

cc:

J. F. Adam
D. L. Maifield
N. M. Miller
G. A. Novey
A. Abu-Hawash
M. A. Swenson
Z. T. Bitting
J. N. Garton
B. E. Azeltine
T. D. Crouch
D. E. Sprengeler
D. McDonald
J. J. Tjaden
T. M. Storey
M. Sloppy
FHWA

M. J. Kennerly
R. L. Stanley
C. C. Poole
D. R. Claman
B. C. Worrel
M. J. Sankey
D. R. Tebben
A. Poole
M. E. Khoda
J.W. Laaser-Webb
E. C. Wright
C. L. Cutler
A. F. Gourley
R. R. Walton
M. J. Donovan
M. E. Ross

K. D. Nicholson
A. A. Welch
N. L. McDonald
P. Lu
J. S. McClain
R. A. Younie
B. D. Hofer
D. L. Newell
S. J. Gent
W.A. Sorenson
K. A. Yanna
D. L. Rick
N. M. Abuissa
S. W. Flockhart
V. A. Brewer

FINAL PROJECT CONCEPT STATEMENT

IA 1 Bridge over a small natural stream, 2.1 miles south of County Road F52

Johnson County
BRF-001-5(108)--38-52
PIN: 15-52-001-010
Maint. No. 5277.3S001
FHWA No. 31670

Highway Division
Office of Design

Kevin K. Patel, P.E.
515-239-1540

August 11, 2015

I. STUDY AREA

A. Project Description

This project involves the replacement of the IA 1 bridge (Maint. No. 5277.3S001) over a small natural stream, 2.1 miles south of County Road F52.

The two alternatives being considered are:

1. Replace the bridge with a twin 10 ft. x 12 ft. x 112 ft. reinforced concrete box culvert on existing profile, using the flowable mortar method of construction. The preliminary estimated cost for this alternative is \$648,600.
2. Replace the bridge with a twin 10 ft. x 12 ft. x 120 ft. reinforced concrete box culvert and raise the vertical profile to meet sag vertical curve criteria. In order to meet the sag curve K value and stopping sight distance, a grade raise of approximately 2 ft. is required resulting in 850 ft. of roadway reconstruction. Traffic will be maintained using a two-lane runaround. The preliminary cost estimated cost for this alternative is \$1,809,800.

Alternative 1 is the preferred alternative due to cost savings, ease of construction and convenience for the traveling public. The existing sag vertical curve is below current K value criteria and the required stopping sight distance is not met; however, it appears that safety has not been adversely affected by the existing vertical alignment. As the intent of this project is to replace the bridge and no safety or operational problems appear to exist, it is proposed that the existing vertical profile be used as constructed. A design exception will therefore be required.

B. Need for Project

This is a 40 ft. x 30 ft. steel beam bridge which was constructed in 1949 and overlaid in 1990. The bridge is classified as functional obsolete (FO) due to the deck geometry. All bridge components are at the end of their service life. Different levels of deteriorations spread all over the bridge. The bridge was designed for H20 load and need to be strengthened to satisfy current highway traffic requirement. Because of the age and size of the structure, bridge repair in conjunction with bridge strengthening would not be cost effective; therefore, the bridge should be replaced. Additionally, with the road reconstruction in this area, it is a good opportunity to replace the bridge.



Looking northeast



Looking southwest

C. Present Facility

The existing structure is a 40 ft. x 30 ft. steel beam bridge constructed in 1949.

IA 1 in the project area is 28 ft. wide PCC pavement with 8 ft. wide partially paved shoulders and 3:1 foreslopes, constructed in 1951. HMA resurfacing was accomplished in 1990 and microsurfacing was accomplished in 1999. HMA shoulders were paved in 2014.

D. Traffic Estimates

The 2018 and 2038 average daily traffic estimates are 7,100 ADT with 7% trucks and 8,200 ADT with 8% trucks, respectively.

E. Sufficiency Ratings

IA 1 is classified as an “area development” route and is a maintenance service level “B” road. The federal bridge sufficiency rating is 54.2.

F. Access Control

Access rights will not be acquired for this project.

G. Crash History

During the five-year study period from January 1, 2010 through December 31, 2014, there was 1 crash near the project location, involving an impaired driver that resulted in 7 possible injuries.

II. PROJECT CONCEPT

A. Feasible Alternatives

Alternative #1 - Replace with a culvert utilizing the flowable mortar method on the existing profile

Replace the existing 40 ft. x 30 ft. steel beam bridge with a twin 10 ft. x 12 ft. x 112 ft. reinforced concrete box utilizing the flowable mortar method of construction. The typical cross section will consist of a 24 ft. roadway (28 ft. wide pavement) with 10 ft. effective shoulders (2 ft. outside pavement, 4 ft. additional paved and 4 ft. granular) and 6:1/3:1 foreslopes. The vertical and horizontal alignments will be used as constructed.

The new RCB can be built under the existing bridge without disturbing the bridge. After the culvert has been constructed, flooded granular backfill and flowable mortar will be used to fill the void between the RCB and bridge deck. New shoulders and 6:1/3:1 foreslopes will be added allowing the bridge rail and guardrail to be removed.

The existing sag vertical curve at this bridge has a K value of 95 which is slightly below a 50 mph design speed. The existing profile also provides approximately 420 ft. of stopping sight distance rather than the required 570 ft. However, the five year accident history has shown only one accident at the project site and the vertical profile does not appear to be a factor in that crash. In order to achieve a 60 mph design speed, a K value of 136 is required. This would require an approximate 2 ft. grade raise resulting in 850 ft. of roadway reconstruction, as shown in Alternative 2. As the intent of this project is to replace the bridge, it is proposed that the existing vertical profile be used as constructed. A design exception will therefore be required for the sag vertical curve K value and stopping sight distance.

There may be compressible soils under the existing bridge which will require removal prior to construction of the new RCB. The compressible soil should be removed to a depth of 10 ft. under the RCB. The soil should then be replaced with 10 ft. of special backfill which will extend from headwall to headwall and provide a working platform for construction of the RCB. A clay plug will be placed under the RCB aprons to prevent piping.

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 will be required for this project.

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 placement of the flowable mortar.

	<u>Estimated Cost</u>
Bridge Items	
New Culvert	\$ 293,300
Revetment	27,000
Mobilization - 10%	32,000
M & C - 20%	<u>70,500</u>
Bridge Total	\$ 422,800
Roadway Items	
Embankment in place, contractor furnished	\$ 26,600
Floodable backfill	6,900
Flowable mortar	19,400
Excavation Unsuitable Material (under RCB)	9,300
Special Backfill (under RCB)	29,500
Paved shoulder	2,100
Granular Shoulders	400
Guardrail removal	1,700
Clearing and Grubbing	2,400
Erosion control	5,000
Wetland Mitigation	50,000
Traffic Control @ 5%	7,700
Mobilization @ 5%	7,700
Right of Way	5,000
M&C @ 30%	<u>52,100</u>
Roadway Total	\$ 225,800
Project Total	\$ 648,600

Alternative #2 - Replace with a culvert utilizing the flowable mortar method and raise the existing vertical profile.

Replace the existing 40 ft. x 30 ft. steel beam bridge with a twin 10 ft. x 12 ft. x 120 ft. reinforced concrete box culvert. Additionally, alternative 2 proposes to raise the vertical profile to meet the sag vertical curve criteria. In order to meet the sag curve K value and required stopping sight distance, a grade raise of approximately 2 ft. is

required resulting in 850 ft. of roadway reconstruction. The RCB can be constructed under the existing bridge using the flowable mortar method of construction; however, during the roadway reconstruction, a two-lane runaround will be required to maintain traffic.

The typical cross section will consist of a 24 ft. roadway (28 ft. wide pavement) with 10 ft. effective shoulders (2 ft. outside pavement, 4 ft. additional paved and 4 ft. granular) and 6:1/3:1 foreslopes.

There may be compressible soils under the existing bridge which will require removal prior to construction of the new RCB. The compressible soil should be removed to a depth of 10 ft. under the RCB. The soil should then be replaced with 10 ft. of special backfill which will extend from headwall to headwall and provide a working platform for construction of the RCB. A clay plug will be placed under the RCB aprons to prevent piping.

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 will be required for this project.

During the roadway reconstruction, traffic will be maintained via a two-lane runaround south of existing IA 1. The runaround will consist of a 22 ft. wide pavement with 3 ft. paved shoulders and 3:1 foreslopes. The runaround will be approximately 1,560 ft. long. A temporary easement will be required to construct the runaround. A temporary entrance will be constructed for the residence northwest of the existing bridge.

Bridge Items	<u>Estimated Costs</u>
New Culvert	\$ 307,300
Revetment	27,000
Mobilization - 10%	33,400
M & C - 20%	<u>73,500</u>
Bridge Costs	\$ 441,200

Roadway Items	
Paved 2 lane runaround	\$ 467,000
Floodable backfill	6,900
Flowable mortar	19,400
Removal of Pavement	19,000
PCC Pavement	155,500
Special Backfill	23,000
Modified Subbase	21,500
Paved Shoulder	27,000

Granular Shoulder	8,800
Embankment in place, contractor furnished	65,000
Excavation Class 13 Waste	15,900
Excavation Unsuitable Material (under RCB)	10,000
Special Backfill (under RCB)	31,600
Longitudinal subdrains and outlets	12,500
Temporary floodlighting	8,000
Guardrail Removal	1,700
Clearing and Grubbing	4,800
Erosion Control	5,000
Wetland Mitigation	50,000
Traffic Control - 5%	47,600
Mobilization - 5%	47,600
Right of Way	5,000
M & C - 30%	<u>315,800</u>
Roadway Costs	\$ 1,368,600
Project Total	\$1,809,800

B. Detour Analysis

There will be no off-site detour. For alternative 1, traffic will be maintained using the flowable mortar method of construction. For alternative 2, a two-lane runaround will be constructed just south of the existing roadway.

C. Recommendations

It is recommended that the present structure be replaced, as described in Alternative No. 1.

D. Construction Sequence

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

E. ADA Accommodations

There are no bike paths or sidewalks adjacent to IA 1; therefore, no ADA accommodations are planned in conjunction with this project.

F. Special Considerations

An accelerated bridge construction (ABC) alternative was not proposed due to this site's suitability for the flowable mortar method of construction.

Right of Way will be required for this project. Temporary easements would also be required for Alternative 2.

The Office of Location and Environment has reviewed this project and has determined that a Section 404 Permit will be required. The work will be covered by a Nationwide Permit, provided that there is less than 0.5 acres of wetland impact.

This project will be let in the same letting as three other bridge projects along IA 1 in Johnson County:

BRF-001-5(104)--38-52 Old Woman's Creek and Old Man's Creek Overflow, 0.6 and 0.8 miles south of County Road F52

BRF-001-5(110)--38-52 Old Man's Creek, 1.5 miles south of County Road F52

BRF-001-5(112)--38-52 a stream 0.6 miles north of County Road F52

F. Program Status

Site data has been developed by the Office of Design. This project is listed in the 2016-2020 Iowa Transportation Improvement Program, with \$825,000 programmed for replacement in FY2020. Costs for this project may be eligible for bridge replacement funds. A schedule of events will be developed following approval of the Project Concept.

KKP: als

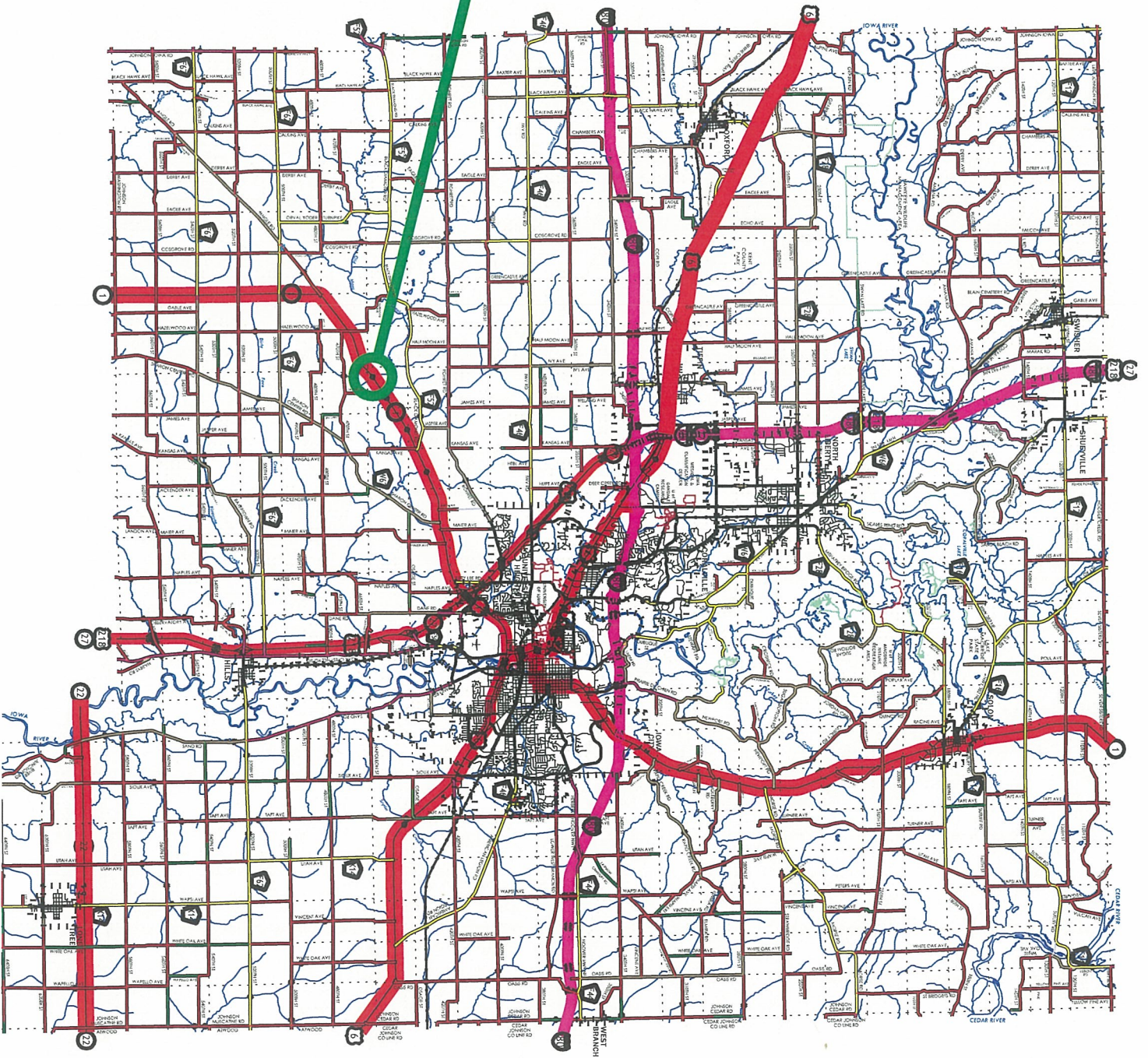
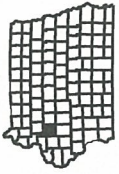


JOHNSON CO.
 IA 1
 Bridge over Stream
 2.1 mi. south of
 Co. Rd. F52

JOHNSON COUNTY

IA 1

#5277.3S001
FHWA #31670



JOHNSON CO. - IA 1
 BRF-001-5(108)38--52
 ALT. 2 PLAN & PROFILE

