Structure Geotechnical Report

PTB 196-017 Work Order 7
FAI 55 (Interstate Route 55)
I-55 Frontage Roads – Culvert Ends Replacement
North and South Frontage Roads over Sawmill Creek
SN 022-0513
DuPage County
Section 2021-068-CR
Contract 62P06

Prepared For:

Illinois Department of Transportation

Submitted: July 28, 2022

Submitted By:
Chicago Testing Laboratory, Inc.
30W114 Butterfield Road
Warrenville, Illinois 60555

Chicago Testing Laboratory, Inc.

Chicago Testing Laboratory, Inc.

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July 28, 2022

Mr. Giancarlo Gierbolini, P.E.
District One Geotechnical Engineer
Illinois Department of Transportation
Region 1/District 1
201 West Center Court
Schaumburg, IL 60196-1096

Re: Structure Geotechnical Report
I-55 Frontage Roads – Culvert Ends Replacement
North and South Frontage Roads over Sawmill Creek
SN 022-0513
Section: 2021-068-CR
Contract: 62P06
PTB: 196/017 (WO 7)

CTL Project Number 22F761

Dear Mr. Gierbolini,

Enclosed are the results of the subsurface exploration and geotechnical engineering evaluation for the above referenced project. The report provides a description of the site investigation, site condition and analysis and recommendations for the proposed culvert ends reconstruction. The site investigation included advancing four (4) soil borings to depths of 30 feet below ground surface (bgs).

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.
Senior Geotechnical Engineer

Jeffrey Rothamer, P.E.
Director of Technical Services

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Appendices:

1.0 Introduction

Chicago Testing Laboratory, Inc. (CTL) completed a geotechnical engineering analysis for the proposed culvert extensions, which include replacement of the north and south ends of the existing box culvert (SN 022-0513) carrying Sawmill Creek under I-55 and the frontage roads. The project is located on Interstate Route 55 (I-55) North and South Frontage Roads at the crossing with Sawmill Creek in DuPage County (see Appendix A - Site Location Map). The objective and scope of the subsurface exploration and geotechnical analysis were to characterize the subsurface soil conditions in order to provide information regarding the physical characteristics and engineering properties of the subsurface soils, and to provide geotechnical recommendations regarding the design and construction of the proposed improvement.

1.1 Project Information

Based on the preliminary General Plan & Section (Appendix D, undated) provided by Mr. Robert Claussen of District 1, the limits of the culvert replacement are north and south of I-55, extending only under the north and south frontage roads. The proposed project will include removing and replacing the existing culvert ends at Sawmill Creek. The existing culvert has end opening dimension of 12 foot by 5 foot and a length of approximately 360 feet. The proposed culvert ends' openings will match the exiting openings' dimensions, with the south end invert elevation of 681.42 feet MSL and the north end invert elevation of 683.72 feet MSL. Wing walls are proposed at the north and south ends. Also, based on the "Culvert Inspection Tech Memo" (dated 3/3/2016), by Ciorba Group Consulting Engineers (Ciorba Group), the new culvert replacements will be connected to the existing culvert with settlement collars to prevent any future cracking due to settlement.

There are two proposed retaining walls, one on the north end of the culvert and one on the south end. 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 a maximum exposed height of approximately 6 feet. As directed by the district, the two walls will be covered under a separate Technical Memorandum.

2.0 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.

2.1 Subsurface Site Investigation

The subsurface investigation was conducted on June 21, June 22, and July 7, 2022. which included advancing a total of four (4) soil borings to depths of 30 feet bgs within the vicinity of the proposed improvements. The borings were performed on the south and north ends of the proposed culvert replacements (see Appendix 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 culvert extensions.

Table 1: Summary of Soil Borings

Boring	Station	Offset (ft)	Ground Surface Elevation (ft MSL)	Depth (ft)	Location
SB-3	563+99.57	120.02 RT	688.76	30	EB S Frontage Road
SB-4	564+69.27	66.21 RT	691.44	30	EB I-55 RT Shoulder
SB-5	565+43.75	62.24 LT	691.59	30	WB I-55 LT Shoulder
SB-6	566+45.78	118.26 LT	691.18	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 Appendix 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 provided by Wang, it is our understand 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).

2.2 General Subsurface Conditions

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

Generally, the borings encountered near surface material consisting of 14 inches of asphalt in three borings (except Boring SB-3 with 6 inches of asphalt) underlain by 9 inches of sandy gravel base course (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 four

borings. The strength of these cohesive soil layers varied from medium stiff to very stiff with Qu values ranging from 0.49 tsf (in one layer, in SB-6) to 6.72 tsf (in one layer, in SB-4).

An intermittent buried topsoil, black silty clay from 1.5 feet to 5 feet thick, was encountered at varying depths of 5.5 feet to 9 feet bgs (Qu from 0.9 to 2.38 tsf). Also, loose to medium dense saturated sand layers (2.5 feet and 3 feet thick) were encountered at depths of 11 feet and 18 feet bgs, in borings SB-4 and SB-5, respectively. These borings were selected to be as close as possible to the new-existing culvert connections on both ends, as access allows, and thus the sand layers observed on the two borings appear to be close to or below the invert elevations. The particle size analysis tests results shown in Appendix C (Laboratory Test results) generally confirmed the original field soil descriptions, except for a 2.7-ft thick layer encountered at Elevation of 676.1 bgs in boring SB-5, described as stiff gravelly loam. This minor change in soil stratification would not significantly affect the geotechnical analyses and recommendations in this report.

Detailed descriptions of the soil borings are provided in Appendix B (Soil Boring Logs) 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.

2.3 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-3	Dry	Dry
SB-4	11.30	Dry
SB-5	15.00	Dry
SB-6	10.00	13.5

3.0 Geotechnical Analysis

This section provides the geotechnical analysis for the proposed culvert improvements based on the results of the field exploration and testing.

3.1 Settlement

Based on the culvert ends' replacement dimensions and the proposed 3 feet of fill on top for both the south and north ends and utilizing soil borings SB-4 and SB-5, the estimated settlement is less than 0.5 inches. It should be noted that the actual soils immediately below the proposed replacements are more likely stream sediments that are not represented in the two borings which are drilled at a distance from the stream bed due to difficulty with access.

Although the soils were already consolidated under the existing culvert on both ends, and the anticipate total settlement and the differential settlements between the existing box and replacements would be negligible, District One prefers to use collars as recommended in the Ciorba Group's Tech Memo. However, according to the Culvert Manual, multiple cell precast concrete box culvert replacements may be considered as viable options because of the anticipated small settlements.

3.2 Seismic Parameters

No seismic design is required for box culverts as they are considered buried structures.

3.3 Scour

Although a design scour table is no longer required for culverts, scour should be taken into consideration, and be taken at the bottom of the toe wall. The wingwalls are designed to support and protect the soil slopes adjacent to the culvert from being eroded by scour. It is recommended that riprap or an apron be placed as scour countermeasures at open ends of the culvert.

3.4 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). However, we recommend 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.

4.0 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.

4.1 Retaining Wall Bearing Capacity and Sliding Resistance

Based on the 7/19/2022 email correspondence with Mr. Robert Claussen of District 1, it is our understanding that the wing walls are planned as horizontal cantilever. However, should the design change to non-cantilever walls to be supported on footings, the footings are assumed to be placed at the elevations shown in Table 3 below. The factored bearing resistance was calculated for the strength limit and service limit states using the AASHTO LRFD Bridge Design Specifications. Table 3 provides the recommended bearing capacity and sliding resistance values to use in the footings design.

Table 3: LRFD Bearing Capacity Parameters

Elevation* (feet MSL)	Nominal Bearing Resistance (ksf)	Bearing Resistance Factor	Factored Bearing at Service Limit (ksf)	Factored Sliding Resistance** (ksf)	Anticipated Bearing Soil
S. End 677.59 N. End 679.89	8.00	0.50	4.00	0.57 V***	Stiff to Very Stiff Silty Clay

*Assuming 2-ft thick footings

**Assuming 35-degree friction angle of CA-7 and sliding resistance factor of 0.85

***V = Total Vertical Force, applied at the footing base

A minimum of 12-inch compacted crushed stone (like IDOT CA-7) bed should be constructed below the bottom of the proposed culvert ends and the wingwalls footings (if non-cantilevered wings are selected). Since the south and north ends invert elevations are 681.42 and 683.72, respectively, the bottom of the 12-inch undercut elevations beneath the box would be 679.25 and 681.55, respectively. Similarly, the bottom of the undercut elevations beneath the footings would be 676.59 and 678.89 for the south and north ends, respectively. The 12-inch compacted crushed stone should extend a minimum of 12 inches on each side of the box culvert and footings with a maximum side slope of 1H:1V.

On the south side replacement, low strength soils encountered at Elevation 680.80 in boring SB-3, and it extends below the culvert bearing grade. Therefore, CTL recommends additional undercut on the south end to elevation 678.3 and replacement with rockfill per the Culvert Manual. The exact depths needed after the soils are exposed can be determined in the field according to IDOT Subgrade Stability Manual, using the dynamic cone penetrometer (DCP). The CA-7 stone should be placed to 12 inches above the water table, in 12-inch lifts, and should be compacted with the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable.

4.2 Culvert Headwall and Wingwall Lateral Earth Pressure

The culvert headwalls and the horizontal cantilevered wingwalls should be designed using Table 4.1.1.2-1 of the Culvert Manual, which is based on the "equivalent fluid pressure" outlined in Article 3.11.5.5 (Table 3.11.5.5-1) of AASHTO LRFD Bridge Design Specifications. The values in AASHTO are based on an angle of internal friction of 30 degrees, assuming either zero (flat) backslope or 25-degree backslope. The actual backslope angle should be measured perpendicular to the face of the wall and calculated using the procedure shown in Figure 4.1.1.2-2 of the Culvert Manual.

Based on the soil strength data in soil borings SB-3 and SB-6 close to the south and north end wingwalls, respectively, we recommend using an average 30 degrees friction angle for the backfill material (which is equivalent to an active earth pressure coefficient Ka of 0.33, or an equivalent fluid pressure of 45 pcf) assuming a 25-degree backslope. Based on the cross sections at Stations 563+50 and 564+00, the backslopes vary from 1V:1.5H to 1V:2H for the south end wingwalls, and hence an average backslope of 1V:2H (26 degrees) may be assumed in Figure 4.1.12-2. For the north end wingwalls, a backslope of 1V:1.5H should be used based on the cross sections at Stations 566+50.

5.0 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.

5.1 Construction Platform

The proposed culvert ends replacement areas are typically constructed on a streambed with loose, wet sand and silt materials that might extend to several feet below grade, in which case a construction platform (crushed stone) will be necessary for the placement of rebar reinforcement and concrete. The depth of crushed stone (CA-7) might extend below the elevations recommended in Section 4.1 above, depending on the actual field soil condition. The need for construction platform will be determined by the contractor and will not be paid for; however, a geotechnical engineer or a qualified soil inspector can assist with determining the required depth of stone (using the DCP) to ensure a stable platform.

If water seepage occurs during footing construction or where wet conditions are encountered, such that the water cannot be removed with conventional sumping, CTL recommends placing open grade stone like IDOT CA-7 to stabilize the bottom of the excavation below the water table.

5.2 Site Excavation and Temporary Soil Retention

It is our understanding that the north and south frontage roads will be detoured and thus stage construction will not be necessary. Therefore, the 3 feet of fill on top of culvert can be sloped at 1V:2H without the need for a geotextile wall, since there will be no traffic. However, if the excavation on both sides of the box cannot be sloped due to space limitations, temporary sheet piling is feasible based on the soil strength not exceeding 4 tsf in most soil layers (except in two layers where the strength marginally exceeds 4 tsf).

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

5.3 Groundwater Management

The Culvert Manual (Item 7, page 2-34) requires that the design high-water elevation (at upstream end of culvert) and the estimated water surface elevation (EWSE) be provided in the SGR and to be shown on the TSL plan. However, District 1 indicated that no hydraulic report is available at this time, and thus the ESWE cannot be provided herein to determine if a cofferdam will be needed, or water can be diverted. In a review comment on the draft SGR by District One, it was recommended that the current water flow through the culvert be provided in this report. However, no such observation was made by Wang during the field drilling operations, and thus this information is not available. It is CTL's opinion that the water elevations could be different at the time of construction in which case the current water flow condition would not be useful to determine the method of securing dry construction condition.

The contractor should control groundwater and surface water infiltration to provide a dry condition for construction. Temporary ditches, sumps, granular drainage blankets, stone ditch protection, or hand-laid riprap with geotextile underlayment could be used to divert groundwater if significant seepage is encountered during construction.

6.0 Professional Disclaimer

This report was prepared on the basis of 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.

APPENDIX A

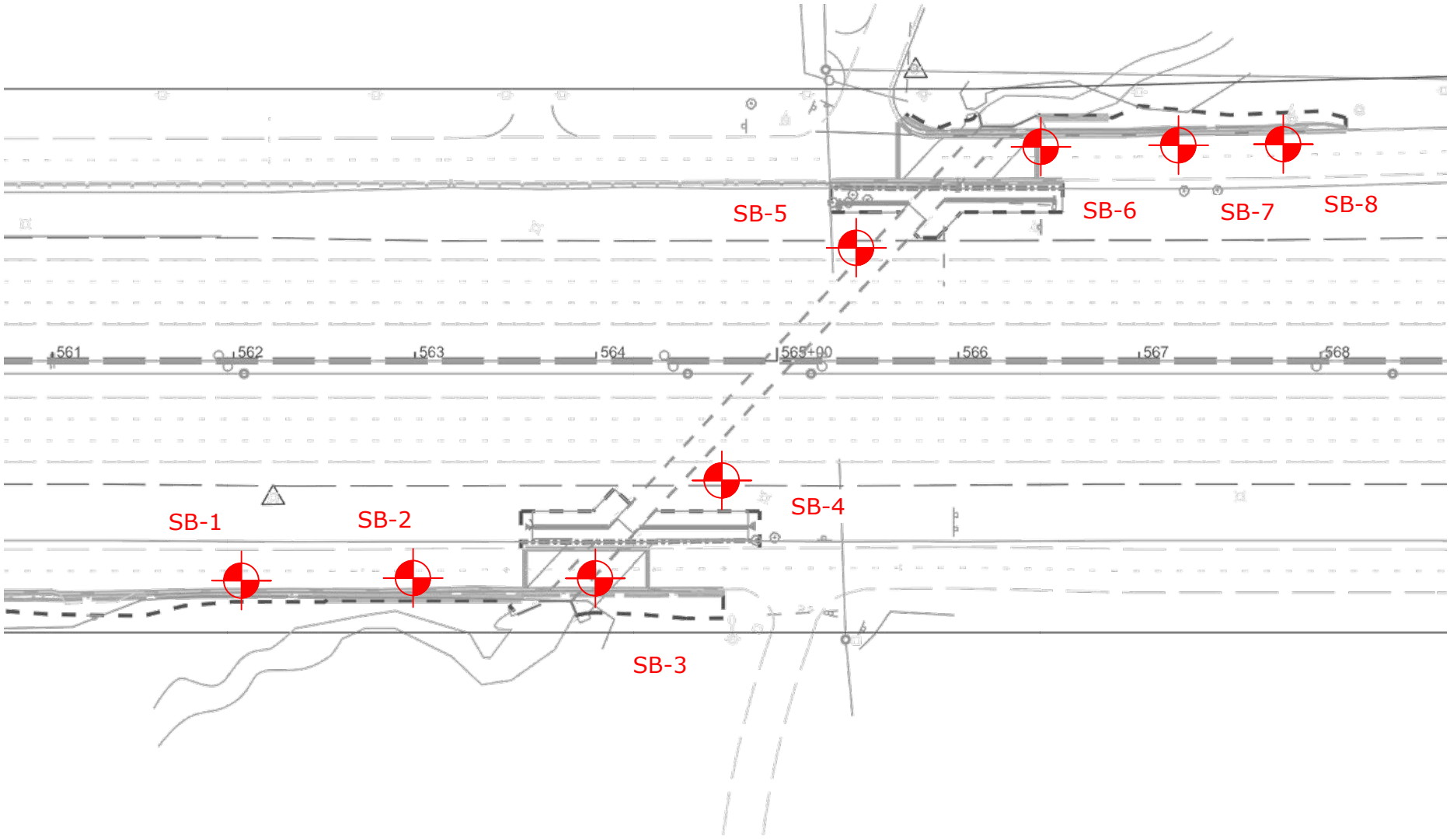
SITE LOCATION MAP AND BORING LOCATION PLAN

SITE LOCATION

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

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



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FAX : (630) 393-2857

DRAWN BY:	CHECKED BY:	SCALE:	DATE:
JAR	RW	NTS	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

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

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

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.

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%]

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

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-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

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	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
			30		11	3 5 8	1.48 B	14
	658.8	Boring terminated at 30.00 ft			12	8 6 11	2.87 B	14
			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: **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.

WANGENGINC KE225150.GPJ WANGENG.GDT 7/25/22

Wang Engineering
wangeng@wangeng.com
Telephone:
Fax:

BORING LOG SB-4

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: 691.44 ft
North: 1846762.02 ft
East: 1086745.62 ft
Station: 564+69.27
Offset: 66.21 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	690.3	14-inch thick ASPHALT --PAVEMENT--						
	689.9	Gray SANDY GRAVEL --BASE COURSE--			1	16 5 5	> 4.50 P	15
		Stiff to hard, brown to gray SILTY CLAY to CLAY, trace gravel; damp to moist --FILL-- --RDR 2-- --L_L(%)=36, P_L(%)=16-- --%Gravel=1.7-- --%Sand=16.9-- --%Silt=47.4-- --%Clay=34.0-- --A-6 (15)--	5		2	3 4 4	6.72 B	18
					3	3 1 2	3.44 B	17
	682.5	Stiff, black SILTY CLAY, trace gravel; moist --BURIED TOPSOIL--	10		4	1 2 2	1.00 P	24
	680.1	Very loose, gray SAND; saturated --RDR 2--			5	1 1 2	NP	19
	677.4	Stiff to very stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp to moist --RDR 2--	15		6	5 2 5	2.95 B	11
					7	3 6 6	1.50 P	13
			20		8	5 6 9	2.25 P	14
					9	3 6 9	3.20 B	13
			25		10	3 5 6	1.72 B	14
					11	4 3 5	1.56 B	15
					12	3 5 7	1.80 B	14
	661.4	Boring terminated at 30.00 ft	30					
			35					
			40					
			45					
			50					

GENERAL NOTES

Begin Drilling: **07-07-2022** Complete Drilling: **07-07-2022**
Drilling Contractor: **Wang Testing Services** Drill Rig: **17B57T [91%]**
Driller: **KS&PH** Logger: **L. Varzaru** Checked by: **J. Bensen**
Drilling Method: **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **11.30 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.

WANGENGINC KE225150.GPJ WANGENG.GDT 7/25/22

Wang Engineering
wangeng@wangeng.com
Telephone:
Fax:

BORING LOG SB-5

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: 691.59 ft
North: 1846910.23 ft
East: 1086759.11 ft
Station: 565+43.75
Offset: 62.64 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	690.4	14-inch thick ASPHALT --PAVEMENT--						
	690.2	Gray SANDY GRAVEL --BASE COURSE--			1	6 4 5	> 4.50 P	16
		Hard, brown SILTY CLAY, trace gravel; damp --FILL--						
	687.5	--RDR 2--			2	6 10 5	NP	8
		Medium dense, brown SANDY GRAVEL; damp	5					
	686.1	--FILL-- --RDR 2--			3	3 4 4	2.38 B	21
		Very stiff, black and gray SILTY CLAY, trace gravel; damp						
	683.6	--BURIED TOPSOIL-- --RDR 2--			4	2 3 3	1.64 B	20
		Medium stiff to stiff, brown and gray SILTY CLAY to CLAY, trace gravel; damp	10					
		--RDR 2--			5	1 2 4	0.66 B	24
	678.6	Hard, gray SILTY CLAY LOAM, trace gravel; damp						
		--RDR 2--	15		6	4 8 8	5.00 B	16
	676.1	Stiff, brown and gray GRAVELLY LOAM; moist						
		--RDR 2--			7	4 6 7	1.39 B	9
		--L_L(%)=15, P_L(%)=10--						
	673.6	--%Gravel=17.0-- --%Sand=40.6-- --%Silt=31.7-- --%Clay=10.7-- --A-4 (0)--						
			20		8	3 5 5	NP	12
	671.1	Medium dense, gray SAND; saturated						
		--RDR 2--			9	3 5 6	2.62 B	13
		Soft to vey stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel; damp						
		--RDR 2--			10	3 4 7	1.23 B	15
			25					
			30		11	3 4 6	0.41 B	16
	661.6	Boring terminated at 30.00 ft			12	6 6 10	2.38 B	13
			35					
			40					
			45					
			50					

GENERAL NOTES

Begin Drilling: **07-07-2022** Complete Drilling: **07-07-2022**
Drilling Contractor: **Wang Testing Services** Drill Rig: **17B57T [91%]**
Driller: **KS&PH** Logger: **L. Varzaru** Checked by: **J. Bensen**
Drilling Method: **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **15.50 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.

WANGENGINC KE225150.GPJ WANGENG.GDT 7/25/22

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

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	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--			1	4 3 4	3.00 P	13
		Very stiff, brown, gray and black SILTY CLAY, trace gravel; damp --FILL--	5		2	3 2 3	2.95 B	17
	685.7	--RDR 2--						
		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--						
		Soft, gray CLAY LOAM, trace gravel; wet --RDR 2--			5	2 3 5	0.49 B	17
	678.2							
		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
					12	4 6 9	2.79 B	12
	661.2		30					
		Boring terminated at 30.00 ft						
			35					
			40					
			45					
			50					

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**

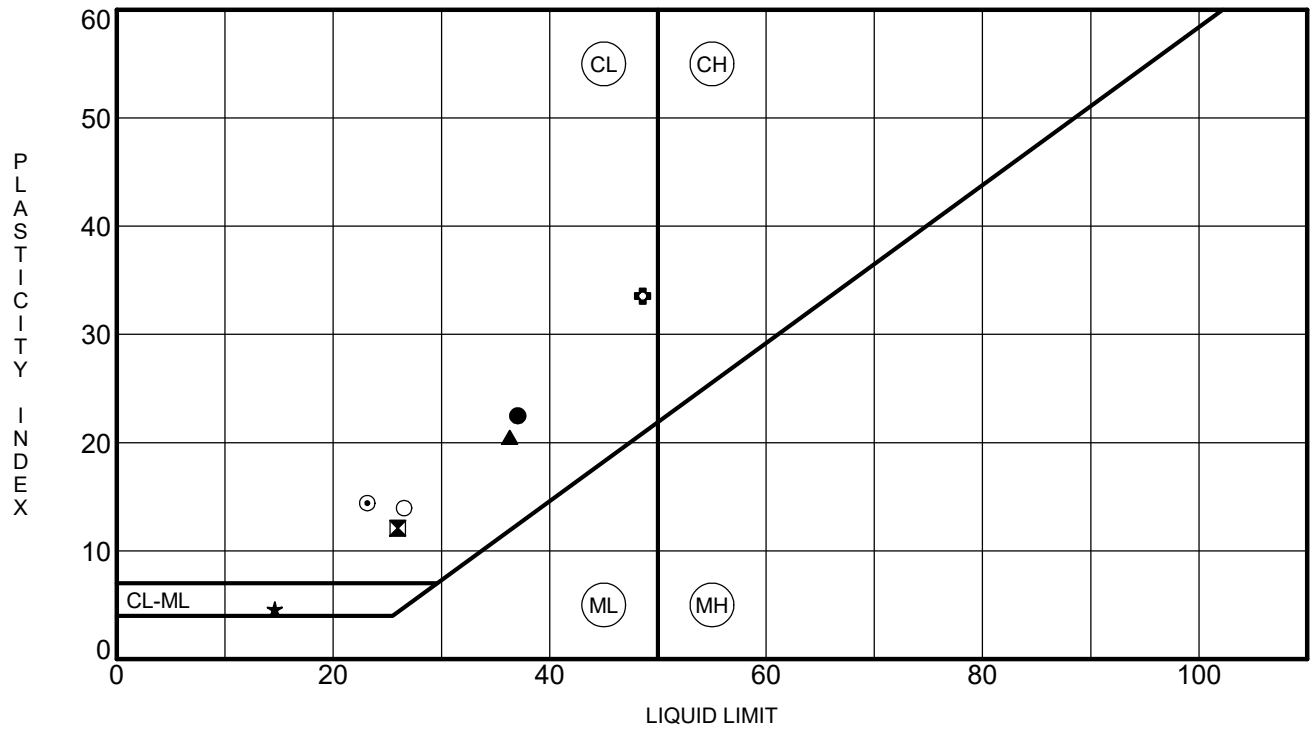
WATER LEVEL DATA

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.

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

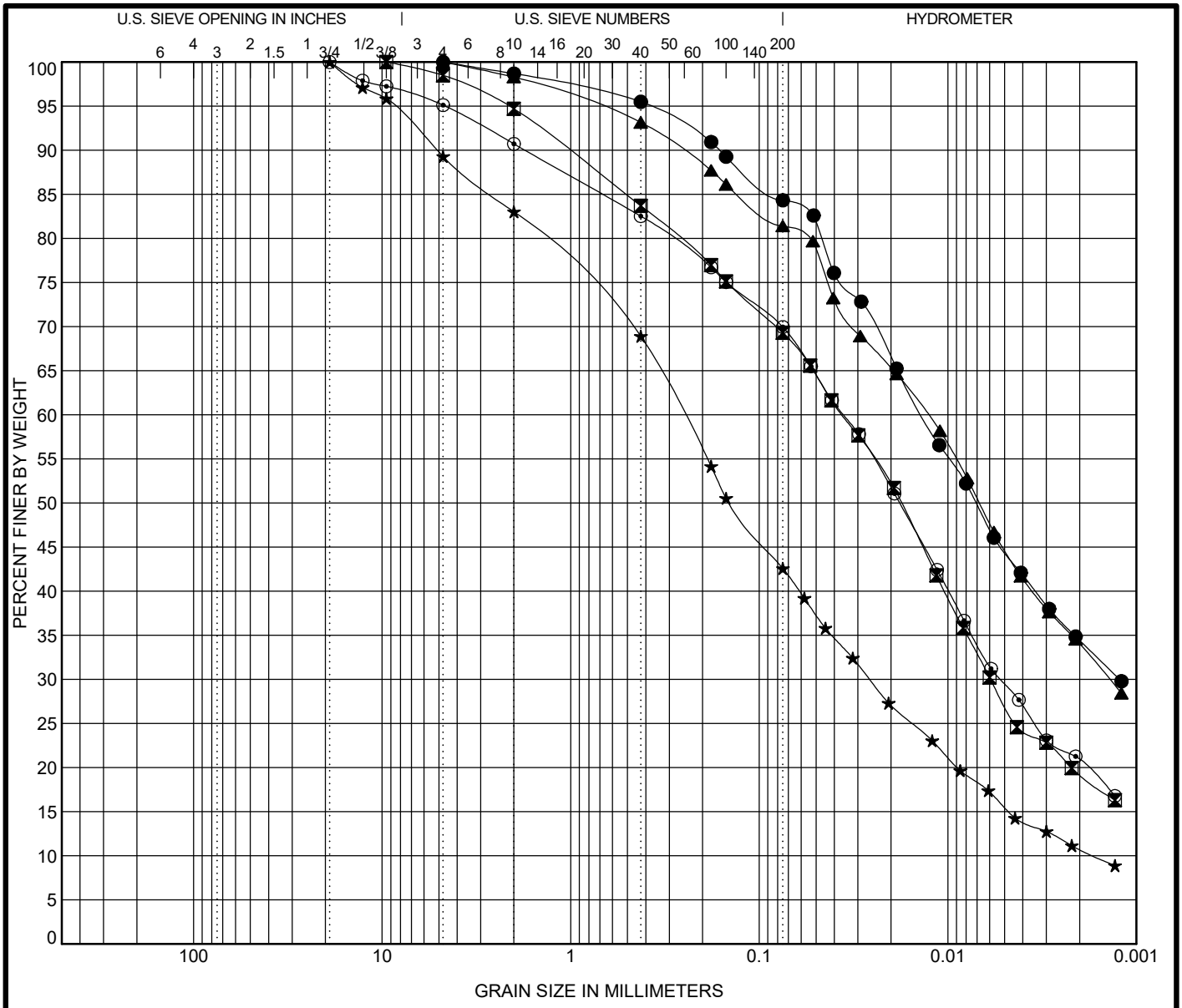
Telephone:
Fax:

ATTERBERG LIMITS' RESULTS

Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)



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

Terracon

Telephone:
Fax:

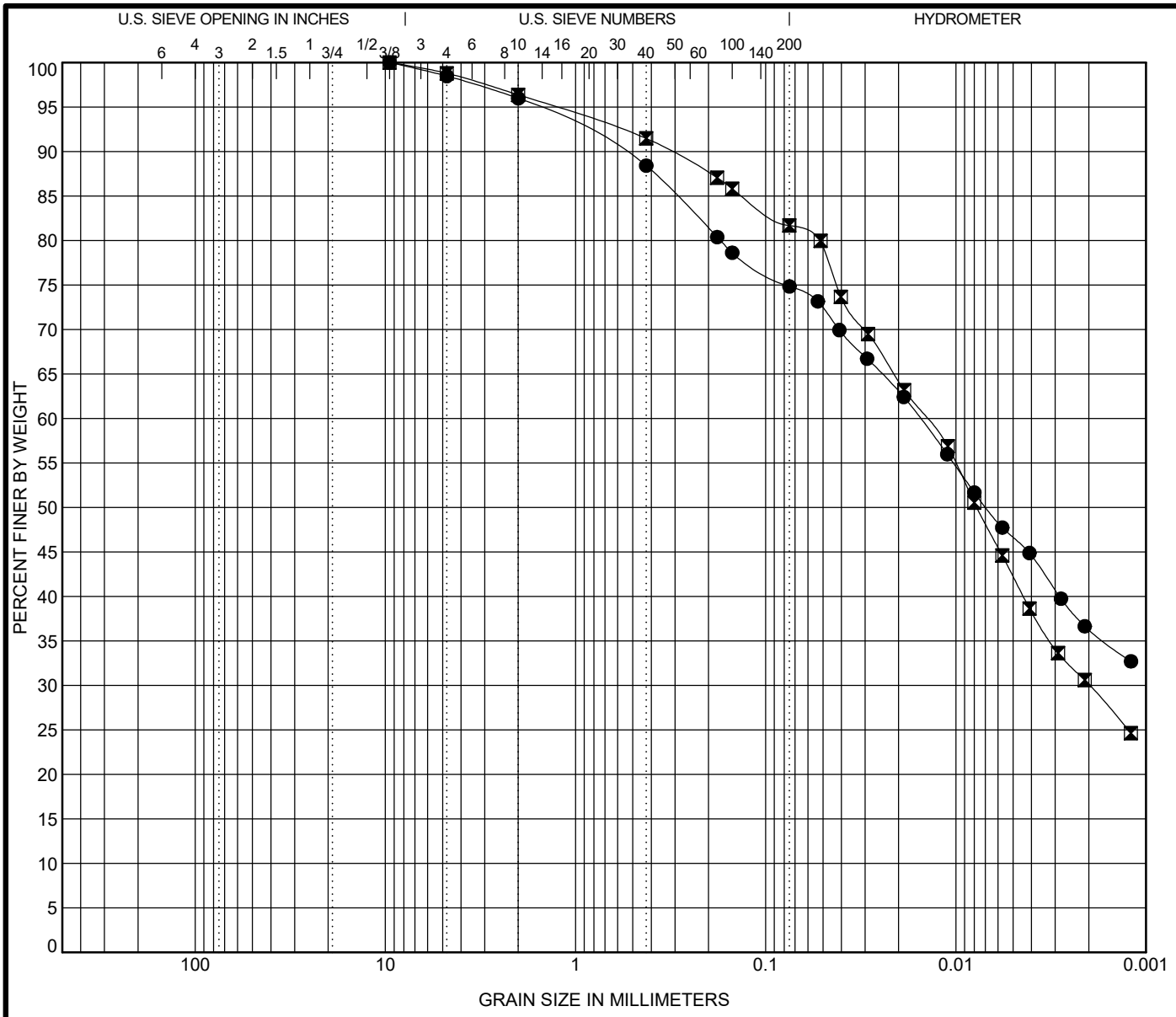
GRAIN SIZE DISTRIBUTION

Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)

WEI GRAIN SIZE 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-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

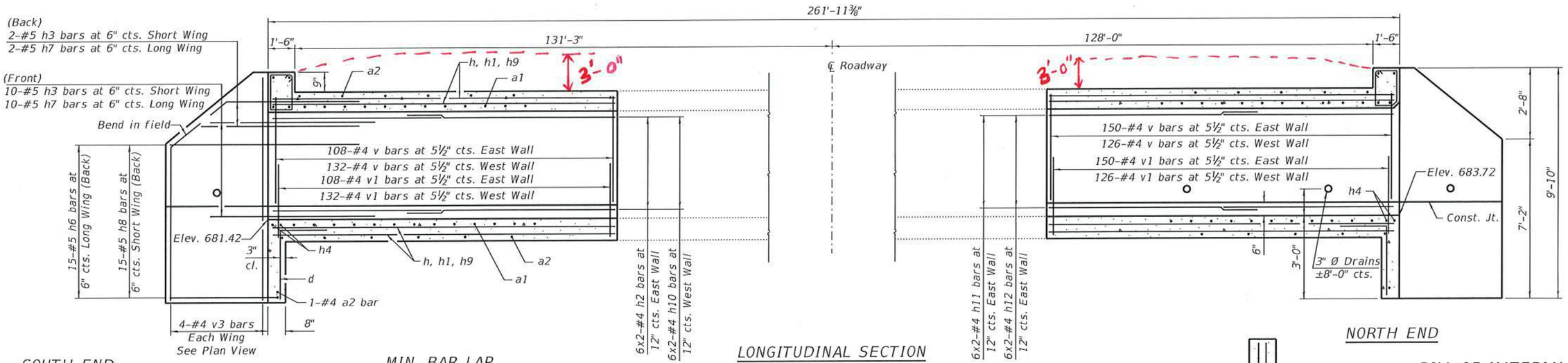
Project: I-55 Frontage Rd over Sawmill Creek

Location: DuPage County, Illinois

Number: KE225150 (555-17-07)

APPENDIX D

GENERAL PLAN AND LONGITUDINAL SECTION (PROVIDED BY IDOT)

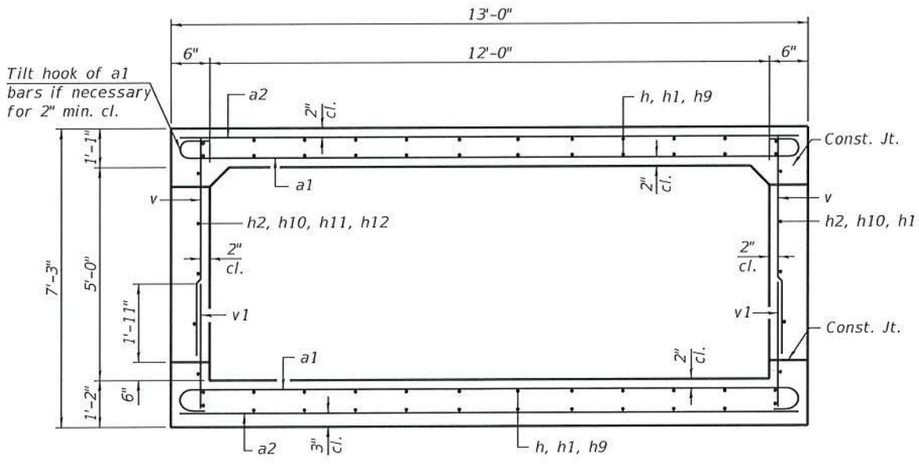


SOUTH END

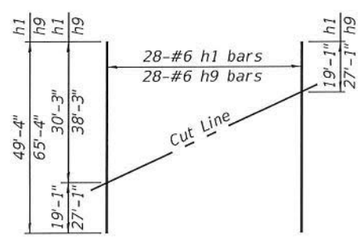
MIN. BAR LAP
#4 bar = 2'-3"

LONGITUDINAL SECTION
(Dimensions at Rt. ℄'s to ℄ Roadway)

NORTH END

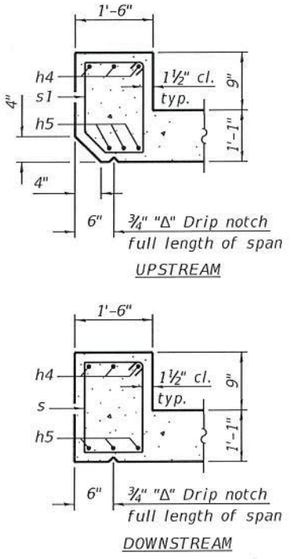


SECTION THRU BARREL

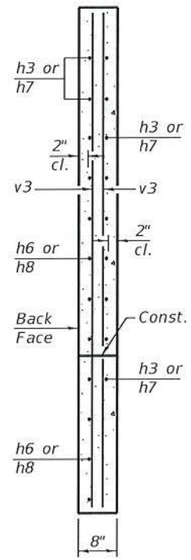


FIELD CUTTING DIAGRAM

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

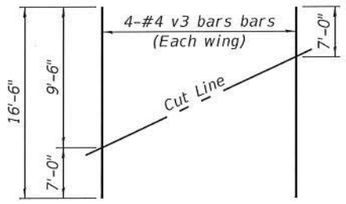


SECTION A-A

BILL OF MATERIAL

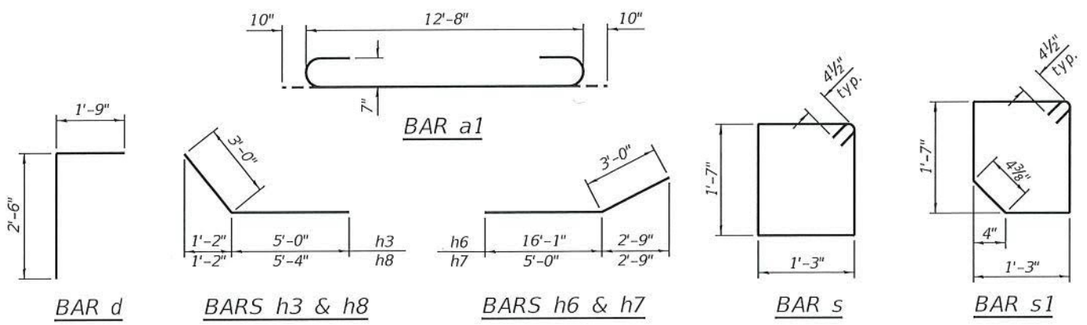
Bar	No.	Size	Length	Shape
a1	512	#7	14'-4"	
a2	274	#6	12'-8"	
d	34	#4	4'-3"	
h	112	#6	33'-4"	
h1	56	#6	49'-4"	
h2	12	#4	25'-8"	
h3	24	#5	8'-0"	
h4	10	#6	16'-1"	
h5	6	#9	16'-1"	
h6	30	#5	19'-1"	
h7	24	#5	8'-0"	
h8	30	#5	8'-4"	
h9	56	#6	65'-4"	
h10	12	#4	31'-3"	
h11	12	#4	35'-3"	
h12	12	#4	29'-8"	
s	17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



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		

℄ I-55

SB I-55

560+00 | 561 | 562 | 563 | 564 | 565+00

NB I-55

Approx. 150' of sheet pile. Max. exposed height 6'

PR P CUL CL C 2 18", 42 LF
PIPE CULVERT REMOV, 42 LF
W INV=683.153
E INV= MATCH EXISTING

PR WOV W FENCE 4', 132 LF
FENCE REMOVAL 132 LF

END SECTIONS 18"
REM CONC END SEC
STA 563+64.69
INV= 683.153

PR P CUL CL C 2 18", 60 LF
PIPE CULVERT REMOV, 60 LF
W INV= MATCH EXISTING
E INV= 683.36

END SECTIONS 18"
REM CONC END SEC
STA 564+83.86
INV= 683.36

+65 | +07 | +24 | +84

S FRONTAGE RD

+53 | +78

PR TBT TY 1

PR AGG SHLDR TY B

+40 | +53

PR TBT TY 2

NB I-55 BEGIN IMPROVEMENTS
STA 561+35.82

NB I-55 BEGIN CONSTRUCTION
STA 563+60.90

NB I-55 END CONSTRUCTION
STA 564+28.63

NB I-55 END IMPROVEMENTS
STA 564+90.26

PR SPBGR TY A 6FT POSTS 262.5 LF
GUARDRAIL REMOV 300.0 LF

PR CL D PATCH, T4 12"
PR AGG SUBGRADE IMPR 12"

LORRAINE DR

FLOODWAY LIMITS (TYP)

N

0 20 40 60
SCALE IN FEET

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	

LEGEND

Ⓐ

R2-1
24" X 30"
STA 565+99.52 LT

Ⓑ

W1-7
48" X 24"
STA 565+36.07 LT

0 20 40 60
SCALE IN FEET

FLOODWAY LIMITS (TYP)

Approx. 150' of sheet pile. Max. exposed height 6'

TENNESSEE AVE

SB I-55 BEGIN CONSTRUCTION
STA 565+68.75

SB I-55 END CONSTRUCTION
STA 566+43.35

SB I-55 END IMPROVEMENTS
STA 568+01.78

SB I-55 BEGIN IMPROVEMENTS
STA 564+50.51

PR TBT TY 2

PR P CUL CL C 2 18", 38 LF
PIPE CULVERT REMOV, 38 LF
W INV= 683.41
E INV= MATCH EXISTING

PR FL INLT BX MED 542546
REMOVE INLET BOX
STA 565+35.39
RIM ELEV= 686.74
E INV= 683.41

PR WOV W FENCE 4', 208 LF
FENCE REMOVAL 208 LF

PR SPBGR TY A 6FT POSTS 237.5 LF
GUARDRAIL REMOV 261.0 LF

PR AGG SHLDR TY B

PR CL D PATCH, T4 12"
PR AGG SUBGRADE IMP 12"

PR TBT TY 1A

+80 +49 +74

N FRONTAGE RD

PR TBT TY 1

+78 +03

PR SPBGR TY A 6FT POSTS 75.0 LF
GUARDRAIL REMOV 104.0 LF

PR AGG SHLDR TY B

+36 +74 +93 +58

PR TBT TY 2

PR FL INLT BX MED 542546
REMOVE INLET BOX
STA 566+53.20
RIM ELEV= 687.58
W INV= 684.25

PR P CUL CL C 2 18", 60 LF
PIPE CULVERT REMOV, 60 LF
W INV= MATCH EXISTING
E INV= 684.25

SB I-55

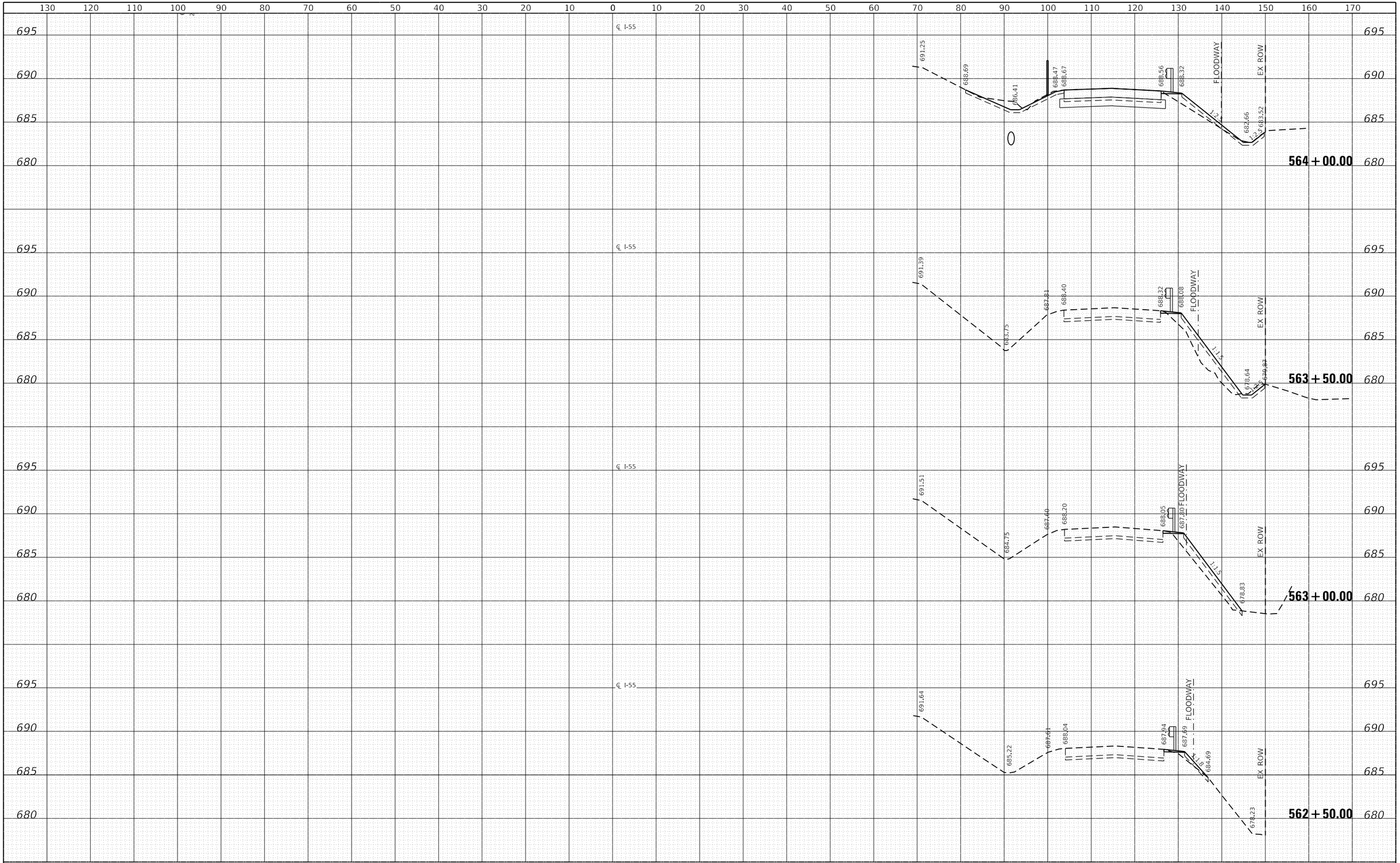
℄ I-55

564 565+00 566 567 568 569

NB I-55

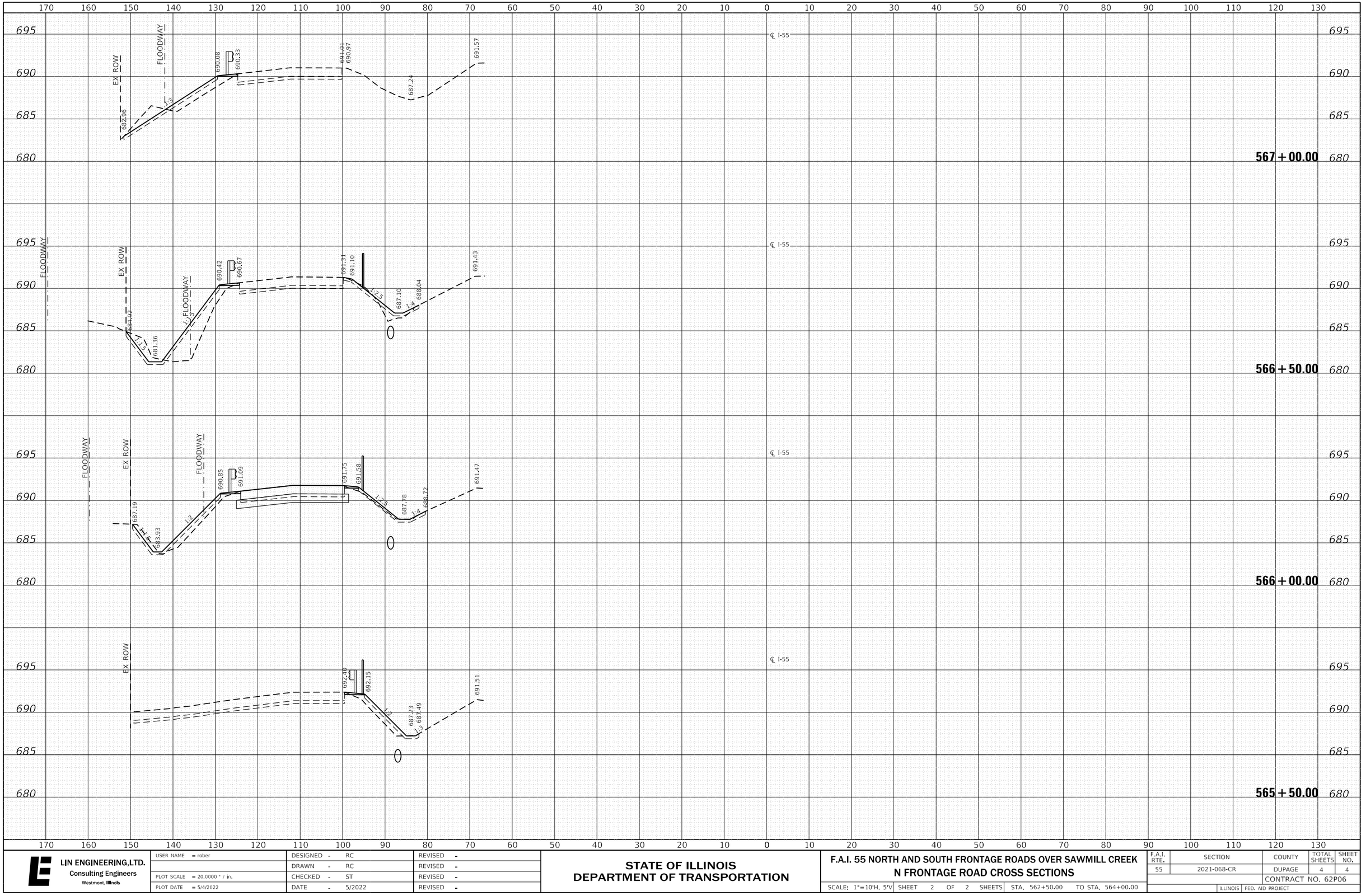
LIN ENGINEERING,LTD. Consulting Engineers Westmont, Illinois	USER NAME = rober	DESIGNED - RC	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK ROADWAY PLAN
		DRAWN - RC	REVISED -		
	PLOT SCALE = 40.0000 ' / in.	CHECKED - ST	REVISED -		SCALE: 1"=20' SHEET 2 OF 2 SHEETS STA. TO STA.
	PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -		

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	F.A.I. 55 NORTH AND SOUTH FRONTAGE ROADS OVER SAWMILL CREEK S 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 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 -		SCALE: 1"=10'H, 5'V SHEET 2 OF 2 SHEETS STA. 562+50.00 TO STA. 564+00.00
	PLOT DATE = 5/4/2022	DATE - 5/2022	REVISED -		

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