# STRUCTURE GEOTECHNICAL REPORT
# BOX CULVERT
# IL ROUTE 72 (HIGGINS ROAD) OVER TYLER CREEK
# EXISTING SN 045-0080; PROPOSED SN 045-0279
# FAP 341, SECTION 2014-089B-R
# IDOT JOB D-91-177-15, PTB 168/008
# KANE COUNTY, ILLINOIS

**For**

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**11. Abstract**


A new triple-cell CIP concrete box culvert with horizontal cantilever wingwalls will be constructed to carry IL Route 72 (Higgins Road) over Tyler Creek. In addition, permanent steel sheet pile wall will be constructed adjacent to the wingwalls. The profile grade elevations will slightly be raised. This report provides geotechnical recommendations for the design of the proposed culvert barrels and horizontal cantilever wingwalls shown in the preliminary TSL plan as well as recommendations for the permanent steel sheet pile walls.

Near the surface, the soils include loose to medium dense fine sand fill. Beneath the fill is loose to medium dense loam to sandy gravel followed by stiff to hard loam to clay loam

The proposed wingwalls have maximum retained heights of approximately 15.3 feet and the proposed permanent steel sheet pile walls have maximum retained heights of approximately 10.0 feet. The barrels and wingwalls could be supported on shallow foundations. We provide geotechnical parameters for the flexible permanent retaining wall design.

Wang estimates a temporary steel sheet piling according to IDOT Design Guide 3.13.1 is feasible and sufficient to accommodate stage construction.


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**STRUCTURE GEOTECHNICAL REPORT**
**BOX CULVERT**
**IL ROUTE 72 OVER TYLER CREEK**
**EXISTING SN 045-0080, PROPOSED SN 045-0279**
**IDOT JOB D-91-177-15, PTB 168/008**
**KANE COUNTY, ILLINOIS**
**FOR**
**ACCURATE GROUP, INC.**

## 1.0 INTRODUCTION

This report presents the results of subsurface investigation, laboratory testing, and geotechnical evaluations for the proposed replacement of the existing culvert carrying IL Route 72 (Higgins Road) over Tyler Creek in Kane County, Illinois. A *Site Location Map* is presented as Exhibit 1.

Based on the latest TSL plan provided by Accurate Group, Inc. (Accurate) in December 2015, Wang Engineering, Inc. (Wang) understands the design of this structure has been revised from a bridge structure to a cast-in-place (CIP) concrete box culvert. Wang has already prepared a Structure Geotechnical Report (SGR) dated April 2, 2015 for the bridge structure under Wang Project No. 491-01-04. The subsurface data from the previous investigation for the bridge is included in this report to support our analyses and recommendations for the box culvert.

### 1.1 Proposed Structure

Wang understands Accurate envisions a new triple-cell CIP concrete box culvert. The center cell will be 11-foot tall by 15-foot wide and the outside cells will be 11-foot tall by 6-foot wide. The structure will be perpendicular to Illinois Route 72 (IL 72). The culvert's length will measure 49.75 feet out-to-out of headwalls and the culvert's width will measure 31.0 feet out-to-out. The proposed culvert upstream invert elevation will be 888.31 feet and downstream invert elevation will be 888.29 feet; flow directed from the north to the south. There will be a weir on the upstream side of the culvert in the two outside cells. The top of weir elevation will be established at 891.31 feet. 14.0 feet long horizontal cantilever wingwalls followed by a 6.25 feet long permanent steel sheet pile walls are proposed at all corners of the box culvert. The maximum retained heights for horizontal cantilever wingwalls and sheet pile walls are approximately 15.3 and 10.0 feet, respectively. The profile grade elevations will only be slightly raised.

The purpose of our investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed box culvert and wingwalls.

## 1.2 Existing Structure

Based on a Bridge Condition Report (BCR) dated November 8, 2013 prepared by Stantec and a preliminary TSL plan received from Accurate, the existing structure carrying IL 72 over Tyler Creek was constructed in 1935 as a cast-in-place reinforced concrete double cell 10 feet wide by 6 feet high box culvert with vertical cantilever wingwalls on each side. The overall double box culvert length is 53.3 feet out-to-out of headwalls. The total structure width is 22 feet. A low flow culvert section 3.0 feet wide by 3.0 feet high below the east cell has an approximate 4.0 feet sloped extension at the south side and an approximately 6.5 feet flat extension at the north side. The west cell has a three-sided structure floor extension at the south end. The L-type wingwalls are approximately 14.0 feet long and 7.5 feet tall. The existing structure will be completely removed and replaced with a triple-cell concrete box culvert using staged construction to maintain one lane of traffic on IL 72.

# 2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The project area is located in Rutland Township in north-central Kane County, Illinois. On the USGS *Pingree Grove Quadrangle 7.5 Minute Series* map, the culvert is located in the NE ¼ of Section 28, Tier 42 North, Range 7 East of the third Principal Meridian.

The following review of published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, is meant to place the project area within a geological framework and, thus, to confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered northern Illinois area in general and Kane County in particular. Exhibit 2 illustrates the *Site and Regional Geology*.

## 2.1 Physiography

Three prominent geomorphic zones with distinct soil properties as a result of the glaciation determine the relief of the area (Grimley, 2005). From west to east and running north-south they are the Marengo Moraine, the Glacial Lake Pingree, and the Elburn Complex. The project area is located within the lowland, generally flat Glacial Lake Pingree section. The investigated segment of IL 72 runs west-east and crosses over the Tylor Creek and its floodplain. Near the Tylor Creek, the surface has an elevation of approximately 890 feet (Grimley 2005).

## 2.2 Surficial Cover

The surficial cover is mainly the result of postglacial and Wisconsin-age glacial activity. Multiple advances and retreats of the glacial ice created a series of arcuate end moraine ridges consisting of unsorted glacial till. Melt water from the glaciers carried and deposited sand and gravel within, along, and away from the moraines as outwash. In low areas, melt water deposited fine grained lake deposits and organic-rich sediments filled the depressions and low-lying areas within and adjacent to lake plains. The project area is situated between Marengo Moraine at west and the Elburn Complex at east, within the former glacial Lake Pingree. The drift thickness is approximately 180 feet (Grimley 2005).

Patches of postglacial organic-rich sediments, peat and organic silt and clay, of the Grayslake Peat overlain the lake formation resulted in the deposition of up to 25 feet thick layer of gray clay and silt associated with the Equality Formation and sand to gravely sand outwash deposits of the Henry Formation that rest over the glacial diamicton. The Elburn Complex, stagnation moraine, is made up of assorted pebbly silty loam to loam diamicton of the Batestown facies of the Lemont Formation. The Marengo Moraine is made up of gray to reddish brown pebbly loam to clay loam diamicton of the Tiskilwa Formation (Grimley 2005).

## 2.3 Bedrock

The uppermost bedrock unit within the project area consists of nearly flat-lying Silurian-age dolomite and Maquoketa Group shale. Within the project area, the bedrock is deeply buried by glacial deposits and the top of the bedrock is approximately at 700 feet elevation, 180 feet below ground surface (bgs) (Grimley 2005).

Our subsurface investigation results fit into the local geologic context. Our borings revealed the native sediments consist of gravelly sand outwash of the Henry Formation overlying the loamy diamictons of the Lemont Formation, the Batestown facies, and the silty clay loam diamicton of Tiskilwa Formation. None of borings reached the top of the bedrock.

## 3.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations performed by Wang. Elevations in this report are in North American Vertical Datum (NAVD) 1988.

### 3.1 Subsurface Investigation

The subsurface investigation was performed by Wang in December 2014. The investigation consisted of two structure borings and one scour boring. The structure borings, designated as Borings CB-01 and CB-02, were drilled from elevation of 904.1 feet to depths of 90.0 feet below ground surface (bgs). The scour boring, designated as SC-01, was drilled on the streambed from elevation 891.0 to depth of 6.0 feet bgs. The coordinates were surveyed by Wang using a mapping-grade GPS unit; stations and offsets were obtained from a plan drawing provided by Accurate. The as-drilled boring locations are shown in the *Boring Logs* (Appendix A) and in the *Boring Location Plan* (Exhibit 3).

A truck mounted drilling rig, equipped with hollow stem augers, was used to advance and maintain an open borehole up to 10 feet bgs; mud-rotary drilling technique was used to advance the borings to the termination depths. 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 30.0 feet bgs and at 5.0-foot intervals thereafter. For the scour boring, a jack hammer geoprobe and hand operated piston sampler was used to advance the boring. The soil was sampled continuously to the boring termination depth of 6 feet. Soil samples collected from each interval were placed in sealed jars for further examination and laboratory testing.

Field boring logs prepared and maintained by a Wang geologist, included lithological descriptions, visual-manual soil classifications (IDH textural classification), results of pocket penetrometer or Rimac unconfined compressive strength ($Q_u$) testing on cohesive soils, and results of Standard Penetration Test (SPT) recorded as blows per 6 inches of penetration.

Groundwater observations were made during and at completion of drilling operations. The borings were backfilled with soil cuttings and bentonite chips, and the surface was restored as close as possible to the original condition.

### 3.2 Laboratory Testing

Soil samples were tested in the laboratory for moisture content (AASHTO T 265). Atterberg limits

(AASHTO T 89/T 90) and particle size (AASHTO T 88) analyses were also performed on selected samples. Field visual descriptions of the soil samples were verified in the laboratory and classified according to the IDH Soil Classification System. Laboratory test results are shown on the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

## 4.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented on 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.

### 4.1 Soil Conditions

Borings CB-01 and CB-02 were drilled along the existing roadway from elevations of 904.1 feet. The pavement structure consists of 5.5 to 8.0 inches of asphalt over 8.0 to 10.0 inches of concrete pavement. In descending order, the general lithologic succession encountered beneath the concrete pavement includes 1) man-made ground (fill); 2) loose to medium dense silt to sandy gravel; and 3) medium stiff to hard loam to clay loam.

*1) Man-made ground(fill)*

Below the pavement, the borings revealed 3.5 to 6.7 feet of loose to medium dense, brown, fine sand fill, with SPT N-values of 8 to 23 blows/ foot with an average of 15 blows/ foot and moisture content values of 5 to 8% with an average of 7%. At elevation of 902.8 feet, Boring CB-02 encountered 2 feet of medium stiff, dark brown silty clay loam, cohesive fill, having unconfined compressive strength (Qu) values of 0.5 tsf and moisture content of 16%.

A 1.2- to 2.5- feet thick layer of medium dense, black organic silt was encountered below the fill at elevations of 896.1 to 897.3 feet with SPT N-values of 8 to 12 blows/foot and moisture content of 57%. Based on a laboratory test performed, the organic silt layer has 26.6 % organic content.

*2) Loose to medium dense loam to sandy gravel*

At elevations of 893.6 to 896.1 feet, the borings advanced through 7.5 feet of loose to medium dense, dark brown to greenish gray fine sandy loam to sandy gravel with SPT N-values of 2 to 26 blows/ foot with an average of 13 blows/foot and moisture content values of 8 to 14% with an average of 11%.

3) *Stiff to hard loam to clay loam*

From elevations of 886.1 to 888.6 feet and extending to the termination depth, borings advanced through medium stiff to hard, pinkish brown loam to clay loam and gravelly clay loam with Qu values of 1.0 to 4.1 tsf with an average of 2.6 tsf and moisture content of 8 to 15% with an average of 12%. Laboratory index testing shows a liquid limit ($L_L$) value of 19% and a plastic limit ($P_L$) value of 11%.

### 4.2 Groundwater Conditions

While drilling, the groundwater table was recorded at elevation of 893.6 (10.5 feet bgs); and at the completion of drilling the water level was recorded at elevation of 893.1 feet (11.0 feet bgs).

## 5.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Wang has performed bearing capacity, settlement, and global stability analyses for the culvert barrels and wingwalls based on the information provided by Accurate. Based on our analysis, a CIP concrete box culvert is feasible and can be considered. The permanent sheet pile walls are feasible from geotechnical point of view. Geotechnical evaluations and recommendations for the culvert barrels and wingwalls are included in the following sections.

### 5.1 Bearing Capacity

The borings encountered organic silt from depths of 7.5 to 10.5 feet bgs, or between elevations of 897.0 and 893.5 feet. The preliminary TSL plan (Exhibit 5) shows the proposed invert elevations at 888.3 feet which is deeper than the organic soil; therefore, the organic soils will be removed during excavation and will not be a concern for the culvert foundation. The proposed box culvert will be founded on stiff to very stiff clay loam to loam.

Horizontal cantilever wingwalls are designed as part of the culvert barrel and supported through cantilever action without footings. The horizontal cantilever wingwalls should be installed at a minimum depth of 3.0 feet bgs.

### 5.2 Global Stability

The global stability of the wingwalls was analyzed based on the soil profile described in Section 4.1. The analyses were performed with the Simplified Bishop Method incorporated in Slide 6.0, and the results of the evaluations are shown in Appendix C. The minimum required FOS for both short-term and long-term conditions is 1.5 (IDOT 1999). We estimated undrained (short-term) and drained (long-term) FOS of 2.9 and 1.5, respectively (Appendix C-1 and C-2).

### 5.3 Settlement

The foundation soils consist primarily of stiff to very stiff clay loam. Based on information provided by Accurate, Wang understands the existing roadway profile along IL 72 will be raised approximately 2 inches. Considering the low moisture content of the foundation soils and the minor fill, culvert settlement is not a concern. Since no roadway widening is proposed, the embankment settlement is also not a concern.

### 5.4 Permanent Steel Sheet Pile Wall

Based on the preliminary TSL drawings, a 6.25-foot long permanent steel sheet pile wall is proposed at each corner of the culvert. The sheet pile will be constructed adjacent to the horizontal cantilever wingwall. The proposed wall maximum retained height is approximately 10.0 feet. The backslope behind the proposed permanent sheet pile walls ranges between 1:2 (V:H) to 1:4 (V:H).

The proposed wall will be a cut type wall and will retain soil below the existing roadway surface elevation. Based on the soil conditions encountered along the proposed wall, Wang estimates the soil conditions are appropriate for the installation of a sheet pile wall. The wall should be designed for drained (long term) condition. We recommend that weep holes be provided or hydrostatic pressure be considered in the design. In place of weep holes, a Geocomposite Wall Drain could be connected to perforated drain pipe.

Hard drilling conditions were observed in both borings at 65 feet bgs or below 839.0 feet elevation. We do not anticipate the embedment depth of the sheet pile wall will be below this elevation. However, if the embedment depth is below this elevation, the sheet pile wall should not be considered. Instead, we recommend a drilled soldier pile.

### 5.5 Soldier Pile Wall

Drilled or driven Soldier Pile and lagging type of retaining wall can be considered as a wall installed with a top-down constructred method. For a higher wall portion a larger section of soldier pile and/or a less spacing of the piles may be necessary. The plan should show minimum timber lagging thickness to be 3 inches. A Geocomposite Wall Drain should be placed over the timber lagging area in front face of the wall and connected to the 4 inches diameter perforated drain pipe.

### 5.6 Geotechnical Design of Steel Sheet and Soldier Pile Walls

The soil parameters shown in Tables 3 and 4 should be used for the design of the steel sheet pile or soldier pile walls.

Table 3: Recommended Soil Parameters for Steel Sheet Pile or Soldier Pile Walls Design at Culvert West End (CB-01)

| Soil Description | Moist Unit Weight** (pcf) | Shear Strength Properties: Short Term: Cohesion Cu (psf) | Shear Strength Properties: Short Term: Friction Angle, φ (Degree) | Shear Strength Properties: Long Term: Friction Angle, φ' (Degree) | Estimated Lateral Soil Modulus Parameter (Static), k (pci) | Estimated Soil Strain Parameter, $\varepsilon_{50}$ |
|---|---|---|---|---|---|---|
| 900.1* to 896.10 Sand | 120 | 0 | 30 | 30 | 90 | -- |
| 896.1 to 893.6 Silt | 120 | 0 | 30 | 30 | 90 | -- |
| 893.6 to 888.6 Gravelly Sandy Loam | 120 | 0 | 30 | 30 | 20 | -- |
| 888.6 to 886.1 Sandy Loam | 63 | 0 | 29 | 29 | 20 | -- |
| 886.1 to 881.1 Loam to Clay Loam | 63 | 1700 | 0 | 32 | 500 | 0.0070 |
| 881.1 to 822.3 Loam to Clay Loam | 63 | 2900 | 0 | 32 | 1000 | 0.0050 |
| 822.3 to 817.3 Loam to Clay Loam | 63 | 4100 | 0 | 32 | 2000 | 0.0040 |
| 817.3 to 814.1 Loam to Clay Loam | 63 | 3300 | 0 | 32 | 1000 | 0.0050 |

* Approximate top of sheet pile wall elevation.

** Submerged soil condition below 893.6 feet.

Table 4: Recommended Soil Parameters for Steel Sheet Pile or Soldier Pile Walls Design at Culvert East End (CB-02)

| Soil Description | Moist Unit Weight* (pcf) | Shear Strength Properties: Short Term Cohesion Cu (psf) | Short Term Friction Angle, φ (Degree) | Long Term Friction Angle, φ' (Degree) | Estimated Lateral Soil Modulus Parameter (Static), k (pci) | Estimated Soil Strain Parameter, $\varepsilon_{50}$ |
|---|---|---|---|---|---|---|
| 902.8 to 900.8 Silty Clay Loam | 120 | 0 | 30 | 30 | 100 | 0.0100 |
| 900.8 to 898.6 Sand | 120 | 0 | 30 | 30 | 90 | -- |
| 898.6 to 893.6 Sand | 120 | 0 | 30 | 30 | 25 | -- |
| 893.6 to 888.6 Sandy Gravel | 120 | 0 | 30 | 30 | 60 | -- |
| 888.6 to 883.6 Loam to Clay Loam | 63 | 1100 | 0 | 32 | 500 | 0.0070 |
| 883.6 to 872.3 Loam to Clay Loam | 63 | 2200 | 0 | 32 | 1000 | 0.0050 |
| 872.3 to 867.3 Loam to Clay Loam | 63 | 1600 | 0 | 32 | 500 | 0.0070 |
| 867.3 to 822.3 Loam to Clay Loam | 63 | 2500 | 0 | 32 | 1000 | 0.0050 |
| 822.3 to 817.3 Loam to Clay Loam | 63 | 4100 | 0 | 32 | 2000 | 0.0040 |
| 817.3 to 814.1 Loam to Clay Loam | 63 | 3500 | 0 | 32 | 1000 | 0.0050 |

* Approximate top of sheet pile wall elevation.

** Submerged soil condition below 893.6 feet.

According to the AASHTO LRFD Bridge Design Specifications (AASHTO, 2014), the lateral pressure on permanent flexible walls should be estimated using the effective stress method analysis and the drained shear strength parameters of the soils. In addition, three feet of the embedded portion below the finished grade in front of the wall should not be considered as providing any passive lateral support. The simplified earth pressure distributions shown in AASHTO (AASHTO, 2014) or other suitable earth pressure distributions should be used. The water pressure should be added to the earth pressure if drainage is not provided.

### 5.7 Stage Construction Considerations

The TSL plan shows the culvert construction occurring in two stages: stage one will involve the removal and construction of the westbound portion of the culvert; stage two will include the removal and construction of the eastbound portion of the culvert. Temporary sheet piling will be utilized to accommodate stage construction. The sheet piling should be designed based on Design Guide 3.13.1 (IDOT 2012a). Assuming an exposed height of about 17 to 19 feet, our evaluations indicate the temporary steel sheet piling is feasible and sufficient.

## 6.0 CONSTRUCTION CONSIDERATIONS

### 6.1 Site Preparation

All vegetation, surface topsoil, existing pavement, and debris should be cleared and stripped where foundations and structural fills will be placed. The exposed subgrade should be proofrolled. To aid in locating unstable and unsuitable materials, the proofrolling should be observed by a qualified engineer. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill as described in Section 6.3.

### 6.2 Excavation and Dewatering

Foundation excavations should be performed in accordance with local, State, and federal regulations. Excavations for the construction of wingwall footings and placement of the barrel should be sloped at no greater than 1:1.5.

The potential effect of ground movements upon nearby utilities should be considered during construction. No utility conflicts were identified that would impact the foundation design. However, the Contractor should ensure there are no utility conflicts with the final design and construction program.

During the subsurface investigation, groundwater was encountered at elevation ranging from 893.1

to 893.6 feet. The proposed barrel and wingwalls will be established at 885.3 to 887.0 feet elevation which is below the encountered groundwater. Therefore, groundwater may be encountered and temporary sheet piling or cofferdam will be required for dewatering of foundation excavation. Contractor should be prepared for dewatering measures should groundwater be encountered above the proposed excavation depth. Depending upon prevailing climate conditions and the time of the year when culvert construction takes place, control runoff and maintenance of existing flows may require temporary water diversion and control.

### 6.3 Filling and Backfilling

Fill material used to attain the final design elevations should be structural fill material. Coarse aggregate of IDOT gradation CA-6 or pre-approved, compacted, cohesive or granular soil conforming to Section 204 would be acceptable as structural fill (IDOT, 2012b). The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to IDOT Section 205, *Embankment* (IDOT, 2012b).

Wang understands the ground behind the wall will be sloped. For 1V:2H slope, assuming granular backfill with friction angle of 32 degree, we estimate an active earth pressure coefficient (Ka) of 0.47. For 1V:1.5H slope, assuming the friction angle of granular backfill of 34 degree, we estimate Ka values between 0.62 and 0.70 (the friction angle of granular backfill should be greater than the slope angle).

### 6.4 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 operations, and provide material inspection services during the construction phase of this project.

## 7.0 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 culvert 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.

| | |
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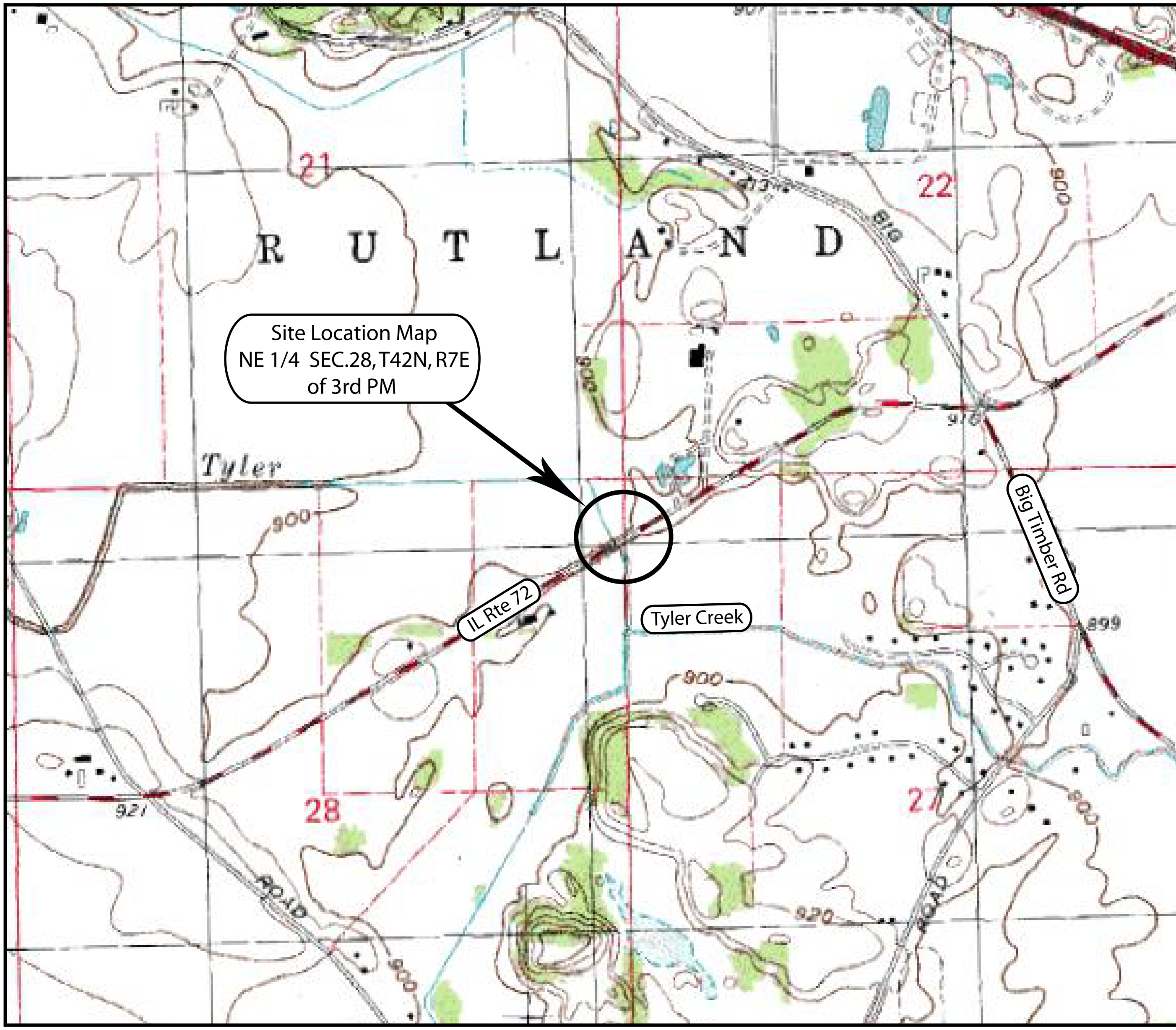
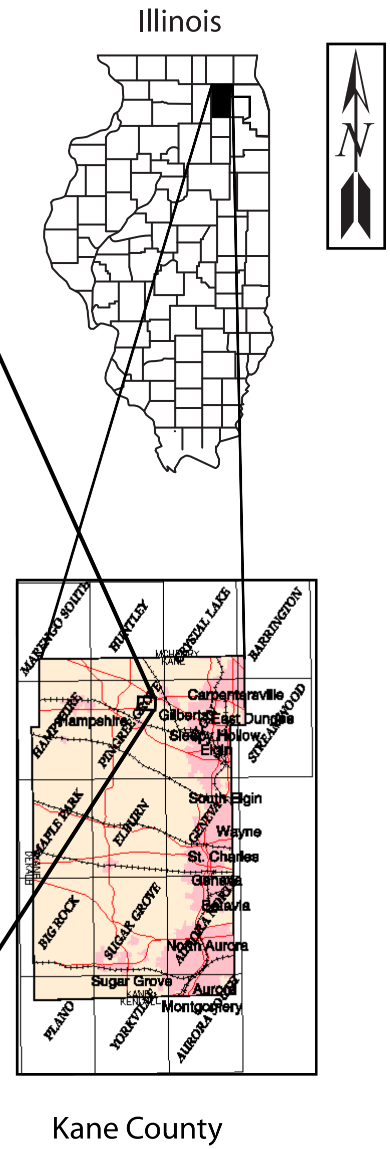
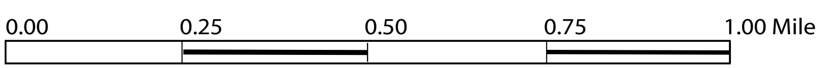
# EXHIBITS




SITE LOCATION MAP: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

| | | |
|---|---|---|
| SCALE: GRAPHICAL | EXHIBIT 1 | DRAWN BY: R. KC<br>CHECKED BY: A. Kurnia |

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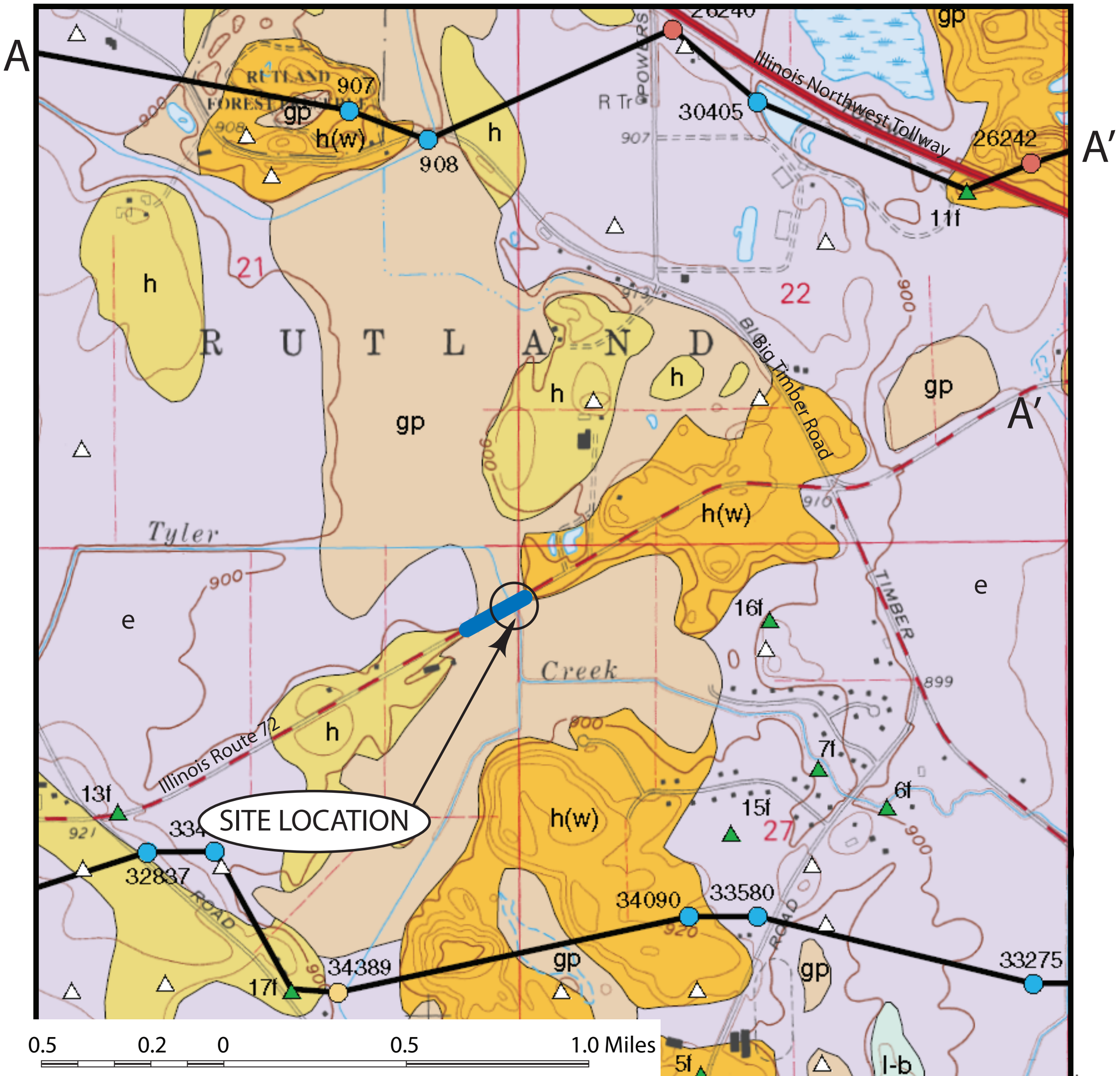
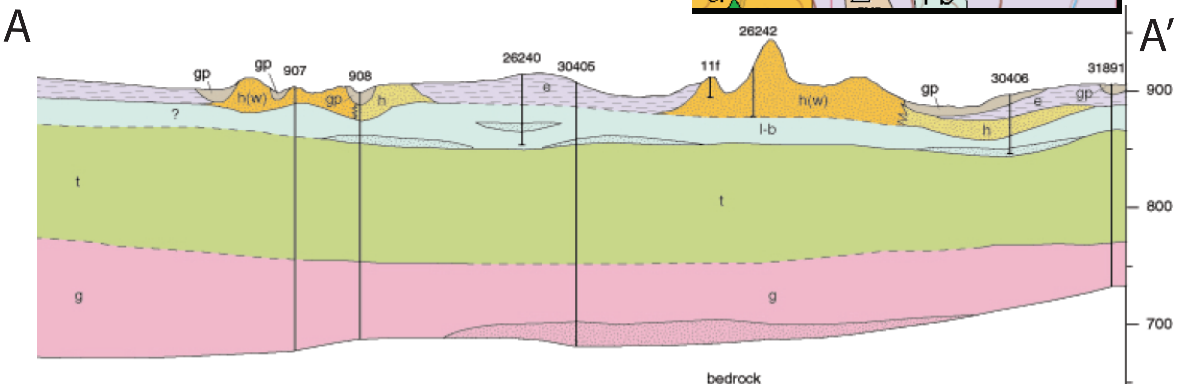
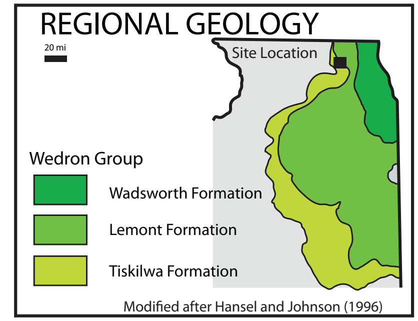
| | |
|---|---|
| FOR ACCURATE GROUP, INC. | 491-02-04 |




# LEGEND

| | |
|---|---|
| gp | **Grayslake Peat**<br>Fibrous peat, muck, organic silt and clay. Organic debris deposited in depressions and lake basins. |
| e | **Equality Formation**<br>Laminated to massive clay and silt containing some fine to medium sand beds. Occurs in proglacial and super glacial, slack water and some modern lake basins. |
| h | **Henry Formation (except Wasco Facies)**<br>Outwash; intertongues with Equality Formation, Wasco facies, and Wedron Group units; Sand and gravel containing beds of silt, clay, and diamicton; stratified to massive; generally well sorted; cross-bedded to plane-bedded; typically less than 35 feet thick |
| h(w) | **Henry Formation (Wasco Facies)**<br>Sand, gravel, sandy silt, silt and sandy loam to loam diamicton. Irregularly bedded and moderately well sorted. Ice contact deposits and containing beds of silt and clay. Outwash deposits in glacial meltwater channels, outwash plains, deltas and bars |
| l-b | **Lemont Formation, Batestown Member,**<br>Gray to gray brown diamiction, pebbly silt loam to loam, oxidizing to yellow brown. Generally massive but may be stratified and interbedded with silt and sand. Till and ice-marginal sediment. Lower portion is typically more uniform subglacial till. |
| t | **Tiskilwa Formation**<br>Gray to reddish brown pebbly loam to clay loam diamiction. Largely subglacial till with sand and gravel lenses deposited by meltwaters. |
| g | **Glasford Formation**<br>Pinkish brown to brown pebbly loam to clay loam diamiction. Till and ice-marginal sediment and channel deposits. |

SITE AND REGIONAL GEOLOGY: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

| SCALE: GRAPHICAL | EXHIBIT 2 | DRAWN BY: C. Marin<br>CHECKED BY: L. Iordache |
|---|---|---|

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Legend

Boring Location

Scale

0 50 100 150 200 Feet

BORING LOCATION PLAN: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

| SCALE: GRAPHICAL | EXHIBIT 3 | DRAWN BY: R. KC<br>CHECKED BY: A. Kurnia |
|---|---|---|

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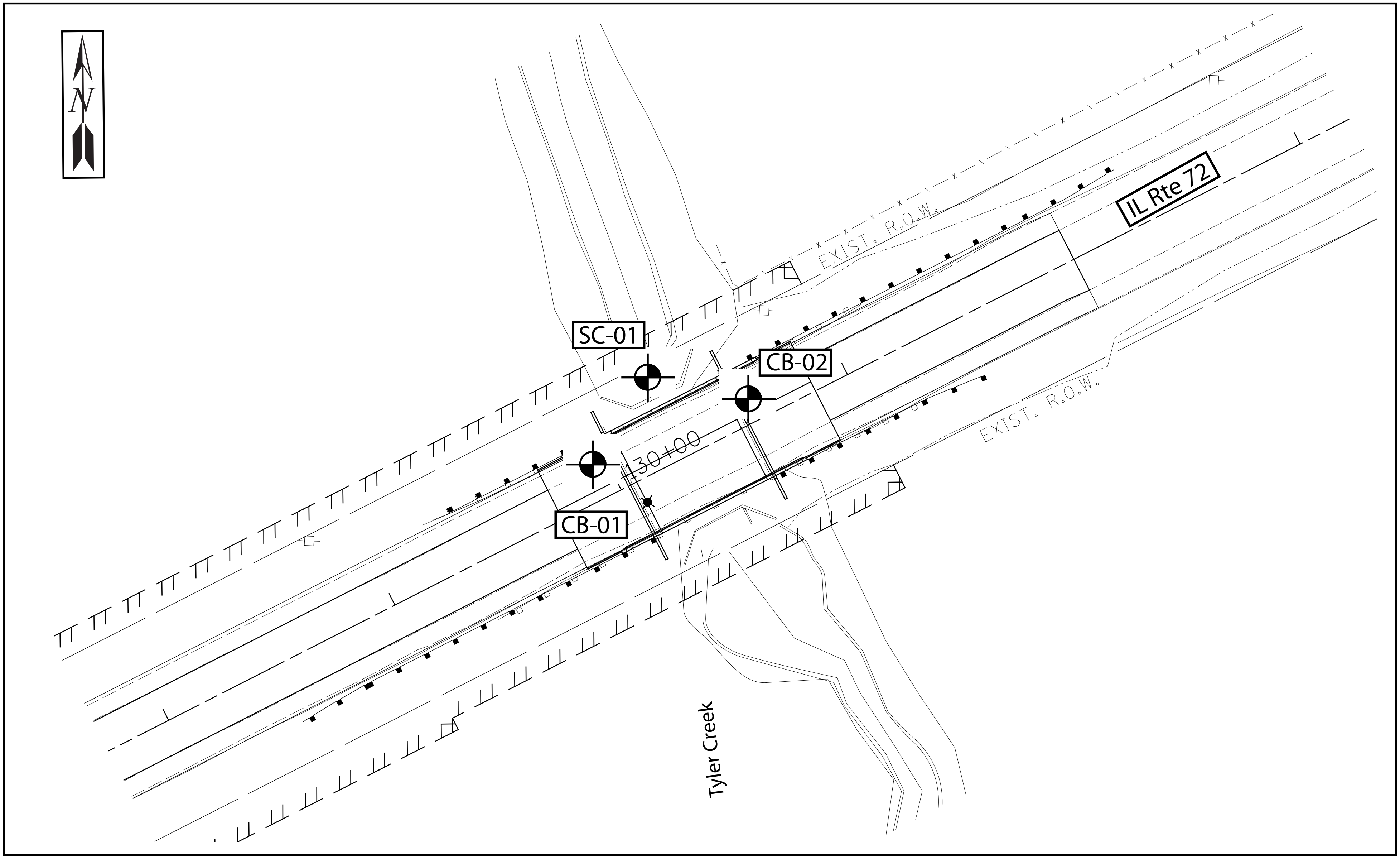


## Legend

Boring Location

## Scale

0 50 100 150 200 Feet

BORING LOCATION PLAN: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

| SCALE: GRAPHICAL | EXHIBIT 3-2 | DRAWN BY: R. KC<br>CHECKED BY: A. Kurnia |
|---|---|---|


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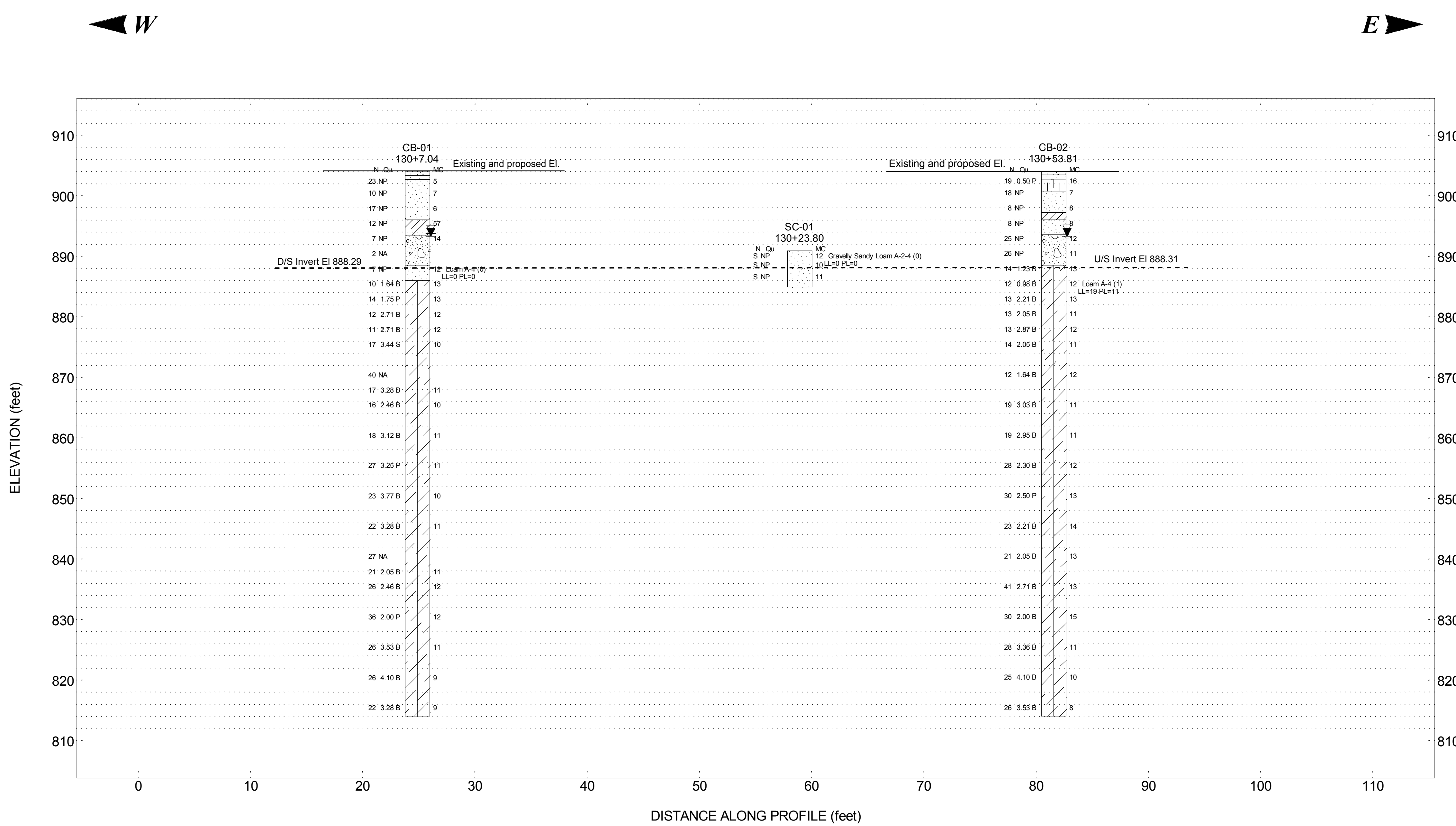
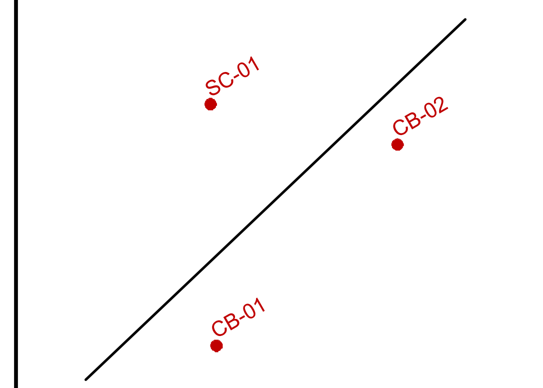
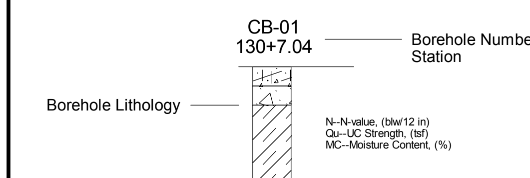
FOR ACCURATE GROUP, INC. | 491-02-04




Site Map Scale 1 inch equals 40 feet

# Explanation:




▽ Water Level Reading at time of drilling.

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

0 11

Horizontal Scale (feet)

Vertical Exaggeration: 0.5x

## Lithology Graphics

- Pavement
- Concrete
- IDH Sand, Sandy Loam
- USCS High Plasticity Organic silt or clay
- Gravelly sand, sandy gravel
- IDH Clay Loam
- IDH Silty Clay, Silty Clay Loam

**Wang Engineering**
1145 N Main Street
Lombard, IL 60148

**Soil Profile**
**SN 045-279**

WEI SINCE 1982

IL Route 72 over Tyler Creek
Pingree Grove, Illinois

| JOB NUMBER | PLATE NUMBER |
|---|---|
| 491-02-04 | EXHIBIT 4 |

WEI 11X17 4910204.GPJ WANGENG.GDT 9/23/15

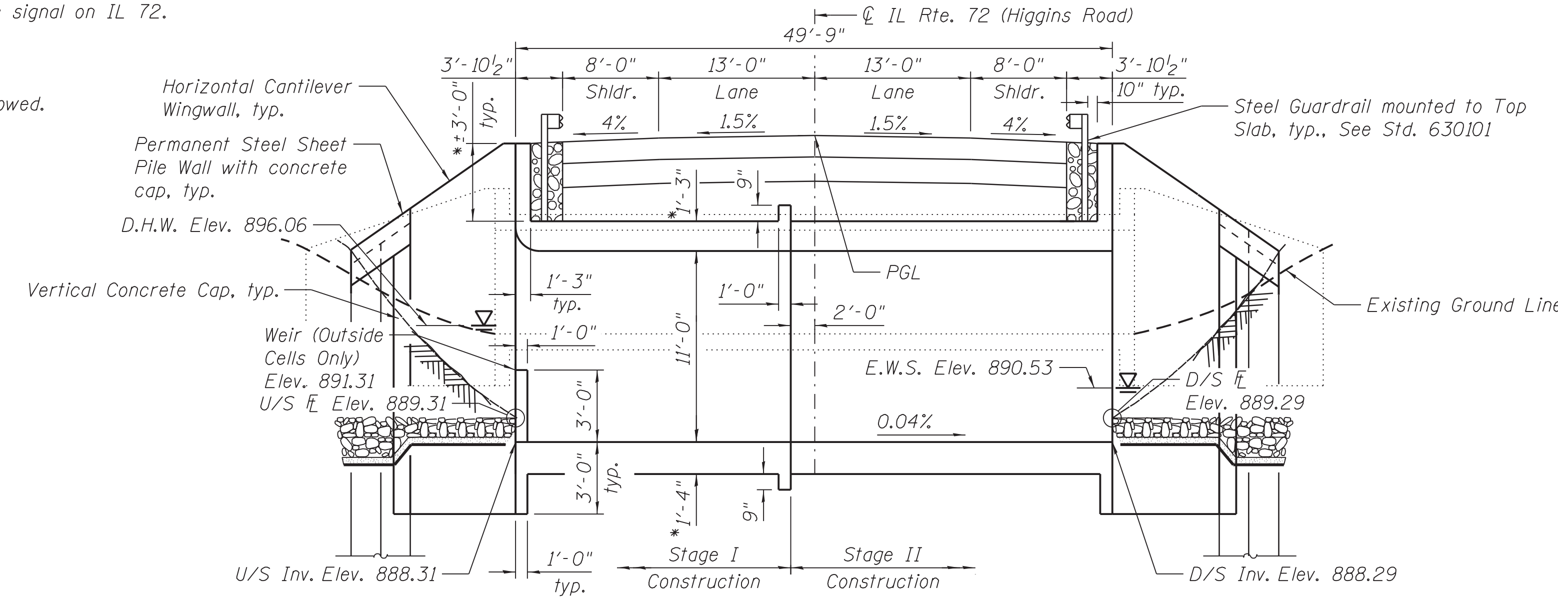
Benchmark: CP#6-Iron Rod with Cap on IL Rte. 72 (Higgins Road) at Sta. 146+04.04, Offset 18.41' Lt. Elevation 919.33

# EXHIBIT 5

Existing Structure: S.N. 045-0080 was originally built in 1935 as S.A. Route 31, Section 109-NRS. The structure is a double cell 10'-0" wide x 6'-0" high cast-in-place reinforced concrete box culvert with vertical cantilever wingwalls on each side. The length of the culvert from out to out of headwall is 53'-4" and width is 22'-0". The low flow culvert section 3'-0" wide x 3'-0" high below the east cell has an approximate 4' sloped extension at the south side and an approximate 6'-6" flat extension at the north side. The west cell has a 3-sided structure floor extension at the south end. The L-Type wingwalls are approximately 14'-0" long and 7'-6" tall. Existing Structure 045-0244 was originally built as 6'-0" wide x 6'-0" high cast-in-place culvert to convey Tyler Creek overflow. The length of the culvert from out to out of headwall is approximately 43'-0". This culvert is located approximately 500'-0" west of S.N. 045-0080. IL 72 was resurfaced in Contract No. 60Y62 in 2015. One lane of traffic will be maintained during staged construction utilizing a temporary traffic signal on IL 72.

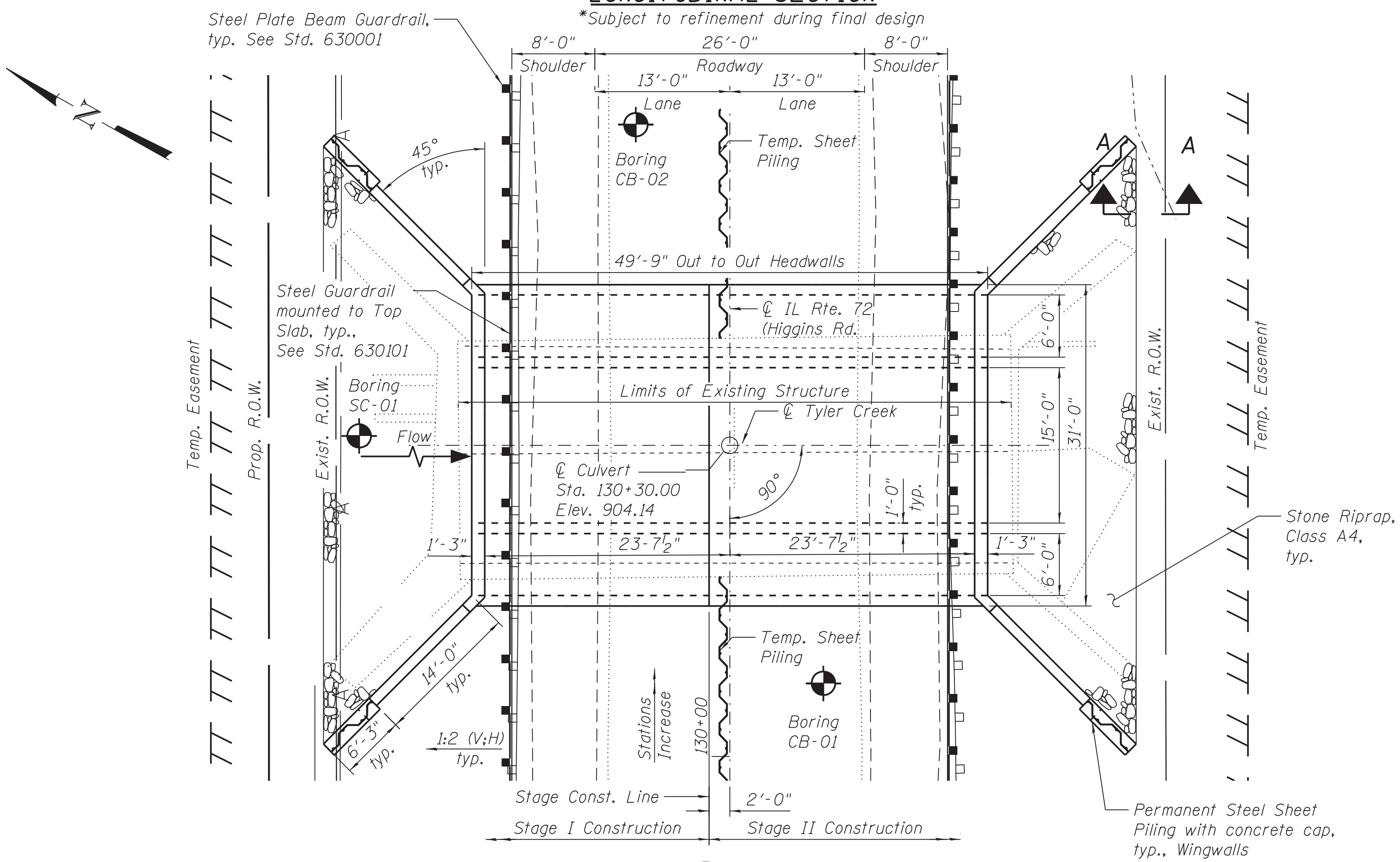
No Salvage.

Precast alternate is not allowed.




## LONGITUDINAL SECTION

*Subject to refinement during final design




## PLAN

## SCOPE OF WORK

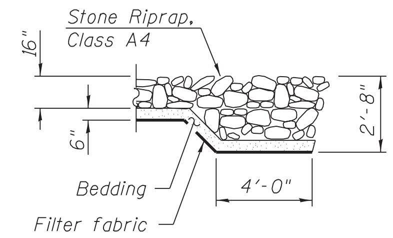
1. Install temporary traffic signal and shift traffic to the south.
2. Install temporary sheet piling at location shown on the plans and as directed by the Engineer.
3. Remove existing roadway and culvert for Stage I Removal.
4. Construct proposed culvert for Stage I Construction.
5. Shift traffic to the north over newly constructed portion of culvert for Stage II Removal.
6. Remove remaining roadway and culvert for Stage II Removal.
7. Construct proposed culvert for Stage II Construction.
8. Re-establish the flow through proposed culvert. Remove temporary traffic signal and open the roadway to traffic.

## WATERWAY INFORMATION

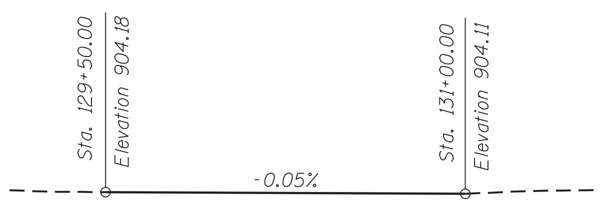
Drainage Area = 5.3 Sq. Mi.
Existing Overtopping Elev. 903.97 at Sta. 129+99.43
Proposed Overtopping Elev. 904.08 at Sta. 125+00.00

| Flood | Freq. Yr. | Q C.F.S. | Opening Sq. Ft. Exist. | Opening Sq. Ft. Prop. | Nat. H.W.E. | Head - Ft. Exist. | Head - Ft. Prop. | Headwater El. Exist. | Headwater El. Prop. |
|---|---|---|---|---|---|---|---|---|---|
| Peak | 2 | 148 | 11 | 94 | 893.69 | 1.81 | 0.00 | 895.50 | 893.69 |
| | 10 | 305 | 26 | 128 | 894.94 | 1.89 | 0.05 | 896.83 | 894.99 |
| Design | 50 | 455 | 48 | 158 | 896.06 | 1.71 | 0.10 | 897.77 | 896.16 |
| Base | 100 | 547 | 61 | 175 | 896.69 | 1.59 | 0.13 | 898.28 | 896.82 |
| Scour Design Check | | | | | | | | | |
| Overtopping-Exist. | | | | | | | | | |
| Overtopping-Prop. | | | | | | | | | |
| Max. Calc. | 500 | 684 | 79 | 200 | 897.59 | 1.38 | 0.20 | 898.97 | 897.79 |

10 Year Velocity Through Existing Culvert = 11.7 ft/s
10 Year Velocity Through Proposed Structure = 3.0 ft/s



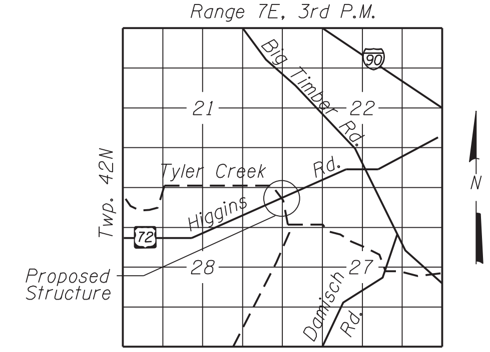

## SECTION A-A




## PROFILE GRADE

(Along ℄ IL Rte. 72)

Range 7E, 3rd P.M.




## LOCATION SKETCH

## HIGHWAY CLASSIFICATION

F.A.P. Rte. 341 - IL Rte. 72
Functional Class: Other Principal Arterial
ADT: 9650 (2013); 14,000 (2040)
ADTT: 7% (2013); 7% (2040)
DHV: 910
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

## DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications, 7th Edition with 2015 Interims

## DESIGN STRESSES

**FIELD UNITS**

f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (Permanent Steel Sheet Piling)

## LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

## GENERAL PLAN
## IL RTE. 72 (HIGGINS ROAD)
## OVER TYLER CREEK
## F.A.P. RTE. 341-SEC. 2014-089B-R
## KANE COUNTY
## STATION 130+30.00
## STRUCTURE NO. 045-0279

FILE NAME = O:\Engineering\LiveProjects\13003 IDOT DUR\13003h - WO 8 (WO 1) Contract No 62A41\CADD\CADD Sheets\Structural\TS&L\045-0279-62A41-00-GPE.dgn

Accurate GROUP, INC.

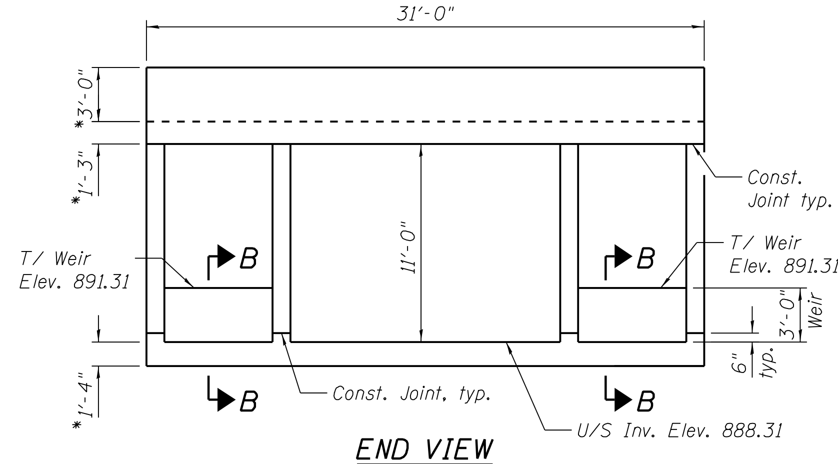
| | | |
|---|---|---|
| USER NAME = sapant | DESIGNED - AB | REVISED |
| | CHECKED - SAT | REVISED |
| PLOT SCALE = 16:0.0000 ':' / in. | DRAWN - JN | REVISED |
| PLOT DATE = 12/17/2015 | CHECKED - JMT | REVISED |

**STATE OF ILLINOIS**
**DEPARTMENT OF TRANSPORTATION**

SHEET NO. 1 OF 3 SHEETS

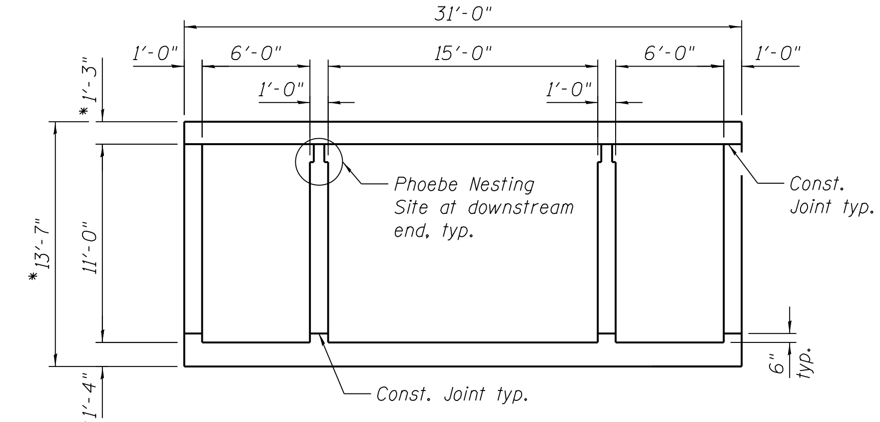
| F.A.P RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| 0341 | 2014-089B-R | KANE | | |

CONTRACT NO. 62A41
ILLINOIS FED. AID PROJECT



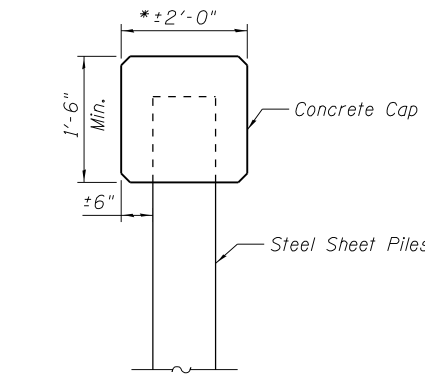

END VIEW

(Upstream End)



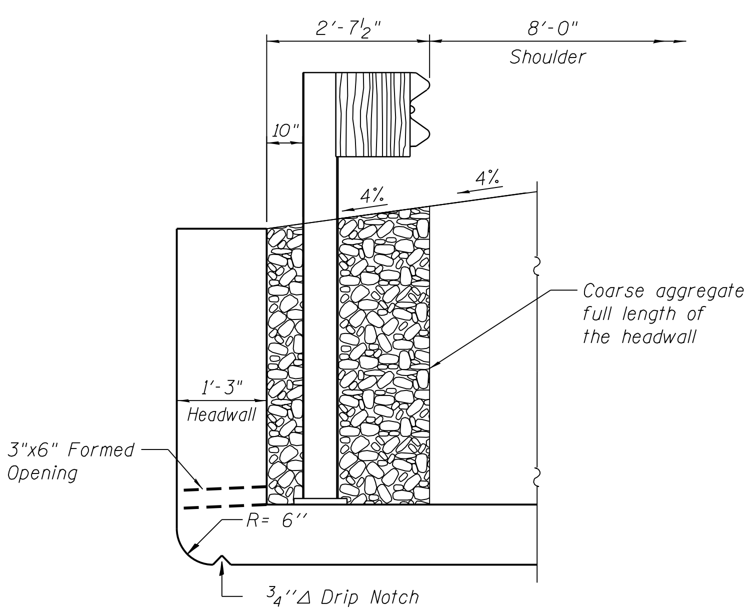

SECTION THRU BARREL

(Looking North)
*Subject to refinement during final design

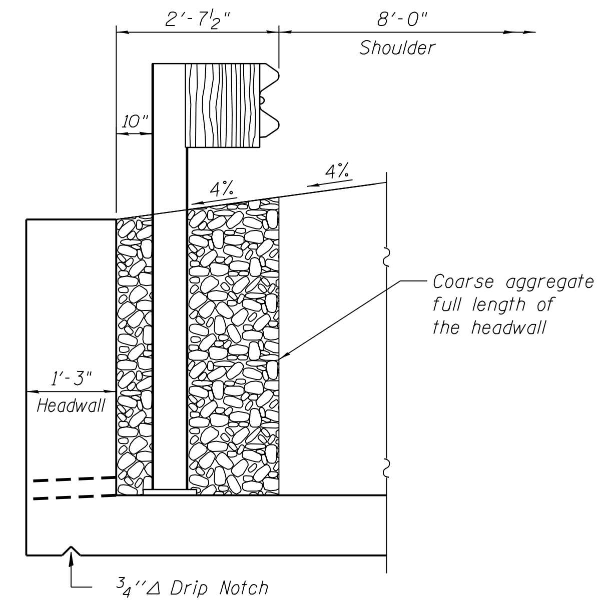



CONCRETE CAP DETAIL

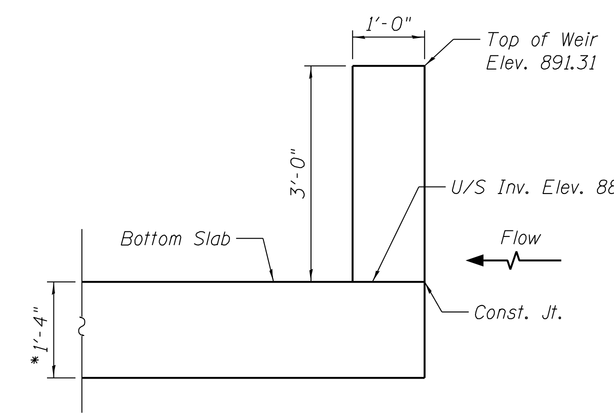
*Subject to refinement during final design




AT UPSTREAM END

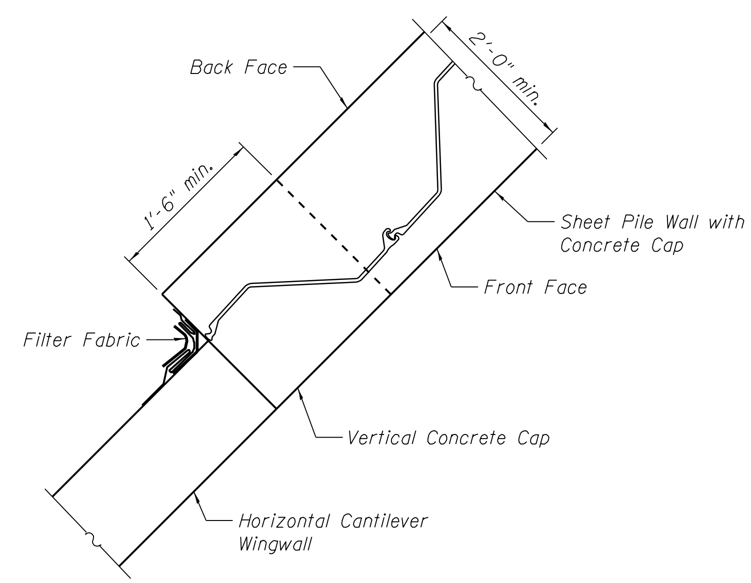



AT DOWNSTREAM END




SECTION B-B

*Subject to refinement during final design




WINGWALL PLAN

GENERAL DETAILS
IL RTE. 72 (HIGGINS ROAD)
OVER TYLER CREEK
F.A.P. RTE. 341 SEC. 2014-089B-R
KANE COUNTY
STATION 130+30.00
STRUCTURE NO. 045-0279

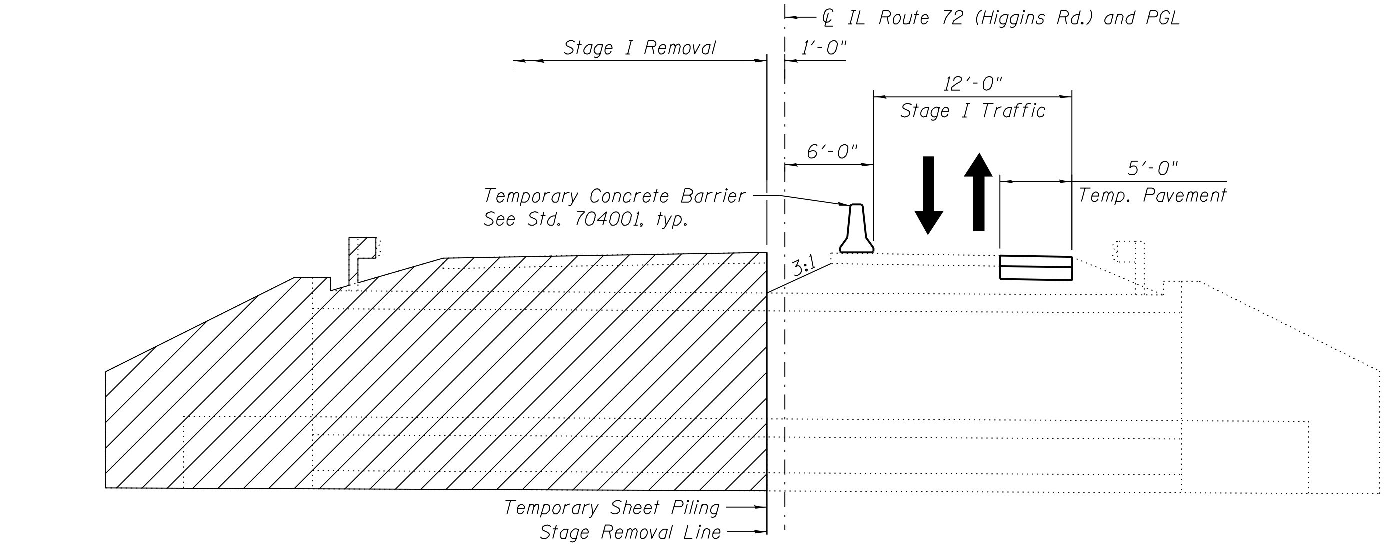
| | | | |
|---|---|---|---|
| Accurate GROUP, INC. | USER NAME = sapant | DESIGNED - AB | REVISED |
| | | CHECKED - SAT | REVISED |
| | PLOT SCALE = 10.6667 ' / in. | DRAWN - JN | REVISED |
| | PLOT DATE = 12/17/2015 | CHECKED - JMT | REVISED |

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

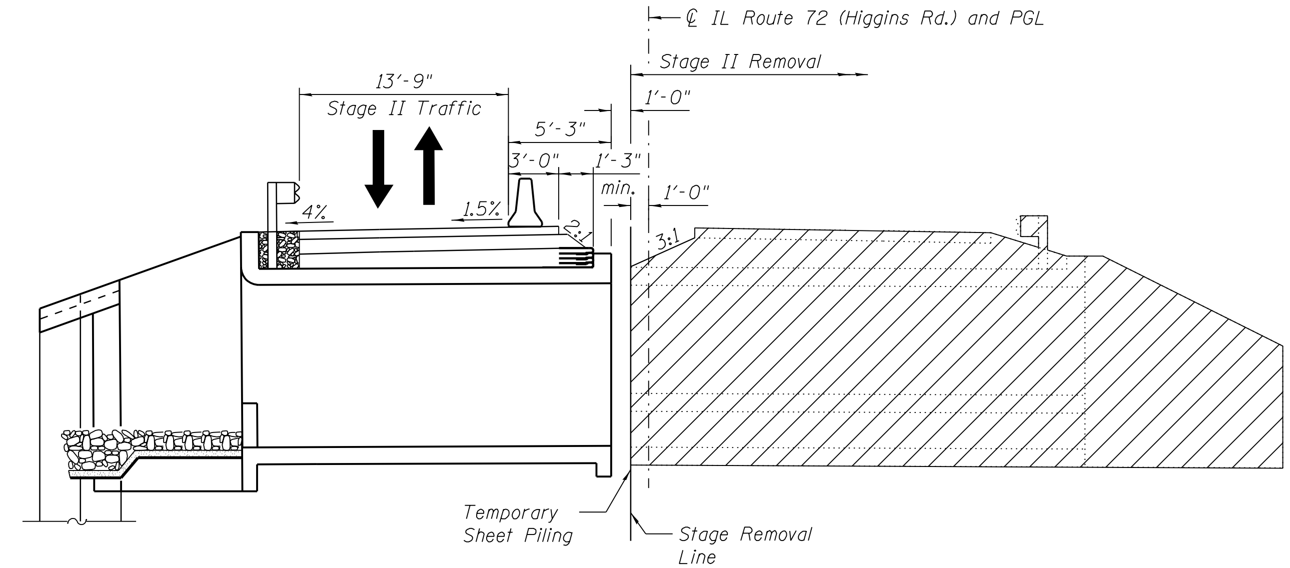
SHEET NO. 2 OF 3 SHEETS

| F.A.P RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| 0341 | 2014-089B-R | KANE | | |
| | | CONTRACT NO. 62A41 | | |
| | | ILLINOIS FED. AID PROJECT | | |

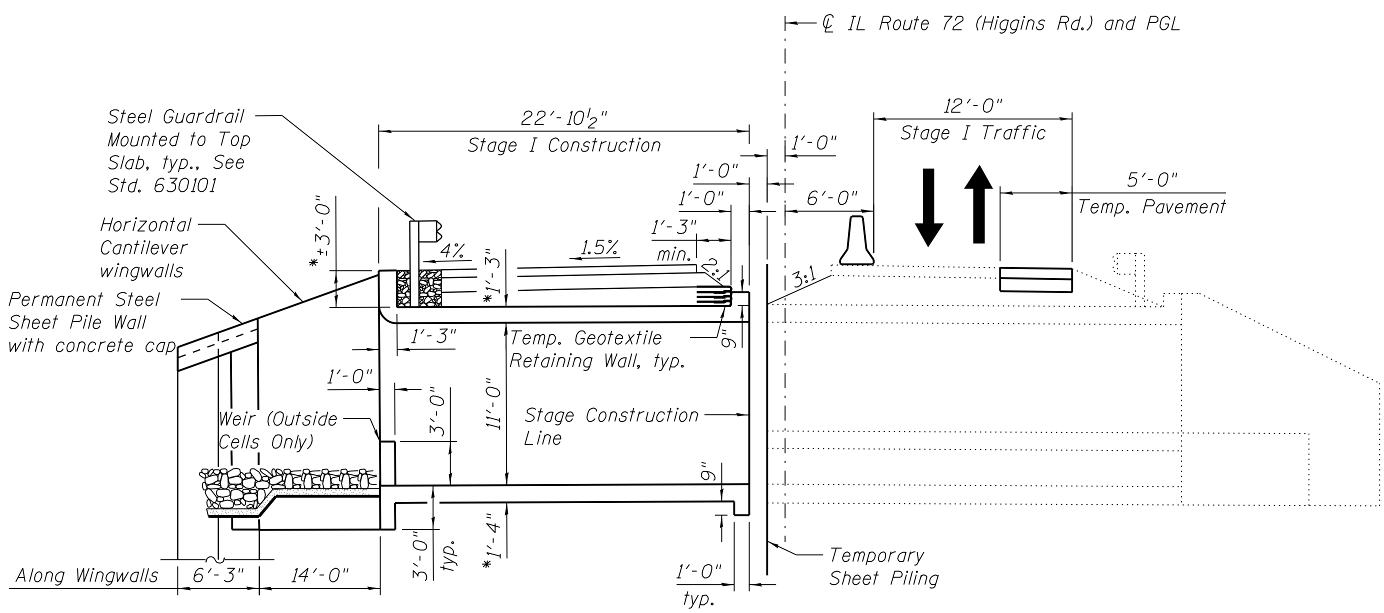
FILE NAME = O:\Engineering\LiveProjects\13003 IDOT DUR\13003h - WO 8 (WO 1) Contract No 62A41\CADD\CADD Sheets\Structural\TS&L\045-0279-62A41-02-General Details.dgn



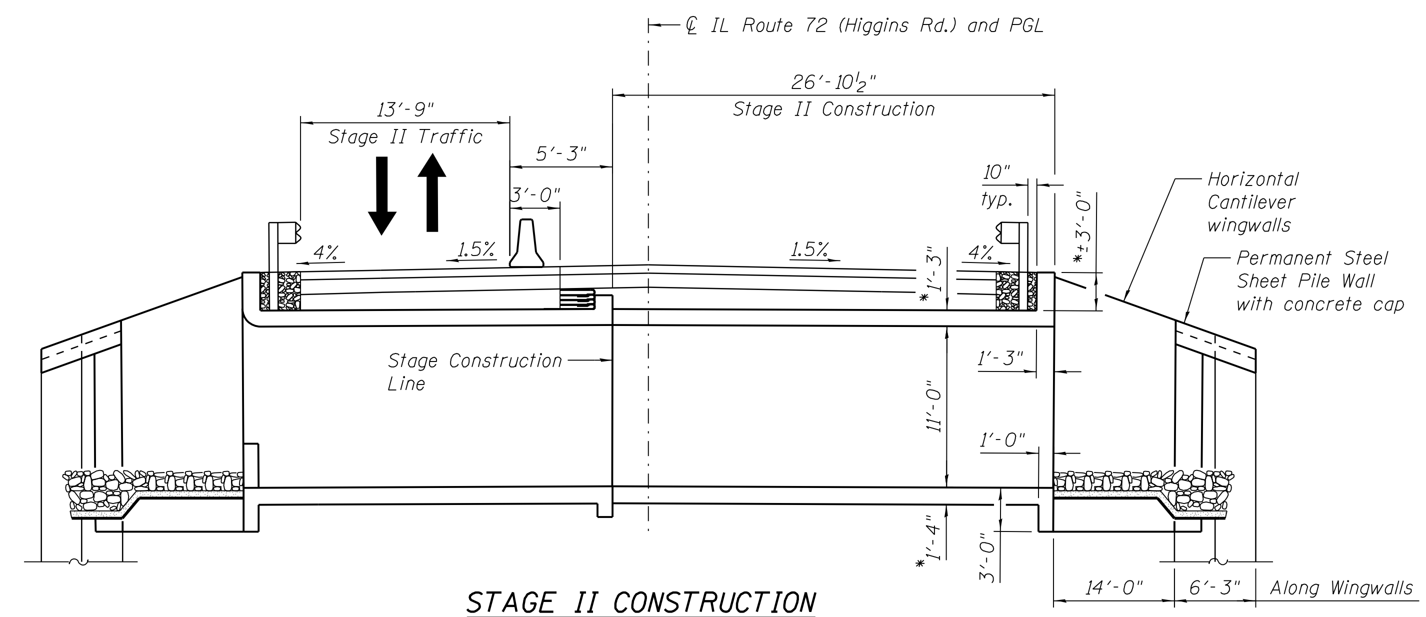

STAGE I REMOVAL




STAGE II REMOVAL




STAGE I CONSTRUCTION




STAGE II CONSTRUCTION

NOTES:

1. All sections are looking East.
2. One lane of traffic will be maintained during each stage utilizing a temporary traffic signal.

*Subject to refinement during final design

LEGEND

(hatched) Removal of Existing Structure and Roadway

STAGE CONSTRUCTION DETAILS
IL RTE. 72 (HIGGINS ROAD)
OVER TYLER CREEK
F.A.P. RTE. 341 SEC. 2014-089B-R
KANE COUNTY
STATION 130+30.00
STRUCTURE NO. 045-0279

FILE NAME = Q:\Engineering\LiveProjects\13003 IDOT DUR\13003h - WO 8 (WO 1) Contract No 62A41\CADD\CADD Sheets\Structural\TS&L\045-0279-62A41-02-Const Stage.dgn

Accurate Group, Inc.

| | | |
|---|---|---|
| USER NAME = sapant | DESIGNED - PP | REVISED |
| | CHECKED - SAT | REVISED |
| PLOT SCALE = 10.0 ' / in. | DRAWN - JN | REVISED |
| PLOT DATE = 12/17/2015 | CHECKED - JMT | REVISED |

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 3 OF 3 SHEETS

| F.A.P RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| 0341 | 2014-089B-R | KANE | | |

CONTRACT NO. 62A41

ILLINOIS FED. AID PROJECT

# APPENDIX A

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9928

# BORING LOG CB-01

**WEI Job No.: 491-02-04**

Client: **Accurate Group, Inc.**
Project: **IL Route 72 over Tyler Creek**
Location: **Pingree Grove, Illinois**

Datum: NAVD
Elevation: 904.05 ft
North: 1976961.27 ft
East: 962428.06 ft
Station: 130+7.04
Offset: 9.04 RT

| Elevation (ft) | SOIL AND ROCK DESCRIPTION | Depth (ft) | Sample No. | SPT Values (blw/6 in) | Qu (tsf) | Moisture Content (%) |
|---|---|---|---|---|---|---|
| 903.4 | 8-inch thick ASPHALT --PAVEMENT-- | | | | | |
| 902.7 | 8-inch thick CONCRETE --PAVEMENT-- | | | | | |
| | Medium dense, brown, fine SAND, little gravel --FILL-- --Dry-- | | 1 | 8 12 11 | NP | 5 |
| | | 5 | 2 | 6 5 5 | NP | 7 |
| | | | 3 | 4 11 6 | NP | 6 |
| 896.1 | Medium dense, black ORGANIC SILT --ORGANIC CONTENT= 26.6 %-- | 10 | 4 | 4 5 7 | NP | 57 |
| 893.6 | *--Obstruction at 10'; relocated 2' W--* | | | | | |
| | Loose, greenish gray GRAVELLY SANDY LOAM --Saturated-- | | 5 | 4 3 4 | NP | 14 |
| | | 15 | 6 | 2 1 1 | | |
| 888.6 | Loose, pinkish brown LOAM *--Disturbed sample* --%Gravel=9.2-- --%Sand=42.3-- --%Silt=41.6-- --%Clay=4.8-- | | 7 | 3 3 4 | NP | 12 |
| 886.1 | Stiff to Hard, pinkish brown CLAY LOAM, trace gravel | 20 | 8 | 3 4 6 | 1.64 B | 13 |
| | | | 9 | 4 6 8 | 1.75 P | 13 |
| | | 25 | 10 | 3 5 7 | 2.71 B | 12 |
| | | | 11 | 3 5 6 | 2.71 B | 12 |
| | | 30 | 12 | 4 7 10 | 3.44 S | 10 |
| | *--Possible Cobbles--* | 35 | 13 | 14 16 24 | | |
| | | | 14 | 5 7 10 | 3.28 B | 11 |
| | | 40 | 15 | 5 7 9 | 2.46 B | 10 |
| | | 45 | 16 | 6 7 11 | 3.12 B | 11 |
| | | 50 | 17 | 9 12 15 | 3.25 P | 11 |

## GENERAL NOTES

Begin Drilling **12-29-2014** Complete Drilling **12-29-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" IDA HSA to 10';mud rotary thereafter; boring backfilled upon completion**

## WATER LEVEL DATA

While Drilling ▽ **10.50 ft**
At Completion of Drilling ▼ **11.00 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.

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

# BORING LOG CB-01

**WEI Job No.: 491-02-04**

Client **Accurate Group, Inc.**
Project **IL Route 72 over Tyler Creek**
Location **Pingree Grove, Illinois**

Datum: NAVD
Elevation: 904.05 ft
North: 1976961.27 ft
East: 962428.06 ft
Station: 130+7.04
Offset: 9.04 RT

| Elevation (ft) | SOIL AND ROCK DESCRIPTION | Depth (ft) | Sample No. | SPT Values (blw/6 in) | Qu (tsf) | Moisture Content (%) |
|---|---|---|---|---|---|---|
| | | 55 | 18 | 10 / 11 / 12 | 3.77 B | 10 |
| | | 60 | 19 | 7 / 10 / 12 | 3.28 B | 11 |
| | *--Possible Cobbles--* | 65 | 20 | 10 / 12 / 15 | | |
| | | | 21 | 7 / 8 / 13 | 2.05 B | 11 |
| | | 70 | 22 | 7 / 11 / 15 | 2.46 B | 12 |
| | *--From 70' to termination depth* --HARD DRILLING-- *--Possible Cobbles--* | | | | | |
| | | 75 | 23 | 7 / 15 / 21 | 2.00 P | 12 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | |
| | | 80 | 24 | 14 / 12 / 14 | 3.53 B | 11 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | |
| | | 85 | 25 | 22 / 11 / 15 | 4.10 B | 9 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | |
| 814.1 | | 90 | 26 | 19 / 10 / 12 | 3.28 B | 9 |
| | Boring terminated at 90.00 ft | | | | | |
| | | 95 | | | | |
| | | 100 | | | | |

## GENERAL NOTES

Begin Drilling **12-29-2014** Complete Drilling **12-29-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" IDA HSA to 10';mud rotary thereafter; boring backfilled upon completion**

## WATER LEVEL DATA

While Drilling ▽ **10.50 ft**
At Completion of Drilling ▼ **11.00 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.

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# BORING LOG CB-02

**WEI Job No.: 491-02-04**

Client: **Accurate Group, Inc.**
Project: **IL Route 72 over Tyler Creek**
Location: **Pingree Grove, Illinois**

Datum: NAVD
Elevation: 904.08 ft
North: 1977003.52 ft
East: 962466.09 ft
Station: 130+53.81
Offset: 9.05 LT

| Elevation (ft) | SOIL AND ROCK DESCRIPTION | Depth (ft) | Sample No. | SPT Values (blw/6 in) | Qu (tsf) | Moisture Content (%) |
|---|---|---|---|---|---|---|
| 903.6 | 5.5-inch thick ASPHALT --PAVEMENT-- | | | | | |
| 902.8 | 10-inch thick CONCRETE --PAVEMENT-- | | | | | |
| | Medium stiff, dark brown SILTY CLAY LOAM, trace gravel | | 1 | 6 10 9 | 0.50 P | 16 |
| 900.8 | --FILL-- | | | | | |
| | Loose to medium dense, brown, fine SAND, trace gravel --FILL-- --Dry-- | 5 | 2 | 11 10 8 | NP | 7 |
| | | | 3 | 2 3 5 | NP | 8 |
| 897.3 | Black ORGANIC SILT | | | | | |
| 896.1 | Loose, dark brown, fine SAND, trace gravel --Damp-- | 10 | 4 | 2 3 5 | NP | 8 |
| 893.6 | Medium dense, brown SANDY GRAVEL --Saturated-- | | 5 | 8 13 12 | NP | 12 |
| | --HARD DRILLING-- *--Possible Cobbles--* | 15 | 6 | 10 15 11 | NP | 11 |
| 888.6 | Medium stiff to hard, pinkish brown LOAM to CLAY LOAM, trace gravel | | 7 | 4 6 8 | 1.23 B | 13 |
| | --$L_L$(%)=19, $P_L$(%)=11-- --%Gravel=4.2-- --%Sand=39.1-- --%Silt=43.5-- --%Clay=13.1-- | 20 | 8 | 10 6 6 | 0.98 B | 12 |
| | | | 9 | 7 6 7 | 2.21 B | 13 |
| | | 25 | 10 | 4 5 8 | 2.05 B | 11 |
| | | | 11 | 3 5 8 | 2.87 B | 12 |
| | | 30 | 12 | 4 6 8 | 2.05 B | 11 |
| | | 35 | 13 | 4 5 7 | 1.64 B | 12 |
| | | 40 | 14 | 5 8 11 | 3.03 B | 11 |
| | | 45 | 15 | 7 7 12 | 2.95 B | 11 |
| | | 50 | 16 | 6 12 16 | 2.30 B | 12 |

## GENERAL NOTES

Begin Drilling **12-23-2014** Complete Drilling **12-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" IDA HSA to 10';mud rotary thereafter; boring backfilled upon completion**

## WATER LEVEL DATA

While Drilling ▽ **10.50 ft**
At Completion of Drilling ▼ **11.00 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.

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# BORING LOG CB-02

**WEI Job No.: 491-02-04**

Client: **Accurate Group, Inc.**
Project: **IL Route 72 over Tyler Creek**
Location: **Pingree Grove, Illinois**

Datum: NAVD
Elevation: 904.08 ft
North: 1977003.52 ft
East: 962466.09 ft
Station: 130+53.81
Offset: 9.05 LT

| Elevation (ft) | SOIL AND ROCK DESCRIPTION | Depth (ft) | Sample Type recovery | Sample No. | SPT Values (blw/6 in) | Qu (tsf) | Moisture Content (%) |
|---|---|---|---|---|---|---|---|
| | | 55 | SS | 17 | 7, 15, 15 | 2.50 P | 13 |
| | | 60 | SS | 18 | 7, 10, 13 | 2.21 B | 14 |
| | | 65 | SS | 19 | 5, 9, 12 | 2.05 B | 13 |
| | *--From 66' to termination depth* --HARD DRILLING-- *--Possible Cobbles--* | | | | | | |
| | | 70 | SS | 20 | 15, 18, 23 | 2.71 B | 13 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | | |
| | | 75 | SS | 21 | 9, 12, 18 | 2.00 B | 15 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | | |
| | | 80 | SS | 22 | 9, 12, 16 | 3.36 B | 11 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | | |
| | | 85 | SS | 23 | 9, 10, 15 | 4.10 B | 10 |
| | --HARD DRILLING-- *--Possible Cobbles--* | | | | | | |
| 814.1 | | 90 | SS | 24 | 8, 12, 14 | 3.53 B | 8 |
| | Boring terminated at 90.00 ft | | | | | | |
| | | 95 | | | | | |
| | | 100 | | | | | |

## GENERAL NOTES

Begin Drilling **12-23-2014** Complete Drilling **12-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" IDA HSA to 10';mud rotary thereafter; boring backfilled upon completion**

## WATER LEVEL DATA

While Drilling ▽ **10.50 ft**
At Completion of Drilling ▼ **11.00 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.

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# BORING LOG SC-01

**WEI Job No.: 491-02-04**

Client: **Accurate Group, Inc.**
Project: **IL Route 72 over Tyler Creek**
Location: **Pingree Grove, Illinois**

Datum: NAVD
Elevation: 890.98 ft
North: 1977011.99 ft
East: 962426.83 ft
Station: 130+23.80
Offset: 35.74 LT

| Profile | Elevation (ft) | SOIL AND ROCK DESCRIPTION | Depth (ft) | Sample Type recovery | Sample No. | SPT Values (blw/6 in) | Qu (tsf) | Moisture Content (%) |
|---|---|---|---|---|---|---|---|---|
| | | *--Stream Bed--* Brown and gray SAND to SANDY LOAM, little gravel --Saturated-- --%Gravel=27.0-- --%Sand=44.3-- --%Silt=23.2-- --%Clay=5.6-- | | | 1 | PUSH | NP | 12 |
| | | | | | 2 | PUSH | NP | 10 |
| | | | 5 | | 3 | PUSH | NP | 11 |
| | 885.0 | Boring terminated at 6.00 ft | | | | | | |
| | | | 10 | | | | | |
| | | | 15 | | | | | |
| | | | 20 | | | | | |
| | | | 25 | | | | | |

## GENERAL NOTES

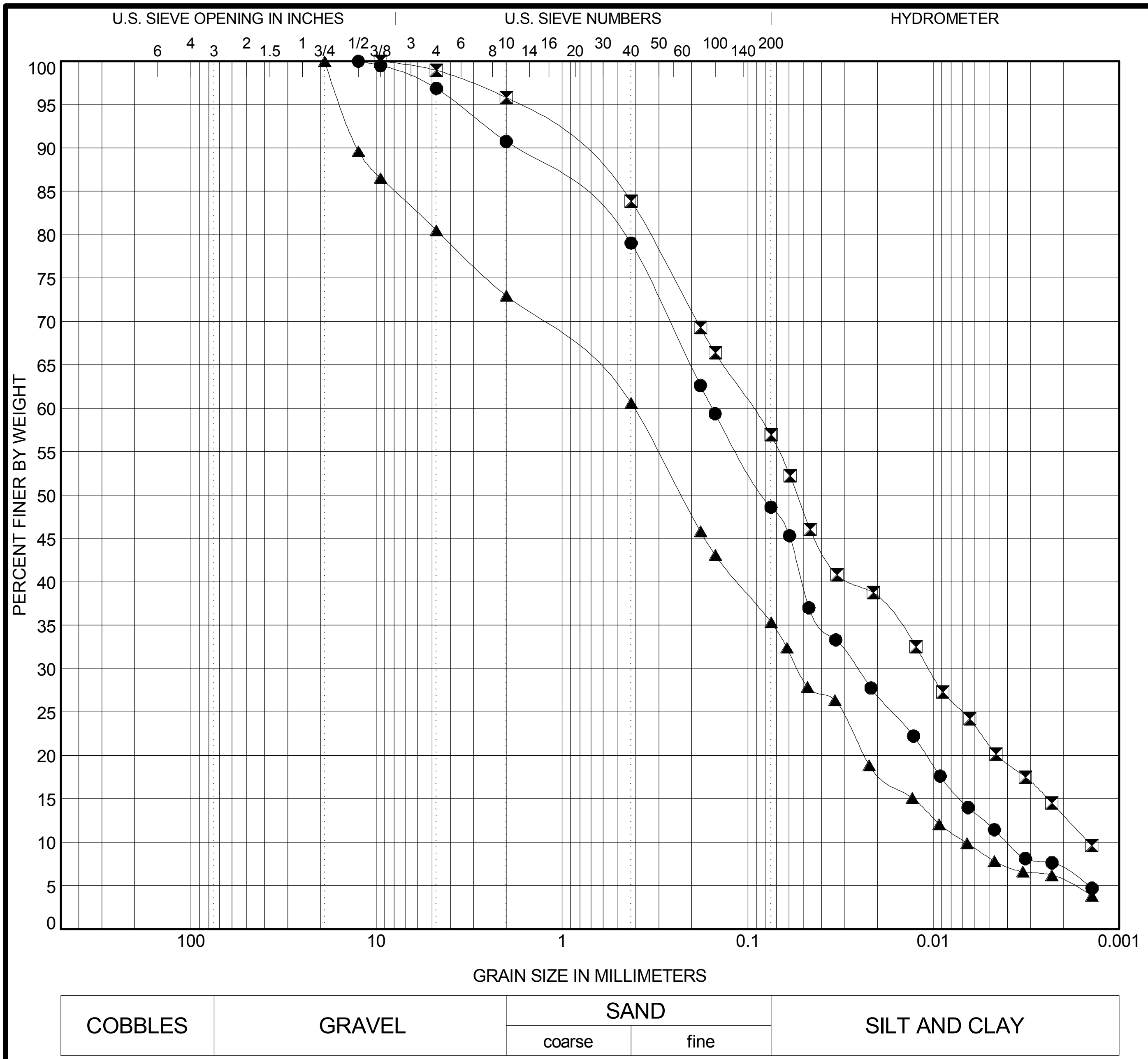
Begin Drilling **12-30-2014** Complete Drilling **12-30-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **GEOPROBE**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **3.25" IDA HSA; boring backfilled upon completion**

## WATER LEVEL DATA

While Drilling ▽ **0.5 ft above streambed**
At Completion of Drilling ▼ **0.5 ft above streambed**
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




| | Specimen Identification | | IDH Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | **CB-01#7** | **16.0 ft** | **Loam** | **NP** | **NP** | **NP** | **1.08** | **39.12** |
| ⧗ | **CB-02#8** | **18.5 ft** | **Loam** | **19** | **11** | **8** | **0.81** | **64.46** |
| ▲ | **SC-01#1** | **0.0 ft** | **Gravelly Sandy Loam** | **NP** | **NP** | **NP** | **1.06** | **61.17** |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **CB-01#7** | **16.0 ft** | **12.5** | **0.155** | **0.026** | **0.004** | **9.2** | **42.3** | **41.6** | **6.8** |
| ⧗ | **CB-02#8** | **18.5 ft** | **9.5** | **0.094** | **0.011** | **0.001** | **4.2** | **39.1** | **43.5** | **13.1** |
| ▲ | **SC-01#1** | **0.0 ft** | **19** | **0.409** | **0.054** | **0.007** | **27.0** | **37.8** | **29.6** | **5.6** |

WEI GRAIN SIZE IDH 4910204.GPJ US LAB.GDT 9/23/15

WEI
SINCE 1982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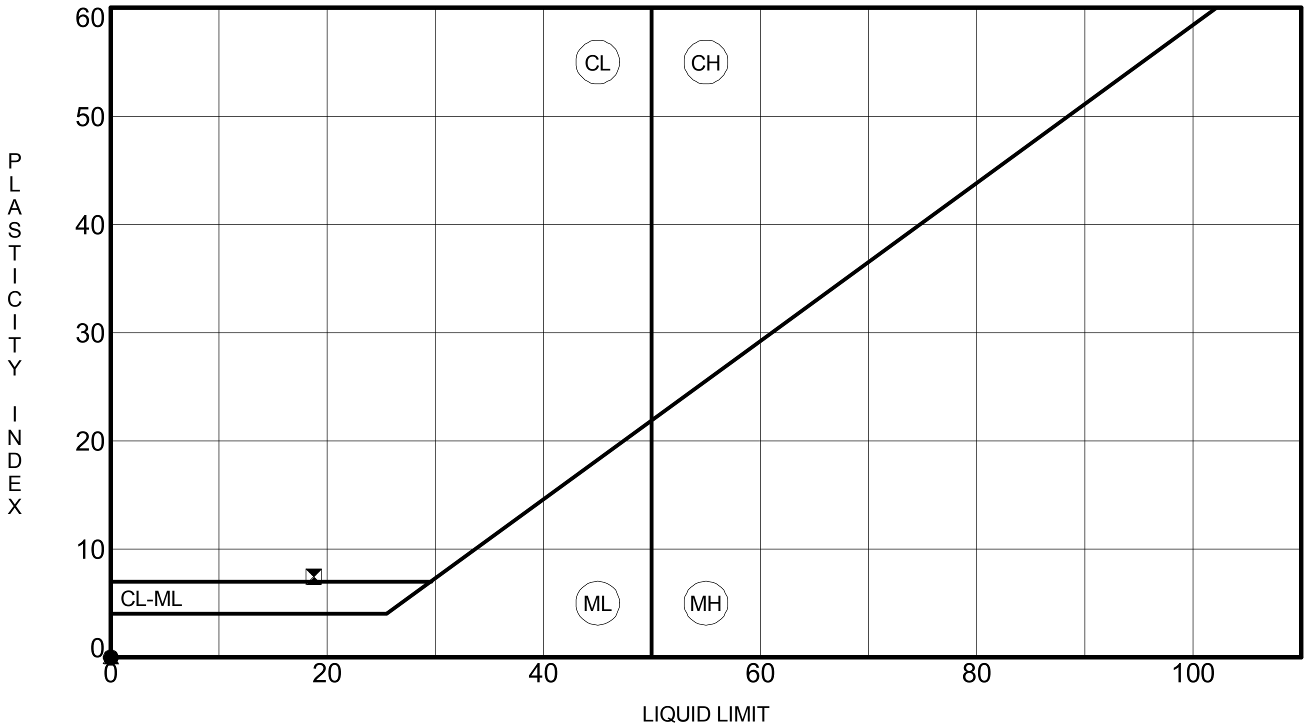
# GRAIN SIZE DISTRIBUTION

Project: IL Route 72 over Tyler Creek

Location: Pingree Grove, Illinois

Number: 491-02-04




| | Specimen Identification | | LL | PL | PI | Fines | IDH Classification |
|---|---|---|---|---|---|---|---|
| ● | **CB-01#7** | **16.0 ft** | **NP** | **NP** | **NP** | **49** | **Loam** |
| ⧗ | **CB-02#8** | **18.5 ft** | **19** | **11** | **8** | **57** | **Loam** |
| ▲ | **SC-01#1** | **0.0 ft** | **NP** | **NP** | **NP** | **35** | **Gravelly Sandy Loam** |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## ATTERBERG LIMITS' RESULTS

Project: IL Route 72 over Tyler Creek

Location: Pingree Grove, Illinois

Number: 491-02-04

1145 North Main Street
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# ORGANIC CONTENT in SOILS by LOSS on IGNITION

**ASTM D 2974, Method C**

| | | | |
|---|---|---|---|
| **Client:** | **Accurate** | **Analyst Name:** | **C. Iordache** |
| **Project:** | **IL 72 over Tyler Creek** | **Date Received:** | **12/29/2014** |
| **WEI Job:** | **491-02-04** | **Date Tested:** | **12/30/2014** |
| **Type/Condition:** | **SS** | **Soil Sample ID:** | **CB-01, No.4 (8.5-10.0ft)** |
| **Testing Furnace Temp °C.:** | 440 | **Sample Description:** | **Organic Silt** |

| **Moisture Content** | **Wet soil + tare (g)** | **Dry Soil + tare (g)** | **Tare mass (g)** | **w (%)** |
|---|---|---|---|---|
| oven-dry method | 32.92 | 25.02 | 11.13 | 57 |

| **Ash Content** | **Dry Soil + tare (g)** | **Ash + tare (g)** | **Tare mass (g)** | **Ash Content (%)** |
|---|---|---|---|---|
| Loss On Ignition | 25.02 | 22.1 | 11.13 | 27 |

**Organic Content (%)= 26.6**

Prepeared By:____________________________________

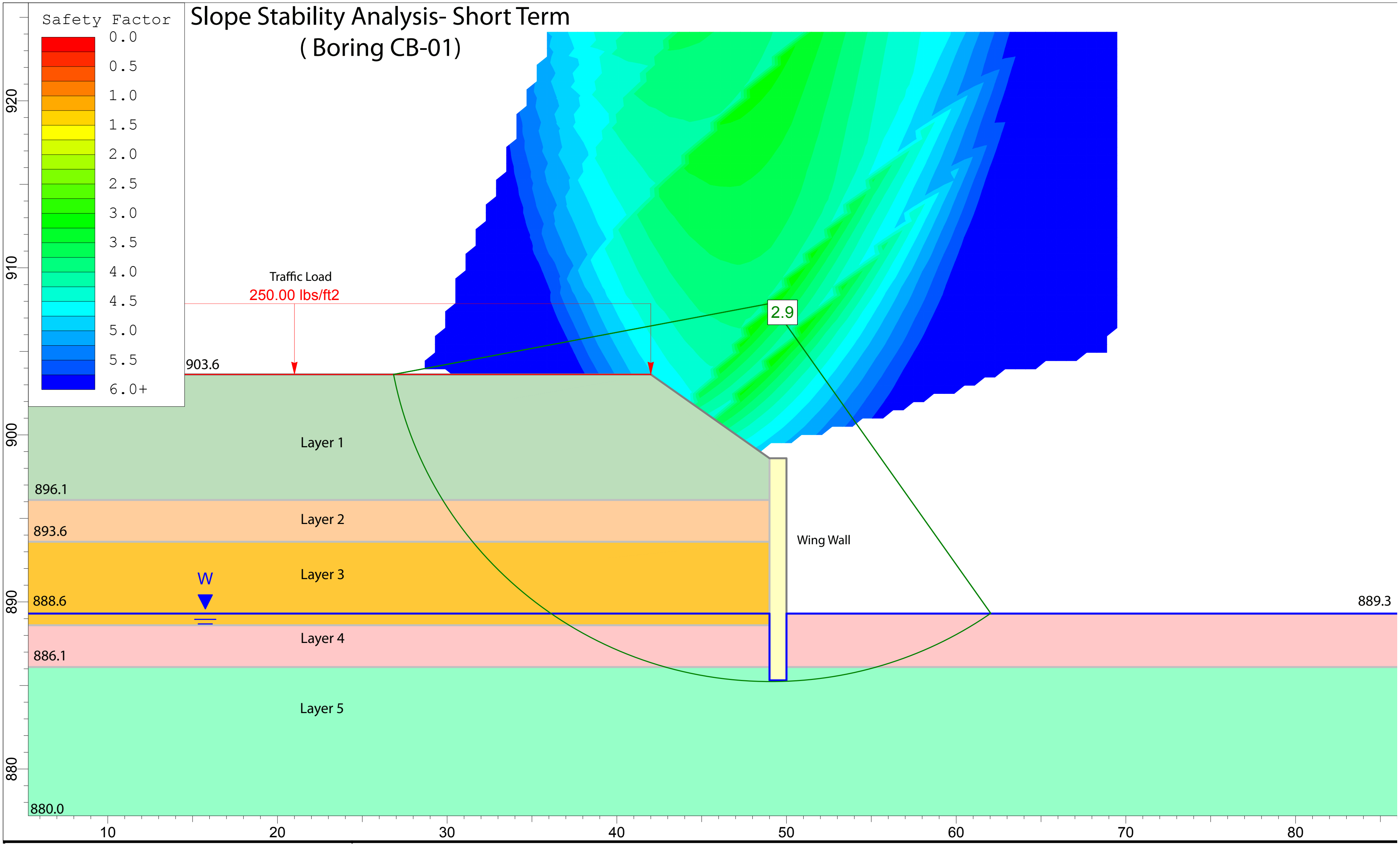
Reviwed By:____________________________________



AASHTO R18

# APPENDIX C

# Slope Stability Analysis- Short Term
## ( Boring CB-01)




## Soil Properties:

| Layer ID | Soil Type | Unit Weight (pcf) | Undrained Parameters C (psf) | Undrained Parameters ϕ (deg.) |
|---|---|---|---|---|
| 1 | Medium Dense SAND | 115 | 0 | 32 |
| 2 | Medium Dense Organic SILT | 110 | 0 | 30 |
| 3 | Loose GRAVELLY SANDY LOAM | 110 | 0 | 30 |
| 4 | Loose SANDY LOAM | 110 | 0 | 30 |
| 5 | Stiff to Very Stiff CLAY LOAM | 120 | 2200 | 0 |

SLOPE STABILITY ANALYSIS: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

SCALE: GRAPHIC

APPENDIX C-1

DRAWN BY: H. Bista
CHECKED BY: A. Kurnia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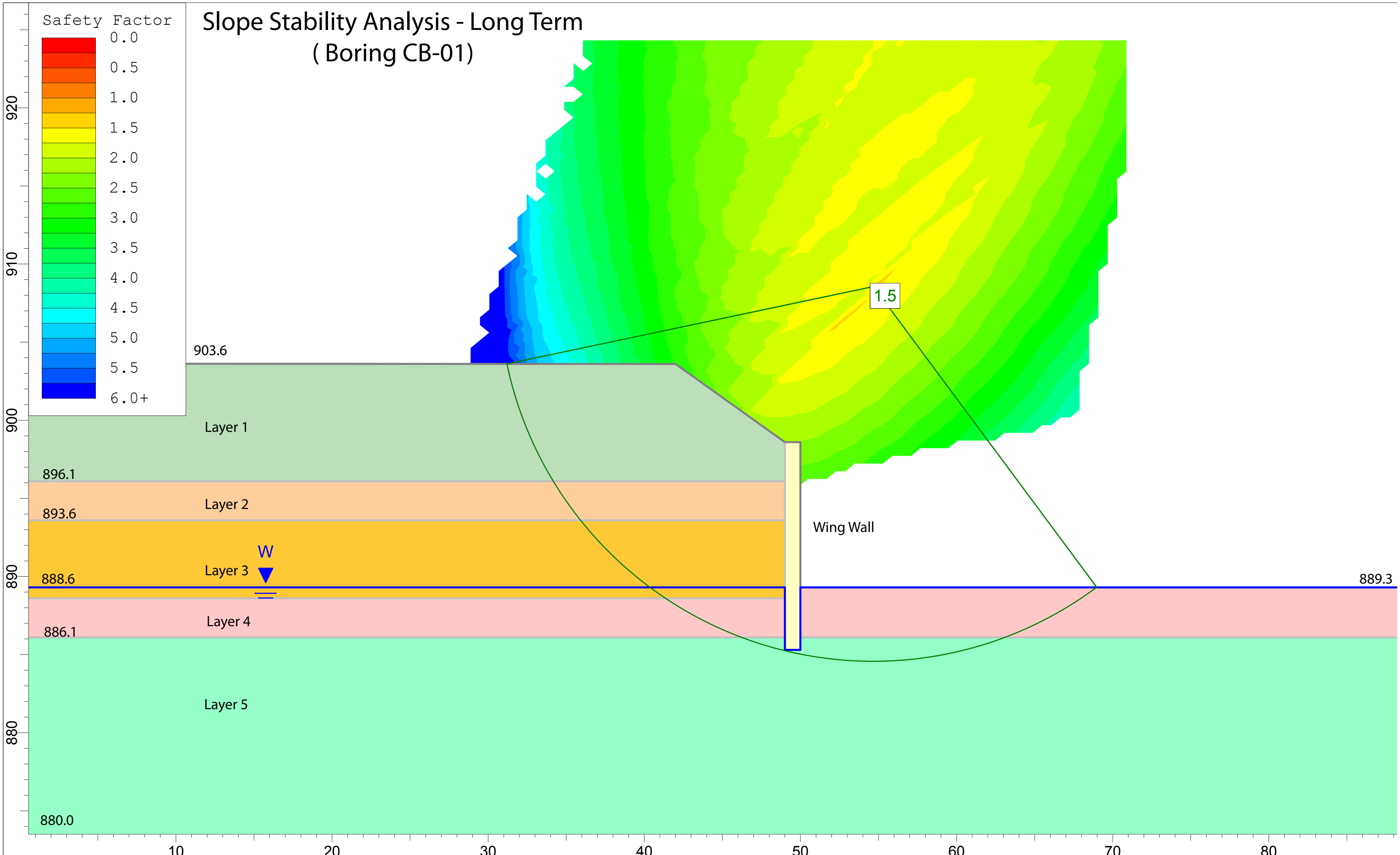
491-02-04




Soil Properties:

| Layer ID | Soil Type | Unit Weight (pcf) | Drained Parameters C' (psf) | Drained Parameters ϕ (deg.) |
|---|---|---|---|---|
| 1 | Medium Dense SAND | 115 | 0 | 32 |
| 2 | Medium Dense Organic SILT | 110 | 0 | 30 |
| 3 | Loose GRAVELLY SANDY LOAM | 110 | 0 | 30 |
| 4 | Loose SANDY LOAM | 110 | 0 | 30 |
| 5 | Stiff to Very Stiff CLAY LOAM | 120 | 100 | 32 |

SLOPE STABILITY ANALYSIS: ILLINOIS ROUTE 72 OVER TYLER CREEK, SN 045-0279, KANE COUNTY, ILLINOIS

SCALE: GRAPHIC

APPENDIX C-2

DRAWN BY: H. Bista
CHECKED BY: A. Kurnia

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