STRUCTURE GEOTECHNICAL REPORT
BOX CULVERTS
US ROUTE 45 (FAP 344) OVER TRIBUTARIES TO MILBURN CREEK
PROPOSED SN 049-C006, 049-0611, 049-C007
SECTION 39R, CONTRACT 60T75
IDOT PROJECT D-91-424-12, PTB 164/04
LAKE COUNTY, ILLINOIS

for

Parsons Transportation Group, Inc.

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submitted by

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Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Box Culverts US Route 45 over Tributaries to Milburn Creek		**2. Report Date** November 16, 2015 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☒ Final ☒ Revised
4. Route / Section / County FAP344 /39R/Lake		**5. IDOT Project Number(s)** Job D-91-424-12
6. PTB / Item No. 164/04	**7. Existing Structure Number(s)** N/A	**8. Proposed Structure Number(s)** SN 049-C006, 049-0611, 049-C007
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11. Abstract

A series of three box culverts will carry the US Route 45 Bypass over Tributaries to Milburn Creek. The culverts are single concrete box culverts with barrel openings of 4×4, 10×5, and 4×5 feet with lengths of 109’-5”, 109’-4”, and 108’-3” measured out-to-out of the culverts headwalls. Culvert headwalls are proposed as continuous Mechanically Stabilized Earth (MSE) with total lengths of 112’-2” and 113’-3” for east and west walls, respectively. This report provides geotechnical recommendations for the design of proposed culverts and MSE walls.

At the site, the general soil profile consists of up to 18-inch thick black loam topsoil overlying up to 4.5 feet thick of very soft to stiff silty clay to silty clay loam underlain by very stiff to hard silty loam to silty clay loam, stiff to hard clay to silty clay loam, and very loose to dense silt to sand gravelly sandy loam. Groundwater was encountered at depths of 15.5 to 48 feet below the existing grade, or elevations ranging from 684 to 710 feet.

With minor foundation soils treatments, it will be feasible to construct the culverts on shallow foundations. Settlement analyses show the foundation soils will undergo settlement of 1.0 inches or less and differential settlement of 0.5 inches or less.

The roadway will require 10 to 11 feet of fill at the culvert approach sections. The proposed MSE walls will have a maximum supported height of about 12 feet. With minor foundation soils treatment, the proposed MSE walls are feasible. The west MSE wall sections have FOS against global instability of 6.2 and 2.0 for the short-term and long-term conditions, and will experience total long-term post-construction consolidation settlement 1.0 inches or less. We recommend the MSE walls be designed based on a factored bearing resistance of 5, 800 psf.

12. Path to archived file

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LAKE COUNTY, ILLINOIS
FOR
PARSONS TRANSPORTATION GROUP, INC.

1.0 INTRODUCTION

This report presents the results of Wang Engineering, Inc. (Wang) subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations for the design and construction of the proposed culverts over Tributaries to Milburn Creek included in the construction of US Route 45 in the Lake County, Illinois. A *Site Location Map* is presented as Exhibit 1.

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 new culverts and associated retaining walls.

1.1 Project Description

The project includes realignment of new roadway US Route 45 (US 45 Bypass) approximately 1,000 feet to the west of the existing US Route 45. The US 45 Bypass will be constructed from County Place on the south to 1,500 feet north of Independence Boulevard on the north, a length of 7,200 feet. In addition, Grass Lake Road will be realigned south of its current location to form the west leg of the intersection of US 45 and Milburn Road. The project lies within the municipal boundaries of the Village of Lindenhurst on the west, and the Village of Old Mill Creek on the east. The project also lies within unincorporated areas of Lake County within Lake Villa and Newport Townships.

The proposed improvements also include construction of, a three-sided structure and a series of box culverts to carry US 45 Bypass over Milburn Creek and Unnamed Tributaries to Milburn Creek, several retaining walls, and detention ponds.

1.2 Proposed Structures

Wang understands Parsons Transportation Group, Inc. (Parsons) envisions a series of three box culverts for the US 45 Bypass over Tributaries to the Milburn Creek. The type, size, and location (TSL) Plan provided by Parsons shows a single cell concrete box culverts and details are summarized in Table 1. The TSL Plan dated November 4, 2015 received on November 5, 2015 is included in Appendix D.

Table 1: Summary of Box Culverts for Tributaries to Milburn Creek

Structure ID	Station	Interior Cell (ft, span×ft, height)	Proposed Length (feet-inch)	Approximate Skew (º)	Invert Elevations	
					Upstream Face (feet)	Downstream Face (feet)
049-C006	134+68.75	4×4	109-5	81	724.25	722.75
049-0611	134+77.87	10×5	109-4	81	723.75	722.00
049-C007	135+19.39	4×5	108-3	86	724.85	723.30

The roadway will require 10 to 11 feet of fill at the culvert approach sections, and about 3 to 4 feet of vertical fill on the culvert top slabs. The roadway approach fill and fill above the culverts will be supported by the Mechanically Stabilized Earth (MSE) walls. The proposed MSE walls will have a maximum supported height of about 12 feet. The proposed length of east and west MSE walls is 112.2 and 113.3 feet, respectively.

Stage construction is not required.

1.3 Existing Structure

There are no existing culverts at these locations.

2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The project area is located in northcentral Lake County along the border of the Villages of Lindenhurst and Old Mill Creek. On the USGS Antioch Quadrangle 7.5 Minute Series map, the proposed structure is located in the SE ¼ of Section 36, Tier 46 North, and Range 10 East of the 3rd Principal Meridian. A Site Location Map is presented as Exhibit 1

The following review of the 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 regional framework and, thus, to confirm the dependability and consistency of the subsurface investigation results. For the study of the regional geologic framework, Wang considered northeastern Illinois in general and northcentral Lake County in particular. Exhibit 2 illustrates the Site and Regional Geology.

2.1 Physiography

Northcentral Lake County, part of the Wheaton Morainal Country within the Great Lake Physiographic Section (Leighton et al. 1948), is characterized by hummocky topography as a result of numerous advances and retreats of ice sheets during the Wisconsin Episode of glaciation. The project site is located along the north to south trending Valparaiso Moraine, which contains abundant kettle lakes and wetland areas. Millburn Creek drains from McDonald Lake, located west of the project area, and crosses the existing US 45 flowing east toward North Mill Creek. Ground elevations at the project site are approximately 720 to 726 feet.

2.2 Surficial Cover

The surficial cover is primarily the result of Wisconsin-age glacial activity (Hansel and Johnson, 1996). The glacigenic deposits were emplaced during pulsating advances and retreats of an ice sheet lobe responsible for the formation of end moraines and associated low-relief till and lake plains. Many kettle depressions and other low-lying areas that scar the Valparaiso Moraine were filled with peat and marl of the Grayslake Peat. The Valparaiso Moraine contains diamicton of the Wadsworth Formation, consisting of clay to silty clay loam and includes lenses of sand, silt, and clay (Hansel and Johnson 1996). The Wadsworth Formation is underlain by sand and gravel outwash deposits of the Henry Formation. The drift thickness along the project alignment ranges from 200 to 260 feet (Dixon-Warren and O'Malley 2004).

2.3 Bedrock

In northcentral Lake County the surficial cover rests unconformably on top of nearly horizontal Silurian-age dolomite. The top of the bedrock lies approximately 200 to 260 feet below the ground surface (bgs) at approximately 500 to 520 feet elevation (Dixon-Warren and O'Malley 2004).

Our subsurface investigation results fit into the local geologic context. In descending order, the borings drilled in the project area revealed that the native sediments along the site consist of clay, silty clay, and silty clay loam diamicton of the Wadsworth Formation overlying sand and gravel outwash of the Henry Formation. None of the borings drilled for this investigation encountered organic soils of the Grayslake Peat or bedrock.

3.0 METHODS OF INVESTIGATION

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

3.1 Subsurface Investigation

The subsurface investigation performed by Wang consisted of ten structure borings, designated as BSB2-01 through BSB2-03, and BSB3-01 through BSB3-03 for the box culverts, RWB3-01 and RWB3-02 for the west wall, and RWB4-01 and RWB4-02 for the east wall. The borings were drilled in September 2014 from elevations of 725.8 to 729.6 feet to depths of 20.0 to 85.0 feet below ground surface (bgs). Boring locations proposed by Wang and approved by Parsons were staked in the field using a mapping-grade GPS. The as-drilled boring locations were surveyed by Dynasty Group and stations and offsets were provided by Parsons. The boring location data are shown in the *Boring Logs* (Appendix A), and the as-drilled locations are shown in the *Boring Location Plan* (Exhibit 3).

An ATV-mounted drill rig, equipped with hollow stem augers, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils*." The soil was sampled at 2.5-foot intervals to 30 feet bgs and at 5.0-foot intervals, thereafter. Soil samples from each interval were placed in sealed jars for further laboratory testing.

Field boring logs, prepared and maintained by a Wang geologist, include lithological descriptions, visual-manual soil classifications (IDH Textural Classification), results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of Standard Penetration Tests (SPT), recorded as blows per 6 inches of penetration.

Groundwater observations were made during and after drilling operations. The borings were backfilled with soil cuttings and bentonite chips after completion.

3.2 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T 265). Selected soils were tested for Atterberg limits (AASHTO T 89/90) and particle size (AASHTO T 88) analyses. The soils were classified according to the IDH Textural Classification system and field visual-manual descriptions were verified in the laboratory. The laboratory results are shown in 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 in the attached *Boring Logs* (Appendix A) and in the *Soil Profiles* (Exhibits 4-1 through 4-5). 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

At the surface, the borings sampled 12- to 18-inch thick black loam to silty loam topsoil. In descending order, the general lithologic succession encountered in the borings includes 1) very soft to stiff silty clay to silty clay loam; 2) very stiff to hard silty loam to silty clay loam; 3) stiff to hard clay to silty clay loam; and 4) very loose to dense silt to sand and gravelly sandy loam.

1) Very soft to stiff silty clay to silty clay loam

Immediately beneath the topsoil, the borings encountered up to 4.5 feet of very soft to stiff silty clay to silty clay loam to depths of 3.0 to 5.5 feet bgs (elevations 720.3 to 723.5 feet). The cohesive soils consist of brown/grayish brown/orange brown to brownish gray silty clay to silty clay loam. Generally, this unit has unconfined compressive strength (Q_u) values of less than 0.25 to 1.6 tsf with an average of 0.97 tsf and moisture content values of 15 to 27% with an average of 22%. This layer is generally discontinuous at the site and primarily encountered at the proposed box culvert locations, and east retaining wall section.

2) Very stiff to hard silty loam to silty clay loam

Underlying the very soft to stiff cohesive soils, at elevations 720.3 to 726.1 feet, the borings revealed very stiff to hard silty loam to silty clay loam. Over all, this unit has Q_u values of 1.3 to 9.3 tsf with an average value of 4 tsf and moisture content values of 13 to 26% with an average of 18%. Laboratory index testing on samples shows liquid limit (L_L) value ranging from 27 to 31% and plastic limit (P_L) value ranging from 14 to 16%. According to the AASHTO soil classification, the soils belong to the A-6 group.

3) Stiff to hard clay to silty clay loam

At elevations 709.7 to 726.2 feet, the borings revealed very stiff to hard clay to silty clay loam containing silt to sand and sandy loam layers. Generally, this unit has Q_u values of 0.8 to 4.8 tsf with an average value of 2 tsf and moisture content values of 12 to 30% with an average of 22%. Laboratory index testing on samples shows liquid limit (L_L) value ranging from 34 to 44% and plastic limit (P_L) value ranging from 16 to 18%. According to the AASHTO soil classification, the soils belong to the A-6 and A-7 groups.

4) Very loose to dense silt to sand and gravelly sandy loam

Underlying the cohesive soils, at elevations of 667.7 to 685.6 feet, the deeper borings encountered very loose to dense, brown to gray, silt to sand, and gravelly sandy loam extending to the boring termination depths (elevations 661.5 to 640.8 feet). These granular soils have SPT N-values ranging from 0 to 33 blows/foot with an average of 13 blows/foot and moisture contents values of 7 to 24% with an average of 17%.

A layer of very soft to hard silty to clay measuring up to 15 feet in thickness was interbedded within the granular soils. The cohesive soil has Q_u values of less than 0.2 to 5.0 tsf with an average of 2.5 tsf and moisture content values ranging from 21 to 27% with an average of 24%.

4.2 Groundwater Conditions

Groundwater was encountered within the granular soil layers while drilling between elevations of 684 and 710 feet (43 to 15.5 feet bgs). Upon completion of drilling, groundwater was measured between elevations of 680 and 710 feet (17 to 48 feet bgs).

5.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the box culvert and retaining wall foundations and our engineering analyses are included in the following sections. Based on the subsurface soil conditions, it is our opinion that it is feasible to construct precast or cast-in-place culverts.

5.1 Culvert Foundations

5.1.1 Culvert at Station 134+68.75, SN 049-C006

The construction of the Culvert at Station 134+68.75 will require excavation up to a depth of 4.5 feet below the existing grade at boring locations. The borings indicate that foundation soils below culvert bearing elevation of 722.2 feet might consist of up to 2 feet of very soft to medium stiff silty clay to silty clay loam overlying stiff to hard silty loam to silty clay loam.

We recommend removing the very soft to medium stiff soil to an elevation 720 feet for the full culvert length and width and replace with IDOT gradation CA-6 (structural fill) to provide adequate bearing capacity and tolerable settlement for the proposed culvert. The excavation and structural fill should extend at least 2 feet laterally beyond the edge of the culvert. The actual extent of the removal shall be determined in the field based on actual soils conditions during construction.

Considering the structural fill improvement for the settlement evaluation, the estimated culvert and roadway fill pressures, we estimate that the culvert will undergo long-term settlement of 1.0 inches or less and a differential settlement of 0.5 inches or less.

5.1.2 Culvert at Station 134+77.87, SN 049-0611

The construction of the Culvert at Station 134+77.87 will require excavation up to a depth of 5.5 feet below the existing grade at boring locations. The borings indicate that foundation soils below culvert bearing elevation of 721.3 feet will consist of up to 1.0 feet of very soft to medium stiff silty clay to silty clay loam overlying stiff to hard silty loam to silty clay loam.

We recommend removing the very soft to medium stiff soil to an elevation 720 feet for the full culvert length and width and replace with structural fill to provide adequate bearing capacity and tolerable settlement for the proposed culvert. The excavation and structural fill should extend laterally at least two feet laterally beyond the edge of the culvert.

Considering the structural fill improvement for the settlement evaluation, the estimated culvert and roadway fill pressures, we estimate that the culvert will undergo long-term settlement of 1.0 inches or less and a differential settlement of 0.5 inches or less.

5.1.3 Culvert at Station 135+19.39, SN 049-C007

The construction of the Culvert at Station 135+19.39 will require excavation up to a depth of 4.5 feet below the existing grade at boring locations. The borings indicate that foundation soils below culvert bearing elevation of 722.8 feet will consist of medium dense silt and stiff to very stiff silty clay to silty clay loam overlying very stiff to hard silty loam to silty clay loam or medium dense silt.

We recommend removing the foundation soils to an elevation 721.5 feet (Boring BSB3-03) for the full barrel width for an approximate length of 25 feet of east end of the culvert and replace with structural fill to provide adequate bearing capacity and tolerable settlement for the proposed culvert. The excavation and structural fill should extend at least 2 feet laterally beyond the edge of the culvert.

We estimate that the culvert will undergo long-term settlement of 1.0 inches or less and a differential settlement of 0.5 inches or less.

5.2 MSE Walls

We understand culvert headwalls are proposed to be continuous between the culverts and extend north and south of the culvert series. The selected MSE type wall is feasible and economical with minor foundation soils treatment.

The 112.2-foot long **east** wall begins at Station 134+30.00 and ends at Station 135+45.00 and top of sidewalk elevations range from 731.83 to 732.21 feet.

The 113.3-foot long **west** wall begins at Station 134+45.00 and ends at Station 135+55.00 and top of sidewalk elevations range from 733.83 to 734.13 feet.

The maximum retained height for both walls ranges from 4 feet on top culverts to 11 feet for the approach roadways.

5.2.1 Bearing Resistance and Sliding

Wang recommends the top of MSE leveling pad at a minimum of 3.5 feet below the finished grade at front face of the wall as required by IDOT (2012a).

Based on borings for some portion along the **east** wall, very soft to medium stiff silty clay to silty clay loam is expected to be encountered at the base of MSE wall. To provide adequate bearing resistance and tolerable settlement we recommend removing very soft soil (Q_u< 0.25 to 0.9 tsf, moisture content = 20 to 24%) to an elevation of 720.0 feet from Station 134+60 to Station 135+30 and removing medium stiff soil (Qu = 0.57 tsf) to an elevation 723.5 feet from Station 135+30 to 135+45. The removed soils should be replaced with compacted structural fill. The actual extent of the removal should be determined in the field during construction.

Based on our borings, the foundation soils along the **west** wall are expected to consist of medium stiff to stiff or hard silty clay to silty clay loam overlying loose silt or very stiff to hard silty loam to silty clay loam. We do not anticipate any removal and replacement.

Considering the foundation treatment at the east wall section, we recommend a nominal bearing resistance of 9,000 psf be considered for the design of MSE wall. Considering a bearing resistance factor of 0.65 (AASTHO, 2012), the factored bearing resistance will be 5,800 psf. We estimate the wall will apply a maximum factored equivalent uniform bearing pressure of about 3,800 psf at the highest wall section adjacent to the box culvert.

The nominal sliding resistance (ultimate value) between the foundation soil and the MSE wall mass can be calculated considering the frictional resistance provided by a foundation soil with an angle of 34 degrees. Sliding resistance factor, as per Table 11.5.7-1 of 2012 AASHTO, should be 1.0. Design lateral pressure from surcharge loads due to roadway traffic and construction equipment should be added to the lateral earth pressure load. The eccentricity lies within the middle third of the walls, and we estimate the resistance against overturning is also sufficient. Our analysis shows the walls with reinforced zone widths of 0.7 times the total height will be stable.

5.2.2 Settlement Analysis

We evaluated the potential consolidation settlements resulting from the proposed fill for the wall using *IDOT Cohesive Soil Settlement Estimate (2014)*. Our evaluations show the foundation soils will undergo long-term settlement of 1.0 inch or less which is acceptable.

5.2.3 Global Stability

The global stability of the proposed wall was analyzed based on the soil profile and the information provided in the cross section drawings. We have analyzed section at Station 134+69 for the west retaining wall where the wall reaches a maximum height of about 12 feet. Wang calculated a FOS of 6.2 (Appendix C-1) in undrained soil conditions (short-term) and FOS of 2.0 (Appendix C-2) in drained soil conditions (long-term). The minimum required factor of safety (FOS) for both short- and long- term conditions is 1.5 (IDOT, 1999). Since the borings drilled for the east wall shows similar soil condition along the west wall, and similar geometry we conclude there are no global stability concerns for the east wall too.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

Vegetation, topsoil, and debris should be cleared and stripped where foundations and structural fills will be placed. During excavation, the engineer should check for any unstable or unsuitable materials within the culvert and MSE wall foundations. Unstable and unsuitable soils 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. The potential effect of ground movements upon nearby utilities should be considered during construction. Any excavation that cannot be graded 1:2 (V: H) should be properly shored with temporary sheet piling or soil retention systems.

We do not expect the need of special dewatering system since the groundwater was encountered at the site 12 to 42 feet below the proposed culvert excavations; however, depending upon prevailing climatic conditions and the time of the year when construction takes place, control of runoff and maintenance of existing flows will require temporary water diversion and control. Any precipitation allowed to enter excavations should be immediately removed via sump pump. Any soil allowed to soften under standing water should be removed and replaced with structural fill.

6.3 Filling and Backfilling

Fill material required to attain the final design subgrade elevations should be in accordance with Section 205 (IDOT 2012b). All fill and backfill materials should be pre-approved by the site engineer. The fill should be free of organic materials and debris.

Backfill materials must be pre-approved by the Resident Engineer. To backfill adjacent to the culvert we recommend the porous granular material conforming to the requirements specified in the IDOT Special Provision, *Granular Backfill for Structures*. Backfill material should be placed and compacted in accordance with the Special Provision.

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 MSE Wall Construction

MSE walls should be constructed using the IDOT Special Provision GBSP38, *Mechanically Stabilized Earth Retaining Walls*.

7.0 QUALIFICATIONS

The analyses 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 structures are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Parsons Transportation 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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Corina T. Farez, P.E., P.G.
QA/QC Reviewer

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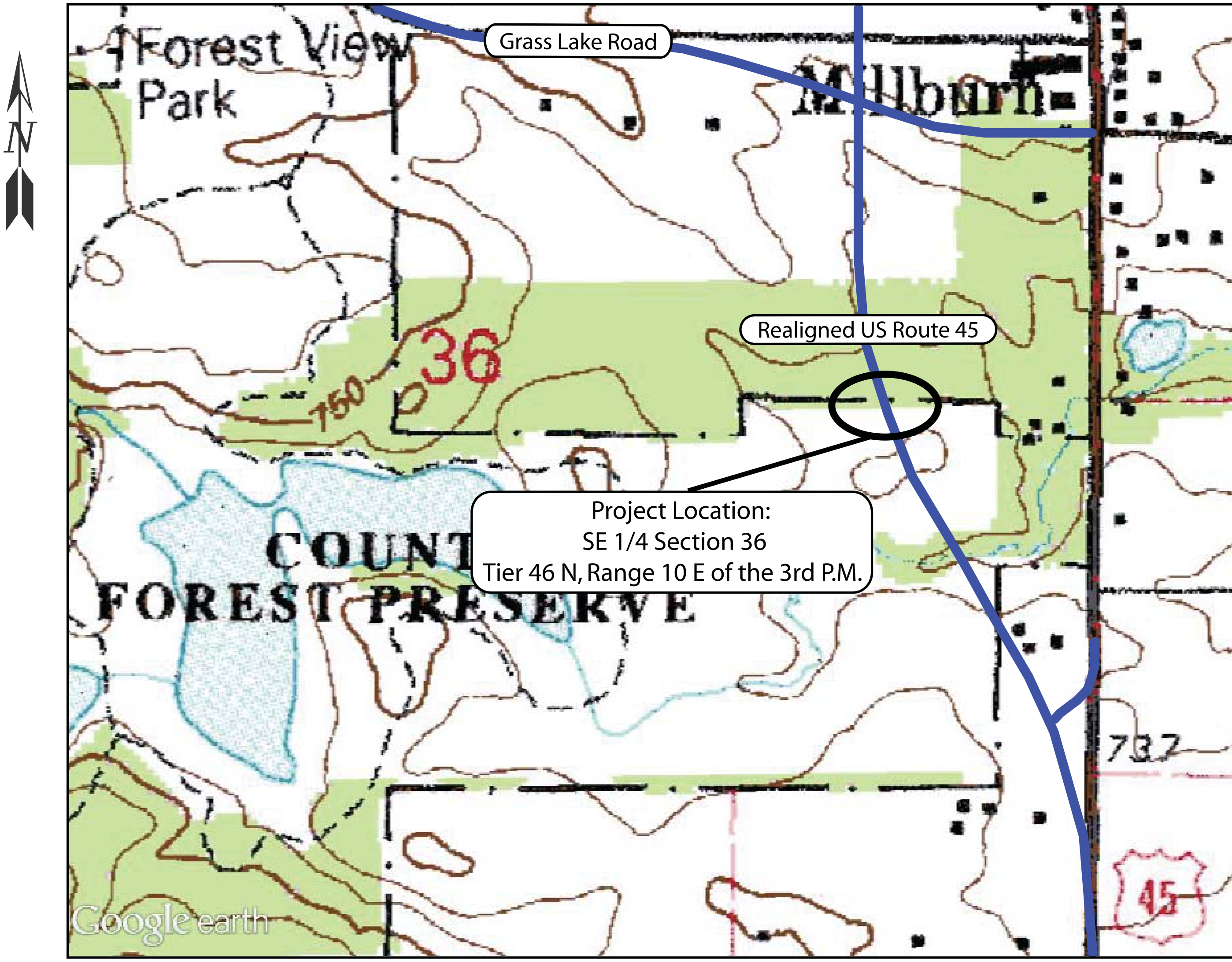
EXHIBITS



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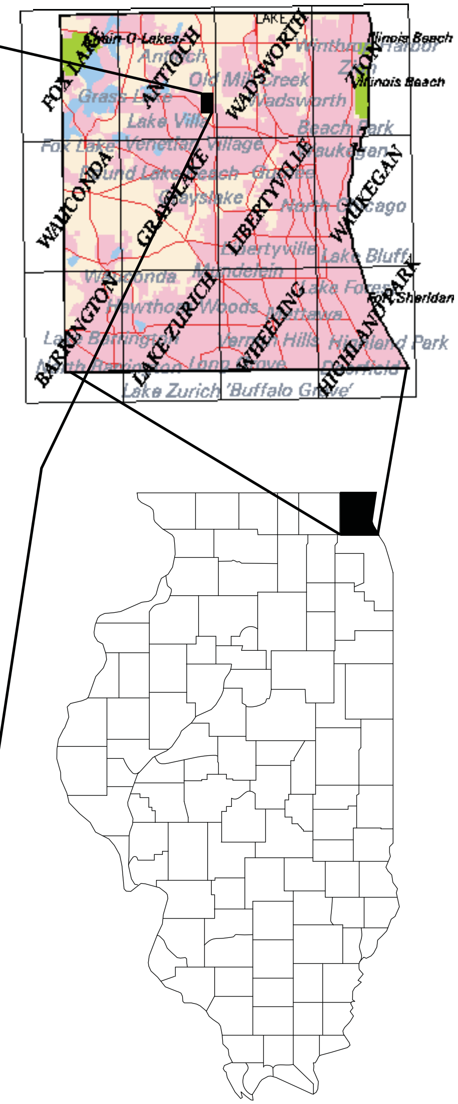

LEGEND

Project Alignment

SITE LOCATION MAP: US ROUTE 45 BYPASS OVER TRIBUTARIES TO MILLBURN CREEK, STRUCTURE NO(s). 049-C006, 049-0611 AND 049-C007, LAKE COUNTY, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: H. Bista CHECKED BY: N. Balakumaran
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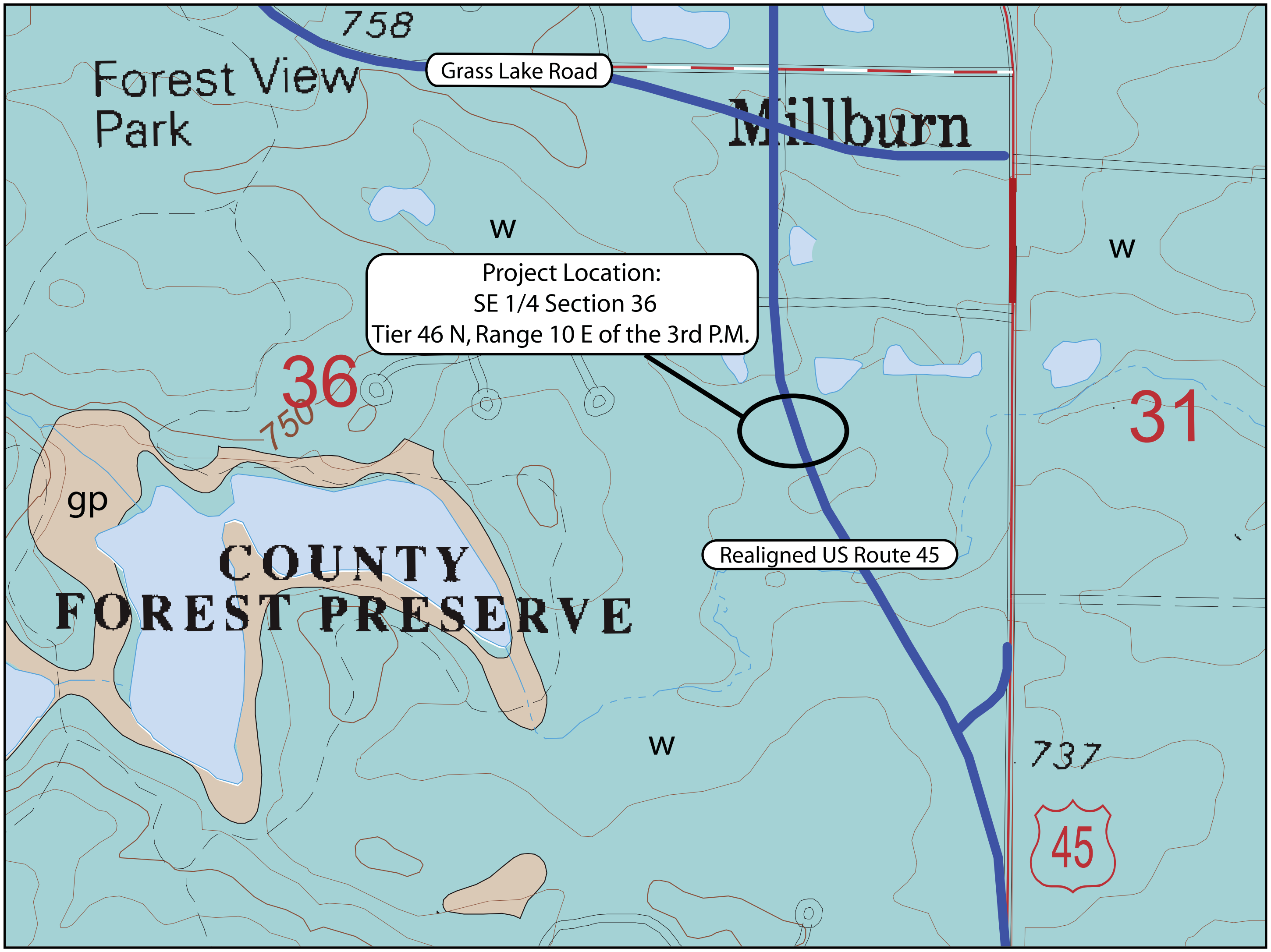
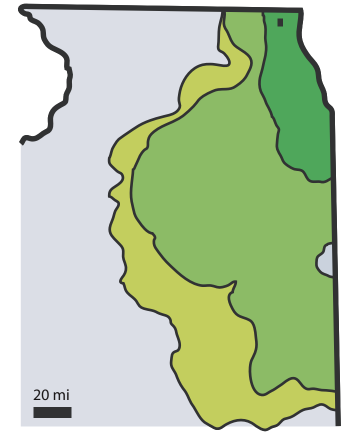
FOR PARSONS TRANSPORTATION GROUP, INC.		342-08-01



0 1000 2000 feet

Modified after Stumpf and Barnhardt (2005)

REGIONAL GEOLOGY



Wedron Group

- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

LEGEND

QUATERNARY DEPOSITS

HUDSON EPISODE

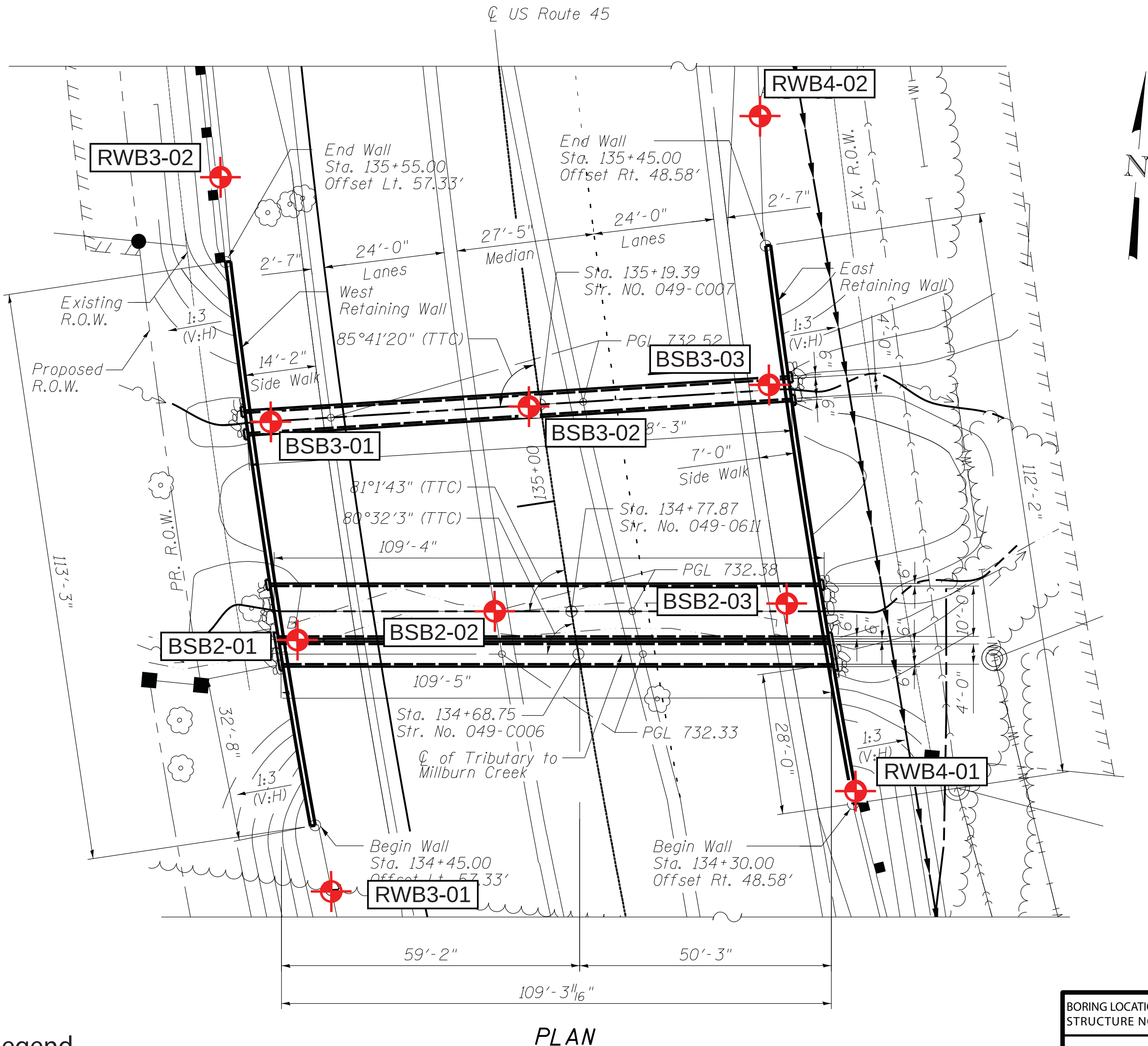
gp — **Grayslake Peat**
Decomposed wetland vegetation and sediment; peat and muck, interbedded sand, silty clay, and marl

WISCONSIN EPISODE

w — **Wadsworth Formation**
Subglacial till, channel and lake deposites; silty clay loam to silty clay, pebbly with ocassional cobbles and boulders, silt and sand inclusions, sand and or gravel lenses common

Project Alignment

SITE AND REGIONAL GEOLOGY: US ROUTE 45 BYPASS OVER TRIBUTARIES TO MILLBURN CREEK, STRUCTURE NO(s). 049-C006, 049-0611 AND 049-C007, LAKE COUNTY, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: H Bista CHECKED BY: N. Balakumaran
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR PARSONS TRANSPORTATION GROUP, INC.		342-08-01



Legend

Soil Boring

BORING LOCATION PLAN:US ROUTE 45 BYPASS OVER TRIBUTARIES TO MILLBURN CREEK, STRUCTURE NO(s). 049-C006, 049-0611 AND 049-C007, LAKE COUNTY, ILLINOIS		
SCALE: GRAPHIC	EXHIBIT 3	DRAWN BY: R. KC CHECKED BY: N. Balakumaran
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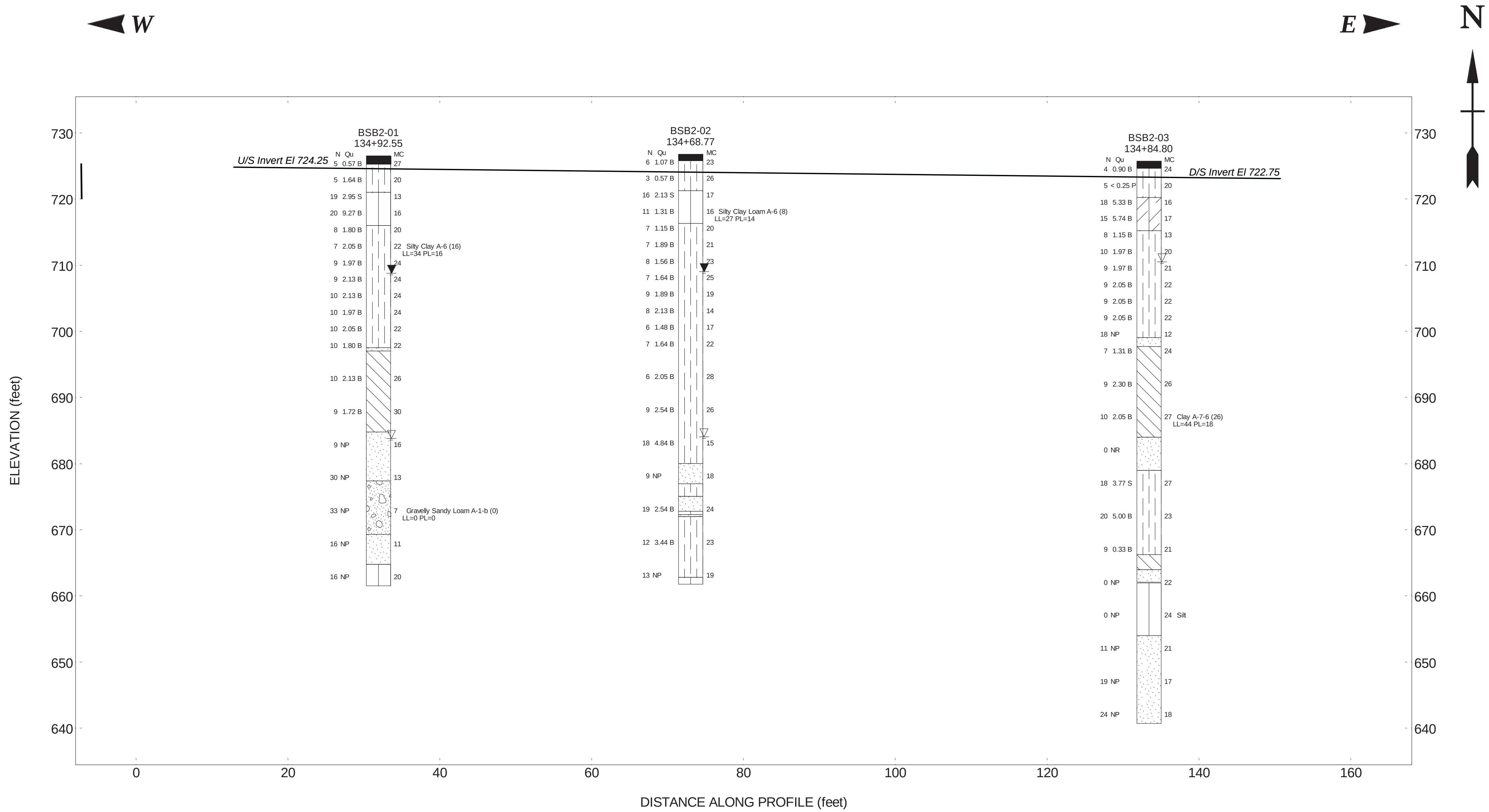
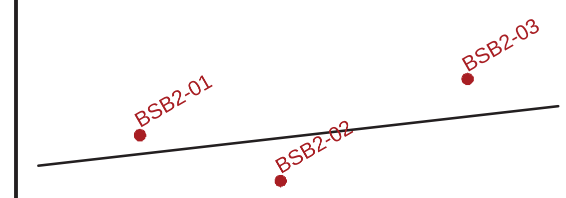
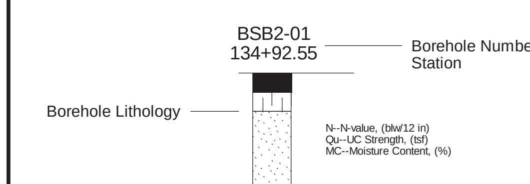
FOR PARSONS TRANSPORTATION GROUP, INC.		342-08-01





Site Map Scale 1 inch equals 60 feet

Explanation:



▽ Water Level Reading at time of drilling.

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

Horizontal Scale (feet)

Vertical Exaggeration: 1x

Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- IDH Clay
- Gravelly sand, sandy gravel
- IDH Clay Loam

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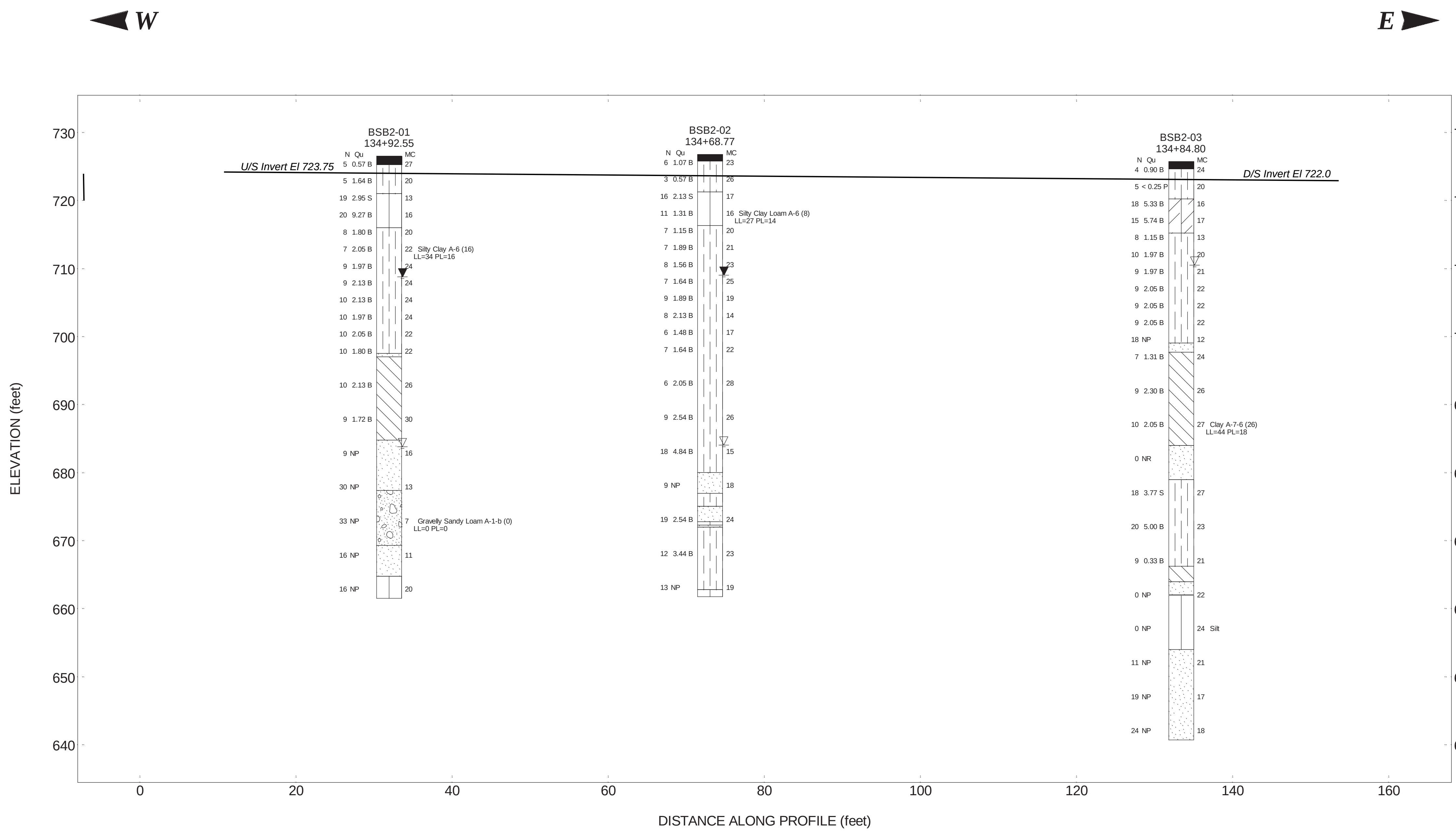
Soil Profile
Culvert at Sta. 134+69.26; SN 049-C006

WEI
SINCE 1982

US 45 - Millburn Bypass
Lake County, Illinois

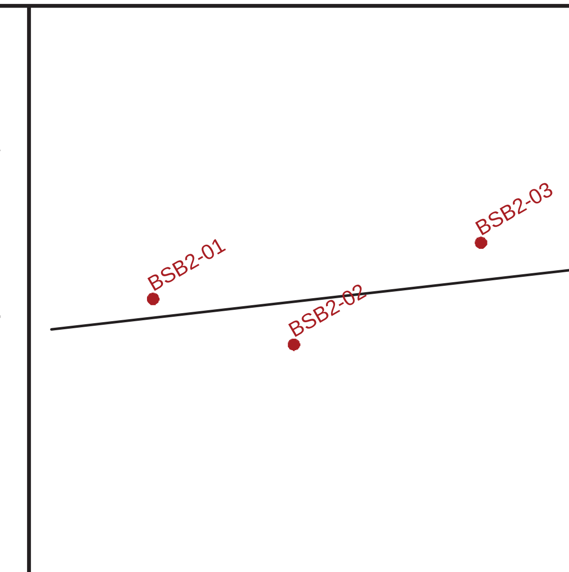
JOB NUMBER	PLATE NUMBER
342-08-01	EXHIBIT 4-1

WEI 11X17 3420801.GPJ WANGENG.GDT 6/3/15



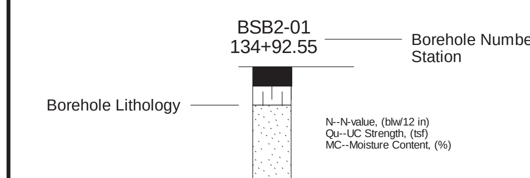
Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- IDH Clay
- Gravelly sand, sandy gravel
- IDH Clay Loam



Site Map Scale 1 inch equals 60 feet

Explanation:



▽ Water Level Reading at time of drilling.

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

0 16

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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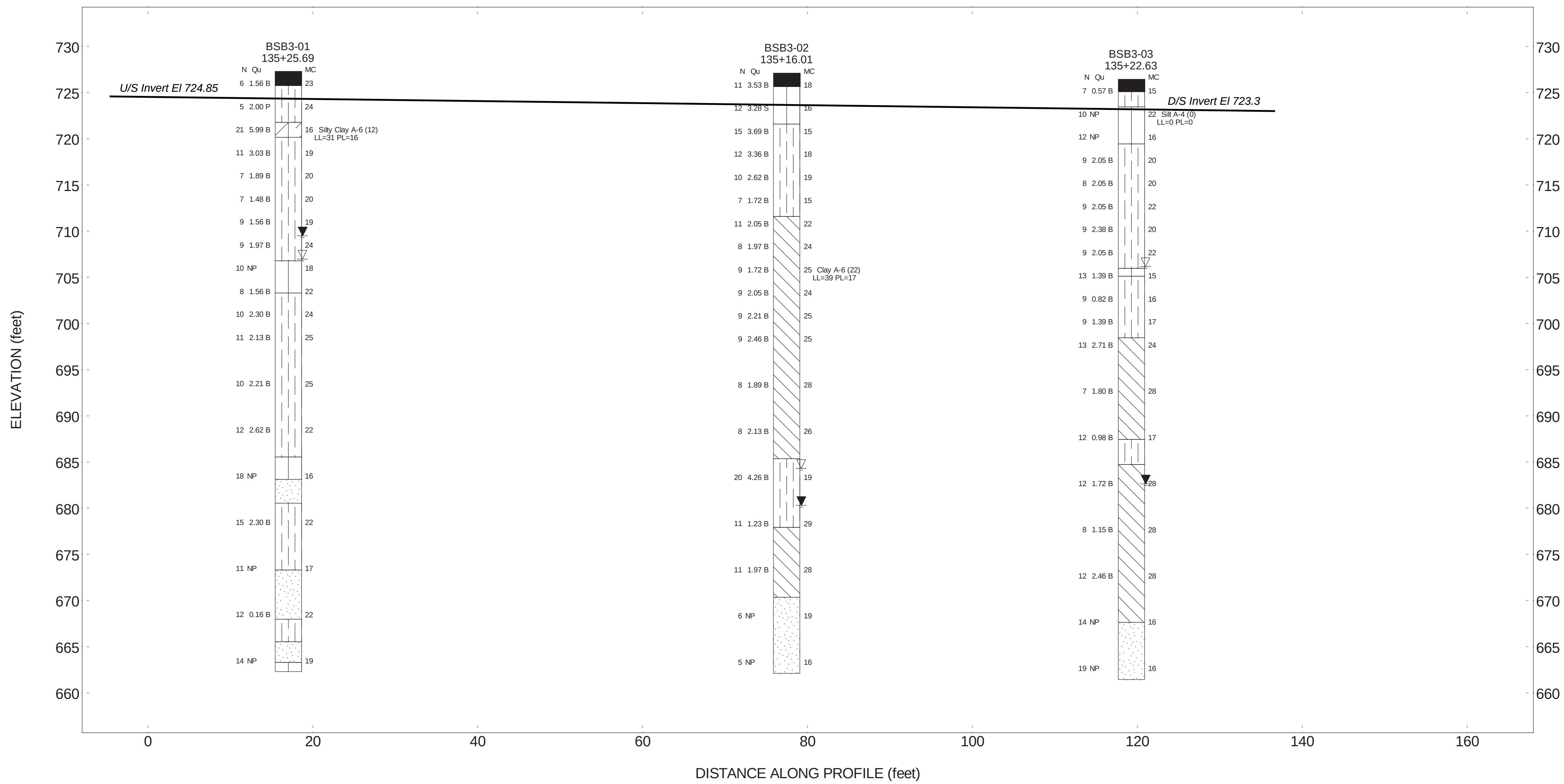
Soil Profile
Culvert at Sta. 134+78.90; SN 049-0611

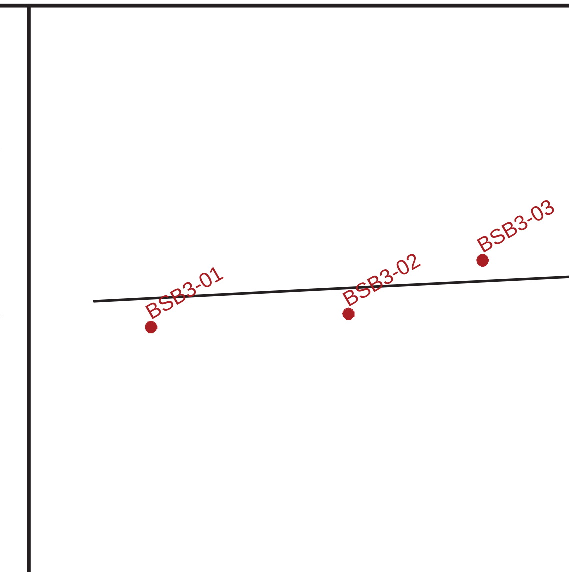
WEI SINCE 1982

US 45 - Millburn Bypass
Lake County, Illinois

JOB NUMBER	PLATE NUMBER
342-08-01	EXHIBIT 4-2

WEI 11X17 3420801.GPJ WANGENG.GDT 6/3/15



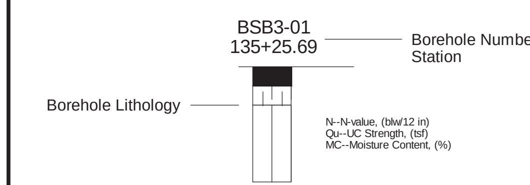


Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Clay Loam
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- IDH Clay

Site Map Scale 1 inch equals 60 feet

Explanation:



▽ Water Level Reading at time of drilling.

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

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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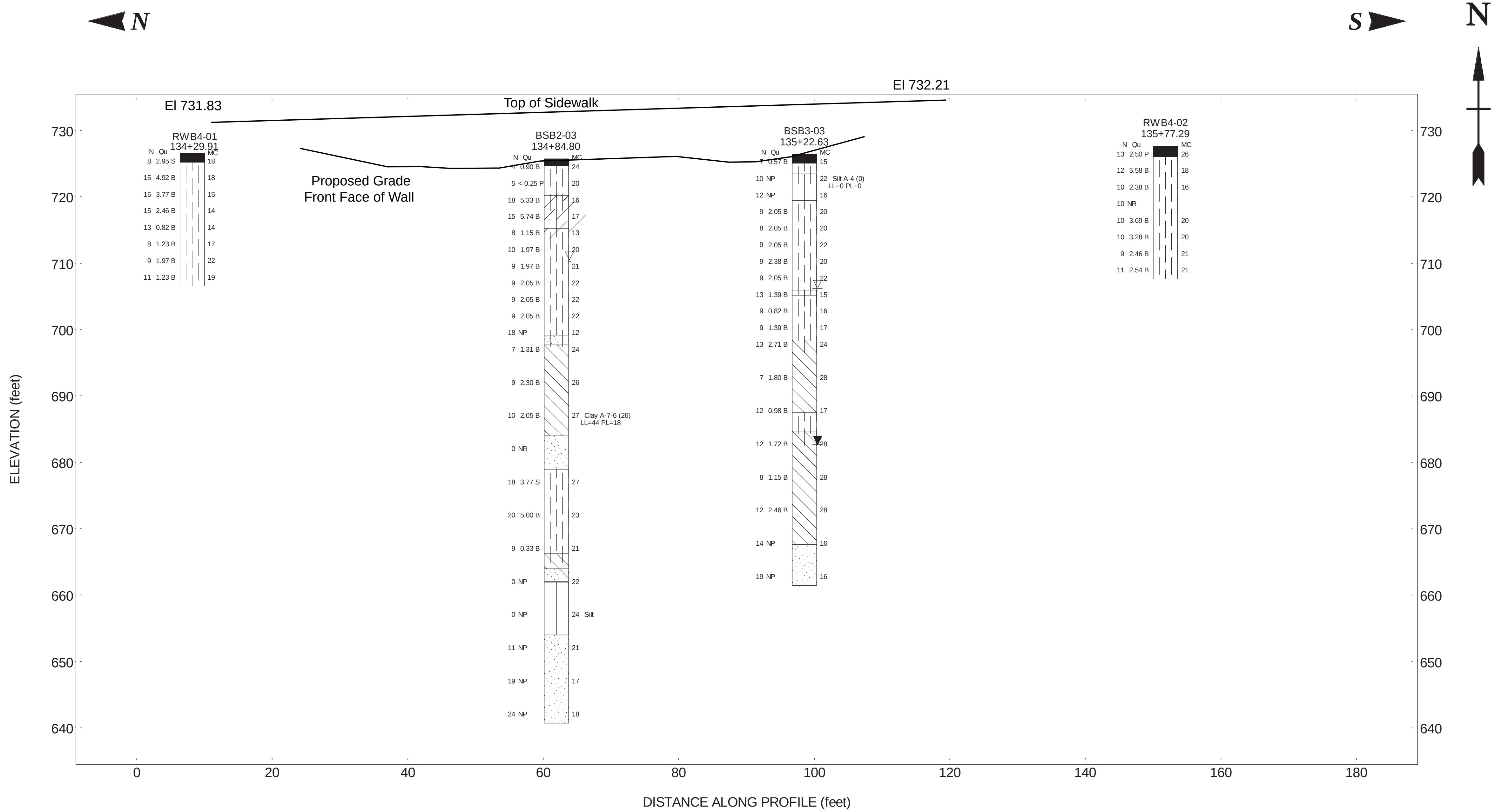
Soil Profile
Culvert at Sta. 135+ 19.10; SN 049-C007

WEI SINCE 1982

US 45 - Millburn Bypass
Lake County, Illinois

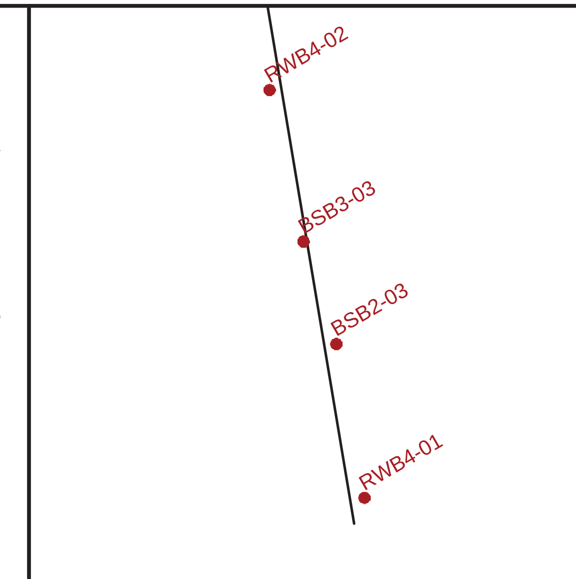
JOB NUMBER	PLATE NUMBER
342-08-01	EXHIBIT 4-3

WEI 11X17 3420801.GPJ WANGENG.GDT 6/3/15



Lithology Graphics

Topsoil
IDH Silty Clay, Silty Clay Loam
IDH Clay Loam
IDH Sand, Sandy Loam
IDH Clay
IDH Silt, Silty Loam



Site Map Scale 1 inch equals 65 feet

Explanation:

BSB2-03
134+84.80
Borehole Number
Station
Borehole Lithology
N--N-value, (blw/12 in)
Qu--UC Strength, (tsf)
MC--Moisture Content, (%)

Water Level Reading at time of drilling.

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

0 18

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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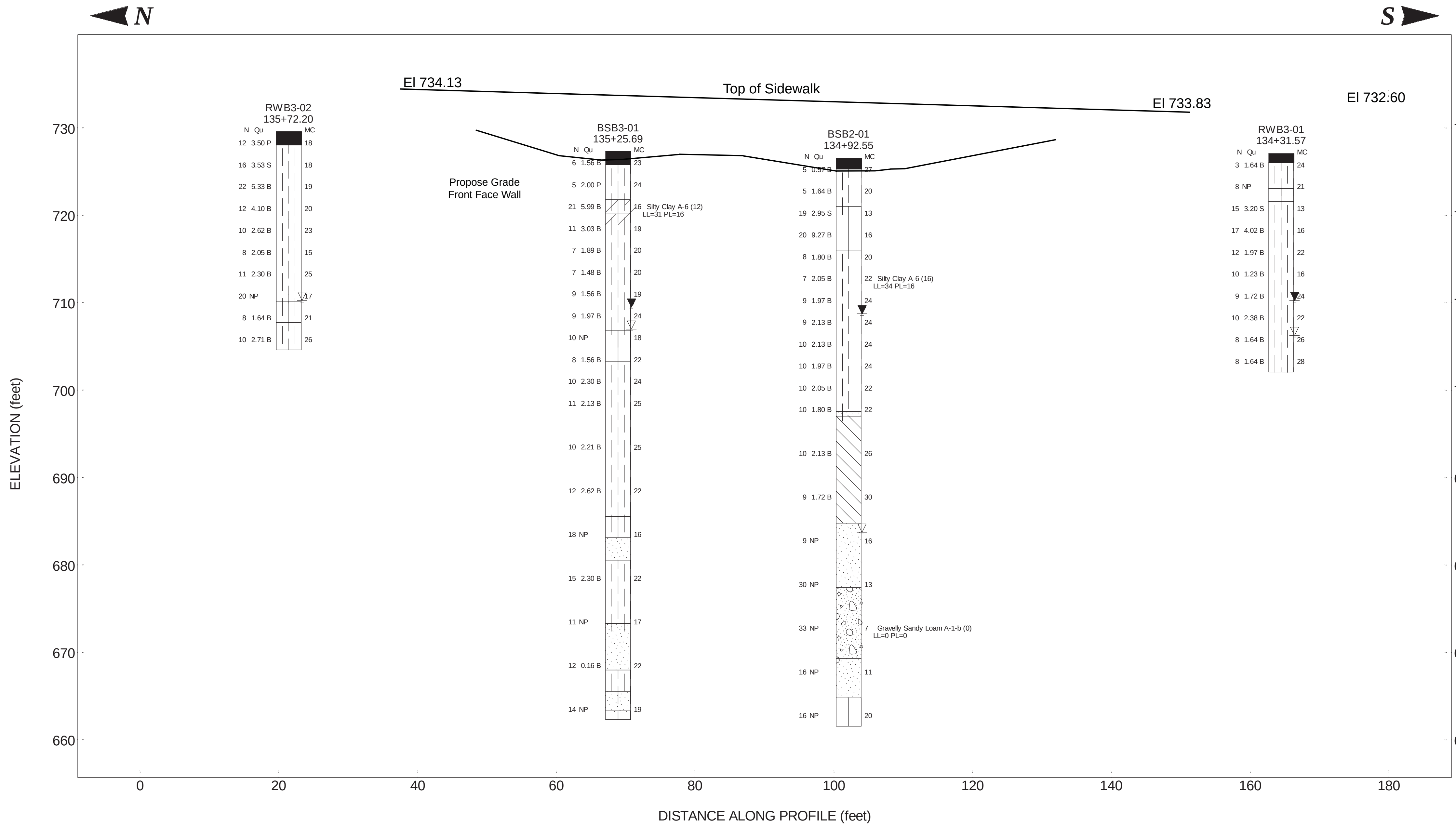
Soil Profile
East Retaining Wall

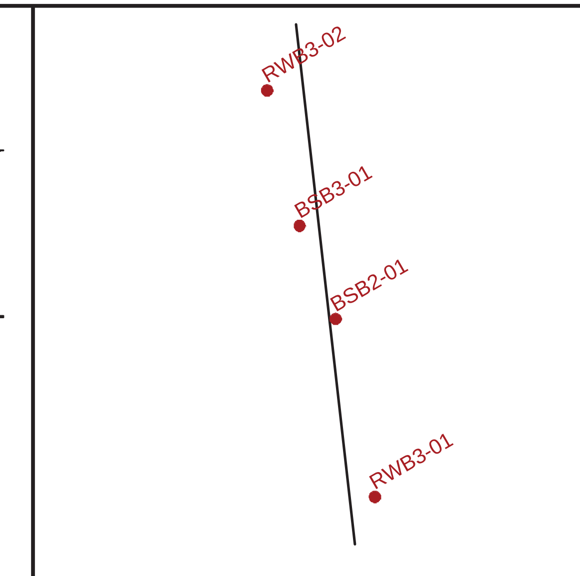
WEI SINCE 1982

US 45 - Millburn Bypass
Lake County, Illinois

JOB NUMBER	PLATE NUMBER
342-08-01	EXHIBIT 4-4

WEI 11X17 3420801.GPJ WANGENG.GDT 6/3/15





Site Map Scale 1 inch equals 65 feet

Explanation:

BSB2-01
134+92.55
Borehole Number
Station
Borehole Lithology
N--N-value, (blw/12 in)
Qu--UC Strength, (tsf)
MC--Moisture Content, (%)

Water Level Reading at time of drilling.

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

0 18

Horizontal Scale (feet)

Vertical Exaggeration: 1.5x

Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- IDH Clay
- Gravelly sand, sandy gravel
- IDH Clay Loam

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Soil Profile
West Retaining Wall

WEI SINCE 1982

US 45 - Millburn Bypass
Lake County, Illinois

JOB NUMBER	PLATE NUMBER
342-08-01	EXHIBIT 4-5

WEI 11X17 3420801.GPJ WANGENG.GDT 6/15/15

APPENDIX A

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BORING LOG BSB2-01

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.57 ft
North: 2096733.91 ft
East: 1072315.64 ft
Station: 134+92.55
Offset: 51.97' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	15-inch thick, black LOAM --TOPSOIL--					
725.3	Medium stiff to very stiff, brown SILTY CLAY, trace gravel		1	1 2 3	0.57 B	27
		5	2	1 2 3	1.64 B	20
721.1	Very stiff to hard, brown to gray SILTY LOAM to SILTY CLAY LOAM, trace gravel		3	6 9 10	2.95 S	13
		10	4	4 9 11	9.27 B	16
716.1	Stiff to very stiff, gray SILTY CLAY, trace gravel		5	2 4 4	1.80 B	20
	--L_L(%)=34, P_L(%)=16-- --%Gravel=0.7-- --%Sand=5.8-- --%Silt=55.7-- --%Clay=37.7-- --A-6 (16)--	15	6	2 3 4	2.05 B	22
			7	2 4 5	1.97 B	24
		20	8	2 4 5	2.13 B	24
			9	2 4 6	2.13 B	24
		25	10	3 5 5	1.97 B	24
			11	3 5 5	2.05 B	22
697.6	Brown, fine SAND					
697.1	Stiff to very stiff, gray CLAY to SILTY CLAY, trace gravel	30	12	7 5 5	1.80 B	22
		35	13	3 4 6	2.13 B	26
		40	14	3 4 5	1.72 B	30
684.8	Loose, brown and gray, fine SAND, trace gravel --Saturated--	45	15	2 3 6	NP	16
677.4	Dense, gray GRAVELLY SANDY	50	16	10 15 15	NP	13

GENERAL NOTES

Begin Drilling **09-18-2014** Complete Drilling **09-18-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **43.00 ft**
At Completion of Drilling ▼ **18.00 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 BSB2-01

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.57 ft
North: 2096733.91 ft
East: 1072315.64 ft
Station: 134+92.55
Offset: 51.97' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type (recovery)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	LOAM --Saturated-- --%Gravel=47.4-- --%Sand=37.0-- --%Silt=11.6-- --%Clay=4.0-- --A-1-b (0)--	55		17	11 13 20	NP	7
669.3	Medium dense, gray, coarse SAND, trace gravel --Saturated--	60		18	6 8 8	NP	11
664.8	Medium dense, gray SILT --Saturated--			19	4 6 10	NP	20
661.6	Boring terminated at 65.00 ft	65					
		70					
		75					

GENERAL NOTES

Begin Drilling	**09-18-2014**	Complete Drilling	**09-18-2014**
Drilling Contractor	**Wang Testing Services**	Drill Rig	**D-50 ATV**
Driller	**K&K**	Logger	**S. Woods**
Checked by	**B. Wilson**		
Drilling Method	**3.25" HSA; Boring backfilled upon completion**		

WATER LEVEL DATA

While Drilling ▽	**43.00 ft**
At Completion of Drilling ▼	**18.00 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 BSB2-02

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.82 ft
North: 2096719.95 ft
East: 1072358.65 ft
Station: 134+68.77
Offset: 13.76' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	12-inch thick, black LOAM					
725.8	--TOPSOIL--					
	Medium stiff to stiff, grayish brown CLAY to SILTY CLAY, trace gravel, roots		1	1 2 4	1.07 B	23
		5	2	1 1 2	0.57 B	26
721.3	Stiff to very stiff, brown SILTY LOAM to SILTY CLAY LOAM, trace gravel		3	5 6 10	2.13 S	17
	--L_L(%)=27, P_L(%)=14-- --%Gravel=4.2-- --%Sand=15.2-- --%Silt=52.9--	10	4	3 5 6	1.31 B	16
716.3	--%Clay=27.7-- --A-6 (8)--					
	Stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		5	2 3 4	1.15 B	20
		15	6	2 3 4	1.89 B	21
			7	2 4 4	1.56 B	23
		20	8	2 3 4	1.64 B	25
			9	2 4 5	1.89 B	19
		25	10	2 3 5	2.13 B	14
			11	2 2 4	1.48 B	17
		30	12	2 3 4	1.64 B	22
		35	13	2 3 3	2.05 B	28
		40	14	3 4 5	2.54 B	26
	--Possible SAND lens-- --Saturated--					
		45	15	4 7 11	4.84 B	15
680.1	Loose, brown, medium to coarse SAND, trace gravel --Saturated--					
677.0		50	16	0 3 6	NP	18

GENERAL NOTES

Begin Drilling **09-17-2014** Complete Drilling **09-17-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **43.00 ft**
At Completion of Drilling ▼ **18.00 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 BSB2-02

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.82 ft
North: 2096719.95 ft
East: 1072358.65 ft
Station: 134+68.77
Offset: 13.76' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	Very stiff, gray SILTY CLAY, trace gravel						
675.1	Medium dense, brown SAND --Saturated--						
672.8	Very stiff, gray SILTY CLAY, trace gravel			17	8 8 11	2.54 B	24
672.3	Brown, medium SAND --Saturated--						
672.0	Very stiff, gray SILTY CLAY, trace gravel	55					
	--SAND seams-- --Saturated--	60		18	4 6 6	3.44 B	23
662.8	Medium dense, gray SILT --Saturated--	65		19	4 8 5	NP	19
661.8	Boring terminated at 65.00 ft						
		70					
		75					

GENERAL NOTES

Begin Drilling	**09-17-2014**	Complete Drilling	**09-17-2014**
Drilling Contractor	**Wang Testing Services**	Drill Rig	**D-50 ATV**
Driller	**K&K**	Logger	**S. Woods**
Checked by	**B. Wilson**		
Drilling Method	**3.25" HSA; Boring backfilled upon completion**		

WATER LEVEL DATA

While Drilling	**43.00 ft**
At Completion of Drilling	**18.00 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 BSB2-03

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 725.76 ft
North: 2096751.09 ft
East: 1072415.81 ft
Station: 134+84.80
Offset: 49.37' RT

SOIL AND ROCK DESCRIPTION

Elevation (ft)	Description
	18-inch thick, black LOAM, trace roots
724.8	--TOPSOIL--
	Very soft to medium stiff, grayish brown SILTY CLAY to SILTY CLAY LOAM, trace gravel
720.3	Hard, brown to gray SILTY CLAY LOAM to CLAY LOAM, trace gravel
715.3	Stiff to very stiff, gray SILTY CLAY, trace gravel --SAND lens-- --Saturated--
699.1	Medium dense, gray SANDY LOAM, little gravel --Saturated--
697.8	Stiff to very stiff, gray CLAY to SILTY CLAY, trace gravel --L_L(%)=44, P_L(%)=18-- --%Gravel=1.2-- --%Sand=3.2-- --%Silt=41.8-- --%Clay=53.8-- --A-7-6 (26)--
684.0	Possible, very loose SAND --Saturated--
679.0	Very stiff to hard, gray SILTY CLAY, trace gravel

Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
1	1, 2, 2	0.90 B	24
2	1, 2, 3	< 0.25 P	20
3	5, 7, 11	5.33 B	16
4	3, 6, 9	5.74 B	17
5	3, 3, 5	1.15 B	13
6	2, 4, 6	1.97 B	20
7	2, 4, 5	1.97 B	21
8	2, 4, 5	2.05 B	22
9	3, 4, 5	2.05 B	22
10	2, 4, 5	2.05 B	22
11	5, 10, 8	NP	12
12	2, 3, 4	1.31 B	24
13	3, 4, 5	2.30 B	26
14	3, 4, 6	2.05 B	27
15	0, 0, 0	NR	
16	4, 8, 10	3.77 S	27

GENERAL NOTES

Begin Drilling **09-22-2014** Complete Drilling **09-22-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **15.50 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.

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BORING LOG BSB2-03

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 725.76 ft
North: 2096751.09 ft
East: 1072415.81 ft
Station: 134+84.80
Offset: 49.37' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	5, 8, 12	5.00 B	23
666.3			18	2, 4, 5	0.33 B	21
	Soft, gray CLAY, some silt interbeds	60				
664.0	Brown medium SAND --Saturated--					
662.1	Very loose, gray SILT --Saturated--	65	19	0, 0, 0	NP	22
	--L_L(%)=NP, P_L(%)=NP-- --%Gravel=0.0-- --%Sand=3.5-- --%Silt=92.1-- --%Clay=4.3-- --A-4 (0)--	70	20	0, 0, 0	NP	24
654.0	Very loose to medium dense, gray, fine to medium SAND --Saturated--	75	21	4, 5, 6	NP	21
		80	22	5, 9, 10	NP	17
640.8		85	23	12, 12, 12	NP	18
	Boring terminated at 85.00 ft					
		90				
		95				
		100				

GENERAL NOTES

Begin Drilling **09-22-2014** Complete Drilling **09-22-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **15.50 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.

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BORING LOG BSB3-01

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.31 ft
North: 2096765.95 ft
East: 1072303.24 ft
Station: 135+25.69
Offset: 56.54' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick, black SILTY LOAM to LOAM, trace roots					
725.8	--TOPSOIL--					
	Stiff to very stiff, brownish gray SILTY CLAY, trace gravel		1	1 3 3	1.56 B	23
		5	2	2 2 3	2.00 P	24
721.8	Hard, brown CLAY LOAM to SILTY CLAY LOAM, trace gravel		3	7 9 12	5.99 B	16
720.2	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel --L_L(%)=31, P_L(%)=16-- --%Gravel=5.5-- --%Sand=7.8-- --%Silt=54.8-- --%Clay=32.0-- --A-6 (12)--	10	4	3 5 6	3.03 B	19
			5	1 3 4	1.89 B	20
		15	6	2 3 4	1.48 B	20
			7	2 4 5	1.56 B	19
		20	8	3 3 6	1.97 B	24
706.8	Medium dense, gray SILT --Saturated--		9	3 4 6	NP	18
703.3	Stiff to very stiff, gray SILTY CLAY, trace gravel	25	10	3 4 4	1.56 B	22
			11	3 4 6	2.30 B	24
		30	12	3 5 6	2.13 B	25
		35	13	4 4 6	2.21 B	25
		40	14	3 5 7	2.62 B	22
685.6	Gray SILT --Saturated--					
683.2	Medium dense, brown, fine SAND --Saturated--	45	15	9 9 9	NP	16
680.6	Stiff to very stiff, gray SILTY CLAY, trace gravel	50	16	5 6 9	2.30 B	22

GENERAL NOTES

Begin Drilling **09-18-2014** Complete Drilling **09-18-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **20.50 ft**
At Completion of Drilling ▼ **18.00 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.

BORING LOG BSB3-01

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WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.31 ft
North: 2096765.95 ft
East: 1072303.24 ft
Station: 135+25.69
Offset: 56.54' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
673.3	Medium dense, brown, fine to medium SAND --Saturated--	55	17	3 3 8	NP	17
668.0	Very soft, gray SILTY CLAY to CLAY, trace gravel	60	18	3 4 8	0.16 B	22
665.6	Brown, fine to medium SAND --Saturated--					
663.3	Medium dense, gray SILT --Saturated--	65	19	7 7 7	NP	19
662.3	Boring terminated at 65.00 ft					
		70				
		75				

GENERAL NOTES

Begin Drilling **09-18-2014** Complete Drilling **09-18-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling	**20.50 ft**
At Completion of Drilling	**18.00 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 BSB3-02

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.14 ft
North: 2096769.99 ft
East: 1072363.56 ft
Station: 135+16.01
Offset: 3.12' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	17-inch thick, black LOAM, trace roots					
725.7	--TOPSOIL--					
	Very stiff, brown SILTY LOAM to SILTY CLAY LOAM, trace gravel		1	4 5 6	3.53 B	18
		5	2	3 5 7	3.28 S	16
721.6	Stiff to very stiff, gray SILTY CLAY LOAM, trace gravel		3	3 7 8	3.69 B	15
		10	4	3 4 8	3.36 B	18
			5	3 4 6	2.62 B	19
	--Interbedded SAND seams--	15	6	2 3 4	1.72 B	15
711.6	Stiff to very stiff, gray CLAY to SILTY CLAY, trace gravel		7	3 5 6	2.05 B	22
		20	8	2 3 5	1.97 B	24
	--L_L(%)=39, P_L(%)=17-- --%Gravel=0.5-- --%Sand=2.6-- --%Silt=48.9-- --%Clay=47.9-- --A-6 (22)--		9	3 4 5	1.72 B	25
		25	10	2 4 5	2.05 B	24
			11	3 4 5	2.21 B	25
		30	12	3 4 5	2.46 B	25
		35	13	3 3 5	1.89 B	28
		40	14	3 3 5	2.13 B	26
685.4	Hard, gray SILTY CLAY, trace gravel and SAND seams					
	--Saturated--	45	15	5 8 12	4.26 B	19
678.0	Stiff, gray CLAY, trace gravel	50	16	4 5 6	1.23 B	29

GENERAL NOTES

Begin Drilling **09-19-2014** Complete Drilling **09-19-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **43.00 ft**
At Completion of Drilling **47.00 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.

BORING LOG BSB3-02

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WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.14 ft
North: 2096769.99 ft
East: 1072363.56 ft
Station: 135+16.01
Offset: 3.12' RT

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	3 5 6	1.97 B	28
670.4	Loose, brown, fine SAND, trace gravel --Saturated--						
		60	SS	18	2 3 3	NP	19
662.1		65	SS	19	4 2 3	NP	16
	Boring terminated at 65.00 ft	70					
		75					

GENERAL NOTES

Begin Drilling **09-19-2014** Complete Drilling **09-19-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **43.00 ft**
At Completion of Drilling **47.00 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 BSB3-03

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.49 ft
North: 2096786.33 ft
East: 1072404.54 ft
Station: 135+22.63
Offset: 46.75' RT

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	16-inch thick, black LOAM, trace roots					
725.2	--TOPSOIL--					
	Medium stiff, orange brown SILTY CLAY to SILTY CLAY LOAM, trace gravel		1	2 3 4	0.57 B	15
723.5	Medium dense, brown SILT, trace SAND seams --L_L(%)=NP, P_L(%)=NP-- --%Gravel=2.4-- --%Sand=7.8-- --%Silt=82.4-- --%Clay=7.5-- --A-4 (0)--	5	2	2 5 5	NP	22
			3	7 6 6	NP	16
719.5	Very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel	10	4	3 4 5	2.05 B	20
			5	2 3 5	2.05 B	20
		15	6	3 4 5	2.05 B	22
			7	2 4 5	2.38 B	20
		20	8	2 4 5	2.05 B	22
706.0	Gray SILTY LOAM, trace gravel --Saturated--					
705.2	Medium stiff to stiff, gray SILTY CLAY LOAM, trace gravel		9	3 6 7	1.39 B	15
		25	10	2 4 5	0.82 B	16
			11	3 4 5	1.39 B	17
698.5	Stiff to very stiff, gray CLAY to SILTY CLAY, trace gravel	30	12	3 6 7	2.71 B	24
		35	13	2 3 4	1.80 B	28
687.5	Medium stiff, gray SILTY CLAY LOAM, trace gravel	40	14	3 4 8	0.98 B	17
684.7	Stiff to very stiff, gray CLAY to SILTY CLAY, trace gravel	45	15	5 6 6	1.72 B	28
		50	16	2 3 5	1.15 B	28

GENERAL NOTES

Begin Drilling	**09-23-2014**	Complete Drilling	**09-23-2014**
Drilling Contractor	**Wang Testing Services**	Drill Rig	**D-50 ATV**
Driller	**K&K**	Logger	**S. Woods**
Checked by	**B. Wilson**		
Drilling Method	**3.25" HSA; Boring backfilled upon completion**		

WATER LEVEL DATA

While Drilling	**20.50 ft**
At Completion of Drilling	**44.00 ft**
Time After Drilling	**NA**
Depth to Water	**NA**

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BORING LOG BSB3-03

WEI Job No.: 342-08-01

Client **Parsons Transportation Group, Inc.**
Project **US 45 - Millburn Bypass**
Location **Lake County, Illinois**

Datum: NGVD
Elevation: 726.49 ft
North: 2096786.33 ft
East: 1072404.54 ft
Station: 135+22.63
Offset: 46.75' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55		17	4 6 6	2.46 B	28
667.7	Medium dense, brown fine SAND --Saturated--	60		18	4 1 13	NP	16
	--Interbedded SILT--			19	3 8 11	NP	16
661.5	Boring terminated at 65.00 ft	65					
		70					
		75					

GENERAL NOTES

Begin Drilling **09-23-2014** Complete Drilling **09-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **20.50 ft**
At Completion of Drilling **44.00 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 RWB3-01

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.10 ft
North: 2096672.69 ft
East: 1072329.10 ft
Station: 134+31.57
Offset: 54.68' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
726.1	12-inch thick, black LOAM --TOPSOIL--					
723.1	Stiff, grayish brown to brown SILTY CLAY to SILTY CLAY LOAM, trace gravel		1	1 1 2	1.64 B	24
721.6	Loose, grayish brown SILT to SILTY LOAM	5	2	1 3 5	NP	21
	Stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		3	3 6 9	3.20 S	13
		10	4	4 6 11	4.02 B	16
			5	3 5 7	1.97 B	22
		15	6	3 3 7	1.23 B	16
			7	3 4 5	1.72 B	24
		20	8	3 4 6	2.38 B	22
	--Possible SAND lens-- --Saturated--		9	3 3 5	1.64 B	26
702.1		25	10	3 3 5	1.64 B	28
	Boring terminated at 25.00 ft					

GENERAL NOTES

Begin Drilling	**09-17-2014**	Complete Drilling	**09-17-2014**
Drilling Contractor	**Wang Testing Services**	Drill Rig	**D-50 ATV**
Driller	**K&K**	Logger	**S. Woods**
Checked by	**B. Wilson**		
Drilling Method	**2.25" HSA; Boring backfilled upon completion**		

WATER LEVEL DATA

While Drilling	**21.00 ft**
At Completion of Drilling	**17.00 ft**
Time After Drilling	**NA**
Depth to Water	**NA**

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BORING LOG RWB3-02

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 729.60 ft
North: 2096812.50 ft
East: 1072292.10 ft
Station: 135+72.20
Offset: 57.46' LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick, black LOAM, trace roots					
728.1	--TOPSOIL--					
	Very stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		1	5 5 7	3.50 P	18
		5	2	4 7 9	3.53 S	18
			3	6 10 12	5.33 B	19
		10	4	3 5 7	4.10 B	20
			5	4 4 6	2.62 B	23
		15	6	2 3 5	2.05 B	15
			7	3 5 6	2.30 B	25
710.2	Gray SILT --Saturated--	20	8	2 8 12	NP	17
707.8	Very stiff, gray SILTY CLAY, trace gravel		9	7 4 4	1.64 B	21
704.6		25	10	2 4 6	2.71 B	26
	Boring terminated at 25.00 ft					

GENERAL NOTES

Begin Drilling **09-19-2014** Complete Drilling **09-19-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **19.50 ft**
At Completion of Drilling **DRY**
Time After Drilling **NA**
Depth to Water **NA**

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

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BORING LOG RWB4-01

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 726.61 ft
North: 2096698.22 ft
East: 1072425.47 ft
Station: 134+29.91
Offset: 45.00' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	16-inch thick, black LOAM, trace roots					
725.3	--TOPSOIL--					
	Medium stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		1	1 3 5	2.95 S	18
		5	2	4 6 9	4.92 B	18
			3	3 6 9	3.77 B	15
		10	4	4 7 8	2.46 B	14
			5	3 6 7	0.82 B	14
		15	6	2 3 5	1.23 B	17
			7	2 4 5	1.97 B	22
706.6		20	8	4 4 7	1.23 B	19
	Boring terminated at 20.00 ft					
		25				

GENERAL NOTES

Begin Drilling **09-23-2014** Complete Drilling **09-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

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

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

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BORING LOG RWB4-02

WEI Job No.: 342-08-01

Client: **Parsons Transportation Group, Inc.**
Project: **US 45 - Millburn Bypass**
Location: **Lake County, Illinois**

Datum: NGVD
Elevation: 727.67 ft
North: 2096838.41 ft
East: 1072392.87 ft
Station: 135+77.29
Offset: 46.46' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick, black LOAM, trace roots					
726.2	--TOPSOIL--					
	Very stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel		1	4 5 8	2.50 P	26
		5	2	5 5 7	5.58 B	18
			3	3 5 5	2.38 B	16
		10	4	3 4 6	NR	
			5	4 4 6	3.69 B	20
		15	6	2 4 6	3.28 B	20
			7	3 4 5	2.46 B	21
707.7		20	8	3 4 7	2.54 B	21
	Boring terminated at 20.00 ft					
		25				

GENERAL NOTES

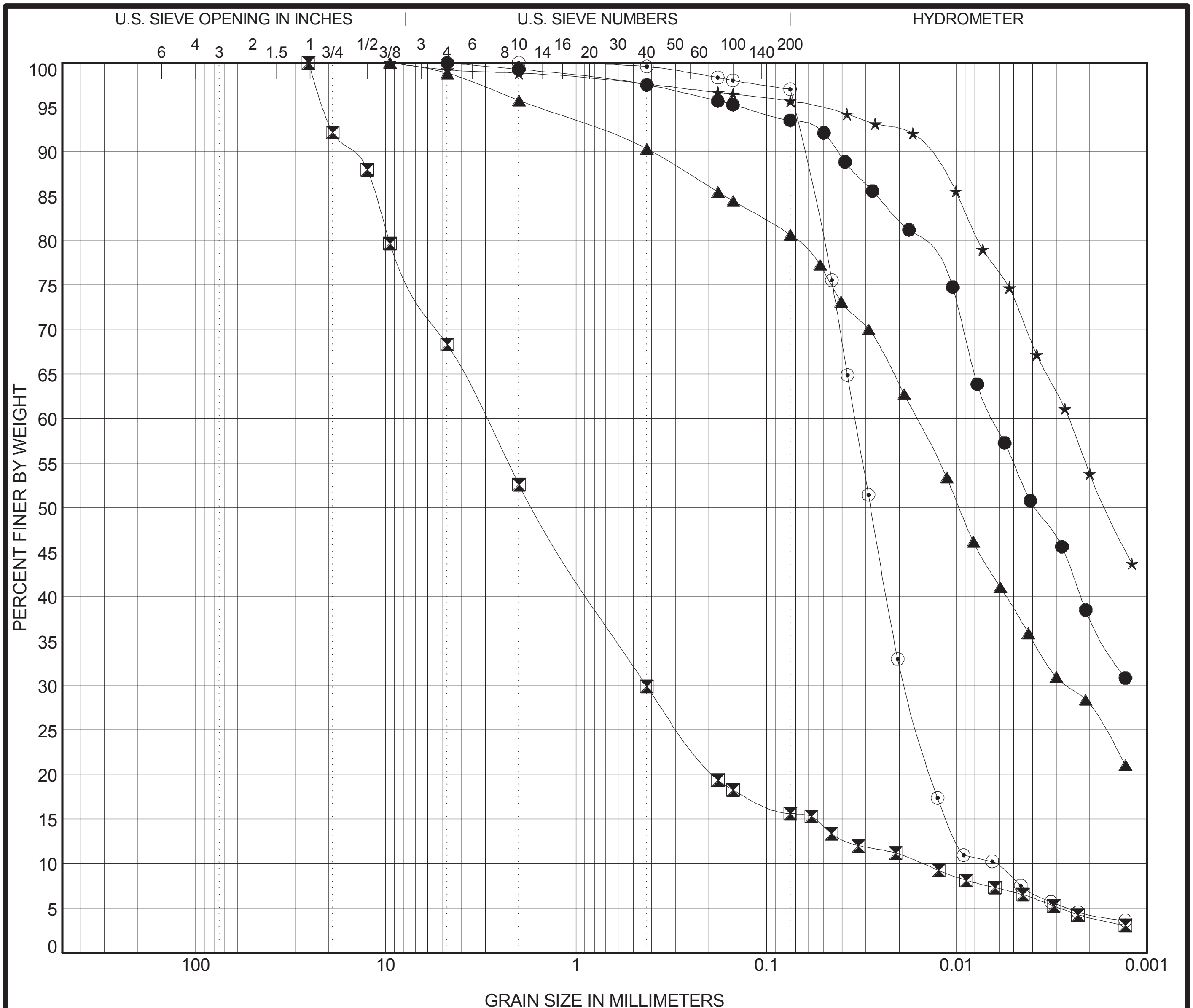
Begin Drilling **09-23-2014** Complete Drilling **09-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 ATV**
Driller **K&K** Logger **S. Woods** Checked by **B. Wilson**
Drilling Method **3.25" HSA; Boring backfilled upon completion**

WATER LEVEL DATA

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

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

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification	LL	PL	PI	Cc	Cu
●	BSB2-01#6	13.5 ft	**Silty Clay**	34	16	18		
⧗	BSB2-01#17	53.5 ft	**Gravelly Sandy Loam**	NP	NP	NP	4.00	197.81
▲	BSB2-02#4	8.5 ft	**Silty Clay Loam**	27	14	13		
★	BSB2-03#14	38.5 ft	**Clay**	44	18	26		
⊙	BSB2-03#20	68.5 ft	**Silt**				1.61	5.44

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BSB2-01#6	13.5 ft	4.75	0.006			0.7	5.8	55.7	37.7
⧗	BSB2-01#17	53.5 ft	25.4	3	0.427	0.015	47.4	37.0	11.6	4.0
▲	BSB2-02#4	8.5 ft	9.5	0.016	0.003		4.2	15.2	52.9	27.7
★	BSB2-03#14	38.5 ft	9.5	0.003			1.2	3.2	41.8	53.8
⊙	BSB2-03#20	68.5 ft	2	0.034	0.019	0.006	0.0	3.5	92.1	4.3

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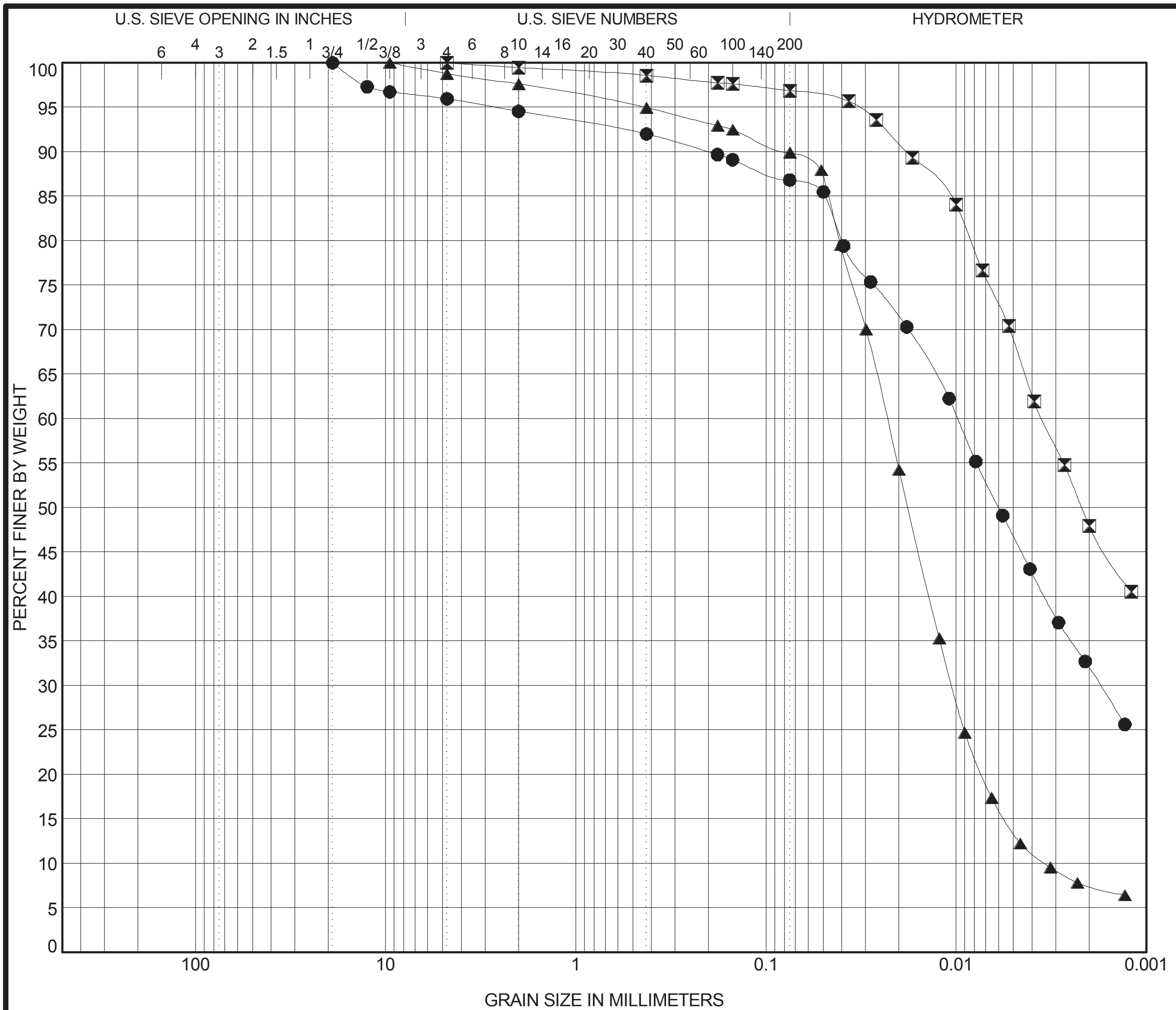
GRAIN SIZE DISTRIBUTION

Project: US 45 - Millburn Bypass

Location: Lake County, Illinois

Number: 342-08-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	**BSB3-01#3**	**6.0 ft**	**Silty Clay**	**31**	**16**	**15**		
⧗	**BSB3-02#9**	**21.0 ft**	**Clay**	**39**	**17**	**22**		
▲	**BSB3-03#2**	**3.5 ft**	**Silt**	**NP**	**NP**	**NP**	**1.40**	**6.79**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BSB3-01#3**	**6.0 ft**	**19**	**0.01**	**0.002**		**5.5**	**7.8**	**54.8**	**32.0**
⧗	**BSB3-02#9**	**21.0 ft**	**4.75**	**0.004**			**0.5**	**2.6**	**48.9**	**47.9**
▲	**BSB3-03#2**	**3.5 ft**	**9.5**	**0.023**	**0.011**	**0.003**	**2.4**	**7.8**	**82.4**	**7.5**

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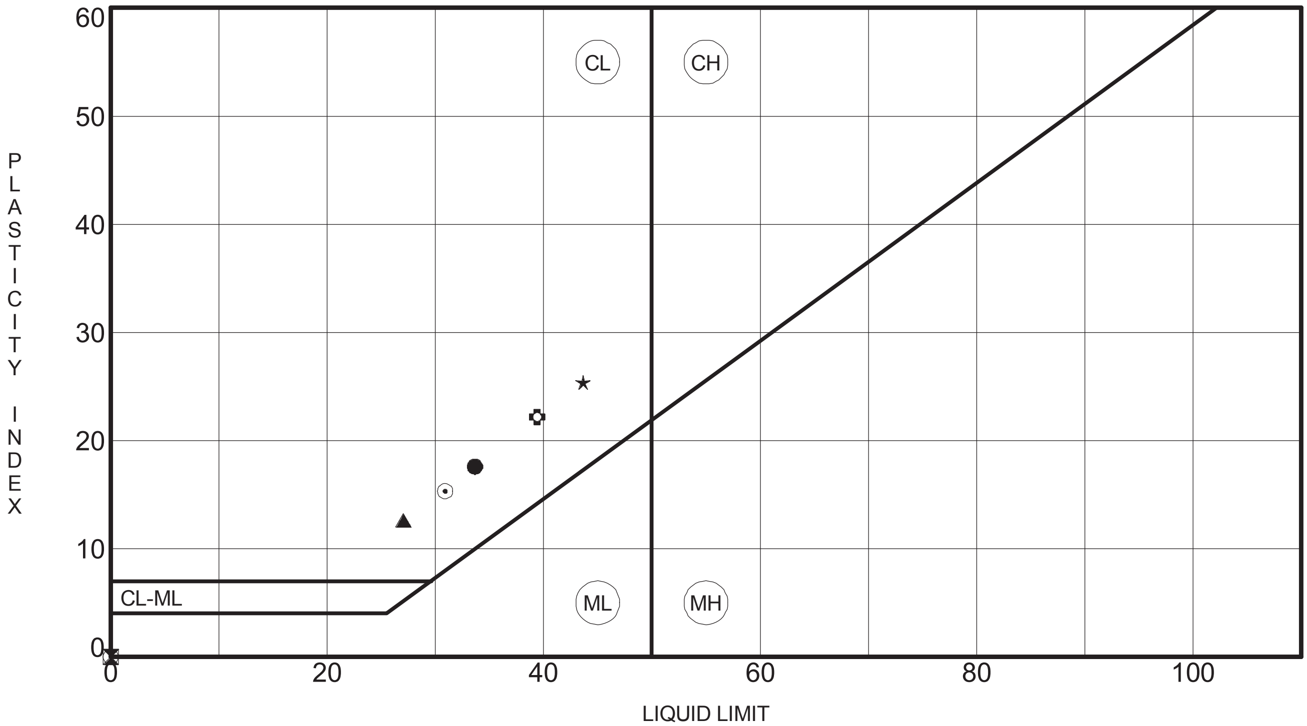
GRAIN SIZE DISTRIBUTION

Project: US 45 - Millburn Bypass

Location: Lake County, Illinois

Number: 342-08-01



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	**BSB2-01#6**	**13.5 ft**	**34**	**16**	**18**	**94**	**Silty Clay**
⧗	**BSB2-01#17**	**53.5 ft**	**NP**	**NP**	**NP**	**16**	**Gravelly Sandy Loam**
▲	**BSB2-02#4**	**8.5 ft**	**27**	**14**	**13**	**81**	**Silty Clay Loam**
★	**BSB2-03#14**	**38.5 ft**	**44**	**18**	**26**	**96**	**Clay**
⊙	**BSB3-01#3**	**6.0 ft**	**31**	**16**	**15**	**87**	**Silty Clay**
✿	**BSB3-02#9**	**21.0 ft**	**39**	**17**	**22**	**97**	**Clay**
○	**BSB3-03#2**	**3.5 ft**	**NP**	**NP**	**NP**	**90**	**Silt**

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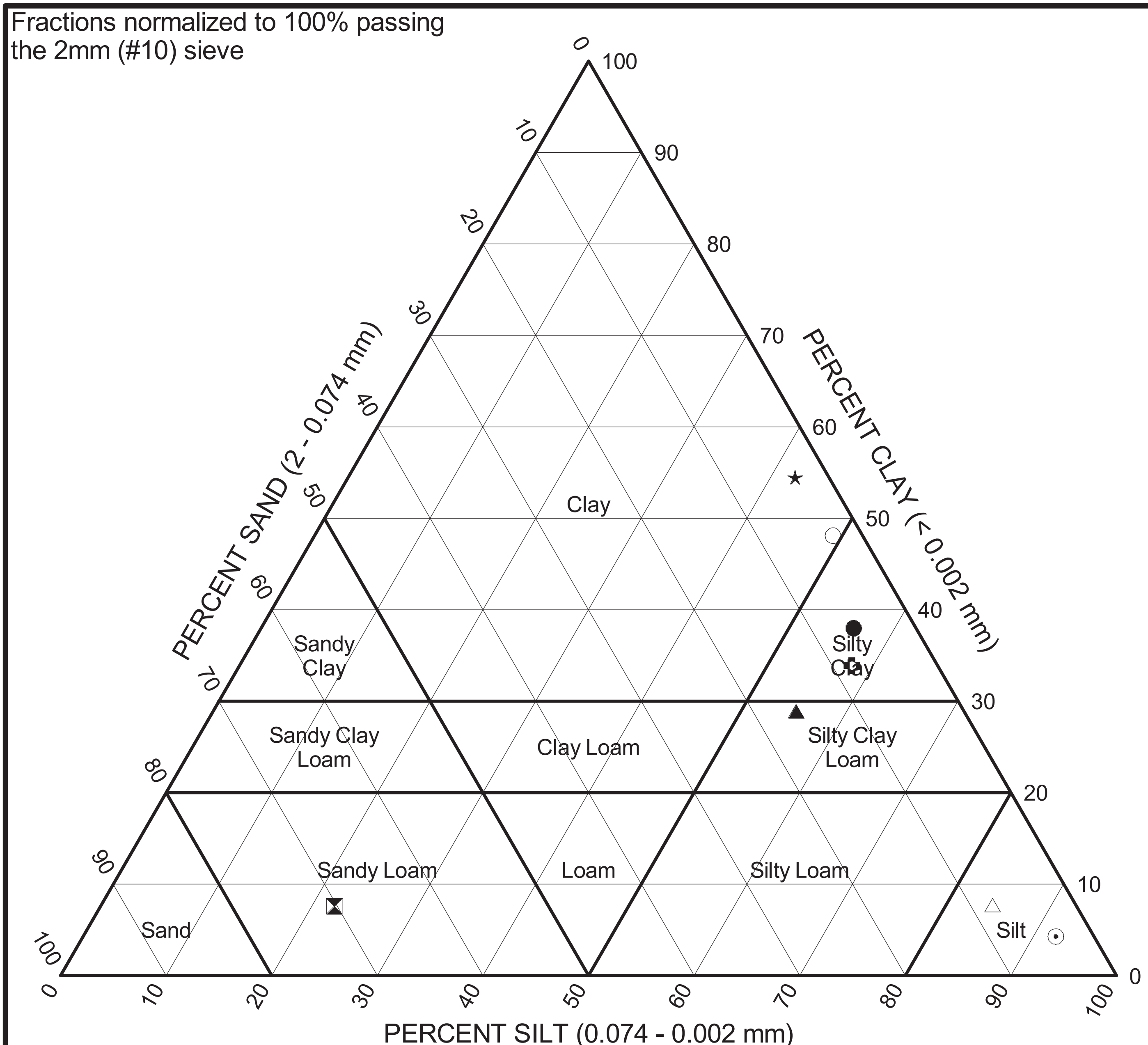
ATTERBERG LIMITS' RESULTS

Project: US 45 - Millburn Bypass

Location: Lake County, Illinois

Number: 342-08-01



	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	BSB2-01#6	13.5	5.8	56.1	38.0	Silty Clay	A-6 (16)	CL
⧗	BSB2-01#17	53.5	70.3	22.1	7.6	Gravelly Sandy Loam	A-1-b (0)	SM
▲	BSB2-02#4	8.5	15.9	55.2	28.9	Silty Clay Loam	A-6 (8)	CL
★	BSB2-03#14	38.5	3.2	42.3	54.5	Clay	A-7-6 (26)	CL
⊙	BSB2-03#20	68.5	3.5	92.1	4.3	Silt		
✿	BSB3-01#3	6.0	8.3	58.0	33.9	Silty Clay	A-6 (12)	CL
○	BSB3-02#9	21.0	2.6	49.1	48.1	Clay	A-6 (22)	CL
△	BSB3-03#2	3.5	8.0	84.4	7.7	Silt	A-4 (0)	ML

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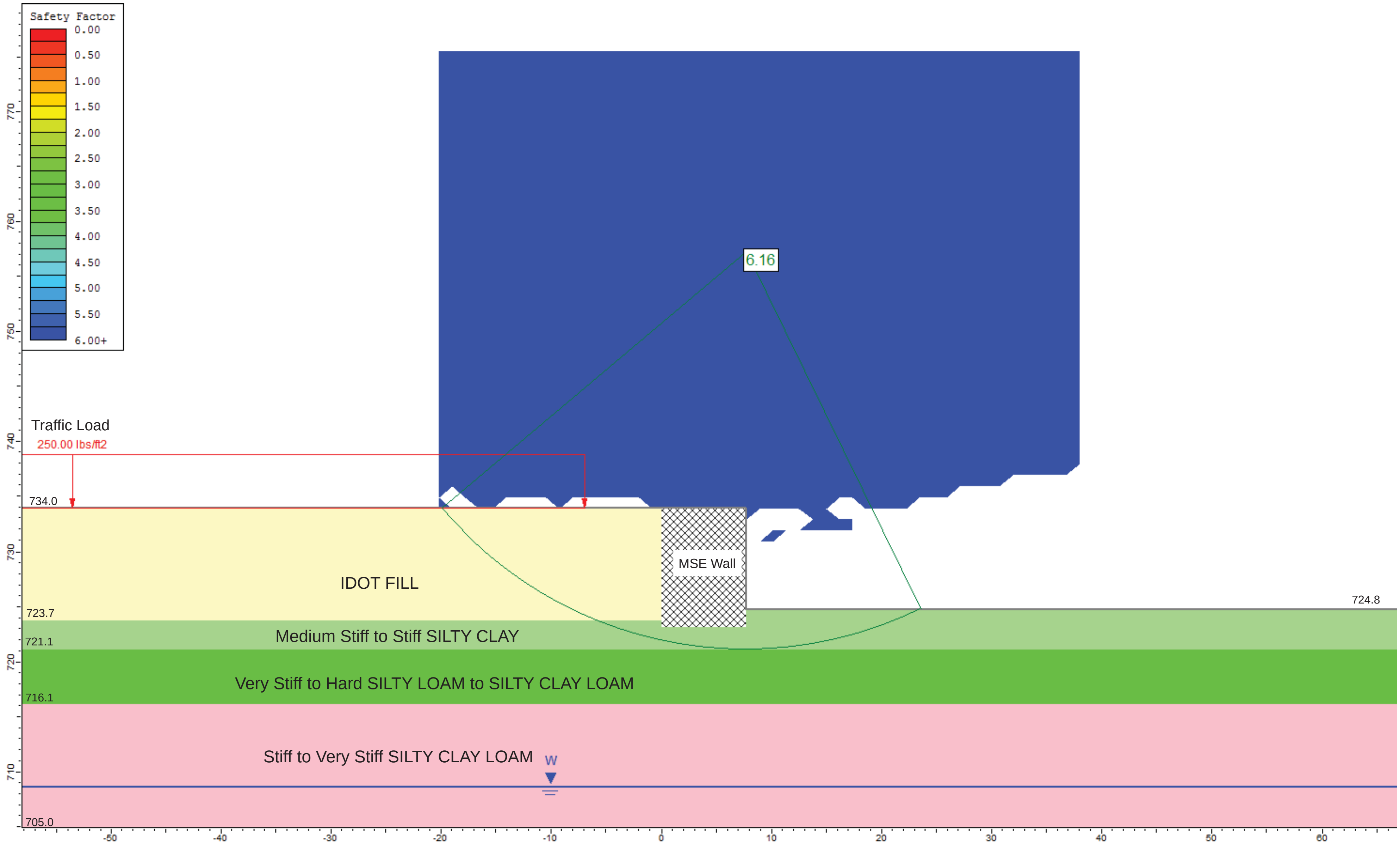
IDH Textural Classification Chart

Project: US 45 - Millburn Bypass

Location: Lake County, Illinois

Number: 342-08-01

APPENDIX C



Undrained Analysis for West MSE Wall at Station 134+68.75, Reference Boring BSB2-01

Layer ID	Soil Type	Unit Weight (pcf)	Undrained Parameter	
			C_u (psf)	ϕ (deg.)
1	IDOT FILL	125	1000	0
2	Medium Stiff to Stiff SILTY CLAY	120	1500	0
3	Very Stiff to Hard SILTY LOAM to SILTY CLAY LOAM	120	3000	0
4	Stiff to Very Stiff SILTY CLAY	120	2000	0

GLOBAL STABILITY ANALYSIS: US ROUTE 45 BYPASS OVER TRIBUTARIES TO MILLBURN CREEK, WEST RETAINING WALL, LAKE COUNTY, ILL INOIS

SCALE: GRAPHICAL

APPENDIX C-1

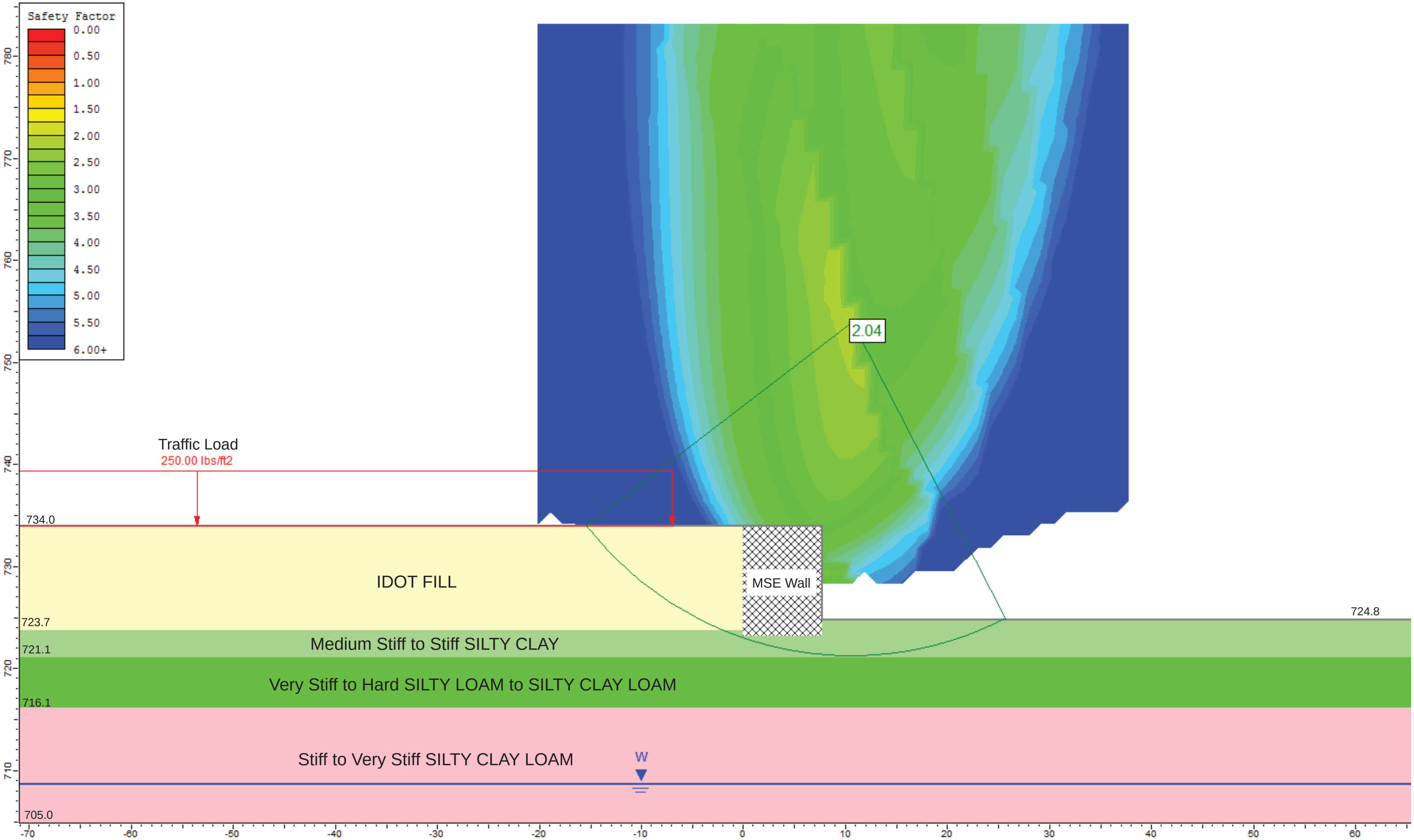
DRAWN BY: H. Bista
CHECKED BY:N. Balakumaran

Wang Engineering

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

FOR PARSONS TRANSPORTATION GROP, INC.

342-08-01



Drained Analysis for West MSE Wall at Station 134+68.75, Reference Boring BSB2-01

Layer ID	Soil Type	Unit Weight	Drained Parameter	
		(pcf)	C' (psf)	ϕ' (deg.)
1	IDOT FILL	125	100	30
2	Medium Stiff to Stiff SILTY CLAY	120	0	28
3	Very Stiff to Hard SILTY LOAM to SILTY CLAY LOAM	120	100	30
4	Stiff to Very Stiff SILTY CLAY	120	100	30

GLOBAL STABILITY ANALYSIS: US ROUTE 45 BYPASS OVER TRIBUTARIES TO MILLBURN CREEK, WEST RETAINING WALL, LAKE COUNTY, ILL INOIS

SCALE: GRAPHICAL

APPENDIX C-2

DRAWN BY: H. Bista
CHECKED BY:N. Balakumaran

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FOR PARSONS TRANSPORTATION GROP, INC.

342-08-01

Wang Engineering

APPENDIX D

Benchmark: LAK45 1A
Station is located 2.8 mi North of Lindenhurst, 1.9 mi Northwest Old Mill Creek in Section 24, T46N, R10E. To reach from the junction of US Rt 45 and IL Rt 173 proceed south on US Rt 45 for 1.10 mi to the station located 53.5 ft east of the centerline of US Rt 45. Station is located 0.1 mi north of Miller Rd. 369.1 ft southeast of end of guardrail, 123.9 ft north of power pole (PP), 119.4 ft south of PP, 111.7 ft east of PP, and 2 ft west of orange fiberglass witness post. Note - Access to datum point is 0.50 ft below cap. PK nails were set in wood physical ties. Elevation: 759.13

Existing Structure: None

HIGHWAY CLASSIFICATION

F.A.P. Route 344, US Route 45
Functional Class: Other Principal Arterial
ADT: 16000 (2009) 34000 (2040)
ADTT : 2890 (2040)
DHV: 3400 (2040)
Design Speed: 50 mph
Posted Speed 45 mph
2-Way Traffic
Directional Distribution; NB:44 : SB:56

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 STRESSES

FIELD UNITS

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

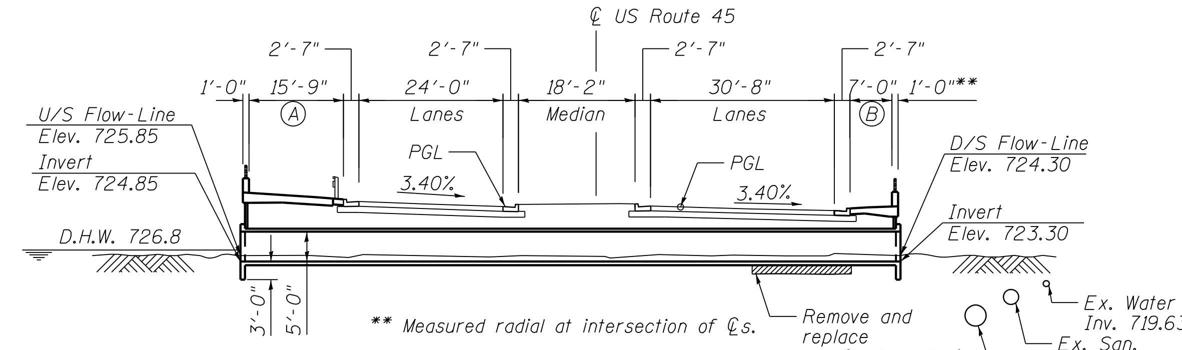
PRECAST UNITS

f'c = 4,500 psi (Precast Panels)

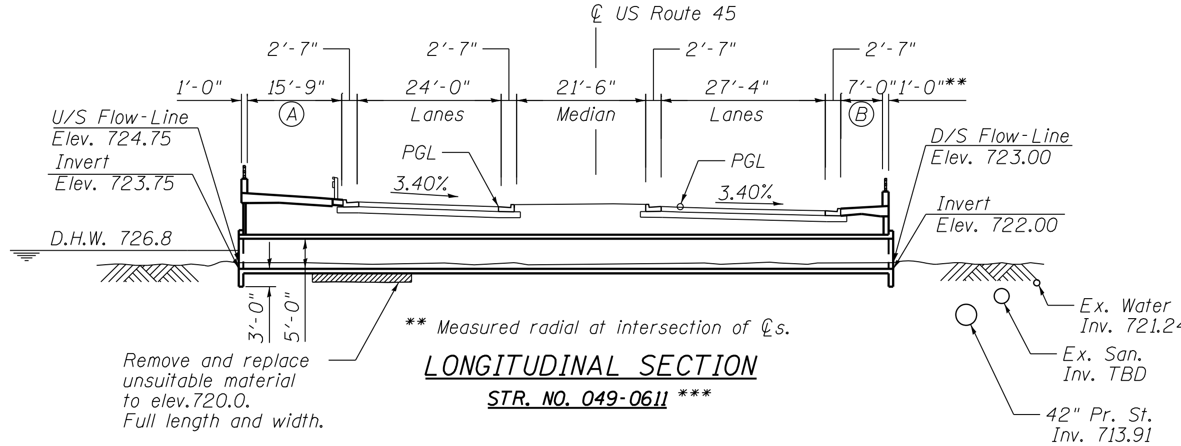
TABLE OF ELEVATIONS

PT.	STA.	ELEV.
A	134+66.23	732.32
B	134+75.43	732.37
C	135+18.23	732.52
D	134+71.23	732.35
E	134+80.28	732.39
F	135+20.53	732.52

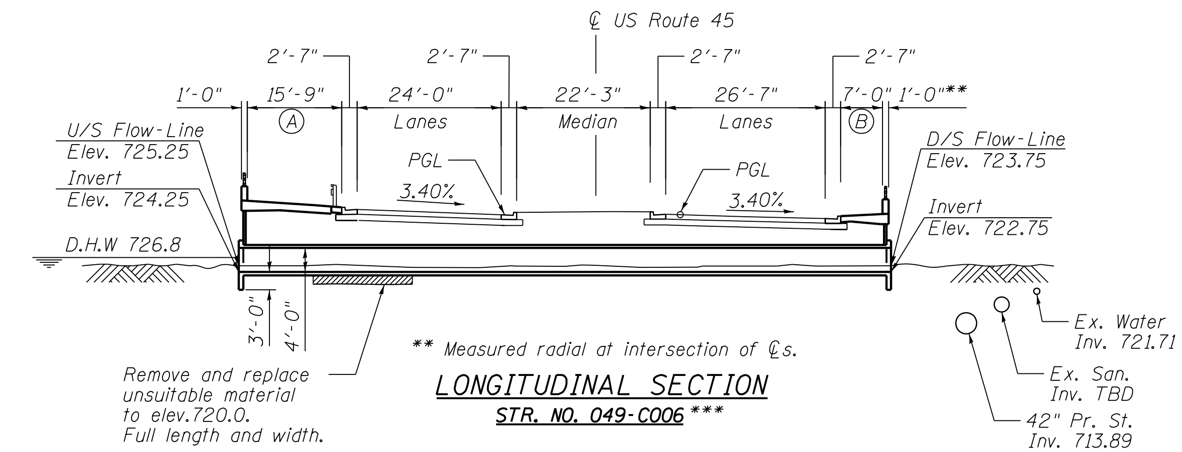
Ⓐ - 14'-0" Anchorage & sidewalk slab @ 2% and 1'-9" parkway @ 4% with bicycle railing
Ⓑ - 7'-0" Anchorage slab @ 2%



LONGITUDINAL SECTION
STR. NO. 049-C007 ***

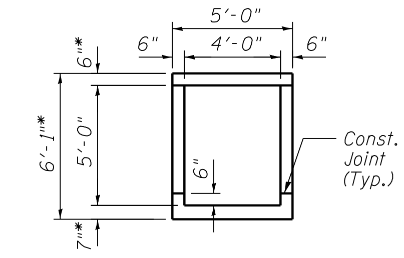


LONGITUDINAL SECTION
STR. NO. 049-0611 ***

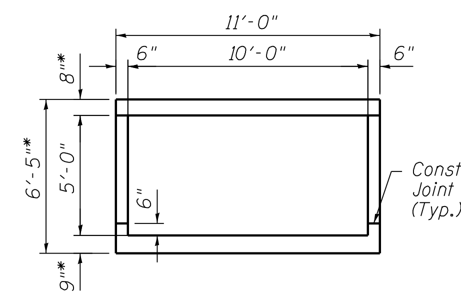


LONGITUDINAL SECTION
STR. NO. 049-C006 ***

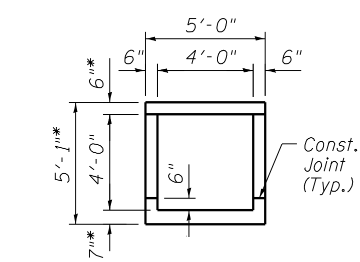
*** Single cell culverts are shown for information only.



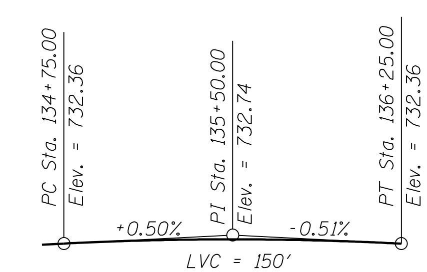
SECTION THRU BARREL
STR. NO. 049-C007 ***
* Slab Thickness may be refined during final design.



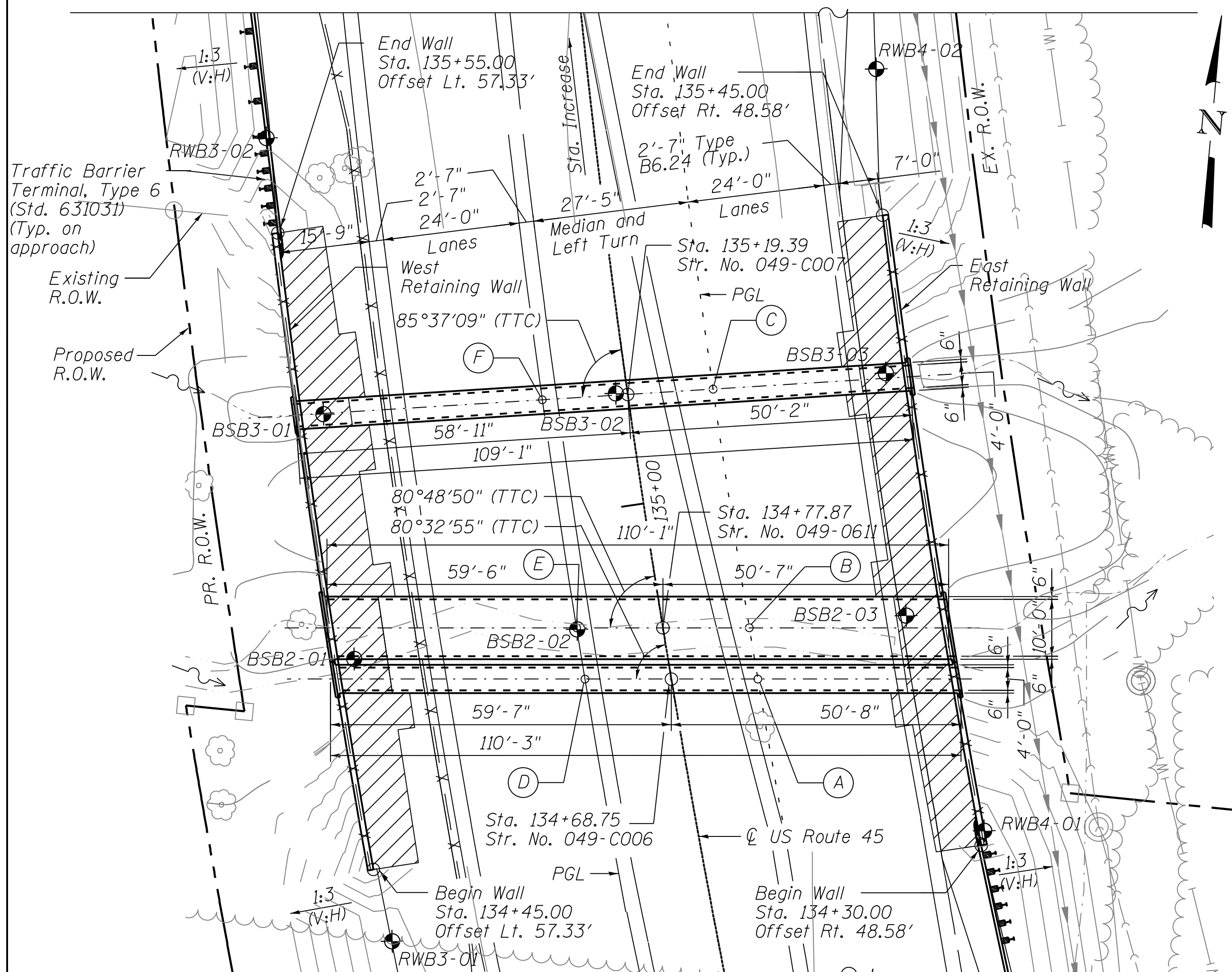
SECTION THRU BARREL
STR. NO. 049-0611 ***
* Slab Thickness may be refined during final design.



SECTION THRU BARREL
STR. NO. 049-C006 ***
* Slab Thickness may be refined during final design.



PROFILE GRADE
(Along Inside Edge of Thru Lanes)



Note: Wall offsets are measured from ℄ US Rte 45 to inside face of concrete parapet.

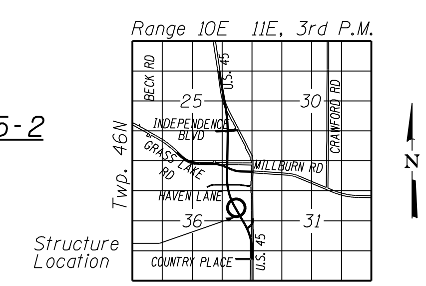
PLAN

LEGEND

TTC	To Tangent on Curve
	Prop. St. Sewer
	Exist. San. Sewer
W	Exist. Water
	Exist. Creek
x x x	Bicycle Railing

CURVE DATA
US RTE 45 - PR 45-2

P.I. Sta. 134+63.95
Δ = 30° 52' 52" (RT)
D = 2° 54' 39"
R = 1968.40'
T = 543.69'
L = 1060.92'
E = 73.71'
P.C. Sta. 129+20.26
P.T. Sta. 139+81.18



LOCATION SKETCH

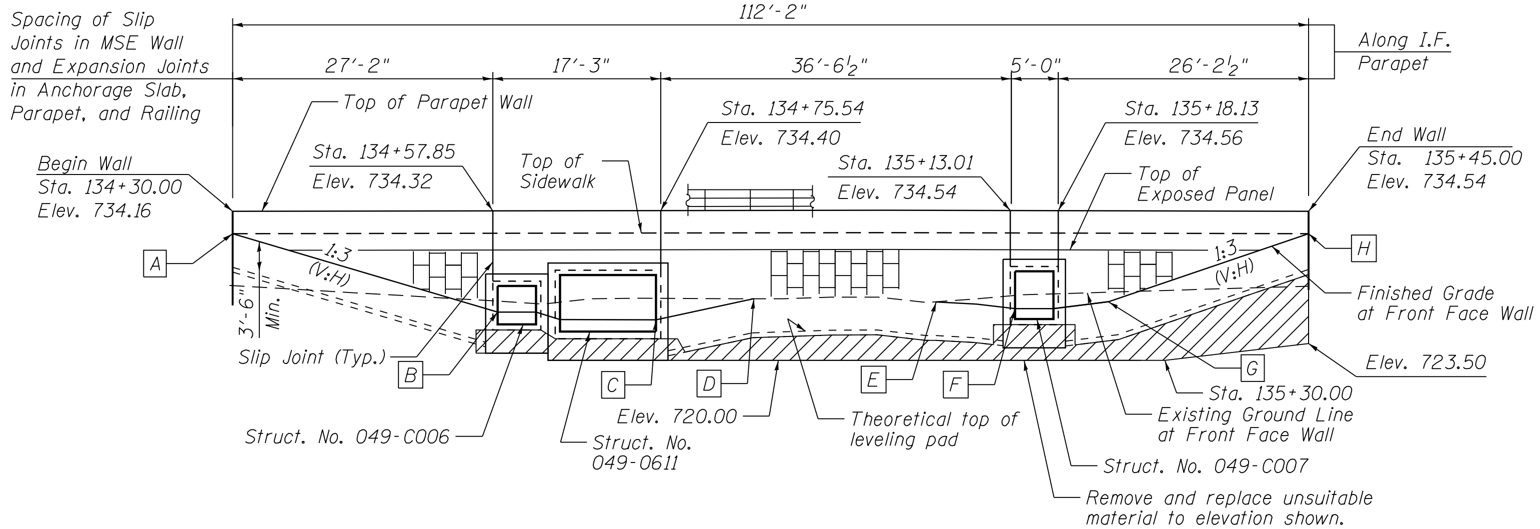
GENERAL PLAN
US RTE 45 OVER TRIBUTARY TO MILLBURN CREEK
F.A.P. RTE 344 - SEC 39 R
LAKE COUNTY
STATION 135+00
STRUCTURE NO. 049-C006, 049-0611 AND 049-C007
(FOR DISTRICT'S INFORMATION ONLY)

FILE NAME =	USER NAME =	DESIGNED - J.W.	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
PARSONS		CHECKED - T.C.U.	REVISED -	
	PLOT SCALE =	DRAWN - S.R.	REVISED -	
	PLOT DATE =	CHECKED - J.W.	REVISED -	

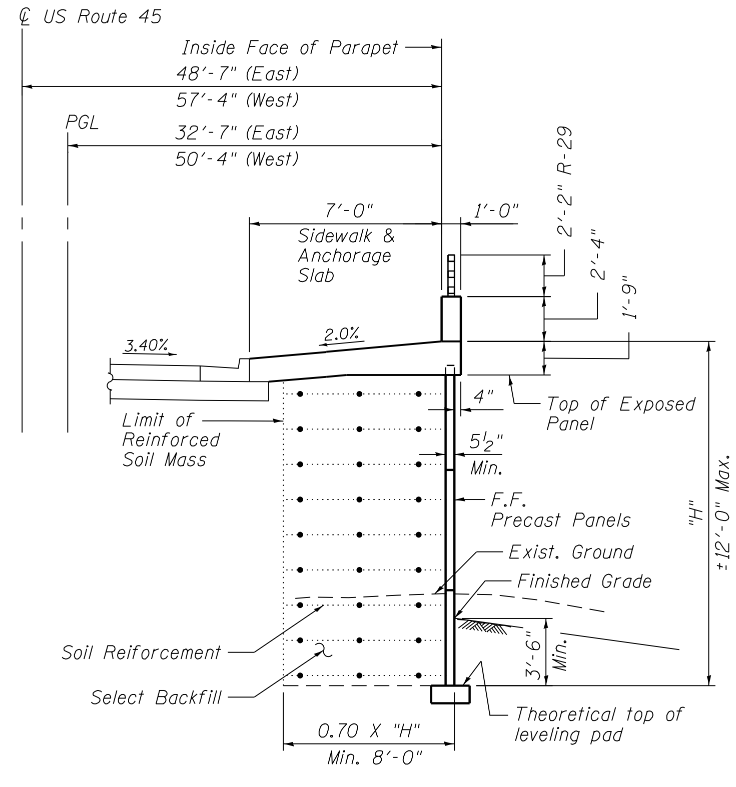
SHEET NO. 256 OF STOTAL SHEETS 430

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
344	39 R	LAKE	430	256
		CONTRACT NO. 60T75		
		ILLINOIS FED. AID PROJECT		

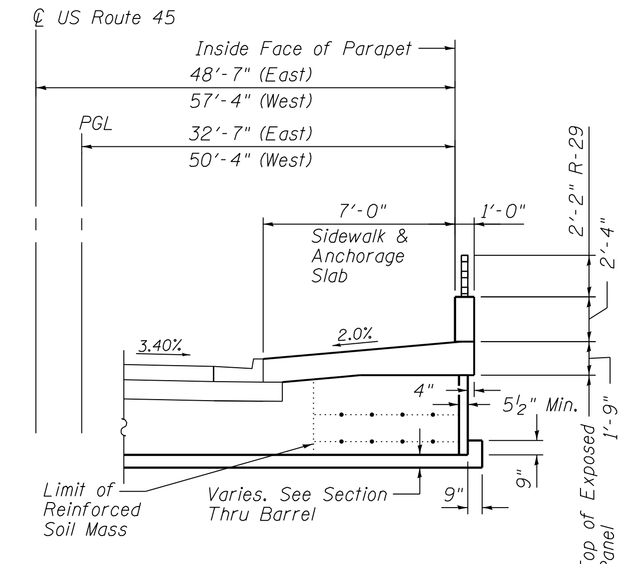
11/4/2015 8:38:26 AM p002694C pw:\\txplo02pwint01.parsons.com:Illinois State\Documents\US45 - 647965\40 - Design\CAD\Bridge\TSL\Sheets\US 45_647965_TS&L_3.dgn



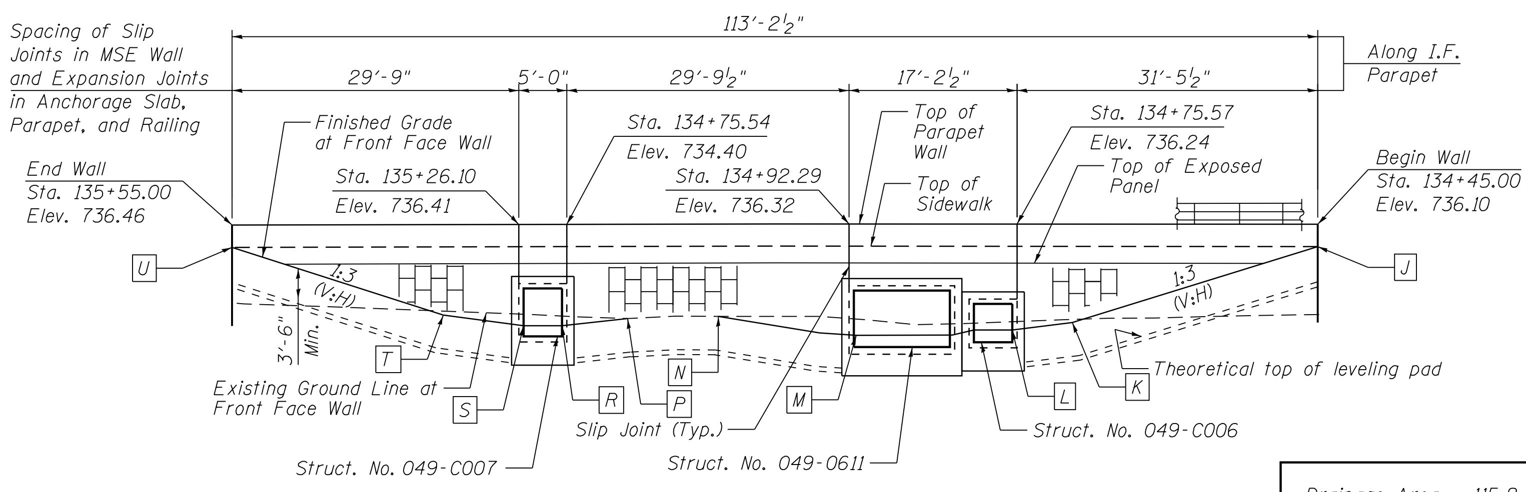
EAST WALL ELEVATION
(Looking West)



TYPICAL WALL SECTION
East wall shown.
West wall similar except as noted in Longitudinal Section.



TYPICAL WALL SECTION AT CULVERT BARREL
East wall shown.
West wall similar except as noted in Longitudinal Section.



WEST WALL ELEVATION
(Looking East)

WATERWAY INFORMATION

Drainage Area = 115.2 acres

Existing Low Grade Elev. = N/A @ Sta. N/A
Proposed Low Grade Elev. = N/A. @ Sta. N/A

Flood	Freq. Yr.		Discharge (cfs) Exist.	Discharge (cfs) Prop.	Water Opening (sq. ft.) Exist.	Water Opening (sq. ft.) Prop.	Natural H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	2	Main Channel	4	4		13			0.1		726.1
		Relief Structure	0	0		4					
		TOTAL	4	4	N/A	17	726.0	N/A	0.1	N/A	726.1
	10	Main Channel		14		19			0.1		726.7
		Relief Structure		1		8			0.1		726.7
		TOTAL	15	15	N/A	27	726.6	N/A	0.1	N/A	726.7
Design	50	Main Channel		35		21			0.1		726.9
		Relief Structure		6		10			0.1		726.9
		TOTAL	41	41	N/A	31	726.8	N/A	0.1	N/A	726.9
Base	100	Main Channel		46		22			0.1		727.0
		Relief Structure		11		11			0.1		727.0
		TOTAL	57	57	N/A	33	726.9	N/A	0.1	N/A	727.0
Over Topping	N/A	Main Channel									
		Relief Structure									
		TOTAL									
Max. Calc.	500	Main Channel		82		25			0.1		727.3
		Relief Structure		31		13			0.1		727.3
		TOTAL	113	113	N/A	38	727.2	N/A	0.1	N/A	727.3

Main channel denotes 10x5 Structure.
Relief Structure denotes 4x4 and 4x5 Structures.

TABLE OF CONTROL POINTS

POINT	STA. ℄ US ROUTE 45	ELEVATION	POINT	STA. ℄ US ROUTE 45	ELEVATION
A	134+30.00	731.83	J	134+45.00	733.83
B	134+57.62	723.75	K	134+63.08	726.00
C	134+73.64	723.75	L	134+69.33	725.25
D	134+84.32	725.93	M	134+85.58	724.75
E	135+03.34	724.99	N	134+99.94	726.71
F	135+11.56	724.30	P	135+09.40	726.60
G	135+21.14	725.00	R	135+16.21	725.85
H	135+45.00	732.21	S	135+20.21	725.85
			T	135+28.60	727.00
			U	135+55.00	734.13

NOTES:

1. Coordinate sequence of east wall construction with installation of 42" storm sewer.

DETAILS
US RTE 45 OVER TRIBUTARY TO MILLBURN CREEK
F.A.P. RTE 344 - SEC 39 R
LAKE COUNTY
STATION 135+00
STRUCTURE NO. 049-C006, 049-0611 AND 049-C007
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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 257 OF STOTAL SHEETS 430

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
344	39 R	LAKE	430	257

CONTRACT NO. 60T75
ILLINOIS FED. AID PROJECT