
Technical Memorandum

To: Dan Manojlovski, P.E. AECOM
Copy To: Amish Bhatt, AECOM; Corina Farez, Wang
From: Mohammed (Mike) Kothawala, P.E., Sr. Geotechnical Engineer
Date: Original: October 24, 2016
Revised: April 17, 2017
Subject: Water Main Riser Vaults and Thrust Restraints, Contract 62A75
Along Jackson Boulevard
Project: Circle Interchange Reconstruction
IDOT Job No. D-91-227-13, IDOT PTB 163, Item 01
Wang Project No. 1100-04-01

INTRODUCTION

Wang Engineering, Inc. (Wang) understands that a new 16-inch diameter water main with 30-inch diameter casing is proposed to be constructed immediately south of Jackson Boulevard Bridge in Contract 62A75 of Circle Interchange Reconstruction project. It is understood that water main will be installed using trenchless technology at the I-90/94 crossing. The proposed water main will have a new riser vault and two thrust restraints on the west side of I-90/94 and a new riser vault and a thrust restraint on the east side of I-90/94. It is understood that thrust restraints are for the horizontal pipe bends. This memorandum is revised based on IDOT District One comments.

Since a subsurface investigation program was not carried out for the proposed water main, we have considered nearby Borings 1702-B-01, 1702-B-02, 1702-B-03, 23-RWB-05, and 23-RWB-05 completed for the Jackson Boulevard Bridge and the Retaining Wall 23. Boring locations relative to the water main alignment, riser vaults, and thrust restraints are shown in the *Boring Location Plan* (Exhibit 1). In addition, Wang performed in situ vane shear tests (VST) in soft clay in Boring 1702-B-03. In situ vane shear tests conducted in nearby Borings VST-02 and VST-06 are also considered for our engineering analysis and to develop recommendations. The VST results are shown on the attached *Boring Logs*.

Detailed descriptions of the soil conditions encountered are presented in the attached Boring Logs and in the *Subsurface Soil Data Profile* (Exhibit 2). The following sections present our geotechnical recommendations for the design and construction of the proposed new riser vaults and thrust restraints.

SUBSURFACE CONDITIONS AND RECOMMENDATIONS

Thrust Restraints and Riser Vaults Foundations

Information provided by AECOM indicates thrust restraints and riser vaults base will be approximately at depths of 6 to 7 feet below ground surface (bgs) or elevation of 587 feet and a depth of 36 feet bgs or elevation of 557 feet, respectively. The water main casing invert below I-90/94 roadway will be approximately at a depth of 12 feet bgs or elevation of 561 feet.

The subsurface soil conditions as revealed by borings at the proposed thrust restraints generally consist of 10.5 feet thick stiff to very stiff silty clay loam fill on the west side of I-90/94 and about 8 feet very loose to medium dense sandy loam to sand fill on the east side of I-90/94. Below this fill layer, a thin layer of up to 2.5 feet medium stiff clay to silty clay followed by up to 35 feet thick very soft to medium stiff clay to silty clay layer was encountered.

At the thrust restraint base elevations of 587 feet, the very stiff silty clay loam fill or medium dense sand fill are expected to be encountered. The thrust restraints foundations can be designed for a maximum allowable soil bearing capacity of 2,000 psf using a factor of safety of 3.0 or a factored bearing resistance of 2,700 psf considering a resistance factor of 0.45.

At the proposed riser vault base elevation of 557 feet, the borings revealed soft to medium stiff clay to silty clay extending to elevations 545 to 552 feet (5 to 12 feet below the base) followed by a layer of stiff silty clay to silty clay loam extending to elevations of 528 (29 feet below the base). The riser vaults can be designed for a maximum allowable soil bearing capacity of 1,500 psf, using a factor of safety of 3.0 or a factored resistance of 2,000 psf considering a resistance factor of 0.45. During construction, soft clay is expected at the base of excavation. The foundation soil may become unstable during construction. The contractor may need a "working platform" to properly construct the base slab. To establish a working platform at the base of the precast riser structures, the soils should first be evaluated during construction by the soil inspector. It is recommended that the working platform consist of 2 to 3 feet of CA-1 gradation aggregate capped with 6 inches of CA-6 gradation aggregate. This should be installed below the sand cushion that is specified in the riser shaft detail.

Groundwater was observed in our borings in the fill layer above the native clay. It is recommended that the design groundwater level be assumed to be at an elevation of 587 feet. The vault walls should be structurally designed for an at-rest lateral earth pressure coefficient of 0.5 and for the additional groundwater loads based on design groundwater elevation.

Design lateral pressure from surcharge loads due to construction, maintenance and operation equipment, etc. should be added to the lateral earth pressure.

The riser vault foundations should be designed to resist uplift pressure. Based on the borings groundwater could be at elevation of 587 feet. However, conservatively ground water level should be considered at the ground surface considering flooding condition. The floatation safety factor should reflect the risk associated with the hydrostatic loading condition. We recommend considering safety factor of 1.1 with groundwater level at the ground surface. When calculating floating safety factor, the vertical resistance mobilized by friction along the exterior faces of the structure should be neglected.

Excavation Base Stability

Based on the in-situ vane shear testing results in nearby Borings 1702-B-03, VST-02, and VST-06, we have performed a preliminary analysis for bottom instability. The in-situ vane shear testing results immediately beneath base of foundation excavations show higher than the field Rimac testing. We calculated a factor of safety of 1.4 against bottom instability for an excavation depth of 34 feet. The minimum required FOS is 1.5. Our analysis indicates the temporary sheeting driven for an additional 1-foot below the bottom of excavation will provide the minimum required FOS of 1.5 against bottom heave instability.

Temporary Earth Retention System

The installation of riser vaults will require excavations to a depth of 35 feet (elevation of 557 feet). The installation of thrust restraints will require excavations with depths of 6 to 7 feet (elevation of 587 feet). Open cut excavations for the construction of thrust restraints could be at a slope of 1:2 (V:H) or flatter. Impact of open cut excavations on adjacent structures should be evaluated. If required, temporary support should be provided.

The lateral soil pressure distribution behind a bracing system will be dependent on the scheme selected to support the excavation walls. Therefore, it is recommended that the pressure distribution utilized in the design of the bracing system be reviewed by a qualified geotechnical engineer. Normally selection of the type of temporary earth retention system and design is left to the contractor. The bracing system should be designed for different construction stages and by a structural engineer licensed in the State of Illinois. It is recommended that the design groundwater elevation be considered to be at elevation 587 feet. In addition, any traffic and surcharge loads should be considered for the design. The soil parameters shown in Table 1 can be used for the design of temporary earth retention. We strongly recommend to temporary support system designers to review the included boring logs and apply their judgement on assessing soil parameters for the type of analyses required for the design of their specific temporary support system.

Table 1: Soil Parameters for the Design of Temporary Earth Retention Systems

| Approximate Elevation Range (feet) | Soil Type (Layer) | Unit Weight (pcf) | Cohesion C_u (psf) | Friction Angle ϕ (degree) | Earth Pressure Coefficients | |
|------------------------------------|---|-------------------|----------------------|--------------------------------|-----------------------------|------------------|
| | | | | | Active Pressure | Passive Pressure |
| Existing Grade to 584 East Side | Granular Fill | 115 | 0 | 28 | 0.36 | 2.77 |
| Existing Grade to 584 West Side | Cohesive Fill | 120 | 1900 | 0 | 1.00 | 1.00 |
| 584 to 582 | Medium stiff to Stiff Silty Clay to Silty Clay Loam | 115 | 950 | 0 | 1.00 | 1.00 |
| 582 to 572 | Soft Clay to Silty Clay | 110 | 550 | 0 | 1.00 | 1.00 |
| 572 to 554 | Soft to Medium Stiff Clay to Silty Clay | 110 | 720 | 0 | 1.00 | 1.00 |
| 554 to 544 | Medium Stiff to Stiff Clay to Silty Clay | 115 | 980 | 0 | 1.00 | 1.00 |
| 544 to 532 | Stiff to Very Stiff Silty Clay to Silty Clay Loam | 120 | 1500 | 0 | 1.00 | 1.00 |
| 532 to 518 | Very Stiff Silty Clay to Silty Clay Loam | 125 | 3000 | 0 | 1.00 | 1.00 |

The design of the temporary earth retention system should be completed by a licensed structural engineer and should be submitted to the Bureau of Bridges and Structures for review and approval.

Global Stability

We performed preliminary global stability analyses for the east side riser vault temporary support. Analyses were performed with Slide v6 computer software. The minimum factor of safety calculated was less than the minimum required of 1.7 without considering temporary support embedment below cut level. We performed global stability analysis considering sheet pile embedment to obtain an FOS of at least 1.7. The embedded portion of the support will provide resistance against the slope instability above the bottom of the support. Our preliminary analysis show the temporary support system could require to be extended 8.5 to 11.5 feet below the excavation depth on the west side and east side riser vaults respectively to achieve the minimum required factor of safety of 1.7. Details of the global stability analysis are attached. The designer should perform global stability analysis and include the results as part of his submittal.

Jacking pipe

The pipe should be jacked in accordance with IDOT Standard Specifications Section 552, *STORM SEWER JACKED IN PLACE*. Frictional resistance to the jacking force can be estimated from the product of shear strength of soil and the surface area of pipe in contact with the soil. The subsurface soil conditions within the jacking depths, as revealed by borings, generally consist of very soft to soft clay. The contractor should review the subsurface soil conditions and judge their effects on means, methods, and progress of work. The jacking operation, once started, should be continued until completed. If continuous jacking cannot be maintained, the contractor should take the necessary precautions for not allowing the jacked pipes to freeze or set in the ground. We recommend that the contractor be required to submit details of his means and methods for constructing pipelines by jacking.

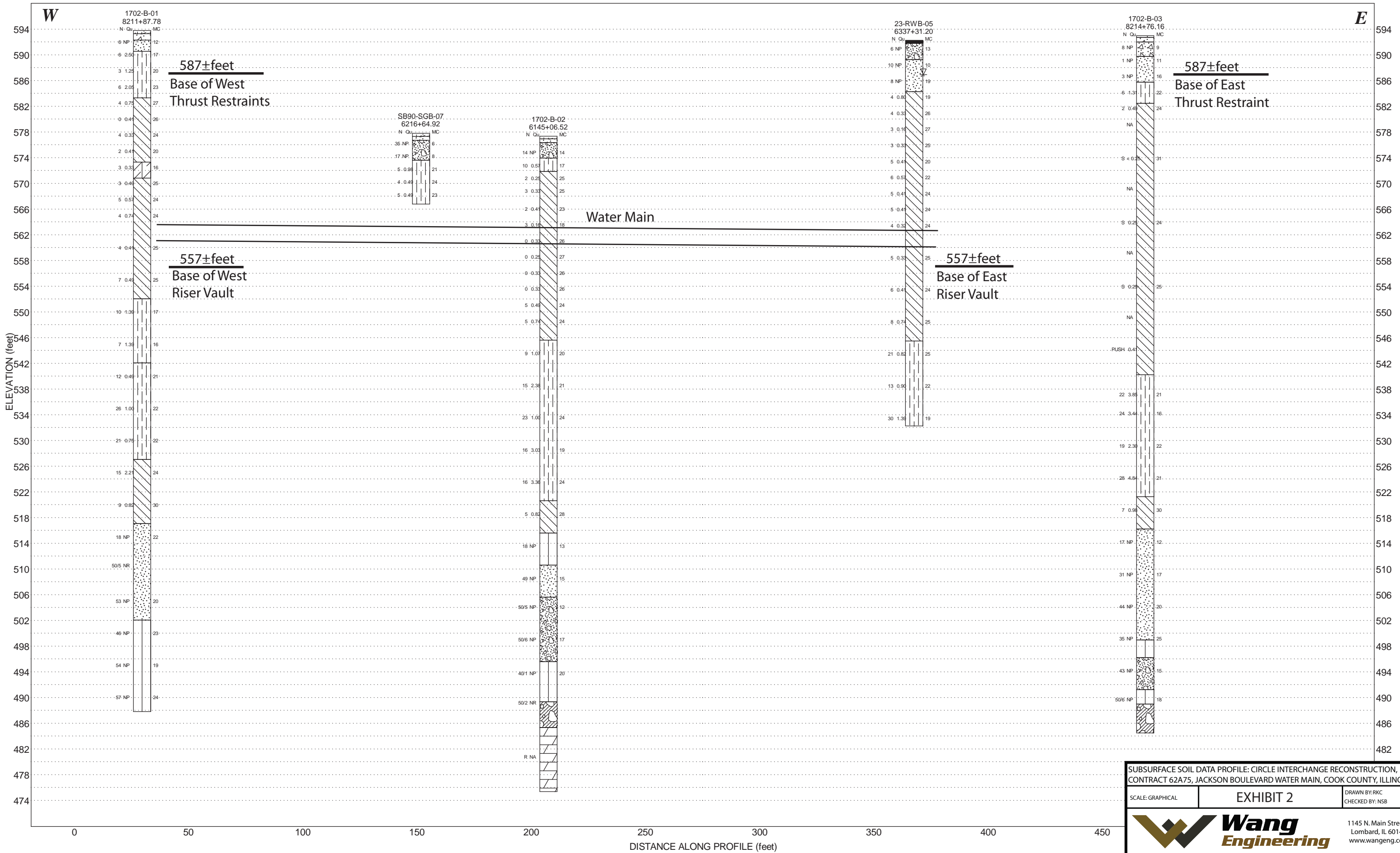
It is understood that riser vault excavation could be used as jacking pit. Its size should be large enough to provide a safe and adequate working area. Pit size will depend on the contractor's equipment and space constraint. The jacking pit walls should be supported in accordance with OSHA construction requirements to insure a solid, stable base for jacking machine and pit sides. Some stabilizing of the base may be necessary. Jacking load can be transferred to the soil behind the jacking pit through a thrust block constructed at the back of the pit. The resistance which the soil can provide to the jacking loads may be estimated from the allowable passive pressures. A factor of safety of 2 should be considered. If enough resistance is not available, additional ground improvement measure may be required to provide additional lateral resistance to withstand the jacking loads. It is expected that the soil at the base would be very soft to soft clay at about elevation of 557 feet. The undrained passive earth pressure coefficients of 1.00 should be considered. We recommend that a provision be made for the removal of some base clay and replacing with the stabilization stone as a working platform as discussed in earlier section of the memorandum. The removal and replacement thickness should be determined in the field based on the contractor's method and equipment to be used. Groundwater was observed in our borings in the fill above the natural clay. Provisions should be made to collect and remove groundwater seepage that may accumulate in the pits.

CONSTRUCTION CONSIDERATIONS

Any required excavations should be performed in accordance with local, state, and federal regulations including current OSHA regulations. The potential effect of ground movements upon nearby structures and utilities should also be taken into consideration.

Attachments:

1. Boring Location Plan, Boring Logs and AECOM Plan Sheets dated 3/21/2017
2. Subsurface Soil Data Profile, Global Stability Analyses Results



SUBSURFACE SOIL DATA PROFILE: CIRCLE INTERCHANGE RECONSTRUCTION,
 CONTRACT 62A75, JACKSON BOULEVARD WATER MAIN, COOK COUNTY, ILLINOIS

| | | |
|------------------|------------------|----------------------------------|
| SCALE: GRAPHICAL | EXHIBIT 2 | DRAWN BY: RKC CHECKED BY: NSB |
|------------------|------------------|----------------------------------|

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FOR AECOM 1100-04-01



BORING LOG 1702-B-01

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 593.83 ft
 North: 1898849.46 ft
 East: 1171361.60 ft
 Station: 8211+87.78
 Offset: 18.3545 RT

| 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 (%) |
|---------|----------------|---|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|
| | 593.3 | 6-inch thick, ASPHALT --PAVEMENT-- | | | | | | | | 573.3 | Soft, gray CLAY LOAM, trace gravel | | | | | | |
| | 592.3 | 12-inch thick, CONCRETE --PAVEMENT-- | | | | | | | | | --L _L (%)=28, P _L (%)=14-- --%Gravel=5.4-- --%Sand=23.0-- --%Silt=46.7-- --%Clay=24.8-- --A-6 (7)-- | | | 9 | 1 1 2 | 0.33 B | 16 |
| | 590.6 | Loose, brown and gray, fine and medium SAND, trace gravel --FILL-- | | | 1 | 3 3 3 | NP | 12 | | | Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel | | | 10 | 1 1 2 | 0.49 B | 25 |
| | | Stiff to very stiff, brown and gray SILTY CLAY LOAM, trace gravel and sand layers --FILL-- | | | 2 | 3 3 3 | 2.50 P | 17 | | | | | | 11 | 0 3 2 | 0.57 B | 24 |
| | | | | | 3 | 2 1 2 | 1.25 P | 20 | | | | | | 12 | 0 2 2 | 0.74 B | 24 |
| | | | | | 4 | 2 2 4 | 2.05 B | 23 | | | | | | 13 | 1 2 2 | 0.41 B | 25 |
| | | | | | 5 | 3 2 2 | 0.75 P | 27 | | | | | | 14 | 2 3 4 | 0.49 B | 25 |
| | | | | | 6 | 0 0 0 | 0.41 B | 26 | | | | | | | | | |
| | | | | | 7 | 0 2 2 | 0.33 B | 24 | | | | | | | | | |
| | | | | | 8 | 0 0 2 | 0.41 B | 20 | | | | | | | | | |
| | 583.3 | Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel | | | | | | | | | | | | | | | |

GENERAL NOTES

Begin Drilling **06-17-2014** Complete Drilling **06-17-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
 Driller **N&K** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **3.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **NA**
 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 11000401.GPJ WANGENG.GDT 10/18/16



BORING LOG 1702-B-01

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WEI Job No.: 1100-04-01

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|---------|----------------|---|---|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---------------------------|---------------|----------------------|------------|-----------------------|----------|----------------------|
| | 552.1 | Stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel | | | | | | | | | | | | | | | |
| | 45 | | 15 | 3 4 6 | 1.39 B | 17 | | | | 65 | 19 | 5 7 14 | 0.75 P | 22 | | | |
| | 527.1 | | Medium stiff to very stiff, gray CLAY, trace gravel | | | | | | | | | | | | | | |
| | 50 | 16 | | 2 4 3 | 1.39 B | 16 | | | | 70 | 20 | 5 7 8 | 2.21 B | 24 | | | |
| | 542.1 | Soft to stiff, gray SILTY CLAY, trace gravel | | | | | | | | | | | | | | | |
| | 55 | | 17 | 4 6 6 | 0.49 B | 21 | | | | 75 | 21 | 3 4 5 | 0.82 B | 30 | | | |
| | 517.1 | Medium dense to very dense, gray, fine SAND and SILT laminations --Moist-- | | | | | | | | | | | | | | | |
| | 60 | | 18 | 5 9 17 | 1.00 P | 22 | | | | 80 | 22 | 10 7 11 | NP | 22 | | | |

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WATER LEVEL DATA

While Drilling **Rotary wash**
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 Time After Drilling **NA**
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|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 502.1 | Dense to very dense, gray SILTY LOAM --Moist-- | 85 | ○ | 23 | 50/5 | NR | | | 487.8 | --AUGER REFUSAL-- Boring terminated at 106.00 ft | 105 | △ | 27 | 23 32 25 | NP | 24 |
| | | | 90 | △ | 24 | 20 21 32 | NP | 20 | | | | | | | | | |
| | | | 95 | △ | 25 | 22 23 23 | NP | 23 | | | | | | | | | |
| | | | 100 | △ | 26 | 18 27 27 | NP | 19 | | | | | | | | | |

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 Drilling Method **3.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

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

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BORING LOG 1702-B-02

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.38 ft
 North: 1898807.43 ft
 East: 1171517.63 ft
 Station: 6145+06.52
 Offset: 5.1113 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|-----------|----------------------|
| | 577.05 | 5-inch thick, ASPHALT --PAVEMENT-- | | | | | | | | | | | | | | | |
| | 576.4 | 7-inch thick, CONCRETE --PAVEMENT-- | | | | | | | | | | | | | | | |
| | | Grayish white CRUSHED STONE --BASE COURSE-- | | | 1 | 6 10 4 5 | NP | 14 | | | | | | 9 | 0 0 0 | 0.33 B | 26 |
| | 574.0 | Medium stiff, brown and gray SILTY CLAY LOAM, trace gravel --FILL-- | | | 2 | 2 5 5 5 | 0.57 B | 17 | | | | 25 | | 10 | 0 0 0 | 0.33 B | 26 |
| | 571.9 | Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel | | | 3 | 1 1 1 2 | 0.25 B | 25 | | | | | | 11 | 1 2 3 | 0.49 B | 24 |
| | | | | | 4 | 0 1 2 2 | 0.33 B | 25 | | | | | | 12 | 0 2 3 | 0.74 B | 24 |
| | | | | | 5 | 0 1 1 | 0.41 B | 23 | | 545.6 | Medium stiff to very stiff, gray SILTY CLAY, trace to little gravel | | | | | | |
| | | | | | 6 | 0 1 2 | 0.16 B | 18 | | | | | | 13 | 1 3 6 | 1.07 B | 20 |
| | | | | | 7 | 0 0 0 | 0.33 B | 26 | | | | | | | | | |
| | | | | | 8 | 0 0 0 | 0.25 B | 27 | | | | | | 14 | 3 6 9 | 2.38 B | 21 |

GENERAL NOTES

Begin Drilling **07-13-2014** Complete Drilling **07-23-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

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

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|---------|----------------|---------------------------------------|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 520.6 | Medium stiff, gray CLAY, trace gravel | | | | | | | | | | | | | | | |
| | | | 45 | | 15 | 6 10 13 | 1.00 P | 24 | | 515.6 | Medium dense, gray SILTY LOAM, trace gravel; moist | 65 | | 19 | 6 9 9 | NP | 13 |
| | | | 50 | | 16 | 4 6 10 | 3.03 B | 19 | | 510.6 | Dense, brown fine to medium SAND, trace gravel; moist | 70 | | 20 | 13 21 28 | NP | 15 |
| | | | 55 | | 17 | 5 7 9 | 3.36 B | 24 | | 505.6 | Very dense, gray GRAVELLY SAND; moist | 75 | | 21 | 50/5 | NP | 12 |
| | | | 60 | | 18 | 1 2 3 | 0.82 B | 28 | | | | 80 | | 22 | 50/6 | NP | 17 |

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GENERAL NOTES

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While Drilling **Rotary wash**
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 Depth to Water **NA**

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|---------|----------------|--|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|--------------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 495.6 | Very dense, gray SILT; moist | | | | | | | | 475.4 | Boring terminated at 102.00 ft | | | | | | |
| | | | 85 | | 23 | 40 56 40/1 | NP | 20 | | | | 105 | | | | | |
| | 489.4 | --difficult drilling from 88.0 feet-- --WEATHERED BEDROCK-- | | | 24 | 50/2 | NR | | | | | 110 | | | | | |
| | 485.4 | Strong, light gray, fair rock mass quality, bedded fresh DOLOSTONE, up to 18-inch beds, 4-inch spaced joints, horizontal joints with none or less than 0.2-inch infilling, hard joint wall, with stylolitic surfaces, and moderately vuggy porosity. | | | | | | | | | | 115 | | | | | |
| | | --Run 1 - RECOVERY=99%-- --RQD=57%-- --Qu = 10,280 psi-- | | | | | | | | | | 120 | | | | | |
| | | | 95 | | | | | | | | | | | | | | |
| | | | 100 | | 1 | | | | | | | | | | | | |

GENERAL NOTES

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 593.01 ft
 North: 1898890.82 ft
 East: 1171649.04 ft
 Station: 8214+76.16
 Offset: 15.8644 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 (%) |
|---------|----------------|---|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|
| | | | | | | H | P | | | | | | | | | | |
| | | --In-Situ Vane Shear, 44.0 feet-- --S _{u undis} = 1450 psf-- --S _{u remold} = 803 psf-- --Sensitivity = 1.81-- | 45 | | 4 | | | | | | | | | 9 | 3 7 12 | 2.30 B | 22 |
| | | | 50 | | 6 | PUSH | 0.41 B | | | | | 70 | | 10 | 6 12 16 | 4.84 B | 21 |
| | 540.3 | Very stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel | 55 | | 7 | 7 9 13 | 3.85 B | 21 | | 521.3 | Medium stiff, gray CLAY to SILTY CLAY, trace gravel | 75 | | 11 | 1 2 5 | 0.98 B | 30 |
| | | | 60 | | 8 | 4 7 17 | 3.44 B | 16 | | 516.3 | Medium dense to dense, gray SAND; moist to saturated | 80 | | 12 | 10 9 8 | NP | 12 |

GENERAL NOTES

Begin Drilling **06-26-2014** Complete Drilling **06-26-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **NA**
 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 11000401.GPJ WANGENG.GDT 10/18/16



BORING LOG 1702-B-03

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 593.01 ft
 North: 1898890.82 ft
 East: 1171649.04 ft
 Station: 8214+76.16
 Offset: 15.8644 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 (%) |
|---------|----------------|---------------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 491.3 | | | | | | | | | 491.3 | Very dense, gray GRAVELLY SILTY LOAM; wet | | | | | | |
| | 489.0 | | 85 | X | 13 | 13 16 15 | NP | 17 | | 489.0 | Dolostone fragments in the head of the spoon --difficult drilling from 104 feet-- --WEATHERED BEDROCK-- | 105 | X | 17 | 50/6 | NP | 18 |
| | 484.5 | | 90 | X | 14 | 17 19 25 | NP | 20 | | 484.5 | --ROLLER BIT REFUSAL-- Boring terminated at 108.50 ft | 110 | | | | | |
| | 499.0 | Dense, gray SILT; saturated | 95 | X | 15 | 13 17 18 | NP | 25 | | | | 115 | | | | | |
| | 496.3 | Dense, brown GRAVELLY SAND; wet | 100 | X | 16 | 18 21 22 | NP | 15 | | | | 120 | | | | | |

GENERAL NOTES

Begin Drilling **06-26-2014** Complete Drilling **06-26-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **NA**
 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 11000401.GPJ WANGENG.GDT 10/18/16



BORING LOG 23-RWB-05

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.28 ft
 North: 1898793.23 ft
 East: 1171675.68 ft
 Station: 6337+31.20
 Offset: 54.1130 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|-----------|----------------------|
| | 591.8 | 6-inch thick, dark brown SANDY LOAM --TOPSOIL-- Loose, brown GRAVELLY SANDY LOAM --FILL-- | | | 1 | 6 3 3 | NP | 13 | | | | | | 9 | 2 2 4 | 0.57 B | 22 |
| | 589.3 | Loose to medium dense, brown and gray, fine SAND, trace gravel --FILL-- | | | 2 | 4 4 6 | NP | 10 | | | | 25 | | 10 | 2 2 3 | 0.41 B | 24 |
| | | | | | 3 | 10 5 3 | NP | 19 | | | | | | 11 | 2 2 3 | 0.41 B | 24 |
| | 584.3 | Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel | | | 4 | 5 2 2 | 0.80 B | 19 | | | | | | 12 | 1 2 2 | 0.32 B | 24 |
| | | | | | 5 | 2 2 2 | 0.33 B | 26 | | | | | | | | | |
| | | | | | 6 | 1 1 2 | 0.16 B | 27 | | | | | | 13 | 0 2 3 | 0.33 B | 25 |
| | | | | | 7 | 0 2 1 | 0.33 B | 25 | | | | | | | | | |
| | | | | | 8 | 1 2 3 | 0.41 B | 20 | | | | | | 14 | 3 3 3 | 0.41 B | 24 |

GENERAL NOTES

Begin Drilling **08-18-2014** Complete Drilling **08-18-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **P&N** Logger **H. Bista** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **5.50 ft**
 At Completion of Drilling ∇ **unable to measure**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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

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BORING LOG 23-RWB-05

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.28 ft
 North: 1898793.23 ft
 East: 1171675.68 ft
 Station: 6337+31.20
 Offset: 54.1130 RT

| 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 (%) |
|-------------------------------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 545.5 | Medium stiff to stiff, gray SILTY CLAY to SILTY CLAY LOAM, little to some gravel | 45 | X | 15 | 3 3 5 | 0.74 B | 25 | | | | | | | | | |
| | | | 50 | X | 16 | 4 10 11 | 0.82 B | 25 | | | | | | | | | |
| | | | 55 | X | 17 | 4 6 7 | 0.90 B | 22 | | | | | | | | | |
| | 532.3 | | 60 | X | 18 | 10 16 14 | 1.39 B | 19 | | | | | | | | | |
| Boring terminated at 60.00 ft | | | | | | | | | | | | | | | | | |

GENERAL NOTES

Begin Drilling **08-18-2014** Complete Drilling **08-18-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **P&N** Logger **H. Bista** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **5.50 ft**
 At Completion of Drilling ∇ **unable to measure**
 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 11000401.GPJ WANGENG.GDT 10/18/16



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BORING LOG 23-RWB-05HA

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 583.84 ft
 North: 1898780.96 ft
 East: 1171640.86 ft
 Station: 6337+25.29
 Offset: 17.6471 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 582.8 | Black SILTY LOAM --TOPSOIL-- | | | 1 | PUSH | NP | 16 | | | | | | | | | |
| | 580.3 | Very stiff, gray SILTY CLAY LOAM, trace gravel --FILL-- | | | 2 | PUSH | 2.00 P | 16 | | | | | | | | | |
| | | Very stiff, gray SILTY CLAY LOAM, trace gravel | 5 | | 3 | PUSH | 2.50 P | 18 | | | | | | | | | |
| | | | | | 4 | PUSH | 2.00 P | 18 | | | | | | | | | |
| | 575.8 | Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel | | | 5 | PUSH | 0.50 P | 19 | | | | | | | | | |
| | | | 10 | | 6 | PUSH | 0.75 P | 19 | | | | | | | | | |
| | | | | | 7 | PUSH | 0.25 P | 21 | | | | | | | | | |
| | | | 15 | | 8 | PUSH | 0.25 P | 22 | | | | | | | | | |
| | 567.8 | Boring terminated at 16.00 ft | | | | | | | | | | | | | | | |

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **07-28-2014** Complete Drilling **07-28-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
 Driller **K&K** Logger **F. Bozga** Checked by **C. Marin**
 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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WANGENGINC 11000401.GPJ WANGENG.GDT 10/18/16



BORING LOG SB90-SGB-07

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.81 ft
 North: 1898785.77 ft
 East: 1171466.21 ft
 Station: 6216+64.92
 Offset: 28.7803 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 577.3 | 6-inch thick, ASPHALT --PAVEMENT-- | | | | | | | | | | | | | | | |
| | 576.7 | 7-inch thick, CONCRETE --BASE COURSE-- | | | | | | | | | | | | | | | |
| | | Medium dense to dense, gray SANDY GRAVEL, crushed stone --BASE COURSE-- | | | 1 | 17 18 17 17 | NP | 6 | | | | | | | | | |
| | 573.6 | Soft to medium stiff, gray SILTY CLAY LOAM, trace gravel | 5 | | 2 | 13 10 7 4 | NP | 8 | | | | | | | | | |
| | | | | | 3 | 2 2 3 3 | 0.98 B | 21 | | | | | | | | | |
| | | | | | 4 | 1 2 2 2 | 0.49 B | 24 | | | | | | | | | |
| | | | | | 5 | 2 2 3 3 | 0.49 B | 23 | | | | | | | | | |
| | 566.8 | Boring terminated at 11.00 ft | | | | | | | | | | | | | | | |

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-26-2014** Complete Drilling **10-26-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
 Driller **P&P** Logger **F. Bozga** Checked by **RKC**
 Drilling Method **2.25" SSA, boring backfilled upon completion**

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

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BORING LOG VST-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 585.26 ft
 North: 1899543.57 ft
 East: 1171652.91 ft
 Station: 8415+02.96
 Offset: 258.109 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 579.8 | Medium stiff, black and gray SILTY CLAY, trace sand and gravel --FILL-- | 5 | | 1 | 6 4 3 | 0.90 B | 28 | | | --In-Situ Vane Shear, 20.5 feet-- -- $S_{u\ undis}$ = 884.6 psf-- -- $S_{u\ remold}$ = 655.2 psf-- --Sensitivity = 1.4-- | 25 | | 5 | | | |
| | 576.8 | Very soft, gray SILTY CLAY, trace sand and gravel | 5 | | 2 | 1 2 1 | 0.20 B | 25 | | | --In-Situ Vane Shear, 23.0 feet-- -- $S_{u\ undis}$ = 939.2 psf-- -- $S_{u\ remold}$ = 655.2 psf-- --Sensitivity = 1.4-- | 30 | | 7 | | | |
| | | | 10 | | 1 | | | | | | --In-Situ Vane Shear, 25.5 feet-- -- $S_{u\ undis}$ = 786.3 psf-- -- $S_{u\ remold}$ = 611.6 psf-- --Sensitivity = 1.3-- | 35 | | 8 | | | |
| | | | 15 | | 2 | | | | | | --In-Situ Vane Shear, 28.0 feet-- -- $S_{u\ undis}$ = 644.3 psf-- -- $S_{u\ remold}$ = 382.2 psf-- --Sensitivity = 1.7-- | 40 | | 9 | | | |
| | | | 20 | | 3 | | | | | | --In-Situ Vane Shear, 30.5 feet-- -- $S_{u\ undis}$ = 720.8 psf-- -- $S_{u\ remold}$ = 458.7 psf-- --Sensitivity = 1.6-- | | | 10 | | | |
| | | | | | 4 | | | | | | --In-Situ Vane Shear, 33.0 feet-- -- $S_{u\ undis}$ = 851.8 psf-- -- $S_{u\ remold}$ = 567.9 psf-- --Sensitivity = 1.5-- | | | 11 | | | |
| | | | | | | | | | | | --In-Situ Vane Shear, 35.5 feet-- -- $S_{u\ undis}$ = 895.5 psf-- -- $S_{u\ remold}$ = 666.2 psf-- --Sensitivity = 1.3-- | | | 12 | | | |
| | | | | | | | | | | | --In-Situ Vane Shear, 38.0 feet-- -- $S_{u\ undis}$ = 993.8 psf-- -- $S_{u\ remold}$ = 720.8 psf-- --Sensitivity = 1.4-- | | | | | | |

GENERAL NOTES

Begin Drilling **12-04-2015** Complete Drilling **12-05-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
 Driller **R&N** Logger **I. Muhammad** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring**
backfilled upon completion

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **unable to measure**
 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 11000401.GPJ WANGENG.GDT 10/18/16



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BORING LOG VST-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 585.26 ft
 North: 1899543.57 ft
 East: 1171652.91 ft
 Station: 8415+02.96
 Offset: 258.109 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | | --In-Situ Vane Shear, 40.5 feet-- -- $S_{u\text{undis}}$ = 1277.7 psf-- -- $S_{u\text{remold}}$ = 808.1 psf-- --Sensitivity = 1.6-- | | | 13 | VS | | | | | | | | | | | |
| | 541.8 | --In-Situ Vane Shear, 43.0 feet-- -- $S_{u\text{undis}}$ > 1750 psf-- Boring terminated at 43.50 ft | | | 14 | VS | | | | | | | | | | | |
| | | | 45 | | | | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | | | | |
| | | | 55 | | | | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | | | | |

GENERAL NOTES

Begin Drilling **12-04-2015** Complete Drilling **12-05-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
 Driller **R&N** Logger **I. Mohamud** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **Rotary wash**
 At Completion of Drilling ∇ **unable to measure**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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



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BORING LOG VST-06

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 585.69 ft
 North: 1898109.29 ft
 East: 1171902.18 ft
 Station: 5213+64.18
 Offset: 85.921 RT

| 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 (%) |
|---------|----------------|---|------------|----------------------|------------|-----------------------|-----------|----------------------|---------|----------------|---|------------|----------------------|------------|-----------------------|----------|----------------------|
| | 580.2 | Hard, brown SILTY CLAY LOAM, trace gravel --FILL-- | 5 | | 1 | 7 6 6 | 4.50 P | 16 | | | --In-Situ Vane Shear, 20.5 feet-- --S _{u undis} = 775.4 psf-- --S _{u remold} = 360.4 psf-- --Sensitivity = 2.2-- | 25 | | 5 | | | |
| | 576.7 | Soft, gray SILTY CLAY LOAM | 5 | | 2 | 1 2 3 | 0.41 B | 23 | | | --In-Situ Vane Shear, 23.0 feet-- --S _{u undis} = 600.6 psf-- --S _{u remold} = 305.8 psf-- --Sensitivity = 2.0-- | 30 | | 7 | | | |
| | | | 10 | | 1 | | | | | | --In-Situ Vane Shear, 25.5 feet-- --S _{u undis} = 578.8 psf-- --S _{u remold} = 316.7 psf-- --Sensitivity = 1.8-- | 35 | | 8 | | | |
| | | | 15 | | 2 | | | | | | --In-Situ Vane Shear, 28.0 feet-- --S _{u undis} = 611.6 psf-- --S _{u remold} = 338.5 psf-- --Sensitivity = 1.8-- | 40 | | 9 | | | |
| | | | 20 | | 3 | | | | | | --In-Situ Vane Shear, 30.5 feet-- --S _{u undis} = 786.3 psf-- --S _{u remold} = 382.2 psf-- --Sensitivity = 2.1-- | | | 10 | | | |
| | | | | | 4 | | | | | | --In-Situ Vane Shear, 33.0 feet-- --S _{u undis} = 698.9 psf-- --S _{u remold} = 404.1 psf-- --Sensitivity = 1.7-- | | | 11 | | | |
| | | | | | | | | | | | --In-Situ Vane Shear, 35.5 feet-- --S _{u undis} = 808.1 psf-- --S _{u remold} = 502.4 psf-- --Sensitivity = 1.6-- | | | 12 | | | |
| | | | | | | | | | | | --In-Situ Vane Shear, 38.0 feet-- --S _{u undis} = 982.9 psf-- --S _{u remold} = 546.0 psf-- --Sensitivity = 1.8-- | | | | | | |

GENERAL NOTES

Begin Drilling **12-09-2015** Complete Drilling **12-14-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
 Driller **R&N** Logger **F. Bozga** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **unable to measure**
 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 11000401.GPJ WANGENG.GDT 10/18/16



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BORING LOG VST-06

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 585.69 ft
 North: 1898109.29 ft
 East: 1171902.18 ft
 Station: 5213+64.18
 Offset: 85.921 RT

| 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 (%) |
|---------|----------------|--|------------|----------------------|------------|-----------------------|----------|----------------------|---------|----------------|---------------------------|------------|----------------------|------------|-----------------------|----------|----------------------|
| | | --In-Situ Vane Shear, 40.5 feet-- -- $S_{u\ undis}$ = 906.4 psf-- -- $S_{u\ remold}$ = 524.2 psf-- --Sensitivity = 1.7-- | | | 13 | VS | | | | | | | | | | | |
| | 542.2 | --In-Situ Vane Shear, 43.0 feet-- -- $S_{u\ undis}$ = 677.1 psf-- -- $S_{u\ remold}$ = 393.1 psf-- --Sensitivity = 1.7-- Boring terminated at 43.50 ft | | | 14 | VS | | | | | | | | | | | |
| | | | 45 | | | | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | | | | |
| | | | 55 | | | | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | | | | |

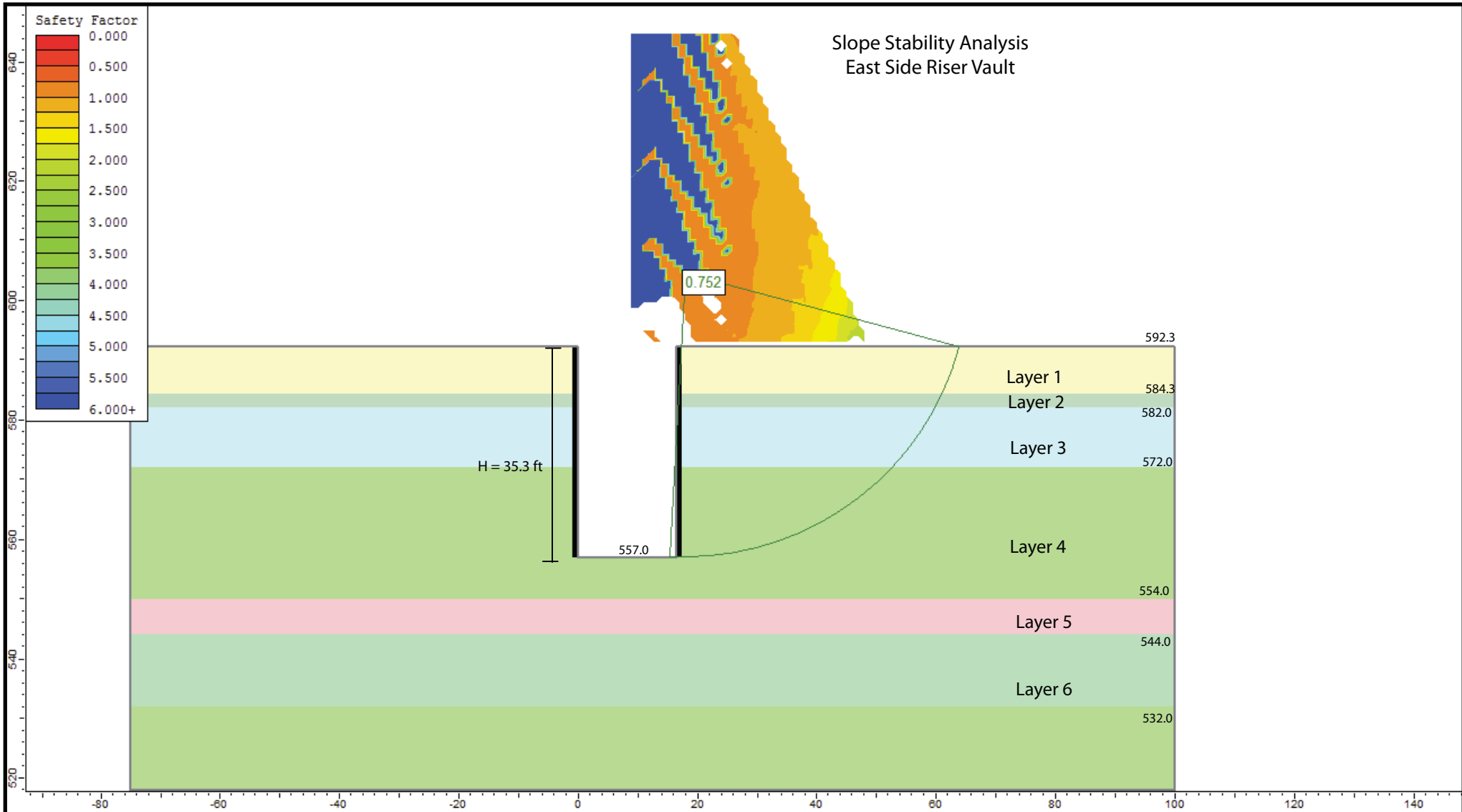
GENERAL NOTES

Begin Drilling **12-09-2015** Complete Drilling **12-14-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
 Driller **R&N** Logger **F. Bozga** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA


While Drilling **Rotary wash**
 At Completion of Drilling **unable to measure**
 Time After Drilling **NA**
 Depth to Water **NA**

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

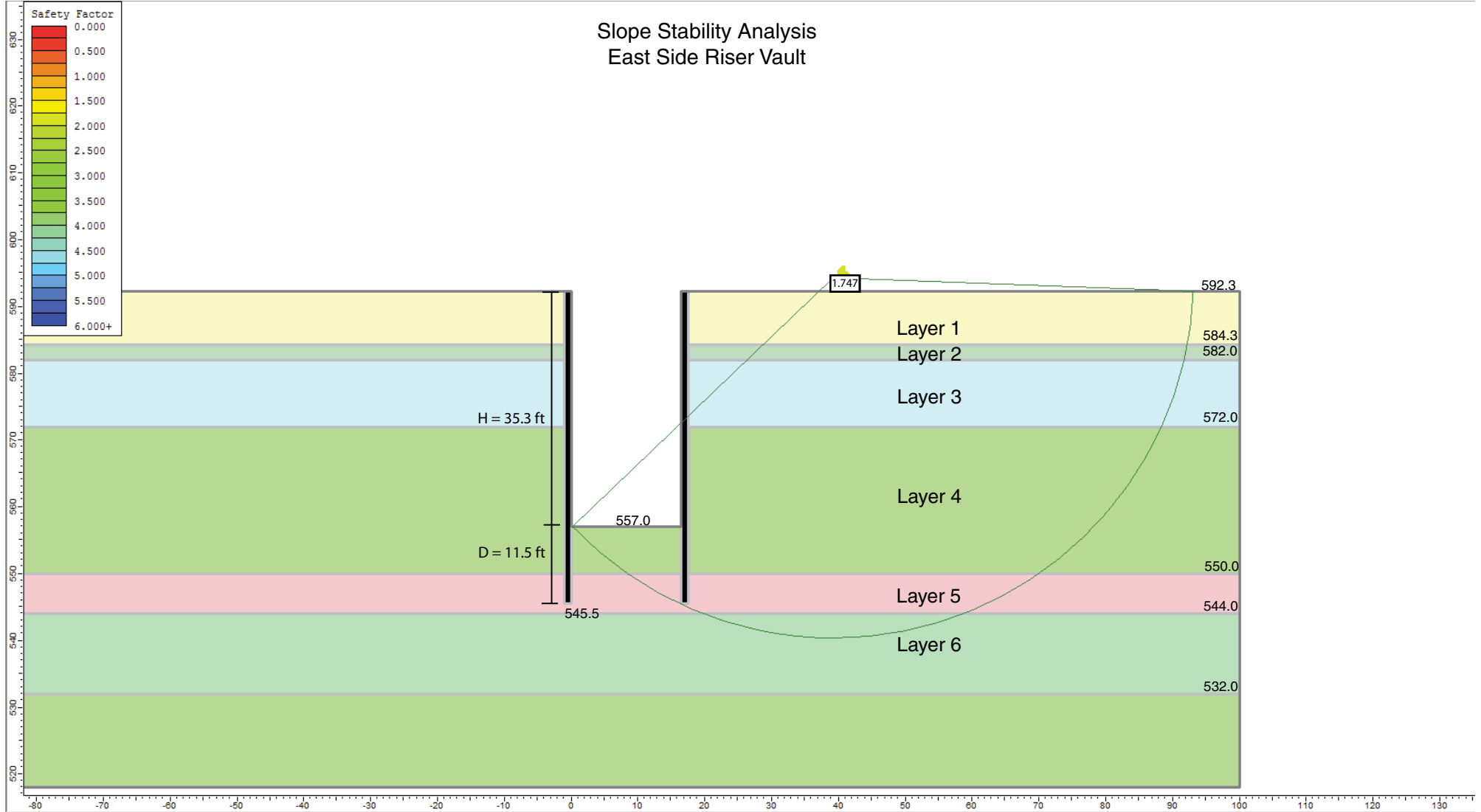


Undrained Analysis, East Side Riser Vault, Ref Borings 1702-B-03, 23-RW-05, VST-02 and VST-06

| Layer ID | Description | Unit Weight (pcf) | Undrained Cohesion (psf) | Undrained Friction Angle (degrees) |
|----------|--|-------------------|--------------------------|------------------------------------|
| 1 | Loose to M dense Sandy Loam to Sand FILL | 115 | 0 | 28 |
| 2 | M Stiff to Stiff CLAY to SILTY CLAY | 115 | 950 | 0 |
| 3 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 550 | 0 |
| 4 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 720 | 0 |
| 5 | M Stiff CLAY to SILTY CLAY | 110 | 980 | 0 |
| 6 | Stiff SILTY CLAY to SILTY CLAY LOAM | 120 | 1500 | 0 |

| | | |
|--|--|---|
| GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION CONTRACT 62A75, JACKSON BOULEVARD WATERMAIN, COOK COUNTY, IL | | |
| SCALE: GRAPHICAL | | DRAWN BY: NSB CHECKED BY: MAK |
|  | | 1145 N. Main Street Lombard, IL 60148 www.wangeng.com |
| FOR AECOM | | 1100-04-01 |

Slope Stability Analysis East Side Riser Vault



Undrained Analysis, East Side Riser Vault, Ref Borings 1702-B-03, 23-RW-05, VST-02 and VST-06

| Layer ID | Description | Unit Weight (pcf) | Undrained Cohesion (psf) | Undrained Friction Angle (degrees) |
|----------|--|-------------------|--------------------------|------------------------------------|
| 1 | Loose to M dense Sandy Loam to Sand FILL | 115 | 0 | 28 |
| 2 | M Stiff to Stiff CLAY to SILTY CLAY | 115 | 950 | 0 |
| 3 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 550 | 0 |
| 4 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 720 | 0 |
| 5 | M Stiff CLAY to SILTY CLAY | 110 | 980 | 0 |
| 6 | Stiff SILTY CLAY to SILTY CLAY LOAM | 120 | 1500 | 0 |

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION
CONTRACT 62A75, JACKSON BOULEVARD WATERMAIN, COOK COUNTY, IL

SCALE: GRAPHICAL

APPENDIX 2

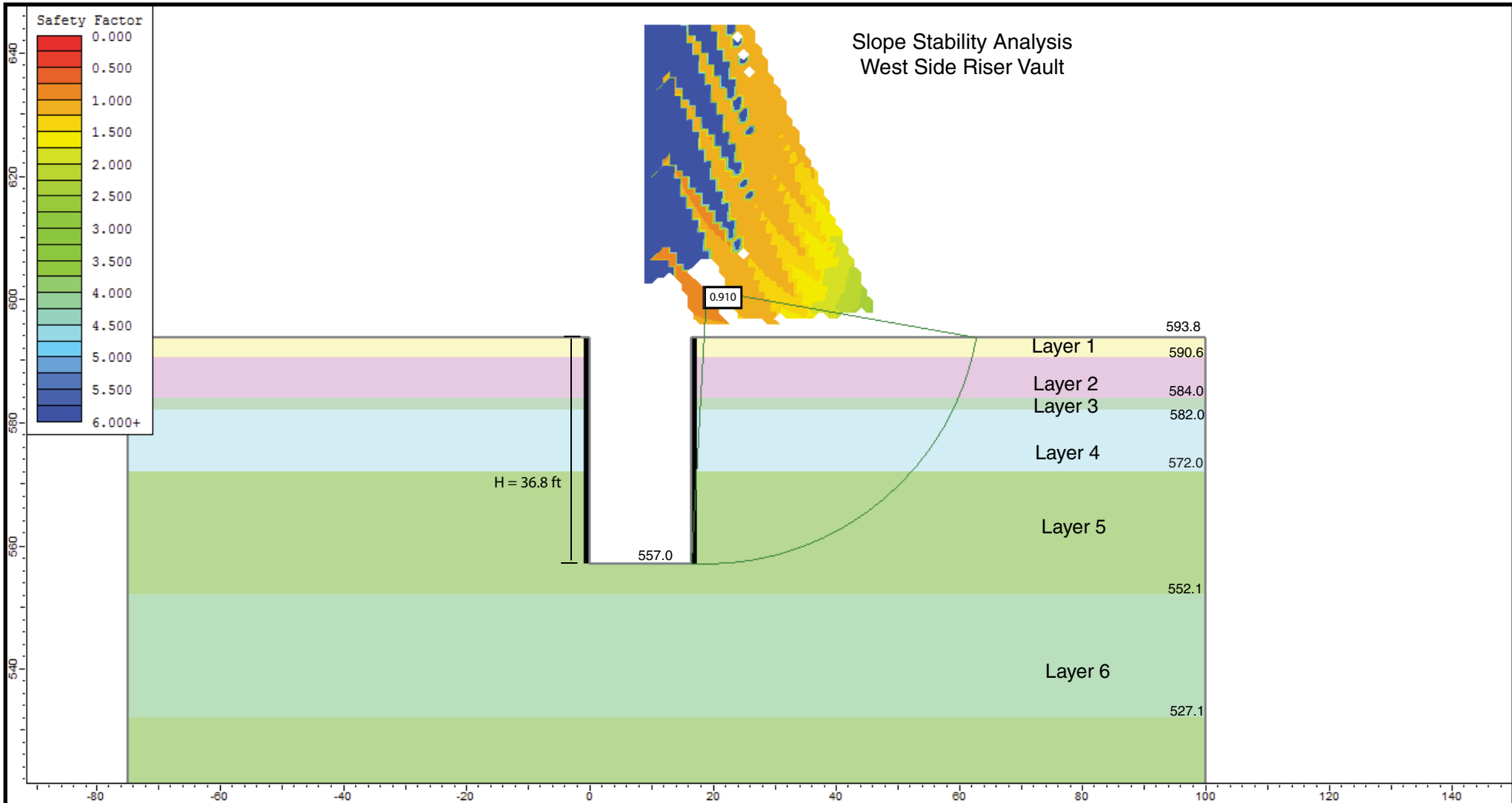
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CHECKED BY: MAK



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


FOR AECOM

1100-04-01

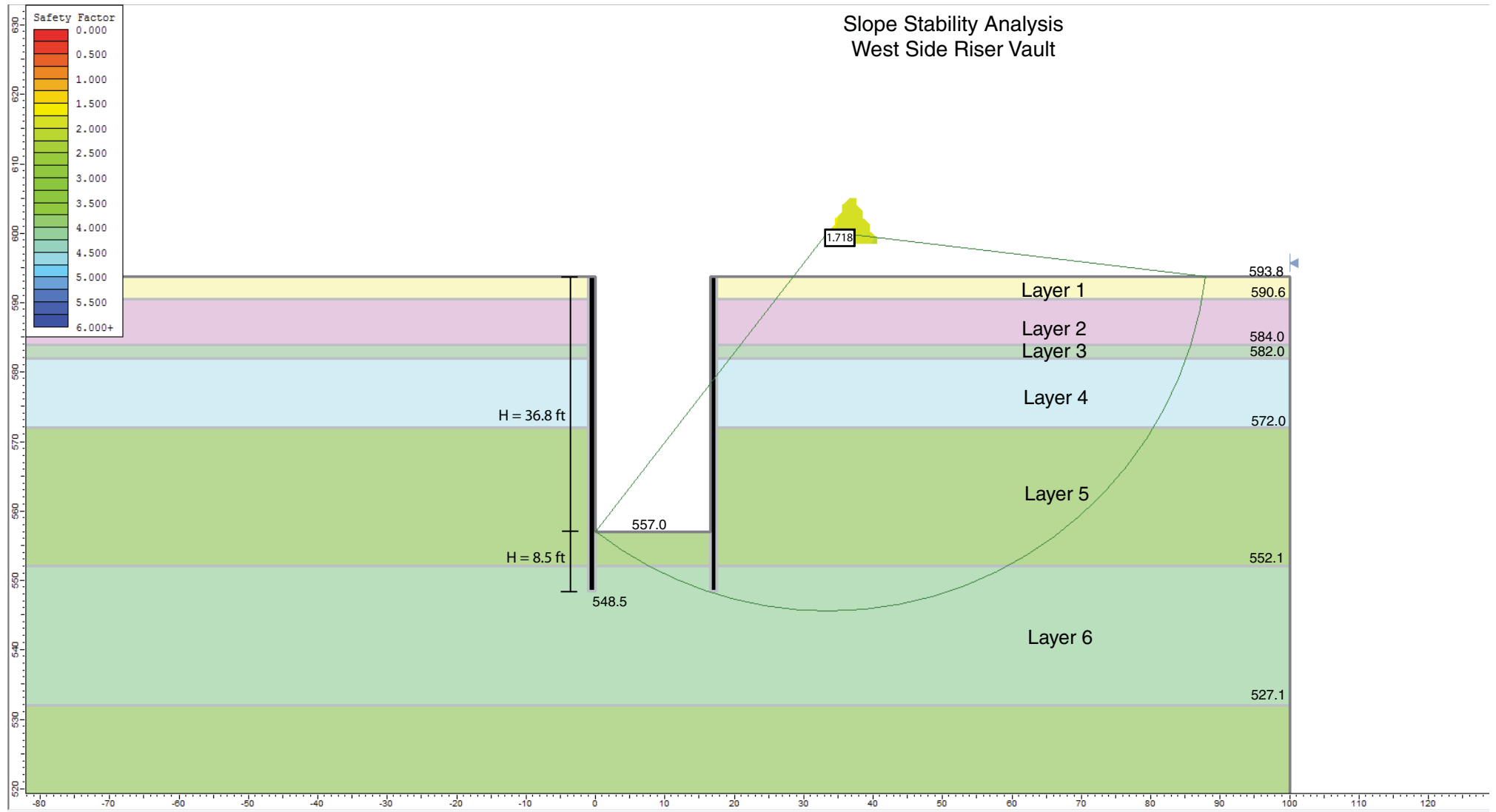


Undrained Analysis, West Side Riser Vault, Ref Borings 1702-B-01, VST-02 and VST-06

| Layer ID | Description | Unit Weight (pcf) | Undrained Cohesion (psf) | Undrained Friction Angle (degrees) |
|----------|--|-------------------|--------------------------|------------------------------------|
| 1 | Loose to M dense Sandy Loam to Sand FILL | 115 | 0 | 28 |
| 2 | Stiff to V Stiff SILTY CLAY LOAM | 120 | 1900 | 0 |
| 3 | M Stiff to Stiff CLAY to SILTY CLAY | 115 | 950 | 0 |
| 4 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 550 | 0 |
| 5 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 720 | 0 |
| 6 | Stiff SILTY CLAY to SILTY CLAY LOAM | 120 | 1500 | 0 |


| | | |
|--|-------------------|---|
| GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION CONTRACT 62A75, JACKSON BOULEVARD WATERMAIN, COOK COUNTY, IL | | |
| SCALE: GRAPHICAL | APPENDIX 3 | DRAWN BY: NSB CHECKED BY: MAK |
|  | | 1145 N. Main Street Lombard, IL 60148 www.wangeng.com |
| | | FOR AECOM |

Slope Stability Analysis West Side Riser Vault



Undrained Analysis, West Side Riser Vault, Ref Borings 1702-B-01, VST-02 and VST-06

| Layer ID | Description | Unit Weight (pcf) | Undrained Cohesion (psf) | Undrained Friction Angle (degrees) |
|----------|--|-------------------|--------------------------|------------------------------------|
| 1 | Loose to M dense Sandy Loam to Sand FILL | 115 | 0 | 28 |
| 2 | Stiff to V Stiff SILTY CLAY LOAM | 120 | 1900 | 0 |
| 3 | M Stiff to Stiff CLAY to SILTY CLAY | 115 | 950 | 0 |
| 4 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 550 | 0 |
| 5 | Soft to M Stiff CLAY to SILTY CLAY | 110 | 720 | 0 |
| 6 | Stiff SILTY CLAY to SILTY CLAY LOAM | 120 | 1500 | 0 |

| | | |
|--|-------------------|---|
| GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION CONTRACT 62A75, JACKSON BOULEVARD WATERMAIN, COOK COUNTY, IL | | |
| SCALE: GRAPHICAL | APPENDIX 4 | DRAWN BY: NSB CHECKED BY: MAK |
|  | | 1145 N. Main Street Lombard, IL 60148 www.wangeng.com |
| FOR AECOM | | 1100-04-01 |

NOTES:

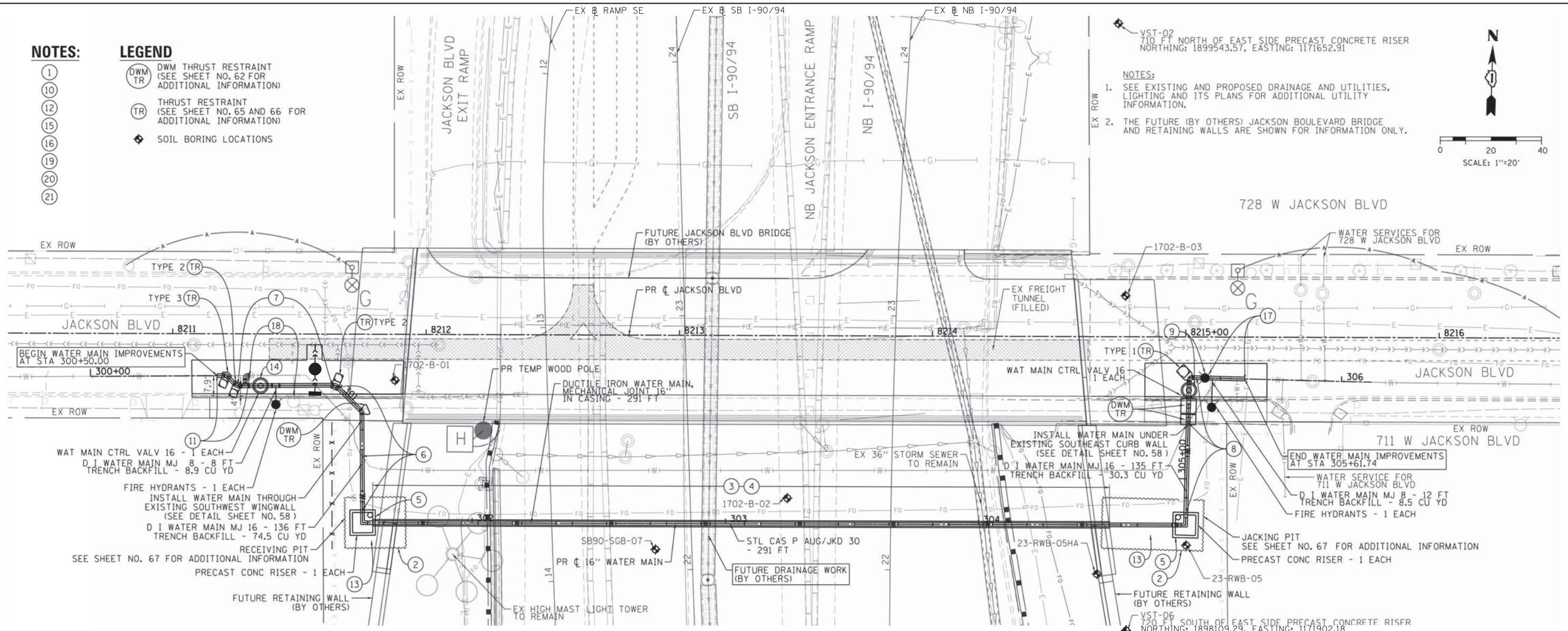
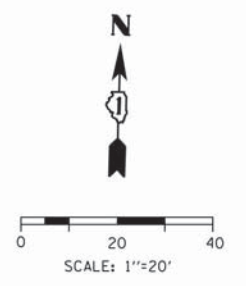
- 1
- 10
- 12
- 15
- 16
- 19
- 20
- 21

LEGEND

- DWM THRUST RESTRAINT (SEE SHEET NO. 62 FOR ADDITIONAL INFORMATION)
- THRUST RESTRAINT (SEE SHEET NO. 65 AND 66 FOR ADDITIONAL INFORMATION)
- SOIL BORING LOCATIONS

VST-02
710 FT NORTH OF EAST SIDE PRECAST CONCRETE RISER
NORTHING: 1899543.57, EASTING: 1171652.91

- NOTES:**
- SEE EXISTING AND PROPOSED DRAINAGE AND UTILITIES, LIGHTING AND ITS PLANS FOR ADDITIONAL UTILITY INFORMATION.
 - THE FUTURE (BY OTHERS) JACKSON BOULEVARD BRIDGE AND RETAINING WALLS ARE SHOWN FOR INFORMATION ONLY.



CONSTRUCTION/SEQUENCING NOTES:

- THE EXISTING 16" WATER MAIN CROSSING MUST BE KEPT IN SERVICE DURING CONSTRUCTION OF THE NEW 16" WATER MAIN CROSSING IN ORDER TO MAINTAIN THE WATER SUPPLY FROM EITHER DIRECTION TO THE DUAL WATER SERVICES FOR THE BUILDING LOCATED AT 728 W JACKSON BLVD. INTERRUPTIONS TO SERVICE SHALL ONLY BE PERMITTED FOR THE CONNECTION WORK SEQUENCES AS DESCRIBED BELOW. THE CONTRACTOR SHALL LIMIT THE SERVICE INTERRUPTIONS TO THE SPECIFIED TIME PERIODS. IF THE WORK CANNOT BE COMPLETED WITHIN THE SPECIFIED TIME PERIOD, THE CONTRACTOR SHALL WORK CONTINUOUSLY FOR AS LONG AS NECESSARY TO COMPLETE THE WORK AND RESTORE THE WATER SUPPLY TO THE SATISFACTION OF CDWM.
- INSTALL EXCAVATION AREAS ON THE EAST AND WEST SIDES REQUIRED FOR AUGERING AND JACKING OF THE CASING PIPE AND FOR CONSTRUCTION OF THE RISER SHAFTS. PROTECT THE EXISTING ADJACENT 16" WATER MAIN SO IT IS NOT DAMAGED DURING CONSTRUCTION.
- INSTALL 291'-30" STEEL CASING PIPE BETWEEN STATIONS 301+61 AND 304+52
- INSTALL 16" WATER MAIN IN CASING PIPE USING CASING SPACERS.
- CONSTRUCT BASE AND WALLS OF NEW PRE-CAST RISER SHAFTS. SEE SHEET NO. 64. INSTALL 16" PIPE AND FITTINGS AS SHOWN IN THE RISER SHAFTS. RESTRAIN TOP AND BOTTOM BASE BENDS, INSTALL 2" TAP FOR FLUSHING ON TOP OF PIPE IN RISER SHAFT. CONNECT RISER PIPING TO 16" WATER MAIN IN CASING PIPE WITH 16" PIPE AND 1-16" MJ SLEEVE AT EACH LOCATION. INSTALL ROOF SLAB.
- INSTALL 16" PIPE AS SHOWN FROM THE RISER SHAFT TO THE NORTH AND WEST IN JACKSON BLVD. INSTALL 2-16" X 1/8 BENDS AT APPROXIMATELY STATIONS 300+98 AND 301+13. THE CONTRACTOR SHALL CONFIRM THE ACTUAL ELEVATION IN THE FIELD OF THE EXISTING WATER MAIN WHERE IT CROSSES THE PROPOSED WATER MAIN. THE ELEVATION OF THE PROPOSED WATER MAIN SHALL BE ADJUSTED AS NECESSARY TO CROSS OVER OR UNDER THE EXISTING WATER MAIN TO MAINTAIN A MINIMUM OF 5' OF COVER ON THE PROPOSED WATER MAIN. INSTALL ADDITIONAL BENDS AS REQUIRED TO ADJUST THE HORIZONTAL AND VERTICAL ALIGNMENT. SUPPORT AND PROTECT THE EXISTING WATER MAIN WHEN CROSSING UNDERNEATH WITH THE PROPOSED WATER MAIN. CORE THROUGH EXISTING WING WALL TO FACILITATE PIPE ROUTING (SEE DETAIL ON SHEET NO. 58) BUILD THRUST RESTRAINT.

- INSTALL 16" PIPE AS SHOWN TO THE WEST IN JACKSON BLVD. INSTALL 1-16" X 8" MJ TEE, 8" MJ PIPE AND FIRE HYDRANT. INSTALL 1-16" MJ GATE VALVE AND 2-2" TEST TAPS AT STA 300+69. BUILD VALVE BASIN (SEE DETAILS). INSTALL 1-16" X 16" MJ TEE AT STA 300+63 FOR TEMPORARY CONNECTION TO EXISTING 16" WATER MAIN. INSTALL 1-16" X 1/8 MJ BEND AT STA 300+59 FOR PERMANENT CONNECTION. BUILD THRUST RESTRAINTS.
- INSTALL 16" PIPE AS SHOWN FROM THE RISER SHAFT TO THE NORTH AND EAST IN JACKSON BLVD. INSTALL 1-16" X 1/4 BEND AT APPROXIMATELY STATION 305+40. THE CONTRACTOR SHALL CONFIRM THE ACTUAL ELEVATION IN THE FIELD OF THE EXISTING WATER MAIN WHERE IT CROSSES THE PROPOSED WATER MAIN. THE ELEVATION OF THE PROPOSED WATER MAIN SHALL BE ADJUSTED AS NECESSARY TO CROSS OVER OR UNDER THE EXISTING WATER MAIN TO MAINTAIN A MINIMUM OF 5' OF COVER ON THE PROPOSED WATER MAIN. INSTALL 2-16" X 1/16 MJ BEND AT STA 305+23 AND 305+29 TO ADJUST VERTICAL ALIGNMENT. INSTALL ADDITIONAL BENDS AS REQUIRED TO ADJUST THE HORIZONTAL AND VERTICAL ALIGNMENT. SUPPORT AND PROTECT THE EXISTING WATER MAIN WHEN CROSSING UNDERNEATH WITH THE PROPOSED WATER MAIN. BUILD THRUST RESTRAINTS.
- INSTALL 1-16" GATE VALVE AND 2-2" TEST TAPS AT STA 305+35. INSTALL TEMPORARY FLUSHING HYDRANT AT END OF PIPE AND BRACE. BUILD VALVE BASIN (SEE DETAILS).
- CONTACT CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM) TO ARRANGE FOR THE SHUTDOWN OF THE EXISTING 16" WATER MAIN (312-744-5070). NOTE: THERE ARE ACTIVE WATER SERVICES ON THE SECTION OF WATER MAIN TO BE SHUTDOWN. THE CONNECTION WORK DESCRIBED IN THE FOLLOWING NOTE MUST BE COMPLETED WITHIN 4 HOURS OF THE SHUTDOWN.
- CUT OUT AND REMOVE SECTION OF EXISTING 16" WATER MAIN. MAKE PERMANENT CONNECTION TO EXISTING 16" PIPE WITH 16" PIPE, 1-16" X 1/8 BEND AND 1-16" MJ SLEEVE OR TRANSITION SLEEVE IF REQUIRED. MAKE TEMPORARY CONNECTION TO EXISTING 16" WATER MAIN CROSSING WITH 16" PIPE, 1-16" X 1/4 BEND AND 1-16" MJ SLEEVE OR TRANSITION SLEEVE IF REQUIRED AND TEMPORARILY BRACE.
- CONTACT CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM) TO ARRANGE FOR OPENING CLOSED VALVES TO FILL, FLUSH AND RESTORE SERVICE TO THE EXISTING 16" WATER MAIN (312-744-5070).

- BEFORE THE NEW 16" WATER MAIN CAN BE FILLED, FLUSHED, AND PRESSURE TESTED, THE EXCAVATION AREA MUST BE BACKFILLED AROUND THE RISER SHAFT AND ALL PIPE STRUCTURAL RESTRAINT SYSTEMS MUST BE IN PLACE.
- SLOWLY OPEN NEW 16" MJ GATE VALVE (NOTE 7) AND THOROUGHLY FLUSH THE NEW 16" WATER MAIN FROM WEST TO EAST TO REMOVE ALL AIR.
- PRESSURE TEST AND DISINFECT THE NEW 16" WATER MAIN IN ACCORDANCE WITH CDWM REQUIREMENTS AND THE CONTRACT DOCUMENTS.
- AFTER APPROVAL OF THE PRESSURE TEST AND DISINFECTION BY CDWM, MAKE FINAL CONNECTIONS. CONTACT CDWM TO ARRANGE FOR THE SHUTDOWN OF THE EXISTING 16" WATER MAIN (312-744-5070). NOTE: THERE ARE ACTIVE WATER SERVICES ON THE SECTION OF WATER MAIN TO BE SHUTDOWN. THE CONNECTION WORK DESCRIBED IN THE FOLLOWING NOTES MUST BE COMPLETED WITHIN 4 HOURS OF THE SHUTDOWN.
- REMOVE TEMPORARY FLUSHING HYDRANT (NOTE 9). CUT OUT EXISTING 16" PIPE AND REMOVE EXISTING FIRE HYDRANT. INSTALL 1-16" X 8" MJ TEE, 8" MJ PIPE AND FIRE HYDRANT. CONNECT WITH 16" PIPE AND 1-16" MJ SLEEVE OR TRANSITION SLEEVE IF REQUIRED.
- REMOVE AND SALVAGE 16" X 1/4 BEND AND 1-16" MJ SLEEVE OR TRANSITION SLEEVE INSTALLED ON THE TEMPORARY CONNECTION TO THE EXISTING 16" MAIN (NOTE 11). PLUG THE 16" X 16" TEE WITH 1-16" MJ PLUG. REMOVE EXISTING FIRE HYDRANT.
- CONTACT CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM) TO ARRANGE FOR OPENING ANY REMAINING VALVES THAT WERE SHUTDOWN (312-744-5070). CONTRACTOR TO ASSIST WITH FLUSHING AS NECESSARY.
- REMOVE OR ABANDON THE EXISTING 16" WATER MAIN AS SHOWN ON THE DRAWINGS ON SHEET NO. 55.
- RESTORE ALL WATER MAIN TRENCHES PER THE DETAILED DRAWINGS.



D162A75-sht-Water-Pr.dgn
USER NAME = dishevo2
PLOT SCALE = 48.0000' / in.
PLOT DATE = 3/20/2017

| | |
|-------------------|-----------|
| DESIGNED - RBB | REVISED - |
| DRAWN - AFC | REVISED - |
| CHECKED - MJE | REVISED - |
| DATE - 03/21/2017 | REVISED - |

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**PROPOSED WATER MAIN PLAN
JACKSON BOULEVARD**

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

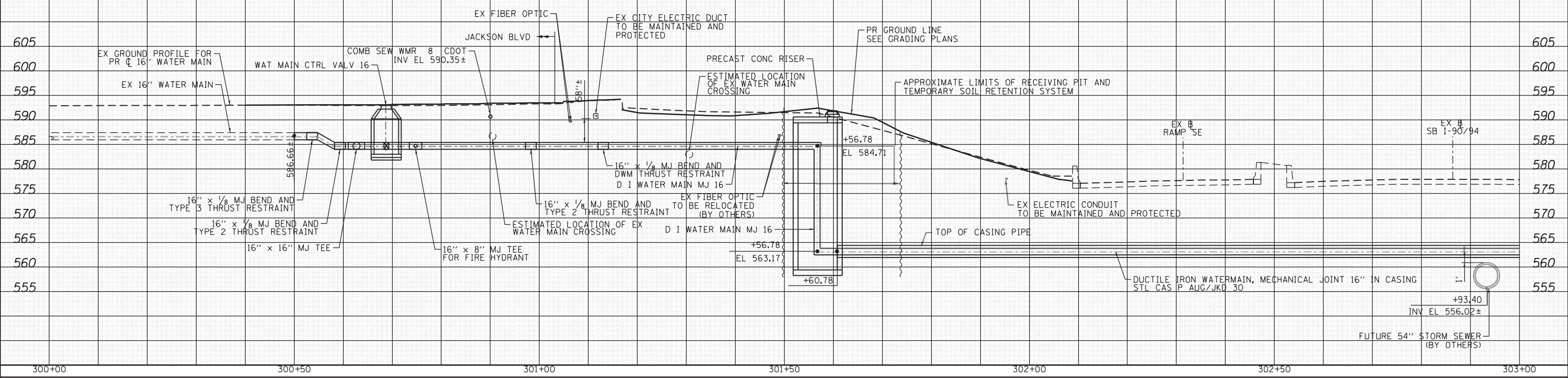
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| F.A.I. RTE. 90/94/290 | SECTION 2015-021-I | COUNTY COOK | TOTAL SHEETS 153 | SHEET NO. 56 |
| CONTRACT NO. 62A75 | | | | |
| ILLINOIS FED. AID PROJECT | | | | |

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|---------------|--|
| DATE | |
| BY | |
| SURVEYED | |
| PLOTTED | |
| TEMPLATE | |
| AREAS CHECKED | |
| FINISH | |
| NO. | |

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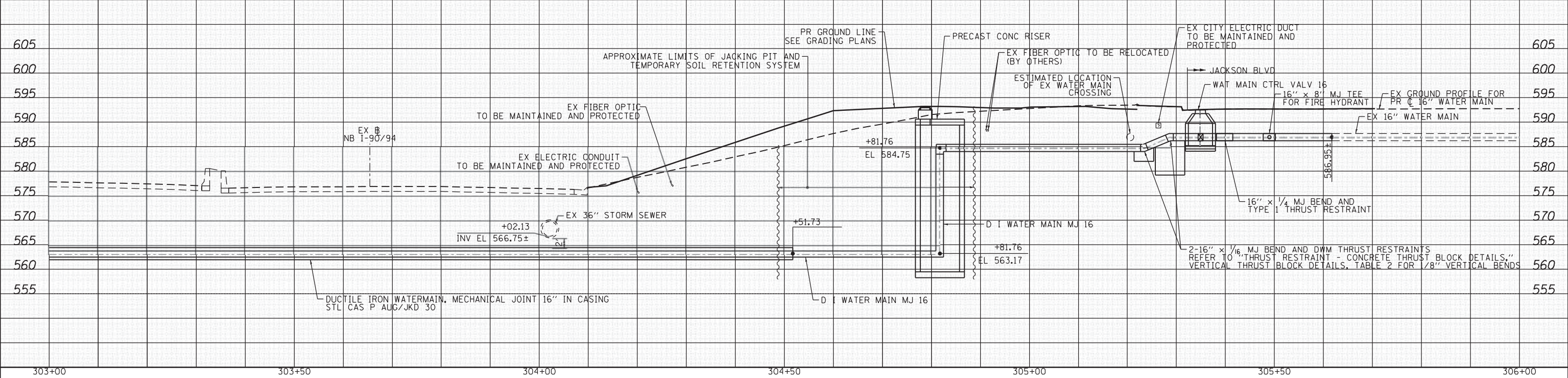
EXISTING UTILITIES ARE BASED UPON SURVEY LOCATION INFORMATION. DEPTHS OF UTILITIES ARE BASED UPON ASSUMED DEPTHS OR RECORD INFORMATION IF AVAILABLE. EXTENTS OF UNDERGROUND STRUCTURES ARE ESTIMATED UPON UTILITY ATLAS INFORMATION. EXISTING AND PROPOSED SEWER IS SHOWN BASED UPON SURVEY DATA, ATLAS INFORMATION AND THE PROPOSED PLANS.



| | |
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| DATE | |
| BY | |
| SURVEYED | |
| PLOTTED | |
| TEMPLATE | |
| AREAS CHECKED | |
| ORIGINAL | |
| NO. | |

NOTES

EXISTING UTILITIES ARE BASED UPON SURVEY LOCATION INFORMATION. DEPTHS OF UTILITIES ARE BASED UPON ASSUMED DEPTHS OR RECORD INFORMATION IF AVAILABLE. EXTENTS OF UNDERGROUND STRUCTURES ARE ESTIMATED UPON UTILITY ATLAS INFORMATION. EXISTING AND PROPOSED SEWER IS SHOWN BASED UPON SURVEY DATA, ATLAS INFORMATION AND THE PROPOSED PLANS.



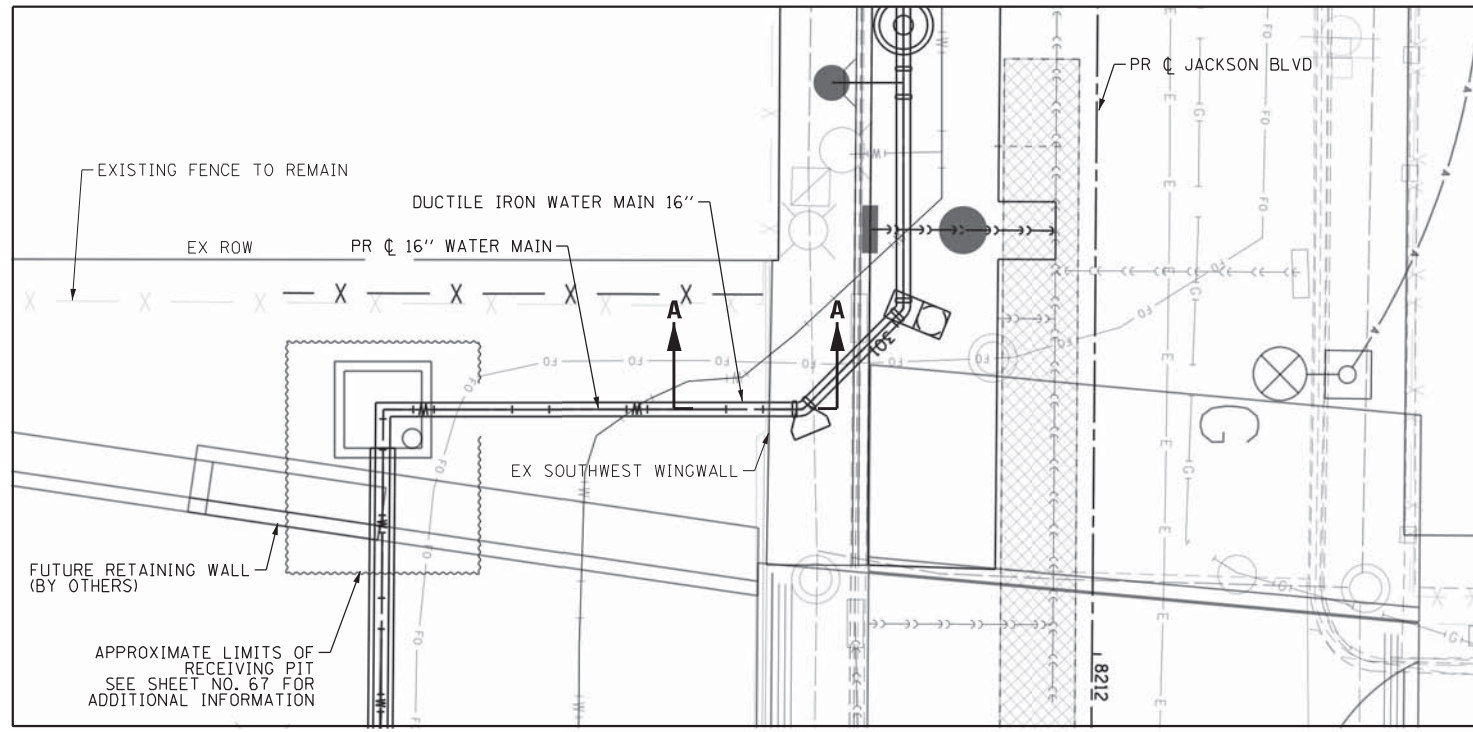
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| PLOT SCALE = 20.0000' / in. | CHECKED - MJE | REVISED - |
| PLOT DATE = 3/20/2017 | DATE - 03/21/2017 | REVISED - |

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

WATER MAIN PROFILE
JACKSON BOULEVARD

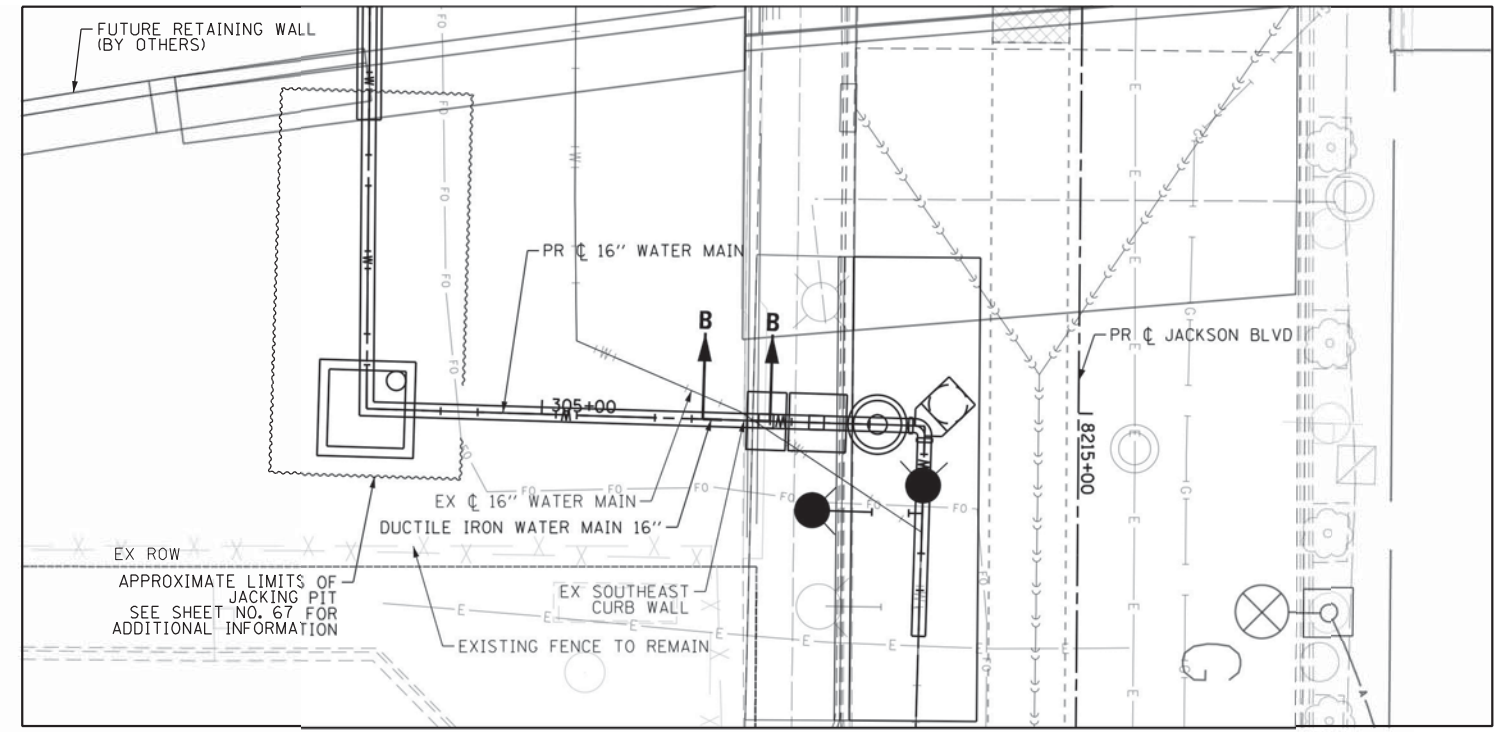
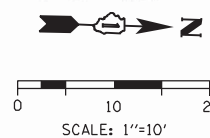
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| | | | | |
|---------------------------|------------|--------|--------------|-----------|
| F.A.I. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
| 90/94/290 | 2015-021-I | COOK | 153 | 57 |
| CONTRACT NO. 62A75 | | | | |
| ILLINOIS FED. AID PROJECT | | | | |



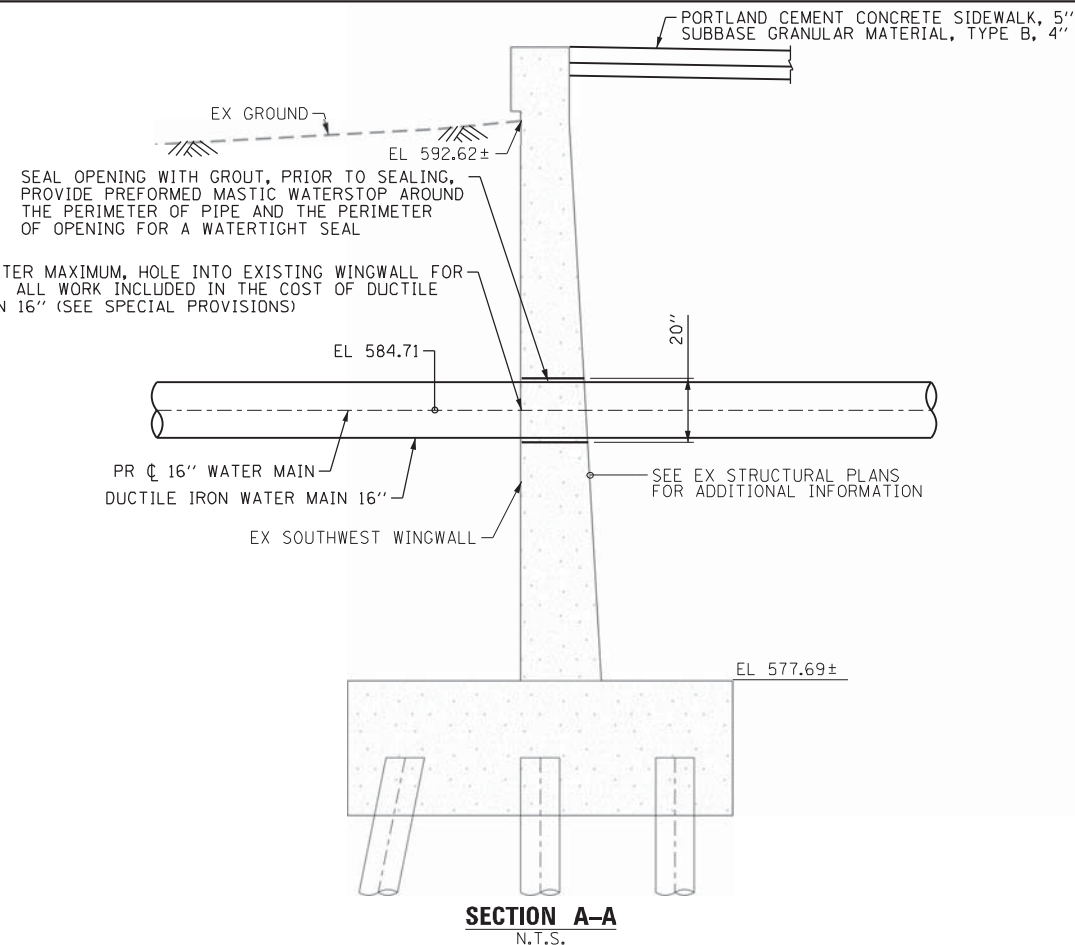
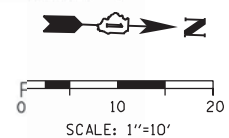
PLAN VIEW

SOUTHWEST SIDE OF JACKSON BLVD

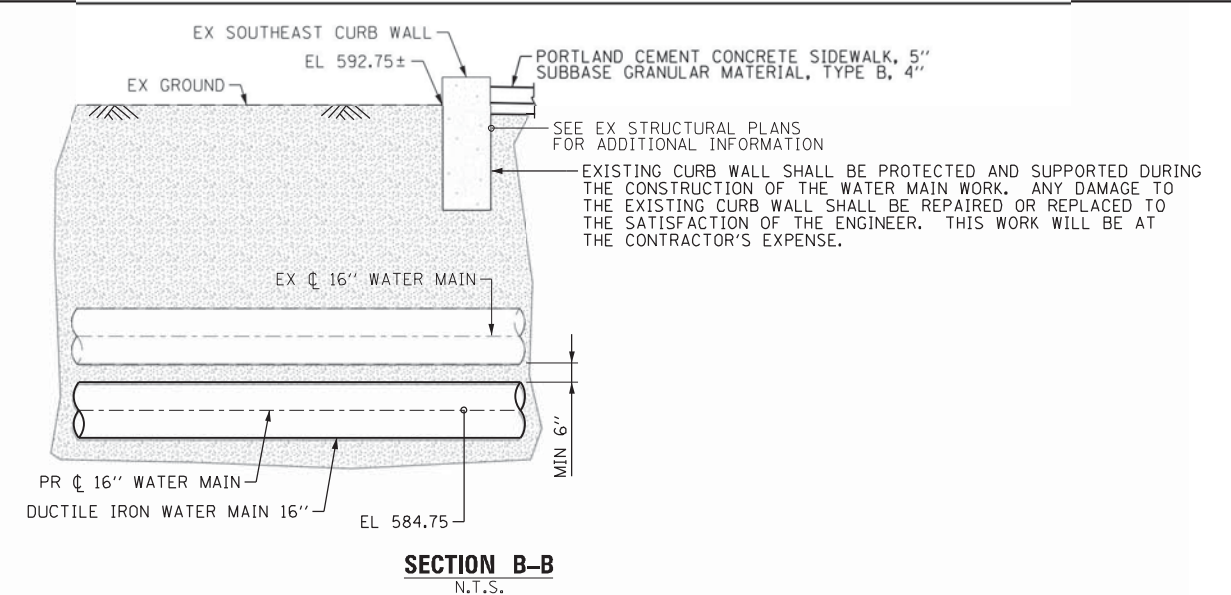


PLAN VIEW

SOUTHWEST SIDE OF JACKSON BLVD



SECTION A-A
N.T.S.



SECTION B-B
N.T.S.

NOTES:

- CONTRACTOR SHALL LOCATE EXISTING VERTICAL AND HORIZONTAL REINFORCING BARS IN THE WINGWALL BY NONDESTRUCTIVE METHODS. PER EXISTING PLAN INFORMATION, EXISTING HORIZONTAL AND VERTICAL WALL REINFORCING BARS ARE SPACED AT APPROXIMATELY 12" CENTERS. EXISTING WINGWALL IS APPROXIMATELY 2' THICK AT THE BASE AND APPROXIMATELY 1.42' THICK AT THE TOP.
- PRIOR TO DRILLING 20" DIAMETER MAXIMUM HOLE IN THE EXISTING WINGWALL, CONTRACTOR SHALL IDENTIFY REINFORCING BARS THAT ARE IMPACTED DUE TO DRILLING OPERATION AND SUBMIT HIS PROPOSED DRILLING PLAN TO THE ENGINEER FOR REVIEW AND APPROVAL. CONTRACTOR SHALL LOCATE THE PROPOSED DRILLED HOLE SUCH THAT IT MINIMIZES NUMBERS OF BARS TO BE CUT BY DRILLING OPERATION. CONTRACTOR SHALL NOT DAMAGE EXISTING WINGWALL DURING CONSTRUCTION.
- ANNULAR SPACE BETWEEN PROPOSED WATER MAIN AND CORE HOLE SHALL BE GROUTED WITH APPROVED NON-SHRINK GROUT. PRIOR TO GROUTING PROVIDE PREFORMED MASTIC WATERSTOP AROUND PIPE AND OPENING FOR A WATERTIGHT SEAL.

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D162828872-SHT-WM-DET-00.dgn
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 PLOT SCALE = 20.0000' / in.
 PLOT DATE = 3/20/2017

DESIGNED - RBB/ATB
 DRAWN - AFC
 CHECKED - MJE
 DATE - 03/21/2017

REVISED -
 REVISED -
 REVISED -
 REVISED -

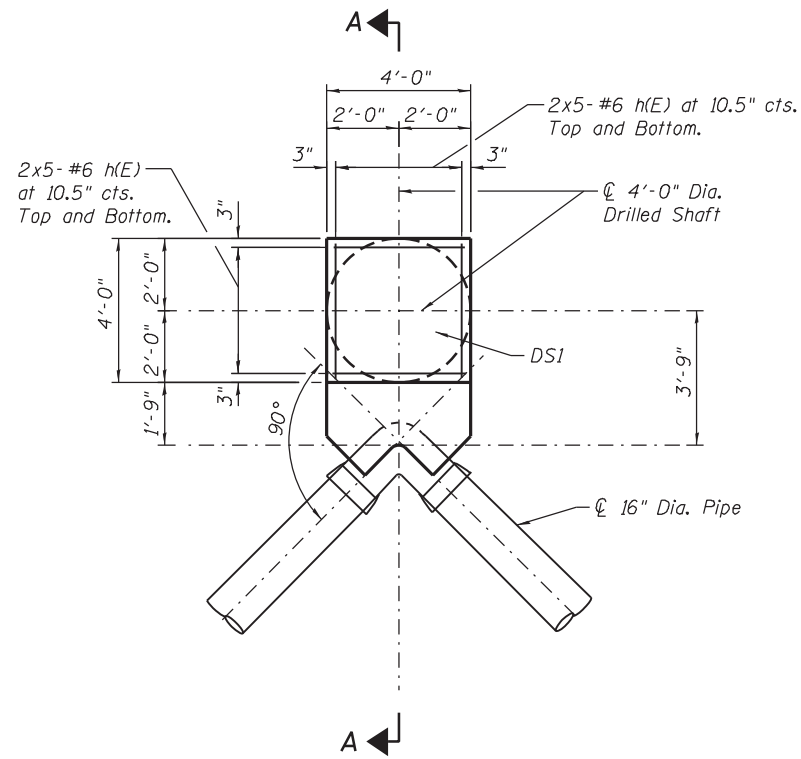
STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

JACKSON BOULEVARD - WATER MAIN DETAILS
 WATER MAIN CROSSING AT WINGWALL/CURB WALL

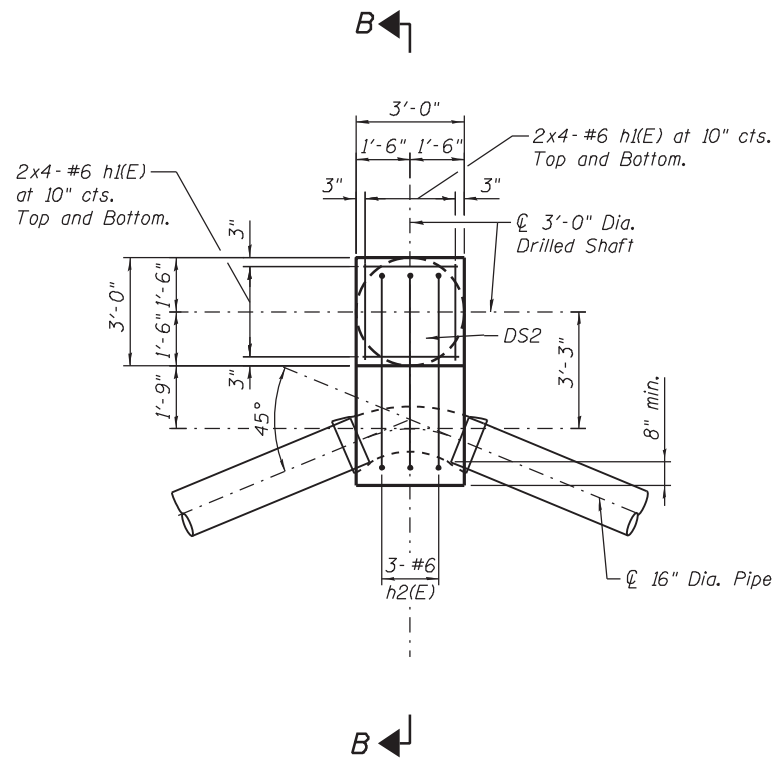
SCALE: SHEET 1 OF 1 SHEETS STA. TO STA.

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| F.A.I. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
| 90/94/290 | 2015-021-I | COOK | 153 | 58 |
| CONTRACT NO. 62A75 | | | | |
| ILLINOIS FED. AID PROJECT | | | | |

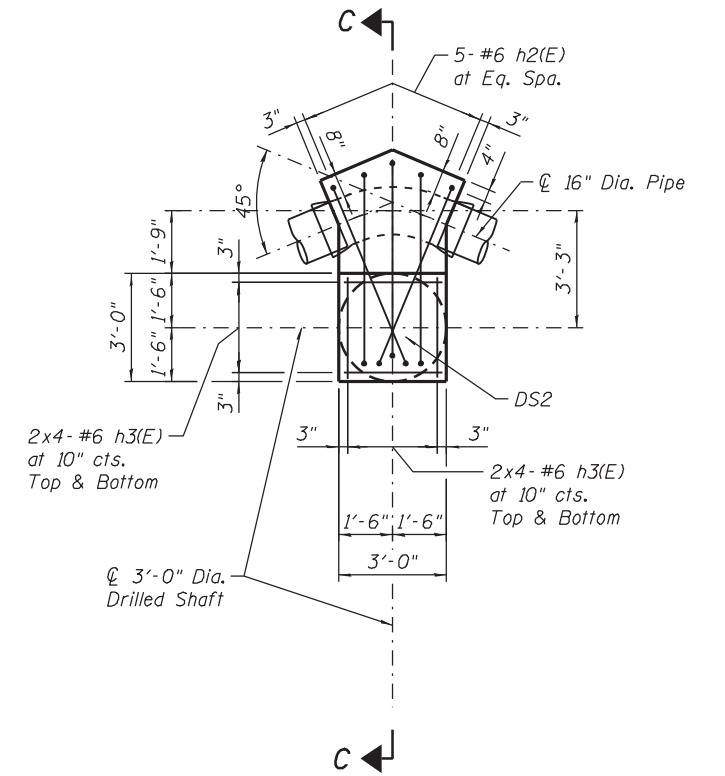
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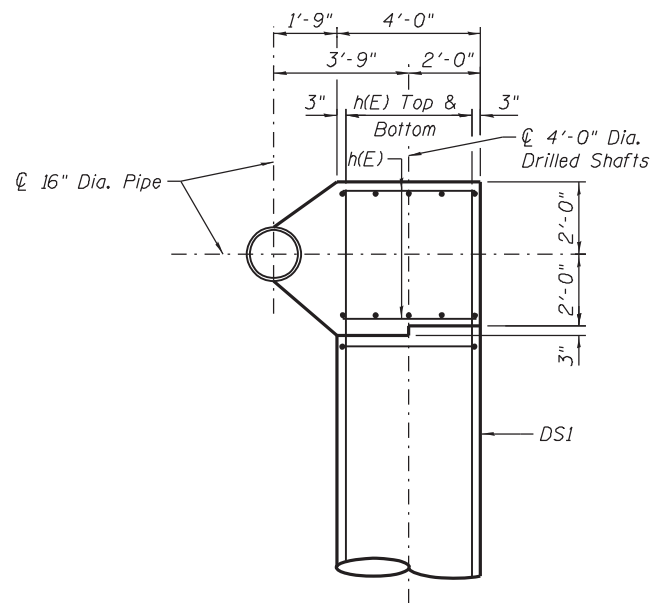
PLAN DETAIL
THRUST RESTRAINT - TYPE 1 (1 THUS)



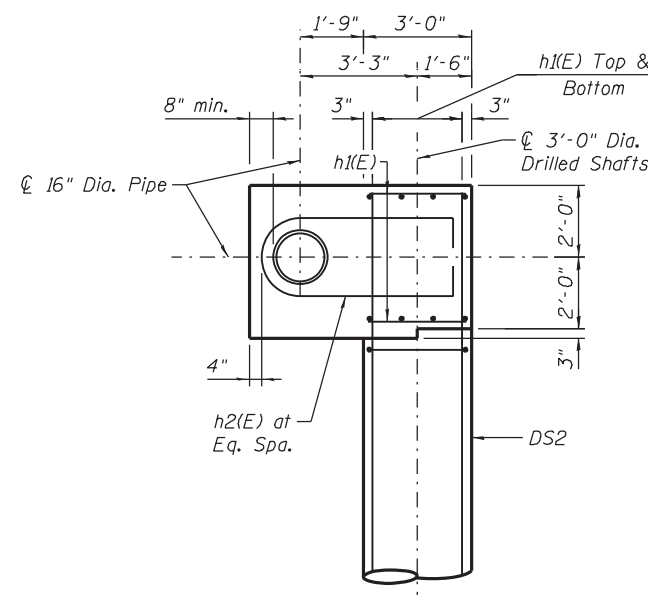
PLAN DETAIL
THRUST RESTRAINT - TYPE 2 (2 THUS)



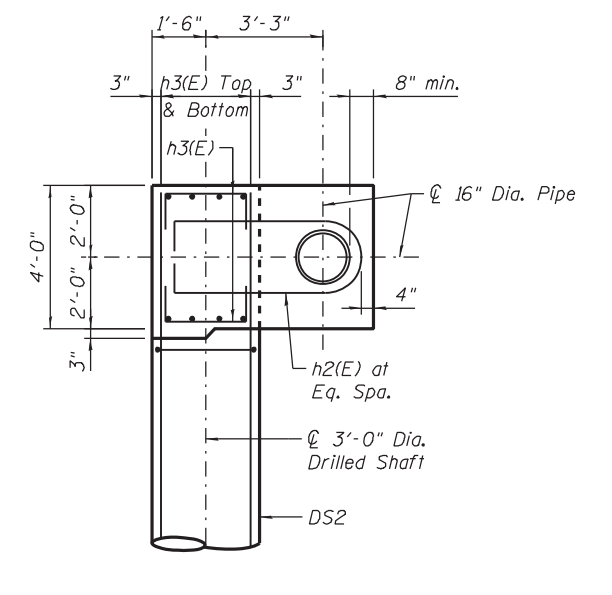
PLAN DETAIL
THRUST RESTRAINT - TYPE 3 (1 THUS)



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. Work this sheet with Sheet No. 66.



D162A75-SHT-WM-Thrust-Detail-01.dgn
USER NAME = floresg
PLOT SCALE = 2:0' = 1" / in.
PLOT DATE = 3/17/2017

DESIGNED - AAG
DRAWN - GF
CHECKED - KWH/AAG
DATE - 03/21/2017

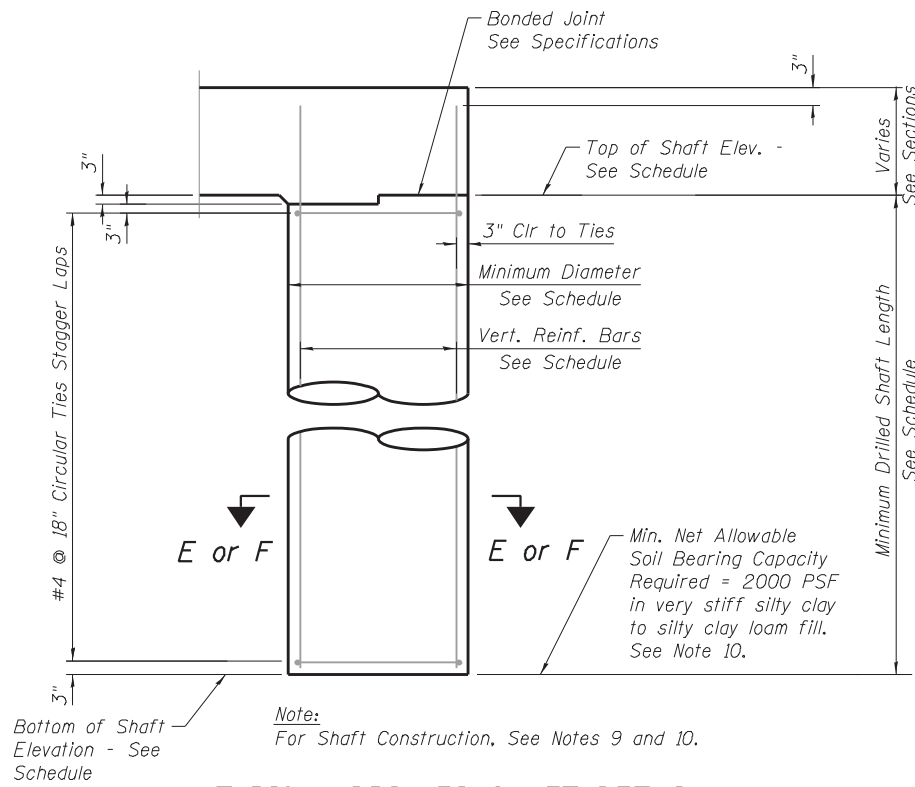
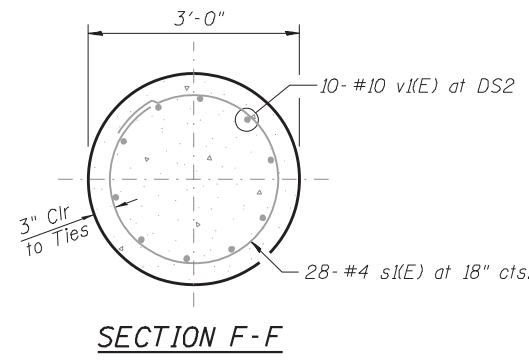
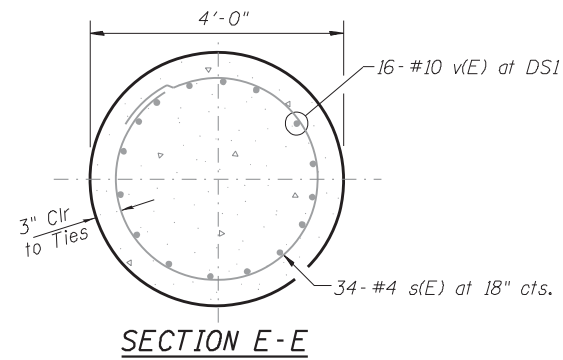
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DEPARTMENT OF TRANSPORTATION

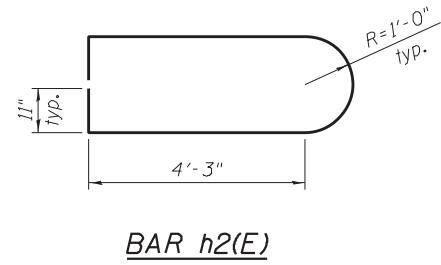
WATER MAIN THRUST RESTRAINT DETAILS AND SECTIONS

SCALE: SHEET 2 OF 3 SHEETS STA. TO STA.

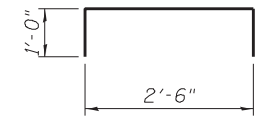
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| F.A.I. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
| 90/94/290 | 2015-021-I | COOK | 153 | 65 |
| CONTRACT NO. 62A75 | | | ILLINOIS FED. AID PROJECT | |



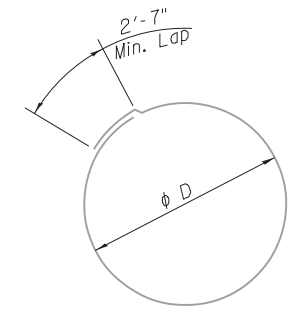
TYPICAL DRILLED SHAFT DETAIL
No Scale



BAR h2(E)



BAR h3(E)



| BAR | phi D |
|------|-------|
| s(E) | 3'-6" |
| s(E) | 2'-6" |

TIES

**THRUST RESTRAINTS
BILL OF MATERIAL**

| Bar | No. | Size | Length | Shape |
|----------------------------------|-----|---------|----------|-------|
| h(E) | 20 | #6 | 3'-6" | — |
| h1(E) | 32 | #6 | 2'-6" | — |
| h2(E) | 11 | #6 | 13'-6" | U |
| h3(E) | 16 | #6 | 4'-6" | U |
| v(E) | 16 | #10 | 53'-6" | — |
| v1(E) | 30 | #10 | 44'-6" | — |
| s(E) | 34 | #4 | 13'-8" | ○ |
| s1(E) | 84 | #4 | 10'-6" | ○ |
| Item | | Unit | Quantity | |
| Concrete Structures | | Cu. Yd. | 12 | |
| Reinforcement Bars, Epoxy Coated | | Pound | 10,890 | |
| Drilled Shaft In Soil | | Cu. Yd. | 56 | |

LEGEND

DS - Drilled Shaft

NOTES:

- For water main general notes, location plans, profiles, details and thrust restraint locations and types see Sheet Nos. 54 through 62. For existing water main reference drawings, see Sheet Nos. 55, 68 and 69.
- Exact locations of existing water mains, existing concrete thrust blocks and existing below grade structures and utilities shall be determined in the field prior to excavation for water mains and drilling shafts for new reinforced concrete thrust restraints and pipe supports. Any conflicts with existing structures and utilities due to field conditions encountered that will impact construction shall be brought to the attention of the Engineer, so as not to delay construction, along with detailed locations of conflicting structures and utilities and suggested solutions to resolve the conflict for Engineer review and approval.
- Contractor shall protect existing buried and above ground structures and utilities that are to remain during construction of the water main and thrust restraints. The cost of such protection shall be considered included within the cost of the respective pay item.
- New permanent concrete thrust restraints shall have been in place for a minimum of 28 days and shall have achieved a minimum 28 day compressive strength of 4000 psi prior to pressure testing pipe with water.
- Maximum test pressure for water mains = 100 psi.
- Fitting bends shall not be encased in concrete unless otherwise noted on the drawings. Minor adjustments to concrete dimensions and reinforcing bars shown may be required in the field and shall be considered included within the cost of the respective pay item.
- Trench excavation and backfill for thrust restraint shall be considered included within the cost of the Ductile Iron Water Main, Mechanical Joint, 16" pay item.
- Mechanical reinforcing bar splices, where shown or required, shall be considered included within the cost of Reinforcement Bars, Epoxy Coated.
- Contractor shall review Geotechnical Report and boring logs in his selection of methods to support the excavation in the various stages of shaft drilling, cleaning and concrete placement dependent on the boring logs and site conditions encountered. Surface water shall not be permitted to enter the hole. The Contractor shall comply with the requirements of the Illinois Department of Transportation (IDOT) and the various infrastructure departments of the City of Chicago, including, but not limited to, the Chicago Department of Transportation (CDOT), the Office of Underground Coordination (OUC) and the Department of Water Management (DWM).
- Shafts must be drilled into very stiff silty clay to silty clay loam with a minimum net allowable soil bearing capacity of 2000 PSF, however, the drilled shaft shall not be less than 50 feet in length for DS1 & 41 feet in length for DS2
- Concrete Cover:
 - Concrete placed against earth - 3"
 - Concrete in contact with earth - 2"
- All work to conform to IDOT Standard Specifications for Road and Bridge Construction, latest edition.
- Work this sheet with Sheet No. 65.

SCHEDULE FOR DRILLED SHAFTS IN SOIL

| MARK | TOTAL QUANTITY | ELEV. @ WATERMAIN (FEET) | ELEV. TOP OF DRILLED SHAFT (FEET) | ELEV. BOTTOM OF DRILLED SHAFT (FEET) | MINIMUM DRILLED SHAFT LENGTH (FEET) | MINIMUM DRILLED SHAFT DIAMETER (FEET) | VERTICAL REINFORCEMENT BARS AT EACH SHAFT | CIRCULAR TIES AT EACH SHAFT | SECTION | THRUST RESTRAINT TYPE |
|------|----------------|--------------------------|-----------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---|-----------------------------|---------|-----------------------|
| DS1 | 1 | 587.37 | 585.37 | 535.37 | 50' | 4'-0" | 16- #10 v(E) | 34- #4 s(E) at 18" | E | 1 |
| DS2 | 3 | 587.47 | 585.47 | 544.47 | 41' | 3'-0" | 10- #10 v(E) | 28- #4 s1(E) at 18" | F | 2, 3 |

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DRAWN - GF
CHECKED - KWH/AAG
DATE - 03/21/2017

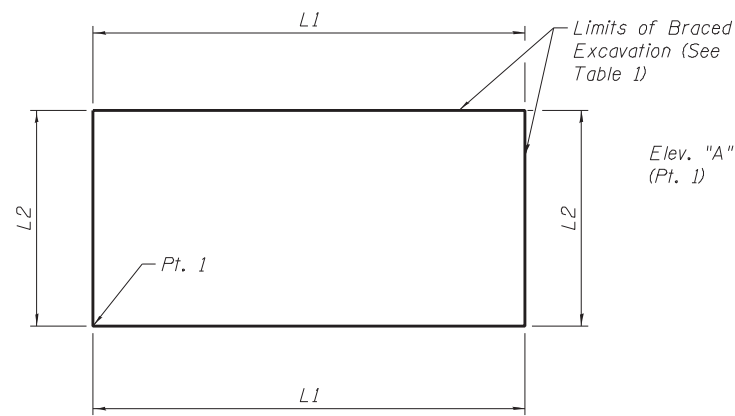
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

WATER MAIN THRUST RESTRAINT DETAILS AND SECTIONS

SCALE: SHEET 3 OF 3 SHEETS STA. TO STA.

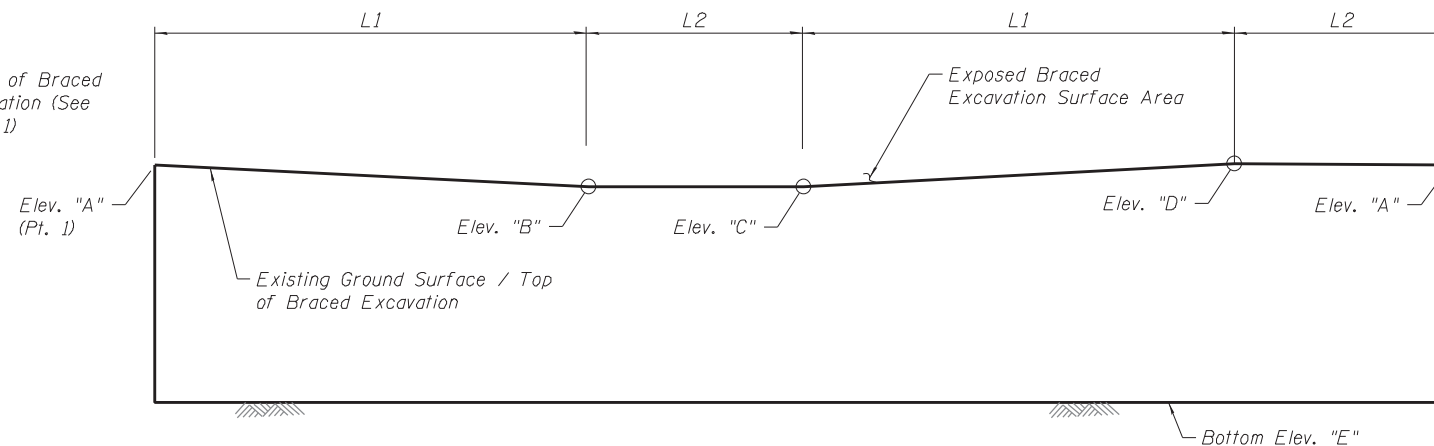
| F.A.I. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---------------------------|------------|--------|--------------|-----------|
| 90/94/290 | 2015-021-I | COOK | 153 | 66 |
| CONTRACT NO. 62A75 | | | | |
| ILLINOIS FED. AID PROJECT | | | | |



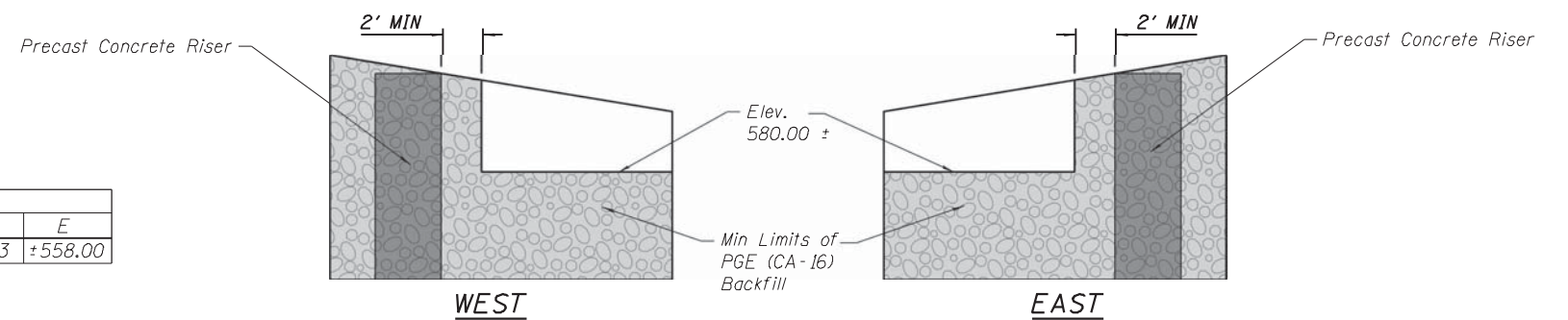
SUGGESTED TEMPORARY SOIL RETENTION SYSTEM (T.S.R.S.) PLAN
(WEST RECEIVING PIT)

TABLE 1

| Pt. | Sta. | Offset. | L1 (ft) | L2 (ft) | Elevation | | | | |
|-----|------------|-----------|---------|---------|-----------|---------|---------|---------|---------|
| | | | | | A | B | C | D | E |
| 1 | 8211+68.25 | 84.27' RT | 24 | 20 | +592.83 | +587.62 | +587.62 | +592.83 | +558.00 |

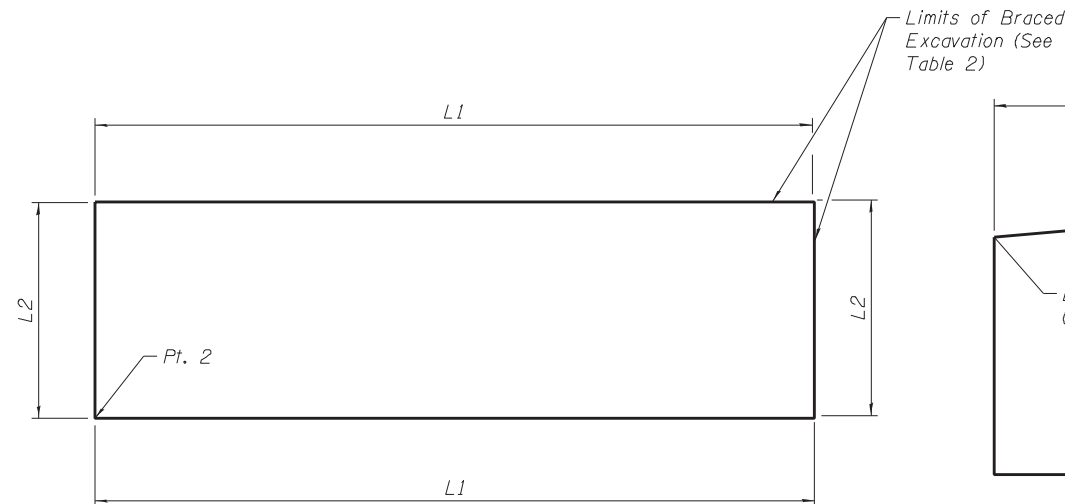


SUGGESTED UNFOLDED T.S.R.S. ELEVATION
(Looking Upstation)



WEST

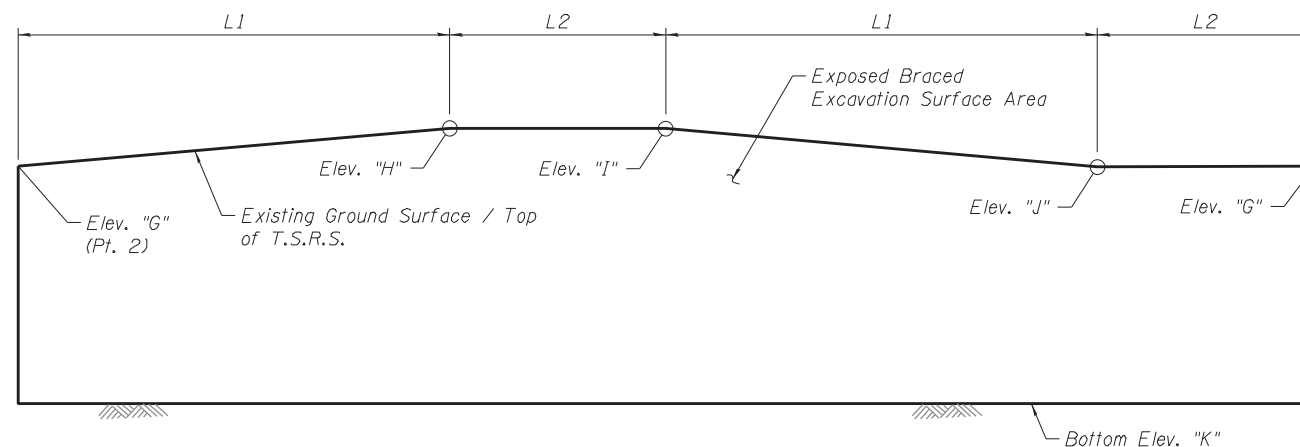
EAST



SUGGESTED TEMPORARY SOIL RETENTION SYSTEM (T.S.R.S.) PLAN
(EAST AUGER PIT)

TABLE 2

| Pt. | Sta. | Offset. | L1 (ft) | L2 (ft) | Elevation | | | | |
|-----|------------|-----------|---------|---------|-----------|---------|---------|---------|---------|
| | | | | | G | H | I | J | K |
| 2 | 8214+66.93 | 83.36' RT | 40 | 20 | +585.58 | +593.23 | +593.23 | +585.58 | +558.00 |



SUGGESTED UNFOLDED T.S.R.S. ELEVATION
(Looking Upstation)

NOTES

1. Temporary Soil Retention System layout and elevations provided are for contractor bidding purposes only. Exact layout and elevations of Temporary Soil Retention System (T.S.R.S) shall be determined by contractor in the field.
2. Excavation, backfilling (including PGE backfill), and bracing system and/or T.S.R.S. is included in the pay item "Steel Casing Pipe Augered and Jacked 30".
3. The bracing system for the T.S.R.S shall be installed without the use of impact-type pile drivers. The proposed equipment and procedures used for the installation of bracing system shall be submitted to the Engineer for approval prior to their use. If vibratory equipment utilized, the Contractor shall also submit documentation regarding the operating noise levels and operating vibration characteristics of the equipment proposed. The approval of the equipment and procedure by the Engineer does not guarantee the performance in the field of the equipment will be acceptable. If in the judgment of the Engineer, the noise and/or vibration effects exceed those required by the local residents, then the Contractor must halt production and find a remedy suitable to the Engineer. Threshold values for vibration monitoring are included in the special provision "CONSTRUCTION VIBRATION MONITORING". The costs incurred finding suitable equipment and procedures shall be included in the cost of "Steel Casing Pipe Augered and Jacked 30". No additional costs shall be paid for this effort.

D162A75-shr-SolRetSys.dgn



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| USER NAME = dishevoz | DESIGNED - CRH | REVISED |
| | CHECKED - ATB | REVISED |
| PLOT SCALE = N.T.S. | DRAWN - CRH | REVISED |
| PLOT DATE = 3/20/2017 | CHECKED - ATB | REVISED |

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**SUGGESTED TEMPORARY SOIL RETENTION SYSTEM DETAIL
JACKING & RECEIVING PITS**

SHEET NO. S-1 OF S-1 SHEETS

| | | | | |
|---------------------------|------------|--------|--------------|-----------|
| F.A.I. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
| 90/94/290 | 2015-021-I | COOK | 153 | 67 |
| CONTRACT NO. | | | 62A75 | |
| ILLINOIS FED. AID PROJECT | | | | |