TECHNICAL MEMORANDUM

To: Mr. Giancarlo Gierbolini, P.E.
District One Geotechnical Engineer
Illinois Department of Transportation
Region 1/District 1

From: Riyad Wahab, Ph.D. P.E.
Senior Geotechnical Engineer

Date: July 28, 2022

Reference: I-55 - North and South Frontage Roads Sheet Pile Walls
SN 022-0513
Section: 2021-068-CR
Contract: 62P06
PTB: 196/017 (WO 7)
CTL Project Number 22F761

As directed in your May 25, 2022, letter to Wang Engineering, Inc. (Wang), we have prepared this Technical Memorandum to address the geotechnical design aspects of the above referenced sheet pile walls. The two walls are part of the culvert ends' replacement project at Sawmill Creek under I-55 and the north and south frontage roads (see Attachment A – Project Location Map). As indicated in your letter and shown on the Preliminary Plans (Attachment D), the north retaining wall will extend from the culvert to approximately 150 feet east of the culvert. The south retaining wall will extend from the culvert to approximately 150 feet west of the culvert. Both walls will consist of driven sheet piles and will have a maximum exposed height of approximately 6 feet. Below is a summary of the subsurface explorations, geotechnical analyses, design recommendations and construction considerations related to the proposed sheet pile walls.

1.0 Subsurface Exploration

This section describes the subsurface exploration completed as part of this project. The subsurface investigation program was performed according to IDOT's Geotechnical Manual.

1.1 Subsurface Site Investigation

The subsurface investigation was conducted on June 21, June 22, and July 7, 2022. which included advancing a total of six (6) soil borings to depths of 30 feet bgs within the vicinity of the proposed improvements. Three borings (SB-1, SB-2 and SB-3) were performed along the proposed south sheet pile wall and three borings (SB-6, SB-7 and SB-8) were performed along the proposed north sheet pile wall (Attachment A – Boring Location Plan). The boring locations were selected by

CTL and were conducted in the field by Wang Engineering, Inc. (Wang) based on site conditions and accessibility, using 2.25-inch ID hallow stem augers, as stated on the boring logs. Ground surface elevations, stations and offsets of the borings were provided by Wang. Table 1 below presents a summary of the borings completed for the proposed sheet pile walls.

Table 1: Summary of Soil Borings

Boring	Station	Offset (ft)	Ground Surface Elevation (ft MSL)	Depth (ft)	Location
SB-1	562+04.28	121.31ft RT	633.13	30	EB S Frontage Road
SB-2	562+98.93	119.83ft RT	688.40	30	EB S Frontage Road
SB-3	563+99.57	120.02 RT	688.76	30	EB S Frontage Road
SB-6	566+45.78	118.26 LT	691.18	30	WB N Frontage Road
SB-7	567+21.58	119.12 LT	690.74	30	WB N Frontage Road
SB-8	567+79.62	119.65 LT	690.74	30	WB N Frontage Road

Based on the information in the boring logs provided by Wang, it appears that soil sampling was performed using the Standard Penetration Test (SPT, ASTM D 1556). In this procedure, a 2-inch O.D. split barrel or split spoon sampler is driven 18 inches into undisturbed soil using a 30-inch drop of a 140-pound hammer. The number of hammer drops (blow counts) is recorded in 6-inch intervals for each sample collected. The number of blow counts to advance the sampler the final 12 inches is called the SPT “N-value”. The N-values are shown on the Soil Boring Logs in Attachment B. Soil samples were obtained with the split barrel sampler at 2.5-foot intervals to the boring termination depths.

Also, based on the information presented in the boring logs, it is our understanding that unconfined compressive strength values (Qu and Qp) were obtained in the field for the cohesive soils encountered during the subsurface investigation, using a calibrated Rimac compressive tester to determine the “Qu” according to IDOT procedure or a calibrated hand penetrometer to determine the “Qp”. The hand penetrometer is typically used when a full-length sample could not be obtained to conduct the Rimac Qu test. Moisture content values for representative soil samples collected from each split spoon sampler are also shown on the boring logs. To verify soil classifications, Atterberg limits and particle size analysis tests were performed on select samples by Wang, Test results are included in Appendix C (Laboratory Test Results).

1.2 General Subsurface Conditions

General subsurface conditions are described below and are grouped based on similar soils encountered throughout the proposed improvements.

Generally, the surficial materials and the subsurface soils along the proposed south and north walls are quite similar in characteristics with varying thicknesses. Borings SB-1 through SB-3 (along the south wall) encountered near surface material consisting of 6 to 7 inches of asphalt; however, its thickness in Borings SB-6 through SB-8 (along the north wall) is 14 inches. The asphalt layer is underlain by 6 to 24 inches of medium dense sandy gravel base course in all borings except in SB-3 where it is 6 feet thick. Below the surficial layers, the borings encountered layers of silty clay, silty clay loam and silty loam to the boring termination depths in the six borings. The strength of these cohesive soil layers varied from medium stiff to very stiff with Qu values ranging from 0.9 to 4.7 tsf, except one thin layer in SB-6 with 0.49 tsf and a near surface thin layer in SB-2 with 7.2 tsf. The particle size analysis tests results shown in Appendix C (Laboratory Test results) generally confirmed the original field soil descriptions, and thus did not affect the geotechnical analyses and recommendations in this report.

Detailed descriptions of the soil borings and the soil profiles along the proposed south and north walls are provided in Attachment B (Soil Borings and Soil Profiles) which provides specific conditions encountered at each soil boring location. The stratifications shown on the soil boring logs represent the conditions only at the actual soil boring locations and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

1.3 Groundwater Conditions

Water level measurements were taken in the soil borings when water was encountered while drilling and after the completion of the soil borings. We assume that Wang did not leave any one of the borings open to collect delayed water readings after leaving the site due to safety concerns. Groundwater depths are shown in Table 2 below.

Table 2: Summery of Groundwater Depths (feet bgs)

Soil Boring	While Drilling	At Completion of Drilling
SB-1	Dry	Dry
SB-2	10.00	25.00
SB-3	Dry	Dry
SB-4	11.30	Dry
SB-6	10.00	13.50
SB-7	10.00	Dry
SB-8	23.00	20.00

2.0 Geotechnical Analysis

This section provides the geotechnical analysis for the proposed sheet pile walls, based on the results of the field exploration and testing.

2.1 Seismic Parameters

The site located in Seismic Performance Zone (SPZ) 1. According to the 2012 IDOT Bridge Manual, Seismic design is not required for retaining walls located in SPZ 1 zone.

2.2 Slope Stability

Base on Figure 9 of the Ciorba Group "Tech Memo" dated 3/3/2016, slope failure was observed at the northeast wingwall; however, it is our opinion the figure rather indicates surficial sloughing or erosion than a typical slope failure. According to the Geotechnical Manual, embankment slopes less 15 feet high do not require slope stability analysis. The proposed cross sections at Stations 563+00, 563+50, 566+25 and 566+50 indicate slopes of 1V:1.5H (steeper than the standard 1:2). Based on the strength data in the soil borings, our preliminary stability analyses indicated adequate factors of safety (greater than the minimum required 1.5 for embankment fill).

2.3 Global Slope Stability

The sheet pile design is based on the lateral earth pressure parameters (Ka, Ko and Kp) which are typically derived by assuming certain failure surfaces, and thus the sheet pile walls are designed to consider these failure surfaces. As such, the sheet piles are design on a built-in safety factor and the slope stability analysis only adds a redundancy. Therefore, in this case where the sheet piles are driven into an embankment of limited height, no global stability analysis is required.

3.0 Geotechnical Recommendations

This section provides the geotechnical recommendations for the proposed improvements based on the results of the subsurface investigation and testing, and geotechnical analysis.

3.1 Lateral Earth Pressure Parameters

Based on the soil strength data in the six soil borings the south and north end wingwalls, respectively, CTL recommends the lateral earth pressure parameters shown in Table 3 below for the design of the south and north sheet pile walls, assuming the back slope is flat. Based on the cross sections at Stations 563+50 and 564+00 that show some backslopes as steep as 1V:1.5H, and the fact that these slopes might be subjected to possible future sloughing, CTL recommends that they should not be accounted for in any passive resistance.

Table 3 – Lateral Earth Pressure Parameters

Soil Description	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At-Rest Earth Pressure Coefficient (K_o)
Stiff to Very Stiff, Silty Clay	0.36	2.77	0.53

4.0 Construction Recommendations

This section provides the construction recommendations for the proposed improvements based on the results of the subsurface investigation and testing, as well as the geotechnical analysis and recommendations. All work performed for the proposed project should conform to the requirements of IDOT Standard Specifications.

Based on the strength data in the soil borings, with Qu values marginally exceeding 4 tsf except in the two thin layers in SB-2 and SB-6, mentioned above, the sheet pile wall option appears to be feasible. However, care should be taken when driving the sheeting into these two thin hard layers mentioned in Section 1.2 above, to avoid possible crushing.

CTL recommends that the standard stepping and benching be followed when placing the new fill over the existing fill to avoid future slope failure. Also, standard, and timely erosion control measures should be constructed over the exposed slopes to avoid sloughing/erosion in the future.

5.0 Professional Disclaimer

This report was prepared based on the project information supplied by the client and is intended only for use on this project. This report was prepared by interpreting the data from the soil borings and field tests made during the field investigation, and from the results of any laboratory tests obtained from the samples taken. The report gives a representative, but not exhaustive, picture of the project subsurface conditions. The geotechnical engineer warrants that the findings, recommendations, specifications, and professional advice given within this report have been prepared using generally accepted professional engineering practices. The recommendations provided in the report are specific to the project described herein and are based on the information obtained from the soil boring locations within the proposed improvements. Changes involving the proposed improvements from those enumerated within this report should be submitted for our review to evaluate our recommendations.

Chicago Testing Laboratory, Inc. (CTL) appreciates the opportunity to work with you on this project and look forward to serving as your Geotechnical Engineering Consultant on future projects. We would be pleased to discuss any questions you have about the contents of this report.

Respectfully Submitted,
CHICAGO TESTING LABORATORY, INC.

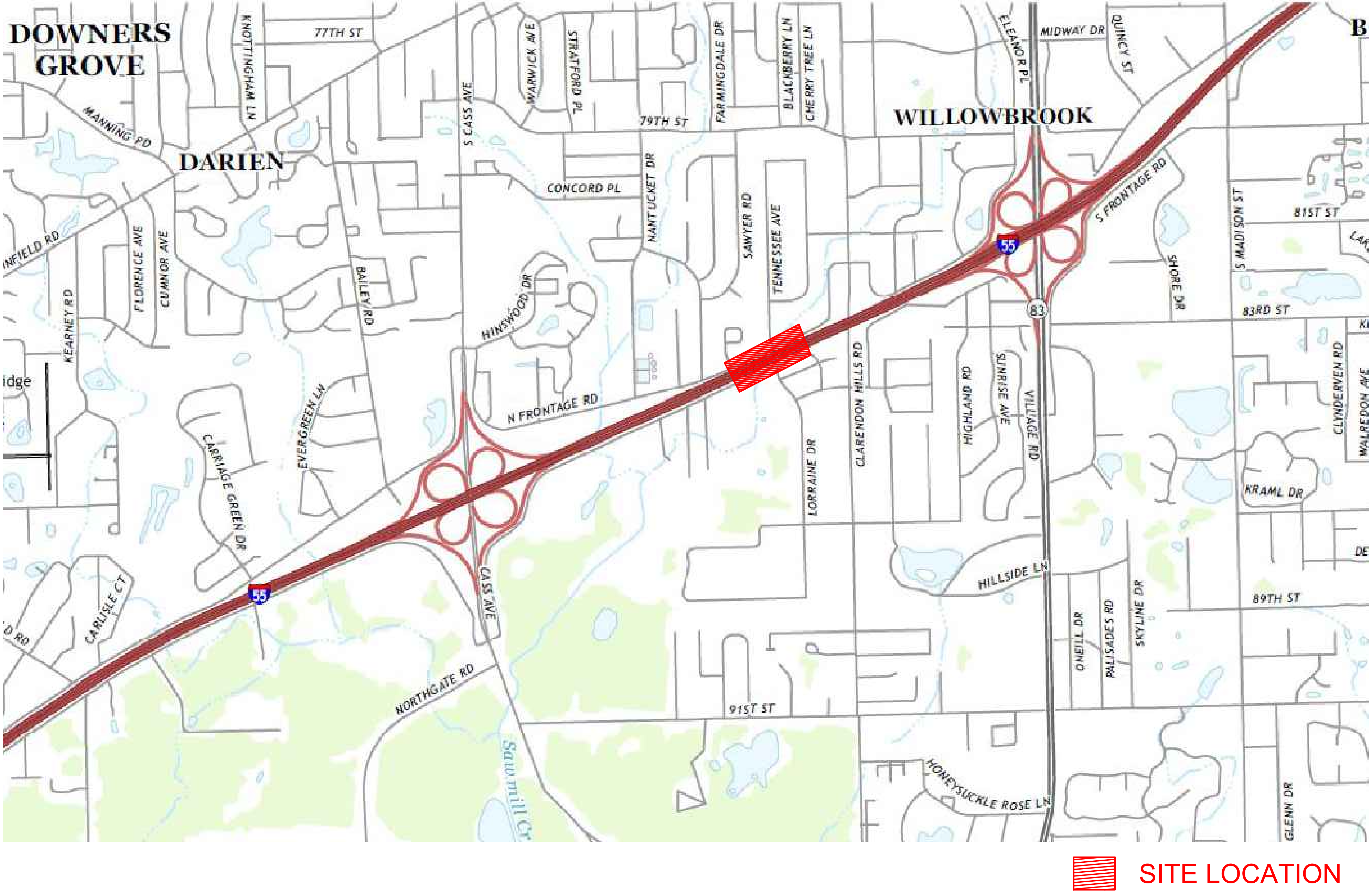
Riyad Wahab, Ph.D., P.E.	Jeffrey Rothamer, P.E.
Senior Geotechnical Engineer	Director of Technical Services

Cc/
Mike Kothawala -Wang Engineering, Inc.

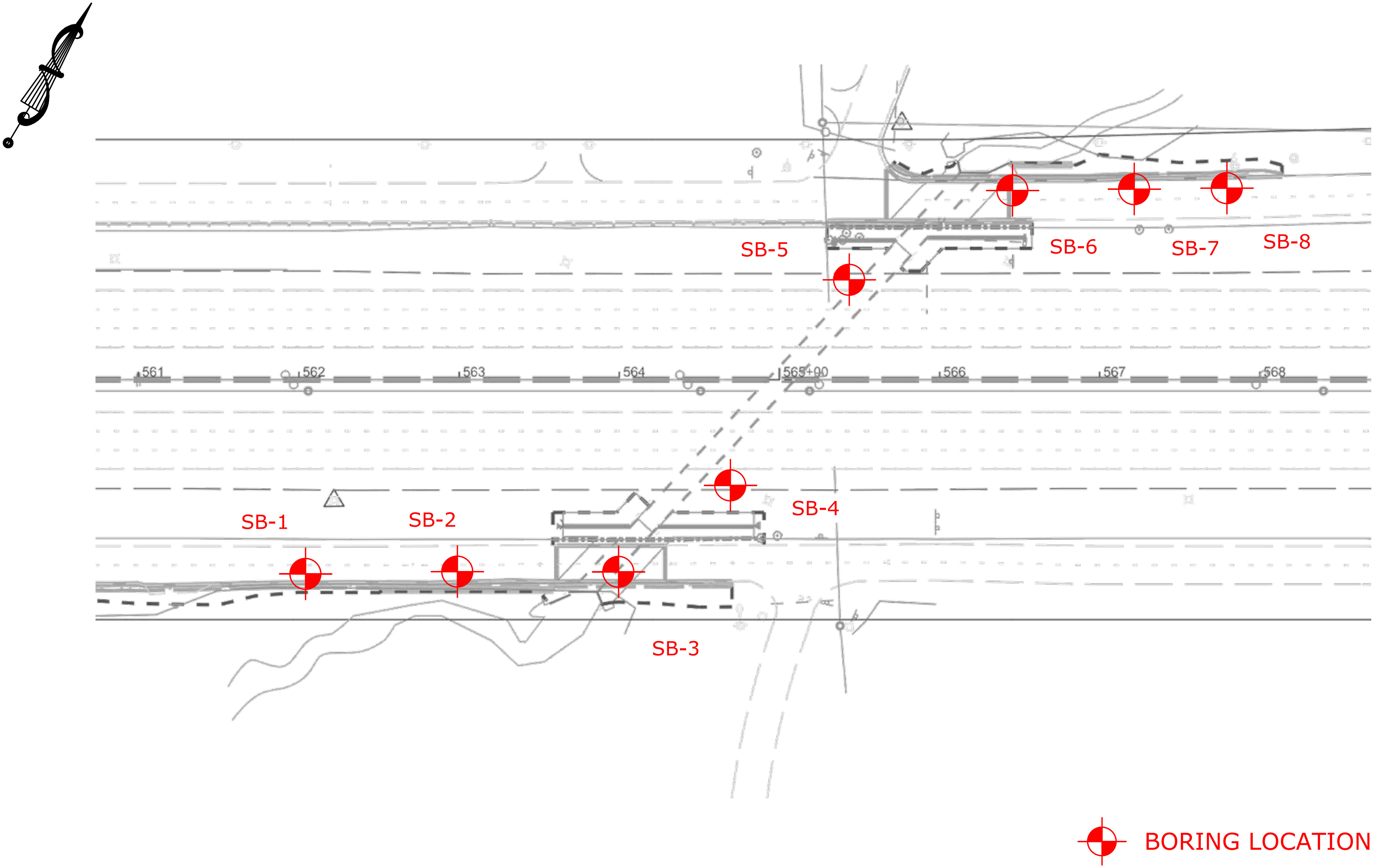
Attachments:
- Appendix A – Site Location and Boring Location Plan
- Appendix B – Soil Boring Logs and Soil Profiles
- Appendix C – Laboratory Test Results
- Appendix D – Preliminary Plans and Cross Sections (Provided by IDOT)

APPENDIX A

SITE LOCATION MAP AND BORING LOCATION PLAN



CHICAGO TESTING LABORATORY, INC. 30W114 BUTTERFIELD ROAD WARRENVILLE, IL 60555 PHONE: (630) 393-2851 FAX : (630) 393-2857	SCALE: NTS	DRAWN BY: JAR CHECKED BY: RW DATE: 7/20/22	SITE LOCATION MAP IDOT PTB 196-017 WORK ORDER 7 I-55 FRONTAGE ROADS OVER SAWMILL CREEK DUPAGE COUNTY, IL



CHICAGO TESTING LABORATORY, INC.

30W114 BUTTERFIELD ROAD
WARRENVILLE, IL 60555
PHONE: (630) 393-2851
FAX : (630) 393-2857

DRAWN BY: JAR	
CHECKED BY: RW	
SCALE: NTS	DATE: 7/20/22

BORING LOCATION PLAN
IDOT PTB 196-017 WORK ORDER 7
I-55 FRONTAGE ROADS OVER SAWMILL CREEK
DUPAGE COUNTY, IL

APPENDIX B

SOIL BORING LOGS AND SOIL PROFILES

Wang Engineering

BORING LOG LEGEND

Relative Drilling Resistance		
RDR	Term	Criterion
1	Very Easy	No chatter, very little resistance, very fast and steady drill advance
2	Easy	No chatter, some resistance, fast and steady drill advance rate
3	Moderate	Some chatter, firm drill resistance, moderate advance
4	Hard	Frequent chatter, variable drill resistance, slow advance rate
5	Very Hard	Constant chatter, variable and very slow drill advance, nearly refusal

Coarse Gradation (mm) (ASTM D2488)	
Gravel	4.75 to 75
Cobbles	75 to 300
Boulders	> 300

Proportional Terms (%) (ASTM D2488)	
Trace	< 5
Few	5 to 10
Little	15 to 25
Some	30 to 45
Mostly	50 to 100

Soil Moisture Conditions	
Term	Appearance and Feel
Dry	Soil sample looks and feels powdery or dusty; no indication of moisture. Free-running granular soils.
Damp	Cohesive soils cannot be molded easily without adding water. Granular soil may not flow very easily.
Moist	Soil is near the optimum moisture content. Cohesive soils are near the plastic limit. Soil changes color slightly when exposed to air for a short period.
Wet	One may feel a high degree of moisture, yet no free water is visible. Water may become visible if the sample is squeezed. Cohesive soil appears weak and sticks to and/or stains hands. Granular soils tend to cohere.
Saturated	Applied to granular soils that have free surface water; water drains freely from the sample.

Relative Density of Non-Cohesive Soils (ASTM D1586)	
No. of Blows/ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

Consistency of Cohesive Soils (ASTM D1586)	
Qu (tsf)	Consistency
< 0.25	Very Soft
0.25 - 0.50	Soft
0.50 - 1.00	Medium Stiff
1.00 - 2.00	Stiff
2.00 - 4.00	Very Stiff
> 4.00	Hard

Rock Quality Designation (ASTM D6032)	
RQD (%)	Classification
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Sample Type Symbols


Split Spoon


Shelby Tube


No Recovery (NR)


Pitcher


Auger Cuttings


Rock Core

Drill Rig:

17 D50 A [87%]

- [87%] – SPT Hammer Efficiency
- A – Rig Type (A or T)
- D50 – Rig Model
- 17 – Calibration Year

A = All Terrain Vehicle Rig
T = Truck Mounted Rig

SPT = Standard Penetration Test

Q_u = Unconfined Compressive Strength Test

P = Pocket Penetrometer

S = Shear failure (Rimac)

B = Bulge failure (Rimac)

SSA = Solid Stem Auger

HSA = Hollow Stem Auger

03/12/2019

Wang Engineering

wangeng@wangeng.com

Telephone:
Fax:

BORING LOG SB-1

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 688.13 ft
North: 1846600.73 ft
East: 1086528.27 ft
Station: 562+04.28
Offset: 121.31 RT

SOIL AND ROCK DESCRIPTION

Elevation (ft)	Soil and Rock Description
687.6	6-inch thick ASPHALT --PAVEMENT--
685.1	Medium dense, brown SANDY GRAVEL; damp --BASE COURSE--
682.6	Stiff, black and gray SILTY CLAY; damp --BURIED TOPSOIL-- --RDR 2--
680.1	Stiff, brown and gray SILTY CLAY; damp --RDR 2-- --L_L(%)=37, P_L(%)=15-- --%Gravel=1.3-- --%Sand=14.4-- --%Silt=49.9-- --%Clay=34.4-- --A-6 (17)--
658.1	Stiff to hard, brown to gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp --RDR 2-3--
	Boring terminated at 30.00 ft

Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
1	8, 11, 3	NP	6
2	2, 4, 5	1.56 B	23
3	2, 3, 5	1.48 B	25
4	6, 6, 8	4.35 B	15
5	6, 10, 13	NA	15
6	9, 9, 8	4.35 B	11
7	6, 8, 8	NR	
8	3, 6, 7	1.89 B	13
9	3, 4, 5	2.21 B	13
10	4, 5, 7	2.05 B	13
11	4, 7, 8	2.05 B	13
12	8, 9, 7	2.30 B	11

GENERAL NOTES

Begin Drilling: **06-22-2022** Complete Drilling: **06-22-2022**
Drilling Contractor: **Wang Testing Services** Drill Rig: **20D50T [80%]**
Driller: **RR&JD** Logger: **L. Varzaru** Checked by: **J. Bensen**
Drilling Method: **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

Wang Engineering
wangeng@wangeng.com
Telephone:
Fax:

BORING LOG SB-2

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 688.42 ft
North: 1846641.83 ft
East: 1086613.53 ft
Station: 562+98.93
Offset: 119.83 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
687.8	7-inch thick ASPHALT --PAVEMENT--						
686.9	Medium dense, brown SANDY GRAVEL;damp --BASE COURSE--			1	7 8 5	7.22 B	23
685.4	Hard, brown SILTY CLAY, trace gravel; damp --FILL-- --RDR 2-3--	5		2	3 3 6	2.71 B	22
682.9	Very stiff, black SILTY CLAY; damp --RDR 2--						
	Very stiff, brown SILTY CLAY to CLAY, trace gravel; damp --RDR 2-3--			3	13 22 13	3.12 B	28
680.4	Stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp to moist --RDR 2-- --sand seam; wet-- --sandy gravel seams; wet	10		4	4 7 5	3.12 B	15
				5	3 5 7	NA	
		15		6	5 7 9	4.67 B	12
				7	4 7 7	4.02 B	12
		20		8	4 8 9	3.28 B	12
				9	5 5 6	1.80 B	13
		25		10	4 6 7	1.31 B	14
				11	4 6 9	1.72 B	14
658.4		30		12	4 7 8	1.56 B	12
	Boring terminated at 30.00 ft						
		35					
		40					
		45					
		50					

GENERAL NOTES

Begin Drilling **06-22-2022** Complete Drilling **06-22-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RR&JD** Logger **L. Varzaru** Checked by **J. Bensen**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **10.00 ft**
At Completion of Drilling ▼ **25.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

Wang Engineering
wangeng@wangeng.com
Telephone:
Fax:

BORING LOG SB-3

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 688.76 ft
North: 1846683.91 ft
East: 1086704.95 ft
Station: 563+99.57
Offset: 120.02 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
688.3	6-inch thick ASPHALT --PAVEMENT--					
	Loose to medium dense, brown SANDY GRAVEL; damp to moist --RDR 2--		1	7 / 12 / 11	NP	6
		5	2	3 / 2 / 2	NP	6
682.3	Stiff, black CLAY; moist --BURIED TOPSOIL--		3	4 / 2 / 3	1.50 P	32
680.8	Medium stiff, brown and gray SILTY CLAY to CLAY, trace gravel; damp --RDR 2--	10	4	6 / 4 / 3	0.74 B	23
678.3	Stiff to hard, brown to gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp to moist --RDR 2-- --L_L(%)=26, P_L(%)=14-- --%Gravel=5.3-- --%Sand=25.6-- --%Silt=49.9-- --%Clay=19.3-- --A-6 (6)--		5	11 / 4 / 5	2.38 B	16
		15	6	3 / 7 / 8	2.30 B	13
			7	3 / 6 / 7	3.94 B	12
		20	8	3 / 6 / 7	3.12 B	12
			9	6 / 9 / 8	3.94 B	11
		25	10	5 / 7 / 10	4.35 B	12
			11	3 / 5 / 8	1.48 B	14
658.8		30	12	8 / 6 / 11	2.87 B	14
	Boring terminated at 30.00 ft					

GENERAL NOTES

Begin Drilling **06-22-2022** Complete Drilling **06-22-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RR&JD** Logger **L. Varzaru** Checked by **J. Bensen**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **DRY**
At Completion of Drilling **DRY**
Time After Drilling **NA**
Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

Wang Engineering

wangeng@wangeng.com

Telephone:
Fax:

BORING LOG SB-6

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 691.18 ft
North: 1847003.55 ft
East: 1086828.36 ft
Station: 566+45.78
Offset: 118.26 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
690.0	14-inch thick ASPHALT --PAVEMENT--					
689.4	Loose, brown SANDY GRAVEL; damp --BASE COURSE--					
	Very stiff, brown, gray and black SILTY CLAY, trace gravel; damp --FILL--		1	4, 3, 4	3.00 P	13
685.7	--RDR 2--	5	2	3, 2, 3	2.95 B	17
	Medium stiff to stiff, black CLAY to SILTY CLAY, trace gravel; damp --BURIED TOPSOIL-- --RDR 2--		3	2, 2, 3	0.90 B	28
		10	4	2, 2, 4	1.80 B	33
680.7	--wet spoon recovery; possible sand lens--					
678.2	Soft, gray CLAY LOAM, trace gravel; wet --RDR 2--		5	2, 3, 5	0.49 B	17
	Stiff to very stiff, gray SITLY CLAY LOAM to SILTY LOAM, trace gravel; damp to moist --RDR 2--	15	6	2, 3, 9	1.23 B	15
			7	5, 6, 7	3.44 B	12
		20	8	6, 6, 7	3.36 B	12
	--L_L(%)=23, P_L(%)=9-- --%Gravel=9.3-- --%Sand=20.9-- --%Silt=49.0-- --%Clay=20.8-- --A-6 (6)--		9	3, 6, 8	3.94 B	12
		25	10	5, 6, 12	2.95 B	12
			11	5, 5, 9	2.62 B	13
661.2		30	12	4, 6, 9	2.79 B	12
	Boring terminated at 30.00 ft					

GENERAL NOTES

Begin Drilling **06-21-2022** Complete Drilling **06-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RR&JD** Logger **L. Varzaru** Checked by **J. Bensen**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **10.00 ft**
At Completion of Drilling ▼ **13.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

Wang Engineering
wangeng@wangeng.com

Telephone:
Fax:

BORING LOG SB-7

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 690.74 ft
North: 1847036.16 ft
East: 1086896.79 ft
Station: 567+21.58
Offset: 119.12 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
689.6	14-inch thick ASPHALT --PAVEMENT--					
689.2	Loose, brown SANDY GRAVEL; moist --BASE COURSE--		1	4 5 4	2.50 P	24
685.2	Medium stiff to very stiff, brown and gray SILTY CLAY to CLAY, trace gravel; damp --FILL-- --RDR 2--	5	2	2 2 3	0.90 B	21
680.7	Medium stiff to very stiff, black CLAY to SILTY CLAY, trace gravel; damp --BURIED TOPSOIL-- --RDR 2--		3	2 3 4	2.30 B	24
	--L_L(%)=49, P_L(%)=15-- --%Gravel=4.0-- --%Sand=21.2-- --%Silt=38.5-- --%Clay=36.3-- --A-7-6 (24)--	10	4	1 1 2	0.90 B	30
	--wet spoon recovery; possible sand lens--		5	2 4 5	1.64 B	13
	Stiff to very stiff, brown to gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp to moist --RDR 2-3--	15	6	3 5 6	2.62 B	13
			7	4 9 12	2.50 P	15
		20	8	5 6 8	1.97 B	12
			9	6 7 9	NR	
		25	10	5 6 10	1.80 B	13
			11	5 7 9	2.46 B	13
660.7		30	12	5 7 10	2.38 B	17
	Boring terminated at 30.00 ft					

GENERAL NOTES

Begin Drilling **06-21-2022** Complete Drilling **06-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RR&JD** Logger **L. Varzaru** Checked by **J. Bensen**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **10.00 ft**
At Completion of Drilling ▼ **DRY**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

Wang Engineering
wangeng@wangeng.com

Telephone:
Fax:

BORING LOG SB-8

WEI Job No.: KE225150 (555-17-07)

Client: **IDOT Dist One PTB 196-017 WO 7**
Project: **I-55 Frontage Rd over Sawmill Creek**
Location: **DuPage County, Illinois**

Datum: NAVD 88
Elevation: 690.74 ft
North: 1847061.01 ft
East: 1086949.25 ft
Station: 567+79.62
Offset: 119.65 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
689.6	14-inch thick ASPHALT --PAVEMENT--					
689.2	Medium dense, gray SANDY GRAVEL --BASE COURSE--		1	8, 9, 5	4.50 P	25
687.7	Hard, black and gray SILTY CLAY to CLAY, trace gravel; damp --FILL-- --RDR 2--	5	2	2, 2, 4	0.74 B	25
685.2	Medium stiff, black SILTY CLAY; damp --BURIED TOPSOIL-- --RDR 2--		3	6, 8, 11	2.50 P	21
	Very stiff, brown SILTY CLAY, trace gravel; damp --RDR 2--		4	5, 8, 10	NR	
681.5	Medium stiff to very stiff, brown to gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp --RDR 2--	10	5	4, 3, 3	0.90 B	13
		15	6	2, 3, 5	2.30 B	13
			7	4, 5, 7	2.95 B	12
		20	8	3, 6, 7	2.13 B	13
			9	3, 4, 7	2.13 B	14
667.7	--wet spoon recovery; possible sand lens-- Stiff to ver stiff, gray SILTY CLAY, trace gravel; moist --RDR 2-- --L_L(%)=27, P_L(%)=13-- --%Gravel=3.6-- --%Sand=14.7-- --%Silt=51.6-- --%Clay=30.1-- --A-6 (9)--	25	10	4, 5, 7	1.64 B	20
			11	6, 2, 6	2.95 B	20
662.7	Very stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; moist --RDR 2--	30	12	6, 9, 10	2.05 B	12
660.7	Boring terminated at 30.00 ft					

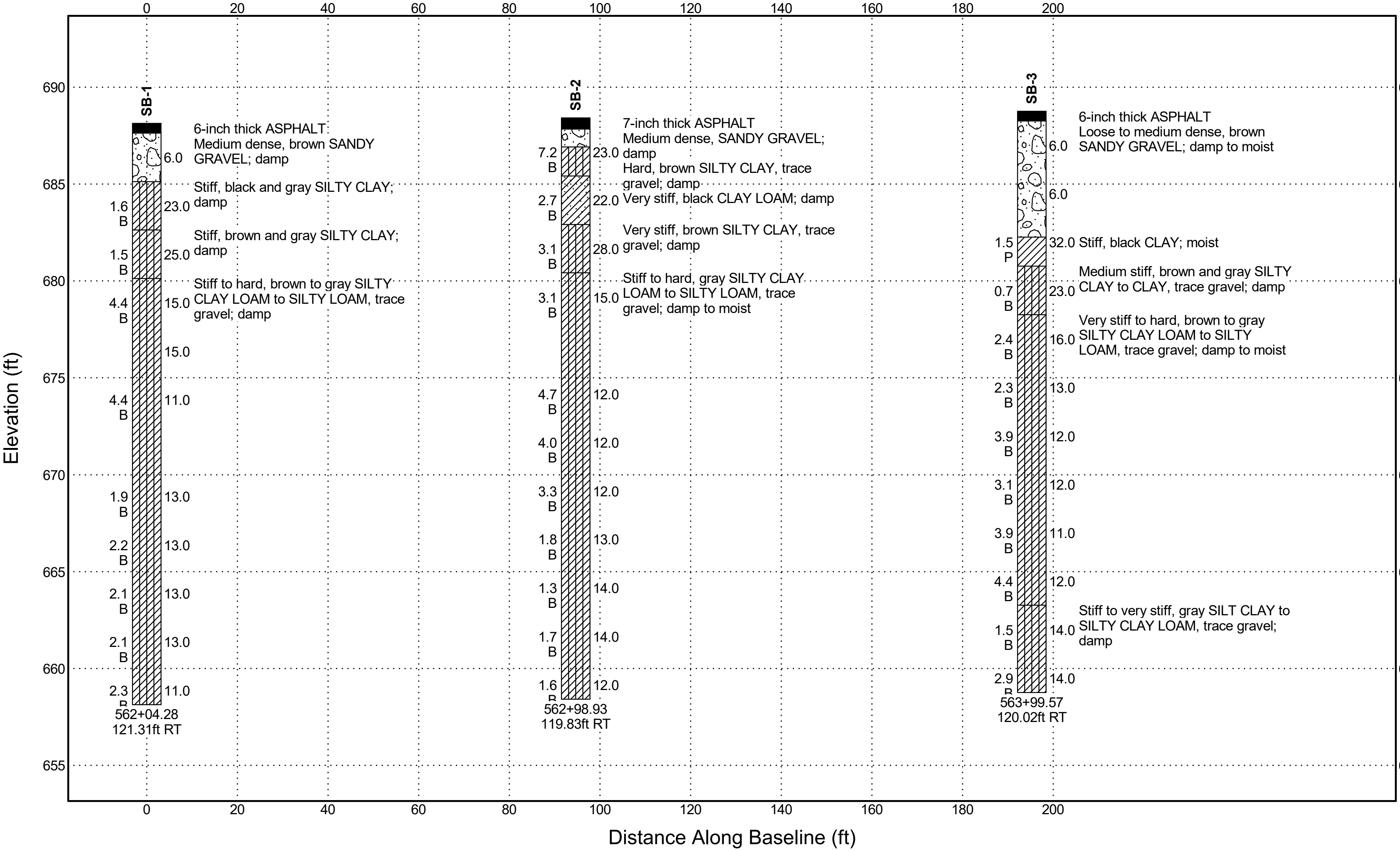
GENERAL NOTES

Begin Drilling **06-21-2022** Complete Drilling **06-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RR&JD** Logger **L. Varzaru** Checked by **J. Bensen**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **23.00 ft**
At Completion of Drilling: **20.00 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



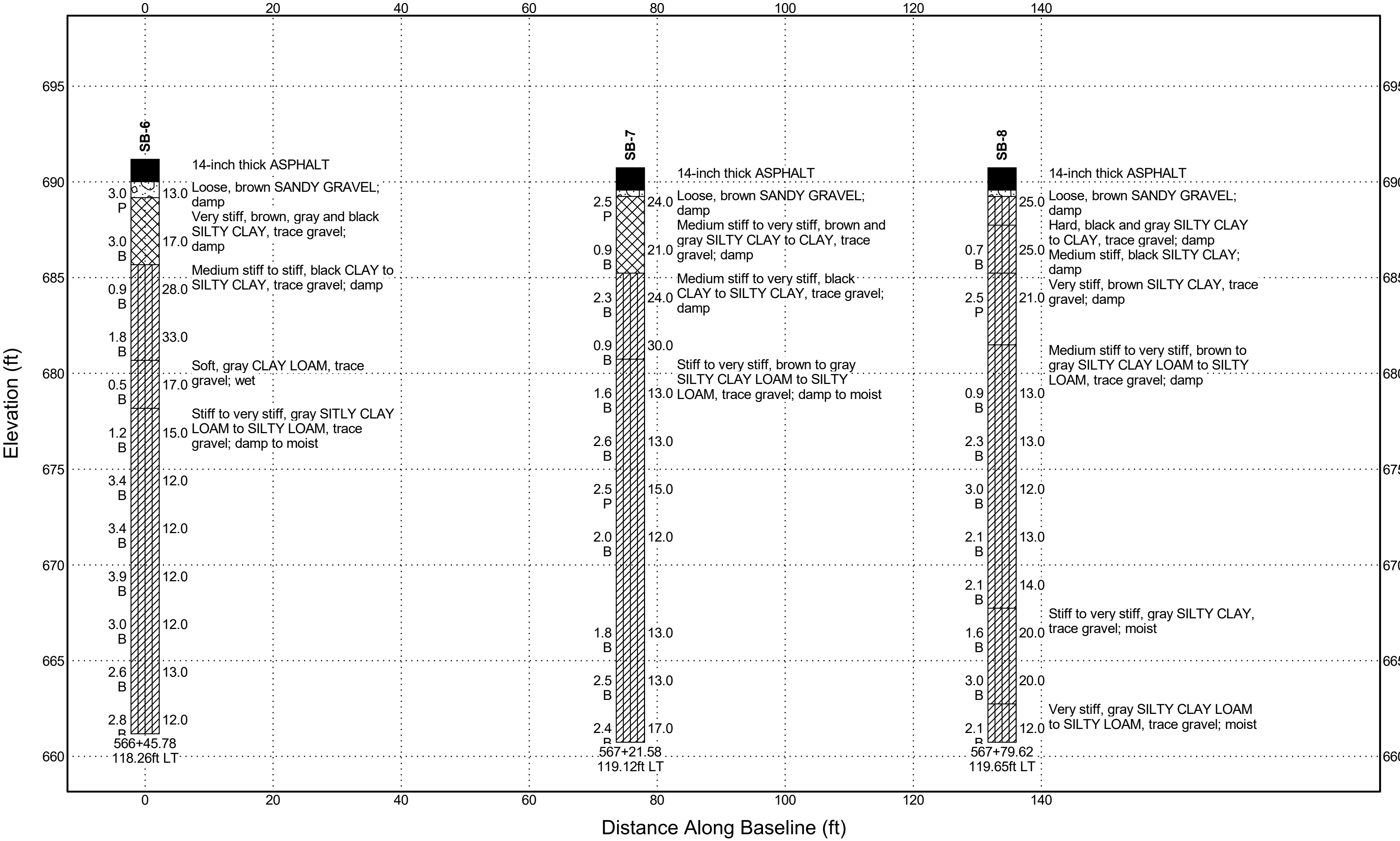
Illinois Department of Transportation
Division of Highways
Chicago Testing Laboratory, Inc.

SUBSURFACE DIAGRAM S Frontage Wall

Route: I-55 Frontage Road

Section: 2021-068-CR

County: DuPage



Illinois Department of Transportation
Division of Highways
Chicago Testing Laboratory, Inc.

SUBSURFACE DIAGRAM N Frontage Wall

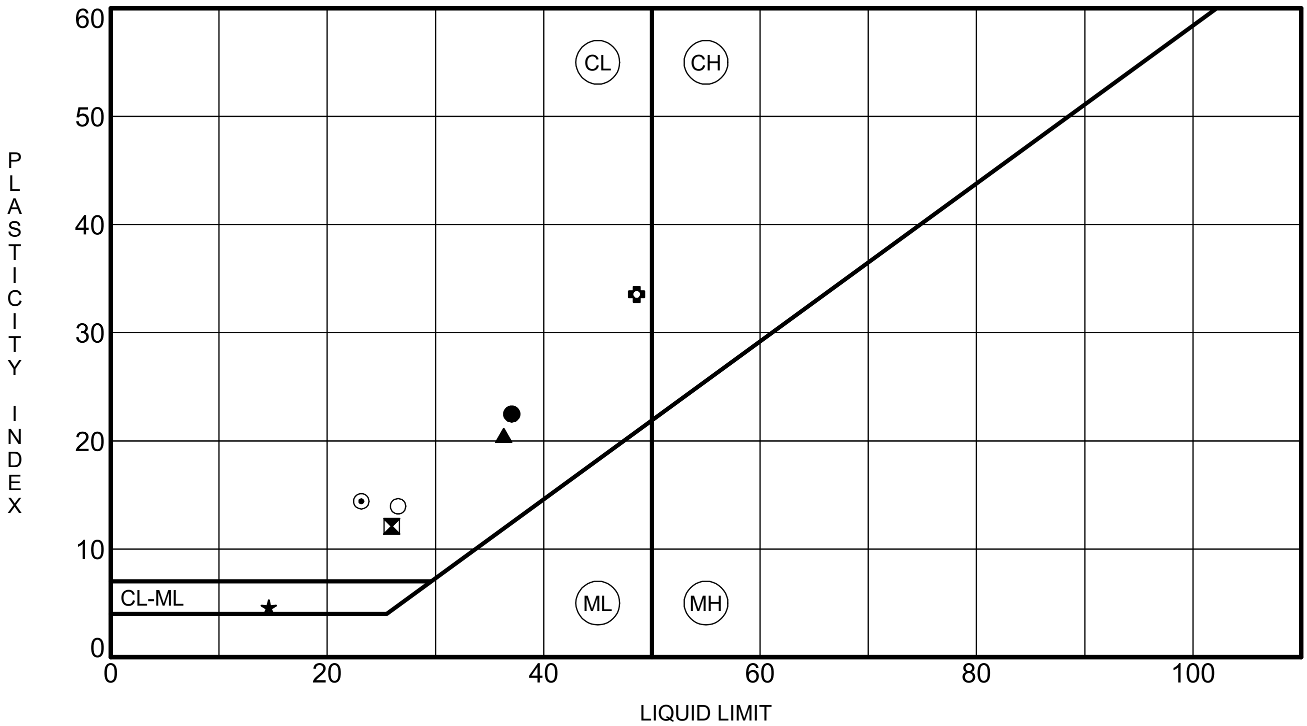
Route: I-55 Frontage Road

Section: 2021-068-CR

County: DuPage

APPENDIX C

LABORATORY TEST RESULTS



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	**SB-1#3**	**6.0 ft**	**37**	**15**	**22**	**84**	**Silty Clay**
⧗	**SB-3#5**	**11.0 ft**	**26**	**14**	**12**	**69**	**Silty Clay Loam**
▲	**SB-4#2**	**3.5 ft**	**36**	**16**	**20**	**81**	**Clay**
★	**SB-5#7**	**16.0 ft**	**15**	**10**	**5**	**43**	**Gravelly Loam**
⊙	**SB-6#9**	**21.0 ft**	**23**	**9**	**14**	**70**	**Silty Clay Loam**
✿	**SB-7#4**	**8.5 ft**	**49**	**15**	**34**	**75**	**Clay**
○	**SB-8#10**	**23.5 ft**	**27**	**13**	**14**	**82**	**Silty Clay**

WEI SINCE 1982

Terracon

Telephone:
Fax:

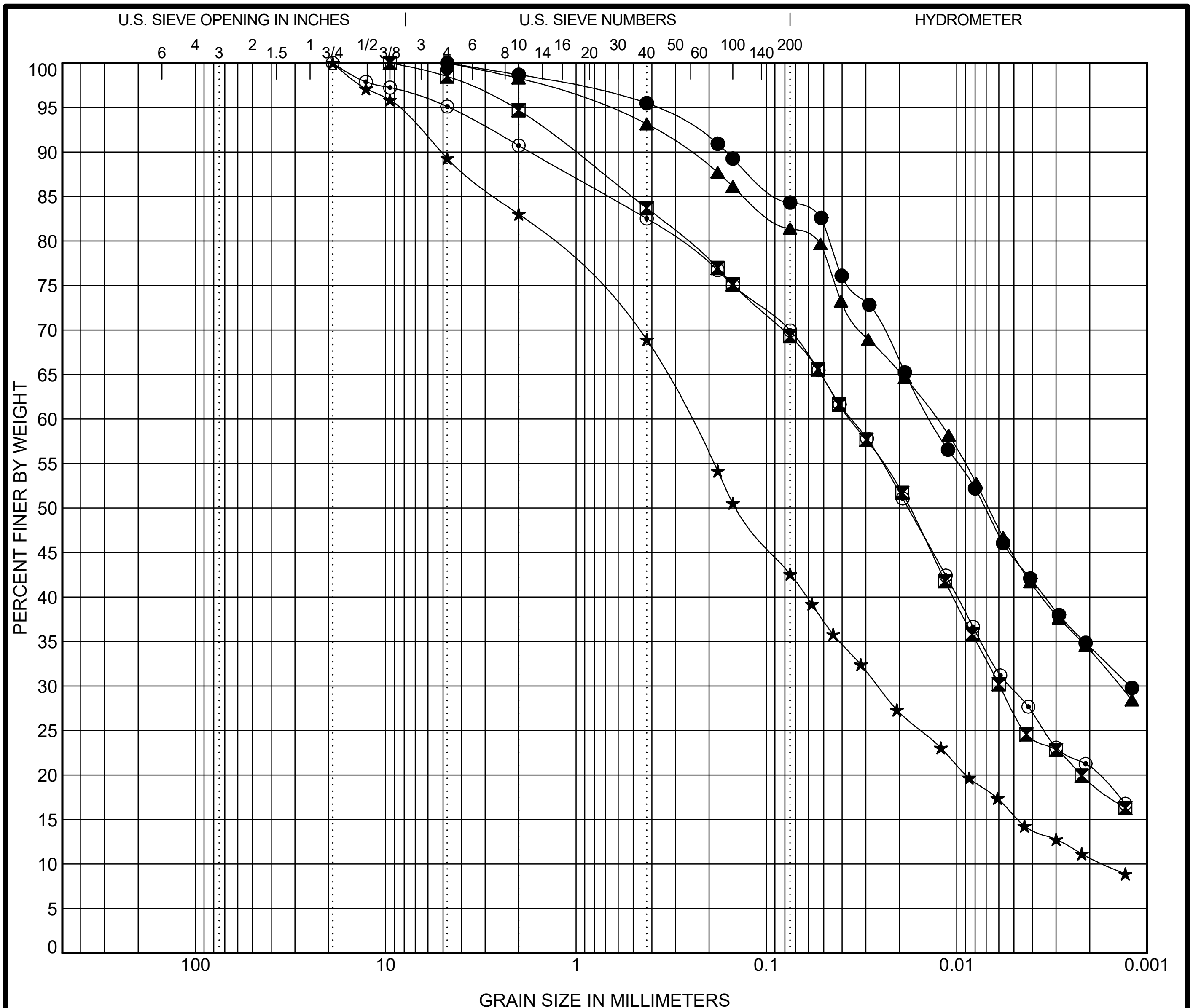
ATTERBERG LIMITS' RESULTS

Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)

WEI ATTERBERG LIMITS IDH KE225150.GPJ US LAB.GDT 7/25/22



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
● SB-1#3	6.0 ft	**Silty Clay**	37	15	22		
⧗ SB-3#5	11.0 ft	**Silty Clay Loam**	26	14	12		
▲ SB-4#2	3.5 ft	**Clay**	36	16	20		
★ SB-5#7	16.0 ft	**Gravelly Loam**	15	10	5	1.58	150.13
⊙ SB-6#9	21.0 ft	**Silty Clay Loam**	23	9	14		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● SB-1#3	6.0 ft	4.75	0.014	0.001		1.3	14.4	49.9	34.4
⧗ SB-3#5	11.0 ft	9.5	0.036	0.006		5.3	25.6	49.9	19.3
▲ SB-4#2	3.5 ft	4.75	0.013	0.001		1.7	16.9	47.4	34.0
★ SB-5#7	16.0 ft	19	0.253	0.026	0.002	17.0	40.6	31.7	10.7
⊙ SB-6#9	21.0 ft	19	0.036	0.005		9.3	20.9	49.0	20.8

WEI SINCE 1982

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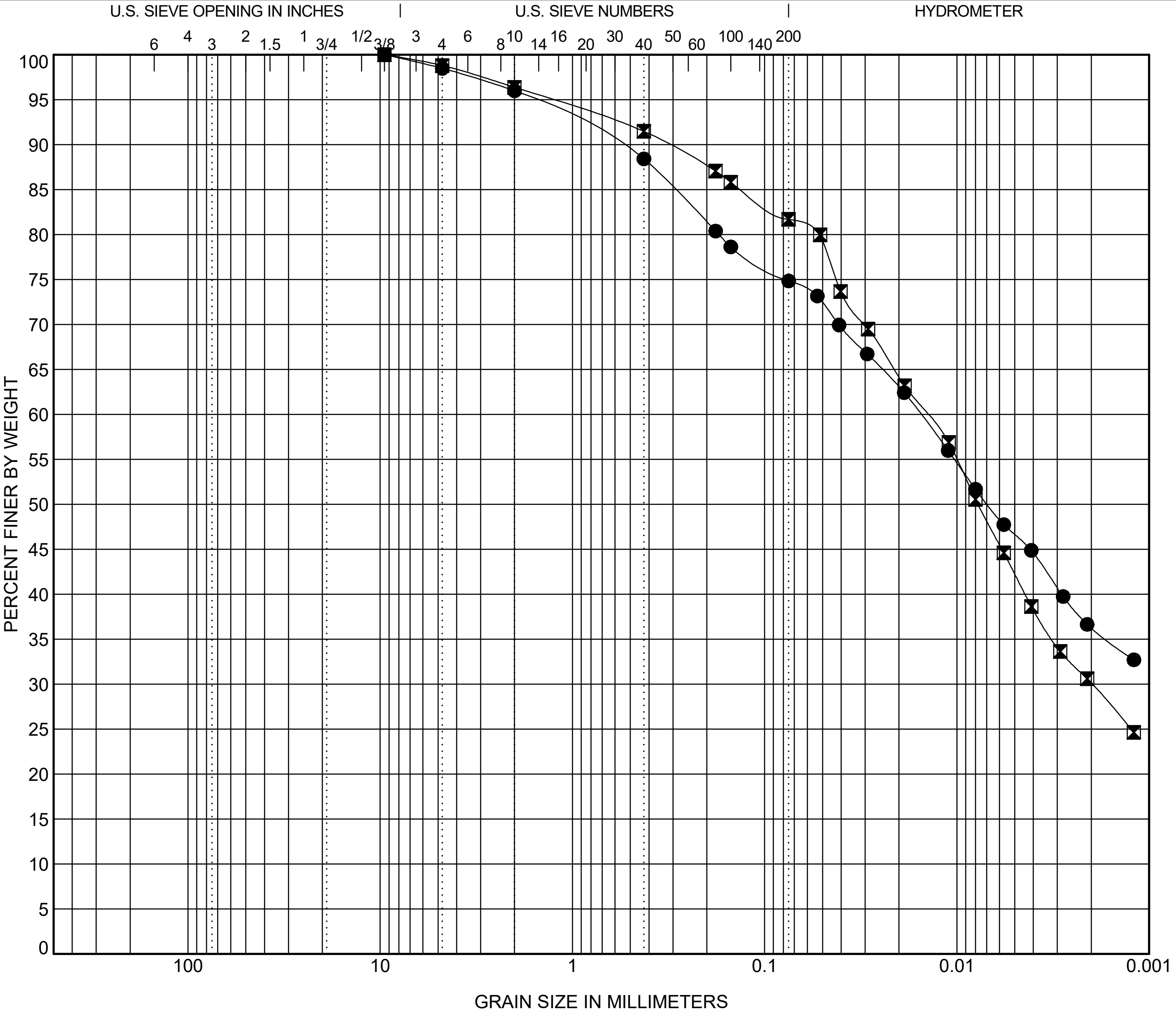
Telephone:
Fax:

GRAIN SIZE DISTRIBUTION

Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)



COBBLES	GRAVEL	SAND coarse	SAND fine	SILT AND CLAY

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	**SB-7#4**	**8.5 ft**	**Clay**	**49**	**15**	**34**		
⊠	**SB-8#10**	**23.5 ft**	**Silty Clay**	**27**	**13**	**14**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-7#4**	**8.5 ft**	**9.5**	**0.015**			**4.0**	**21.2**	**38.5**	**36.3**
⊠	**SB-8#10**	**23.5 ft**	**9.5**	**0.014**	**0.002**		**3.6**	**14.7**	**51.6**	**30.1**

WEI GRAIN SIZE IDH KE225150.GPJ US LAB.GDT 7/25/22

WEI SINCE 1982

Terracon

Telephone:
Fax:

GRAIN SIZE DISTRIBUTION

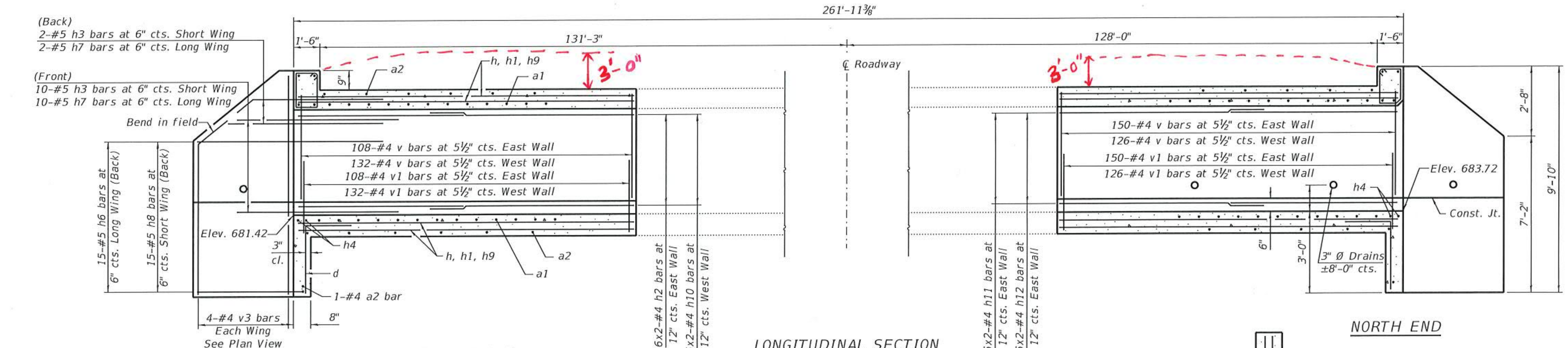
Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)

APPENDIX D

GENERAL PLAN AND LONGITUDINAL SECTION (PROVIDED BY IDOT)



SOUTH END

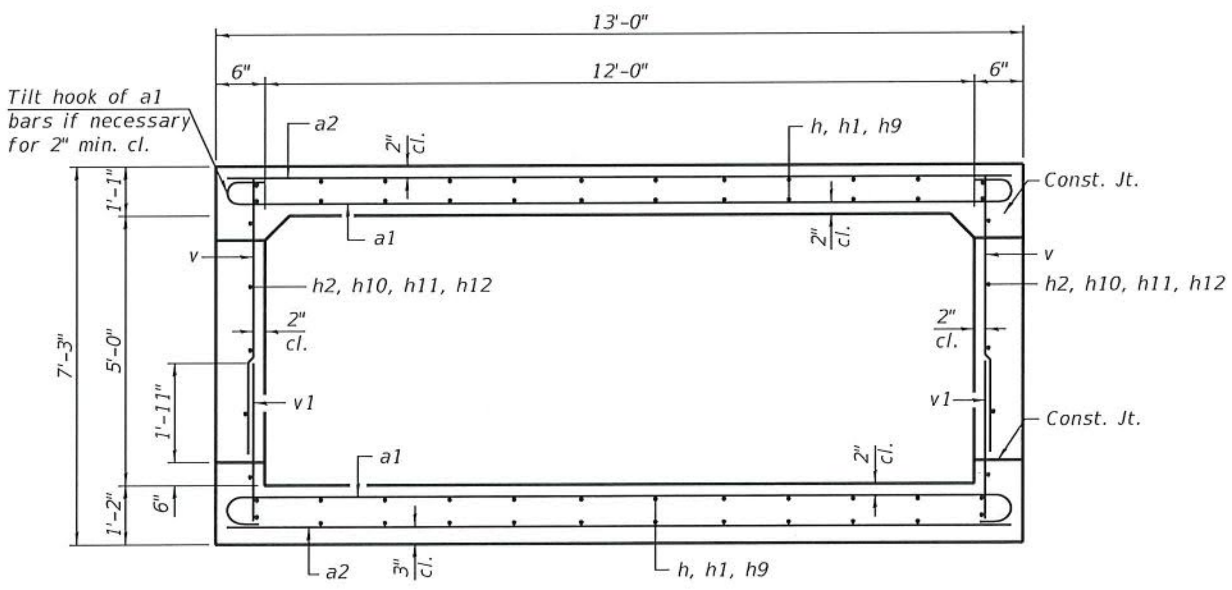
MIN. BAR LAP

#4 bar = 2'-3"

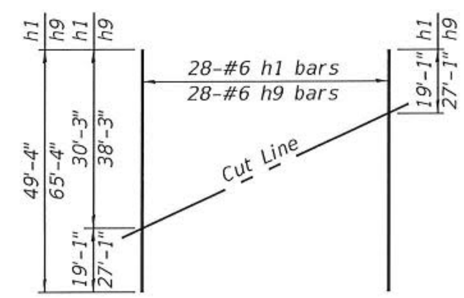
LONGITUDINAL SECTION

(Dimensions at Rt. ∠'s to ℄ Roadway)

NORTH END

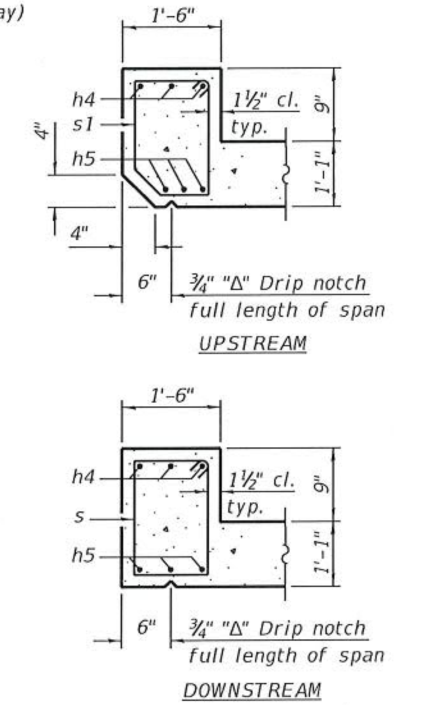


SECTION THRU BARREL

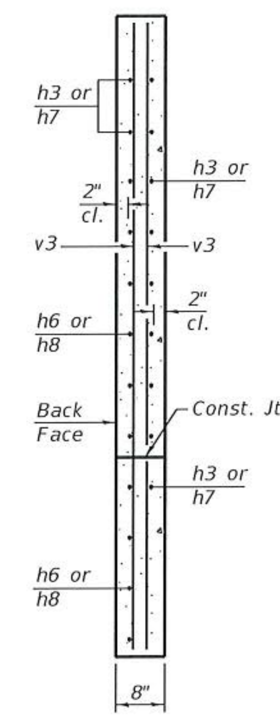


FIELD CUTTING DIAGRAM

Order h1 and h9 bars full length. Cut as shown for top of slab and use remainder of bars for bottom of slab.



SECTION THRU HEADWALL



SECTION A-A

BILL OF MATERIAL

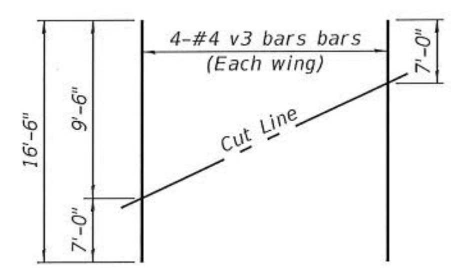
Bar	No.	Size	Length	Shape
a1	512	#7	14'-4"	
a2	274	#6	12'-8"	
d	34	#4	4'-3"	
h	112	#6	33'-4"	
h1	56	#6	49'-4"	
h2	12	#4	25'-8"	
h3	24	#5	8'-0"	
h4	10	#6	16'-1"	
h5	6	#9	16'-1"	
h6	30	#5	19'-1"	
h7	24	#5	8'-0"	
h8	30	#5	8'-4"	
h9	56	#6	65'-4"	
h10	12	#4	31'-3"	
h11	12	#4	35'-3"	
h12	12	#4	29'-8"	
s	17	#4	6'-5"	
s1	17	#4	6'-3"	
v	520	#4	5'-3"	
v1	520	#4	3'-4"	
v3	16	#4	16'-6"	
Concrete Box Culverts			Cu. Yd.	
Reinforcement Bars			Pound	

Notes:

A distance of half the length of the wingwall but not less than six feet of the barrel shall be poured monolithically with the wingwalls.

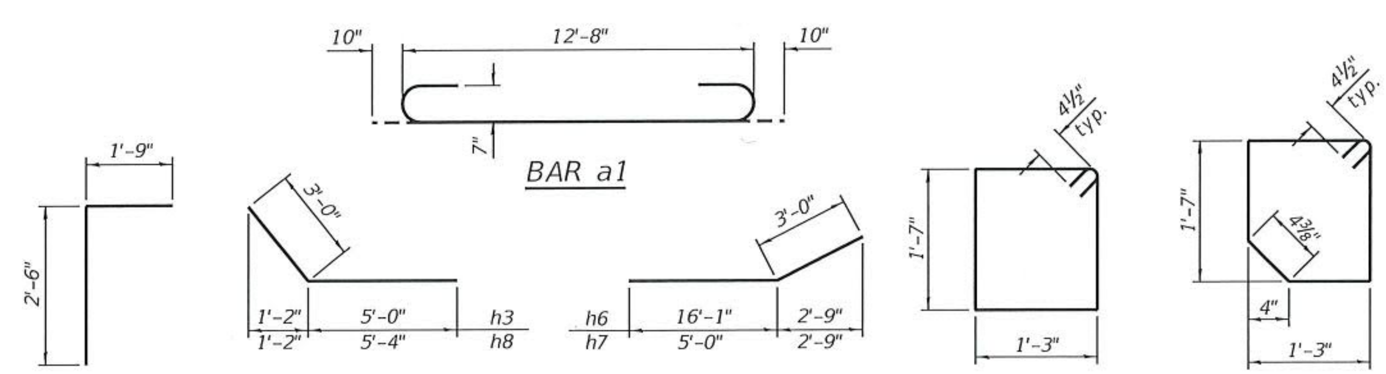
Bars indicated thus 12 x 4-#5 etc. indicates 12 lines of bars with 4 lengths per line.

At the Contractor's option, a longer v1 bar may be ordered to replace the v bar. No reduction in quantities shall be made for this substitution.



FIELD CUTTING DIAGRAM

Order v3 bars full length.
Cut as shown and use remainder of bars in opposite end wingwall.



BAR d

BARS h3 & h8

BARS h6 & h7

BAR s

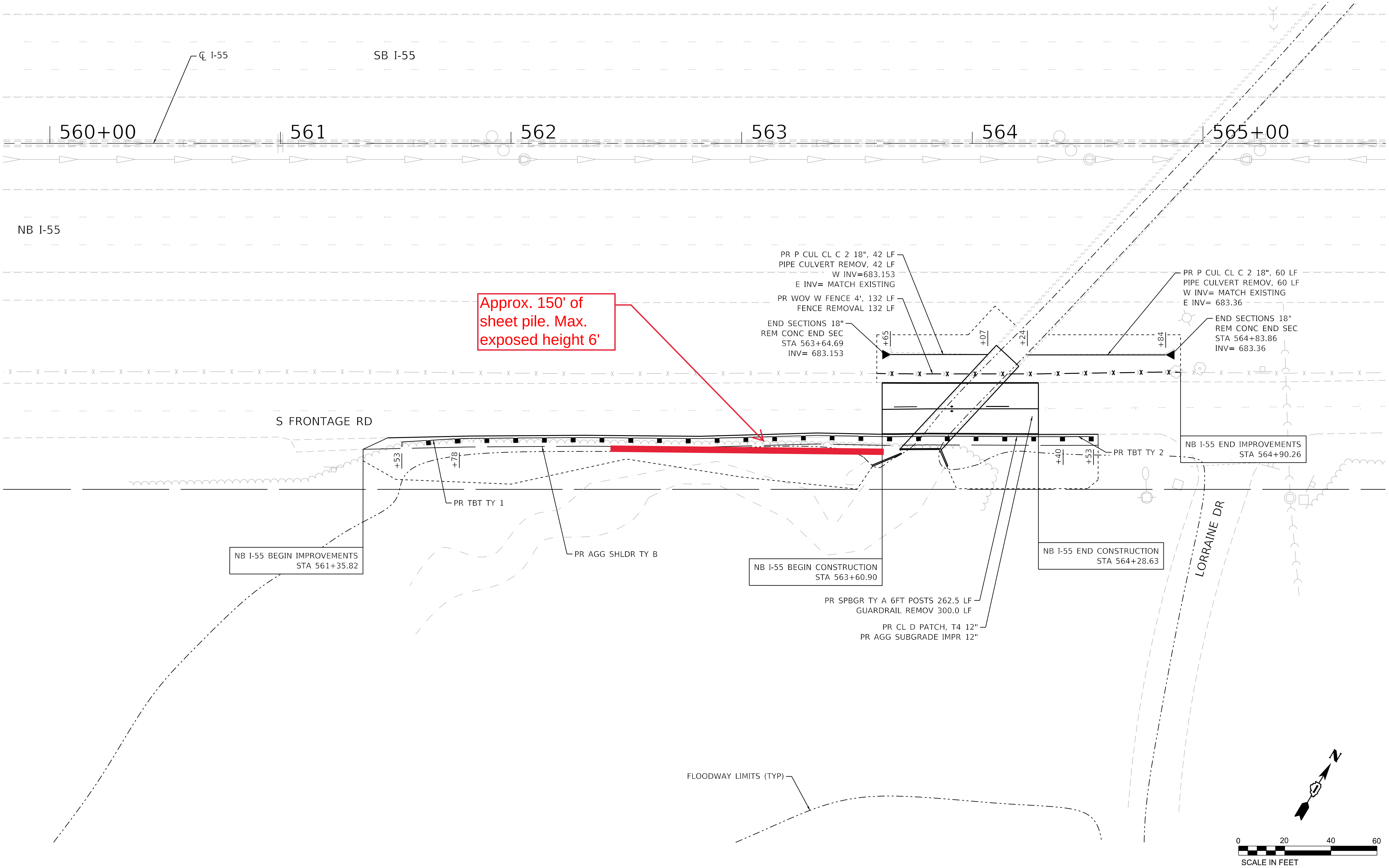
BAR s1

LIN ENGINEERING, LTD. Consulting Engineers Springfield, Illinois	USER NAME =	DESIGNED - XX	REVISED -
		CHECKED - XX	REVISED -
	PLOT SCALE =	DRAWN - XX	REVISED -
	PLOT DATE = 5/20/2022	CHECKED - XX	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

XXXX
STRUCTURE NO. 022-0513
SHEET XX OF $Tot SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
XX	XX	XX	$SetTot	XX
		CONTRACT NO. 62P06		
		ILLINOIS FED. AID PROJECT		



LIN ENGINEERING,LTD.
Consulting Engineers
Westmont, Illinois

USER NAME = rober	DESIGNED - RC	REVISED -	
	DRAWN - RC	REVISED -	
PLOT SCALE = 40.0000 ' / in.	CHECKED - ST	REVISED -	
PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -	

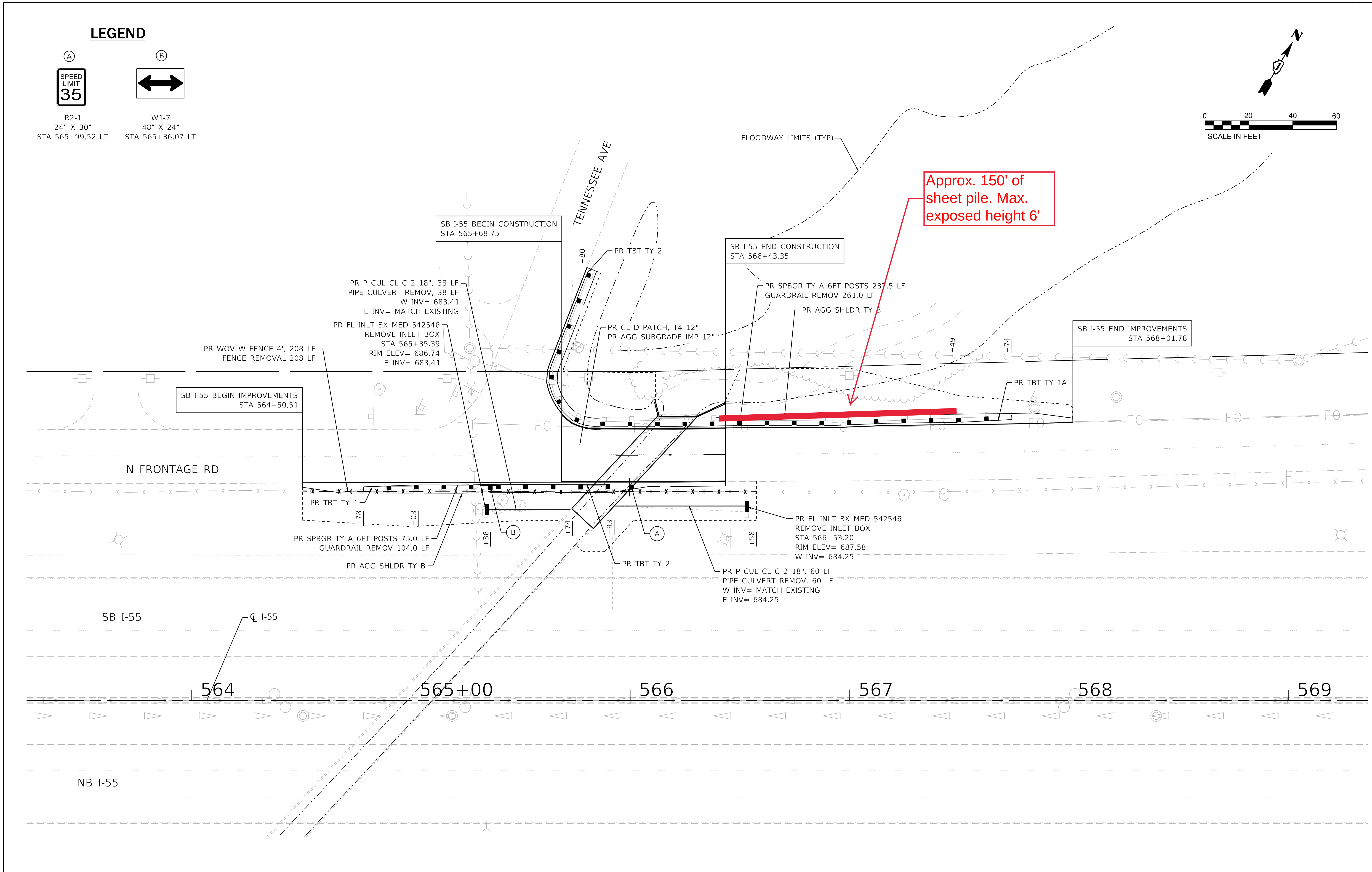
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK
ROADWAY PLAN

SCALE: 1"=20' | SHEET 1 OF 2 SHEETS | STA. TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
55	2021-068-CR	DUPAGE	4	1

CONTRACT NO. 62P06
ILLINOIS | FED. AID PROJECT



LIN ENGINEERING,LTD. Consulting Engineers Westmont, Illinois

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	DRAWN - RC	REVISED -	
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PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

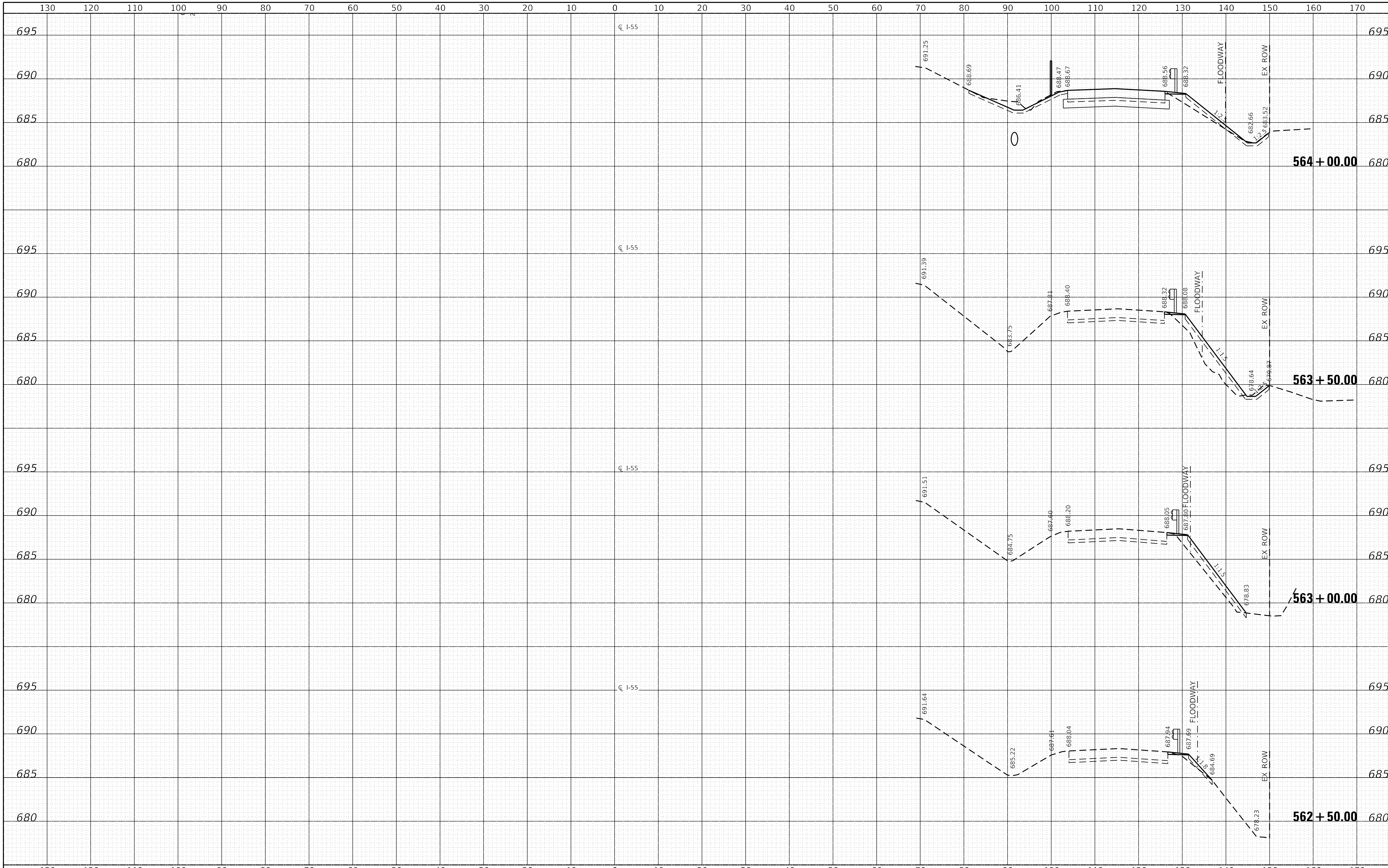
F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK
ROADWAY PLAN

SCALE: 1"=20' | SHEET 2 OF 2 SHEETS | STA. TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
55	2021-068-CR	DUPAGE	4	2

CONTRACT NO. 62P06

ILLINOIS FED. AID PROJECT

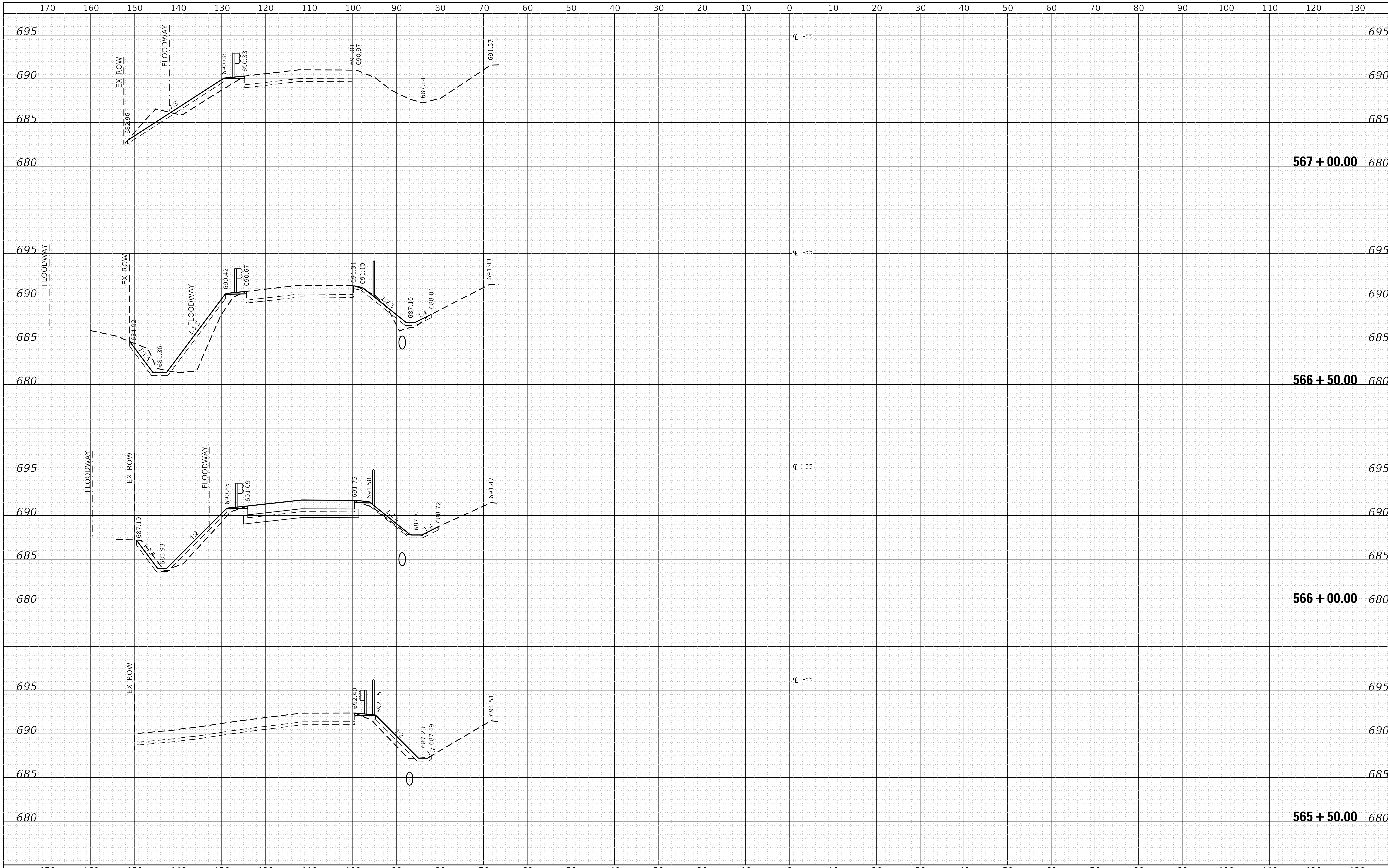


LIN ENGINEERING,LTD. Consulting Engineers Westmont, Illinois	USER NAME = rober	DESIGNED - RC	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
		DRAWN - RC	REVISED -	
	PLOT SCALE = 20.0000 ' / in.	CHECKED - ST	REVISED -	
	PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -	

F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK
S FRONTAGE ROAD CROSS SECTIONS

SCALE: 1"=10'H, 5'V | SHEET 1 OF 2 SHEETS | STA. 562+50.00 TO STA. 564+00.00

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
55	2021-068-CR	DUPAGE	4	3
		CONTRACT NO. 62P06		
	ILLINOIS	FED. AID PROJECT		



LIN ENGINEERING,LTD. Consulting Engineers Westmont, Illinois	USER NAME = rober	DESIGNED - RC	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK N FRONTAGE ROAD CROSS SECTIONS
		DRAWN - RC	REVISED -		
	PLOT SCALE = 20.0000 ' / in.	CHECKED - ST	REVISED -		
	PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -		SCALE: 1"=10'H, 5'V SHEET 2 OF 2 SHEETS STA. 562+50.00 TO STA. 564+00.00

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
55	2021-068-CR	DUPAGE	4	4
		CONTRACT NO. 62P06		
		ILLINOIS FED. AID PROJECT		