
**STRUCTURE GEOTECHNICAL REPORT
US ROUTE 14 RETAINING WALL
PROPOSED SN 016-9200
COOK COUNTY, ILLINOIS**

**For
Accurate Group, Inc.
101 Shelter Road, Suite B200
Lincolnshire, IL 60069**

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

**Original Report: March 26, 2021
Revised Report: NA**

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report US Route 14 Retaining Wall		2. Original Date: March 26, 2021 Revised Date: NA
		3. Report Type <input checked="" type="checkbox"/> SGR <input type="checkbox"/> RGR <input checked="" type="checkbox"/> Draft <input type="checkbox"/> Final <input type="checkbox"/> Revised
4. Route / Section / County FAU 3512/ 2018-109-RS,SW&T/ Cook		5. Contract 62H38
6. PTB / Item No. 184/ 010 (Task 39)	7. Existing Structure Number(s) NA	8. Proposed Structure Number(s) 016-9200
9. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	Contributor(s) Author: Nesam S. Balakumaran, PEng QA/QC: Corina T. Farez, PE, PG PM: Andri Kurnia, PE	Contact Information (630) 953-9928 ext. 1025 akurnia@wangeng.com
10. Prepared for Accurate Group, Inc. 101 Schelter Road, Suite B200 Lincolnshire, IL, 60069	Contact(s) Jennifer Tobergte, PE (Accurate Group, Inc.) Robert T. Boro, PE (HBM Engineering Group, LLC)	Contact Information (847) 613-1100 ext. 507 jent@accgi.com (708) 236-0900 ext. 115 robert.boro@hbmengineering.com
11. Abstract A new retaining wall is proposed along westbound US Route 14 to support a new 10.0-foot wide bike path. The wall will be about 380.0 feet long, extending from Station 113+98 to Station 117+65. The face of the wall will be constructed about 46 feet north of the US 14 centerline. The wall will have a maximum exposed height of 11.4 feet. This report provides geotechnical recommendations for the design and construction of the proposed retaining wall. Along the proposed wall alignment, the foundation soils consists of up to 4 feet of stiff to hard silty clay to silty clay loam fill overlying natural stiff to hard clay and silty clay to silty clay loam interbedded with wet to saturated sand and silt layers. We estimate the groundwater table may be at elevation of 625 feet and perched groundwater elevation as high as 641 feet. The proposed retaining wall will be in a cut section. A drilled soldier-pile wall type is proposed at the site. Geotechnical parameters for the design and construction of soldier pile and lagging walls are provided. The minimum cantilevered pile embedment depths necessary to achieve the required factor of safety for global stability is 627.5 feet elevation. Groundwater was encountered at elevations ranging from 641 to 604 feet within the interbedded silt/sand layers. For drilled soldier piles installations, temporary casing and/or wet installation methods will be required. In addition, hard drilling should be anticipated during drilled soldier pile installation at or below 615 feet.		
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FOR
ACCURATE GROUP, INC.**

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, and geotechnical engineering evaluations in support of the design and construction of a new retaining wall, designated as SN 016-9200, proposed along westbound US Route 14 (US 14) and immediately west of Wisconsin Central Ltd. Railroad at US 14 in Cook County, Illinois. A *Site Location Map* is presented as Exhibit 1.

1.1 Proposed Structure

Based on the in-progress *General Plan and Elevation (GPE)* drawings provided by HBM Engineering Group, LLC on March 24, 2021, Wang Engineering, Inc. (Wang) understands the proposed retaining wall will measure about 380.0 feet in length, extending along US 14 from Station 113+98.39 to Station 117+64.59. The face of the wall will be constructed at average distance of about 46 feet north of the existing US 14 centerline. The wall will support a new 10.0-foot wide bike path to be constructed along US 14 westbound. Based on the drawings, we estimate the wall will have a maximum exposed height of approximately 11.4 feet at Station 116+48. A drilled soldier-pile wall type is preferred wall type and shown on the GPE sheets (Appendix D).

The purpose of this investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed retaining wall.

2.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations performed by Wang.

2.1 Field Investigation

The current subsurface investigation along the wall alignment consisted of five structure borings, designated as RW-01 through RW-5 drilled by Wang on March 9 to 10, 2021. The borings were drilled from elevations of 630.0 to 638.6 feet to depths of 20 feet below the ground surface (bgs). To supplement our investigation, we considered several nearby borings performed by Wang in 2015. The supplemental borings NDB-04 through NDB-08, HA-NDB-05, and RWB-06 through RWB-08 were advanced to depths of 6 to 40 bgs from elevations 643.4 to 627.4 feet.

The as-drilled northings and eastings were acquired with a mapping-grade GPS unit. Elevations, stations, and offsets were provided by Accurate. The boring location information is included in the *Boring Logs* (Appendix A) and the as-drilled locations are shown in the *Boring Location Plan* (Exhibit 3).

An ATV-mounted drilling rig equipped with hollow stem augers was used to advance and maintain open boreholes. 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 sampling interval were placed in sealed jars and transported to the laboratory for further examination and laboratory testing.

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

Groundwater levels were measured while drilling and at completion of each boring. At each structure boring location, the boreholes were backfilled upon completion with lean grout, and the surface was restored as close as possible to its original condition.

2.2 Laboratory Testing

Soil samples were tested in our laboratory for moisture content (AASHTO T 265). Atterberg limits (AASHTO T 89/90) and particle size (AASHTO T 88) analyses are being performed on selected samples. Field visual descriptions of soil samples were verified in the laboratory and index tested soils were classified according to the IDH Soil Classification System. The laboratory test results are shown in the *Boring Logs* (Appendix A) and *Laboratory Test Results* (Appendix B).

3.0 INVESTIGATION RESULTS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 4). Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

3.1 Lithological Profile

Boring RW-01 through RW-05, drilled along the existing westbound, encountered either 15 inches of asphalt or 2.5 to 7 inches asphalt over 8 to 8.5 inches concrete. Previous RWB- and HA-series borings, drilled from the existing top of US 14 embankment back slope, encountered 6 to 23 inches of black and dark brown, silty clay to silty loam topsoil at the surface. In descending order, the general lithologic succession encountered beneath the topsoil or pavement includes: 1) man-made ground (fill) and 2) stiff to hard silty clay to silty clay loam.

(1) Man-made ground (fill)

Underneath the pavement, the borings encountered 2 to 4 feet of fill materials. The fill consists of very stiff to hard, brown to gray and black silty clay to silty clay loam. The cohesive fill has unconfined compressive strength (Q_u) values of 1.8 to 5.7 tsf and moisture content values of 16 to 23%.

(2) Stiff to hard clay and silty clay to silty clay loam

Beneath the fill and topsoil, the borings advanced through stiff to hard, brown to gray clay and silty clay to silty clay loam with Q_u values of 1.0 to greater than 10 tsf and moisture content values of 13 to 26% interbedded with wet to saturated silt, sand, and silty loam. Laboratory index testing within this layer shows liquid limit (L_L) values of 25 to 38% and plastic limit (P_L) values of 14 to 18%

Interbedded wet to saturated silt, sand, and silty loam layers of thickness ranging from 2 to 8 feet are characterized by N values of 5 to 77 blows per foot and moisture contents of 9 to 22%. Hard drilling conditions should be expected at or below elevation of 615 feet in dense to very dense silt to sand layers and hard silty clay to silty clay loam for drilled pile installation.

3.2 Groundwater Conditions

Groundwater was encountered within interbedded silt and sand layers while drilling at elevations of 613 to 641 (2 to 23 feet bgs). At the completion of drilling, the groundwater was observed at elevations of 604 to 635 feet (8 to 28 feet bgs). The interbedded silt and sand layers were mostly saturated. We estimate the permanent groundwater lies at 625 feet elevation and perched water as high as 641 feet elevation. It should be noted that groundwater levels might change with seasonal rainfall patterns and long-term climate fluctuations or may be influenced by local site conditions.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

The retaining wall will support a new 10.0-foot wide proposed bike path proposed along westbound US Route 14. Based on the GPE (Appendix D), the wall will have a total length of 380.0 feet and a maximum exposed height of 11.4 feet near Station 116+48. As part of the improvements proposed along US 14, we understand the new storm sewer will be installed about 20 feet from proposed wall.

The proposed wall will be a cut wall with a back slope of 1:2 (V:H). Generally, non-gravity wall types such as a sheet pile or soldier pile type wall would be more suitable. Mechanically Stabilized Earth (MSE) and Reinforced Concrete Cantilever (RCC) would require large open cut excavations into the existing slope, temporary soil retention systems, and will impact the existing US 14 right of way. The construction of these wall types would likely also require more backfilling thus longer construction time. Installation of sheet pile or driven soldier pile walls will be difficult due to the encountered soil conditions and existing powerline and will likely require anchors. We concur the proposed drilled soldier pile wall would be more appropriate for this site. Recommendations for the design and construction of drilled soldier pile walls are discussed in the following sections.

4.1 Seismic Design Considerations

Seismic design is not required for retaining wall structures located in Seismic Performance Zone (SPZ) 1 in accordance with the IDOT *Bridge Manual* (2012).

4.2 Drilled Soldier Pile and Lagging Wall

Drilled soldier pile system should be designed for both lateral earth pressure and lateral deformation. The embedment depth in moment equilibrium for the wall sections should be designed in accordance with the AASHTO LRFD guidelines (AASHTO 2020).

Generally, both granular soils and overconsolidated clayey soils, such as the stiff to hard silty clay to silty clay loam encountered in the borings will exhibit lower overall shear strength in the long-term condition. However, we recommend the lateral earth pressure analysis should be performed for walls in both short-term (undrained) and long-term (drained) conditions using the soil parameters recommended in Tables 1 and 6 based on station limits. Elevations provided in tables are based on the average layer elevations across the soil profile and may vary from one boring location to another. The active and passive earth pressure coefficients are provided for a slope of 1:2 (V:H) backfill behind the wall and a straight slope in front of the wall.

The design of the wall should ignore 3.0 feet of soil in front of the wall measured from the finished ground surface elevation in providing passive pressure due to excavations required for installation of concrete facing, drainage systems, and frost-heave conditions. In developing the design lateral pressure, the pressure due to any existing buildings/structures and construction equipment surcharge loads should be added to the lateral earth pressure. Drainage behind the wall should be in accordance with IDOT guidelines (IDOT 2012). The water pressures should be added to the earth pressure if drainage is not provided.

The wall design should consider the permanent groundwater at elevation of 625 feet and perched water at elevation of 641 feet.

Table 1: Undrained (Short-term) Geotechnical Parameters for Design of S-P Wall, Sta. 113+98 to 115+03
 Ref Borings: RW-01, NDB-04, and NDB-05

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle (°)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to V Stiff CLAY to SILTY CLAY Surface to EL 636 feet	120	2700	0	1.00	1.00
M Dense to Dense SILT to SILTY LOAM EL 626 to 620 feet	58 (submerged)	0	32	0.46	3.26
Stiff SI CLAY to SI CL LOAM EL 620 to 615 feet	58 (submerged)	1700	0	1.00	1.00
Dense to V Dense SILTY LOAM El 615 to 610 feet	63 (submerged)	0	33	0.43	3.39

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Hard SILTY CLAY El 610 to 601 feet (EOB)	63 (submerged)	5000	0	1.00	1.00

Table 2: Undrained (Short-term) Geotechnical Parameters for Design of S-P Wall, Sta. 115+03 to 117+13
 Ref Borings: RW-02 to RW-04, RWB-06, RWB-07 and NDB-05 to NDB-07

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to Hard SILTY CLAY Surface to Elevation 630 feet	120	3200	0	1.00	--
Stiff to Hard CLAY to SILTY CLAY EL 630 to 624 feet	120	2100	0	1.00	1.00
Loose to M Dense SILT to SILTY LOAM EL 624 to 617 feet	53 (submerged)	0	29	0.59	2.88
M Stiff to Stiff SI CLAY to SI CL LOAM EL 617 to 613 feet	58 (submerged)	1100	0	1.00	1.00
Hard SILTY CLAY to SILTY LOAM El 613 to 601 feet	63 (submerged)	6000	0	1.00	1.00
Dense SAND EL 604 to 597 feet (EOB)	53 (submerged)	0	35	0.38	3.69

Table 3: Undrained (Short-term) Geotechnical Parameters for Design of S-P Wall, Sta. 117+13 to 117+65
 Ref Borings: RW-05, RWB-07, RWB-08, NDB-07, and NDB-08

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to Hard SILTY CLAY Surface to Elevation 628 feet	120	4000	0	1.00	--
Stiff to V Stiff CLAY to SILTY CLAY EL 628 to 624 feet	120	1800	0	1.00	1.00
M Dense SAND to SILT EL 624 to 619 feet	58 (submerged)	0	30	0.54	3.00
M Stiff to Stiff SILTY CLAY EL 619 to 615 feet	58 (submerged)	1400	0	1.00	1.00
Dense to V Dense SAND/SILT EL 615 to 607 feet	63 (submerged)	0	35	0.38	3.69
Hard SILTY CLAY El 607 to 604 feet (EOB)	63 (submerged)	5000	0	1.00	1.00

Table 4: Drained (Long-term) Geotechnical Parameters for Design of S-P Wall, Sta. 113+98 to 115+03
 Ref Borings: RW-01, NDB-04, and NDB-05

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to V Stiff CLAY to SILTY CLAY Surface to EL 636 feet	120	100	30	0.54	3.00
M Dense to Dense SILT to SILTY LOAM EL 626 to 620 feet	58 (submerged)	0	32	0.47	3.26
Stiff SI CLAY to SI CL LOAM EL 620 to 615 feet	58 (submerged)	100	30	0.54	3.00
Dense to V Dense SILTY LOAM El 615 to 610 feet	63 (submerged)	0	33	0.43	3.39
Hard SILTY CLAY El 610 to 601 feet (EOB)	63 (submerged)	100	32	0.47	3.26

Table 5: Drained (Long-term) Geotechnical Parameters for Design of S-P Wall, Sta. 115+03 to 117+13
 Ref Borings: RW-02 to RW-04, RWB-06, RWB-07 and NDB-05 to NDB-07

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to Hard SILTY CLAY Surface to Elevation 630 feet	120	100	30	0.54	--
Stiff to Hard CLAY to SILTY CLAY EL 630 to 624 feet	120	100	30	0.54	3.00
Loose to M Dense SILT to SILTY LOAM EL 624 to 617 feet	53 (submerged)	0	29	0.59	2.88
M Stiff to Stiff SI CLAY to SI CL LOAM EL 617 to 613 feet	58 (submerged)	80	29	0.59	2.88
Hard SILTY CLAY to SILTY LOAM El 613 to 601 feet	63 (submerged)	100	32	0.47	3.26
Dense SAND EL 604 to 597 feet (EOB)	53 (submerged)	0	35	0.38	3.69

Table 6: Drained (Long-term) Geotechnical Parameters for Design of S-P Wall, Sta. 117+13 to 117+65
 Ref Borings: RW-05, RWB-07, RWB-08, NDB-07, and NDB-08

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle ($^{\circ}$)	Active Pressure (1V:2H)	Passive Pressure (straight)
Stiff to Hard SILTY CLAY Surface to Elevation 628 feet	120	100	30	0.54	--
Stiff to V Stiff CLAY to SILTY CLAY EL 628 to 624 feet	120	100	30	0.54	3.00
M Dense SAND to SILT EL 624 to 619 feet	58 (submerged)	0	30	0.54	3.00
M Stiff to Stiff SILTY CLAY EL 619 to 615 feet	58 (submerged)	100	30	0.54	3.00

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle (°)	Active Pressure (1V:2H)	Passive Pressure (straight)
Dense to V Dense SAND/SILT EL 615 to 607 feet	63 (submerged)	0	35	0.38	3.69
Hard SILTY CLAY El 607 to 604 feet (EOB)	63 (submerged)	100	32	0.47	3.26

The lateral deformation of the wall should be designed for movement and moment fixity at the base of the pile. The roadway and utilities should not be impacted by the lateral movement of the wall. Therefore, the design of the soldier pile wall should include the maximum allowable lateral wall deflection. The evaluations should be performed using the recommended soil parameters shown in Tables 7 to 9, based on station limits, via the p-y curve (COM624) method. Elevations provided in Tables 7 to 9 are based on the average layer elevations across the profile and may vary from one boring location to another.

Table 7: Recommended Geotechnical Parameters for Lateral Load Analysis, Sta. 113+98 to 115+03
 Ref Borings: RW-01, NDB-04, and NDB-05

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength c_u (psf)	Estimated Friction Angle Φ (°)	Estimated Lateral Soil Modulus Parameter k (pci)	Estimated Soil Strain Parameter ϵ_{50} (%)
Stiff to V Stiff CLAY to SILTY CLAY Surface to EL 636 feet	120	2700	0	1000	0.5
M Dense to Dense SILT to SILTY LOAM EL 626 to 620 feet	58 (submerged)	0	32	60	--
Stiff SI CLAY to SI CL LOAM EL 620 to 615 feet	58 (submerged)	1700	0	500	0.7
Dense to V Dense SILTY LOAM El 615 to 610 feet	63 (submerged)	0	33	100	--
Hard SILTY CLAY El 610 to 601 feet (EOB)	63 (submerged)	5000	0	2000	0.4

Table 8: Recommended Geotechnical Parameters for Lateral Load Analysis, Sta. 115+03 to 117+13
 Ref Borings: RW-02 to RW-04, RWB-06, RWB-07 and NDB-05 to NDB-07

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength c_u (psf)	Estimated Friction Angle Φ ($^\circ$)	Estimated Lateral Soil Modulus Parameter k (pci)	Estimated Soil Strain Parameter ϵ_{50} (%)
Stiff to Hard SILTY CLAY Surface to Elevation 630 feet	120	3200	0	1000	0.7
Stiff to Hard CLAY to SILTY CLAY EL 630 to 624 feet	120	2100	0	1000	0.7
Loose to M Dense SILT to SILTY LOAM EL 624 to 617 feet	53 (submerged)	0	29	40	--
M Stiff to Stiff SI CLAY to SI CL LOAM EL 617 to 615 feet	58 (submerged)	1100	0	500	0.7
Hard SILTY CLAY to SILTY LOAM El 615 to 601 feet	63 (submerged)	6000	0	2000	0.4
Dense SAND EL 604 to 597 feet (EOB)	53 (submerged)	0	35	120	--

Table 9: Recommended Geotechnical Parameters for Lateral Load Analysis, Sta. 117+13 to 117+65
 Ref Borings: RW-05, RWB-07, RWB-08, NDB-07, and NDB-08

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength c_u (psf)	Estimated Friction Angle Φ ($^\circ$)	Estimated Lateral Soil Modulus Parameter k (pci)	Estimated Soil Strain Parameter ϵ_{50} (%)
Stiff to Hard SILTY CLAY Surface to Elevation 628 feet	120	4000	0	2000	0.4
Stiff to V Stiff CLAY to SILTY CLAY EL 628 to 624 feet	120	1800	0	1000	0.7
M Dense SAND to SILT EL 624 to 619 feet	58 (submerged)	0	30	60	--
M Stiff to Stiff SILTY CLAY EL 619 to 615 feet	58 (submerged)	1400	0	500	0.7
Dense to V Dense SAND/SILT EL 615 to 607 feet	63 (submerged)	0	35	100	--

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength c_u (psf)	Estimated Friction Angle Φ ($^\circ$)	Estimated Lateral Soil Modulus Parameter k (pci)	Estimated Soil Strain Parameter ϵ_{50} (%)
Hard SILTY CLAY El 607 to 604 feet (EOB)	63 (submerged)	5000	0	2000	0.4

4.3 Global Stability

The global stability of the proposed wall was analyzed based on the soil profile described in Section 3.1 and the information provided in the GPE. The stability was analyzed at the critical section near Station 116+48 where the maximum exposed height is 11.4 feet. The minimum required factor of safety (FOS) is 1.7 in both short-term (undrained) and long-term (drained) conditions (IDOT 2015).

Details of the global stability analysis with critical failure surfaces and results are presented in Appendix C. We estimate the wall will have an adequate FOS of 4.3 (Appendix C-1) in the undrained condition. Global stability evaluations were performed to estimate the minimum pile tip elevation required to achieve an FOS of 1.7 in the drained condition. The embedded portion of the cantilevered piles will provide resistance against the slope instability above the tip of the piles. The results of our analysis are summarized in Table 10. We recommend that the wall tip elevations be installed at or deeper than the minimum elevations shown in Table 10 to provide long-term global stability FOS values of at least 1.7 as shown in Appendix C-2. It should be noted that typically, the lateral earth pressure and deformation analyses will determine the minimum embedment depth for cantilevered pile walls. Therefore, the designer should perform other analyses including lateral earth pressure and deflection analyses to determine the required design pile embedment.

Table 10: Results of Global Stability Analysis

Station	Reference Boring(s)	Retained Wall Height (feet)	Short-term (Undrained) Condition		Long-term (Drained) Condition	
			FOS	Minimum Tip Elevation (feet)	FOS	Minimum Tip Elevation (feet)
116+48	RW-03, RW-04 RWB-06, RWB-07, NDB-06	11.3	4.3	--	1.7	627.5

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Vegetation, surface topsoil, debris, and any existing ditch sediment encountered should be cleared and stripped where the structure will be placed. If unstable or unsuitable materials are exposed during excavation, they should be removed and replaced with compacted fill as described in Section 5.3.

5.2 Excavation, Dewatering, and Utilities

Excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon nearby utilities should be considered during construction. Excavations deeper than 4 feet should be sloped at no steeper than 1:2 (V: H). Any slope that cannot be graded at 1:2 (V: H) should be properly shored. Excavated material should not be stockpiled immediately adjacent to the top of slopes.

Groundwater was encountered at elevations of 641 to 604 feet within the interbedded silt/sand layers. For drilled soldier piles installations, temporary casing and/or wet installation methods will be required. In addition, hard drilling should be anticipated during drilled soldier pile installation at or below 615 feet elevation.

5.3 Filling and Backfilling

Fill material used to attain final design elevations should be pre-approved, compacted; cohesive or granular soil conforming to IDOT Section 205, *Embankment* (2016). The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to the Standard.

Backfill materials must be pre-approved by the Resident Engineer. Backfill material should be placed and compacted in accordance with the Special Provision.

5.4 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the Contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion.

Earth moving operations should be scheduled to not coincide with excessive cold or wet weather (early spring, late fall or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction.

It is recommended that an experienced geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork and soldier pile drilling operations, pile installation, and provide material inspection services during the construction phase of this project.

6.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This 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 the course of construction. In the event that any changes in the design and/or location of the walls are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Accurate Group, Inc. and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Andri Kurnia, P.E.
Senior Geotechnical Engineer

Nesam S. Balakumaran, P.Eng.
Project Geotechnical Engineer

Corina T. Farez, P.E., P.G.
QA/QC Reviewer

REFERENCES

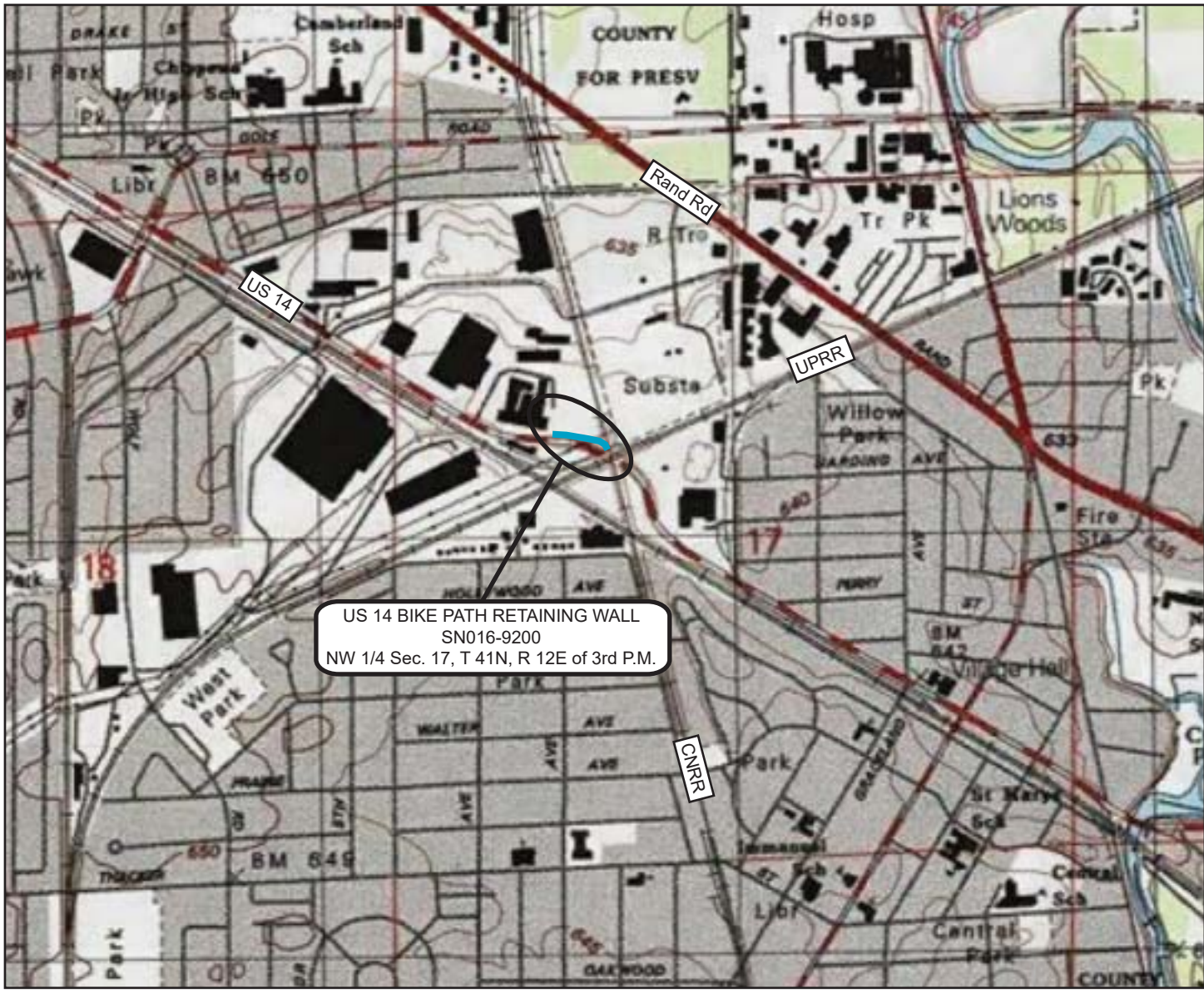
AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (20207) "AASHTO LRFD Bridge Design Specifications." United States Dept of Transportation, Washington, D.C.

IDOT (2012) *Bridge Manual*. Illinois Department of Transportation.

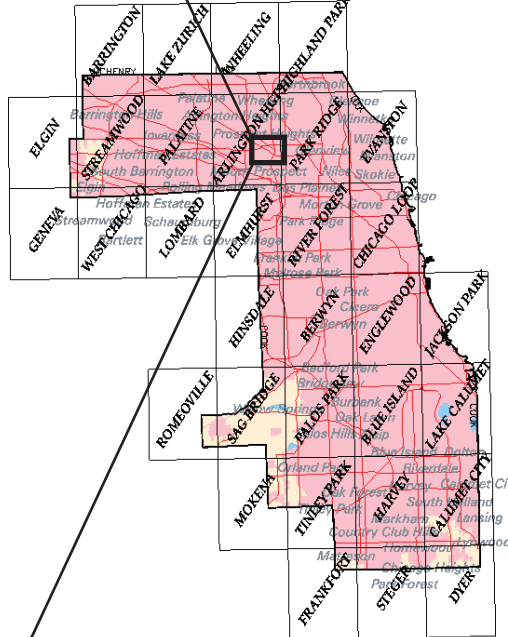
IDOT (2015) *Geotechnical Manual*. Illinois Department of Transportation.

IDOT (2016) *Standard Specifications for Road and Bridge Construction*. Illinois Department of Transportation, 1098 pp.

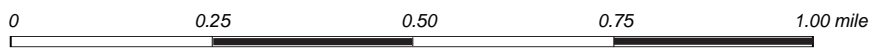
EXHIBITS



US 14 BIKE PATH RETAINING WALL
 SN016-9200
 NW 1/4 Sec. 17, T 41N, R 12E of 3rd P.M.



Cook County

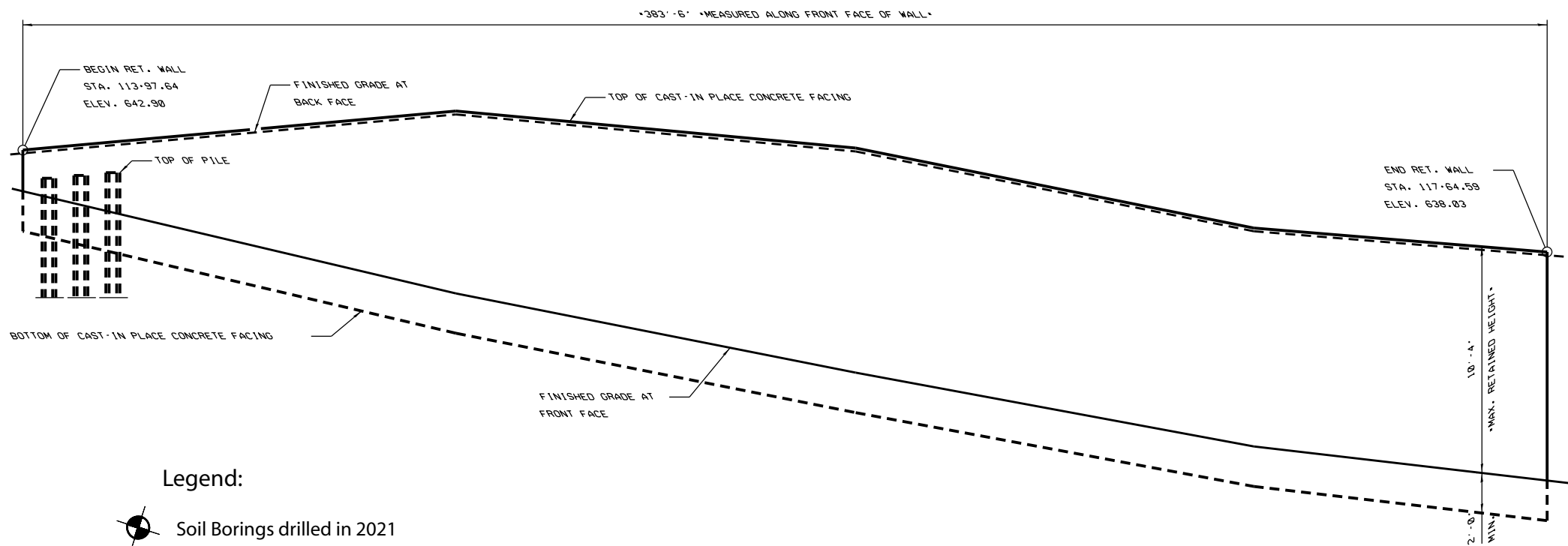


SITE LOCATION MAP: US 14 BIKE PATH RETAINING WALL,
 SN 016-9200, DES PLAINES, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: J. Bensen CHECKED BY: A. Kurmia
------------------	------------------	--



FOR ACCURATE GROUP, INC.	491-04-04
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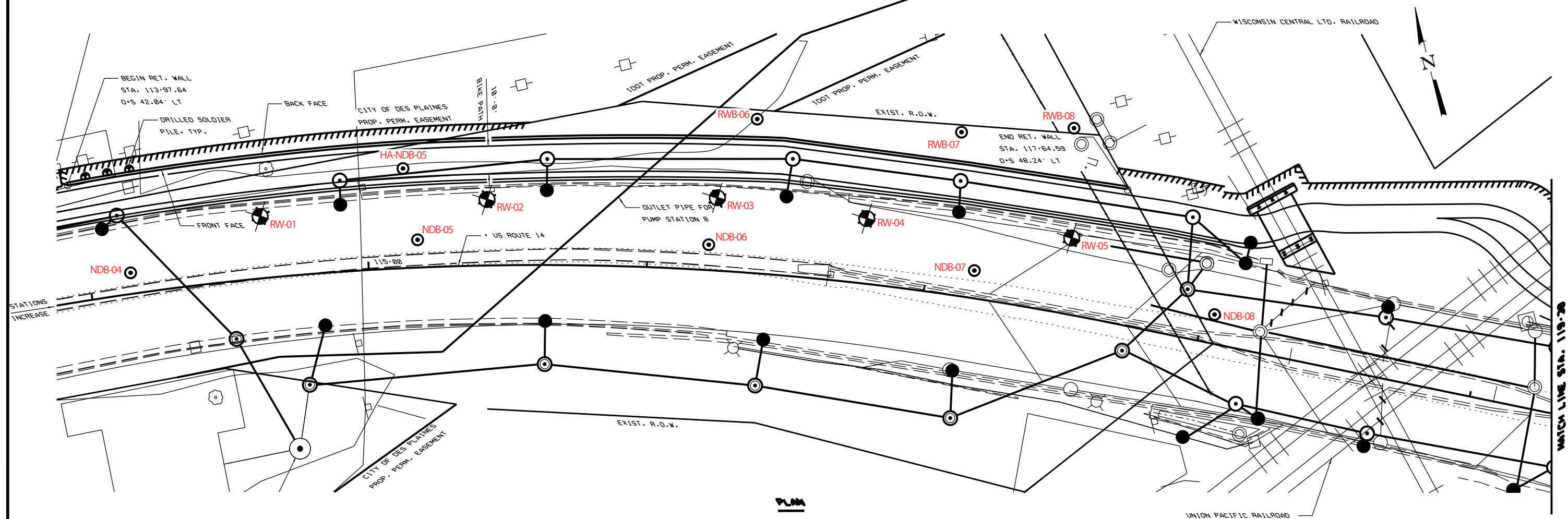


Legend:

- Soil Borings drilled in 2021
- Soil Borings drilled in 2015

ELEVATION

LOOKING AT FRONT FACE OF WALL



PLAN

FILE NAME = \$FILEL\$



USER NAME = \$USER\$	DESIGNED - SAT	REVISED -
PLOT SCALE = \$SCALE\$	CHECKED - JMT	REVISED -
PLOT DATE = \$DATE\$	DRAWN - SAT	REVISED -
	CHECKED - SPS	REVISED -

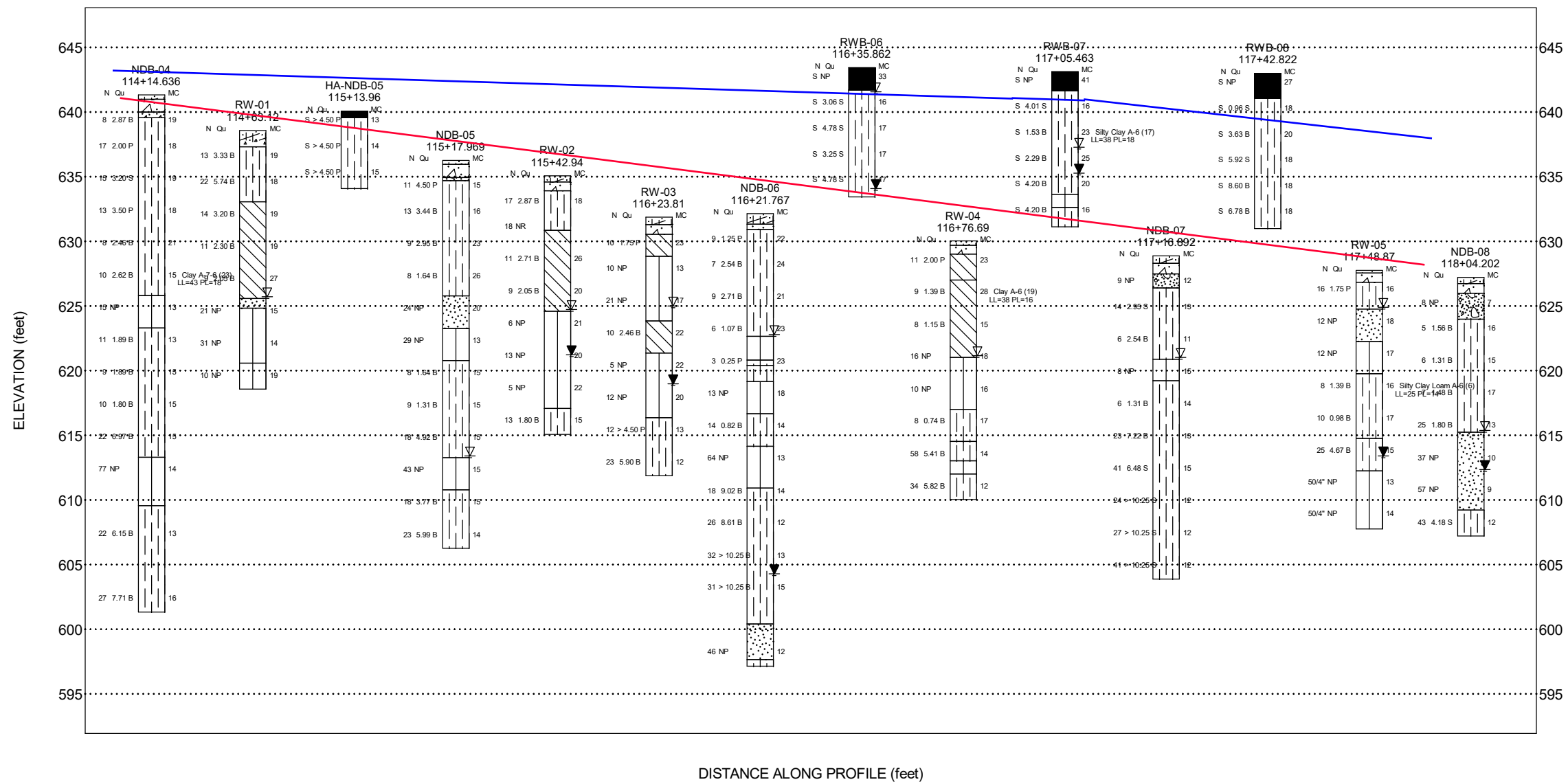
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RETAINING WALL FEASIBILITY STUDY - PLAN AND ELEVATION		COUNTY	TOTAL SHEETS	SHEET NO.
352	86 S-1-I	COOK		
SHEET NO. OF SHEETS		CONTRACT NO. 60149		
ILLINOIS FED. AID PROJECT				

W

Top of Facia Panel
Finished Grade at F.F of Wall

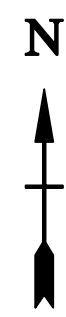
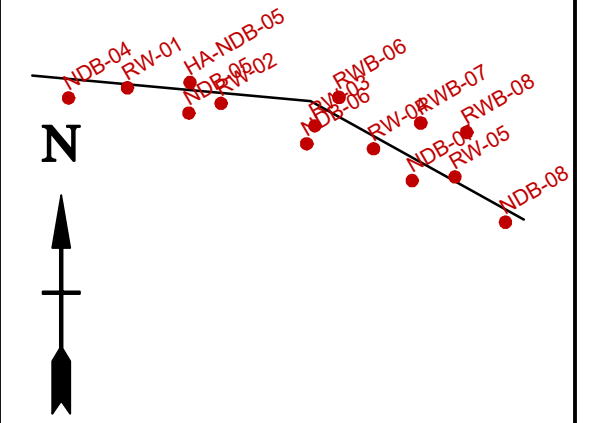
E



DISTANCE ALONG PROFILE (feet)

Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- Pavement
- Concrete
- Crushed stone
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- Gravelly sand, sandy gravel
- IDH Clay

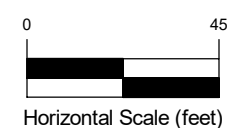


Site Map Scale 1 inch equals 165 feet

Explanation:

- Borehole Number Station
- Borehole Lithology
- N-value, (blw/12 in)
- UC Strength, (lbf)
- MC--Moisture Content, (%)

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



Vertical Exaggeration: 4.5x

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

Soil Profile
US Route 14 Retaining Wall
SN 016-9200



US 14 Bike Path Retaining Wall
Cook County, Illinois

JOB NUMBER	PLATE NUMBER
491-04-04	EXHIBIT 3

APPENDIX A



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RW-01

WEI Job No.: 491-04-04

Client: **Accurate Group, Inc.**
 Project: **US 14 Bike Path Retaining Wall**
 Location: **Cook County, Illinois**

Datum: NAVD 88
 Elevation: 638.57 ft
 North: 1960227.98 ft
 East: 1102158.44 ft
 Station: 114+63.12
 Offset: 22.351 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 (%)
	637.3	15-inch thick ASPHALT --PAVEMENT--															
		Very stiff to hard, brown SILTY CLAY, trace gravel; damp --FILL-- --RDR 2--	5		1	4 6 7	3.33 B	19									
			5		2	7 9 13	5.74 B	18									
	633.1	Very stiff, gray CLAY, trace gravel; damp --RDR 2--			3	4 6 8	3.20 B	19									
			10		4	3 4 7	2.30 B	19									
					5	3 4 5	2.05 B	27									
	625.6	Gray, coarse SAND; wet															
	624.8	Medium dense to dense, gray SILT; dry to moist	15		6	4 8 13	NP	15									
					7	12 16 15	NP	14									
	620.6	Medium dense, gray SILTY LOAM; damp			8	4 5 5	NP	19									
	618.6	Boring terminated at 20.00 ft	20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-10-2021** Complete Drilling **03-10-2021**
 Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
 Driller **R&J** Logger **F. Bozga** Checked by **J. Bensen**
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

While Drilling ∇ **13.00 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.

WANGENGINC 4910404.GPJ WANGENG.GDT 3/25/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RW-02

WEI Job No.: 491-04-04

Client: **Accurate Group, Inc.**
 Project: **US 14 Bike Path Retaining Wall**
 Location: **Cook County, Illinois**

Datum: NAVD 88
 Elevation: 635.09 ft
 North: 1960214.59 ft
 East: 1102238.93 ft
 Station: 115+42.94
 Offset: 23.803 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 (%)
	634.6	6-inch thick ASPHALT --PAVEMENT--															
	633.9	8-inch thick CONCRETE --PAVEMENT--															
		Very stiff, gray SILTY CLAY, trace gravel; damp --FILL-- --RDR 2--			1	11 8 9	2.87 B	18									
	630.8	Very stiff, gray CLAY, trace gravel; damp --RDR 2--	5		2	7 8 10	NR										
					3	4 5 6	2.71 B	26									
					4	2 4 5	2.05 B	20									
	624.6	Loose to medium dense, gray SILTY LOAM to SILT; wet to saturated --RDR 1-2--			5	3 3 3	NP	21									
					6	4 6 7	NP	20									
					7	2 3 2	NP	22									
	617.1	Stiff, gray SILTY CLAY LOAM, trace gravel; damp			8	4 6 7	1.80 B	15									
	615.1	Boring terminated at 20.00 ft	20														

GENERAL NOTES

Begin Drilling **03-10-2021** Complete Drilling **03-10-2021**
 Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
 Driller **R&J** Logger **F. Bozga** Checked by **J. Bensen**
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **10.50 ft**
 At Completion of Drilling \blacktriangledown **14.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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WANGENGINC 4910404.GPJ WANGENG.GDT 3/25/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RW-03

WEI Job No.: 491-04-04

Client: **Accurate Group, Inc.**
 Project: **US 14 Bike Path Retaining Wall**
 Location: **Cook County, Illinois**

Datum: NAVD 88
 Elevation: 631.86 ft
 North: 1960195.25 ft
 East: 1102319.46 ft
 Station: 116+23.81
 Offset: 25.854 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 (%)
	631.3	7-inch thick ASPHALT --PAVEMENT--															
	630.68	8.5-inch thick CONCRETE --PAVEMENT--															
	628.9	Stiff, gray CLAY, trace gravel; damp --FILL--	1	X	1	4 5 5	1.75 P	23									
		Medium dense, gray SILTY LOAM to SILT; damp to wet --RDR 2--	2	X	2	5 6 4	NP	13									
			3	X	3	7 12 9	NP	17									
	623.9	Very stiff, gray CLAY; damp --RDR 2--	4	X	4	3 4 6	2.46 B	22									
	621.4	Loose to medium dense, gray SILT; saturated --RDR 1-2--	5	X	5	3 2 3	NP	22									
			6	X	6	4 6 6	NP	20									
	616.4	Hard, gray SILTY CLAY LOAM, trace gravel; damp --RDR 2--	7	X	7	3 4 8	> 4.50 P	13									
			8	X	8	3 11 12	5.90 B	12									
	611.9	Boring terminated at 20.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-09-2021** Complete Drilling **03-09-2021**
 Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
 Driller **R&J** Logger **F. Bozga** Checked by **J. Bensen**
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

While Drilling ∇ **7.00 ft**
 At Completion of Drilling ∇ **13.00 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.

WANGENGINC 4910404.GPJ WANGENG.GDT 3/25/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RW-04

WEI Job No.: 491-04-04

Client: **Accurate Group, Inc.**
 Project: **US 14 Bike Path Retaining Wall**
 Location: **Cook County, Illinois**

Datum: NAVD 88
 Elevation: 630.02 ft
 North: 1960175.54 ft
 East: 1102369.94 ft
 Station: 116+76.69
 Offset: 23.300 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 (%)
	629.74	1/4-inch thick ASPHALT --PAVEMENT--															
	629.0	8-inch thick CONCRETE --PAVEMENT--															
		Very stiff, brown, gray and black CLAY, trace gravel; damp			1	5 5 6	2.00 P	23									
	627.0	--FILL-- Stiff, gray CLAY, trace gravel; damp			2	3 3 6	1.39 B	28									
		--RDR 2-- --L _L (%)=38, P _L (%)=16-- --%Gravel=0.0-- --%Sand=9.8-- --%Silt=43.4-- --%Clay=46.8-- --A-6 (19)--			3	3 3 5	1.15 B	15									
	621.0	Medium dense, gray SILT to SILTY LOAM; damp to wet --RDR 2--			4	5 7 9	NP	18									
					5	5 5 5	NP	16									
	617.0	Medium stiff, gray SILTY CLAY LOAM; damp --RDR 2--			6	5 4 4	0.74 B	17									
	614.5	Hard, gray SILTY CLAY LOAM, trace gravel; damp --RDR 2--			7	10 19 39	5.41 B	14									
	613.0	Gray SILT; damp to moist			8	13 16 18	5.82 B	12									
	612.0	Hard, gray SILTY CLAY LOAM, trace gravel; damp															
	610.0	Boring terminated at 20.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-09-2021** Complete Drilling **03-09-2021**
 Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
 Driller **R&J** Logger **F. Bozga** Checked by **J. Bensen**
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

While Drilling ∇ **9.00 ft**
 At Completion of Drilling ∇ **DRY**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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WANGENGINC 4910404.GPJ WANGENG.GDT 3/25/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RW-05

WEI Job No.: 491-04-04

Client: **Accurate Group, Inc.**
 Project: **US 14 Bike Path Retaining Wall**
 Location: **Cook County, Illinois**

Datum: NAVD 88
 Elevation: 627.76 ft
 North: 1960151.36 ft
 East: 1102439.92 ft
 Station: 117+48.87
 Offset: 27.225 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 (%)
	627.6	2.5-inch thick ASPHALT --PAVEMENT--															
	626.8	8.5-inch thick CONCRETE --PAVEMENT--															
		Stiff, brown SILTY CLAY LOAM, trace gravel; damp			1	4 8 8	1.75 P	16									
	624.8	--FILL--															
		Medium dense, gray, fine SAND; wet			2	4 6 6	NP	18									
	622.3	--RDR 2--															
		Medium dense, gray SILT; moist			3	5 6 6	NP	17									
	619.8	--RDR 2--															
		Medium stiff to stiff, gray SILTY CLAY LOAM, trace gravel; damp			4	4 4 4	1.39 B	16									
		--L _L (%)=25, P _L (%)=14-- --%Gravel=4.3-- --%Sand=16.1-- --%Silt=57.4-- --%Clay=22.2--															
		--A-6 (6)-- --1-inch thick silt seams; wet--			5	3 4 6	0.98 B	17									
	614.8	--RDR 2--															
		Hard, gray SILTY CLAY LOAM, trace gravel; damp			6	8 8 17	4.67 B	15									
	612.3	--RDR 2--															
		Very dense, gray SILT; damp			7	24 42 50/4"	NP	13									
	607.8	--RDR 2--															
					8	24 42 50/4"	NP	14									

Boring terminated at 20.00 ft

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-09-2021** Complete Drilling **03-09-2021**
 Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
 Driller **R&J** Logger **F. Bozga** Checked by **J. Bensen**
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

While Drilling ∇ **3.00 ft**
 At Completion of Drilling ∇ **14.50 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.



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG HA-NDB-05

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 640.07 ft
 North: 1960232.49 ft
 East: 1102212.23 ft
 Station: 115+13.96
 Offset: 35.83 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 (%)
	639.6	6-inch thick, dark brown SILTY LOAM --TOPSOIL-- Hard, brown SILTY CLAY, trace gravel			1	P C S H	> 4.50 P	13									
					2	P C S H	> 4.50 P	14									
			5		3	P C S H	> 4.50 P	15									
	634.1	Boring terminated at 6.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **09-02-2015** Complete Drilling **09-02-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **R&K** Logger **D. Kolpacki** Checked by **B. Wilson**
 Drilling Method **.1" IDA Pneumatic Geoprobe LB Sampler**

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

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wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG NDB-04

WEI Job No.: 491-02-03

Client: **Accurate Group, Inc.**
 Project: **US 14 under CN/UP RR**
 Location: **Des Plaines, IL**

Datum: NAVD
 Elevation: 641.32 ft
 North: 1960219.21 ft
 East: 1102107.84 ft
 Station: 114+14.636
 Offset: LT 7.565

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 (%)
	641.04	1/2-inch thick, ASPHALT --PAVEMENT--															
	640.0	12-inch thick, CONCRETE --PAVEMENT--															
	639.6	5-inch thick, gray CRUSHED STONE --BASE COURSE--			1	3 3 5	2.87 B	19						9	3 4 5	1.89 B	15
		Very stiff, brown to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel			2	9 10 7	2.00 P	18						10	2 4 6	1.80 B	15
					3	7 7 8	3.20 S	19						11	4 8 14	6.97 B	15
					4	2 5 8	3.50 P	18		613.3	Very dense, gray SILTY LOAM --Dry--			12	17 34 43	NP	14
					5	3 3 5	2.46 B	21		609.6	Hard, gray SILTY CLAY, trace gravel			13	6 9 13	6.15 B	13
					6	2 3 7	2.62 B	15						14	8 12 15	7.71 B	16
	625.8	Medium dense, gray SILTY LOAM, trace gravel --Moist--			7	5 8 7	NP	13									
	623.3	Stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel			8	4 5 6	1.89 B	13		601.3							

Boring terminated at 40.00 ft

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-24-2015** Complete Drilling **06-24-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **K&K** Logger **A. Happel** Checked by **B. Wilson**
 Drilling Method **2.25 IDA 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 4910203.GPJ WANGENG.GDT 3/24/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG NDB-05

WEI Job No.: 491-02-03

Client: **Accurate Group, Inc.**
 Project: **US 14 under CN/UP RR**
 Location: **Des Plaines, IL**

Datum: NAVD
 Elevation: 636.27 ft
 North: 1960206.23 ft
 East: 1102211.21 ft
 Station: 115+17.969
 Offset: LT 9.872

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 (%)
	635.94	1-inch thick, ASPHALT --PAVEMENT--															
	634.9	12-inch thick, CONCRETE --PAVEMENT--															
	634.7	3-inch thick, gray CRUSHED STONE --BASE COURSE--			1	5 4 7	4.50 P	15		613.3	Dense, gray SILTY LOAM --Wet--			9	3 7 11	4.92 B	15
		Stiff to hard, gray SILTY CLAY to CLAY, trace gravel			2	6 5 8	3.44 B	16				25		10	4 16 27	NP	15
					3	6 3 6	2.95 B	23		610.8	Very stiff to hard, gray SILTY CLAY, trace gravel			11	5 7 11	3.77 B	15
					4	3 3 5	1.64 B	26						12	8 10 13	5.99 B	14
	625.8	Medium dense, gray SANDY LOAM, trace gravel --Moist--			5	6 11 13	NP	20		606.3	Boring terminated at 30.00 ft						
	623.3	Medium dense, gray SILTY LOAM --Dry--			6	8 17 12	NP	13									
	620.8	Stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel			7	3 3 5	1.64 B	15									
					8	3 4 5	1.31 B	15									

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-24-2015** Complete Drilling **06-24-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **K&K** Logger **A. Happel** Checked by **B. Wilson**
 Drilling Method **2.25 IDA HSA; Backfilled upon completion**

While Drilling ∇ **23.00 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.

WANGENGINC 4910203.GPJ WANGENG.GDT 3/24/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG NDB-06

WEI Job No.: 491-02-03

Client: **Accurate Group, Inc.**
 Project: **US 14 under CN/UP RR**
 Location: **Des Plaines, IL**

Datum: NGVD
 Elevation: 632.16 ft
 North: 1960179.88 ft
 East: 1102312.55 ft
 Station: 116+21.767
 Offset: LT 9.128

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 (%)
	631.3	10-inch thick, ASPHALT --PAVEMENT--															
	630.95	1/2-inch thick, CONCRETE --PAVEMENT--															
		Stiff to very stiff, gray SILTY CLAY, trace gravel			1	5 4 5	1.25 P	22		610.9	Hard, gray SILTY CLAY, trace gravel			9	12 9 9	9.02 B	14
			5		2	2 3 4	2.54 B	24				25		10	9 12 14	8.61 B	12
					3	2 4 5	2.71 B	21						11	8 13 19	10.25 B	13
					4	2 2 4	1.07 B	23				30		12	8 12 19	10.25 B	15
	622.7	Gray SILT --Wet--	10														
	620.8	Very stiff, gray SILTY CLAY (Qu-2.5tsf)			5	2 1 2	0.25 P	23		600.4	Dense, gray, medium SAND, little gravel --Wet--						
		Soft, gray SILTY CLAY															
	619.2	Medium dense, gray SILT --Wet--			6	3 8 5	NP	18						13	9 22 24	NP	12
			15							597.7	Hard, gray SILTY CLAY, trace gravel, silt lenses	35					
	616.7	Medium stiff, gray SILTY CLAY LOAM			7	2 6 8	0.82 B	14		597.2	Boring terminated at 35.00 ft						
	614.2	Very dense, gray SILT --Dry--			8	18 28 36	NP	13				40					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling: **07-07-2015** Complete Drilling: **07-07-2015**
 Drilling Contractor: **Wang Testing Services** Drill Rig: _____
 Driller: **K&R** Logger: **A. Tomaras** Checked by: **B. Wilson**
 Drilling Method: **3.25 IDA HSA; Backfilled upon completion**

While Drilling: **9.50 ft**
 At Completion of Drilling: **28.00 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.

WANGENGINC 4910203.GPJ WANGENG.GDT 3/24/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG NDB-07

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 628.89 ft
 North: 1960148.20 ft
 East: 1102403.14 ft
 Station: 117+16.892
 Offset: LT 9.824

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 (%)
	628.3	7-inch thick, ASPHALT --PAVEMENT--															
	627.5	10-inch thick, CONCRETE --PAVEMENT--															
	626.4	Loose, white SANDY GRAVEL --BASE COURSE-- --Moist--		X	1	7 5 4	NP	12					X	9	10 15 12	10.25 S	12
		Very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		X	2	4 8 6	2.95 S	13					X	10	7 20 21	10.25 S	12
			5							603.9	--Sand lenses--						
											Boring terminated at 25.00 ft						
	620.9	Loose, gray SILT --Wet--		X	3	2 3 3	2.54 B	11									
	619.2	Stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel --Sand lenses--		X	4	4 5 3	NP	15									
			10														
				X	5	2 2 4	1.31 B	14									
		--Sandy gravel lenses--		X	6	6 10 13	7.22 B	13									
			15														
		--Silty loam lenses--		X	7	5 14 27	6.48 S	15									
				X	8	5 12 12	10.25 S	12									
			20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-16-2015** Complete Drilling **06-16-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **R&J** Logger **A. Tomaras** Checked by **B. Wilson**
 Drilling Method **3.25 IDA HSA; Backfilled upon completion**

While Drilling ▽ **8.00 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.

WANGENGINC 4910203.GPJ WANGENG.GDT 3/24/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG NDB-08

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 627.22 ft
 North: 1960112.45 ft
 East: 1102483.35 ft
 Station: 118+04.202
 Offset: LT 10.375

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 (%)
	626.7	6-inch thick, ASPHALT --PAVEMENT--															
	626.0	9-inch thick, CONCRETE --PAVEMENT--															
	624.0	Loose, brown SANDY GRAVEL --BASE COURSE-- --Dry--	1	X	1	5 5 3	NP	7									
		Stiff, gray SILTY CLAY, trace gravel	2	X	2	3 2 3	1.56 B	16									
			3	X	3	2 2 4	1.31 B	15									
			4	X	4	2 3 4	1.48 B	17									
	615.2	Dense to very dense, gray SANDY LOAM, some gravel --Wet--	5	X	5	3 9 16	1.80 B	13									
			6	X	6	10 16 21	NP	10									
	609.2	Hard, gray SILTY CLAY LOAM, trace gravel	7	X	7	16 24 33	NP	9									
	607.2	Boring terminated at 20.00 ft	8	X	8	15 17 26	4.18 S	12									

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-16-2015** Complete Drilling **06-16-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **R&J** Logger **A. Tomaras** Checked by **B. Wilson**
 Drilling Method **3.25 IDA HSA; Backfilled upon completion**

While Drilling ▽ **12.00 ft**
 At Completion of Drilling ▼ **15.00 ft**
 Time After Drilling **NA**
 Depth to Water ▼ **NA**

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WANGENG 4910203.GPJ WANGENG.GDT 3/24/21



wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RWB-06

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 643.44 ft
 North: 1960219.65 ft
 East: 1102340.28 ft
 Station: 116+35.862
 Offset: LT 55.385

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 (%)
	641.7	Black SILTY LOAM --TOPSOIL--			1	P C S H	NP	33									
		Stiff to hard, brown and gray SILTY CLAY LOAM, trace gravel --Wet, possible sand lens--			2	P C S H	3.06 S	16									
			5		3	P C S H	4.78 S	17									
					4	P C S H	3.25 S	17									
					5	P C S H	4.78 S	17									
	633.4	Boring terminated at 10.00 ft	10														
			15														
			20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-26-2015** Complete Drilling **06-26-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **S&J** Logger **A. Happel** Checked by **B. Wilson**
 Drilling Method **.1" IDA Pneumatic Geoprobe LB Sampler**

While Drilling ▽ **2.00 ft**
 At Completion of Drilling ▼ **9.50 ft**
 Time After Drilling **NA**
 Depth to Water ▼ **NA**

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wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RWB-07

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 643.13 ft
 North: 1960197.74 ft
 East: 1102410.43 ft
 Station: 117+05.463
 Offset: LT 58.483

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 (%)
	641.6	18-inch thick, black SILTY LOAM --TOPSOIL-- --Dry--			1	P U S H	NP	41									
		Stiff to hard, brown to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel			2	P U S H	4.01 S	16									
		--L _L (%)=38, P _L (%)=18-- --%Gravel=1.3-- --%Sand=12.3-- --%Silt=50.3-- --%Clay=36.1-- --A-6 (17)-- --Wet, seams of fine sand--	5		3	P U S H	1.53 B	23									
					4	P U S H	2.29 B	25									
	633.6	Gray SILTY LOAM			5	P U S H	4.20 B	20									
	632.6	--Wet--	10														
	631.1	Hard, gray SILTY CLAY, trace gravel			6	P U S H	4.20 B	16									
		Boring terminated at 12.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-26-2015** Complete Drilling **06-26-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **S&J** Logger **A. Happel** Checked by **B. Wilson**
 Drilling Method **.1" IDA Pneumatic Geoprobe LB Sampler**

While Drilling ▽ **6.00 ft**
 At Completion of Drilling ▼ **8.00 ft**
 Time After Drilling **NA**
 Depth to Water ▼ **NA**

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wangeng@wangeng.com
 1145 N. Main Street
 Lombard/IL/60148
 Telephone: 6309539928
 Fax: 6309539938

BORING LOG RWB-08

WEI Job No.: 491-02-03

Client **Accurate Group, Inc.**
 Project **US 14 under CN/UP RR**
 Location **Des Plaines, IL**

Datum: NAVD
 Elevation: 642.99 ft
 North: 1960189.62 ft
 East: 1102449.98 ft
 Station: 117+42.822
 Offset: LT 66.278

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 (%)
	641.1	Black SILTY LOAM, trace roots --TOPSOIL-- --Dry--			1	P U S H	NP	27									
		Medium stiff to hard, brown and gray to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel			2	P U S H	0.96 S	18									
			5		3	P U S H	3.63 B	20									
					4	P U S H	5.92 S	18									
					5	P U S H	8.60 B	18									
			10		6	P U S H	6.78 B	18									
	631.0	Boring terminated at 12.00 ft															
			15														
			20														

GENERAL NOTES

WATER LEVEL DATA

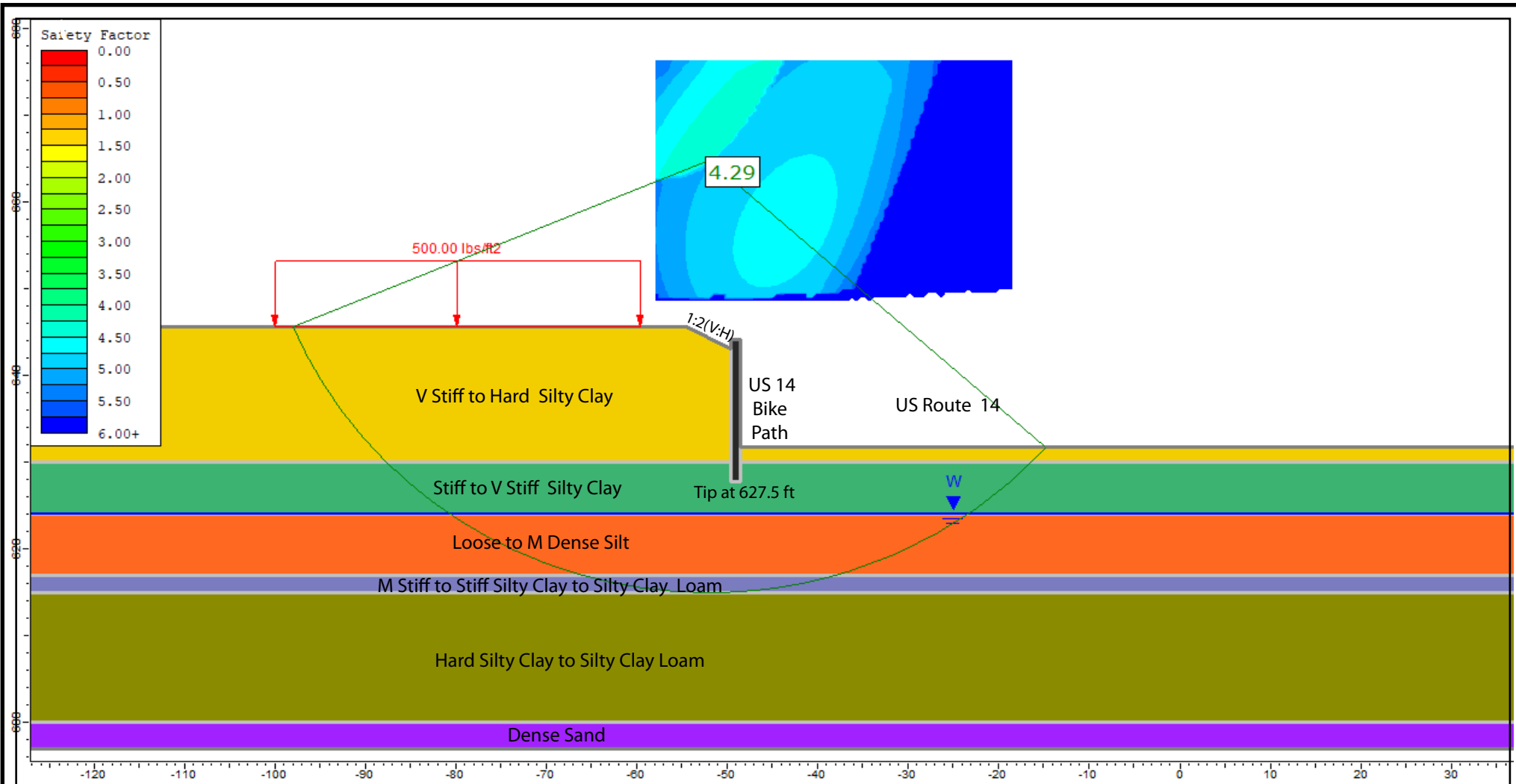
Begin Drilling **06-26-2015** Complete Drilling **06-26-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig
 Driller **S&J** Logger **A. Happel** Checked by **B. Wilson**
 Drilling Method **.1" IDA Pneumatic Geoprobe LB Sampler**

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.

APPENDIX B

APPENDIX C



Undrained Analysis, Station 116+48, Ref Borings: RW-03, RW-04, RWB-06, RWB-07, and NDB-06

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	V Stiff to Hard Silty Clay	120	3200	0
2	Stiff to V Stiff Silty Clay	120	1800	0
3	Loose to M Dense Silt	120	0	29
4	M Stiff to Stiff Silty Clay to Silty Clay Loam	115	1100	0
5	Hard Silty Clay to Silty Clay Loam	125	6000	0

GLOBAL STABILITY: US ROUTE 14 BIKE PATH RETAINING WALL, SN 016-9200, COOK COUNTY, IL

SCALE: GRAPHICAL

APPENDIX C-1

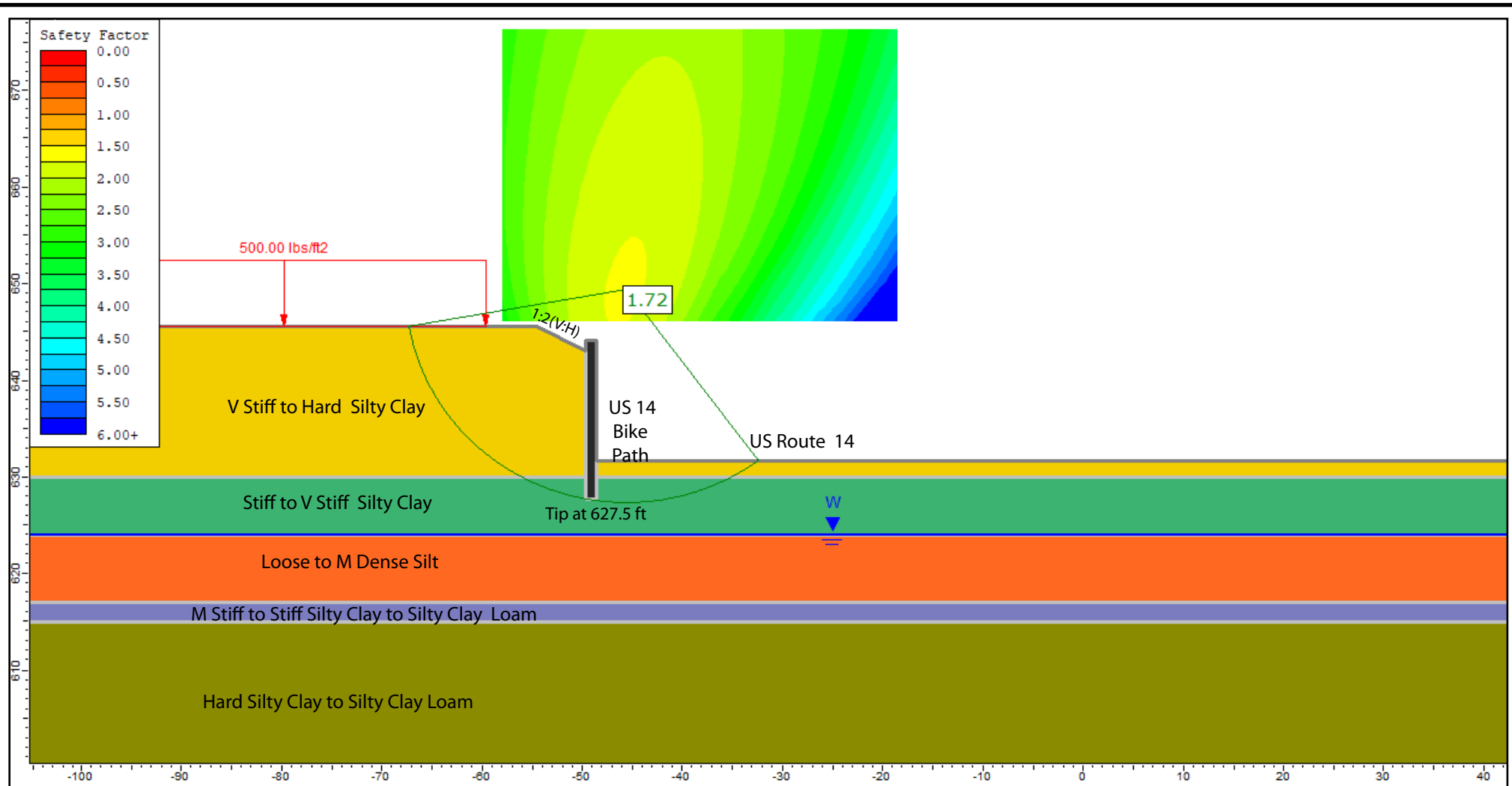
DRAWN BY: N. Balakumaran
CHECKED BY: A. Kurnia



1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR ACCURATE GROUP, INC.

498-04-04



Drained Analysis, Station 116+48, Ref Borings: RW-03, RW-04, RWB-06, RWB-07, and NDB-06

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	V Stiff to Hard Silty Clay	120	100	30
2	Stiff to V Stiff Silty Clay	120	100	30
3	Loose to M Dense Silt	120	0	29
4	M Stiff to Stiff Silty Clay to Silty Clay Loam	115	0	29
5	Hard Silty Clay to Silty Clay Loam	125	100	32

GLOBAL STABILITY: US ROUTE 14 BIKE PATH RETAINING WALL,
SN 016-9200, COOK COUNTY, IL

SCALE: GRAPHICAL

APPENDIX C-2

DRAWN BY: N. Balakumaran
CHECKED BY: A. Kurnia



1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR ACCURATE GROUP, INC.

498-04-04

APPENDIX D

Benchmark: Temp benchmark #1 set chiseled "x" on top of 6" concrete barrier curb at southeast corner of existing dayton freight parking lot adjacent to the existing pump station no. 8 elevation 643.93 (highway datum)

Traffic Control: Traffic is to be maintained during construction

Existing Structure: None

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

HIGHWAY CLASSIFICATION

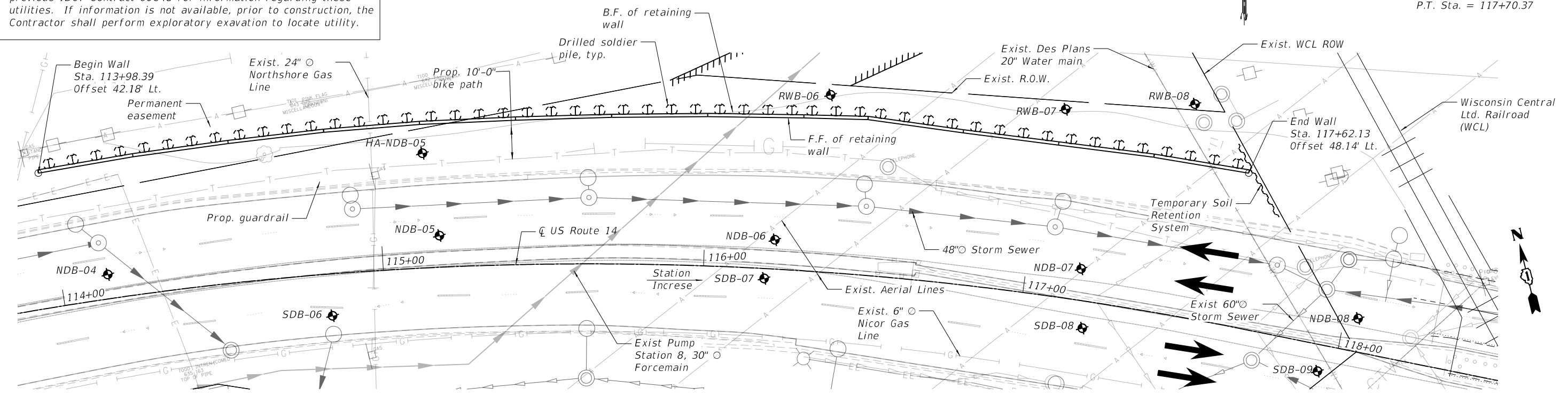
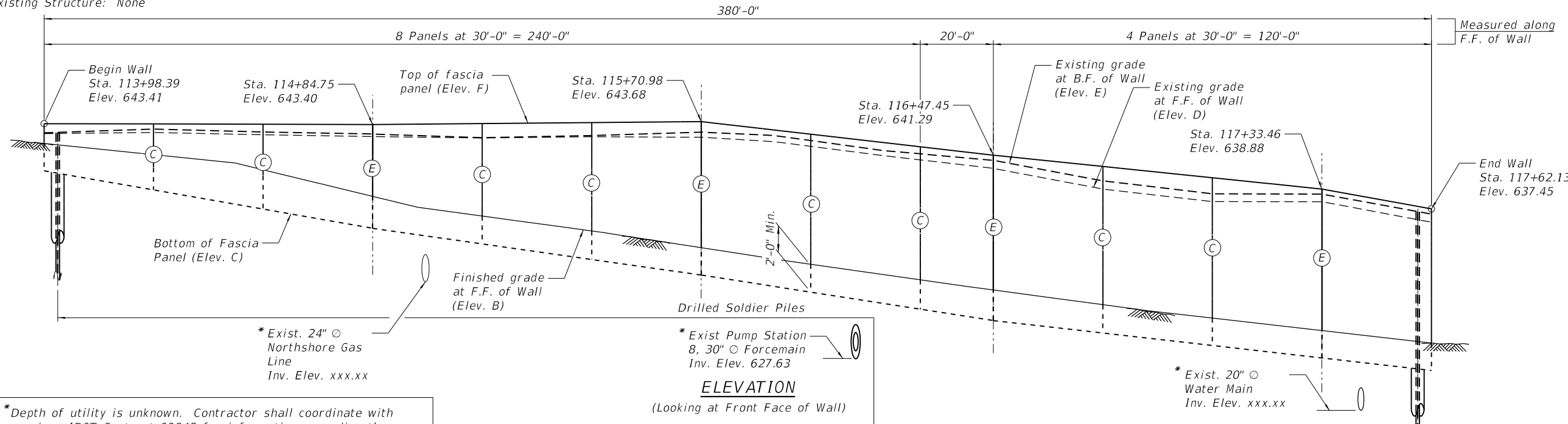
FAU Rte. 3512
 Functional Class: Minor Arterial
 ADT: 16100 (2019)
 ADTT: 5% (2019)
 DHV: 1288
 Design Speed: 30 m.p.h.
 Posted Speed: 30 m.p.h.
 Two-Way Traffic
 Directional Distribution: 50/50

DESIGN STRESSES

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

CURVE DATA

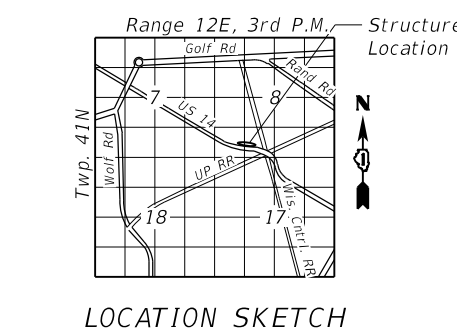
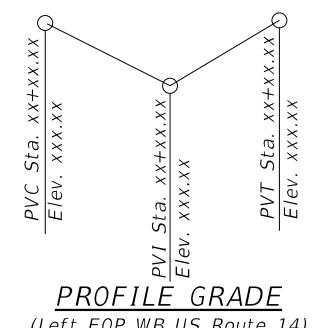
P.I. Sta. = 115+61.03
 Δ = 23° 34' 00" (RT)
 D = 5° 32' 53"
 R = 1,032.72'
 T = 215.43'
 L = 424.78'
 E = 22.23'
 e = -----
 T.R. = -----
 S.E. Run = -----
 P.C. Sta. = 113+45.59
 P.T. Sta. = 117+70.37



LEGEND

—T—	Exist. Underground Telephone	⊕	Boring Location
—G—	Exist. Underground Gas	●	Prop. Catch Basin
—E—	Exist. Underground Electric	⊙	Exist. Manhole
—W—	Exist. Underground Water Main	⊗	Prop. Manhole
—S—	Exist. Storm Sewer	⊘	Exist. Light Pole
—>—	Prop. Storm Sewer		

- NOTES**
1. Wall offsets are measured from the CL of US Route 14 to the front face of cast-in-place concrete facing.
 2. "C" denotes Construction Joint.
 3. "E" denotes Expansion Joint.
 4. "F.F." denotes Front Face.
 5. "B.F." denotes Back Face.
 6. Wall is to be built along straight chords between construction joints.
 7. Shaft diameter, pile section, spacing, top and tip elevations to be determined during final design.



GENERAL PLAN AND ELEVATION

RETAINING WALL 1

US ROUTE 14

F.A.U. RTE. 3512

SECTION 2018-109-RS, SW&T

COOK COUNTY

STATION 113+98.39 TO 117+62.13

STRUCTURE NO. 016-9200

MODEL: Default FILE NAME: P:\2004-823 PTB195-006-ACCURATE\W0#11 US14 RW\Sheet Files\016-9200 West Wall\TSL\0169200-62H38-501-TSL.dgn



USER NAME =	DESIGNED -	REVISED -
PLOT SCALE =	CHECKED -	REVISED -
PLOT DATE =	DRAWN -	REVISED -
	DATE - \$DATE	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

FAU RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3512	2018-109-RS, SW&T	COOK	2	1
CONTRACT NO. 62H38				
ILLINOIS FED. AID PROJECT				

SHEET 1 OF 2 SHEETS

