
**GEOTECHNICAL LETTER REPORT
RETAINING WALL ALONG 55TH ST. AT SERGO DR.
SECTION NO. 0102N&T
CONTRACT NO. 62C25
COOK COUNTY, ILLINOIS**

**for
Accurate Group, Inc.
101 Schelter Road, Suite B200
Lincolnshire, IL 60069**

**Submitted by
Wang Engineering, Inc.
1145 North Main Street
Lombard, IL 60148**

**Original Report: April 4, 2018
Revised Report: NA**

April 4, 2018

Sapan Trivedi, EIT

Accurate Group, Inc.

101 Schelster Road, Suite B200

Lincolnshire, IL 60069

Re: Foundation Recommendations
Retaining Wall along 55th St. at Sergo Dr.
Section No. 0102N&T,
Cook County, Illinois
Wang No. 491-03-01

Dear Mr. Trivedi,

Wang Engineering Inc. (Wang) is pleased to present this letter report presenting the results of our geotechnical investigations, evaluations, and recommendations for a proposed retaining wall along 55th Street in Cook County. A *Site Location Map* is presented in Exhibit 1. Based on information provided by Accurate Group, Inc. (Accurate), we understand that the improvements include a Segmental Block Wall located along westbound 55th Street. The 152-foot long wall begins at Station 319+42.03, offset 56.04 feet left and ends at Station 320+94.00, offset 56.36 feet left with an approximate maximum exposed height of 2.5 feet.

On the USGS *Barrington Quadrangle 7.5 Minute Series* map, the project site is located in the SW ¼ of Sections 10, Tier 38 N, Range 12 E. A *Site Location Map* is presented in Exhibit 1.

The purpose of our investigation was to characterize the subsurface conditions and provide recommendations for the design and construction of the proposed wall.

Subsurface Investigation

Three borings, designated as RWB-23, RWB-24, and RWB-25, were drilled by Wang in October, 2017 for depths of 18.7 to 20.0 feet below ground surface (bgs). Boring coordinates were surveyed by

Wang using a GPS unit. Boring stations and offsets were taken from design drawings provided by Accurate. Station, offset and elevation information is shown in the *Boring Logs* (Appendix A). As-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 2).

A truck-mounted drilling rig, equipped with hollow stem augers, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils.*" The soil was sampled at 2.5-foot intervals to the boring termination depths. Soil samples collected from each interval were placed in sealed jars for further examination and laboratory testing.

Field boring logs, prepared and maintained by a Wang geologist, included lithologic descriptions, visual-manual soil classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of standard penetration tests (SPT) recorded as blows per 6 inches of penetration.

Groundwater levels were observed while drilling and at completion of each boring. The boreholes were backfilled with soil cuttings and/or bentonite chips and the surface was restored as close as possible to its original condition.

Laboratory Testing

Soil samples were tested in the laboratory for moisture content (AASHTO T 265). The soils were classified according to the IDH soil classification system. Field visual-manual classifications were also verified in the laboratory. The results of the lab testing are shown in Boring logs (Appendix A).

Subsurface Conditions

Detailed descriptions of encountered lithologic units are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 3). Please note the lithologic boundaries shown on logs and profiles represent approximate limits between soil types. In the field, the actual transition between soil types might be gradual in horizontal and vertical directions.

The pavement consists of 6 to 15-inch thick asphalt. An 11-inch thick concrete base was encountered beneath the asphalt pavement in Boring RWB-23. Beneath the pavement section, the borings encountered cohesive and granular fills consisting of stiff to very stiff, black, brown and gray silty clay loam, clay loam to medium dense gravelly sand. The cohesive fill has unconfined compressive strength

(Q_u) values of 1.0 to 2.8 tsf, with an average of 1.9 tsf and moisture content values of 21 to 28%, with an average of 25%. Underlying the fill, borings encountered buried topsoil in Borings RWB-23 and RWB-24, consisting of stiff, black and brown silty clay. At an elevation of 643.2 to 646.1 feet, the borings advanced through 11 to 13 feet of stiff to hard silty clay to clay with sand lenses. The soil has Q_u values of 1.8 to 6.2 tsf with an average of 3.7 tsf and moisture content values of 16 to 26% with an average of 21%. Borings RWB-23 and RWB-24 encountered weathered bedrock at a depth of 18 feet bgs.

Groundwater was not encountered during or at the completion of drilling.

Foundation Design Recommendations

Wang understands a segmental block wall with a maximum retained height of 2.5 feet is proposed. We assume the wall will retain primarily new granular fill. Below the footing level, at approximately elevation 646 feet, the wall will be supported by stiff to hard silty clay. Based on the soil conditions encountered along the wall, Wang estimates the soil conditions are appropriate for the support of the wall. The wall should be designed based on a maximum factored bearing resistance (q_b) of 3,500 psf, considering a geotechnical resistance factor (ϕ_b) of 0.55 (AASHTO 2017). The maximum long-term settlement of the wall is estimated less than 0.5 inch.

Global stability evaluations for the wall were performed using *Slide V6*. IDOT requires a minimum Factor of Safety (FOS) of 1.5 (IDOT 2015). The analyses were performed for both short-term (undrained) and long-term (drained) conditions based on the soils encountered in Boring RWB-24 at Station 320+00. Analysis results are presented in Exhibits 4-1 and 4-2. We determined the proposed wall has a FOS of 7.5 (undrained) and 2.8 (drained) which meet the IDOT minimum FOS of 1.5.

Construction Consideration

Site Preparation and Excavation

All vegetation, surface topsoil, and debris should be cleared and stripped where fills and structures will be placed. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill as described in section *filling and backfilling*.

Foundation excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon nearby roadways and utilities should also be taken into consideration. Excavations must be sloped at no steeper than 1:1.5 (V: H). Excavated material should

not be stockpiled immediately adjacent to the top of slopes, nor should equipment be allowed to operate too closely to open excavations.

Dewatering

Groundwater was not observed during and at the end of drilling. Contractor should be prepared for dewatering measures if groundwater is encountered above the proposed excavation depth. Depending upon prevailing climate conditions and the time of the year when wall construction takes place, control runoff and maintenance of existing flows may require temporary water diversion and control.

Filling and Backfilling

Backfill materials must be preapproved by the site engineer. The fill material should be free of organic matter and debris and should be placed in lifts and compacted in accordance with the IDOT Standard Specifications for Road and Bridge Construction (2016). To backfill the walls, we recommend porous granular material conforming to the requirements specified in the IDOT Recurring Special Provision, Granular Backfill for Structures (2017).

Wall Construction

The walls should be constructed according to the current IDOT Standard Specifications for Road and Bridge Construction.

Construction Monitoring

There is no need for a special construction monitoring for the retaining walls except normally required by the IDOT Standard Specifications.

Qualifications

The analysis and recommendations contained in this letter report are based on the soils encountered at the boring locations shown in Exhibit 2. This letter report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until a later stage of construction. Should conditions encountered during excavation and construction operations differ from those encountered in the borings, Wang should be notified so that recommendations can be reviewed and revised if necessary.

It has been a pleasure to assist Accurate Group, Inc. in this project. Please contact us if there are any questions, or if we can be of further service.

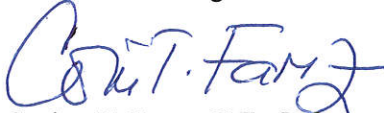
Respectfully Submitted,

WANG ENGINEERING, INC.



Ramesh KC, EIT

Geotechnical Engineer



Corina T. Farez, P.E., P.G.

QC/QA Reviewer



Andri Kurnia, P.E.

Project Manager

Attachments

Exhibit 1: *Site Location Map*

Exhibit 2: *Boring Locations Plan*

Exhibit 3: *Soil Profile*

Exhibit 4: *Global Stability Analyses*

Appendix A: *Boring Logs*

Appendix B: *GPE Drawing*

Appendix C: *Cross-Section Drawing*

REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (2017) *LRFD Bridge Design Specifications*. United States Department of Transportation, Washington, D.C.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2015) *Geotechnical Manual*. IDOT Bureau of Materials and Physical Research, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2016) *Standard Specifications for Road and Bridge Construction*. IDOT Division of Highways, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2017) *Supplemental Specifications and Recurring Special Provisions*. DOT Bureau of Bridges and Structures, Springfield, IL.

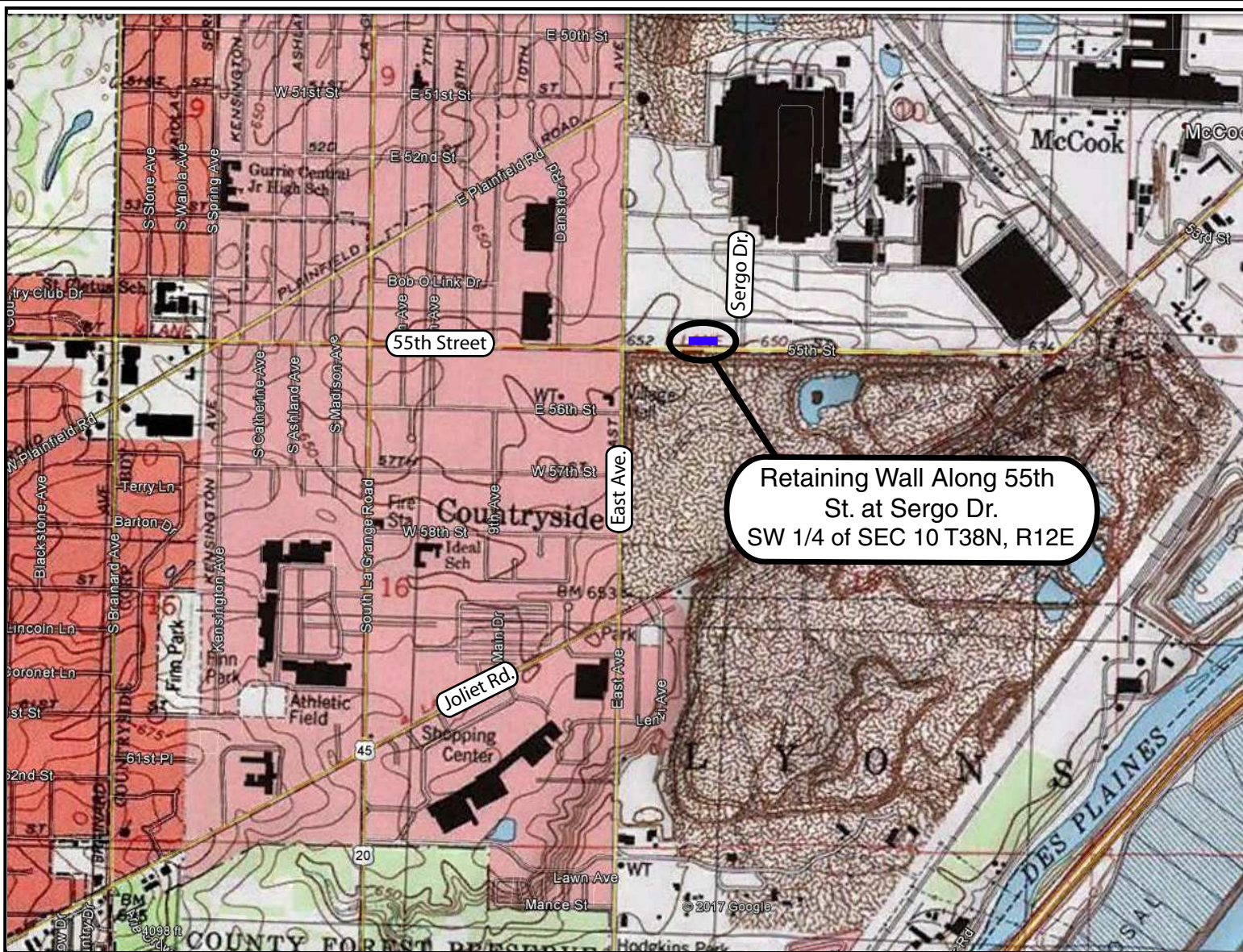
EXHIBITS

Exhibit 1: Site Location Map

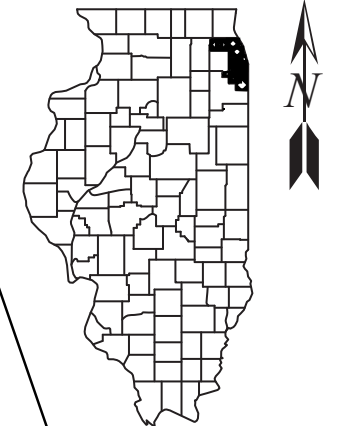
Exhibit 2: Boring Locations Plan

Exhibit 3: Soil Profile

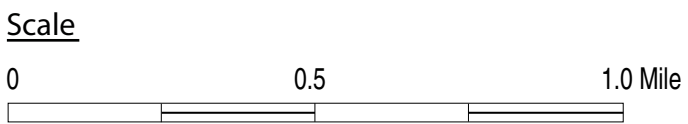
Exhibit 4: Global Stability Analyses



Retaining Wall Along 55th St. at Sergo Dr.
SW 1/4 of SEC 10 T38N, R12E



Cook County



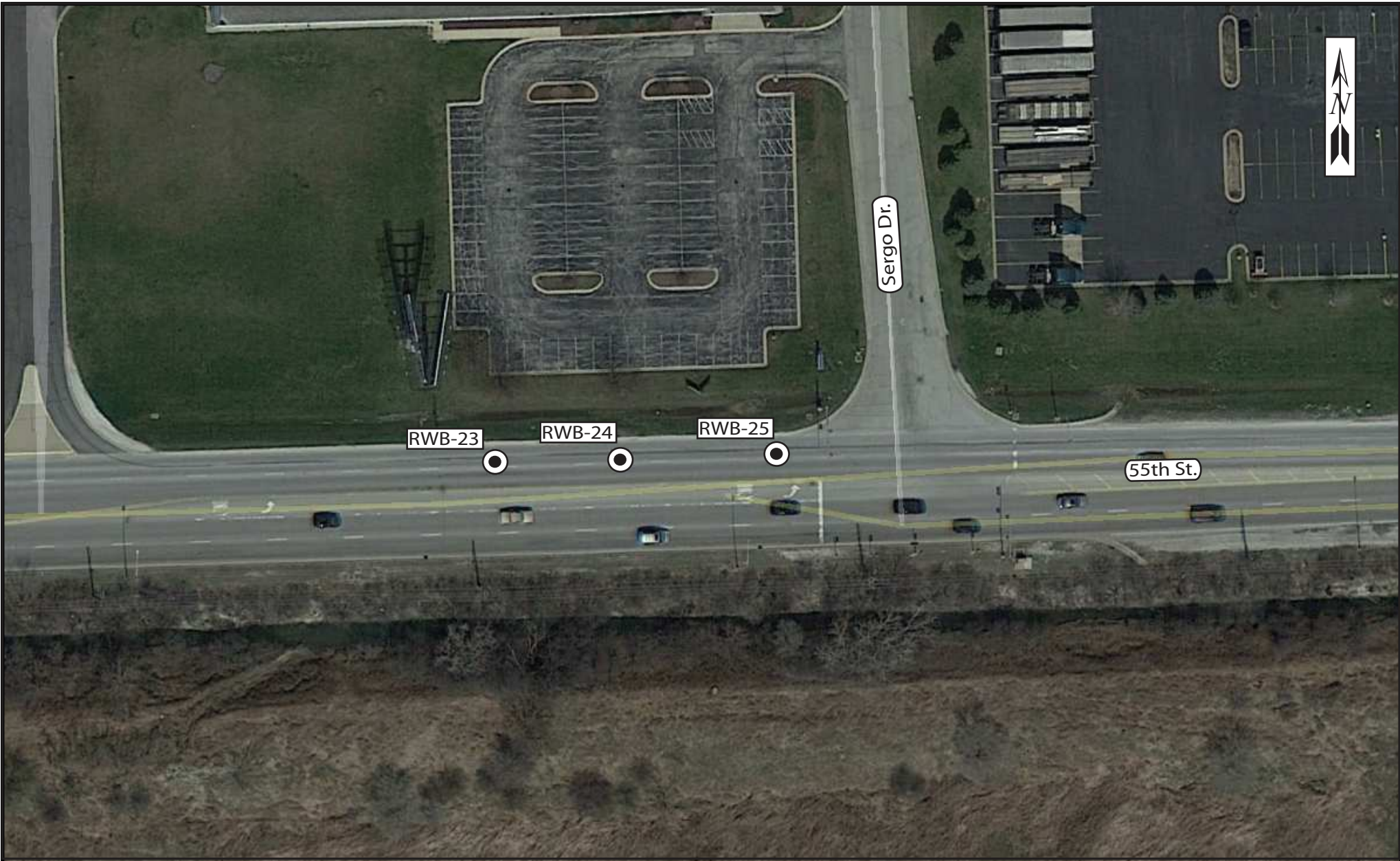
SITE LOCATION MAP: RETAINING WALL ALONG 55th ST. AT SERGO DR. SEC. NO. 0102N&T, CONTRACT NO. 62C25, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: H. Bista CHECKED BY: A. Kurnia
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FOR ACCURATE GROUP, INC.	491-03-01
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Legend

● Retaining Wall Borings

0 150 300 Feet

BORING LOCATION PLAN: RETAINING WALL ALONG 55th ST. AT SERGO DR.
 SEC. NO. 0102N&T, CONTRACT NO. 62C25, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL

EXHIBIT 2

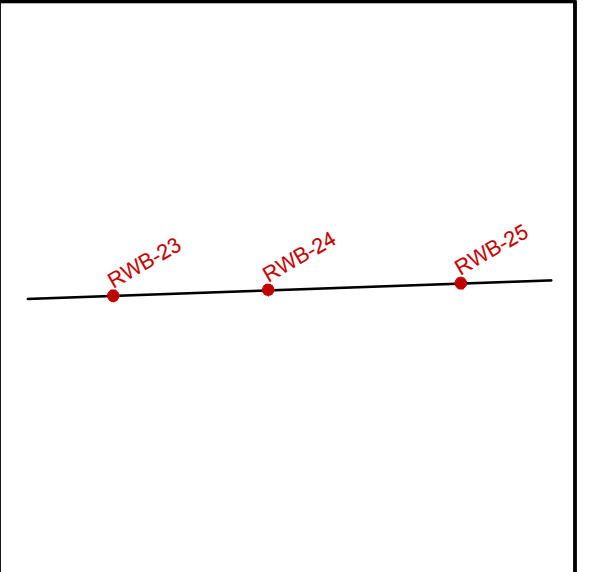
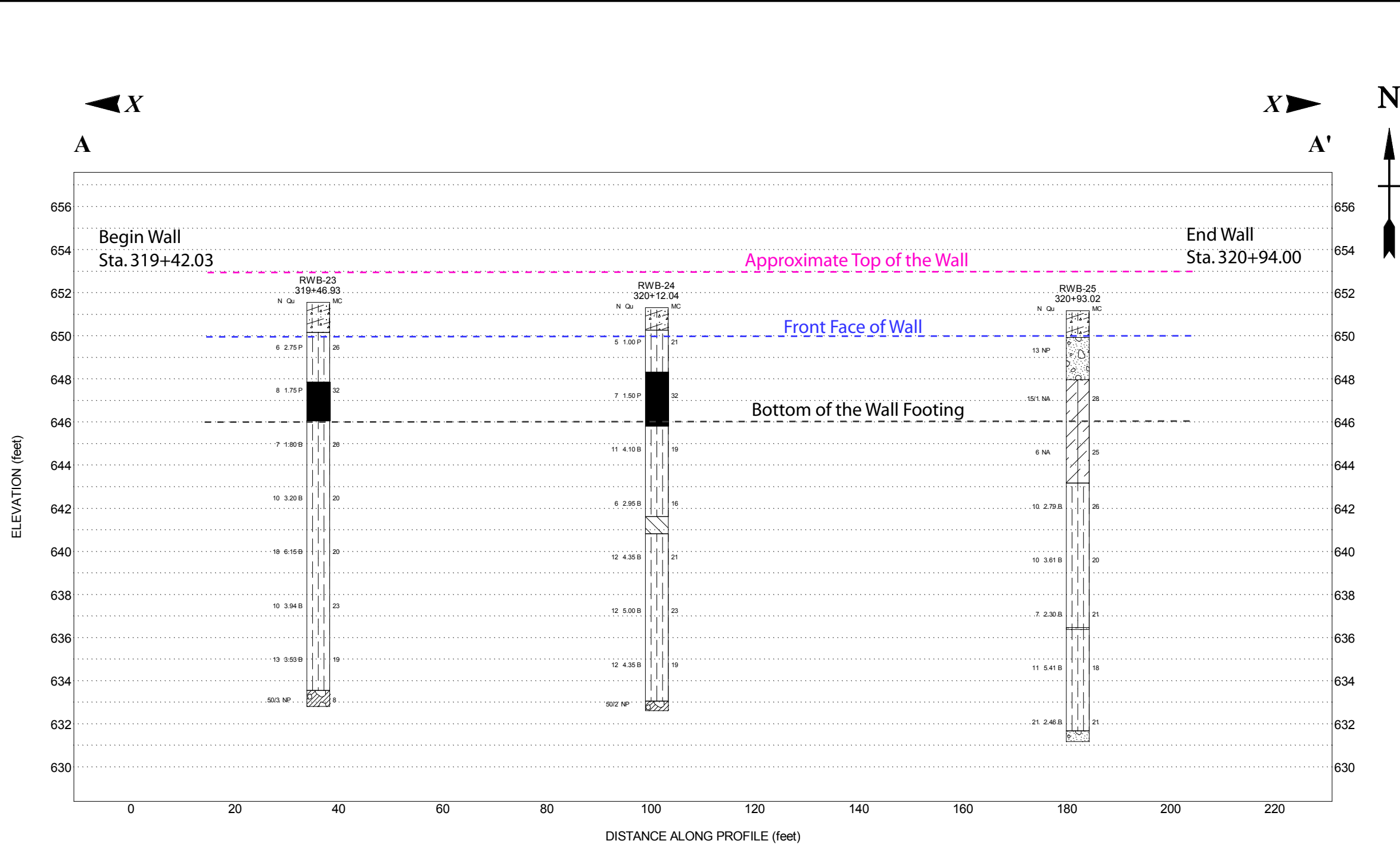
DRAWN BY: R. KC
 CHECKED BY: A. Kumia



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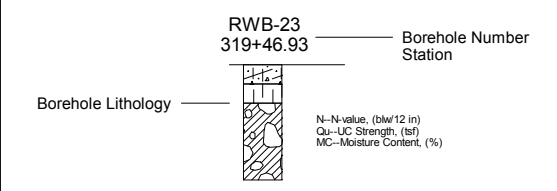
FOR ACCURATE GROUP, INC.

491-03-01



Site Map Scale 1 inch equals 80 feet

Explanation:



- ▽ Water Level Reading at time of drilling.
- ▼ Water Level Reading 24-hr after drilling or at end of drilling



Vertical Exaggeration: 4x

Lithology Graphics

- | | | | |
|----------|---------------------------------|---------------|----------------------|
| Pavement | IDH Silty Clay, Silty Clay Loam | Topsoil | Weathered bedrock |
| IDH Clay | Gravelly sand, sandy gravel | IDH Clay Loam | IDH Sand, Sandy Loam |

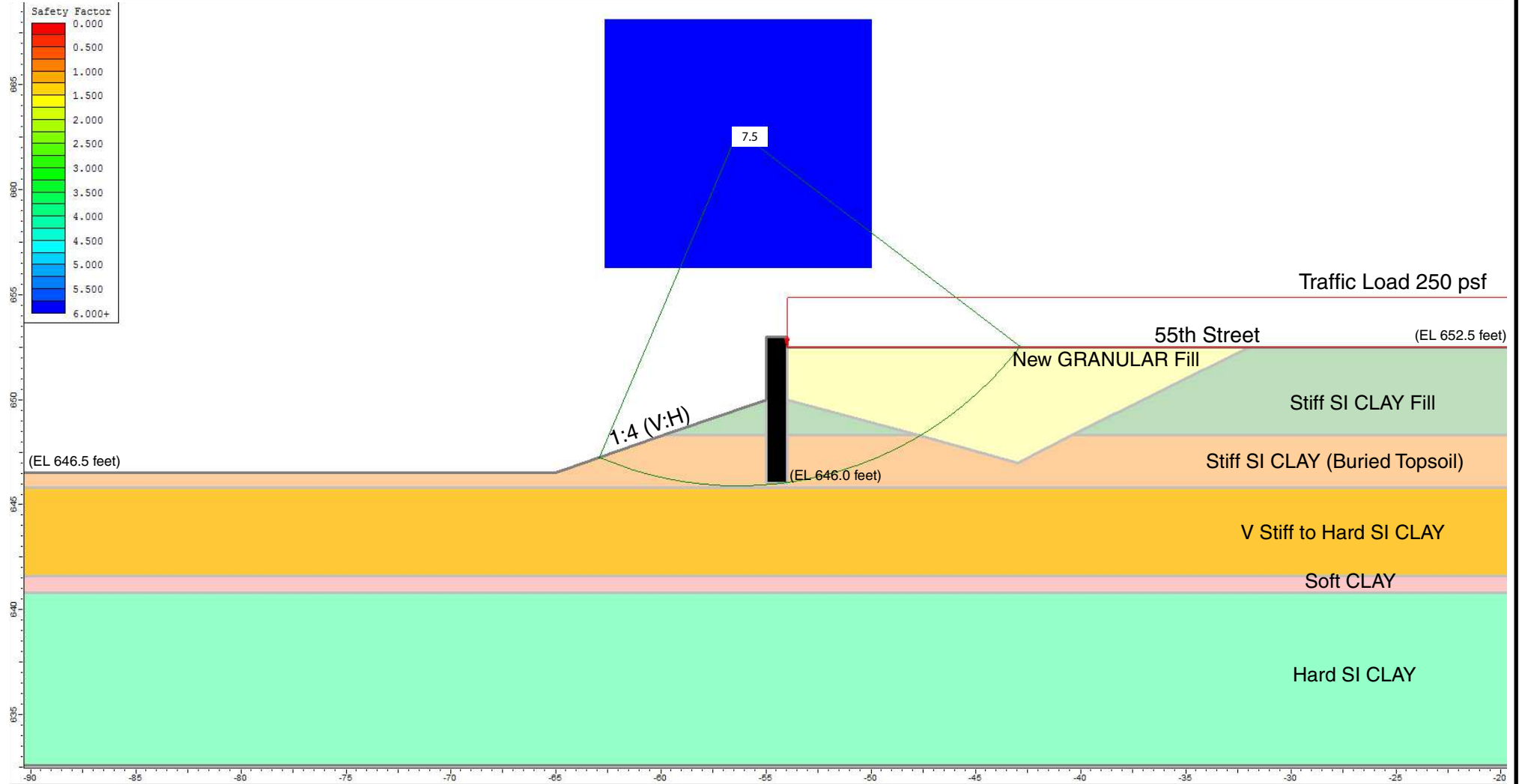
Wang Engineering, Inc.
1145 N Main Street
Lombard, IL 60148

Subsurface Data Profile
Retaining Wall Along 55th St. at Sergo Dr.
Contract 62C25



East Avenue from Joliet Road to 55th Street
Cook County, IL

JOB NUMBER	PLATE NUMBER
491-03-01	EXHIBIT 3



Undrained Analysis, Retaining Wall at Sta. 320+00, Ref Boring: RWB-24

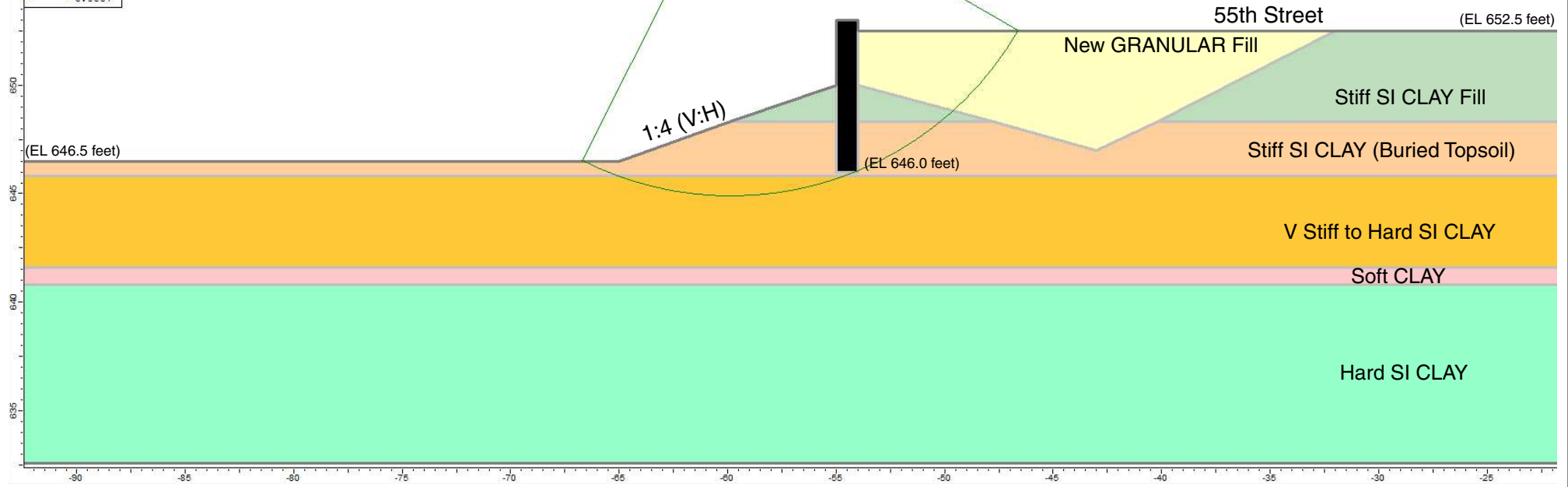
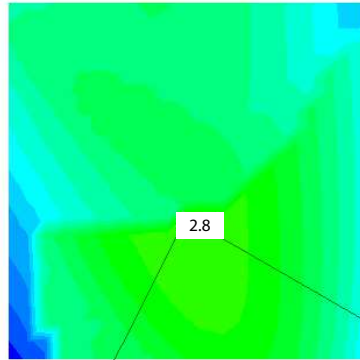
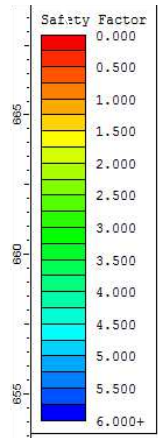
Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	New GRANULAR Fill	125	0	32
2	Stiff SI CLAY Fill	120	1000	0
3	Stiff SI CLAY (Buried Topsoil)	120	1500	0
4	V Stiff to Hard SI CLAY	120	3500	0
5	Soft CLAY	110	250	0
6	Hard SI CLAY	120	4600	0

GLOBAL STABILITY: RETAINING WALL ALONG 55th ST. AT SERGO DR. SEC. NO. 0102N&T, CONTRACT NO. 62C25, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL **EXHIBIT 4-1** DRAWN BY: RKC
 CHECKED BY: A. Kumia

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FOR ACCURATE GROUP, INC. 491-03-01



Drained Analysis, Retaining Wall at Sta. 320+00, Ref Boring: RWB-24

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	New GRANULAR Fill	125	0	32
2	Stiff SI CLAY Fill	120	100	31
3	Stiff SI CLAY (Buried Topsoil)	120	100	31
4	V Stiff to Hard SI CLAY	120	100	31
5	Soft CLAY	110	0	29
6	Hard SI CLAY	120	100	31

GLOBAL STABILITY: RETAINING WALL ALONG 55th ST. AT SERGO DR. SEC. NO. 0102N&T, CONTRACT NO. 62C25, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL EXHIBIT 4-2 DRAWN BY: RKC
CHECKED BY: A. Kurnia

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FOR ACCURATE GROUP, INC. 491-03-01

APPENDIX A: BORING LOGS



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 1145 N Main Street
 Lombard, IL 60148
 Telephone: 630 953-9928
 Fax: 630 953-9938

BORING LOG RWB-23

WEI Job No.: 491-03-01

Client **Accurate Group, Inc.**
 Project **East Avenue from Joliet Road to 55th Street**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 651.56 ft
 North: 1866715.95 ft
 East: 1114366.65 ft
 Station: 319+46.93
 Offset: 22.81 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	650.2	6-inch thick, ASPHALT over 11-inch thick CONCRETE --PAVEMENT--															
	647.9	Very stiff, gray, brown, and black SILTY CLAY LOAM, trace gravel; moist --FILL-- --RDR 2--			1	3 3 3	2.75 P	26									
	646.1	Stiff, black SILTY CLAY, trace roots; moist --BURIED TOPSOIL-- --RDR 2--			2	3 3 5	1.75 P	32									
		Stiff to hard, brown to gray SILTY CLAY, trace gravel; moist --RDR 2--			3	2 3 4	1.80 B	26									
					4	4 4 6	3.20 B	20									
					5	7 7 11	6.15 B	20									
					6	3 4 6	3.94 B	23									
					7	4 5 8	3.53 B	19									
	633.6	Very dense DOLOSTONE fragments --RDR 4-- --WEATHERED BEDROCK--			8	50/3	NP	8									
		Boring terminated at 18.75 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **08-09-2017** Complete Drilling **08-09-2017**
 Drilling Contractor **Wang Testing Services** Drill Rig **B57 TMR [100%]**
 Driller **N&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **2.25 HSA; backfilled upon completion**

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 4910301.GPJ WANGENG.GDT 3/28/18



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 Lombard, IL 60148
 Telephone: 630 953-9928
 Fax: 630 953-9938

BORING LOG RWB-24

WEI Job No.: 491-03-01

Client **Accurate Group, Inc.**
 Project **East Avenue from Joliet Road to 55th Street**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 651.32 ft
 North: 1866718.44 ft
 East: 1114431.72 ft
 Station: 320+12.04
 Offset: 22.91 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	650.3	13-inch thick, ASPHALT --PAVEMENT--									Boring terminated at 18.70 ft						
	648.3	Stiff, gray and black SILTY CLAY, trace gravel; moist --FILL-- --RDR 2--			1	3 2 3	1.00 P	21									
	645.8	Stiff, black and brown SILTY CLAY; moist --BURIED TOPSOIL-- --RDR 2--	5		2	2 2 5	1.50 P	32				25					
	641.6	Very stiff to hard, brown to gray SILTY CLAY, trace gravel; moist --RDR 2--			3	3 5 6	4.10 B	19									
	640.8	Soft (0.25P), gray CLAY; wet	10		4	2 3 3	2.95 B	16				30					
	633.1	Hard, gray SILTY CLAY, trace gravel; moist --RDR 2--			5	3 5 7	4.35 B	21									
	632.6	--difficult drilling from 18.25 feet--			6	4 5 7	5.00 B	23				35					
	632.6	Very dense DOLOSTONE fragments --RDR 4-- --WEATHERED BEDROCK--	20		7	4 5 7	4.35 B	19									
					8	50/2	NP					40					

GENERAL NOTES

WATER LEVEL DATA

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 Driller **N&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **2.25 HSA; backfilled upon completion**

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.

WANGENG 4910301.GPJ WANGENG.GDT 3/28/18



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 Lombard, IL 60148
 Telephone: 630 953-9928
 Fax: 630 953-9938

BORING LOG RWB-25

WEI Job No.: 491-03-01

Client **Accurate Group, Inc.**
 Project **East Avenue from Joliet Road to 55th Street**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 651.18 ft
 North: 1866721.26 ft
 East: 1114512.66 ft
 Station: 320+93.02
 Offset: 22.77 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	649.9	15-inch thick, ASPHALT --PAVEMENT--									GRAVELLY SAND; moist Boring terminated at 20.00 ft						
	648.0	Medium dense, white GRAVELLY SAND; dry --BASE COURSE-- --RDR 2--			1	9 8 5	NP										
		Brown and black CLAY LOAM, trace gravel; moist --FILL-- --RDR 2--	5		2	4 3 15/1	NA	28				25					
					3	3 2 4	NA	25									
	643.2	Very stiff to hard, brown to gray SILTY CLAY, trace gravel; moist --RDR 2--	10		4	2 4 6	2.79 B	26				30					
					5	3 5 5	3.61 B	20									
	636.4	--sand lenses; damp--	15		6	3 3 4	2.30 B	21				35					
					7	2 4 7	5.41 B	18									
	631.7				8	4 11	2.46 B	21									
	631.2	Medium dense, brown	20			10						40					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **08-09-2017** Complete Drilling **08-09-2017**
 Drilling Contractor **Wang Testing Services** Drill Rig **B57 TMR [100%]**
 Driller **N&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **2.25 HSA; backfilled upon completion**

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 4910301.GPJ WANGENG.GDT 3/28/18

APPENDIX B: GPE DRAWING

Benchmark

Existing Structure: None

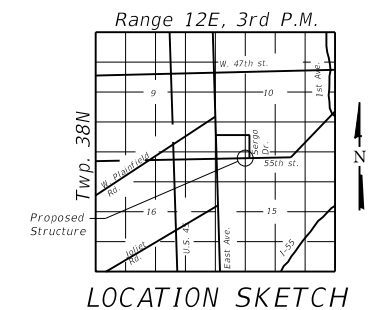
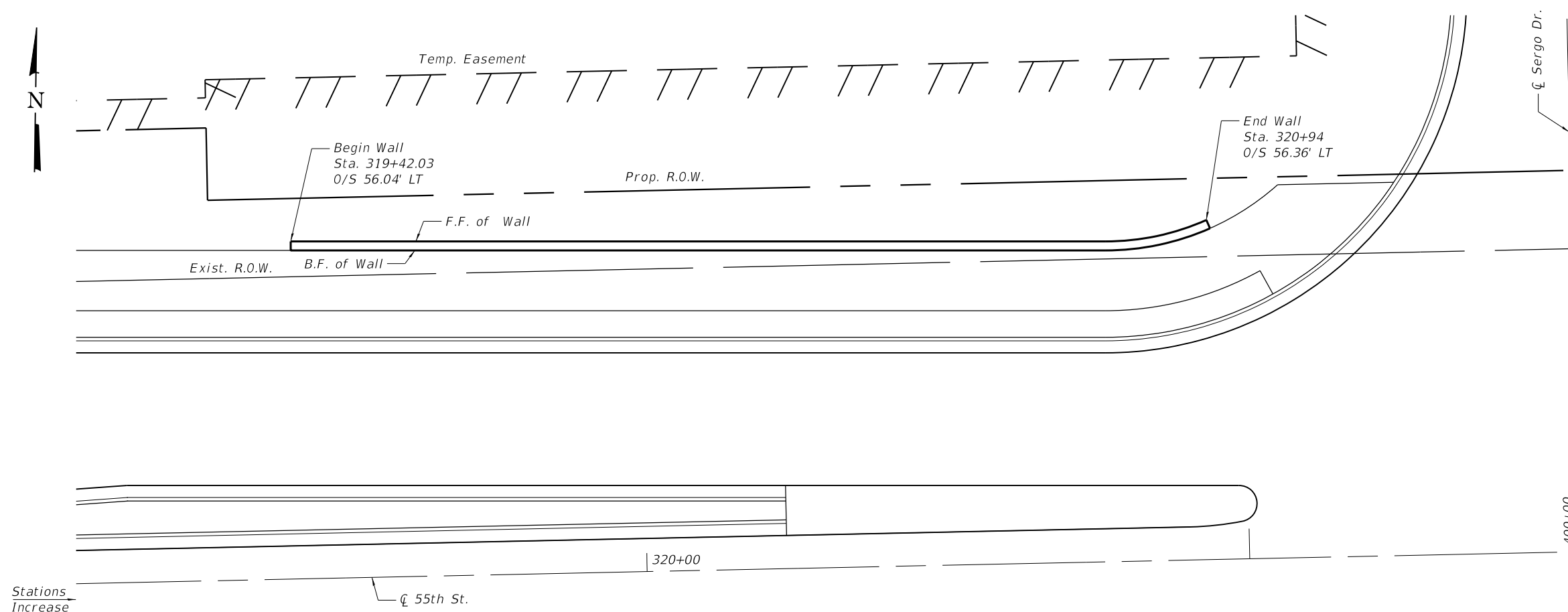
Traffic on 55th St. and Segro Dr. will be maintained utilizing staged construction.

DESIGN SPECIFICATIONS
2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

DESIGN STRESSES

FIELD UNITS

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



PLAN

GENERAL PLAN AND ELEVATION
RETAINING WALL ALONG
55TH ST. AT SERGO DR.
SECTION NO. 0102N&T
COOK COUNTY
STATION 319+42.03

MODEL: Default
FILE NAME: Q:\Engineering\LiveProjects\13031_IDOT_East Ave\CADD\CADD Sheets\Structural\55th St_Sergo Dr_Ret_Wall_GPE.dgn



USER NAME =	MNeishapouri	DESIGNED -	REVISED -
		CHECKED -	REVISED -
PLOT SCALE =	21,333' / in.	DRAWN -	REVISED -
PLOT DATE =	3/22/2018	CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET OF SHEETS

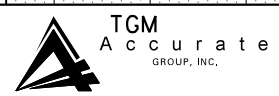
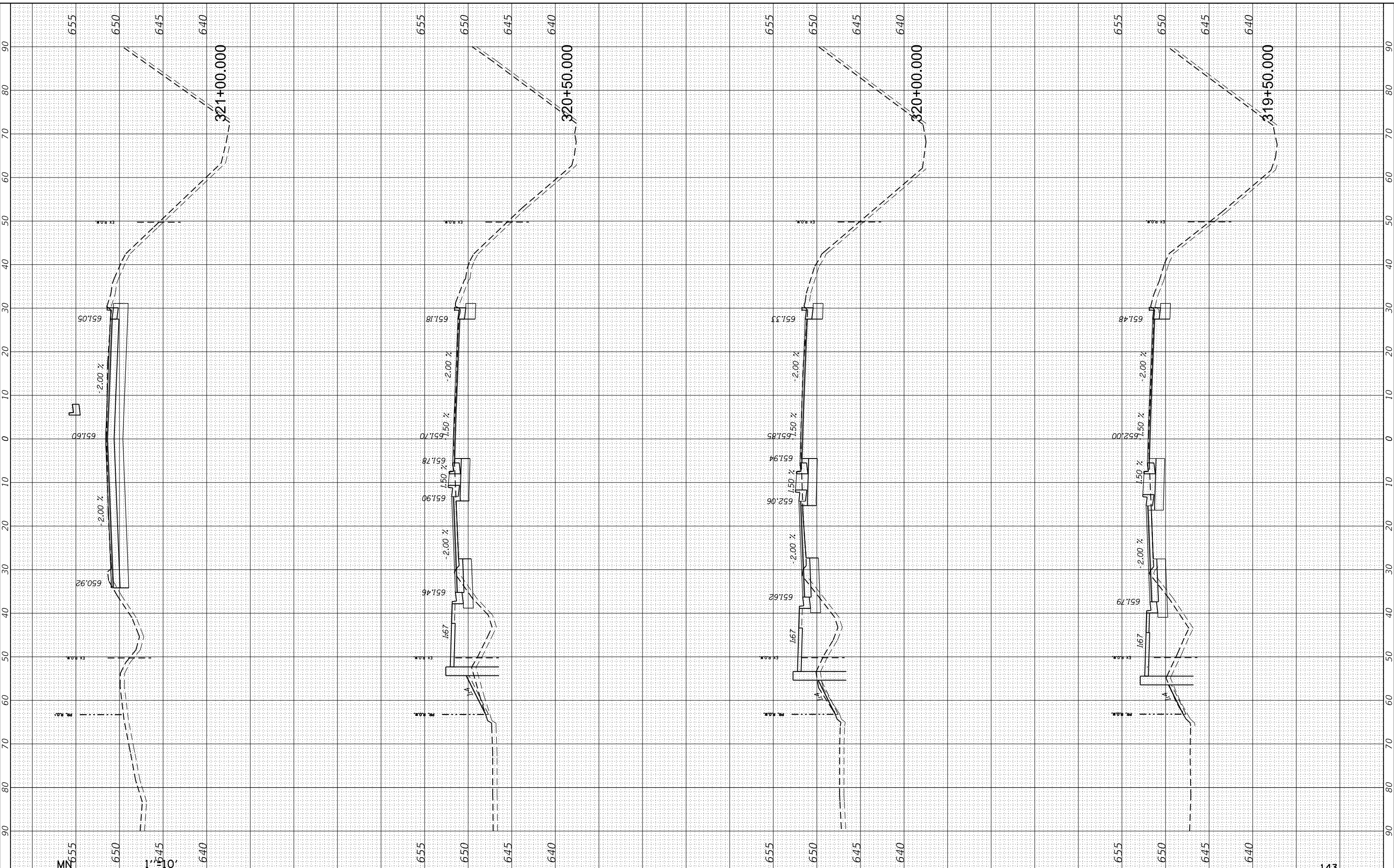
F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
2719	0102N&T	COOK		
CONTRACT NO. 62C25				
ILLINOIS FED. AID PROJECT				

APPENDIX C: X-SECTION DRAWING

FINAL SURVEY NO.	SURVEYED PLOTTED AREAS CHECKED	BY	DATE
NOTE BOOK NO.	TEMPLATE AREAS CHECKED		

ORIGINAL SURVEY NO.	SURVEYED PLOTTED AREAS CHECKED	BY	DATE
NOTE BOOK NO.	TEMPLATE AREAS CHECKED		

MODEL: XS_SHEET_7
FILE NAME: Q:\Engineering\Live\Projects\13031 IDOT East Ave\CAD\CADD Sheets\CADD Sheets\13031 XS 55th.dgn



USER NAME =	MNeishapouri
PLOT SCALE =	20.0000' / in.
PLOT DATE =	3/22/2018

DESIGNED -		REVISED -	
DRAWN -		REVISED -	
CHECKED -		REVISED -	
DATE -		REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SCALE: SHEET OF SHEETS STA. 319+50.000 TO STA. 321+00.000

55TH ST. CROSS SECTIONS
EAST AVENUE (55TH TO JOLIET RD.)

SHEET NO. 143	TOTAL SHEETS	SHEET NO.
COUNTY	COOK	CONTRACT NO. 62C25
ILLINOIS	FED. AID PROJECT	