure is to be removed and replaced. Traffic is to be shifted to the adjacent structure. There will be no salvage of the existing structures.

The proposed structures will be three (3) span 60" web girder beams will be supported by thru abutments and two (2) piers. The span lengths are proposed to be 124'-9" for Span 1 and Span 3 and 150'-0" for Span 2. The decks are proposed to be curved, and proposed substructures to be parallel. The back-to-back abutment length is proposed to be 405'-6", a face to curb width of 40'-0", and out to out deck width of 42'-10". The proposed abutment piles are proposed to be installed behind the existing abutment concrete piles.

Project/Proposed Structure Information: provided by CDM Smith.

Abutment Pile Cut-Off Elevations	North Abutment of NB Lane =	493.4 feet
	South Abutment of NB Lane =	504.7 feet
	North Abutment of SB Lane =	492.9 feet
	South Abutment of SB Lane =	504.7 feet
Pier Elevations	Top of Pier 1 NB =	507.10 feet
	Top of Pier 2 NB =	511.38 feet
	Top of Pier 1 SB =	506.28 feet
	Top of Pier 2 SB =	510.75 feet
	Ground Surface of Piers =	≈ 470 feet
Abutment Loading and Number of Pile Rows	Total Factored Substructure Load =	1,537 kips
	Number of Rows of Piles =	2
Pier Loading	Controlling Limit State =	Strength - I
	Controlling Total Factored Load =	4,241.1 kips

Plans Received:

Rubino has received the following plans and information for the existing and proposed structured:

- "SN 006-0051 original bridge plans 1967" provided by IDOT District 3 which contains seven (7) soil borings.



- “SN 006-0051 original bridge plans-2 1967” provided by IDOT District 3.
- “006-0051,0052 soil 2022” provided by IDOT District 3 which contains 4 soil borings conducted at the proposed abutments.
- “I-180 TS&L_8.8.22” provided by CDM Smith which contains the preliminary TS&L for the proposed structures.
- “180 over Bureau Creek TSL.pdf” dated 9/12/2022 provided by CDM Smith which contains the updated preliminary TS&L for the proposed structures.
- “VBent Output for LPile_Caissons” dated 07/29/22 provided by CDM Smith.
- “107741-001 R1 I-180 Over Bureau Creek – Geotech Data Report” dated March 3, 2023, completed by Shannon & Workman provided by Steve Ferguson.
- “SN 006-0051 I-180SB Over Bureau Creek Logs 3-16-23” dated February 13, 2023, completed by Wang Engineering, provided by Steve Ferguson.

Please see [Appendix A](#) for the Soil Boring Logs and [Appendix B](#) for the Preliminary TS&L and the Proposed Loading Information.

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the information on which this report is based is incorrect, please inform Rubino in writing so that we may amend the recommendations presented in this report (if appropriate, and if desired by the client). Rubino will not be responsible for the implementation of our recommendations if we are not notified of changes in the project.

This report briefly outlines the following:

- *Summary of client-provided project information and report basis*
- *Overview of subsurface conditions per the supplied IDOT boring logs*
- *Geotechnical recommendations pertaining to:*
 - *Settlement*
 - *Slope Stability*
 - *Scour*
 - *Seismic Considerations*
 - *Abutment Foundation Recommendations*
 - *Pier Foundation Recommendations*
 - *Construction considerations, including:*
 - *Temporary Soil Retention or Soil Slopes*
 - *Pier Foundation Construction Considerations*

FIELD EXPLORATION

Subsurface Exploration and Testing

Seven (7) soil boring were conducted for the existing structures construction in 1967 and the boring logs were provided to Rubino for use on this project. One (1) of the borings was conducted at the north abutment for the southbound structure. The remaining six (6) borings were conducted at the



piers. Four (4) soil borings were conducted by IDOT at the proposed abutments for each structure in 2022. Four (4) additional soil borings were conducted by Shannon & Wilson and Wang Engineering, Inc. in February 2023 at the four proposed pier locations.

Table 1 below summarizes the soil borings utilized for this report. Please see [Appendix A](#) for the Soil Boring Logs.

Table 1: Boring Logs Provided to Rubino

BORING NUMBER	DATE DRILLED**	DEPTH (FEET BEG*)	LOCATION (REFERENCE TO PROPOSED STRUCTURES)
1	Approved 8/11/67	45	Between N Abutment NB and Pier 1 NB
2	Approved 8/11/67	45	Between N Abutment SB and Pier 1 SB
3	Approved 8/11/67	50	Between Pier 1 NB and Pier 2 NB
4	Approved 8/11/67	50	Approximately at Pier 2 SB
5	Approved 8/11/67	60	Between Pier 2 NB and S Abutment NB
6	Approved 8/11/67	60	Between Pier 2 SB and S Abutment SB
7	Approved 8/11/67	45	N Abutment SB Lane
01 (NW Quad)	4/19/22	66 ½	N Abutment SB Lane
02 (SE Quad)	4/21/22	71 ½	S Abutment SB Lane
03 (SE Quad)	4/26/22	66 ½	S Abutment NB Lane
04 (NW Quad)	4/27/22	66 ½	N Abutment NB Lane
NB-SW-2	2/9/23	128.9	Pier 1 NB
NB-SW-1	2/6/23	128.8	Pier 2 NB
SB-01	2/13/23	135	Pier 1 SB
SB-02	2/15/23	125* (Blind core to 83 ½)	Pier 2 SB

*BEG = Below existing grade

**Borings 1 – 7 do not list a drilled date

*Drilled from the existing bridge deck

The boring logs list the following data:

- Water table below ground surface 24 hours after completion (1967 Borings).
- First encountered groundwater elevation (2022 Borings and 2023 Borings)
- Water table below ground at the end of boring/upon completion.
- N-Values:
 - 1967 Borings: Blows per foot of penetration acquired by driving a 2" O.D. split spoon sampler with a 140-pound drop 30 inches.
 - 2022 & 2023 Borings: CME Automatic Hammer blows per 6 inches.
- Qu (Unconfined compressive strength in tons per square foot).
- Qp (Pocket penetrometer readings in tons per square foot).
- Water content in percent.
- Ground surface elevation in feet.

Recommended Additional Field Exploration:

No additional field exploration is recommended.



Subsurface Conditions

The geotechnical-related recommendations in this report are presented based on the subsurface conditions described on the soil borings listed in *Table 1* which were provided to Rubino by IDOT District 3. Should changes in the project criteria occur, a review must be made by Rubino to determine if modifications to our recommendations will be necessary.

Subsurface conditions at the abutments generally consisted of cohesive undocumented fill which contained layers of granular undocumented fill, medium loam, medium to stiff silty loam, hard silty loam till, soft to hard silty clay with silt and sand layers, very stiff to hard silty clay loam till or silty clay loam, and loose to dense fine to coarse sand and gravel.

Subsurface conditions encountered in the 1967 soil borings at the piers generally consisted of soft organic sandy clay, soft to stiff silty clay and silty and sandy clay, tough to very tough silty clay, very loose to firm fine/medium sand or silty sand, medium gravelly sand, dense to very dense medium to coarse sand, hard gray silty clay, and very tough clay.

Subsurface conditions encountered in the 2023 additional borings for the north bound structure for the piers generally consisted of medium dense silty sand, very loose to loose sandy silt, and alternating layers of very loose to medium dense sand and loose to medium dense gravel over dense to very dense sand and very dense to hard gravel. Completely weathered shale, slightly fissile to fissile rock, completely weathered limestone/shale, argillaceous limestone, calcareous shale was encountered.

Subsurface conditions encountered in the 2023 additional borings for the south bound structure for the piers in boring SB-01, generally consisted of alternating layers of soft to stiff silty loam and loose to very dense sand which becomes more stiff/dense with depth, with a medium dense gravel layer beginning near elevation 435.5 feet. Shale was encountered in SB-01 beginning approximately at elevation 385.5 feet. Blind drilling was performed in SB-02 to an elevation of 430.4 feet, and sampling began with mainly dense sand soils encountered until termination at elevation 390.4 feet.

Please see the Soil Boring Logs in [Appendix A](#) and the Subsurface Soil Profile in [Appendix C](#) for more detailed subsurface information.

Groundwater Conditions

Groundwater was noted on the soil boring logs provided to Rubino by IDOT. *Table 2* summarizes the groundwater elevations noted on the soil boring logs. All elevations are considered approximate.



Table 2: Groundwater Elevations

BORING NUMBER	DATE DRILLED*	APPROXIMATE BORING SURFACE ELEVATION (FEET)	GROUNDWATER ELEVATION DURING DRILLING (FEET)	GROUNDWATER ELEVATION UPON COMPLETION (FEET)	GROUNDWATER ELEVATION 24 HOURS AFTER COMPLETION (FEET)
1	Approved 8/11/67	470.0	Not Noted	464	Not Noted
2	Approved 8/11/67	471.0	Not Noted	465	Not Noted
3	Approved 8/11/67	471.0	Not Noted	467	460
4	Approved 8/11/67	464.0	Not Noted	460	455
5	Approved 8/11/67	471.0	Not Noted	465	Not Noted
6	Approved 8/11/67	471.0	Not Noted	467 ½	Not Noted
7	Approved 8/11/67	471.0	Not Noted	464	Not Noted
01 (NW Quad)	4/19/22	502.55	461.5	474.5	Not Noted
02 (SE Quad)	4/21/22	514.12	459.1	464.1	Not Noted
03 (SE Quad)	4/26/22	514.87	457.9	457.9	Not Noted
04 (NW Quad)	4/27/22	502.28	462.3	462.3	Not Noted
NB-SW-2	2/6/23	477.00	468.6**	N/A**	Not Noted
NB-SW-1	2/9/23	476.00	463.5**	N/A**	Not Noted
SB-01	2/13/23	468.97	453.0**	N/A**	Not Noted
SB-02	2/15/23	513.86	N/A**	N/A**	Not Noted

*Borings 1 – 7 do not list a drilled date

**Mud rotary drilling methods were utilized in these borings which may have influenced the groundwater observations per Shannon & Wilson.

Please note that soil boring SB-02 was blind cored to an elevation of 430.4 feet. It should be noted that fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project.

When bidding this project, the contractor should anticipate that groundwater will be present.



GEOTECHNICAL EVALUATIONS AND RECOMMENDATIONS

Settlement

The new profile of the structures is anticipated to change minimally. It is Rubino's understanding that significant fills are not anticipated for this project. Therefore, minimal settlements are anticipated for the existing embankments. Please notify Rubino if significant fills are proposed for this project.

The proposed structures are recommended to be supported by piles for the abutments and drilled shafts for the piers. Please see Abutment Foundation Recommendations and Pier Foundation Recommendations sections herein for settlement estimates for each respective foundation type.

Slope Stability

From the preliminary TS&L dated August 8, 2022, cuts are proposed for the north and south abutment slope walls. The cuts are anticipated to be topped with riprap. The proposed slope for the slope walls is 1:2 (V:H).

A review of the soil conditions, ground water levels, and proposed abutment and bridge geometry was performed to perform global wall stability. A model was developed for the South Bound structure at the south abutment based the cross section of the abutment and the soils encountered in Boring 02 (SE Quad). *Table 3* below provides a summary of the soil properties utilized in the global stability analysis.

A computer program, Stedwin Version 2.90, was used to calculate the factor of safety (FOS) against a global stability failure using the Bishop's method of slices. Circular shear surfaces were evaluated. A search routine was employed to evaluate several circular shear surfaces to identify the most critical shear surfaces within constraints defined by the program user. A summary of the analysis results is shown in *Table 4* below and results can be found in Appendix D.

According to Section 6.5.1 of the IDOT Geotechnical Manual (2020): Cut Slopes Stability, the minimum factor of safety (FOS) is 1.7 when the slope stability analysis is based on the field (Rimac) test of split-spoon samples.

Based on the slope stability analysis results, Rubino does not recommend additional analysis or treatment for the proposed slopes.



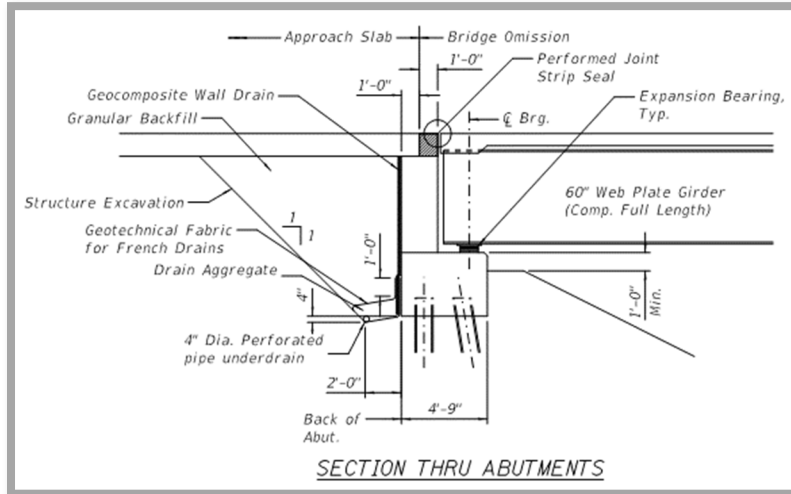


Exhibit 1) Cross-section through abutment

Table 3: Summary of Material Properties Used for Stability

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
CONCRETE	1	145.0	145.0	10000.0	0.0
GVL BKFL	2	135.0	135.0	0.0	32.0
HARDTILL	3	135.0	135.0	0.0	34.0
DENSESND	4	135.0	135.0	0.0	36.0
MEDLOAM	5	125.0	125.0	0.0	28.0
SILTYCLY	6	125.0	125.0	0.0	26.0
RIPRAP	7	145.0	145.0	0.0	40.0

Drained Analysis Material Properties

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
CONCRETE	1	145.0	145.0	10000.0	0.0
GVL BKFL	2	135.0	135.0	0.0	32.0
HARDTILL	3	135.0	135.0	4000.0	0.0
DENSESND	4	135.0	135.0	0.0	36.0
MEDLOAM	5	125.0	125.0	0.0	28.0
SILTYCLY	6	125.0	125.0	1000.0	0.0
RIPRAP	7	145.0	145.0	0.0	40.0

Undrained Analysis Material Properties

Table 4: Summary of Slope Stability Analysis Results

CONDITION	RECOMMENDED MINIMUM FOS	CALCULATED FOS
Drained	1.7	1.75
Undrained	1.7	3.09



Scour

The proposed bridge structures cross over Bureau Creek. Scour elevations were provided to Rubino by IDOT and are summarized in *Table 5* below. IDOT’s scour memorandum can be found in *Appendix E*.

Within pier borings SB-02, NB-SW-1, NB-SW-1, 1, and 1967 borings 3 through 6, granular soils were encountered to the Q100 & Q500 scour elevations. Based on this information, Rubino does not recommend a scour adjustment for the substructures located at/near these borings (Pier 1 NB, Pier 2 NB, and Pier 2 SB). Please see *Table 6* below for more details.

Within pier borings 2 & SB-01 at Pier 1 for the Southbound Structure, cohesive soils over granular soils were encountered at and above the Q100 & Q500 scour elevations. The cohesive soils in boring SB-01 encountered to elevation 453.0 feet (with a layer of sand between elevation 458 feet and 455.5 feet) had Q_u ’s ranging from 0.1 tsf to 0.7 tsf. Granular soils were encountered below the cohesive soils to elevation 430.5 feet in SB-01. Finally, cohesive soils with a Q_u of 1.5 tsf were encountered from elevation 430.5 feet in SB-01 to the Q100 & Q500 scour elevations of 429.3 feet and 425.4 feet, respectively. Rubino has recommended a scour adjustment for Pier 1 at the Southbound Structure based on this information and the IDOT Bridge Manual (2023) section 2.3.6.3.2. The scour adjustment was made with respect to the cohesive soils encountered (below the granular soils) from elevation 430.5 feet in SB-01 to the unadjusted Q100 & Q500 scour elevations of 429.3 feet and 425.4 feet, respectively, and a 25% reduction between these elevations based on the Q_u of 1.5 tsf. Please see *Table 5* and *Table 6* below for details.

Table 5: Unadjusted Scour Design Elevations

FREQUENCY	SCOUR ELEVATION (FEET)
Q100	429.3
Q200	427.7
Q500	425.4

Table 6: Adjusted Scour Design Elevations

SUBSTRUCTURE	BORING	SOIL TYPES ENCOUNTERED AT AND ABOVE THE Q100 & Q500 SCOUR ELEVATIONS	SCOUR ADJUSTMENT RECOMMENDATION
Pier 1 NB	NB-SW-2	Granular Soils	No Adjustment
Pier 2 NB	NB-SW-1	Granular Soils	No Adjustment
Pier 1 SB	2 & SB-01	Cohesive over Granular over Cohesive Soils	Q100: 429.6 feet Q500: 426.6 feet
Pier 1 NB	4 & SB-02	Granular Soils	No Adjustment



Drilled shafts should be designed to penetrate to a sufficient elevation that axial and lateral resistance is met without including the soil above the design scour elevation. Please notify Rubino if the unadjusted scour elevations change so that Rubino can modify the drilled shaft foundation recommendations accordingly.

Seismic Considerations

The seismic site class was determined using the IDOT Spreadsheet “*Seismic Site Class Determination*” dated December 10, 2010, the 2022 Abutment Borings (Borings 01 through 04), and 2023 Pier Borings SB-01 and NB-SW-1. Based on the soils encountered and bedrock elevation of approximately 390 feet estimated for the abutment borings, the project area is in Seismic Site Class D. The results of the “*Seismic Site Class Determination*” are shown in [Appendix F](#).

The USGS Unified Hazard Tool was used to calculate the PGA , S_s , and S_1 values for bedrock motion. Those values were then used to determine the Design Spectral Acceleration Parameters at zero period (F_{PGA}), short period (S_{DS}), and 1-second period (S_{D1}). Based on the S_{D1} parameter, the site has a seismic performance zone (SPZ) of 1. Liquefaction is not applicable because the SPZ of 1. The Design Spectral Acceleration Parameters in accordance with *AASHTO, 2020* are shown in *Table 7* below.

Table 7: Seismic Design Parameters

SPECTRAL ACCELERATION PERIOD (SEC)	SPECTRAL ACCELERATION COEFFICIENT (g)	SITE FACTORS	DESIGN SPECTRUM FOR SITE CLASS D (g)
0.0	$PGA = 0.044$	$F_{PGA} = 1.6$	$A_s = 0.071$
0.2	$S_s = 0.099$	$F_a = 1.6$	$S_{DS} = 0.158$
1.0	$S_1 = 0.041$	$F_v = 2.4$	$S_{D1} = 0.098$



FOUNDATION RECOMMENDATIONS

Abutment Foundation Recommendations

The proposed structure abutments are stub abutments. Given the soil conditions encountered in the abutment soil borings, Rubino is recommending driven piles for the proposed stub abutments. Rubino is providing geotechnical recommendations for driven piles for each of the four (4) abutments. Metal shell piles are recommended over H-Piles due to bedrock not being encountered in the abutment soil borings.

The driven metal shell piles should be designed to be at least 3 diameters apart (center-to-center) from each other or group reduction factors will need to be employed in the design capacity of these members. Based on the subgrade information obtained in the abutment soil borings, vertical capacities of driven piles for each abutment boring were calculated and a summary of the vertical capacities and pile lengths for recommended pile types and sizes are shown in *Table 8* through *Table 11* below.

The capacities were derived using the IDOT Static Method of Estimating Pile Length Spreadsheet and the procedure outlined in the IDOT Design Guide AGMU 10.2 Geotechnical Pile Design.

The IDOT Static Method of Estimating Pile Length Spreadsheet calculates the factored resistance available in the boring using LRFD and the WSDOT Method for calculating pile capacities. The following excerpt can be found in the above referenced Design Guide:

The Geotechnical Resistance Factor (ϕ_G) shall be selected to represent the reliability of the construction method used to verify that the R_N has been developed. Our analysis using both national and local driving records and load tests indicated a ϕ_G of 0.55 should be used to compute R_F if the WSDOT formula is specified for construction verification. When more accurate construction verification methods are proposed, such as with static load test or a Pile Driving Analyzer (PDA), the resistance factor used may be increased to the values provided in the AASHTO specifications.

The following table summarizes the estimated pile lengths for selected piles for each abutment. Pile cutoff elevations and number of rows of piles were obtained from the Preliminary TS&L (which can be found in [Appendix B](#)), and the abutment factored loading was provided by CDM Smith via email and used in the Pile Capacity spreadsheets. Geotechnical losses due to scour were not applied to the pile calculations.



Table 8: Pile Capacity – North Abutment (NB Structure) (Boring 04 NW)

R_N NOMINAL REQUIRED BEARING (KIPS)	R_F FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FEET)	ESTIMATED PILE TIP ELEVATION (FEET)
METAL SHELL PILE – 12” DIAMETER 0.25” WALLS			
292	160	31	462 ½
334	184	36	457 ½
392*	216	42	451 ½
METAL SHELL PILE – 14” DIAMETER 0.25” WALLS			
346	190	31	462 ½
401	221	36	457 ½
459*	252	42	451½
METAL SHELL PILE – 14” DIAMETER 0.312” WALLS			
401	221	36	457 ½
429	236	41	452 ½
570*	314	44	449 ½
METAL SHELL PILE – 16” DIAMETER 0.312” WALLS			
484	266	38	455 ½
570	314	43	450 ½
654*	360	46	447 ½
METAL SHELL PILE – 16” DIAMETER 0.375” WALLS			
570	314	43	450 ½
708	389	45	448 ½
728	400	48	445 ½

*Maximum Nominal Required Bearing of Pile achieved within the boring

Table 9: Pile Capacity – North Abutment (SB Structure) (Boring 01 NW)

R_N NOMINAL REQUIRED BEARING (KIPS)	R_F FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FEET)	ESTIMATED PILE TIP ELEVATION (FEET)
METAL SHELL PILE – 12” DIAMETER 0.25” WALLS			
274	151	30	463
285	157	35	458
392*	216	37	456
METAL SHELL PILE – 14” DIAMETER 0.25” WALLS			
315	173	32	461
340	187	35	458
459*	252	37	456



R_N NOMINAL REQUIRED BEARING (KIPS)	R_F FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FEET)	ESTIMATED PILE TIP ELEVATION (FEET)
METAL SHELL PILE – 14” DIAMETER 0.312” WALLS			
340	187	35	458
494	272	40	453
513	282	45	448
570*	314	48	445
METAL SHELL PILE – 16” DIAMETER 0.312” WALLS			
397	218	35	458
592	326	42	451
654*	360	46	447
METAL SHELL PILE – 16” DIAMETER 0.375” WALLS			
397	218	35	458
611	336	45	448
676	372	47	446

*Maximum Nominal Required Bearing of Pile achieved within the boring

Table 10: Pile Capacity – South Abutment (NB Structure) (Boring 03 SE)

R_N NOMINAL REQUIRED BEARING (KIPS)	R_F FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FEET)	ESTIMATED PILE TIP ELEVATION (FEET)
METAL SHELL PILE – 12” DIAMETER 0.25” WALLS			
338	186	32	472 ½
376	207	37	467 ½
392*	216	44	460 ½
METAL SHELL PILE – 14” DIAMETER 0.25” WALLS			
382	210	30	474 ½
422	232	34	470 ½
459*	252	44	460 ½
METAL SHELL PILE – 14” DIAMETER 0.312” WALLS			
422	232	34	470 ½
449	247	42	462 ½
475	261	47	457 ½
METAL SHELL PILE – 16” DIAMETER 0.312” WALLS			
490	269	34	470 ½
515	283	42	462 ½
546	300	47	457 ½

*Maximum Nominal Required Bearing of Pile Achieved within the boring



Table 11: Pile Capacity – South Abutment (SB Structure) (Boring 02 SE)

R_N NOMINAL REQUIRED BEARING (KIPS)	R_F FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FEET)	ESTIMATED PILE TIP ELEVATION (FEET)
METAL SHELL PILE – 12” DIAMETER 0.25” WALLS			
351	193	38	467
382	210	45	460
392*	216	48	457
METAL SHELL PILE – 14” DIAMETER 0.25” WALLS			
405	223	35	470
427	235	43	462
459*	252	48	457
METAL SHELL PILE – 14” DIAMETER 0.312” WALLS			
427	235	43	462
456	251	50	455
478	263	53	452
METAL SHELL PILE – 16” DIAMETER 0.312” WALLS			
491	270	43	462
525	288	50	455
551	303	53	452

*Maximum Nominal Required Bearing of Pile Achieved within the boring

Conical Tips

Rubino recommends that conical tips be installed on the metal shell piles due to hard and dense soil stratum noted on the boring logs where the piles are not anticipated to terminate. This recommendation has been made in accordance with the 2023 IDOT Bridge Manual Section 3.10.1.8. Test piles are recommended to more accurately determine the need for conical tips.

Test Piles

Given the soil conditions encountered in the abutment borings and the estimated pile driving lengths at each abutment, Rubino recommends a test pile at either of the two North Abutments and test piles at each of the South Abutments. Rubino is recommending a test pile at each of the South Abutments due to the varying soil conditions between Boring 2 (SE Quad) and Boring 3 (SE Quad).

This data can be used, in addition to the boring information, to supplement the estimated plan lengths, and to more accurately determine the need for conical tips. This recommendation has been made in accordance with the 2023 IDOT Bridge Manual Section 3.10.1.7.



Pier Foundation Recommendations

The supplied TS&L proposes drilled shafts for the proposed piers. Given the soil conditions in the 2023 soil borings, the design scour elevations, and the proposed pier controlling total factored load, Rubino is recommending drilled shaft foundations for the proposed piers that are socketed into rock.

The 2023 IDOT Bridge Manual Section 3.10.2.1 states that shafts extending into rock, in most cases, be designed utilizing only end bearing or side resistance in rock, whichever is larger, and neglect the overburden side resistance in soil. However, due to the presence of completely weathered shale, Rubino recommends including the side resistance of soil below the scour elevations in the design calculations. The adjusted design scour elevations, as noted in the Scour section of this report, should be taken into consideration in the drilled shaft design.

Due to the quality of rock being so poor, Rubino has treated the completely weathered shale as a hard clay.

Based on the subgrade information obtained during this investigation, the following table has been compiled for the side and tip resistances for the drilled shaft deep foundation system. In addition to side and tip resistances, lateral parameters have been included for use in discrete element analysis software such as LPILE or COM624P.

Table 12: Estimated Top of Rock and Groundwater Elevations

SUBSTRUCTURE	SOIL BORING	ESTIMATED TOP OF ROCK (SHALE) ELEVATION (FEET)	MAXIMUM ESTIMATED GROUNDWATER ELEVATION (FEET)
NB Structure Pier 1	NB-SW-2	392.5	463.5
NB Structure Pier 2	NB-SW-1	406.0	468.6
SB Structure Pier 1	SB-01	385.5	453.0
SB Structure Pier 2	SB-02	390.4**	Approx. 460*

*Based on Boring 4 soil data. Boring 4 is located near boring SB-02. See Groundwater Conditions section.

**Bedrock was not noted within the soil boring; however, the top of rock elevation is estimated based on the blow count of 100/1" at elevation 390.4 feet and the termination of the boring.



Table 13: Design Parameters for NB and SB Pier Drilled Shafts

SOIL TYPE	ELEVATION RANGE (FEET)	FACTORED SIDE RESISTANCE, q_s (PSF)	FRICTION ANGLE (DEG)	AVERAGE UNDRAINED COHESION (PSF)	FACTORED TIP RESISTANCE, q_p (PSF)	HORIZONTAL SUBGRADE MODULUS (PCI)	CYCLIC LATERAL MODULUS (PCI)	STRAIN FACTOR E_{50}
SIDE RESISTANCE FACTOR, SAND, $\phi_{qs} = 0.55$ / CLAY, $\phi_{qs} = 0.45$ / ROCK, $\phi_{qp} = 0.50$								
TIP RESISTANCE FACTOR, SAND, $\phi_{qp} = 0.50$ / CLAY, $\phi_{qp} = 0.40$ / ROCK, $\phi_{qp} = 0.50$								
Medium Dense to Dense Sand	429.6 – 416.36	3,600	30	--	---	60	---	---
Medium Stiff to Stiff Silt Loam (SB-01)	429.6 – 410.5	945	--	2,800	---	500	200	0.007
Dense to Very Dense Sand	419.5 – 385.5	7,000	40	--	---	125	---	---
Very Dense to Hard Gravel	408.5 – 392.5	5,300	44	--	---	125	---	---
Moderately Hard to Hard Shale (SB-01/Pier 1 SB)	385.5 – 334.0	8,250	--	51,000	94,000	2,000	800	0.004
Completely Weathered Shale (NB-SW-1/Pier 1 NB & NB-SW-2/Pier 2 NB & SB-02 Pier 2 SB)	406.0 – 347.1	2,900	--	13,200	32,000	2,000	800	0.004

Site Specific Design Considerations – Drilled Shafts

- Due to the very dense to hard sand and gravel soils encountered during drilling, beginning at approximately EL 419-418 feet in borings NB-SW-1 and NB-SW-2 and approximately EL 410 feet in borings SB-01 and SB-02, drilling for drilled pier construction should be expected to be hard.
- Drilled shaft casing recommendations are discussed in the Pier Foundation Construction Considerations section.
- This report does not include structural design for the deep foundation elements.
- At this time, Rubino anticipates that the maximum factored anticipated pier load of 4241.1 kips will need to be supported by pier groups.
- Uplift capacity requirements were not available at the time this report was prepared. Please contact Rubino if uplift is a concern at this site.



Pier Groups

If grouped drilled shafts are considered for the foundations in cohesionless soil, the nominal resistance of the individual drilled shafts should be reduced by applying an adjustment factor found in Table 10.8.3.6.3-1 in *AASHTO LRFD Bridge Design Specifications (AASHTO, 2020)*.

Ideally, the drilled shafts should be placed so that the areas of influence of adjacent drilled shafts do not interact, thus allowing an efficiency of 100% to be used in the design. Deep foundations that are not bearing on a very stiff stratum such as rock shall be at least 3 diameters apart from each other or **group reduction factors** will need to be employed in the design resistance of these members.

The nominal resistance of a grouped drilled pier system depends on the size of the drilled shafts used, the configuration of the drilled shafts in the group, and the spacing of the drilled shafts.

The installation of piers is not recommended to be performed within a distance equal to 8 diameters of pier elements that have been installed fewer than 24-hours previously.

Lateral Resistance – Drilled Shafts

The lateral resistance is directly linked to the strain characteristics of the foundation element. The lateral capacity of the drilled shafts can be calculated with the parameters given in *Table 13* above. These parameters are for analytical programs such as L-Pile or COM624P which will analyze both the applied load versus strain resistance of the soil and the deflection of the structural element. The parameters given are nominal values and a resistance factor of 1.0 should be applied to these values. Lateral resistance from the anticipated stream bed to the design scour depth should be ignored, per the IDOT Bridge Design Manual. In general, the upper 5-feet below grade of the drilled pier is ignored in the lateral capacity.

Drilled Shaft Load Test

The drilled shaft resistances recommended in this report are based on empirical methods using resistance factors. Actual resistances can be determined by performing a drilled shaft load test.

If desired by the client, the load test should be performed in general accordance with the “Standard Method of Testing Piles under Axial Compressive Load,” (ASTM D1143) prior to constructing the remaining drilled shaft foundations.

Procedures required for constructing the test shaft should be observed to establish desirable procedures for constructing the remaining drilled shafts. The test shaft concrete should be at least 14-days old at the start of the load test with a 7-day break of a test cylinder of at least 80% of the ultimate design strength. Accurate records of the drilled shafts’ installations shall be obtained during construction.



CONSTRUCTION CONSIDERATIONS

Temporary Soil Retention or Soil Slopes

It is Rubino’s understanding that one structure will be replaced at a time. Based on the TS&L (see Appendix B), traffic is to be shifted to the adjacent structure during construction. Additionally, the TS&L does not state that soil retention or temporary soil slopes are proposed.

If stage construction occurs where traffic is shifted to the adjacent structure during construction, Rubino does not anticipate that temporary soil retention or soil slopes are necessary for construction.

Pier Foundation Construction Considerations

Table 14 summarizes the ground surface elevation at the proposed piers and the water elevations for Bureau Creek provided in the TS&L.

Table 14: Ground Surface Elevation at the Proposed Piers vs Water Elevations for Bureau Creek		
GROUND SURFACE ELEVATION AT THE PIERS (FEET)	E.W.S. ELEVATION (FEET)	D.S.W. ELEVATION (FEET)
≈ 470	460.0	475.2

Based on the elevations listed in Table 14, there is the possibility for the Bureau Creek water level to be at or above the ground surface elevation (G.S.E.) at the piers at the time of construction.

If the proposed piers are to be constructed as drilled shaft-supported footings, Rubino recommends Type 1 cofferdams be utilized for construction of the piers based on the elevation difference between the D.S.W. Elevation and the G.S.E. being less than 6 feet. This recommendation was made referencing section 2.3.6.4.2 of the IDOT Bridge Manual (2023). If the proposed pier drilled shafts are to be individually constructed as separate footing elements, a cofferdam is not warranted.

The 1967 and 2023 soil borings indicate granular soils are present within the water table, which may cause water to seep into the excavation when drilling the piers. Rubino believes that there is the possibility that reasonable pumping efforts may not be able to keep the drilled shaft excavation dry during construction due to the presence of granular soils and the high-water elevation. Therefore, Rubino recommends the use of either temporary or permanent casings for the installation of the proposed drilled shafts for the piers.

Rubino recommends that drilled shafts be constructed per the IDOT Standard Specifications for Road and Bridge Construction (2022) Section 516.



CLOSING

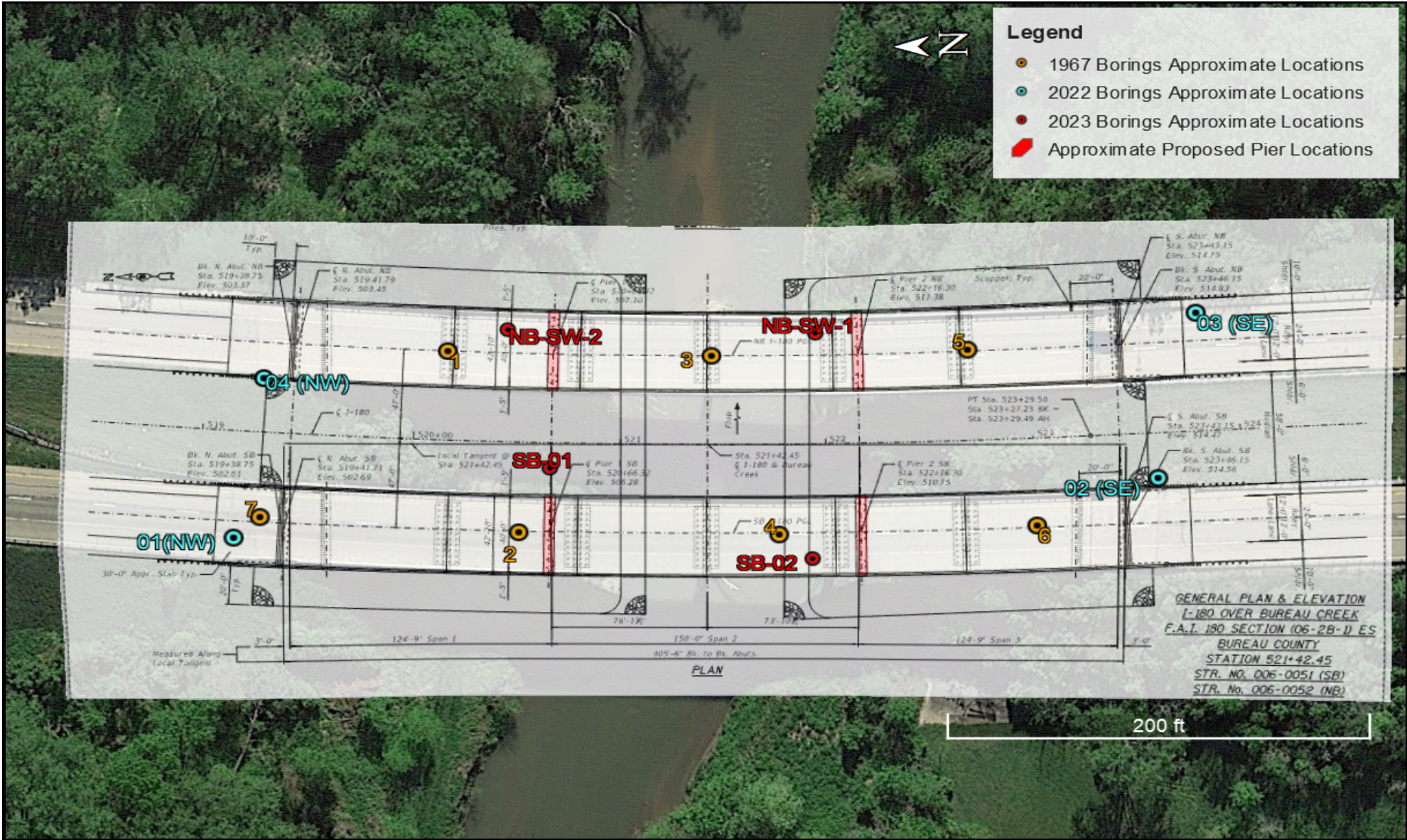
The recommendations submitted are based on the available subsurface information provided to Rubino Engineering, Inc. and design details furnished by IDOT District 3 for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Rubino should be notified immediately to determine if changes in the foundation recommendations are required. If Rubino is not retained to perform these functions, we will not be responsible for the impact of those conditions on the project.

The scope of services did not include an environmental assessment to determine the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater or air on, below, or around this site. Any statements in this report regarding odors, colors, and/or unusual or suspicious items or conditions are strictly for informational purposes.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of IDOT District 3 and their consultants for the specific application to the proposed Replacement of SN 006-0051 and SN 006-0052 in Bureau County, Illinois.



Appendix A – Soil Borings by IDOT and Consultants and Boring Location Plan



rubino
ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

Project Name: I-180 over Bureau Creek SGR
Project Location: SN 006-051 and 006-052 Removal and Replacement
 Bureau County, Illinois
Client: IDOT District 3
Rubino Project # : G22.097

**Boring
Location
Plan**



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.3008, Longitude -89.40105

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0051 (Exist.)
 Station 521+42.00

BORING NO. 01 (NW Quad)
 Station _____
 Offset _____
 Ground Surface Elev. 502.55 ft

D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____	ft
Stream Bed Elev. _____	ft
Groundwater Elev.:	
First Encounter _____	461.5 ft ▼
Upon Completion _____	474.5 ft ▼
After _____ Hrs.	ft

D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Dense to Loose Gray Fine to Coarse Sand with Some Fine to Medium Gravel Pieces (continued)	2			Dense to Medium Gray Fine Sand to Coarse Gravel (continued)	11		
	3		16		13		14
	4				17		
Free Water at 41' 460.55							
Loose Gray and Black Silty Fine to Medium Sand with Some Black Organics	2				10		
	2		26		18		16
	4				21		
	-45				-65		
	5				11		
	4		25		22		12
	6				24		
				436.05			
455.55				End of Boring			
Dense to Medium Gray Fine Sand to Coarse Gravel	10						
	14		11				
	18						
	-50				-70		
*Washed Sample 50.0'-51.5'	6						
	11		12				
	14	*					
*Washed Sample 52.5'-54.0'	8						
	10		11				
	12	*					
	-55				-75		
*Washed Sample 55.0'-56.5'	11						
	10		13				
	12	*					
	10						
	12		18				
	15						
	-60				-80		

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.29959, Longitude -89.40096

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 02 (SE Quad)
Station _____
Offset _____
Ground Surface Elev. 514.12 ft

D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)	Stream Bed Elev. _____ ft	(ft)	(/6")	(tsf)	(%)

Augered Brown and Gray Silty Clay Loam Fill				Hard Gray Silty Clay Loam Till Fill with Some Larger Gravel Pieces (continued)	5			
					5	4.5	11	
					7	S		
511.62								
Very Stiff Brown Silty Clay Loam Till Fill, and Sand and Gravel Fill	3				5			
	4	2.5	13		7	5.8	9	
	3	P			15	S		
509.62				489.62				
Hard Gray Silty Clay Loam Till Fill with Some Larger Gravel Pieces	-5			Dense Brown Fine Sand to Coarse Gravel - Layered Fill	-25			
	3				20			
	7	4.8	10		22		8	
	8	S			21			
				487.12				
	3			Hard Gray Silty Clay Loam Till Fill		5		
	6	5.1	11		7	4.3	11	
	10	S			8	S		
-10	10				-30			
	12	5.1	10		4			
	9	S			6	4.6	11	
					9	S		
				482.12				
	11			Medium Gray and Brown Sandy Loam, Sand, Loam Layered - Possibly Fill		6		
	12	5.0	10		9		11	
	13	S			10			
-15	5				-35			
	11		6		4			
	13				7		14	
					7			
	2							
	5	4.6	10	476.12	12			
	7	S		Hard Gray Silty Clay Loam Till		9	4.6	11
						10	S	
-20					-40			

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.29959, Longitude -89.40096

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 02 (SE Quad)
Station _____
Offset _____
Ground Surface Elev. 514.12 ft

D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)
-----------------------------------	------------------------------------	--------------------------	----------------------------------

Surface Water Elev. _____ ft	D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)
Stream Bed Elev. _____ ft				
Groundwater Elev.:				
First Encounter <u>459.1</u> ft ▼				
Upon Completion <u>464.1</u> ft ▼				
After _____ Hrs. _____ ft				

Hard Gray Silty Clay Loam Till (continued)	7			Very Stiff to Soft Brown Silty Clay with Silty Loam/Silt Layers, and Sand Layers Alternating	3		
	8	4.6	9		4	2.0	25
	8	S			5	P*	
471.62							
Medium Gray Sandy Loam Grading to Medium Sand with Organics	8			WH = Weight of Hammer (continued) *Washed Sample 60.0'-61.5'	4		
	11		15		5	2.5	28
	16				6	P	
469.62							
Hard Black to Gray Silty Clay with Some Organics	-45				-65		
	7				5		
	8	4.0	16		5	3.0	23
9	S		6	P			
467.12							
Very Stiff to Soft Brown Silty Clay with Silty Loam/Silt Layers, and Sand Layers Alternating	3				6		
	4	2.4	22		7	3.5	21
	5	B			8	P	
WH = Weight of Hammer							
▼ -50				-70			
WH				7			
WH	0.5	24		7	3.5	25	
2	P			9	P		
442.62							
End of Boring							
3							
2	1.5	22					
3	P						
▼ -55				-75			
3							
2		24					
3							
3							
3		27					
4	*						
-60				-80			

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.29954, Longitude -89.40064

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 03 (SE Quad)
Station _____
Offset _____
Ground Surface Elev. 514.87 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	Surface Water Elev. ft	Stream Bed Elev. ft	DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)

Augered Bituminous Shoulder.
Brown/Gray Silty Clay Loam Till
Fill

Hard Gray Silty Clay Loam Till Fill
with Some Silty Loam Till Fill
Layers *(continued)*

509.87 -5

Hard Gray Silty Clay Loam Till Fill
with Some Silty Loam Till Fill
Layers

Minor Fill Sand Layer at 27.5'

-10

-15

-20

Minor Fill Sand Layer at 37.5'

-20

SOIL BORING 006-0051,0052.GPJ IL_DOT.GDT 5/16/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 4/26/22

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.29954, Longitude -89.40064

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 03 (SE Quad)
Station _____
Offset _____
Ground Surface Elev. 514.87 ft

D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)
-----------------------------------	------------------------------------	--------------------------	----------------------------------

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

Groundwater Elev.:

First Encounter 457.9 ft ▼
Upon Completion 457.9 ft ▼
After _____ Hrs. _____ ft

D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)
-----------------------------------	------------------------------------	--------------------------	----------------------------------

Hard Gray Silty Clay Loam Till Fill with Some Silty Loam Till Fill Layers (continued)	9			Medium to Stiff Brown Silty Loam with Layers of Silt and Fine Sand and Fine Gravel Layers (continued) *Washed Sample 60.0'-61.5'	3		
	10	5.1	10		3	1.5	27
	11	S			4	P*	
	6				3		
	6	4.2	10		4	1.5	28
	7	S			4	P*	
	470.87						
Hard to Very Stiff Black to Brown Silty Clay	-45			*Washed Sample 65.0'-66.5'	-65		
	5				3		
	5	4.0	20		5	2.0	24
	9	B			4	P*	
465.37			448.37				
Medium to Stiff Brown Silty Loam with Layers of Silt and Fine Sand and Fine Gravel Layers	3			End of Boring			
	5	3.6	15				
	6	B					
	-50				-70		
	2						
	2	1.0	25				
	2	P					
	1						
	2	1.0	24				
	3	P					
-55			-75				
2							
2	1.0	19					
3	P						
▼							
*Washed Sample 57.5'-59.0'	2						
	3	1.5	25				
	4	P*					
-60			-80				

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41.30076, Longitude -89.40074

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 006-0052 (Exist.)
 Station 521+42.00

BORING NO. 04 (NW Quad)
 Station _____
 Offset _____
 Ground Surface Elev. 502.28 ft

D E P T H H	B L O W S	U C S Qu	M O I S T T	Surface Water Elev. _____ ft	D E P T H H	B L O W S	U C S Qu	M O I S T T
(ft)	(/6")	(tsf)	(%)	Stream Bed Elev. _____ ft	(ft)	(/6")	(tsf)	(%)
				Groundwater Elev.:				
				First Encounter <u>462.3</u> ft ▼				
				Upon Completion <u>462.3</u> ft ▼				
				After _____ Hrs. _____ ft				
				Hard to Very Stiff Gray Silty Clay Loam Till Fill (<i>continued</i>)	5			
					6	5.0	11	
					11	S		
				10" Fill Sand at 22.5'	5			
					4	3.8	12	
					4	B		
				497.28 -5	-25			
				Hard to Very Stiff Gray Silty Clay Loam Till Fill	4			
					5	4.0	10	
					5	P		
					6	B		
				Some Silty Clay and Silty Loam Fill Layers after 27'	3			
					2	2.0	22	
					4	P		
				-10	-30			
					3			
					5	4.1	14	
					5	B		
				470.28				
				Hard Alternating Layers of Black, Brown, Gray Silty Clay, Silty Loam, Silty Clay Loam Till, Silt - Possibly Fill	7			
					11	5.1	14	
					14	S		
					8			
					11	5.1	12	
					13	S		
				-15	-35			
					5			
					8	4.4	11	
					7	S		
				465.28				
				Medium to Loose Brown Fine to Coarse Gravel	4			
					7		11	
					8	S		
				WH = Weight of Hammer	9			
				-20	-40			

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Larry Myers
 SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM, Latitude 41.30076, Longitude -89.40074
 COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. Station	BORING NO. Station Offset	Ground Surface Elev.	DEPTH (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)	Surface Water Elev.		Groundwater Elev.:		DEPTH (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)
							ft	ft	ft	ft				
006-0052 (Exist.) 521+42.00	04 (NW Quad)	502.28												
				WH										
				2		18						12		
				4								13		10
												15	*	
				2								13		
				4		25						15		13
				6								16	*	
										437.78				
			-45											
				3								20		
				5		28						13	5.1	12
				7								20	S*	
		455.28								435.78				
				3										
				5		9								
				7	*									
			-50											
				3										
				5		13								
				8	*									
				6										
				9		18								
		448.28		10										
			-55											
				13										
				20		9								
				13										
				13										
				14		14								
				15	*									
			-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)

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 5/16/22



Illinois Department of Transportation

Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION _____ LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude , Longitude _____

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 1
Station 520+18
Offset 0.0 ft NB CL
Ground Surface Elev. 470.00 ft

D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)	Stream Bed Elev. _____ ft	(ft)	(/6")	(tsf)	(%)

Topsoil	469.50								Firm Medium Gravelly Sand (continued)				
Soft Gray and Black Organic Sandy Clay		3				16							
								24					
		3							445.00	-25	20		
								25					
		4				38							
	461.50							34					
Loose Fine Sand, Trace Gravel		6				40			440.00	-30	40		
	458.00	8				51					>4.5 P	15	
Firm Medium Gravelly Sand													
		12				60				-35	>4.5 P	13	
													14
		9				61							
		10								-40	>4.5 P	10	

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

Latitude , Longitude

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 1
Station 520+18

Offset 0.0 ft NB CL

Ground Surface Elev. 470.00 ft

D E P T H	B L O W S	U C S	M O I S T
(ft)	(/6")	(tsf)	(%)

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

Groundwater Elev.:
First Encounter _____ ft
Upon Completion 464.0 ft ▽
After _____ Hrs. _____ ft

Hard Gray Silty Clay, with Little
Fine Sand (*continued*)

143 >4.5 P 10

425.00 -45 184 >4.5 P 10

End of Boring

-50

-55

-60

SOIL BORING 006-0051,0052.GPJ IL_DOT.GDT 2/10/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 2
Station 520+55
Offset 0.0 ft SB CL
Ground Surface Elev. 471.00 ft

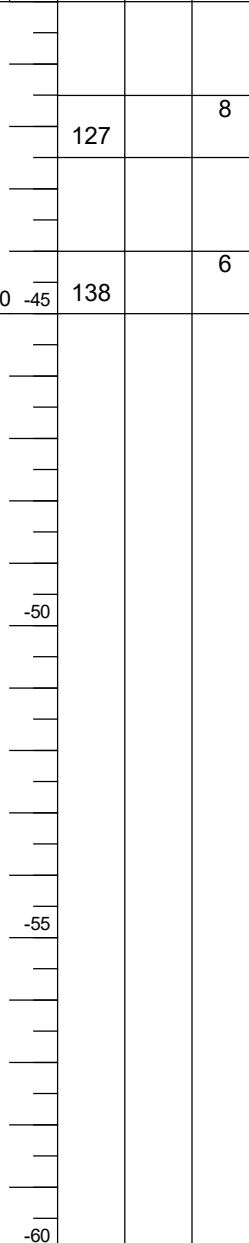
DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
	127		8
426.00 -45	138		6

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

Groundwater Elev.:
First Encounter _____ ft
Upon Completion 465.0 ft ▽
After _____ Hrs. _____ ft

Hard Silty Clay (*continued*)

End of Boring



SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM, Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00
BORING NO. 3
Station 521+46
Offset 0.0 ft NB CL
Ground Surface Elev. 471.00 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter _____ ft
Upon Completion 467.0 ft
After 24 Hrs. 460.0 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Brown Silty Topsoil				Very Tough Gray Clay (continued)	450.00			
	469.50							
Soft Dark Brown Silty Clay		2	27	Firm Fine Sand with Trace Small Gravel		24		
	▽		114					
	-5	4			-25	25		
					445.00			
		3	33	Dense Coarse Sand with Trace Small Gravel		36		
	-10	3	27		-30	46		
	▽		25			29		
		3						
	456.00 -15	4	28		-35	30		
Very Tough Gray Clay								
		29	0.7-1.0 P 31			30		
	-20	33	1.1-1.5 P		-40	27		

SOIL BORING 006-0051,0052.GPJ IL_DOT.GDT 2/10/22

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 4
Station 521+80
Offset 0.0 ft SB CL
Ground Surface Elev. 464.00 ft

D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter _____ ft
Upon Completion 460.0 ft ▽
After 24 Hrs. 455.0 ft ▽

Dense Medium Sand with Trace Small Gravel (<i>continued</i>)			
	421.50	48	
Very Dense Coarse Sand, Some Small Gravel			
	-45	52	
		54	
	414.00	-50	51
End of Boring			
	-55		
	-60		

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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)



SOIL BORING LOG

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,

Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 5
Station 522+72

Offset 0.0 ft NB CL

Ground Surface Elev. 471.00 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	Surface Water Elev. ft	Stream Bed Elev. ft	GROUNDWATER ELEV. (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
470.50									
	5		28				24	0.4 P	28
-5	10	0.9 P	20			-25	24		39
						445.00			
	7		22				40		
-10	8		25			-30	40		
460.00									
	7						100/0"		
457.50									
-15	5		28			-35	100/0"		
	16						42		
-20	23					-40	46		

Brown Topsoil
Stiff Brown Silty Clay, Trace Small Gravel

Firm Brown Silty Fine Sand
(continued)

Dense Fine to Medium Sand

Boulder at 31 Feet

Loose Fine to Medium Sand

Firm Brown Silty Fine Sand

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,

Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0052 (Exist.)
Station 521+42.00

BORING NO. 5
Station 522+72

Offset 0.0 ft NB CL

Ground Surface Elev. 471.00 ft

D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

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

Groundwater Elev.:
First Encounter _____ ft
Upon Completion 465.0 ft ∇
After _____ Hrs. _____ ft

Dense Fine to Medium Sand
(continued) 430.00

Very Dense Fine to Medium Sand,
Wet

52

-45 56

47

-50 24

53

-55 65

74

411.00 -60 74

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

End of Boring

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

The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)



Illinois Department of Transportation

Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,

Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 6
Station 523+04
Offset 0.0 ft SB CL
Ground Surface Elev. 471.00 ft

D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter _____ ft
Upon Completion 467.5 ft ∇
After _____ Hrs. _____ ft

Very Dense Medium Sand, with
Some Medium Gravel (continued)

59			
-45	60		
72			
-50	75		
81			
-55	96		
104			
411.00 -60	113		

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

End of Boring

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

The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)



Illinois Department of Transportation

Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 7
Station 519+31
Offset 0.0 ft SB CL
Ground Surface Elev. 470.00 ft

D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)	Stream Bed Elev. _____ ft	(ft)	(/6")	(tsf)	(%)

Soft Black Topsoil	469.00				Firm Silty Fine Sand with Trace Gravel (continued)			
Stiff Black to Brown Silty Clay, Moist		4	32			19		
		6	30					
	-5			445.00		23		
					Dense Medium Sand			
			32			29		
	-10	8	8	440.00		39		
					Very Dense Silty Fine Sand			
	459.00							
Firm Silty Fine Sand with Trace Gravel		16				51		
	-15	14				53		
		16				48		
	-20	21	28			51		

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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
Illinois Department of Transportation

SOIL BORING LOG

Date 1/1/67

I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 miles South of IL 26 Junction LOGGED BY _____

SECTION 06-2B-1 LOCATION NE 1/4, SEC. 12, TWP. 15N, RNG. 9E, 4th PM,

Latitude , Longitude

COUNTY Bureau DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 006-0051 (Exist.)
Station 521+42.00

BORING NO. 7
Station 519+31

Offset 0.0 ft SB CL

Ground Surface Elev. 470.00 ft

D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

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

Groundwater Elev.:
First Encounter _____ ft
Upon Completion 464.0 ft ∇
After _____ Hrs. _____ ft

Very Dense Silty Fine Sand
(continued)

54

425.00 -45 57

End of Boring

-50

-55

-60

SOIL BORING 006-0051.0052.GPJ IL_DOT.GDT 2/10/22

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)



SOIL BORING LOG

ROUTE F. A. I. - 180 DESCRIPTION I-180 over Bureau Creek LOGGED BY KEG

SECTION 06-2B-1 LOCATION Near Princeton IL, 41.300390333° Latitude and -89.400923361° Longitude

COUNTY Bureau DRILLING METHOD _____ HSA _____ HAMMER TYPE _____ AUTO _____

STRUCT. NO. 006-0051
Station 521+42.45

BORING NO. SB-01
Station 520+25.53
Offset 19.9 ft RT
Ground Surface Elev. 468.97 ft

D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

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

Groundwater Elev.:
First Encounter 453.0 ft ▼
Upon Completion _____ ft
After _____ Hrs. _____ ft

D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

SILT LOAM - Grayish Brown, Soft w/ Some Fine Sand + Gravel 13.9% Gravel, 30.2% Sand, 45.3% Silt, 10.5% Clay w/ Some Coarse Sand	3			SAND - Gray, Loose, Coarse, w/ Some Pebbles (<i>continued</i>) Becomes Medium Dense	8		
	3	0.7	20		8	-	10
	3	B			11		
	2				4		
	2	0.2	28		4	-	13
	3	B			10		
	4				9		
	6	0.1	27		8	-	18
	9	B			12		
	4				6		
7	0.2	25	10	-	20		
6	B		12				
----- 458.0 -----							
SAND - Gray, Loose, w/ Organics	1						
	2	-	24				
	4						
----- 455.5 -----							
SILT LOAM- Light Brown, Soft, w/ some Gray, Fine, Sands	2			GRAVEL - Medium-dense	11		
	3	0.2	23		14	-	7
	1	B			12		
----- 453.0 ▼ -----							
SAND - Gray, Loose, Coarse, w/ Some Pebbles	3						
	3	-	16				
	4						
	5						
	4	-	12				
----- 430.5 -----							
				SILT LOAM - Gray, Medium Stiff to Stiff, w/ Trace Gravel	10		
					11	1.5	15
					12	B	
----- 20 -----							

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)



SOIL BORING LOG

ROUTE F. A. I. - 180 DESCRIPTION I-180 over Bureau Creek LOGGED BY KEG
 SECTION 06-2B-1 LOCATION Near Princeton IL, 41.300390333° Latitude and -89.400923361° Longitude
 COUNTY Bureau DRILLING METHOD HSA HAMMER TYPE AUTO

STRUCT. NO.	Station	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	ft	D E P T H H	B L O W S	U C S Qu	M O I S T
BORING NO.	Station	(ft)	(/6")	(tsf)	(%)	Stream Bed Elev.	ft	(ft)	(/6")	(tsf)	(%)
006-0051	521+42.45										
SB-01	520+25.53										
	19.9 ft RT										
	468.97										
SAND - Gray, Medium Dense to Very Dense, w/Gravel + Granite Fragments <i>(continued)</i>						SHALE - Gray, Moderately Hard <i>(continued)</i>					
		385.5									
SHALE - Gray, Moderately Hard			100/5"		17	Becomes Moderately Hard			100/2.75"		17
			-	5.6					-	2.8	
		-85		S				-105		P	
Poor Recovery			100/1"		20				100/3.25"		18
			-	-					-	3.2	
		-90						-110		S	
Becomes Blueish Gray			100/3.25"		15				100/2.5"		17
			-	1.5					-	1.2	
		-95		B				-115		S	
Becomes Soft, Dark Gray Poor Recovery			100/3"		19				100/5.375"		18
			-	-					-	0.7	
		-100						-120		B	

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)



SOIL BORING LOG

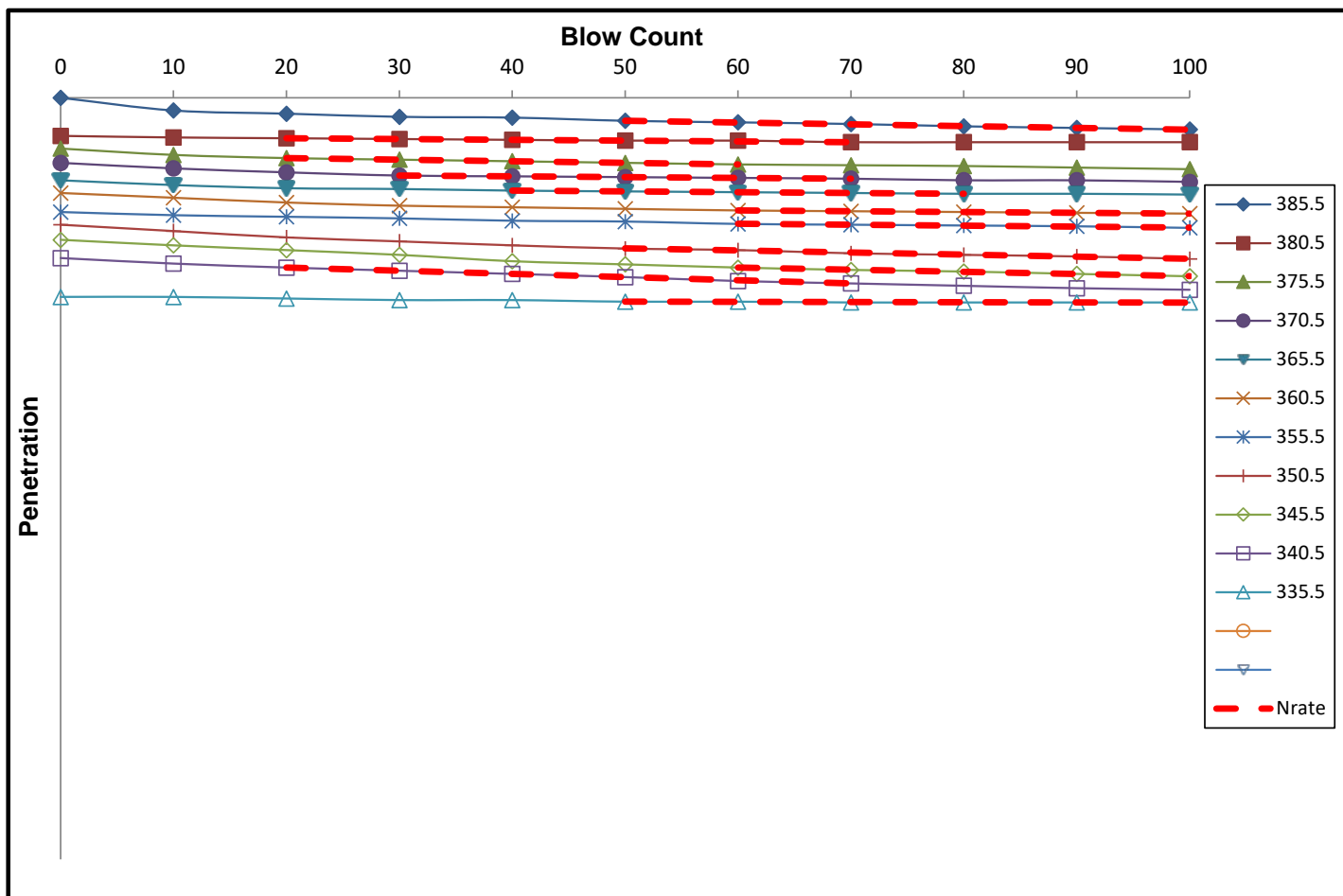
ROUTE F. A. I. - 180 DESCRIPTION I-180 over Bureau Creek LOGGED BY KEG
 SECTION 06-2B-1 LOCATION Near Princeton IL, 41.300390333° Latitude and -89.400923361° Longitude
 COUNTY Bureau DRILLING METHOD HSA HAMMER TYPE AUTO

STRUCT. NO.	Station	DEPTH	BLOW	UCS	MOIST	Surface Water Elev.	Stream Bed Elev.	Groundwater Elev.:	First Encounter	Upon Completion	After	Hrs.
006-0051	521+42.45	(ft)	(/6")	(tsf)	(%)	_____ ft	_____ ft		_____ ft	_____ ft	_____ ft	_____ Hrs.
BORING NO.	Station								453.0			
	520+25.53			Qu					▼			
	19.9 ft RT											
	Ground Surface Elev. 468.97	ft										
SHALE - Gray, Moderately Hard <i>(continued)</i>												
Becomes Moderately Hard to Hard						100/5.75"						
						-		4.2	19			
						-125		B				
						100/5"						
						-		4.8	21			
						-130		B				
No Recovery						100/0.8"						
						-		-				
						334.0		-				
End of Boring						-135						
						-140						

Route: **F. A. I. - 180** Structure No.: **006-0051** (Exist.) (Prop.) Date: **1/13/23** Page: **1** of **1**
 Section: **06-2B-1** Description: **I-180 over Bureau Creek**
 County: **Bureau** Logged by: **KEG** Sampler Tube Length: **18** in.
 Boring No.: **SB-01** Station: _____ Offset: _____ Latitude: **41.3003903** Longitude: **-89.400923**
 Drill Rig: _____ Hammer Type: **AUTO** Hammer Efficiency (%): **70** Surface Elevation: **468.97**
 Borehole Diameter. (in.) **2.5 to 4.5** Split-barrel Sampler Description: **1.375-in. I.D.**

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)												N _{rate,90} (bpf)	q _u (ksf)	Young's Modulus (ksi)
	0	10	20	30	40	50	60	70	80	90	100				
385.47	1.5	1.333	1.292	1.25	1.24	1.198	1.18	1.156	1.13	1.1	1.08	332.7	31.9	7.28	
380.47	1.5	1.479	1.47	1.46	1.45	1.438	1.438	1.42	1.417	1.417	1.417	746.7	71.7	20.33	
375.47	1.5	1.417	1.38	1.35	1.33	1.313	1.29	1.281	1.271	1.25	1.229	373.3	35.8	8.31	
370.47	1.5	1.427	1.375	1.33	1.32	1.313	1.3	1.29	1.271	1.271	1.25	746.7	71.7	20.33	
365.47	1.5	1.438	1.396	1.385	1.36	1.354	1.34	1.33	1.32	1.323	1.313	746.7	71.7	20.33	
360.47	1.5	1.438	1.375	1.333	1.313	1.292	1.27	1.26	1.25	1.24	1.23	746.7	71.7	20.33	
355.47	1.5	1.458	1.438	1.417	1.385	1.375	1.34	1.33	1.32	1.31	1.29	622.2	59.7	15.86	
350.47	1.5	1.417	1.333	1.281	1.229	1.188	1.17	1.125	1.1	1.08	1.05	284.1	27.3	6.14	
345.47	1.5	1.427	1.365	1.302	1.219	1.177	1.14	1.1	1.08	1.05	1.02	276.5	26.5	5.94	
340.47	1.5	1.427	1.38	1.33	1.29	1.25	1.198	1.17	1.135	1.104	1.083	186.7	17.9	4.00	
335.47	1.5	1.5	1.479	1.458	1.458	1.438	1.44	1.427	1.43	1.43	1.43	3058	294	4183.05	

Note: "**Values**" indicates data used to calculate N_{rate,90}.





SOIL BORING LOG

ROUTE F. A. I. - 180 DESCRIPTION I-180 over Bureau Creek LOGGED BY KEG

SECTION 06-2B-1 LOCATION Near Princeton IL, 41.3000433° Latitude and -89.4011098° Longitude

COUNTY Bureau DRILLING METHOD _____ HSA _____ HAMMER TYPE AUTO

STRUCT. NO.	Station	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	Stream Bed Elev.	D E P T H	B L O W S	U C S Qu	M O I S T
		(ft)	(/6")	(tsf)	(%)	ft	ft	(ft)	(/6")	(tsf)	(%)
006-0051	521+42.45										
SB-02	521+80.00										
	60.4 ft RT										
	513.86										
Blind Coring (continued)						SAND - Grayish Brown, Dense, Coarse, w/Gravel (continued)					
	430.4										
SAND - Grayish Brown, Dense, Coarse, w/Gravel			18			Poor Recovery					
			19	-	15				50/5"		
			23						-	-	19
		-85						-105			
1.3% Gravel, 93.8% Sand, 4.9% Silt + Clay			12			Poor Recovery					
			14	-	18				50/3.75"		
			15						-	-	12
		-90						-110			
			13						36		
			16	-	14				50/4.75"	-	21
			27						-		
		-95						-115			
Becomes Very Dense			43			Poor Recovery					
			26	-	15				50/5.25"		
			34						-	-	19
		-100						-120			

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)



SOIL BORING LOG

ROUTE F. A. I. - 180 DESCRIPTION I-180 over Bureau Creek LOGGED BY KEG

SECTION 06-2B-1 LOCATION Near Princeton IL, 41.3000433° Latitude and -89.4011098° Longitude

COUNTY Bureau DRILLING METHOD HSA HAMMER TYPE AUTO

STRUCT. NO. 006-0051
Station 521+42.45

BORING NO. SB-02
Station 521+80.00
Offset 60.4 ft RT
Ground Surface Elev. 513.86 ft

D E P T H	B L O W S	U C S	M O I S T
(ft)	(/6")	(tsf)	(%)

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

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

SAND - Grayish Brown, Dense, Coarse, w/Gravel (<i>continued</i>)	390.4				
No Recovery		100/1"	-	-	
End of Boring			-125		
			-130		
			-135		
			-140		

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau
 SECTION 06-2B-1 LOCATION East shoulder, NB lane, south of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM, Latitude 41°18'0.17"N, Longitude 89°24'2.38"W
 COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO.	Station	BORING NO.	Station	Offset	Ground Surface Elev.	D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	Surface Water Elev.	Stream Bed Elev.	D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
006-0052 (Exist.)	521+42	NB-SW-1	521+95	16.0 ft East	477.00										
Medium Dense Gray-brown, Moist SILTY SAND; trace organics, iron-oxide staining						9									
						3									
						14			26						
474.00															
Medium Dense Brown, Wet GRAVEL with Sand; well-graded gravel (continued)															
										455.00					
Dense Brown, Wet SAND; trace fine gravel, poorly-graded sand															
Loose to Medium Dense Brown, Wet GRAVEL; poorly-graded gravel						2									
						4							18		
						-5			7				17		20
													24		
						7									
						8									
						6			14						
469.00															
Medium Dense Brown, Wet SILTY GRAVEL with Sand						9									
						9								21	
						-10			8				19		14
													18		
466.50															
Loose Brown, Wet SAND with Silt and Gravel; poorly-graded sand						6									
						2									
						3			16						
463.30															
Medium Dense Brown, Wet GRAVEL with Sand; well-graded gravel						3									
						4								12	
						-15			18				15		19
													17		
460.50															
Medium Dense Brown, Wet SAND with Gravel; well-graded sand						8									
						10			23						
459.00															
Medium Dense Brown, Wet GRAVEL with Sand; well-graded gravel						10									
						9								13	
						-20			18				15		19
													17		

SOIL BORING - 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau

SECTION 06-2B-1 LOCATION East shoulder, NB lane, south of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'0.17"N, Longitude 89°24'2.38"W

COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO.	Station	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	Stream Bed Elev.	D E P T H H	B L O W S	U C S Qu	M O I S T
		(ft)	(/6")	(tsf)	(%)	ft	ft	(ft)	(/6")	(tsf)	(%)
006-0052 (Exist.)	521+42										
NB-SW-1	521+95										
	16.0 ft East										
	477.00										
Dense Brown, Wet SAND; trace fine gravel, poorly-graded sand (continued)											
			13								
			16		15				47		
	432.00	-45	22					-65	36		15
									44		
Dense Brown, Wet SAND with Silt and Gravel; poorly-graded sand											
			24								
			22				408.50		50/3		7
		-50	21		17			-70			
	423.50						406.00				
Dense to Very Dense Brown to Gray-brown, Wet SAND with Silt and Gravel; poorly-graded sand			20								
			18						50/4		23
		-55	18		13		403.00	-75			
			28								
			37						50/5		15
		-60	47		11			-80			

SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau

SECTION 06-2B-1 LOCATION East shoulder, NB lane, south of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'0.17"N, Longitude 89°24'2.38"W

COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO.	Station	D E P T H H	B L O W S	U C S Qu	M O I S T T	Surface Water Elev.	Stream Bed Elev.	D E P T H H	B L O W S	U C S Qu	M O I S T T
		(ft)	(/6")	(tsf)	(%)	ft	ft	(ft)	(/6")	(tsf)	(%)
006-0052 (Exist.)	521+42										
NB-SW-1	521+95										
	16.0 ft East										
	477.00										
Completely Weathered, Light-gray, Wet SHALE; slightly fissile rock (continued)											
	394.00										
Completely Weathered, Light-gray, Wet LIMESTONE/SHALE; slightly fissile rock, argillaceous Limestone, calcareous Shale			50/4		23				50/5		25
	-85							-105			
	390.00										
Completely Weathered, Light-gray to Gray, Wet SHALE; slightly fissile to fissile rock			50/2		21				50/4		20
	-90							-110			
			50/5		16				50/5		15
	-95							-115			
			50/4		16				50/3		16
	-100							-120			

SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau
SECTION 06-2B-1 LOCATION East shoulder, NB lane, north of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'1.35"N, Longitude 89°24'2.35"W
COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO.	Station	BORING NO.	Station	Offset	Ground Surface Elev.	D E P T H ft	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	Surface Water Elev.	Stream Bed Elev.	D E P T H ft	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
006-0052 (Exist.)	521+42	NB-SW-2	520+45	11.0 ft East	476.00										
Loose Brown, Moist SANDY SILT							4								
							2		18			454.00			
							4								
							2						4		
							4		15				10		13
						-5	4					-25	10		
							1								
							1		17						
							3					449.00			
							1						6		
467.20							1		11				14		13
Very Loose Brown, Moist SAND with Gravel; well-graded sand						-10	2					-30	15		
							1								
465.00							1		28						
Very Loose to Loose Gray, Wet SANDY SILT							1								
							1						10		
							1						11		
						-15	2		33			-35	12		16
							4								
							2		23						
							3								
457.70							4								
Loose Gray, Wet SAND with Gravel; poorly-graded sand							4					437.20	9		
							4		21				10		19
						-20	4					-40	13		

SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau

SECTION 06-2B-1 LOCATION East shoulder, NB lane, north of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'1.35"N, Longitude 89°24'2.35"W

COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO. 006-0052 (Exist.)
Station 521+42

BORING NO. NB-SW-2
Station 520+45
Offset 11.0 ft East
Ground Surface Elev. 476.00 ft

D E P T H H S	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	D E P T H H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)	Stream Bed Elev. _____ ft	(ft)	(/6")	(tsf)	(%)

Medium Dense to Dense Gray, Wet SAND with Gravel; poorly-graded sand (*continued*)

Dense to Very Dense Gray-brown, Wet SAND with Silt; poorly-graded sand (*continued*)

9						25		
11			19			27		
-45	12				-65	27		10

17				407.20		12		
17			17			19		
-50	14				-70	21		17

Dense to Very Dense Gray-brown, Wet SAND with Silt; poorly-graded sand

Dense Gray, Wet SAND with Silt; poorly-graded sand

11						20		
18			16			20		
-55	30				-75	28		14

17				399.00		30		
25			8			26		
-60	38				-80	50/4		9

Very Dense Gray, Wet GRAVEL with Sand; poorly-graded gravel

SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau
 SECTION 06-2B-1 LOCATION East shoulder, NB lane, north of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'1.35"N, Longitude 89°24'2.35"W
 COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO.	Station	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	Stream Bed Elev.	D E P T H H	B L O W S	U C S Qu	M O I S T
		(ft)	(/6")	(tsf)	(%)	ft	ft	(ft)	(/6")	(tsf)	(%)
006-0052 (Exist.)	521+42										
NB-SW-2	520+45										
	11.0 ft East										
	476.00										
Very Dense Gray, Wet GRAVEL with Sand; poorly-graded gravel (continued)											
		392.50									
Completely Weathered, Light-gray, Wet SHALE; slightly fissile rock			17						50/4		18
		-85	50/4		18			-105			
			50/5	6.6 S	14				50/5		12
		-90						-110			
			50/3		9				50/3		15
		-95						-115			
			50/3		15				50/4		13
		-100						-120			
Completely Weathered, Light-gray, Wet SHALE; slightly fissile rock (continued)											

SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

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)



SOIL BORING LOG

ROUTE FAI 180 (I-180) DESCRIPTION I-180 over Bureau Creek, 1.2 mi South of IL 26 LOGGED BY Jim Zschau
 SECTION 06-2B-1 LOCATION East shoulder, NB lane, north of creek., SEC. 12, TWP. 15N, RNG. 9E, 4th PM,
Latitude 41°18'1.35"N, Longitude 89°24'2.35"W
 COUNTY Bureau DRILLING METHOD Mud Rotary (4.0" ID, 8.0" OD) HAMMER TYPE Auto SPT 140 lb

STRUCT. NO. <u>006-0052 (Exist.)</u>	D E P T H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft
Station <u>521+42</u>					Stream Bed Elev. _____ ft
BORING NO. <u>NB-SW-2</u>	ft (ft)	(/6")	(tsf)	(%)	Groundwater Elev.: _____
Station <u>520+45</u>					First Encounter <u>463.5</u> ft ▼
Offset <u>11.0 ft East</u>					Upon Completion _____ ft
Ground Surface Elev. <u>476.00</u>					After _____ Hrs. _____ ft

Completely Weathered, Light-gray, Wet SHALE; slightly fissile rock (continued)					
		50/4		13	
	-125				
	347.10	50/5		14	
Bottom of hole @ 128.9 ft End of Boring	-130				
	-135				
	-140				

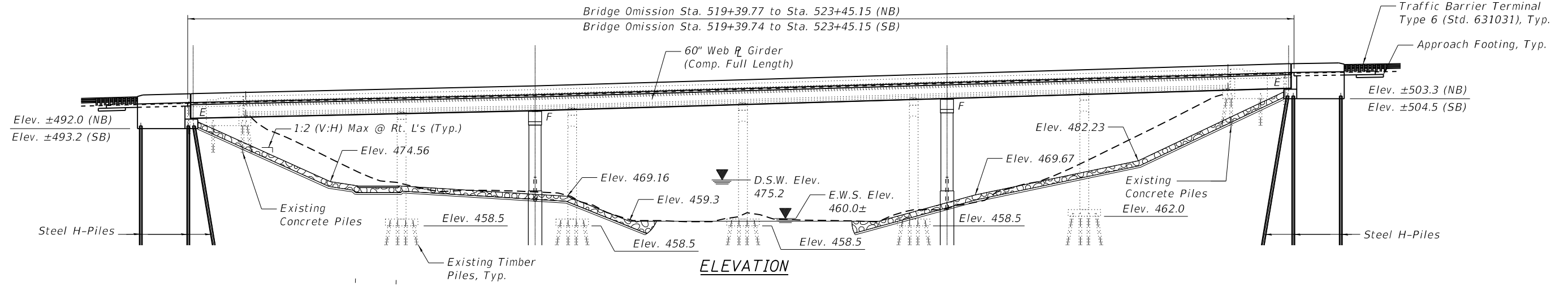
SOIL BORING 107741-026.GPJ IL_DOT.GDT 3/3/23

Appendix B – Preliminary TSL

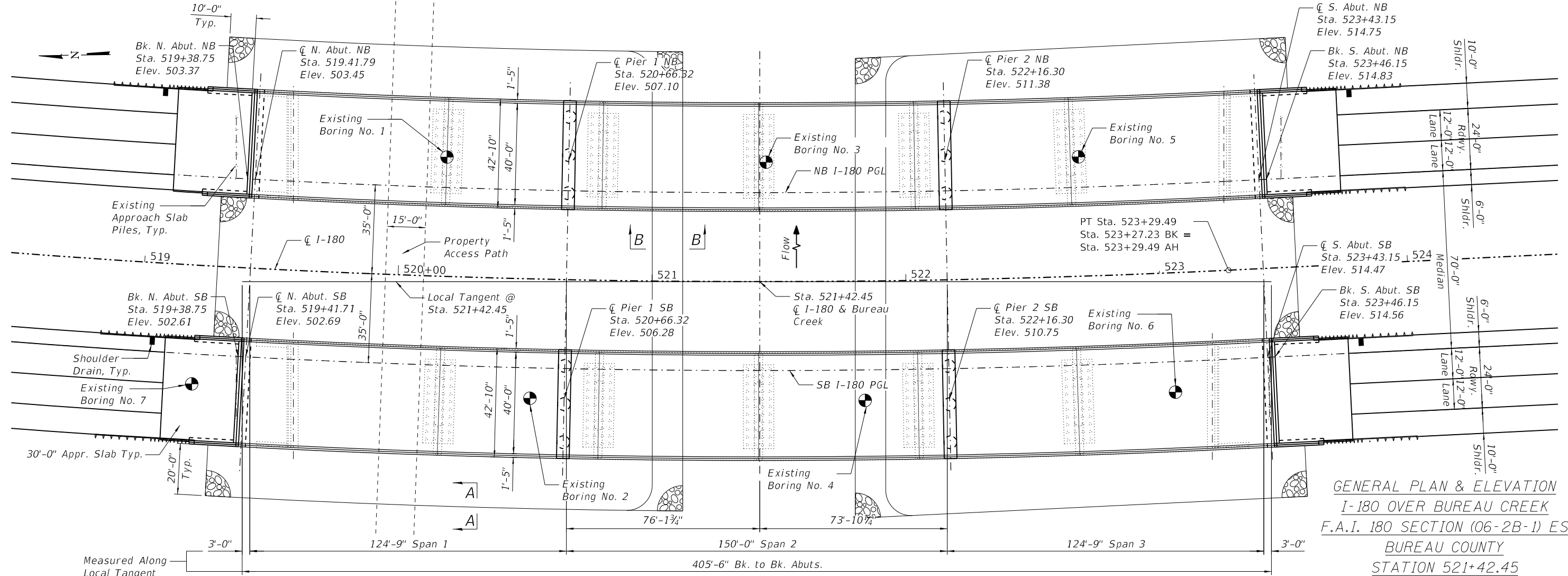
Benchmark 1: Chiseled "□" in corner of Northwest bridge wingwall of existing S.N. 006-0053, Sta. 526+40.41, 70.03 feet right of C, NAVD 88 Elev. 526.13.
 Benchmark 2: Brass disc on C I-180, Sta. 507+58.24, Offset 0.00, NAVD 88 Elev. 495.40.

Existing Structure: SN 006-0051 (SB) and SN006-0052 (NB), built in 1967 as F.A.I. Route I-180, Section 06-2B-1 at Station 521+42.00. The existing dual structures are non-composite, six span 48" concrete I-beams with 7 1/2" super-elevated concrete deck with micro-silica overlay. Span lengths are 60'-6", 61'-4", 61'-5", 61'-5", 61'-4", 60'-6". The decks are curved, and substructures are parallel. The superstructures are supported by open, reinforced concrete abutments supported by concrete piles and solid wall, hammer head piers on spread footings supported by timber piles. The back to back abutment length is 371'-6", face to face of curb width is 40'-6", an out to out deck width is 42'-6". The structure is to be removed and replaced. Traffic is to be shifted to adjacent structures using crossovers.

No salvage



ELEVATION



PLAN

GENERAL PLAN & ELEVATION
 I-180 OVER BUREAU CREEK
 F.A.I. 180 SECTION (06-2B-1) ES
 BUREAU COUNTY
 STATION 521+42.45
 STR. NO. 006-0193 (SB)
 STR. No. 006-0194 (NB)

MODEL: TEL: Plan
 FILE: \\naamc\proj\cdmsm\th-302\p\h\entlev\comp\pw\pl\l\documents\20281127397810_Transportation\02_Engineering_Services\NA_S\003_Structure\10_BIM_CADD\01_Work\plan\027397810-mod-bridge-plan-CDM

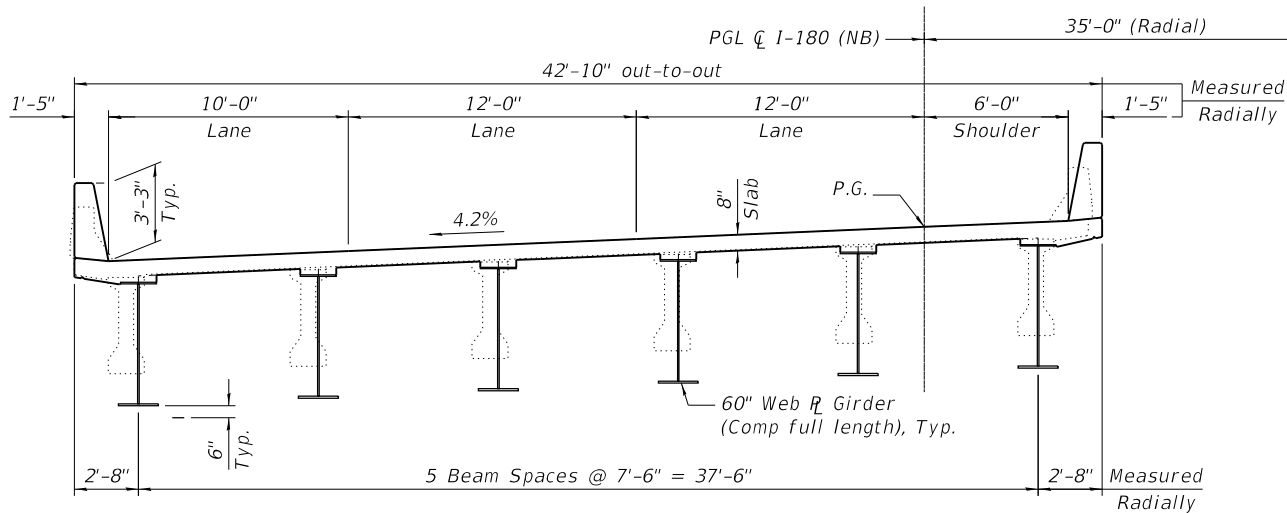


USER NAME = CARSONRT	DESIGNED - RTC	REVISED -
DRAWN - RTC	REVISED -	
PLOT SCALE = 0.1667' / in.	CHECKED - KES	REVISED -
PLOT DATE = 9/12/2022	DATE - 8/4/22	REVISED -

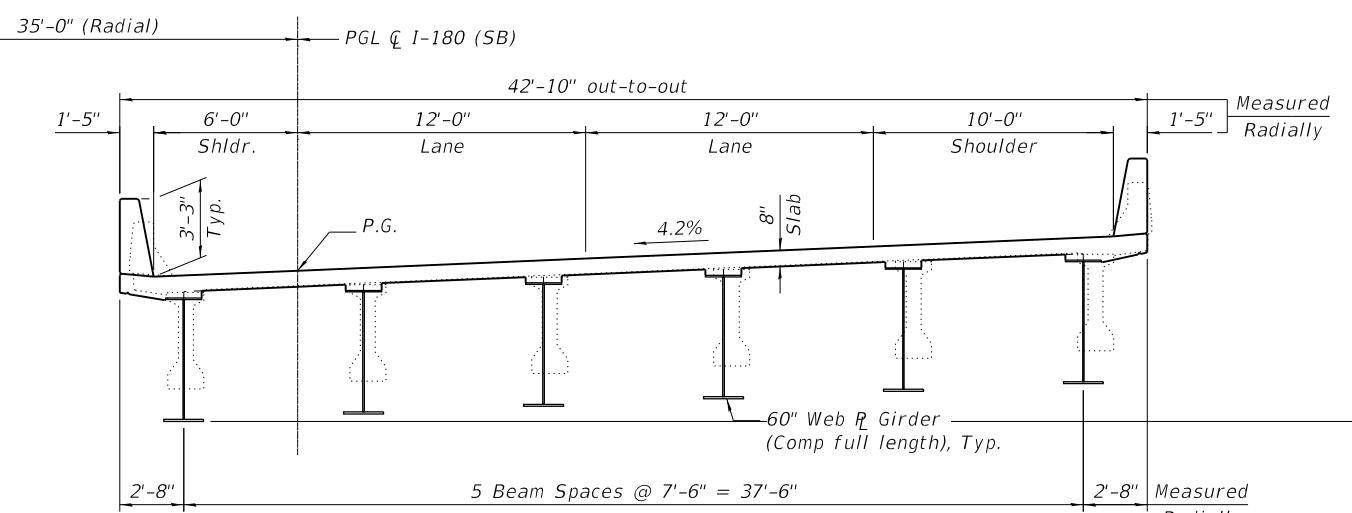
STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: _____	SHEET 1 OF 2 SHEETS	STA. _____ TO STA. _____
--------------	---------------------	--------------------------

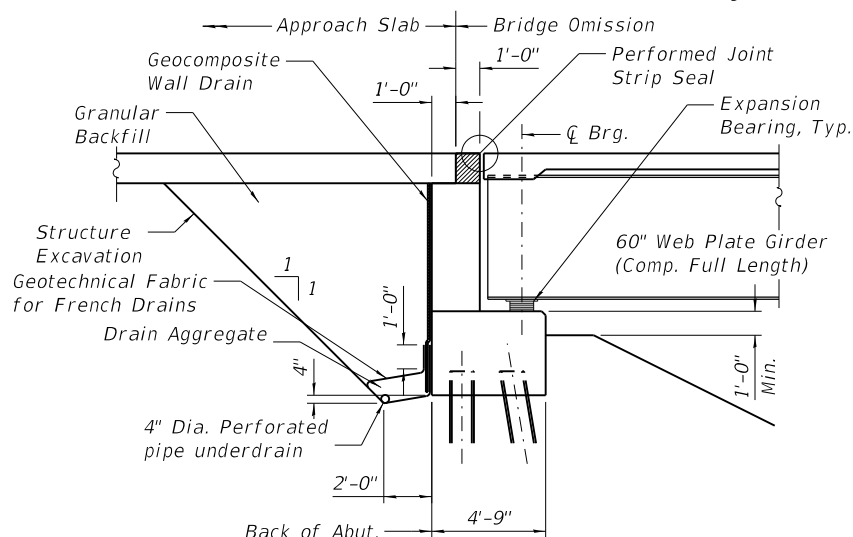
F.A.I. RTE. 180	SECTION (06-2B-1) ES	COUNTY BUREAU	TOTAL SHEETS 2	SHEET NO. 1
CONTRACT NO. 66K66			ILLINOIS FED. AID PROJECT	



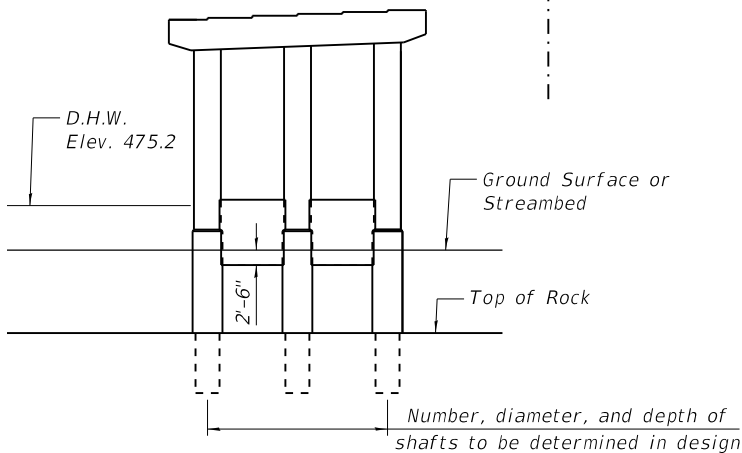
CROSS SECTION (NB)
(Looking South)



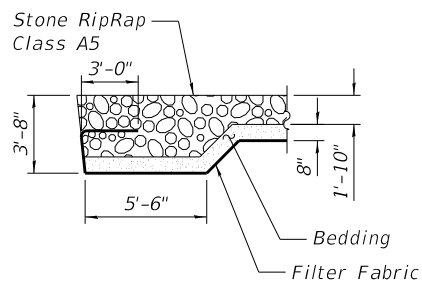
CROSS SECTION (SB)
(Looking South)



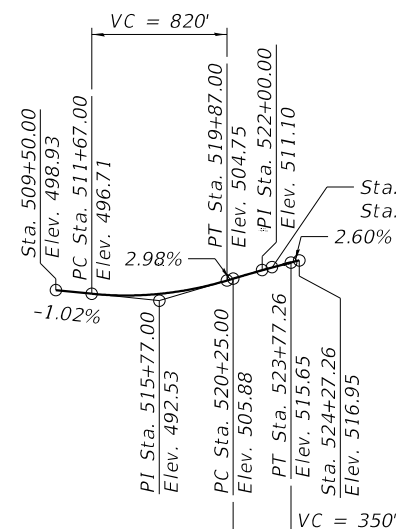
SECTION THRU ABUTMENTS



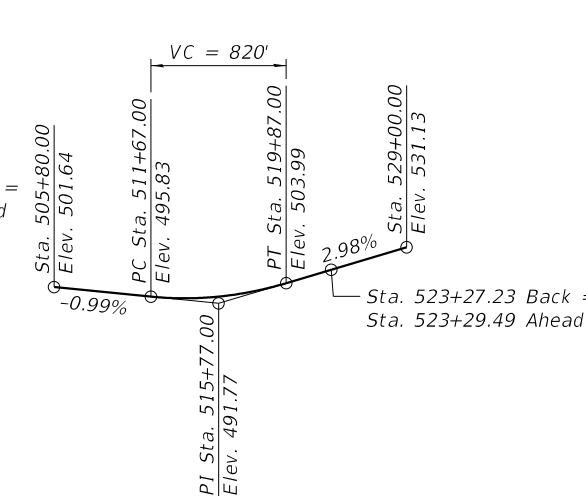
PIER SKETCH
(Southbound Shown, Northbound Similar)



SECTION A-A



PROFILE GRADE
(Northbound; 35' LT Q I-180)



PROFILE GRADE
(Southbound; 35' RT Q I-180)

DESIGN SPECIFICATIONS
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

FIELD UNITS
 $f'_c = 3,500$ psi
 $f_y = 60,000$ psi (reinforcement)
 $f_y = 50,000$ psi (M270 Grade 50)

LOADING HL-93

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

HIGHWAY CLASSIFICATION

F.A.I. Rte. 180 - I-180
 Functional Class: Interstate
 ADT: 4,730 (2024); 6,450 (2044)
 ADTT: 1,154 (2024)
 DHV: 473
 Design Speed: 70 m.p.h.
 Posted Speed: 70 m.p.h.

SEISMIC DATA

Seismic Performance Zone (SPZ) = X
 Design Spectral Acceleration at 1.0 sec. (SD1) = X.X
 Design Spectral Acceleration at 0.2 sec. (SDS) = X.X
 Soil Site Class = X

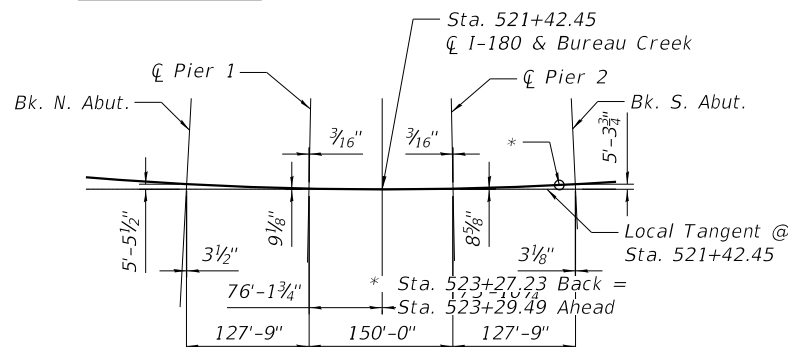
WATERWAY INFORMATION

Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft.		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
			Exist. Low Grade Elev. 499.22 @ Sta. 519+63			Prop. Low Grade Elev. 495.69 @ Sta. 519+42			
Design	10	17400	1913	1964	473.7	2.1	2.0	475.8	475.7
Base	50	27200	2262	2346	475.2	2.3	2.2	477.5	477.4
Scour Check	100	31400	2382	2478	475.7	2.4	2.3	478.1	478.0
Max. Calc.	200	35500	2494	2601	476.2	2.6	2.4	478.8	478.7
	500	40900	2631	2752	476.7	2.8	2.7	479.5	479.4

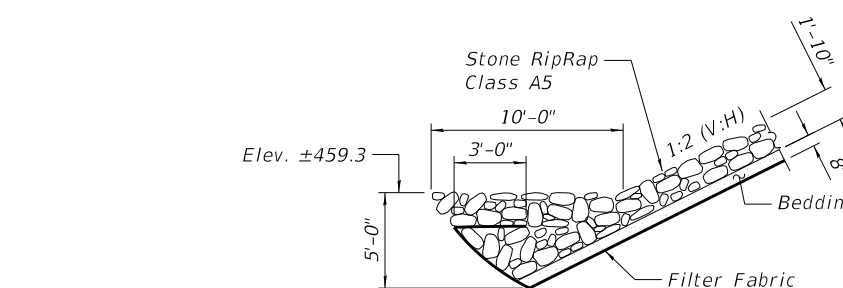
10 year velocity through existing bridge = 4.9 fps
 10 year velocity through prop. bridge = 4.9 fps

CURVE DATA

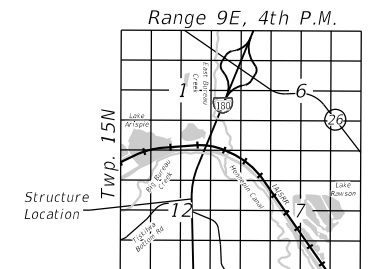
$D = 23^{\circ}38'10.6''$
 $R = 3803.32'$
 $T = 795.81'$
 $L = 1,568.99'$
 $E = 82.37'$
 $S.E = 4.2%$ (NB); 4.2% (SB)
 P.C. Sta. = 507+58.24
 P.T. Sta. = 523+29.49
 Sta. 523+27.23 Back = Sta. 523+29.49 Ahead



OFFSET SKETCH



SECTION B-B



LOCATION SKETCH

DETAILS
I-180 OVER BUREAU CREEK
 F.A.I. 180 SECTION (06-2B-1) ES
 BUREAU COUNTY
 STATION 521+42.45
 STR. NO. 006-0193 (SB)
 STR. NO. 006-0194 (NB)



USER NAME = CARSONRT
 PLOT SCALE = 0.1667' / in.
 PLOT DATE = 9/12/2022

DESIGNED - RTC
 DRAWN - RTC
 CHECKED - KES
 DATE - 8/4/22

REVISED - _____
 REVISED - _____
 REVISED - _____
 REVISED - _____

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SCALE: _____ SHEET 2 OF 2 SHEETS STA. _____ TO STA. _____

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
180	(06-2B-1) ES	BUREAU	2	2
CONTRACT NO. 66K66			ILLINOIS FED. AID PROJECT	

MODEL: TSI Details FILE NAME: P:\CDM Smith\302528311\273972810_Transportation\02_Engineering_Services\MS_Spec\03_Structures\10 BIM\CADD\01_Worksheets\273972810-m02-hdr\bridge.sxd



PROJECT: I-180 Over Bureau Creek

JOB NO: 273978

TS&L Calculations

MADE BY: RTC

DATE: 07/28/22

SUBJECT: Vbent Output Summary for Lpile (Caissons)

CHK'D BY: KES

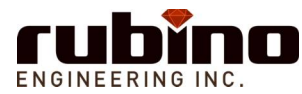
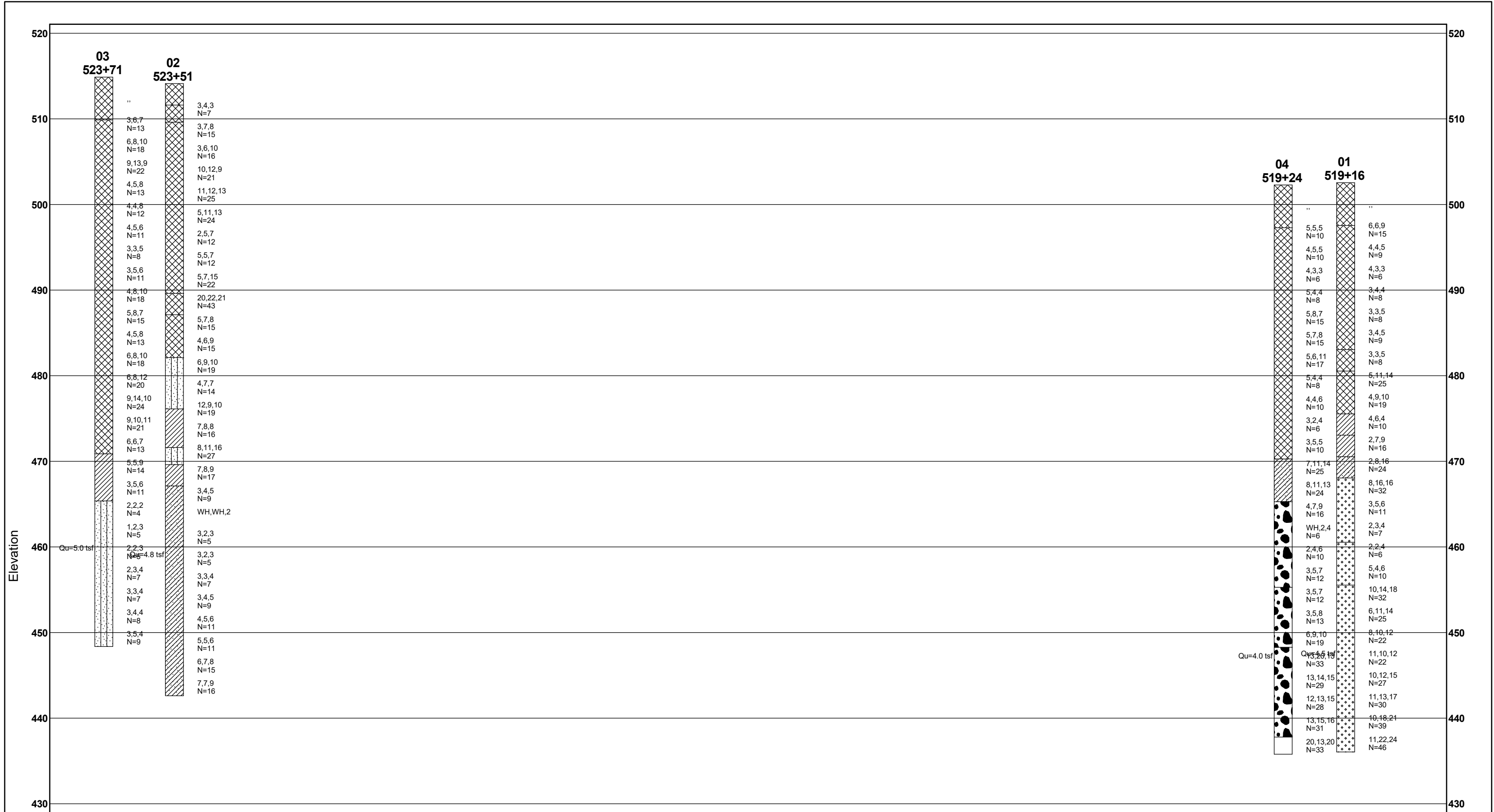
DATE: 07/29/22

Substructure Unit	Substructure Element	Load Case	Limit State	M _u (kip-ft)	A _u (kip)	V _u (kip)	See Note 3
Pier 2 (SB)	Column 1	4	STR-I	720.3	1447.0	16.9	A
		4	SER-I	646.8	1058.1	22.3	D
		8	STR-III	1151.8	974.6	33.6	B
		8	SER-I	1013.5	767.3	26.5	E
		21	STR-III	358.1	706.6	42.8	C
		14	SER-I	975.9	588.2	28.0	
	Column 2	3	STR-I	846.6	1384.7	21.7	
		3	SER-I	966.6	991.6	28.2	
		11	STR-III	1122.2	853.8	34.4	
		13	SER-I	1007.9	723.1	27.2	
		16	STR-III	328.7	853.8	40.7	
	Column 3	1	STR-I	707.2	1409.4	14.7	
		1	SER-I	634.9	1036.6	18.5	
		6	STR-III	1151.8	974.6	33.6	
		6	SER-I	1004.1	739.6	24.6	
		16	STR-III	358.1	706.6	42.8	
		16	SER-I	676.8	632.7	32.9	F

Notes

- (1) The controlling load combination and cases are listed in the Vbent output.
- (2) Loads are resultants.
- (3) (A) - Maximum Axial for Strength Limit State
 (B) - Maximum Moment for Strength Limit State
 (C) - Maximum Shear for Strength Limit State
 (D) - Maximum Axial for Service Limit State
 (E) - Maximum Moment for Service Limit State
 (F) - Maximum Shear for Service Limit State
- (4) Assumed 5' diameter caisson with length of 20 ft. The caisson point of fixity from L-Pile analysis needs to be greater than 20'. If point of fixity is higher than assume length the length of caisson in Vbent will be adjusted and re-run.

Appendix C – Subsurface Soil Profile for Abutment Borings



Rubino Engineering, Inc.
 425 Shepard Drive
 Elgin, IL 60123
 Telephone: 847-931-1555
 Fax: 847-931-1560

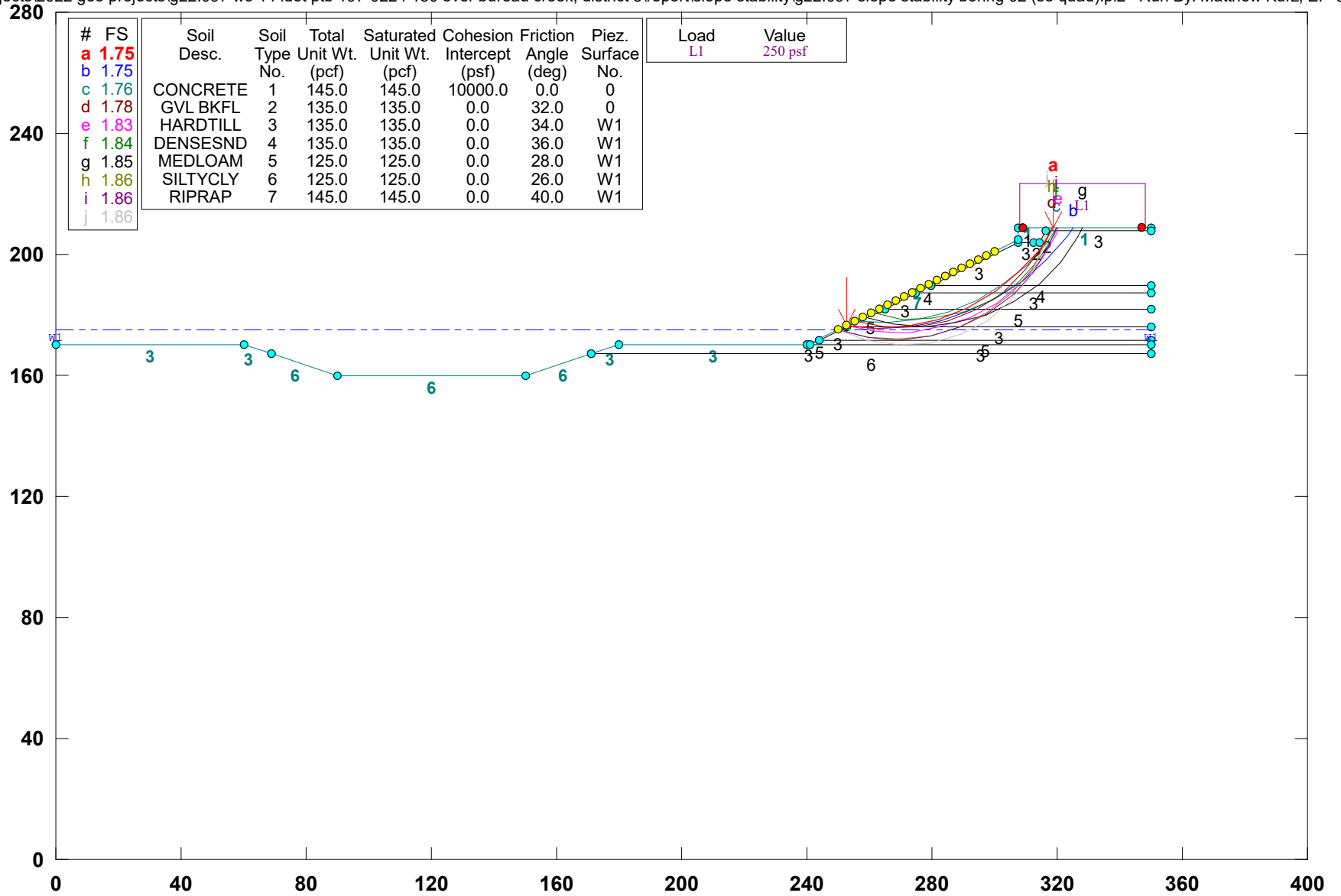
Soil Profile

Rubino Job No.: G22.097
 Project & location: I-180 over Bureau Creek in Bureau County, IL
 Route: FAI 180 (I-180)
 County: Bureau
 Section: 06-2B-1

Appendix D – Slope Stability

G22.097 IDOT PTB 197-022 WO14 Boring 02 (SE Quad) DRAINED ANALYSIS

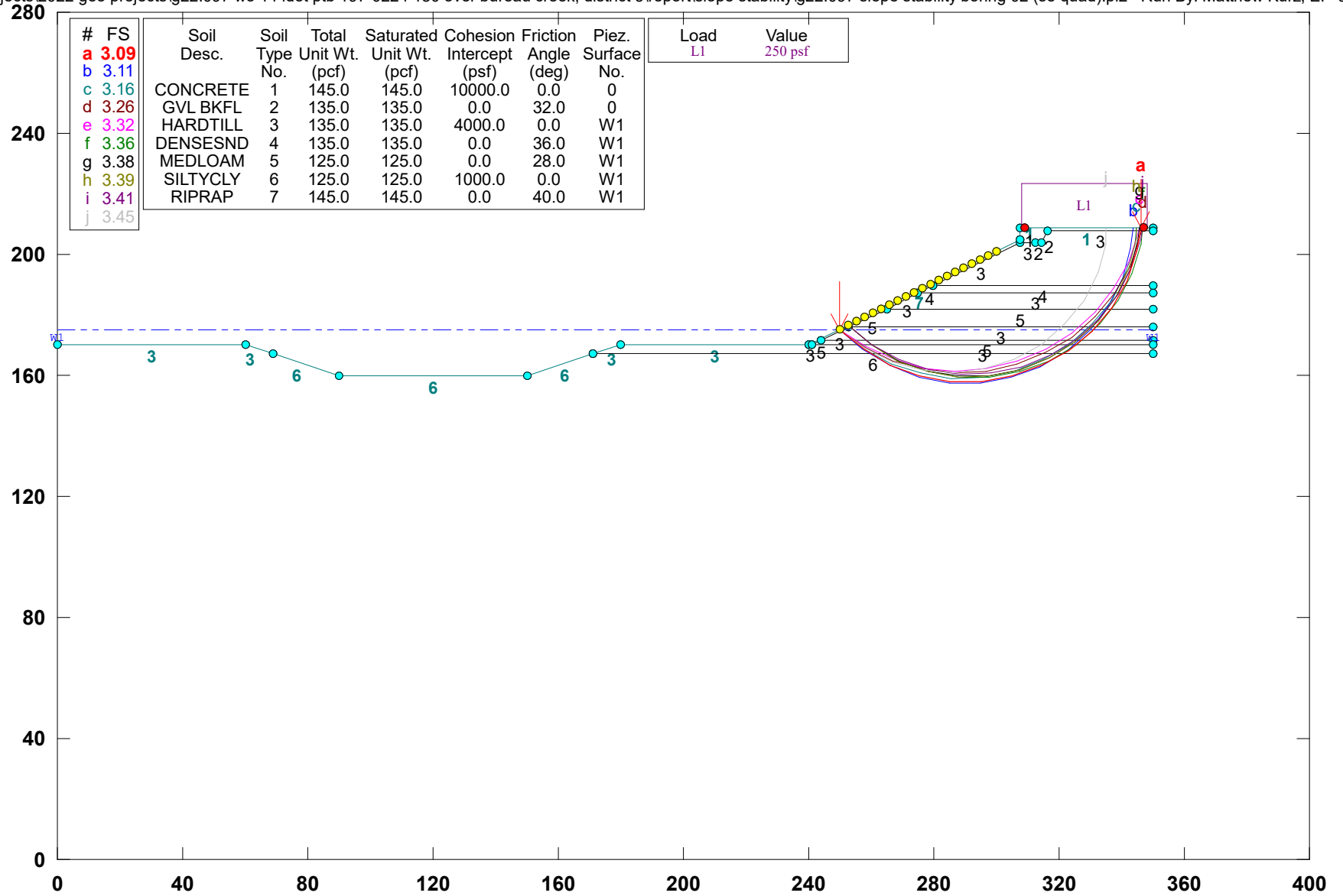
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PCSTABL5M/si FSmin=1.75
Safety Factors Are Calculated By The Modified Bishop Method

G22.097 IDOT PTB 197-022 WO14 Boring 02 (SE Quad) UNDRAINED ANALYSIS

z:\rubino eng projects\2022 geo projects\g22.097 wo 14 idot ptb 197-022 i-180 over bureau creek, district 3\report\slope stability\g22.097 slope stability boring 02 (se quad).pl2 Run By: Matthew Kurz, EI 9/21/2022 03



PCSTABL5M/si FSmin=3.09
Safety Factors Are Calculated By The Modified Bishop Method

Appendix E – IDOT Scour Memorandum

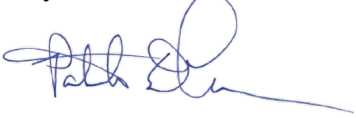


Illinois Department of Transportation

Memorandum

To: Masood Ahmad, District 3 / Attn: Steven P. Ferguson
From: Jayme F. Schiff
Subject: Hydraulic Analysis
Date: June 13, 2022

By: Patrik D. Claussen



FAI Route 180
Section (06-2B-1)ES
Bureau County

P-93-021-20
SNs 006-0051 SB (Exist.)
006-0052 NB (Exist.)

I-180 SB/NB over Big Bureau Creek

We have completed our 2D analysis of the above referenced structures, as requested. The necessary information to complete the waterway information table and the scour analysis is attached. Per our phone conversation on June 2, 2022, the District will use this information to complete and approve the Hydraulic Report.

Once you have approved the Hydraulic Report, please follow with an approval memo. We will post the SMS/SRH2D files to the SharePoint site.

If you have any questions or comments, please contact Nick Jack by telephone at (217) 782-2714 or email at nicholas.jack@illinois.gov.

Attachments

NJ/kkt0060051sb0052nb-20220613

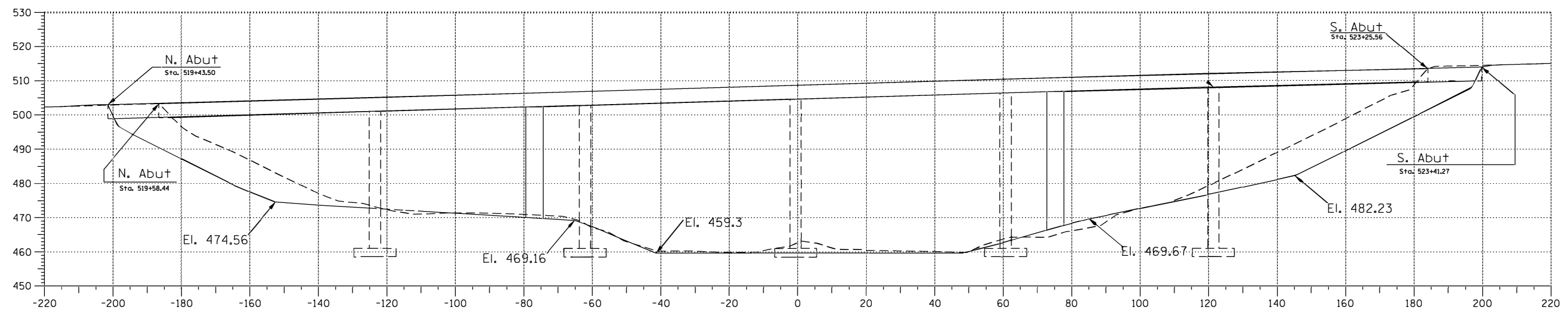
Flood Frequency	Existing					Proposed				
	Thalweg Elevation	Contraction Scour	Pier Scour	Total Scour	Scour Elevation	Thalweg Elevation	Contraction Scour	Pier Scour	Total Scour	Scour Elevation
		Ft.	Ft.	Ft.	Ft.		Ft.	Ft.	Ft.	Ft.
10	459.3	4.5	24.9	29.4	429.9	459.3	4.7	21.8	26.5	432.8
50	459.3	10.6	20.6	31.2	428.1	459.3	10.9	17.6	28.5	430.8
100	459.3	13.0	19.9	32.9	426.4	459.3	13.1	16.9	30.0	429.3
200	459.3	15.3	19.5	34.8	424.5	459.3	15.5	16.1	31.6	427.7
500	459.3	17.8	18.9	36.7	422.6	459.3	18.1	15.8	33.9	425.4

Unadjusted Scour Table

Flood	Frequency	Discharge (cfs)	Waterway Opening (ft ²)		Natural HWE (ft)	Created Head (ft)		Headwater Elevation (ft)	
			Existing	Proposed		Existing	Proposed	Existing	Proposed
	Q10	17,400	1,913	1,964	473.7	2.1	2.0	475.8	475.7
Design	Q50	27,200	2,262	2,346	475.2	2.3	2.2	477.5	477.4
Base	Q100	31,400	2,382	2,478	475.7	2.4	2.3	478.1	478.0
Scour Check	Q200	35,500	2,494	2,601	476.2	2.6	2.5	478.8	478.7
Overtopping	> Q500								
Max. Calc	Q500	40,900	2,631	2,752	476.7	2.8	2.7	479.5	479.4

10 YR. VELOCITY THROUGH EXISTING BRIDGE = 4.9 ft/s
 10 YR. VELOCITY THROUGH PROPOSED BRIDGE = 4.9 ft/s

Waterway Information Table Data



UPSTREAM FACE
 LOOKING DOWNSTREAM

MODEL: Default
 FILE NAME: S:\GEN1\23\DATA\HYDROL-180 Over Tiskilwa Road\existandpropopenimg.dgn

USER NAME = jacknw	DESIGNED -	REVISED -
DRAWN -	REVISED -	REVISED -
PLOT SCALE = 39.7849' / in.	CHECKED -	REVISED -
PLOT DATE = 6/3/2022	DATE -	REVISED -

**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

SCALE:	SHEET	OF	SHEETS	STA.	TO STA.
--------	-------	----	--------	------	---------

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

Appendix F – Seismic Site Class Determination

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====**G22.097 IDOT PTB 197-022 WO 14 I-180 Over Bureau Creek - Replacement of SN 006-0051 and SN 006-052**

Substructure 1 - North Abutment NB Structure

Base of Substruct. Elev. (or ground surf for bents) **492.4** ft.
 Pile or Shaft Dia. **12** inches
 Boring Number **04 (NW Quad)**
 Top of Boring Elev. **502.28** ft.
 Approximate Fixity Elev. **486.4** ft.

Individual Site Class Definition:
 N (bar): 21 (Blows/ft.) Soil Site Class D
 N_{ch} (bar): 22 (Blows/ft.) Soil Site Class D <-----Controls
 s_u (bar): 1.84 (ksf) Soil Site Class D

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation (ft.)	Sample Thick. (ft.)	Layer Description	
			N	Qu (tsf) Boundary
497.3	5.00	Augered		
494.8	2.50	10	4.00	
492.3	2.50	10	4.40	
489.8	2.50	6	3.20	
487.3	2.50	8	3.90	
1.6	484.8	2.50	15	4.40
4.1	482.3	2.50	15	4.60
6.6	479.8	2.50	17	5.00
9.1	477.3	2.50	8	3.80
11.6	474.8	2.50	10	3.90
14.1	472.3	2.50	6	2.00
16.6	469.8	2.50	10	4.10
19.1	467.3	2.50	25	5.10
21.6	464.8	2.50	24	5.10
24.1	462.3	2.50	16	
26.6	459.8	2.50	6	
29.1	457.3	2.50	10	
31.6	454.8	2.50	12	
34.1	452.3	2.50	12	
36.6	449.8	2.50	13	
39.1	447.3	2.50	19	
41.6	444.8	2.50	33	
44.1	442.3	2.50	29	
46.6	439.8	2.50	28	
49.1	437.3	2.50	31	
50.6	435.8	1.50	33	
85.6	400.8	35.00	30	
100.0	386.4	14.40	100	1.00

Substructure 2 - North Abutment SB Structure

Base of Substruct. Elev. (or ground surf for bents) **491.9** ft.
 Pile or Shaft Dia. **12** inches
 Boring Number **01 (NW Quad)**
 Top of Boring Elev. **502.55** ft.
 Approximate Fixity Elev. **485.9** ft.

Individual Site Class Definition:
 N (bar): 22 (Blows/ft.) Soil Site Class D
 N_{ch} (bar): 23 (Blows/ft.) Soil Site Class D <-----Controls
 s_u (bar): 1.57 (ksf) Soil Site Class D

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation (ft.)	Sample Thick. (ft.)	Layer Description	
			N	Qu (tsf) Boundary
497.6	5.00	Augered		
495.1	2.50	15	4.50	
492.6	2.50	9	4.50	
490.1	2.50	6	4.10	
487.6	2.50	8	4.20	
3.3	485.1	2.50	8	4.10
5.8	482.6	2.50	9	4.10
8.3	480.1	2.50	8	3.80
10.9	477.6	2.50	25	
13.4	475.1	2.50	19	
16.6	472.6	2.50	10	3.40
19.1	470.1	2.50	16	4.10
21.6	467.6	2.50	24	4.50
23.4	465.1	2.50	32	
25.9	462.6	2.50	11	
28.4	460.1	2.50	7	
30.9	457.6	2.50	6	
33.4	455.1	2.50	10	
35.9	452.6	2.50	32	
38.4	450.1	2.50	25	
40.9	447.6	2.50	22	
43.4	445.1	2.50	22	
45.9	442.6	2.50	27	
48.4	440.1	2.50	30	
50.9	437.6	2.50	39	
85.9	400.1	35.00	30	
100.0	386.0	14.10	100	1.00

Substructure 3 - South Abutment NB Structure

Base of Substruct. Elev. (or ground surf for bents) **503.7** ft.
 Pile or Shaft Dia. **12** inches
 Boring Number **03 (SE Quad)**
 Top of Boring Elev. **514.87** ft.
 Approximate Fixity Elev. **497.7** ft.

Individual Site Class Definition:
 N (bar): 12 (Blows/ft.) Soil Site Class E
 N_{ch} (bar): 15 (Blows/ft.) Soil Site Class D <-----Controls
 s_u (bar): 2.18 (ksf) Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation (ft.)	Sample Thick. (ft.)	Layer Description	
			N	Qu (tsf) Boundary
509.9	5.00	Augered		
507.4	2.50	13	5.00	
504.9	2.50	18	5.00	
502.4	2.50	22	6.10	
499.9	2.50	13	5.00	
0.3	497.4	2.50	12	4.60
2.8	494.9	2.50	11	4.00
5.3	492.4	2.50	8	3.80
7.8	489.9	2.50	11	4.00
10.3	487.4	2.50	18	5.10
12.8	484.9	2.50	15	4.60
15.3	482.4	2.50	13	4.20
17.8	479.9	2.50	18	4.70
20.3	477.4	2.50	20	5.10
22.8	474.9	2.50	28	
25.3	472.4	2.50	21	5.10
27.8	469.9	2.50	13	4.20
30.3	467.4	2.50	14	4.00
32.8	464.9	2.50	11	3.60
35.3	462.4	2.50	4	1.00
37.8	459.9	2.50	5	1.00
40.3	457.4	2.50	5	1.00
42.8	454.9	2.50	7	1.50
45.3	452.4	2.50	7	1.50
47.8	449.9	2.50	8	1.50
50.3	447.4	2.50	9	2.00
52.8	444.9	2.50	10	2.00
55.3	442.4	2.50	10	2.00
57.8	439.9	2.50	10	2.00
60.3	437.4	2.50	10	2.00
97.0	400.7	36.70	15	
100.0	397.7	3.00	100	1.00

Substructure 4 - South Abutment SB Structure

Base of Substruct. Elev. (or ground surf for bents) **503.7** ft.
 Pile or Shaft Dia. **12** inches
 Boring Number **02 (SE Quad)**
 Top of Boring Elev. **514.2** ft.
 Approximate Fixity Elev. **497.7** ft.

Individual Site Class Definition:
 N (bar): 13 (Blows/ft.) Soil Site Class E
 N_{ch} (bar): 16 (Blows/ft.) Soil Site Class D <-----Controls
 s_u (bar): 2.67 (ksf) Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation (ft.)	Sample Thick. (ft.)	Layer Description	
			N	Qu (tsf) Boundary
511.7	2.50	7	2.50	
509.2	2.50	7	2.50	B
506.7	2.50	15	4.80	
504.2	2.50	16	5.10	
501.7	2.50	21	5.10	
499.2	2.50	25	5.00	B
1.0	496.7	2.50	24	
3.5	494.2	2.50	12	4.60
6.0	491.7	2.50	12	4.50
8.5	489.2	2.50	22	5.80
11.0	486.7	2.50	43	
13.5	484.2	2.50	15	4.30
16.0	481.7	2.50	15	4.60
18.5	479.2	2.50	19	
21.0	476.7	2.50	14	
23.5	474.2	2.50	19	4.60
26.0	471.7	2.50	16	4.60
28.5	469.2	2.50	27	
31.0	466.7	2.50	17	4.00
33.5	464.2	2.50	9	2.40
36.0	461.7	2.50	2	0.50
38.5	459.2	2.50	5	1.50
41.0	456.7	2.50	5	
43.5	454.2	2.50	7	
46.0	451.7	2.50	9	2.00
48.5	449.2	2.50	11	2.50
51.0	446.7	2.50	11	3.00
53.5	444.2	2.50	15	3.50
56.0	441.7	2.50	16	3.50
58.5	439.2	2.50	15	3.50
61.0	436.7	2.50	15	3.50
97.0	400.7	36.00	15	
100.0	397.7	3.00	100	1.00

Global Site Class Definition: Substructures 1 through 6

N (bar): 29 (Blows/ft.) Soil Site Class D <-----Controls
 N_{ch} (bar): 26 (Blows/ft.) Soil Site Class D
 s_u (bar): 1.76 (ksf) Soil Site Class D

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE===== **G22.097 IDOT PTB 197-022 WO 14 I-180 Over Bureau Creek - Replacement of SN 006-0051 and SN 006-052**

Substructure 5 -North Pier SB Structure						
Base of Substruct. Elev. (or ground surf for bents)					470	ft.
Pile or Shaft Dia.					36	inches
Boring Number					SB-01	
Top of Boring Elev.					468.97	ft.
Approximate Fixity Elev.					452	ft.
Individual Site Class Definition:						
N (bar):		39	(Blows/ft.)		Soil Site Class D <----Controls	
N _{ch} (bar):		31	(Blows/ft.)		Soil Site Class D	
s _u (bar):		1.13	(ksf)		Soil Site Class D	
Seismic Soil Column	Bot. Of Sample	Sample	Layer Description			
Depth	Elevation	Thick.	N	Qu	Boundary	
(ft)	(ft)	(ft.)	(tsf)			
	465.5	3.50	6	0.70		
	463.0	2.50	5	0.20		
	460.5	2.50	15	0.10		
	458.0	2.50	13	0.20	B	
	455.5	2.50	6		B	
	453.0	2.50	7			
1.5	450.5	2.50	9			
4.0	448.0	2.50	19			
6.5	445.5	2.50	14			
9.0	443.0	2.50	20			
11.5	440.5	2.50	22			
14.0	438.0	2.50	22			
16.5	435.5	2.50	22		B	
19.0	433.0	2.50	26			
21.5	430.5	2.50	26		B	
24.0	428.0	2.50	23	1.50		
26.5	425.5	2.50	23	1.50		
29.0	423.0	2.50	29	1.30		
31.5	420.5	2.50	29	1.30		
34.0	418.0	2.50	30	1.50		
36.5	415.5	2.50	30	1.50		
39.0	413.0	2.50	30	1.50		
41.5	410.5	2.50	30	1.50	B	
44.0	408.0	2.50	71			
46.5	405.5	2.50	71			
49.0	403.0	2.50	71			
51.5	400.5	2.50	71			
54.0	398.0	2.50	54			
56.5	395.5	2.50	54			
59.0	393.0	2.50	54			
61.5	390.5	2.50	54			
64.0	388.0	2.50	54			
66.5	385.5	2.50	54		B	
100.0	352.0	33.47	100	1.00	B	

Substructure 6 - South Pier NB Structure						
Base of Substruct. Elev. (or ground surf for bents)					470	ft.
Pile or Shaft Dia.					36	inches
Boring Number					NB-SW-1	
Top of Boring Elev.					477	ft.
Approximate Fixity Elev.					452	ft.
Individual Site Class Definition:						
N (bar):		64	(Blows/ft.)		Soil Site Class C <----Controls	
N _{ch} (bar):		47	(Blows/ft.)		Soil Site Class D	
s _u (bar):		1	(ksf)		Soil Site Class D	
Seismic Soil Column	Bot. Of Sample	Sample	Layer Description			
Depth	Elevation	Thick.	N	Qu	Boundary	
(ft)	(ft)	(ft.)	(tsf)			
	474.0	3.00	17		B	
	471.5	2.50	8			
	469.0	2.50	14		B	
	466.5	2.50	14		B	
	463.3	3.20	5		B	
	460.5	2.80	10		B	
	459.0	1.50	18		B	
	456.5	2.50	20			
	455.0	1.50	20		B	
	452.5	2.50	41			
2.0	450.0	2.50	41			
4.5	447.5	2.50	37			
7.0	445.0	2.50	37			
9.5	442.5	2.50	32			
12.0	440.0	2.50	32			
14.5	437.5	2.50	32			
17.0	435.0	2.50	32			
20.0	432.0	3.00	38		B	
22.5	429.5	2.50	43			
25.0	427.0	2.50	43			
28.5	423.5	3.50	43		B	
31.0	421.0	2.50	36			
33.5	418.5	2.50	36			
36.0	416.0	2.50	84			
38.5	413.5	2.50	84			
41.0	411.0	2.50	80			
43.5	408.5	2.50	80		B	
46.0	406.0	2.50	100		B	
49.0	403.0	3.00	100		B	
100.0	352.0	51.00	100	1.00	B	

Substructure 7						
Base of Substruct. Elev. (or ground surf for bents)						ft.
Pile or Shaft Dia.						inches
Boring Number						
Top of Boring Elev.						ft.
Approximate Fixity Elev.						ft.
Individual Site Class Definition:						
N (bar):			(Blows/ft.)		NA	
N _{ch} (bar):			(Blows/ft.)		NA	
s _u (bar):			(ksf)		NA	
Seismic Soil Column	Bot. Of Sample	Sample	Layer Description			
Depth	Elevation	Thick.	N	Qu	Boundary	
(ft)	(ft)	(ft.)	(tsf)			

Substructure 8						
Base of Substruct. Elev. (or ground surf for bents)						ft.
Pile or Shaft Dia.						inches
Boring Number						
Top of Boring Elev.						ft.
Approximate Fixity Elev.						ft.
Individual Site Class Definition:						
N (bar):			(Blows/ft.)		NA	
N _{ch} (bar):			(Blows/ft.)		NA	
s _u (bar):			(ksf)		NA	
Seismic Soil Column	Bot. Of Sample	Sample	Layer Description			
Depth	Elevation	Thick.	N	Qu	Boundary	
(ft)	(ft)	(ft.)	(tsf)			