PROJECT CONCEPT STATEMENT

Bridge on Iowa Highway 9
Over the North Branch of the Turkey River

Howard County
Project # BRFN-009-7(38)--39-45
PIN: 18-45-009-010
Maint. No. 4534.7S009
FHWA No. 28760

Prepared for:
Iowa Department of Transportation
District 2
Nick Humpal, P.E.

Prepared by: Snyder & Associates, Inc. / Shuck-Britson, Inc.

December 3, 2019

I. STUDY AREA

A. Project Description

This project involves replacement of the Iowa Highway 9 bridge over the North Branch of the Turkey River (Maintenance No. 4534.7S009), approximately 4.3 miles east of U.S. Highway 63, in Howard County.

B. Present Facility--Need for Project

The existing bridge is a 75' x 28' continuous concrete slab bridge with vertical wall abutments built in 1959 to replace a 75' x 20' pony truss bridge constructed in 1919. Neither the 1919 bridge nor the 1959 bridge was built with a skew. Past repairs done under contract have consisted of a low-slump concrete overlay (1987) and retrofit of the barrier rails (1987 & 2005).

The sixty year old bridge was last inspected in April, 2019 and has deck, superstructure and substructure condition ratings of 5, 5 and 5, respectively, on a scale of 0 to 9. A rating of '4' or less on any of the condition ratings would make the bridge "Structural Deficient". Maintenance and repairs have been made over the years to extend the life of the bridge. Repairs done to typical bridges with this current level of condition ratings are often an exercise in diminishing returns. It is likely that at least one of the condition ratings will drop to a '4' in the near future which would make the bridge both "Structurally Deficient" and eligible for federal funds through the Highway Bridge Replacement and Rehabilitation Program.

The bridge also has a Deck Geometry appraisal rating of '4' on a scale of 0 to 9 determined by the roadway width on the bridge available for the Average Daily Traffic. Under old bridge deficiency procedures, a rating of '3' would have made the bridge "Functionally Obsolete".

For these reasons, the bridge is not a rehabilitation or widening candidate but should be held as a replacement candidate for a future letting. The bridge's expected replacement type and total project cost should be determined with this Project Concept phase.

East and west of the bridge, the roadway is a 24 foot wide paved rural section with 4 foot wide paved shoulders and 6 foot wide granular shoulders. Milled shoulder rumble strips are present in this area. Roadway foreslopes are 3:1, and the roadway was built without clear zone considerations.

Iowa 9 intersects with V46 approximately 1,350 feet west of the bridge location. This intersection has left turn lanes, and widening / tapers for the left turn lane ends just west of the bridge site. An entrance is present on the right side of the roadway approximately 230 feet east of the bridge.

C. Hydrology

StreamStats discharges are 5,520 cfs (50-year) and 6,520 (100-year) for the 20.6 square mile drainage area. USGS Gage 05411530 was put into service in 1966 and its last peak measurement was in 1993.

The bridge is located in FEMA Zone A. A floodplain permit will not be required for bridge construction.

Analysis shows that over 25% of the total design flow will be present in the east overbank. Wing dikes will be required on the upstream side of the bridge.

D. Traffic Estimates

Year 2017 annual average daily traffic (AADT) volumes were 2,790 vehicles per day (VPD), with trucks comprising approximately 18% of total traffic. Historic AADT volumes between 1993 and 2017 have varied between 2,530 VPD and 3,420 VPD.

Iowa DOT Office of Systems Planning forecasts an AADT volume of 3,480 VPD in Year 2023 and 3,960 VPD in Year 2043, with 14% truck percentage for both years. Year 2043 design hour forecast volumes are 400 vehicles per hour (60% eastbound) for the AM peak hour, and 400 vehicles per hour (65% westbound) for PM peak hour.

E. Crash History

No crashes were reported on Iowa 9 at the bridge location in the past 10 years. Two single vehicle crashes were reported within 500' – 1,000 feet east and west of the bridge, each with one minor injury and one major injury. The bridge is in a sag vertical curve and has adequate sight distance available.

F. Sufficiency Ratings

The official federal bridge sufficiency rating is 53.9 and the unofficial federal bridge sufficiency rating is 54.3. A drop in any of the aforementioned bridge condition ratings is expected to drop the sufficiency rating below 50. In the past, there was an instruction to those determining appropriate rehabilitation or replacement strategies for bridges eligible for federal funding that both rehabilitation and replacement options should be evaluated when the sufficiency rating was between 50 and 80. With a sufficiency rating below 50 and the '5" condition ratings of the deck, superstructure and substructure, replacement is the clear choice.

G. Accelerated Bridge Construction Score

The Accelerated Bridge Construction (ABC) normalized score using state roads is 52, which would qualify the project for further evaluation of ABC techniques. The largest contributing factor to the raw score is the out of distance travel (OODT) of 29 miles, which contributes 50 to the total. The daily road user costs (DRUC) raw score is elevated to a score of 20 because the OODT is included in the calculation. The

remainder of the score is due to an average annual daily traffic (AADT) raw score of 10 and an economy of scale (EOS) raw score of 5.

The ABC normalized score using county roads is 33, which indicates that further evaluation of ABC techniques for this project is not necessary. The individual raw scores for AADT, OODT, DRUC, and EOS were 10, 20, 20, and 5, respectively.

H. Access Control

Access rights will not be acquired on this project.

II. PROJECT CONCEPT

A. Proposed Improvements

Because of the roadway and bridge overtopping found during the bridge hydraulics analyses and the challenge in identifying cost-effective solutions mitigating the overtopping, two options were explored for replacement of the existing bridge.

1. Alternative Number 1: 3-Span Continuous Concrete Slab Bridge on Existing Vertical Alignment

Replace the existing 75' x 28' continuous concrete slab bridge with a 100' x 44' continuous concrete slab bridge at the same roadway profile as the existing. Traffic will be detoured off-project to allow the removal of the existing bridge and the construction of the replacement bridge in one stage.

The proposed bridge will not be skewed and will be centered on the channel, similar to the existing bridge. 3'-0 wide berms and 2.5:1 (H:V) slopes to the existing ground line in front of each abutment are proposed. Flow velocities through the bridge opening are relatively slow but Class E Revetment is proposed as protection for the abutment slopes. Each abutment will be founded on steel H-piles. Diaphragm piers with monolithic caps and spread footings keyed 18" into hard shale are proposed as well.

The maximum Q100 backwater is 0.20 feet. The roadway will be overtopped and the bridge structurally designed for loads associated with inundation.

Estimated Construction Cost

Bridge Item	Estimated Cost
New Bridge – CCS Bridge	$433,800

Remove Existing Bridge	$ 26,000
Revetment, Class E	$ 10,000
Upstream Wing Dikes	$ 20,000
Staging @ 0%	$ 0
Aesthetics @ 0%	$ 0
Mobilization @ 10%	$ 47,000
Contingency @ 20%	$103,400
Bridge Total	**$640,200**

Roadway Item	Estimated Cost
Removal of Pavement	$ 6,700
PCC Bridge Approach Pavement	$ 94,960
9” HMA Shoulder	$ 35,364
Guard Rail Items	$ 21,074
Bridge End Drains	$ 16,000
Traffic Control (5%)	$ 8,705
Mobilization (5%)	$ 8,705
Contingency (30%)	$ 57,452
Roadway Total	**$248,960**

Project Total: $889,160

Costs above assume that Iowa 9 will be closed to traffic during construction. As an alternative, it is possible to stage construct the new bridge while maintaining one lane of traffic on the existing bridge. Temporary barrier rail can be placed such that 14.5 feet of deck is available between the TBR and the bridge rail. This will allow enough of the new bridge to be constructed that 14.5 feet of deck will be available in the second phase of construction.

Staged construction will also increase the overall duration of construction. It’s estimated that the additional time will add around 2 weeks to the project schedule. Although it is not anticipated that the bridge construction will take the entire construction season, adding time to the contract duration will likely increase mobilization costs and may reduce the flexibility the contractor has in scheduling the improvements. This would have the effect of increasing the overall project cost. This increase is reflected in the estimate below, and amounts to 10% of the bridge cost.

Additional costs for staged construction are as follows:

Item	Estimated Cost
Pavement Markings Removed	$ 277
Temporary Barrier Rail, Concrete	$11,625
Temporary Traffic Signals	$ 9,000
Temporary Crash Cushions	$ 5,000
Additional Structural Cost	$43,380
Traffic Control (5%)	$ 3,464
Mobilization (5%)	$ 3,464
Contingency (30%)	$20,784
Total	**$96,994**

2. Alternative Number 2: 3-Span Continuous Concrete Slab Bridge with a 5.3' Profile Grade Raise at the Bridge

   Replace the existing 75' x 28' continuous concrete slab bridge with a 100' x 44' continuous concrete slab bridge with a profile grade elevation 5.3 feet higher than existing. Traffic will be detoured off-site to allow the removal of the existing bridge and the construction of the replacement bridge in one stage.

   The proposed bridge will not be skewed and will be centered on the channel just as the existing bridge is. 3'-0 wide berms and 2.5:1 (H:V) abutment slopes are proposed. Flow velocities through the bridge opening are relatively slow but Class E Revetment is proposed as protection for the abutment slopes. Each abutment will be founded on steel H-piles. Diaphragm piers with monolithic caps and spread footings keyed 18" into hard shale are proposed as well.

   The maximum Q100 backwater is 1.18 feet. The roadway approaches will be overtopped but the bridge will not.

   Costs for staged construction were not evaluated on this alternate.

Estimated Construction Cost

Bridge Item	Estimated Cost
New Bridge – CCS Bridge	$458,000
Remove Existing Bridge	$ 26,000
Revetment, Class E	$ 10,000
Upstream Wing Dikes	$ 20,000
Staging @ 0%	$ 0
Aesthetics @ 0%	$ 0
Mobilization @ 10%	$ 49,400

Contingency @ 20%	$108,700
Bridge Total	**$672,100**

Roadway Item	Estimated Cost
Removal of Pavement	$41,544
10" PCC Pavement	$152,928
PCC Bridge Approach Pavement	$94,960
9" HMA Shoulder	$35,364
6" HMA Shoulder	$22,500
Granular Shoulders	$7,443
Guard Rail Items	$21,074
Embankment-in-place	$216,000
Bridge End Drains	$16,000
Traffic Control (5%)	$30,391
Mobilization (5%)	$30,391
Contingency (30%)	$200,577
Roadway Total	**$869,172**

Project Total: $1,541,272

B. Recommendations

Alternative Number 1 is our recommended bridge solution because of its cost effectiveness and how it compares to the existing structure. Alternative Number 2 is not recommended because even with a significant grade raise to the bridge, the backwater is significantly increased and the roadway approaches would be overtopped as well. During a flood event, the bridge will still need be closed and traffic will be re-rerouted onto county roads.

The roadway will be reconstructed with this project through the end of the proposed bridge approach section. Shoulder reconstruction will need to be extended past the end of the bridge approach to accommodate new guardrail installation. The proposed roadway profile generally follows the existing profile.

We recommend closure of the roadway during construction to facilitate faster construction and due to the overall lower construction costs associated with this option.

C. Detour Analysis

Iowa 9 will be closed to traffic during construction. The proposed detour route will follow V46 (Robin Avenue) south to A46 (150th Street), then east to V58 (Willow Avenue), then north to Iowa 9 in Cresco (see detour sheet in Appendix B). Because this

detour route utilizes county roads, an agreement will need to be made with Howard County for its use.

D. Special Considerations

No existing entrances will be impacted by construction if Alternate 1 is chosen. Alternate 2 impacts 3 entrances.

There are no pedestrian accommodations within the project limits.

An existing fiber optic line has been exposed in the stream channel. It is proposed that rip rap be added to the channel in the vicinity of the bridge to avoid additional future erosion.

E. Construction Sequence

It is anticipated that all work will be awarded to one prime contractor. The Bridges and Structures Bureau will coordinate the plan preparation with Snyder & Associates, Inc. / Shuck-Britson, Inc.

F. Program Status

This project is listed in the 2020-2024 Iowa Transportation Improvement Program with $805,000 programmed for construction in FY 2023. The project is currently scheduled for a November 15, 2022 letting.

BRIDGE REPLACEMENT - CCS LETTING DATE 11-15-2022

BRFN-009-7(38)--39-45

HOWARD COUNTY - DESIGN NO. 0123

LEGEND

- INTERSTATE HIGHWAY
- PRIMARY HIGHWAY-DIVIDED
- PRIMARY HIGHWAY
- PORTLAND CEMENT CONCRETE ROAD
- ASPHALT ROAD
- BITUMINOUS ROAD
- GRAVEL ROAD
- EARTHEN ROAD
- INTERSTATE HIGHWAY (80)
- UNITED STATES HIGHWAY (65)
- STATE HIGHWAY (175)
- COUNTY HIGHWAY (S27)
- RAILROAD
- PIPELINE
- AIRPORT
- HYDROLOGY
- BRIDGE
- STATE BOUNDARY
- COUNTY BOUNDARY
- CORPORATE BOUNDARY
- TOWNSHIP LINE
- SECTION LINE
- ROAD NAMES — ABBEY ROAD
- UNINCORPORATED PLACE — ELWOOD

IOWA DOT

Highway Division

PLANS OF PROPOSED IMPROVEMENTS ON THE

PRIMARY ROAD SYSTEM

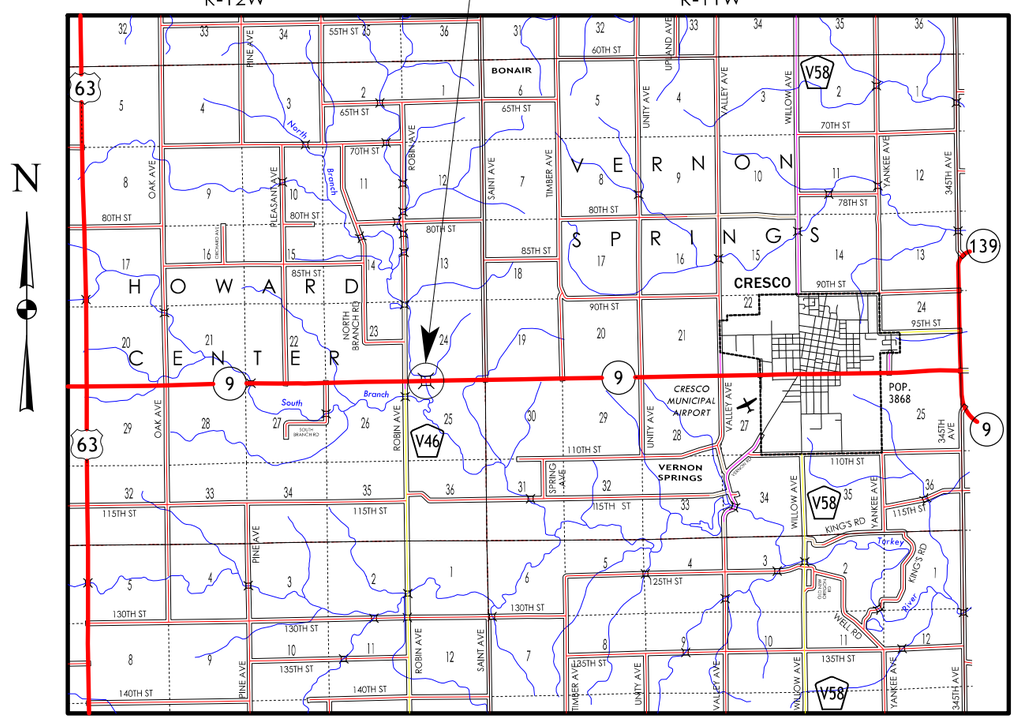
HOWARD COUNTY

BRIDGE REPLACEMENT - CCS

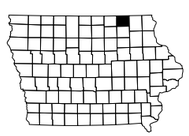
IOWA 9 OVER NORTH BRANCH TURKEY RIVER

THE IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2015, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS SHALL APPLY TO CONSTRUCTION WORK ON THIS PROJECT.

DESIGN NO. 0123



LOCATION MAP



LOCATION MAP SCALE
0 1 Miles 2 3
1 2 3 4 5 Kilometers

PROJECT DIRECTORY NAME: 4500901018

ENGLISH STANDARD BRIDGE PLANS

STANDARD	ISSUED	REVISED
J44-01-14	07-14	03-16
J44-08-14	07-14	
J44-09-14	07-14	04-16
J44-20-14	07-14	09-16
J44-21-14	07-14	
J44-25-14	07-14	
J44-26-14	07-14	
J44-39-14	07-14	03-16
J44-44-14	07-14	
J44-45-14	07-14	
J44-46-14	07-14	09-14
J44-47-14	07-14	09-16
J44-50-14	07-14	03-16
J44-51-14	07-14	
J44-52-14	07-14	09-16

PRELIMINARY
NOT FOR CONSTRUCTION

REVISIONS

IOWA ONE CALL
1-800-292-8989 | 811
www.iowaonecall.com
Know what's below. Call before you dig.

REVISIONS TO THIS DESIGN PLAN AND/OR PROJECT SPECIFICATIONS SHOULD BE SUBMITTED BY _____

TOTAL SHEETS
18
PROJECT NUMBER
BRFN-009-7(38)--39-45
R.O.W. PROJECT NUMBER
NHSN-009-7(39)--2R-45
PROJECT IDENTIFICATION NUMBER
18-45-009-010

INDEX OF SHEETS

STANDARD ROAD PLANS

STANDARD ROAD PLANS ARE LISTED ON SHEET NUMBER ?

DESIGN DATA RURAL

2023	AADT	3480	V.P.D.
2043	AADT	3960	V.P.D.
2043	DHV	400	V.P.H.
TRUCKS		14	%
Total Design ESALs		?	

INDEX OF SEALS

SHEET NO.	NAME	TYPE
1	CHRISTOPHER J. CRISWELL	STRUCTURAL DESIGN
B.1	CINDY A. SPENCER	ROADWAY DESIGN
V.1	STEVEN A. KLOCKE	HYDRAULIC DESIGN
J44 BRIDGE STANDARDS	NORMAN L. MCDONALD	STRUCTURAL DESIGN

STRUCTURAL DESIGN

LICENSED PROFESSIONAL ENGINEER
Christopher J. Criswell
P14447
IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

D.02 SUBMITTAL

Signature — Date

Christopher J. Criswell

Printed or Typed Name

My license renewal date is December 31, 2021

Pages or sheets covered by this seal: SHEETS ? THRU ? OF ?

DESIGN TEAM	SHUCK-BRITSON, INC.	ENGLISH	IOWA DOT * BRIDGES AND STRUCTURES BUREAU	FILE NO. 31709	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER

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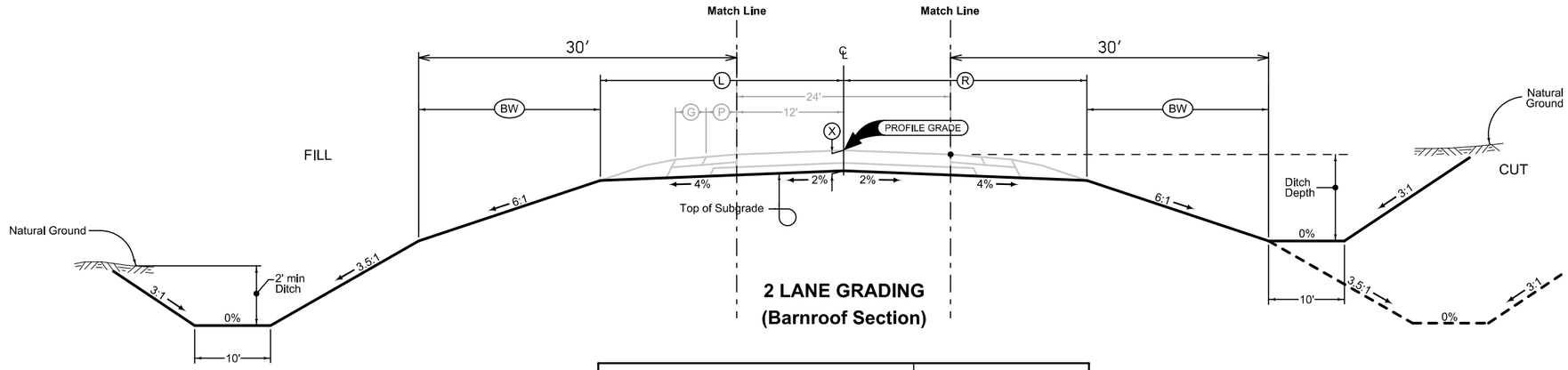
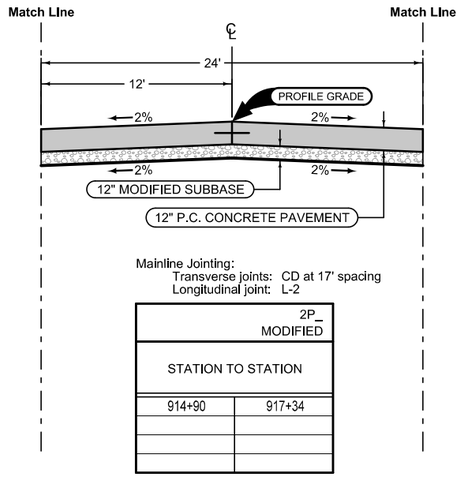


2 LANE GRADING (Barnroof Section)

Normal section shown may be modified appropriately in areas of superelevated curves or other locations specifically designated by the Engineer.

See Plan & Profile sheets and cross sections for additional details of ditches and backslopes.

LOCATION			DIMENSIONS			
ROAD IDENTIFICATION	STATION TO STATION		(L) Feet	(R) Feet	(X) Inches	(BW) Feet
Iowa 9	914+90	917+34			24	



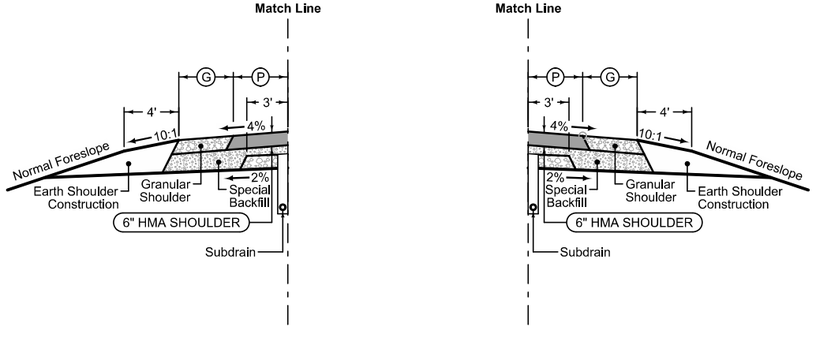
Mainline Jointing:
Transverse joints: CD at 17' spacing
Longitudinal joint: L-2

2P_ MODIFIED	
STATION TO STATION	
914+90	917+34

Combination Shoulder

Shoulder Jointing:
Longitudinal joint: B

2_C_ 10-15-13			
STATION TO STATION		(P) Feet	(G) Feet
914+90	917+34	4	6



Combination Shoulder

Shoulder Jointing:
Longitudinal joint: B

2_C_ 10-15-13			
STATION TO STATION		(P) Feet	(G) Feet
914+90	917+34	4	6

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER B.1

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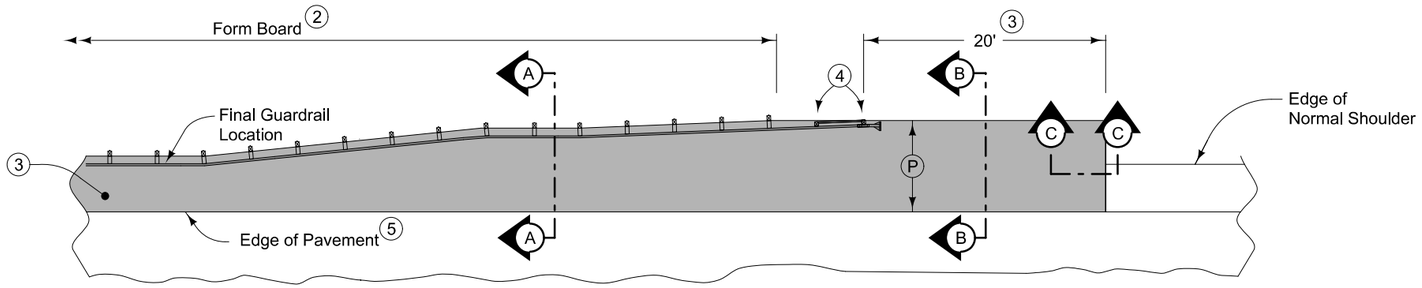
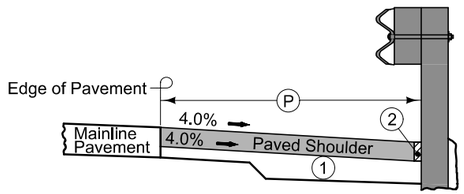
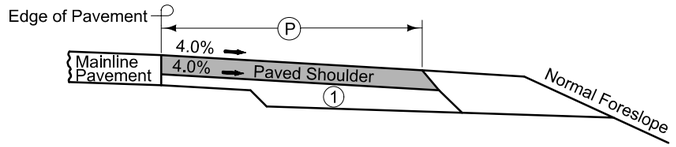


PLAN VIEW

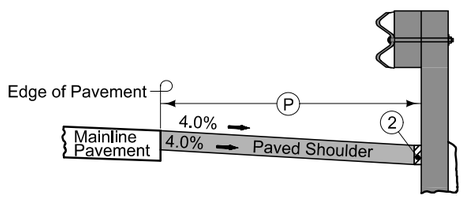


Section A-A

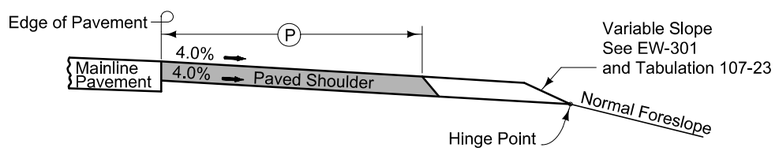


Section B-B

NEW CONSTRUCTION



Section A-A



Section B-B

EXISTING SHOULDER

9" HMA Paved Shoulder at guardrail. 8" PCC may be substituted with the following jointing layout:

Match mainline pavement joint spacing. When mainline pavement is 8" or greater in thickness, place additional transverse 'C' joints in shoulder at mid-panel of the mainline pavement. Place longitudinal 'C' joint at P/2 from edge of mainline pavement when P is greater than 10' wide. Terminate longitudinal joint at transverse joint less than 10' in length.

Compaction of HMA is required to face of guardrail post. Hand compaction will be allowed under guardrail. Removal and reinstallation of guardrail will be allowed with no additional payment.

Refer to Tabulation 112-9 for shoulder quantities.

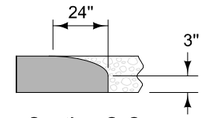
(1) For subgrade treatment, refer to other details in the plan.

(2) PCC option only: When guardrail posts are installed prior to construction of PCC paved shoulder, fasten form board to the face of guardrail posts for the length shown. Refer to note 4 for final 2 posts.

(3) Continue paved shoulder to existing paved shoulder or 20 feet beyond the center of the first post.

(4) Shoulder may be notched for final 2 posts or post sleeves may be installed through pavement. Do not drive posts through pavement.

(5) 'KT-1 joint for PCC shoulder.
'B' joint for HMA shoulder.



Section C-C
Roll down at granular shoulder or earth.

PAVED SHOULDER AT GUARDRAIL

112-6
04-18-17

BRIDGE APPROACH SECTION

Refer to the BR Series.

* Not a bid item

Location				Approach Pavement					Standard Road Plans BR Series			Subdrain					* Modified Subbase	* Polymer Grid	* Special Backfill	Remarks
Bridge Station	End	Skew Ahead Degrees LEFT	Skew Ahead Degrees RIGHT	(T) Thickness	Pay Length	Non-Reinf. Pavement Area	Single-Reinf. Pavement Area	Double-Reinf. Pavement Area	Approach	Fixed or Movable Abutment	Abutting Pavement	* Perforated Subdrain 4"	* Subdrain Outlet		* Porous Backfill	* Class 'A' Crushed Stone Backfill				
				Inches	FT	SY	SY	SY				LF	STA	Side	CY	CY	TON	SY	TON	
916+11.70	W			12.0	70.0	80.0	53.3	100.0	BR-205											
916+11.70	E			12.0	70.0	80.0	53.3	100.0	BR-205											

112-9
10-15-13

SHOULDERS

(1) Lane(s) to which the shoulder is adjacent.
(2) Bid Item
(3) Applies only for Paved Shoulders constructed on project with existing granular shoulders.
(4) Does not include shrink.

Calculations assume a HMA unit weight (lbs/cf) of 0, a Special Backfill unit weight (lbs/cf) of 140, and a Granular Shoulder unit weight (lbs/cf) of 140.

Location					(P) Width	(G) Width	(L) Length	Quantities														Remarks
								Class 13 Excavation (3)	Hot Mix Asphalt		Binder	Paved Shoulder	Reinforced Paved Shoulder	Special Backfill HMA Alternate		Special Backfill PCC Alternate		Modified Subbase	Granular Shoulder		Earth Shoulder Construction Alternates			
Road Identification	(1) Direction Of Traffic	Station to Station		Side																	(2) STA	HMA	PCC
					FT	FT	FT	CY (2)	TON	TON/STA	TONS	SY (2)	SY (2)	TON (2)	TON/STA	TON (2)	TON/STA	CY (2)	TON (2)	TON/STA		CY (4)	CY (4)	
Iowa 9	EB	914+07.35	914+78.14	R	13.0		70.8					102.3									0.7			
Iowa 9	EB	914+78.14	915+03.14	R	13 to 10.5		25.0					32.6									0.3			
Iowa 9	EB	915+03.14	915+40.20	R	10.5		37.1					43.2									0.4			
Iowa 9	WB	914+44.85	914+89.64	L	10.5		44.8					52.3									0.4			
Iowa 9	WB	914+89.64	915+15.64	L	.5 to 11.5		26.0					31.8									0.3			
Iowa 9	WB	915+15.64	915+40.20	L	11.5		24.6					31.4									0.2			
Iowa 9	EB	916+83.20	917+07.77	R	10.5		24.6					28.7									0.2			
Iowa 9	EB	917+07.77	917+33.77	R	.5 to 11.5		26.0					31.8									0.3			
Iowa 9	EB	917+33.77	917+78.56	R	11.5		44.8					57.2									0.4			
Iowa 9	WB	916+83.20	917+20.27	L	10.5		37.1					43.2									0.4			
Iowa 9	WB	917+20.27	917+45.27	L	10.5 to 13		25.0					32.6									0.3			
Iowa 9	WB	917+45.27	918+16.06	L	13.0		70.8					102.3									0.7			

108-8A
10-16-18

STEEL BEAM GUARDRAIL AT CONCRETE BARRIER OR BRIDGE RAIL END SECTION

Possible Standards: BA-200, BA-201, BA-202, BA-205, BA-206, BA-210, BA-211, BA-221, BA-225, BA-250, BA-260, LS-625, LS-626, LS-630, LS-635, SI-172, SI-173 and SI-211.

(1) Lane(s) to which the obstacle is adjacent.
(2) Not a bid item. Incidental to guardrail installation.

Location					Layout Lengths BA-250, BA-260, LS-630, or LS-635				Long-Span System		Delineators and Object Markers (2)					Bid Items										Remarks
		(1) Side										Delineator SI-172	Object Marker SI-173			Bolted End Anchor		Post Adapter	Steel Beam Guardrail	BA-250 or LS-630					BA-260 or LS-635		
No.	Direction of Traffic	O = Outside M = Median	Station	Offset	(VT1)	(VF)	(VT2)	(ET)	BA-211		SI-211	Type 1	Type 2	Type 3		BA-202		BA-210	BA-200	Barrier Transition Section	End Terminal				Barrier Transition Section	End Terminal	
																					Tangent	Flared	Tangent	Flared		Tangent	
				FT	LF	LF	LF	LF	STATION	TYPE	TYPE	White	OM2-2	OM3-L	OM3-R	TYPE	EACH	EACH	LF	BA-201 EACH	BA-205 EACH	BA-206 EACH	LS-625 EACH	LS-626 EACH	BA-221 EACH	BA-225 EACH	
1	WB	O			53.125	25.00	0.00	47.7								A	1		37.5	1	1						
2	EB	O			40.625	0.00	0.00	47.7								A	1		0.0	1	1						
3	WB	O			40.625	0.00	0.00	47.7								A	1		0.0	1	1						
4	EB	O			53.125	25.00	0.00	47.7								A	1		37.5	1	1						

FILE NO.	ENGLISH	DESIGN TEAM Snyder & Associates, Inc.	Howard COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER C.1

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SURVEY SYMBOLS

UTILITY LEGEND

PLAN VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

LINEWORK	Design Color No.	
Green	(2)	Existing Topographic Features and Labels
Blue	(1)	Proposed Alignment, Stationing, Tic Marks, and Alignment Annotation
Magenta	(5)	Existing Utilities
SHADING	**Design Color No.**	
Yellow	(4)	Highlight for Critical Notes or Features
Red	(3)	Delineates Restricted Areas
Lavender	(9)	Temporary Pavement Shading
Gray, Light	(48)	Proposed Pavement Shading
Gray, Med	(80)	Proposed Granular Shading
Gray, Dark	(112)	Proposed Grade and Pave Shading "In conjunction with a paving project"
Brown, Light	(236)	Grading Shading
Tan	(8)	Proposed Sidewalk Shading
Blue, Light	(230)	Proposed Sidewalk Landing Shading
Pink	(11)	Proposed Sidewalk Ramp Shading

PROFILE VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

LINEWORK	Design Color No.	
Green	(2)	Existing Ground Line Profile
Blue	(1)	Proposed Profile and Annotation
Magenta	(5)	Existing Utilities
Blue, Light	(230)	Proposed Ditch Grades, Left
Black	(0)	Proposed Ditch Grades, Median
Rust	(14)	Proposed Ditch Grades, Right

Reference Point
Station
Survey Line
Section Corner
Ground Line Intercept
Saw Cut
Guardrail
Trench Drain
HighTension Cable Guardrail
Sheet Pile
Pavement Removal
Clearing & Grubbing Area

RIGHT-OF-WAY LEGEND

- Proposed Right-of-Way
- Existing Right of Way
- Existing and Proposed Right-of-Way
- Easement and Existing Right-of-Way
- Easement (Temporary)
- Easement
- C/A Access Control
- Property Line

PLAN AND PROFILE LEGEND AND SYMBOL INFORMATION SHEET

(COVERS SHEET SERIES D, E, F, & K)

FILE NO.	ENGLISH	DESIGN TEAM **SNYDER & ASSOCIATES, INC.**	**HOWARD** COUNTY	PROJECT NUMBER **BRFN-009-7(38)--39-45**	SHEET NUMBER **D.1**

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Howard Center TWP.
T-99N R-12W
SEC. 24

Sta. 914+90.00
Begin Construction

Sta. 917+34.00
End Construction

909+63 Lt.
Type C Ent.
(UAC)

18" x 71'
H.D.P.E.

910

915

920

920+26 Lt.
Type C Ent.
(UAC)

36" x 51'
C.M.P.

922+30 Lt.
Type C Ent.
(UAC)

36" x 60'
C.M.P.

910+80 Rt.
Type C Ent.
(UAC)

18" x 71'
C.M.P.

Sta. 916+11.7
75'x28'
Conc. Slab Bridge
D.A.=19.5 Sq. Mi. -R
(From Plans)

918+58 Rt.
Type C Ent.
(U.A.C.)

24" x 63'
C.M.P.

Howard Center TWP.
T-99N R-12W
SEC. 25

0 FEET 50

Begin Construction
Sta. 914+90.00
Elev. = 1199.10

VPI 916+11.70
Elv 1,199.47
ex = -0.07'
K = 177
Len 100.00 ft

End Construction
Sta. 917+34.00
Elev. = 1199.14

+71 Rt.
1195.15

+18 Lt.
1194.47

-1.620% Rt. Ditch Grade

-4.540% Lt. Ditch Grade

+45 Lt.
1188.71

+79 Rt.
1191.78

+0.30%

-0.27%

+22 Lt.
1188.34

+1.080% Rt. Ditch Grade

+1.860% Lt. Ditch Grade

+44 Rt.
1192.00

+05 Rt.
1193.74

+1.204% Lt. Ditch Grade

+57 Lt.
1192.70

+04 Lt.
1194.53

1,225
1,215
1,205
1,195
1,185
1,175
1,165
1,155

1,199.13
1,199.28
1,199.39
1,199.36
1,199.23

909 910 911 912 913 914 915 916 917 918 919 920 921 922 923

FILE NO.	ENGLISH	DESIGN TEAM	SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER	BRFN-009-7(38)--39-45	SHEET NUMBER	D.2

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Survey Information

Howard County
BRFN-009-7(38)—39-45
North Branch Turkey River 4.3 mi E of US 63
Bridge - Unspecified
PIN 18-45-009-010
Sap-0808.1

General Information

Measurement units for this survey are US survey feet. This survey is for proposed replacement of the Iowa Hwy. 9 bridge over the North Branch of the Turkey River. Project datum and control information is provided by Design Survey Office. This project is a Partial DTM with Photo control. This survey request was for the Iowa Hwy. 9 corridor only.

Vertical Control

Vertical datum for this survey is NAVD88 (Computed using Geoid12b). GRS80 Ellipsoidal Height was computed at project Pts. 2000-411, CRESCO, OREGON, CP1, CP2 & CP3 by conducting one concurrent 5 ½-hour static session. Additional benchmarks were placed throughout the project using a GNSS Base-Rover setup relative to Pt. CP1 and Pt. CP2. Two observations with a minimum of 4-hours between were collected and used in a weighted average.

This survey observed 1 NGS Control Monument with published NAVD88 height to compare to local ground control:

NGS 2nd. order class 0 mark designated CRESCO has a published Elev. Of 1297.75
Survey Elev. = 1297.79

This survey observed 1 local area county Control Monument with published NAVD88 height to compare to local ground control:

Howard County Control mark designated 2000-411 has a published Elev. of 1266.13
Survey Elev. = 1266.26

This survey observed 1 As-built plan bench mark to compare to local ground control:

BM 24B As-built Plans Project No. FN-9-7(6)—21-45 Culverts Elev. 1209.35
BM 502 Survey Elev. = 1209.38
The vertical difference at this mark is +0.03 to be applied to as-built plan elevations.

Bridge seat elevation from As-built Plans FN-31 Design No. 158 = 1198.71
Bridge seat average elevation this survey = 1197.72
The vertical difference is -1.01 to be applied to as-built plan elevations.

This survey established two additional local bench marks:

BM 500 Survey Elev. = 1199.62
BM 501 Survey Elev. = 1201.81

Horizontal Control

The project coordinate system for this survey is Iowa RCS Zone 2 (U.S. Survey Feet). This survey control is relative to IaRTN reference stations. IaRTN Reference Station coordinates are relative to the National Reference Station network datum: NAD83 (2011) for Epoch 2010.00. Coordinates were determined by conducting one concurrent 5 ½-hour static session. Additional control points were placed throughout the project using a GNSS Base-Rover setup relative to Pt. CP1 and Pt. CP2. Two observations with a minimum of 4-hours between were collected and used in a weighted average.

Alignment Information

The horizontal alignment for this survey is a retrace of As-built Plans Project No. FN-9-7(6)—21-45 Grade and Pave. Survey stationing was equated to the plan PI at Sta. 928+85.20 and run back and ahead without equation throughout the survey.

Survey stationing relates to as built plan stationing as follows:

PI Sta. 955+52.00 As-built Plans Project No. FN-9-7(6)—21-45
Survey PI Sta. 955+51.58

PI Sta. 928+85.20 As-built Plans Project No. FN-9-7(6)—21-45
Survey PI Sta. 928+85.20

PI Sta. 902+19.46 As-built Plans Project No. FN-9-7(6)—21-45
Survey PI Sta. 902+19.91

CONTROL POINT VICINITY MAP

This map is a guide to the vicinity of the primary project control points
Primary control is for use with RTK base stations and for RTN validation.
Future surveys will use primary project control to establish temporary control as needed for construction or other surveying applications.

HORIZ. DATUM: NAD83(2011) EPOCH 2010.00
VERT. DATUM: NAVD88
Ia. Regional Coordinate System Zone 2

Coordinate listing from next sheet will be used with IaRTN for monument recovery. No other reference ties are given.

HORIZONTAL AND VERTICAL PROJECT CONTROL COORDINATE LISTING

HORIZ. DATUM: NAD83(2011) EPOCH 2010.00

VERT. DATUM: NAVD88

Ia. Regional Coordinate System Zone 2

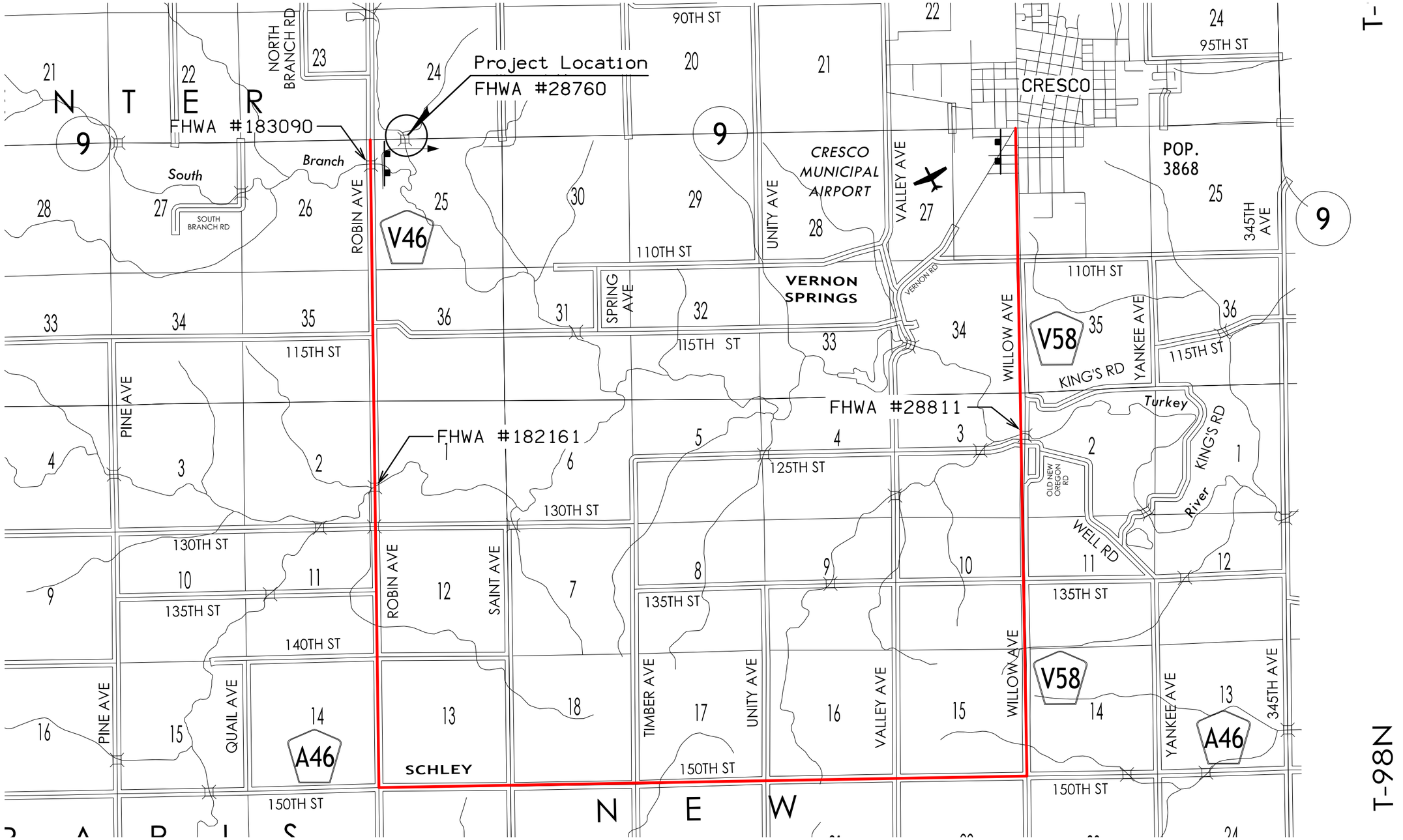
Point Name	Northing	Easting	Elevation	Feature Code-Monument Description
CP1	9875036.34	12641177.06	1224.47	BM DRILL HOLE IN FLANGE ROW RAIL...140 FT NORTH AND 64 FT WEST OF INTSEC HWY 9 AND ROBIN AVE
CP2	9874840.76	12642934.97	1198.92	BM SET FENO MON 0.32 MI EAST OF INTSEC HWY 9 AND ROBIN AVE...76 FT SOUTH OF CTR HWY 9 AND 50 FT EAST OF CTR PARK ENT.
CP3	9874843.14	12646491.85	1205.91	BM FD CONC MON WITH #4 RBR CTR...108 FT SOUTH AND 80 FT WEST OF INTSEC HWY 9 AND SAINT AVE

108-23A
08-01-08

TRAFFIC CONTROL PLAN

1. Iowa 9 will be closed to traffic during construction. Traffic will be detoured as shown on Sheet J.2.

2. Local access shall be maintained at all times.



FILE NO.	ENGLISH	DESIGN TEAM Snyder & Associates, Inc.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER J.2

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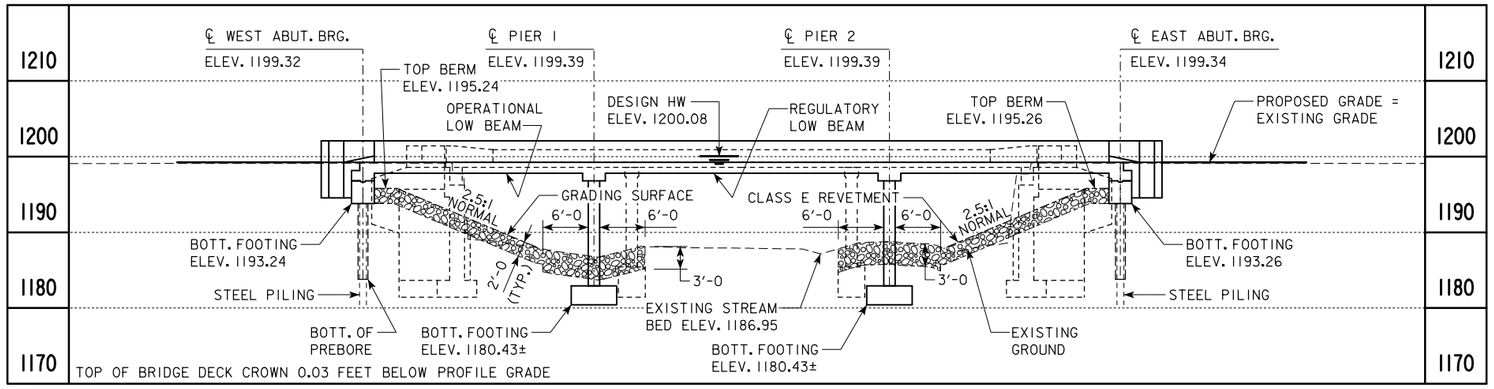
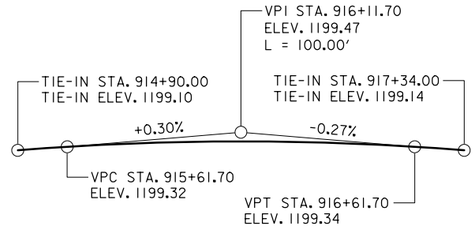
CONTROL POINT 2 NORTHING 9874840.76 EASTING 12642934.97 ELEVATION 1198.92
DESCRIPTION: BM SET FENO MON 0.32 MI EAST OF INTESC HWY 9 AND ROBIN AVE... 76 FT SOUTH OF CTR HWY 9 AND 50 FT EAST OF CTR PARK ENT.



LONGITUDINAL SECTION ALONG ℄ ROADWAY



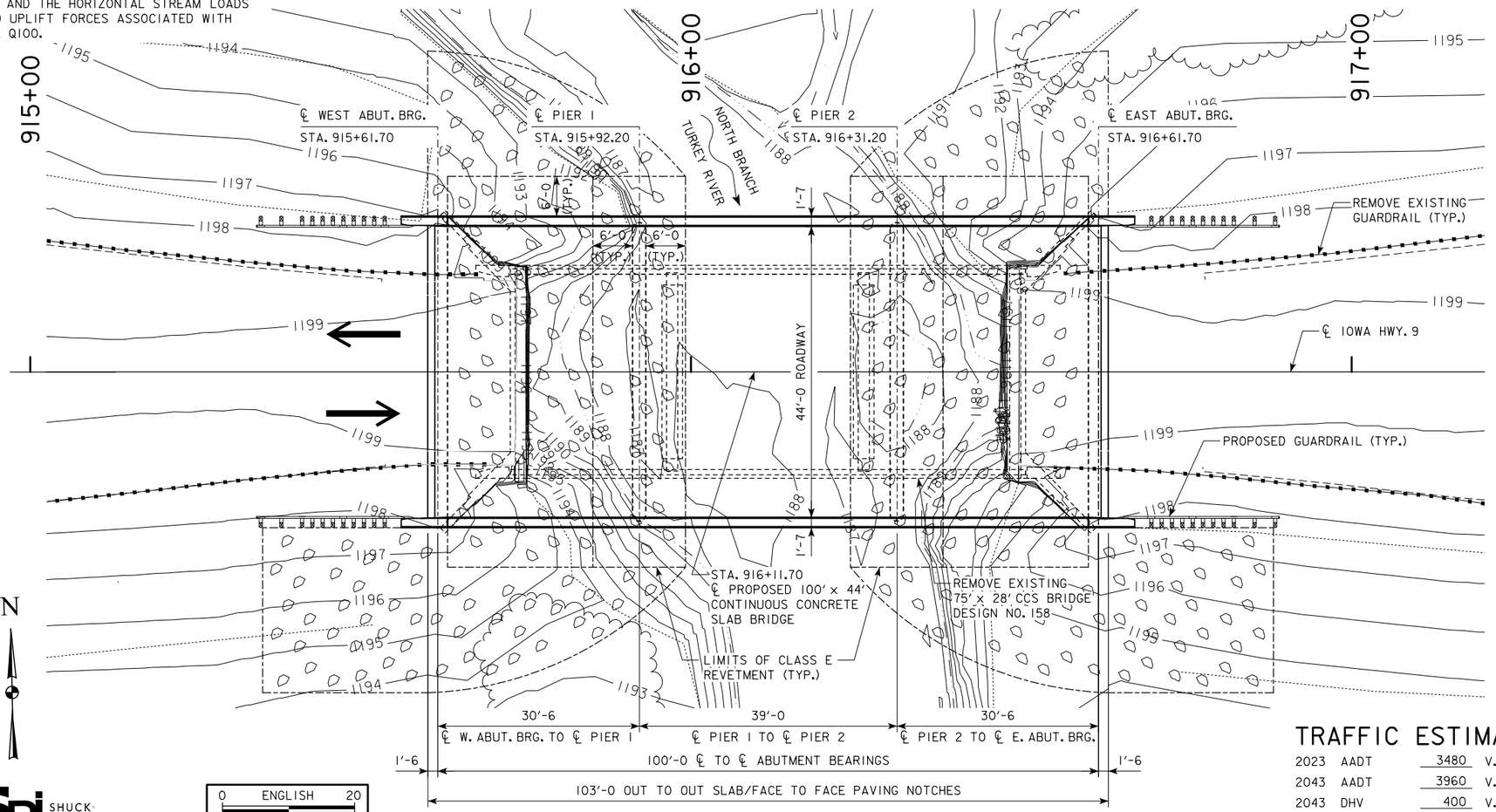
PROPOSED PROFILE GRADE

NOTES:
STANDARD BRIDGE (J44-06)
TL-4 BRIDGE RAILING PROPOSED
PIER TYPE - MONOLITHIC DIAPHRAGM WITH 2'-0 THICK WALL ON SPREAD FOOTING.
CLASS E REVETMENT STONE IS EMBEDDED.
THE BRIDGE WILL BE DESIGNED TO WITHSTAND THE APPLICABLE EFFECTS OF ICE AND THE HORIZONTAL STREAM LOADS AND UPLIFT FORCES ASSOCIATED WITH THE Q100.

WING DIKES AND CHANNEL GRADING WILL BE NEEDED AT THE UPSTREAM SIDE OF THE BRIDGE, BUT ARE NOT SHOWN FOR CLARITY.

UTILITIES LEGEND

FO - FIBER OPTIC - UNKNOWN
T - TELEPHONE - UNKNOWN



SITUATION PLAN

HYDRAULIC DATA

DRAINAGE AREA = 20.6 SQ. MI.
STREAM SLOPE = 11.4 FT./MI.

DESIGN DISCHARGE, Q_{50} = 5,520 CFS
STAGE = 1200.08 FT.
REGULATORY LOW BEAM = 1197.48 FT.
BACKWATER = 0.31 FT.
AVG. BRIDGE VELOCITY = 3.16

DISCHARGE, Q_{100} = 6,520 CFS
STAGE = 1200.58 FT.
OPERATIONAL LOW BEAM = 1197.40 FT.
BACKWATER = 0.20 FT.
AVG. BRIDGE VELOCITY = 3.92 FPS

DISCHARGE, Q_{200} = 8,440 CFS
STAGE = 1201.08 FT.
DESIGN SCOUR ELEVATION = 1177.1

Q OVERTOP = 3,510 CFS
AVG. BRIDGE VELOCITY = 5.04 FPS
CHECK SCOUR ELEVATION = 1177.99
ROADWAY OVERTOP ELEVATION = 1199.1
STA. 914+65.70

Q_{500} = 9,240 CFS

LOCATION

HWY. 9 OVER NORTH BRANCH TURKEY CREEK
4.3 MILES EAST OF U.S. 63
T-99N R-12W
SECTION 24
HOWARD CENTER TOWNSHIP
HOWARD COUNTY
LATITUDE 43.370937°
LONGITUDE -92.213613°

TRAFFIC ESTIMATE

2023 AADT	3480	V.P.D.
2043 AADT	3960	V.P.D.
2043 DHV	400	V.P.H.
TRUCKS	14	%

HYDRAULIC DESIGN

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

LICENSED PROFESSIONAL ENGINEER
Steven A. Klocke
P16312
IOWA

D.02 SUBMITTAL
Signature Date
Steven A. Klocke
Printed or Typed Name
My license renewal date is December 31, 2021
Pages or sheets covered by this seal: V.1 & V.2 (HYDRAULIC DATA, CHANNEL GRADING AND REVETMENT)

PRELIMINARY

DESIGN FOR 0° SKEW

100' X 44' CONTINUOUS CONCRETE SLAB BRIDGE

30'-6 END SPANS 39'-0 CENTER SPAN

SITUATION PLAN

STATION 916+11.70 NOVEMBER 2022

HOWARD COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 1 OF 2 FILE NO. _____ DESIGN NO. _____

SHUCK-BRITSON

DESIGN TEAM CJC/CLS | S.B.I. NO. 119.1213.01B | HOWARD COUNTY | PROJECT NUMBER BRFN-009-7(38)--39-45 | SHEET NUMBER V.1

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CONTROL POINT 2 NORTHING 9874840.76 EASTING 12642934.97 ELEVATION 1198.92
DESCRIPTION: BM SET FENO MON 0.32 MI EAST OF INTESC HWY 9 AND ROBIN AVE... 76 FT SOUTH OF CTR HWY 9 AND 50 FT EAST OF CTR PARK ENT.

ESTIMATED BERM ARMORING QUANTITIES

LOCATION	REVETMENT CL. ?? (TON)	EROSION STONE (TON)	ENGINEERING FABRIC (SY)	EXCAVATION (CY)
BERM LINING - WEST ABUTMENT	XX	XX	XX	XX
STONE TOE - WEST ABUTMENT	XX	XX	XX	XX
BERM LINING - EAST ABUTMENT	XX	XX	XX	XX
STONE TOE - EAST ABUTMENT	XX	XX	XX	XX
TOTALS	XX	XX	XX	XX

EXCAVATION QUANTITY CALCULATED FROM GRADING SURFACE.
REVETMENT ESTIMATED AT X.X TON/CY.

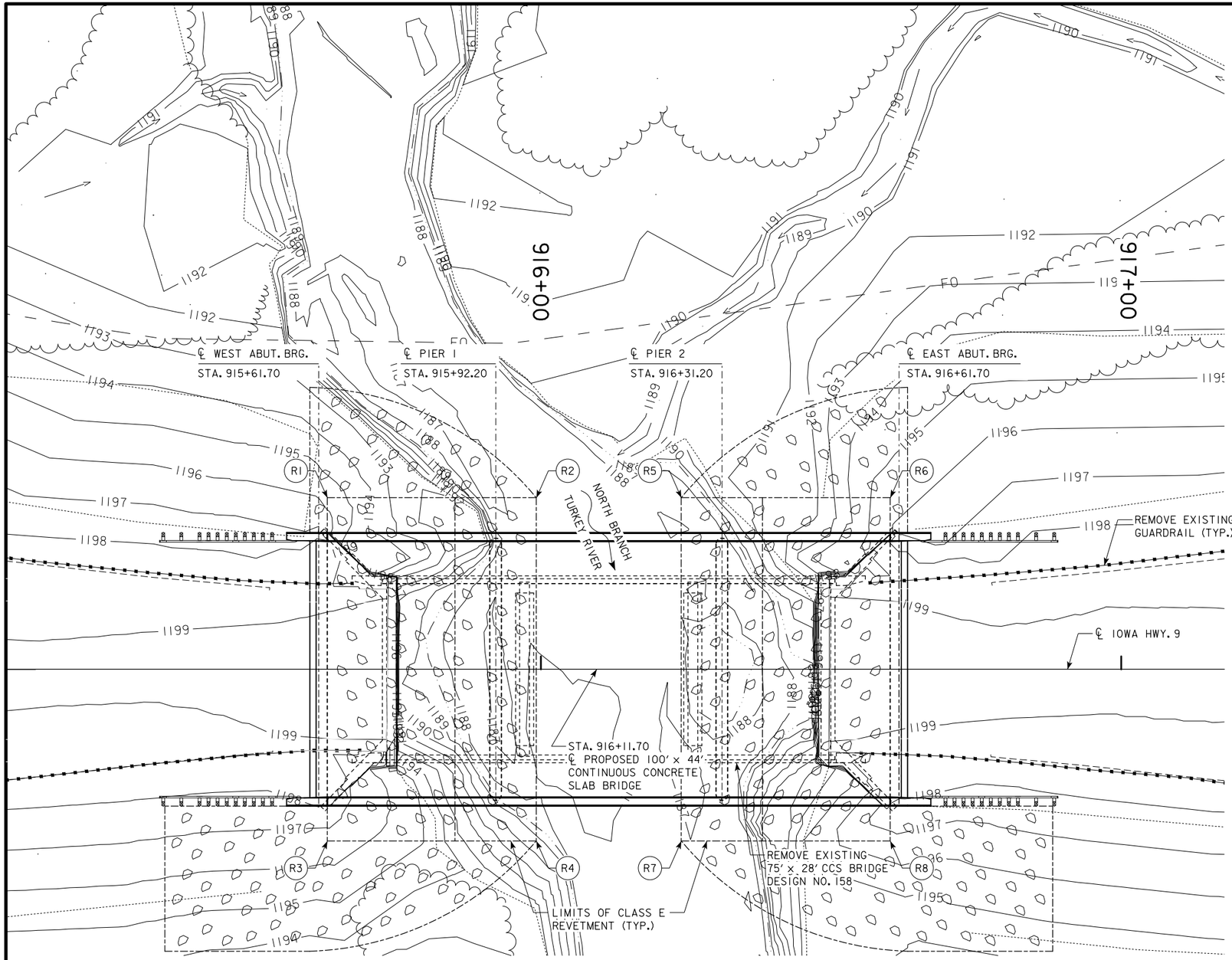
BERM SLOPE LOCATION TABLE

POINTS	WEST ABUTMENT			EAST ABUTMENT		
	STATION	OFFSET	ELEV.	STATION	OFFSET	ELEV.
A1	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX
A2	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX
B1	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX
B2	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX
W1	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX
W2	XXXX+XX.XX	XX.XX' XX	XXX.XX	XXXX+XX.XX	XX.XX' XX	XXX.XX

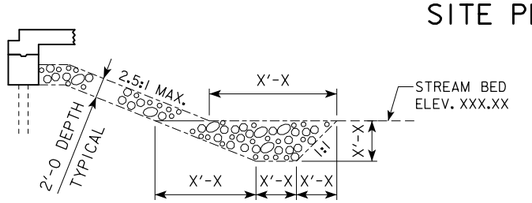
BERM SLOPE ELEVATIONS REFLECT THE GRADING SURFACE

REVETMENT LAYOUT:

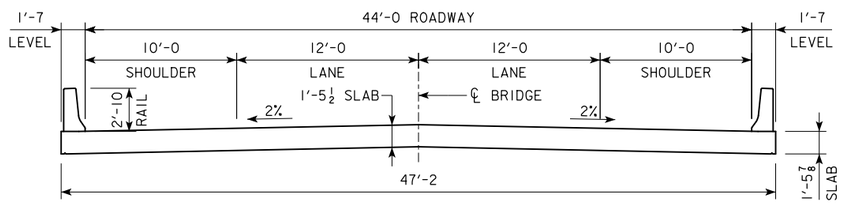
- (R1) HWY. 15 915+63.20, 29.58' LT:
- (R2) HWY. 15 915+99.20, 29.58' LT:
- (R3) HWY. 15 915+63.20, 29.58' RT:
- (R4) HWY. 15 915+99.20, 29.58' RT:
- (R5) HWY. 15 916+24.20, 29.58' LT:
- (R6) HWY. 15 916+60.20, 29.58' LT:
- (R7) HWY. 15 916+24.20, 29.58' RT:
- (R8) HWY. 15 916+60.20, 29.58' RT:



SITE PLAN



SECTION THRU EMBEDDED REVETMENT BERM



TYPICAL SECTION
(CONTINUOUS CONCRETE SLAB)

0 ENGLISH 20
SCALE IN FEET

PRELIMINARY

DESIGN FOR 0° SKEW

100' X 44' CONTINUOUS CONCRETE SLAB BRIDGE

30'-6 END SPANS — 39'-0 CENTER SPAN

SITUATION PLAN - SITE

STATION 916+11.70 — NOVEMBER 2022

HOWARD COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 2 OF 2 FILE NO. _____ DESIGN NO. _____

SHUCK-BRITSON

DESIGN TEAM CJC/CLS	S.B.I. NO. 119.1213.01B	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER V.2

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LINE STYLE LEGEND OF CROSS SECTION SHEETS (ROAD)

- Existing Ground Line
- Proposed Template
- Proposed Topsoil Placement
- Additional Topsoil Removal
- Subgrade Treatment
- Granular Shoulder
- Pavement
- Existing Pipe\RCB
- Proposed Pipe\RCB
- Proposed Dike
- All Elements Associated with Proposed Entrances

LINE STYLE LEGEND OF CROSS SECTION SHEETS (SOILS)

- TOPSOIL — Topsoil (Class 10)
- Slope Dressing Only
- CL 10 — Class 10 Materials
- SEL LO — Select Loams And Clay-Loams
- SEL SA — Select Sand
- UNS A — Unsuitable Type A Disposal
- UNS B — Unsuitable Type B Disposal
- UNS C — Unsuitable Type C Disposal
- SHALE — Shale
- WASTE — Waste
- BRK LS — Broken and Weathered Rock
- ROCK — Solid Rock
- BLDRS — Boulders

Note: All layer lines and descriptions identify layers above the line.

Note: Vertical or near vertical lines connecting soil layers at edges of cross sections are only for the purpose of calculating template quantities and do not depict soil stratification.

SYMBOL LEGEND OF CROSS SECTION SHEETS

Existing ROW — Existing Right-of-Way Limit

Proposed ROW — Proposed Right-of-Way Limit

Temporary ROW — Temporary Right-of-Way Limit

CROSS SECTION LEGEND AND SYMBOL INFORMATION SHEET

(COVERS SHEET SERIES W, X, Y, & Z)

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER W.1

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Highway 9
Preliminary

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

1210
1200
1190
1180
1170

914+50.00

914+00.00

913+77.53

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER W.2

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Highway 9
Preliminary

916+00.00

915+50.00

915+00.00

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER W.3

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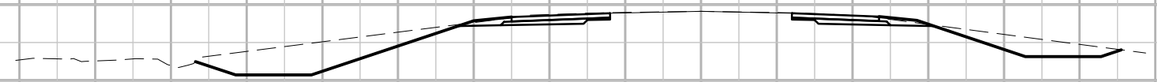
Highway 9
Preliminary

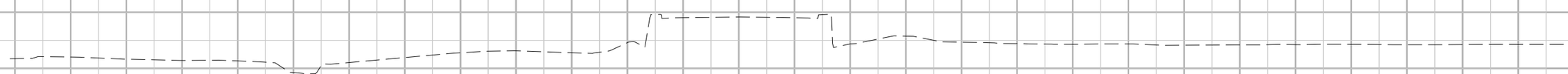
140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

1210
1200
1190
1180
1170



917+50.00

917+00.00



916+50.00

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER W.4

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Highway 9
Preliminary

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

1210
1200
1190
1180
1170

918+45.95

918+00.00

FILE NO.	ENGLISH	DESIGN TEAM SNYDER & ASSOCIATES, INC.	HOWARD COUNTY	PROJECT NUMBER BRFN-009-7(38)--39-45	SHEET NUMBER W.5

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