STRUCTURE GEOTECHNICAL REPORT
MULTI-USE PATH BRIDGE & RAMP
IDOT SN: 045-3164
NEW STEARNS ROAD CONTRACT 4
KANE COUNTY PROJECT P-91-051-07
KANE COUNTY, ILLINOIS

For:

Baker Engineering, Inc.

801 W. Adams Street

Chicago, IL 60607

(312) 707-8770

Submitted By:

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

(630) 953-9928

September 11, 2008

Wang Engineering

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September 11, 2008

Mr. Dave Pellizzari, P.E.
Project Manager
Baker Engineering, Inc.
801 W. Adams Street
Chicago, IL 60607

Attention: Mr. Kenton Zinn, S.E.
Structure Engineer

Ref: Multi-Use Path Bridge and Ramp
IDOT SN 045-3164
Kane County, Illinois
WEI No. 707-11-01

Dear Mr. Pellizzari:

Wang Engineering, Inc. is pleased to present the Structure Geotechnical Report (SGR) for the referenced project. This report presents the results of our subsurface investigation, laboratory testing, and geotechnical evaluation and recommendations for the proposed Multi-Use Path Bridge and Ramp.

Four copies of the report are provided. This report incorporates comments made by you on our draft report.

It has been a pleasure being of service to Baker Engineering, Inc. If you have any questions please call us at 630-953-9928.

Sincerely,

WANG ENGINEERING, INC.

Corina Farez, P.E., P.G.
Vice President

Mohammed (Mike) Kothawala, P.E.
Project Manager

Illinois Department of Transportation

Structure Geotechnical Report Responsibility Checklist

Structure Number: 045-3164 (prop.) None (exist.) Contract Number: _____ Date: 9/11/2008

Route: FAP 361 New Stearns Road Section: 06-00214-20-BR County: Kane

TSL plans by: Baker Engineering, Inc. 801 W Adams Street, Chicago, IL 60607

Structure Geotechnical Report and Checklist by: Wang Engineering, Inc., 1145 N. Main St; Lombard, Illinois 60148

IDOT Structure Geotechnical Report Approval Responsibility :
☐ Qualified District Geotechnical Personnel
☒ BBS Central Geotechnical Unit

	Yes	No	N/A
Geotechnical Data, Subsurface Exploration and Testing			
All pertinent existing boring data, pile driving data, site inspection information included in the report?	☐	☒	☐
Are the preliminary substructure locations, foundation needs, and project scope discussions between Geotechnical Engineer and Structure Planner included in the report?	☒	☐	☐
All ground and surface water elevations shown on all soil borings and discussed in the report?	☒	☐	☐
Has all existing and new exploration and test data been presented on a subsurface data profile?	☒	☐	☐
Is the exploration and testing in accordance with the IDOT Geotechnical Manual policy?	☒	☐	☐
Are the number, locations, depths, sampling, testing, and subsurface data adequate for design?	☒	☐	☐
Geotechnical Evaluations			
Have structure or embankment settlement amounts and times been discussed in report?	☒	☐	☐
Does the report provide recommendations/treatments to address settlement concerns?	☒	☐	☐
Has the critical factor of safety against slope instability been identified and discussed in the report?	☒	☐	☐
Does the report provide recommendations/treatments to address stability concerns?	☒	☐	☐
Is the seismic design data (PGA, amplification, category, etc.) noted in the report?	☒	☐	☐
Have the vertical and horizontal limits of any liquefiable layers been identified and discussed?	☒	☐	☐
Has seismic stability been discussed and have any slope deformation estimates been provided?	☐	☐	☒
Has the report discussed the proximity of ISGS mapped mines or known subsidence events?	☒	☐	☐
Has scour been discussed, any Hydraulics Report depths reported & soil type reductions made?	☒	☐	☐
Do the Factors of Safety meet AASHTO and IDOT policy requirements?	☒	☐	☐
Geotechnical Analyses and Design Recommendations			
When spread footings are recommended, has a bearing capacity and footing elevation been provided for each substructure or footing region?	☐	☐	☒
Has footing sliding capacity been discussed?	☐	☐	☒
When piles are recommended, does the report include a table indicating estimated pile lengths vs. a range of feasible required bearings and design capacities for each pile type recommended?	☒	☐	☐
Have any downdrag, scour, and liquefaction reductions in pile capacity been addressed?	☒	☐	☐
Will piles have sufficient embedment to achieve fixity and lateral capacity?	☒	☐	☐
Have the diameters & elevations of any pile pre-coring been specified (when recommended)?	☒	☐	☐
Has the need for test piles been discussed and the locations specified (when recommended)?	☒	☐	☐
Has the need for metal shoes been discussed and specified (when recommended)?	☒	☐	☐
When drilled shafts are recommended, have side friction and/or end-bearing values been provided?	☒	☐	☐
Has the feasibility of using belled shafts been discussed when terminating above rock, or have estimated top of rock elevations been provided when extending into rock?	☐	☐	☒
Have shaft fixity, lateral capacity, and min. embedment been discussed?	☒	☐	☐
When retaining walls are required, has feasibility and relative costs for various wall types been discussed?	☐	☐	☒
Have lateral earth pressures and backfill drainage recommendations been discussed?	☒	☐	☐
Has ground modification been discussed as a way to use a less expensive foundation or address feasibility concerns?	☐	☐	☒
Have any deviations from IDOT Geotechnical Manual or Bridge Manual policy been recommended?	☐	☒	☐
Construction Considerations			
Has the need for cofferdams, seal coat, or underwater structure excavation protection been discussed?	☒	☐	☐
Has stability of temporary construction slopes vs. the need for temporary walls been discussed?	☐	☐	☒
Has the feasibility of cantilevered sheeting vs. a temporary soil retention system been discussed?	☐	☐	☒
Has the feasibility of using a geotextile wall vs. a temp. MSE for any temp fill retention been noted?	☐	☐	☒

"In order to aid in determining the level of departmental review, please attach additional documentation or reference specific portions of the SGR to clarify any checklist responses that reflect deviation from IDOT policy/practice."

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STRUCTURE GEOTECHNICAL REPORT

MULTI-USE PATH BRIDGE AND RAMP
NEW STEARNS ROAD CONTRACT 4

IDOT STRUCTURE NUMBER 045-3164
KANE COUNTY PROJECT NO. P-91-051-07

FOR

BAKER ENGINEERING, INC.

1.0 INTRODUCTION

This report presents the results of subsurface investigation, laboratory testing, and geotechnical evaluation for the proposed Multi-Use Path (MUP) Bridge and Ramp structures. MUP Bridge will be along the Fox River Bridge and the ramp will be located along the Fox River on the west side of the Fox River Bridge. The project site is located in Kane County, Illinois. The *Project and Site Location Maps* are presented as Exhibits 1 and 2.

2.0 PROJECT DESCRIPTION

The Stearns Road Corridor will include a new Fox River Bridge and a 4.6 mile new road alignment that extends from approximately the Kane/DuPage County line to Randall Road. The corridor is broken down into 6 stages. The proposed typical cross section of new Stearns Road consists of two 12-foot wide lanes in each direction separated by an 8- to 32-foot wide median with curb and gutter. Signalized intersection improvements will be provided at Randall Road/McDonald Road (the western terminus), McLean Boulevard, Illinois Route 25, Gilbert Street, and Dunham Road. The proposed roadway continues east of the intersection to join the four lane section of Stearns Road completed by DuPage County.

Wang Engineering Inc. (WEI) was selected to provide geotechnical engineering services for the stage 4. The stage 4 scope of work includes construction of the new Stearns Road corridor from east of McLean Boulevard to Illinois Route 25 including a new structure over the Fox River. A new Multi-Use Path (MUP) Bridge will also be constructed adjacent to the Fox River Bridge. This stage also includes a new Stearns Road/IL Route 25 intersection that includes widening of IL Route 25, culvert under new Stearns Road and detention basins.

In addition to this Structure Geotechnical Report, a Roadway Geotechnical Report has been prepared by WEI for the following items:

1. New Stearns Road from east of McLean Boulevard (Station 511+20) to west abutment of the Fox River Bridge (Station 566+50).
2. Culvert at Station 325+75.
3. Five detention basins along new Stearns Road
4. IL Route 25 widening from Station 22+30 to Station 37+80.
5. Pavement coring at IL Route 25.

Furthermore a separate Structure Geotechnical Report has been prepared by WEI for the Fox River Bridge and the Retaining Wall No. 1 located on the northeast side of the west abutment of the Fox River Bridge.

3.0 EXISTING AND PROPOSED STRCUTURES

This is a new structure. There is a concrete pathway on grade along the river where MUP Ramp will be constructed. The proposed MUP bridge structures will be a 4-span steel plate girder structure with cast-in-place concrete deck. The bridge and ramp will be 12'-0" wide. Three MUP bridge piers will be part of the Fox River Bridge piers. Both MUP abutments are expansion type and separate from the Fox River Bridge abutments. The abutments will be stubtype abutments. The substructure locations are shown in Exhibit 4, Boring Location Plan.

The preliminary estimated LRFD loads have been provided by Baker Engineering, Inc. (Baker) at the substructures, and are presented below.

Substructure	Factored Strength Limit State, Loads (kips)		Service Limit State (Unfactored) Loads (kips)	
	DL	LL	DL	LL
MUP Bridge East Abutment	144	34	115	19
MUP Bridge West Abutment	125	65	100	37
MUP Ramp North & South Abutments	90	32	72	18
MUP Ramp Piers	140	56	112	32

4.0 PURPOSE AND SCOPE

The purpose of our geotechnical work was to investigate and evaluate the subsurface soil and groundwater conditions within this project area that would form a basis for foundation and earthwork design recommendations. Specifically, the scope of the work was as follows:

- To investigate by means of exploratory borings, the subsurface soils and ground water level conditions at the site to depths that will be influenced by the proposed construction;
- To evaluate the physical properties of the soils underlying the site that will influence foundation design and construction;
- To perform analyses and provide recommendations and data for the design and installation of foundations, including the suitable foundation type or types, bearing capacity, the elevation or elevations at which the foundations should be established, and the estimated foundation settlement;
- To provide recommendations relative to construction operations and special design precaution that may be required; and
- To provide a report summarizing the results of our studies, conclusions, and recommendations.

5.0 GEOLOGIC SETTING

The project is located in the eastern part of Kane County. On the USGS "Geneva" quadrangle map, the project spans mainly sections 2 and 3 of Tier 40 North Range 8 East. The following review of published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, intends to place the project area within a geological framework and to confirm the dependability and consistency of our investigation results. Exhibit 3 illustrates the *Site and Regional Geology.*

5.1 Bedrock Geology

The uppermost bedrock unit in Kane County consists of Silurian-age dolostones that rest on top of Ordovician-age shale and dolostone of the Maquoketa Group. The bedrock strata dip gently toward southeast (Curry et al., 1999; Dey et al., 2007).

The bedrock crops out along the Fox River just south of the McLean Boulevard and IL Route 31 intersection. At the project site, the proglacial St. Charles Bedrock Valley shapes the bedrock topography: The valley is oriented NNE to SSW and has a relief of about 100 feet. The McLean Boulevard and IL Route 31 intersection is located above the western bank of the bedrock valley, whereas the proposed Fox River Bridge lies above the valley's axis where the top of bedrock elevation measures 575 to 550 feet. The valley fill includes up to 100 feet of glacial outwash and till (Dey et al., 2007; Grimley and Curry, 2002).

5.2 Surficial Geology

Glacial and postglacial deposits overlie the bedrock surface. Near the project area, the glacial deposits include diamictons of the Yorkville Member of the Lemont Formation and sand and gravel of the Henry Formation (Hansel and Johnson, 1996). Postglacial deposits are made up of sand and silt alluvium deposited by the Fox River (Cahokia Formation) and peat and muck accumulated in marshy depressions (Grayslake Peat).

The Yorkville Member consists of low moisture content, high blow counts, low compressibility silty to silty clay loam diamicton (Bauer et al., 1991). It occurs at the east end of the project area and its thickness may range between 0 and 50 feet. The Yorkville Member rests over the Yorkville member deposit and it is overlain by medium dense to dense sand and gravel of the Henry Formation, which makes up most of the subgrade in the project area. The Henry Formation deposit may be as thick as 75 feet. Older diamictons may underline both the Yorkville Member and the Henry Formation (Grimley and Curry, 2002).

Less than 20-foot thick Cahokia Alluvium (sand, silt, and clay) occurs in the project area, mostly east of the Fox River. A prominent deposit of peat, muck, organic silt and clay associated with the Grayslake Peat occur within a fen area just west of McLean Boulevard (Grimley and Curry, 2002).

Our and previous subsurface investigations result fit into the local geologic context. The investigation revealed the lithological profile includes mostly outwash sand and gravel and clayey to silty diamictons. None of the borings drilled near the proposed MUP Bridge and ramp locations reached the top of the bedrock.

5.3 Mining Activity

Areas of disturbed ground with spoil piles or removed earth in gravel pits, dolostone quarries, and landfills are present within or near the project area. Fox River Quarry (crushed stone) is located at the west end of the project. Another area with disturbed ground, probably associated with the Elgin-Wayne Landfill, is located at the east end of the project area. We assume there were no past coal mining activities at the proposed structure locations since the Kane County is not identified as coal producing area by Illinois State Geological Survey (ISGS, 2000).

5.4 Seismic Activity

The 2002 US Geological Survey National Seismic Hazard Map (USGS, 2002) indicates for the Kane County area a peak ground acceleration of 2% of gravity, with a 10% probability of exceedance in 50 years. No active, major faults are present near the project area (Kolata, 2005).

6.0 METHODS OF INVESTIGATION

6.1 Subsurface Investigation

During the Phase I investigations, Testing Services Corporation (TSC) performed two structure borings, STFX-4 and STFX-7 to depths of 100 and 75feet below ground surface (bgs) respectively. Borings locations are shown in Exhibit 4. Boring logs are included in Appendix A.

The subsurface exploration performed by WEI consisted of four structure borings (BP-1 through and BP-4) at the proposed MUP ramp. Borings were drilled during the period of August 7 and August 13, 2008. Borings were located in the field by WEI. After completion of borings, as-drilled borings coordinates locations were surveyed by WEI. Based on WEI coordinates, Baker provided station offset and grade elevation for each boring location. A Boring Locations Plan is included as Exhibits 4A and 4B. The survey information (ground surface elevation, coordinates, stations and offset) included in the attached boring logs (Appendix A).

A truck mounted drilling rig, equipped with hollow stem augers, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206-87, "Penetration Test and Split Barrel Sampling of Soils." The soil was sampled at 2.5-foot intervals to a depth of 30 feet and at 5-foot intervals below 30 feet to termination depths. The clay soil in Borings BP-3 and BP-4 was sampled at 2.5-foot intervals between depths of 60 and 70 feet bgs. Borings were drilled few feet deeper than required by IDOT Geotechnical Manual guidelines in order to obtain necessary information for an adequate engineering analysis. Borings were drilled to depths ranging from 73.5 to 80 feet bgs.

A WEI field engineer or geologist monitored the drilling activities and maintained field boring logs. The field logs included results of Standard Penetration Test (SPT) recorded as blows per 6 inches of penetration. Theses values are shown on the boring logs as SPT values. The N value shown in Exhibit 5 is the sum of the last two SPT numbers (blows per final 12 inches). The unconfined compressive strengths of cohesive soil samples were obtained in the field using Rimac Spring Tester on the split spoon samples. The soils were described and classified according to IDH classification system.

All soil samples collected in the field were placed in sealed glass jars and transported to WEI Geotechnical Laboratory in Lombard, Illinois for further laboratory testing and examination. The field logs were finalized by an experienced geologist after verifying the field visual classifications and laboratory test results.

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

Groundwater observations were made during and at the end of drilling operations. Due to safety considerations, the land borehole was backfilled with bentonite chips mixed with soil cuttings immediately upon completion and patched with cement concrete at the surface.

6.2 Laboratory Testing

Laboratory testing program included moisture content (AASHTO T 265) on all the soil samples. Atterberg Limits tests (AASHTO T 89 & T 90) and particle-size analyses (AASHTO T 88) were performed on selected soil samples. The field visual descriptions of the samples were reviewed in the laboratory. The laboratory test results are presented on the boring logs (Appendix A) and included in Appendix B.

7.0 SUBSURFACE CONDITIONS

7.1 Subsurface Soil Conditions

Detailed descriptions of the subsurface conditions encountered in the borings are presented on the attached boring logs (Appendix A) and Subsurface Data Profile (Exhibit 5). Please note that the strata contact lines shown on logs and profiles represent approximate boundaries between soil types. The actual transition between soil types in the field may be different in horizontal and vertical directions.

The subsurface investigation uncovered a vertical sequence of soil units laterally traceable throughout Borings STFX-4, STFX-7, and BP-1 through BP-4. From top to bottom, the sequence consists of five lithological units: (1) brown and gray sand to sandy gravel; (2) brown and gray clay to clay loam; and (3) brown and gray sand to sandy gravel, (4) gray very stiff to hard silty clay and (5) gray dense to very sense sand and gravel with intermittent thin layers of clay and silty loam. Only Boring STFX-4 penetrated into the fifth unit.

Bedrock was not encountered in any of the borings. The bedrock is estimated to be at a depth of 120 feet below the river bed. This would place the bedrock immediately below the silty loam that was encountered in STFX-4. Details on the type of bedrock expected to be encountered in this area is presented in Section 5.1 Bedrock Geology of this report.

7.2 Groundwater Levels

Water levels in the river Boring STFX-4 could not be recorded since it was drilled in the river. While drilling, BP-1 through BP-4, groundwater was encountered at a depth of 6 feet bgs.

Boring STFX-7 encountered groundwater at a depth of 3.5 feet bgs. At the completion of drilling, groundwater level was found at a depth of 3 feet bgs. We expect that the groundwater levels will fluctuate seasonally and with Fox River surface water level.

7.3 Seismic Considerations

7.3.1 Seismic Data

The following seismic data is recommended for the design which should be shown on the bridge plans.

Soil Profile Type: I
(According to 2007 AASHTO LRFD Bridge Design and Specifications)
Bedrock Acceleration Coefficient (A): 0.038g
(According to the AASHTO Seismic Acceleration Coefficient Map and 2008 IDOT Bridge Design Manual)
The Site Coefficient (S): 1.0
(Based on Soil Profile Type I)
Seismic Performance Zone (SPZ): 1
(Based on the Bedrock Acceleration coefficient according to 2007 AASHTO LRFD Bridge Design and Specifications)

7.3.2 Liquefaction Potential

Liquefaction analysis at each bridge structure boring was performed using a Simplified Procedure originally developed by Seed and Idriss (1982) and revised in 1990. The minimum factors of safety range between 1.8 and 3.1 considering groundwater level at the existing grade. A design earthquake with a magnitude of 7.5 was used in the analyses. The minimum factor of safety required by IDOT is 1.0. The liquefaction of the soils at the site is unlikely to occur and therefore, there is no need for any remedial treatment of the soils or foundation.

8.0 ANALYSIS AND RECOMMENDATIONS

During the structure and foundation system studies conducted by Baker, WEI evaluated possible foundation solution that can be considered for support of the proposed bridge and ramp structures. All three MUP Bridge piers will be integral part of the Fox River Bridge piers. The recommendations for the Fox River Bridge piers are included in a separate SGR. The foundation options considered in the preliminary foundation evaluation for the MUP Bridge abutments and Ramp substructures were spread footing, driven piles and drilled shafts.

Based on the soil conditions encountered during our investigation, Baker and WEI concluded that the ramp substructures could be supported on drilled shafts and the bridge abutments on driven piles. The spread footings and pile footings for the ramp will require temporary soil retention system with groundwater control or cofferdams. The single drilled shaft eliminates the need for a cofferdam, seal coat and structure excavation. The east abutment of the MUP Bridge is proposed to be supported on the driven piles and MUP Ramp substructures on a single drilled shaft. Foundation design data and recommendations pertaining to construction are presented in subsequent sections of this report.

8.1 Foundation Recommendations

8.1.1 Bridge Abutments

The metal shell cast-in-place (MSCIP) pile driving through very dense/hard soils will be difficult and could damage the pile toe and cause deformation at the pile head. Therefore, we do not recommend MSCIP concrete piles for the west and east abutments.

The top of the dolomitic limestone bedrock is estimated at approximate Elevation 570. The pile length from the bottom of the pile cap to top of the limestone bedrock would be on the order of 120 feet. Based on the soil information from the borings, it appears that driving H-piles to top of bedrock, through very dense/very hard soils, will be very difficult and the refusal will be obtained before reaching top of the bedrock. Therefore, we do not recommend utilizing end bearing H-piles. The required driven capacity for steel H-piles installed as friction piles could be achieved with shorter lengths.

Several H-piles options for the foundations could be considered. Driven H-pile foundations could be designed for various capacities. The pile capacity will be developed in skin friction between the pile surface and the soils above the tip with some end bearing capacity at the tip.

The estimated pile lengths at each bridge abutment location for various H-pile sizes and capacities are shown in Tables 1A through 1C. The most economical pile sizes should be selected. The sections of the pile through the precored holes in the newly placed embankment were not considered in providing vertical pile load carrying capacity. Precoring is recommended to avoid downdrag load on the piles and is discussed in the subsequent section of the report. The maximum structural design capacity of the steel pile and the spacing should be as per IDOT Bridge Manual (IDOT 2006). Hard pile driving during installation might be experienced in very dense sand and gravel deposits containing potentially cobbles. Therefore, we recommend that the piles be installed with metal shoes. One test pile should be identified on the plans at each abutment which should be installed prior to production pile installation. There is no need for a full scale load test.

The soil immediately below the pile footing should not be considered as carrying any vertical load. The estimated lengths shown in the Tables 1A through 1C do not include any embedment into the pile footing. The estimated length to be shown on the bridge plans should include embedment in to the pile footing as per IDOT Bridge Manual (IDOT 2006). The base of all pile footings should be established at a minimum depth of 4 feet below the finished grade for frost protection.

8.1.2 Ramp Substructures

It is our opinion that a deep foundation scheme consisting of drilled shaft established in hard clay stratum can be utilized for the support of the ramp substructures including MUP Bridge west abutment. The geotechnical recommendations for the design of drilled shafts are presented in Table 2. All shafts should be sized in 6 inches increments with a minimum diameter of 30 inches. A permanent liner in the granular soils should be provided.

The *Factored Resistance* R_R of drilled shafts in kips can be calculated as per equation 10.8.3.5-1, page 1-131 of AASHTO LRFD Bridge Design Specifications, 4th Edition 2007 (2007 AASHTO).

The portions of the drilled shaft which should not be taken in contributing to the development of resistance through skin friction should be as specified in 2007 AASHTO. The reduction in resistance from group effects should also be evaluated as per 2007 AASHTO. The scour depth should also be considered in the drilled shaft design.

8.2 Downdrag Loads

Negligible downdrag load due to the negative skin friction will occur on piles at the east abutment when soil strata move downward relative to the piles due to compression of the foundation soils. The west abutment will not retain any embankment. We recommend that the piles be installed in precored holes in the new embankment for the east abutment.

8.3 Lateral Design Pressures

For the design of east abutment and wingwalls, we recommend linearly increasing lateral pressure of 40 and 72 pounds per square foot (psf) per foot of depth below finished grade for embankment slope of horizontal and 1V:2H respectively considering drainable backfill. When no approach slab is provided, additional lateral load from traffic should include a surcharge of 2 feet of soil considering unit weight of 120 pounds per cubic foot. The backfill and the drainage behind the abutments should be in accordance with IDOT Bridge Manual (IDOT 2006).

8.4 Resistance to Lateral Loads

Batter piles can be considered to resist the lateral loads. For such pile footing, the horizontal component of the axial load on battered piles can be taken at full value. The use of battered shaft is not recommended due to their difficulty of construction and high cost. The required lateral capacity can be obtained by increasing the number of shafts or the shaft diameter. No allowance should be made for the frictional resistance of the cap concrete on soil. Lateral resistance from the soils from the proposed grade to the design scour depth, as per IDOT Bridge Design Manual (IDOT 2006), should be ignored. The lateral load capacity analysis of the piles/drilled shafts can be performed using computer program such as COMP 624P and L-pile. The estimated soil parameters that may be used for the analysis of stresses and deflection under lateral loads are presented in the attached Table 3. The geotechnical resistance factor of 1.0 should be used. The group action should be considered in calculating total lateral load resistance of the substructures.

8.5 Scour Potential

The existing scour data is not available since there is no existing structure for the Fox River crossing at this location. The scour analysis was performed by Christopher B. Burke Engineering (CBBE) for the Fox River Bridge. The flood elevations are shown in Tables 4. The scour data at the MUP Bridge east abutment was not available. The scour elevations for the foundation design are shown in Table 5. The piles and drilled shafts should be designed so that the pile and shaft penetration after the design scour event satisfies the required axial and lateral resistance. The soil lost due to scour should not be considered in contributing the overburden stress in the soil below the scour zone.

8.6 Foundation Settlement

The driven H-pile foundations designed and constructed as recommended will undergo negligible settlement (less than 0.5 inch).

We performed settlement analyses for a single drilled shaft. The settlement considering applied pressure of 18 kips per square foot is estimated to be on the order of 0.50 inch for a 4-foot diameter straight drilled shaft. There would be an additional settlement due to elastic compression of the concrete shaft.

8.7 Embankment Slope Stability

The maximum height of the embankment will be 10 feet at the east abutment. The embankments constructed to the design grades of 1V:2H or flatter are expected to be stable. The end slopes of 1V:2H are expected to be stable with additional resistance provided by the piles.

8.8 Embankment Settlement

The pathway approach embankment immediately behind the east abutments will require approximately 10 feet of new fill above the existing grade. The approach embankments will have 1V:2H end slopes and 1V:2H or flatter side slopes. The placement of fill for the embankment will result in settlement of the underlying natural soils. Most of the settlement is expected to be occurring at the same rate as the construction of the embankment progresses. We anticipate that by the time the proposed embankment is built to the bottom of abutment footing, the soil would undergo most of the settlement in the area of the proposed abutment.

Settlement within new embankment fill would also occur. For granular soil embankment, the majority of the settlement is expected to be completed by the end of construction. For cohesive soil embankment, a significant portion of total settlement within the embankment can also be expected to occur by the end of construction; however complete consolidation may take some time. As discussed earlier in the report, the piles should be installed in precored holes though the new embankment fill to avoid the downdrag load.

9.0 CONSTRUCTION CONSIDERATIONS

9.1 Excavation

Due to the existing soil conditions and close proximity to the river it might not be possible to slope the excavation sidewalls near the river. If that's the case, bracing with groundwater level control might be required. Temporary excavations required for other areas should have a slope of 1V:2H or flatter, as required to provide a stable side slopes. Foundation excavations should be performed in accordance with local, state, and federal regulations.

9.2 Dewatering

Seepage water that does accumulate in open excavations at the east abutment location can be removed using the sump pump method.

9.3 Filling and Backfilling

Structural fill used to attain the final design subgrade elevations should be IDOT gradation CA-6 or equivalent. This fill material should be free of organic matter and debris. Fill should be placed in lifts not exceeding 8 inches loose thickness and compacted to minimum 95 percent maximum dry density, as determined in accordance with AASTHO T-99, Standard Proctor Method.

Any backfill should be pre-approved by the site engineer. The fill should be free of organic materials and debris. We recommend using a porous granular material, such as IDOT gradation FA-1/FA-2 or the equivalent, to backfill the proposed east abutment. All backfill material should

be compacted in lifts no greater than 8 inches loose thickness. Each layer should be compacted to minimum 95 percent maximum dry density, as determined by AASTHO T-99, Standard Proctor Method.

9.4 Cofferdam

Cofferdam and seal coat will not be necessary for construction of the MUP ramp substructures supported on a single drilled shaft.

9.5 Drilled Shafts

We recommend that a permanent casing with teeth at the bottom be installed in order to provide a good seal at top of the clay layer. The excavation below the casing in the clay should be performed with a dry method. After drilled shaft is completed to the required elevation, the base should be cleaned and inspected, the reinforcing cage placed, and the concrete can be discharged at the base using a tremie pipe or concrete pump. The drilled shafts should be constructed in accordance with Section 516 Drilled Shafts of the IDOT 2007 Standard Specifications for Road and Bridge Construction (IDOT 2007).

9.6 Construction Monitoring

There is no need for a special construction monitoring for the foundations except normally required by the IDOT Standard Specifications, Special Provisions and Contract Plans.

9.7 Embankment Construction

Bridge abutment fill should be constructed as early as possible in the project construction period in order to allow the embankments to adjust or settle under its own weight as much as possible prior to piles installation for the east abutment. The embankment construction should be performed in accordance with Section 205 of the IDOT Standard Specifications for Road and Bridge Construction (IDOT 2007).

10.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the 4 soil borings drilled by WEI and 2 borings drilled by others. WEI does not assume any responsibility for the data presented on the boring logs prepared by others. In addition, 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 bridge or substructures are planned, we should be timely informed so that changes can be reviewed, modified, and approved in writing by the geotechnical engineer.

It has been a pleasure to assist Baker Engineering, Inc. and Kane County on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Jerry W.H. Wang, Ph.D., P.E.
Principal

Mohammed (Mike) Kothawala, P.E.
Sr. Project Manager/Sr. Geotechnical Engineer

REFERENCES

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10.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the 4 soil borings drilled by WEI and 2 borings drilled by others. WEI does not assume any responsibility for the data presented on the boring logs prepared by others. In addition, 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 bridge or substructures are planned, we should be timely informed so that changes can be reviewed, modified, and approved in writing by the geotechnical engineer.

It has been a pleasure to assist Baker Engineering, Inc. and Kane County on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

for JWHW

Jerry W.H. Wang, Ph.D., P.E.
Principal

Mohammed (Mike) Kothawala, P.E.
Sr. Project Manager/Sr. Geotechnical Engineer

TABLES

Multi-Use Path Bridge & Ramp New Stearns Road over Fox River

IDOT SN: 045-3164

Kane County Division of Transportation

Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 1A

Pile Design Data for HP 10x42

Sub-Structure ID	Reference Boring Number	Bottom of Footing Elevation	Precoring To Elevation	Pile Capacity Calculated From Elevation	Estimated pile length below footing, ft				
					NRB: 210 kips	NRB: 240 kips	NRB: 270 kips	NRB: 300 kips	NRB: 330 kips
West Abutment	STFX-4	694.37	687.0	687.0	38	41	44	46	48
East Abutment	STFX-7	695.30	691.0	691.0	23	24	26	27	29

1. The estimated length does not include any embedment into the footing. For estimated length to be shown on the plans, add embedment in accordance with IDOT Bridge Manual.
2. NRB = Nominal Required Bearing, FRA = Factored Resistance Available, FRA=0.5 times NRB
3. Maximum NRB for HP 10x42 is 335 kips

Multi-Use Path Bridge & Ramp New Stearns Road over Fox River

IDOT SN: 045-3164

Kane County Division of Transportation

Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 1B

Pile Design Data for HP 12x53

Sub-Structure ID	Reference Boring Number	Bottom of Footing Elevation	Precoring To Elevation	Pile Capacity Calculated From Elevation	Estimated pile length below footing, ft				
					NRB: 270 kips	NRB: 300 kips	NRB: 330 kips	NRB: 360 kips	NRB: 390 kips
West Abutment	STFX-4	694.37	687.0	687.0	40	42	44	46	47
East Abutment	STFX-7	695.30	691.0	691.0	24	25	26	27	28

1. The estimated length does not include any embedment into the footing. For estimated length to be shown on the plans, add embedment in accordance with IDOT Bridge Manual.
2. NRB = Nominal Required Bearing, FRA = Factored Resistance Available, FRA=0.5 times NRB
3. Maximum NRB for HP 12x53 is 419 kips

Multi-Use Path Bridge & Ramp New Stearns Road over Fox River

IDOT SN: 045-3164

Kane County Division of Transportation

Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 1C

Pile Design Data for HP 14x73

Sub-Structure ID	Reference Boring Number	Bottom of Footing Elevation	Precoring To Elevation	Pile Capacity Calculated From Elevation	Estimated pile length below footing, ft				
					NRB: 300 kips	NRB: 330 kips	NRB: 360 kips	NRB: 390 kips	NRB: 420 kips
West Abutment	STFX-4	694.37	687.0	687.0	38	40	42	44	46
East Abutment	STFX-7	695.30	691.0	691.0	23	24	25	26	27

1. The estimated length does not include any embedment into the footing. For estimated length to be shown on the plans, add embedment in accordance with IDOT Bridge Manual.
2. NRB = Nominal Required Bearing, FRA = Factored Resistance Available, FRA=0.5 times NRB
3. Maximum NRB for HP 14x73 is 578 kips

Multi-Use Path Bridge & Ramp New Stearns Road over Fox River

IDOT SN: 045-3164

Kane County Division of Transportation

Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 2: Drilled Shaft Geotechnical Design Parameters

Soil Boring	BP-1	BP-2	STFX-4	BP-3	BP-4
Drilled Shaft Base Elevation	624.0	622.0	624.0	624.0	622.0
Unit Tip Resistance $q_{p,}$ ksf	45	45	45	45	45
Resistance factor for tip resistance, φ_{qp}	0.40	0.40	0.40	0.40	0.40
Unit Side Resistance $q_{s,}$ ksf	Elevation Range / Value 686 to 662 / 1.03 662 to 628 / 0.92 628 to 624 / 1.90	Elevation Range / Value 685 to 672 / 0.53 672 to 668 / 0.90 668 to 637 / 0.87 637 to 622 / 1.90	Elevation Range / Value 685 to 638 / 0.75 638 to 624 / 1.90	Elevation Range / Value 684.5 to 666 / 0.60 666 to 661 / 0.90 661 to 632 / 0.92 632 to 624 / 1.90	Elevation Range / Value 684 to 668 / 0.58 668 to 659 / 0.90 659 to 626 / 0.94 626 to 622 / 1.90
Resistance factor for shaft side resistance, φ_{qs}	0.45	0.45	0.45	0.45	0.45
Bottom of Permanent Casing	Elevation 628.0	Elevation 637.0	Elevation 638.0	Elevation 632.0	Elevation 626.0

Multi-Use Path Bridge & Ramp New Stearns Road over Fox River

IDOT SN: 045-3164

Kane County Division of Transportation

Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 3 Recommended Soil Parameters for Lateral Load Analysis

Parameter / Subsurface Material	Loose Granular Soils	Medium Dense Granular Soils	Dense Granular Soils	Very Dense Granular Soils	Stiff Clays	Very Stiff Clays	Hard Clays
SPT Value(N, blows per foot) for Granular Soils OR Unconfined Compressive Strength (Qu, tsf) for Clays	Less than 10	10 to 30	31 to 50	Over 50	1.0 to 2.0	2.0 to 4.0	Over 4.0
Above Water Level							
Total Unit Weight, pci (gamma)	0.067	0.068	0.075	0.078	0.069	0.072	0.075
Angle of Internal Friction, degree (phi)	30	34	38	42	--	--	--
Cohesion, psi (c) (Undrained Shear Strength of soil)	---	--	--	--	10	20	30
Modulus of Subgrade Reaction, pci (k)	25	90	220	270	400	1030	1710
Strain at 50% stress, Percent (e50)	---	--	--	--	0.79	0.50	0.4
Below Water Level							
Submerged Unit Weight, pci (gamma)	0.029	0.032	0.039	0.042	0.033	0.036	0.039
Angle of Internal Friction (phi)	30	34	38	42	--	--	--
Cohesion, psi (c) (Undrained Shear Strength of soil)	---	--	--	--	10	20	30
Modulus of Subgrade Reaction, pci (k)	20	60	120	150	400	1030	1710
Strain at 50% stress, Percent (e50)	---	--	--	--	0.79	0.50	0.4

Boring logs show SPT Values number for three consecutive 6 inch penetration. N value is the total of second and the third numbers.

TABLE 4
Waterway Information *

Flood Frequency (year)	Headwater Elevation (ft) (Proposed)
10	695.64
50 (Design)	697.13
100 (Base)	698.02
500 (Max. Calc.)	699.99

* Per Hydraulic Report & Baker Engineering

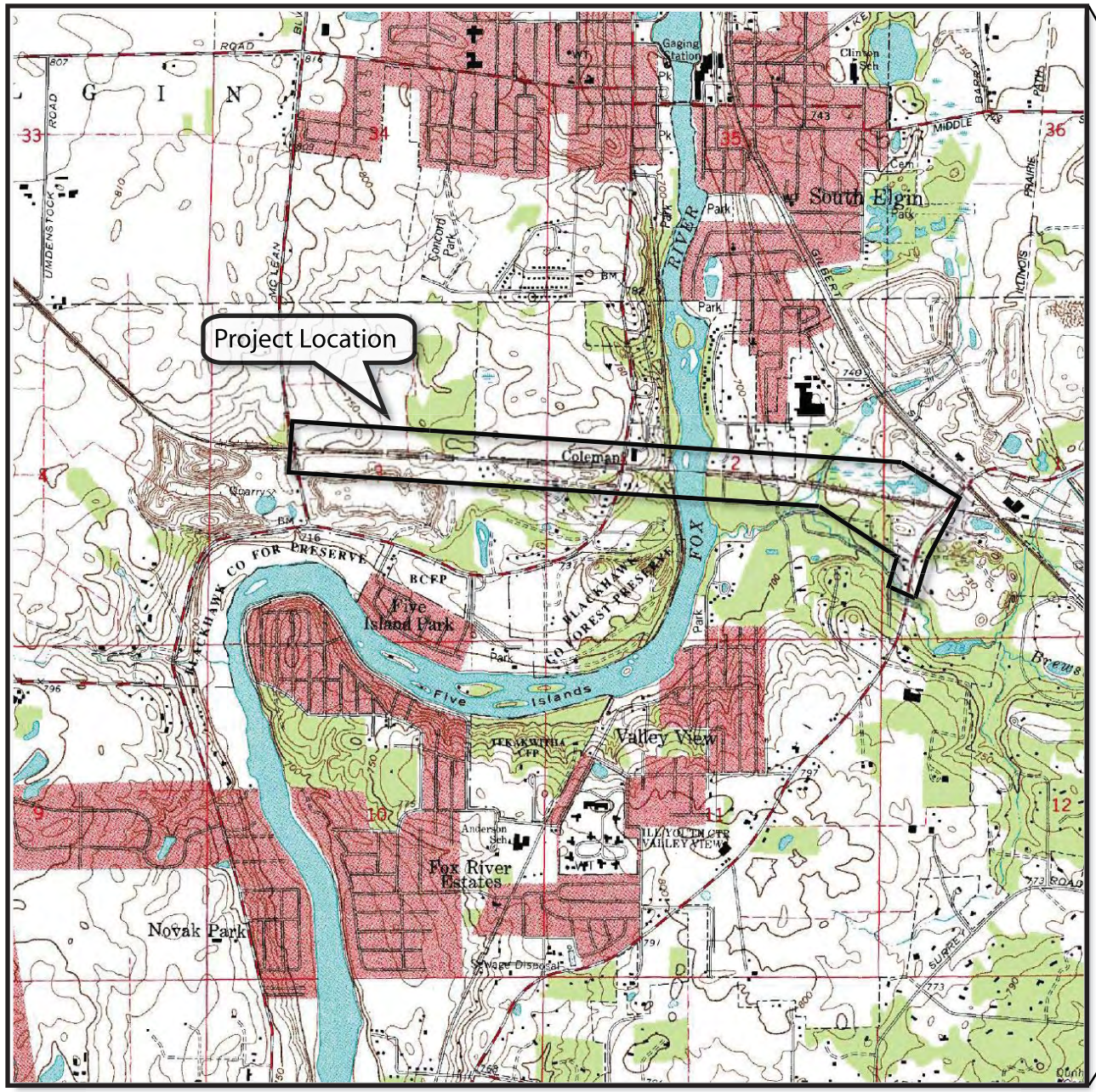
Multi-Use Path Bridge & Ramp New Stearns Road over Fox River
IDOT SN: 045-3164
Kane County Division of Transportation
Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

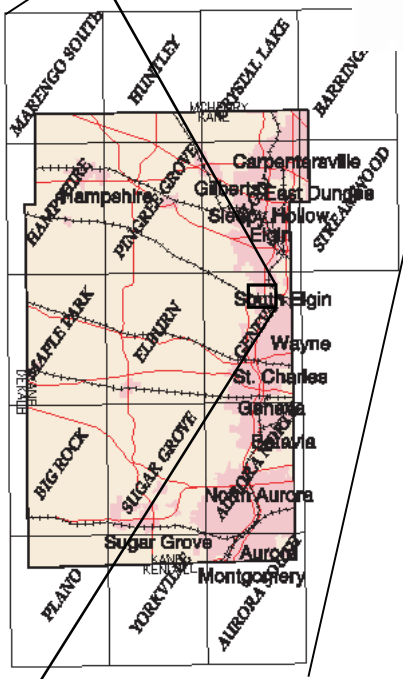
TABLE 5
Foundation Design Scour Data

Sub-structure	Location Station	Design Scour Elevation*	Design Scour Elevation For Foundation Design
MUP Ramp, S. Abutment	2001+39.25	686.04	686.04
MUP Ramp, Pier 1	2001+69.88	685.87	685.87
MUP Ramp, Pier 2	2002+01.13	685.50	685.50
MUP Ramp, Pier 3	2002+32.38	684.87	684.87
MUP Ramp, Pier 4	2002+63.63	684.97	684.97
MUP Ramp, Pier 5	2002+94.88	685.05	685.05
MUP Ramp, Pier 6	2003+26.13	685.04	685.04
MUP Ramp, Pier 7	2003+57.38	684.76	684.76
MUP Ramp, Pier 8	2003+88.63	684.57	684.57
MUP Ramp, Pier 9	2004+19.88	684.32	684.32
MUP Ramp, Pier 10	2004+51.13	684.34	684.34
MUP Ramp, Pier 11	2004+82.38	684.19	684.19
MUP Ramp N. Abutment	2005+13.00	684.98	684.98
MUP Bridge West Abutment	569+72.90	685.04	685.04
FRB Pier 4	574+66.25	678.00	---
MUP Bridge East Abutment	575+03.17	Not Available	678.00

FRB = Fox River Bridge, MUP = Multi-Use Path
* Per Hydraulic Report & Baker Engineering

EXHIBITS





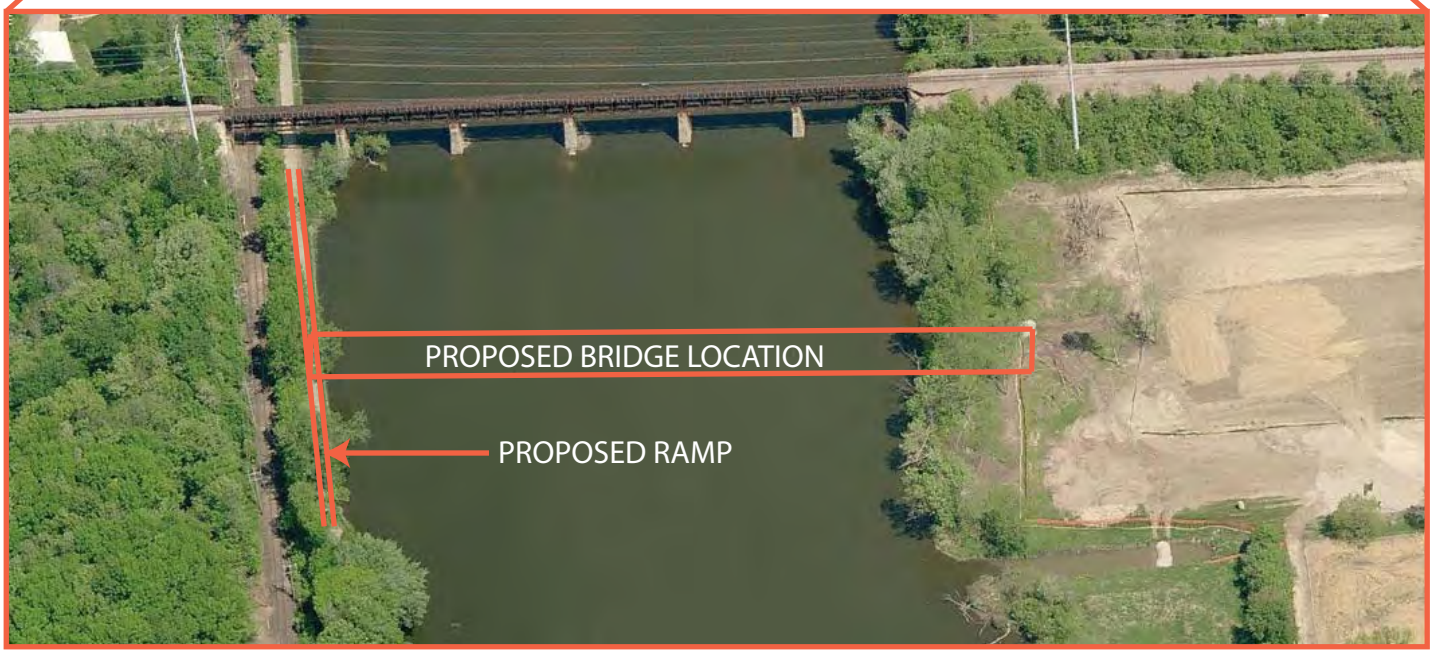
KANE COUNTY

SITE LOCATION MAP: NEW STEARNS ROAD, KANE COUNTY, IL.

SCALE: SEE SCALE BAR	**EXHIBIT 1**	DRAWN BY: Y. SHIU CHECKED BY:

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

FOR BAKER ENGINEERING, INC. **707-11-01**



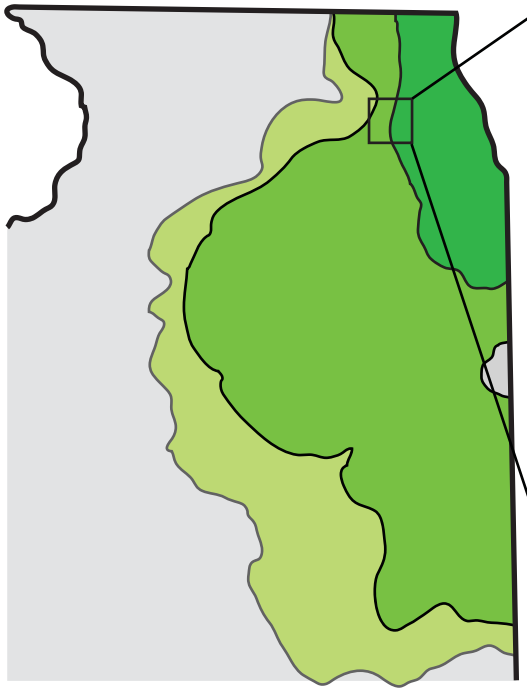
0 250 FT 500 FT

SITE LOCATION MAP: MULTI-USE PATH BRIDGE
KANE COUNTY, IL

Scale: See Scale Bar	EXHIBIT 2	Drawn by: Wei H. Wang

Wang Engineering, INC.
Geo-Environmental Engineers
1145 N Main Street
Lombard, IL 60148
630 953-9928

FOR BAKER ENGINEERING, INC. 707-11-01



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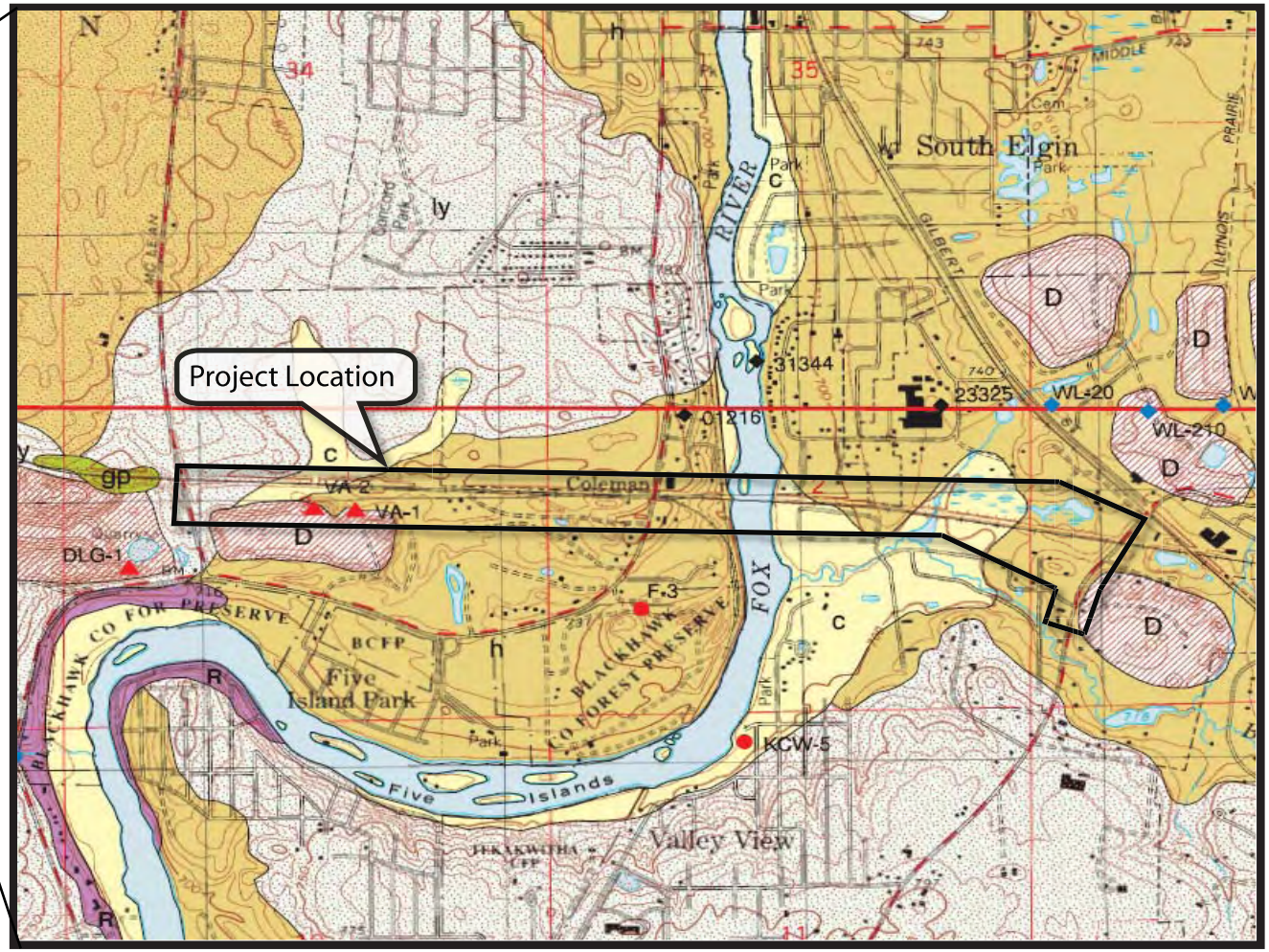


After Grimley and Curry (2002)

2 mi

Wedron Group Formations in Illinois

- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Postglacial Deposits

- c / gp — Cahokia Fm. (c) and Grayslake Peat (gp)

Mason Group

- h — Henry Formation

Wedron Group

- ly — Yorkville Member: ***Lemont Formation***

Bedrock

- R — Bedrock exposures or near surface exposures
- D — Disturbed Ground (spoil piles, gravel pits, quarries and landfills)

SITE AND REGIONAL GEOLOGY: NEW STEARNS ROAD, SOUTH ELGIN, KANE COUNTY, IL.

SCALE: SEE SCALE BAR | **EXHIBIT 3** | DRAWN BY: Y. SHIU CHECKED BY:

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

FOR BAKER ENGINEERING, INC. | **707-11-01**

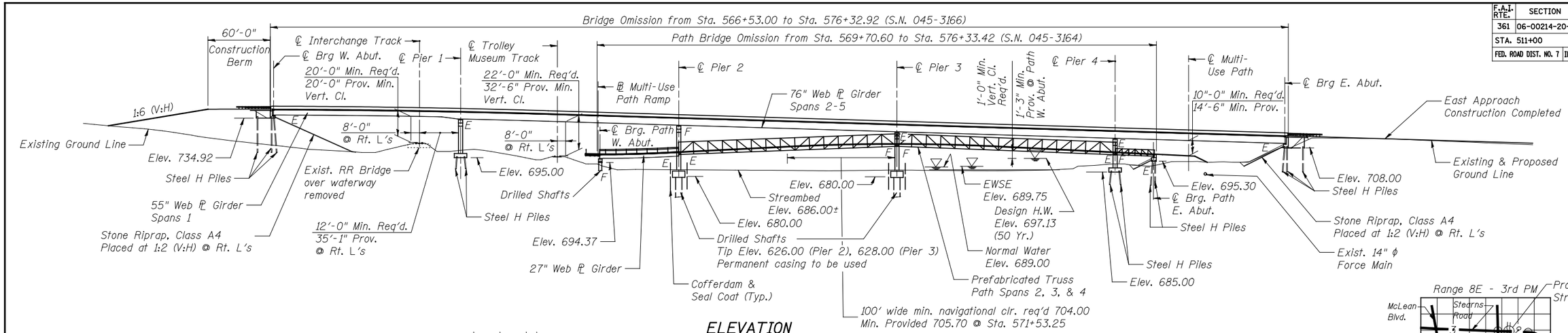
CONTRACT NO. 63075

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
361	06-00214-20-BR	KANE	5	1
STA. 511+00		TO STA. 609+00		
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

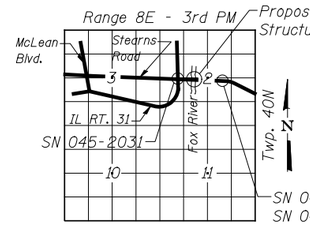
SHEET NO. S1 OF S5

Bridge Omission from Sta. 566+53.00 to Sta. 576+32.92 (S.N. 045-3166)

Path Bridge Omission from Sta. 569+70.60 to Sta. 576+33.42 (S.N. 045-3164)



ELEVATION



LOCATION SKETCH

PLAN

LEGEND

⊕ Boring Number and Location

NOTE

See contract plans for proposed improvement. This sheet is for Boring Locations only.

Boring Locations Plan

Horizontal Scale:
Vertical Scale:

EXHIBIT 4A

Drawn By: S. Sugiarto
Checked By: E. Datz

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
Phone: (630) 953-9928
www.wangeng.com

BASED ON DRAWING PREPARED BY BAKER ENGINEERING, INC. 707-11-01

REVISIONS NAME	DATE

Baker
Baker Engineering, Inc.

ILLINOIS DEPARTMENT OF TRANSPORTATION

GENERAL PLAN

STEARNS ROAD BRIDGE OVER THE FOX RIVER
STRUCTURE NUMBER 045-3166
MILTI-USE PATH BRIDGE OVER THE FOX RIVER
STRUCTURE NUMBER 045-3164

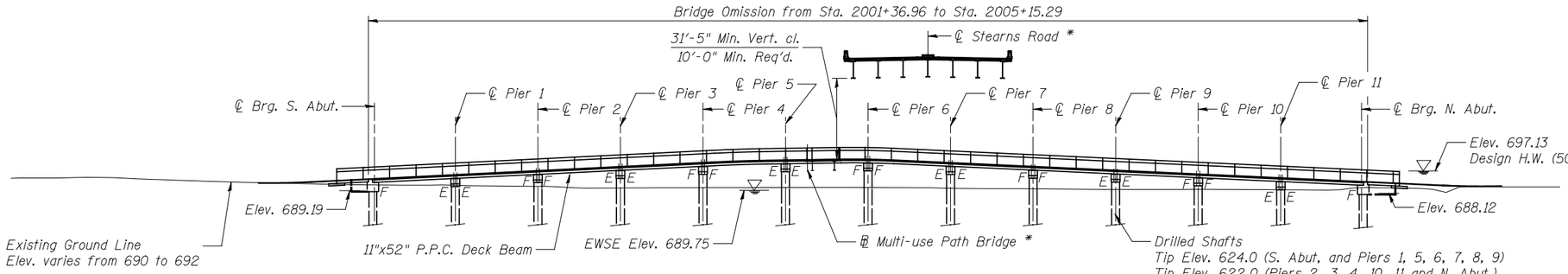
KANE COUNTY FAP 361 SECTION 06-00214-20-BR
STATION 571+42.96 DESIGNED: KPZ DRAWN: DFM
DATE: MARCH 2008 CHECKED: GG CHECKED: KPZ

$$dgn$$
$$sytime$$

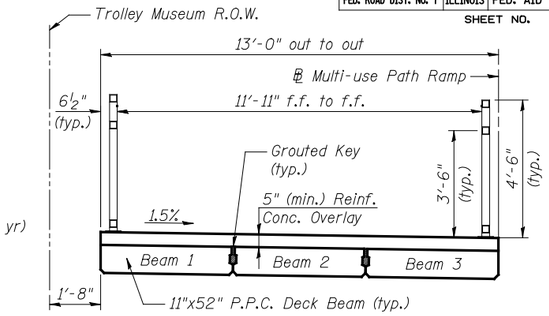
CONTRACT NO. 63075

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
361	06-00214-20-BR	KANE	180	85
STA. 511+00	TO STA. 609+00			
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

SHEET NO. OF S4



ELEVATION



CROSS SECTION

(Looking North)

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft.)	S. Abut.	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8	Pier 9	Pier 10	Pier 11	N. Abut.
	686.04	685.87	685.50	684.87	684.97	685.05	685.04	684.76	684.57	684.32	684.34	684.19	684.98

DESIGN SPECIFICATIONS

2007 AASHTO LRFD Bridge Design Specifications with 2008 Interims

MULTI-USE PATH BRIDGE LOADING

85#/sq. ft Pedestrian Load
H-10 Vehicle Loading

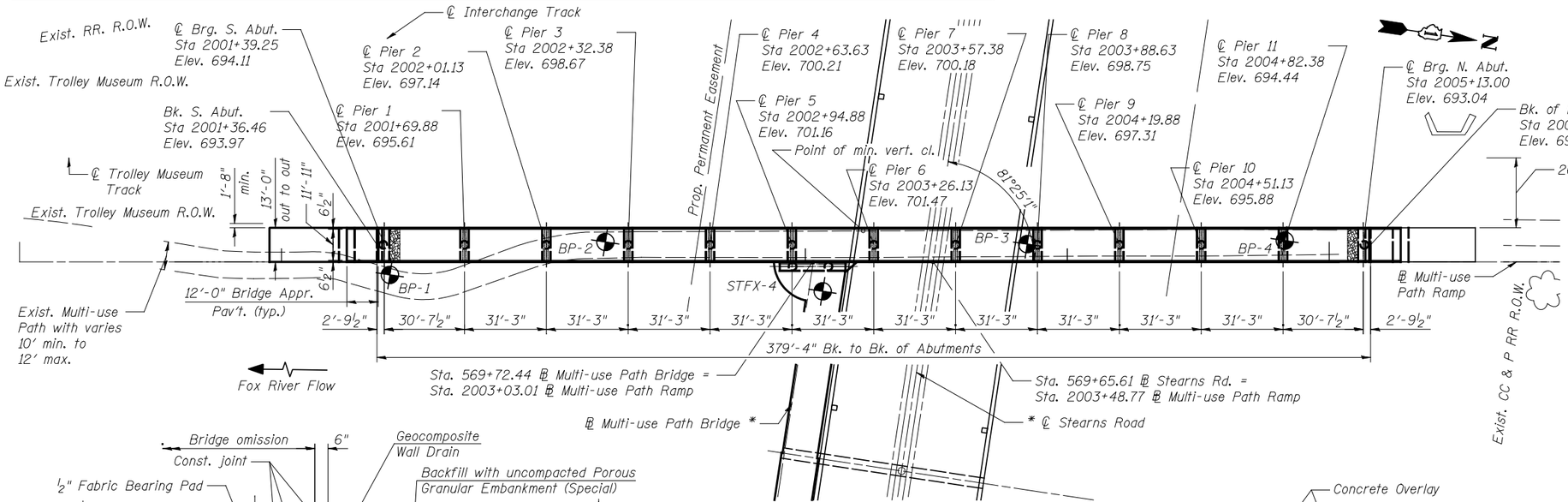
DESIGN STRESSES

FIELD UNITS

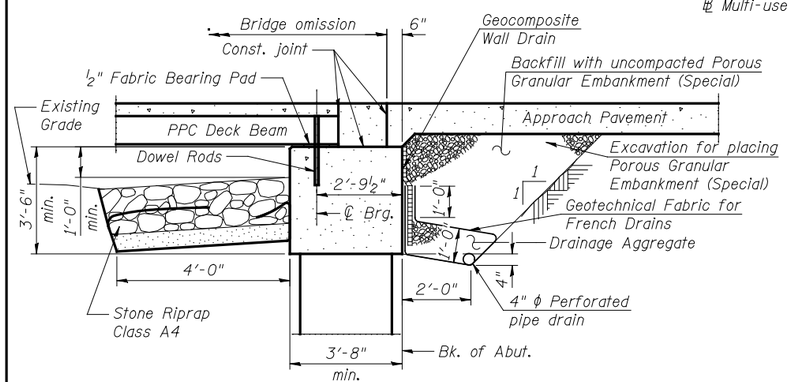
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

PRECAST PRESTRESSED UNITS

f'ci = 5,000 psi (P.P.C. Deck Beams)
f'c = 6,000 psi (P.P.C. Deck Beams)



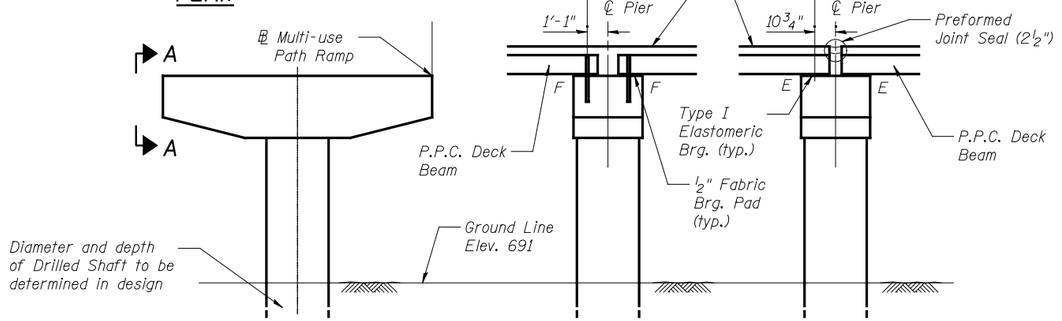
PLAN



SECTION THRU STUB ABUTMENT

(Horiz. dim. @ Rt. L's)

Denotes Soil Boring



PIER SKETCH

SECTION A-A

(Fixed Pier)

SECTION A-A

(Expansion Pier)

* See Sheet 1 of 6 for the General Plan and Elevation of Stearns Road Bridge and the Multi-use Path Bridge

LEGEND

Boring Number and Location

NOTES

See contract plans for proposed improvement.
This sheet is for Boring Locations only.

Boring Locations Plan

Horizontal Scale:
Vertical Scale:
EXHIBIT 4B
Drawn By: S. Suglarlo
Checked By: M. A. K.

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
Phone: (630) 953-9928
www.wangeng.com

BASED ON DRAWING PREPARED BY BAKER ENGINEERING, INC. 707-11-01

REVISIONS NAME	DATE

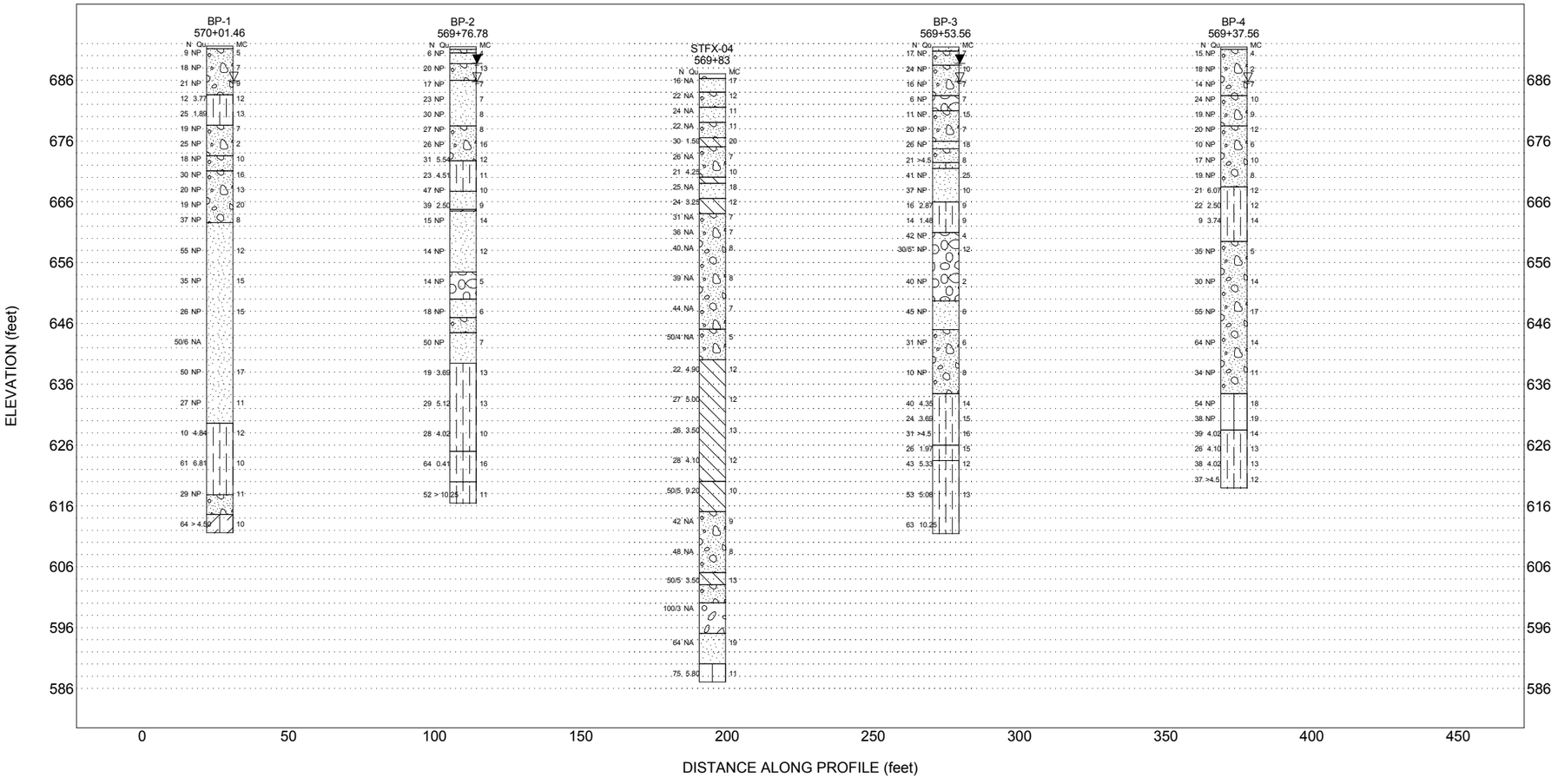
ILLINOIS DEPARTMENT OF TRANSPORTATION

GENERAL PLAN

STEARNS ROAD BRIDGE OVER THE FOX RIVER
STRUCTURE NUMBER 045-3166
MILTI-USE PATH BRIDGE OVER THE FOX RIVER
STRUCTURE NUMBER 045-3164
KANE COUNTY FAP 361 SECTION 06-00214-20-BR
STATION 571+42.96
DESIGNED: DFM DRAWN: DFM
DATE: MARCH 2008
CHECKED: KPZ CHECKED: KPZ

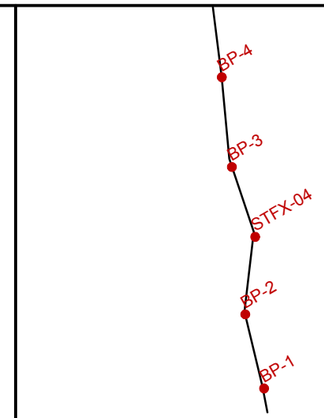
Baker
Baker Engineering, Inc.

$$dgn$$
$$sy+time$$



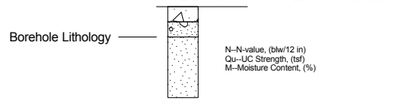
Lithology Graphics

- Concrete
- Gravelly sand, sandy gravel
- AASHTO Silty Clay, Silty Clay Loam
- AASHTO, Sand, Sandy Loam
- AASHTO Clay Loam
- Gravel
- Pavement
- AASHTO Silt, Silty Loam
- Boulders and cobbles
- AASHTO Clay



Site Map Scale 1 inch equals 165 feet

Explanation:



▽ Water Level Reading at time of drilling.

▼ Water Level Reading after drilling.

Horizontal Scale (feet)

Vertical Exaggeration: 2x

Wang Engineering
1145 Main Street
Lombard, IL 60148

Subsurface Data Profile
Multi-Use Path Ramp

WEI SINCE 1982

New Stearns Road over Fox River
Sec. 2 and 3, T 40 N, R 8 E of
Geneva Quadrangle

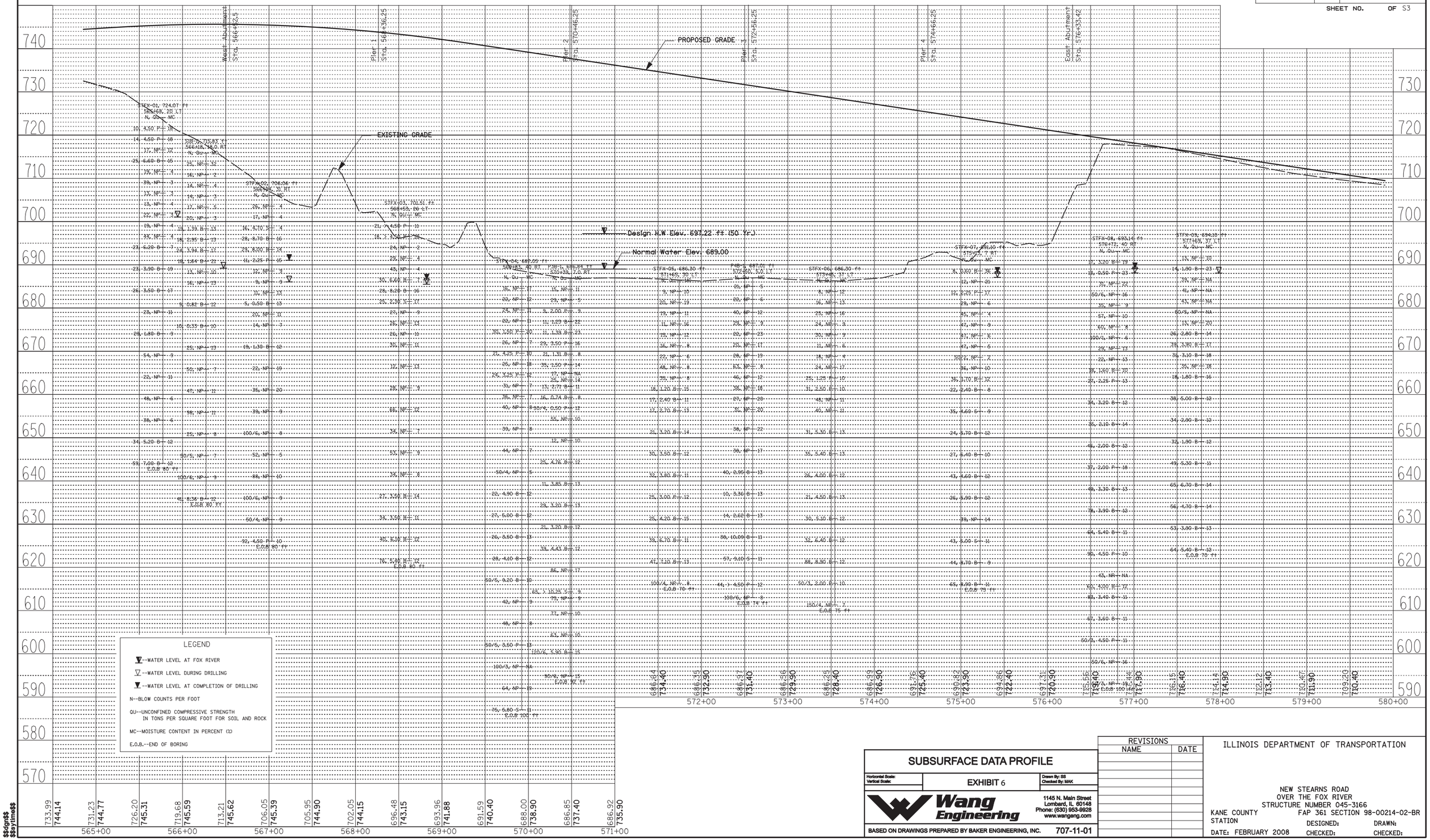
JOB NUMBER	PLATE NUMBER
707-11-01	EXHIBIT 5

WEI 11X17 7071101.GPJ WANGENG.GDT 8/29/08

CONTRACT NO. XXXXX

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
361	98-00214-02-BR	KANE	$$TOT$$	
STA. XXX+XX	TO STA. XXX+XX			
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

SHEET NO. OF S3



LEGEND

▼--WATER LEVEL AT FOX RIVER

▽--WATER LEVEL DURING DRILLING

▼--WATER LEVEL AT COMPLETION OF DRILLING

N--BLOW COUNTS PER FOOT

QU--UNCONFINED COMPRESSIVE STRENGTH IN TONS PER SQUARE FOOT FOR SOIL AND ROCK

MC--MOISTURE CONTENT IN PERCENT (%)

E.O.B.--END OF BORING

SUBSURFACE DATA PROFILE

Horizontal Scale:
Vertical Scale:

EXHIBIT 6

Drawn By: SS
Checked By: MAK

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
Phone: (630) 953-9928
www.wangeng.com

BASED ON DRAWINGS PREPARED BY BAKER ENGINEERING, INC. 707-11-01

REVISIONS	
NAME	DATE

ILLINOIS DEPARTMENT OF TRANSPORTATION

NEW STEARNS ROAD
OVER THE FOX RIVER
STRUCTURE NUMBER 045-3166
KANE COUNTY FAP 361 SECTION 98-00214-02-BR
STATION

DESIGNED: DRAWN:
DATE: FEBRUARY 2008 CHECKED: CHECKED:

$$dgn$$
$$sylime$$

APPENDIX A

Wang Engineering, INC.
Consulting Geotechnical and Environmental Engineers
wangeng3@wangeng.com
1145 Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG BP-1

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.59 ft
North: 1934282.19 ft
East: 994877.83 ft
Station: 570+01.46
Offset: 204.3 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	691.2	5-inch thick CONCRETE --SIDEWALK--						
		Loose to medium dense, brown SANDY GRAVEL --FILL--			1	4 4 5	NP	5
			5		2	4 9 9	NP	7
					3	9 12 9	NP	9
	683.6	Stiff to very stiff, gray SILTY CLAY, trace gravel						
			10		4	5 6 6	3.77 B	12
					5	6 8 17	1.89 B	13
	678.6	Medium dense, brown SANDY GRAVEL						
			15		6	8 9 10	NP	7
					7	12 17 8	NP	2
	673.6	Medium dense, gray GRAVELLY SAND						
			20		8	35 8 10	NP	10
	671.1	Dense, brown and gray SANDY GRAVEL						
					9	15 13 17	NP	16
			25		10	7 9 11	NP	13
					11	4 11 8	NP	20
	662.6	Medium dense to very dense, gray and brown SAND to SANDY LOAM, trace gravel						
			30		12	18 20 17	NP	8
			35		13	18 29 26	NP	12
			40		14	5 12 23	NP	15
			45		15	49 14 12	NP	15
			50		16	16 50/6		

GENERAL NOTES

Begin Drilling **08-07-2008** Complete Drilling **08-07-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **F. Bozga** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼

Time After Drilling **NA**

Depth to Water ▼ **NA**

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

WANGENGINC 7071101.GPJ WANGENG.GDT 9/3/08

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BORING LOG BP-1

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.59 ft
North: 1934282.19 ft
East: 994877.83 ft
Station: 570+01.46
Offset: 204.3 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		17	13 31 19	NP	17
			60		18	10 10 17	NP	11
	629.6	Hard, gray SILTY CLAY	65		19	3 3 7	4.84 B	12
			70		20	8 25 36	6.81 B	10
	617.8	Medium dense, brown SANDY GRAVEL	75		21	9 9 20	NP	11
	614.6	Hard, gray CLAY LOAM	80		22	24 50 14	> 4.50 P	10
	611.6	Boring terminated at 80.00 ft	85					
			90					
			95					
			100					

GENERAL NOTES

Begin Drilling **08-07-2008** Complete Drilling **08-07-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **F. Bozga** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼

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 BP-2

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.48 ft
North: 1934362.89 ft
East: 994857.41 ft
Station: 569+76.78
Offset: 124.75 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	691.1	5-inch thick CONCRETE						
	690.5	--SIDEWALK--						
		6-inch thick GRAVELLY SAND --BASE COURSE--			1	9 4 2	NP	4
	688.7	Loose, brown SANDY LOAM, trace gravel --FILL--			2	5 9 11	NP	13
		Medium dense, brown SANDY GRAVEL	5					
	686.0	Medium dense to dense, brown SAND, trace to little gravel			3	6 9 8	NP	7
					4	6 10 13	NP	7
			10					
					5	5 14 16	NP	8
	678.5	Medium dense, brown and gray SANDY GRAVEL						
					6	5 14 13	NP	8
			15					
					7	3 12 14	NP	16
	672.7	Hard, gray SILTY CLAY, trace sand and gravel			8	6 9 22	5.54 B	12
			20					
					9	4 9 14	4.51 B	11
	667.7	Dense, gray SANDY LOAM, trace gravel						
			25		10	13 26 21	NP	10
	664.7	Stiff, gray CLAY LOAM						
	664.5	Medium dense, brown and gray SAND, trace to little gravel			11	4 14 25	2.50 P	9
			30		12	2 5 10	NP	14
	654.5	Medium dense, brown and gray GRAVEL						
			35		13	7 7 7	NP	12
			40		14	5 6 8	NP	5
	650.0	Medium dense, brown SAND						
	647.0	Medium dense, gray SANDY GRAVEL	45		15	16 10 8	NP	6
	644.5	Very dense, gray SAND						
			50		16	19 33 17	NP	7

GENERAL NOTES

Begin Drilling **08-13-2008** Complete Drilling **08-13-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **R.Edelmann** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼ **3.00 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 BP-2

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.48 ft
North: 1934362.89 ft
East: 994857.41 ft
Station: 569+76.78
Offset: 124.75 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	639.5							
		Very stiff to hard, gray SILTY CLAY, trace sand						
			55		17	4 6 13	3.69 B	13
			60		18	8 12 17	5.12 B	13
			65		19	8 12 16	4.02 B	10
	625.0							
		Medium stiff, gray SILTY CLAY						
			70		20	19 31 33		16
	620.0							
		Hard, gray SILTY CLAY						
			75		21	14 24 28	> 10.25 B	11
	616.5							

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Boring terminated at 75.00 ft	80					
			85					
			90					
			95					
			100					

GENERAL NOTES

Begin Drilling **08-13-2008** Complete Drilling **08-13-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **R.Edelmann** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼ **3.00 ft**

Time After Drilling **NA**

Depth to Water ▼ **NA**

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BORING LOG BP-3

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.47 ft
North: 1934523.31 ft
East: 994842.81 ft
Station: 569+53.56
Offset: 34.62 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	690.8	6.5-inch thick CONCRETE --PAVEMENT--						
		Medium dense, brown SANDY GRAVEL			1	4 9 8	NP	7
	688.5	Medium dense, brown and gray SANDY GRAVEL	5		2	2 8 16	NP	10
					3	4 7 9	NP	7
	683.5	Loose, medium to course GRAVEL	10		4	3 4 2	NP	7
	681.0	Medium dense, brown and gray SANDY GRAVEL			5	2 4 7	NP	15
			15		6	3 6 14	NP	7
	676.0	Medium dense, brown SAND						
	674.7	Medium dense, brown SANDY GRAVEL			7	4 11 15	NP	18
	672.5	Hard, gray SILTY CLAY, little gravel	20		8	3 7 14	>4.5 P	8
	671.5	Dense, gray SANDY LOAM, trace gravel			9	12 20 21	NP	25
			25		10	12 18 19	NP	10
	666.0	Stiff to very stiff, gray SILTY CLAY, trace to little gravel			11	5 7 9	2.87 B	9
			30		12	5 8 6	1.48 B	9
	661.0	Dense to very dense, brown and gray GRAVEL			13	17 26 16	NP	4
			35		14	16 30/5"	NP	12
			40		15	16 24 16	NP	2
	649.7	Dense, brown and gray SAND						
			45		16	8 12 33	NP	6
	645.0	Medium dense to dense, brown and gray SANDY GRAVEL						
			50		17	17 14 17	NP	6

GENERAL NOTES

Begin Drilling **08-12-2008** Complete Drilling **08-12-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **N. Davis** Checked by **M. Kothawala**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼ **3.00 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 BP-3

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.47 ft
North: 1934523.31 ft
East: 994842.81 ft
Station: 569+53.56
Offset: 34.62 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		18	8 4 6	NP	8
	634.5	Very stiff to hard, gray SILTY CLAY, trace gravel						
			60		19	10 17 23	4.35 B	14
					20	5 9 15	3.69 B	15
			65		21	8 13 18	>4.5 P	16
	626.0	Stiff, gray SILTY CLAY, trace gravel			22	8 10 16	1.97 B	15
	623.5	Hard, gray SILTY CLAY, trace gravel						
			70		23	12 19 24	5.33 B	12
			75		24	11 23 30	5.08 B	13
			80		25	12 25 38	10.25 B	
	611.5	Boring terminated at 80.00 ft						
			85					
			90					
			95					
			100					

GENERAL NOTES

Begin Drilling **08-12-2008** Complete Drilling **08-12-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **N. Davis** Checked by **M. Kothawala**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼ **3.00 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 BP-4

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.47 ft
North: 1934621.08 ft
East: 994831.86 ft
Station: 569+37.56
Offset: 131.63 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	691.1	5-inch thick CONCRETE --PAVEMENT--						
		Medium dense, brown and gray SANDY GRAVEL --FILL--			1	4 8 7	NP	4
			5		2	4 9 9	NP	2
					3	4 6 8	NP	7
	683.5	Medium dense, brown and gray GRAVELLY SAND			4	14 12 12	NP	10
			10		5	8 10 9	NP	9
	678.5	Medium dense, brown and gray SANDY GRAVEL			6	9 10 10	NP	12
			15		7	3 3 7	NP	6
			20		8	8 8 9	NP	10
					9	4 7 12	NP	8
	668.5	Very stiff to hard, brown and gray SILTY CLAY, trace gravel			10	10 10 11	6.07 B	12
			25					
	659.5	Dense to very dense, gray SANDY GRAVEL			11	6 12 10	2.50 P	12
			30		12	5 4 5	3.74 B	14
			35		13	8 21 14	NP	5
			40		14	7 14 16	NP	14
			45		15	3 18 37	NP	17
			50		16	5 23 41	NP	14

GENERAL NOTES

Begin Drilling **08-08-2008** Complete Drilling **08-08-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **F. Bozga** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼

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 BP-4

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**

Project **New Stearns Road over Fox River**

Location **Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle**

Datum: NGVD
Elevation: 691.47 ft
North: 1934621.08 ft
East: 994831.86 ft
Station: 569+37.56
Offset: 131.63 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		17	5 7 27	NP	11
	634.5	Dense to very dense, gray SILTY LOAM						
			60		18	23 20 34	NP	18
					19	19 23 15	NP	19
	628.5	Hard, gray SILTY CLAY						
			65		20	10 17 22	4.02 B	14
					21	5 11 15	4.10 B	13
			70		22	4 14 24	4.02 B	13
	619.0				23	6 14 23	>4.5 P	12
		Boring terminated at 73.50 ft	75					

GENERAL NOTES

Begin Drilling **08-08-2008** Complete Drilling **08-08-2008**

Drilling Contractor **WTS** Drill Rig **Mobile B-57 TMR**

Driller **K & J** Logger **F. Bozga** Checked by **N. Davis**

Drilling Method **4.25"ID HSA; Boring Backfilled Upon Completion**

WATER LEVEL DATA

While Drilling ▽ **6.00 ft**

At Completion of Drilling ▼

Time After Drilling **NA**

Depth to Water ▼ **NA**

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

WANGENGINC 7071101.GPJ WANGENG.GDT 9/3/08

ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/27/04

Date Completed 8/30/04

ROUTE F.A.U. 361 DESCRIPTION New Stearns Road over the Fox River

SECT. 98-00214-02-BR STRUCT. NO. 045-3166 DRILLED BY TSC L-60,939

COUNTY Kane LOCATION South End Pier 3 S. 2 - SW 1/4 , TWP. 40 N , RNG. 8 E

Boring No. STFX-4
Station 569+83
Offset 40.00ft RT
Surface Elev. 687.05 ft

Surface Water Elev. +1.3
Groundwater Elev.:
when drilling River
at Completion River
after ____ Hrs. ____

	DEPTH	BLOWS	Qu tsf	W %
Cobbles and Boulders				
686.25				
Medium dense gray SAND, some gravel, saturated A-1		5 7 9		17.3
684.05				
Medium dense gray GRAVEL, some sand, saturated A-1-a	-5	9 11 11		11.8
681.55				
Medium dense brown fine to medium SAND, trace gravel, saturated A-1-b		8 11 13		11.2
679.05				
Medium dense brown SAND and GRAVEL, trace clay, saturated A-1	-10	8 10 12		10.7
676.55				
Stiff gray CLAY, occasional silt seams, moist A-6		12 14 16	P 1.5	20.0 6.9
675.05				
Medium dense gray SAND and GRAVEL, saturated A-1-a	-15	10 12 14		7.0
		7 9 12	P 4.25	10.2 14.3
670.05				
Hard gray CLAY, little gravel, moist A-6				
669.05				
Medium dense gray fine to medium SAND, trace gravel, occasional silt seams, saturated A-1-b	-20	8 12 13		17.5
666.55				
Very stiff gray CLAY, trace gravel, moist A-6		10 12 12	P 3.25	12.4
664.05				
Dense gray SAND and GRAVEL, saturated A-1-a	-25	8 14 17		7.3
662.05				

	DEPTH	BLOWS	Qu tsf	W %
		10 15 21		7.2
* Boulder Zone 27.5'-28.5'		17 18 22		7.7
	-30			
Dense gray SAND and GRAVEL, occasional Cobbles and Boulders, saturated A-1-a		13 17 22		7.6
	-35			
		17 24 20		7.1
	-40			
645.05				
Very dense gray SAND and GRAVEL, occasional Cobbles and Boulders, saturated A-1-a		53 50/4"		5.1
	-45			
640.05				
Hard gray CLAY, trace gravel, moist A-6		10 11 11	B 4.9 15%	12.2
637.05	-50			

SPT. (N) = Sum of last two blow values in sample. (Qu) B=Bulge S=Shear P=Penetration Test
Stations, Depths, Offset, and Elevations are in Feet

ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/27/04

Date Completed 8/30/04

STRUCTURE NO. 045-3166
ROUTE F.A.U. 361
SECTION 98-00214-02-BR
COUNTY Kane

STRUCTURE NO. 045-3166
ROUTE F.A.U. 361
SECTION 98-00214-02-BR
COUNTY Kane

Boring No. STFX-4
Station 569+83
Offset 40.00ft RT
Elevation 637.05 ft

DEPTH	BLOWS	Qu tsf	W %
-55	12 13 14	B 5.0 15%	12.3
-60	8 12 14	B 3.5 15%	12.7
-65	9 12 16	B 4.1 15%	12.1
-70	18 35 50/5"	B 9.2 15%	10.4
-75	5 14 28		9.0

Hard to very stiff gray CLAY, trace gravel, moist
A-6

End of Boring at 100.0'

CME-75 Truck Rig (#256)
CME Automatic Hammer

3.25" (83 mm) ID HSA

Depth of River = 1.3'

620.05

Very hard brownish-gray CLAY, little to some gravel, moist
A-6

615.05

Dense gray SAND and GRAVEL, occasional Cobbles, (rock fragments recovered), saturated
A-1-a

Elevation 612.05 ft

DEPTH	BLOWS	Qu tsf	W %
-80	18 24 24		7.5
-85	21 50/5"	P 3.5	13.0 13.7
-90	100/3"		
-95	19 24 40		19.1
-100	5 25 50	S 5.8 15%	11.3

Dense gray SAND and GRAVEL, occasional Cobbles, (rock fragments recovered), saturated
A-1-a

605.05

Very stiff gray CLAY, trace gravel, moist
A-6

603.05

Very dense GRAVEL, occasional Cobbles, trace clay, saturated
A-1-a

600.05

Very dense Cobbles and Boulders, little sand and gravel, saturated
A-1-a

595.05

Very dense brownish-gray fine SAND, trace silt, saturated
A-3

590.05

Very dense gray SILTY LOAM, trace gravel, moist
A-4

587.05

SPT. (N) = Sum of last two blow values in sample. (Qu) B=Bulge S=Shear P=Penetration Test
Stations, Depths, Offset, and Elevations are in Feet

ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 3/12/04

ROUTE F.A.U. 361 DESCRIPTION New Stearns Road Bridge over the Fox River Date Completed 3/12/04

SECT. 98-00214-02-BR STRUCT. NO. 045-3166 DRILLED BY TSC/L-59,965

COUNTY Kane LOCATION Pier No. 7 S. 2-SW 1/4 , TWP. 40 N , RNG. 8 E

Boring No. STFX-7
Station 575+13
Offset 7.00ft RT
Surface Elev. 691.10 ft

Surface Water Elev. ____
Groundwater Elev.:
when drilling 687.6
at Completion 688.1
after 24 Hrs. 688.6

DEPTH	BLOWS	Qu tsf	W %
Black and dark gray ORGANIC CLAY, very moist A-7-6			
689.10	3 4 4	B 0.6 15%	36.2 30.6
Medium stiff brown and gray CLAY, very moist A-7-6			
688.10			
Medium dense brown and gray SAND and GRAVEL, saturated A-1	5 6 6		20.8
-5 685.60			
Medium dense gray SILTY LOAM, occasional silt seams, moist A-4	4 6 6	P 2.25	16.7
683.10			
Medium dense to dense gray GRAVEL, little sand, saturated A-1-a	8 13 16		6.0
-10 680.60			
	18 20 25		4.4
Dense gray GRAVEL, little sand, occasional Cobbles, saturated A-1-a	17 22 25		8.8
-15			
	15 25 22		6.4
	18 21 26		4.7
-20 670.60			
Very dense gray GRAVEL and COBBLES, saturated A-1-a	23 50/2"		2.2
668.10			
Dense gray fine to medium SAND, trace gravel, saturated A-1-b	15 17 19		10.4
666.10 -25			

DEPTH	BLOWS	Qu tsf	W %
Stiff gray CLAY LOAM, trace gravel, moist A-4/A-6	16 19 17	B 1.7 15%	12.0
663.10			
Very stiff gray SANDY LOAM, trace gravel, moist A-2-4/A-4	9 9 13	B 2.4 15%	8.4
-30 659.10			
Very hard brownish-gray CLAY LOAM and SANDY LOAM, trace gravel, damp A-4/A-6	11 16 19	S 4.6 10%	9.4
-35 654.10			
	8 12 12	B 5.7 15%	12.4
Sample 14: LL/PL/PI=24/13/11			
-40			
Hard to very hard brownish-gray CLAY LOAM, trace gravel, damp to moist A-6(5)	10 12 15	B 6.4 15%	9.8
-45			
642.10	12 18 25	B 4.6 15%	12.4 10.3
Dark brown and gray silty fine SAND, wet A-1-b			
-50			

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ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 3/12/04

Date Completed 3/12/04

STRUCTURE NO. 045-3166
ROUTE F.A.U. 361
SECTION 98-00214-02-BR
COUNTY Kane

STRUCTURE NO. 045-3166
ROUTE F.A.U. 361
SECTION 98-00214-02-BR
COUNTY Kane

Boring No. STFX-7
Station 575+13
Offset 7.00ft RT
Elevation 641.10 ft

Elevation 616.10 ft

DEPTH	BLOWS	Qu tsf	W %
Dark brown and gray silty fine SAND, wet A-1-b			
639.10			
Hard gray CLAY, trace gravel, damp A-6	11 13 13	B 5.9 15%	11.6
-55			
634.10			
Dark brown and gray fine to medium SAND, trace silt, saturated A-1-b	13 18 21		14.3
-60			
629.10			
	18 20 23	S 5.0 10%	10.9
-65			
Hard to very hard brownish-gray CLAY LOAM and SANDY LOAM, trace gravel, damp to moist A-4/A-6	13 19 25	B 8.7 15%	9.1
-70			
	26 30 35	B 8.9 15%	11.4 9.2
616.60 *** 616.10			
-75			

DEPTH	BLOWS	Qu tsf	W %
-80			
-85			
***74.5' - 75.0' Very dense gray silty SAND and GRAVEL, saturated A-1-a			
-90			
-95			
Mobile B-57 Ardco ATV Rig (#159) CME Automatic Hammer			
3.25" (83 mm) ID HSA			
End of Boring at 75.0'			
-100			

SPT. (N) = Sum of last two blow values in sample. (Qu) B=Bulge S=Shear P=Penetration Test
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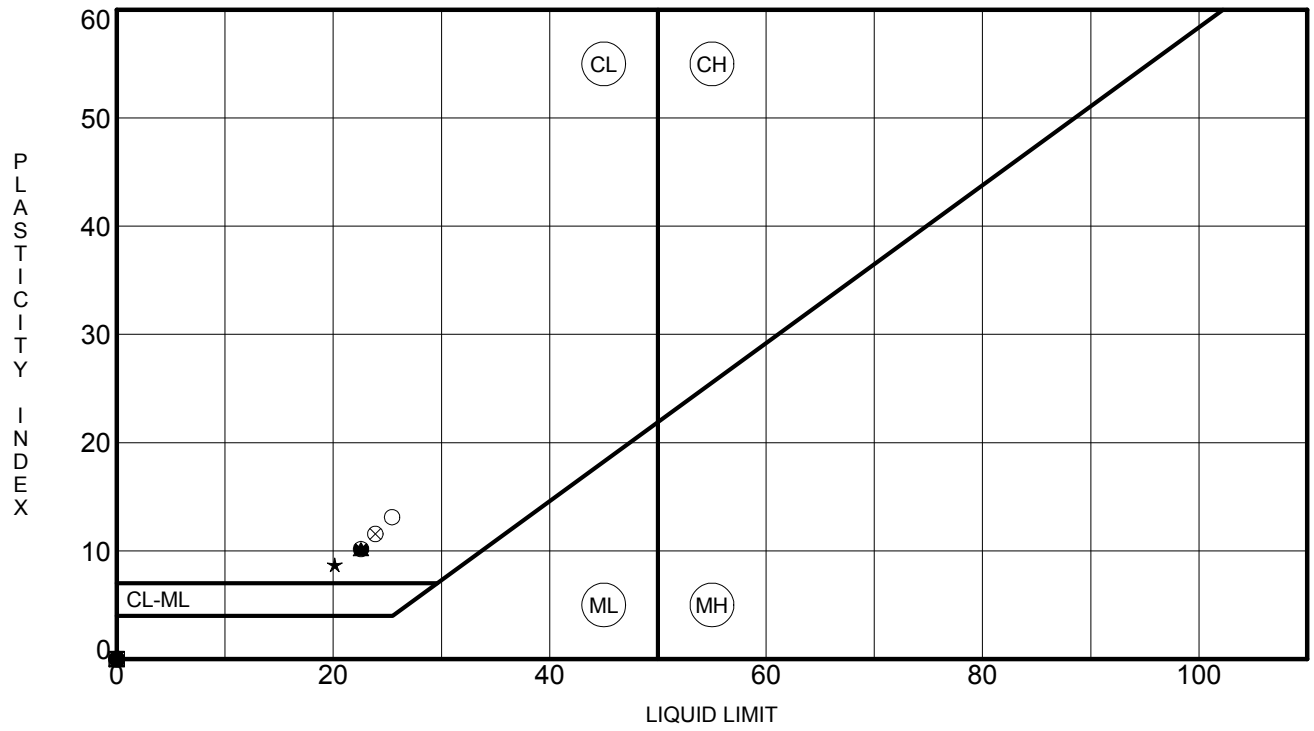
APPENDIX B



	Specimen Identification		LL	PL	PI	Fines	Classification
●	BP-1	33.5	NP	NP	NP	16	SILTY SAND with GRAVEL(SM)
⧓	BP-1	43.5	NP	NP	NP	5	POORLY GRADED SAND(SP)
▲	BP-1	68.5	23	12	11		
★	BP-1	78.5	20	11	9		
⊙	BP-2	11.0	NP	NP	NP	17	SILTY GRAVEL with SAND(GM)
✿	BP-2	48.5	NP	NP	NP	3	POORLY GRADED SAND(SP)
○	BP-2	63.5	25	12	13		
△	BP-3	23.5	NP	NP	NP	47	SILTY SAND(SM)
⊗	BP-3	66.0	24	12	12		
⊕	BP-4	43.5	NP	NP	NP	1	WELL-GRADED SAND(SW)
□	BP-4	61.0	NP	NP	NP	87	SILT(ML)
⊠	BP-4	68.5	23	12	11		

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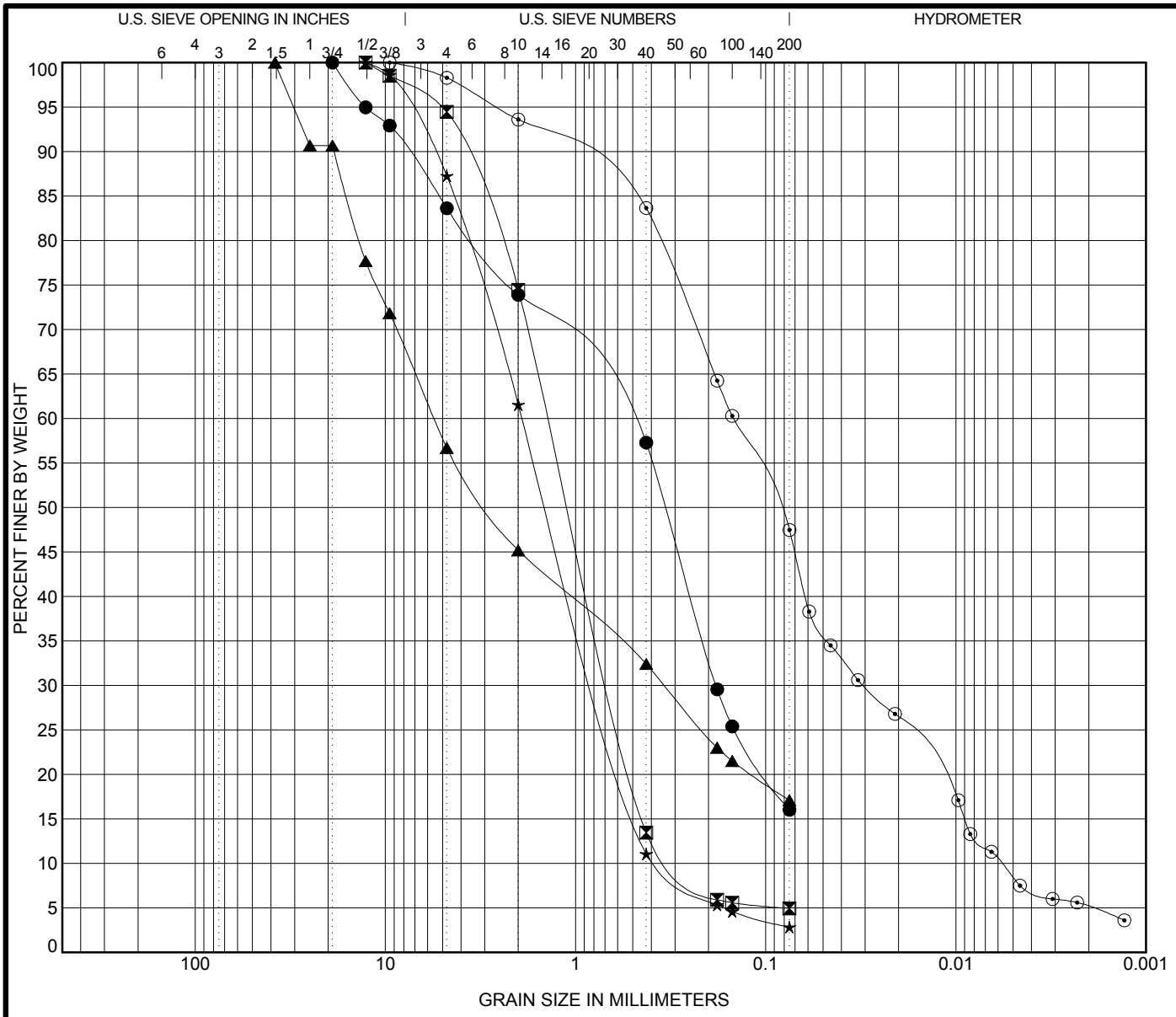
ATTERBERG LIMITS' RESULTS

Project: New Stearns Road over Fox River

Location: Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle

Number: 707-11-01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**BP-1**	**33.5**	**SILTY SAND with GRAVEL(SM)**	**NP**	**NP**	**NP**		
⊠	**BP-1**	**43.5**	**POORLY GRADED SAND(SP)**	**NP**	**NP**	**NP**	**1.05**	**4.82**
▲	**BP-2**	**11.0**	**SILTY GRAVEL with SAND(GM)**	**NP**	**NP**	**NP**		
★	**BP-2**	**48.5**	**POORLY GRADED SAND(SP)**	**NP**	**NP**	**NP**	**0.84**	**5.26**
⊙	**BP-3**	**23.5**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**	**1.09**	**25.57**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BP-1**	**33.5**	**19**	**0.547**	**0.182**		**16.4**	**67.6**	**16.0**	
⊠	**BP-1**	**43.5**	**12.7**	**1.386**	**0.647**	**0.287**	**5.6**	**89.5**	**4.9**	
▲	**BP-2**	**11.0**	**38.1**	**5.526**	**0.341**		**43.3**	**39.6**	**17.1**	
★	**BP-2**	**48.5**	**12.7**	**1.907**	**0.76**	**0.362**	**12.7**	**84.4**	**2.8**	
⊙	**BP-3**	**23.5**	**9.5**	**0.148**	**0.03**	**0.006**	**1.7**	**50.8**	**39.1**	**8.4**

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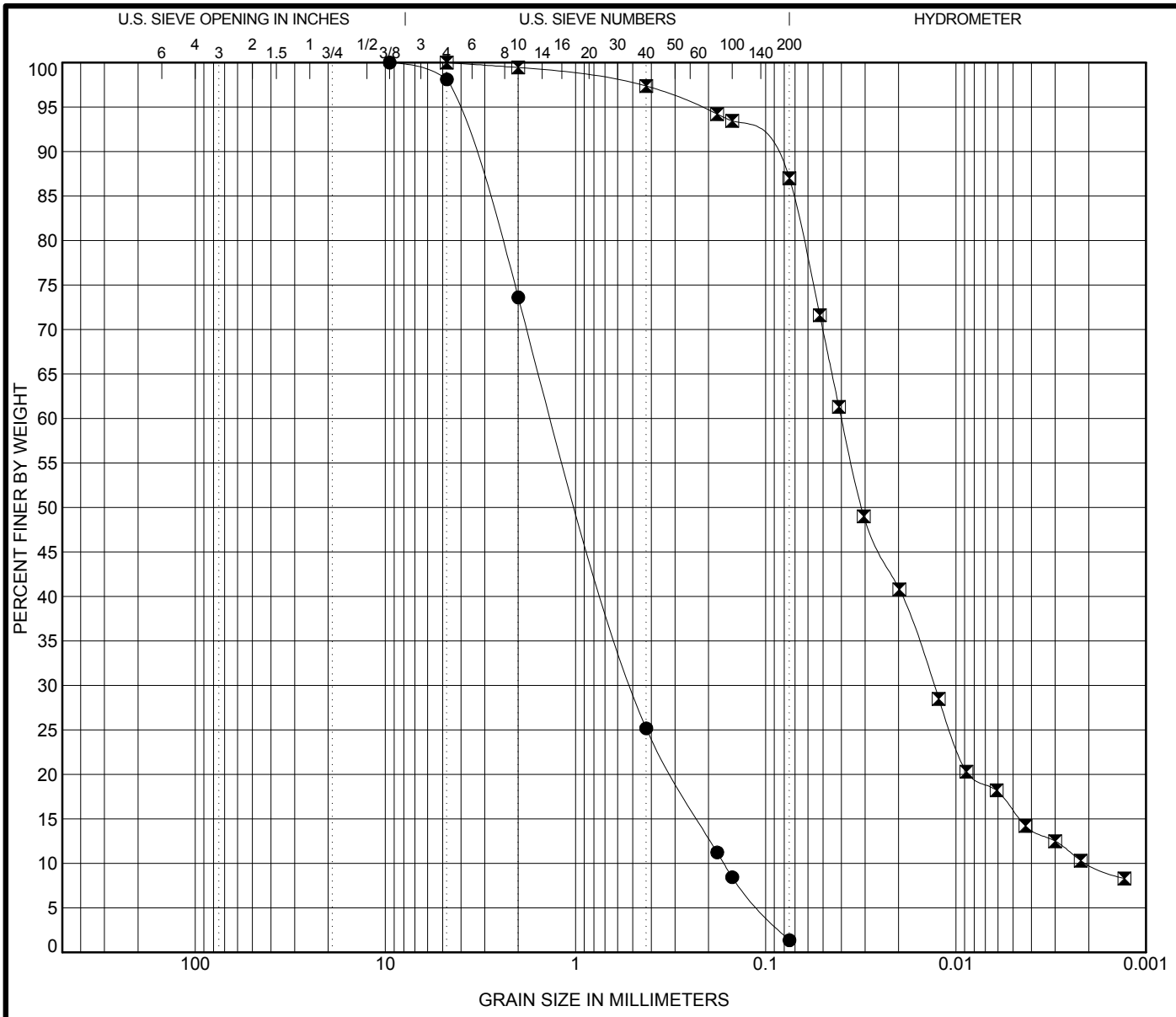
GRAIN SIZE DISTRIBUTION

Project: New Stearns Road over Fox River

Location: Sec. 2 and 3, T 40 N, R 8 E of Geneva Quadrangle

Number: 707-11-01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**BP-4**	**43.5**	**WELL-GRADED SAND(SW)**	**NP**	**NP**	**NP**	**1.14**	**7.79**
⊠	**BP-4**	**61.0**	**SILT(ML)**	**NP**	**NP**	**NP**	**2.09**	**19.63**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BP-4**	**43.5**	**9.5**	**1.294**	**0.496**	**0.166**	**1.9**	**96.7**	**1.4**	
⊠	**BP-4**	**61.0**	**4.75**	**0.04**	**0.013**	**0.002**	**0.0**	**13.0**	**71.1**	**15.9**

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