IOWA DEPARTMENT OF TRANSPORTATION

TO OFFICE:	District 5	**DATE:**	January 27, 2020
ATTENTION:	James V. Armstrong	**PROJECT:**	Appanoose County BRF-005-1(71)--38-04
FROM:	John E. Bartholomew		PIN: 17-04-005-010
BUREAU:	Design		
SUBJECT:	Project Concept Statement; (Final Approval, D0)		

This project involves the replacement of the IA 5 bridge (Maint No. 0402.1S005) over North Creek, 2.6 miles south of County Road T-20.

A concept review was held on October 26, 2017. Those present included Mark Van Dyke and James Philips from the District 5 Office, Roger Dyke and Travis Foglesong from District 5 Maintenance; Dave Mulholland from the Bridges and Structures Bureau; Tami Quam from the Location and Environment Bureau; and Kevin Patel and Seana Godbold from the Design Bureau.

The three alternatives considered were:

1. Replace bridge with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge, using an off-site detour. The estimated cost for this alternative is $3,217,300.

2. Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using Geofoam blocks and class 10 embankment to fill the void between the RCB and bridge deck. The estimated cost for this alternative is $4,979,500.

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Alternative 3 is the preferred alternative due to future maintenance benefits, decreased project cost and less disruption to the traveling public. Additional right of way appears to be required. Traffic will be maintained at all times. However, it will be necessary to reduce traffic down to one lane via the use of flaggers during the removal of the bridge rail, guardrail, and the placement of the shoulders.

The Draft Project Concept Statement was sent out for review and comment with concerns to be resolved by Thursday, January 23, 2020. Comments received during the review period have been considered and resolved.

This project is recommended for construction in FY 2023. The Design Bureau will coordinate plan preparation with assistance from the Bridges and Structures Bureau.

JEB: hsr
Attach.
cc:

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J. Woodcock	B. M. Clancy	B. Hucker
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R. Dyke	B. Beavers	FHWA

FINAL PROJECT CONCEPT STATEMENT

IA 5 bridge over North Creek, 2.6 miles south of County Road T-20.

Appanoose County
BRF-005-1(71)--38-04
PIN: 17-04-005-010
Maint. No. 0402.1S005
FHWA No. 13870

Highway Division
Design Bureau

John Bartholomew, P.E.
515-239-1540

January 27, 2020

I. STUDY AREA

A. Project Description

This project involves the replacement of the IA 5 bridge (Maint. No. 0404.1S005) over North Creek, 2.6 miles south of County Road T-20.

The three alternatives considered were:

1. Replace bridge with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge, using an off-site detour. The estimated cost for this alternative is $3,217,300.

2. Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using Geofoam blocks and class 10 embankment to fill the void between the RCB and bridge deck. This alternative will provide less than 1 inch of settlement. The estimated cost for this alternative is $4,979,500.

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A bridge replacement with staging option was also considered but due to a grade raise requirement of 1.7 ft. this option was dismissed from further consideration.

An option of replacing the bridge with a reinforced concrete box culvert using the flowable mortar method was also considered, but due to the soil fill under the bridge and estimated settlement of 12 to 13 inches with the downdrag forces were deemed to be excessive. This option was dismissed from further consideration.

Alternative 3 is recommended due to future maintenance benefits, reduced project cost and less disruption to the traveling public.

B. Need for Project

The existing bridge is a 180 ft. x 26 ft. continuous I-beam bridge constructed in 1950 and overlaid in 1989. The bottom of the deck and the abutments are severely spalled with exposed reinforcing steel. There is measured section loss on the exterior beams and the abutment bearings have severe corrosion and pack rust. The bridge was designed for live loads below current standards and the overlay is near the end of its useful life and needs to be replaced. Because of the age of the structure, permanent repairs to the substructure and deck are not a viable option. Therefore, the structure should be replaced.

C. Present Facility

The existing structure is a 180 ft. x 26 ft. continuous I-beam bridge constructed in 1950.

IA 5 in the project area was 24 ft. wide with 8 inches of soil aggregate subbase with ½ inch bituminous seal coat and approximately 10 ft. wide shoulders in 1952. HMA resurfacing was completed in 1972 and 1986 with 3.5 inches of type B asphalt cement concrete base and 1 inch type B asphalt cement concrete in 1972 and 3 inches of Type

B asphalt cement concrete in 1986. In 1999 the project area was microsurfaced and in 2018 this section of roadway was resurfaced with 3 inches of HMA and widened to provide 12 ft. lanes and 10 ft. effective shoulders (4 ft. paved shoulder and 6 ft. granular shoulder).

D. Traffic Estimates

The 2022 construction year and 2042 design year average daily traffic estimates are 1400 ADT with 11% trucks and 1800 ADT with 11% trucks, respectively.

E. Sufficiency Ratings

IA 5 is classified as an "Area Development" route and is a maintenance service level "C" road. The federal bridge sufficiency rating is 55.8.

F. Access Control

Access rights will not be acquired for this project.

G. Crash History

During the five-year study period from January 1, 2014 through December 31, 2018, there were no crashes near the project location.

II. PROJECT CONCEPT

A. Feasible Alternatives

Alternative #1 - Replace bridge with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge, using an off-site detour.

The existing 180 ft. x 26 ft. bridge will be replaced with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge.

The typical cross section adjacent to the bridge will consist of a 24 ft. roadway with 10 ft. effective shoulders (4 ft. paved and 6 ft. granular) and 6:1/3:1 foreslopes.

This bridge will be constructed on the existing vertical and horizontal alignment. New bridge approaches will be constructed. The existing guardrail will be replaced with new and updated guardrail and the shoulders will be paved 20 ft. beyond the ends of the guardrail. Class 10 will be necessary to flatten the existing foreslopes and to construct the new guardrail blisters. Class E revetment will be placed under the bridge for slope protection. New bridge end drains will be constructed on 4 ends of the bridge.

Apply erosion control and rural seeding and fertilizing to all disturbed areas.

Right of way may not be required for the bridge alternative.

Traffic will be maintained by an off-site detour.

Bridge Items	**Estimated Costs**
New Bridge	$ 1,273,700
Bridge Removal	47,600
Revetment	48,000
Erosion Stone	42,000
Mobilization (10%)	141,100
Contingency (15%)	232,900
Bridge Costs	**$ 1,785,300**

Roadway Items	
Bridge Approaches	$88,800
Removal of Pavement	8,200
Excavation Class 10 Waste	438,200
Excavation Class 13 Waste	5,900
Excavation Class 20 Waste	6,100
Guardrail (Includes Removal)	20,200
Paved Shoulders for Guardrail	125,000
Class 10 for Guardrail Blisters	49,800
Bridge End Drains	10,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Wetland Mitigation	50,000
Traffic Control - 5%	71,600
Mobilization - 5%	71,600
M & C - 30%	429,600
Roadway costs	**$ 1,432,000**

Project Total	**$3,217,300**

Alternative #2 - Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using geofoam blocks.

The existing 180 ft. x 26 ft. bridge will be replaced with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box (RCB) culvert. The typical cross section will consist of a 24 ft. roadway with 10 ft. effective shoulders (4 ft. paved and 6 ft. granular) and 6:1/3:1 foreslopes.

The new RCB can be built under the existing bridge without disturbing the bridge. After the culvert has been constructed, expanded polystyrene fill (EPS), also known as 'geofoam' blocks and class 10 embankment will be used between the RCB and bridge deck. Flowable mortar will be placed between the geofoam and the bridge deck to fill any voids. The existing bridge rail and guardrail will then be removed.

Geofoam blocks will be used, rather than the conventional granular backfill and flowable mortar to fill the void under the existing bridge due to an expected settlement of 12 to 13 inches. Downdrag forces on, and the settlement of the existing pile were deemed to be excessive. The use of geofoam blocks for this option will reduce the settlement to less than an inch.

The flow line of the box will be buried one foot below the existing flow line in the channel. This will allow the bottom of the box to silt in and provide a natural stream bed along the bottom of the culvert for fish passage. Additional stream mitigation measures will be required. A 20 degree bend in the culvert will be located just downstream of the inlet. The bend is needed so the inlet is in line with the creek channel. The existing ditches will need to be relocated to meet the inlet and outlet flowlines of the new RCB. Class E revetment will be placed at the ends of the RCB.

Apply erosion control and rural seeding and fertilizing to all disturbed areas.

Right of way appears to be required for the culvert alternative.

Traffic will be maintained at all times. However, it will be necessary to reduce traffic down to one lane via the use of flaggers during the removal of the bridge rails, guardrails, placement of flowable mortar and the placement of the shoulders.

Bridge Items	Estimated Costs
New Culvert	$ 911,300
Headwall	114,700
Revetment	48,000
Mobilization - 10%	107,400
M & C - 15%	177,200
Bridge Total	**$ 1,358,600**

Roadway Items	
Granular Shoulder	3,800
HMA Paved Shoulders	25,800
Embankment in place, contractor furnished	122,400
Topsoil	60,000
Excavation Class 20 Waste	6,100
Geofoam blocks	1,531,400
Geomembrane	95,800
Guardrail Removal	4,300
Flowable Mortar	6,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Right of Way	10,000
Wetland Mitigation	50,000
Stream Mitigation	200,000
Traffic Control - 5%	181,000
Mobilization - 5%	181,000
M & C - 30%	1,086,300
Roadway Costs	**$ 3,620,900**
Project Total	**$4,979,500**

Alternative #3 - Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using geofoam blocks allowing for 6 inches of settlement or less.

This alternative was added to reduce the project cost by decreasing the quantity of geofoam and the geomembrane in Alternative #2. This alternative is similar to Alternative 2 except a soils analysis was carried out to allow for maximum settlement of the foundation soils to be 6 inches or less. The geofoam and geomembrane were then decreased to acceptable quantities to match the settlement range.

Flowable mortar may need to be placed at 60 day intervals to account for settlement. Monitoring will be needed every 60 days for 180 days. If settlement occurs, the contractor will be required to place additional applications of flowable mortar through the bridge deck. The flowable mortar applications should take place after 60 day, 120 day and 180 day time periods. This is to ensure that contact is maintained between the bottom of the bridge deck floor and the top of the last flowable mortar application. Additional flowable mortar quantities have been included in the concept estimate to account for this. A plan note will be required.

Bridge Items	Estimated Costs
New Culvert	$ 911,300
Headwall	114,700
Revetment	48,000
Mobilization - 10%	107,400
M & C - 15%	177,200
Bridge Total	**$ 1,358,600**

Roadway Items	
Granular Shoulder	3,800
HMA Paved Shoulders	25,800
Embankment in place, contractor furnished	299,700
Topsoil	60,000
Excavation Class 20 Waste	6,100
Geofoam blocks	765,600
Geomembrane	47,900
Guardrail Removal	4,300
Flowable Mortar	6,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Right of Way	10,000
Wetland Mitigation	50,000
Stream Mitigation	200,000
Traffic Control - 5%	130,000
Mobilization - 5%	130,000
Additional Flowable Mortar	8,800
Additional Mobilization and Traffic Control for Flowable Mortar	15,000
M & C - 30%	780,000
Roadway Costs	**$ 2,600,100**

Project Total	**$3,958,700**

Two other options were discussed and dismissed. A bridge replacement with staging option was considered, but due to a grade raise requirement of 1.7 ft. this option was dismissed from further consideration.

An option of replacing the bridge with a reinforced concrete box culvert using the flowable mortar method was also considered, but due to the soil fill under the bridge and estimated settlement of foundation soils of 12 to 13 inches with the downdrag forces was deemed to be excessive. This option was dismissed from further consideration

B. Detour Analysis

Alternative No. 1: IA 5 will be closed for the bridge alternative and an offsite detour will be utilized. It is anticipated the detour will be in place for approximately 150 days. The detour would follow U.S. 136 east approximately 24.76 miles. At the junction with U.S. 63 the detour would turn north approximately 17.6 miles to the junction with IA 2 and then west approximately 19.75 miles to IA 5. Out of distance travel is 40.14 miles. The total distance user cost is anticipated to be $1,928,225.

Alternative No. 2 and Alternative No. 3: Traffic will be maintained at all times. However, it will be necessary to reduce traffic down to one lane via the use of flaggers during the removal of the bridge rail, guardrail, and the placement of the shoulders.

C. Recommendations

It is recommended that the present structure be replaced, as described in Alternative No. 3.

D. Construction Sequence

It is anticipated that all work on this project will be awarded to one prime contractor. The Design Bureau will coordinate the plan preparation with assistance from the Bridges and Structures Bureau.

E. ADA Accommodations

There are no bike paths or sidewalks adjacent to IA 5; therefore, no ADA accommodations are planned in conjunction with this project.

F. Special Considerations

The ABC Rating Score of 21 is less than the first stage filter threshold of 50, therefore an ABC option was dismissed from further consideration.

No bike path or sidewalk will be required as part of this project.

Special provisions will be required for the placement of the expanded polystyrene fill (EPS), also known as 'geofoam blocks' and for the geomembrane over the expanded polystyrene fill.

Right of Way appears to be required for the culvert alternatives but may not be required for the bridge alternative.

The Location and Environment Bureau has reviewed this project and based on preliminary desktop observations, has determined that a Section 404 Permit will be required. It is expected that the work will be covered by Nationwide Permit 14. Forested wetland is present in the project area and wetland mitigation may be required.

The Location and Environment Bureau has determined that this bridge, built in 1950, FHWA No. 13870, is considered historic. A Section 4(f) review looking at three alternatives is needed.

1. Do nothing.

2. Build a new structure off existing alighnment without affecting the historic integrity of the old bridge, as determined by procedures implementing the NHPA.

3. Rehabilitate the historic bridge without affecting the historic integrity of the structure, as determined by procedures implementing the NHPA.

The responses to the three alternatives are shown below:

1. The "Do nothing" alternative is not feasible as the bridge was designed for live loads below current standards and has fracture critical members that can not be eliminated with any retrofit method.

2. The cost for constructing a bridge on an alternate alignment would be approximately $2.5 million more than the roadway costs for the bridge replacement alternative, the total approximate cost would be $5,331,400. Constructing on another alignment would create two bridges that would need to be maintained. With the extra costs associated with the construction on a new alignment and with maintaining two separate bridges, this alternative was not considered feasible.

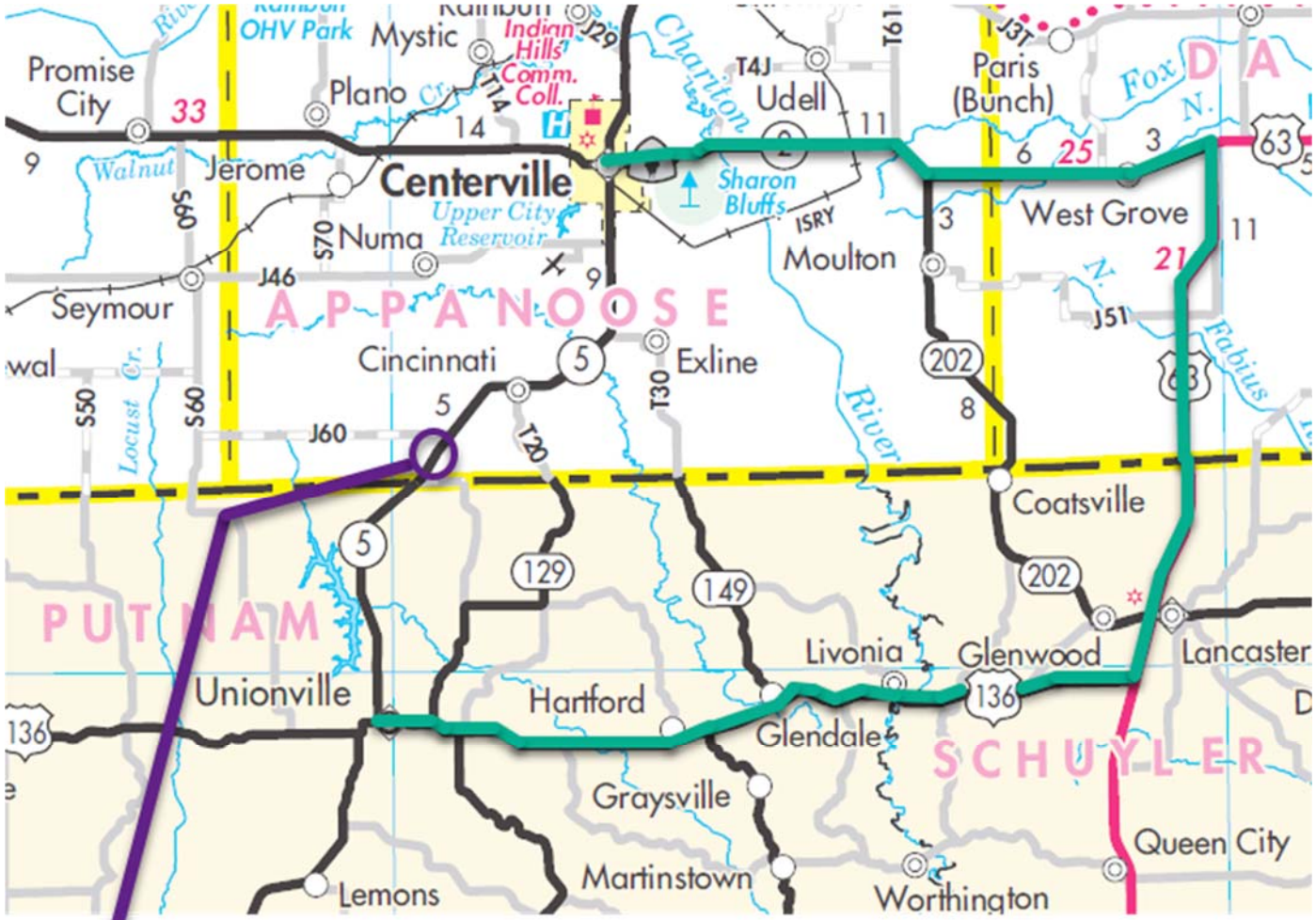
3. Eliminating the fracture critical members of the bridge and strengthening to current standards would be impossible without eliminating the historic aspects of the substructure.

F. Program Status

Site data has been developed by the Design Bureau. This project is listed in the 2020-2024 Iowa Transportation Improvement Program, with $1,620,000 programmed for replacement in FY 2023. Costs for this project may be eligible for bridge replacement funds. A schedule of events will be developed following approval of the Project Concept.

JEB: hsr

DETOUR ROUTE



APPANOOSE COUNTY

NORTH CREEK 2.6 MILES SOUTH OF COUNTY ROAD T20

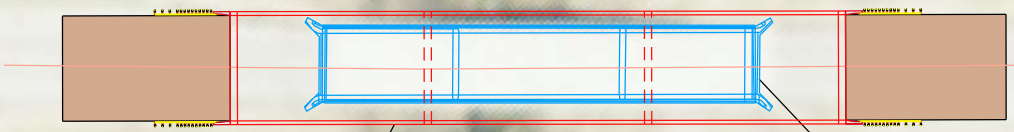
BRF-005-1(71)--38-04

PIN: 17-04-005-010

ALTERNATIVE #1

APPANOOSE COUNTY
BRF-005-1(71)--38-04
NORTH CREEK, 2.6 MILES
SOUTH OF COUNTY ROAD T-20

NEW BRIDGE APPROACH



IA 5

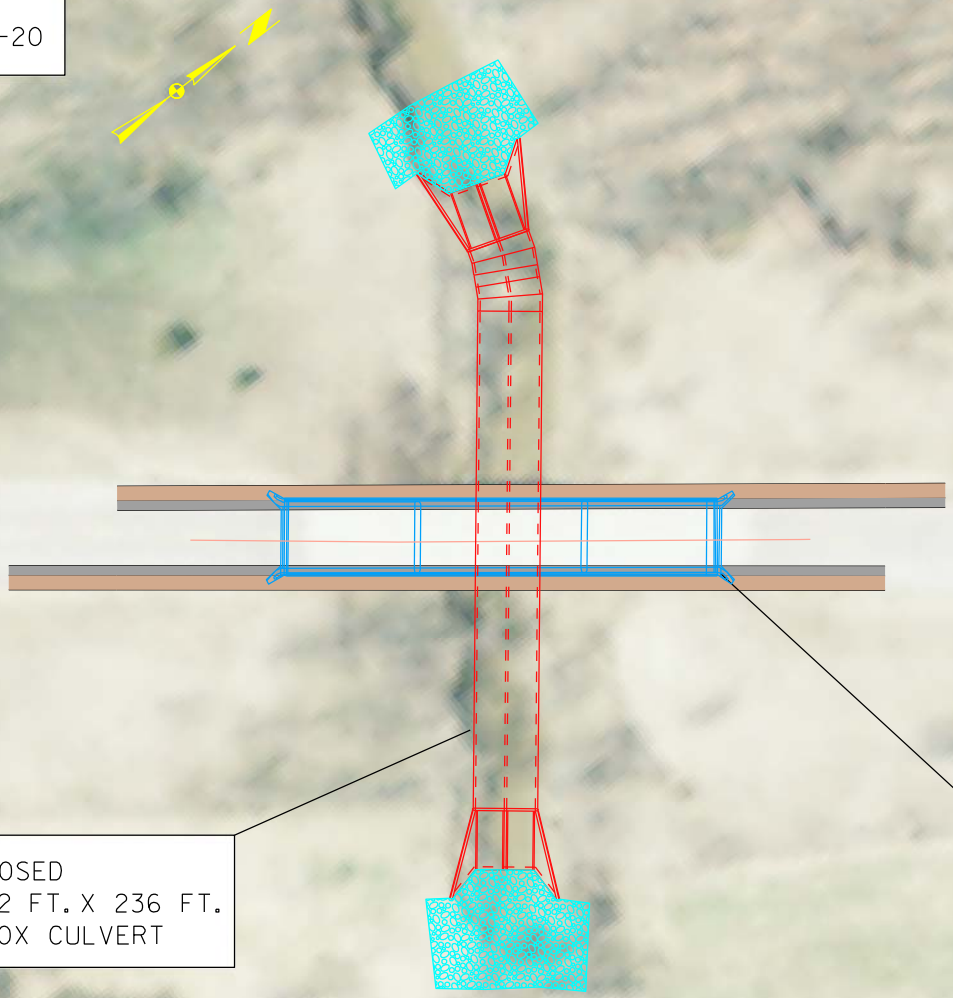
PROPOSED
254 FT. X 44 FT.
PRESTRESSED CONCRETE BEAM BRIDGE

EXISTING
180 FT. X 26 FT.
CONTINUOUS I-BEAM BRIDGE

APPANOOSE COUNTY
BRF-005-1(71)--38-04
NORTH CREEK, 2.6 MILES
SOUTH OF COUNTY ROAD T-20

ALTERNATIVE #2 AND #3

NEW HMA FOR SHOULDERS
NEW GRANULAR SHOULDERS



IA 5

PROPOSED
TWIN 12 FT. X 12 FT. X 236 FT.
CONCRETE BOX CULVERT

EXISTING
180 FT. X 26 FT.
CONTINUOUS I-BEAM BRIDGE

Utilities

Alliant - Interstate Power and Light Company
Steven Marean
Team Lead Field Engineering
208 West Taylor
Creston, IA 50801
(641) 782-7426
stevemarean@alliantenergy.com

Chariton Valley Electric Cooperative, Inc.
Todd Culley
Manager
2090 Highway 5 S
Albia, IA 52531-0486
(641) 932-7126
tculley@cvrec.com

Rathbun Regional Water Association
Mike Stevens
Construction Foremen
16166 Hwy. J-29
Centerville, IA 52544
(641) 647-1084
Mstevens@rrwa.net

Southern Iowa Electric Cooperative, Inc.
Jeremy Wilcox
Chief Operations Officer (COO)
800 E Franklin St.
Bloomfield, IA 52537
(641) 664-2277
jwilcox@sie.coop

LETTING DATE 12/20/2022

APPANOOSE CO.

RCB CULVERT REPLACEMENT - TWIN BOX
BRFN-005-1(71)--38-04

IOWA DOT

Highway Division

PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM

APPANOOSE COUNTY

RCB CULVERT REPLACEMENT - TWIN BOX

North Creek 2.6 mi S of Co Rd T20

SCALES: As Noted

Refer to the Proposal Form for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.14 of the Specifications.

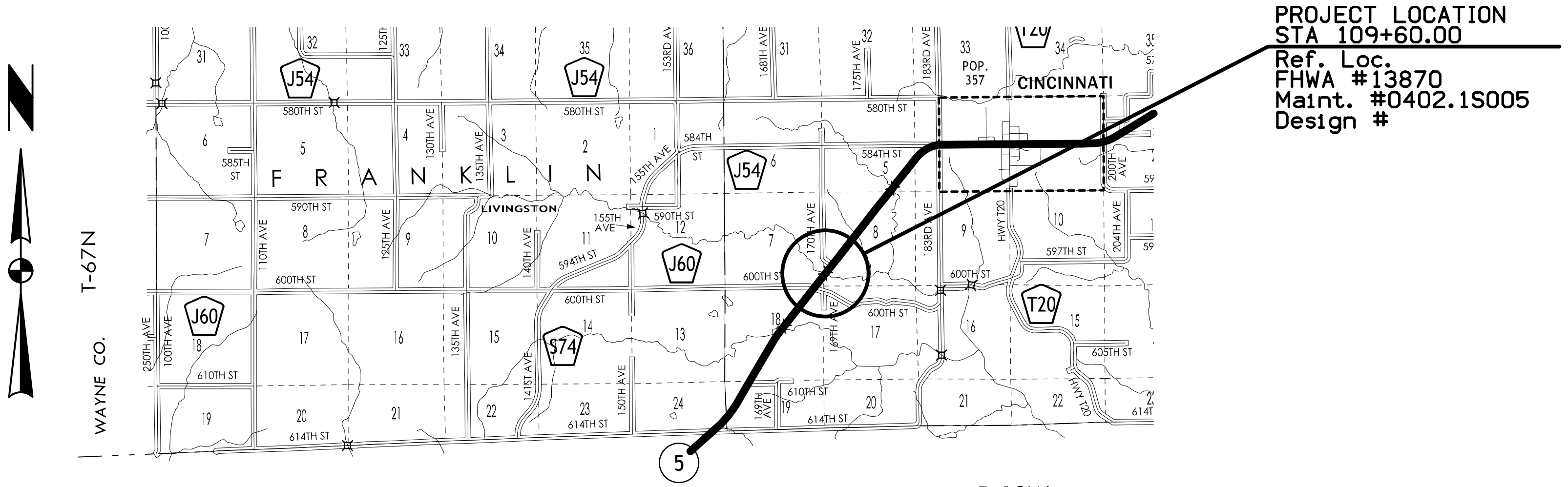
IOWA ONE CALL
1-800-292-8989 | 811 Know what's below. Call before you dig.
www.iowaonecall.com

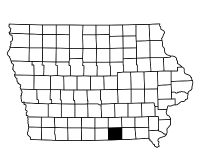
REVISIONS

	TOTAL 22
PROJECT IDENTIFICATION NUMBER	
17-04-005-010	
PROJECT NUMBER	
BRFN-005-1(71)--38-04	
R.O.W. PROJECT NUMBER	

INDEX OF SHEETS

No.	DESCRIPTION
A Sheets	Title Sheets
A.1 - 11	Title Sheet
B Sheets	Typical Cross Sections and Details
B.1 - 3	Typical Cross Sections and Details
D Sheets	Mainline Plan and Profile Sheets
* D.1	Plan & Profile Legend & Symbol Information Sheet
* D.1 - 2	"IA 5"
J Sheets	Traffic Control and Staging Sheets
* J.1	Traffic Control Plan
V Sheets	Bridge and Culvert Situation Plans
V.1	Bridge and Culvert Situation Plans
W Sheets	Mainline Cross Sections
W.1	Cross Sections Legend & Symbol Information Sheet
W.1 - 4	Mainline Cross Sections
	* Color Plan Sheets





LOCATION MAP SCALE
0 1 2 3
Miles

DESIGN DATA RURAL		
2022 AADT	1400	V.P.D.
2042 AADT	1800	V.P.D.
20 DHV		V.P.H.
TRUCKS	11	%
Total Design ESALs		

INDEX OF SEALS

SHEET NO.	NAME	TYPE
A.1	Kelly C. Bell	Primary Signature Block

PRELIMINARY PLANS

Subject to change by final design.

D2/D3 PLAN – Date: 8/18/2020

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER A.1

1:45:44 PM 8/18/2020 kpeter4 pw:\\ntPwInt1.dot.int.lan:PWMain\Documents\Projects\0400501017\Design\CADD_Files\Sheet_Files\04005071_A01.dgn

IOWA DEPARTMENT OF TRANSPORTATION

TO OFFICE: District 5 **DATE:** January 27, 2020

ATTENTION: James V. Armstrong **PROJECT:** Appanoose County
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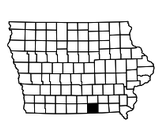

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515-239-1540

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2. Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using Geofoam blocks and class 10 embankment to fill the void between the RCB and bridge deck. This alternative will provide less than 1 inch of settlement. The estimated cost for this alternative is $4,979,500.

3. Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using Geofoam blocks and class 10 embankment to fill the void between the RCB and bridge deck. A soil analysis to allow for 6 inches or less settlement was used to decrease the geofoam and geomembrane quantities. The estimated cost for this alternative is $3,958,700.

A bridge replacement with staging option was also considered but due to a grade raise requirement of 1.7 ft. this option was dismissed from further consideration.

An option of replacing the bridge with a reinforced concrete box culvert using the flowable mortar method was also considered, but due to the soil fill under the bridge and estimated settlement of 12 to 13 inches with the downdrag forces were deemed to be excessive. This option was dismissed from further consideration.

Alternative 3 is recommended due to future maintenance benefits, reduced project cost and less disruption to the traveling public.

B. Need for Project

The existing bridge is a 180 ft. x 26 ft. continuous I-beam bridge constructed in 1950 and overlaid in 1989. The bottom of the deck and the abutments are severely spalled with exposed reinforcing steel. There is measured section loss on the exterior beams and the abutment bearings have severe corrosion and pack rust. The bridge was designed for live loads below current standards and the overlay is near the end of its useful life and needs to be replaced. Because of the age of the structure, permanent repairs to the substructure and deck are not a viable option. Therefore, the structure should be replaced.

C. Present Facility

The existing structure is a 180 ft. x 26 ft. continuous I-beam bridge constructed in 1950.

IA 5 in the project area was 24 ft. wide with 8 inches of soil aggregate subbase with ½ inch bituminous seal coat and approximately 10 ft. wide shoulders in 1952. HMA resurfacing was completed in 1972 and 1986 with 3.5 inches of type B asphalt cement concrete base and 1 inch type B asphalt cement concrete in 1972 and 3 inches of Type

B asphalt cement concrete in 1986. In 1999 the project area was microsurfaced and in 2018 this section of roadway was resurfaced with 3 inches of HMA and widened to provide 12 ft. lanes and 10 ft. effective shoulders (4 ft. paved shoulder and 6 ft. granular shoulder).

D. Traffic Estimates

The 2022 construction year and 2042 design year average daily traffic estimates are 1400 ADT with 11% trucks and 1800 ADT with 11% trucks, respectively.

E. Sufficiency Ratings

IA 5 is classified as an "Area Development" route and is a maintenance service level "C" road. The federal bridge sufficiency rating is 55.8.

F. Access Control

Access rights will not be acquired for this project.

G. Crash History

During the five-year study period from January 1, 2014 through December 31, 2018, there were no crashes near the project location.

II. PROJECT CONCEPT

A. Feasible Alternatives

Alternative #1 - Replace bridge with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge, using an off-site detour.

The existing 180 ft. x 26 ft. bridge will be replaced with a 254 ft. x 44 ft. pretensioned prestressed concrete beam bridge.

The typical cross section adjacent to the bridge will consist of a 24 ft. roadway with 10 ft. effective shoulders (4 ft. paved and 6 ft. granular) and 6:1/3:1 foreslopes.

This bridge will be constructed on the existing vertical and horizontal alignment. New bridge approaches will be constructed. The existing guardrail will be replaced with new and updated guardrail and the shoulders will be paved 20 ft. beyond the ends of the guardrail. Class 10 will be necessary to flatten the existing foreslopes and to construct the new guardrail blisters. Class E revetment will be placed under the bridge for slope protection. New bridge end drains will be constructed on 4 ends of the bridge.

Apply erosion control and rural seeding and fertilizing to all disturbed areas.

Right of way may not be required for the bridge alternative.

Traffic will be maintained by an off-site detour.

Bridge Items	**Estimated Costs**
New Bridge	$ 1,273,700
Bridge Removal	47,600
Revetment	48,000
Erosion Stone	42,000
Mobilization (10%)	141,100
Contingency (15%)	232,900
Bridge Costs	**$ 1,785,300**

Roadway Items	
Bridge Approaches	$88,800
Removal of Pavement	8,200
Excavation Class 10 Waste	438,200
Excavation Class 13 Waste	5,900
Excavation Class 20 Waste	6,100
Guardrail (Includes Removal)	20,200
Paved Shoulders for Guardrail	125,000
Class 10 for Guardrail Blisters	49,800
Bridge End Drains	10,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Wetland Mitigation	50,000
Traffic Control - 5%	71,600
Mobilization - 5%	71,600
M & C - 30%	429,600
Roadway costs	**$ 1,432,000**
Project Total	**$3,217,300**

Alternative #2 - Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using geofoam blocks.

The existing 180 ft. x 26 ft. bridge will be replaced with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box (RCB) culvert. The typical cross section will consist of a 24 ft. roadway with 10 ft. effective shoulders (4 ft. paved and 6 ft. granular) and 6:1/3:1 foreslopes.

The new RCB can be built under the existing bridge without disturbing the bridge. After the culvert has been constructed, expanded polystyrene fill (EPS), also known as 'geofoam' blocks and class 10 embankment will be used between the RCB and bridge deck. Flowable mortar will be placed between the geofoam and the bridge deck to fill any voids. The existing bridge rail and guardrail will then be removed.

Geofoam blocks will be used, rather than the conventional granular backfill and flowable mortar to fill the void under the existing bridge due to an expected settlement of 12 to 13 inches. Downdrag forces on, and the settlement of the existing pile were deemed to be excessive. The use of geofoam blocks for this option will reduce the settlement to less than an inch.

The flow line of the box will be buried one foot below the existing flow line in the channel. This will allow the bottom of the box to silt in and provide a natural stream bed along the bottom of the culvert for fish passage. Additional stream mitigation measures will be required. A 20 degree bend in the culvert will be located just downstream of the inlet. The bend is needed so the inlet is in line with the creek channel. The existing ditches will need to be relocated to meet the inlet and outlet flowlines of the new RCB. Class E revetment will be placed at the ends of the RCB.

Apply erosion control and rural seeding and fertilizing to all disturbed areas.

Right of way appears to be required for the culvert alternative.

Traffic will be maintained at all times. However, it will be necessary to reduce traffic down to one lane via the use of flaggers during the removal of the bridge rails, guardrails, placement of flowable mortar and the placement of the shoulders.

Bridge Items	Estimated Costs
New Culvert	$ 911,300
Headwall	114,700
Revetment	48,000
Mobilization - 10%	107,400
M & C - 15%	177,200
Bridge Total	**$ 1,358,600**

Roadway Items	
Granular Shoulder	3,800
HMA Paved Shoulders	25,800
Embankment in place, contractor furnished	122,400
Topsoil	60,000
Excavation Class 20 Waste	6,100
Geofoam blocks	1,531,400
Geomembrane	95,800
Guardrail Removal	4,300
Flowable Mortar	6,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Right of Way	10,000
Wetland Mitigation	50,000
Stream Mitigation	200,000
Traffic Control - 5%	181,000
Mobilization - 5%	181,000
M & C - 30%	1,086,300
Roadway Costs	**$ 3,620,900**
Project Total	**$4,979,500**

Alternative #3 - Replace bridge with a twin 12 ft. x 12 ft. x 236 ft. reinforced concrete box culvert under the existing bridge using geofoam blocks allowing for 6 inches of settlement or less.

This alternative was added to reduce the project cost by decreasing the quantity of geofoam and the geomembrane in Alternative #2. This alternative is similar to Alternative 2 except a soils analysis was carried out to allow for maximum settlement of the foundation soils to be 6 inches or less. The geofoam and geomembrane were then decreased to acceptable quantities to match the settlement range.

Flowable mortar may need to be placed at 60 day intervals to account for settlement. Monitoring will be needed every 60 days for 180 days. If settlement occurs, the contractor will be required to place additional applications of flowable mortar through the bridge deck. The flowable mortar applications should take place after 60 day, 120 day and 180 day time periods. This is to ensure that contact is maintained between the bottom of the bridge deck floor and the top of the last flowable mortar application. Additional flowable mortar quantities have been included in the concept estimate to account for this. A plan note will be required.

Bridge Items	Estimated Costs
New Culvert	$ 911,300
Headwall	114,700
Revetment	48,000
Mobilization - 10%	107,400
M & C - 15%	177,200
Bridge Total	**$ 1,358,600**
Roadway Items	
Granular Shoulder	3,800
HMA Paved Shoulders	25,800
Embankment in place, contractor furnished	299,700
Topsoil	60,000
Excavation Class 20 Waste	6,100
Geofoam blocks	765,600
Geomembrane	47,900
Guardrail Removal	4,300
Flowable Mortar	6,700
Clearing and Grubbing	4,100
Seeding and Fertilizing	2,200
Erosion Control	50,000
Right of Way	10,000
Wetland Mitigation	50,000
Stream Mitigation	200,000
Traffic Control - 5%	130,000
Mobilization - 5%	130,000
Additional Flowable Mortar	8,800
Additional Mobilization and Traffic Control for Flowable Mortar	15,000
M & C - 30%	780,000
Roadway Costs	**$ 2,600,100**
Project Total	**$3,958,700**

Two other options were discussed and dismissed. A bridge replacement with staging option was considered, but due to a grade raise requirement of 1.7 ft. this option was dismissed from further consideration.

An option of replacing the bridge with a reinforced concrete box culvert using the flowable mortar method was also considered, but due to the soil fill under the bridge and estimated settlement of foundation soils of 12 to 13 inches with the downdrag forces was deemed to be excessive. This option was dismissed from further consideration

B. Detour Analysis

Alternative No. 1: IA 5 will be closed for the bridge alternative and an offsite detour will be utilized. It is anticipated the detour will be in place for approximately 150 days. The detour would follow U.S. 136 east approximately 24.76 miles. At the junction with U.S. 63 the detour would turn north approximately 17.6 miles to the junction with IA 2 and then west approximately 19.75 miles to IA 5. Out of distance travel is 40.14 miles. The total distance user cost is anticipated to be $1,928,225.

Alternative No. 2 and Alternative No. 3: Traffic will be maintained at all times. However, it will be necessary to reduce traffic down to one lane via the use of flaggers during the removal of the bridge rail, guardrail, and the placement of the shoulders.

C. Recommendations

It is recommended that the present structure be replaced, as described in Alternative No. 3.

D. Construction Sequence

It is anticipated that all work on this project will be awarded to one prime contractor. The Design Bureau will coordinate the plan preparation with assistance from the Bridges and Structures Bureau.

E. ADA Accommodations

There are no bike paths or sidewalks adjacent to IA 5; therefore, no ADA accommodations are planned in conjunction with this project.

F. Special Considerations

The ABC Rating Score of 21 is less than the first stage filter threshold of 50, therefore an ABC option was dismissed from further consideration.

No bike path or sidewalk will be required as part of this project.

Special provisions will be required for the placement of the expanded polystyrene fill (EPS), also known as 'geofoam blocks' and for the geomembrane over the expanded polystyrene fill.

Right of Way appears to be required for the culvert alternatives but may not be required for the bridge alternative.

The Location and Environment Bureau has reviewed this project and based on preliminary desktop observations, has determined that a Section 404 Permit will be required. It is expected that the work will be covered by Nationwide Permit 14. Forested wetland is present in the project area and wetland mitigation may be required.

The Location and Environment Bureau has determined that this bridge, built in 1950, FHWA No. 13870, is considered historic. A Section 4(f) review looking at three alternatives is needed.

1. Do nothing.

2. Build a new structure off existing alighnment without affecting the historic integrity of the old bridge, as determined by procedures implementing the NHPA.

3. Rehabilitate the historic bridge without affecting the historic integrity of the structure, as determined by procedures implementing the NHPA.

The responses to the three alternatives are shown below:

1. The "Do nothing" alternative is not feasible as the bridge was designed for live loads below current standards and has fracture critical members that can not be eliminated with any retrofit method.

2. The cost for constructing a bridge on an alternate alignment would be approximately $2.5 million more than the roadway costs for the bridge replacement alternative, the total approximate cost would be $5,331,400. Constructing on another alignment would create two bridges that would need to be maintained. With the extra costs associated with the construction on a new alignment and with maintaining two separate bridges, this alternative was not considered feasible.

3. Eliminating the fracture critical members of the bridge and strengthening to current standards would be impossible without eliminating the historic aspects of the substructure.

Appanoose County
BRF-005-1(71)--38-04
PIN: 17-04-005-010

F. Program Status

Site data has been developed by the Design Bureau. This project is listed in the 2020-2024 Iowa Transportation Improvement Program, with $1,620,000 programmed for replacement in FY 2023. Costs for this project may be eligible for bridge replacement funds. A schedule of events will be developed following approval of the Project Concept.

JEB: hsr

DETOUR ROUTE

PROJECT SITE

DETOUR ROUTE

APPANOOSE COUNTY

NORTH CREEK 2.6 MILES SOUTH OF COUNTY ROAD T20

BRF-005-1(71)--38-04

PIN: 17-04-005-010

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER A.8

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ALTERNATIVE #1

APPANOOSE COUNTY
BRF-005-1(71)--38-04
NORTH CREEK, 2.6 MILES
SOUTH OF COUNTY ROAD T-20

NEW BRIDGE APPROACH

IA 5

PROPOSED
254 FT. X 44 FT.
PRESTRESSED CONCRETE BEAM BRIDGE

EXISTING
180 FT. X 26 FT.
CONTINUOUS I-BEAM BRIDGE

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER A.9

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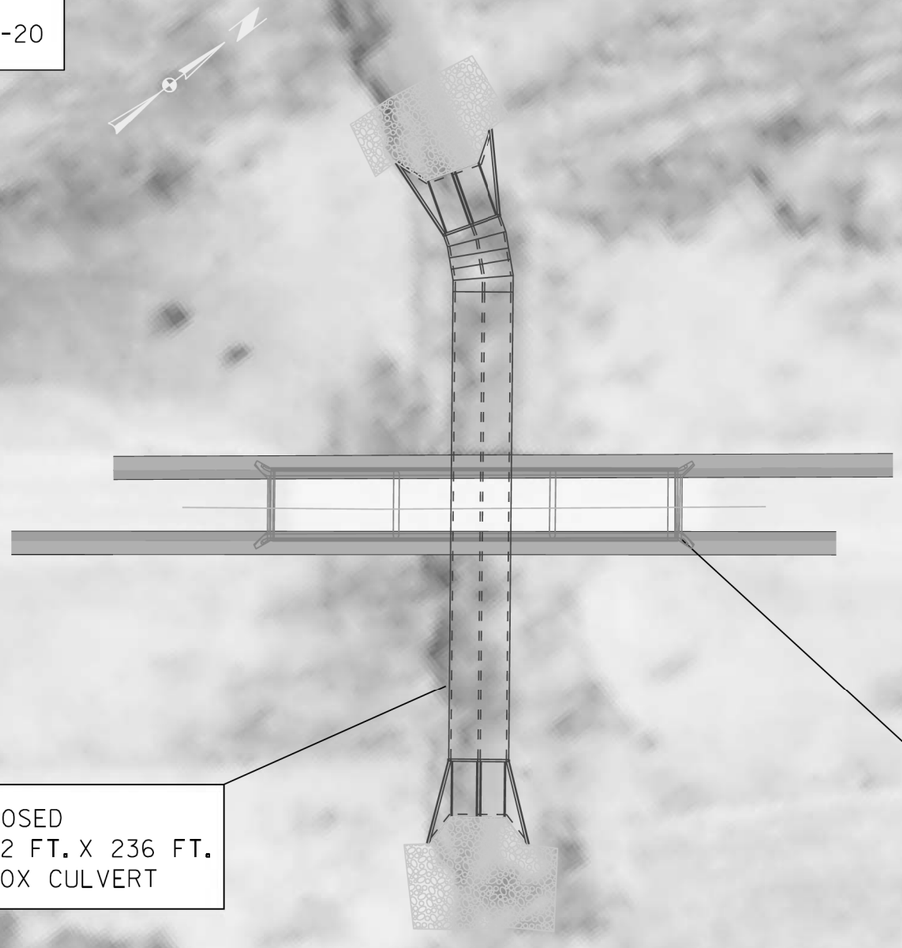
APPANOOSE COUNTY
BRF-005-1(71)--38-04
NORTH CREEK, 2.6 MILES
SOUTH OF COUNTY ROAD T-20

ALTERNATIVE #2 AND #3

NEW HMA FOR SHOULDERS

NEW GRANULAR SHOULDERS



IA 5

PROPOSED
TWIN 12 FT. X 12 FT. X 236 FT.
CONCRETE BOX CULVERT

EXISTING
180 FT. X 26 FT.
CONTINUOUS I-BEAM BRIDGE

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER A.10

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Utilities

Alliant - Interstate Power and Light Company
Steven Marean
Team Lead Field Engineering
208 West Taylor
Creston, IA 50801
(641) 782-7426
stevemarean@alliantenergy.com

Chariton Valley Electric Cooperative, Inc.
Todd Culley
Manager
2090 Highway 5 S
Albia, IA 52531-0486
(641) 932-7126
tculley@cvrec.com

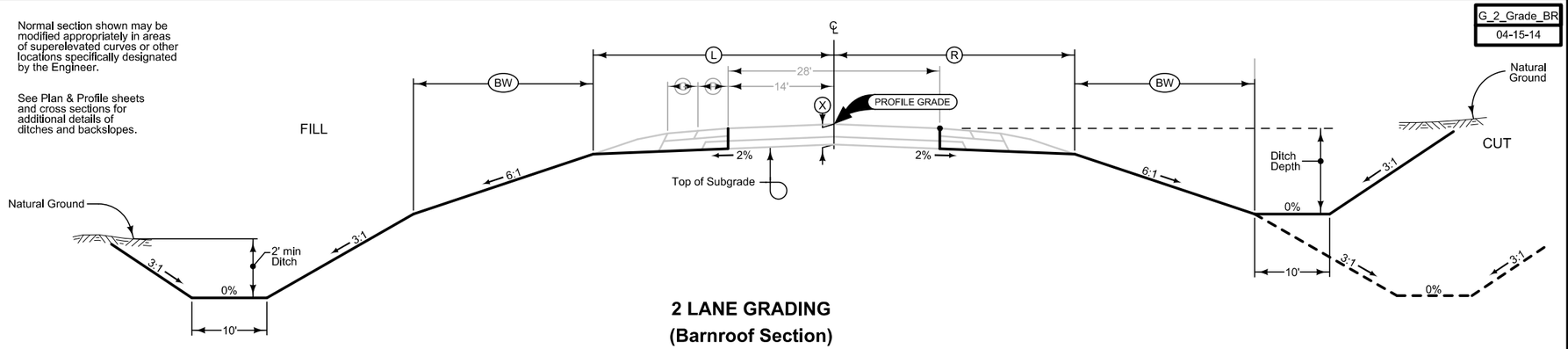
Rathbun Regional Water Association
Mike Stevens
Construction Foremen
16166 Hwy. J-29
Centerville, IA 52544
(641) 647-1084
Mstevens@rrwa.net

Southern Iowa Electric Cooperative, Inc.
Jeremy Wilcox
Chief Operations Officer (COO)
800 E Franklin St.
Bloomfield, IA 52537
(641) 664-2277
jwilcox@sie.coop

LOCATION			DIMENSIONS			
ROAD IDENTIFICATION	STATION TO STATION		(L) Feet	(R) Feet	(X) Inches	(BW) Feet
IA 5	106+10.00	113+10.00				

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.



2 LANE GRADING
(Barnroof Section)

G_2_Grade_BR
04-15-14

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER B.1

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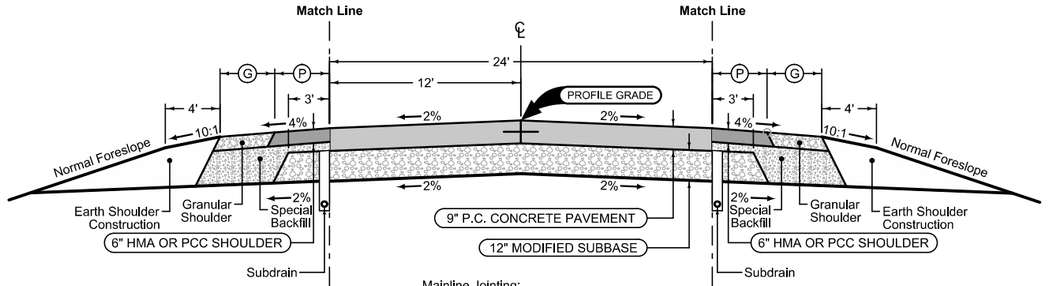
Combination Shoulder

Shoulder Jointing:
Longitudinal joint: B

		2_C_ 10-15-13	
STATION TO STATION		(P) Feet	(G) Feet
106+10.00	113+10.00	6	4



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

	2P_ 04-21-20
STATION TO STATION	
106+10.00	113+10.00

Combination Shoulder

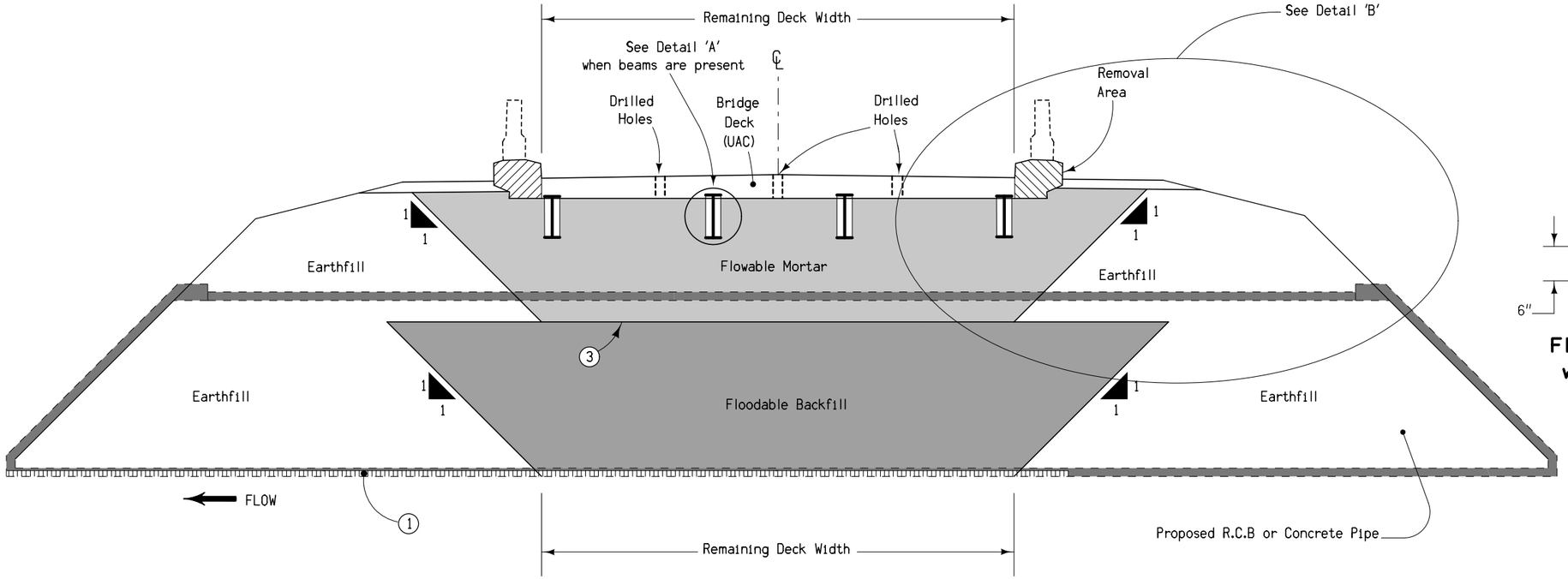
Shoulder Jointing:
Longitudinal joint: B

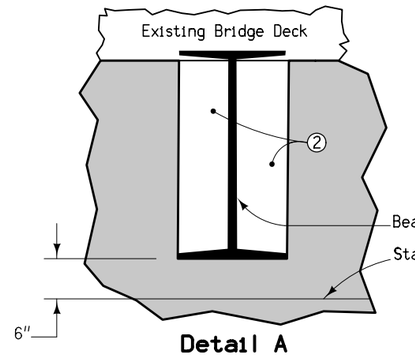
		2_C_ 10-15-13	
STATION TO STATION		(P) Feet	(G) Feet
106+10.00	113+10.00	6	4

See Tab 100-24 or 100-25 for pavement quantities.

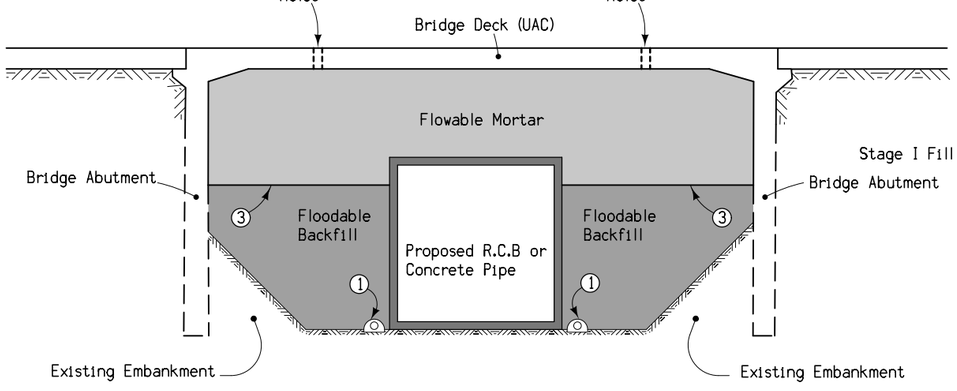
See Tab 112-9 for shoulder quantities.

IA 5

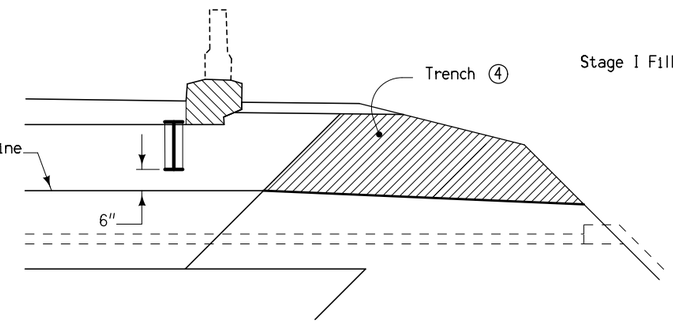




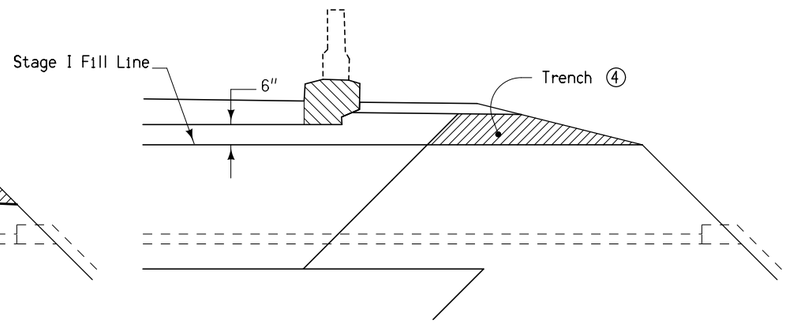
Detail A
Flange Filler Material Area when beams are present



Section along Centerline



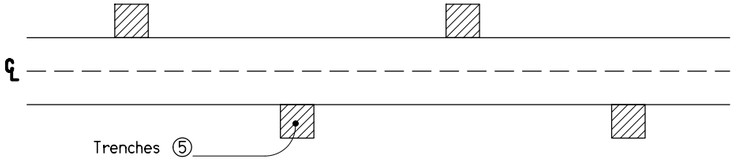
Detail B (Beam Bridge)



Detail B (Slab Bridge)

Denotes pay limits for flowable mortar

Denotes pay limits for flooded backfill



Trench Layout

1. 4" Subdrain at flowline elevation of culvert with 4" cover of porous backfill.
2. Place Flange Filler Material to fill pocket area between flanges to prevent flowable mortar from building up. Flange Filler Material is incidental to flowable mortar.
3. Fill void with the maximum amount of Floodable Backfill possible. Distance from Floodable Backfill to bridge beams (when present) or bridge deck shall not exceed 5'.
4. Cut trenches in the soil plug to provide drainage for the flowable mortar. Backfill the trenches with open graded crushed stone, gravel, or recycled PCC to allow water to drain. Backfill material is incidental to flowable mortar.
5. Place trenches at 20' spacing with a minimum of two trenches on each side of the roadway.

FILL FOR CULVERT USED IN BRIDGE REPLACEMENTS

N

105

110

115

STA 106+10.00
Start Construction

STA 113+10.00
End Construction

Sec. 7

APPROX. SEC. LINE

102+23
73' RCP
15°03'55.1"
2 ACRES-H

18" x 39' CMP

APPROX. SEC. LINE

APPROX. SEC. LINE

Pleasant Twp.
T-67N R-18W
Sec. 8

Sta. 109+58
180' X 26' CONTINUOUS
I-BEAM BRIDGE
DA = 5400 ACRES V.H.

0 100
FEET

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER D.1	REVISED

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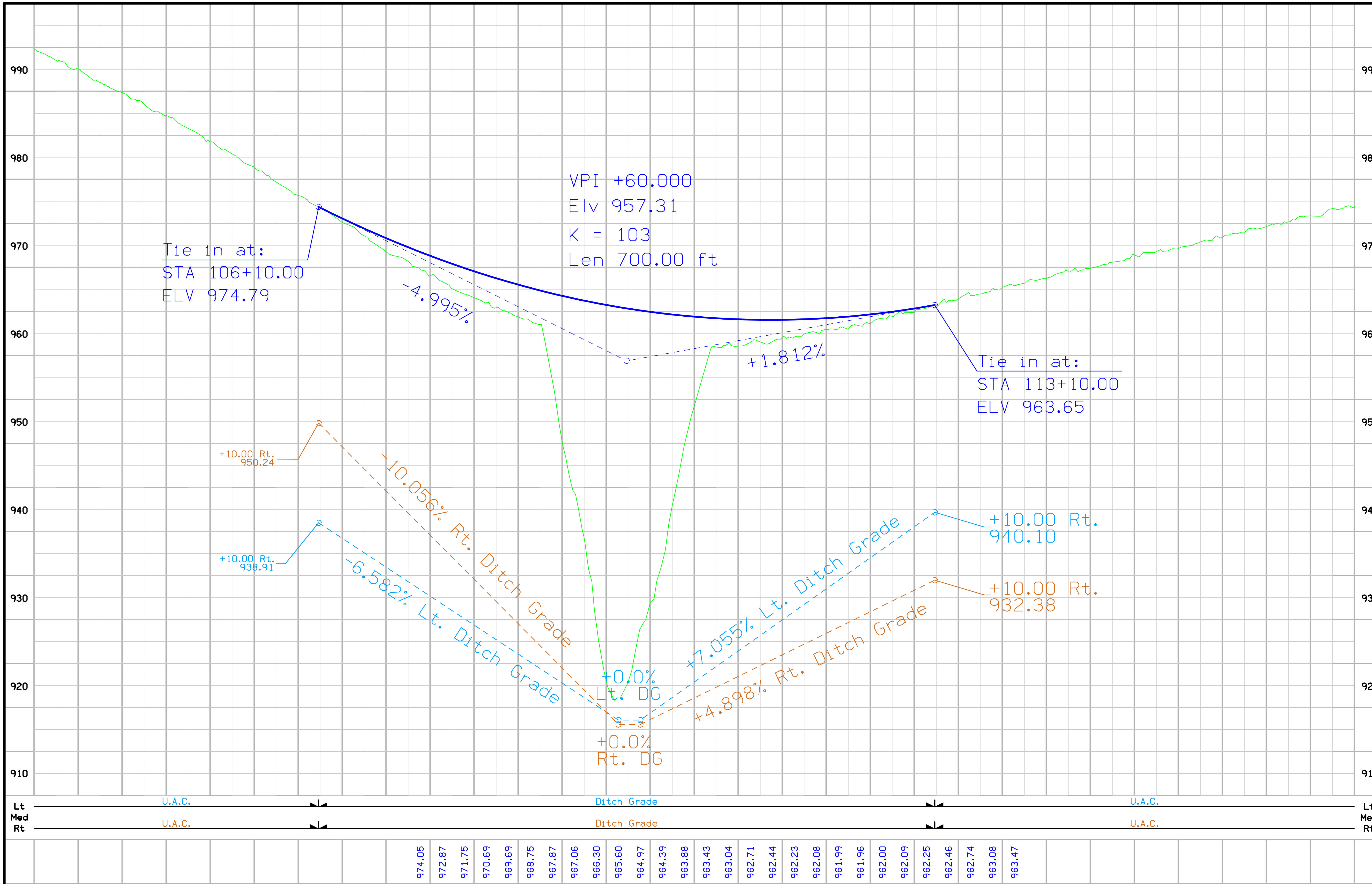

FILE NO.	ENGLISH	DESIGN TEAM **Flattery \ Bell \ Peterson**	**APPANOOSE** COUNTY	PROJECT NUMBER **BRFN-005-1(71)--38-04**	SHEET NUMBER **D.2**	REVISED

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108-23A
08-01-08

TRAFFIC CONTROL PLAN

Traffic will be maintained at all times.
Traffic will need to be reduced to one lane with the use of flaggers.

108-25
10-21-14

511 TRAVEL RESTRICTIONS

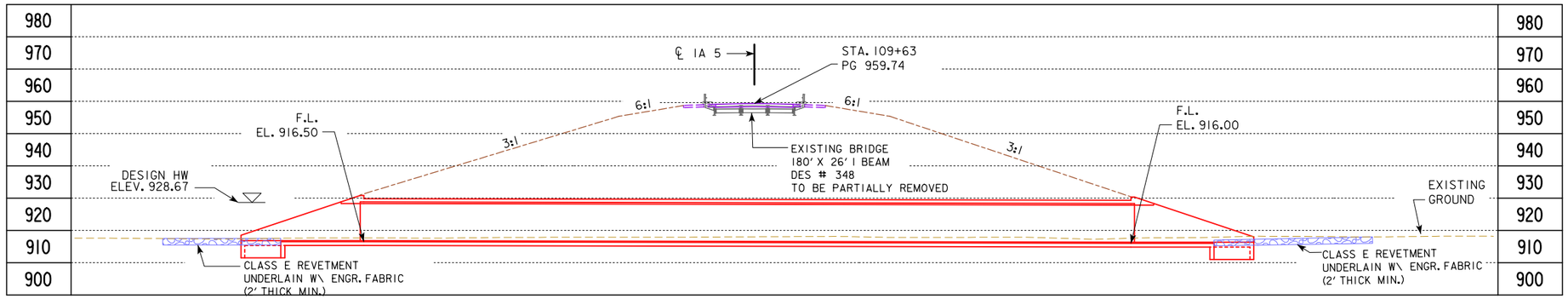
Route	Direction	County	Location Description	Feature Crossed	Object Type	Maint. Bridge No., Structure ID, or FHWA No.	Type of Restriction	Existing Measurement	Construction Measurement	Construction Measurement as Signed	Projected As Built Measurement	Remarks

111-01
04-17-12

COORDINATED OPERATIONS

Other work in progress during the same period of time will include the construction of the projects listed. Coordinate operations with those of other contractors working within the same area.

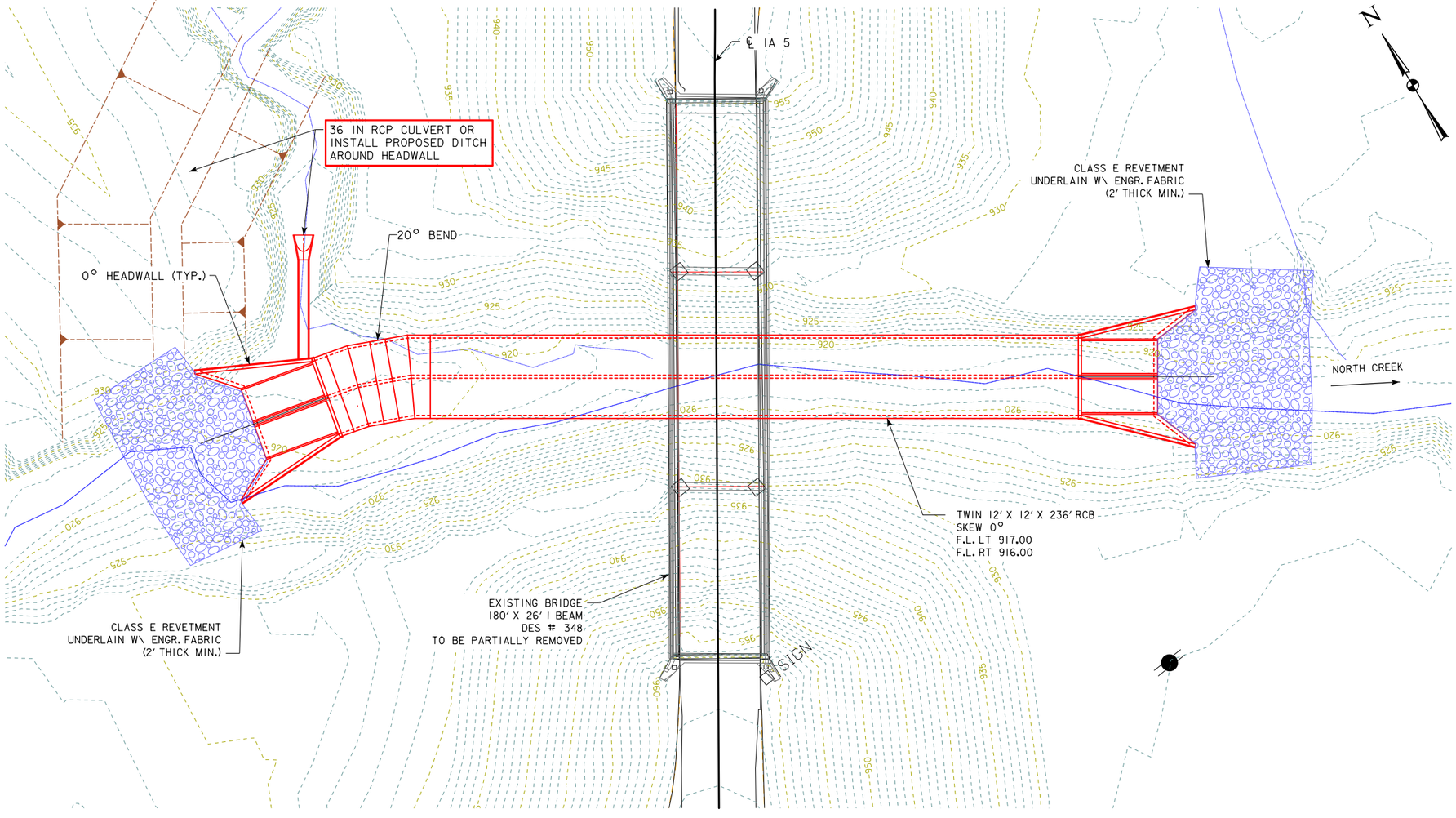
Project	Type of Work



LONGITUDINAL SECTION ALONG ℄ CULVERT

CULVERT FLOW LINE BURIED 1'

SLOPE STABILITY ANALYSIS NEEDED
TO EVALUATE BOX CULVERT EXCAVATION
EFFECTS TO EXISTING BRIDGE ABUTMENTS



SITUATION PLAN

LOCATION

IA 5 OVER NORTH CREEK
T-67N R-18W
SECTION 8
PLEASANT TOWNSHIP
APPANOOSE COUNTY
BRIDGE MAINT. NO. 0402.IS005
LATITUDE °
LONGITUDE °

HYDRAULIC DATA

DRAINAGE AREA = 7.9 SQ. MI.
Q_{50} = 2,580 CFS
HW ELEV. = 928.67
STREAM SLOPE = 9.5 FT./MI.

TRAFFIC ESTIMATE

2014 AADT	1,290	V.P.D.
2036 AADT	2,200	V.P.D.
202_ DHV	-	V.P.H.
TRUCKS	-	%
TOTAL DESIGN ESALs	-	

0 ENGLISH 40
SCALE IN FEET

D2

DESIGN FOR 0° SKEW

TWIN 12' X 12' X 244' REINFORCED CONCRETE BOX CULVERT

SITUATION PLAN

STATION 109+62.8 JUNE 2020

APPANOOSE COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. ___ OF ? FILE NO. ? DESIGN NO. ?

DESIGN TEAM | APPANOOSE COUNTY | PROJECT NUMBER BRFN-005-1(71)--39-04 | SHEET NUMBER ??

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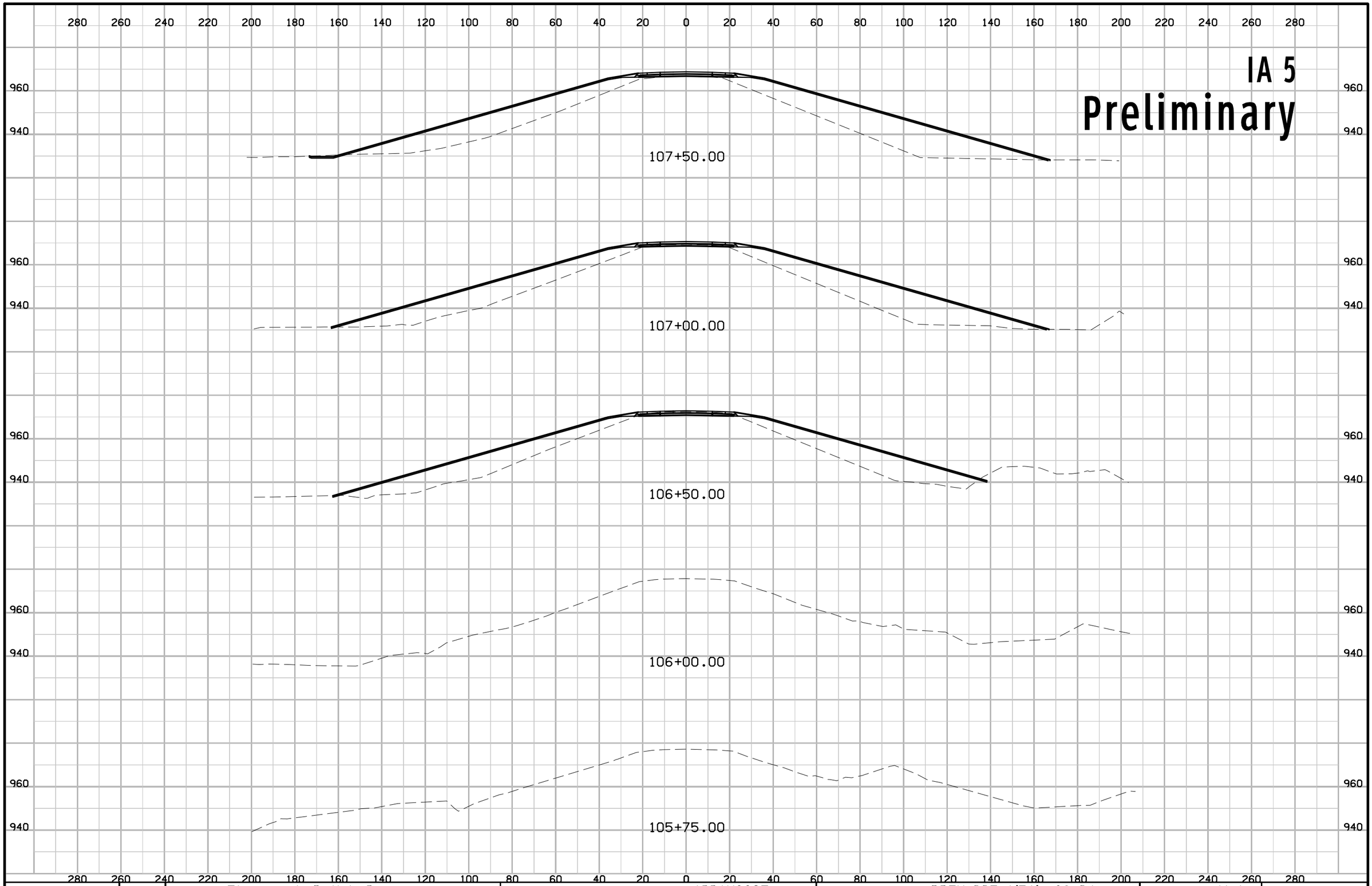
IA 5

Preliminary

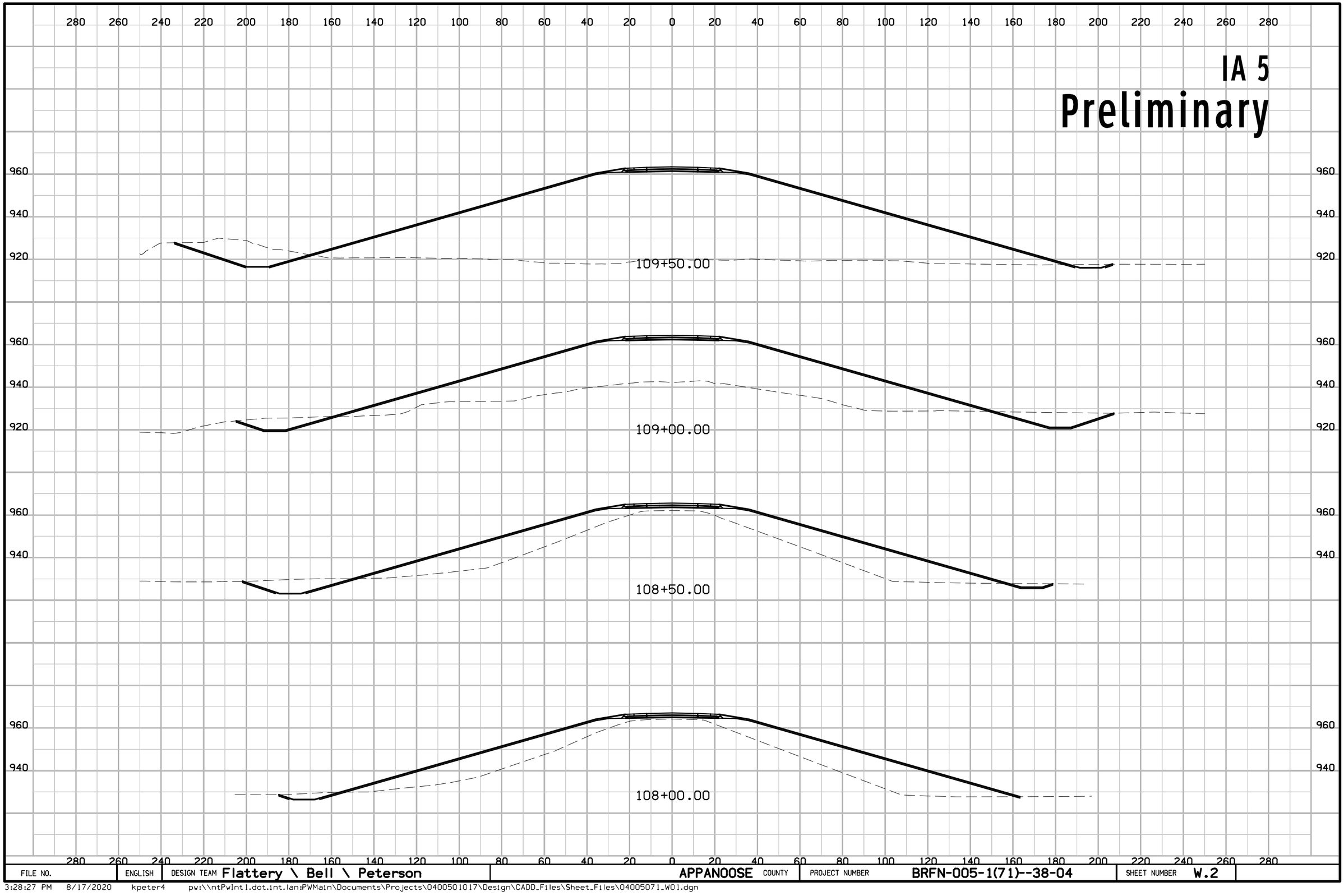


FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER W.1

3:28:27 PM 8/17/2020 kpeter4 pw:\\ntPwInt1.dot.int.lan:PWMain\Documents\Projects\04005010I7\Design\CADD_Files\Sheet_Files\04005071_W01.dgn

IA 5

Preliminary



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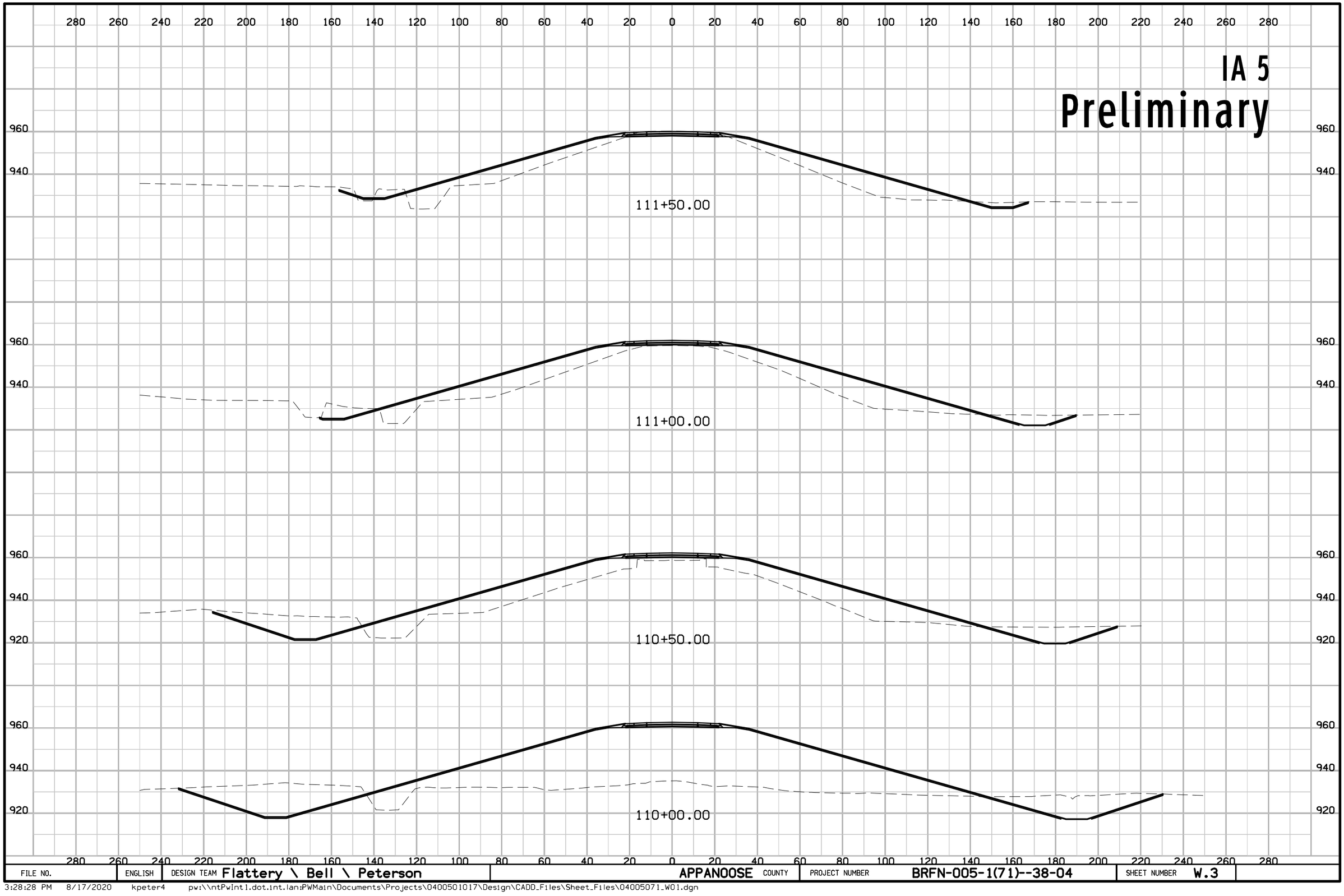
IA 5

Preliminary



FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER W.3

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IA 5

Preliminary

280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280

960
940

113+50.00

113+00.00

112+50.00

112+00.00

FILE NO.	ENGLISH	DESIGN TEAM Flattery \ Bell \ Peterson	APPANOOSE COUNTY	PROJECT NUMBER BRFN-005-1(71)--38-04	SHEET NUMBER W.4

3:28:28 PM 8/17/2020 kpeter4 pw:\\ntPwInt1.dot.int.lan:PWMain\Documents\Projects\0400501017\Design\CADD_Files\Sheet_Files\04005071_W01.dgn