Roadway Geotechnical Report

Proposed IL Route 72 Intersection Reconstruction
IL Route 72 and State Street
Hampshire, Kane County, IL 60140

Prepared for:

Illinois Department of Transportation

IDOT PTB 187-005
Contract: P-91-557-11

Project Design Engineer:
Lochmueller Group

Prepared by:

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June 19, 2020

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June 19, 2020

Ms. Elizabeth S. Witt, P.E.
Project Engineer - Associate
Lochmueller Group
1928 SRA Bradley R. Smith Drive
Troy, IL 62294

Subgrade Evaluation Geotechnical Report
Proposed IL Route 72 Intersection Reconstruction
IDOT PTB 187-005
Contract: P-91-557-11
Hampshire, Kane County, IL

Dear Ms. Witt:

Attached is a copy of the Geotechnical Subsurface Investigation for the above referenced project. The report provides a brief description of the site investigation, site conditions, and geotechnical recommendations for the proposed reconstruction. The site investigation included advancing twelve (12) soil borings to depths of 10 to 25 feet.

Should you have any questions or require additional information, please call us at 630-994-2600.

Sincerely,

Thomas E. Kasang, E.I.T.
Project Engineer

Dawn Edgell, P.E.
Sr. Project Engineer

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1.0 INTRODUCTION

On behalf of the Illinois Department of Transportation (IDOT), Lochmueller Group retained GSG Consultants, Inc. (GSG) to complete a geotechnical investigation and to provide recommendations regarding the proposed IL Route 72 Intersection Reconstruction. The site is located at the intersection of IL Route 72 and State Street in Hampshire, Illinois **(Project Location Map – Exhibit 1)**.

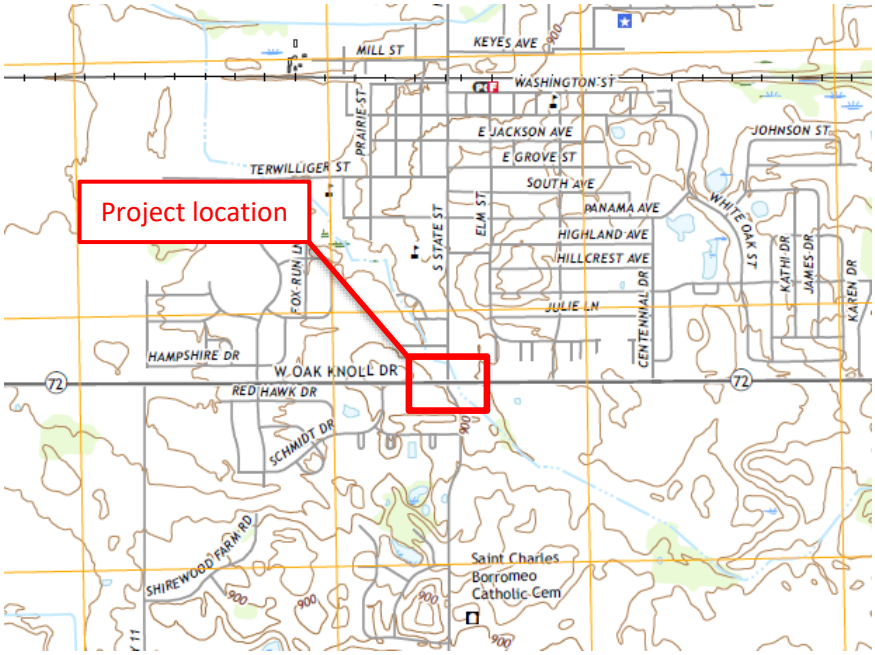


Exhibit 1: Project Location Map

1.1 Project Information

Based on preliminary information and plan drawings provided by Lochmueller Group (dated 3/13/2020), the proposed reconstruction will include regrading and raising the profile grade at the intersection of IL Route 72 and State Street; constructing a 10-foot wide shared-use bicycle and pedestrian path directly south of IL Route 72; and a sidewalk to the east of State Street. Additional project improvements will include replacing the existing drainage structures below State Street and IL Route 72, and the installation of permanent traffic signals. Recommendations for the proposed drainage structures will be discussed in a separate report.

The improvements addressed in this report will include the following:

- Reconstruction of IL Route 72 from Station 495+21 to 504+84
- Reconstruction of State Street from Station 199+23.32 to 204+00
- Construction of a shared-use bicycle and pedestrian path directly south of IL Route 72
- Construction of a sidewalk directly east of State Street and north of IL Route 72

Based on the preliminary plans, we understand that the pavement section for State Street and IL Route 72 will be approximately 20 and 22 inches, respectively. Across the project limits, the proposed profile will be relatively consistent with the existing roadway profile. It is anticipated that minimal cut and fill (less than 2 feet) would be required for the majority of the proposed reconstruction along IL Route 72 and State Street. Up to 4 feet of new fill will be required for the shared-use bicycle and pedestrian path. The proposed roadway drainage systems will maintain the existing drainage patterns on the east, north, and south legs of the project. An existing storm sewer west of the intersection will be removed and replaced.

1.2 Purpose and Scope of Services

The objective of this study was to explore and characterize the subsurface soil conditions in order to provide recommendations regarding the suitability of the subsurface soil to support the proposed reconstruction. The scope of this study includes the following:

1. Perform site reconnaissance.
2. Advance twelve (12) soil boring to depths of 10 to 25 feet each.
3. Perform the geotechnical laboratory testing program on selected representative soil samples obtained during the field investigation to evaluate relevant engineering parameters of the subsurface soils.
4. Perform engineering analysis and evaluation of the data collected during the field study investigation and laboratory testing.
5. Provide recommendations for design parameters and associated construction activities.

1.3 Regional Geology

GSG reviewed several published documents in an effort to determine the regional geological setting in the area of the site. The subject area is located in Kane County, in Hampshire,

Illinois. The project area consists of deposits primarily from the Equality Formation of the Hudson and Wisconsin Glacial Age. The surficial geologic deposits in the area consist silty clay, sand, silt, and gravel extending to approximately 150 to 200 feet below ground surface, at which point bedrock is generally encountered. Underlying the surficial deposits, the bedrock is predominately from the Maquoketa Formation Group, which consists of shale and limestone.

The subject area is located approximately 30 miles northeast of the Sandwich Fault Zone. The Sandwich fault zone is one of the longest fault zones in Illinois and runs along a southeast-northwest track for approximately 85 miles, from Manhattan in Will County to Oregon in Ogle County. The fault zone has a maximum displacement of approximately 800 feet at its midpoint in southeastern DeKalb County and is approximately ½ to 2 miles in width.

2.0 SITE SUBSURFACE EXPLORATION PROGRAM

This section describes the subsurface exploration program and laboratory testing program completed as part of this project. The subsurface exploration program was performed in accordance with applicable IDOT geotechnical manuals and procedures.

2.1 Subsurface Exploration Program

The subsurface soil investigation was conducted between March 23 and March 26, 2020 and included advancing a total of five (5) subgrade soil borings (SGB) to depths of 10 feet. An additional seven (7) borings were completed to depths of 25 feet for the proposed culvert and traffic signal structures. The borings were completed through the existing pavement on IL Route 72 and State Street. The soil boring locations were selected by GSG based on the preliminary design plans provided by Lochmueller Group and completed at locations based on field conditions and site accessibility. **Table 1** presents a list of the borings completed along with their location information.

Table 1 – Boring Information

Boring	Location	Station	Offset (feet)/ Direction	Existing Ground Elevation (ft)
SGB-1	IL Route 72	495+34	11.02 RT	906.6
SGB-2	IL Route 72	497+64	16.74 LT	901.2
SGB-3	IL Route 72	502+24	20.37 RT	897.2
SGB-4	IL Route 72	504+47	14.35 RT	900.6
SGB-5	State Street	203+31	9.20 RT	896.2
OSB-1/CB-3	IL Route 72	500+64	17.31 LT	896.8
OSB-2	IL Route 72	500+55	24.32 RT	896.7
OSB-3	State Street	199+43	10.59 LT	897.0
OSB-4	IL Route 72	499+36	16.75 LT	897.6
CB-1	State Street	202+41	7.56 LT	896.7
CB-2	State Street	201+24	12.88 RT	896.8
CB-4	IL Route 72	501+47	23.09 RT	896.9

The soil borings were drilled using a truck mounted CME-75 drill rig using 3¼-inch I.D. hollow stem augers and automatic hammers. Soil sampling was performed according to AASHTO T 206, "Penetration Test and Split Barrel Sampling of Soils." Soil samples were obtained at 2.5-foot intervals to the boring termination depths. GSG's field representative inspected, visually classified and logged the soil samples during the subsurface exploration activities and performed unconfined compressive strength tests on cohesive soil samples using a calibrated Rimac compression tester and a calibrated hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval, were placed in jars, and returned to the laboratory for further testing and evaluation.

Borings OSB-1/CB-3, OSB-2, OSB-3, OSB-4, CB-1, CB-2, and CB-4 were completed within the vicinity of the proposed culverts and traffic sign structures. These borings were advanced to depths of 25 feet below existing ground surface.

The existing ground surface elevations for the borings were based on the field survey performed by GSG. The approximate locations of the soil borings are shown on the **Boring Location Plan & Subsurface Profiles (Appendix A)**.

2.2 Laboratory Testing Program

All samples were inspected in the laboratory to verify the field classifications. A laboratory testing program was undertaken to characterize and determine engineering properties of the subsurface soils encountered. The following laboratory tests were performed on representative soil boring samples:

- Moisture Contents - ASTM D2216 / AASHTO T-265
- Atterberg Limits – ASTM D4318 / AASHTO T-89 / AASHTO T-90
- Organic Content – ASTM D7348 / AASHTO T-267

The laboratory tests were performed in accordance with ASTM test procedures and requirements. Based on the laboratory test results, the soils encountered were classified according to the United Soil Classification System (USCS). The results of the laboratory testing

program are shown on the **Soil Boring Logs (Appendix B)** and included in the Laboratory Test Results (**Appendix C**).

2.3 Existing Pavement Conditions

The borings generally encountered 3 to 12 inches of asphalt pavement. Borings OSB-1/CB-3 and OSB-4 encountered 7 inches of concrete beneath the asphalt pavement. The borings did not encounter base course materials beneath the pavement layers. A summary of the pavement thicknesses is shown in **Table 2**.

Table 2 – Pavement Summary

Boring ID	Asphalt Thickness (inches)	Concrete Thickness (inches)	Total Thickness (inches)
SGB-1	10	None	10
SGB-2	12	None	12
SGB-3	6	None	6
SGB-4	13	None	13
SGB-5	8	None	8
OSB-1/CB-3	7	7	14
OSB-2	10	None	10
OSB-3	5	None	5
OSB-4	7	7	14
CB-1	11	None	11
CB-2	10	None	10
CB-4	3	None	3

2.4 Subsurface Soil Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed reconstruction. Variations in the general subsurface soil profile were noted during the drilling activities. Detailed descriptions of the subsurface soils are provided in the Soil Boring Logs (**Appendix B**) and are shown graphically in the Boring Location Map & Subsurface Profiles (**Appendix A**). The soil boring logs provide specific conditions encountered at each boring location, including: soil descriptions, stratifications, penetration resistance,

elevations, location of the samples, water levels (when encountered), and laboratory test data. Variations in the general subsurface soil profile were noted during the drilling activities. The stratifications shown on the boring logs represent the conditions only at the actual boring locations and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

IL Route 72

Borings SGB-1, SGB-2, SGB-3, SGB-4, OSB-1/CB-3, OSB-2, OSB-4, and CB-4 were drilled through the existing pavement on IL Route 72. The surface elevations of these borings ranged between 906.6 feet to the west of the intersection at SGB-1, between 896.8 and 897.6 feet at the intersection of IL Route 72 and State Street at OSB-1/CB-3, OSB-2, OSB-4 and CB-4, and 900.6 feet east of the intersection at SGB-4.

Beneath the pavement layers, the borings noted existing fill soils consisting of silty clay, clay loam, and sandy clay loam to depths between of 2 and 4 feet below grade. The existing fill soils were underlain by loose to medium dense brown sand and sandy loam in borings OSB-1/CB-3 and OSB-2, which extended to a depth of 8.5 feet below grade. Beneath these soils and the existing fill in the remaining borings, soft to hard brown silty clay soils were generally encountered to the boring termination depths. Borings SGB-2, OSB-2, OSB-4, and CB-4 noted sandy loam and sand seams interbedded at varying depths within the brown silty clay soils. The unconfined compressive strength values of the brown silty clay soils ranged between 0.42 tsf and 4.0 tsf. The SPT blow count 'N' values of the granular soils ranged between 5 and 30 blows per foot (bpf).

State Street

Borings SGB-5, OSB-3, CB-1, CB-2 were drilled through the existing pavement on State Street. The surface elevations of these borings ranged between 896.2 and 897.0 feet moving north to south.

Beneath the pavement layers, the borings noted silty clay existing fill soils to depths between 2 and 3.5 feet below grade. The existing fill soils were underlain by soft to hard brown silty clay soils, which extended to depths between 9 and 23.5 feet below grade. Beneath the brown silty clay, very loose to dense brown sand was encountered to the boring termination depths in SGB-5 and OSB-3, and to depths of 18.5 and 21.5 feet below grade in CB-1 and CB-2. Very stiff brown

and gray silty clay was then encountered to the boring termination depth in CB-2 and to 21.5 feet below grade in CB-1. Medium dense to dense brown sand was then encountered to the boring termination depth in CB-1. The unconfined compressive strength values of the brown and gray silty clay soils ranged between 0.42 tsf and 4.5 tsf. The SPT blow count 'N' values of the granular soils ranged between 5 and 41 bpf.

2.5 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was encountered in borings SGB-3, CB-1, CB-2, CB-4, OSB-1/CB-4, OSB-2, OSB-3, and OSB-4 while drilling at depths ranging from 8.5 to 23.5 feet (elevations of 884.6 to 873.5 feet), generally within the sand layers and lenses encountered in the borings. These water levels were likely perched water within the isolated and confined granular layers. Groundwater was not encountered after drilling in any of the boring locations.

It is anticipated that the long-term groundwater level is below the depth of the borings. Water level readings were made in the boreholes at times and under conditions shown on the boring logs and stated in the text of this report. Long term observations in cased borings or piezometers would be necessary to more accurately evaluate the long-term groundwater conditions at the site. However, it should be noted that fluctuations in groundwater level may occur due to variations in rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

3.0 GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed reconstruction based the results of the field exploration, laboratory testing, and geotechnical analysis.

3.1 Embankment Settlement

Based on the preliminary plans provided by Lochmueller Group, the proposed profile will be relatively consistent with the existing roadway profile. It is anticipated that minimal cut and fill (less than 2 feet) would be required for the majority of the proposed reconstruction along IL Route 72 and State Street. The anticipated settlement caused by up to 2 feet of new fill material is expected to be negligible. Up to 4 feet of new fill will be required to construct the 10-foot wide shared-use bicycle and pedestrian path. It is anticipated that the settlement of the shared-use path will be on the order of 1 inch or less.

3.1 Slope Stability

IDOT requires that slope stability analysis be performed in areas where the cut or fill heights will exceed 15 feet in height. For the proposed reconstruction, it is anticipated that the maximum fill height will be less than 4 feet; therefore, no slope stability analysis was required for this report.

3.2 Drainage Characteristics

The drainage characteristics of the site were evaluated per the IDOT Geotechnical Manual, Section 6.3.4, based on the subgrade soil type and moisture condition, depth of water table, project topography, the anticipated profile grade line, and depth and grade of drainage ditch along the roadways. Based on the proposed profile, a majority of the roadway improvements will be supported on subgrade soils consisting of silty clay fill soils. In areas where the existing native soils will be within the subgrade soil zone, the soils encountered were typically cohesive, consisting of silty clays or clays.

Based on the preliminary plans and existing conditions, GSG understands that the proposed drainage will consist of shallow ditches with slopes greater than 0.5%. GSG utilized Table 6.3.4.1-1, Drainage Classification in the IDOT Geotechnical Manual, to assign the drainage classes for the

site. The drainage class should be taken as Poor to Fair along IL Route 72 and State Street due to the moist to very moist clays in the upper layers.

3.3 Frost Susceptibility

The frost susceptibility of the subgrade soils was evaluated per Section 6.3.2.2.3 of the IDOT Geotechnical Manual. The maximum anticipated frost penetration depth below pavement in northern Illinois is 45 to 60 inches for extreme weather conditions. The frost susceptibility was evaluated for the soils encountered that would be within the proposed roadway subgrade. The frost class for the subgrade soils in these areas was assigned using Table 6.3.2.2.3-1, Frost Susceptibility Classification of Soils, in the IDOT Geotechnical Manual. The subgrade soils primarily consisted of clayey soils and were found to have a Frost Class of F3 (high frost susceptibility).

Perched water could be present in the upper soil layers. Water trapped in the soil layers closer to the pavement section is susceptible to frost action and should be considered when designing the proposed roadway. Treatment measures, such as maintaining proper drainage of the subgrade soils through raising the grade line above the surrounding area, or the using an underdrain system to lower the water table and eliminate capillary rise of groundwater could be considered.

3.4 Subgrade Support Rating

The subgrade support rating (SSR) was determined based on the physical properties of in-situ soils present beneath the proposed pavement section. The SSR includes three categories (poor, fair, and granular), and are used to determine the depth of soil treatment to provide a stable working platform that is required to prevent excessive rutting, and moisture related problems during construction activities. Granular soils have the highest rating, and provide a stable working platform that may require less than a 12-inch thick improved subgrade layer, while poor subgrade may require more than 12 inches to provide stable subgrade during construction activities. The near surface soils encountered in the borings along Il Route 72 and State Street were generally cohesive, consisting of silty clay. These soils have a Subgrade Support Rating (SSR) of Poor. It is recommended that a Subgrade Support Rating of Poor be used for areas where silty clay will be part of the proposed subgrade.

3.5 Illinois Bearing Ratio

The Illinois Bearing Ratio (IBR) is a measure of the support provided by the roadbed soils for the new pavement. Based on the results of the laboratory testing, where the native clays will be included as part of the roadway subgrade, it is recommended that an IBR value of 5, be used for the roadway pavement design and correlated to the subgrade resilient modulus based on the AASHTO recommended pavement design formula for fine grained soils (M_r = 1,500 x IBR).

3.6 Organic Content

Soils that were encountered in the borings in which organic material was observed were tested to determine the percentage of organic content present. The organic contents of samples from borings SGB-2 and SGB-4, at depths of 3.5 feet below grade, were 1.5 and 1.7 percent, respectively. Typically, soils with an organic content in excess of 10 percent are considered unsuitable to remain below proposed pavement areas. Based on the soil borings and laboratory testing performed, it is not anticipated that highly organic soils will be encountered in subgrade soils for the proposed roadway.

4.0 ROADWAY RECOMMENDATIONS

This section provides GSG's geotechnical recommendations for the design of the proposed improvements based on the results of the field exploration, laboratory testing, and geotechnical analysis. The proposed pavement section should be designed according to the IDOT Mechanistic Pavement Design (MPD). IDOT policy requires providing a minimum of 12 inches of improved subgrade beneath the pavement section to ensure a stable construction platform. Subgrade improvements including any undercuts or compaction of existing soils should be completed to the proposed elevations in the design plan and in accordance with the Subgrade Treatment and Recommendation Section of this report.

4.1 Subgrade Preparation

Any vegetation, surface topsoil, existing pavement and aggregate base should be cleared and stripped where new fill will be placed. Based on the pavement thicknesses encountered in the borings, it is anticipated that pavement stripping depths of asphalt and/or concrete materials will range from 3 to 14 inches. For purposes of estimating, a topsoil thickness of 6 inches should be assumed, and field verified during construction. Undercuts of the subgrade soils and backfilling should be based on the recommendations provided in this report, and field evaluation of the materials encountered during construction. Any unstable or unsuitable materials encountered during construction activities should be removed and replaced with compacted structural fill.

4.2 Subgrade Treatment and Recommendations

The suitability of the existing subgrade soils was evaluated in terms of frost susceptibly, stability, settlement, and drainage. The evaluation included determining the presence of unstable, compressible deposits, low-strength soils, high organic content soils, and soils with high-moisture content immediately below the proposed pavement section.

Treatment options for unsuitable subgrade soils include mechanical stabilization, chemical stabilization or soil modification. Mechanical stabilization includes methods such as removal and replacement with select materials or using geosynthetics (geotextiles and/or geogrids). Chemical stabilization or soil modification includes the use of additives to improve the engineering properties of the in-situ soils. The choice of a specific treatment option depends on

several factors, including: soil type; required treatment depth; construction variables (cost, availability, and time); project location; and treatment objective. Based on the subsurface conditions, mechanical stabilization and chemical modification methods can be used to remediate the unsuitable soils noted at the site. However, given the proximity of the project to existing commercial and residential developments, GSG does not recommend the use of any chemical stabilization; GSG recommends mechanical stabilization as the preferred option.

4.2.1 Subgrade Undercut Areas

We understand that the IDOT provided pavement section design for this project will consist of 10 inches of full depth HMA supported upon 12 inches of aggregate subgrade treatment for IL Route 72, and 8 inches of full depth HMA supported upon 12 inches of aggregate subgrade treatment for State Street. IDOT policy requires providing a minimum of 12 inches of improved subgrade beneath the pavement section to ensure a stable construction platform. Based on the existing site conditions, including low strength fill materials, additional undercuts may be necessary along sections of the proposed improvements. The recommended undercuts and locations are summarized in **Table 3** and shown on the soil profiles in **Appendix A**. The depth, location, and extent of the proposed undercuts should be field verified during construction. All potentially unstable soils should be tested with a cone penetrometer and treated in accordance with Article 301.04 of the SSRBC and the undercut guidelines in the IDOT Subgrade Stability Manual.

Table 3 – Recommended Undercuts and/or Mitigation

Location	Station Range	Lateral Limits	Recommended Undercuts*	Nearest Boring	Comments
State Street	201+00 to 202+00	Entire Roadway Width	24 inches	CB-2, SGB-5	Low strength fill less than 0.5 tsf
IL Route 72	496+50 to 498+50	Entire Roadway Width	18 inches	SGB-2	Low strength fill less than 1.0 tsf

Location	Station Range	Lateral Limits	Recommended Undercuts*	Nearest Boring	Comments
IL Route 72	501+00 to 502+00	Entire Roadway Width	24 inches	CB-4	Low strength fill less than 1.0 tsf

* All undercuts are measured from the bottom of the proposed 12 inches of aggregate subgrade improvement

Approved structural fill includes IDOT Porous Granular Embankment (PGE), or suitable borrow materials, as specified in the Borrow Material and Compaction Requirements section of this report. It is also recommended that a woven geotechnical fabric be placed at the base of the undercut. The geotextile fabric should consist of a woven material meeting the requirements of Section 1080.02 of the IDOT SSRBC (2016) and should be placed in accordance with Section 210 of the IDOT SSRBC (2016). The geotextile fabric should be placed under the full width of the proposed pavement area.

4.3 Drainage Recommendations

The drainage classification of Poor to Fair should be used for the project design. Groundwater was encountered while drilling at depths ranging from 8.5 to 23.5 feet (elevations of 884.6 to 873.5 feet), generally within the sand layers and lenses encountered in the borings. The long-term groundwater depth is assumed to be deeper than the anticipated frost depth of 45 to 60 inches for the northern Illinois region, and as such no subgrade saturation is anticipated due to capillary action. GSG anticipates that storm drainage system will be constructed along the sides of the proposed roadways. Longitudinal and transverse underdrains are anticipated in areas where the roadway will be completely reconstructed, in low lying areas, and at the base of the undercuts shown in **Table 3**. Transverse drains should be installed at 300 foot spacing for the proposed roadways. The underdrains should tie into the storm water drainage system and should be installed per Article 601 in the IDOT Standard Specifications and consist of Type 2 underdrains.

The project is anticipated to apply for a National Pollutant Discharge Elimination System (NPDES) storm water permit for construction site activities. **Table 4** presents soil erosion factors (K factors) and erosion hazard ratings from the Natural Resources Conservation Service (NRCS) soil

maps for the soil types found within the project limits. These results along with the soil type map for the site are presented in **NRCS Soil Survey Map (Appendix D).**

Table 4 - Recommended Soil Erosion Characteristics

Map Unit Name / Soil Name	Map Symbol	Slopes (%)	Erosion factor, K
Elpaso silty clay loam	356A	0 to 2	0.24
Kidami silt loam	527B	2 to 4	0.37
Kidami silt loam, eroded	527C	4 to 6	0.37
Blackberry silt loam	679A	0 to 2	0.32

5.0 CONSTRUCTION CONSIDERATIONS

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction (SSRBC) (2016) and the IDOT Subgrade Stability Manual (2005). Any deviation from the requirements in the manuals above should be approved by the design engineer.

5.1 Site Preparation

Although not encountered in the borings, any topsoil present within the improvement limits should be stripped and stockpiled as per Section 211.03 of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC). The topsoil should be separated from other materials being stockpiled onsite for reuse or haul off. Base course aggregate, if any, encountered at the site should be evaluated to determine suitability for reuse as general fill. The contractor should not mix the existing base course materials with existing subgrade soils during the stripping and stockpiling activities.

5.2 Pavement Subgrade Preparation

The stability of the subgrade should be evaluated immediately after excavation and prior to placement of base aggregate in the field in accordance with the IDOT Subgrade Stability Manual (2005) to determine if additional treatment is required. The subgrade soils inspection should include visual inspection and performing a proof roll using heavy equipment or heavily loaded tandem axle dump truck with a minimum gross weight of 25 tons to check for deflection or rutting. Areas with excessive rutting and deflection shall be evaluated using a dynamic cone penetrometer (DCP) and static cone penetrometer (SCP) to determine the depth of required treatment in accordance with the IDOT Subgrade Stability Manual (2005) and IDOT SSRBC (2015), Section 301. The subgrade should be prepared in accordance with Section 301, Subgrade preparation, of the IDOT SSRBC (2016).

Treatment for unstable and unsuitable soils encountered during proof rolling and subgrade evaluation may include the use of a geotextile fabric, removal and replacement with approved structural fill for small areas. Subgrade improvements should be based on the recommendations in the Subgrade Treatment and Recommendations Section of this report or based on field evaluation of the materials during construction. Field evaluation of the subgrade soils should be

conducted in accordance with the procedures outlined in the IDOT Geotechnical Manual and Subgrade Stability Manual, and under the supervision of a licensed geotechnical engineer.

5.3 Site Excavation

Site excavations are expected to encounter various types of soils as described in the Subsurface Exploration section of this report. The contractor will be responsible to provide a safe excavation during the construction activities of the project. All excavations should be conducted in accordance with applicable federal, state, and local safety regulations, including, but not limited to the Occupational Safety and Health Administration (OSHA) excavation safety standards. Excavation stability and soil pressures on temporary shoring are dependent on soil conditions, depth of excavations, installation procedures, and the magnitude of any surcharge loads on the ground surface adjacent to the excavation. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures. Excavations should not extend below the level of adjacent existing foundations or utilities unless underpinning or other support is installed. It is the responsibility of the contractor for field determinations of applicable conditions and providing adequate shoring for all excavation activities.

5.4 Borrow Material and Compaction Requirements

If borrow material is to be used for onsite construction, it should conform to Section 204 "Borrow and Furnish Excavations" of the IDOT Standard Specifications for Road and Bridge Construction (2016). Imported fill materials should be evaluated using Table 8.4-1 of the IDOT Geotechnical Manual, Requirements of Borrow Soils for the Top 24 inch, and Section 204, "Borrow and Furnish Excavations" of the SSRBC. **Table 5** provides a summary of the imported fill requirements.

Table 5 - Requirements of Borrow Soils for the Top 24 inch Subgrade

REQUIRED TEST	AASHTO METHOD	PERMISSIBLE LIMIT
Standard Dry Density (SDD)	T 99 (Method C)	90 pcf min.*
Organic Content	T 194	10 % max.*
Percent Silt and Fine Sand	T 88	65 % max. **
Plasticity Index	T 90	12 % min. **
Liquid Limit	T 89	50 % max.
Shear Strength (c) at 95 % SDD	T 208 or T 234	1,000 psf min.

* As per Standard Specifications.
** Frost Susceptibility Criteria

The fill material should be free of organic matter and debris and should be placed and compacted in accordance with Section 205, Embankment, of the IDOT SSRBC (2016). Earth-moving operations should be avoided during excessively cold or wet weather to avoid freezing of softening subgrade soils. Fill should be placed in lifts and compacted according to Section 205, Embankment (IDOT, 2016). Backfill materials for undercut areas should be placed in 8 inches loose lifts and should be compacted to 95% of the maximum dry density as determined by AASTHO T 99, Standard Proctor Method.

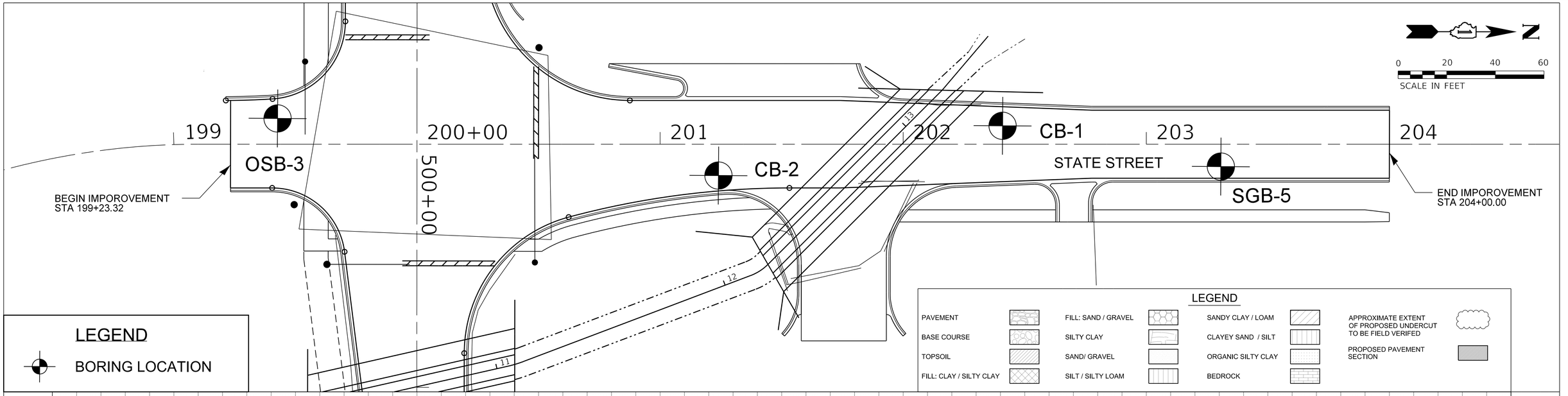
6.0 LIMITATIONS

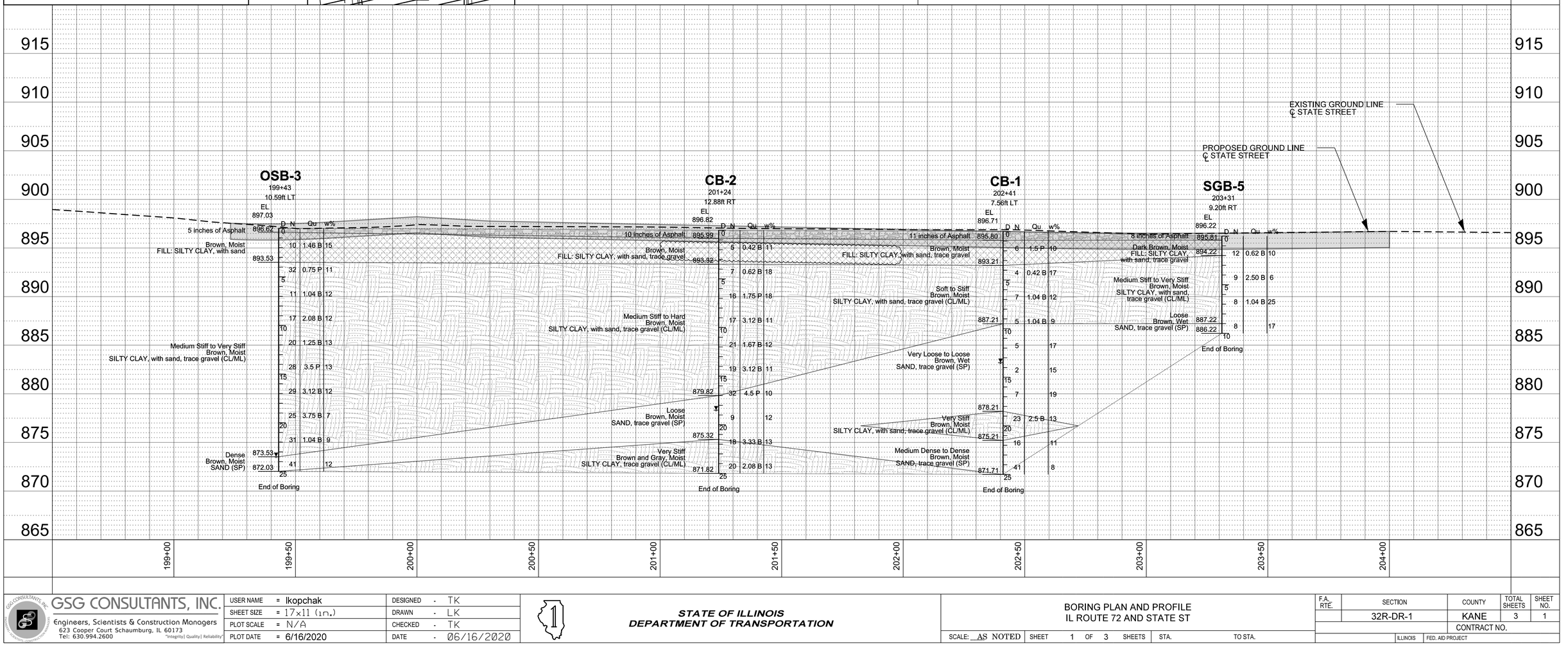
GSG has prepared this report in accordance with generally accepted geotechnical engineering practices to aid in the evaluation of the site subsurface soils. No other warranty, expressed or implied, is made. The scope of this report is limited to the specific project and location described herein, and our description of this project represents our understanding of the project. The geotechnical engineering analysis presented herein was developed based on the information obtained during the subsurface investigation. It should be noted that the borehole data reflects the subsurface conditions only at the specific locations at the particular time designated on the logs, and that soil and groundwater conditions could vary widely throughout the site. The nature and extent of any variation in the borings may not become evident until subsurface exposure, during construction activities. If variations do appear, it may become necessary to re-evaluate the recommendations of this report. It is recommended that all field construction activities be inspected by GSG's geotechnical engineer to verify the type and strength of soil materials present at the site and their conformance with the geotechnical recommendations in this report.

APPENDIX A

BORING LOCATION PLAN

AND SUBSURFACE PROFILES





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Engineers, Scientists & Construction Managers
623 Cooper Court Schaumburg, IL 60173
Tel: 630.994.2600
"Integrity| Quality| Reliability"

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SHEET SIZE	= 17x11 (in.)	DRAWN	- LK
PLOT SCALE	= N/A	CHECKED	- TK
PLOT DATE	= 6/16/2020	DATE	- 06/16/2020

1

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

BORING PLAN AND PROFILE
IL ROUTE 72 AND STATE ST

SCALE: AS NOTED | SHEET 1 OF 3 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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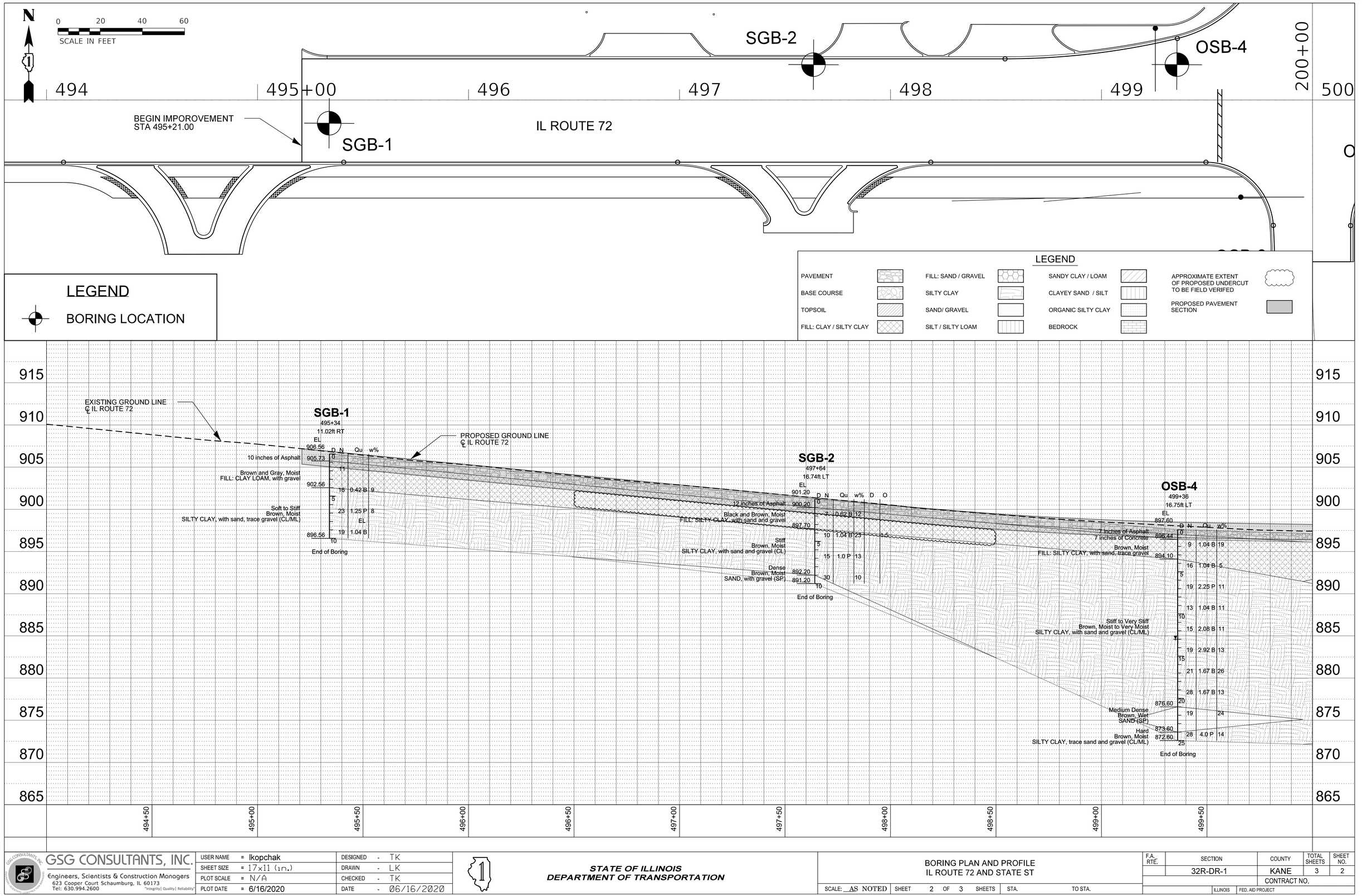
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		



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USER NAME = lkopchak

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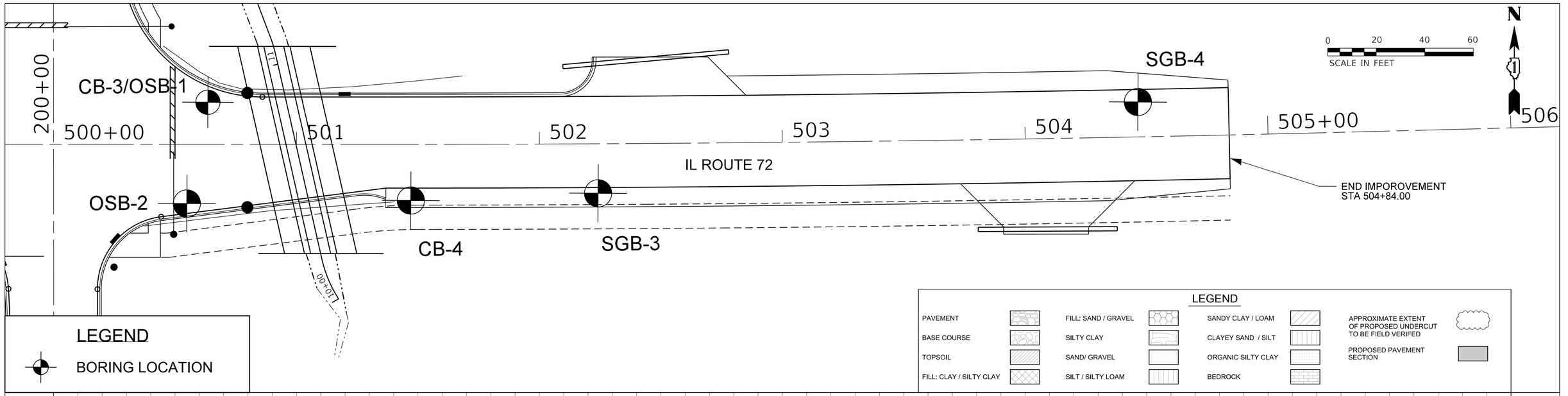
USER NAME = lkopchak		DESIGNED - TK	
SHEET SIZE = 17x11 (in.)		DRAWN - LK	
PLOT SCALE = N/A		CHECKED - TK	
PLOT DATE = 6/16/2020		DATE - 06/16/2020	

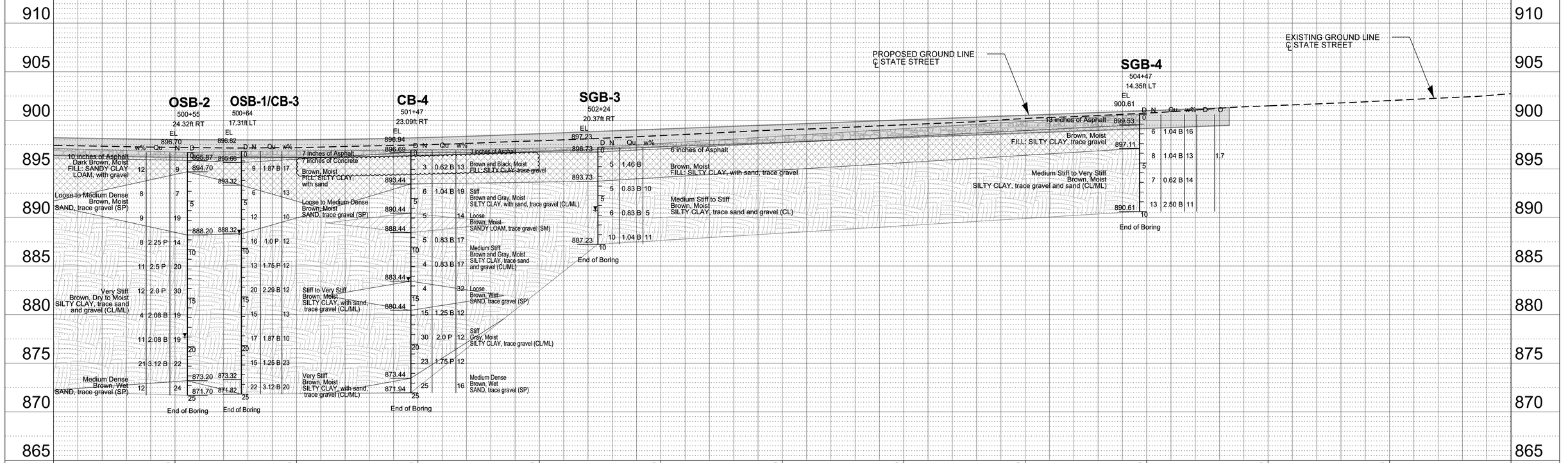
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

BORING PLAN AND PROFILE
IL ROUTE 72 AND STATE ST

SCALE: AS NOTED | SHEET 2 OF 3 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	32R-DR-1	KANE	3	2
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		





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USER NAME = lkopchak

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623 Cooper Court Schaumburg, IL 60173
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USER NAME = lkopchak		DESIGNED - TK	
SHEET SIZE = 17x11 (in.)		DRAWN - LK	
PLOT SCALE = N/A		CHECKED - TK	
PLOT DATE = 6/16/2020		DATE - 06/16/2020	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

BORING PLAN AND PROFILE
IL ROUTE 72 AND STATE ST

SCALE: AS NOTED | SHEET 3 OF 3 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	32R-DR-1	KANE	3	3
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		

APPENDIX B

SOIL BORING LOGS

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/26/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0889778, **Longitude** -88.5301358

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. Culvert @ State St
Station 201+93.80

BORING NO. CB-1
Station 202+41
Offset 7.56ft LT
Ground Surface Elev. 896.71 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 883.2 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				11 inches of Asphalt
				895.80
	7			Brown, Moist
	3	1.5	10	FILL: SILTY CLAY, with sand,
	3	P		trace gravel
				893.21
	1			Soft to Stiff
	1	0.4	17	Brown, Moist
-5	3	B		SILTY CLAY, with sand, trace
				gravel (CL/ML)
	2			
	3	1.0	12	
	4	B		
	3			
				887.21
-10	2	1.0	9	Very Loose to Loose
	3	B		Brown, Wet
				SAND, trace gravel (SP)
	3			
	2		17	
	3			
▼				
	1			
	1		15	
-15	1			
	1			
	2		19	
	5			
				878.21
	10			
	10	2.5	13	
-20	13	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Very Stiff
				Brown, Moist
	10			SILTY CLAY, with sand, trace
				875.21 gravel (CL/ML) *(continued)*
	10		11	Medium Dense to Dense
	6			Brown, Moist
				SAND, trace gravel (SP)
	20			
	24		8	
-25	17			871.71
				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/26/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0886573, **Longitude** -88.5300588

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. Culvert @ State St
Station 201+93.80

BORING NO. CB-2
Station 201+24
Offset 12.88ft RT
Ground Surface Elev. 896.82 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 878.3 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				10 inches of Asphalt
				895.99
	4			Brown, Moist
	2	0.4	11	FILL: SILTY CLAY, with sand,
	3	B		trace gravel
				893.32
	2			Medium Stiff to Hard
	3	0.6	18	Brown, Moist
-5	4	B		SILTY CLAY, with sand, trace gravel (CL/ML)
	7			
	7	1.8	18	
	9	P		
				Sand seam at 7.5 feet
	8			
	8	3.1	11	
-10	9	B		
	9			
	10	1.7	12	
	11	B		
	5			
	9	3.1	11	
-15	10	B		
	10			Cobbles at 16-17.5 feet
	18	4.5	10	879.82
	14	P		Loose
				Brown, Moist
▼	7			SAND, trace gravel (SP)
	5		12	
-20	4			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Loose
				Brown, Moist
	6			SAND, trace gravel (SP)
				875.32
	8	3.3	13	*(continued)*
	10	B		Very Stiff
				Brown and Gray, Moist
				SILTY CLAY, trace gravel
	6			(CL/ML)
	8	2.1	13	
-25	12	B		
				871.82
				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/24/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0882548, **Longitude** -88.5295625

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. Culvert @ IL-72
Station 500+99.77

BORING NO. CB-4
Station 501+47
Offset 23.09ft RT
Ground Surface Elev. 896.94 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 883.4 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
896.69				3 inches of Asphalt
	2			Brown and Black, Moist FILL: SILTY CLAY, trace gravel
	2	0.6	13	
	1	B		
893.44				
	2			Stiff Brown and Gray, Moist SILTY CLAY, with sand, trace gravel (CL/ML)
	2	1.0	19	
-5	4	B		
890.44				
	3			Loose Brown, Moist SANDY LOAM, trace gravel (SM)
	2		14	
888.44				
	2			Medium Stiff Brown and Gray, Moist SILTY CLAY, trace sand and gravel (CL/ML)
	2	0.8	17	
-10	3	B		
	1			
	2	0.8	17	
	2	B		
883.44 ▼				
	2			Loose Brown, Wet SAND, trace gravel (SP)
	2		32	
-15	2			
880.44				
	5			Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML) Cobbles at 18.5-20 feet
	7	1.3	12	
	8	B		
	6			
	13	2.0	12	
-20	17	P		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	6			Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)* Cobbles at 21-22.5 feet
	10	1.8	12	
	13	P		
873.44				
	9			Medium Dense Brown, Wet SAND, trace gravel (SP)
	13		16	
871.94 -25	12			
				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/24/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.088365, **Longitude** -88.5298707

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. Culvert @ IL-72
Station 500+99.77

BORING NO. OSB-1/CB-3
Station 500+64
Offset 17.31ft LT
Ground Surface Elev. 896.82 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 888.3 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				7 inches of Asphalt 7 inches of Concrete
895.66				
	3			Brown, Moist FILL: SILTY CLAY, with sand
	4 5	1.9 B	17	
893.32				
	3			Loose to Medium Dense Brown, Moist SAND, trace gravel (SP)
	3 3		13	
-5				
	6			Cobbles at 6-7.5 feet
	6 6		10	
888.32 ▼				
	7			Stiff to Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML)
	11 5	1.0 P	12	
-10				
	6			
	6 7	1.8 P	12	
	7			
	9 11	2.3 B	12	
-15				
	8			Cobbles at 16-17.5 feet
	7 8		13	
	4			
	8 9	1.9 B	10	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	3			Stiff to Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML) *(continued)*
	7 8	1.3 B	23	
873.32				
	8			Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML)
	7 15	3.1 B	20	
871.82 -25				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/23/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0882506, **Longitude** -88.5299022

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. OSB-2
Station 500+55
Offset 24.32ft RT
Ground Surface Elev. 896.70 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 877.7 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				10 inches of Asphalt
				895.87
	6			Dark Brown, Moist
	5		12	FILL: SANDY CLAY LOAM, with gravel
	4			894.70
				Loose to Medium Dense
				Brown, Moist
				SAND, trace gravel (SP)
	4			
	4		8	
-5	3			
	13			
	13		9	
	6			
				888.20
	6			Very Stiff
	6	2.3	8	Brown, Dry to Moist
-10	8	P		SILTY CLAY, trace sand and gravel (CL/ML)
	7			
	10	2.5	11	
	10	P		
				Cobbles at 13.5-15 feet
	15			
	19	2.0	12	
-15	11	P		
	6			
	8	2.1	4	
	11	B		
▼	3			
	8	2.1	11	
-20	11	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Very Stiff
				Brown, Dry to Moist
				SILTY CLAY, trace sand and gravel (CL/ML) *(continued)*
	5			
	9	3.1	21	
	13	B		
				873.20
	13			Medium Dense
	12		12	Brown, Wet
-25	12			SAND, trace gravel (SP)
				871.70
				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/26/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0881594, **Longitude** -88.5301428

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. OSB-3
Station 199+43
Offset 10.59ft LT
Ground Surface Elev. 897.03 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 873.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				5 inches of Asphalt 896.62
	5			Brown, Moist FILL: SILTY CLAY, with sand
	5 5	1.5 B	15	
				893.53
	10			Medium Stiff to Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML) Cobbles at 3.5-5 feet
	12 20	0.8 P	11	
-5				
	5			
	4 7	1.0 B	12	
	4			
	7 10	2.1 B	12	
-10				
	5			
	9 11	1.3 B	13	
	6			
	14 14	3.5 P	13	
-15				
	8			
	12 17	3.1 B	12	
	6			
	12 13	3.8 B	7	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	7			Medium Stiff to Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML) *(continued)* Cobbles at 21-22.5 feet
	13 18	1.0 B	9	
				873.53 ▼
	15			Dense Brown, Moist SAND (SP)
	21 20		12	
-25				872.03
				End of Boring
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/24/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0883623, **Longitude** -88.5303415

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. OSB-4
Station 499+36
Offset 16.75ft LT
Ground Surface Elev. 897.60 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 884.6 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				7 inches of Asphalt 7 inches of Concrete
				896.44
	4			Brown, Moist FILL: SILTY CLAY, with sand, trace gravel
	4 5	1.0 B	19	
				894.10
	11			Stiff to Very Stiff Brown, Moist to Very Moist SILTY CLAY, with sand and gravel (CL/ML)
-5	7 9	1.0 B	5	
	16			Cobbles at 6-7.5 feet
	9 10	2.3 P	11	
	6			
-10	6 7	1.0 B	11	
	6			
	7 8	2.1 B	11	
▼				Sand seam at 13 feet
	6			
-15	7 12	2.9 B	13	
	6			
	9 12	1.7 B	26	
	5			Cobbles at 18.5-20 feet
-20	8 20	1.7 B	13	
				876.60
	9			Medium Dense Brown, Wet SAND (SP)
	9 10		24	
	9			873.60
-25	11 17	4.0 P	14	Hard Brown, Moist 872.60 SILTY CLAY, trace sand and gravel (CL/ML)
-30				End of Boring
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/23/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0882828, **Longitude** -88.5318214

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-1
Station 495+34
Offset 11.02ft RT
Ground Surface Elev. 906.56 **ft**

Surface Water Elev. N/A **ft**
Stream Bed Elev. N/A **ft**

Groundwater Elev.:
First Encounter None **ft**
Upon Completion N/A **ft**
After N/A **Hrs.** N/A **ft**

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Asphalt				
905.73				
Brown and Gray, Moist FILL: CLAY LOAM, with gravel		8		
		5 6		
		11		
902.56				
Soft to Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML)	-5	10 6	0.4 B	9
Cobbles at 6-7.5 feet		15		
		11 12	1.3 P	8
		9		
		7 12	1.0 B	12
896.56	-10			
End of Boring				
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/24/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0883609, **Longitude** -88.530976

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-2
Station 497+64
Offset 16.74ft LT
Ground Surface Elev. 901.20 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
12 inches of Asphalt			
900.20			
Black and Brown, Moist FILL: SILTY CLAY, with sand and gravel	4		
	3 4	0.6 B	12
897.70			
Stiff Brown, Moist SILTY CLAY, with sand and gravel (CL)	3		
-5	5 5	1.0 B	23
Cobbles at 6-7.5 feet	4		
	6 9	1.0 P	13
892.20	14		
Dense Brown, Moist SAND, with gravel (SP)	16 14		10
891.20 -10			
Cobbles at 8.5-10 feet			
End of Boring			
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/23/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0882635, **Longitude** -88.5292785

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-3
Station 502+24
Offset 20.37ft RT
Ground Surface Elev. 897.23 **ft**

Surface Water Elev. N/A **ft**
Stream Bed Elev. N/A **ft**

Groundwater Elev.:
First Encounter 890.7 **ft** ▼
Upon Completion N/A **ft**
After N/A **Hrs.** N/A **ft**

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Asphalt 896.73				
Brown, Moist FILL: SILTY CLAY, with sand, trace gravel		3		
		2 3	1.5 B	
893.73		5		
Medium Stiff to Stiff Brown, Moist SILTY CLAY, trace sand and gravel (CL)		3 2	0.8 B	10
	-5	5		
▼		3 3	0.8 B	5
		3		
887.23	-10	4 6	1.0 B	11
End of Boring				
	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/24/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0883684, **Longitude** -88.5284602

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-4
Station 504+47
Offset 14.35ft LT
Ground Surface Elev. 900.61 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
13 inches of Asphalt			
899.53	3		
Brown, Moist FILL: SILTY CLAY, trace gravel	3 3	1.0 B	16
897.11	3		
Medium Stiff to Very Stiff Brown, Moist SILTY CLAY, trace gravel and sand (CL/ML)	4 4	1.0 B	13
-5	3		
	3 4	0.6 B	14
	5		
	5 8	2.5 B	11
890.61 -10			
End of Boring			
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 3/26/20

ROUTE IL Route 72 **DESCRIPTION** IL Route 72 at State Street **LOGGED BY** PS

SECTION 32R-DR-1 **LOCATION** Hampshire, IL, **SEC.** , **TWP.** , **RNG.** ,
Latitude 42.0892244, **Longitude** -88.5300753

COUNTY Kane **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-5
Station 203+31
Offset 9.20ft RT
Ground Surface Elev. 896.22 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

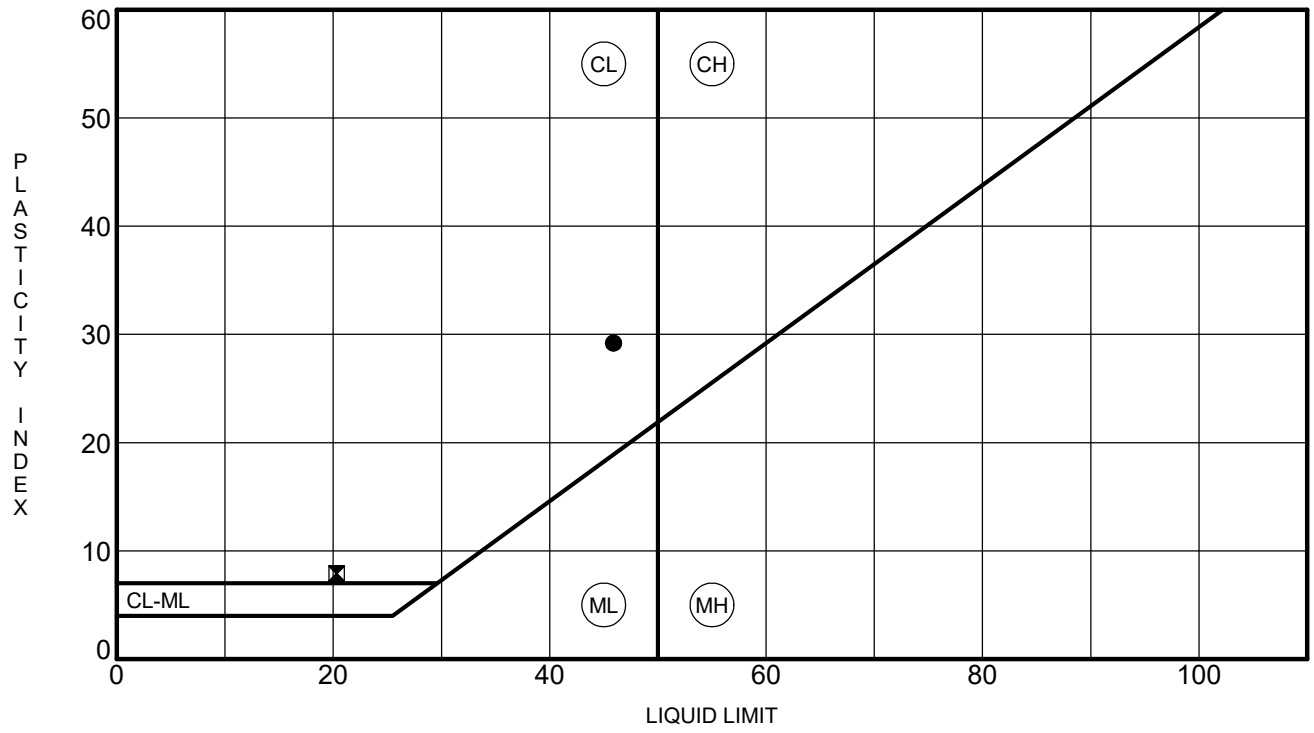
Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Asphalt 895.81			
Dark Brown, Moist FILL: SILTY CLAY, with sand, trace gravel	8		
894.22	7 5	0.6 B	10
Medium Stiff to Very Stiff Brown, Moist SILTY CLAY, with sand, trace gravel (CL/ML)	4		
-5	3 6	2.5 B	6
	3		
	3 5	1.0 B	25
887.22	3		
Loose Brown, Wet	4 4		17
886.22 -10 SAND, trace gravel (SP)			
End of Boring			
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

APPENDIX C

LABORATORY TEST RESULTS



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**SGB-2**	**3.50**	**45.9**	**16.7**	**29.2**		
⊠	**SGB-3**	**3.50**	**20.3**	**12.4**	**7.9**		

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

ATTERBERG LIMITS' RESULTS

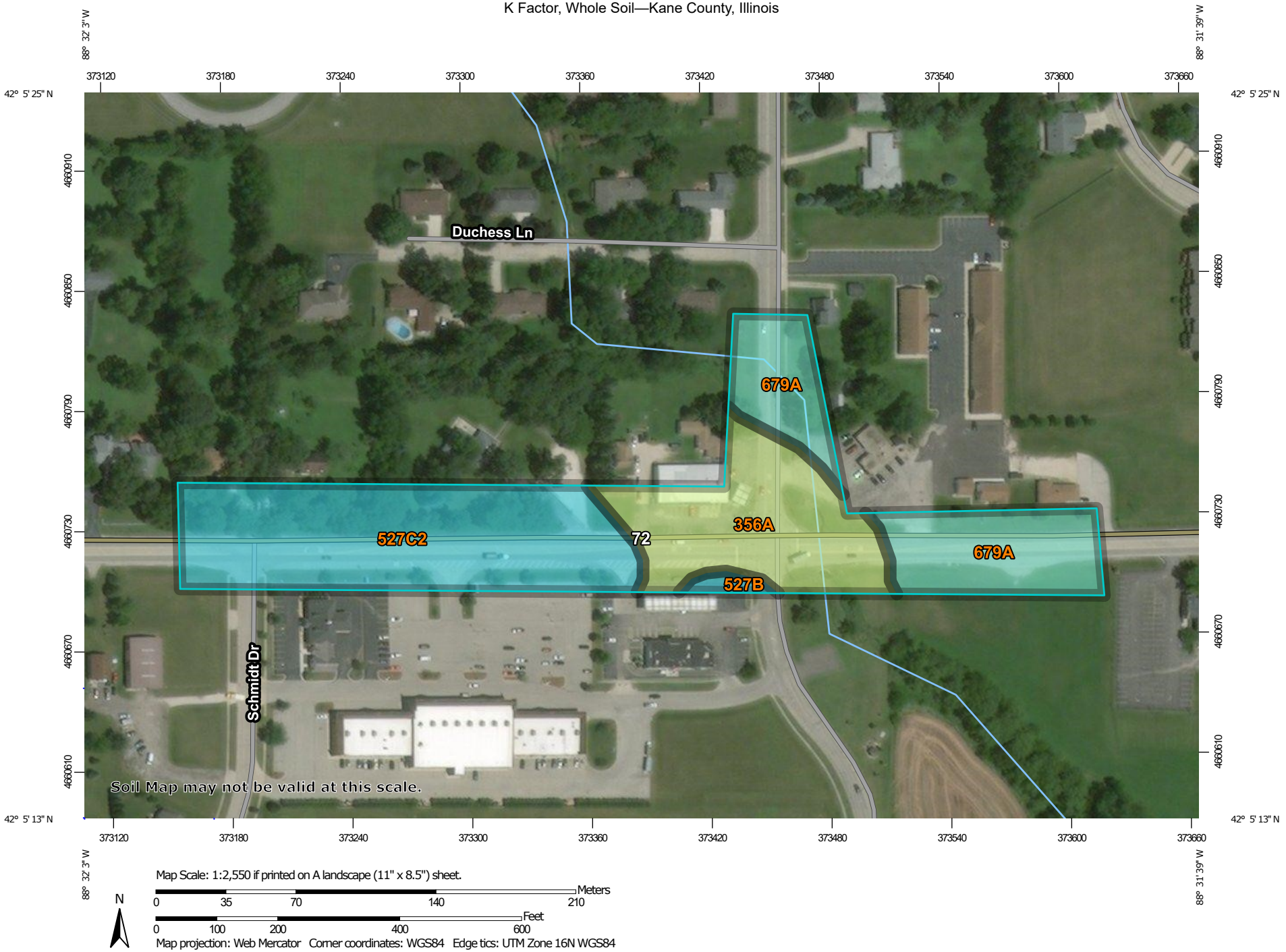
Route: IL Route 72

Section: 32R-DR-1

County: Kane

APPENDIX D

NRCS SOIL SURVEY MAP



Map Scale: 1:2,550 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kane County, Illinois
Survey Area Data: Version 13, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 3, 2011—Oct 22, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
356A	Elpaso silty clay loam, 0 to 2 percent slopes	.24	1.9	27.8%
527B	Kidami silt loam, 2 to 4 percent slopes	.37	0.1	1.4%
527C2	Kidami loam, 4 to 6 percent slopes, eroded	.37	2.9	43.6%
679A	Blackberry silt loam, 0 to 2 percent slopes	.32	1.8	27.3%
Totals for Area of Interest			**6.7**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)