
**STRUCTURE GEOTECHNICAL REPORT
BARRINGTON ROAD IMPROVEMENT (F.A.P. 362)
BARRINGTON ROAD OVER POPLAR CREEK
CULVERT AT STATION 83+22.86
PR SN 016-2313
IDOT JOB No. D-91-312-20
COOK COUNTY, ILLINOIS**

**For
Ardmore Roderick
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Chicago, IL 60607
(312) 795-1400**

**Submitted by
Wang Engineering, Inc.
1145 North Main Street
Lombard, IL 60148**

**Original Report: February 17, 2023
Revised Report: October 16, 2023, August 9, 2024**

Technical Report Documentation Page

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11. Abstract <p>The existing 7-foot wide by 5.0-foot tall single cell concrete box culvert carrying Barrington Road over Poplar Creek will be removed and replaced with a double-cell box culvert with an interior cell opening of 12-foot wide by 6-foot tall. The proposed culvert will have an out-to-out headwall length of 108.3 feet. The new culvert will have upstream invert elevation at 831.55 feet and the downstream invert elevation at 831.48 feet; with flow directed from east to west.</p> <p>Beneath the pavement and up to 7.2 feet of cohesive fill, the soils consist of up to 12 feet of peat and very soft to medium stiff organic clay, silty clay, and silty loam. Deeper foundation soils include stiff to very stiff silty clay to silty clay loam. The groundwater level during drilling was observed at elevation of 832.0 to 836.9 feet (2.0 to 6.0 feet bgs) and at completion of 833.5 feet (2.0 feet bgs). We estimate a design groundwater elevation of 833 feet.</p> <p>At culvert base elevations, the borings encountered 3 to 9.5 feet peat and very soft to medium stiff to organic clay, silty clay, and silty loam. Therefore, foundation improvements such as removal and replacement (Option 1) or pile supported embankments (Option 2) could be considered. The removal and replacement include removal of soft soils (up to 9.5 feet deep below culvert base). The replacement material could be rockfill capped with 6-inches of CA-7 bedding in accordance with 2017 <i>IDOT Culvert Manual</i>.</p> <p>For the replacement of the culvert, temporary soil retention system (TSRS) will be required. We note that temporary soil retention system for removal and replacement will be larger than for supporting the culvert on pile supported embankment due to retention depths.</p> <p>Excavations for ground improvement and installation of the culvert will encounter groundwater and appropriate measures should be taken to remove the water or control the flow into the excavation prior to placing material.</p>		
12. Path to archived file <small>N:_WANGLegacy\SHARED\Netprojects\10640101\Reports\Culvert SN016-2313\V_03_WithIDOTComments\RPT_Wang_AAK_10640101CulSN0162313V03_20240809.doc</small>		

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**STRUCTURE GEOTECHNICAL REPORT
CULVERT AT STATION 83+22.86
BARRINGTON ROAD OVER POPLAR CREEK
PR SN 016-2313
IDOT JOB No. D-91-20
COOK COUNTY, ILLINOIS
FOR
ARDMORE RODERICK.**

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, and geotechnical evaluations to support the removal and replacement of the culvert carrying Barrington Road over Poplar Creek at Station 83+22.86 that is about 1,700 feet south of the intersection between Barrington Road and Algonquin Road. The proposed structure replacement is part of the reconstruction of 2.0-mile-long Barrington Road between Algonquin Road and Central Road in Cook County, Illinois. A *Site Location Map* is presented as Exhibit 1.

1.1 Proposed Structure

Based on the updated *General Plan and Elevation (GPE)* drawings provided by Ardmore Roderick (AR) on October 10, 2023, Wang Engineering, Inc. (Wang) understands the existing single cell box culvert will be removed and replaced with a double-cell box culvert with an interior cell opening of 12-foot wide by 6-foot tall. The proposed culvert (SN016-2313) will be 108.3-foot long and will have upstream invert elevation at 831.55 feet and the downstream invert elevation at 831.48 feet; with flow directed from east to west. The proposed culvert will have horizontal wingwalls at both the upstream and downstream ends. The proposed culvert overlaps with the existing 7.0-foot wide culvert along the centerline with the new culvert having a much larger footprint of 25.8-foot width, as well as 21-foot longer with most of the extra length on east end. The new roadway will be widened at both sides and raised at about 2 feet. Traffic will be maintained in two construction stages.

1.2 Existing Structure and Land Use

The existing structure (SN016-1294) is a 7.0-foot by 5-foot single cell box culvert with a length of 86.8 feet. The surrounding land at the proposed site are wetlands on the east and west of the existing Barrington Roadway, and Poplar Creek on the north with the existing culvert. Nearby the site are residential homes and the Willow Creek Care Center and Church.

The purpose of this investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed culvert and wingwalls.

2.0 METHODS OF INVESTIGATION

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

2.1 Field Investigation

The subsurface investigation consisted of three structure borings, designated as CUL-01, CUL-02, and RWB-05 and two peat delineation borings, designated as PT-05 and PT-08. The borings were drilled by Wang from February 7 to July 27, 2022 and were advanced to depths of 16 to 40 feet below ground surface (bgs). The as-drilled northings and eastings were acquired with a mapping-grade GPS unit. Boring elevations, stations, and offsets were provided by Ardmore Roderick. Boring location data are presented in the *Boring Logs* (Appendix A). The as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 3).

An ATV- mounted drilling rig, equipped with hollow stem augers, was used to advance, and maintain open boreholes. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils.*" The soil was sampled at 2.5-foot intervals to 30 feet below ground surface (bgs) and at 5-foot intervals, thereafter. Jackhammer driven Geoprobe samplers were used to continuously sample the peat Borings PT-05 and PT-08. Soil samples collected from each sampling interval were placed in sealed jars and transported to the laboratory for further examination and laboratory testing.

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

Groundwater observations were made during and at the end of drilling operations. For safety considerations each borehole was backfilled upon completion with soil cuttings and/or bentonite chips and the pavement restored as close as possible to its original condition.

2.2 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T265). Atterberg limits (AASHTO T89/T90) and particle size (AASHTO T88) analyses were performed on selected samples. One dimensional consolidation test (AASHTO T 208) was performed on selected Shelby tube samples. Field visual descriptions of the soil samples were verified in the laboratory and index tested samples were classified according to the IDH Soil Classification System. Laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

3.0 INVESTIGATION RESULTS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 3). Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

3.1 Lithological Profile

The borings encountered 6 to 45 inches of sandy loam, silty loam to silty clay topsoil at the surface. Boring CUL-01, drilled on the pavement, encountered 15 inches of asphalt pavement. In descending order, the general lithologic succession encountered beneath the surface includes: 1) man-made ground (fill); 2) very soft to medium stiff peat to organic clay, silty clay, and silty loam; 3) medium stiff to very stiff silty clay to silty clay loam and clay; and 4) stiff to very stiff silty clay to silty clay loam.

1) *Man-made ground (fill)*

Beneath the topsoil and pavement structure, borings revealed 2.5 to 7.2 feet of fill material. The fill material is cohesive, consisting of soft to hard, black, brown, and gray clay loam, silty clay, and silty clay loam. The fill has unconfined compressive strength (Q_u) values of 0.3 to 5.3 tsf and the moisture content values of 16 to 60%.

2) *Very soft to medium stiff peat to organic clay, silty clay, and silty loam*

At elevations of 832 to 835 feet (1.2 to 8.0 feet bgs), the borings encountered 5 to 12 feet of very soft to medium stiff, black, brown, and gray clay, silty clay with organic matter, organic silty loam, and peat. The unit has Q_u values of less than 0.2 to 0.8 tsf, averaging 0.3 tsf, and moisture content values

of 42 to 640%, averaging 255%. Laboratory index testing on samples from this layer shows L_L values of 59 to 120% and P_L values of 29 to 101%.

3) *Medium stiff to very stiff silty clay to silty clay loam and clay*

At elevations of 824 to 828 feet (10.5 to 18.0 feet bgs), the borings encountered 2.5 to 7.5 gray, medium stiff to very stiff silty clay to silty clay loam and clay. The unit has Q_u values of 0.5 to 2.4 tsf, averaging 1.3 tsf, and moisture content values of 21 to 25%, averaging 23%.

4) *Stiff to very stiff silty clay to silty clay loam*

At elevations of 799 to 829 feet (11.5 to 36.9 feet bgs), the borings encountered gray, stiff to very stiff silty clay to silty clay loam with medium dense silt interbeds. The unit has Q_u values of 1.0 to 2.6 tsf, averaging 1.8 tsf, and moisture content values of 14 to 22%, averaging 18%.

3.2 Groundwater Conditions

Groundwater was observed while drilling at elevations of 832.0 to 836.9 feet (2.0 to 6.0 feet bgs). At completion of drilling, groundwater was observed at an elevation of 833.5 feet (2.0 feet bgs). For the purposes of engineering analyses, the groundwater table is estimated to be at an elevation of 833 feet. It should be noted that groundwater levels might change with seasonal rainfall patterns and long-term climate fluctuations or may be influenced by local site conditions.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the culvert and wingwalls are included in the following sections. The proposed culvert will have upstream invert elevation at 831.55 feet and the downstream invert elevation at 831.48 feet. Horizontal wingwalls are proposed at both ends of the culvert.

4.1 Scour Considerations

The design scour elevation should be taken at the bottom of the cutoff wall (IDOT 2012). At the horizontal cantilever wingwalls, the cutoff walls are established at 3.0 feet below the culvert invert elevations. To prevent local erosion, we recommend placing stone riprap or a concrete apron at the ends of the culvert. This will also prevent sediments from entering and accumulating in the culvert, minimize long term maintenance, and provide protection to the stream bed at the interface.

4.2 Culvert Foundation Treatment and Settlement

Based on our subsurface investigation, the soils below the base of the culvert barrel at approximately 830.0 feet elevation are expected to be very soft to medium stiff peat or organic clay to silty clay. For the downstream half (west section) the unsuitable soils below the culvert range from 3 feet at boring PT-05 to 6 feet at boring CUL-01 at about the center of new culvert; and for the upstream half (east section) the unsuitable soils range from 4.5 feet at boring CUL-02 to 9.5 feet at boring PT-08.

Based on the subsurface profile and the proposed culvert geometry, our settlement calculations show 1.7 inches of settlement at the downstream end versus 7.6 inches in the upstream end. Therefore, we recommend ground improvement along the proposed culvert footprint to mitigate excessive differential settlements.

Removal and Replacement – Option 1: This option includes up to 6.0 feet removal of very soft to medium stiff peat or organic clay from the downstream half (west section) to an elevation 624 feet and up to 9.5 feet removal from the upstream half (east section) to an elevation of about 620 feet. The replacement material could be rockfill capped with 6-inches of CA-7 bedding in accordance with 2017 *IDOT Culvert Manual*. The removal and replacement should extend 2 feet beyond the edge of the cast-in-place sections both sides of the culvert. A temporary soil retention system will be required for removal and replacement. It should be noted that water can be a significant issue during deep replacement and large shoring systems can be costly. Prior to placement of replacement material, we recommend installing fabric for ground stabilization in accordance with IDOT Section 210 (IDOT 2016). In addition, the following note should be shown in the plans.

“The limits and quantities of removal and replacement shown are based on the boring data may be modified by the District Geotechnical and Field Engineers for variable subsurface conditions encountered in the field”

Pile Supported Embankment (PSE) – Option 2: The PSE system has been used at several locations within the State of Illinois to successfully support both roadway embankments as well as earth retaining structures. The columns support the embankment and load transfer platform above via optional, square, or round pile caps. The load from the embankment is distributed along the load transfer platform, which transfers the system load to the columns. The columns then transmit the load into the more competent strata below. Timber to metal piles or rigid inclusions generally fulfill this role. Timber piles would be the least expensive option while metal piles would be the most expensive

option. A Geosynthetic-reinforced Load Transfer Platform (LTP) will be placed above the pile caps and collect the culvert and embankment load and transfer it to the pile caps. The platform consists of compacted, select, granular fill material, typically IDOT aggregate gradation CA-19, with layers of geosynthetics placed at specifically designed levels.

In our opinion, both options are technically feasible; however, we recommend performing a cost and constructability analysis to choose a preferred option.

4.3 Wingwalls

Wingwall types should be selected after the selection of the ground improvement type as recommended in Section 4.2.

4.4 Cast-In-Place or Precast Culvert Considerations

Cast-in place culvert type is recommended for both ground improvement options.

4.5 Stage Construction Considerations

We understand staged construction will be required to maintain the traffic along Barrington Road. For the staged construction a temporary soil retention system (TSRS) will be required. We recommend including TSRS as a *Pay Item* at the west abutment. Due to the presence of groundwater below the base of the excavation where the sheet pile will be installed, significant dewatering efforts may be necessary for groundwater control. The sheetpile should be anchored a minimum of 12 inches into the underlying very stiff clay layer below 820 feet elevation to control groundwater.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

The existing culvert will be removed and any vegetation, surface topsoil, pavements, and debris should be cleared and stripped where the new culvert and wingwalls will be placed.

5.2 Excavation, Dewatering, and Utilities

Excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon nearby structures, pavements, and utilities should be considered during construction. Given the presence of the unstable peat and soft organic soils, any unsupported excavation should be analyzed for stability. Any slope that cannot be graded should be

properly shored and dewatering will be necessary. Excavated material should not be stockpiled immediately adjacent to the top of slopes, nor should equipment be allowed to operate too closely to open excavations. We recommend considering Temporary Soil Retention System (TSRS). The TSRS can be included as *Pay Item*.

Excavations for ground improvement and installation of the culvert will encounter groundwater and appropriate measures should be taken to remove the water or control the flow into the excavation prior to placing material. If open excavations are proposed, significant pumping efforts may be necessary to maintain a dry subgrade for compaction. Precipitation allowed to enter excavations should be immediately removed via sump pump. Any soils allowed to soften under standing water should be removed and replaced with compacted fill as described in Section 5.3.

5.3 Filling and Backfilling

Fill material used to attain the final design elevations should be structural fill material. Coarse aggregate of IDOT gradation CA-6 or pre-approved, compacted, cohesive or granular soil conforming to Section 204 would be acceptable as structural fill (IDOT, 2022). The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to IDOT Section 205, *Embankment* (IDOT, 2022).

Groundwater may exist beneath the culvert. As mentioned in IDOT Culvert Manual (IDOT 2017), in cases such as replacement below box culvert where dewatering and compaction may not be possible, the pay item “Rockfill” is commonly used. In this case, the following note should be added.

“The Rockfill shall be capped with 6 in. of CA7 and satisfy the Standard Specifications unless otherwise indicated in the Special Provisions. The cost of the capping material shall be included in the pay item for Rockfill.”

5.4 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the Contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion.

Earth moving operations should be scheduled to not coincide with excessive cold or wet weather

(early spring, late fall, or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction.

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

6.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 2. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of the structure are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Ardmore Roderick, and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Metin W. Seyhun, P.E.
Senior Geotechnical Engineer

Corina T. Farez, P.E., P.G.
QA/QC Reviewer

Andri A. Kurnia, P.E.
Project Manager

REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (2020) *AASHTO LRFD Bridge Design Specification*. United States Department of Transportation, Washington, D.C.

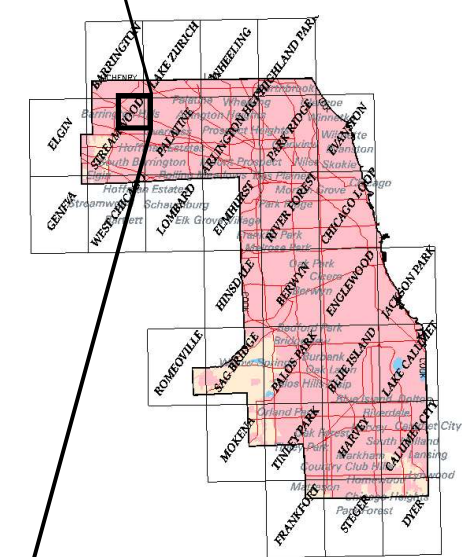
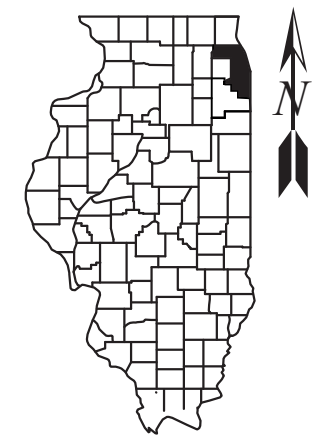
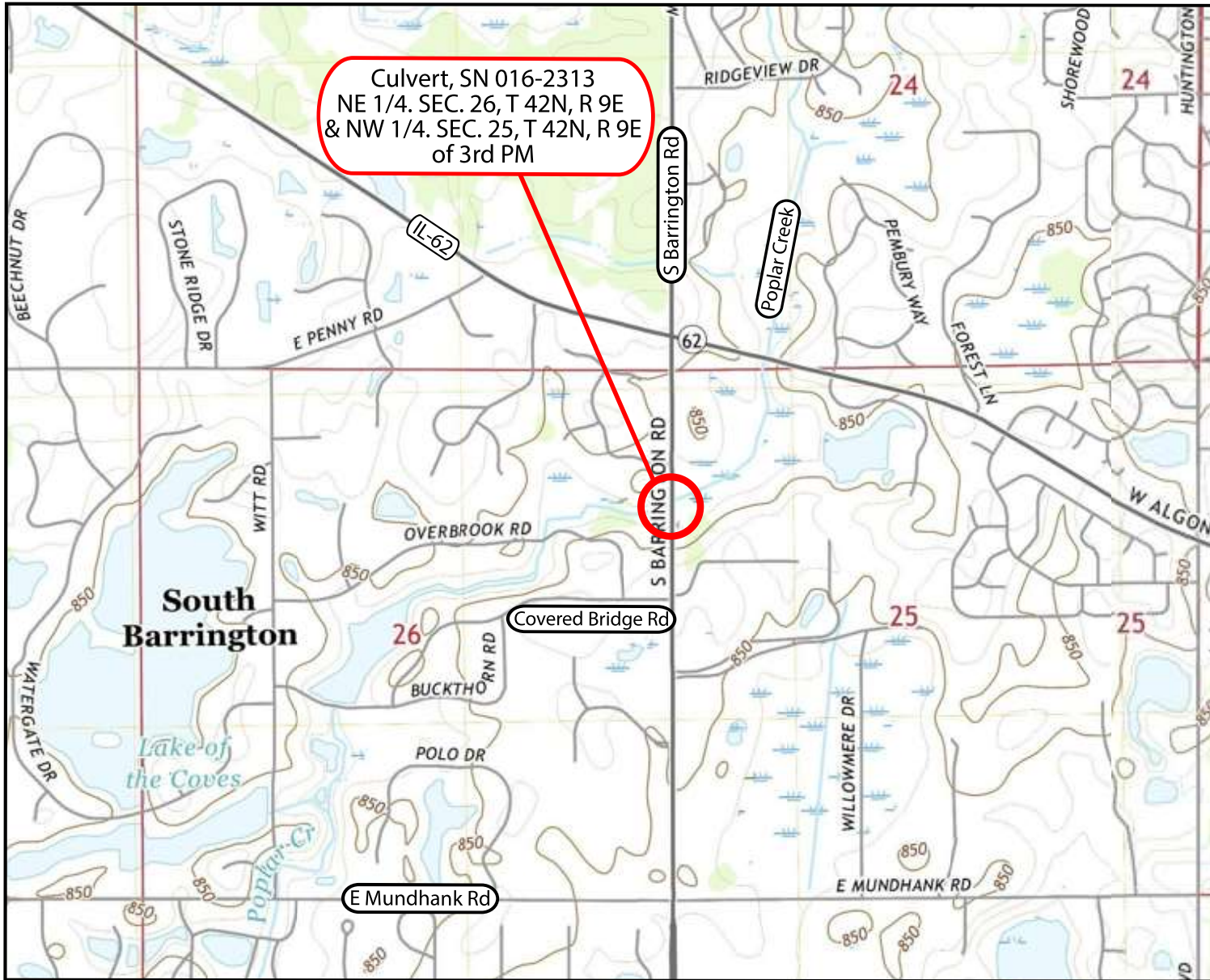
ILLINOIS DEPARTMENT OF TRANSPORTATION (2020) *Geotechnical Manual*. IDOT Bureau of Materials and Physical Research, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2022) *Standard Specifications for Road and Bridge Construction*. IDOT Division of Highways, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2012) *Bridge Manual*. IDOT Division of Highways, Springfield, IL.

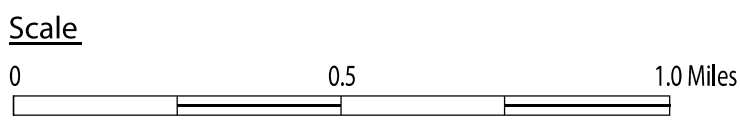
ILLINOIS DEPARTMENT OF TRANSPORTATION (2017) *Culvert Manual*. IDOT Division of Highways, Springfield, IL.

EXHIBITS



Cook County

Legend
 Site Locations



SITE LOCATION MAP: BARRINGTON ROAD FROM ALGONQUIN ROAD TO CENTRAL ROAD; CULVERT, SN 016-2313, COOK COUNTY, ILLINOIS

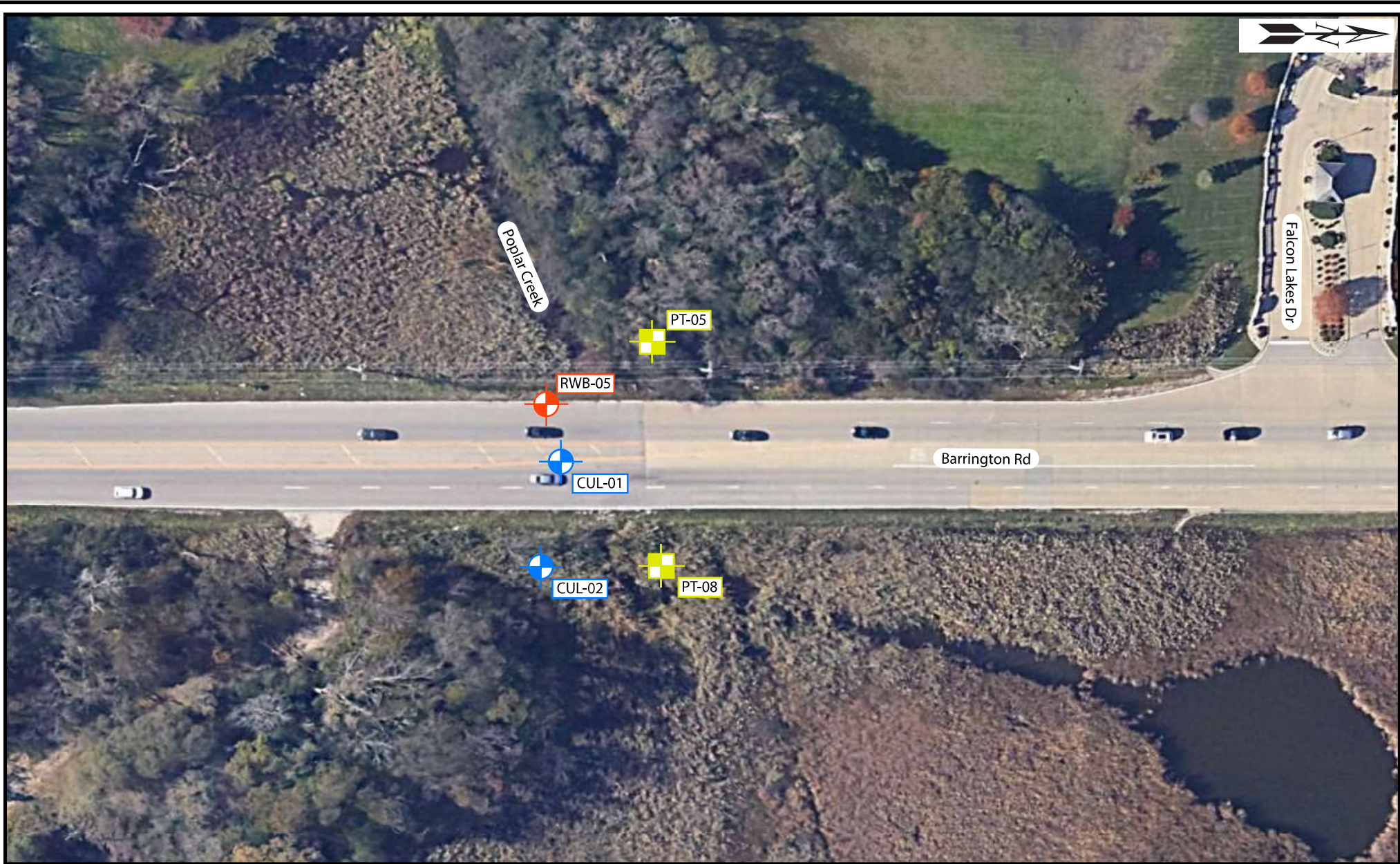
SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: D. You CHECKED BY: A. Kurnia
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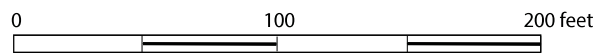
FOR ARDMORE RODERICK	KE225002 1064-01-01
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Legend

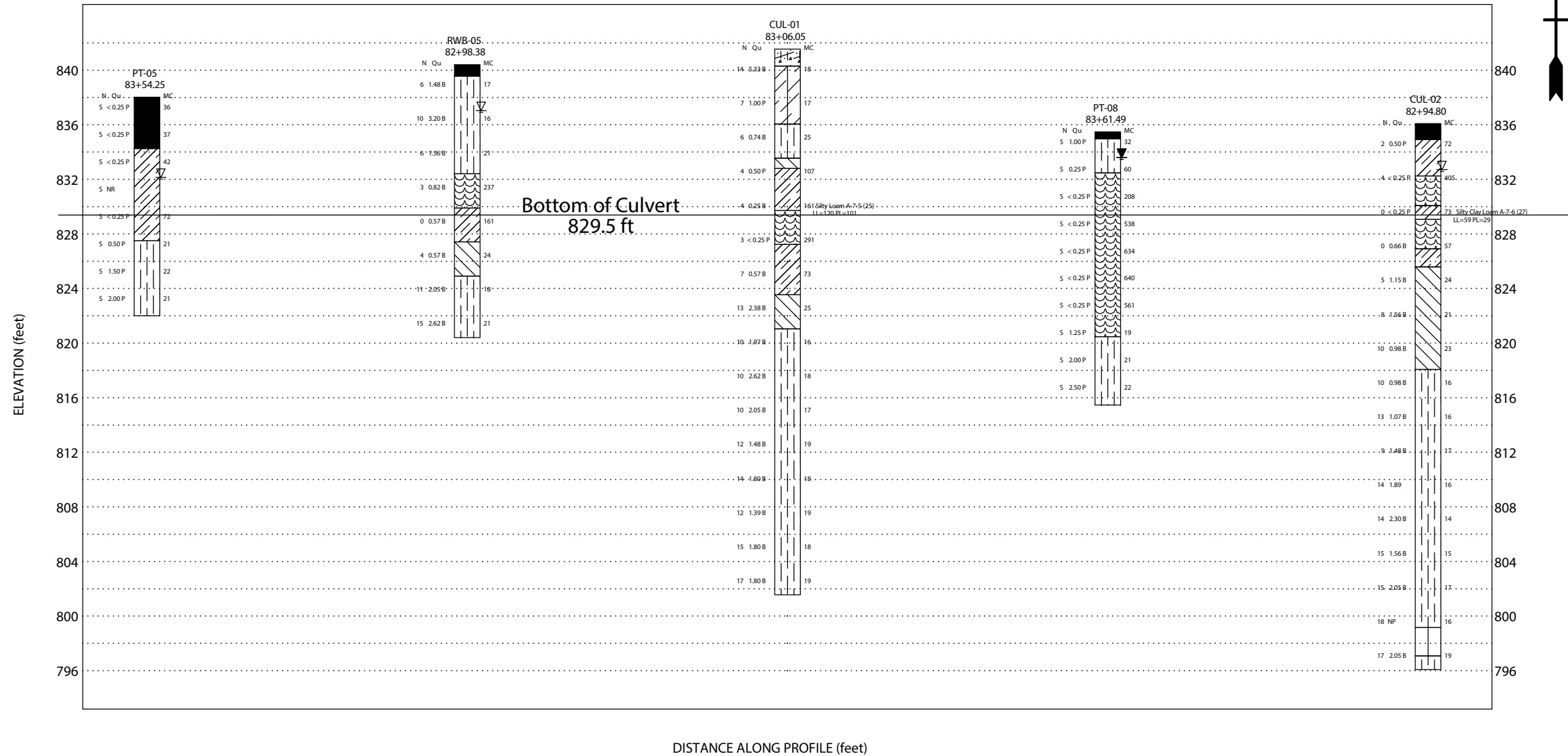
-  Retaining Wall Boring
-  Culvert Boring
-  Peat Boring

Scale



BORING LOCATION PLAN: BARRINGTON ROAD FROM ALGONQUIN ROAD TO CENTRAL ROAD; CULVERT, SN 016-2313, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: D. You CHECKED BY: A. Kurnia
 Wang Engineering A Terracon Company		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR ARDMORE RODERICK		KE225002 1064-01-01



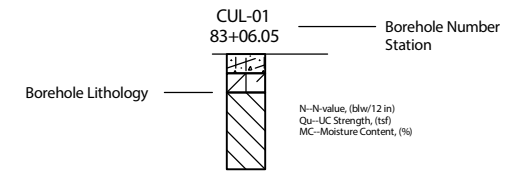
DISTANCE ALONG PROFILE (feet)



Lithology Graphics

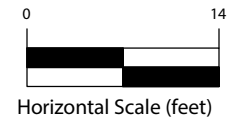
-  Pavement
-  USCS High Plasticity Organic silt or clay
-  IDH Clay Loam
-  USCS Peat
-  IDH Silty Clay, Silty Clay Loam
-  Topsail
-  IDH Clay
-  IDH Silt, Silty Loam

Site Map Scale 1 inch equals 50 feet

Explanation:



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



Vertical Exaggeration: 1.5x

Wang Engineering, Inc.
1145 N Main Street
Lomard, IL 60148

Soil Profile



Barrington Rd from Algonquin Rd to Central Rd
Cook County, IL

JOB NUMBER	PLATE NUMBER
1064-01-01	EXHIBIT 3

APPENDIX A



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 1145 N. Main Street
 Lombard, IL 60148
 Telephone: 630-953-9928
 Fax: 630-953-9938

BORING LOG CUL-01

WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 841.55 ft
 North: 1976246.54 ft
 East: 1036428.95 ft
 Station: 83+06.05
 Offset: 9.78 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	840.3	15-inch thick ASPHALT --PAVEMENT--								821.1	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; moist						
		Stiff to hard, brown and gray CLAY LOAM to SILTY CLAY LOAM, trace gravel; moist			1	8 7 7	5.33 B	18			--RDR 2--			9	4 5 5	1.97 B	16
		--FILL-- --RDR 2 to 3--			2	3 3 4	1.00 P	17				25		10	4 4 6	2.62 B	18
	836.1	Medium stiff, gray SILTY CLAY, trace gravel; moist			3	3 2 4	0.74 B	25						11	3 4 6	2.05 B	17
	833.6	Stiff (1.0P), gray CLAY to SILTY CLAY; moist			4	2 2 2	0.50 P	107				30		12	4 4 8	1.48 B	19
	832.8	--RDR 2--			5	2 2 2	0.25 B	161						13	4 5 9	1.80 B	18
	829.7	Soft to medium stiff, black Organic SILTY LOAM; moist			6	2 1 2	< 0.25 P	291						14	4 6 6	1.39 B	19
	827.2	--RDR 1-- --L _L (%)=120, P _L (%)=101-- --%Gravel=0.0-- --%Sand=31.5-- --%Silt=58.7-- --%Clay=9.9-- --A-7-5 (25)--			7	2 3 4	0.57 B	73						15	3 6 9	1.80 B	18
	827.2	Very soft, black and brown PEAT; moist			8	4 6 7	2.38 B	25						16	7 8 9	1.80 B	19
	823.6	Very soft to medium stiff, gray Organic SILTY CLAY; moist								801.6	Very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; moist						
		--RDR 2--										40					

Boring terminated at 40.00 ft

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **02-08-2022** Complete Drilling **02-08-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **21D50A [84%]**
 Driller **KS&AP** Logger **A. Scifers** Checked by **C. Marin**
 Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

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

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

WANGENGINC_10640101.GPJ WANGENG.GDT 2/17/23



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BORING LOG CUL-02

WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 836.08 ft
 North: 1976235.54 ft
 East: 1036487.22 ft
 Station: 82+94.80
 Offset: 48.44 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	834.9	Black SANDY LOAM --TOPSOIL--															
		Very soft to medium stiff, gray to green Organic SILTY CLAY; damp --RDR 1 to 2--			1	1 1 1	0.50 P	72						9	5 6 7	1.07 B	16
	832.3	Very soft, black PEAT, trace gravel; moist --RDR 1--	5		2	1 2 2	< 0.25 P	405				25		10	4 4 5	1.48 B	17
	830.1	Very soft, gray SILTY CLAY LOAM to PEAT, trace gravel; moist --RDR 1-- --L _c (%)=59, P _L (%)=29-- --%Gravel=1.8-- --%Sand=15.8-- --%Silt=57.9-- --%Clay=24.4-- --A-7-6 (27)--			3	0 0 0	< 0.25 P	73						11	4 6 8	1.89	16
	826.9	Very soft, black PEAT; moist --RDR 1--			4	0 0 0	0.66 B	57						12	4 6 8	2.30 B	14
	825.6	Medium stiff, gray SILTY CLAY, trace organic matter; moist --RDR 2--			5	2 2 3	1.15 B	24						13	5 7 8	1.56 B	15
		Medium stiff to stiff, gray CLAY to SILTY CLAY; moist --RDR 2--			6	3 3 5	1.56 B	21						14	5 6 9	2.05 B	17
			15		7	4 4 6	0.98 B	23						15	4 8 10	NP	16
	818.1	Medium stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; moist --RDR 2--			8	4 5 5	0.98 B	16		799.2	Gray SILT, trace to little gravel; moist --RDR 2--			16	7 6 11	2.05 B	19
			20							797.1	Very stiff, gray SILTY CLAY, trace gravel; moist						
										796.1		40					

GENERAL NOTES

Begin Drilling **02-07-2022** Complete Drilling **02-07-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **21D50A [84%]**
 Driller **KS&AP** Logger **A. Scifers** Checked by **C. Marin**
 Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **3.50 ft**
 At Completion of Drilling **Dry**
 Time After Drilling **NA**
 Depth to Water **NA**

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

WANGENGINC_10640101.GPJ WANGENG.GDT 2/17/23



BORING LOG CUL-02

Datum: NAVD 88
 Elevation: 836.08 ft
 North: 1976235.54 ft
 East: 1036487.22 ft
 Station: 82+94.80
 Offset: 48.44 RT

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WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--RDR 2-- Boring terminated at 40.00 ft	45														
			50														
			55														
			60														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **02-07-2022** Complete Drilling **02-07-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **21D50A [84%]**
 Driller **KS&AP** Logger **A. Scifers** Checked by **C. Marin**
 Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

While Drilling ∇ **3.50 ft**
 At Completion of Drilling ∇ **Dry**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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



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BORING LOG PT-05

WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 838.01 ft
 North: 1976294.47 ft
 East: 1036365.89 ft
 Station: 83+54.25
 Offset: 72.63 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Very soft, black SILTY CLAY, trace to little gravel; moist --TOPSOIL--			1	PUSH	< 0.25	36									
		--trace organic matter--			2	PUSH	< 0.25	37									
	834.3	Very soft to medium stiff, black to dark brown to gray Organic SILTY CLAY; moist to wet	5		3	PUSH	< 0.25	42									
					4	PUSH	NR										
					5	PUSH	< 0.25	72									
	827.5	Stiff to very stiff, gray SILTY CLAY, trace gravel; moist			6	PUSH	0.50	21									
					7	PUSH	1.50	22									
			15		8	PUSH	2.00	21									
	822.0	Boring terminated at 16.00 ft															

GENERAL NOTES

Begin Drilling **07-06-2022** Complete Drilling **07-06-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
 Driller **AG&TC** Logger **A. Scifers** Checked by **C. Marin**
 Drilling Method **.1" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **6.00 ft**
 At Completion of Drilling ∇ **NA**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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BORING LOG PT-08

WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 835.47 ft
 North: 1976302.23 ft
 East: 1036484.96 ft
 Station: 83+61.49
 Offset: 46.47 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	835.0	6-inch thick, black SILTY LOAM; damp --TOPSOIL-- Soft to stiff, black, gray and green SILTY CLAY, trace brick fragments; damp			1	PUSH	1.00	32									
	832.5	--FILL-- Very soft, black and brown PEAT; moist to saturated			2	PUSH	0.25	60									
			5		3	PUSH	< 0.25	208									
					4	PUSH	< 0.25	538									
					5	PUSH	< 0.25	634									
			10		6	PUSH	< 0.25	640									
					7	PUSH	< 0.25	561									
	820.5	Stiff to very stiff, gray SILTY CLAY, trace gravel; damp	15		8	PUSH	1.25	19									
					9	PUSH	2.00	21									
					10	PUSH	2.50	22									
	815.5	Boring terminated at 20.00 ft	20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **07-27-2022** Complete Drilling **07-27-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
 Driller **KS&AG** Logger **E. Greenwood** Checked by **C. Marin**
 Drilling Method **.1" ID HSA; Boring backfilled upon completion**

While Drilling ∇ **2.00 ft**
 At Completion of Drilling ∇ **2.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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

WANGENGINC_10640101.GPJ WANGENG.GDT 2/17/23



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BORING LOG RWB-05

WEI Job No.: 1064-01-01

Client **Ardmore Roderick**
 Project **Barrington Rd from Algonquin Rd to Central Rd**
 Location **Cook County, IL**

Datum: NAVD 88
 Elevation: 840.41 ft
 North: 1976238.74 ft
 East: 1036396.46 ft
 Station: 82+98.38
 Offset: 42.30 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	839.6	10-inch thick, black SANDY LOAM; moist															
		--TOPSOIL--															
		Stiff to very stiff, black and gray CLAY LOAM to SILTY CLAY, trace to some gravel; moist			1	5 2 4	1.48 B	17									
		--FILL--															
		--RDR 2--															
		--wet spoon--															
			5		2	3 6 4	3.20 B	16									
	832.4	Medium stiff, black PEAT; interbedded with Organic Silty Clay; wet			3	3 3 3	1.56 B	21									
		--RDR 2--															
			10		4	3 1 2	0.82 B	237									
	829.9	Medium stiff, gray Organic SILTY CLAY; wet															
		--RDR 1--															
					5	0 0 0	0.57 B	161									
	827.4	Medium stiff, light gray CLAY to SILTY CLAY LOAM, trace gravel; moist															
		--RDR 2--															
			15		6	2 2 2	0.57 B	24									
	824.9	Very stiff, gray SILTY CLAY, trace gravel; moist															
		--RDR 2--															
					7	4 5 6	2.05 B	18									
	820.4	Boring terminated at 20.00 ft	20		8	5 6 9	2.62 B	21									

GENERAL NOTES

WATER LEVEL DATA

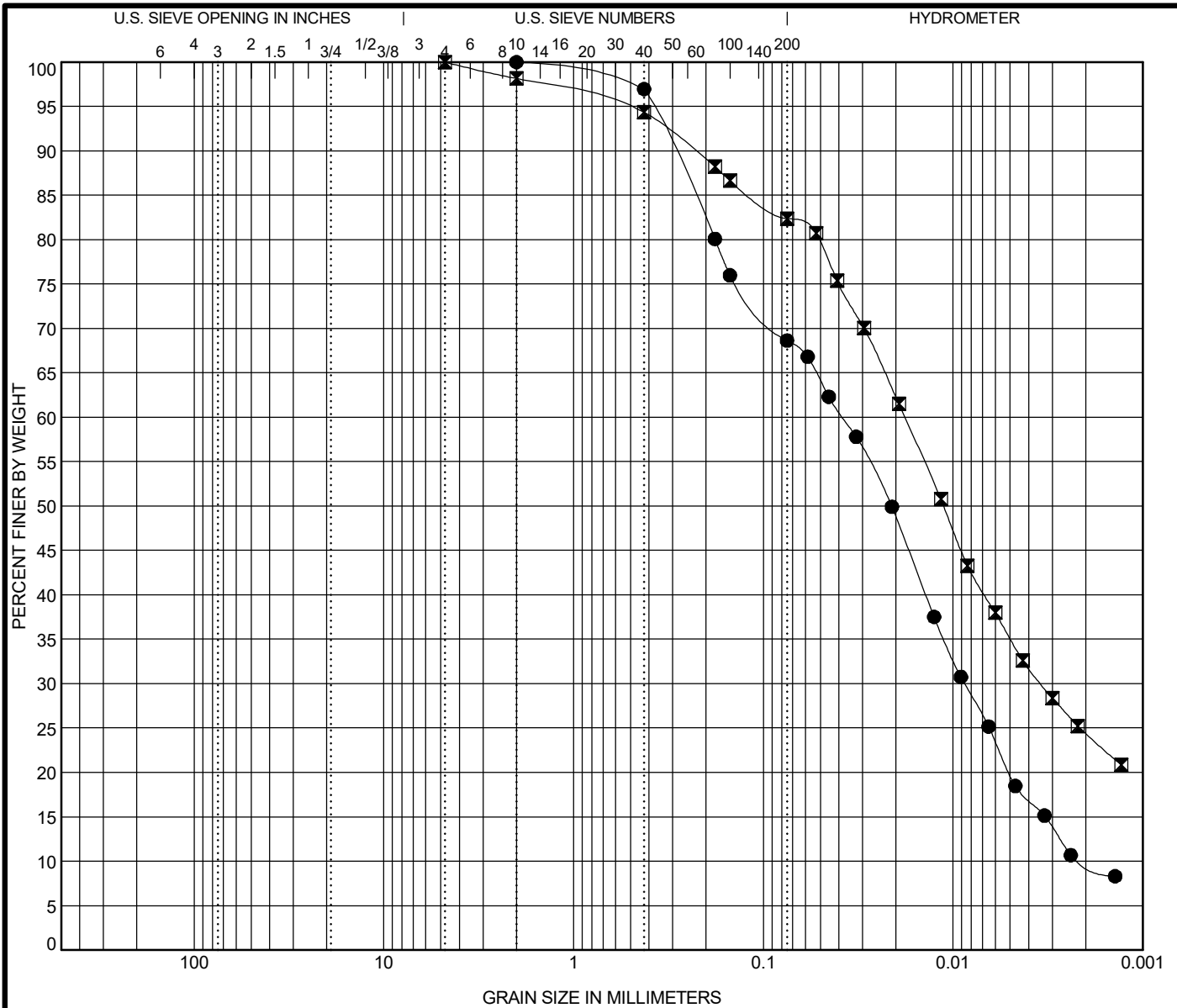
Begin Drilling **02-08-2022** Complete Drilling **02-08-2022**
 Drilling Contractor **Wang Testing Services** Drill Rig **21D50A [84%]**
 Driller **KS&AP** Logger **A. Scifers** Checked by **C. Marin**
 Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

While Drilling ∇ **3.50 ft**
 At Completion of Drilling ∇ **Dry**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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

WANGENGINC_10640101.GPJ WANGENG.GDT 2/17/23

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification	IDH Classification	LL	PL	PI	Cc	Cu
● CUL-01#5 11.0 ft	Silty Loam	120	101	19	0.96	18.50
■ CUL-02#3 6.0 ft	Silty Clay Loam	59	29	30		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● CUL-01#5 11.0 ft	2	0.038	0.009	0.002	0.0	31.5	58.7	9.9
■ CUL-02#3 6.0 ft	4.75	0.018	0.003		1.8	15.8	57.9	24.4



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GRAIN SIZE DISTRIBUTION
 Project: Barrington Rd from Algonquin Rd to Central Rd
 Location: Cook County, IL
 Number: 1064-01-01

WEI GRAIN SIZE IDH 10640101.GPJ US LAB.GDT 2/17/23

APPENDIX C

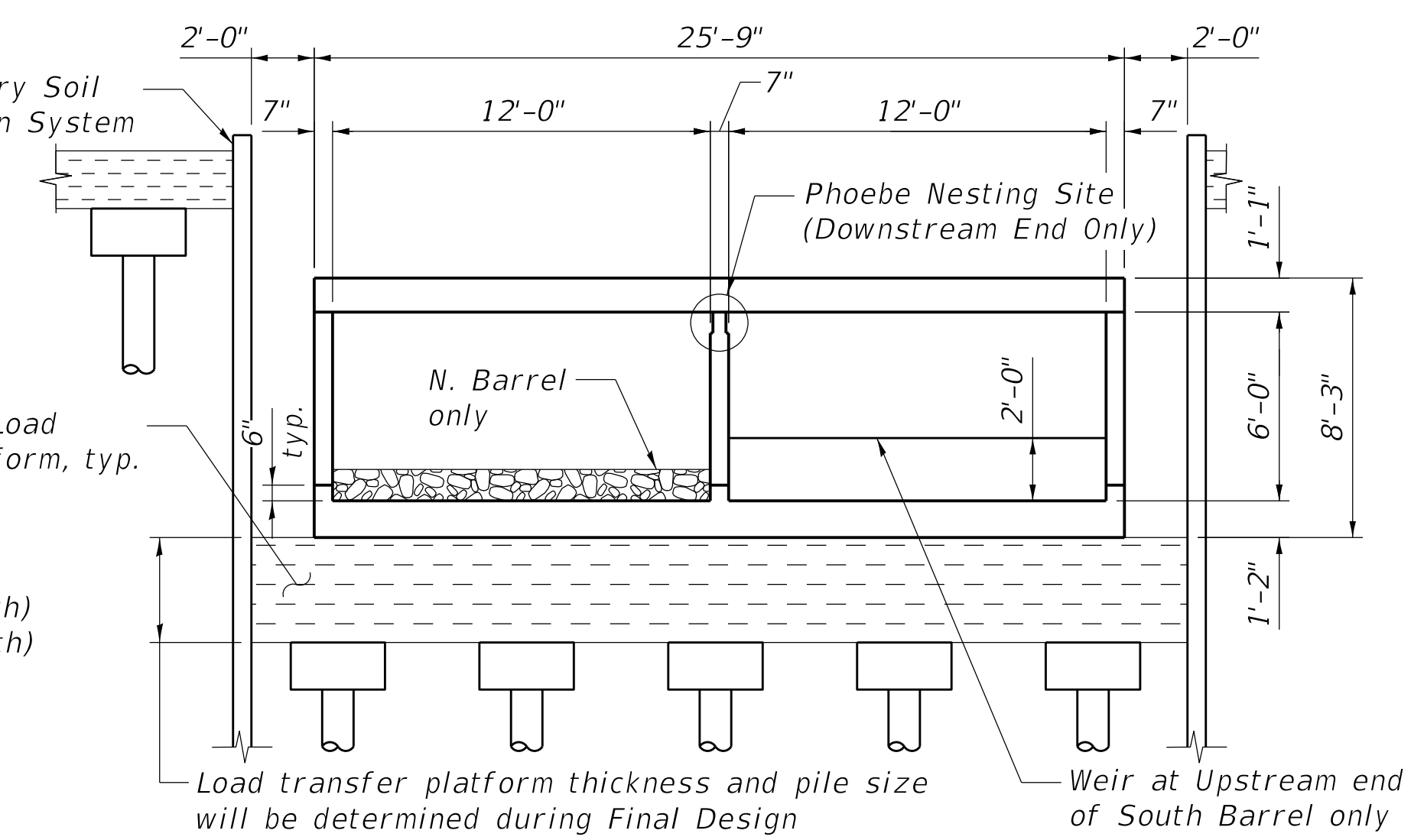
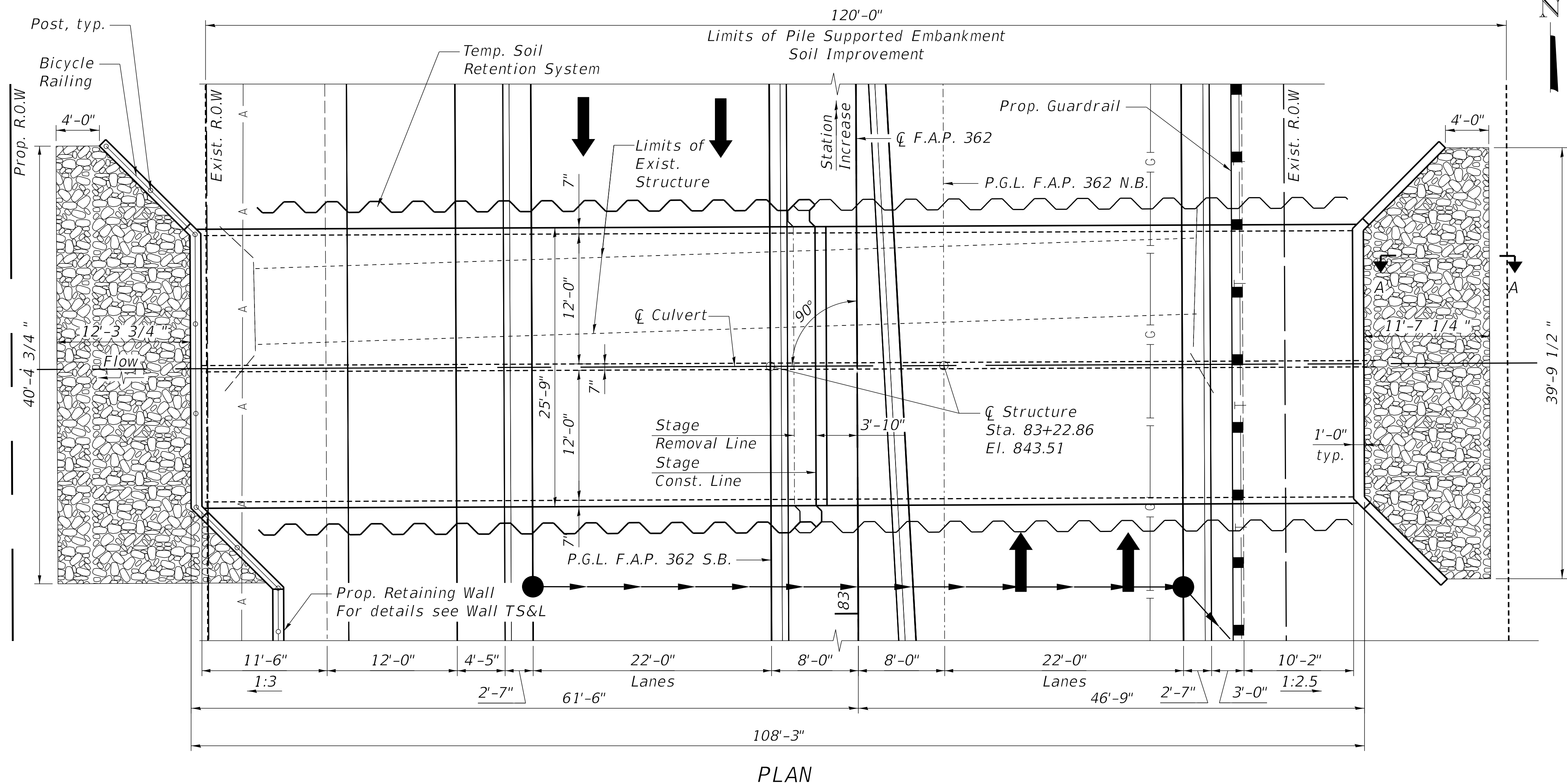
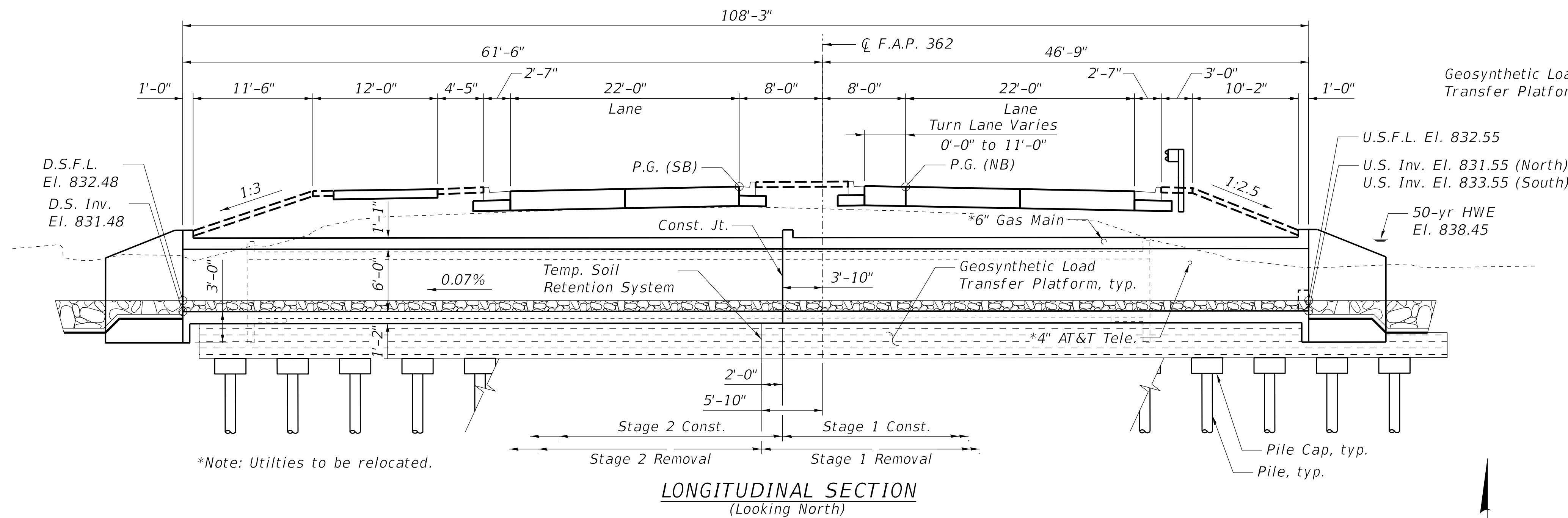
Bench Mark: Mag Nail in S. Edge of Pavement at Covered Bridge Road & Barrington Road. STA 83+42.52, 10' LT. Elev. 841.48
 Mag Nail near nose at entrance to Falcon Lakes Subdivision. STA 75+03.15, 11' LT. Elev. 866.79

Existing Structure:

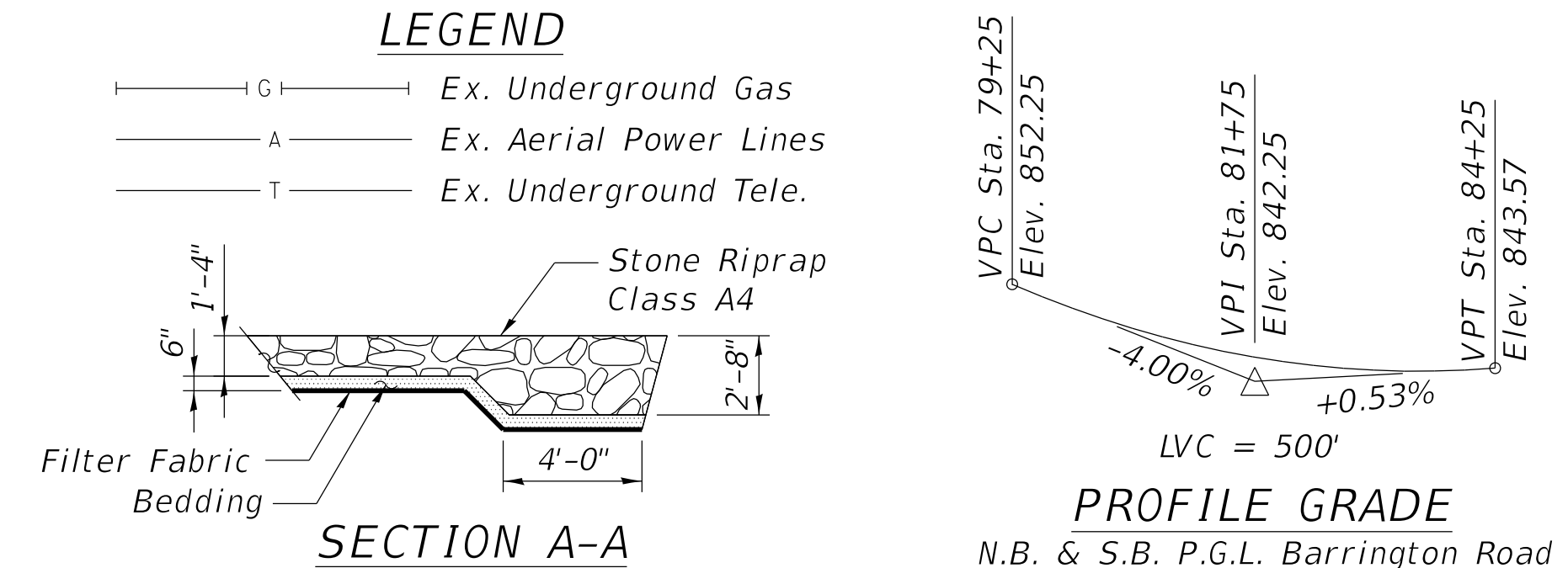
Structure No. 16-1294 built under F.A.P. Route 362. The existing Structure is a 7'w x5'h single cell box culvert and 86.8' long. Existing Structure skewed 91.6° southwest of alignment. Traffic will be maintained utilizing stage construction.

Salvage: None

Precast alternate is not allowed.



(Culvert top and bottom slab thickness is subject to refinement during final design)



WATERWAY INFORMATION

Drainage Area = 3.4 sq. mi

Flood	Freq. Yr.	Q C.F.S.	Opening Sq.Ft.		Head - Ft.		Headwater El.		
			Exist.	Prop.	Nat. H.W.E.	Exist. Prop.	Exist.	Prop.	
Ten-Year	10	165	35	108	837.57	1.24	0.19	838.81	837.76
Design	50	260	35	108	838.45	2.08	0.37	840.53	838.82
Base	100	307	35	108	838.92	1.77	0.46	840.69	839.38
Scour Design Check	-	-	-	-	-	-	-	-	-
Max Calc	500	426	35	108	840.31	0.66	0.47	840.97	840.78

10-Year Velocity through Existing Structure = 2 ft/s
 10-Year Velocity through Proposed Structure = 1 ft/s
 2-Year Flow Rate = 78 cu.ft/s

LOADING HL-93

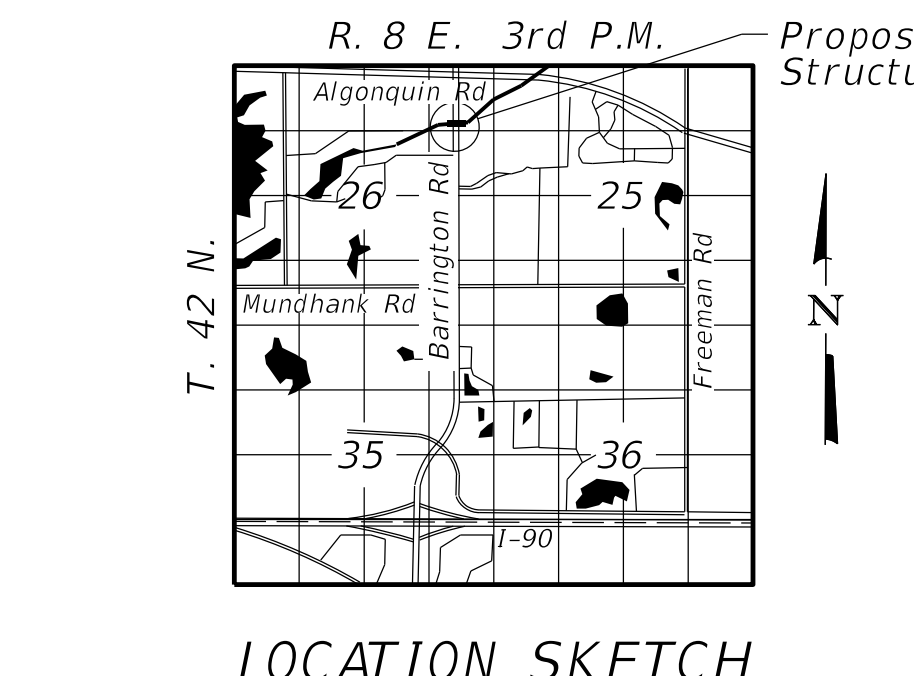
Allow 50#/sq. ft. for future wearing surface.

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES (FIELD UNITS)

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



GENERAL PLAN & ELEVATION

BARRINGTON ROAD OVER POPLAR CREEK

F.A.P. RTE 362

COOK COUNTY

STATION 83+22.86

STRUCTURE NO. 016-2313

MODEL: 6108161000
 FILE NAME: 0161313



USER NAME = \$USERS	DESIGNED - STB	REVISED -
PLOT SCALE = \$SCALE\$	DRAWN -	REVISED -
PLOT DATE = \$DATES	CHECKED - STB	REVISED -
	DATE -	REVISED -

STATE OF ILLINOIS

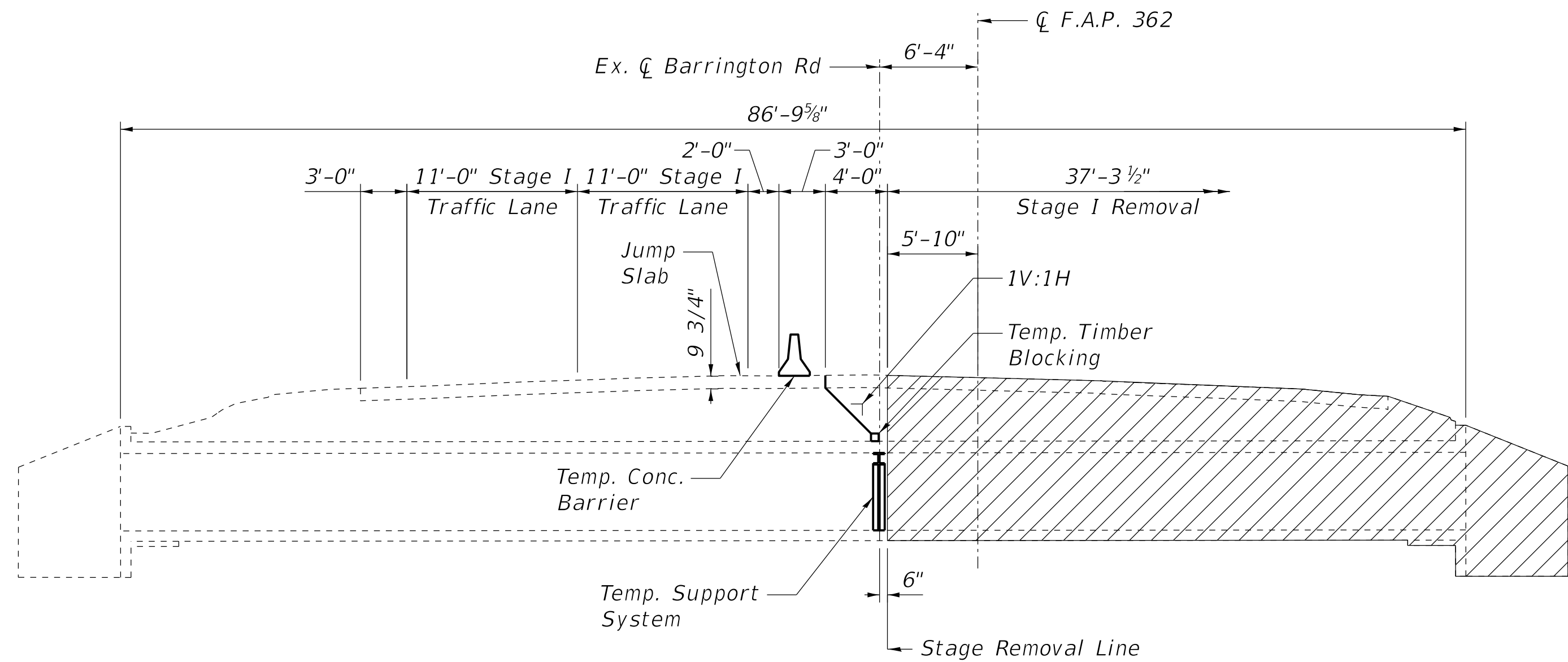
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN & ELEVATION

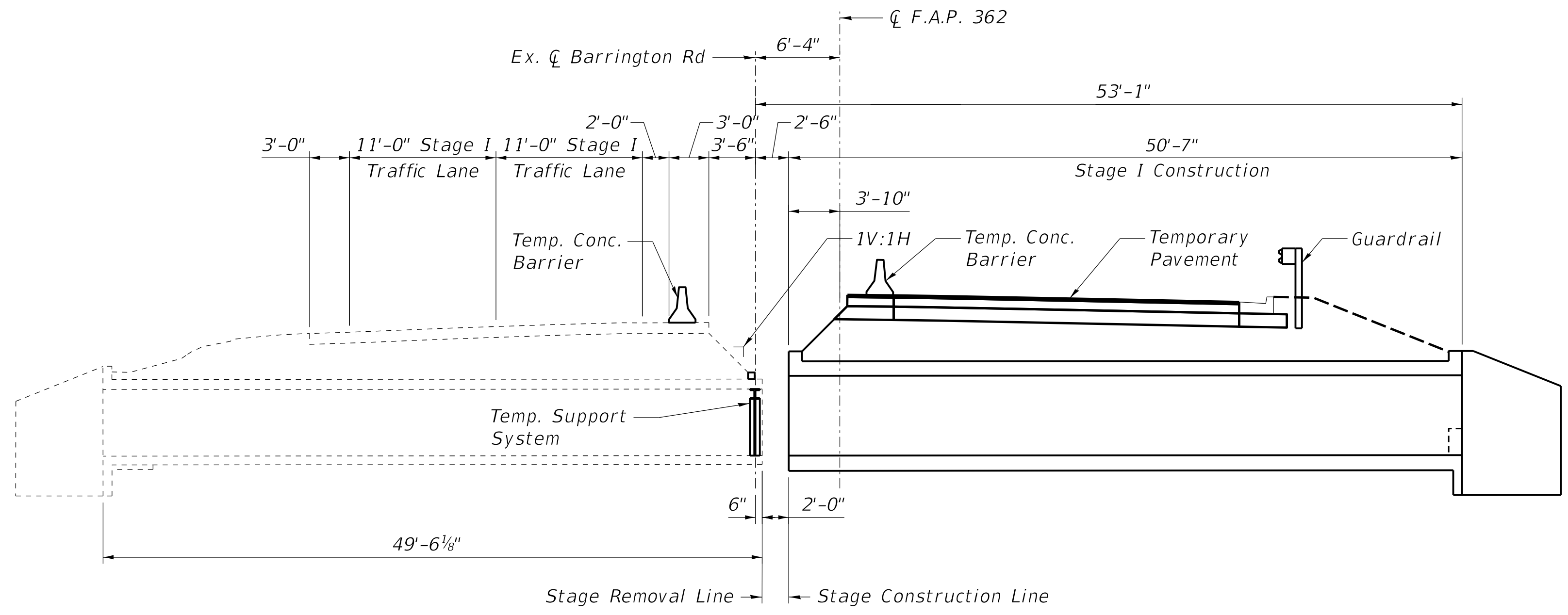
BARRINGTON ROAD OVER POPLAR CREEK

SCALE: SHEET 1 OF 3 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
362	2019-161-W	COOK	1	3
CONTRACT NO. 62K33			ILLINOIS / FED. AID PROJECT	



STAGE I REMOVAL
(All Dim. @ Rt. L's to Roadway)



STAGE I CONSTRUCTION
(All Dim. @ Rt. L's to Roadway)

STAGE I CONSTRUCTION DETAILS
BARRINGTON ROAD OVER
POPLAR CREEK
F.A.P. RTE 362
COOK COUNTY
STATION 83+22.86
STRUCTURE NO. 016-2313

MODEL: 6100RFLANAMES
FILE NAME: 311ELE1



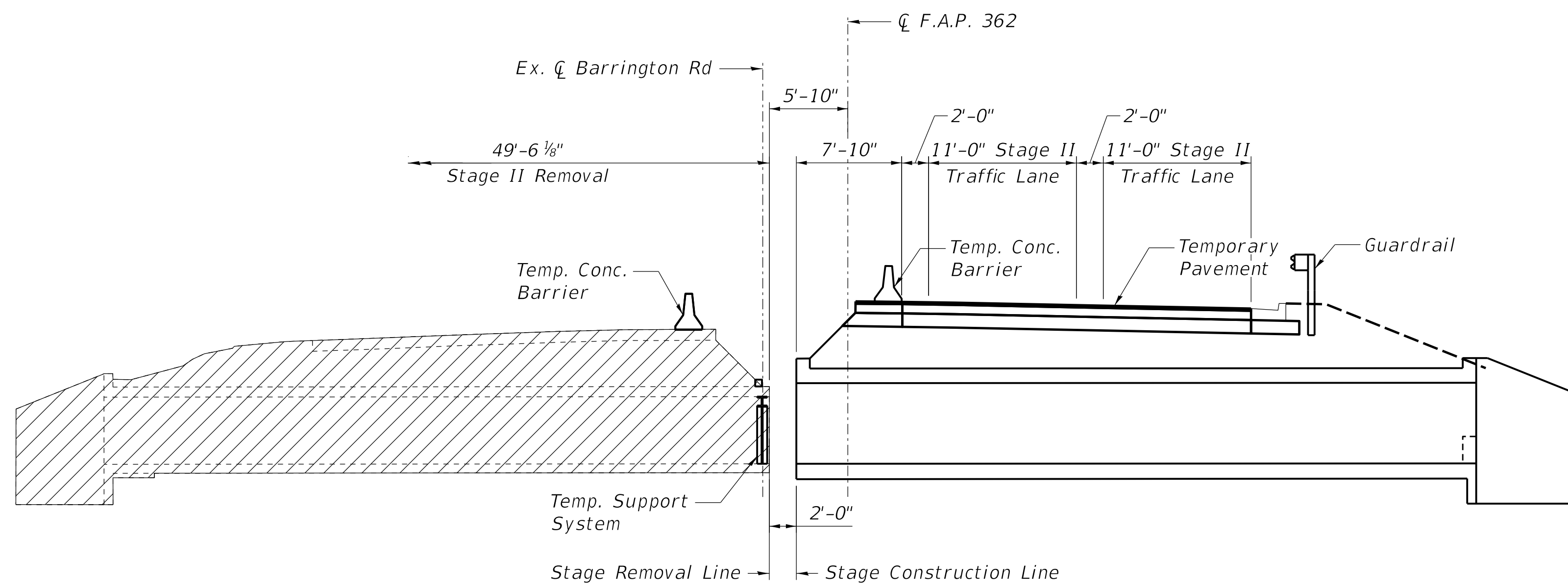
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DRAWN -	DRAWN -	REVISED -
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PLOT DATE = \$DATES	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

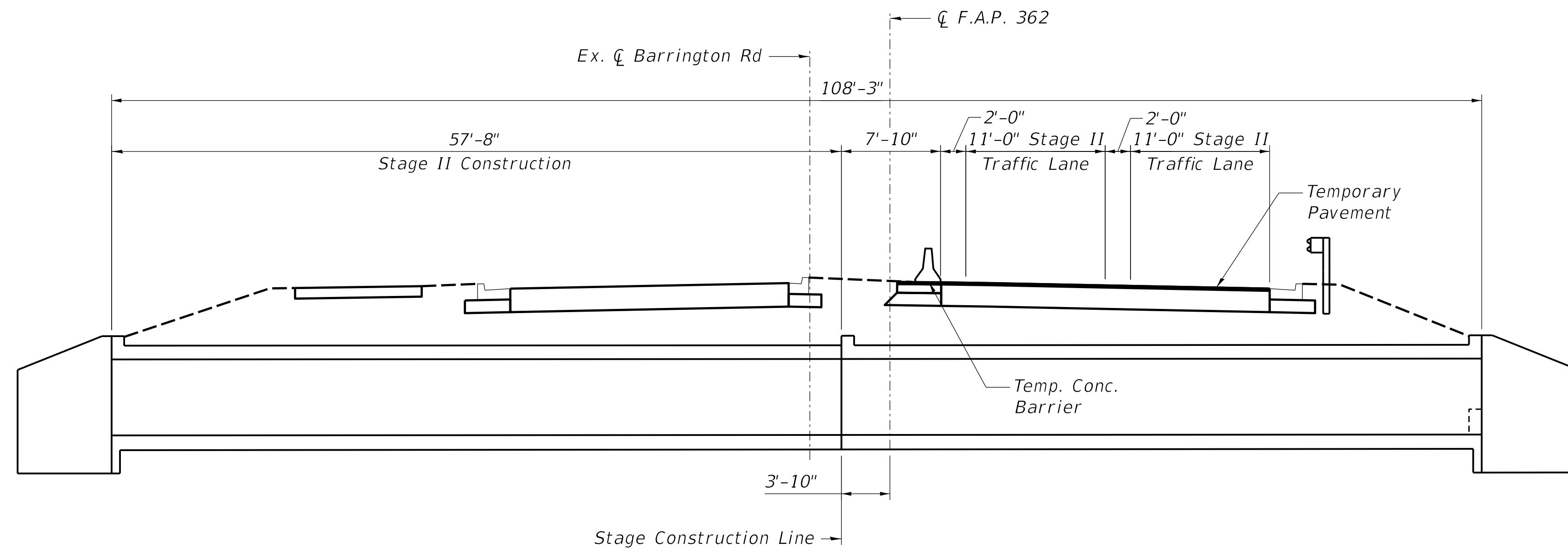
STAGE CONSTRUCTION DETAILS
BARRINGTON ROAD OVER POPLAR CREEK

SCALE: SHEET 2 OF 3 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
362	2019-161-W	COOK	2	3
CONTRACT NO. 62K33				
ILLINOIS FED. AID PROJECT				



STAGE 2 REMOVAL
(All Dim. @ Rt. L's to Roadway)



STAGE 2 CONSTRUCTION
(All Dim. @ Rt. L's to Roadway)

STAGE II CONSTRUCTION DETAILS
BARRINGTON ROAD OVER
POPLAR CREEK
F.A.P. RTE 362
COOK COUNTY
STATION 83+22.86
STRUCTURE NO. 016-2313

MODEL: 610DFLX.MXS
FILE NAME: 311E13



USER NAME = \$USERS	DESIGNED - STB	REVISED -
	DRAWN -	REVISED -
PLOT SCALE = \$SCALE\$	CHECKED - STB	REVISED -
PLOT DATE = \$DATES	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STAGE CONSTRUCTION DETAILS
BARRINGTON ROAD OVER POPLAR CREEK

SCALE: SHEET 3 OF 3 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
362	2019-161-W	COOK	3	3
CONTRACT NO. 62K33				
ILLINOIS FED. AID PROJECT				