



**BACON | FARMER | WORKMAN**  
ENGINEERING & TESTING, INC.

# STRUCTURE GEOTECHNICAL REPORT

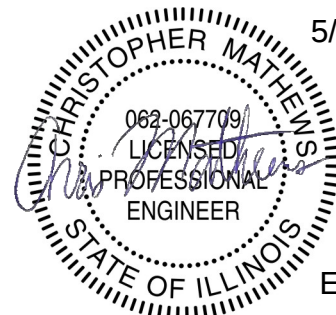
**IL Route 142 over Stream  
F.A.P. Route 849  
Section 113B-2  
Existing Structure No. 041-0043  
Proposed Structure No. 041-2025  
Jefferson County, Illinois**

**Prepared for:**

Mr. Mike Cima, PE, SE  
Director of Bridges & Structures  
Quigg Engineering, Inc.  
2351 S. Dirksen Parkway  
Springfield, Illinois 62703

**Submission Date:**

May 13, 2024



5/13/2024

Exp. 11/30/2025



**BACON | FARMER | WORKMAN**

**ENGINEERING & TESTING, INC.**

521 WEST MAIN STREET | SUITE 200 | BELLEVILLE, IL 62220

May 13, 2024

Mr. Mike Cima, PE, SE  
Director of Bridges & Structures  
Quigg Engineering, Inc.  
2351 S. Dirksen Parkway  
Springfield, IL 62703

RE: ***Structure Geotechnical Report  
IL Route 142 over Stream  
Structure 041-2025  
Jefferson County, Illinois  
BFW No: 22285***

Dear Mr. Cima:

Bacon Farmer Workman Engineering & Testing, Inc. (BFW), is pleased to present the attached DRAFT Structure Geotechnical Report for the referenced project. The foundation investigation was conducted in accordance with applicable IDOT and AASHTO Standards.

The attached report includes a review of pertinent project information, descriptions of site and subsurface conditions encountered, and our general recommendations for foundation design and construction of the proposed bridge.

Sincerely,

**BACON | FARMER | WORKMAN**

ENGINEERING & TESTING, INC.

Shelby N. Livingstone, EIT  
Staff Engineer

Christopher L. Mathews, P.E.  
Geotechnical Engineer/Project Manager

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# 1. PROJECT DESCRIPTION AND SCOPE

The purpose of this geotechnical study was to use the provided subsurface information to prepare geotechnical recommendations for the proposed bridge replacement.

The proposed project includes the removal and replacement of the existing single-span bridge that carries IL Route 142 over an unnamed stream. This structure is located approximately 1.8 miles southeast of Mt. Vernon in Jefferson County, Illinois. The existing structure (SN 041-0043) was originally built in 1928 as SBI Route 142, Section 113-B. See the *Aerial Photograph* and *Site Plan* in Appendix B.

The new structure will be a triple 10' x 9' cast-in-place reinforced concrete box culvert with horizontal cantilever wingwalls and permanent sheet pile extensions. The planned structure's length is 33 feet, and its width is 39 feet with an upstream invert elevation of 432.87 and a downstream invert elevation of 432.75. Traffic will be maintained during the project utilizing staged construction and a temporary soil retention system. The structure will be designed according to the IDOT Bridge Manual and AASHTO LRFD Bridge Design Specifications. The site location is shown in Figure 1.1. The TS&L prepared by Quigg Engineering, Inc (QEI) is attached in Appendix A.

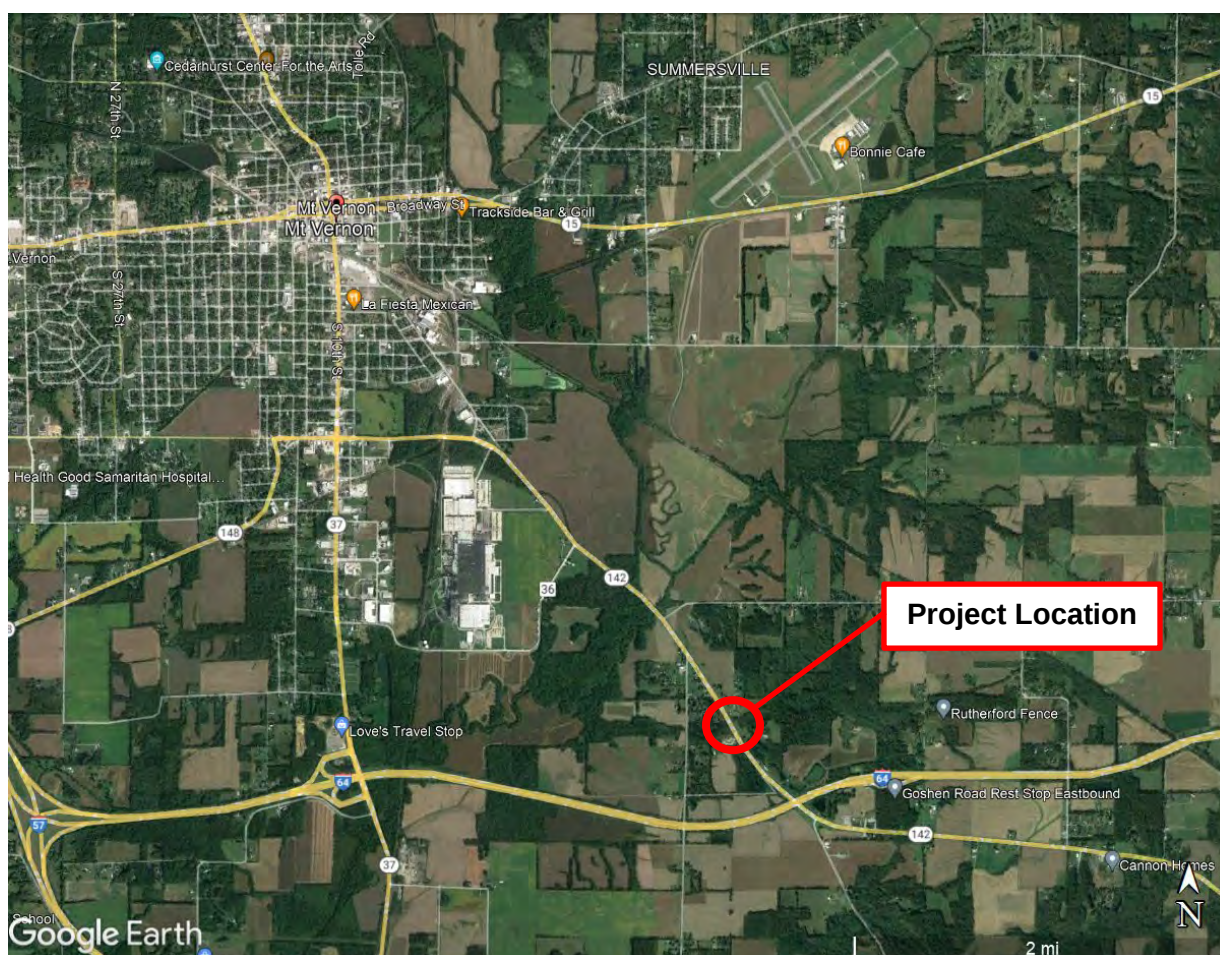


Figure 1.1. Project Location

## 2. FIELD EXPLORATION

The subsurface exploration was completed by Holcomb Foundation Engineering and logged by Gonzalez Companies, LLC in July 2022 and boring logs were provided to BFW in a letter dated August 25, 2022. Two borings were advanced near each of the existing north and south abutments. Based on the information included on the provided borings logs, the borings were advanced using 8-inch outside diameter hollow steam augers and SPT samples were collected with an auto hammer. Table 2.1 summarizes the boring locations and depths. The boring locations are shown on the *Aerial Photograph* and *Site Plan* in Appendix A, and the *Subsurface Boring Logs* are shown in Appendix C.

**Table 2.1 – Summary of Soil Testing Borings**

| Boring | Structure      | Ground Surface Elevation (msl) | Depth (ft) | Station | Offset  |
|--------|----------------|--------------------------------|------------|---------|---------|
| 1-S    | North Abutment | 443.6                          | 24.25      | 160+87  | 8.5' RT |
| 2-S    | South Abutment | 442.6                          | 24.75      | 161+52  | 9.4' LT |

### 2.1 REGIONAL GEOLOGY

The Natural Resource Conservation Service (NRCS) online web soil database was reviewed to determine the type of soil underlying the area of interest. Based on the available data, the soils on the project site consist primarily of Belknap silty loam. These soils are classified as somewhat poorly drained with 0 to 2 percent slopes and belonging to hydraulic soil group B/D. The soil parent materials were derived from silty alluvium.

### 2.2 SUBSURFACE CONDITIONS

Approximately 7 inches of asphalt was encountered at the surface of the borings. Six inches of concrete was encountered beneath the asphalt in Boring 1-S and 10 inches of crushed stone was found beneath the asphalt and concrete in Borings 2-S and 1-S, respectively.

Layers of clay and silty loam were primarily found beneath the crushed stone, extending to elevations 422.4 and 418.5 in Borings 1-S and 2-S, respectively. These materials exhibited moisture contents of 15 to 26 percent, SPT “N” values (blow counts) of 2 to 24 blows per foot (bpf), and unconfined compressive strengths of 0.4 to 3.0 tons per square foot (tsf), indicating a soft to very stiff consistency.

Weathered clay shale was encountered beneath the previously described clay and silty loam in the borings, extending to boring completion depths. Moisture contents of this material ranged from 7 to 10 percent with SPT “N” values of over 50 bpf and unconfined compressive strengths of 1.4 to 4.5 tsf.

### 2.3 GROUNDWATER

Groundwater was encountered at elevations 431.6 and 432.6 during drilling activities in Boring 1-S and 2-S, respectively. The groundwater depth fell 10 feet to elevation 422.6 in Boring 2-S upon completion of drilling. It should be noted that the ground water levels are dependent upon seasonal and climatic variations and may be present at different depths in the future.

## 3. GEOTECHNICAL EVALUATIONS

Based on the results of the subsurface exploration, current site conditions observed, laboratory results, and our review of the project plans, the following geotechnical evaluations were performed. The recommendations developed from these evaluations should be used in the design of the culvert structures.

### 3.1 BASIS FOR RECOMMENDATIONS

The following recommendations are based on data from this exploration and the stated project information. In our evaluations, we have utilized both subsurface data provided by IDOT and our experience with similar structures and subsurface conditions. If the structural information is incorrect or changed after our reporting, or if the subsurface conditions encountered during the construction vary from those reported, our recommendations should be reviewed based on the changed conditions.

Experience indicates that the actual subsoil conditions at a site could vary from those generalized based on soil test borings made at specific locations. Therefore, it is essential that a geotechnical engineer be retained to provide soil-engineering services during the site preparation, excavation, and foundation construction phases of the proposed project. The geotechnical engineer should observe compliance with the design concepts, specifications, and recommendations, and to be allowed to review design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

### 3.2 BOX CULVERT FOUNDATIONS

Given that the proposed culvert is replacing an existing bridge and minimal grade changes will occur, settlement and slope stability are not of concern for the project.

Any differences between bearing surfaces could negatively impact the connections of the box culvert sections. Based on the provided TS&L, the culvert will bear at elevation 432.75 on potentially soft clay and/or silty loam soils, characterized by a blow count of less than 5 bpf. These soils extended to approximate elevation 429. As a result, we recommend removal and replacement of 24-inches of the soft clay soil subgrade below the culvert bearing elevation. This would improve the uniformity of the bearing conditions and provide a working platform for construction. The overexcavation should be backfilled with rockfill and capped with 6 inches of CA7. The limits and quantities of removal and replacement recommended are based on the boring data and may be modified by the District Geotechnical and Field Engineers for variable subsurface conditions encountered in the field.

### 3.3 WING WALLS

Based on the existing site conditions and the proposed box culvert dimensions, the use of Horizontal Cantilever Wingwalls and permanent sheet piling extensions of the wings appears suitable for the proposed culvert. Based on a maximum exposed sheet pile height of approximately 6 feet, the sheet piling may be designed as a cantilevered sheet pile wall.

## 4. CONSTRUCTION CONSIDERATIONS

Based on the TS&L, staged construction will be utilized, and a temporary soil retention system (TSRS) will be required. The IDOT *Temporary Soil Retention System* construction specification should be utilized for the design of the TSRS.

All work performed for the proposed project should conform to the requirements in the *IDOT Standard Specifications for Road and Bridge Construction* and any pertinent special provisions or policies. Any deviation from the requirements in the manuals above should be approved by the design engineer.

## 5. LIMITATIONS

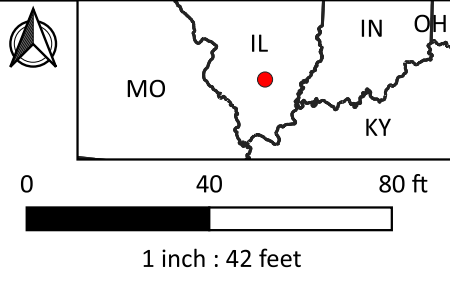
This report has been prepared for the exclusive use of Quigg Engineering, Inc. and its subconsultants for the project and the Illinois Department of Transportation. The recommendations provided in the report are specific to the project described herein and are based on the information obtained from the soil boring locations provided by IDOT within the project limits. The analyses performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the borings. The report may not reflect

all variations that may occur between boring locations or at some other time, the nature and extent of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations provided herein considering the new conditions.

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## **Appendix A**

### **Aerial Photograph & Site Plan**



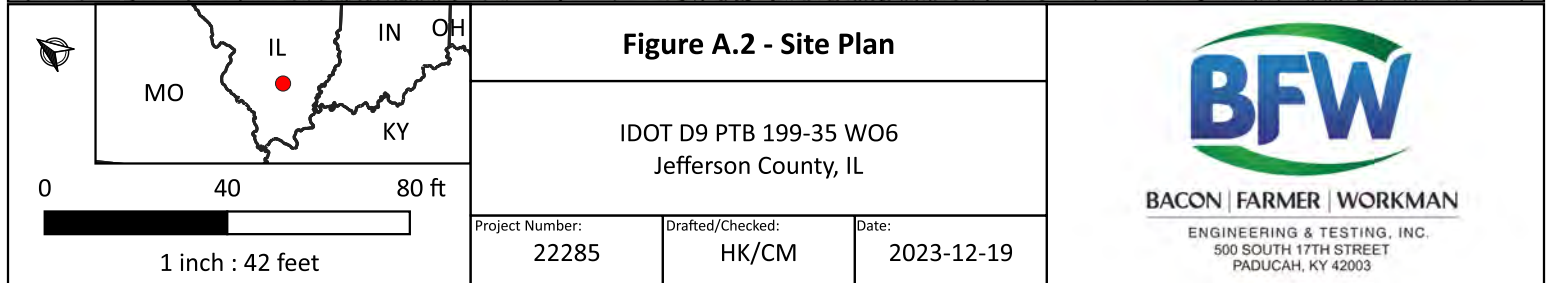
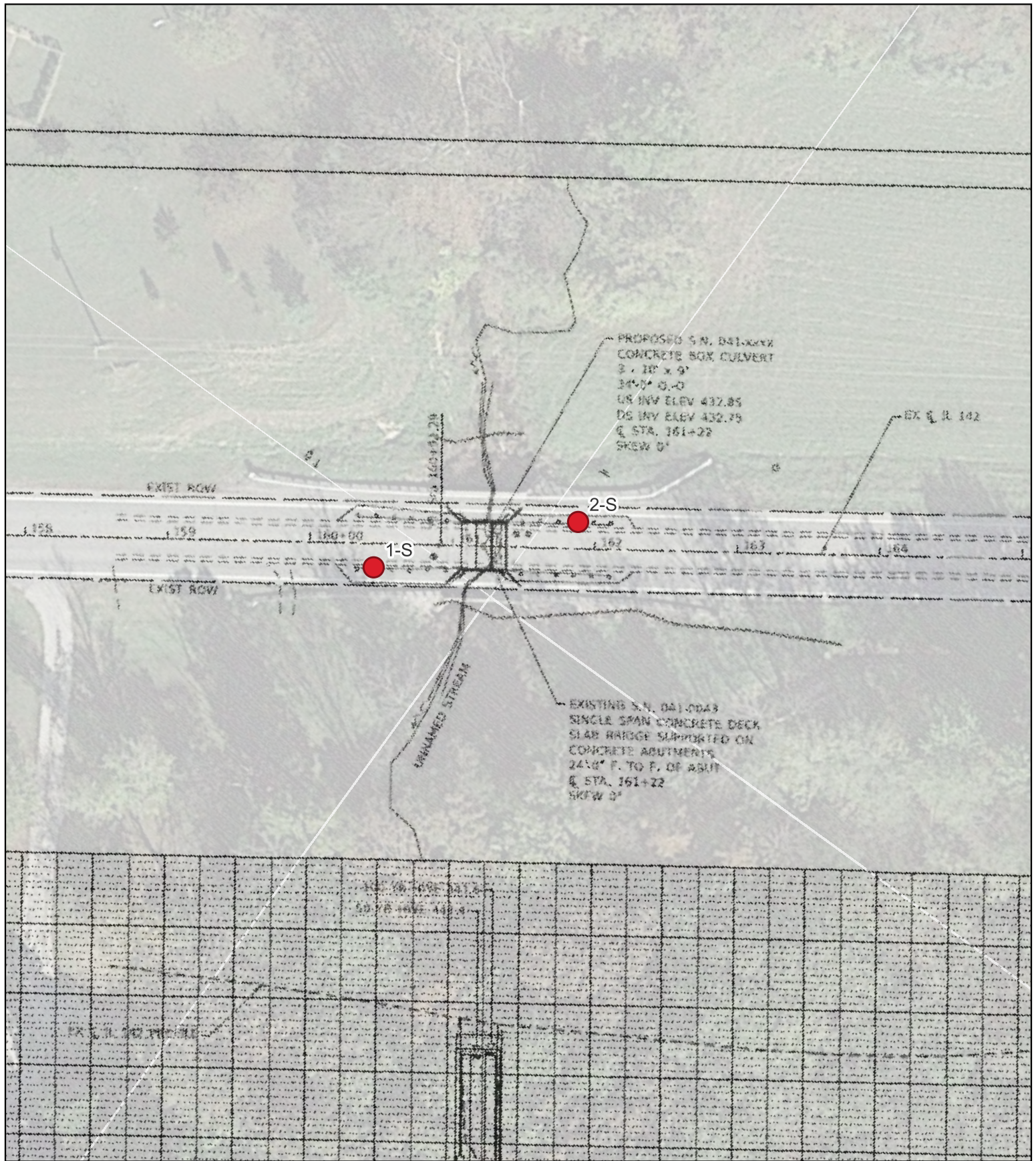
**Figure A.1 - Aerial Photograph**

IDOT D9 PTB 199-35 WO6  
Jefferson County, IL

|                          |                           |                     |
|--------------------------|---------------------------|---------------------|
| Project Number:<br>22285 | Drafted/Checked:<br>HK/CM | Date:<br>2023-12-19 |
|--------------------------|---------------------------|---------------------|



1 inch : 42 feet



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## Appendix B

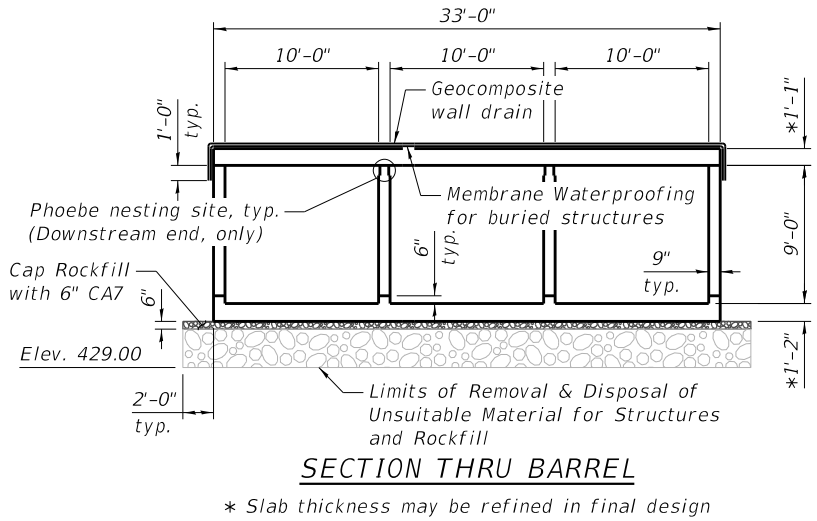
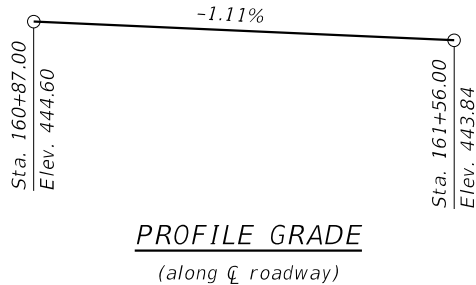
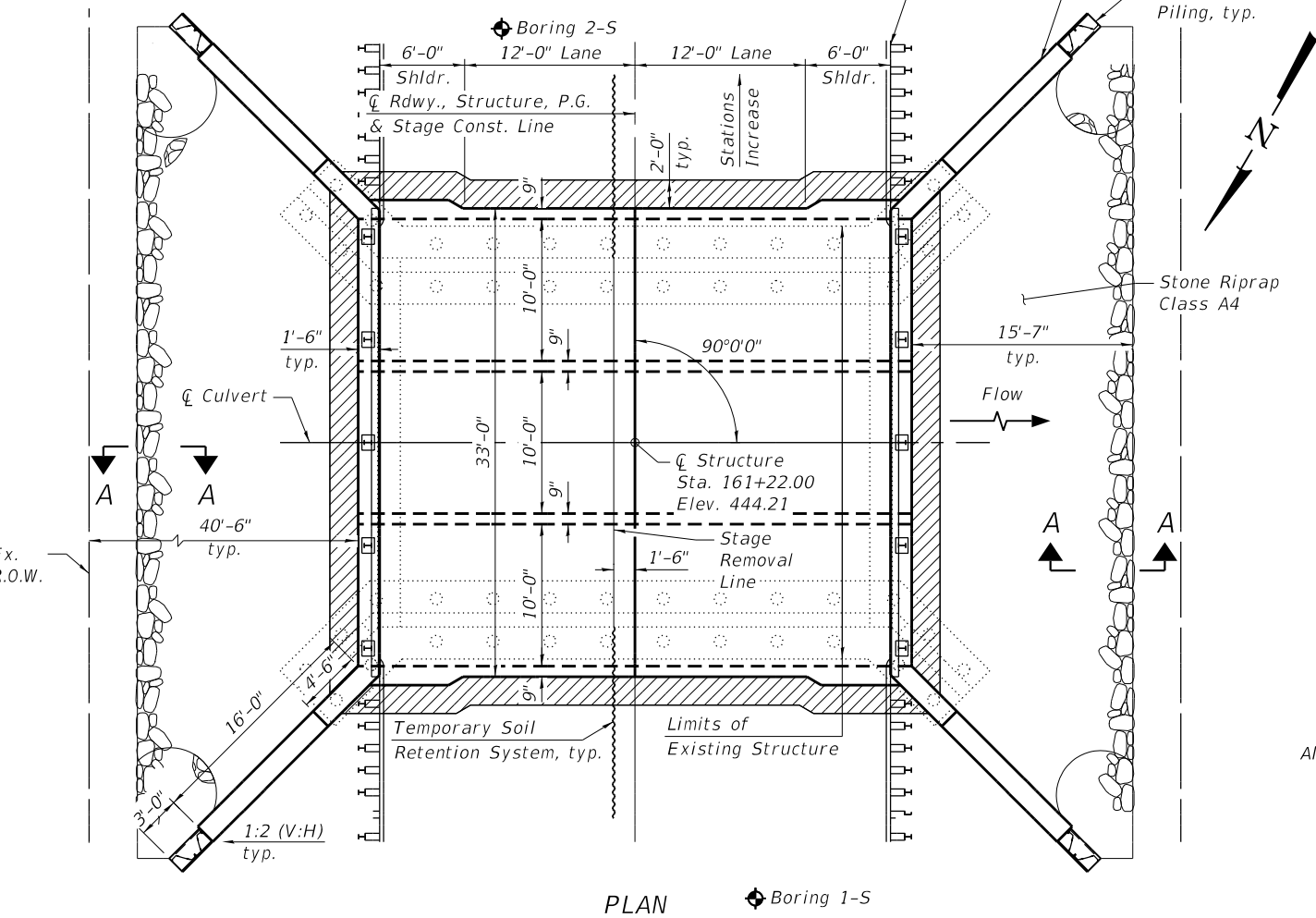
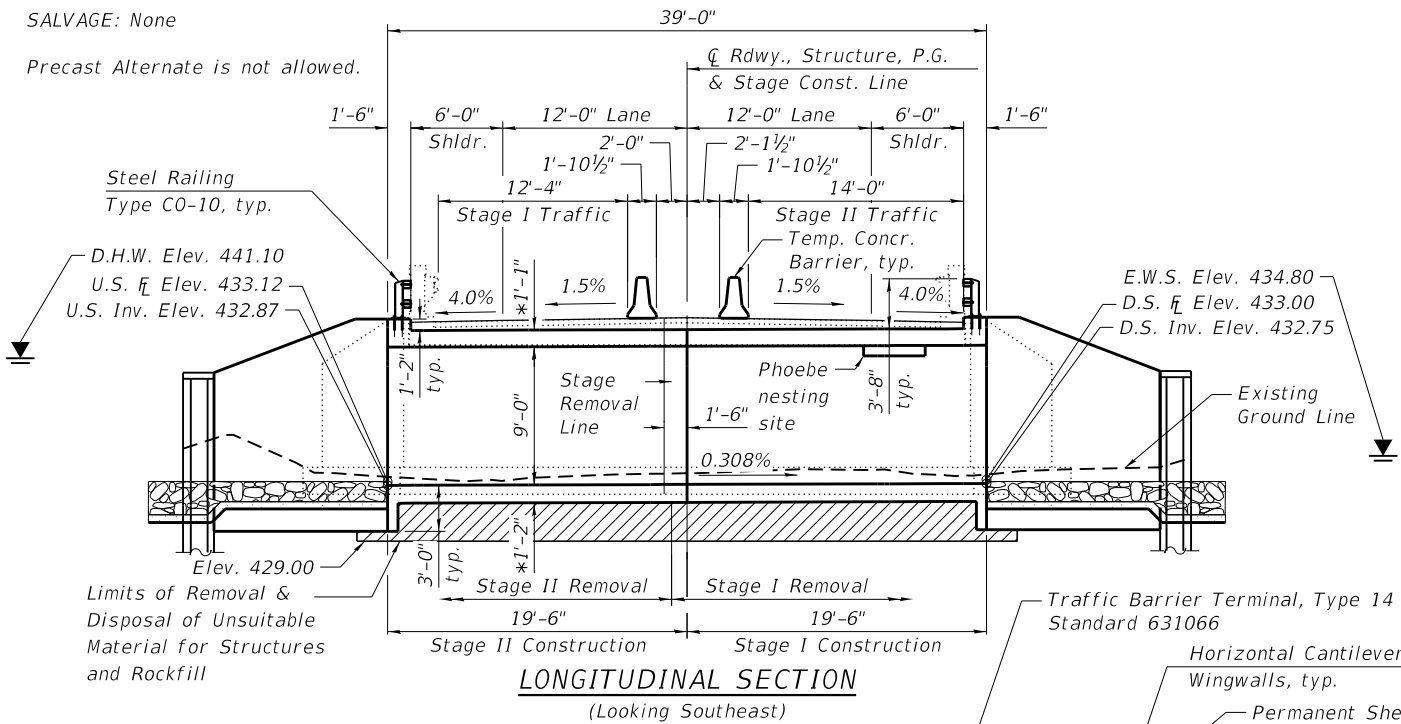
TS&L

BENCHMARK: BM #4143 Chiseled "□" on top of SW Wingwall on SN 041-0043. Elev. 443.11

EXISTING STRUCTURE: SN 041-0043 was built in 1928 as SBI Route 142 Section 113,B. The structure is a single span reinforced concrete slab on closed abutments supported on timber piles. The existing structure is to be removed and replaced with a triple box culvert. Traffic will be maintained utilizing stage construction.

SALVAGE: None

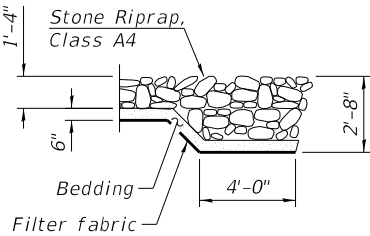
Precast Alternate is not allowed.



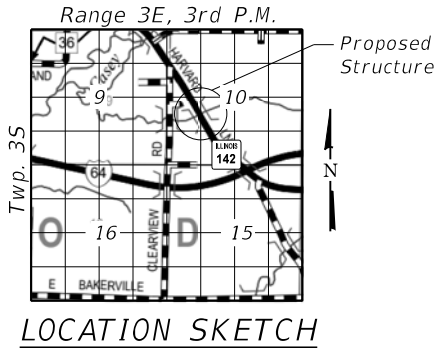
### WATERWAY INFORMATION

| Drainage Area = 2.3 sq. mi. |           |           | Existing Overtopping Elev. = |          | 441.83      | at Sta.   | 164+13.00 |                      |          |
|-----------------------------|-----------|-----------|------------------------------|----------|-------------|-----------|-----------|----------------------|----------|
|                             |           |           | Proposed Overtopping Elev. = |          | 441.83      | at Sta.   | 164+13.00 |                      |          |
| Flood Event                 | Freq. Yr. | Discharge | Waterway Opening (sf)        |          | Natural     | Head (ft) |           | Headwater Elev. (ft) |          |
|                             |           | (cfs)     | Existing                     | Proposed | H.W.E. (ft) | Existing  | Proposed  | Existing             | Proposed |
| Ten-Year                    | 10        | 974       | 160                          | 225      | 440.6       | 1.4       | 0.6       | 442.0                | 441.2    |
| Design                      | 50        | 1,610     | 176                          | 249      | 441.1       | 1.2       | 1.1       | 442.6                | 442.5    |
| Base                        | 100       | 1,900     | 176                          | 255      | 441.6       | 1.2       | 0.9       | 442.8                | 442.5    |
| Overtop Existing            | 10        | 974       | 160                          |          | 440.6       | 1.4       |           | 442.0                |          |
| Overtop Proposed            | 50        | 1,610     |                              | 249      | 441.4       |           | 1.1       |                      | 442.5    |
| Max. Calc.                  | 500       | 2,660     | 176                          | 263      | 442.2       | 1.2       | 1.0       | 443.4                | 443.2    |

10-Year Velocity through Existing Structure = 4.9 ft/s  
10-Year Velocity through Proposed Structure = 4.0 ft/s



Note:  
Excavation behind existing abutment walls shall be performed to balance front and back soil pressure before removing the existing superstructure.



DESIGN SPECIFICATIONS  
2020 AASHTO LRFD Bridge Design  
Specifications, 9th Edition

LOADING HL-93

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

DESIGN STRESSES  
FIELD UNITS

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

### HIGHWAY CLASSIFICATION

F.A.P. Rte. 849-IL Rte. 142  
Functional Class: Minor Arterial  
ADT: 3650 (2023); 3636 (2046)  
ADTT: 219 (2023); 218 (2046)  
DHV: 327  
Design Speed: 55 m.p.h.  
Posted Speed: 55 m.p.h.  
Two-Way Traffic  
Directional Distribution: 50%/50%

GENERAL PLAN AND ELEVATION  
IL ROUTE 142 OVER STREAM  
F.A.P. RTE. 849 - SECTION 113B-2  
JEFFERSON COUNTY  
STATION 161+22.00  
STRUCTURE NO. 041-2025

MODEL: Default  
FILE NAME: S:\2021\12\10\033 - PTB 195-38 D9 - QEI - Various HIWO-6 - IL-142 BR Replace 041-0043 PH\1\CADD\CADD Sheets\0412025-78935-TSL-001.dgn  
5/7/2024 8:14:27 AM



QUIGG ENGINEERING INC

|                                    |                |           |
|------------------------------------|----------------|-----------|
| USER NAME = kortega                | DESIGNED - KFO | REVISED - |
| 0412025-78935-TSL-001.dgn          | CHECKED - KWB  | REVISED - |
| PLOT SCALE = 12:6.0000 " : " / in. | DRAWN - JDC    | REVISED - |
| PLOT DATE =                        | CHECKED - MDC  | REVISED - |

STATE OF ILLINOIS  
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 1 SHEETS

| F.A.P. RTE.               | SECTION | COUNTY    | TOTAL SHEETS | SHEET NO. |
|---------------------------|---------|-----------|--------------|-----------|
| 849                       | 113B-2  | JEFFERSON |              |           |
| CONTRACT NO. 78935        |         |           |              |           |
| ILLINOIS FED. AID PROJECT |         |           |              |           |

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## **Appendix C**

### **Boring Logs and Laboratory Test Results**



# Illinois Department of Transportation

## Memorandum

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|          |                       |                       |
|----------|-----------------------|-----------------------|
| To:      | Carrie Nelsen         | Attn: Grant Deterding |
| From:    | Rob Graeff            | By: Aaron Hayes       |
| Subject: | Structure Boring Logs | (AH)                  |
| Date:    | August 25, 2022       |                       |

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**IL 142 over Stream  
Jefferson County  
Structure No.: 041-0043 (Ex.)**

Attached are boring logs to be used for the design of a multi-barrel box culvert to replace SN 041-0043. The location was drilled by Holcomb Foundation Engineering and logged by Gonzalez Companies in July of 2022.

AWH:ah  
Attachments

cc: Soils File\Jefferson Co.\Structure Borings



# SOIL BORING LOG

Page 1 of 1

Date 07/14/22

ROUTE IL 142 over Stream DESCRIPTION IL 142 over Stream, 1.8 miles S of Mt. Vernon LOGGED BY NRK (Gonzalez)

SECTION 113,B (Ex) LOCATION 1.8 miles south of Mt. Vernon, SEC. 10, TWP. 3S, RNG. 3E, 3<sup>rd</sup> PM,  
Latitude 38.27819484, Longitude -88.86503568

COUNTY Jefferson DRILLING METHOD Hollow Stem Auger (8" O.D., 3.25" I.D.) HAMMER TYPE Auto 140 lb HE 92

| STRUCT. NO.                       | 041-0043  | D    | B     | U     | M   | Surface Water Elev.              | ft    | D     | B     | U     | M   |
|-----------------------------------|-----------|------|-------|-------|-----|----------------------------------|-------|-------|-------|-------|-----|
| Station                           | 161+22    | E    | L     | C     | O   | Stream Bed Elev.                 | ft    | E     | L     | C     | O   |
| BORING NO.                        | 1-S       | P    | W     | S     | I   | Groundwater Elev.:               |       | T     | S     | Qu    | S   |
| Station                           | 160+87    | H    | S     | Qu    | T   | First Encounter                  | 431.6 | H     | S     | Qu    | T   |
| Offset                            | 8.5 ft RT |      |       |       |     | Upon Completion                  | ft    |       |       |       |     |
| Ground Surface Elev.              | 443.6     | (ft) | (/6") | (tsf) | (%) | After                            | Hrs.  | (ft)  | (/6") | (tsf) | (%) |
| ASPHALT - 7"                      | 443.0     |      |       |       |     | CLAY: Very Stiff, Brown, Moist   |       |       |       |       |     |
| CONCRETE - 6"                     | 442.5     |      |       |       |     | (continued)                      | 422.4 |       |       |       |     |
| CRUSHED STONE - 10"               | 442.2     |      | 1     |       |     | CLAY SHALE: Gray, Dry,           |       | 16    |       |       |     |
| CLAY: Medium Stiff, Brown, Moist  | 441.9     |      | 2     | 2.8   | 15  | Weathered                        |       | 60/5" | 4.5   | 9     |     |
| SILTY LOAM: Soft to Medium Stiff, |           |      | 2     | S     |     |                                  |       |       | P     |       |     |
| Gray and Brown, Moist             |           |      |       |       |     |                                  |       |       |       |       |     |
| A-4(3)                            |           |      | 1     |       |     |                                  |       | 36    |       |       |     |
| LL=26, PL=21, 86% Fines           |           |      | 1     | 1.2   | 19  |                                  | 419.4 | 60/3" |       | 7     |     |
|                                   |           | -5   | 2     | S     |     | Boring terminated at 24.25 feet. |       | -25   |       |       |     |
|                                   |           |      |       |       |     | BM 4143 (chiseled square on top  |       |       |       |       |     |
|                                   |           |      | 2     |       |     | of SW wing wall of SN 041-0043)  |       |       |       |       |     |
|                                   |           |      | 4     | 1.5   | 18  | EL 443.11                        |       |       |       |       |     |
|                                   |           |      | 4     | S     |     |                                  |       |       |       |       |     |
|                                   |           |      |       |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 1     |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 2     | 1.2   | 20  |                                  |       |       |       |       |     |
|                                   |           | -10  | 2     | S     |     |                                  |       | -30   |       |       |     |
|                                   |           |      |       |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 1     |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 1     | 0.6   | 25  |                                  |       |       |       |       |     |
| becomes Wet                       |           |      | 2     | B     |     |                                  |       |       |       |       |     |
|                                   | 430.6     |      |       |       |     |                                  |       |       |       |       |     |
| CLAY: Very Stiff, Brown, Moist    |           |      | 8     |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 11    |       | 19  |                                  |       |       |       |       |     |
|                                   |           | -15  | 13    |       |     |                                  |       | -35   |       |       |     |
|                                   |           |      |       |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 4     |       |     |                                  |       |       |       |       |     |
| A-7-6(23)                         |           |      | 6     | 2.9   | 21  |                                  |       |       |       |       |     |
| LL=48, PL=21, 84% Fines           |           |      | 8     | B     |     |                                  |       |       |       |       |     |
|                                   |           |      |       |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 3     |       |     |                                  |       |       |       |       |     |
|                                   |           |      | 7     | 3.0   | 23  |                                  |       |       |       |       |     |
|                                   |           | -20  | 11    | S     |     |                                  |       | -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)



# SOIL BORING LOG

Page 1 of 1

Date 07/14/22

ROUTE IL 142 over Stream DESCRIPTION IL 142 over Stream, 1.8 miles S of Mt. Vernon LOGGED BY NRK (Gonzalez)

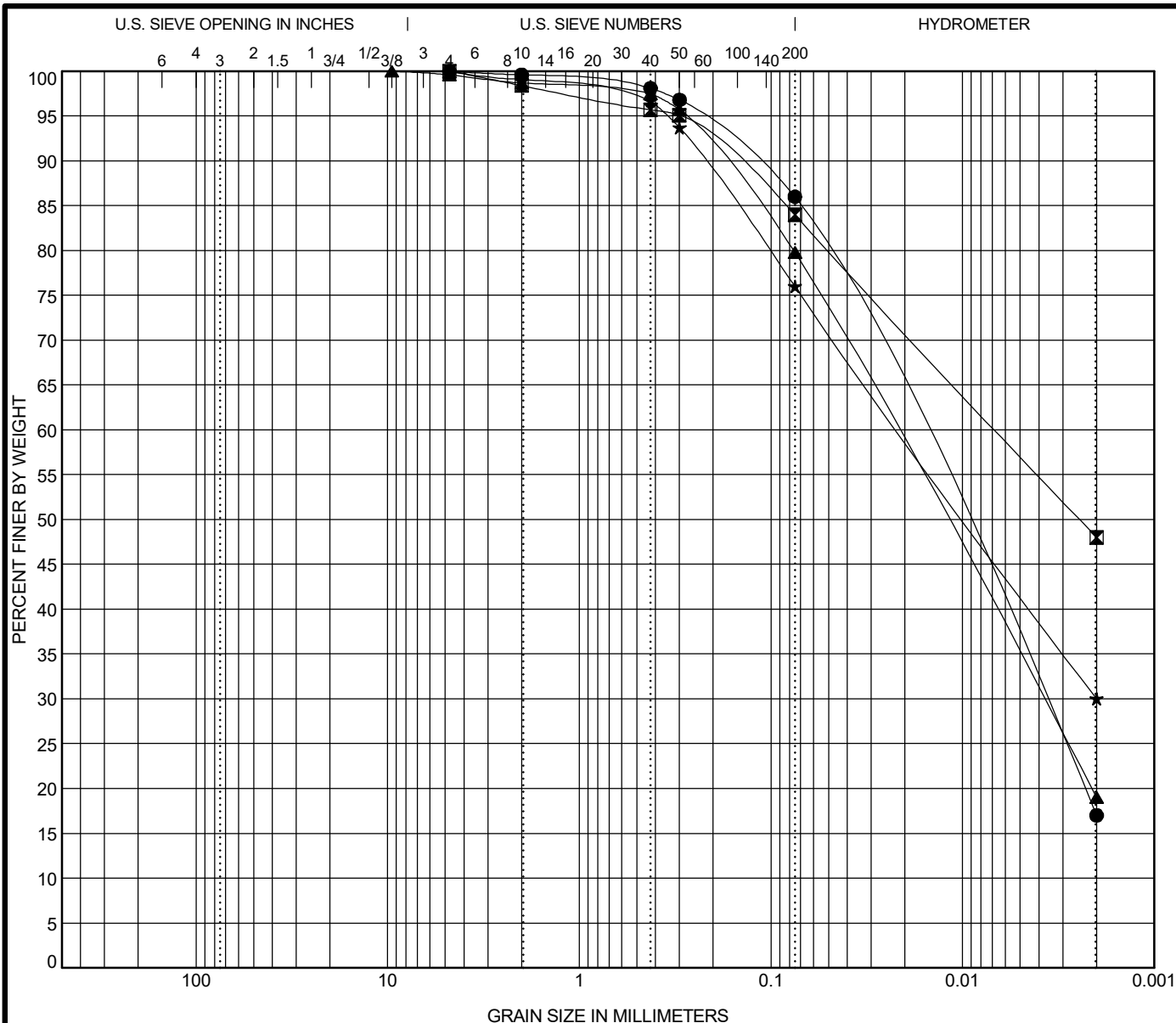
SECTION 113,B (Ex) LOCATION 1.8 miles south of Mt. Vernon, SEC. 10, TWP. 3S, RNG. 3E, 3<sup>rd</sup> PM,  
Latitude 38.27806223, Longitude -88.86486877

COUNTY Jefferson DRILLING METHOD Hollow Stem Auger (8" O.D., 3.25" I.D.) HAMMER TYPE Auto 140 lb HE 92

| STRUCT. NO.                                        | 041-0043  | D    | B     | U     | M   | Surface Water Elev.                                             | ft    | D    | B     | U     | M   |
|----------------------------------------------------|-----------|------|-------|-------|-----|-----------------------------------------------------------------|-------|------|-------|-------|-----|
| Station                                            | 161+22    | E    | L     | C     | O   | Stream Bed Elev.                                                | ft    | E    | L     | C     | O   |
| BORING NO.                                         | 2-S       | P    | W     | S     | I   | Groundwater Elev.:                                              |       | T    | W     | S     | S   |
| Station                                            | 161+52    | H    | S     | Qu    | T   | First Encounter                                                 | 432.6 | H    | S     | Qu    | T   |
| Offset                                             | 9.4 ft LT |      |       |       |     | Upon Completion                                                 | 422.6 |      |       |       |     |
| Ground Surface Elev.                               | 442.6     | (ft) | (/6") | (tsf) | (%) | After                                                           | Hrs.  | (ft) | (/6") | (tsf) | (%) |
| ASPHALT - 7"                                       | 442.0     |      |       |       |     | CLAY LOAM: Stiff, Brown and Gray, Moist (continued)             |       |      |       |       |     |
| CRUSHED STONE - 10"                                | 441.2     |      | 1     |       |     |                                                                 |       |      | 2     |       |     |
| SILTY CLAY: Soft, Brown, Moist                     |           |      | 1     |       | 23  |                                                                 |       |      | 5     | 2.3   | 16  |
|                                                    |           |      | 1     |       |     |                                                                 |       |      | 6     | B     |     |
|                                                    | 438.6     |      | 1     |       |     |                                                                 | 418.5 |      | 1     | 1.4   | 17  |
| SILTY LOAM: Soft, Gray, Moist to Wet               |           |      | 2     | 1.1   | 24  | CLAY SHALE: Gray, Dry, Weathered                                | 417.9 |      | 36    | B     | 10  |
|                                                    | -5        |      | 1     | S     |     | Boring terminated at 24.75 feet.                                | -25   |      | 60/3" |       |     |
|                                                    |           |      | 1     |       |     | BM 4143 (chiseled square on top of SW wing wall of SN 041-0043) |       |      |       |       |     |
|                                                    |           |      | 1     | 0.4   | 25  | EL 443.11                                                       |       |      |       |       |     |
|                                                    |           |      | 1     | B     |     |                                                                 |       |      |       |       |     |
| A-4(5)                                             |           |      | 0     |       |     |                                                                 |       |      |       |       |     |
| LL=27, PL=18, 80% Fines                            |           |      | 1     |       | 26  |                                                                 |       |      |       |       |     |
|                                                    | -10       |      | 1     |       |     |                                                                 |       |      | -30   |       |     |
|                                                    | 432.1     |      |       |       |     |                                                                 |       |      |       |       |     |
| CLAY: Medium Stiff, Brown, Moist to Wet, with Sand |           |      | 1     |       |     |                                                                 |       |      |       |       |     |
|                                                    |           |      | 3     | 0.8   | 20  |                                                                 |       |      |       |       |     |
|                                                    |           |      | 3     | S     |     |                                                                 |       |      |       |       |     |
|                                                    | 429.6     |      |       |       |     |                                                                 |       |      |       |       |     |
| CLAY LOAM: Stiff, Brown and Gray, Moist            |           |      | 1     |       |     |                                                                 |       |      |       |       |     |
| A-6(11)                                            |           |      | 3     | 1.4   | 19  |                                                                 |       |      |       |       |     |
| LL=34, PL=18, 76% Fines                            |           |      | 4     | B     |     |                                                                 |       |      | -35   |       |     |
|                                                    | -15       |      |       |       |     |                                                                 |       |      |       |       |     |
|                                                    |           |      | 2     |       |     |                                                                 |       |      |       |       |     |
|                                                    |           |      | 5     | 1.9   | 18  |                                                                 |       |      |       |       |     |
|                                                    |           |      | 6     | B     |     |                                                                 |       |      |       |       |     |
|                                                    |           |      |       |       |     |                                                                 |       |      |       |       |     |
|                                                    |           |      | 2     |       |     |                                                                 |       |      |       |       |     |
|                                                    |           |      | 4     | 2.3   | 17  |                                                                 |       |      |       |       |     |
|                                                    | -20       |      | 8     | B     |     |                                                                 |       |      | -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)





| COBBLES | GRAVEL | SAND   |      | SILT | CLAY |
|---------|--------|--------|------|------|------|
|         |        | coarse | fine |      |      |

| Sample ID | Depth | Classification     | LL | PL | PI | Cc | Cu |
|-----------|-------|--------------------|----|----|----|----|----|
| ● 1-S     | 3.5   | A-4 (3) SILTY LOAM | 26 | 21 | 5  |    |    |
| ☒ 1-S     | 16.0  | A-7-6 (23) CLAY    | 48 | 21 | 27 |    |    |
| ▲ 2-S     | 8.5   | A-4 (5) SILTY LOAM | 27 | 18 | 9  |    |    |
| ★ 2-S     | 13.5  | A-6 (11) CLAY LOAM | 34 | 18 | 16 |    |    |

| Sample ID | Depth | D100 | D60   | D30   | D10 | %Gravel | %Sand | %Silt | %Clay |
|-----------|-------|------|-------|-------|-----|---------|-------|-------|-------|
| ● 1-S     | 3.5   | 4.76 | 0.019 | 0.004 |     | 0.4     | 13.6  | 69.0  | 17.0  |
| ☒ 1-S     | 16.0  | 4.76 | 0.007 |       |     | 1.6     | 14.4  | 36.0  | 48.0  |
| ▲ 2-S     | 8.5   | 9.53 | 0.023 | 0.004 |     | 1.3     | 18.9  | 60.8  | 19.0  |
| ★ 2-S     | 13.5  | 4.76 | 0.021 | 0.002 |     | 0.9     | 23.1  | 46.0  | 30.0  |

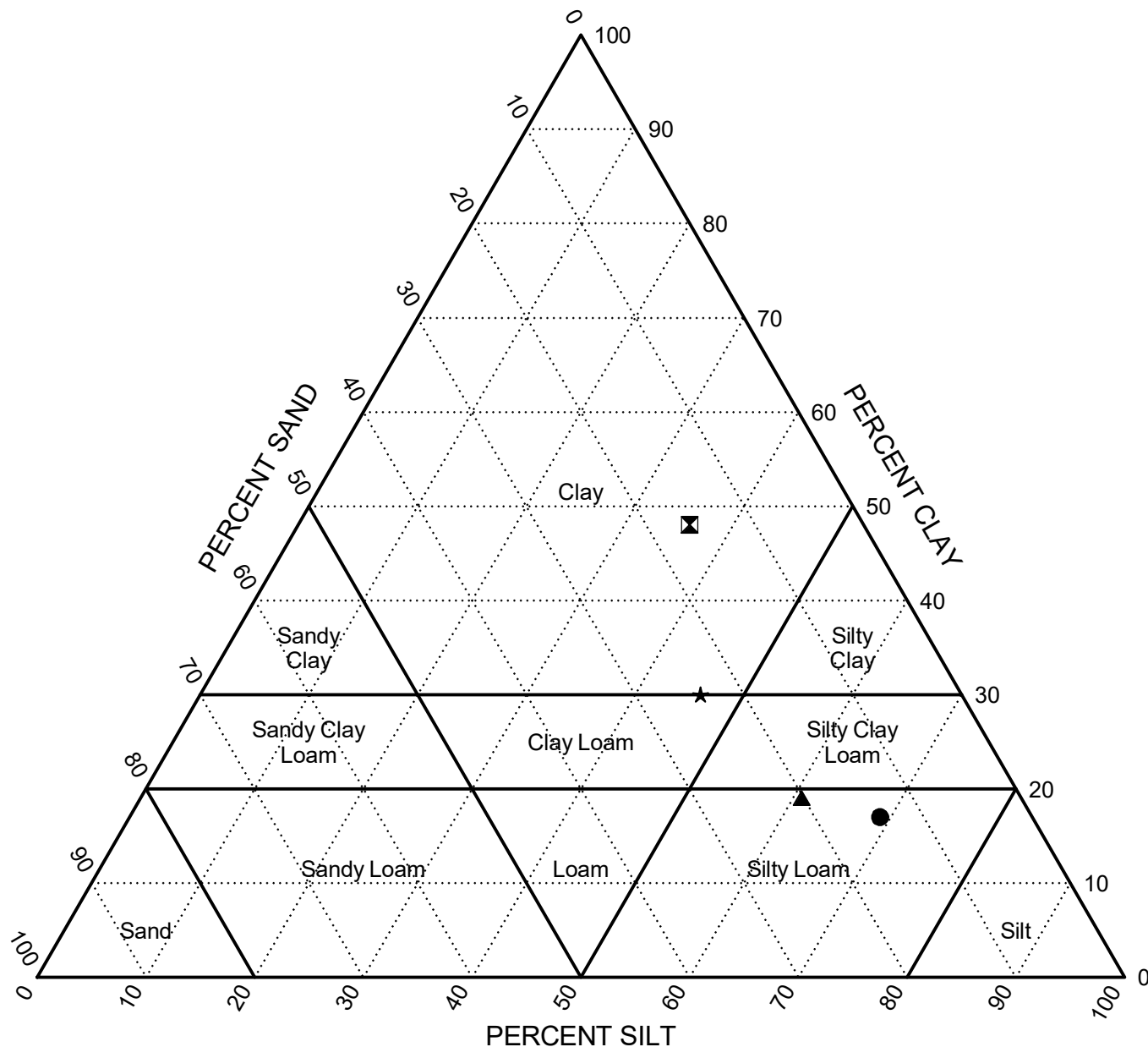


### IDH GRAIN SIZE DISTRIBUTION

Route: IL 142 over Stream (1.8 miles south of Mt. Vernon)

Section: 113,B (Ex)

County: Jefferson



|   | Borehole | Station | Offset    | Depth ( ft) | IDH Textural Classification |
|---|----------|---------|-----------|-------------|-----------------------------|
| ● | 1-S      | 160+87  | 8.5 ft RT | 3.5         | A-4 (3) SILTY LOAM          |
| ⊠ | 1-S      | 160+87  | 8.5 ft RT | 16.0        | A-7-6 (23) CLAY             |
| ▲ | 2-S      | 161+52  | 9.4 ft LT | 8.5         | A-4 (5) SILTY LOAM          |
| ★ | 2-S      | 161+52  | 9.4 ft LT | 13.5        | A-6 (11) CLAY LOAM          |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |
|   |          |         |           |             |                             |



### IDH Textural Classification Chart

Route: IL 142 over Stream (1.8 miles south of Mt. Vernon)

Section: 113,B (Ex)

County: Jefferson



Job No.

BMPR 508A (Rev. 08/23/13)  
(Formerly BBS 2640)