STRUCTURE GEOTECHNICAL REPORT
NEW STEARNS ROAD FOX RIVER BRIDGE
RETAINING WALL 1
FAP 361 SECTION 06-00214-20-BR
KANE COUNTY, ILLINOIS
KANE COUNTY PROJECT P-91-051-07

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: New Stearns Road Fox River Bridge Retaining Wall 1
IDOT SN: 045-3166, Kane County, Illinois
WEI No. 707-11-01

Dear Mr. Pellizzari:

Wang Engineering, Inc. is pleased to present the draft 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 retaining wall.

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.

for CF

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: 045-3166 (prop.) None (exist.) Contract Number: ____ Date: 9/11/2008

Route: New Stearns Road Section: 98-00214-02BR 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

Geotechnical Data, Subsurface Exploration and Testing	Yes	No	N/A
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

NEW STEARNS ROAD CONTRACT 4
FOX RIVER BRIDGE RETAINING WALL 1

FOR

BAKER ENGINEERING, INC.

1.0 INTRODUCTION

This report presents the results of subsurface investigation, laboratory testing, and geotechnical evaluation for the proposed retaining wall. Our geotechnical evaluation is based on the boring performed by Wang Engineering, Inc. (WEI) and review of the logs of the borings performed by Testing Service Corporation near the wall location. The project is located in the eastern part of Kane County. The Project and Site Location Maps are presented as Exhibits 1 and 2.

A separate 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.

Separate Structure Geotechnical Reports have been prepared by WEI for the Fox River Bridge, and Multi-Use Path Bridge and Ramp structures.

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 lanes in each direction separated by an 8- to 32-foot 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.

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 purpose pathway 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.

The geotechnical work for the portion of New Stearns Road between the east abutment of the Fox River Bridge and IL Route 25 was not in WEI's scope of work. It is WEI understanding that the earthwork (rough grading to the design grade) for this portion of the Stearns Road was completed by November 2007 and the embankment materials used was predominantly cohesive soil mixed with on-site granular soils.

3.0 EXISTING AND PROPOSED STRCUTURES

There is no existing retaining wall. A new retaining wall is required due to lack of right of way available for the embankment on the northeast side of the west abutment of the New Stearns Road Bridge over Fox River. Based on information provided by Baker, the proposed retaining wall length is 167 feet and its maximum total height is 25 feet. The proposed retaining wall location is shown in Exhibit 2.

4.0 PURPOSE AND SCOPE

The purpose of our geotechnical evaluation was to determine 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 investigation was as follows:

- To evaluate the subsurface soil and groundwater level conditions at the site that will influence the proposed construction;
- To evaluate the physical properties of the soils underlying the site from the laboratory test results that will influence foundation design and construction;
- To perform analyses and provide recommendations and data for the design and installation of suitable wall type or types, including external stability;
- 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

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 Exploration

WEI performed one structure boring on the existing Interchange Track (Trolley) embankment near center of the proposed wall alignment. Due to the slope of the embankment and wooded area, it was not feasible to drill boring at the proposed wall alignment location. WEI used a mapping-grade Trimble GeoXH GPS unit to locate the boring and survey the as-drilled boring location. Northing, Easting, and elevation data are included in the attached boring log. The logs of other borings performed by WEI and others in the vicinity are also included in Appendix A. A Boring Locations Plan and a Site Contour Plan are included as Exhibits 4 and 5, respectively.

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, "Penetration Test and Split Barrel Sampling of Soils." The soil was continuously sampled to the boring termination depth. Samples collected from each sampling interval were placed in sealed jars.

Field boring log, prepared and maintained by WEI geologist, included lithology descriptions, visual-manual classifications, Rimac or penetrometer unconfined compressive strength tests, and results of field standard penetration tests, recorded on the boring log as blows per 6 inches of split spoon penetration.

Groundwater levels were measured while drilling and at completion of boring. The borehole was backfilled with bentonite chips mixed with soil cuttings.

6.2 Laboratory Testing

Samples obtained in the field were transported to our in-house laboratory in Lombard, Illinois. The testing program included water content determination (AASHTO T 265). In addition, field visual classifications were verified in the laboratory. The results of the laboratory tests are summarized on the attached Boring Logs (Appendix A).

7.0 SUBSURFACE CONDITIONS

7.1 Subsurface and Groundwater Conditions

Detailed descriptions of the subsurface conditions encountered in the Boring RWB-1 are presented on the attached boring log (Appendix A). Please note that the strata contact lines shown on logs represent approximate boundaries between soil types. The actual transition between soil types in the field may be different in horizontal and vertical directions.

In general, Boring RWB-1 encountered fill soils, consisting of medium dense, brown sandy gravel to a depth of 15.5 feet bgs. The fill overlies natural granular soils consisting of medium dense, gravelly sand to sandy gravel to a depth of 26.5 feet bgs. Below the natural granular soils, a layer of brown and gray cohesive soils consisting of very stiff to hard silty clay to clay was encountered to a depth of 39.5 feet bgs. Below cohesive soils to boring termination depth layers of silt, clay loam and sandy loam were encountered.

Groundwater was observed during and after drilling at a depth of 26 feet and 29 feet bgs respectively. The long term groundwater level is not known. Groundwater levels will fluctuate seasonally and with Fox River level.

7.2 Seismic Considerations

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

Soil Profile Type: I
(According to AASHTO Standard Specifications for Highway Bridges)
Bedrock Acceleration Coefficient (A): 0.038g
(According to the AASHTO Seismic Acceleration Coefficient Map)

The Site Coefficient (S): 1.0
(Based on Soil Profile Type I)
Seismic Performance Category (SPC): A
(Based on the Bedrock Acceleration coefficient and the Importance Classification according to the AASHTO Standard Specifications for Highway Bridges)

7.4.2 Liquefaction Potential

Liquefaction analysis was performed using a Simplified Procedure originally developed by Seed and Idriss (1982) and revised in 1990. The minimum factors of safety range between 3.3 and 6.2 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

The proposed retaining wall is basically a fill wall. Based on cross sections provided by Baker to WEI, the proposed retaining wall will retain the northeast portion of the embankment at the west abutment of the Fox River Bridge. The slope of the embankment behind the wall will be 1V:2H. The possible wall types that could be considered are cast-in-place concrete cantilever wall, Mechanically Stabilized Earth (MSE) wall, soldier-pile wall and steel sheet pile wall with concrete facing. The particular wall should be selected based on the wall type study including cost analysis. It is our opinion that the MSE wall would be more appropriate considering feasibility, soil conditions, construction and the cost. Design considerations should include deflection control at the top of the wall particularly for steel sheet pile and soldier pile retaining walls. The following sections present the results of our analysis and recommendations for the retaining wall.

CAST-IN-PLACE CONCRETE CANTILEVER WALL

A conventional reinforced concrete retaining wall supported on spread footings can be considered. Based on the design cross sections at the retaining wall location, it appears that an additional open cut excavation into the existing embankment slope will not be required to construct the footing. It is likely that the footings will be established in the exiting granular fill material.

Bearing Capacity
The footings for the wall can be dimensioned using an allowable soil bearing pressure of 5,000 pounds per square foot (psf). The allowable bearing pressure includes a factor of safety of 3 against a bearing capacity failure. The footings should be sized to provide sufficient weight to resist sliding and overturning. The bottom of spread footings should be placed at a minimum depth of 4 feet below the final lowest adjacent grade for frost protection. In case of sloping embankment

in front of the wall, the outer edge of the footings should be at least 4 feet below the final grade at the outer edge.

Lateral Load Resistance

Lateral loads on walls may be resisted by the frictional resistance between the concrete footing and supporting soil. For the sliding, the ultimate value of friction resistance between the concrete and footing and supporting subgrade may be computed by using a coefficient of friction of 0.60. If the frictional resistance of the soil is inadequate to withstand the horizontal load, the footing size can be increased. Typically the resistance to sliding supplied by passive pressure is neglected.

Lateral Design Pressure

It is recommended that the wall should be designed for an active earth pressure of 40 psf and 72 psf per foot depth for embankment slope of horizontal and 1V:2H respectively considering drainable backfill. Design lateral pressure from surcharge loads due to construction equipments should be added to the lateral earth pressure load. A Geocomposite Wall Drain should be placed over the entire length of the back face of the wall and connected to the 6-inch diameter perforated drain pipe. The backfill material behind the retaining wall for a width of 2 feet should be free draining type Porous Granular Embankment (Special).

MSE WALL

The analyses and evaluations of the field and laboratory test data obtained from boring indicate that the construction of a MSE wall is feasible at the proposed retaining wall location. Based on the design cross sections along the retaining wall, it appears that very little open cut excavation will be required. The MSE retaining wall must have both internal and external stability and tolerable settlement. WEI analyzed the external stability with respect to bearing capacity, sliding, overturning, settlement, and global stability. The internal sliding resistance along the soil reinforcement and final sliding resistance analysis along the foundation soil, design of soil reinforcement including distribution etc. will have to be performed by the Contractor as part of the system design. The internal stability will be designed by the specialty vendor. A note should be shown on the contract plan indicating that soil reinforcement should be adjusted to avoid abutment foundation piles without cutting of soil reinforcement.

Bearing Capacity

Based on the soil conditions revealed by Boring RWB-1 the reinforced system should be designed considering a maximum allowable bearing pressure of 6,000 psf. The allowable bearing pressure includes a factor of safety of 2.5 against a bearing capacity failure. The bottom of the concrete leveling pad should be established at a depth of at least 4 feet below finished grade at the front face of the wall.

Sliding Resistance

The ultimate sliding resisting force can be calculated considering frictional resistance provided by the foundation soil with coefficient of friction of 0.60. The reinforced mass must be sufficiently wide at the base to resist sliding. Design lateral pressure from surcharge loads due to roadway and construction equipments should be added to the lateral earth pressure load. There is no need for a Geocomposite Wall Drain for a MSE wall system.

Our preliminary analysis indicates that for adequate protection against sliding at the MSE wall base, the reinforcement length should be 75 percent of the wall height as measured from the leveling pad. In our analysis, we ignored passive resistance. We recommend specifying the MSE wall base width (L) as a minimum of 0.75 times the height of the MSE wall between Stations 566+40 and 566+75. For rest of the wall portion, the base width (L) can be 0.70 times the total height but minimum of 8 feet. This should be reflected on the contract plans.

Vertical Pressure for External Stability

We performed a preliminary analysis to estimate the applied vertical stress at the base of the MSE wall, considering the following parameters and the MSE wall geometry shown on the roadway cross sections. AASHTO requires the width of the base to be at least 0.7 times the total height (H) of the MSE wall; however, we considered 0.75 times the total height.

Maximum total height of the wall, H = 25 feet
Unit weight of the retained fill (embankment) = 120 pcf
Unit weight of the reinforced soil mass = 130 pcf
Width of the base, L = 0.75 times H (L=18.8 feet)
Effective base width = 14.3 feet
Embankment slope behind the panels: 1V:2H
Internal friction angle for the retained soil (embankment) = 30 degree
Calculated equivalent uniform vertical pressure = 5,005 psf < 6,000 psf (allowable value)

Overturning/Eccentricity

The location of the reaction forces should be within the middle one-half of the base width. Our preliminary calculations indicate that the design considering base width of 18.8 feet would be adequate with regard to eccentricity. We recommend that the overturning should be checked for the final design dimensions.

GLOBAL SLOPE STABILITY ANALYSIS

Global stability evaluations were performed at the critical cross section for the cast-in-place concrete cantilever and MSE walls. According to the AASHTO Standard Specifications for Highway Bridges, 2000, a minimum safety factor of 1.3 for global stability analysis is required. A computer program, SLIDE Version 5.0, was used to calculate the factor of safety using the circular surface method. The analyses showed a factor of safety higher than the minimum required factor of safety against global stability. In our analysis we ignored stability provided by the existing Interchange Track embankment. The results of the global stability analyses are presented in Exhibits 6.

ESTIMATED SETTLEMENT

Mostly elastic (immediate) settlement of the soils will occur under the new gravity retaining wall. The total settlement is estimated to be on the order of 0.5 inch for the cantilever cast-in-place concrete and MSE walls. The immediate elastic settlement from the granular soils is expected to occur at the same rate as the construction. The MSE walls are more tolerant to deformation than the concrete cantilever walls.

STEEL SHEET PILE WALL

Steel Sheet Pile wall is mostly suited for a cut condition; however it could also be used for a fill condition. A cast-in-place concrete facing is normally provided with shear studs, however, the piles above the ground can be left exposed with concrete cap at the top. The soil parameters shown in Table 1 should be used for the design of the walls based on the soil conditions encountered in the boring. Since the wall is permanent, the soil strength parameters shown in Table 1 are for drained conditions and the effective stress method. The simplified earth pressure distributions shown in AASHTO Standard Specifications for Highway Bridges should be used. We recommend a linearly increasing lateral active earth pressure at 72 psf per foot of depth below the grade behind the wall considering 1V:2H slope retained embankment. The design of the steel sheet pile wall should ignore 3 feet of soil in front of the wall measured from the finished ground surface elevation in providing passive pressure due to excavation required for installation of concrete facing, drainage system and frost-heave condition. In developing the design lateral pressure, the lateral pressure due to construction equipment surcharge loads should be added to the lateral earth pressure. We recommend using granular backfill behind the wall.

The steel sheet pile wall will not require any excavation or dewatering. The steel sheet piles should be made of new material. The interlocks partially get clogged during driving and after installation due to fine soil particle migration. Full groundwater drainage through interlocks may not be possible for a permanent condition. We recommend that weep holes be provided or hydrostatic pressure be considered in the design. A Geocomposite Wall Drain should be placed over the interlocks and area of the weep holes. In place of weep holes, a Geocomposite Wall Drain could be connected to the 4-inch diameter perforated drain pipe. The backfill behind the wall for a width of 2 feet should be free drain Porous Granular Embankment (Special).

The maximum retained height of the wall is about 22 feet near the north end of the west abutment for an approximate wall length of 32 feet. For the wall height greater than approximately 15 feet, the lateral deflection may become unacceptable and the ground anchors may be required unless very high section steel sheet pilings are used. There may not be enough space for the ground anchors due to the west abutment foundation. The feasibility and economic analysis should be performed including availability of such piles before finalizing the design.

SOLDIER-PILE WALL

Soldier Pile wall is mostly suited for a cut condition; however it could also be used for a fill condition. The Soldier Pile and Lagging type of retaining wall (S-P Wall) is feasible. It will not be difficult to drive soldier piles in existing soils; however, piles will be limited to H-pile sections. Soldier piles installed in drilled shafts will provide more passive resistance and wider section can be used such as wide flange beam (W) section. However, the pre-drilling of soldier piles and providing temporary casing will be a significant cost component. The portion of the wall near the north end of the west abutment as discussed in the above section will require ground anchors, larger beam section or closely spaced soldier piles. The feasibility and economic analysis should be performed before finalizing the design.

The soil parameters shown in Table 1 should be used in the design of the wall based on the soil conditions encountered in the borings. Since the wall is permanent, the soil strength parameters shown in Table 1 are for drained conditions and the effective stress method. The simplified earth pressure distributions shown in the AASHTO Standard Specifications for Highway Bridges should be used. In developing the design lateral pressure, the lateral pressure due to construction equipment surcharge load should be added to the lateral earth pressure. We recommend using granular backfill behind the soldier-pile wall. The water pressure should be added to the earth pressure if a positive drainage is not provided. The timber lagging is temporary therefore; the contractor should be required to design the lagging. The plan should show minimum timber lagging thickness to be 3 inches. A Geocomposite Wall Drain should be placed over the timber lagging area in front face of the wall and connected to the 6 inch diameter perforated drain pipe.

9.0 CONSTRUCTION CONSIDERATIONS

9.1 Excavation

All vegetation, surface topsoil and debris should be cleared and stripped where retaining wall backfill, embankment, structural fills, and foundations are to be placed. The exposed subgrade should be proofrolled. To aid in locating unstable and unsuitable materials, the proofrolling should be observed by a qualified engineer. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill.

9.2 Dewatering

Based on the results of borings, serious groundwater problems are not anticipated during the construction. Perched water existing in the sand and silt layers will seep into the excavation in relatively small quantity which can be handled by the sump and pump method.

9.3 Filling and Backfilling

All fill and backfill materials should be pre-approved by the site engineer. The backfill material should be porous granular material free of organic materials and debris. Backfill material should be compacted in lifts no greater than 8 inches in loose thickness. Each layer should be compacted to a minimum 95 percent of the maximum dry density as determined by AASTHO T-99, Standard Proctor Method. In general IDOT Standard Specifications for Road and Bridge Construction should be followed.

9.4 Foundation Bearing Stratum

The in-place bearing stratum for the foundation should be checked to verify the in-situ condition. If the conditions deviate from those anticipated, the geotechnical engineer should be consulted to determine if additional measures are necessary. Prior to pouring foundation for the cast-in-place concrete wall or constructing reinforced soil mass for the MSE wall, all loose and soft material and water must be removed from the bottom of the foundation excavation. If soft cohesive soils are encountered at the bottom of the foundation excavations, the soft soils should be excavated and replaced with a controlled, compacted structural fill. If the loose granular soils are encountered, the subgrade should be thoroughly proofrolled in place or removed, replaced and recompacted. No softening of the subgrade should be allowed because of water accumulation at the bottom of the foundation excavations, particularly if construction is undertaken during periods of rain. The exposed foundation bearing subgrade may deteriorate upon exposure to the construction disturbance and water. Therefore, final excavation should be deferred until just before concreting. If delays in pouring of foundations are anticipated, the bottom of the foundation excavation should be protected by a thin layer of lean concrete for the CIP concrete wall.

9.5 Wall Construction

We recommend using the special provisions developed by IDOT for construction of MSE wall, steel sheet pile wall or soldier-pile wall, available at the IDOT web-site (http://www.dot.state.il.us/bridges/gbsp.html).

9.6 Construction Monitoring

There is no need for a special construction monitoring for the retaining walls except normally required by the IDOT Standard Specifications.

9.7 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Precautions should be taken by the contractor to prevent water erosion of the exposed foundation subgrade. A compacted subgrade will minimize water runoff erosion. Sands are sensitive to mechanical disturbance such as traffic and construction crew and will cause deterioration of exposed subgrade soils. Earthwork procedures should include provisions to minimize soil disturbance and exposure.

Earth moving operations should be scheduled not to coincide with excessive cold or wet weather (early spring, late fall or winter). Wet sand exposed to cold weather should be protected from freezing. Any soil allowed to freeze or soften due to the standing water should be removed from the subgrade. Wet weather can cause problems with subgrade compaction when the water contents exceed optimum.

It is recommended that an experience geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork operations and provide material inspection services during the construction phase of this project. WEI would be pleased to provide such services.

10.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the WEI boring. This report does not reflect any variations that may occur 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 retaining wall 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.
Project Manager/Senior Geotechnical Engineer

REFERENCES

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New Stearns Road Fox River Bridge Retaining Wall
IDOT SN: 045-3166
Kane County Division of Transportation
Baker Engineering, Inc. Project No. 113005, Wang Engineering, Inc. Project No. 707-11-01

Table 1

Soil Parameters for Long Term Condition
Soldier Pile and Steel Sheet Pile Wall Design

Soil Type	Unit Weight (pcf)	Friction Angle (degree)	Cohesion (psf)
Granular Fill	125	31	0
Medium Dense Granular Soils (N value between 10 & 30)	125	33	0
Very Stiff Cohesive Soils (Qu value between 2.0 & 4.0 tsf)	125	30	300
Hard Cohesive Soils (Qu value more than 4.5 tsf)	130	31	450

Reference: Soil Boring RWB-1

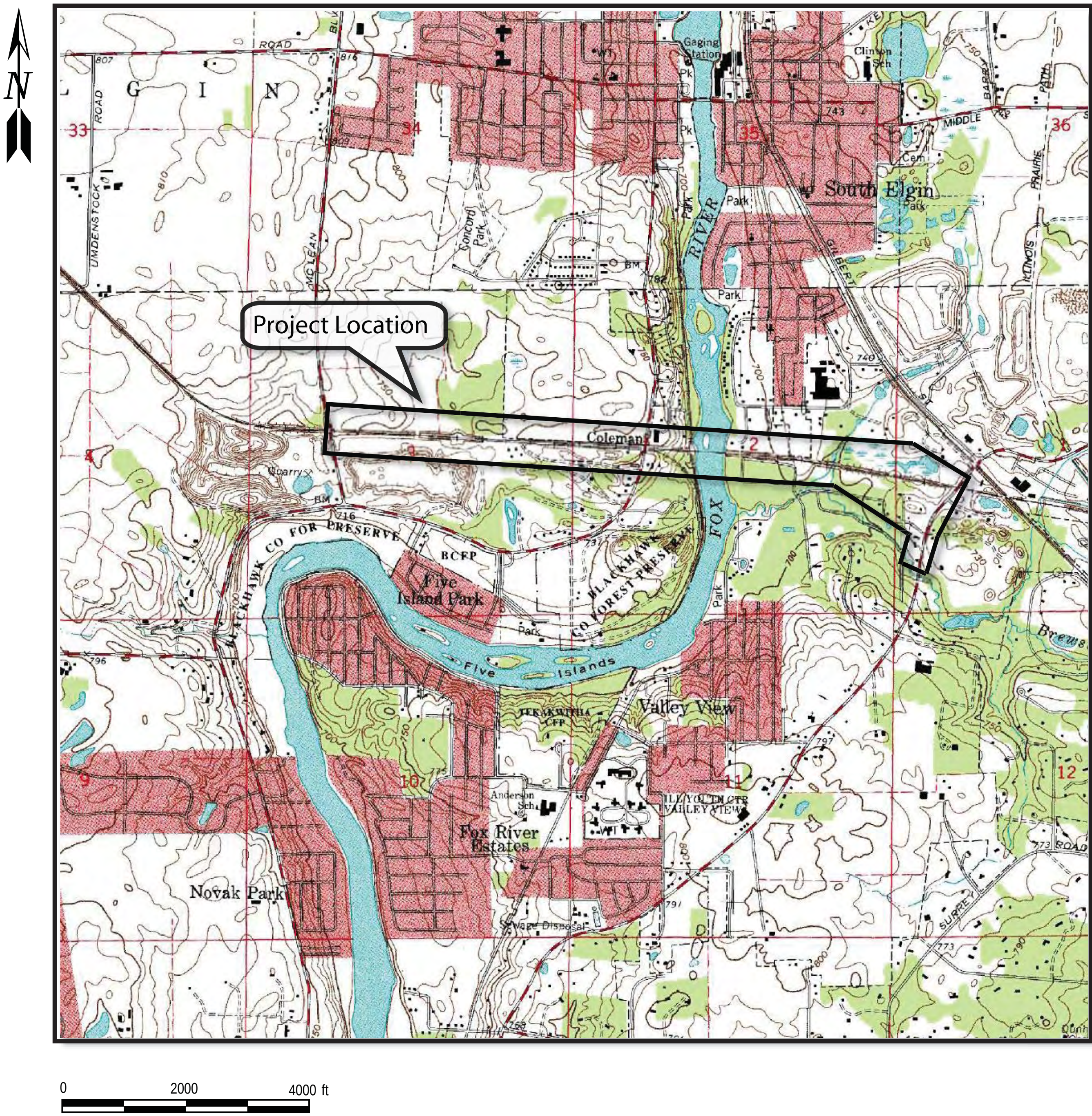
Granular Soils: Sandy Gravel, Gravelly Sand, Sandy Loam and Silt

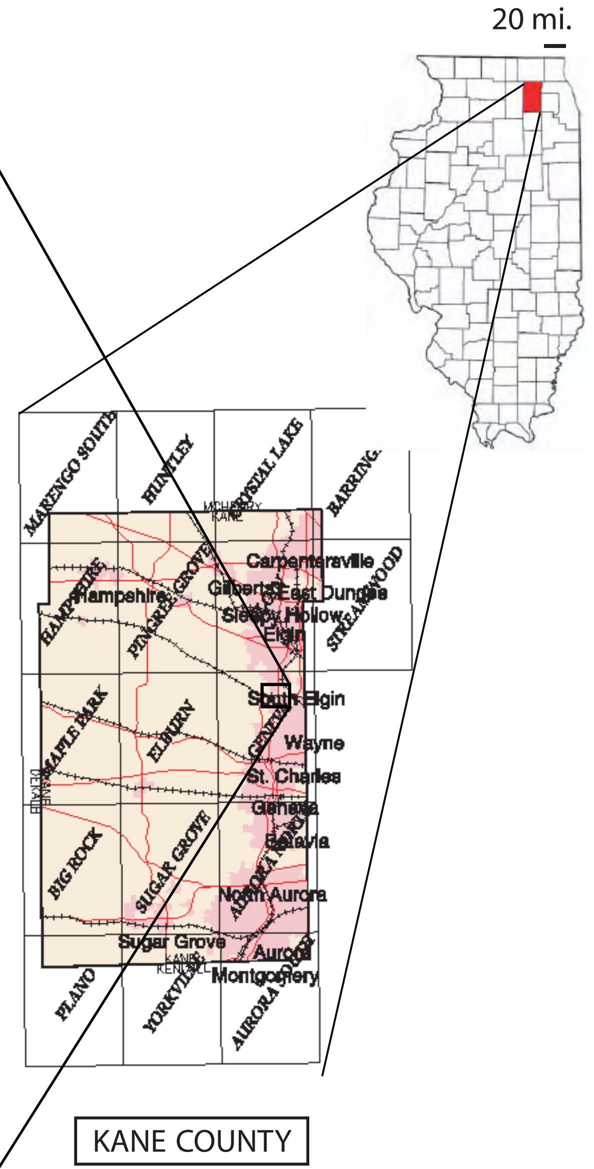
Cohesive Soils: Clay, Silty Clay and Clay Loam

N value is the sum of the second and the third SPT Values shown on the boring logs.

Qu value is shown on the boring logs and is the Unconfined Compressive Strength of the cohesive soil.

EXHIBITS





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

SCALE: SEE SCALE BAR

EXHIBIT 1

DRAWN BY: Y. SHIU
CHECKED BY:

Wang Engineering

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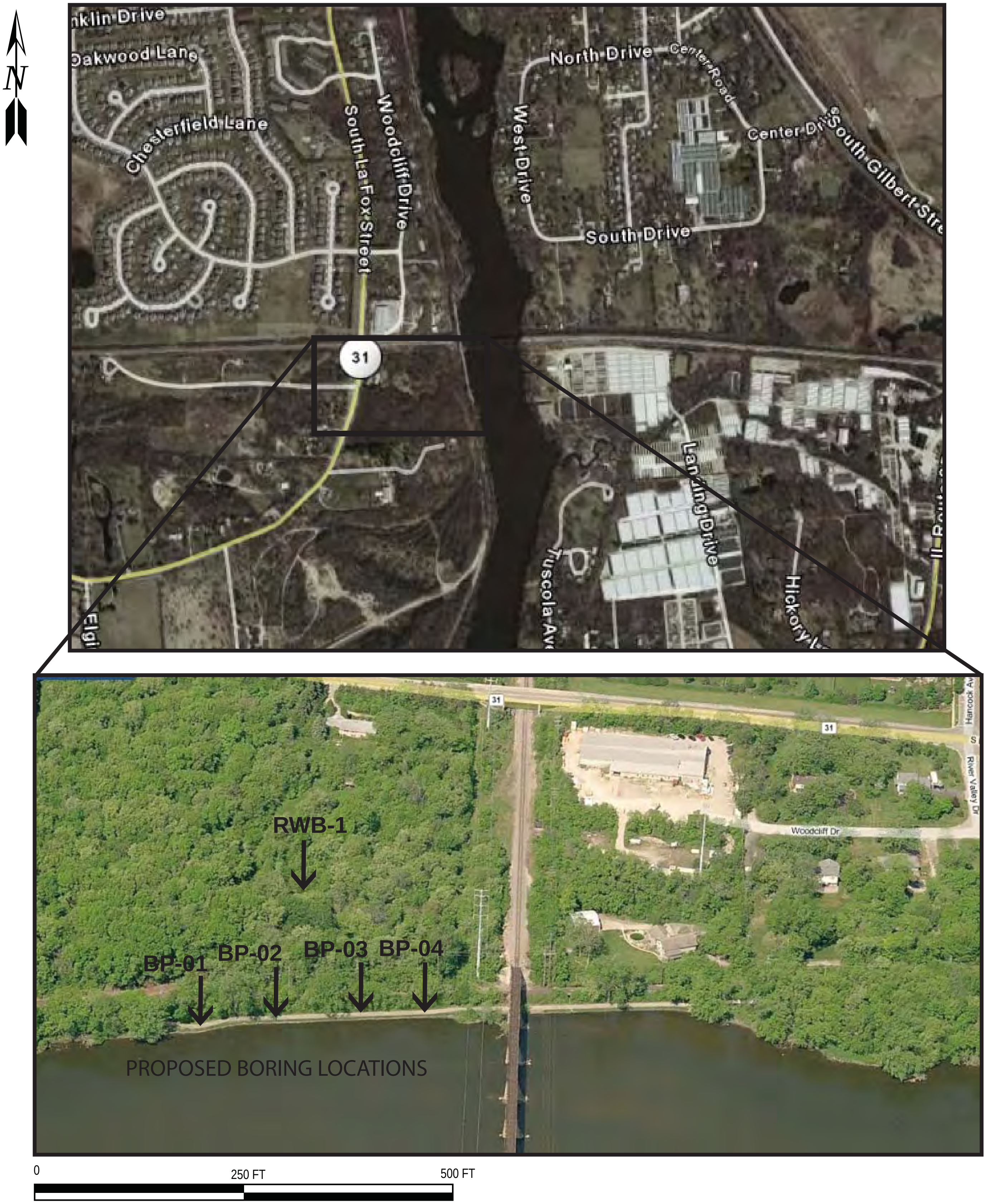
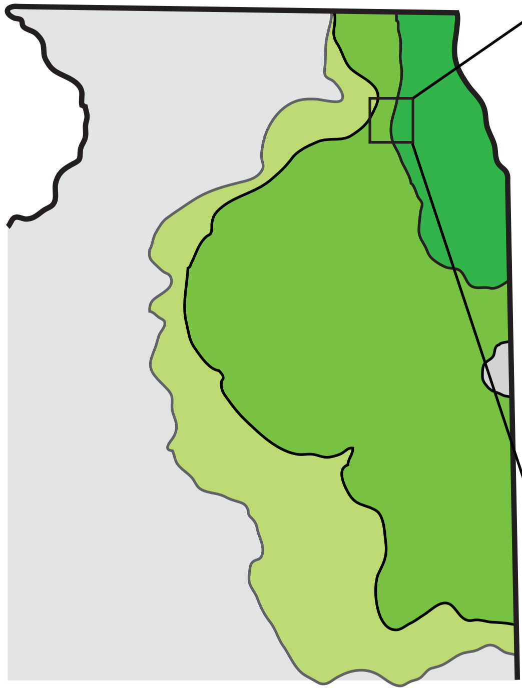
Lombard, IL 60148
www.wangeng.com

FOR BAKER ENGINEERING, INC.

707-11-01

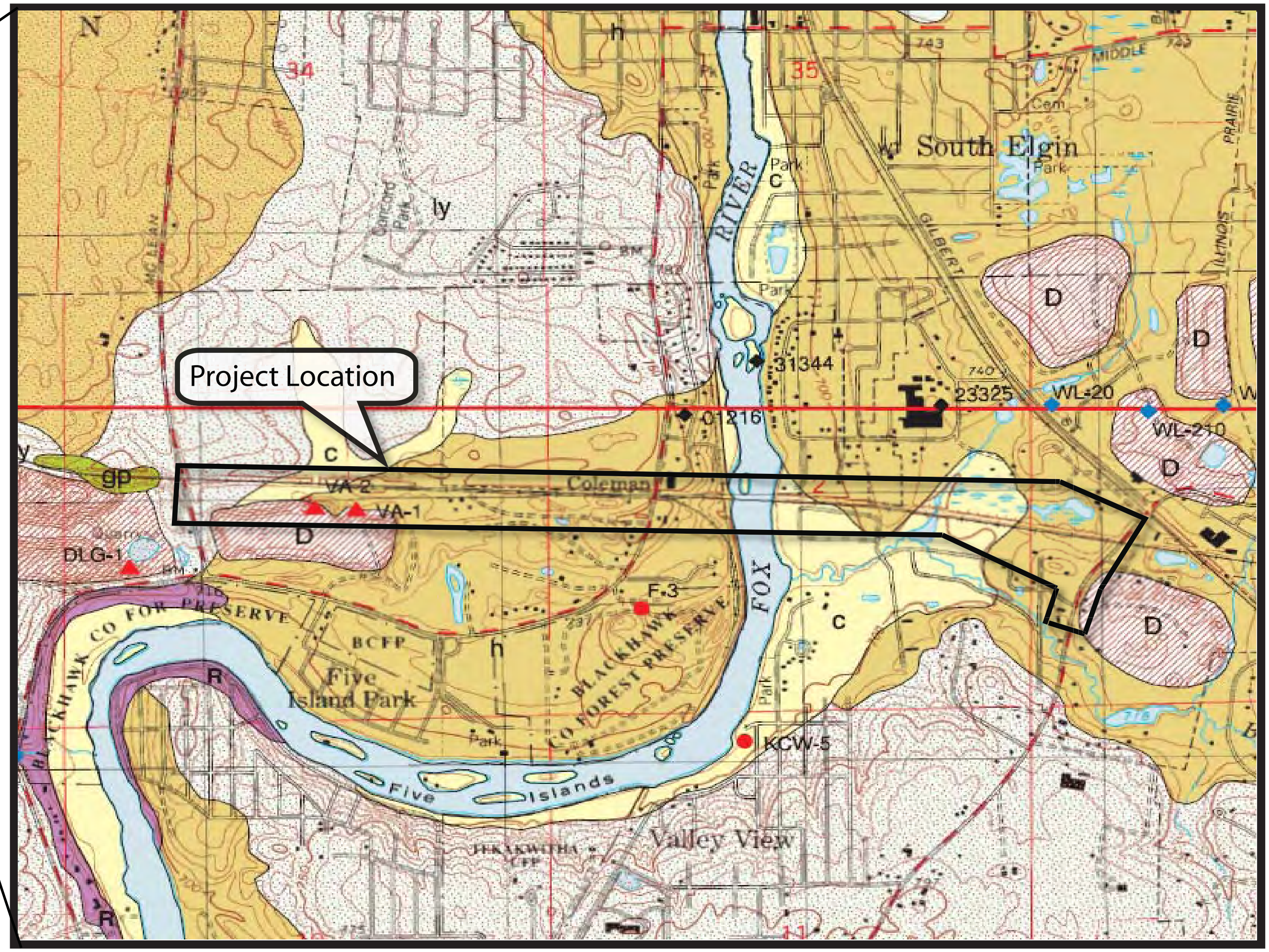


SITE LOCATION MAP: NEW STEARNS ROAD, FOX RIVER BRIDGE RETAINING WALL, KANE COUNTY, IL		
Scale: See Scale Bar	EXHIBIT 2	Drawn by: Nathan Davis
	Wang Engineering, INC. Geo-Environmental Engineers	1145 N Main Street Lombard, IL 60148 630 953-9928
FOR BAKER ENGINEERING, INC.		707-11-01



Modified after Hansel and Johnson (1996)

N



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

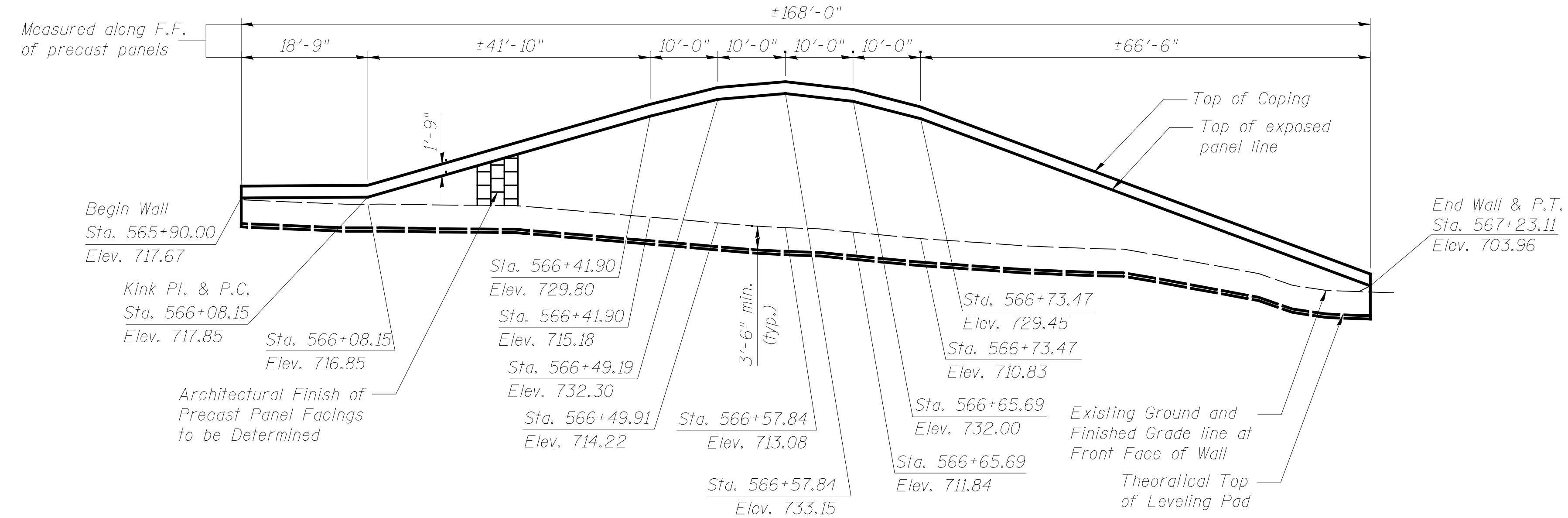
- R — Bedrock exposures or near surface exposures
- D — Disturbed Ground (spoil piles, gravel pits, quarries and landfills)

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

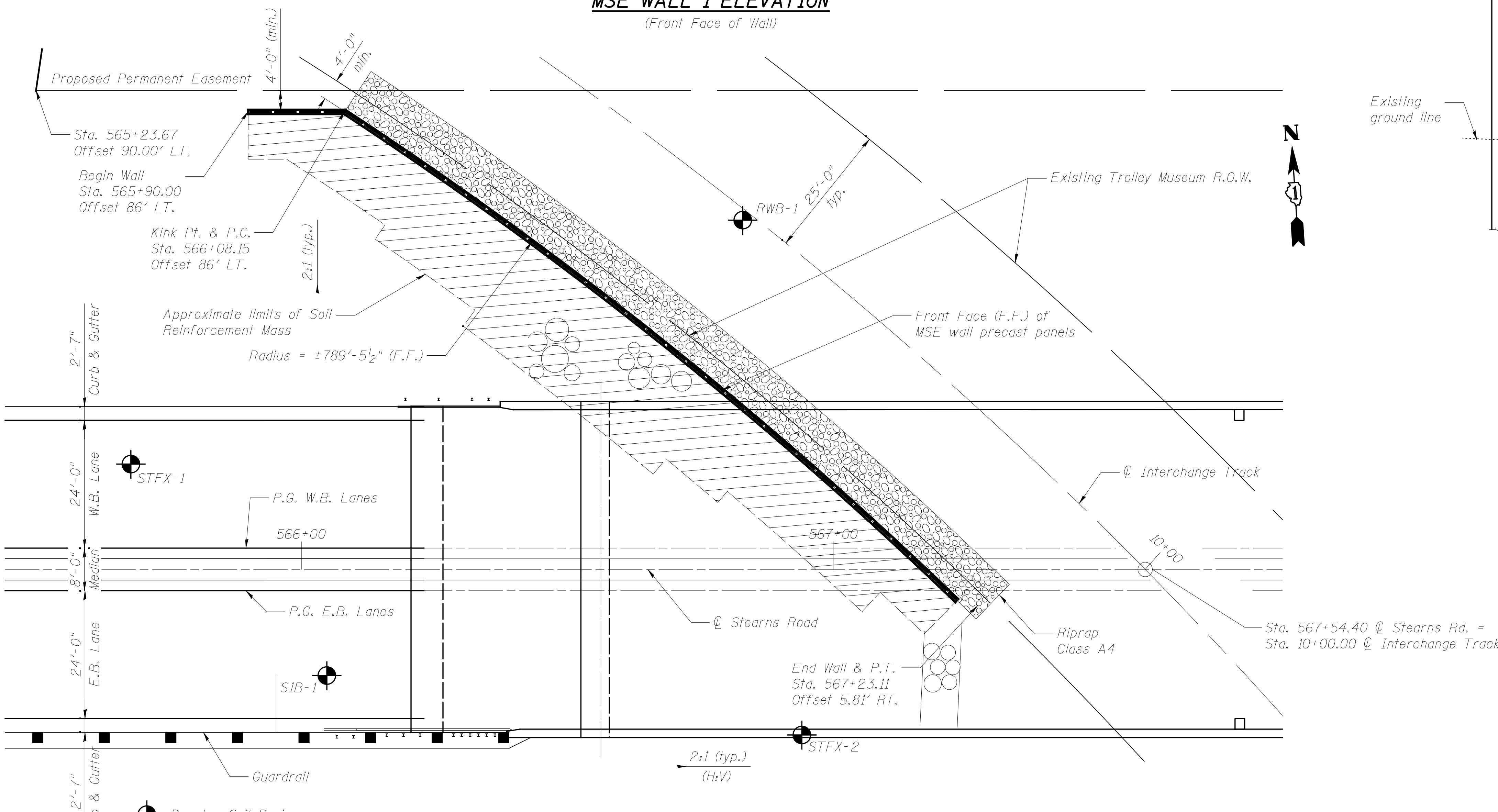
CONTRACT NO. 63075

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
361	06-00214-20-BR	KANE	5	4
STA. 511+00	TO STA. 609+00			
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

SHEET NO. S4 OF S5

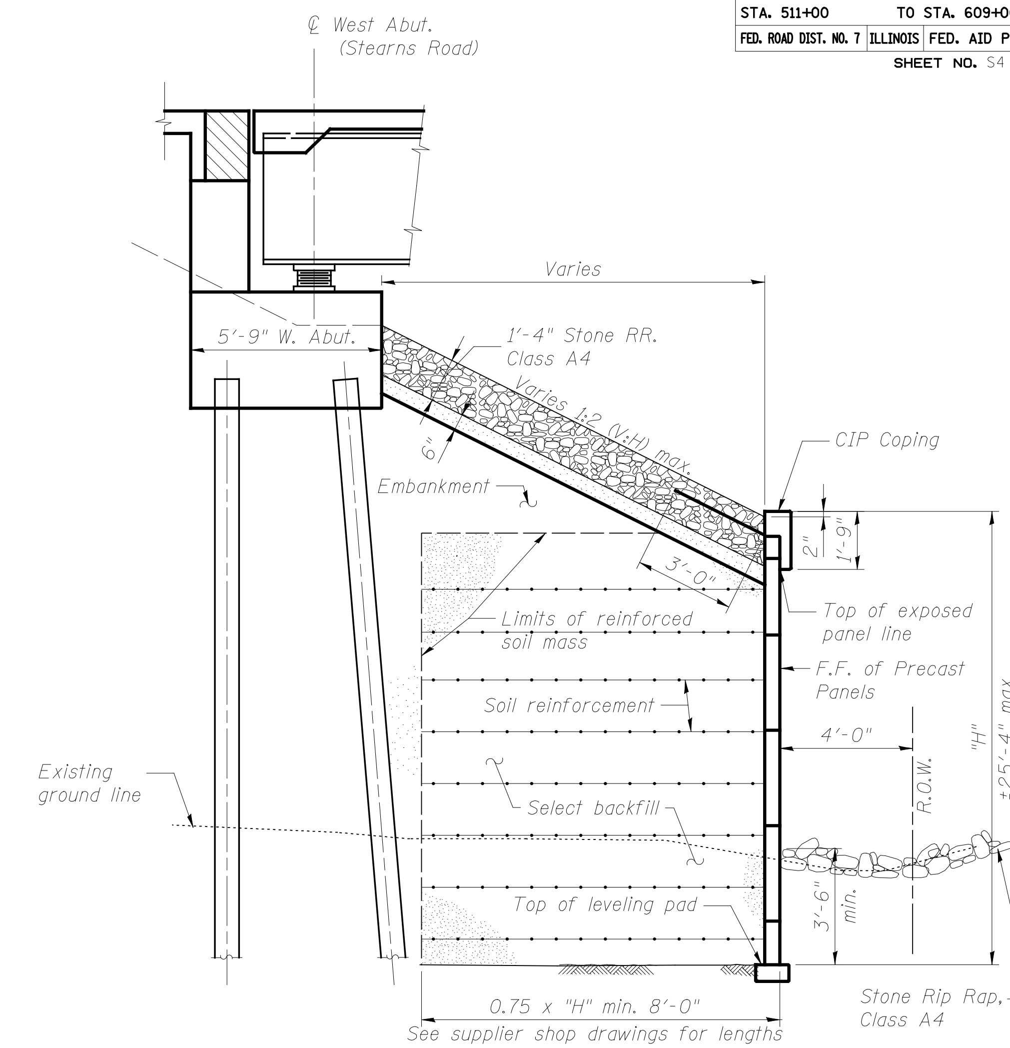


MSE WALL 1 ELEVATION
(Front Face of Wall)



Note:
Wall offsets are measured from the ℄ Stearns Road to the front face of precast panels.

MSE WALL 1 PLAN



WALL 1 CROSS SECTION

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 4 | Drawn By: S. Sugiarto Checked By: M. A. K.

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

REVISIONS NAME	DATE

ILLINOIS DEPARTMENT OF TRANSPORTATION

MSE WALL 1 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.

$$dgn$$
$$sytime$$

CONTRACT NO. 63075

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
361	06-00214-20-BR	KANE		
STA. 564+20	TO STA. 568+25			
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		
	SHEET NO.	OF		

Site Contour Map

Horizontal Scale:
Vertical Scale:

EXHIBIT 5

Drawn By: S. Sugiarto
Checked By: M. A. K.

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

REVISIONS	
NAME	DATE

Baker
Baker Engineering, Inc.

ILLINOIS DEPARTMENT OF TRANSPORTATION

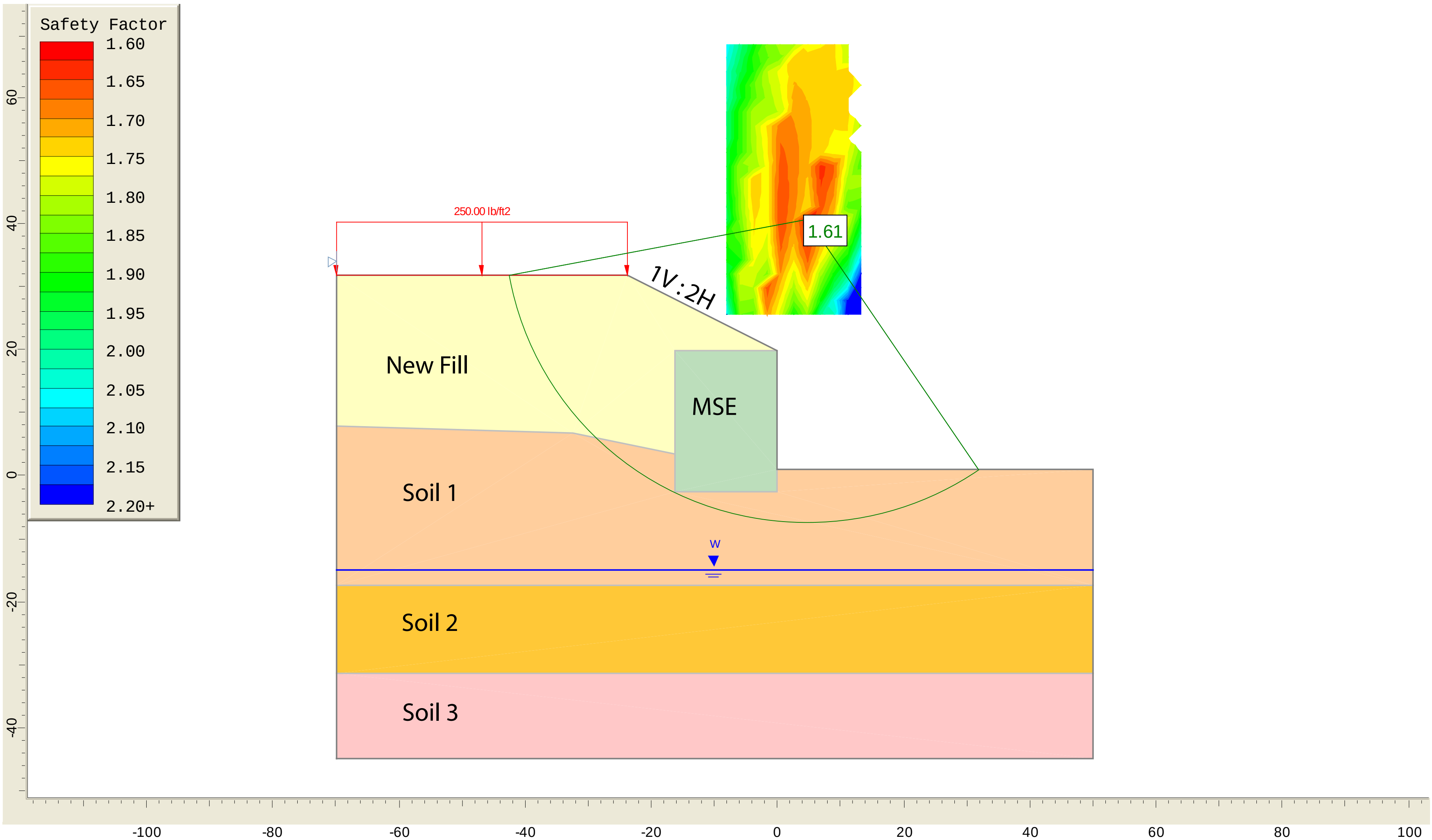
MSE WALL 1 GENERAL PLAN

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

$$dgn$$
$$sytime$$

LONG TERM GLOBAL STABILITY



SHORT TERM FOS = 2.03

Soil ID	Material	Unit Weight [pcf]	Short Term Parameter		Long Term Parameter	
			Cohesion [psf]	Friction Angle [deg.]	Cohesion [psf]	Friction Angle [deg.]
New Fill	Cohesive	120	1500	0	50	28
Soil 1	Granular	120	0	32.6	0	32.6
Soil 2	Cohesive	120	2750	0	135	30
Soil 3	Granular	115	0	31	0	31

SLOPE STABILITY ANALYSIS - COHESIVE FILL

SCALE: GRAPHIC

EXHIBIT 6-1

DRAWN BY: S. SUGIARTO
CHECKED BY: M. A. K.

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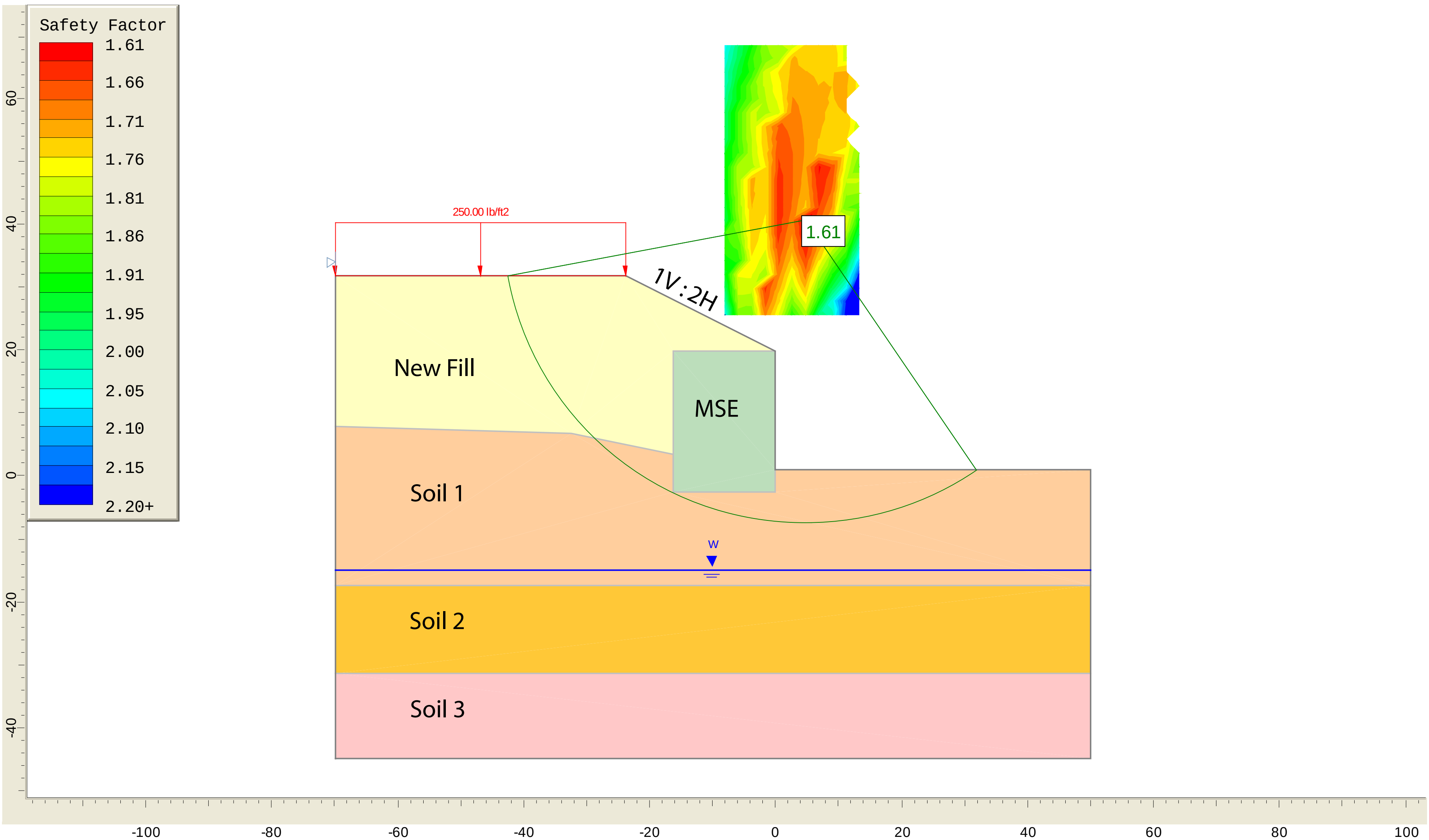
707-11-01

LONG/SHORT TERM GLOBAL STABILITY



Soil ID	Material	Unit Weight [pcf]	Short Term Parameter		Long Term Parameter	
			Cohesion [psf]	Friction Angle [deg.]	Cohesion [psf]	Friction Angle [deg.]
New Fill	Granular	120	0	30	0	30
Soil 1	Granular	120	0	32.6	0	32.6
Soil 2	Cohesive	120	2750	0	135	30
Soil 3	Granular	115	0	31	0	31

SLOPE STABILITY ANALYSIS - GRANULAR FILL

SCALE: GRAPHIC

EXHIBIT 6-2

DRAWN BY: S. SUGIARTO
CHECKED BY: M. A. K.

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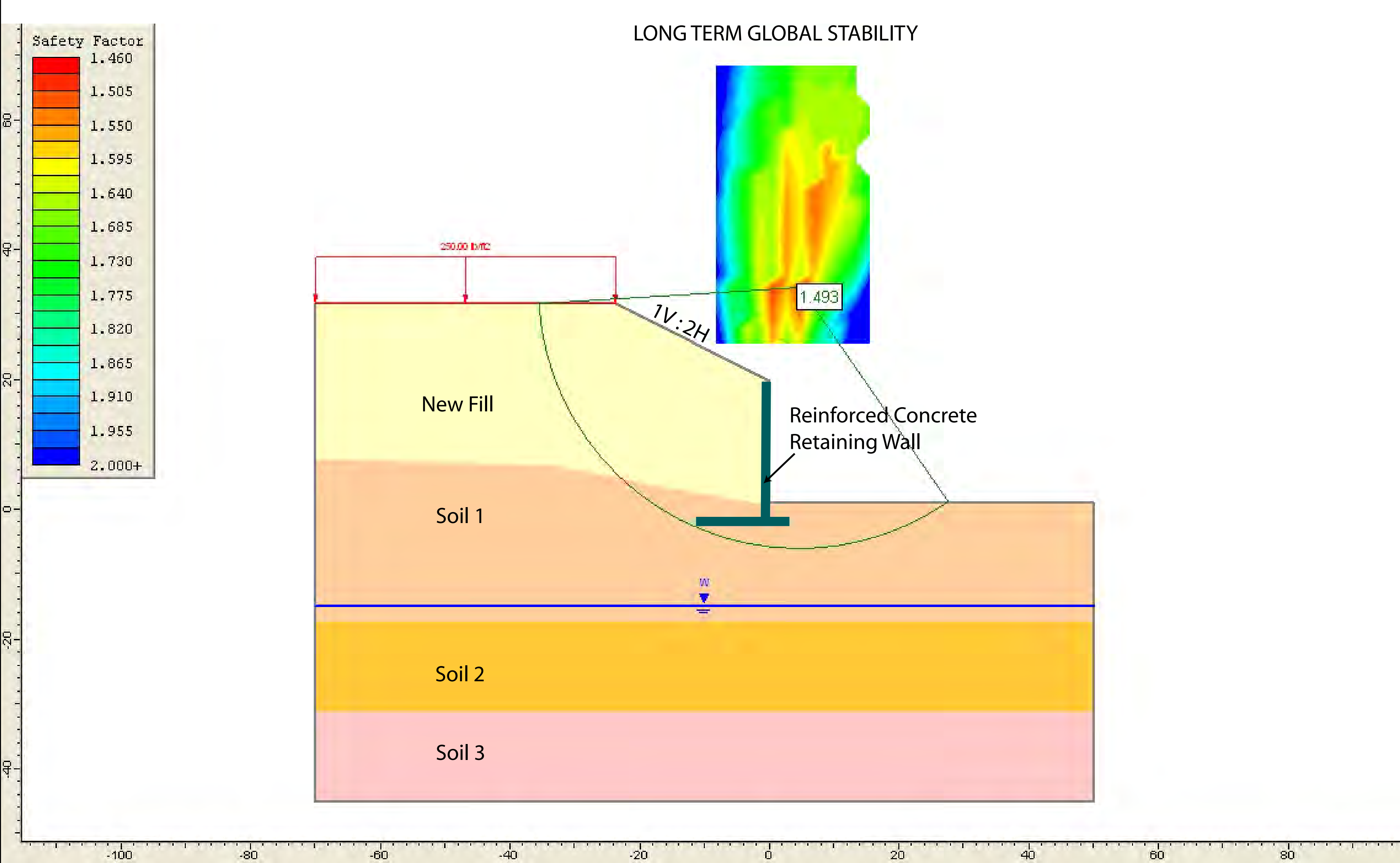

Short Term FOS = 1.954

Soil ID	Material	Unit Weight [pcf]	Short Term Parameter		Long Term Parameter	
			Cohesion [psf]	Friction Angle [deg.]	Cohesion [psf]	Friction Angle [deg.]
New Fill	Cohesive	120	1500	0	50	28
Soil 1	Granular	120	0	32.6	0	32.6
Soil 2	Cohesive	120	2750	0	135	30
Soil 3	Granular	115	0	31	0	31

SLOPE STABILITY ANALYSIS - COHESIVE FILL

SCALE: GRAPHIC

EXHIBIT 6-3

DRAWN BY: S. SUGIARTO
CHECKED BY: M. A. K.

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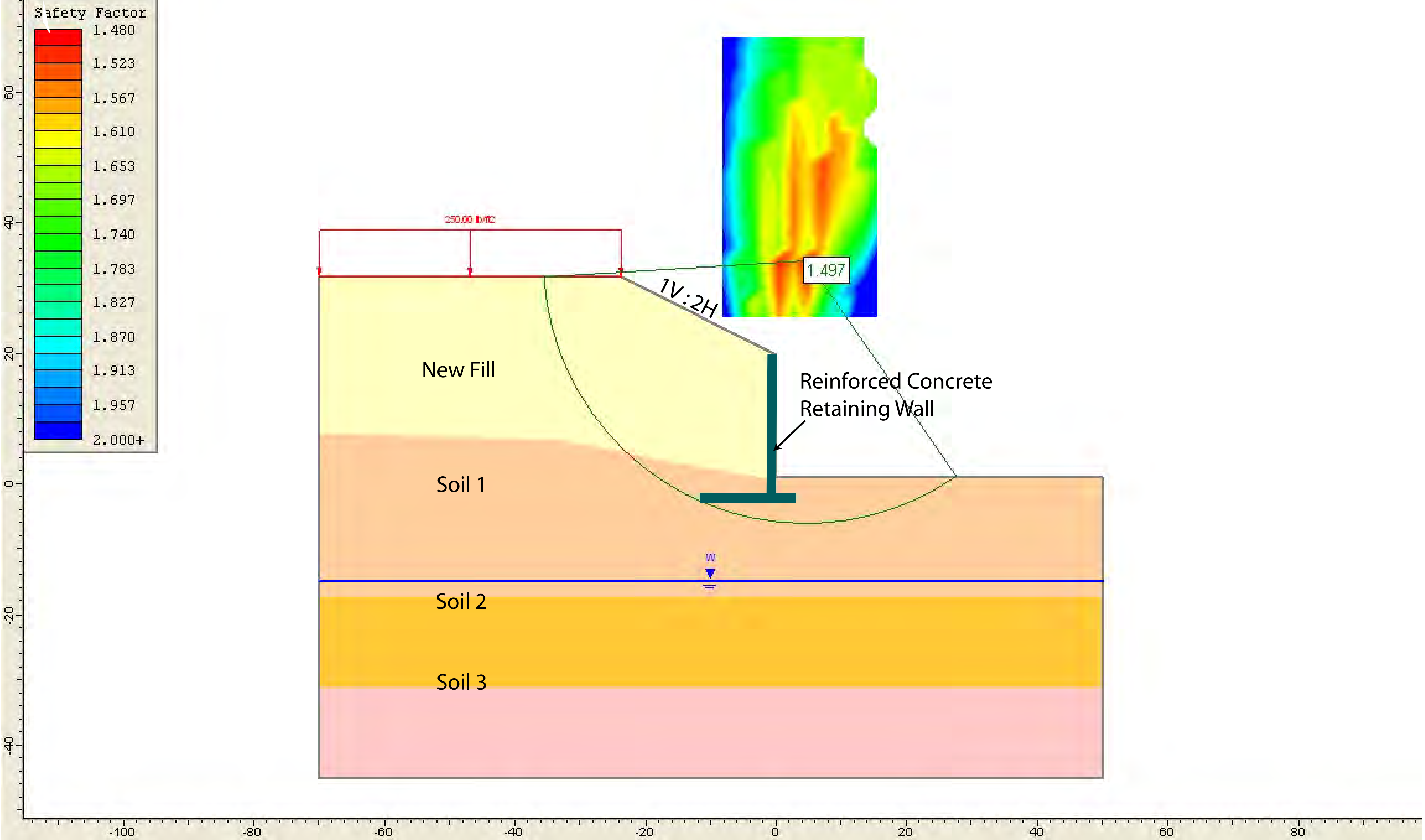
707-11-01

LONG/SHORT TERM GLOBAL STABILITY



Soil ID	Material	Unit Weight [pcf]	Short Term Parameter		Long Term Parameter	
			Cohesion [psf]	Friction Angle [deg.]	Cohesion [psf]	Friction Angle [deg.]
New Fill	Granular	120	0	30	0	30
Soil 1	Granular	120	0	32.6	0	32.6
Soil 2	Cohesive	120	2750	0	135	30
Soil 3	Granular	115	0	31	0	31

SLOPE STABILITY ANALYSIS - GRANULAR FILL

SCALE: GRAPHIC

EXHIBIT 6-4

DRAWN BY: S. SUGIARTO
CHECKED BY: M. A. K.

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FOR BAKER ENGINEERING, INC.

707-11-01

APPENDIX A

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

BORING LOG RWB-01

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: 720.50 ft
North: 1934568.90 ft
East: 994574.19 ft
Station:
Offset:

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
720.1	5-inch thick, brown SANDY LOAM --FILL--					
	Medium dense, brown GRAVELLY SAND --FILL--		1	3, 6, 6	NP	7
		5	2	8, 5, 5	NP	5
			3	4, 5, 5	NP	6
		10	4	8, 6, 5	NP	6
710.0	Medium dense, brown SANDY GRAVEL --FILL--		5	9, 12, 8	NP	2
		15	6	4, 6, 10	NP	4
705.0	Medium dense, brown GRAVELLY SAND		7	5, 7, 9	NP	4
		20	8	5, 8, 6	NP	4
			9	7, 9, 8	NP	4
		25	10	7, 7, 7	NP	9

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
695.0	Medium dense, brown SANDY GRAVEL					
694.0	Very stiff, brown and gray SILTY CLAY, trace gravel		11	6, 7, 9	2.75 P	13
		30	12	4, 7, 10	3.75 P	13
688.5	Very stiff to hard, gray CLAY					
		35	13	5, 8, 12	5.12 B	17
681.0	Medium dense, gray SILT	40	14	7, 9, 11	2.30 B	10
678.5	Medium dense, gray SANDY LOAM					
676.0	Medium stiff, brown CLAY LOAM	45	15	8, 8, 8	0.74 B	
673.5	Medium dense, gray SANDY LOAM					
670.5		50	16	10, 7, 10	NP	

GENERAL NOTES

Begin Drilling **08-14-2008** Complete Drilling **08-14-2008**
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 ▽ **26.00 ft**
At Completion of Drilling ▼ **29.00 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 RWB-01

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: 720.50 ft
North: 1934568.90 ft
East: 994574.19 ft
Station:
Offset:

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Boring terminated at 50.00 ft															
			55														
			60														
			65														
			70														
			75														

GENERAL NOTES

Begin Drilling **08-14-2008** Complete Drilling **08-14-2008**
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 ▽ **26.00 ft**
At Completion of Drilling ▼ **29.00 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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wangeng3@wangeng.com
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Lombard, IL 60148
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Fax: 630 953-9938

BORING LOG S1B-1

WEI Job No.: 707-11-01

Client: **Baker Engineering, Inc.**
Project: **New Stearns Road**
Location: **Elgin, Illinois**

Datum: NGVD
Elevation: 715.83 ft
North: 1934488.61 ft
East: 994504.83 ft
Station: 566+18
Offset: 18.0 RT

SOIL AND ROCK DESCRIPTION

Elevation (ft)	Soil and Rock Description	Depth (ft)
	14-inch thick black SILTY LOAM --TOPSOIL--	
714.7	Hard, brown SANDY CLAY	
714.3	Medium dense, brown GRAVELLY SAND to SANDY GRAVEL	
699.6	Stiff to very stiff, gray CLAY, with gravel	
690.9	Medium dense, brown to gray, fine SAND, little gravel	25
683.6	Soft to medium stiff, brown CLAY LOAM	
673.3	Medium dense to dense, gray GRAVELLY SAND	

Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
1	7, 13, 12	NP	32
2	6, 6, 10	NP	2
3	3, 6, 8	NP	4
4	4, 6, 8	NP	3
5	4, 6, 11	NP	5
6	6, 9, 11	NP	3
7	5, 7, 12	1.39 B	13
8	5, 8, 10	2.95 B	13
9	7, 11, 13	3.94 B	17
10	5, 7, 11	1.64 B	21
11	5, 6, 7	NP	10
12	7, 9, 7	NP B	13
13	3, 4, 5	0.82 B	12
14	3, 5, 5	0.33 B	10
15	10, 12, 13	NP	13
16	15, 22, 28	NP	7

GENERAL NOTES

Begin Drilling: **12-13-2007** Complete Drilling: **12-13-2007**
Drilling Contractor: **TSC** Drill Rig: **CME-55 ATV**
Driller: **F & C** Logger: **J. Kasnick** Checked by: **E. Datz**
Drilling Method: **3.25"ID HSA**

WATER LEVEL DATA

While Drilling: **26.66 ft**
At Completion of Drilling: **N/A**
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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Fax: 630 953-9938

BORING LOG S1B-1

WEI Job No.: 707-11-01

Client **Baker Engineering, Inc.**
Project **New Stearns Road**
Location **Elgin, Illinois**

Datum: NGVD
Elevation: 715.83 ft
North: 1934488.61 ft
East: 994504.83 ft
Station: 566+18
Offset: 18.0 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
663.8	Dense to very dense, gray coarse SAND					
		55	17	36 26 21	NP	11
		60	18	36 73 25	NP	11
653.3	Medium dense to very dense, GRAVELLY SAND					
		65	19	11 8 17	NP	8
		70	20	42 50/5	NP	7
		75	21	100/6	NP	9
638.8	Hard, brown CLAY LOAM					
635.8		80	22	10 16 25	8.36 B	12
	Boring terminated at 80.00 ft					

GENERAL NOTES

Begin Drilling **12-13-2007** Complete Drilling **12-13-2007**
Drilling Contractor **TSC** Drill Rig **CME-55 ATV**
Driller **F & C** Logger **J. Kasnick** Checked by **E. Datz**
Drilling Method **3.25"ID HSA**

WATER LEVEL DATA

While Drilling **26.66 ft**
At Completion of Drilling **N/A**
Time After Drilling **NA**
Depth to Water **NA**

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

ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/16/04
Date Completed 8/16/04

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-60,393

COUNTY Kane LOCATION North End West Abutment S. 2 - SW 1/4 , TWP. 40 N , RNG. 8 E

Boring No. STFX-1
Station 565+68
Offset 20.00ft LT
Surface Elev. 724.07 ft

Surface Water Elev. ______
Groundwater Elev.:
when drilling 671.1
at Completion Cave at 42.0'
after ____ Hrs. ______

		Depth	Blows	Qu tsf	W %
Black clayey Topsoil	723.77				
Hard brown CLAY, damp to moist A-6			3 4 6	P 4.5	17.9
			4 7 7	P 4.5	17.8
	718.57	-5			
Medium dense brown SILTY LOAM, damp A-4			4 7 10		12.4
	716.07				
Hard brown CLAY, moist A-6	714.57		12 16 9	B 6.6 15%	14.5 / 3.6
		-10			
Medium dense to dense brown SAND and GRAVEL, occasional Cobbles, damp A-1-a			5 9 10		4.1
			20 26 13		3.3
		-15			
			4 7 6		3.4
	706.07				
Medium dense brown SAND, trace gravel, damp A-1-b			9 7 6		3.8
		-20			
	703.57				
Medium dense brown SAND and GRAVEL, damp A-1			5 9 13		3.4
			7 9 10		4.3
	699.07	-25			

		Depth	Blows	Qu tsf	W %
Dense brown SAND and GRAVEL, occasional Cobbles, damp A-1-a			12 20 24		3.8
			22 19 4	B 6.2 15%	6.5 / 13.9
	694.57	-30			
Hard brownish-gray CLAY, moist A-6	692.07				
Very stiff gray CLAY, trace gravel, moist A-6			8 8 15	B 3.9 15%	18.7
		-35			
			9 12 14	B 3.5 15%	16.6
		-40			
	682.07				
Medium dense gray sandy SILT, damp A-4			8 10 13		11.3
		-45			
	677.07				
Stiff gray CLAY LOAM, trace gravel, moist A-4/A-6			10 9 20	B 1.8 15%	9.0
		-50			

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Stations, Depths, Offset, and Elevations are in Feet

ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/16/04

Date Completed 8/16/04

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-1
Station 565+68
Offset 20.00ft LT

Elevation 674.07 ft

Description	DEPTH	BLOWS	Qu tsf	W %
Stiff gray CLAY LOAM, trace gravel, moist A-4/A-6				
672.07				
	-55	30 37 17		8.8
	-60	20 10 12		10.7
Medium dense to dense gray SAND and GRAVEL, saturated A-1-a				
	-65	9 19 29		5.7
	-70	12 19 19		6.0
652.07				
Hard gray CLAY, trace gravel, moist A-6	-75	4 15 19	B 5.2 15%	12.1

Elevation 649.07 ft

Description	DEPTH	BLOWS	Qu tsf	W %
Hard gray CLAY, trace gravel, moist A-6				
644.07	-80	18 26 33	B 7.0 15%	11.9
End of Boring at 80.0' CME 850 Track ATV Drill Rig (#127) CME Automatic Hammer 3.25" (83 mm) ID HSA				
	-85			
	-90			
	-95			
	-100			

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ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/13/04
Date Completed 8/13/04

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-60,393

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

Boring No.	STFX-2
Station	566+94
Offset	31.00ft RT
Surface Elev.	706.06 ft
Surface Water Elev.	
Groundwater Elev.: when drilling	685.1
at Completion	690.1
after ___ Hrs.	

Description	Bottom Elev.	DEPTH	BLOWS	Qu tsf	W %
Black clayey Topsoil	705.56				
Medium dense brown SAND and GRAVEL, damp A-1-a (possible fill)			4 10 16		3.9
		-5	6 7 10		3.8
	699.06		8 8 8	S 4.7 10%	4.4 14.1
Hard brown and gray CLAY, trace gravel, moist A-6		-10	17 11 17	B 8.7 15%	16.4
	692.56		12 14 15	B 8.0 15%	13.6
Very stiff gray SANDY LOAM, trace gravel, moist A-4/A-6	690.56	-15	6 4 7	P 2.25	15.2
Medium dense gray SAND, some gravel, moist A-1-b	689.56		5 6 6		9.3 9.6
Loose to medium dense gray fine to medium SAND, little gravel, saturated A-1-b		-20	4 5 4		8.7
	683.56		6 6 5		12.5
Loose brownish-gray SANDY LOAM, trace gravel, very moist A-2-4	681.06	-25	2 2 3	B 0.5 15%	12.8
Medium dense brown SAND, some gravel, saturated A-1-b	678.06		7 9 11		10.8
Medium dense gray SAND and GRAVEL, saturated A-1-a	674.06	-30	5 6 8		6.8
Stiff brown and gray CLAY LOAM, trace gravel, moist A-4	669.06	-35	6 9 10	B 1.3 15%	12.0
Medium dense to dense gray fine to medium SAND, saturated A-3		-40	8 10 12		19.4
	659.06	-45	9 15 20		20.2
Dense gray SAND and GRAVEL, occasional Cobbles, (rock fragments recovered), saturated A-1-a	656.06	-50	10 19 20		9.0

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ILLINOIS DEPARTMENT OF TRANSPORTATION
Testing Service Corporation
STRUCTURE BORING LOG

Date Started 8/13/04
Date Completed 8/13/04

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-2
Station 566+94
Offset 31.00ft RT
Elevation 656.06 ft

Description	DEPTH	BLOWS	Qu tsf	W %
Dense gray SAND and GRAVEL, occasional Cobbles, saturated A-1-a (653.06)				
Very dense Cobbles and Boulders, some sand and gravel, saturated A-1-a (649.06)	-55	100/6"		7.7
Dense to very dense gray SAND and GRAVEL, occasional Cobbles, saturated A-1-a	-60	21 22 30		5.4
	-65	53 50 38		10.1
	-70	100/6"		9.0
	-75	60 50/4"		8.6

Elevation 631.06 ft

Description	DEPTH	BLOWS	Qu tsf	W %
Very dense gray SAND and GRAVEL, occasional Cobbles, saturated A-1-a (629.06)				
Hard brown and gray CLAY LOAM, trace gravel, moist A-6 (626.06)	-80	16 42 50	P 4.5	10.2
End of Boring at 80.0'	-85			
CME 850 Track ATV Drill Rig (#127)	-90			
CME Automatic Hammer	-95			
3.25" (83 mm) ID HSA	-100			

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