Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 09/15/23	**Proposed SN:** 096-2013	**Route:**	FAP Rte. 821
Revised Date:	**Existing SN:** 096-2000	**Section:**	(19B2)B-1
Geotechnical Engineer: BBS - Doris D. Gonzalez		**County:**	Wayne
Structural Engineer: Nephtali Rivera-Martinez		**Contract:**	74648

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The project is a structure replacement. The proposed structure is a triple-barrel, cast-in-place (CIP) box culvert. The current TSL shows horizontal cantilever wingwalls at all four ends, with extensions at the Northeast and Southwest wingwalls. The box has a skew of 30 degrees.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): The existing structure is a CIP box culvert with horizontal cantilever and L-type wingwalls was constructed in 1957. It should be noted that the original structure was a bridge constructed at the same location in 1922, and parts of the original substructure may be encountered as it may not have been completely removed.

Two borings, designated Boring 1 and Boring 2, were advanced in May 2022. The soil profile consists of interbedded layers of silt, clay, silty loam, and clay loam over clay loam till ending on sandstone. The unconfined compressive strengths range from 0.1 to 1.7 tsf in the silts and loams, and 1.7 to 4.3 tsf in the clay till. Sandstone was encountered in Boring 2 at elevation 380.26 ft.

The existing plans show two borings, which will referred to as B1 (1956) and B2 (1956). The soils shown in these borings are consistent with the soil descriptions on the 2022 borings; however, sandstone was encountered 11 ft higher, at an approximate elevation of 391.3 ft.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: The grade is being maintained, and the proposed culvert's invert is approximately 2 ft below the existing invert. Additional fill may be added behind the new wingwalls; however, the embankment does not appear to be widened significantly. Since the proposed culvert will occupy the footprint of the existing culvert, and the roadway centerline elevation will be increased by less than 6 inches, settlement is not expected to be significant and was not calculated.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: As mentioned above, the grade is being maintained, also the proposed embankment will have a 2H:1V slope, as the existing. There here was no indication of slope stability issues or movement of the wingwalls in the Bridge Condition Report (BCR) dated January 14, 2021; therefore, slope stability is not a concern and it's expected to have a satisfactory factor of safety.

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: Since the proposed structure is a box culvert, design scour elevations are not required.

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: Since buried structures are not designed for seismic effects, seismic data is not required.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: The construction of a precast or cast-in-place concrete box culvert is geotechnically feasible; however, per the Structure Report dated August 30, 2022, a cast-in-place is preferred.

Horizontal cantilever wingwalls are feasible, but are limited to a maximum length of 16 ft. The FGU recommends utilizing horizontal cantilever wingwalls at the NW and SE ends (short wingwalls).

For the NE and SW ends (long wingwalls), the FGU recommends utilizing two-way L-type cantilever wingwalls. Horizontal cantilever wingwalls with extensions are also feasible. Permanent sheet piling extensions were evaluated, but due to the nature of the soil profile and limited embedment due to sandstone being encountered, these would need to be anchored. Soldier pile walls could also be utilized as extensions, but the piles would have to be drilled into rock. In conclusion, based on the encountered soils as well as the proximity to rock, we recommend utilizing two-way L-type cantilever wingwalls at these locations.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: An Estimated Water Surface Elevation equal to 403.55 was provided by the Bridge Planning Unit. The soils under the proposed culvert are mainly composed of silty loams. Since the EWSE is less than 4 ft above the bottom of the box culvert barrel, temporary dewatering of the excavations by stream diversion will be required.

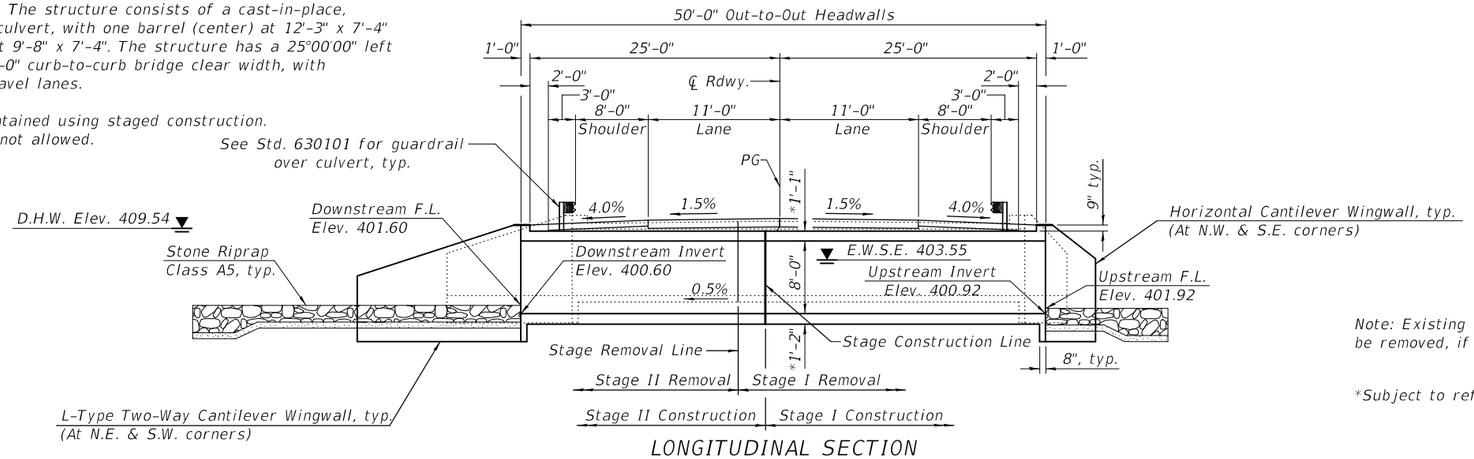
Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: The proposed structure will be constructed utilizing stage construction, so temporary earth retention will be required. Based on the soil types, retained height, proximity to rock as well as the potential for encountering obstructions, the Temporary Soil Retention System pay item should be utilized.

Benchmark: BM 475–Chiseled square at west end of south curb on existing structure 096–2000, Sta. 297+10, 21' LT of C.L., Elev = 411.563.

Existing Structure: S.N. 096–2000 was originally constructed in 1957 under S.B.I. Route 15, Section 19–BY–1 and 19B–2 at station 296+84. The structure consists of a cast–in–place, triple barrel box culvert, with one barrel (center) at 12'–3" x 7'–4" and two barrels at 9'–8" x 7'–4". The structure has a 25°00'00" left ahead skew, a 42'–0" curb–to–curb bridge clear width, with two 11' striped travel lanes.

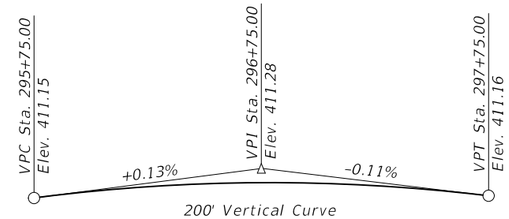
Traffic to be maintained using staged construction. Precast option is not allowed.

No salvage.



LONGITUDINAL SECTION

(All horizontal perpendicular to ℄ Rdwy – Looking West.)

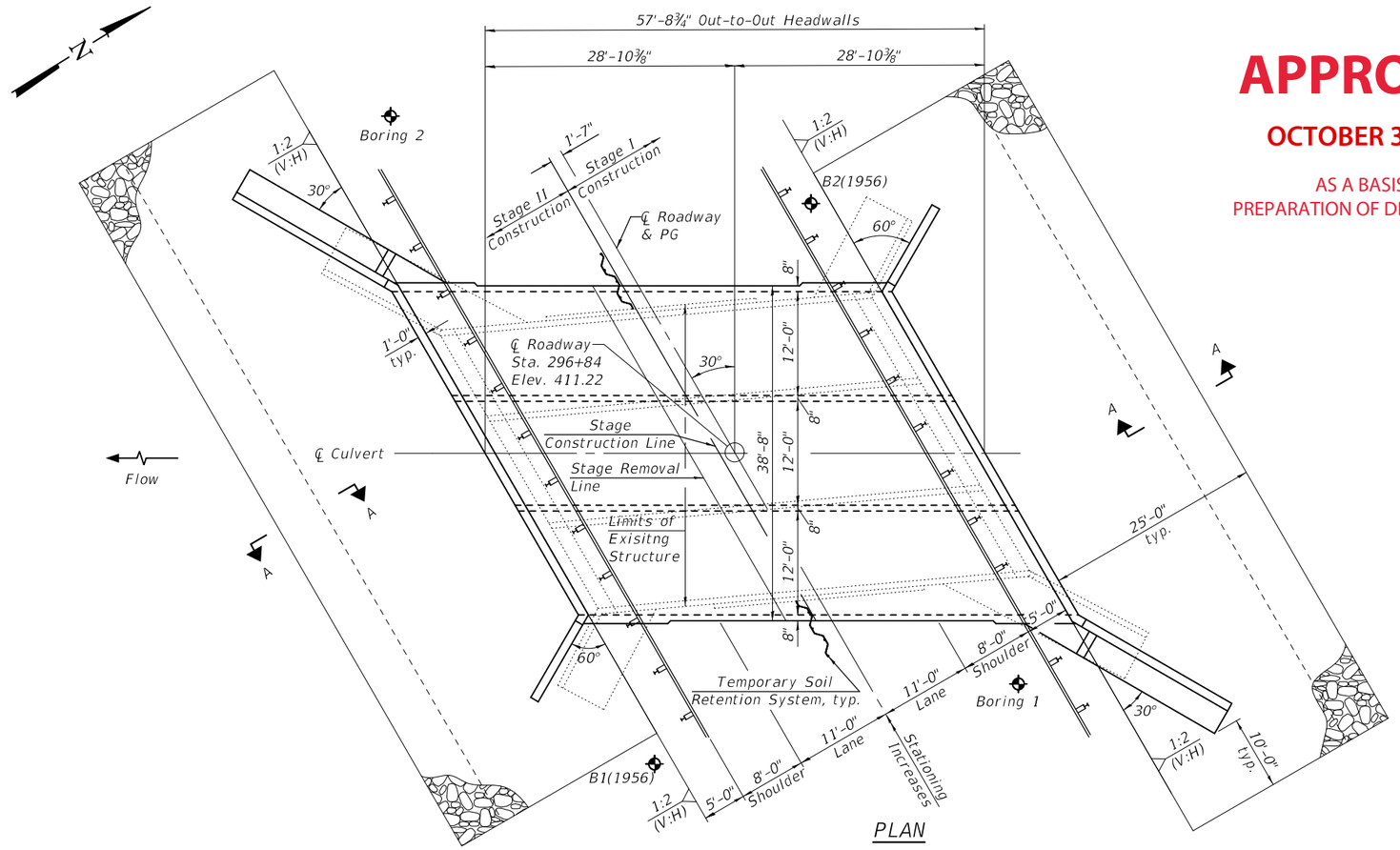


PROFILE GRADE

(along ℄ IL 15)

Note: Existing 1922 abutments portions to be removed, if required.

*Subject to refinement during final design



PLAN

APPROVED

OCTOBER 30, 2023

AS A BASIS FOR
PREPARATION OF DETAILED PLANS

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL–93

Allow 50#/sq.ft. for Future Wearing Surface

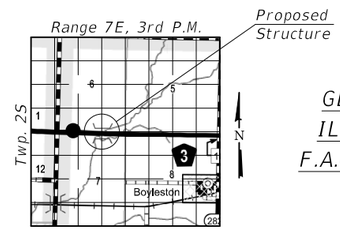
DESIGN STRESSES

FIELD UNITS

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

HIGHWAY CLASSIFICATION

F.A.P. Rte. 821 (IL Rte. 15)
Functional Class: Other Principal Arterial
ADT: 3400 (2025); 3900 (2045)
ADTT: 299 (2025); 343 (2045)
DHV: 413 (2045)
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
Two–Way Traffic; Directional Distribution: 51:49



LOCATION SKETCH

GENERAL PLAN & ELEVATION
IL. 15 OVER UNNAMED CREEK
F.A.P. RTE. 821 – SEC. (19B2)B–1
WAYNE COUNTY
STATION 296+84.00
STRUCTURE NO. 096–2013

DESIGNED	-	NEPHTALI RIVERA-MARTINEZ
CHECKED	-	MICHAEL A. PAULIONIS
DRAWN	-	ALAN JOHNSTONE
CHECKED	-	N.R.M. / M.A.P. / P.D.C.

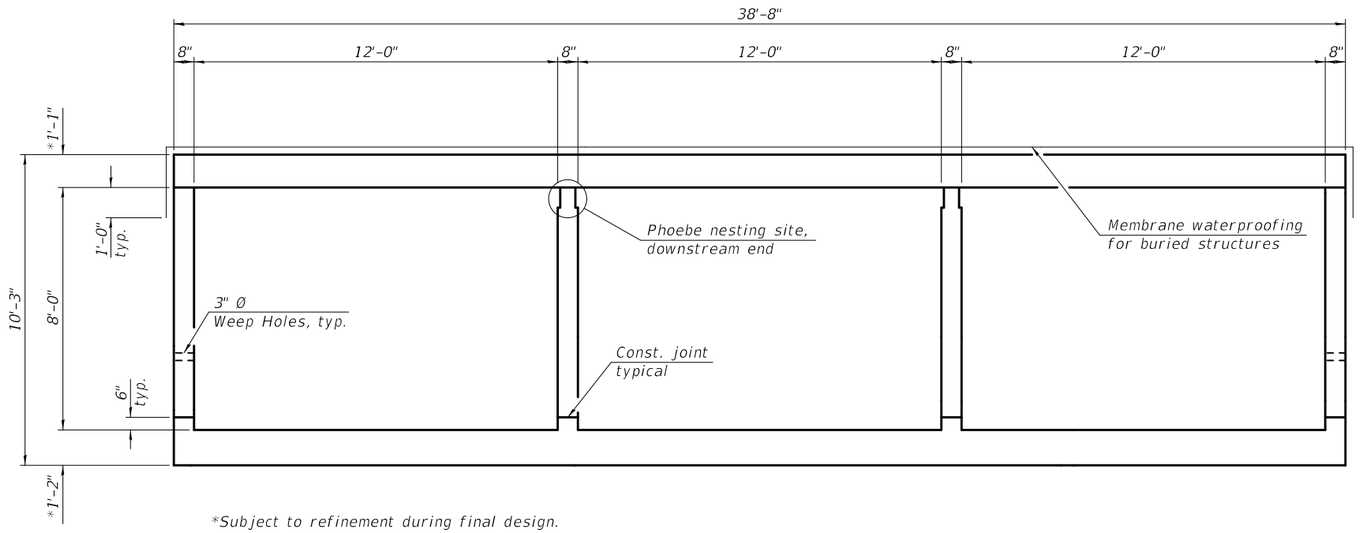
10/26/2023 11:25:36 AM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
821	(19B2)B-1	WAYNE	2	1
		CONTRACT NO. 74648		
	ILLINOIS	FED. AID PROJECT		

MODEL: 0962013-74648-TSL-001
FILE NAME: pw:\\dot-pw.bentley.com:PWIDOT\Documents\IDOT Offices\Bureau of Bridges and Structures\Projects\0962013\CADD Plans\0962013-74648.dgn



*Subject to refinement during final design.

SECTION THRU BAREL

WATERWAY INFORMATION

Drainage Area = 2.4

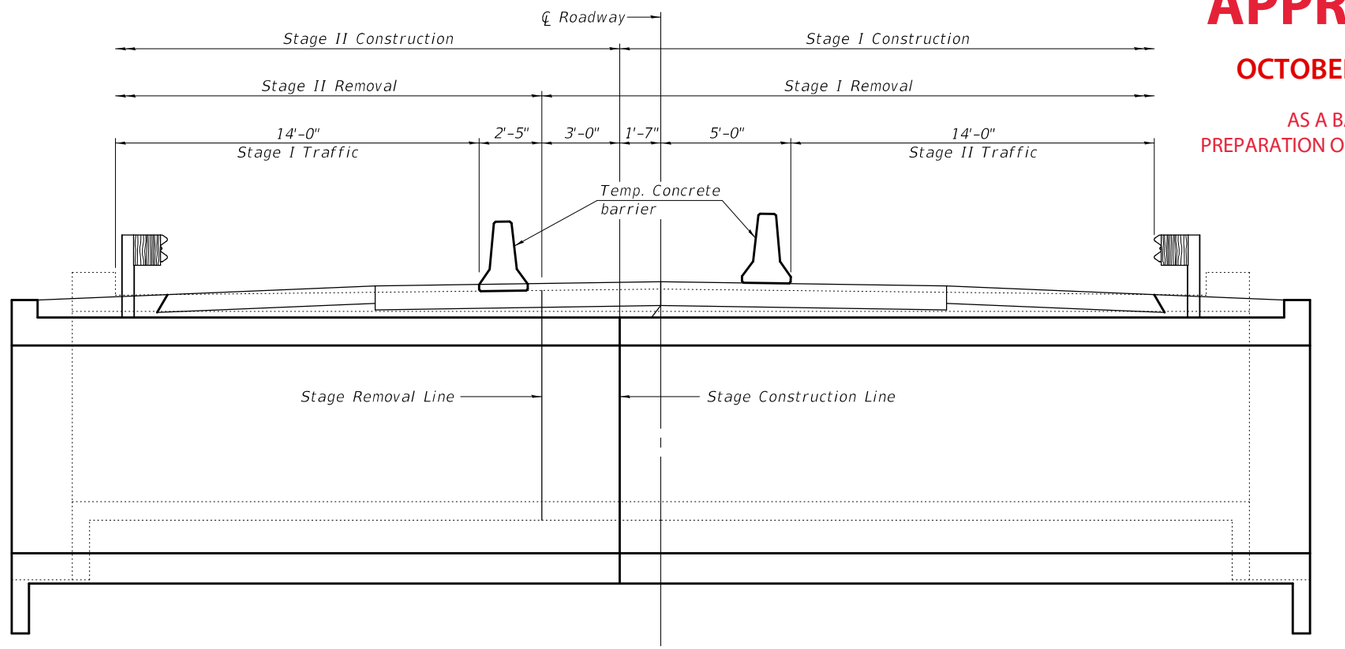
Existing Overtopping Elev. 410.79 @ Sta. 301+74

Proposed Overtopping Elev. 410.79 @ Sta. 301+74

Flood	Freq. Yr.	Q C.F.S.	Opening Ft²		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
Ten-Year	10	935	190	288	409.09	1.12	1.00	410.21	410.09
Overtop Existing	30	1,373	201	288	409.44	1.59	1.39	411.03	410.83
Overtop Proposed	40	1,484	203	288	409.51	1.70	1.48	411.21	410.99
Design	50	1,540	204	288	409.54	1.73	1.67	411.27	411.21
Base	100	1,810	210	288	409.70	1.81	1.80	411.51	411.50

Existing 10 Year Outlet Velocity = 4.9 ft/s

Proposed 10 Year Outlet Velocity = 3.3 ft/s



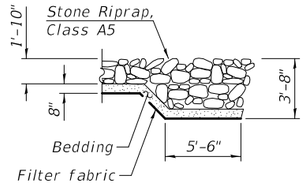
LONGITUDINAL SECTION - STAGE CONSTRUCTION

(Horizontal dimensions are perpendicular to ℄ roadway-Looking West)

APPROVED

OCTOBER 30, 2023

AS A BASIS FOR
PREPARATION OF DETAILED PLANS



SECTION A-A

DETAILS
IL. 15 OVER UNNAMED CREEK
F.A.P. RTE. 821 - SEC. (19B2)B-1
WAYNE COUNTY
STATION 296+84.00
STRUCTURE NO. 096-2013

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DESIGNED	-	NEPHTALI RIVERA-MARTINEZ
CHECKED	-	MICHAEL A. PAULIONIS
DRAWN	-	ALAN JOHNSTONE
CHECKED	-	N.R.M. / M.A.P. / P.D.C.

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
821	(19B2)B-1	WAYNE	2	2
		CONTRACT NO. 74648		
		ILLINOIS	FED. AID PROJECT	

Illinois Department of Transportation
Division of Highways
IDOT D7

SOIL BORING LOG

Page 1 of 1

Date 5/9/22

ROUTE FAP 821 (IL 15) **DESCRIPTION** IL 15 over Unnamed Stream **LOGGED BY** E. Sandschafer

SECTION (19B2)B-1 **LOCATION** Northeast Corner, **SEC.** 7, **TWP.** 2E, **RNG.** 7S, 3rd **PM**, **Latitude** N 38.370146, **Longitude** W 88.465384

COUNTY Wayne **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER** Auto ETR = 91.8% @ 57.4

STRUCT. NO. 096-2000 (E) 096-2013 (P)
Station 296+84

BORING NO. 1 East Abutment
Station 296+45
Offset 15.0 ft RT
Ground Surface Elev. 410.95 ft

Surface Water Elev. 402.90 ft
Stream Bed Elev. 402.60 ft

Groundwater Elev.:
First Encounter 394.0 ft ▼
Upon Completion 403.0 Caved ft ▽
After 24 **Hrs.** 404.5 ft ▼

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Aggregate Shoulder Mixed with Clay	409.95			
Brown, CLAY		2		
Stiff, moist		2 1	1.5 P	18
	406.45			
Very soft, wet, brown, SILT	-5	1		
		1 1	0.2 B	32
		1		
Grey ▽		1 1	0.1 B	27
	401.45			
Stiff, moist, grey, SILTY LOAM	-10	1		
		3 3	1.0 B	20
Medium, grey and brown marbled		1		
		6 3	0.4 B	19
	395.95 -15	1		
Stiff, moist, grey, CLAY		2 3	1.2 B	19
	393.95 ▼			
Soft, moist, grey, SILTY LOAM		2		
		2 2	0.3 B	18
	391.45			
Stiff, moist, brown, CLAY LOAM	390.95 -20	1		
Stiff, moist, brown, CLAY LOAM		3 3	1.2 B	18
	388.95			
Brown, fine-grained, SAND	388.45	2		
Hard, moist, grey, CLAY LOAM Till		5 10	4.3 B	13
	-25	3		
Stiff		3 6	1.7 B	18
		2		
Hard		4 8	4.1 B	15
	-30	2		
Very stiff		5 7	2.1 B	15
	379.95			
Benchmark: BM 475 - Cut Square in Southwest Corner of Bridge Curb SN 096-2000, Sta. 297+10, 21 feet LT; Elevation = 411.563 feet. End of Boring	-35			
	-40			

SOIL BORING 096-2000(E), -2013(P) SOIL 2022.GPJ IL_DOT.GDT 5/25/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated) The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206), WH-Weight of Hammer, NT-Not Tested.

Illinois Department of Transportation
Division of Highways
IDOT D7

SOIL BORING LOG

Page 1 of 1

Date 5/9/22

ROUTE FAP 821 (IL 15) **DESCRIPTION** IL 15 over Unnamed Stream **LOGGED BY** E. Sandschafer

SECTION (19B2)B-1 **LOCATION** Northeast Corner, **SEC.** 7, **TWP.** 2E, **RNG.** 7S, 3rd **PM**, **Latitude** N 38.370086, **Longitude** W 88.465719

COUNTY Wayne **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER** Auto ETR = 91.8% @ 57.4

STRUCT. NO. 096-2000 (E) 096-2013 (P)
Station 296+84

BORING NO. 2 West Abutment
Station 297+38
Offset 15.0 ft LT
Ground Surface Elev. 410.76 ft

Surface Water Elev. 402.90 ft
Stream Bed Elev. 402.60 ft

Groundwater Elev.:
First Encounter 393.8 ft ▼
Upon Completion 399.8 Caved ft ▽
After 24 **Hrs.** 404.3 ft ▼

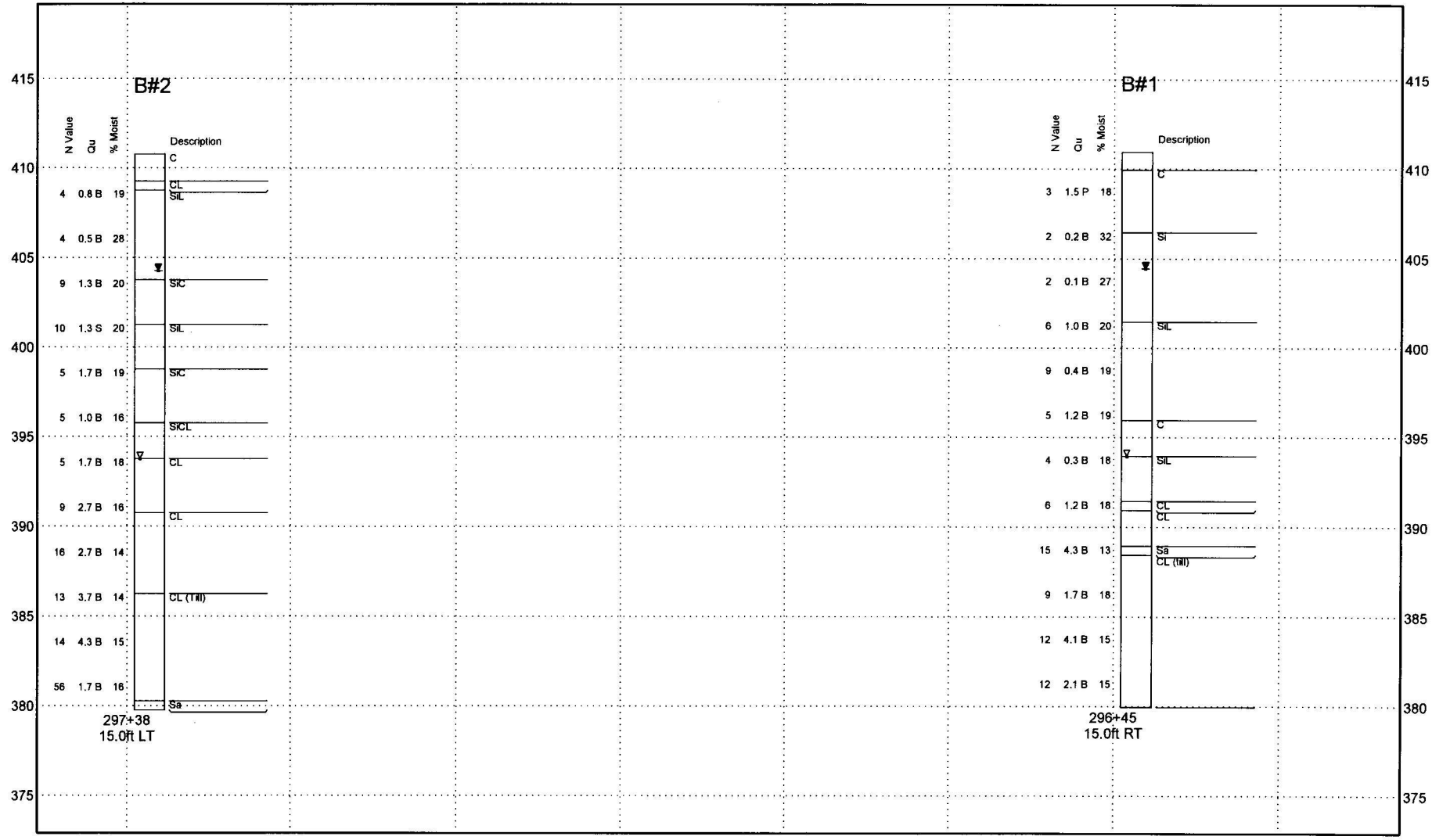
DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Aggregate Shoulder with Brown Clay
409.26				
408.76				Brown, CLAY LOAM
	1			Medium, moist, brown, SILTY LOAM
	2 2	0.8 B	19	
-5	1			
	2 2	0.5 B	28	*Soft*
403.76 ▼				
	1			Stiff, moist, grey, SILTY CLAY
	4 5	1.3 B	20	
401.26				
-10	2			Stiff, moist, grey, SILTY LOAM
▽	5 5	1.3 S	20	
398.76				
	1			Stiff, moist, grey, SILTY CLAY
	2 3	1.7 B	19	
395.76 -15	1			
	2 3	1.0 B	16	Medium, moist, grey, SILTY CLAY LOAM
393.76 ▼				
	1			Stiff, moist, brown, CLAY LOAM
	2 3	1.7 B	18	
390.76 -20	2			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	4 5	2.7 B	16	Very stiff, moist, brown, CLAY LOAM
	2			
	6 10	2.7 B	14	
386.26				
-25	2			Very stiff, moist, grey, CLAY LOAM Till
	6 7	3.7 B	14	
	2			
	5 9	4.3 B	15	*Hard*
-30	2			
380.26	40 16	1.7 B	16	
379.76				Soft, brown, SANDSTONE
				Benchmark: BM 475 - Cut Square in Southwest Corner of Bridge Curb SN 096-2000, Sta. 297+10, 21 feet LT; Elevation = 411.563 feet.
				End of Boring
-35				
-40				

SOIL BORING 096-2000(E), -2013(P) SOIL 2022.GPJ IL_DOT.GDT 5/25/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated) The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206), WH-Weight of Hammer, NT-Not Tested.

Structure Number 096-2000 (E) 096-2013 (P) IL 15 over Unnamed Stream
Located in the Northeast Corner of Section 7, Township 2E, Range 7S of the 3 P.M.



NOT TO HORIZONTAL SCALE

Illinois Department of Transportation
Division of Highways
IDOT D7

VARIATIONS IN SUBSURFACE CONDITIONS MAY EXIST BETWEEN BORINGS

Groundwater
▽ First Encounter
▼ Completion
▼ after (refer to log) hours

Abbreviations
WH - Sampler Advanced by Weight of Hammer, WOP - Weight of Pipe
B.S. - Before Seating
NT- Not Tested

SUBSURFACE DATA PROFILE

Route: FAP 821 (IL 15)
Section: (19B2)B-1
County: Wayne

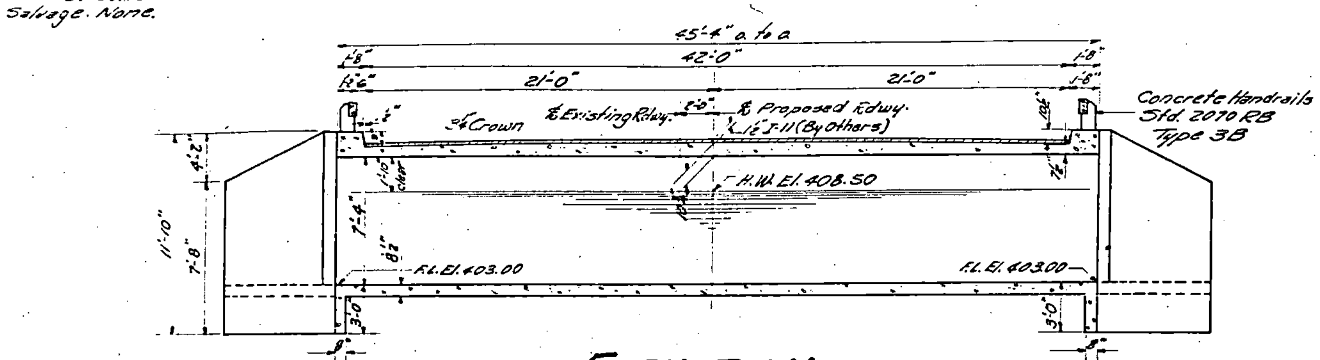
TEST FENCE 2 096-2000(E)_-2013(P) SOIL 2022.GPJ D7.GDT 5/25/22

Route No.	Section	County		
F.A.I. 15	18-B1-1, 19-B2	Wayne	25	22

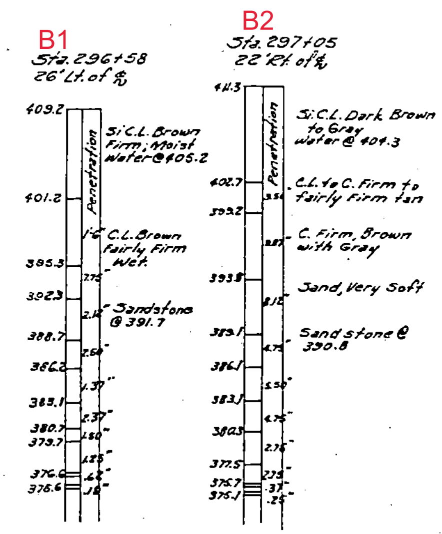
2 SHEETS

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

B.M. Chiseled □ on S.W. Wingwall of Existing Bridge Sta. 296+76.5 Elev. 410.61 (USGS Datum).
Existing Structures: R.C. Thru Girder, 1 Span @ 35' clear, 20' Roadway, Built 1922, R.C. Abutments.
Removal: Bridge Contractor to remove existing Superstructure and necessary portion of Existing Abutments at time of construction.
Salvage. None.



ELEVATION

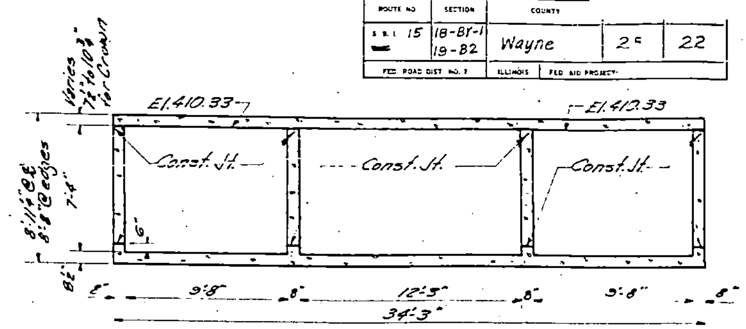


All penetrations with 190* hammer droping 19.5" for 10 blows.

BORING DATA

WATERWAY INFORMATION

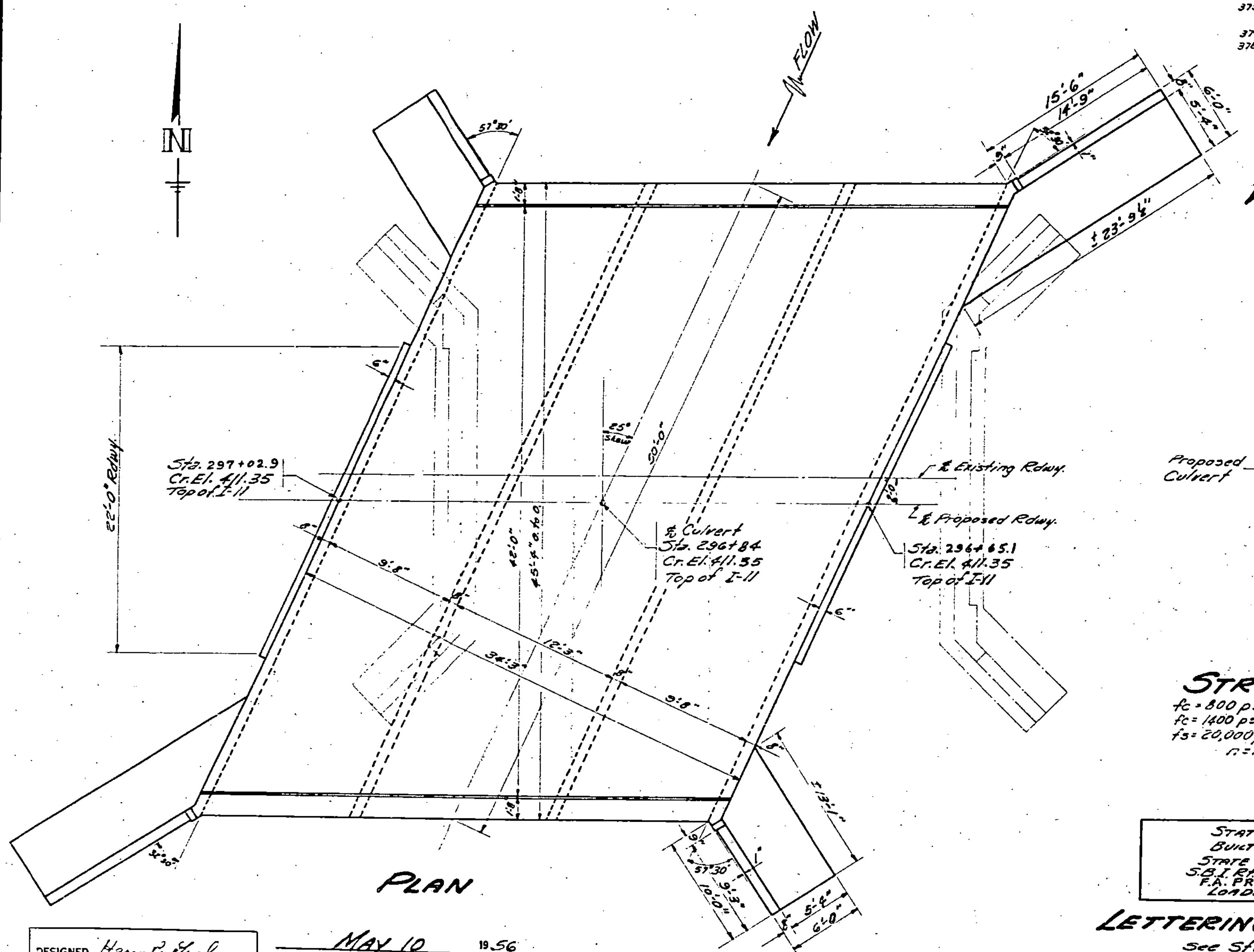
Drainage Area .... 1600 Acres
Character .... Level Rolling Wooded & Cultivated
Required Opening .... 173 Sq. Ft. (30 yr. flood)
Present Opening .... 95 Sq. Ft.
Proposed Opening .... 173 Sq. Ft.



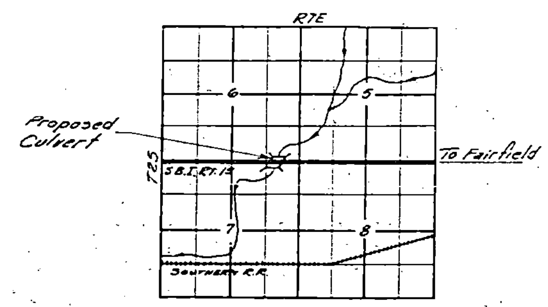
CROSS SECTION

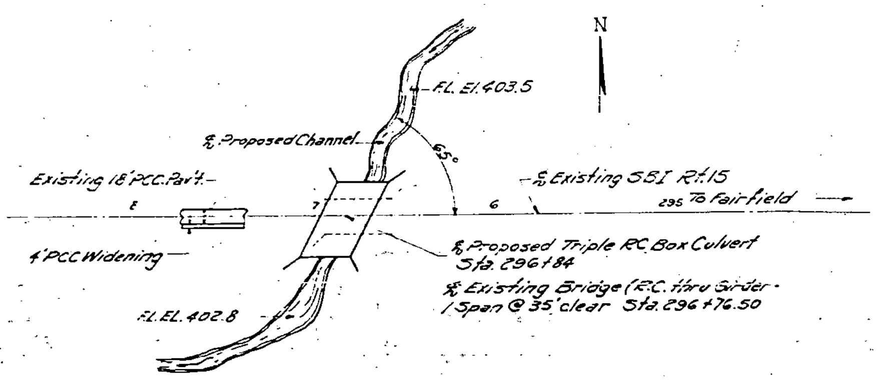
GENERAL NOTES

Class X Concrete shall be used throughout except in handrails.
Handrail Concrete shall be used in handrails.
The handrail concrete in the rail posts and railing shall be poured in separate operations.
Bar lap is 20 diameters minimum unless otherwise shown.
The following surface shall be waterproofed; the backs of wingwalls from top of footing to top of wing; the top & sides of culvert to lower construction joint. Waterproofing shall be done in accordance with Article 51.20 of the Standard Specifications.
Exposed edges shall be beveled ¾".
For back filling and embankment, see Standard Specification.



PLAN





LOCATION SKETCH

STRESSES

fc = 800 psi (Wings & Footings)
fc = 1400 psi (Barrel)
fs = 20,000 psi (Reinf.)
n = 10

STATION 296+84
BUILT 195_ BY
STATE OF ILLINOIS
S.B.I. RT. 15 SEC. 19B-2
F.A. PROJECT F-16 (7)
LOADING H20-S16

LETTERING FOR NAME PL.
See Std 2113

TOTAL BILL OF MATERIAL

Item	Unit	Total
Class X Concrete	Cu. Yds.	165.0
Handrail Concrete	Cu. Yds.	1.9
Reinforcement Bars	Lbs.	30,400
Name Plates	Each	One
Removal of Existing Structures	Each	One

DESIGNED	Harry P. Graham
CHECKED	Dale L. ...
DRAWN	D. L. / E. Rush
CHECKED	H.P.G.

MAY 10 1956
EXAMINED — Engineer of Bridge and Traffic Structures
PASSED — Engineer of Design
APPROVED — Chief Highway Engineer

GENERAL PLAN & ELEVATION
S.B.I. RT. 15 SEC. 19B-2
WAYNE COUNTY
STATION 296+84

LOADING H20-S16-44

BENCHMARK:

BM 475 - Chiseled square at west end of south bridge curb on structure 096-2000
STA 297+10, 21.0' Left of ℄ ILL-15, Elevation = 411.563

PROPOSED SN 096-2013
Cast-in-place box culvert
Three cells - 12' span by 8' rise
C.L. Str. STA 296+84
SKEW = 30° LT-AH

PROPOSED GUARDRAIL
Length TBD

EXISTING ROW

62'
67'
58'
63'

293 ℄ ILL 15 294 295+00 296 297 298 299 300+00

EXISTING ROW

EXISTING SN 096-2000
Cast-in-place three-cell box culvert
2@9.7'+1@12.3' span by 7.3' rise
C.L. Str. STA 296+84
SKEW = 25° LT-AH

Note: Final structure configuration subject to refinement during TSL development.

N

PLAN
NOTE BOOK
NO.
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
CADD FILE NAME
BY
DATE

PROFILE
NOTE BOOK
NO.
SURVEYED
PLOTTED
CROSS SECTIONS CHECKED
B.M. NOTED
STRUCTURE NOTATIONS CHKD
BY
DATE

420
415
410
405

VPI STA. 296+75.00
ELEVATION 411.28
+0.13% -0.11%
+75.00 EL. 411.15
+75.00 EL. 411.16
411.14
K = 837
200.00' V.C.

410.98 410.99 411.01 411.01 411.02 411.02 411.02 411.03 411.06 411.09 411.12 411.15 411.15 411.18 411.18 411.21 411.20 411.23 411.21 411.25 411.22 411.27 411.21 411.23 411.21 411.19 411.19 411.16 411.16 411.14 411.14 411.11 411.09 411.07 411.04 411.02 410.99 410.96 410.95 410.94 410.92

293+00 293+50 294+00 294+50 295+00 295+50 296+00 296+50 297+00 297+50 298+00 298+50 299+00 299+50 300+00 300+50

CN 74648
EX SN 096-2000
PR SN 096-2013
GPK: JOBOCL.GPK
EX PROFILE: EXIL15EOFBRIDGE
PR PROFILE: PRIL15
8/12/2022

MODEL: $MODELNAME$
FILE NAME: $FILE$

USER NAME = $USER$	DESIGNED -	REVISED - _____
	DRAWN - D. Macklin	REVISED - _____
PLOT SCALE = $SCALE$	CHECKED - _____	REVISED - _____
PLOT DATE = $DATE$	DATE - August 2022	REVISED - _____

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PLAN & PROFILE VIEW
STRUCTURE 096-2000 EXISTING / 096-2013 PROPOSED

SCALE: _____ SHEET 1 OF 1 SHEETS STA. ###+### TO STA. ###+###

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
821	(19B2)B-1	WAYNE		
		CONTRACT NO. 74648		
	ILLINOIS FED. AID PROJECT			