

J. Selmer
A. Abu-Hawash
S. Neubauer
O. Lechnowsky
K. Shackelford
J. Woodcock

D. R. Claman
M. E. Khoda
J. Bane
R. Moraine
M. Solberg
M. Masteller

J. Hauber
K. Olson
J. Garton
D. Redmond
S. Suhr
FHWA

FINAL PROJECT CONCEPT STATEMENT

I-29 Bridge over a Ditch, 0.6 Mi. South of the North Jct. I-680

Pottawattamie County
IMN-029-4(111)71--0E-78
PIN: 1678029060
Maint. No.7870.8S029
FHWA No. 45010

Highway Division
Office of Design

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

September 21, 2017

I. STUDY AREA

A. Project Description

This project involves the replacement of the Interstate 29 bridge (Maint. No 7870.8S029) over a ditch, 0.6 miles south of the north junction of I-680.

The existing bridge will be replaced with a twin 10' x 6' x 188' reinforced concrete box culvert with standard headwalls. Traffic will be maintained by the use of median crossovers. The estimated cost for this alternative is \$1,509,800.

The recommended alternative is to proceed with a twin 10' x 6' RCB due to the cost savings, reduced future maintenance and the elimination of the need for guardrail when compared to a bridge alternative. Additional right of way will be required.

B. Need for Project



Northbound looking North



Below looking West

This is a 31' x 122' concrete slab structure originally constructed in 1958. The bridge deck was widened and overlaid in 1996 and has been epoxy injected. The overlay is now reaching the end of its service life. The top and bottom of the deck has several hollow areas and leaching transverse cracks. Extensive repairs have been made to the substructure, slab deck, and barrier rail curb. Because of the age of the structure, permanent repairs to the substructure and deck are not a viable option; therefore, this structure should be replaced.

C. Present Facility

The existing structure is a 31' x 122' concrete slab bridge constructed in 1958.

I-29 was originally constructed in 1957 with 4:1 median foreslopes and 4:1 outside foreslopes. In 1992 the pavement was replaced with 26' wide PCC pavement with 6' wide HMA median shoulders and 8' HMA outside shoulders. The median foreslopes were flattened in 1992 to 6:1. The existing typical section is comprised of 4" recycled HMA subbase, 9" granular base, and 11.5" PCC pavement. HMA resurfacing, consisting of two 2" lifts, was accomplished in 2008.

D. Traffic Estimates

The 2021 construction year and 2041 design year average daily traffic estimates are 23,500 ADT with 21% trucks and 33,200 ADT with 22% trucks, respectively.

E. Sufficiency Ratings

I-29 is classified as an Interstate route and is a maintenance service level "A" road. The federal bridge sufficiency rating is 84.

F. Access Control

Access rights will not be acquired for this project.

G. Crash History

During the five-year study period from January 1, 2013 through December 31, 2017, there were only 4 crashes; 3 personal damage only and one rear-end collision.

II. PROJECT CONCEPT

A. Feasible Alternatives

The existing 31' x 122' concrete slab bridge will be replaced with a twin 10' x 6' x 188' reinforced concrete box culvert. Articulated Block Mat (ABM) will also need to be removed. The new RCB will extend under the northbound and southbound lanes of I-29. The placement of the new RCB will require approximately 150' of new pavement reconstruction on both the northbound and southbound lanes. To address compressible soils, construction of the RCB will require a 5' core of existing streambed material to allow the placement of 2' of erosion stone and 3' of granular backfill. The limits of the core out will be verified once soil borings have been obtained. Once the RCB has been constructed, floodable backfill and suitable soil will be used to backfill around the RCB.

The typical cross section will consist of a 24' wide roadway (26' wide pavement) with 10' effective outside paved shoulders and 6' wide median paved shoulders. The mainline pavement will be 11.5" PCC on 12" of modified subbase. Longitudinal subdrains will be installed.

Apply erosion control and rural seeding and fertilizing to all disturbed areas. Due to highly erodible soils in the area, District 4 recommends all seeded areas to be covered by wood excelsior mat (or equivalent).

It appears that right of way will be required for this project.

The RCB will be constructed in two stages with traffic being maintained by constructing two crossovers to allow for two-lane, two-way operation for the duration of construction. This RCB will be staged similar to the RCB in projects, IMN-029-4(109)69--0E-78 and IMN-029-4(110)70--0E-78. Therefore, the east sections of these RCB's will be constructed at the same time thus allowing traffic to be shifted to the southbound lanes utilizing median crossovers. During completion of the west sections of the RCBs, traffic will be shifted to two-lane, two-way operation on the northbound lanes. High tension guardrail will need to be removed and replaced, in between the median crossover locations.

Bridge Items	<u>Estimated Costs</u>
Culvert – Twin 10' x 6' RCB	\$ 219,000
Headwalls	43,000
Culvert, stage construction	26,200
Bridge Removal	37,000
Revetment	42,000

Mobilization - 10%	36,700
M & C - 15%	<u>60,600</u>
Bridge Costs	\$ 464,500

Roadway Items

Crossover (50' Median)	\$448,800
Removal of Pavement	8,800
Guardrail (Includes Removal)	2,100
High Tension Guardrail (Removal)	5,800
High Tension Guardrail End Anchors	4,700
Excavation Class 10, Channel	12,000
Clearing and Grubbing	1,250
Erosion Stone	22,200
Granular Backfill	20,500
Flooded Backfill	17,700
Embankment-in-place	11,000
Modified Subbase	13,250
Compaction w/Moisture & Density Control	1,000
Longitudinal Subdrain and Outlets	6,000
PCC Pavement – 11”	57,000
Paved Shoulder	20,850
High Tension Guardrail	21,250
Seeding and Fertilizing	1,800
Erosion Control	50,000
Right of Way	5,000
Traffic Control - 5%	36,550
Mobilization - 5%	36,550
M & C - 30%	<u>241,200</u>
Roadway costs	\$ 1,045,300

Project Total	\$1,509,800
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B. Detour Analysis

Traffic will be maintained on I-29 at all times via two crossovers with traffic reduced to two lanes. The placement of the north crossover will conflict with the southbound I-680 entrance ramp and therefore will require the ramp to be closed temporarily. With the I-29/I-680 southbound entrance ramp closed, a detour that travels north to the I-29/Desoto Avenue (County Road G12) interchange will be utilized for traffic heading southbound from I-680. It is anticipated the detour will be in place for approximately 180 days. The detour would follow I-29 north at the I-29/I-680 Interchange to the I-29/Desoto Avenue Interchange, west on Desoto Avenue, then south on I-29. Out of distance travel is 1.5 miles. Detour signing costs will be \$10,000.

Existing high-tension guardrail will need to be removed, from just south of the southern crossover to just north of the northern crossover, in order to construct the RCB's for all three bridge replacement projects. At that time end anchors will need to be installed outside of the crossovers. High-tension guardrail and end anchors will be reinstalled once construction is complete.

C. Recommendations

This project will be constructed as described above.

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 I-29; therefore, no ADA accommodations are planned in conjunction with this project.

F. Special Considerations

The directional design hourly truck volume (DDHV) for this project is approximately of 365 vehicles per hour. This is based on a design year ADT of 33,200, a truck percentage of 22%, and an assumed peak hour factor of 0.1 and 50/50 directional distribution. AASHTO recommends that if the DDHV exceeds 250 vph, 12' wide outside paved shoulders should be considered. As only 10' outside paved shoulders exist, these shoulders will not be widened to 12', and a design exception will be required.

The ABC Rating Score of 50 is equal to the first stage filter threshold of 50. The Concept Team has determined that site conditions and project delivery do not support ABC construction.

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

Right of Way appears to be required for this project.

The project may be within a drainage district. The District 4 Office should contact the county to verify the existence of drainage districts.

The Office of Location and Environment 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.

F. Program Status

Site data has been developed by the Office of Design. This project is listed in the 2018-2022 Iowa Transportation Improvement Program, with \$900,000 programmed for replacement in FY 2021. 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: skg

POTTAWATTAMIE COUNTY

STA 829+00.00

FHWA 45010

MAINT. 7870.8S029

DESIGN 2757

STA 769+80.00

FHWA 44980

MAINT. 7869.7S029

DESIGN 2657

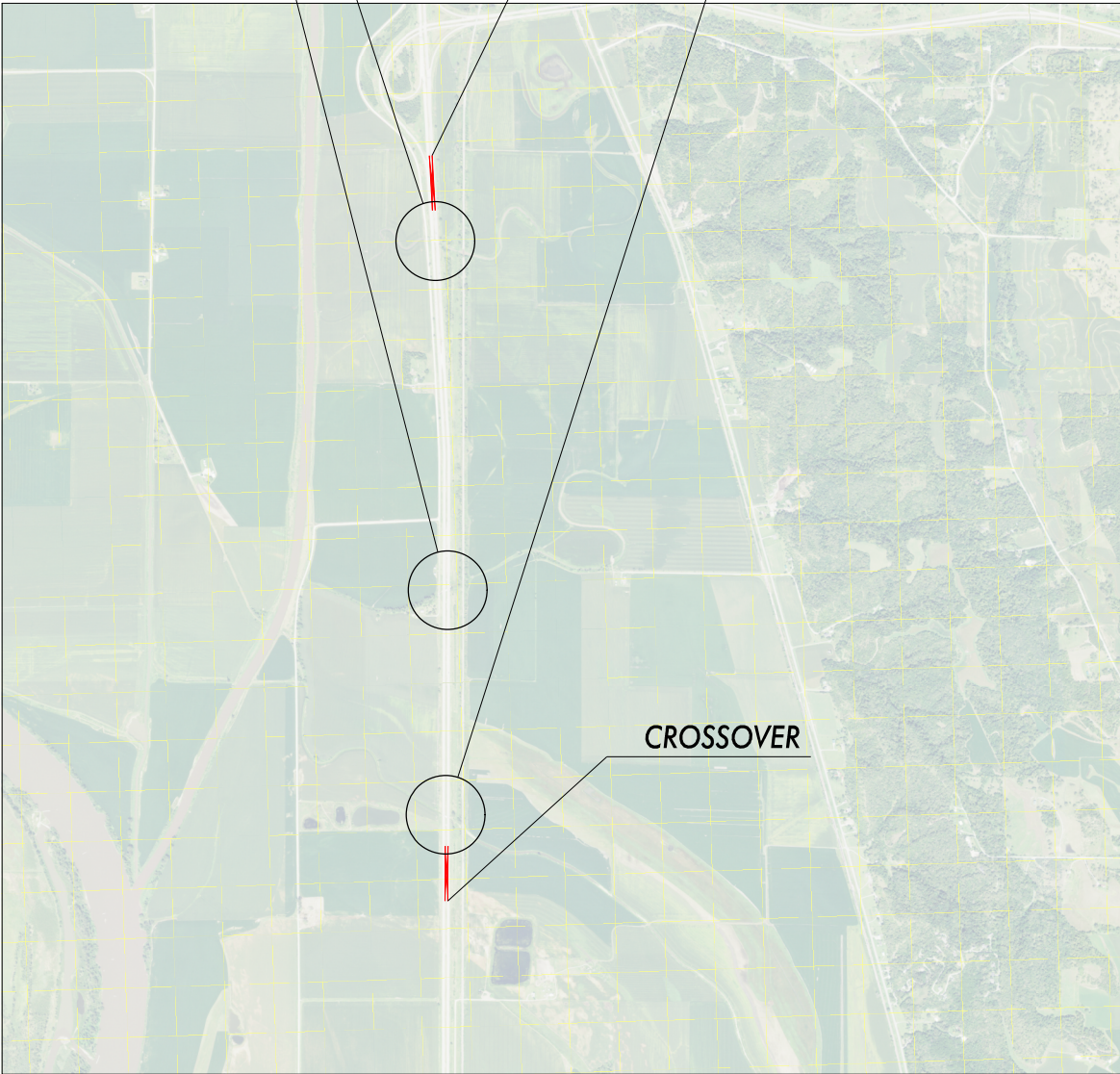
CROSSOVER

STA 730+60.00

FHWA 44960

MAINT. 7868.9S029

DESIGN 4757



CROSSOVER

DITCH, 0.5 MI. S OF N JCT I-680,
IMN-029-4(111)71-0E-78 PIN 16-78-029-060
DITCH, 1.6 MI. S OF N JCT I-680,
IMN-029-4(110)70-0E-78 PIN 16-78-029-050
DITCH, 2.4 MI. S OF N JCT I-680,
IMN-029-4(109)69-0E-78 PIN 16-78-029-040

POTTAWATTAMIE COUNTY

STA 829+00.00

FHWA 45010

MAINT. 7870.8S029

DESIGN 2757

STA 769+80.00

FHWA 44980

MAINT. 7869.7S029

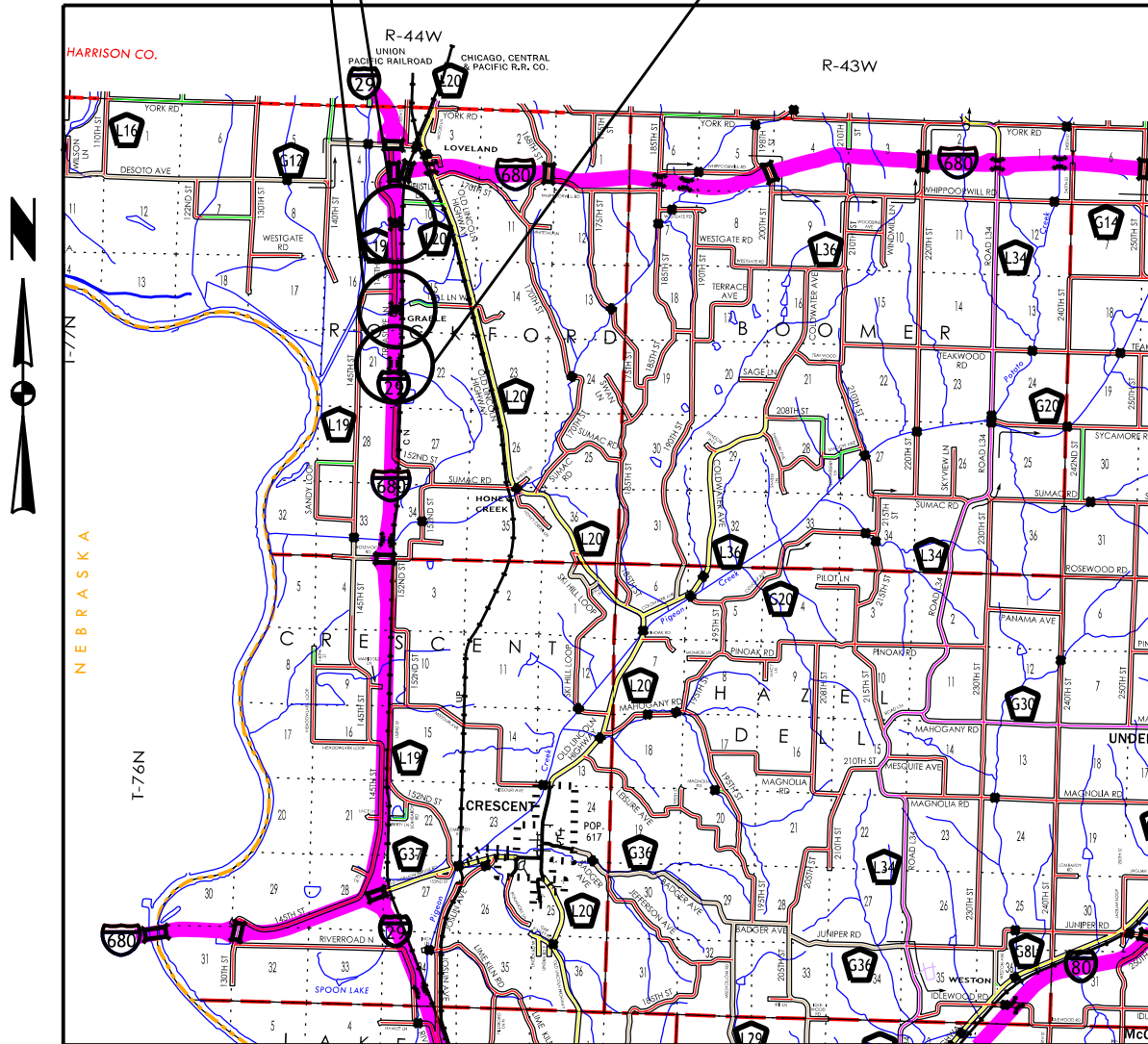
DESIGN 2657

STA 730+60.00

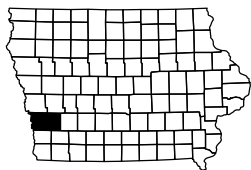
FHWA 44960

MAINT. 7868.9S029

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- DITCH, 0.5 MI. S OF N JCT I-680,
IMN-029-4(111)71-0E-78 PIN 16-78-029-060
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IMN-029-4(109)69-0E-78 PIN 16-78-029-040



POTTAWATTAMIE COUNTY
IMN-029-4(111)71--OE-78
OVER DITCH 0.6 MI
S OF N JCT OF I-680

EXISTING 40' WIDE HMA PAVEMENT
(6' SHOULDER, 12' LANE, 14' LANE, 8' SHOULDER)

CONSTRUCTION LIMITS

PROPOSED TWIN
10' X 6' X 188' REINFORCED
CONCRETE BOX
W/STANDARD HEADWALLS

EXISTING 31' X 122' CONCRETE
SLAB BRIDGE & CONCRETE MEDIAN DECK
(TO BE REMOVED)

