STRUCTURE GEOTECHNICAL REPORT
FAP 344A/IL ROUTE 83 OVER TINLEY CREEK
SN 016-0569 (EXISTING BRIDGE)
SN 016-1331 (PROPOSED CULVERT)
SECTION 3034B&N-2
IDOT D-91-314-13, PTB 168/ITEM 07
COOK COUNTY, ILLINOIS

For

Collins Engineers, Inc.

123 N. Wacker Drive

Suite 900

Chicago, IL 60606-1793

(312) 236-5117

Submitted by

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

(630) 953-9928

Original: June 2, 2015
Revised: January 12, 2016

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report IL Route 83 over Tinley Creek Culvert at Station 116+38.40		**2. Report Date** Original: June 2, 2015 Revised: January 12, 2016 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☒ Final ☒ Revised
4. Route / Section / County FAP 344A/ 3034B&N-2/Cook		**5. IDOT Job / Contract No.** D-91-314-13
6. PTB / Item No. 168/07	**5. Existing Structure Number(s)** SN 016-0569 (Bridge)	**6. Proposed Structure Number(s)** SN 016-1331 (Culvert)
7. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Metin W. Seyhun, P.E. QC/QA: Jerry W.H. Wang, PhD, P.E. PIC: Corina T. Farez, P.E., P.G.	**Author Phone Number/Email** (630) 953-9928 Ext. 1018 mseyhun@wangeng.com
9. Prepared for Collins Engineers, Inc. 303 E Wacker Drive Chicago, IL 60601	**Design / Structural Engineer** James M. Hamelka, P.E., S.E.	**Contact Phone Number** (312) 236-5117

10. Abstract

The existing bridge structure carrying IL Route 83 over Tinley Creek at Sta. 116+38.40 will be replaced by a triple cell cast-in-place (CIP) box culvert. This report provides geotechnical recommendations for the design of the proposed culvert and wingwalls.

Below the pavement structure or topsoil, the soils consist of up to 8.5 feet of medium dense silty loam or stiff clay loam fill. Underneath the fill, there is loose to very dense silt to sandy gravel to the top of dolostone bedrock at about 31 to 35.5 feet below existing ground surface (bgs). The bedrock is of very poor to fair quality.

The culvert and wingwalls may be supported on a shallow foundation system. Alternative wingwall types can be drilled soldier pile, and horizontal cantilever with drilled pile extension. Based on the proposed cut off walls and riprap protection we do not anticipate scour to undermine the foundations for culvert and wingwalls. Any soft compressible layers and the channel bottom materials underneath culvert base elevation should be removed and replaced with structural fill. A maximum factored bearing capacity of 3,000 psf is recommended for footing design. Settlement analyses under the recommended bearing pressure revealed maximum ½ inch settlement with ¼ inch differential settlement. Global stability analyses show suitable factors of safety for the walls.

Stage construction will be used to maintain one lane of traffic in each direction at all times. A temporary shoring system is recommended. The existing structure appears to be supported on drilled shafts and H-piles which will be partially left in place. Wang recommends to cut-off the top of existing foundations by 2 feet below the proposed culvert elements to avoid stress concentrations.

11. Path to archived file

S:\Netprojects\4861702\Reports\Revised Final December 1, 2015\RPT_Wang_MWS_4861702IL83overTinleyV03_20160112.doc

TABLE OF CONTENTS

1145 North Main Street
Lombard, Illinois 60148
Phone (630) 953-9928
www.wangeng.com

STRUCTURE GEOTECHNICAL REPORT
FAP 344A/IL ROUTE 83 OVER TINLEY CREEK
SN 016-0569 (EXISTING BRIDGE), SN 016-1331 (PROPOSED CULVERT)
SECTION 3034B&N-2
IDOT D-91-314-13, PTB 168/ITEM 07
COOK COUNTY, ILLINOIS
FOR
COLLINS ENGINEERS, INC.

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, and geotechnical evaluations for the removal and replacement of the existing single span bridge carrying IL Route 83 (Cal Sag Road) over Tinley Creek (at 127th Street) with a new culvert in Crestwood, Cook County, Illinois. A *Site Location Map* is presented as Exhibit 1.

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

1.1 Proposed Structure

A Type, Size and Location (TSL) plan was provided by Collins Engineers, Inc. (Collins) for the preparation of this Structure Geotechnical Report (SGR). The *TSL* is presented in Appendix D.

Wang understands the proposed structure (SN 016-1331) will be a triple cell, 12-foot wide by 10.5-foot high side cells with 14-foot wide by 13.5-foot high center cell, CIP box culvert with horizontal cantilever and T-type vertical cantilever wingwalls. The centerline of culvert will be located at Station 116+38.40 on IL Route 83. The structure length will measure 170.0 feet along culvert center line, with out-to-out width of 42.0 feet (1 to 1.5-foot wall thickness), and will intersect IL 83 at 34^{0} skew. The existing roadway profile along IL 83 and 127th will have minor grade change. The upstream (U.S.) and downstream (D.S.) culvert invert elevations will be 583.72 and 582.13 feet, respectively with flow directed from south to north. The top of roadway elevation will be 603 feet with top of culvert estimated at 595 feet resulting in an 8-foot roadway fill above top of culvert.

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 new culvert structure and wingwalls.

1.2 Existing Structure

The existing structure (SN016-0569) was originally as a single span bridge of reinforced concrete T-Beams on closed abutments. In 1935 and 1984, the structure was widened to the north and south with single span reinforced concrete slabs on cantilevered closed abutments. There is an existing upstream weir structure which will remain and will be connected to the proposed triple cell culvert.

Wang understands that stage construction will be utilized to maintain one lane of traffic in each direction at all times during the removal and replacement of the existing structure.

2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The site is located in the Village of Crestwood, at the bridge where Illinois Route 83 intersects with West 127th Street, in Cook County, Illinois. On the USGS *Palos Park 7.5 Minute Series* map, the bridge is located in the SW¼ of Section 28 and NW¼ of Section 33, Tier 37 N, Range 13 E 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 confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered northeastern Illinois in general and Cook County in particular. Exhibit 2 illustrates the *Site and Regional Geology*.

2.1 Physiography

The site is situated along the south bank of the Cal Sag Channel, which follows the path of a former drainage way of glacial Lake Chicago. The area is flat, with Tinley Creek draining the rougher, higher terrain to the southwest, into the Cal Sag Channel. Elevations around the project site range from 600 to 603 feet.

2.2 Surficial Cover

Within the project area, 30- to 35-foot thick, Wisconsinan-age glacial drift covers the bedrock. The glacial cover is made up of clay and silt of the Equality Formation of the Mason Group and silty loam diamicton of the Batestown Member of the Lemont Formation (Hansel and Johnson 1996). The Equality Formation is made up of bedded silt and clay, locally laminated, with lenses and/or thin beds of sand and gravel. The Batestown Member consists of massive, gray till with a silty loam to loam matrix, dolostone clasts, and occasional lenses sand, gravel, and silt.

From a geotechnical viewpoint, the Equality Formation is characterized by low strength, medium to high plasticity, and medium to high moisture content. The Batestown Member is characterized by low plasticity, medium to high blow counts, and low moisture content (Bauer et al. 1991; Peck and Reed 1954).

2.3 Bedrock

In the project area, the glacigenic deposits rest unconformably over Silurian-age dolostone. The top of bedrock may be encountered between 30 to 35 feet below ground surface (bgs) or elevations of 569 to 572 feet. The Silurian dolostone dips gently eastward at a pace of 15 feet per mile. Only inactive faults are known in the area, and the seismic risk to the proposed structure from the existing faults is minimal (Leetaru et al. 2004; Willman 1971).

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed the native sediments consist of silt to silty loam lacustrine deposits of the Equality Formation resting on top of more competent gravelly silty loam diamicton of the Batestown Member of the Lemont Formation, which in turn is underlain by bedrock. The borings encountered bedrock at 31.0 and 35.5 feet bgs or elevations of 570 and 567 feet, consistent with the estimated bedrock in the area.

3.0 METHODS OF INVESTIGATION

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

3.1 Subsurface Investigation

The subsurface investigation was performed by Wang on September 22 and 23, 2014, and consisted of two structure borings designated as SSB-01 and SSB-02. Boring SSB-01 was drilled from top of roadway on the northeast side of the intersection adjacent to the existing structure, and Boring SSB-02 was drilled from the grass area at the southwest side of intersection. Both borings were drilled to the top of bedrock at 31.0 and 35.5 feet bgs. Northings and eastings were surveyed by Wang with a mapping-grade GPS unit. The boring locations are presented in the *Boring Logs* (Appendix A) and in the *Boring Location Plan* (Exhibit 3).

An ATV drilling rig, equipped with solid stem augers and mud rotary equipment, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils*." The soil was sampled at 2.5-foot intervals to 30 feet bgs and at 5-foot intervals thereafter. Samples collected from each interval were placed in sealed jars for further examination and testing. NWD4-size bedrock cores were collected from both borings.

Field boring logs, prepared and maintained by a Wang engineer, include lithological descriptions, visual-manual soil/rock classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration. The SPT N value, shown on the soil profile, is the sum of the second and third blows per 6 inches. The soils were described and classified according to Illinois Division of Highways (IDH) Textural Classification system. The field logs were finalized by an experienced engineering geologist after verifying the field visual classifications and laboratory test results. The bedrock cores were described and measured for recovery and Rock Quality Designation (RQD).

Groundwater observations were made during and at the end of drilling operations. Due to safety considerations, boreholes were grouted immediately upon completion.

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 performed to classify selected samples. Field visual descriptions of the soil samples were verified in the laboratory, and the tested samples were classified in accordance with the IDH Textural Classification chart. Selected rock core samples were tested for unconfined compressive strength (ASTM D7012). Laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

The soil and rock core samples will be retained in our laboratory for 60 days following this report submittal. The samples will be discarded unless a specific written request is received as to their disposition.

4.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

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

4.1 Soil Conditions

Boring SSB-02 taken from top of roadway revealed a pavement structure of 11-inch asphalt overlying 5 inches of crushed stone base course, and Boring SSB-02 taken from top of grass revealed a 5-inch thick black silty loam topsoil.

In descending order, the general lithologic succession encountered beneath the topsoil/pavement includes 1) man-made ground (fill); 2) loose to very dense silt, silty loam, sandy gravel; and 3) dolostone bedrock.

1) Man-made ground (fill)

Underneath the pavement structure or topsoil, borings encountered 5.5 and 8.5 feet of fill consisting of medium dense silty loam or stiff to very stiff clay loam. The silty loam has SPT N values of 12 and 13 blows per foot with moisture content (MC) values of 16 %, and the clay loam has unconfined compressive strength (Qu) values of 1.75 to 3.50 tsf with MC values of 14 to 17 %.

2) Loose to very dense silt, silty loam, sandy gravel

Beneath the fill, loose to very dense silt, silty loam, and sandy gravel was encountered to the top of dolostone bedrock located at a depth of 31.0 and 35.5 below ground surface (bgs) corresponding to 570.4 and 567.3 feet elevations. The granular material in general has SPT N values of 4 to 83 blows per foot with moisture content (MC) values of 8 to 23 %. However, below a depth of 23.5 feet bgs, the soil becomes dense to very dense with SPT N values of 35 to 83 blows per foot with moisture content (MC) values of 9 to 13 %. About 2 feet of weathered bedrock was encountered at a depth of 28.8 and 33.5 bgs, corresponding to 572.6 and 569.3 feet elevations. It should be noted that hard drilling was encountered at about 18, 20, 28 and 33 feet bgs which indicates the possibility of gravel and cobbles.

3) Dolostone bedrock

Dolostone bedrock was confirmed by coring at 35.5 to 39.75 feet bgs in Boring SSB-01 and at 31.0 to 37.5 feet in Boring SSB-02 corresponding to elevations of 563.9 and 563.0 feet. Based on rock cores taken, RQD ranges from 0 to 52% corresponding to very poor to fair quality rock. Dolostone bedrock was strong, gray to greenish gray, bedded, and shaly. Unconfined compressive strength of rock sample tested from Boring SSB-02 was 10,120 psi. Bedrock core photographs are shown in Appendix A.

4.2 Groundwater Conditions

Groundwater was located at approximately 8.75 to 10.25 feet bgs within the granular fill or silty loam layers. Afterwards, the groundwater level could not be determined due to the mud drilling and rock boring operations, which involve injection of mud and water, thereby making any groundwater readings unreliable. However, based on the wetness of the soil samples, we estimate groundwater to be at an elevation of about 592 feet within the granular soils.

5.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the box culvert and wingwalls wall are included in the following sections.

5.1 Culvert and Wingwalls

The new structure will be a triple cell, 12-foot wide by 10.5-foot high side cells with 14-foot wide by 13.5-foot high center cell, CIP box culvert with horizontal cantilever and T-type vertical cantilever wingwalls. Alternative wingwall types can be drilled soldier pile, and horizontal cantilever with drilled pile extension. These wingwall types tend to be more favorable in culvert locations with a high volume of water since a cofferdam is not required.

Wang has performed bearing capacity, settlement, and global stability analyses for the culvert box and wingwalls. Our analyses show that the culvert box and wingwalls can be supported on a shallow foundation system, and that the wingwalls are globally stable.

The upstream (U.S.) and downstream (D.S.) culvert invert elevations will be 583.72 and 582.13 feet, respectively with flow directed from south to north. The top of roadway elevation will be about 603 feet with top of culvert estimated at 595 feet resulting in an 8-foot roadway fill above top of culvert. There will be a 4-foot cut off wall and A-4 class riprap protection at the downstream end. There is also riprap protection around the wingwalls. Therefore, with the provision of cut off wall and riprap protection we do not anticipate scour of the culvert and wingwall foundations.

5.1.1 Bearing Capacity

The foundation soils below the culvert box and the wingwalls will generally consist of medium to very dense sandy gravel, silt and silty loam to the top of bedrock at about 570 feet elevation. However, it should be noted that there are saturated silt layers at the foundation level. If this layer is encountered during construction, the silt layer can become unstable, thus it is recommended to remove and replace about 12-inch of the silt by structural fill in order to have proper foundation bearing surface and construction working platform. Dewatering may be necessary to stabilize the excavation. The extent of removal and replacement shall be determined through field verification in order to address local problem zones or areas of uncertainty between borings.

Our evaluations show the bearing capacity of the foundation soils or new structural fill to carry the box culvert at the proposed foundation bearing elevation of about 581 feet (23 feet below the proposed roadway) is satisfactory and is not a governing factor.

Wang recommends the T-type vertical cantilever wingwall foundations to be established 4.0 feet below the culvert invert elevation. The recommended maximum factored bearing resistance for footing design is 3,000 psf calculated with a bearing resistance factor of 0.55. The estimated friction angle between the base of a concrete wingwall and the underlying silty soils is 24º as per NAVFAC *Foundations and Earth Structures* (NAVFAC 1986). The corresponding friction coefficient is 0.45. The wingwalls should be designed with a minimum factor of safety against sliding of 1.50 (LRFD resistance factor of 1.0) and a minimum factor of safety against overturning of 2.0 (LRFD resistance factor of 0.5).

Wingwalls and culvert box should be designed based on a lateral earth pressure diagram determined according to IDOT *Culvert Manual* (IDOT, 2000). Alternatively, backfill parameters recommended in Table 3 can be used to estimate lateral pressures on the side of the barrels and wingwalls.

5.1.2 Settlement

The foundation soils consist of medium to very dense sandy gravel, silt and silty loam to the top of bedrock. Based on a maximum applied soil pressure of 3,000 psf, we estimate the maximum total settlement of the culvert and the wingwalls to be ½ inch. The maximum differential settlement between areas that have been preloaded by the existing structure and the virgin soil loading areas is ¼ inch, especially the north end. This settlement is expected to occur through the construction period due to the granular nature of the soils.

5.1.3 Global Stability

The global stability of the wingwalls was analyzed based on the soil profile described in Section 4.1 and the TSL plan. The maximum wingwall height is approximately 13.0 feet with exposed height of approximately 9.0 feet.

The minimum required FOS for both short-term and long-term conditions is 1.5 (IDOT, 1999). Analyses were performed with Slide v6.0, and the results of slope stability evaluations are shown in Appendix C. We estimated undrained (short-term) and drained (long-term) FOS of 1.9 and 1.6, respectively (Appendix C-1 and C-2). These conditions meet the IDOT's minimum requirement for slope stability.

The earth pressure recommendations for soldier pile wingwall alternative are shown in Tables 1 and 2.

Table 1: Design Earth Pressure Parameters for Soldier Pile Wingwall (Boring: SSB-01)

Layer Elevations/ Soil Description	Unit Weight (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients(2)	
		Cohesion (psf)	Friction Angle(3) φ' (Degree)	Active Pressure	Passive Pressure
602.77 to 597.30 Stiff to V Stiff CL LOAM	120	100	30	0.54	3.00
597.30 to 593.80 Loose to M Dense SI LOAM	110	0	28	0.63	2.77
593.80 to 592.30 Stiff CL LOAM	120	100	29	0.58	2.88
592.30 to 589.80 M Dense SANDY GR	115	0	31	0.50	3.12
589.80 to 587.30 Loose SI	105	0	28	0.63	2.77
587.30 to 579.80 M Dense SI LOAM	115	0	30	0.54	3.00
579.80 to 569.30 Dense to V Dense SI LOAM	120	0	32	0.47	3.25
569.30 to 567.30(1) Weathered BEDROCK	125	0	38	0.33	4.20

(1) Top of bedrock. (2) For inclined backfill slope of 2H:1V (approximate) and ignoring wall friction (Coulomb's Theory).
(3)Based on SPT N-values

Table 2: Design Earth Pressure Parameters for Soldier Pile Wing Wall (Boring: SSB-02)

Layer Elevations/ Soil Description	Unit Weight (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients(2)	
		Cohesion (psf)	Friction Angle(3) φ' (Degree)	Active Pressure	Passive Pressure
601.37 to 598.40 V Stiff CL LOAM	120	100	30	0.54	3.00
598.40 to 592.50 M Dense SI LOAM	115	0	29	0.58	2.88
592.50 to 583.40 Loose SI	105	0	28	0.63	2.77
583.40 to 580.90 M Dense SI	115	0	30	0.54	3.00
580.90 to 575.90 M Dense to Dense SANDY GR	120	0	35	0.39	3.69
575.90 to 572.60 V Dense SI LOAM	120	0	32	0.47	3.25
572.60 to 570.40(1) Weathered BEDROCK	120	0	38	0.33	4.20

(1) Top of bedrock. (2) For inclined backfill slope of 2H:1V (approximate) and ignoring wall friction (Coulomb's Theory).
(3)Based on SPT N-values

5.2 Existing Foundations

It is understood that the existing structure will be removed and replaced by the new structure. Based on the TSL, the existing foundations for the original cantilever closed abutments appear to be supported on drilled shafts and H-piles. The existing structures shall be removed in accordance with section 501.01 of specifications (IDOT, 2012B). Wang recommends to cut-off the top of existing foundations by 2 feet below the proposed culvert elements to avoid stress concentrations. We do not anticipate settlement of these existing foundation structures since they are likely bearing upon the shallow bedrock located about 10 feet below.

5.3 Stage Construction Considerations

Based on the TSL plan, Wang understands that staged construction will be utilized to maintain one lane of traffic in each direction at all times. The simple cantilevered temporary steel sheet piling designed using charts and methods provided in *IDOT Design Guide 3.13.1* (IDOT, 2009) is not a feasible shoring system due to the very high wall retention height (19 feet) and shallow bedrock, thus a temporary soil retention system will be required.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

All vegetation, surface topsoil, and debris should be cleared and stripped where fills and structures will be placed. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill as described in Section 6.3. Precipitation run-off should be diverted away from excavations.

6.2 Excavation and Utilities

Excavations should be performed in accordance with local, state, and federal regulations. The excavation and backfill for the new precast culvert structures shall be according to Section 502 and removal of the existing culvert shall be according to Section 501 of IDOT Standard Specifications for Bridge and Road Construction (IDOT 2012B). Deep excavations are planned to be supported through a temporary shoring system. There is an existing storm sewer that will be removed and should be filled with structural fill. The Designer should ensure there are no other utility conflicts with the final design and construction program.

6.3 Filling and Backfilling

Fill material 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 IDOT Section 204 would be acceptable as structural fill (IDOT 2012B). The fill material should be free of organic matter and debris. Structural fill should be placed in lifts and compacted according to Section 205, *Embankment* (IDOT 2012B).

All backfill materials must be pre-approved by the site engineer. To backfill the box culvert sections and wingwalls, we recommend porous granular material, such as crushed stone or crushed gravel that conforms to the gradation requirements specified in the standard specifications Section 1004 (IDOT 2012B). Backfill material should be placed and compacted in accordance with the Section 205, *Embankment* and the *Culvert Manual* (IDOT 2000). Estimated design parameters for granular structural backfill materials are presented in Table 3.

Table 3: Estimated Granular Backfill Parameters

Soil Description	Porous Granular Material Backfill
Unit Weight	125 pcf
Angle of Effective Internal Friction	32°
Active Earth Pressure Coefficient[1]	0.31
Passive Earth Pressure Coefficient[1]	3.26
At-Rest Earth Pressure Coefficient	0.5

[1]Straight backfill

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.

6.5 Diversion and Cofferdam

The current water flowing from the upstream weir will need to be diverted during construction. If T-type wingwalls are selected, a Type 2 Cofferdam with Seal Coat will be needed to construct the wingwalls if diversion and pumping are not sufficient.

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 Collins Engineers, 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.

Exp. 11/30/2017

METIN WOLFGANG SEYHUN
062-052583
LICENSED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

Metin W. Seyhun, P.E.
Senior Geotechnical Engineer

Corina Farez, P.E., P.G.
Principal

Jerry WH Wang KTF

Jerry W.H. Wang, PhD., P.E.
QA/QC Reviewer

REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (2012) *AASHTO LRFD Bridge Design Specifications*. US Department of Transportation, Washington, D.C.

BAUER, R.A., CURRY, B.B., GRAESE, A.M., VAIDEN, R.C., SU, W.J., and HASEK, M.J., 1991, Geotechnical Properties of Selected Pleistocene, Silurian, and Ordovician Deposits of Northeastern Illinois: Environmental Geology 139, Illinois State Geological Survey, 69 p.

LEETARU, H.E., SARGENT, M.L., AND KOLATA, D.R, 2004, *Geologic Atlas of Cook County for Planning Purposes,* ISGS, Champaign, IL

PECK, R.B., and REED, W.C., 1954, Engineering Properties of Chicago Subsoils: University of Illinois Engineering Experiment Station Bulletin No. 423: Urbana, University of Illinois, 62 p.

WILLMAN, H.B., 1971, Summary of the Geology of the Chicago Area, ISGS Circular C460: Urbana, Illinois State Geological Survey, p. 77.

HANSEL, A.K., AND JOHNSON, W.H. (1996) *Wedron and Mason Groups: Lithostratigraphic Reclassification of the Wisconsin Episode, Lake Michigan Lobe Area. ISGS Bulletin 104.* Champaign, Illinois State Geological Survey.

ILLINOIS DEPARTMENT OF TRANSPORTATION (1999) *Geotechnical Manual*. IDOT Bureau of Materials and Physical Research.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2012A) *IDOT Bridge Manual.* IDOT Bureau of Bridges and Structures.

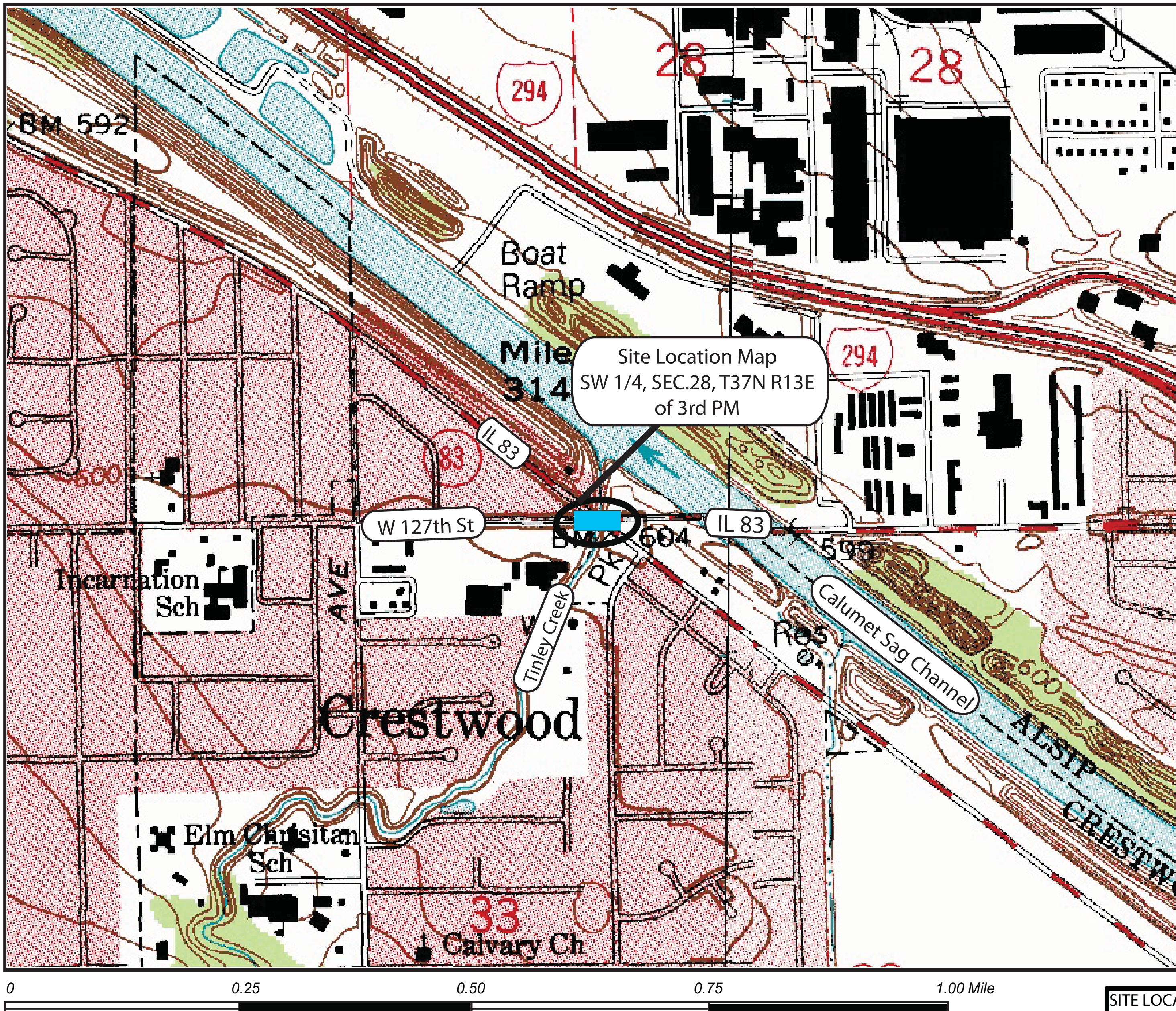
ILLINOIS DEPARTMENT OF TRANSPORTATION (2012B) *Standard Specifications for Road and Bridge Construction*.

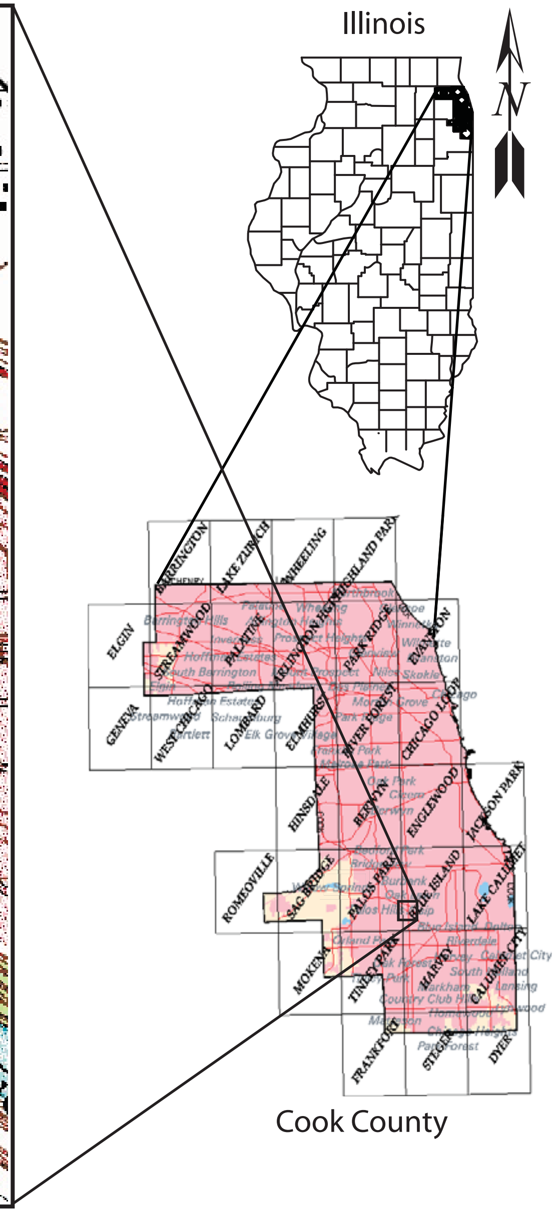
ILLINOIS DEPARTMENT OF TRANSPORTATION (2000) *Culvert Manual*.

NAVFAC, 1986, DM-7.02 *Foundations and Earth Structures,* Naval Facilities Engineering Command

IDOT DESIGN GUIDE 3.13.1, *Temporary Sheet Piling Design* (2009).

EXHIBITS





SITE LOCATION MAP: IL ROUTE 83 OVER TINLEY CREEK,
COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: H. Bista CHECKED BY: M. Seyhun

Wang Engineering

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

FOR COLLINS ENGINEERS, INC. 486-17-02

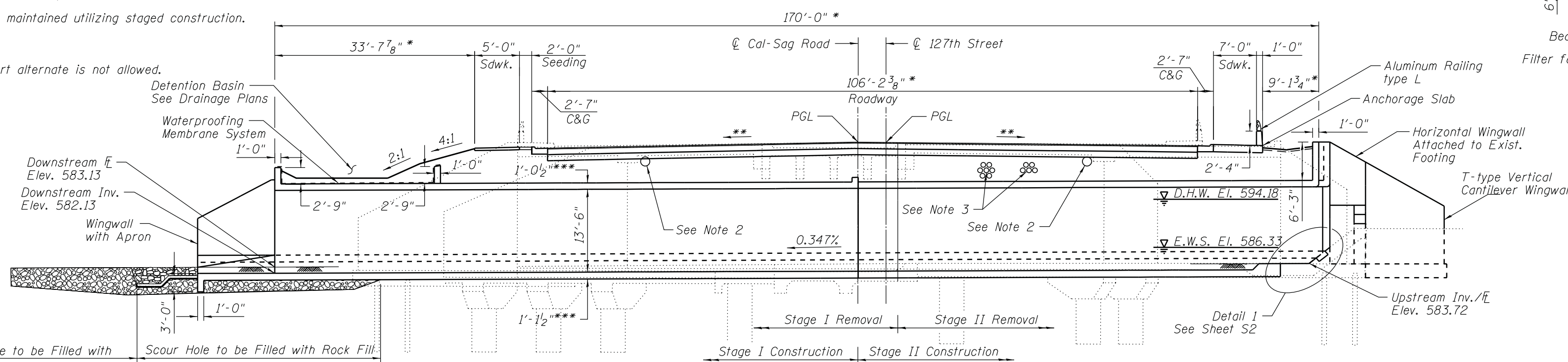
Bench Mark T137: $3\frac{1}{2}$" brass disc found in top of southeast concrete wingwall; Sta. 16+16.22, 67.06' Rt. (Prop. 127th St. ℄), Sta. 116+92.68, 48.60' Rt. (Prop. Cal-Sag Rd. ℄), Elevation 603.19

Existing Structure: S.N. 016-0569 was originally constructed as a single span of reinforced concrete T-Beams on closed abutments. In 1935 and 1984, the structure was widened to the north and south with single span reinforced concrete slabs on cantilevered closed abutments. The existing structure is to be removed and replaced with a triple barrel cast in place concrete box culvert.

Traffic to be maintained utilizing staged construction.

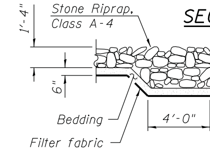
No Salvage.

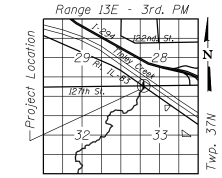
Precast culvert alternate is not allowed.



LONGITUDINAL SECTION

At ℄ Culvert





LOCATION SKETCH

* Measured along ℄ culvert.

** See roadway plans.

*** Slab thickness may be refined in final design.

DESIGN SPECIFICATIONS

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

LOADING HL-93

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

DESIGN FILL HEIGHT

Design earth cover = varies from 5'-0" to 6'-6" (Measured to top of pavement)

DESIGN STRESSES

FIELD UNITS

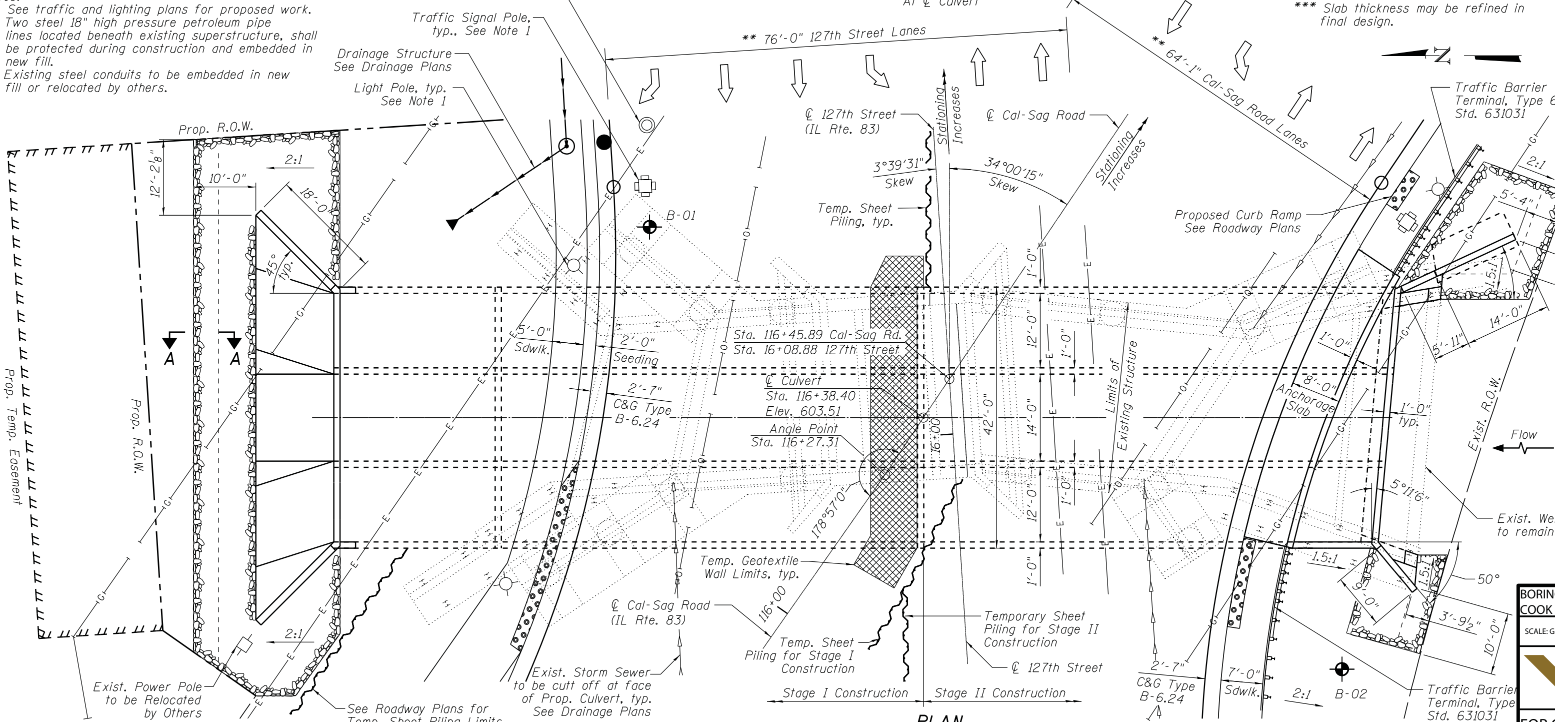
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)

HIGHWAY CLASSIFICATION

F.A.P. Rte. 344 - IL Rte. 83
Functional Class: Other Principal Arterial
ADT: 28,900 (2013); 16,377 (2032)
ADTT: 8.0%
DHV: 1,638
Design Speed: 45 m.p.h.
Posted Speed: 40 m.p.h.
Two-Way Traffic
Directional Distribution: 54:46

GENERAL PLAN
IL RTE. 83 OVER TINLEY CREEK
F.A.P. RT. 344 - SEC. 3034B&N-2
COOK COUNTY
STATION 116+38.40
STRUCTURE NO. 016-1331

Notes:
1. See traffic and lighting plans for proposed work.
2. Two steel 18" high pressure petroleum pipe lines located beneath existing superstructure, shall be protected during construction and embedded in new fill.
3. Existing steel conduits to be embedded in new fill or relocated by others.



PLAN

BORING LOCATION PLAN: IL ROUTE 83 OVER TINLEY CREEK, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL — EXHIBIT 2 — DRAWN BY: H. Bista — CHECKED BY: M. Seyhun

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

FOR COLLINS ENGINEERS, INC. — 486-17-02

COLLINS ENGINEERS — 123 N. Wacker Dr., Suite 900, Chicago, IL 60606, Tele. (312) 704-9300, Fax (312) 704-9320, www.collinsengr.com — ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993

USER NAME =	DESIGNED - AMS	REVISED -
	CHECKED - EKM	REVISED -
PLOT SCALE =	DRAWN - DR	REVISED -
PLOT DATE =	CHECKED - AMS	REVISED -

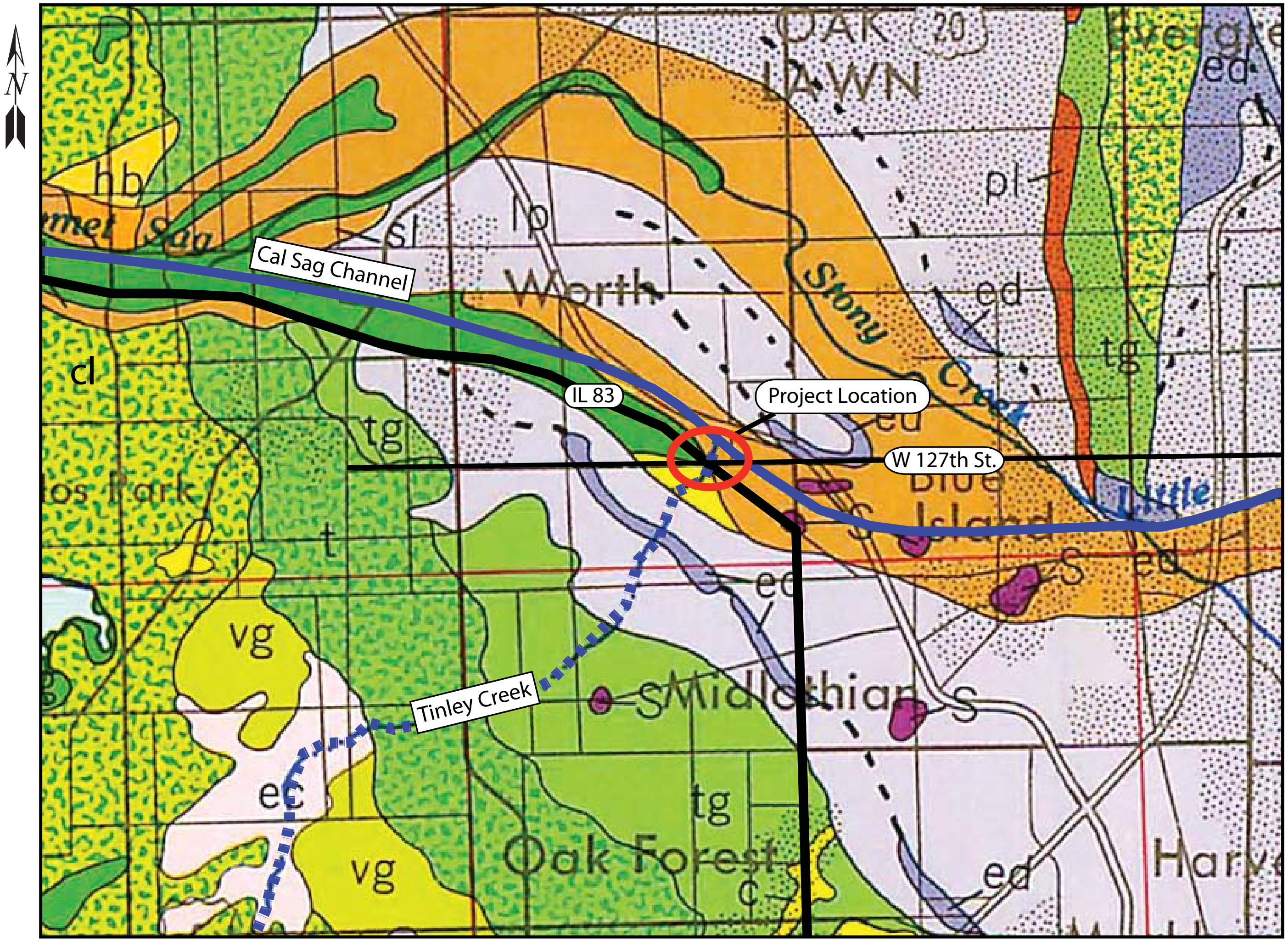
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN & ELEVATION
STRUCTURE NO. 016-1331
SHEET NO. S-1 OF S-4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
344	3034B&N-2	COOK	---	01

CONTRACT NO. 60X74

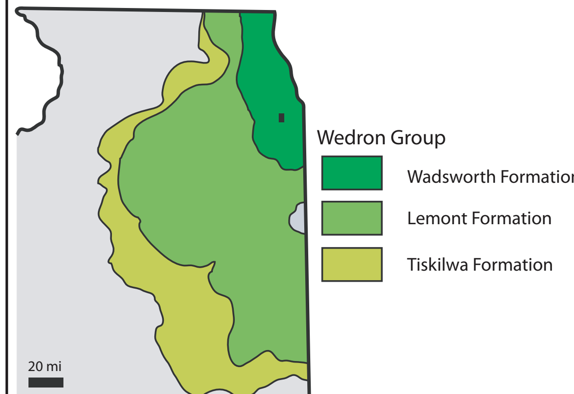
ILLINOIS FED. AID PROJECT



0 0.5 1.0 1.5 2.5 Miles

Modified after Willman 1971

REGIONAL GEOLOGY



Modified after Hansel and Johnson 1996

LEGEND

Postglacial Cover

- **c** — Cahokia Formation: Deposits in floodplains and channels of modern rivers and streams; mostly poorly sorted silt and sand containing local deposits of sandy gravel.
- **g** — Grayslake Peat: Peat, muck, and locally marl; dominantly organic deposits with interbedded silt and clay in places; mostly in glacial lake basins; locally in lake basins or floodplains of major rivers.
- **pl** — Parkland Sand: Wind-blown sand; largely well sorted medium-grained sand in dunes.

Glacial Cover

Mason Group

- **ec** — Equality Formation; Carmi Member: Quiet-water lake sediments; well bedded silt and clay, containing local lenses of sand and gravel
- **ed** — Equality Formation; Dolton Member: Near-shore lake sediments in beaches, bars, spits, and deltas; medium-grained sand containing beds of silt and lenses of sandy gravel
- **lp** — Lake Plain: Floors of glacial lakes flatten by wave erosion and by minor deposition in low areas; thin deposits of silt, clay, and sand of the Equality Formation present locally
- Lake Shoreline: Shorelines within lake plains; usually consists of a slightly elevated beach ridge or erosional scarp forming a terrace; discontinuous deposits of sand of the Equality Formation present
- **sl** — Glacial Sluiceway: Erosional channels; mostly outlets of glacial lakes where cut into glacial till; contains local deposits of sand and gravel

Wedron Group

Wadsworth Formation
Mostly gray pebbly silty clayey till;contains local lenses of laminated silt and sand.

Valparaiso Morainic System

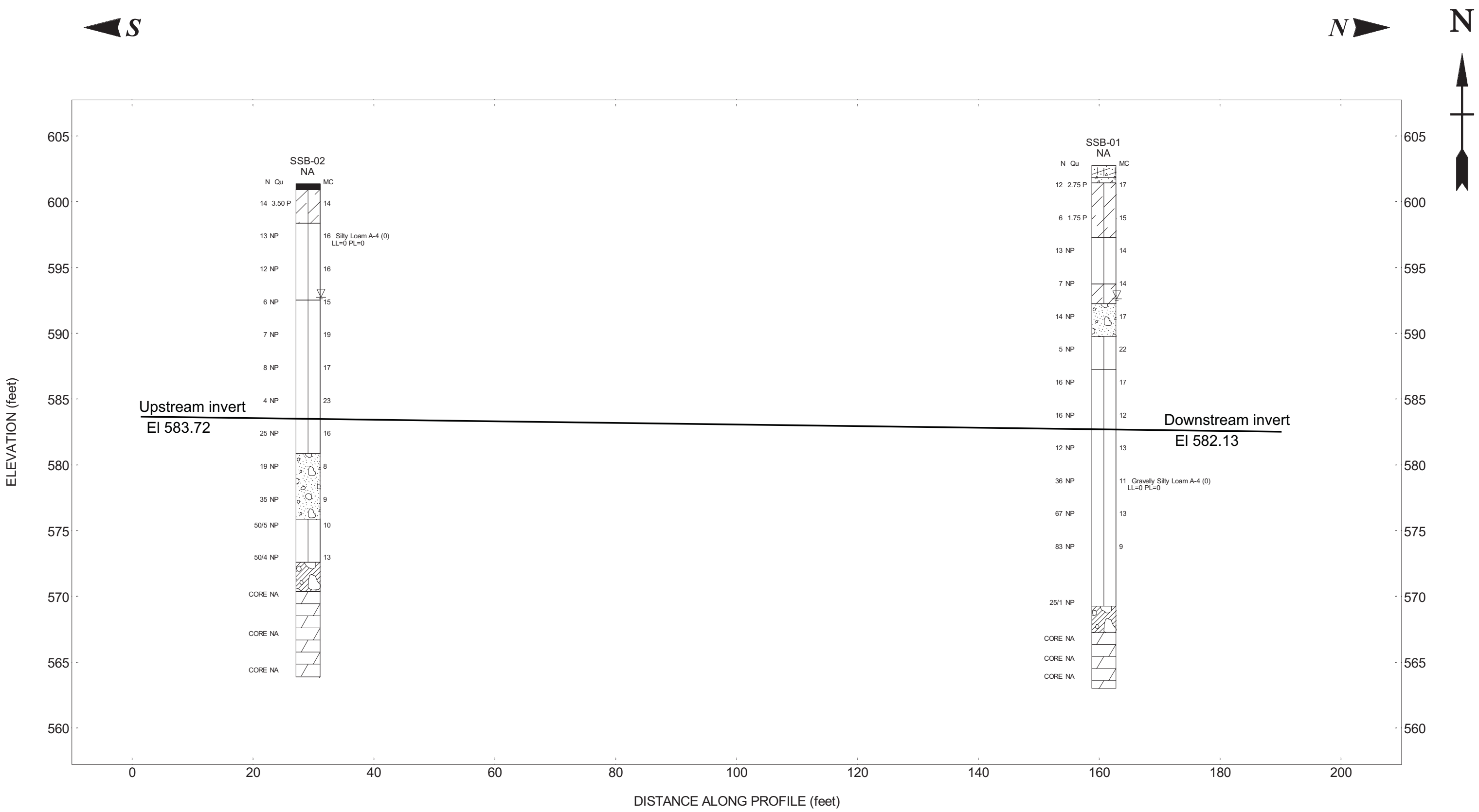
- **t** — Tinley Moraine
- **tg** — Tinley Groundmoraine
- **vg** — Roselle Moraine
- **cl** — Clarendon Moraine

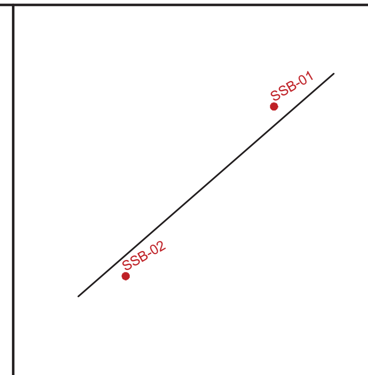
Bedrock

- **s** — Sillurian Bedrock: Largely dolomite, slightly to moderally argillaceous with scattered chert nodules; contains large reefs of massive to well bedded pure dolomite; minor beds of shale and shaly dolomite in lower part and locally bordering reefs in upper part;

Modified after Willman 1971

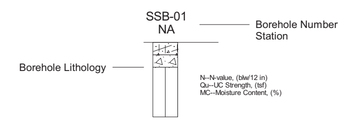
SITE AND REGIONAL GEOLOGY: ILLINOIS ROUTE 83 OVER TINLEY CREEK D-91-314-13; COOK COUNTY, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 3	DRAWN BY: B. Wilson CHECKED BY: M. Seyhun
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR COLLINS ENGINEEERS, INC.		486-17-02





Site Map Scale 1 inch equals 75 feet

Explanation:



Water Level Reading at time of drilling.

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

0 20

Horizontal Scale (feet)

Vertical Exaggeration: 2x

Lithology Graphics

- Pavement
- Crushed stone
- IDH Clay Loam
- IDH Silt, Silty Loam
- Gravelly sand, sandy gravel
- Weathered bedrock
- Dolomite or Dolomitic Limestone
- Topsoil

Wang Engineering
1145 N Main Street
Lombard, IL 60148

Soil Profile

WEI SINCE 1982

IL Route 83 over Tinley Creek
Crestwood, Illinois

JOB NUMBER	PLATE NUMBER
486-17-02	EXHIBIT 4

WEI 11X17 4861702.GPJ WANGENG.GDT 6/3/15

APPENDIX A

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG SSB-01

WEI Job No.: 486-17-02

Client: **Collins Engineers, Inc.**
Project: **IL Route 83 over Tinley Creek**
Location: **Crestwood, Illinois**

Datum: NAVD 88
Elevation: 602.77 ft
North: 1819801.59 ft
East: 1142902.32 ft
Station: NA
Offset: NA

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	11-inch thick ASPHALT --PAVEMENT--					
601.9	5-inch thick CRUSHED STONE --BASE COURSE--					
601.4	Stiff to very stiff, black and brown CLAY LOAM, trace gravel --FILL--		1	11 7 5	2.75 P	17
		5	2	3 3 3	1.75 P	15
597.3	Loose to medium dense, brown SILTY LOAM, trace gravel and organics --Dry-- --Moist--		3	4 8 5	NP	14
593.8	Stiff (1.5P), brown CLAY LOAM, trace gravel	10	4	2 3 4	NP	14
592.3	Medium dense, brown SANDY GRAVEL --Wet--		5	6 8 6	NP	17
589.8	Loose, gray SILT --Wet--	15	6	3 2 3	NP	22
587.3	Medium dense to very dense, gray SILTY LOAM, trace to little gravel --Moist--		7	5 5 11	NP	17
	--HARD DRILLING from 18 ft-- *--Possible Gravel and Cobbles--*	20	8	14 8 8	NP	12
			9	3 6 6	NP	13
		25	10	13 21 15	NP	11
	--HARD DRILLING to 33.5 ft-- *--Possible Cobbles--*		11	23 28 39	NP	13
		30	12	33 39 44	NP	9
569.3	--DIFFICULT DRILLING-- --WEATHERED BEDROCK--	35	13	25/1	NP	
567.3	Strong, gray to greenish gray, very poor to poor rock mass quality, bedded shaly DOLOSTONE, horizontal and vertical joints with none or little infill, hard joint wall		1	CORE		
			2	CORE		
			3	CORE		
563.0	--Run 1 - RECOVERY=100%-- --RQD =31%-- --Run 2 - RECOVERY=83%-- --RQD=0%-- --Run 3 - RECOVERY=90%-- --RQD=27%--	40				
	Boring terminated at 39.75 ft	45				
		50				

GENERAL NOTES

Begin Drilling **09-22-2014** Complete Drilling **09-22-2014**
Drilling Contractor **Wang Testing Service** Drill Rig **D-50**
Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', Mud Rotary to rock**

WATER LEVEL DATA

While Drilling ▽ **10.25 ft**
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.

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG SSB-02

WEI Job No.: 486-17-02

Client: **Collins Engineers, Inc.**
Project: **IL Route 83 over Tinley Creek**
Location: **Crestwood, Illinois**

Datum: NAVD 88
Elevation: 601.37 ft
North: 1819701.48 ft
East: 1142814.94 ft
Station: NA
Offset: NA

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
601.0	5-inch thick, black SILTY LOAM --TOPSOIL--					
	Very stiff, black and brown CLAY LOAM, trace gravel, roots --FILL--		1	4 4 10	3.50 P	14
598.4	Medium dense, brown, gray, and black SILTY LOAM, trace gravel --FILL-- --Dry--	5	2	7 5 8	NP	16
	--Dry--		3	4 7 5	NP	16
	--Moist--					
592.5	Loose to medium dense, gray SILT, trace gravel --Wet--	10	4	2 3 3	NP	15
			5	3 3 4	NP	19
		15	6	5 4 4	NP	17
			7	1 1 3	NP	23
		20	8	8 14 11	NP	16
580.9	--HARD DRILLING from 20.5-- *--Possible Cobbles--*					
	Medium dense to dense, gray SANDY GRAVEL --Wet--		9	11 10 9	NP	8
		25	10	23 19 16	NP	9
575.9	Very dense, gray SILTY LOAM, and gravel, rock fragments --Moist-- --HARD DRILLING to 28.8 ft-- *--Possible Cobbles--*		11	50/5	NP	10
572.6	--DIFFICULT DRILLING-- --WEATHERED BEDROCK--	30	12	50/4	NP	13
570.4	Strong, gray to greenish gray, very poor to fair rock mass quality, bedded shaly DOLOSTONE, horizontal and vertical joints with none or little infill, hard joint wall --Run 1 - RECOVERY=100%-- --RQD =52%--		1	CORE		
	--Qu=10,120 tsf-- --Run 2 - RECOVERY=99%-- --RQD =8%--	35	2	CORE		
563.9	--Run 3 - RECOVERY=67%-- --RQD =0%--		3	CORE		
	Boring terminated at 37.50 ft	40				

GENERAL NOTES

Begin Drilling **09-23-2014** Complete Drilling **09-23-2014**
Drilling Contractor **Wang Testing Service** Drill Rig **D-50**
Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', Mud Rotary to rock**

WATER LEVEL DATA

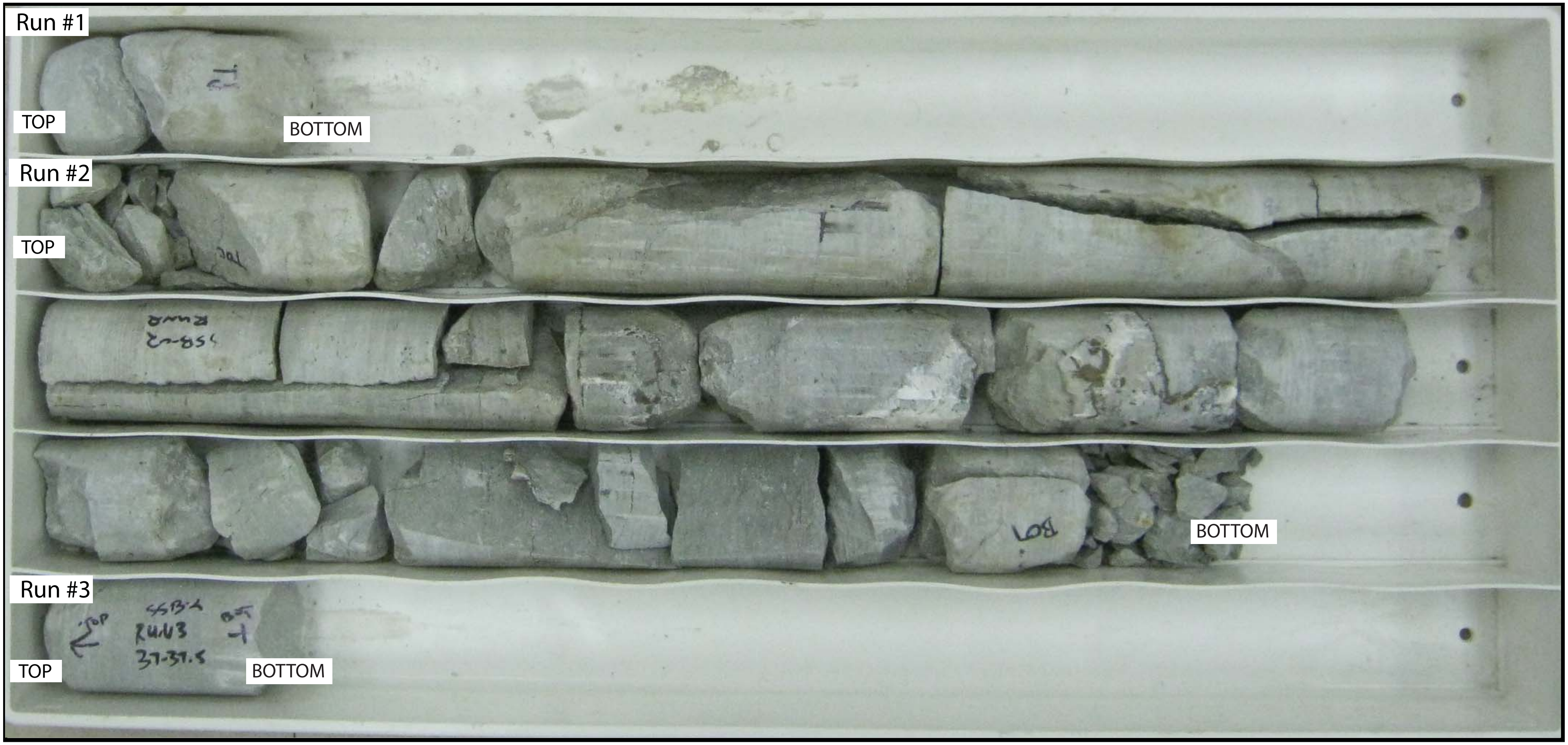
While Drilling ∇ **8.75 ft**
At Completion of Drilling ▼ **NA**
Time After Drilling **NA**
Depth to Water ∇ **NA**

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

0 3 6 9 12 inches

Boring SSB-01:
Run 1, 35.5' to 37', RECOVERY = 100%, RQD = 31%
Run 2, 37' to 38.5', RECOVERY = 83%, RQD = 0%
Run 3, 38.5' to 39.75', RECOVERY = 90%, RQD = 27%

BEDROCK CORE: IL ROUTE 83 OVER TINLEY CREEK, COOK COUNTY, ILLINOIS		
SCALE : GRAPHIC	SSB-01	DRAWN BY: H. Bista CHECKED BY: C. Marin
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR COLLINS ENGINEERS, INC.		486-17-02



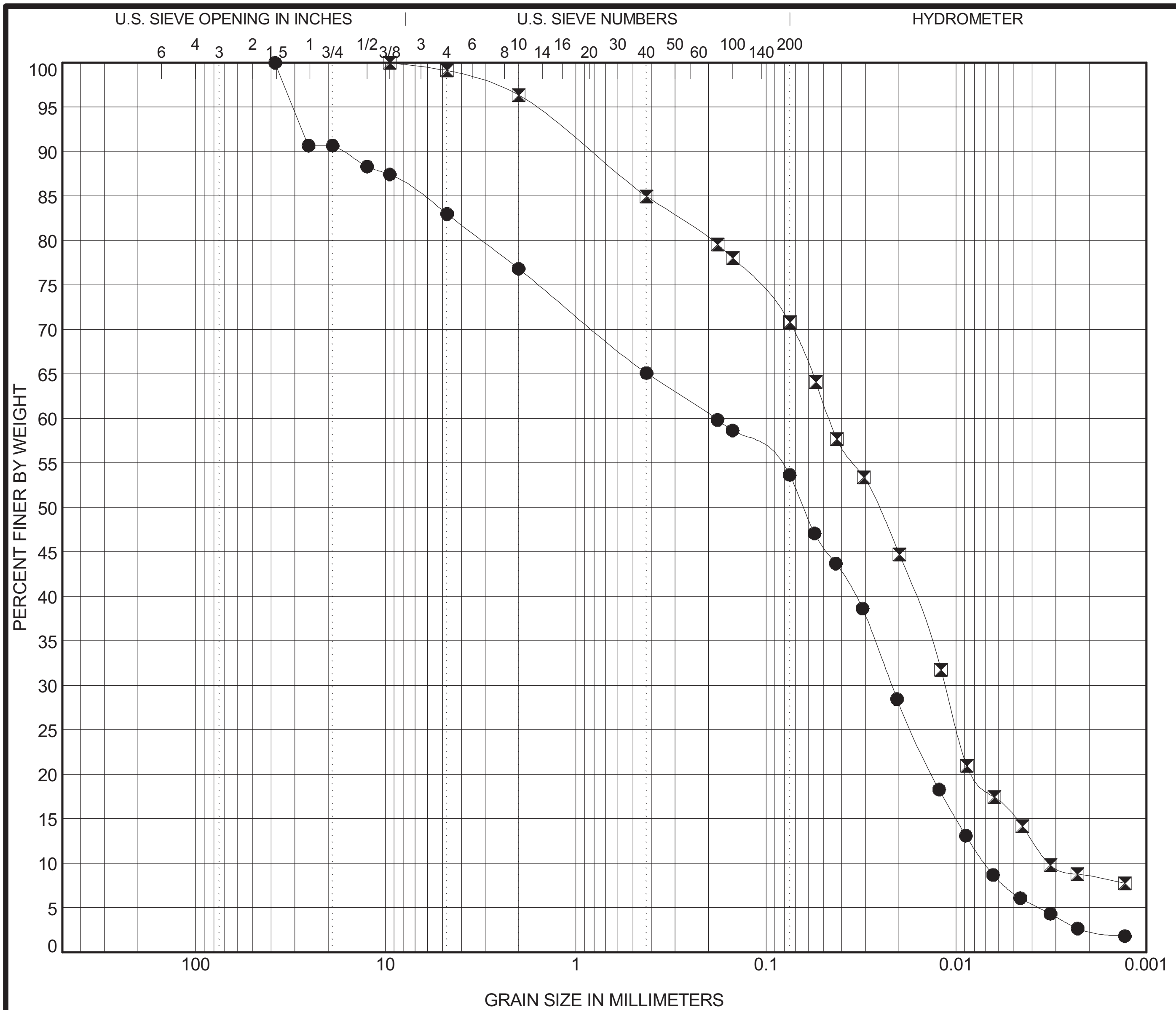
0 3 6 9 12 inches

Boring SSB-02:
Run 1, 31' to 32', RECOVERY = 100%, RQD = 52%
Run 2, 32' to 37', RECOVERY = 99%, RQD = 8%
Run 3, 37' to 37.5, RECOVERY = 67%, RQD = 0%

BEDROCK CORE: IL ROUTE 83 OVER TINLEY CREEK, COOK COUNTY, ILLINOIS		
SCALE : GRAPHIC	SSB-02	DRAWN BY: H. Bista CHECKED BY: C. Marin
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR COLLINS ENGINEERS, INC.		486-17-02

Wang Engineering

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	**SSB-01#10**	**23.5 ft**	**Gravelly Silty Loam**	**NP**	**NP**	**NP**	**0.37**	**26.13**
⧗	**SSB-02#2**	**3.5 ft**	**Silty Loam**	**NP**	**NP**	**NP**	**0.86**	**14.30**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SSB-01#10**	**23.5 ft**	**38.1**	**0.184**	**0.022**	**0.007**	**23.2**	**23.5**	**50.9**	**2.5**
⧗	**SSB-02#2**	**3.5 ft**	**9.5**	**0.047**	**0.011**	**0.003**	**3.6**	**25.8**	**62.0**	**8.5**

WEI SINCE 1982
Wang Engineering, Inc.
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

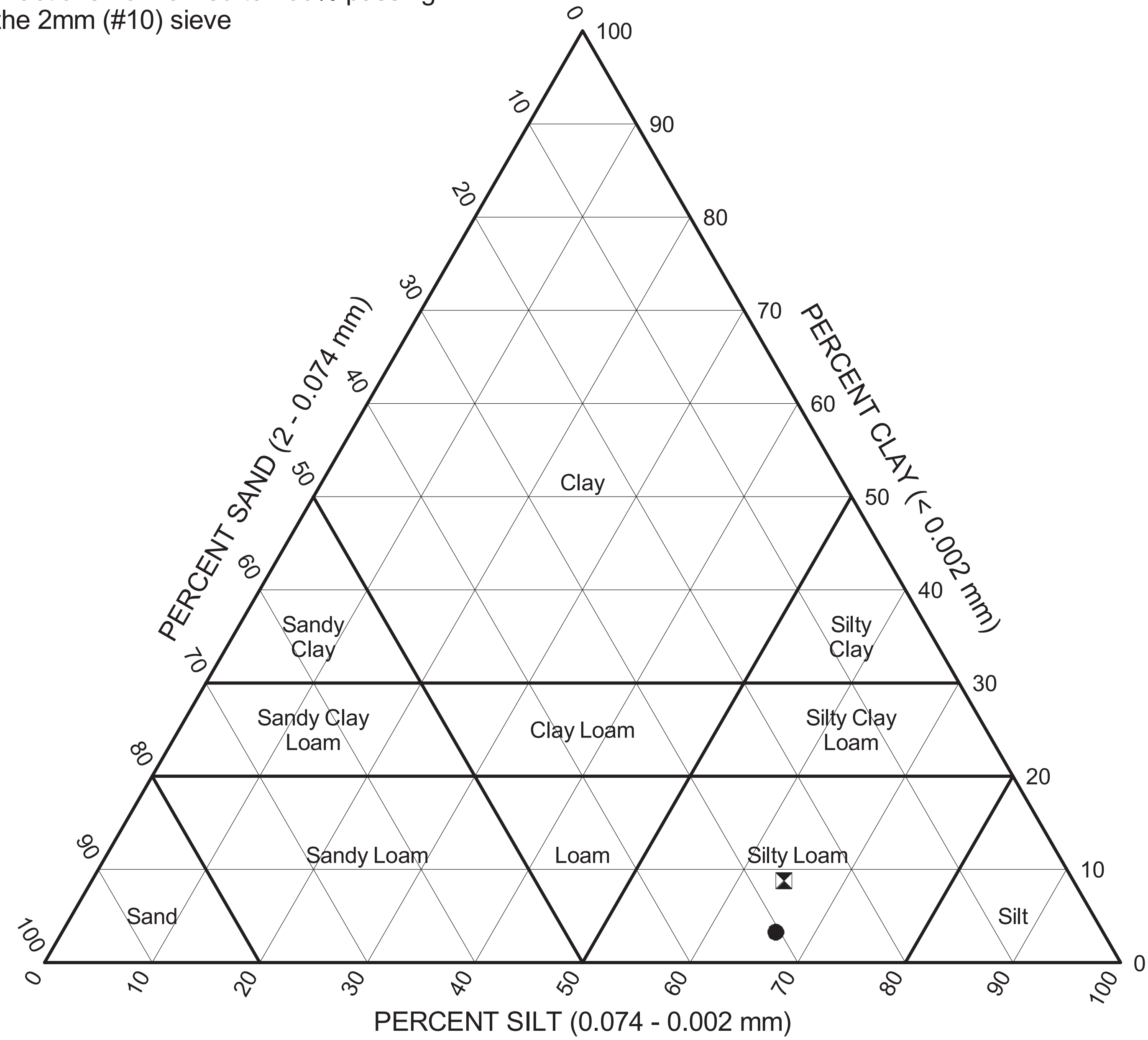
GRAIN SIZE DISTRIBUTION

Project: IL Route 83 over Tinley Creek

Location: Crestwood, Illinois

Number: 486-17-02

Fractions normalized to 100% passing
the 2mm (#10) sieve



	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	SSB-01#10	23.5	**30.6**	**66.3**	**3.3**	**Gravelly Silty Loam**	**A-4 (0)**	**ML**
⧗	SSB-02#2	3.5	**26.8**	**64.3**	**8.8**	**Silty Loam**	**A-4 (0)**	**ML**

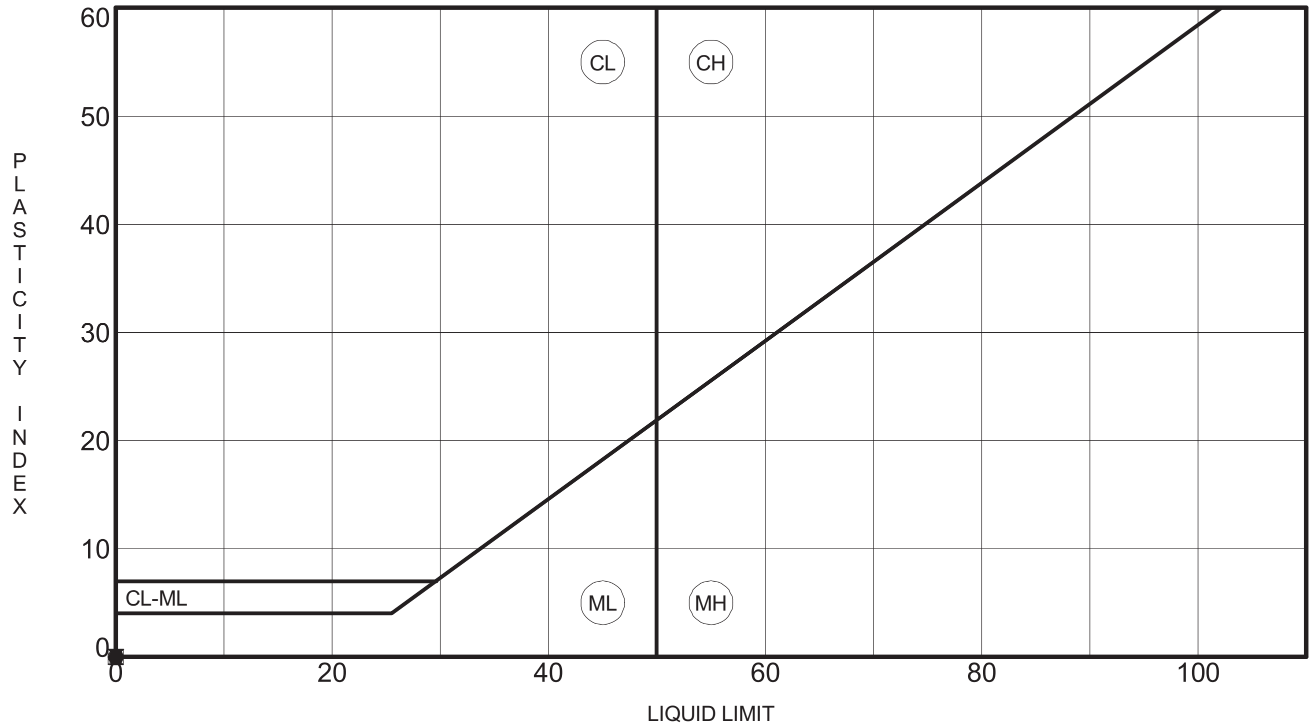
Wang Engineering, Inc.
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

IDH Textural Classification Chart

Project: IL Route 83 over Tinley Creek

Location: Crestwood, Illinois

Number: 486-17-02



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	**SSB-01#10**	**23.5 ft**	**NP**	**NP**	**NP**	**54**	**Gravelly Silty Loam**
⧗	**SSB-02#2**	**3.5 ft**	**NP**	**NP**	**NP**	**71**	**Silty Loam**

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

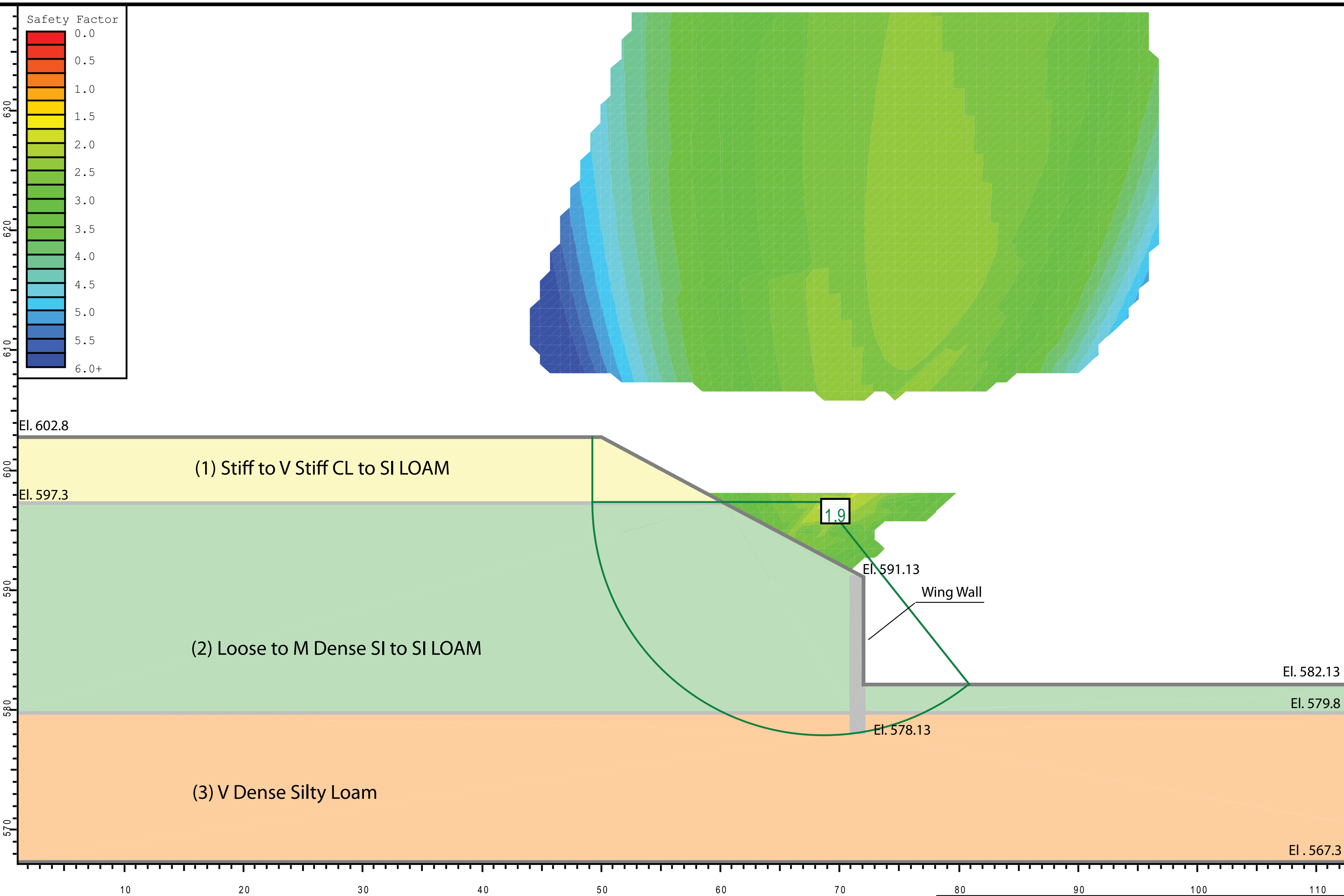
ATTERBERG LIMITS' RESULTS

Project: IL Route 83 over Tinley Creek

Location: Crestwood, Illinois

Number: 486-17-02

APPENDIX C



Slope Stability Analysis-Short Term, Ref Boring SSB-01 & SSB-02

Layer ID	Soil Type	Unit Weight	Undrained Parameter	
		(pcf)	C_u (psf)	ϕ (deg.)
1	Stiff to Very Stiff CLAY LOAM	120	2200	0
2	Loose to Medium Dense SILT to SILTY LOAM	110	0	29
3	Very Dense SILTY LOAM	125	0	35

SLOPE STABILITY ANALYSIS: IL ROUTE 83 OVER TINLEY CREEK, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX C-1

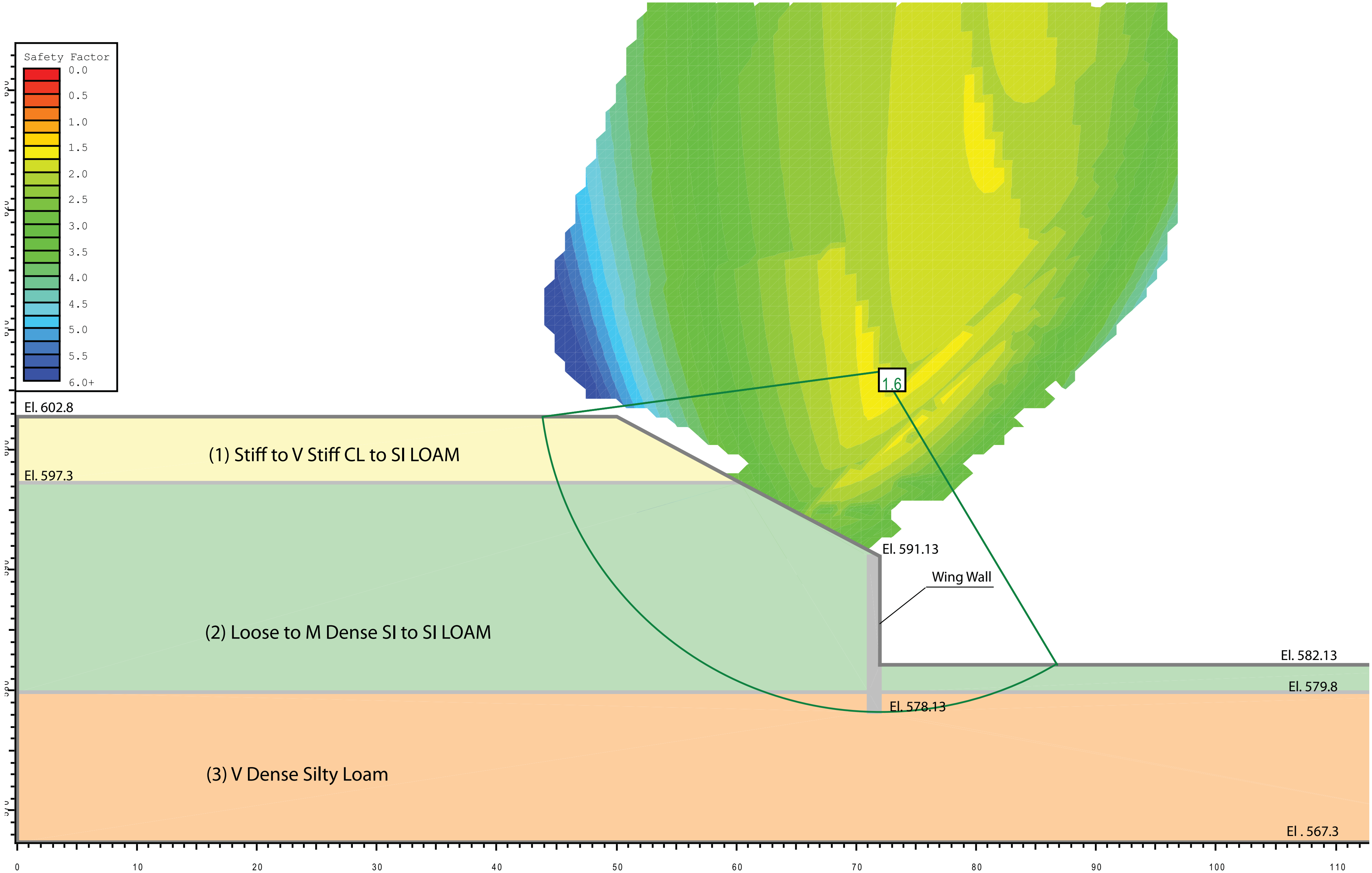
DRAWN BY: H. Bista
CHECKED BY: M. Seyhun

Wang Engineering

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

FOR COLLINS ENGINEERS, INC.

486-17-02



Slope Stability Analysis-Long Term, Ref Boring SSB-01 & SSB-02

Layer ID	Soil Type	Unit Weight (pcf)	Drained Parameter C' (psf)	ϕ (deg.)
1	Stiff to Very Stiff CLAY LOAM	120	100	29
2	Loose to Medium Dense SILT to SILTY LOAM	110	0	29
3	Very Dense SILTY LOAM	125	0	35

SLOPE STABILITY ANALYSIS: IL ROUTE 83 OVER TINLEY CREEK, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX C-2

DRAWN BY: H. Bista
CHECKED BY: M. Seyhun

Wang Engineering

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

FOR COLLINS ENGINEERS, INC.

486-17-02

APPENDIX D

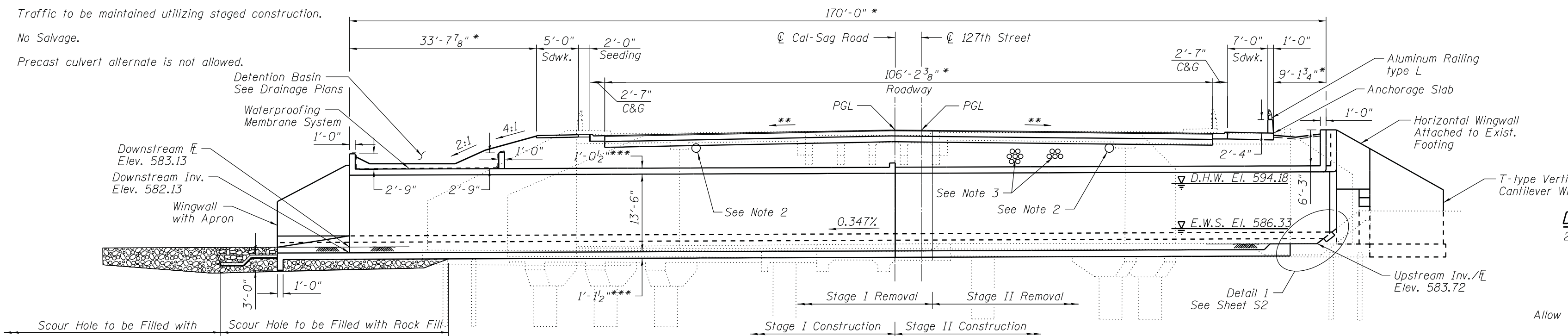
Bench Mark T137: 3½" brass disc found in top of southeast concrete wingwall; Sta. 16+16.22, 67.06' Rt. (Prop. 127th St. ℄), Sta. 116+92.68, 48.60' Rt. (Prop. Cal-Sag Rd. ℄), Elevation 603.19

Existing Structure: S.N. 016-0569 was originally constructed as a single span of reinforced concrete T-Beams on closed abutments. In 1935 and 1984, the structure was widened to the north and south with single span reinforced concrete slabs on cantilevered closed abutments. The existing structure is to be removed and replaced with a triple barrel cast in place concrete box culvert.

Traffic to be maintained utilizing staged construction.

No Salvage.

Precast culvert alternate is not allowed.



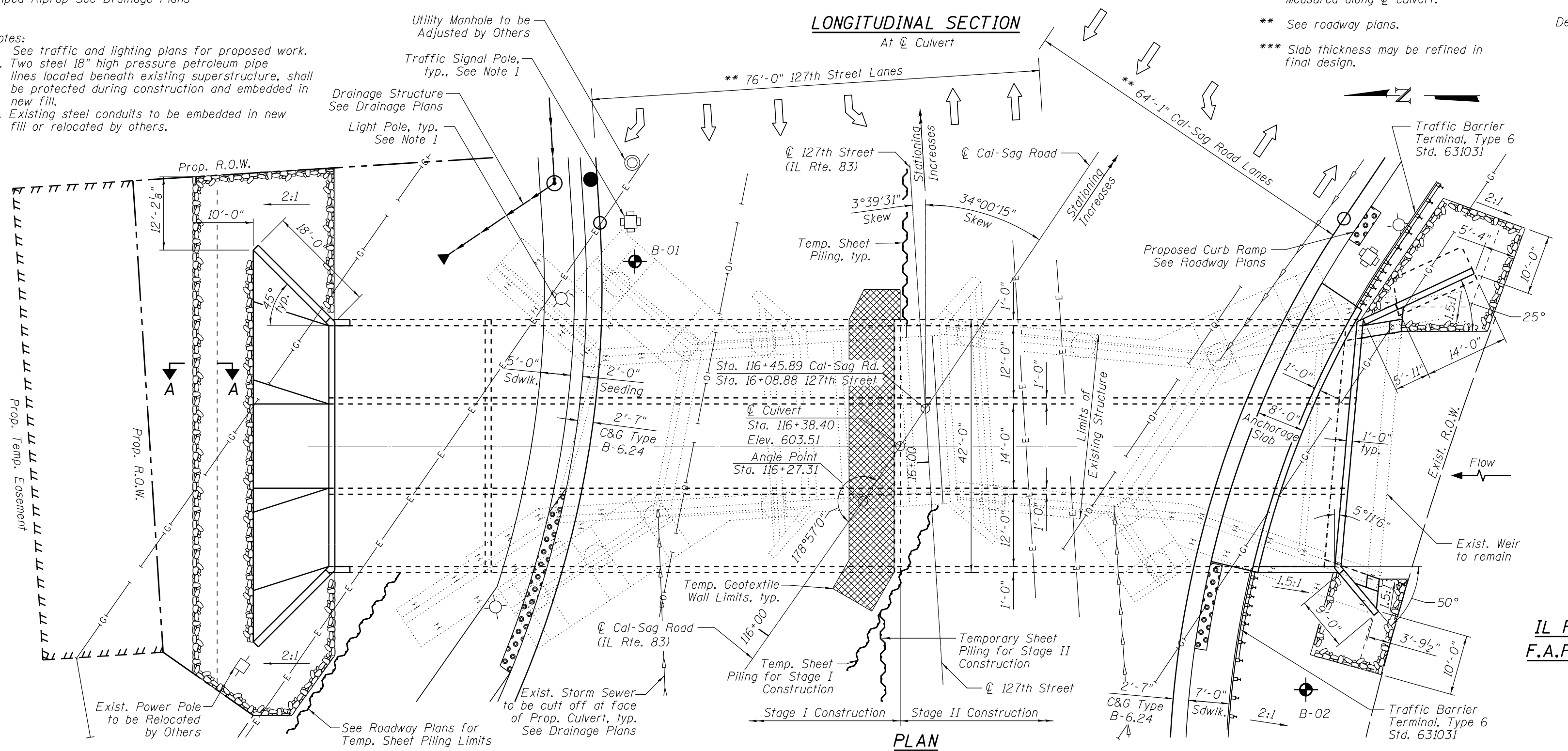
LONGITUDINAL SECTION
At ℄ Culvert

* Measured along ℄ culvert.

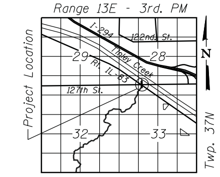
** See roadway plans.

*** Slab thickness may be refined in final design.

Notes:
1. See traffic and lighting plans for proposed work.
2. Two steel 18" high pressure petroleum pipe lines located beneath existing superstructure, shall be protected during construction and embedded in new fill.
3. Existing steel conduits to be embedded in new fill or relocated by others.



PLAN



LOCATION SKETCH

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

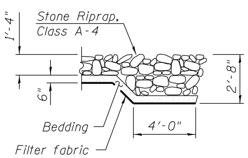
LOADING HL-93
Allow 50#/sq. ft. for future wearing surface.

DESIGN FILL HEIGHT
Design earth cover = varies from 5'-0" to 6'-6" (Measured to top of pavement)

DESIGN STRESSES
FIELD UNITS

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

HIGHWAY CLASSIFICATION
F.A.P. Rte. 344 - IL Rte. 83
Functional Class: Other Principal Arterial
ADT: 28,900 (2013); 16,377 (2032)
ADTT: 8.0%
DHV: 1,638
Design Speed: 45 m.p.h.
Posted Speed: 40 m.p.h.
Two-Way Traffic
Directional Distribution: 54:46

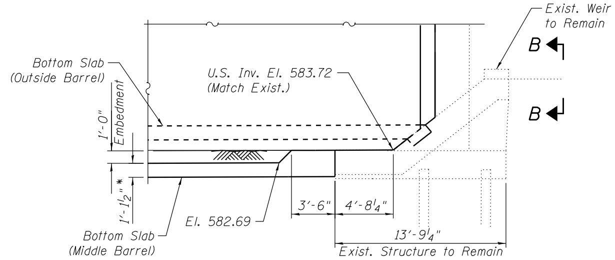


SECTION A-A

GENERAL PLAN
IL RTE. 83 OVER TINLEY CREEK
F.A.P. RT. 344 - SEC. 3034B&N-2
COOK COUNTY
STATION 116+38.40
STRUCTURE NO. 016-1331

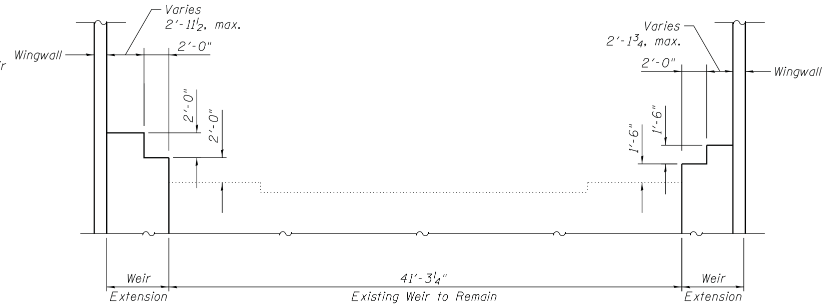
COLLINS ENGINEERS 123 N. Wacker Dr. Suite 900 Chicago, IL 60606 Tele. (312) 704-9300 Fax (312) 704-9320 www.collinsengr.com ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993	USER NAME =	DESIGNED - AMS	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	GENERAL PLAN & ELEVATION STRUCTURE NO. 016-1331
		CHECKED - EKM	REVISED		
	PLOT SCALE =	DRAWN - DR	REVISED		
	PLOT DATE =	CHECKED - AMS	REVISED		SHEET NO. S-1 OF S-4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
344	3034B&N-2	COOK	---	01
CONTRACT NO. 60X74				
ILLINOIS FED. AID PROJECT				

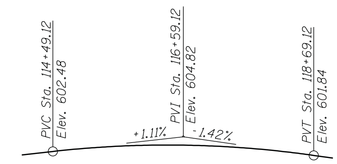


DETAIL 1

Wingwall Not Shown for Clarity

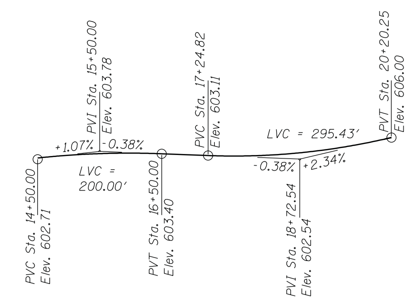


VIEW B-B



PROFILE GRADE

(Along PGL Cal-Sag Road)



PROFILE GRADE

(Along PGL 127th Street)

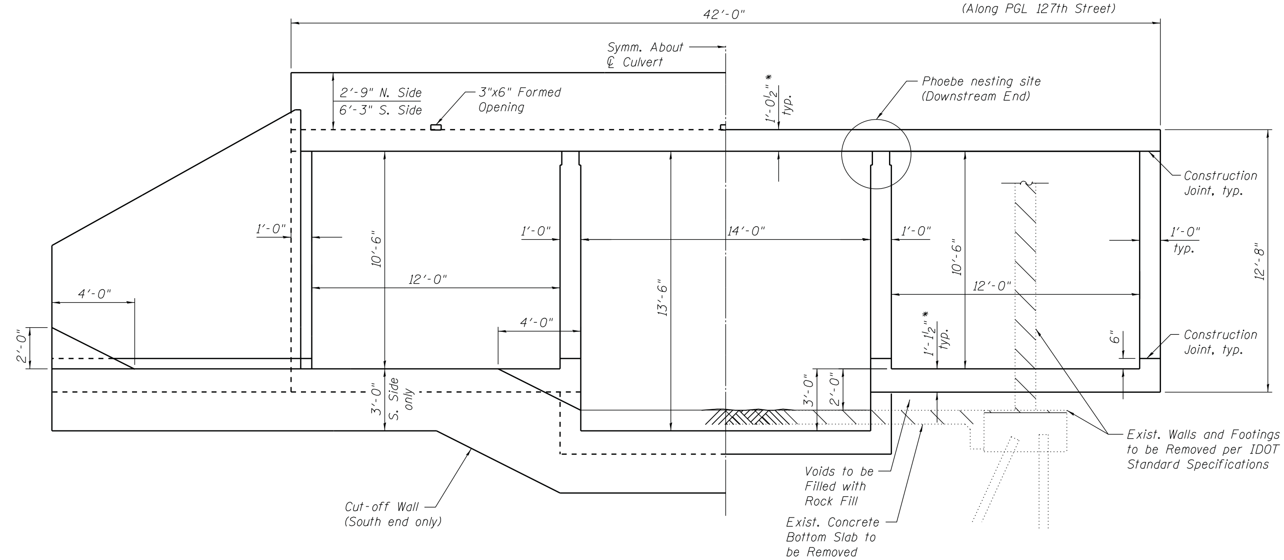
WATERWAY INFORMATION

Drainage Area = 12.8 Sq. mi. Exist. Low Grade Elev. 600.63 @ Exist. Sta. 11+00 Prop. Low Grade Elev. 600.63 @ Prop. Sta. 11+00									
Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft.		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
	10	1368	242.0	297.24	593.25	0.06	0.0	593.31	593.25
Design	50	1665	266.0	328.92	594.18	0.13	0.0	594.31	594.18
Base	100	1770	265.5	343.32	594.61	0.13	0.0	594.74	594.61
Max. Calc.	500	2005	299.3	388.68	595.94	0.18	0.0	596.12	595.94

10-Year Velocity through Proposed Bridge = 4.6 fps.
2-Year Peak Discharge Rate = 1123 cfs.
2-Year Peak Elevation = 592.72
2 Year Bypass Water Opening = 232.2 sq. ft.

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft)	D.S. Invert	U.S. Invert
	579.09	NA

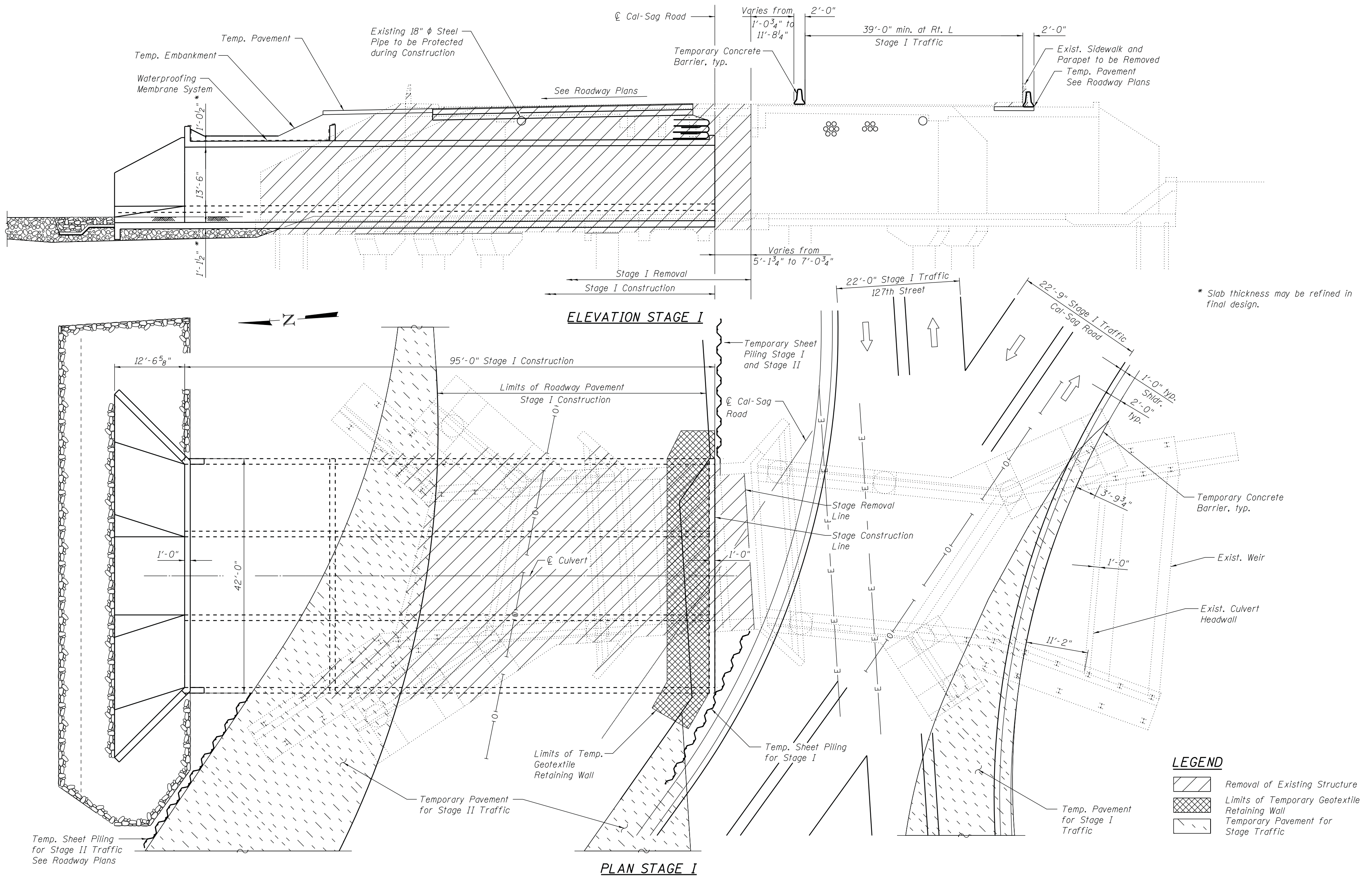


SOUTH END VIEW

SECTION THRU BARRELS

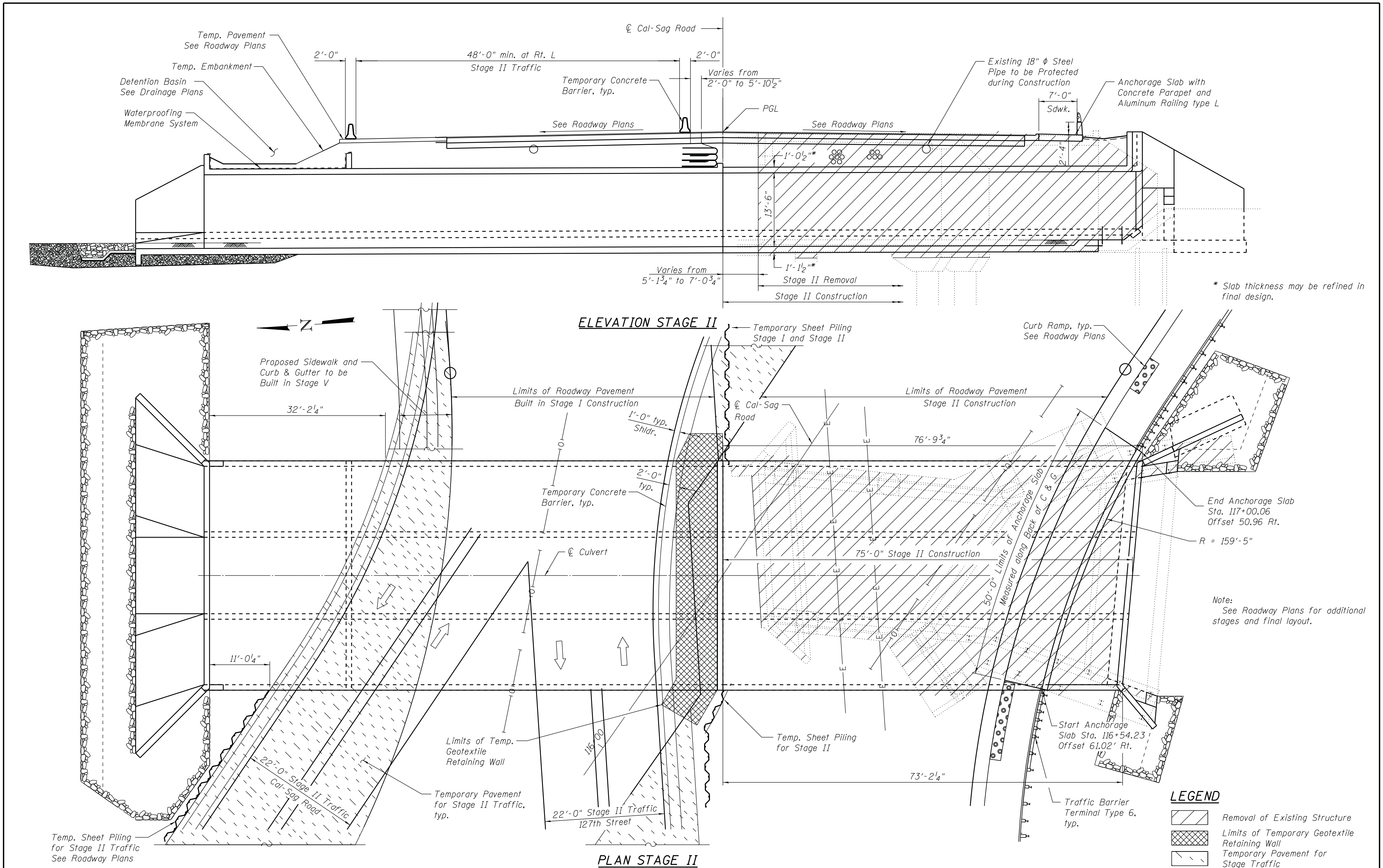
* Slab thickness may be refined in final design.

COLLINS ENGINEERS INC. 123 N. Wacker Dr. Suite 900 Chicago, Il. 60606 Tele. (312) 704-9300 Fax (312) 704-9320 www.collinsengr.com ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993	USER NAME =	DESIGNED - AMS	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	GENERAL NOTES, INDEX OF SHEETS AND TOTAL BILL OF MATERIALS STRUCTURE NO. 016-1331	F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CHECKED - EKM	REVISED			344	3034B&N-2	COOK	---	01
	PLOT SCALE =	DRAWN - DR	REVISED					CONTRACT NO. 60X74		
	PLOT DATE =	CHECKED - AMS	REVISED		SHEET NO. S-2 OF S-4 SHEETS		ILLINOIS	FED. AID PROJECT		



COLLINS ENGINEERS 123 N. Wacker Dr. Suite 900 Chicago, Il. 60606 Tele. (312) 704-9300 Fax (312) 704-9320 www.collinsengr.com ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993	USER NAME =	DESIGNED - AMS	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	STAGE I CONSTRUCTION DETAILS STRUCTURE NO. 016–1331
		CHECKED - EKM	REVISED		
	PLOT SCALE =	DRAWN - DR	REVISED		
	PLOT DATE =	CHECKED - AMS	REVISED		SHEET NO. S-3 OF S-4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
344	3034B&N-2	COOK	---	01
CONTRACT NO. 60X74				
ILLINOIS FED. AID PROJECT				



COLLINS ENGINEERS 123 N. Wacker Dr. Suite 900 Chicago, IL 60606 Tele. (312) 704-9300 Fax (312) 704-9320 www.collinsengr.com ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993	USER NAME =	DESIGNED - AMS	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	STAGE II CONSTRUCTION DETAILS STRUCTURE NO. 016-1331	F.A.P. RTE. 344	SECTION 3034B&N-2	COUNTY COOK	TOTAL SHEETS --- / SHEET NO. 01
		CHECKED - EKM	REVISED						
	PLOT SCALE =	DRAWN - DR	REVISED			CONTRACT NO. 60X74			
	PLOT DATE =	CHECKED - AMS	REVISED		SHEET NO. S-4 OF S-4 SHEETS	ILLINOIS FED. AID PROJECT			