

BRIDGE HYDRAULIC REPORT

Bridge Number: I70-59-05180 CEBL & JCWB

Route Identification: I-70

Crossing: Branch of McCracken Creek

Location: 0.43 miles East of SR 39

County: Hendricks



Prepared by:
Robyn M. Toole, P.E.
WSP | Parsons Brinckerhoff
September 22, 2016



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SAMPLE

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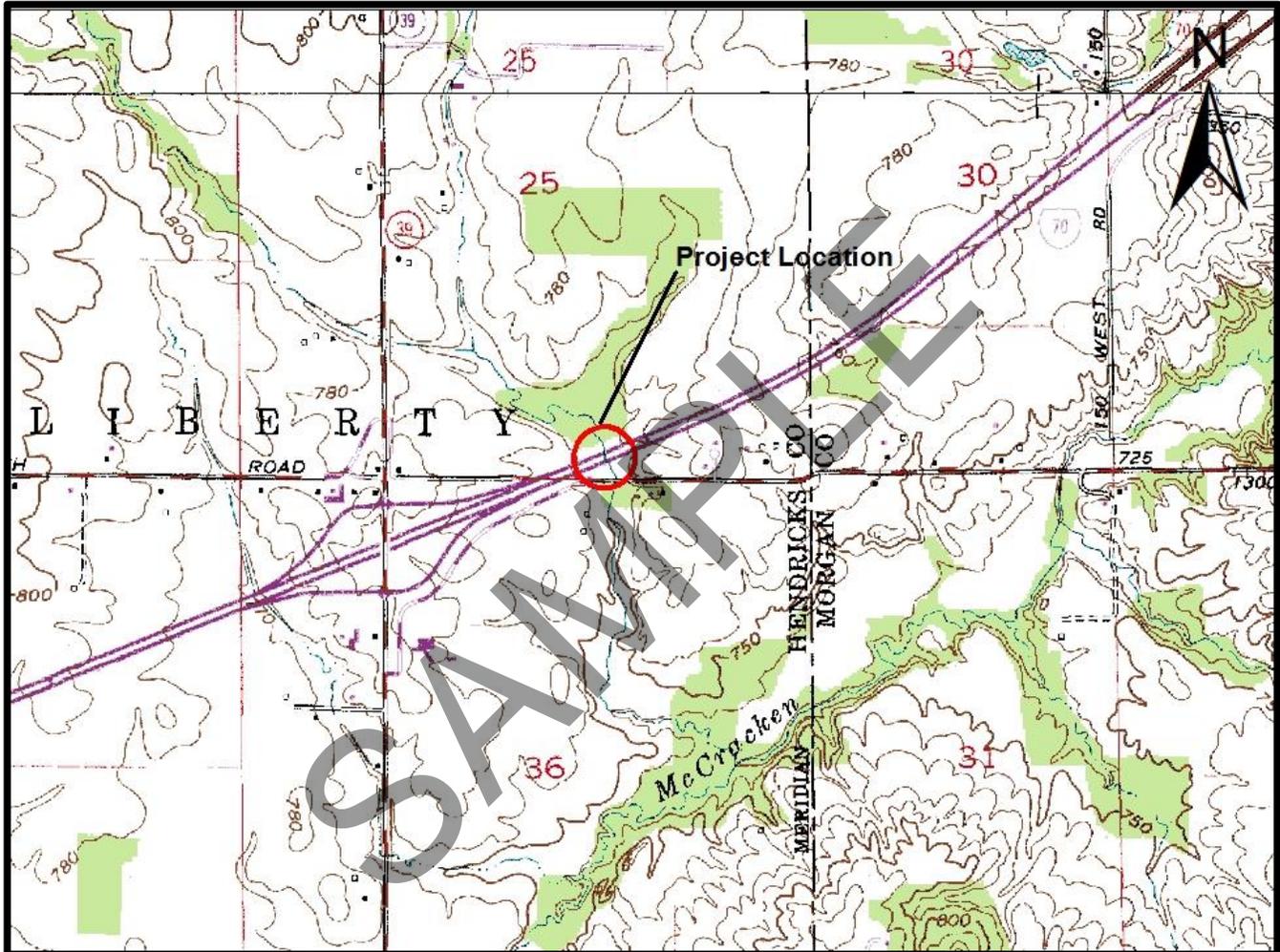
Appendix D: Proposed Structure Information

1. Proposed Structure Sheets

SAMPLE

1. LOCATION

The I-70 crossing of Branch McCracken Creek is located 0.43 miles east of the I-70 junction with SR 39 in Section 25, Township 14 North and Range 1 West, in Hendricks County, Indiana, as shown below on the USGS Mooresville West quadrangle map.



2. INTRODUCTION

The Branch McCracken Creek Bridge is composed of two 3-span bridges, one carrying the I-70 westbound lanes and the other carrying the I-70 eastbound lanes, located in Hendricks County, Indiana within the INDOT Crawfordsville District. An excerpt of the original bridge plans is provided in Appendix A-1 and the most recent INDOT inspection report is provided in Appendix A-2.

This report presents the hydrologic analysis and proposed condition scour analysis for the I-70 crossing of Branch of McCracken Creek. Both the Eastbound (Bridge No. 170-59-05180 CEBL) and Westbound (Bridge No. 170-59-05180 JCWB) bridges at this crossing will be widened to allow for the addition of one travel lane in each direction. The bridge piers will be extended as part of the

widening of both bridges. Pertinent information about the existing structure is provided below. Survey data, LiDAR elevation data, field reconnaissance, existing bridge plans (Appendix A-1), and previous inspection reports (Appendix A-2) were utilized to develop a model of the existing conditions for this structure.

EXISTING STRUCTURE INFORMATION

- Year Built: 1966
- Year Reconstructed: 1996
- Surface Type: Concrete Cast-in-Place
- Out-to-Out of Copings (Eastbound): 51'9"
- Out-to-Out of Copings (Westbound): 55'5"
- Out-to-Out of Bridge Floor (Eastbound): 73'0"
- Out-to-Out of Bridge Floor (Westbound): 73'0"
- Skew: 0 degrees
- Type of Superstructure: Slab, Concrete Continuous
- Spans: 3
- Type of Substructure/Foundation: Spread Footing
- Spans: 22'0", 27'6", 22'0"
- Location: Rural
- INDOT District: Crawfordsville
- Quadrangle: Mooresville West

I-70 is classified as a Principal, Arterial. In the existing condition it consists of three 12' lanes with a 10' outside shoulder and a 4' inside shoulder in each direction. The area around the Branch McCracken Creek crossing consists of a mix of farm fields, wooded areas and suburban developments. The bridge was constructed in 1966. The bridge piers are on relatively shallow spread footings; the abutments are supported by piles.

3. PROJECT SUMMARY

The intent of the proposed work at the McCracken Creek Bridge is to rehabilitate the bridge deck, as well as widen the existing 4' inside shoulder to a 10' shoulder and add one 12' travel lane. The existing bridges have a 45.5' gap between them (measured perpendicular to the bridge face). The proposed widening would leave a 9.0' gap in the proposed condition. There is no proposed change to the bridge opening area. Pavement design has not been completed, but based on amount of available freeboard no change to the bridge net waterway opening is anticipated.

INDOT personnel met with WSP | Parsons Brinkerhoff staff on-site on May 4, 2016 to inspect Bridge No. I70-60-5180 and discuss the details of the bridge widening associated with the added travel lanes project. During inspection, it was observed that one of the bridge pier footings was exposed. Field Inspection Notes are provided in Appendix A-3 and a log of the photographs taken during the field inspection is provided in Appendix A-4.

Permit requirements for the project are summarized below.

PERMIT REQUIREMENTS

- Hendricks County GIS was referenced to verify that Branch McCracken Creek is not a regulated drain at the I-70 crossing in Hendricks County
- Rule 5 Permit will be investigated
- IDEM Section 401 Permit will be required
- IDEM Isolated Wetlands Permit will be investigated
- USACE Section 404 Permit will be required
- IDNR Construction in a Floodway permit is not required due to the drainage area being less than 50 square miles in a rural area

4. HYDROLOGIC ANALYSIS

4.1 Drainage Area

The contributing watershed boundary was delineated using the field survey data provided by INDOT's survey team and 1-foot contours created from the 2011-2013 Indiana Orthophotography (RGBI), LiDAR and Elevation data set available via the Indiana Spatial Data Portal (ISDP). The ISDP LiDAR data and the survey information provided by INDOT are both set to the NAVD 1988 vertical control datum. The delineated drainage area and time of concentration flowpath are shown on a topographic map with 10-foot contours in Appendix B-1 and on aerial photography in Appendix B-2. The calculated drainage area is estimated to be 1,398 acres or 2.18 square miles.

4.2 Runoff Curve Number

The weighted runoff curve number (CN) was determined using the land use and soil group combinations provided by aerial photography, the USDA Natural Resources Conservation Service Web Soil Survey, the Purdue University Long Term Hydrologic Impact Analysis (L-THIA) tool, and Figure 202-2E in the Indiana Design Manual (IDM). See Appendix B-3 for the Web Soil Survey information and Appendix B-4 for L-THIA information for the contributing watershed area. See Appendix B-5 for the resultant land use and soil group breakdown as well as the calculation of the weighted CN value used for the hydrologic analysis. The weighted runoff curve number was estimated to be 83 for the contributing watershed area.

4.3 Rainfall Volume

Rainfall data was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the nearest gauge located in Indianapolis, Indiana. See Appendix B-6 for the NOAA output utilized for hydrologic analysis. The rainfall distribution used was the 50% Probability Huff Distribution (Quartile II) for the Indianapolis Station from IDM Figure 29-10A.

4.4 Time of Concentration/Lag Time

The time of concentration and the lag time were calculated using the TR-55 methodology as specified in the Section 202-2.05 of the IDM. See Appendix B-7 for the worksheet showing calculations for the contributing watershed. The calculated time of concentration was estimated to be 101 minutes. The lag time was estimated to be 61 minutes (60% of the time of concentration).

4.5 Hydrologic Modeling Results

Figure 203-2C of the Indiana Design Manual (IDM) specifies the use of the 1% (100-year) annual Exceedance Probability (EP) for allowable backwater and roadway serviceability. The SCS unit hydrograph method was used to calculate the peak design discharge value for the 100-year annual EP. The USACE HEC-HMS Version 4.0 software program was applied to calculate the peak discharge for various storm durations to determine the highest peak discharge for the 100-year design storm event. Based on the results of the hydrologic analysis, the 100-year peak design discharge was determined to be 1,306 cfs. See Appendix B-8 for the HEC-HMS model results for the 100-year design storm event for various storm durations.

5. HYDRAULIC ANALYSIS

5.1 Data and Methodology

A hydraulic model of the I-70 crossing of Branch McCracken Creek was developed using the USACE HEC-RAS Version 4.1.0 software. Cross sections were developed using a combination of LiDAR elevation data and the ground survey data collected by INDOT. Appendix C-1 contains a map of the cross sections used for model development. Cross sections were started approximately 850 feet downstream of the downstream face of the eastbound I-70 bridge. The cross section designations correlate to the river station measured upstream from the confluence of Branch McCracken Creek with McCracken Creek.

There are two cross sections located between the westbound and eastbound I-70 bridges: cross section 5185 and 5188. These cross sections are necessary for modeling the existing bridges in HEC-RAS. The cross sections at river station 5185 and 5188 are elevation adjusted copies of the cross section at river station 5323, which is the first cross-section upstream from the I-70 crossing. This was done because the roadway embankment from the downstream side of the westbound bridge meets the roadway embankment and upstream side of the eastbound bridge with no remaining natural topography available to create cross sections between the bridges.

There is a 36 ft. wide arch bridge located approximately 150 feet downstream of the eastbound I-70 bridge which carries County Road 1000 S over Branch McCracken Creek. Information on the location of this bridge, the low chord elevation, and the channel thalweg elevations at the bridge faces was collected by the INDOT ground survey team. The CR 1000 S bridge is located between the cross sections at river station 4912 and river station 5007.

The model vertical datum is NAVD88 and horizontal datum is NAD83.

Branch McCracken Creek is a natural stream channel with a bank-to-bank width of approximately 30 feet. The channel bottom is slightly meandering and the banks are overgrown with dense and high grass. Agricultural fields with some forested and pastured land are located on both sides of the channel.

The boundary condition used for the hydraulic model was the normal depth boundary condition. For normal depth, Manning's equation is used to calculate the normal depth of flow using the energy slope. The energy slope can be approximated using the average slope of the channel. For the Branch McCracken Creek model the average slope of the channel was calculated using the USGS Topographic Map 10-foot contours. The CheckRAS output is included as Appendix C-2.

Hydraulic Data Table for Eastbound Bridge

Parameter	Existing	Proposed
Drainage Area (acres)	1,398 acres	
Skew (degrees)	0 degrees	
Q ₁₀₀ (cubic feet per second)	1,306 cfs	
Q ₁₀₀ Elevation (feet NAVD88)	753.21	
Q ₁₀₀ Headwater Elevation (feet NAVD88)	753.68	753.70
Gross Waterway Opening Below Q ₁₀₀ Elevation (feet NAVD88)	230	230
Road-Overflow Area (square feet)	0	0
Q ₁₀₀ Velocity (feet per second)	5.58	5.58
Minimum Low-Structure Elevation (feet NAVD88)	759.13	759.13

Hydraulic Data Table for Westbound Bridge

Parameter	Existing	Proposed
Drainage Area (acres)	1,398 acres	
Skew (degrees)	0 degrees	
Q ₁₀₀ (cubic feet per second)	1,306 cfs	
Q ₁₀₀ Elevation (feet NAVD88)	753.54	
Q ₁₀₀ Headwater Elevation (feet NAVD88)	754.77	754.80
Gross Waterway Opening Below Q ₁₀₀ Elevation (feet NAVD88)	225	225
Road-Overflow Area (square feet)	0	0
Q ₁₀₀ Velocity (feet per second)	5.99	5.94
Minimum Low-Structure Elevation (feet NAVD88)	759.13	759.13

6. SCOUR ANALYSIS

6.1 Results and Conclusions

Scour analysis for the proposed condition hydraulic model was performed using the Q₁₀₀ discharge of 1,306 cfs. HEC-RAS Version 4.1.0 was used for analysis of contraction scour and pier scour as described in IDM Section 203-303(04).

During the inspection of the eastbound bridge on September 14, 2015 a large scour hole was noted between the piers. This scour hole could not be seen during the May 4, 2016 inspection likely due to the murkiness of the water from spring rains. Results from the HEC-RAS scour analysis are provided in the tables below. Appendix C-3 contains the HEC-RAS output and the bridge cross section plot for the proposed condition for both the eastbound and westbound bridges. The cross section at River Station 6015 was used as the approach cross section for both bridges.

Scour Data Table for Eastbound Bridge

Parameter	
Q ₁₀₀ Maximum Velocity (feet per second)	6.82
Q ₁₀₀ Contraction Scour (feet)	2.23
Q ₁₀₀ Total Scour (feet)	5.83
Flowline Elevation (feet NAVD88)	744.60
Q ₁₀₀ Low-Scour Elevation (feet NAVD88)	738.77
Spread Footing Elevation (feet NAVD88)	739.64

Scour Data Table for Westbound Bridge

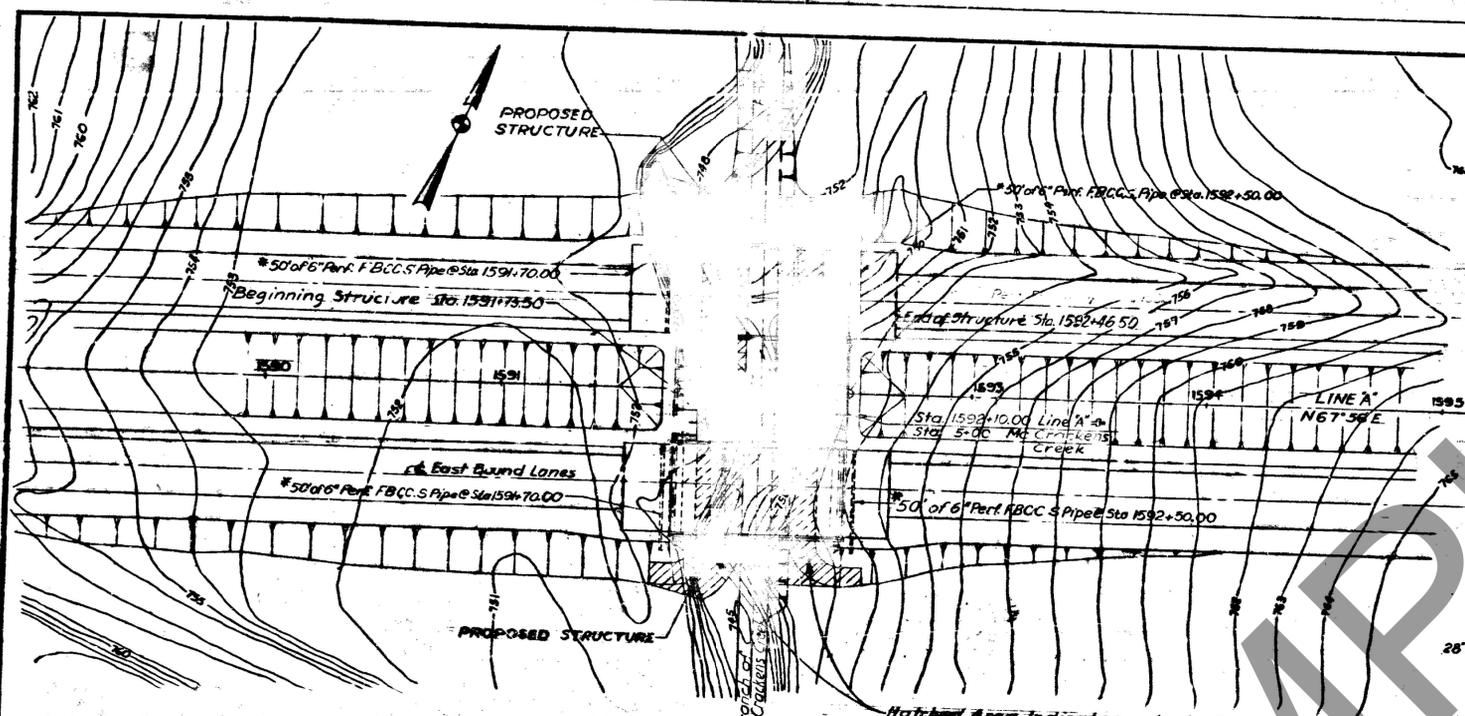
Parameter	
Q ₁₀₀ Maximum Velocity (feet per second)	7.75
Q ₁₀₀ Contraction Scour (feet)	3.21
Q ₁₀₀ Total Scour (feet)	6.54
Flowline Elevation (feet NAVD88)	745.19
Q ₁₀₀ Low-Scour Elevation (feet NAVD88)	738.65
Spread Footing Elevation (feet NAVD88)	739.64

6.2 Proposed Countermeasures

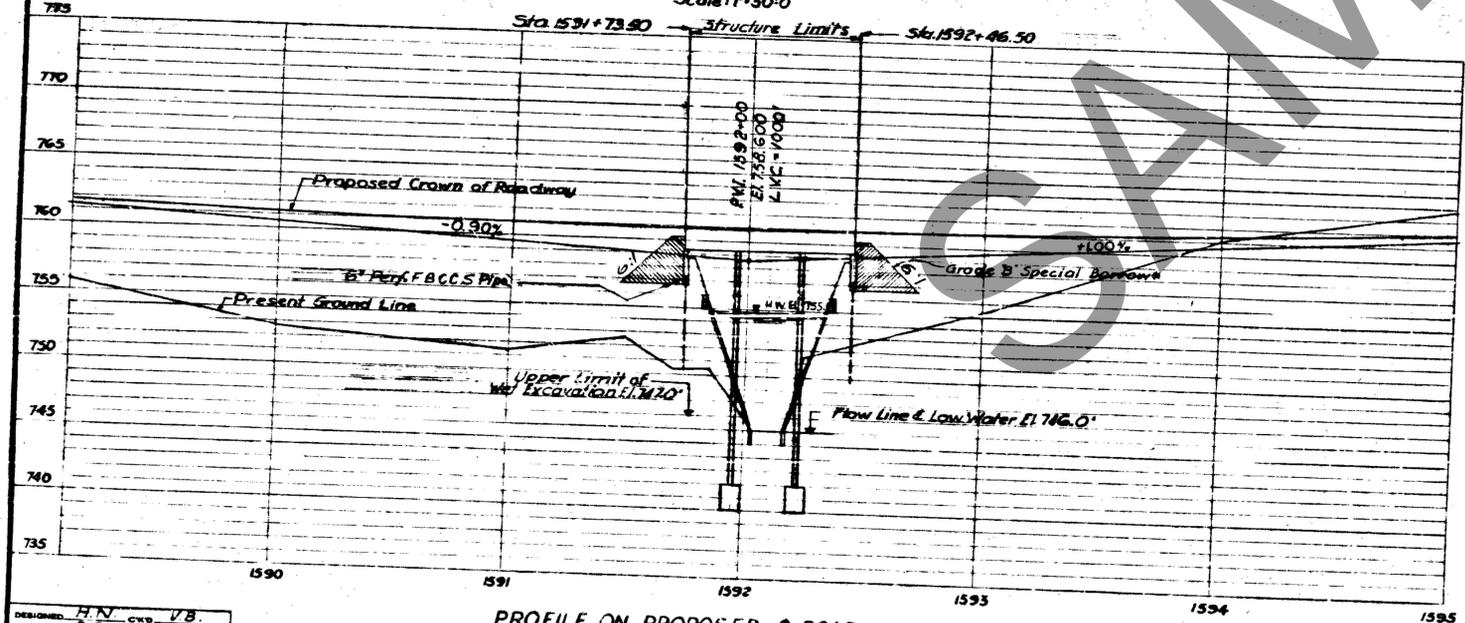
Based on the results of the scour analysis, both the eastbound and westbound North Branch McCracken Creek bridges are considered to be scour critical. Class 1 Riprap is recommended for scour protection at both abutments and piers at both the eastbound and westbound bridges based upon the Q₁₀₀ maximum velocity and IDM Figure 203-2D. Class 1 Riprap will be placed around each bridge pier at a minimum thickness of 3 feet and out to a distance of 6 feet from the outside wall of the piers. For the bridge abutments, Class 1 riprap will be placed around the cone of the abutment from top of bank to toe of slope with a square toe trench placed below the riprap and at a minimum thickness of 2 feet.

APPENDIX A
General Project Information

SAMPLE

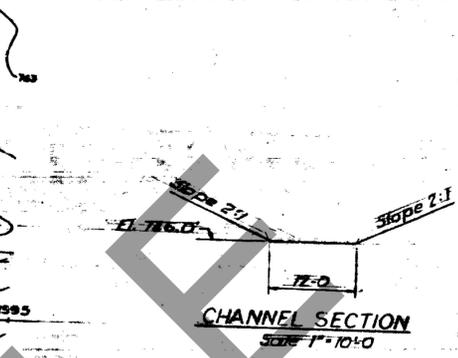


SITUATION PLAN
Scale: 1"=30'-0"

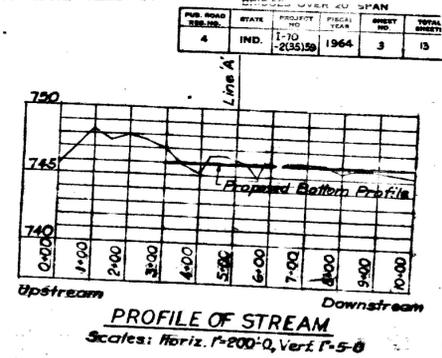


PROFILE ON PROPOSED ROADWAY
Scale: Vertical 1"=5'-0"; Horizontal 1"=30'-0"

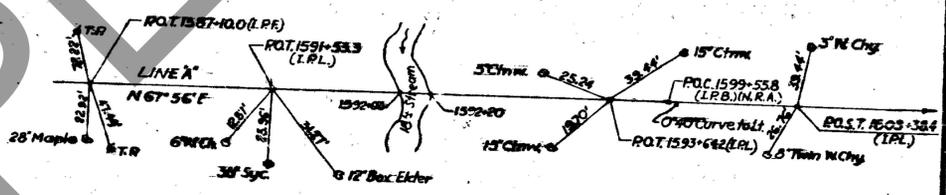
DESIGNED: H.N. C.W. V.B.
DRAWN: B.B. C.W. V.B.
CHECKED: C.W. V.B.



CHANNEL SECTION
Scale: 1"=10'-0"



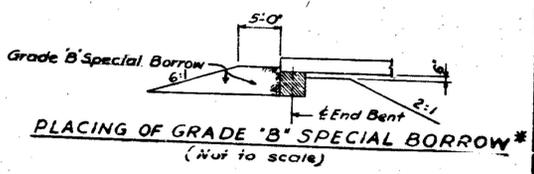
PROFILE OF STREAM
Scales: Horiz. 1"=200'-0"; Vert. 1"=5'-0"



REFERENCE
(Not to Scale)

NOTES:
Present Structure - None
See Art. A203 of the Specifications regarding Test Pit Data.
SURVEY BOOKS: BR. 1854
*Grade 'B' Special Borrow
*Perforated FBCC'S Pipe in Road Project.

Drainage area 2.25 Sq. Mi.
Waterway area req'd 178 a'
Waterway area provided 270 a'



PLACING OF GRADE 'B' SPECIAL BORROW*
(Not to scale)

LAYOUT
CONTINUOUS REINFORCED CONCRETE SLAB BRIDGES
3-SPANS: 22'-0"; 27'-6" & 22'-0"; TWIN STRUCTURES, SKEW: NONE
TWO 39'-6" ROADWAYS: 6" CURBS
I-70 OVER BRANCH OF MC CRACKENS CREEK

INDIANA STATE HIGHWAY COMMISSION
HENDRICKS COUNTY

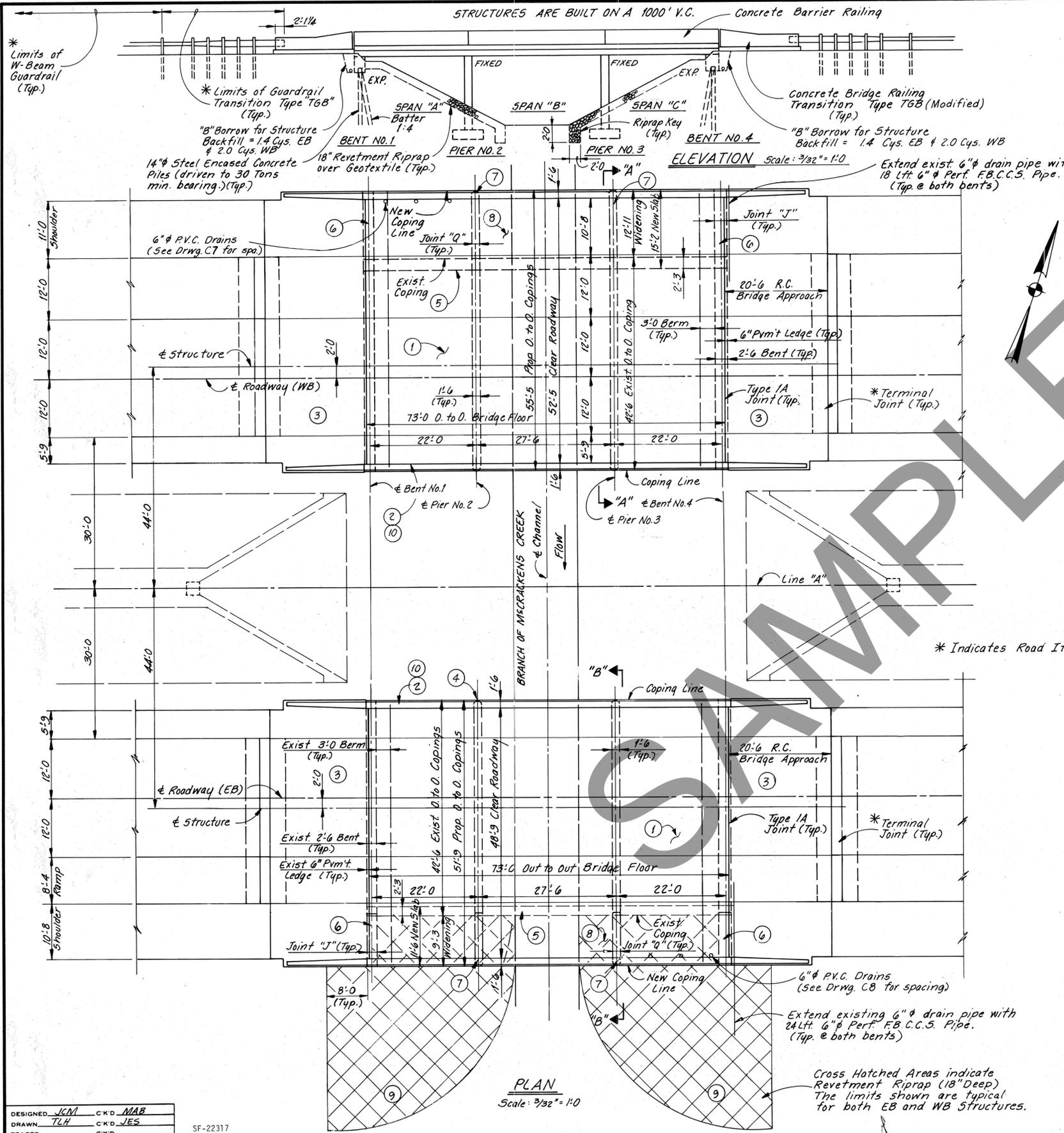
SCALE: AS INDICATED JAN 2, 1964

SUBMITTED FOR APPROVAL: [Signature]
DRAWING: CI OF 5
PROJECT: I-70-2(35) 59
BRIDGE CONTRACT NO. R-6988
BRIDGE FILE: I-70-60-5180



W.W. LOCHNER, INC.

Rev. 12-10-63 Riprap 4" BCC'S Pipe
Rev. 1-17-64 Pipe



LEGEND

1. Remove the bridge deck overlays, BS expansion joints and the overlay dams of both structures. Mill, clean and patch the bridge decks as required (estimated 427 Sft. of deck surface area partial depth only each structure). All existing reinforcing steel shall be cleaned and straightened and left in place. Construct new bridge deck overlays.
2. Remove the existing bridge railings and concrete end posts and that portion of the existing curb as shown in Section "A-A" on Drwg. C9. The existing bridge railing is to become the property of the Contractor.
3. Remove the entire approach slabs and the integral curbs. Reconstruct the bridge approach slabs and the approach slab extensions. Dowel into the existing bridge deck for the connection of the new approach slabs to the bridge decks. (216 Field drilled holes and 216 #6 x 4'-3" required) Surface seal the top of the new approach slabs. See Longitudinal Section on Drwg. C1. (Total Epoxy Coated Reinforcing Steel = 1379 Lbs.)
4. Remove the deteriorated concrete from around the exposed reinforcing and patch as required. Estimated quantity 25 Sft.
5. Sawcut and remove the deck slab, existing bridge railing, concrete end posts, and curb on a line 6" from the face of curb as shown.
6. Construct new widened end bents as required. See Drwg. C4 for details.
7. Construct new widened piers as required. See Drwg. C6 for details.
8. Construct new widened superstructure slabs as required. See Drwg. C7 and C8 for details.
9. Hatched area indicates 600 Tons of revetment riprap (18" deep) and 660 Sys. of geotextile to be used during the reshaping of the bridge spill slopes.
10. Construct new concrete barrier railings and the new concrete barrier railing transitions, type TGB on the R. C. Approach slabs.

DESIGN DATA

Allowable Design Stresses:

Class C Concrete	f'c = 4000 psi
Class A Concrete	f'c = 3500 psi
Class B Concrete	f'c = 3000 psi
Reinforcing Steel (Grade 60)	fy = 60,000 psi

Live Load

HS20-44 loading with distribution in accordance with 1992 AASHTO, Specifications and subsequent interim Specifications.

DEAD LOAD

New Slab designed with a 14-3/4" structural depth and 1-3/4" overlay to match existing slab.

Actual weight plus 35 psf for future wearing surface.

JOINT "J" (EXP.): 1/2" preformed expansion joint material placed on the front 6" of the slab bearing area with two layers of medium weight roofing felt on the remaining bearing area.

JOINT "Q" (FIXED): 1/2" preformed expansion joint material placed on each of the outer 3" portions of the slab bearing area with bare concrete on the remaining bearing area.

SUMMARY OF EARTHWORK

Foundation Excavation Unclassified
 Pier No. 2 and No. 3 E. B. = 32 Cys.
 Pier No. 2 and No. 3 W. B. = 44 Cys.
 Total = 76 Cys.

Borrow
 Bent No. 1 and No. 4 E. B. = 766 Cys.
 Bent No. 1 and No. 4 W. B. = 766 Cys.
 Total = 1532 Cys.

NOTE

See Drwg. C1 for General Notes, Design Data and Overlay Notes. See Drwg. C3 for Additional General Plan Details.

**GENERAL PLAN
 DECK RECONSTRUCTION AND OVERLAY
 CONTINUOUS REINFORCED CONCRETE SLAB BRIDGES**

3 SPANS 22'-0", 27'-6", 22'-0" TWIN STRUCTURES NO SKEW, 48'-9" EB CLR. ROWY., 52'-5" WB CLR. ROWY., I-70 OVER BR. OF McCRACKENS CREEK

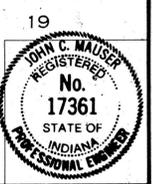
INDIANA DEPARTMENT OF TRANSPORTATION
 HENDRICKS COUNTY

SCALE: - AS NOTED

DATE: -

SUBMITTED FOR APPROVAL *John C. Mauer* 11/1/94

DRAWING: C2 OF C21 SHEET: 3 OF 30
 PROJECT: IM170-2 (074) STATION: -
 BRIDGE CONTRACT NO. R-21606
 BRIDGE FILE: I-70-60-5180B



DESIGNED: JCM	CKD: MAB
DRAWN: TGH	CKD: JES
TRACED: CKD	

SF-22317

PLAN
 Scale: 3/32" = 1'-0"

DES. NO. 9240615

Bridge Inspection Report

**I70-60-05180 CEBL
I-70 EB
over
BRANCH MCCRACKEN CREEK**



Inspection Date: 09/14/2015

Inspected By: Melvin Hughes

Inspection Type(s): Routine

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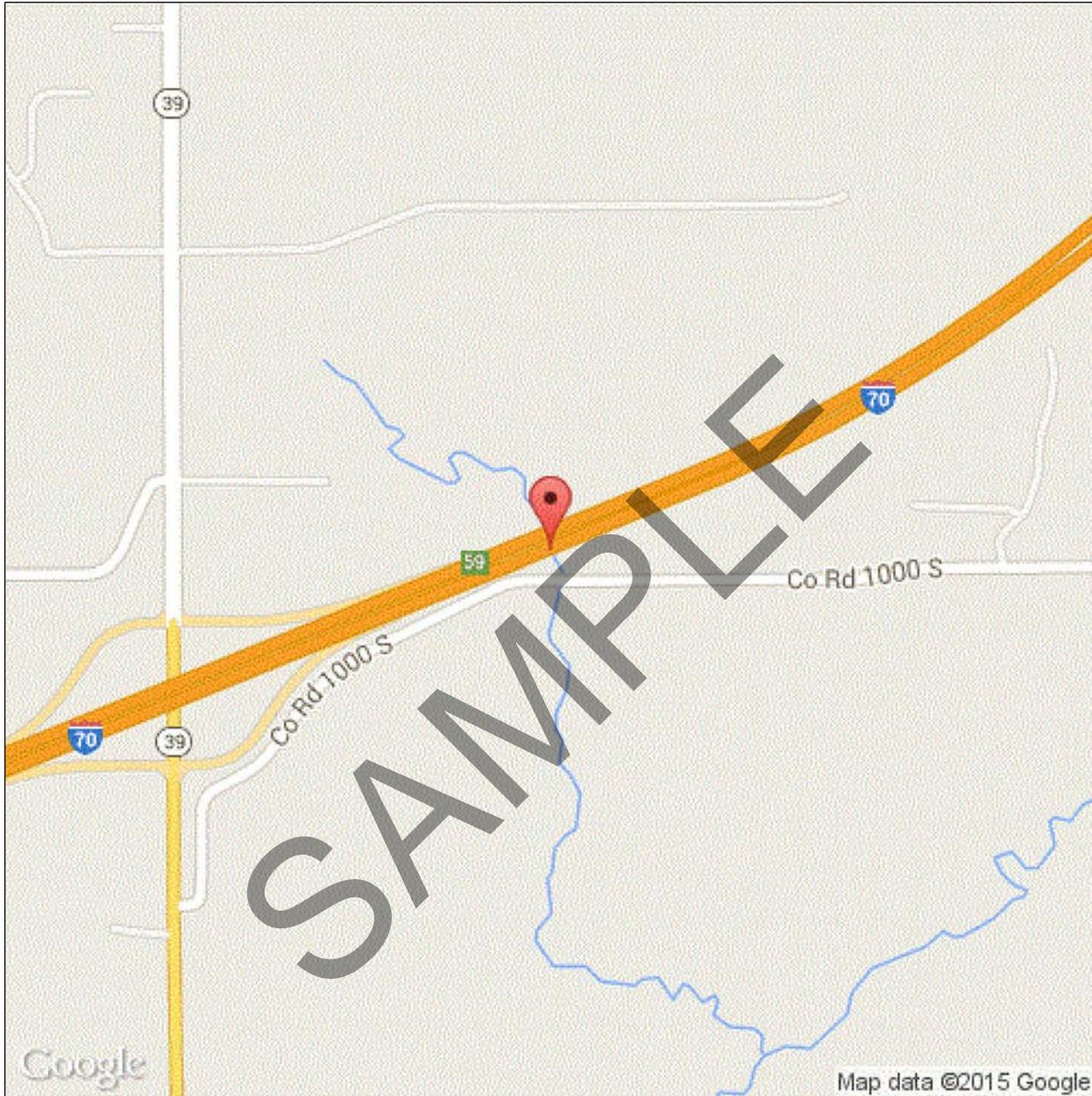
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SAMPLE

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



Latitude: 39.61572

Longitude: -86.472374

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report

Inspection notes by Melvin Hughes that do not appear elsewhere in the report.

Both approach slabs have longitudinal cracking and the west has two patches and 1 spall 1' x 1'.

The west joint has 8' missing.

Parapet walls are in good shape.

SAMPLE

Inspector: Melvin Hughes
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
 Facility Carried: I-70 EB

Bridge Inspection Report

IDENTIFICATION

(1) STATE CODE:	185 - Indiana	(12) BASE HIGHWAY NETWORK:	1
(8) STRUCTURE:	041780	(13A) INVENTORY ROUTE:	0000000001
(5 A-B-C-D-E) INV. ROUTE:	1 - 1 - 1 - 00070 - 0	(13B) SUBROUTE NUMBER:	01
(2) HIGHWAY AGENCY DISTRICT:	01 - Crawfordsville	(16) LATITUDE:	39.61572
(3) COUNTY CODE:	032 - HENDRICKS	(17) LONGITUDE:	-86.472374
(4) PLACE CODE:	00000 - N/A	(98) BORDER	
(6) FEATURES INTERSECTED:	BRANCH	A) STATE NAME:	
(7) FACILITY CARRIED:	MCCRACKEN	B) PERCENT	%
(9) LOCATION:	I-70 EB	(99) BORDER BRIDGE STRUCT. NO:	
(11) MILEPOINT:	00.43 E SR 39		
	0059.640		

STRUCTURE TYPE AND MATERIAL

(43) STRUCTURE TYPE, MAIN:		(45) NUMBER OF SPANS IN MAIN	003
A) KIND OF MATERIAL/DESIGN:	2 - Concrete continuous	UNIT:	
B) TYPE OF DESIGN/CONSTR:	01 - Slab	(46) NUMBER OF APPROACH SPANS:	0000
(44) STRUCTURE TYPE, APPROACH SPANS:		(107) DECK STRUCTURE TYPE:	1 - Concrete Cast-in-Place
A) KIND OF MATERIAL/DESIGN:	0 - Other	(108) WEARING SURFACE/PROT SYS:	
B) TYPE OF DESIGN/CONSTR:	00 - Other	A) WEARING SURFACE:	3 - Latex Concrete or similar additive
		B) DECK MEMBRANE:	0 - None
		C) DECK PROTECTION:	0 - None

AGE OF SERVICE

(27) YEAR BUILT:	1966	(28) LANES:	
(106) YEAR RECONSTRUCTED:	1996	A) ON BRIDGE:	02
(42) TYPE OF SERVICE:		B) UNDER BRIDGE:	00
A) ON BRIDGE:	1 - Highway	(29) AVERAGE DAILY TRAFFIC:	029080
B) UNDER BRIDGE:	5 - Waterway	(30) YEAR OF AVERAGE DAILY TRAFFIC:	2006
		(109) AVERAGE DAILY TRUCK TRAFFIC:	28 %
		(19) BYPASS DETOUR LENGTH:	001 MI

Inspector: Melvin Hughes
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
 Facility Carried: I-70 EB

Bridge Inspection Report

GEOMETRIC DATA

(48) LENGTH OF MAX SPAN: 0027.5 FT	(35) STRUCTURE FLARED: 0 - No flare
(49) STRUCTURE LENGTH: 00073.0 FT	(10) INV RTE, MIN VERT CLEARANCE: 99.99 FT
(50) CURB/SIDEWALK WIDTHS:	(47) TOT HORIZ CLEARANCE: 048.7 FT
A) LEFT 00.0 FT	(53) VERT CLEAR OVER BR RDWY: 99.99 FT
B) RIGHT: 00.0 FT	(54) MIN VERTICAL UNDERCLEARANCE:
(51) BRDG RDWY WIDTH CURB-TO-CURB: 048.7 FT	A) REFERENCE FEATURE: N
(52) DECK WIDTH, OUT-TO-OUT: 051.7 FT	B) MIN VERT UNDERCLEAR: 0 FT
(32) APPROACH ROADWAY 038.0 FT	(55) LATERAL UNDERCLEARANCE RIGHT:
(33) BRIDGE MEDIAN: 0 - No median	A) REFERENCE FEATURE: N
(34) SKEW: 00 DEG	B) MIN LATERAL UNDERCLEAR: 000.0 FT
	(56) MIN LATERAL UNDERCLEAR ON LEFT: 00.0 FT

INSPECTIONS

(90) INSPECTION DATE: 09/14/2015	(91) DESIGNATED INSPECTION FREQUENCY: 24 MONTHS
(92) CRITICAL FEATURE INSPECTION:	(93) CRITICAL FEATURE INSPECTION DATE:
A) FRACTURE CRITICAL REQUIRED/FREQUENCY: N	A) FRACTURE CRITICAL DATE:
B) UNDERWATER INSPECTION REQUIRED/FREQUENCY: N	B) UNDERWATER INSP DATE:
C) OTHER SPECIAL INSPECTION REQUIRED/FREQUENCY: N	C) OTHER SPECIAL INSP DATE:

CONDITION

(58) DECK: 6 - Satisfactory Condition (minor deterioration)	(60) SUBSTRUCTURE: 7 - Good Condition (some minor problems)
(58.01) WEARING SURFACE: 6 - Satisfactory Condition	(61) CHANNEL/CHANNEL PROTECTION: 7 - Bank protection needs minor repairs
(59) SUPERSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)	(62) CULVERTS: N - Not Applicable

CONDITION COMMENTS

(58) DECK: 6 - Satisfactory Condition (minor deterioration)

Comments:

There is a longitudinal crack with white efflorescence and rust stains in all 3 spans along the edge where the deck was widened. All spans have longitudinal cracking and transverse in span B. {Melvin Hughes,09-14-2015}.

(58.01) WEARING SURFACE: 6 - Satisfactory Condition

Comments:

The wearing surface has a longitudinal crack along the length of the deck on the shoulder, south of the white edge line. {Melvin Hughes,09-14-2015}.

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report

(59) SUPERSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)

Comments:

There is a longitudinal crack with white efflorescence and rust stains in all 3 spans along the edge where the deck was widened. All spans have longitudinal cracking with efflorescence and transverse in span B. {Melvin Hughes,09-14-2015}.

(60) SUBSTRUCTURE: 7 - Good Condition (some minor problems)

Comments:

Pier 3 has a spall on the west pier wall. {Melvin Hughes,09-14-2015}.

(61) CHANNEL/CHANNEL PROTECTION 7 - Bank protection needs minor repairs

Comments:

The water was not flowing during the inspection; The channel has a large scour under the structure between the piers. {Melvin Hughes,09-14-2015}.

(62) CULVERTS: N - Not Applicable

Comments:

LOAD RATING AND POSTING

(31) DESIGN LOAD:	6 - HS 20+Mod	(66) INVENTORY RATING:	36
(70) BRIDGE POSTING	5 - Equal to or above legal loads	(65) INVENTORY RATING METHOD:	2 - Allowable Stress (AS)
(41) STRUCTURE OPEN/POSTED/CLOSED:	A - Open	(66B) INVENTORY RATING (H):	20
(64) OPERATING RATING:	61	(66D) DATE POSTED/CLOSED:	
(63) OPERATING RATING METHOD:	2 - Allowable Stress (AS)		

APPRAISAL

SUFFICIENCY RATING:	95.3	(36) TRAFFIC SAFETY FEATURE:	
STATUS:	0	36A) BRIDGE RAILINGS:	1
(67) STRUCTURAL EVALUATION:	6	36B) TRANSITIONS:	1
(68) DECK GEOMETRY:	9	36C) APPROACH GUARDRAIL:	1
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL:	N	36D) APPROACH GUARDRAIL ENDS:	1

(71) WATERWAY ADEQUACY: 7 - Slight Chance of Overtopping Bridge

Comments:

Slight chance of over topping bridge deck and roadway approaches.

(72) APPROACH ROADWAY ALIGNMENT: 8 - Equal to present desirable criteria

Comments:

The approaching roadway and bridge alignments do not impede traffic in anyway for vehicles traveling at the current speed limit.

(113) SCOUR CRITICAL BRIDGES: 7 - Countermeasures installed to correct scour problem

Comments:

The water was not flowing during the inspection; The channel has a large scour under the structure between the piers. Rip rap was seen below the water at the piers. {Melvin Hughes,09-14-2015}.

Inspector: Melvin Hughes
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
 Facility Carried: I-70 EB

Bridge Inspection Report

CLASSIFICATION

(20) TOLL:	3 - On Free Road	(21) MAINT. RESPONSIBILITY:	01 - State Highway Agency
(22) OWNER:	01 - State Highway Agency	(26) FUNCTIONAL CLASS OF INVENTORY RTE:	01 - Rural - Principal Arterial - Interstate
(37) HISTORICAL SIGNIFICANCE:	5 - Not eligible	(100) STRAHNET HIGHWAY:	Is on an Interstate STRAHNET route
(101) PARALLEL STRUCTURE:	R - Right structure (North or East)	(102) DIRECTION OF TRAFFIC:	1-way traffic
(103) TEMPORARY STRUCTURE:		(104) HIGHWAY SYSTEM OF INVENTORY ROUTE:	1 - Structure/Route is on NHS
(105) FEDERAL LANDS HIGHWAYS:	0-Not Applicable	(110) DESIGNATED NATIONAL NETWORK:	Inventory route on National Truck Network
(112) NBIS BRIDGE LENGTH:	Yes		

NAVIGATION DATA

(38) NAVIGATION CONTROL:	0 - No navigation control on waterway (bridge permit not required)	(39) NAVIGATION VERTICAL CLEAR:	000.0 FT
(111) PIER OR ABUTMENT PROTECTION:		(116) MINIMUM NAVIGATION VERT. CLEARANCE, VERT. LIFT BRIDGE:	FT
		(40) NAV HORIZONTAL CLEARANCE:	0000.0 FT

PROPOSED IMPROVEMENTS

(75A) TYPE OF WORK:	35 - Rehabilitation - Deterioration	(95) ROADWAY IMPROVEMENT COST:	\$ 000000
(75B) WORK DONE BY:	1 - Work to be done by contract	(96) TOTAL PROJECT COST:	\$ 000424
(76) LENGTH OF IMPROVEMENT:	000073 FT	(97) YR OF IMPROVEMENT COST EST:	2006
(94) BRIDGE IMPROVEMENT COST:	\$ 000424	(114) FUTURE AVG DAILY TRAFFIC:	052665
		(115) YR OF FUTURE ADT:	2033

Inspector: Melvin Hughes
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
 Facility Carried: I-70 EB

Bridge Inspection Report

	Environment	Total Quantity	Units	Condition State 1	Condition State 2	Condition State 3	Condition State 4
38 - Reinforced Concrete Slab	2 - Low	3778	sq. ft.	3581	197	0	0
Longitudinal and transverse cracking with efflorescence.							
1120 - Efflorescence/Rust Staining		95			95		
1130 - Cracking (RC and Other)		102			102		
510 - Wearing Surfaces		3559	sq. ft.	3486	73	0	0
3220 - Crack (Wearing Surface)		73			73		
210 - Reinforced Concrete Pier Wall	2 - Low	104	ft.	103	0	1	0
Spall on the west side of pier 3 CS3.							
1080 - Delamination/Spall/Patched Area		1				1	
215 - Reinforced Concrete Abutment	2 - Low	103	ft.	103			
301 - Pourable Joint Seal	2 - Low	103	ft.	95	0	0	8
West joint is missing 8' of material.							
2330 - Seal Damage		8					8
321 - Reinforced Concrete Approach Slab	2 - Low	1999	sq. ft.	1962	36	1	0
Both approach slabs have cracking and the west has spalling.							
1080 - Delamination/Spall/Patched Area		1				1	
1130 - Cracking (RC and Other)		36			36		
331 - Reinforced Concrete Bridge Railing	2 - Low	146	ft.	146			

SAMPLE

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 1
Description



PHOTO 2
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 3
Description

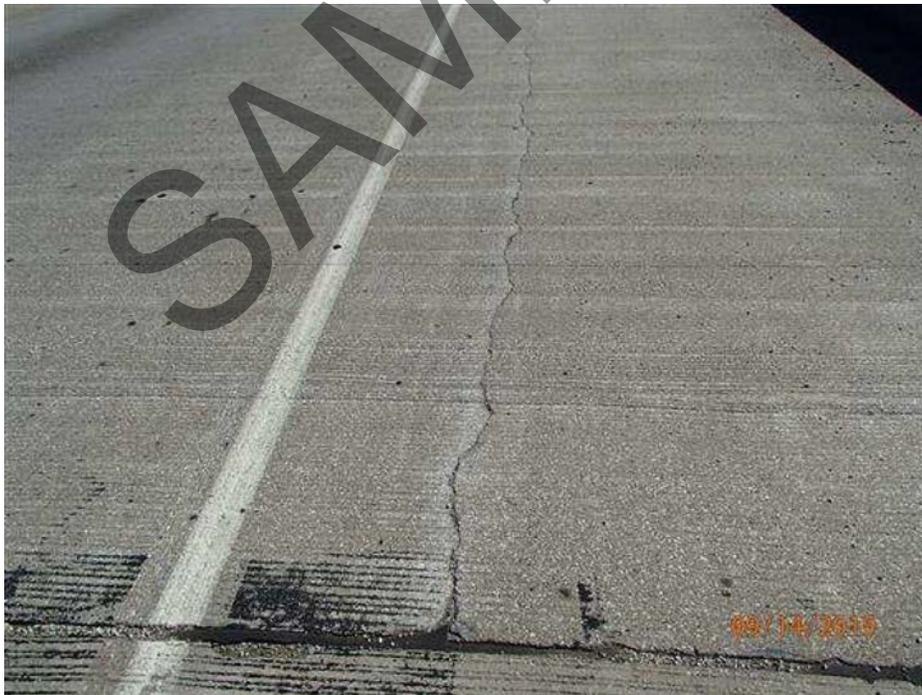


PHOTO 4
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 5
Description



PHOTO 6
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 7
Description



PHOTO 8
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 9
Description



PHOTO 10
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 11
Description



PHOTO 12
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 13
Description



PHOTO 14
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report



PHOTO 15
Description



PHOTO 16
Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report

SAMPLE

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report

Date Reported: 09/14/2015
Priority: Grey - 4
Work Code: Brush Cutting / Herbicide Spray

Deficiency Description:
Unwanted trees and brush around bridge.
Work Description:

Date Repairs Completed:
Maintenance Comments:

Stage: Open



PHOTO 1 Description

Stage: Open



PHOTO 2 Description

Inspector: Melvin Hughes
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 CEBL
Facility Carried: I-70 EB

Bridge Inspection Report

Date Reported: 09/14/2015
Priority: Green - 3
Work Code: Approach Repair

Deficiency Description:
West approach slab has a 1' x 1' spall in the driving lane.
Work Description:

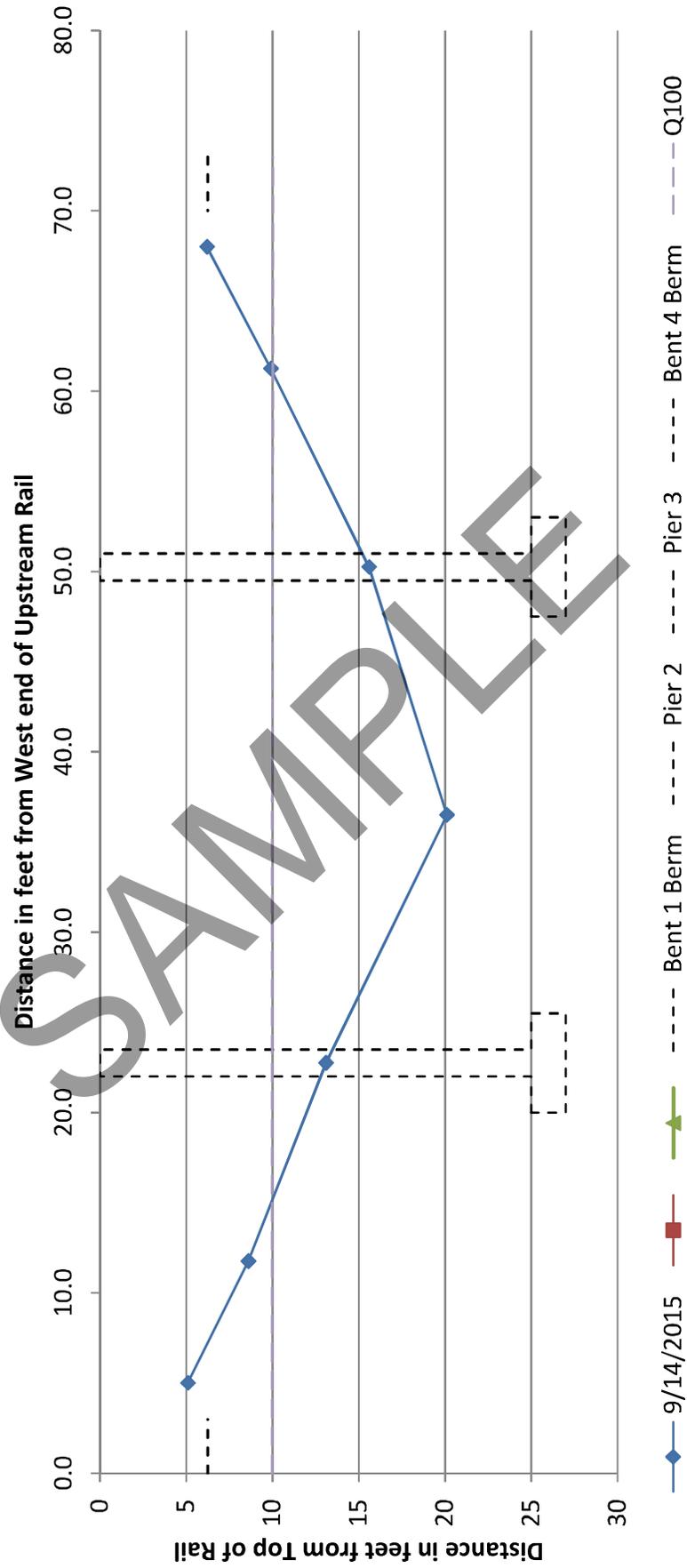
Date Repairs Completed:
Maintenance Comments:

Stage: Open



PHOTO 1 Description

Channel Profile for Bridge I70-60-05180 CEBL (RP 59.86)



MH 9-14-2015

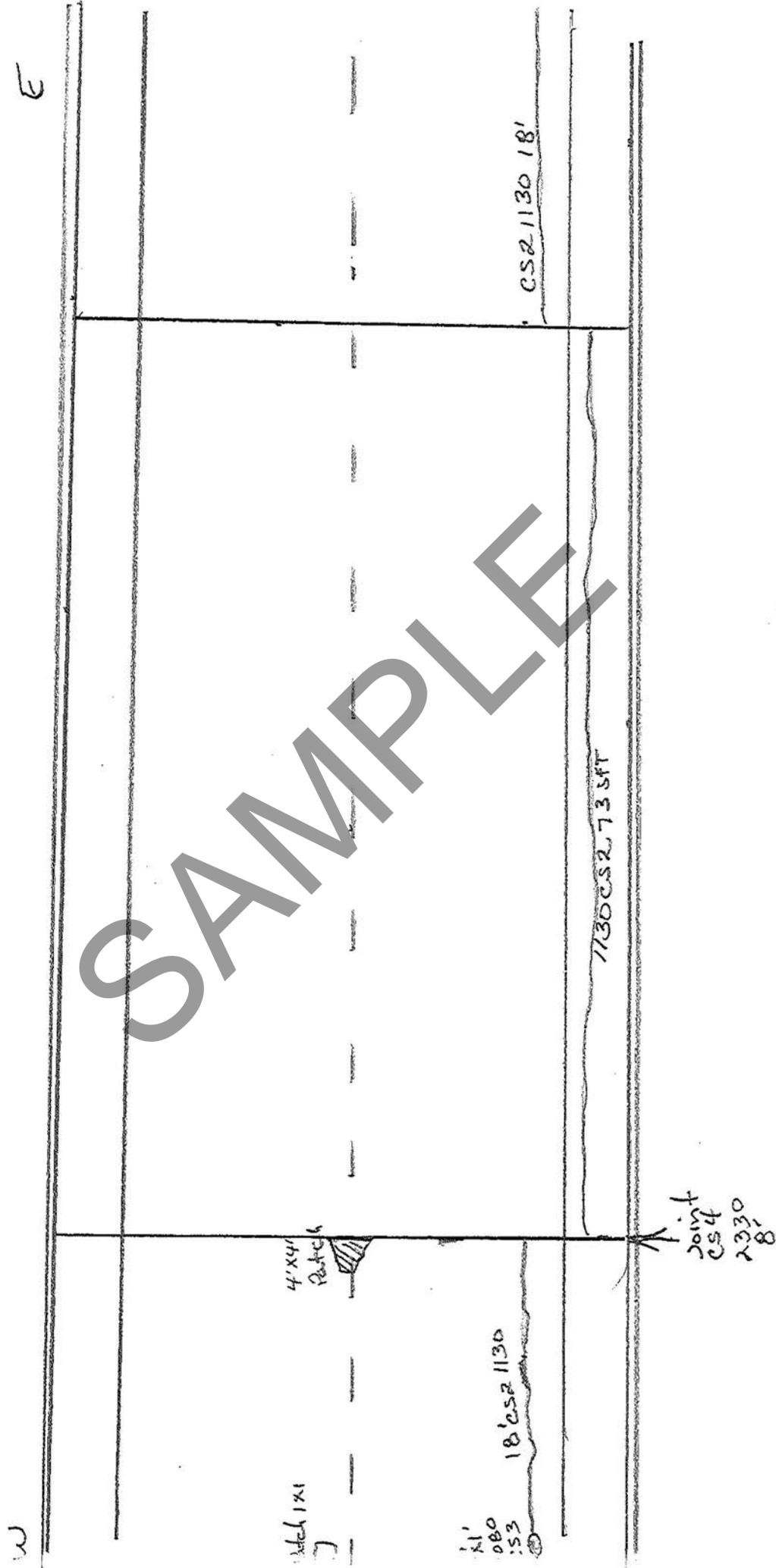
AASHTO Bridge Elements

Structure #:	170-60-05180 CEBL
NBI #:	041780
Calculated by:	Nate Pfeiffer 9/9/2015

	Elements/Defects		Description	Unit	Quantity
	Element Number	Defect Number			
National Bridge Elements (NBE)	38	1130	Reinforced Concrete Slab CS2	102SFT	3778
		1120	CS2	95SFT	
	331		Reinforced Concrete Bridge Railing CS1	LFT	146
	210	1080	Reinforced Concrete Pier Wall CS3	1 LFT	104
	215		Reinforced Concrete Abutment CS1	LFT	103
Bridge Management Elements (BME)	301	2330	Pourable Joint Seal CS4	8' LFT	103
	321	1130	Reinforced Concrete Approach Slab CS2	36SFT	1999
		1080	CS3	1 SFT	
	510	3220	Wearing Surfaces CS2	73SFT	3559

Notes & Comments:	
Slab:	73'-0" long x 51'-9" wide
Rail:	73'-0" long x 2 rails
Appr:	20'-6" long x 48'-9" wide x 2 slabs
Seal:	(41'-10" (original) + 9'-7" (widening) long) x 2 joints
Wall:	(41'-7" (original) + 10'-3" (widening) long) x 2 piers
Bent:	(41'-10" (original) + 9'-7" (widening) long) x 2 bents
Wear:	73'-0" long x 48'-9" wide

mtt.
9-14-2015
170-60-05180 CEBL
NB I# 041780
Approach slabs
Joints
wearing surface



SAMPLE

M.H.

9-14-2015

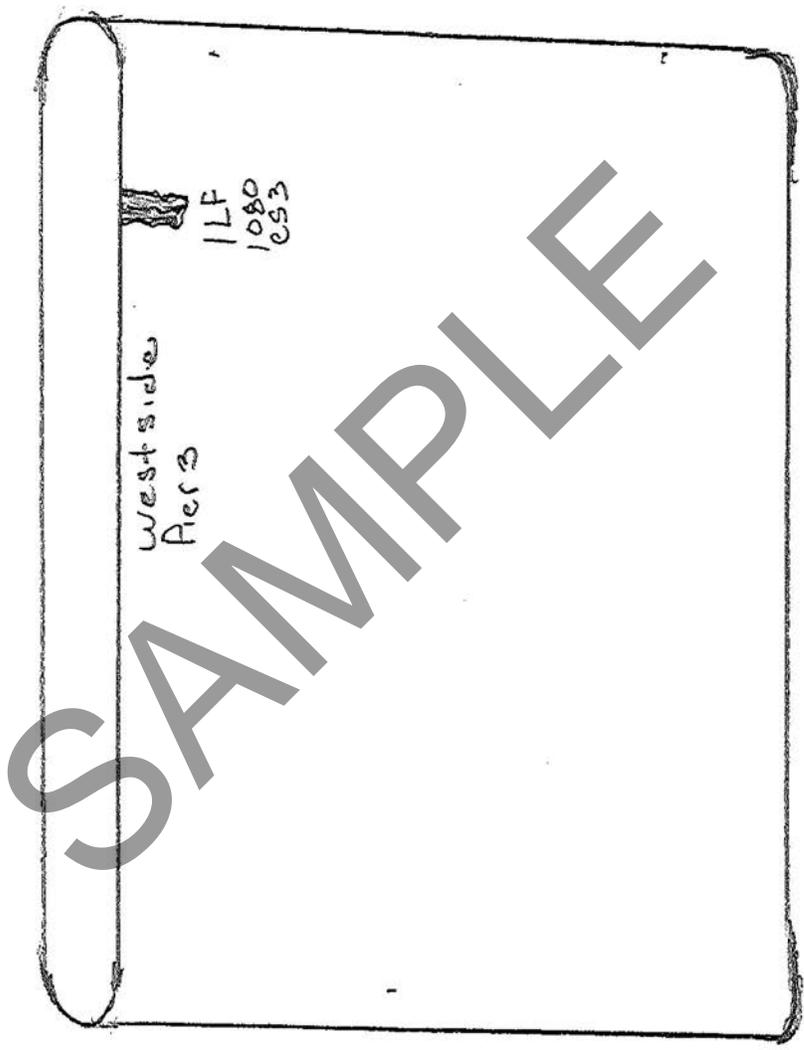
170-60-05180CEBL

NBT# 041780

Pier 3

1080 CS3

ILF



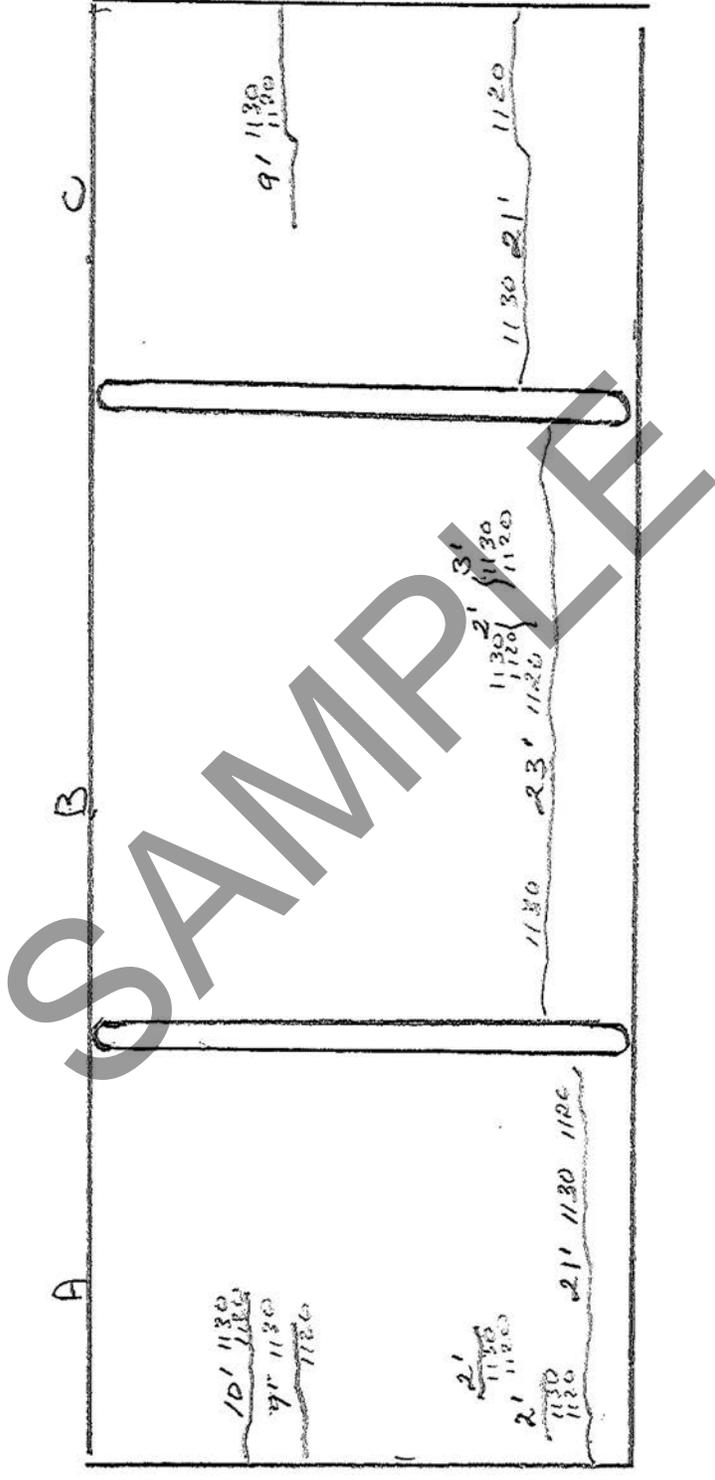
M.H.
9-14-2015

170-60-05780CEBL

NBSM 041780

Deck under 1130cs2 102sft

1120cs2 96sft



Bridge Inspection Report

I70-60-05180 JCWB
I-70 WB
over
BRANCH MCCRACKEN CREEK



Inspection Date: 09/14/2015

Inspected By: Dan Bewley

Inspection Type(s): Routine

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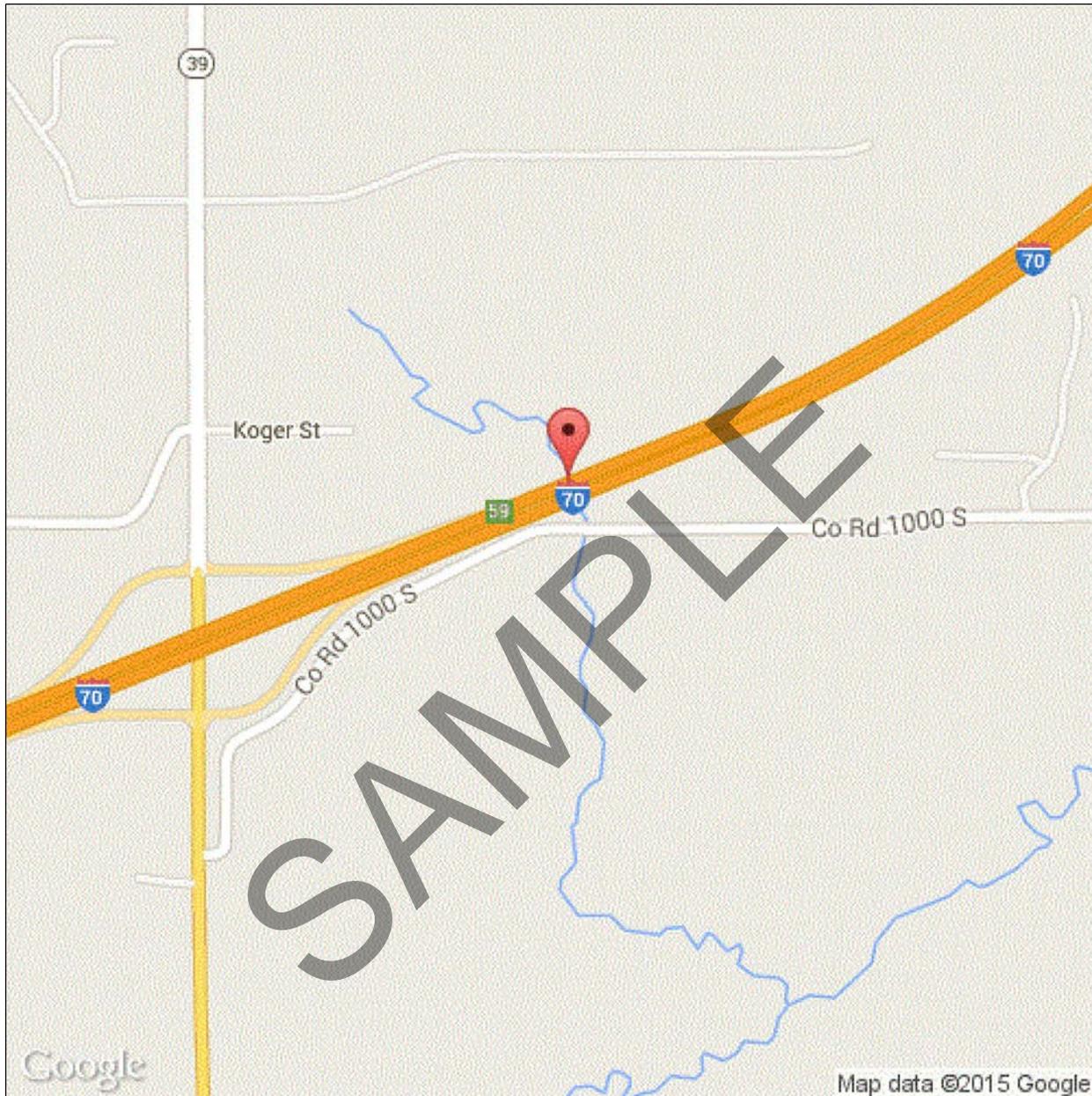
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EXECUTIVE SUMMARY	4
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ELEMENTS	9
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MAINTENANCE NEEDS	31
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SAMPLE

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



Latitude: 39.61597

Longitude: -86.472496

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report

9/14/2015 Inspection notes by Dan Bewley that do not appear elsewhere on the report. The approach pavement & guardrail seem to be in good condition. The West approach slab only has concrete in the left lane & emergency shoulder, the rest of it is in asphalt. The East approach slab has a few spalled areas on the cold joint. The joints are in poor condition. The wearing surface has a longitudinal wide crack in the right emergency lane the entire length of the bridge. I also noted longitudinal hair line cracks in the main 2 lanes of the bridge. Both parapet walls meet CS 1 criteria. The East interior pier has an approximate 8' area of spalls with exposed rebar. I also noted erosion occurring about mid span at the East abutment. I can not see exposed piling but, I am assuming it will be soon. Maintenance letter was written. Dan Bewley 9/14/2015

SAMPLE

Inspector: Dan Bewley
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
 Facility Carried: I-70 WB

Bridge Inspection Report

GEOMETRIC DATA

(48) LENGTH OF MAX SPAN: 0027.5 FT	(35) STRUCTURE FLARED: 0 - No flare
(49) STRUCTURE LENGTH: 00073.0 FT	(10) INV RTE, MIN VERT CLEARANCE: 99.99 FT
(50) CURB/SIDEWALK WIDTHS:	(47) TOT HORIZ CLEARANCE: 052.4 FT
A) LEFT 00.0 FT	(53) VERT CLEAR OVER BR RDWY: 99.99 FT
B) RIGHT: 00.0 FT	(54) MIN VERTICAL UNDERCLEARANCE:
(51) BRDG RDWY WIDTH CURB-TO-CURB: 052.4 FT	A) REFERENCE FEATURE: N
(52) DECK WIDTH, OUT-TO-OUT: 055.4 FT	B) MIN VERT UNDERCLEAR: 0 FT
(32) APPROACH ROADWAY 038.0 FT	(55) LATERAL UNDERCLEARANCE RIGHT:
(33) BRIDGE MEDIAN: 0 - No median	A) REFERENCE FEATURE: N
(34) SKEW: 00 DEG	B) MIN LATERAL UNDERCLEAR: 000.0 FT
	(56) MIN LATERAL UNDERCLEAR ON LEFT: 00.0 FT

INSPECTIONS

(90) INSPECTION DATE: 09/14/2015	(91) DESIGNATED INSPECTION FREQUENCY: 24 MONTHS
(92) CRITICAL FEATURE INSPECTION:	(93) CRITICAL FEATURE INSPECTION DATE:
A) FRACTURE CRITICAL REQUIRED/FREQUENCY: N	A) FRACTURE CRITICAL DATE:
B) UNDERWATER INSPECTION REQUIRED/FREQUENCY: N	B) UNDERWATER INSP DATE:
C) OTHER SPECIAL INSPECTION REQUIRED/FREQUENCY: N	C) OTHER SPECIAL INSP DATE:

CONDITION

(58) DECK: 6 - Satisfactory Condition (minor deterioration)	(60) SUBSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)
(58.01) WEARING SURFACE: 7 - Good Condition	(61) CHANNEL/CHANNEL PROTECTION: 6 - Bank slump. widespread minor damage
(59) SUPERSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)	(62) CULVERTS: N - Not Applicable

CONDITION COMMENTS

(58) DECK: 6 - Satisfactory Condition (minor deterioration)

Comments:

The bottom of the deck has a wide crack with efflorescence on the North cold joint. Some of the crack is wet. Photos were taken, sketch was drawn & both are attached to the report. Dan Bewley 9/14/2015

(58.01) WEARING SURFACE: 7 - Good Condition

Comments:

The Wearing surface has a wide longitudinal crack in the Emergency lane. I did note 3 longitudinal hair line cracks in the main line lanes of the bridge. Photos were taken & sketch was done. Both are attached to the report. Dan Bewley 9/14/2015

Inspector: Dan Bewley
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
 Facility Carried: I-70 WB

Bridge Inspection Report

(59) SUPERSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)

Comments:

The bottom of the deck has a wide crack with efflorescence on the North cold joint. Some of the crack is wet. Photos were taken, sketch was drawn & both are attached to the report. Dan Bewley 9/14/2015

(60) SUBSTRUCTURE: 6 - Satisfactory Condition (minor deterioration)

Comments:

The West abutment seems to be in good condition. The East abutment has a large eroded area about mid span. The West interior pier seems to be in good condition & the East interior pier has approximately 8' of spalled area & a wide crack that goes from the top of the pier to ground level. These are occurring on the East face. Dan Bewley 9/14/2015

(61) CHANNEL/CHANNEL PROTECTION: 6 - Bank slump, widespread minor damage

Comments:

The channel runs from the North toward the South & has good alignment to the bridge. The channel seems deeper along the East pier & is slow moving. The banks are well vegetated. I could not cross over the channel. Photos were taken & attached to the report. Dan Bewley 9/14/2015

(62) CULVERTS: N - Not Applicable

Comments:

LOAD RATING AND POSTING

(31) DESIGN LOAD:	6 - HS 20+Mod	(66) INVENTORY RATING:	30
(70) BRIDGE POSTING	5 - Equal to or above legal loads	(65) INVENTORY RATING METHOD:	2 - Allowable Stress (AS)
(41) STRUCTURE OPEN/POSTED/CLOSED:	A - Open	(66B) INVENTORY RATING (H):	24
(64) OPERATING RATING:	49	(66D) DATE POSTED/CLOSED:	
(63) OPERATING RATING METHOD:	2 - Allowable Stress (AS)		

APPRAISAL

SUFFICIENCY RATING:	91.3	(36) TRAFFIC SAFETY FEATURE:	
STATUS:	0	36A) BRIDGE RAILINGS:	1
(67) STRUCTURAL EVALUATION:	6	36B) TRANSITIONS:	1
(68) DECK GEOMETRY:	9	36C) APPROACH GUARDRAIL:	1
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL:	N	36D) APPROACH GUARDRAIL ENDS:	1

(71) WATERWAY ADEQUACY: 7 - Slight Chance of Overtopping Bridge

Comments:

Slight chance of overtopping the bridge. Dan Bewley 9/14/2015

(72) APPROACH ROADWAY ALIGNMENT: 8 - Equal to present desirable criteria

Comments:

Traffic is not impeded in any way. Dan Bewley 9/14/2015

(113) SCOUR CRITICAL BRIDGES: 7 - Countermeasures installed to correct scour problem

Comments:

Spread footings, NO piles, rip rap (sized by hydraulics) Dan Bewley 9/14/2015

Appendix A-2

Inspector: Dan Bewley
 Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
 Facility Carried: I-70 WB

Bridge Inspection Report

CLASSIFICATION

(20) TOLL:	3 - On Free Road	(21) MAINT. RESPONSIBILITY:	01 - State Highway Agency
(22) OWNER:	01 - State Highway Agency	(26) FUNCTIONAL CLASS OF INVENTORY RTE:	01 - Rural - Principal Arterial - Interstate
(37) HISTORICAL SIGNIFICANCE:	5 - Not eligible	(100) STRAHNET HIGHWAY:	Is on an Interstate STRAHNET route
(101) PARALLEL STRUCTURE:	L - Left structure (South or West)	(102) DIRECTION OF TRAFFIC:	1-way traffic
(103) TEMPORARY STRUCTURE:		(104) HIGHWAY SYSTEM OF INVENTORY ROUTE:	1 - Structure/Route is on NHS
(105) FEDERAL LANDS HIGHWAYS:	0-Not Applicable	(110) DESIGNATED NATIONAL NETWORK:	Inventory route on National Truck Network
(112) NBIS BRIDGE LENGTH:	Yes		

NAVIGATION DATA

(38) NAVIGATION CONTROL:	0 - No navigation control on waterway (bridge permit not required)	(39) NAVIGATION VERTICAL CLEAR:	000.0 FT
(111) PIER OR ABUTMENT PROTECTION:		(116) MINIMUM NAVIGATION VERT. CLEARANCE, VERT. LIFT BRIDGE:	FT
		(40) NAV HORIZONTAL CLEARANCE:	0000.0 FT

PROPOSED IMPROVEMENTS

(75A) TYPE OF WORK:	35 - Rehabilitation - Deterioration	(95) ROADWAY IMPROVEMENT COST:	\$ 000000
(75B) WORK DONE BY:	1 - Work to be done by contract	(96) TOTAL PROJECT COST:	\$ 000442
(76) LENGTH OF IMPROVEMENT:	000073 FT	(97) YR OF IMPROVEMENT COST EST:	2006
(94) BRIDGE IMPROVEMENT COST:	\$ 000442	(114) FUTURE AVG DAILY TRAFFIC:	052665
		(115) YR OF FUTURE ADT:	2030

Inspector: Dan Bewley
 Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
 Facility Carried: I-70 WB

Bridge Inspection Report

	Environment	Total Quantity	Units	Condition State 1	Condition State 2	Condition State 3	Condition State 4
38 - Reinforced Concrete Slab	1- Ben.	4045	sq. ft.	3895		150	
The reinforced concrete slab has a wide crack with efflorescence on the North cold joint. The wearing surface has a wide crack that mirrors the cold joint in the emergency lane. The main lanes have longitudinal hair line cracks. Photos were taken & sketches were drawn. Dan Bewley 9/14/2015							
510 - Wearing Surfaces		3826	sq. ft.	3826			
210 - Reinforced Concrete Pier Wall	1- Ben.	111	ft.	111			
The East interior pier on the East face has a wide vertical crack from top to bottom & next to that there is an approximate 8' wide area of spalls with exposed rebar. Photos were taken & sketches drawn. Both are attached to the report. Dan Bewley 9/14/2015							
215 - Reinforced Concrete Abutment	1- Ben.	110	ft.	110			
The concrete on the abutments seem to be in good condition. There is however erosion occurring about mid span at the East abutment. I can not tell if piling is exposed yet. If not I assume it soon will be. Dan Bewley 9/14/2015							
302 - Compression Joint Seal	1- Ben.	74	ft.	37		37	
The Compression Joint Seal only exist in the left lane & left emergency shoulder area at the West end. The right, ramp & emergency lanes are paved with asphalt. The East joint is missing the rubber material in the right lane & the joint has no adhesion in the emergency lane. Dan Bewley 9/14/2015							
321 - Reinforced Concrete Approach Slab	1- Ben.	2149	sq. ft.	2063		86	
The East approach slab has a few areas of spalling occurring on the cold joints. I also noted a wide longitudinal crack in the emergency lane. The West approach only has concrete in the left emergency shoulder & lane. The rest of the approach area is asphalt. Photos were taken & sketches were done. Dan Bewley 9/14/2015							
331 - Reinforced Concrete Bridge Railing	1- Ben.	146	ft.	146			
North bridge rail is in good condition, South bridge rail has vertical hair line cracks spaced about 4' to 5'. Dan Bewley 9/14/2015							

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 1

Description 9-14-2015 I70-60-05180JCWB (1) Road alignment looking West



PHOTO 2

Description 9-14-2015 I70-60-05180JCWB (17) Road alignment looking East

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 3

Description 9-14-2015 I70-60-05180JCWB (2) East approach pavement & guardrail condition



PHOTO 4

Description 9-14-2015 I70-60-05180JCWB (16) West approach pavement condition

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 5

Description 9-14-2015 I70-60-05180JCWB (14) West approach has asphalt on the right, emergency & ramp exit lanes



PHOTO 6

Description 9-14-2015 I70-60-05180JCWB (15) West asphalt approach slab has an asphalt patch on the right lane

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 7

Description 9-14-2015 I70-60-05180JCWB (13) Asphalt portion of the West approach slab has spalls & cracks in the joint area



PHOTO 8

Description 9-14-2015 I70-60-05180JCWB (3) East concrete approach slab condition

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 9

Description 9-14-2015 I70-60-05180JCWB (4) East concrete approach slab has spall along center line



PHOTO 10

Description 9-14-2015 I70-60-05180JCWB (5) East concrete approach slab has wide crack in the North cold joint

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 11
Description 9-14-2015 I70-60-05180JCWB (6) East 1A bridge joint condition



PHOTO 12
Description 9-14-2015 I70-60-05180JCWB (12) West 1A rubber is only in the left lane

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 13

Description 9-14-2015 I70-60-05180JCWB (11) West 1A bridge joint is missing in the right & exit lanes



PHOTO 14

Description 9-14-2015 I70-60-05180JCWB (7) East 1A bridge joint has spall in shoulder area & missing rubber in right lane

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 15

Description 9-14-2015 I70-60-05180JCWB (8) Wearing surface has wide crack on North cold joint



PHOTO 16

Description 9-14-2015 I70-60-05180JCWB (9) Wearing surface has 2 longitudinal hair line cracks in the right lane

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 17

Description 9-14-2015 I70-60-05180JCWB (10) North parapet wall is in good condition



PHOTO 18

Description 9-14-2015 I70-60-05180JCWB (19) South coping condition

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 19

Description 9-14-2015 I70-60-05180JCWB (27) North coping condition



PHOTO 20

Description 9-14-2015 I70-60-05180JCWB (28) North coping has leached vertical cracks at both interior piers

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 21

Description 9-14-2015 I70-60-05180JCWB (20) West abutment condition



PHOTO 22

Description 9-14-2015 I70-60-05180JCWB (32) East abutment condition

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report

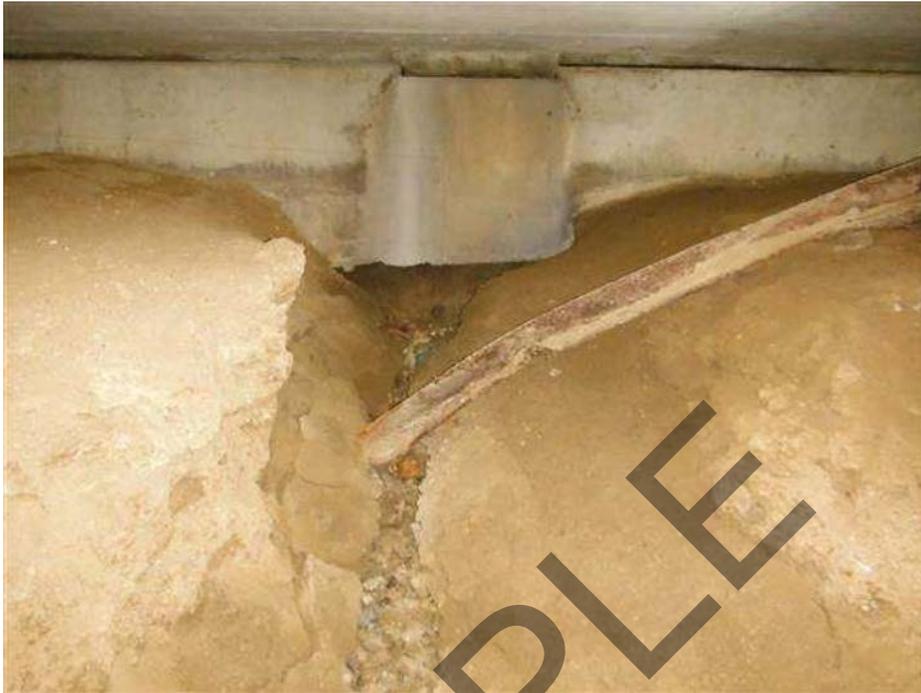


PHOTO 23

Description 9-14-2015 I70-60-05180JCWB (33) East abutment has erosion occurring about mid span, piling is exposed

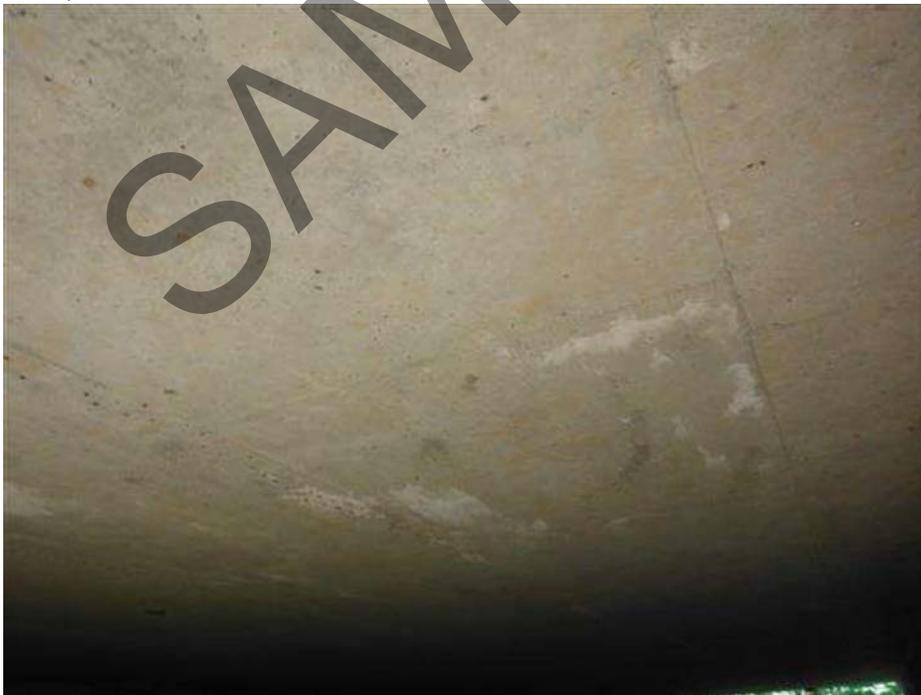


PHOTO 24

Description 9-14-2015 I70-60-05180JCWB (21) Bottom of the West span

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 25

Description 9-14-2015 I70-60-05180JCWB (22) The West span has efflorescence on the North cold joint

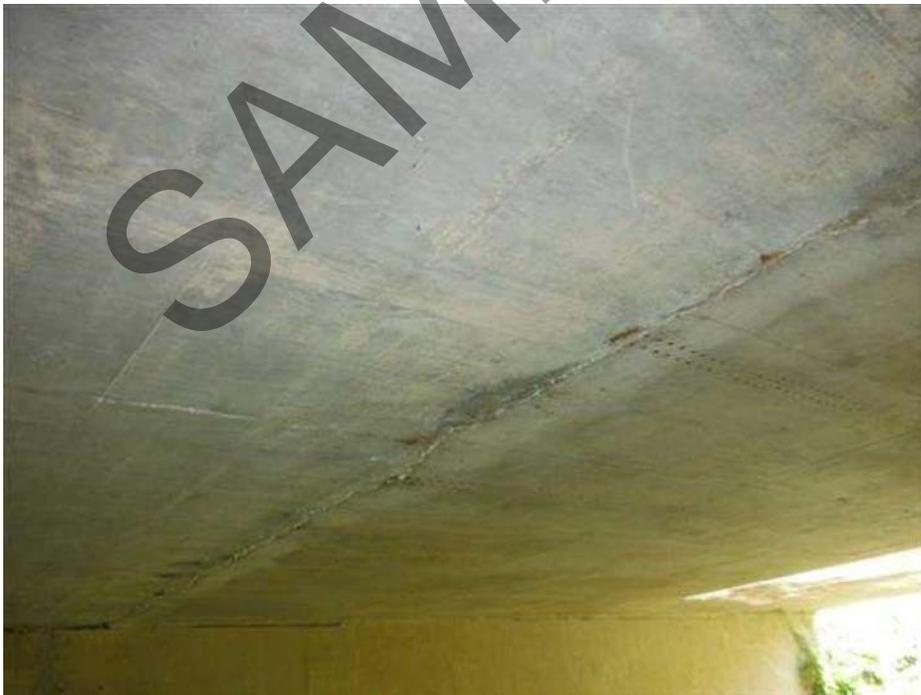


PHOTO 26

Description 9-14-2015 I70-60-05180JCWB (25) Center span condition

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 27
Description 9-14-2015 I70-60-05180JCWB (30) East span condition

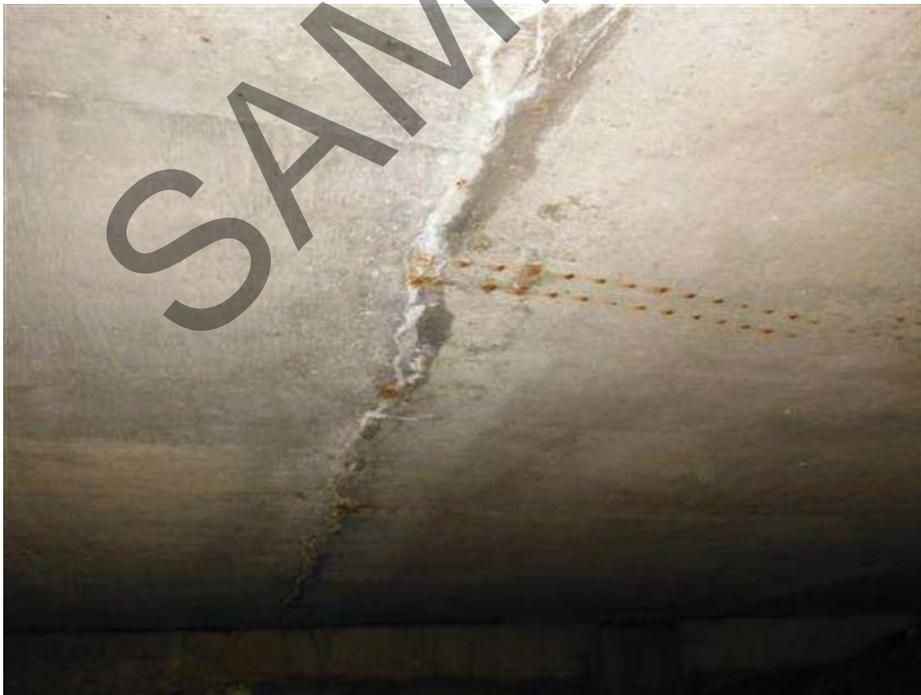


PHOTO 28
Description 9-14-2015 I70-60-05180JCWB (31) East span has efflorescence on the North cold joint

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 29
Description 9-14-2015 I70-60-05180JCWB (24) East interior pier condition West face



PHOTO 30
Description 9-14-2015 I70-60-05180JCWB (29) West interior pier condition East face

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 31

Description 9-14-2015 I70-60-05180JCWB (34) East interior pier has about 8' of spalling with exposed rebar on the East face



PHOTO 32

Description 9-14-2015 I70-60-05180JCWB (35) East interior pier has wide vertical crack on the East face about mid span

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 33

Description 9-14-2015 I70-60-05180JCWB (26) Up stream alignment or looking North from below the bridge



PHOTO 34

Description 9-14-2015 I70-60-05180JCWB (23) Down stream alignment or looking South from below the bridge

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 35
Description 9-14-2015 I70-60-05180JCWB (18) Profile looking NE

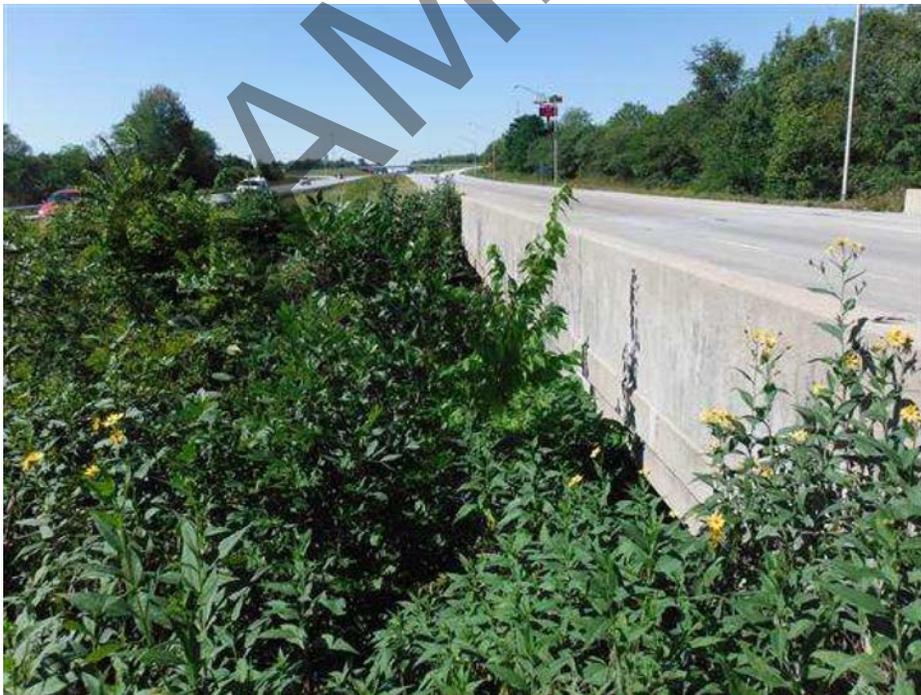


PHOTO 36
Description 9-14-2015 I70-60-05180JCWB (36) Trees growing around the parapet wall on the South side

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report



PHOTO 37

Description 9-14-2015 I70-60-05180JCWB (37) Trees growing over the North parapet wall

SAMPLE

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report

SAMPLE

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: 170-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report

Date Reported: 09/16/2015
Priority: Yellow - 2
Work Code: Erosion Control / Rip Rap

Deficiency Description:
Erosion is occurring mid span of the East abutment.
Work Description:

Date Repairs Completed:
Maintenance Comments:

Stage: Open



PHOTO 1 Description

Stage: Open



PHOTO 2 Description

Inspector: Dan Bewley
Inspection Date: 09/14/2015

Asset Name: I70-60-05180 JCWB
Facility Carried: I-70 WB

Bridge Inspection Report

Date Reported: 09/16/2015
Priority: Green - 3
Work Code: Brush Cutting / Herbicide Spray

Deficiency Description:
Trees growing along both sides of the structure.
Work Description:

Date Repairs Completed:
Maintenance Comments:

Stage: Open



PHOTO 1 Description

Stage: Open

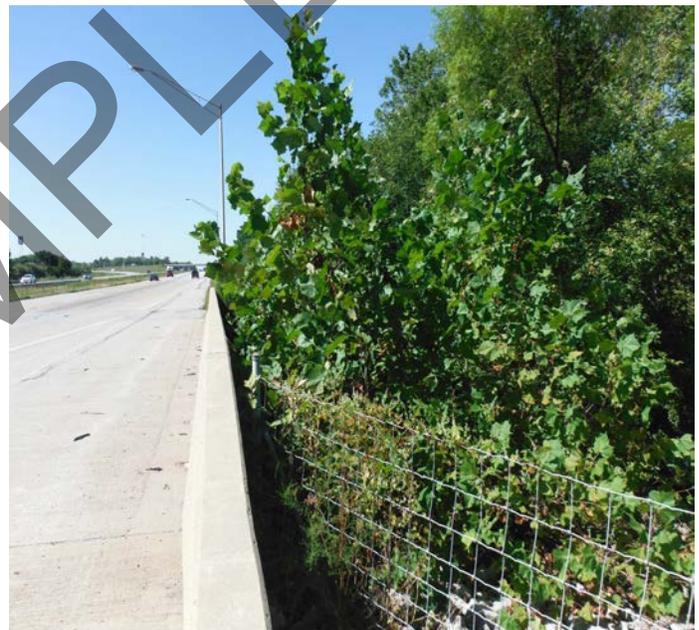
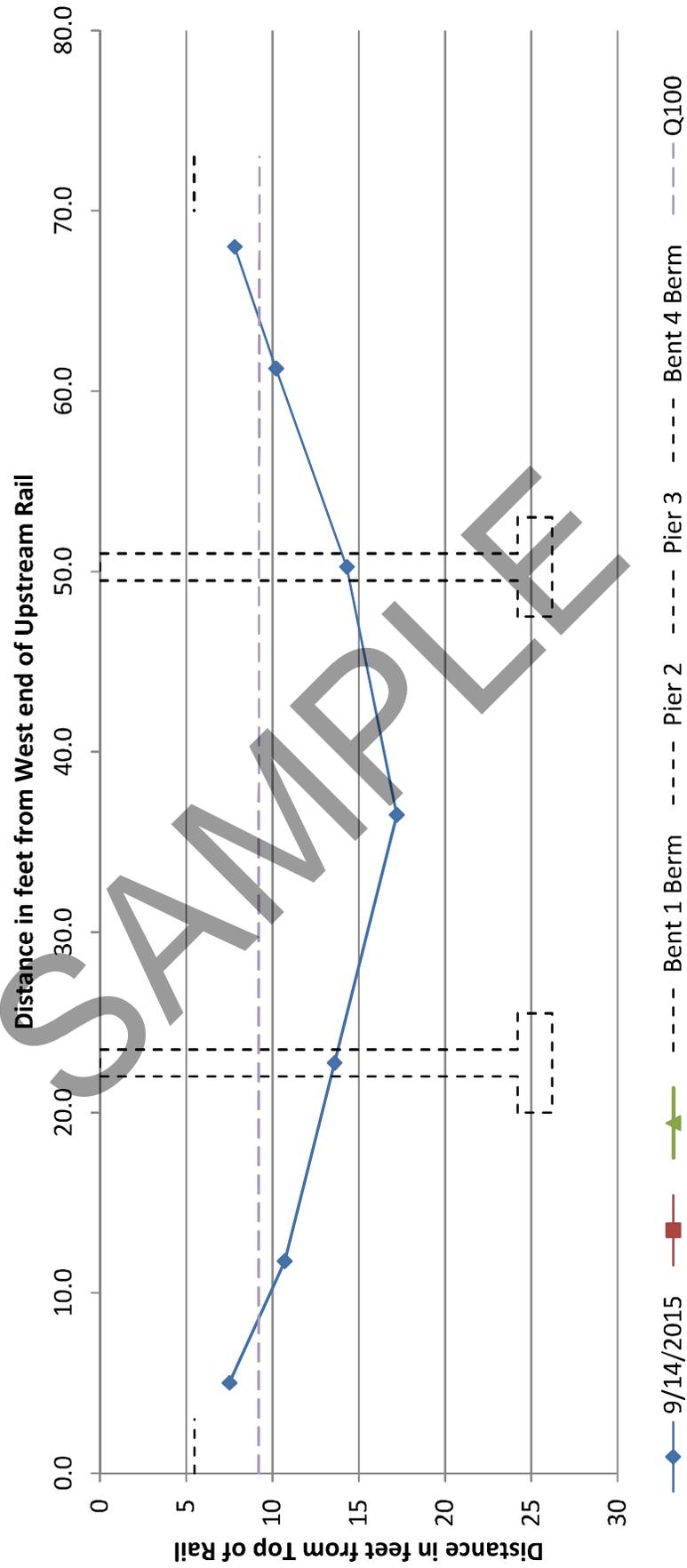


PHOTO 2 Description

Channel Profile for Bridge I70-60-05180 JCWB (RP 59.86)



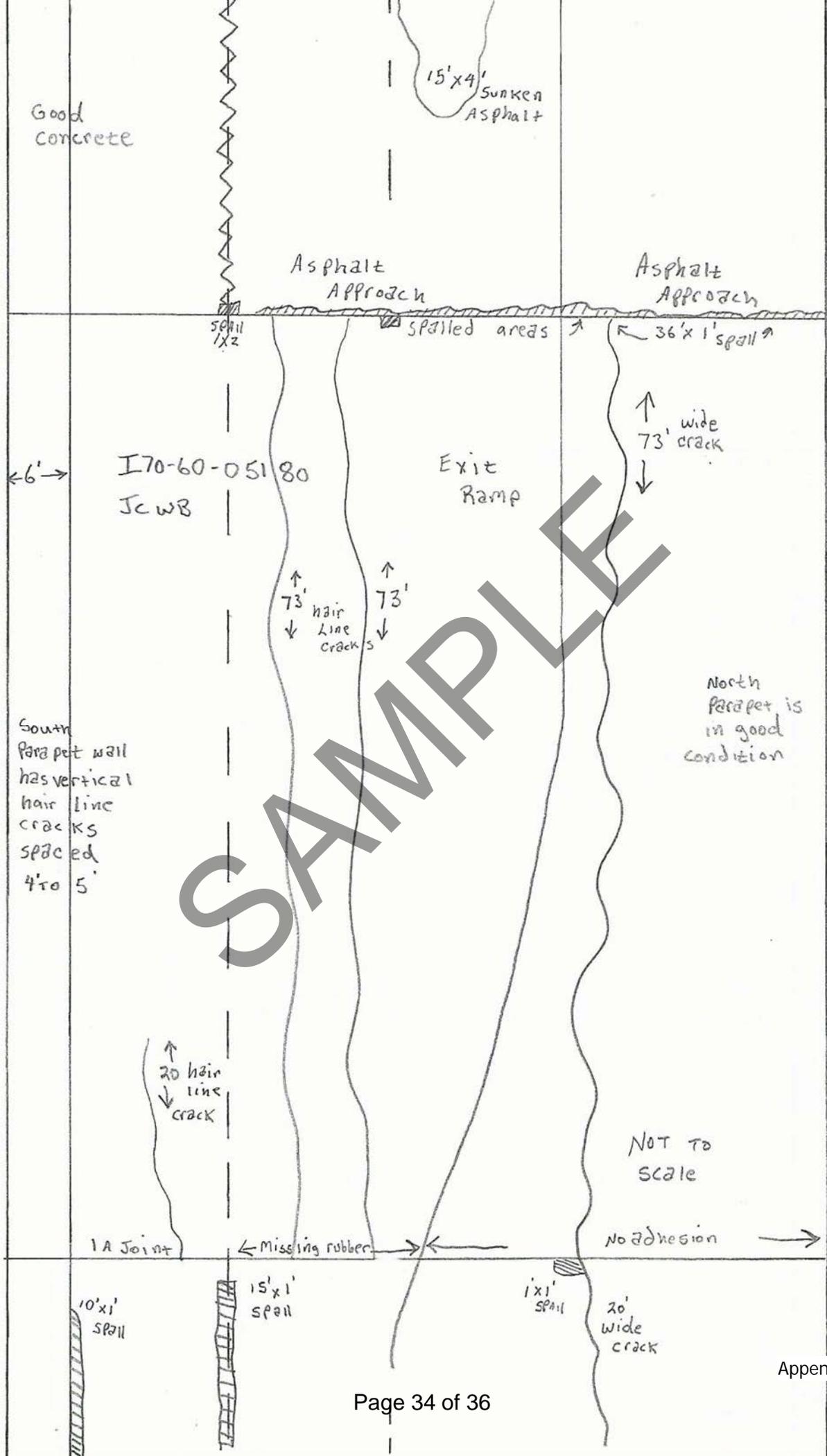
AASHTO Bridge Elements

Structure #:	170-60-05180 JCWB
NBI #:	041790
Calculated by:	Nate Pfeiffer 9/9/2015

	Elements/Defects		Description	Unit	Quantity
	Element Number	Defect Number			
National Bridge Elements (NBE)	38		Reinforced Concrete Slab	SFT	4045
	331		Reinforced Concrete Bridge Railing	LFT	146
	210		Reinforced Concrete Pier Wall	LFT	111
	215		Reinforced Concrete Abutment	LFT	110
Bridge Management Elements (BME)	302		Compression Joint Seal	LFT	74
	321		Reinforced Concrete Approach Slab	SFT	2149
	510		Wearing Surfaces	SFT	3826

Notes & Comments:

Slab: 73'-0" long x 55'-5" wide
 Rail: 73'-0" long x 2 rails
 Appr: 20'-6" long x 52'-5" wide x 2 slabs
 Seal: (41'-10" (original) + 13'-3" (widening) long) for E joint + 18'-6" for W joint
 Wall: (41'-7" (original) + 13'-11" (widening) long) x 2 piers
 Bent: (41'-10" (original) + 13'-3" (widening) long) x 2 bents
 Wear: 73'-0" long x 52'-5" wide



25'
wide
crack
on
cold
Joint
with
efflorescence

West Interior Pier is in good condition

25' wide
crack on
cold joint
with
efflorescence

Transverse
1/2" leached hair
line crack

I70-60-5180
JCWB

SAMPLE

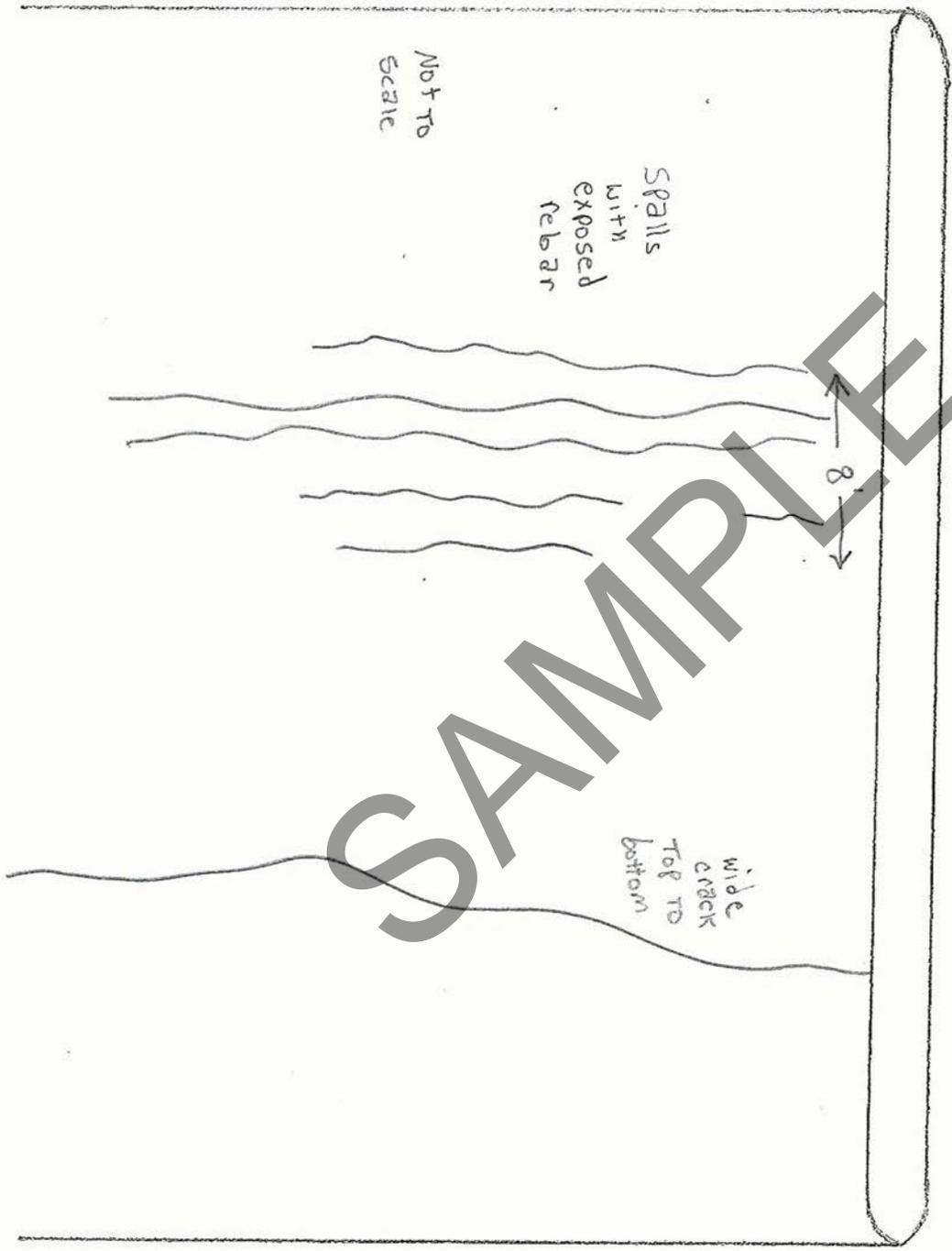
N
→

East Interior Pier has crack & spalled areas rebar exposed

25' wide
crack on
cold joint
with
efflorescence

I 70-60-05180
Jcwr

East Face of East interior Pier



Description: I-70 over Branch of McCracken Creek
Structure Number(s): I70-60-05180 CEBL & JCWB
Location: 0.43 mile East of SR39, Hendricks County

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ACTION BY</u>
1	Bridge Approach	
1.1	New approach slabs were installed during the rehabilitation of these structures in 1996. New approach slabs will be constructed to accommodate the new widened section of roadway.	
2	Bridge Superstructure	
2.1	Bridge Deck is original from 1966, in 1996 the previous overlay was removed and a new overlay as well as joints were replaced. The bridge deck was also widened during this time.	
2.2	The underside of the deck has several areas of cracking and efflorescence in each span. The worst areas of cracking and leaching is along the joints where the bridges were widened.	
2.3	Due to the quality of this deck it was talked about possibly keeping the superstructure and just widening it on the median side to accommodate the extra lane. Mick will be checking into having the deck tested or cored. WSP Parsons Brinckerhoff will also investigate alternate overlay options other than LMC. They will also look into completely closing in the median to see if this would be a best value option.	Mick Brinkerhoff
2.4	Another option that will be looked into is the use of Conspan structures which would eliminate this structure.	
3	Bridge Substructure	
3.1	Other than widening the piers no other work will be needed on the substructure.	
4	Bridge Embankments	
4.1	Banks are in great shape. WSP Parsons Brinckerhoff will be doing a scour analysis to see if any scour measures need to be taken.	WSP Parsons Brinckerhoff
5	Utilities	

5.1

No utilities in the area to be effected.

END OF SECTION

SAMPLE



Photo 1: Upstream Face of Eastbound Bridge (facing south)



Photo 2: Roadway over Eastbound Bridge (facing northwest)



Photo 2: Looking Upstream from beneath the Eastbound Bridge (facing north)



Photo 3: Looking Downstream from beneath the Westbound Bridge (facing south)



Photo 4: Downstream Channel (facing south)



Photo 5: Upstream Channel (facing north)

Hydraulics OA Checklist

Route: I-70 Des No. 1600384 & 1600385
County: Hendricks City or Town: Indianapolis
Description: I-70 Branch McCracken Creek
(Bridge No. I70-59-05180 CEBL & JCWB)
Designer: R. Toole Reviewer: R. Rampone

MAPS

- USGS Quad. Scale 1:24000 Date 2013
- ARC GIS Date
- Flood-Insurance Firm and FHBM
- Soils Map
- Aerial Photos Scale Date

STUDIES BY EXTERNAL AGENCIES

- FEMA Flood-Insurance Studies
- NRCS Watershed Studies
- USGS Gages and Studies
- Interim Floodplain Studies

STUDIES BY INTERNAL SOURCES

- Office Records
- Flood Record (High Water, Newspaper Imaging Data)

BRIDGE INSPECTION REPORTS

CALIBRATION OF HIGH-WATER DATA

- Discharge and Frequency of H.W. el.
- Influences Responsible for H.W. el. - Check Maps for Larger Streams Nearby that May Backwater the Site
- Analyze Hydraulic Performance of Existing Facility for 100-Year Flood
- Analyze Hydraulic Performance of Proposed Facility for 100-Year Flood
- Field Reconnaissance Revisions Report

DESIGN APPURTENANCES

- Dissipators, Riprap
- Scour Analysis/Evaluation

TECHNICAL RESOURCES

- Indiana Design Manual, Part II*
- Other _____

DISCHARGE CALCULATIONS

- Drainage Area Delineation
- Drainage Areas of IN Streams
- DNR Discharge Letter
- Rational Formula
- HEC-HMS / TR-20
- NRCS
- Regional Analysis
- Coordinated Discharges of IN Streams
- Log-Pearson Type III Gage Rating

HIGH-WATER ELEVATIONS

- INDOT Survey
- Plans for Existing Structure
- DNR Historic Flood Profiles
- Maintenance Records
- External Sources
- Personal Reconnaissance

ENVIRONMENTAL REPORTS

INDOT

TECHNICAL AIDS

Indiana Design Manual, Part II

INDOT and FHWA Directives

FHWA Publications

COMPUTER PROGRAMS

HY8

HEC-RAS River Analysis System

Log-Pearson Type III Analysis

WSPRO Water-Surface Profile

PFP-HYDRA

HEC-HMS / TR 20

HEC-RAS Scour Analysis

Other _____

Designed by: *Roby M Tol* _____

Date: 09-20-2016

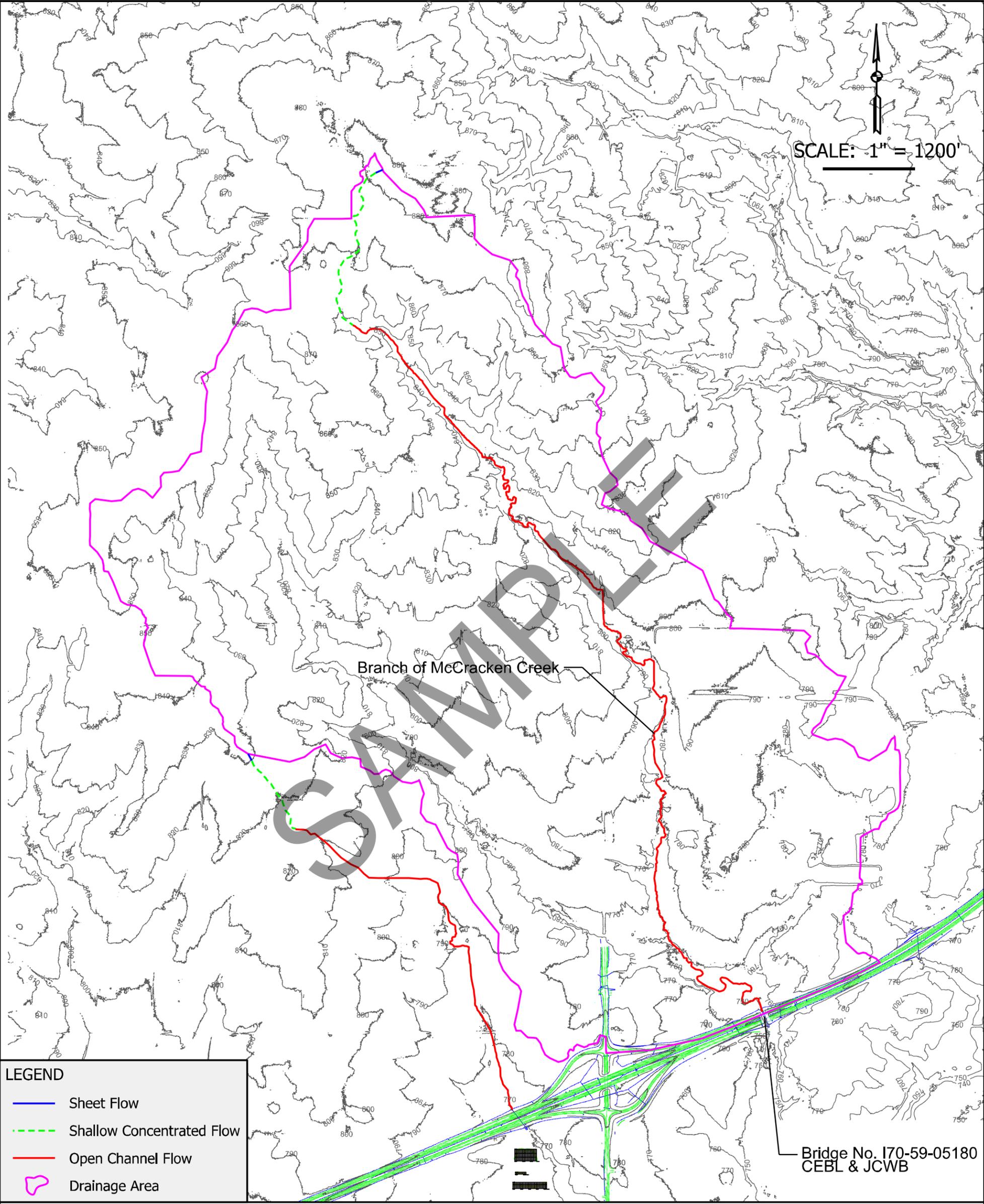
Reviewed by: *Richard A. Lamperto* _____

Date: 09-20-2016

SAMPLE

APPENDIX B
Hydrologic Data

SAMPLE

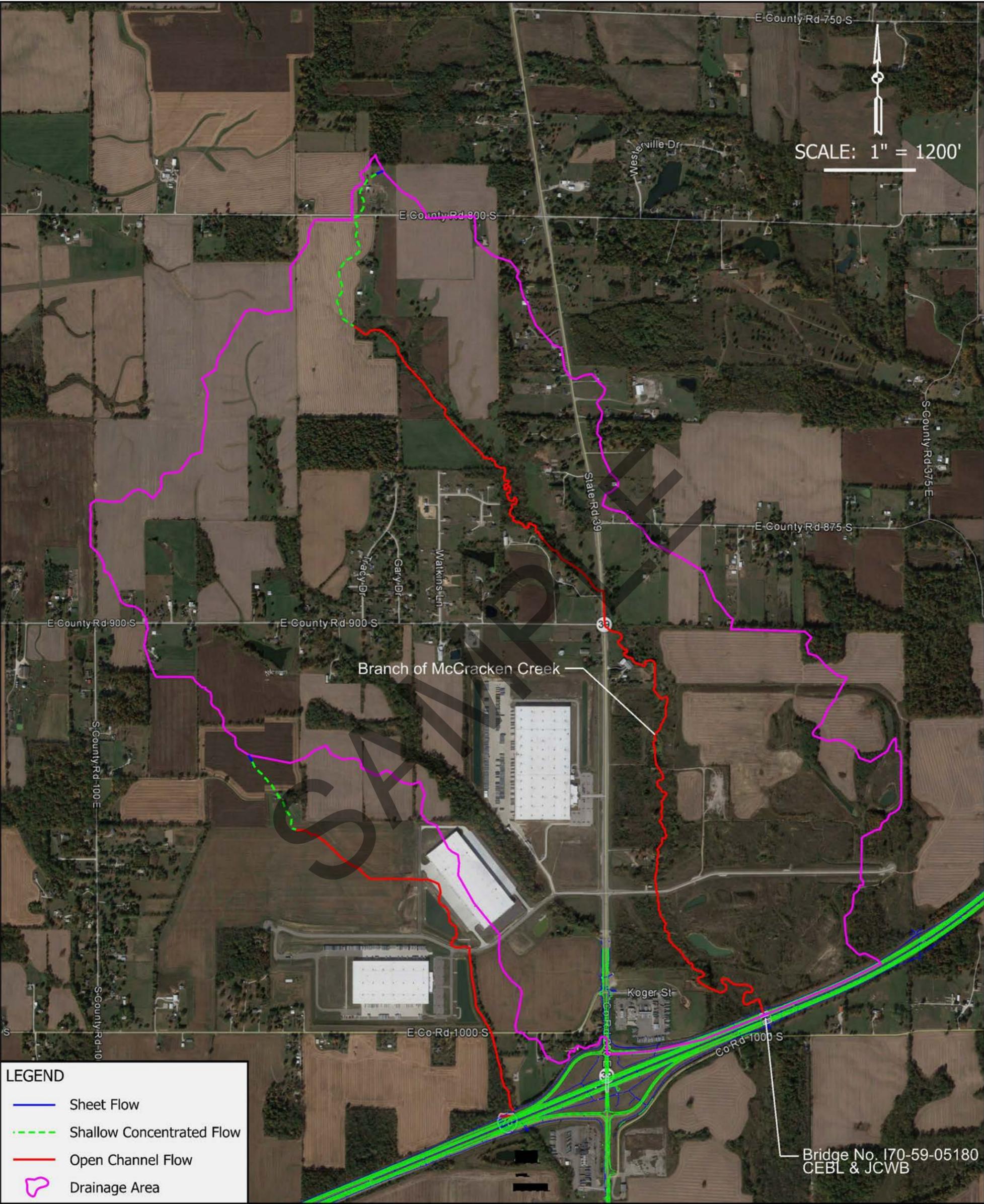


LEGEND

- Sheet Flow
- - - Shallow Concentrated Flow
- Open Channel Flow
- Drainage Area

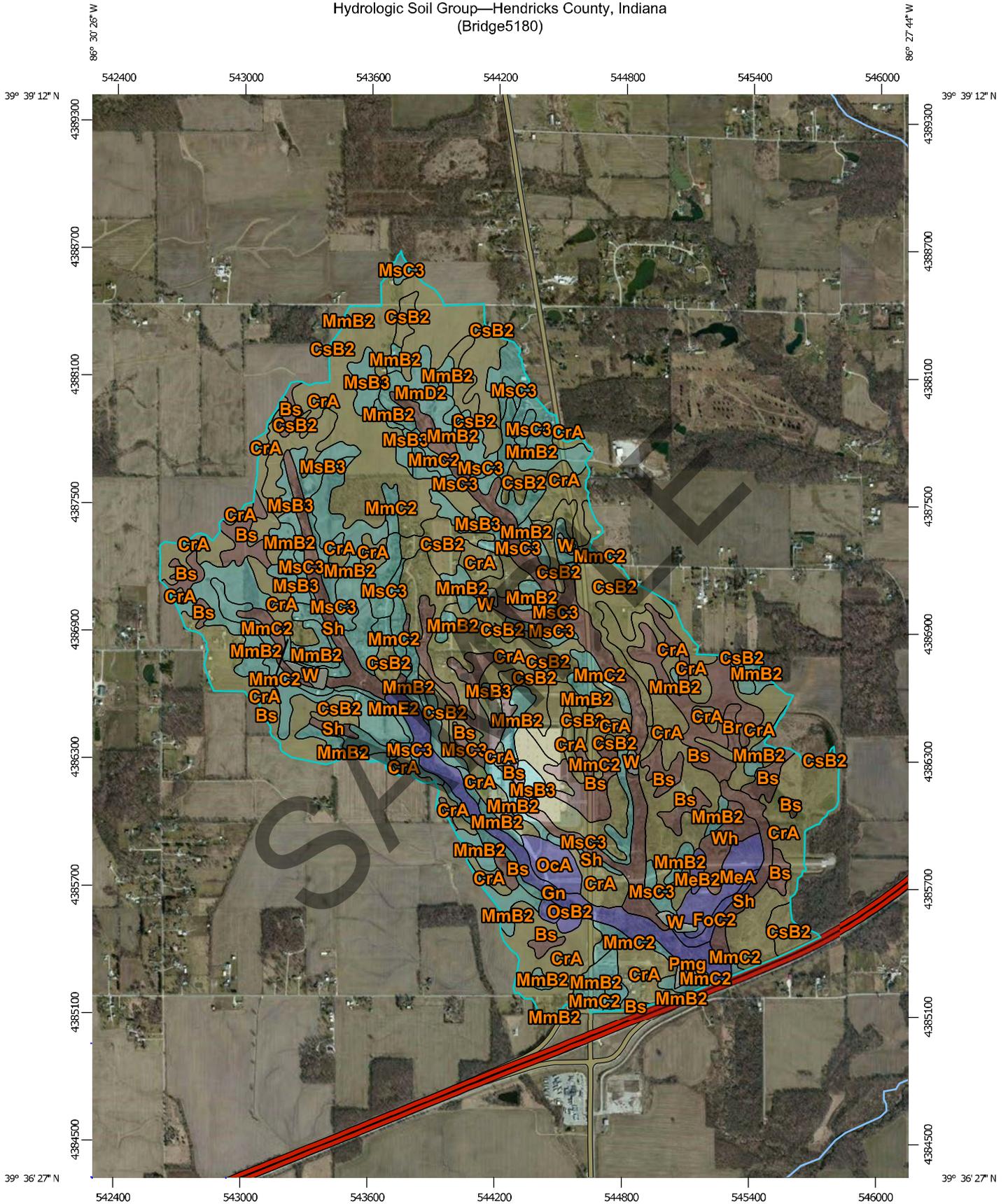


Appendix B-1
 Topographic Map with Drainage Area and Flowpath
 Bridge No. I70-59-51080 CEBL & JCWB



Appendix B-2
 Aerial Photograph with Drainage Area and Flowpath
 Bridge No. 170-59-51080 CEBL & JCWB

Hydrologic Soil Group—Hendricks County, Indiana
(Bridge5180)



Map Scale: 1:24,800 if printed on A portrait (8.5" x 11") sheet.

0 350 700 1400 2100 Meters

0 1000 2000 4000 6000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

Soil Rating Lines

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

Soil Rating Points

-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hendricks County, Indiana
Survey Area Data: Version 19, Sep 9, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 26, 2012—Mar 28, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

SAMPLE

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Hendricks County, Indiana (IN063)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Br	Brookston silt loam, overwash	B/D	3.4	0.2%
Bs	Brookston silty clay loam, 0 to 2 percent slopes	B/D	123.7	8.9%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	C/D	513.1	36.7%
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded	C/D	141.5	10.1%
FoC2	Fox loam, 6 to 12 percent slopes, eroded	B	7.4	0.5%
Gn	Genesee silt loam, 0 to 2 percent slopes, frequently flooded, very brief duration	B	40.4	2.9%
MeA	Martinsville loam, 0 to 2 percent slopes	B	16.6	1.2%
MeB2	Martinsville loam, 2 to 6 percent slopes, eroded	B	2.9	0.2%
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	C	198.1	14.2%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	C	65.8	4.7%
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded	C	25.0	1.8%
MmE2	Miami silt loam, 18 to 25 percent slopes, eroded	C	2.8	0.2%
MsB3	Miami clay loam, 2 to 6 percent slopes, severely eroded	C	47.9	3.4%
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	C	62.0	4.4%
OcA	Ockley silt loam, 0 to 2 percent slopes	B	11.7	0.8%
OsB2	Ockley silt loam, loamy substratum, 2 to 6 percent slopes, eroded	B	2.1	0.1%

Hydrologic Soil Group— Summary by Map Unit — Hendricks County, Indiana (IN063)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Pmg	Pits, gravel		2.7	0.2%
Sh	Shoals silt loam, 0 to 2 percent slopes, frequently flooded, brief duration	B/D	108.8	7.8%
W	Water		9.5	0.7%
Wh	Whitaker silt loam	B/D	12.5	0.9%
Totals for Area of Interest			1,397.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

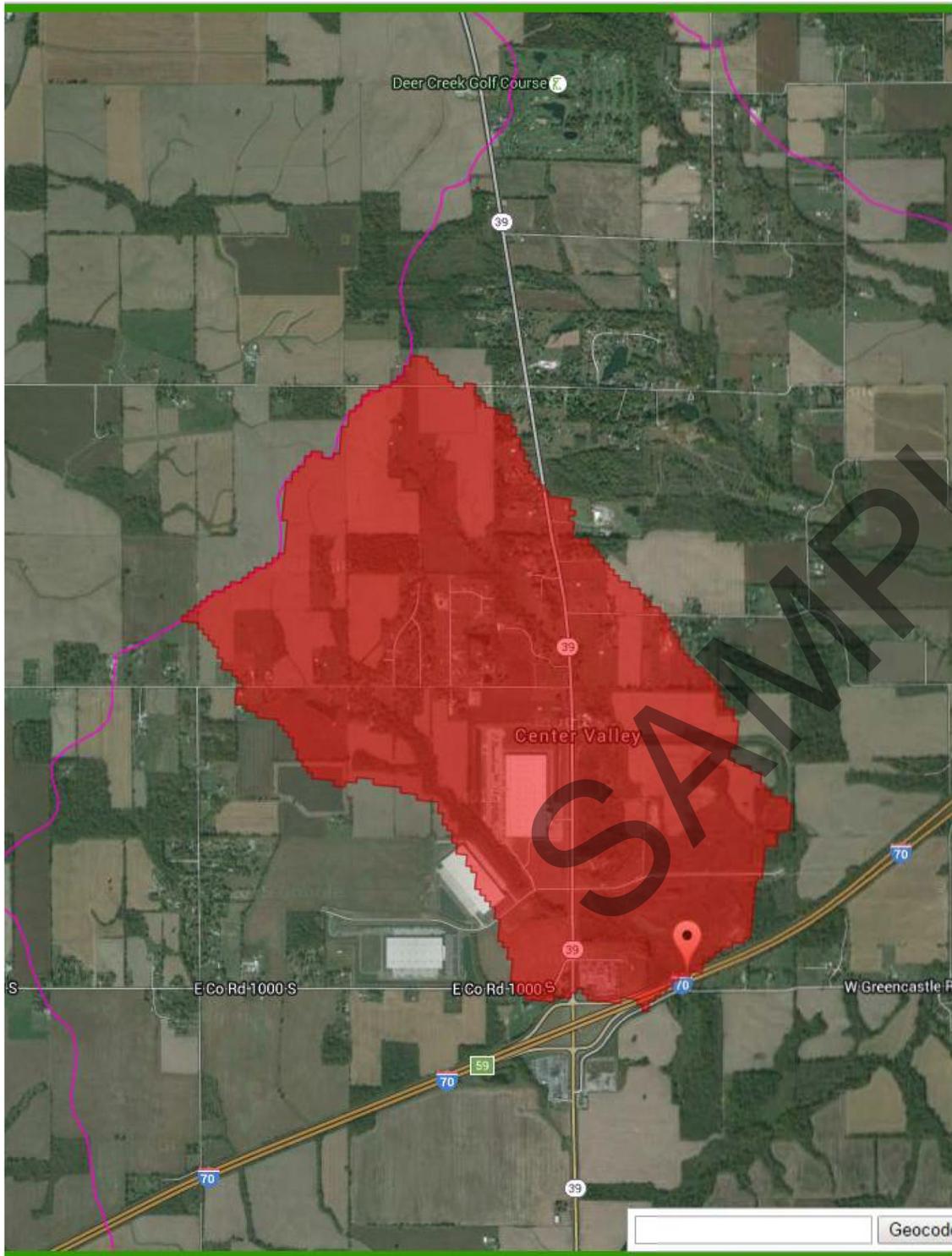
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

SAMPLE



L-THIA GLWMS		
Open Water	B	2.22
Open Water	C	0.22
Open Water	D	2.45
Open Space/Park	B	4.67
Open Space/Park	C	19.57
Open Space/Park	D	76.50
Low-Density Residential (general 1/3 - 2 ac lots)	C	3.56
Low-Density Residential (general 1/3 - 2 ac lots)	D	9.79
High-density Residential (townhomes to 1/4 ac lots)	B	0.67
High-density Residential (townhomes to 1/4 ac lots)	C	2.22
High-density Residential (townhomes to 1/4 ac lots)	D	2.45
Deciduous Forest	B	44.26
Deciduous Forest	C	48.04
Deciduous Forest	D	151.67
Grassland; Herbaceous	B	0.22
Grassland; Herbaceous	C	1.78
Grassland; Herbaceous	D	10.45
Pasture/Hay	B	1.33
Pasture/Hay	C	86.96
Pasture/Hay	D	213.50
Cropland generalized agriculture	B	39.36
Cropland generalized agriculture	C	232.85
Cropland generalized agriculture	D	477.70
Total		1432.45

**WSP | Parsons Brinckerhoff
Runoff Coefficient Calculation**

Based on IDM Figure 202-2E & IDM Figure 202-2F

Project: INDOT I-70 Added Travel Lanes
Location: Bridge I70-59-05180

Calculated By: RMT Date: 7/29/2016
Checked By: RAR Date: 8/3/2016

average slope % 0.008

Land use	Soil group	Area (acres)	CN (IDM 202-2F)	C (IDM 202-2E)
Water	Any	4.9	100	1
Commercial	A		89	0.7
Commercial	B		92	0.78
Commercial	C		94	0.87
Commercial	D		95	0.95
Agriculture	A		67	0.3
Agriculture	B	35.0	76	0.5
Agriculture	C	212.0	83	0.5
Agriculture	D	475.0	86	0.6
HD - Residential	A		77	0.6
HD - Residential	B	0.7	85	0.65
HD - Residential	C	2.2	90	0.7
HD - Residential	D	2.5	92	0.75
LD - Residential	A		54	0.25
LD - Residential	B		70	0.3
LD - Residential	C		80	0.35
LD - Residential	D	9.5	85	0.4
Grass / Pasture	A		49	0.1
Grass / Pasture	B	6.0	69	0.3
Grass / Pasture	C	102.8	79	0.3
Grass / Pasture	D	300.0	84	0.4
Forest	A		43	0.1
Forest	B	40.0	65	0.3
Forest	C	45.0	76	0.3
Forest	D	150.0	82	0.4
Industrial	A		81	0.6
Industrial	B		88	0.7
Industrial	C		91	0.8
Industrial	D		93	0.9
Others	Any		100	1
Impervious	Any	12.4	98	0.9

Total Area **1398.0**

weighted CN **83**

weighted C **0.48**



NOAA Atlas 14, Volume 2, Version 3
INDIANAPOLIS WSFO AP
 Station ID: 12-4259
 Location name: Indianapolis, Indiana, US*
 Latitude: 39.7317°, Longitude: -86.2789°
 Elevation:
 Elevation (station metadata): 790 ft*
 * source: Google Maps



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.384 (0.346-0.427)	0.457 (0.412-0.508)	0.547 (0.493-0.608)	0.618 (0.554-0.686)	0.709 (0.631-0.788)	0.782 (0.691-0.871)	0.852 (0.746-0.951)	0.925 (0.802-1.04)	1.02 (0.873-1.16)	1.10 (0.923-1.25)
10-min	0.596 (0.537-0.664)	0.713 (0.643-0.792)	0.850 (0.766-0.945)	0.954 (0.855-1.06)	1.08 (0.966-1.21)	1.19 (1.05-1.32)	1.28 (1.12-1.43)	1.38 (1.20-1.55)	1.50 (1.28-1.70)	1.60 (1.34-1.82)
15-min	0.731 (0.659-0.813)	0.872 (0.787-0.969)	1.04 (0.940-1.16)	1.17 (1.05-1.30)	1.34 (1.19-1.49)	1.47 (1.30-1.63)	1.59 (1.40-1.78)	1.72 (1.49-1.93)	1.88 (1.60-2.12)	2.00 (1.68-2.27)
30-min	0.967 (0.871-1.08)	1.17 (1.05-1.30)	1.43 (1.29-1.59)	1.63 (1.46-1.81)	1.89 (1.69-2.10)	2.10 (1.85-2.34)	2.30 (2.01-2.57)	2.51 (2.17-2.81)	2.78 (2.37-3.14)	2.99 (2.52-3.40)
60-min	1.18 (1.06-1.31)	1.43 (1.29-1.59)	1.79 (1.61-1.99)	2.07 (1.86-2.30)	2.46 (2.19-2.73)	2.76 (2.44-3.08)	3.08 (2.69-3.43)	3.40 (2.95-3.81)	3.85 (3.28-4.34)	4.20 (3.54-4.78)
2-hr	1.39 (1.25-1.54)	1.68 (1.51-1.87)	2.11 (1.90-2.34)	2.45 (2.20-2.72)	2.94 (2.61-3.25)	3.33 (2.93-3.70)	3.75 (3.26-4.17)	4.19 (3.59-4.67)	4.81 (4.04-5.39)	5.31 (4.38-6.01)
3-hr	1.47 (1.33-1.64)	1.78 (1.61-1.98)	2.24 (2.02-2.49)	2.61 (2.35-2.90)	3.14 (2.79-3.49)	3.58 (3.15-3.97)	4.05 (3.52-4.50)	4.55 (3.89-5.08)	5.26 (4.40-5.92)	5.84 (4.79-6.62)
6-hr	1.74 (1.58-1.94)	2.11 (1.92-2.35)	2.67 (2.41-2.96)	3.12 (2.80-3.45)	3.77 (3.35-4.16)	4.31 (3.79-4.76)	4.89 (4.24-5.42)	5.51 (4.70-6.13)	6.41 (5.34-7.17)	7.15 (5.82-8.06)
12-hr	2.07 (1.89-2.29)	2.49 (2.27-2.76)	3.10 (2.82-3.43)	3.60 (3.26-3.97)	4.29 (3.84-4.73)	4.86 (4.31-5.35)	5.46 (4.79-6.02)	6.08 (5.26-6.75)	6.97 (5.89-7.80)	7.68 (6.37-8.65)
24-hr	2.46 (2.29-2.65)	2.95 (2.75-3.18)	3.62 (3.37-3.89)	4.13 (3.85-4.45)	4.83 (4.48-5.20)	5.38 (4.97-5.79)	5.94 (5.47-6.38)	6.50 (5.96-6.99)	7.27 (6.62-7.83)	7.86 (7.11-8.73)
2-day	2.87 (2.68-3.07)	3.43 (3.21-3.68)	4.19 (3.91-4.48)	4.76 (4.44-5.10)	5.54 (5.15-5.92)	6.15 (5.70-6.57)	6.76 (6.25-7.23)	7.39 (6.79-7.91)	8.22 (7.51-8.81)	8.86 (8.04-9.51)
3-day	3.06 (2.88-3.27)	3.66 (3.44-3.91)	4.44 (4.17-4.73)	5.04 (4.72-5.37)	5.85 (5.47-6.23)	6.48 (6.04-6.90)	7.12 (6.61-7.58)	7.76 (7.18-8.27)	8.62 (7.93-9.20)	9.28 (8.50-9.92)
4-day	3.26 (3.08-3.46)	3.89 (3.67-4.13)	4.69 (4.43-4.99)	5.31 (5.00-5.63)	6.15 (5.78-6.53)	6.81 (6.38-7.22)	7.47 (6.98-7.92)	8.13 (7.57-8.63)	9.02 (8.36-9.58)	9.71 (8.96-10.3)
7-day	3.85 (3.63-4.09)	4.58 (4.31-4.86)	5.49 (5.17-5.83)	6.22 (5.84-6.59)	7.20 (6.75-7.63)	7.98 (7.45-8.44)	8.76 (8.16-9.28)	9.56 (8.88-10.1)	10.6 (9.83-11.3)	11.5 (10.6-12.2)
10-day	4.39 (4.14-4.68)	5.21 (4.92-5.55)	6.23 (5.88-6.63)	7.03 (6.63-7.48)	8.12 (7.63-8.63)	8.98 (8.41-9.53)	9.84 (9.20-10.5)	10.7 (9.98-11.4)	11.9 (11.0-12.7)	12.8 (11.8-13.6)
20-day	5.99 (5.67-6.36)	7.09 (6.71-7.51)	8.36 (7.90-8.86)	9.35 (8.82-9.90)	10.7 (10.0-11.3)	11.7 (11.0-12.3)	12.7 (11.9-13.4)	13.7 (12.8-14.4)	15.0 (13.9-15.8)	15.9 (14.8-16.9)
30-day	7.39 (6.99-7.81)	8.71 (8.23-9.20)	10.1 (9.57-10.7)	11.2 (10.6-11.8)	12.7 (11.9-13.4)	13.7 (12.9-14.5)	14.8 (13.9-15.6)	15.9 (14.8-16.8)	17.2 (16.0-18.2)	18.2 (16.9-19.3)
45-day	9.35 (8.88-9.85)	11.0 (10.4-11.6)	12.6 (12.0-13.3)	13.9 (13.2-14.7)	15.6 (14.7-16.4)	16.8 (15.9-17.7)	18.0 (16.9-18.9)	19.1 (18.0-20.1)	20.5 (19.3-21.6)	21.6 (20.2-22.8)
60-day	11.2 (10.6-11.8)	13.1 (12.4-13.8)	15.0 (14.3-15.8)	16.5 (15.6-17.4)	18.4 (17.4-19.3)	19.8 (18.7-20.8)	21.1 (19.9-22.2)	22.4 (21.1-23.6)	24.0 (22.5-25.3)	25.2 (23.6-26.6)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.61 (4.15-5.12)	5.48 (4.94-6.10)	6.56 (5.92-7.30)	7.42 (6.65-8.23)	8.51 (7.57-9.46)	9.38 (8.29-10.5)	10.2 (8.95-11.4)	11.1 (9.62-12.4)	12.3 (10.5-13.9)	13.2 (11.1-15.0)
10-min	3.58 (3.22-3.98)	4.28 (3.86-4.75)	5.10 (4.60-5.67)	5.72 (5.13-6.35)	6.51 (5.80-7.23)	7.11 (6.28-7.92)	7.70 (6.74-8.59)	8.29 (7.18-9.29)	9.03 (7.70-10.2)	9.58 (8.06-10.9)
15-min	2.92 (2.64-3.25)	3.49 (3.15-3.88)	4.18 (3.76-4.64)	4.69 (4.21-5.21)	5.36 (4.77-5.96)	5.87 (5.18-6.54)	6.38 (5.58-7.11)	6.87 (5.95-7.70)	7.51 (6.41-8.48)	7.98 (6.72-9.08)
30-min	1.93 (1.74-2.15)	2.33 (2.11-2.59)	2.86 (2.57-3.18)	3.26 (2.92-3.62)	3.79 (3.37-4.21)	4.19 (3.71-4.67)	4.60 (4.03-5.13)	5.01 (4.34-5.62)	5.57 (4.75-6.28)	5.98 (5.03-6.81)
60-min	1.18 (1.06-1.31)	1.43 (1.29-1.59)	1.79 (1.61-1.99)	2.07 (1.86-2.30)	2.46 (2.19-2.73)	2.76 (2.44-3.08)	3.08 (2.69-3.43)	3.40 (2.95-3.81)	3.85 (3.28-4.34)	4.20 (3.54-4.78)
2-hr	0.693 (0.626-0.772)	0.838 (0.756-0.934)	1.05 (0.949-1.17)	1.23 (1.10-1.36)	1.47 (1.30-1.63)	1.67 (1.47-1.85)	1.88 (1.63-2.08)	2.10 (1.80-2.33)	2.41 (2.02-2.70)	2.66 (2.19-3.00)
3-hr	0.489 (0.442-0.546)	0.592 (0.536-0.659)	0.746 (0.673-0.829)	0.870 (0.782-0.967)	1.05 (0.930-1.16)	1.19 (1.05-1.32)	1.35 (1.17-1.50)	1.51 (1.30-1.69)	1.75 (1.47-1.97)	1.94 (1.59-2.20)
6-hr	0.291 (0.265-0.324)	0.353 (0.320-0.392)	0.445 (0.403-0.494)	0.521 (0.468-0.576)	0.629 (0.559-0.695)	0.720 (0.633-0.796)	0.817 (0.708-0.905)	0.920 (0.785-1.02)	1.07 (0.891-1.20)	1.19 (0.972-1.35)
12-hr	0.172 (0.157-0.190)	0.207 (0.189-0.229)	0.257 (0.234-0.284)	0.299 (0.270-0.329)	0.356 (0.319-0.392)	0.403 (0.357-0.444)	0.453 (0.397-0.500)	0.505 (0.436-0.560)	0.578 (0.489-0.647)	0.637 (0.529-0.718)
24-hr	0.103 (0.096-0.110)	0.123 (0.115-0.133)	0.151 (0.140-0.162)	0.172 (0.160-0.185)	0.201 (0.187-0.217)	0.224 (0.207-0.241)	0.247 (0.228-0.266)	0.271 (0.248-0.291)	0.303 (0.276-0.326)	0.328 (0.296-0.364)
2-day	0.060 (0.056-0.064)	0.072 (0.067-0.077)	0.087 (0.081-0.093)	0.099 (0.093-0.106)	0.115 (0.107-0.123)	0.128 (0.119-0.137)	0.141 (0.130-0.151)	0.154 (0.142-0.165)	0.171 (0.156-0.184)	0.184 (0.168-0.198)
3-day	0.043 (0.040-0.045)	0.051 (0.048-0.054)	0.062 (0.058-0.066)	0.070 (0.066-0.075)	0.081 (0.076-0.086)	0.090 (0.084-0.096)	0.099 (0.092-0.105)	0.108 (0.100-0.115)	0.120 (0.110-0.128)	0.129 (0.118-0.138)
4-day	0.034 (0.032-0.036)	0.041 (0.038-0.043)	0.049 (0.046-0.052)	0.055 (0.052-0.059)	0.064 (0.060-0.068)	0.071 (0.066-0.075)	0.078 (0.073-0.082)	0.085 (0.079-0.090)	0.094 (0.087-0.100)	0.101 (0.093-0.108)
7-day	0.023 (0.022-0.024)	0.027 (0.026-0.029)	0.033 (0.031-0.035)	0.037 (0.035-0.039)	0.043 (0.040-0.045)	0.047 (0.044-0.050)	0.052 (0.049-0.055)	0.057 (0.053-0.060)	0.063 (0.058-0.067)	0.068 (0.063-0.072)
10-day	0.018 (0.017-0.019)	0.022 (0.020-0.023)	0.026 (0.024-0.028)	0.029 (0.028-0.031)	0.034 (0.032-0.036)	0.037 (0.035-0.040)	0.041 (0.038-0.044)	0.045 (0.042-0.047)	0.050 (0.046-0.053)	0.053 (0.049-0.057)
20-day	0.012 (0.012-0.013)	0.015 (0.014-0.016)	0.017 (0.016-0.018)	0.019 (0.018-0.021)	0.022 (0.021-0.023)	0.024 (0.023-0.026)	0.026 (0.025-0.028)	0.028 (0.027-0.030)	0.031 (0.029-0.033)	0.033 (0.031-0.035)
30-day	0.010 (0.010-0.011)	0.012 (0.011-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.016)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.021 (0.019-0.022)	0.022 (0.021-0.023)	0.024 (0.022-0.025)	0.025 (0.023-0.027)
45-day	0.009 (0.008-0.009)	0.010 (0.010-0.011)	0.012 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.014-0.015)	0.016 (0.015-0.016)	0.017 (0.016-0.017)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.020 (0.019-0.021)
60-day	0.008 (0.007-0.008)	0.009 (0.009-0.010)	0.010 (0.010-0.011)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.014)	0.015 (0.014-0.015)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.017 (0.016-0.018)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

WSP | Parsons Brinckerhoff
Time of Concentration (Tc) or Travel Time (Tt)
Based on TR-55 Worksheet 3. & IDM Figure 202-2A

Project: INDOT I-70 Added Travel Lanes
Location: Bridge I70-59-05180

By: RMT
Checked: RAR

Date: 7/29/2016
Date: 8/3/2016

Present or Developed?

Tc or Tt through subarea?

NOTES: Space for as many as two segments per flow type can be used for each worksheet.
 Text in blue does not need to be entered -- it will be automatically calculated.

Sheet Flow (Applicable to Tc only)

1. Surface description (Figure 202-2B)
2. Manning's roughness coefficient for sheet flow, n (Figure 202-2B)
3. Flow Length, L (total L <= 100 ft)
4. Two year 24-hour rainfall, P2 (NOAA Table)
5. Land slope, s
6. $T_t = [0.007 (n L)^{0.8}] / [p_2^{0.5} s^{0.4}]$

Segment ID	A		
	Short Grass		
	0.15		
ft	100		
in	2.95		
ft/ft	0.014	0.017	
hr	0.1962		sub total
			0.1962

Shallow Concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (Figure 202-2D)
11. $T_t = L / (3600 V)$

Segment ID	B		
	unpaved		
ft	2422		
ft/ft	0.010		
ft/s	1.60		sub total
hr	0.4204		0.4204

Channel Flow

12. Width of ditch bottom
13. Ratio of Horizontal to Vertical of left ditch side slope (XH:1V)
14. Ratio of Horizontal to Vertical of right ditch side slope (XH:1V)
15. Bankfull depth of flow:
16. Cross sectional flow area, a
17. Wetted Perimeter, p_w
18. Hydraulic radius, r=a/p_w
19. Channel slope, s
20. Manning's roughness coeff. for channel flow, n (Figure 202-2C)
21. $V = [1.49 r^{0.67} s^{0.5}] / n$
22. Flow Length, L
23. $T_t = L / (3600 V)$

Segment ID	C	D	
ft	5	3	
	2	4	
	2.5	6	
ft	2.0	2.0	
ft ²	19.00	26.00	
ft ²	14.86	23.41	
ft ²	1.28	1.11	
ft/ft	0.013	0.006	
	0.04	0.035	
ft/s	5.01	3.54	
ft	2994	11370	sub total
hr	0.1661	0.8928	1.0589

24. Total Time of Concentration or Travel Time

Tc/Tt for area in hours	1.6754
Tc/Tt for area in minutes (5 minutes is minimum)	101
T_{lag} (T_{lag} = 0.6*Tc) for area in minutes	61

BASIN INPUTS

Subbasin | Loss | Transform | Options

Basin Name: Bridge5180
Element Name: Bridge5180

Description:

Downstream: --None--

*Area (MI2) 2.18

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Canopy Method: --None--

Surface Method: --None--

Loss Method: SCS Curve Number

Transform Method: SCS Unit Hydrograph

Baseflow Method: --None--

Subbasin | Loss | Transform | Options

Basin Name: Bridge5180
Element Name: Bridge5180

Initial Abstraction (IN)

*Curve Number: 83

*Impervious (%) 0.0

Subbasin | Loss | Transform | Options

Basin Name: Bridge5180
Element Name: Bridge5180

Graph Type: Standard

*Lag Time (MIN) 61

SAMPLE

STORM INPUTS & OUTPUTS – 100 YEAR, 15 MINUTE STORM DURATION

Time-Series Gage

Name: 100yr 015min

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

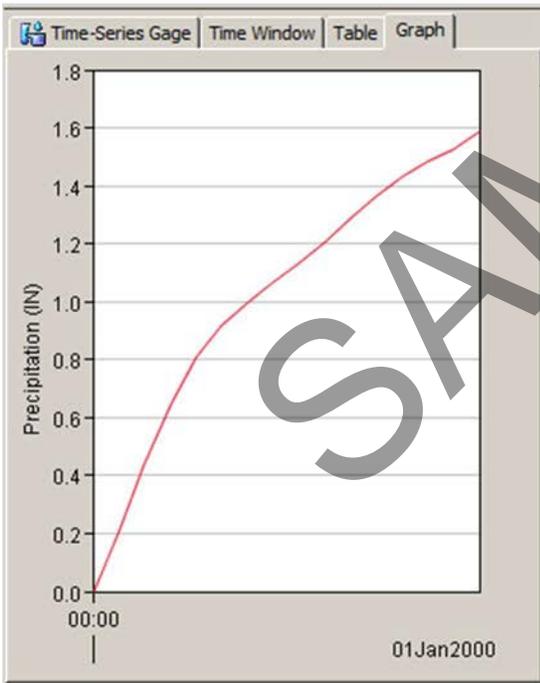
Name: 100yr 015min

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr015min"

Project: I-70 Drainage Simulation Run: 5180 100yr015min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 00:15 Meteorologic Model: 100yr 015min

Compute Time: 03Aug2016, 16:15:25 Control Specifications: 15 Minute Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	20.820	01Jan2000, 00:15	0.001

STORM INPUTS & OUTPUTS – 100 YEAR, 30 MINUTE STORM DURATION

Time-Series Gage

Name: 100yr 030min

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

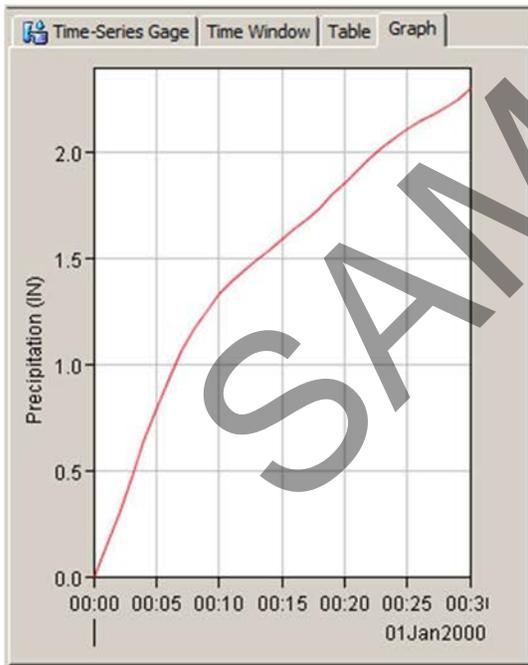
Name: 100yr 030min

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr030min"

Project: I-70 Drainage Simulation Run: 5180 100yr030min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 00:30 Meteorologic Model: 100yr 030min

Compute Time: 03Aug2016, 16:15:26 Control Specifications: 30 Minute Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	145.482	01Jan2000, 00:30	0.013

STORM INPUTS & OUTPUTS – 100 YEAR, 1 HOUR STORM DURATION

Time-Series Gage

Name: 100yr 060min (1hr)

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

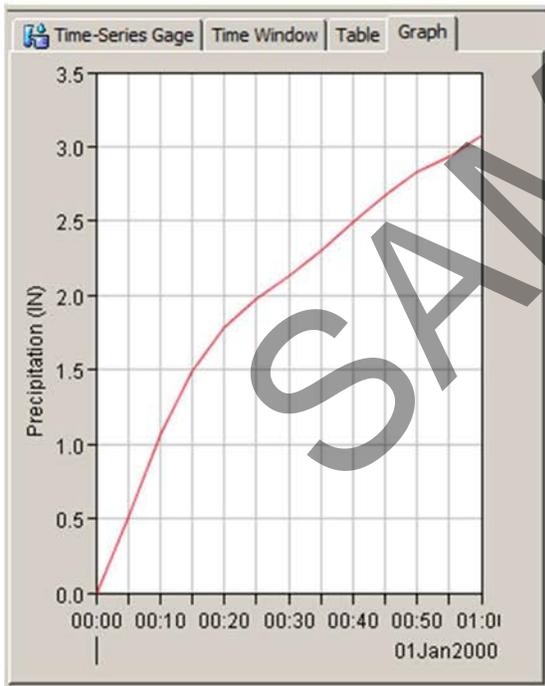
Name: 100yr 060min (1hr)

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr060min"

Project: I-70 Drainage Simulation Run: 5180 100yr060min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 01:00 Meteorologic Model: 100yr 060min (1hr)

Compute Time: 03Aug2016, 16:15:26 Control Specifications: 1 Hour Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	792.923	01Jan2000, 01:00	0.161

STORM INPUTS & OUTPUTS – 100 YEAR, 2 HOUR STORM DURATION

Time-Series Gage

Name: 100yr 120min (2hr)

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

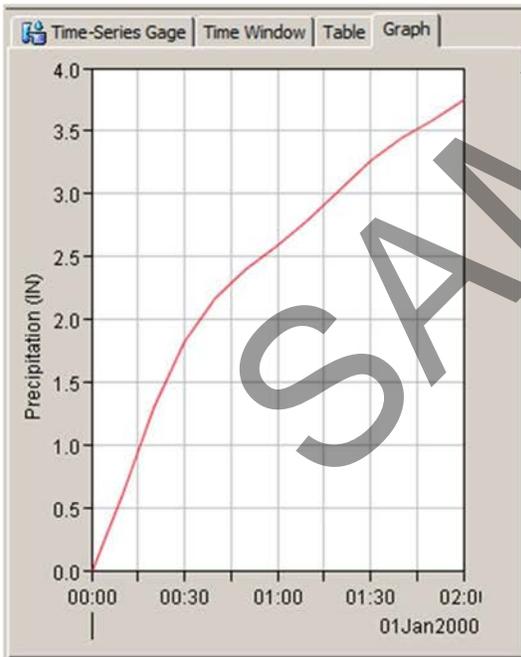
Name: 100yr 120min (2hr)

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr120min"

Project: I-70 Drainage Simulation Run: 5180 100yr120min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 02:00 Meteorologic Model: 100yr 120min (2hr)

Compute Time: 03Aug2016, 16:15:26 Control Specifications: 2 Hour Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	1305.953	01Jan2000, 02:00	0.842

STORM INPUTS & OUTPUTS – 100 YEAR, 3 HOUR STORM DURATION

Time-Series Gage

Name: 100yr 180min (3hr)

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

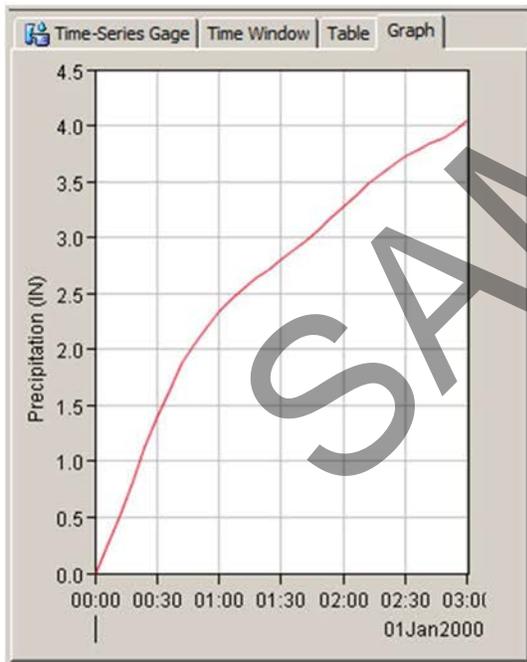
Name: 100yr 180min (3hr)

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr180min"

Project: I-70 Drainage Simulation Run: 5180 100yr180min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 03:00 Meteorologic Model: 100yr 180min (3hr)

Compute Time: 03Aug2016, 16:15:27 Control Specifications: 3 Hour Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	1093.446	01Jan2000, 02:00	1.415

STORM INPUTS & OUTPUTS – 100 YEAR, 6 HOUR STORM DURATION

Time-Series Gage

Name: 100yr 360min (6hr)

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

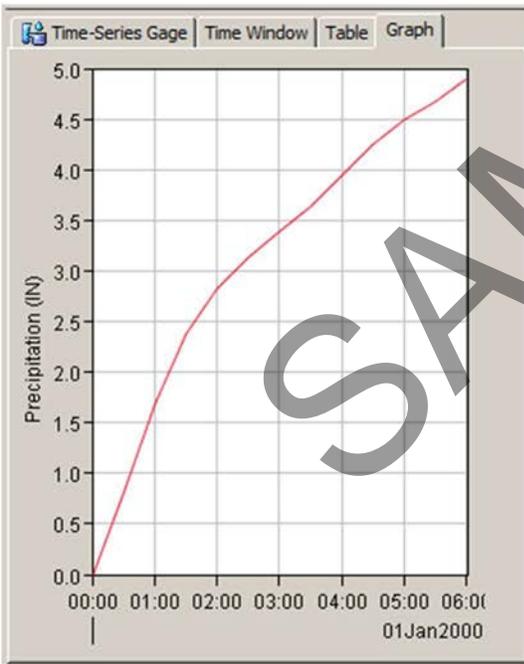
Name: 100yr 360min (6hr)

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr360min"

Project: I-70 Drainage Simulation Run: 5180 100yr360min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 06:00 Meteorologic Model: 100yr 360min (6hr)

Compute Time: 03Aug2016, 16:15:27 Control Specifications: 6 Hour Storm

Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	923.685	01Jan2000, 02:30	2.513

STORM INPUTS & OUTPUTS – 100 YEAR, 12 HOUR STORM DURATION

Time-Series Gage

Name: 100yr 720min (12hr)

Description:

Data Source:

Units:

Time Interval:

Latitude Degrees:

Latitude Minutes:

Latitude Seconds:

Longitude Degrees:

Longitude Minutes:

Longitude Seconds:

Time-Series Gage | Time Window | Table | Graph

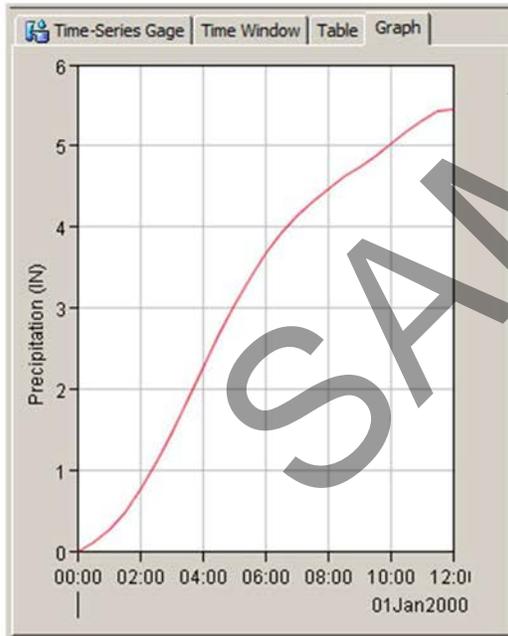
Name: 100yr 720min (12hr)

*Start Date (ddMMYYYY)

*Start Time (HH:mm)

*End Date (ddMMYYYY)

*End Time (HH:mm)



Global Summary Results for Run "5180 100yr720min"

Project: I-70 Drainage Simulation Run: 5180 100yr 720min

Start of Run: 01Jan2000, 00:00 Basin Model: Bridge5180

End of Run: 01Jan2000, 12:00 Meteorologic Model: 100yr 720min (12hr)

Compute Time: 03Aug2016, 16:15:27 Control Specifications: 12 Hour Storm

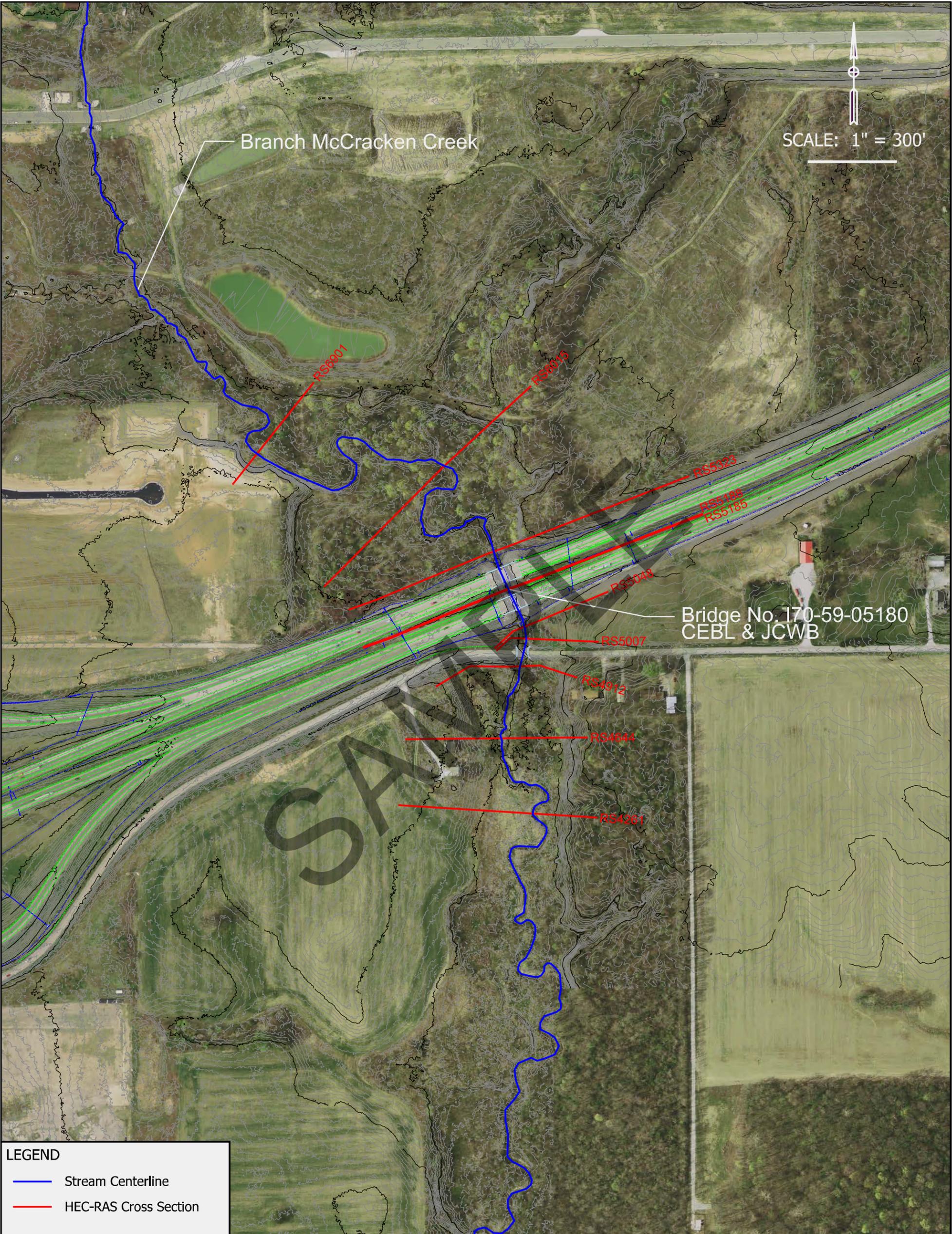
Show Elements: Volume Units: IN AC-FT Sorting:

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Bridge5180	2.18	772.412	01Jan2000, 06:00	3.347

APPENDIX C

Hydraulic Data

SAMPLE



cHECK-RAS Report

HEC-RAS Project: *bridge5180alt.prj*
 Plan File: *bridge5180alt.p03*
 Geometry File: *bridge5180alt.g03*
 Flow File: *bridge5180alt.f01*
 Report Date: *9/20/2016*

Message ID	Message	Cross sections affected	Comments
BR LF 01	This is (\$strucname\$). The selected profile is \$profilename\$. Type of flow is low flow because, 1. EGEL 3 of \$egel3\$ is less than or equal to MinTopRd of \$minelweirflow\$. 2. EGEL 3 of \$egel3\$ is less than MxLoCdu of \$mxlocdu\$.	5163(Bridge-UP); 5264(Bridge-UP)	
CV LF 01	This is (\$strucname\$). The selected profile is \$profilename\$. Type of flow is low flow because, 1. EGEL 3 of \$egel3\$ is less than or equal to MinTopRd of \$minelweirflow\$. 2. EGEL 3 of \$egel3\$ is less than MxLoCdu of \$mxlocdu\$.	4961	
NT RS 02BDC	This is the Downstream Bridge Section (BRD). The channel n value of \$schldn\$ for the downstream internal bridge opening section is equal to or larger than the channel n value of \$chl2\$ at Section 2. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 2. The "n" value for Section 2 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of the higher "n" value.	5163(Bridge-DN); 5264(Bridge-DN)	The Branch McCracken Creek channel was not observed to have a significantly different roughness in the channel at the bridge as compared to the upstream and downstream portions of the stream channel.
NT RS 02BUC	This is the Upstream Bridge Section (BRU). The channel n value of \$chlup\$ for the upstream internal bridge opening section is equal to or larger than the channel n value of \$chl3\$ at Section 3. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 3. The "n" value for Section 3 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of a higher "n" value.	5163(Bridge-UP); 5264(Bridge-UP)	The Branch McCracken Creek channel was not observed to have a significantly different roughness in the channel at the bridge as compared to the upstream and downstream portions of the stream channel.

XS DC 02	<p>Constant discharge used for the entire profile for \$assignedname\$ flood.</p> <p>At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.</p>		<p>This model has been created for scour analysis only and does not require additional discharge values to provide a good representation of the bridge for this type of analysis.</p>
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SAMPLE

Eastbound I-70 Bridge
Bridge No. I70-59-05180 CEBL

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	1.90	4.73	1.55
Approach Velocity (ft/s):	0.79	3.67	0.75
Br Average Depth (ft):	2.06	7.48	1.73
BR Opening Flow (cfs):	31.63	1253.20	21.17
BR Top WD (ft):	10.01	28.36	7.65
Grain Size D50 (mm):	0.01	0.01	0.01
Approach Flow (cfs):	229.14	804.72	272.14
Approach Top WD (ft):	152.81	46.36	236.21
K1 Coefficient:	0.690	0.690	0.690
Results			
Scour Depth Ys (ft):	0.22	2.23	0.12
Critical Velocity (ft/s):			
Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	1.50
Grain Size D50 (mm):	0.01000
Depth Upstream (ft):	8.64
Velocity Upstream (ft/s):	6.02
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	70.00
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	3.60
Froude #:	0.36
Equation:	CSU equation
Pier Scour Limited to Maximum of $Y_s = 2.4 * a$	

Abutment Scour

	Left	Right
Input Data		
Station at Toe (ft):	-35.83	35.86
Toe Sta at appr (ft):	-35.83	35.86
Abutment Length (ft):	137.96	380.01
Depth at Toe (ft):	2.06	2.52
K1 Shape Coef:	1.00 - Vertical abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	137.96	380.01
Avg Depth Obstructed Ya (ft):	1.90	1.12
Flow Obstructed Qe (cfs):	206.89	261.41
Area Obstructed Ae (sq ft):	261.74	425.46
Results		
Scour Depth Ys (ft):	0.00	0.00

Eastbound I-70 Bridge
Bridge No. 170-59-05180 CEBL

Froude #:	0.00	0.00
Equation:	HIRE	HIRE

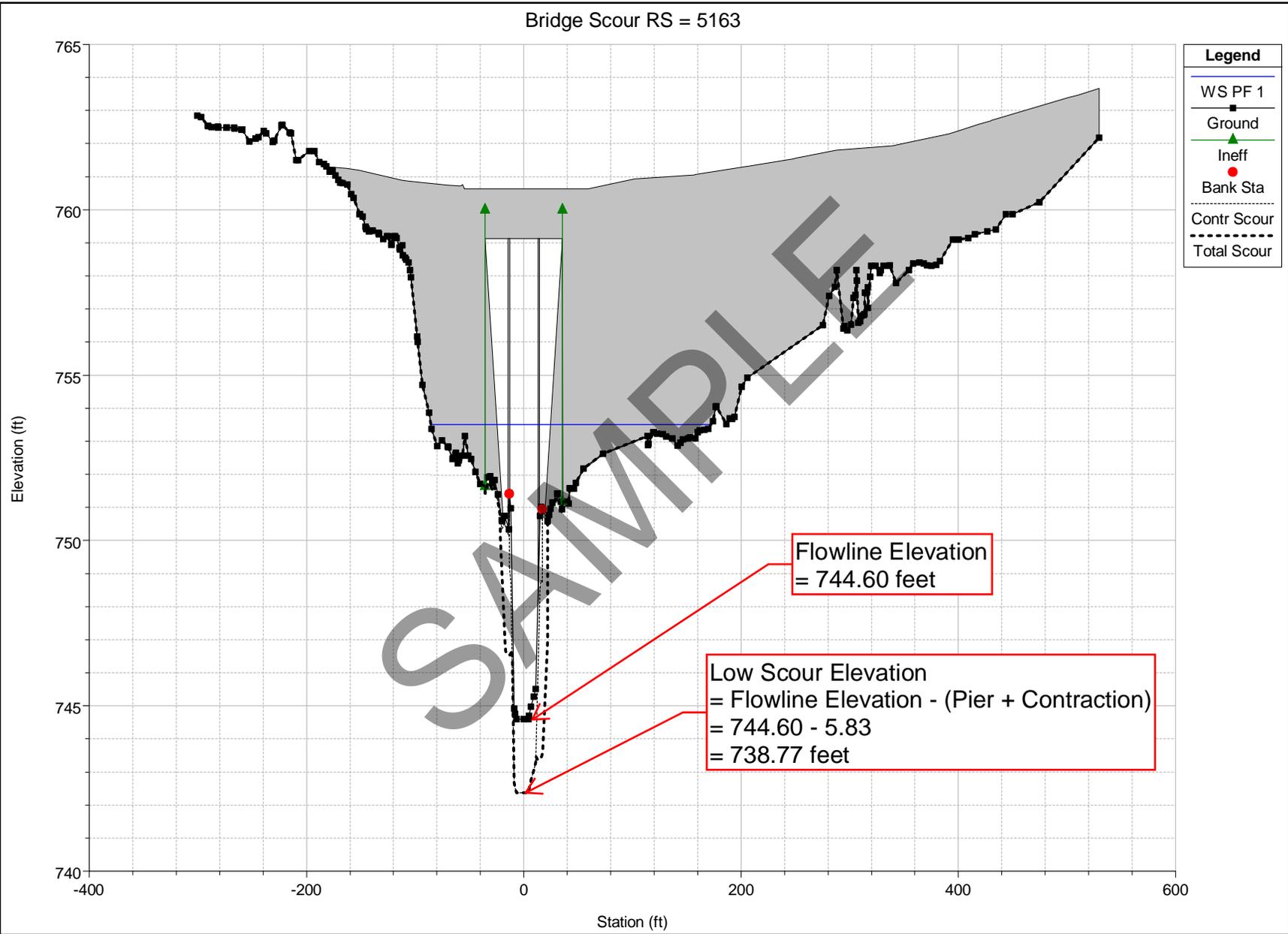
Combined Scour Depths

Pier Scour + Contraction Scour (ft):	Left Bank:	3.82
	Channel:	5.83
Left abutment scour + contraction scour (ft):		0.22
Right abutment scour + contraction scour (ft):		0.12

SAMPLE

Eastbound I-70 Bridge
 Bridge No. I70-59-05180 CEBL

Bridge Scour RS = 5163



Approach Cross Section used = River Station 6015
 Maximum Velocity at Bridge = 6.82 feet per second

Westbound I-70 Bridge
Bridge No. I70-59-05180 JCWB

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	1.90	4.73	1.55
Approach Velocity (ft/s):	0.79	3.67	0.75
Br Average Depth (ft):	2.32	6.25	1.99
BR Opening Flow (cfs):	52.54	1216.34	37.13
BR Top WD (ft):	10.96	28.36	8.62
Grain Size D50 (mm):	0.01	0.01	0.01
Approach Flow (cfs):	229.14	804.72	272.14
Approach Top WD (ft):	152.81	46.36	236.21
K1 Coefficient:	0.690	0.690	0.690

Results

Scour Depth Ys (ft):	0.99	3.21	0.77
Critical Velocity (ft/s):			
Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	1.50
Grain Size D50 (mm):	0.01000
Depth Upstream (ft):	7.77
Velocity Upstream (ft/s):	4.25
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	73.67
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	3.33
Froude #:	0.27
Equation:	CSU equation

Abutment Scour

	Left	Right
Input Data		
Station at Toe (ft):	-35.83	35.86
Toe Sta at appr (ft):	-42.80	45.04
Abutment Length (ft):	131.29	371.30
Depth at Toe (ft):	3.15	3.62
K1 Shape Coef:	1.00 - Vertical abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	131.29	371.30
Avg Depth Obstructed Ya (ft):	1.90	1.11
Flow Obstructed Qe (cfs):	196.88	251.37
Area Obstructed Ae (sq ft):	249.09	412.00

Results

Scour Depth Ys (ft):	0.00	0.00
Froude #:	0.00	0.00

Westbound I-70 Bridge
Bridge No. I70-59-05180 JCWB

Equation:

HIRE

HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank: 4.33

Channel: 6.54

Left abutment scour + contraction scour (ft):

0.99

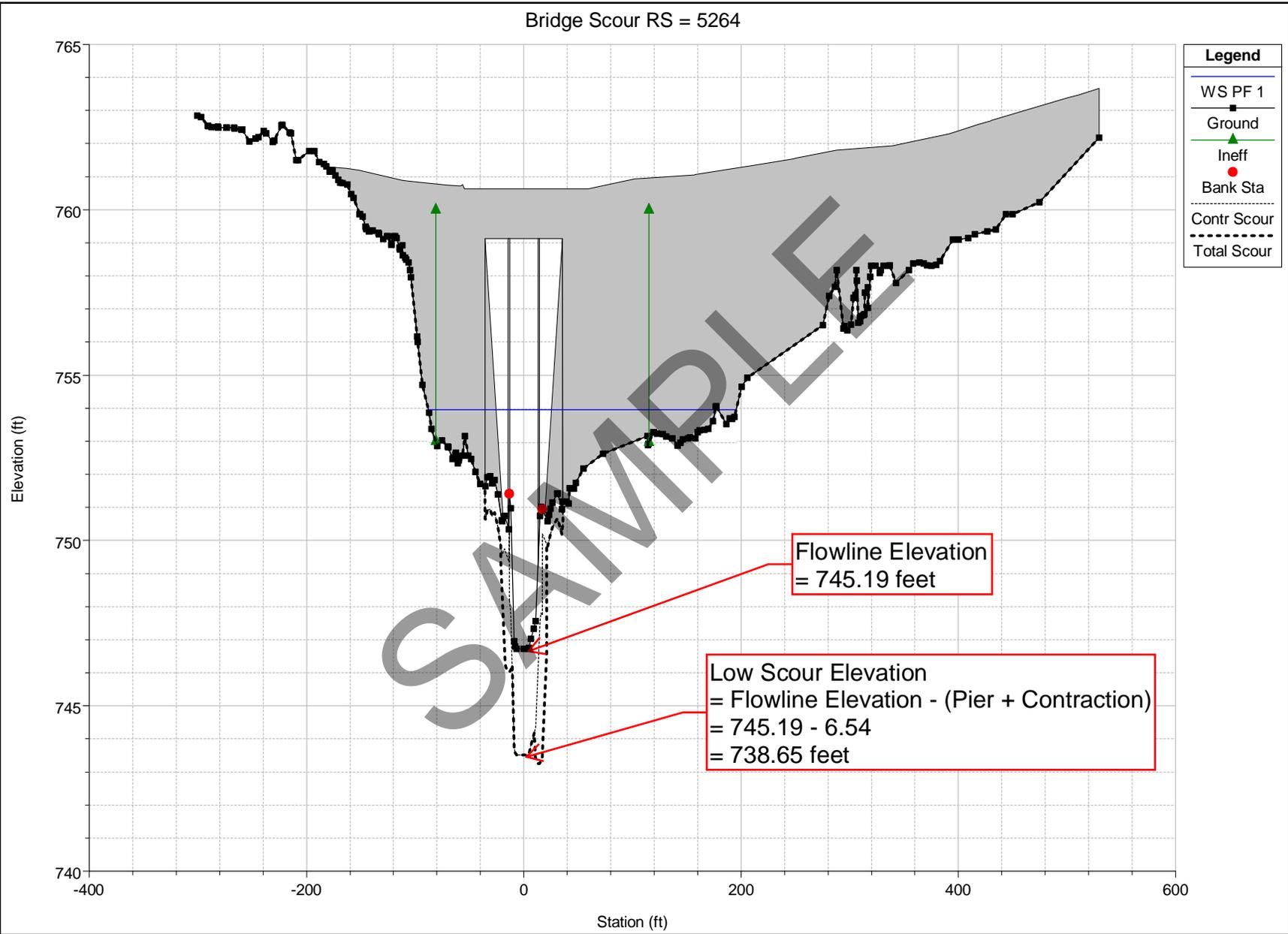
Right abutment scour + contraction scour (ft):

0.77

SAMPLE

Westbound I-70 Bridge
 Bridge No. I70-59-05180 JCWB

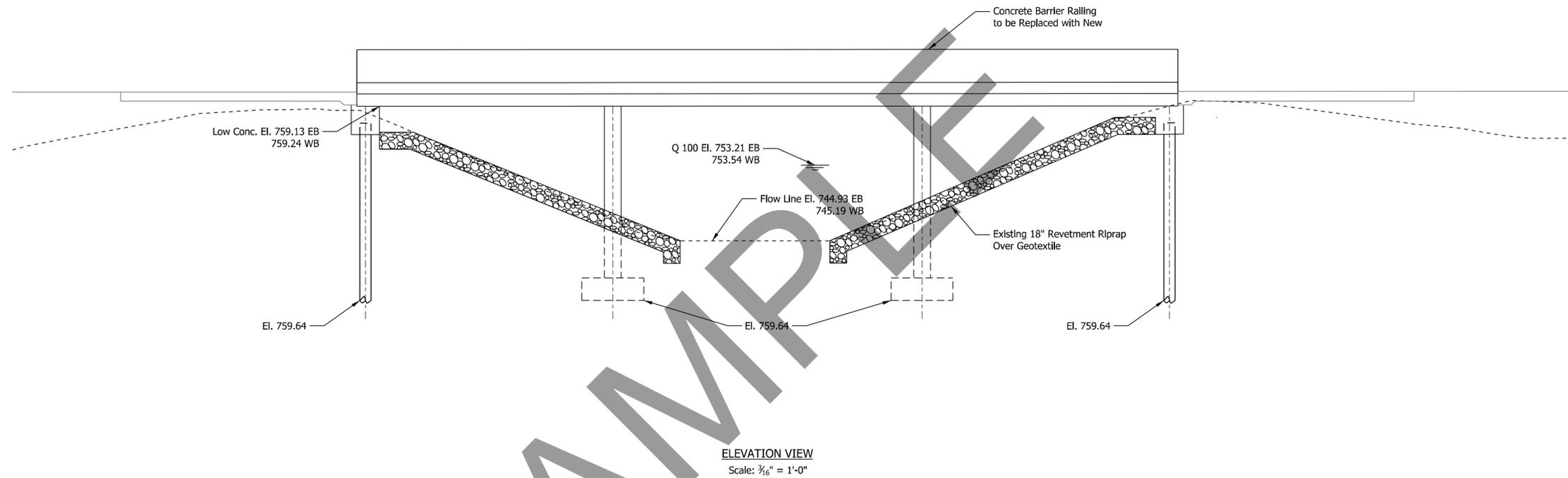
Bridge Scour RS = 5264



Approach Cross Section used = River Station 6015
 Maximum Velocity at Bridge = 7.75 feet per second

APPENDIX D
Proposed Structure Information

SAMPLE



CONTINUOUS REINFORCED CONCRETE
SLAB BRIDGE
I-70 Over Branch of McCrackens Creek
3 Spans: 22'-0"; 27'-6"; 22'-0"; Twin Structures. Square
All Elevations provided in feet NAVD88.

Pkg: 9/21/2016 10:44 AM

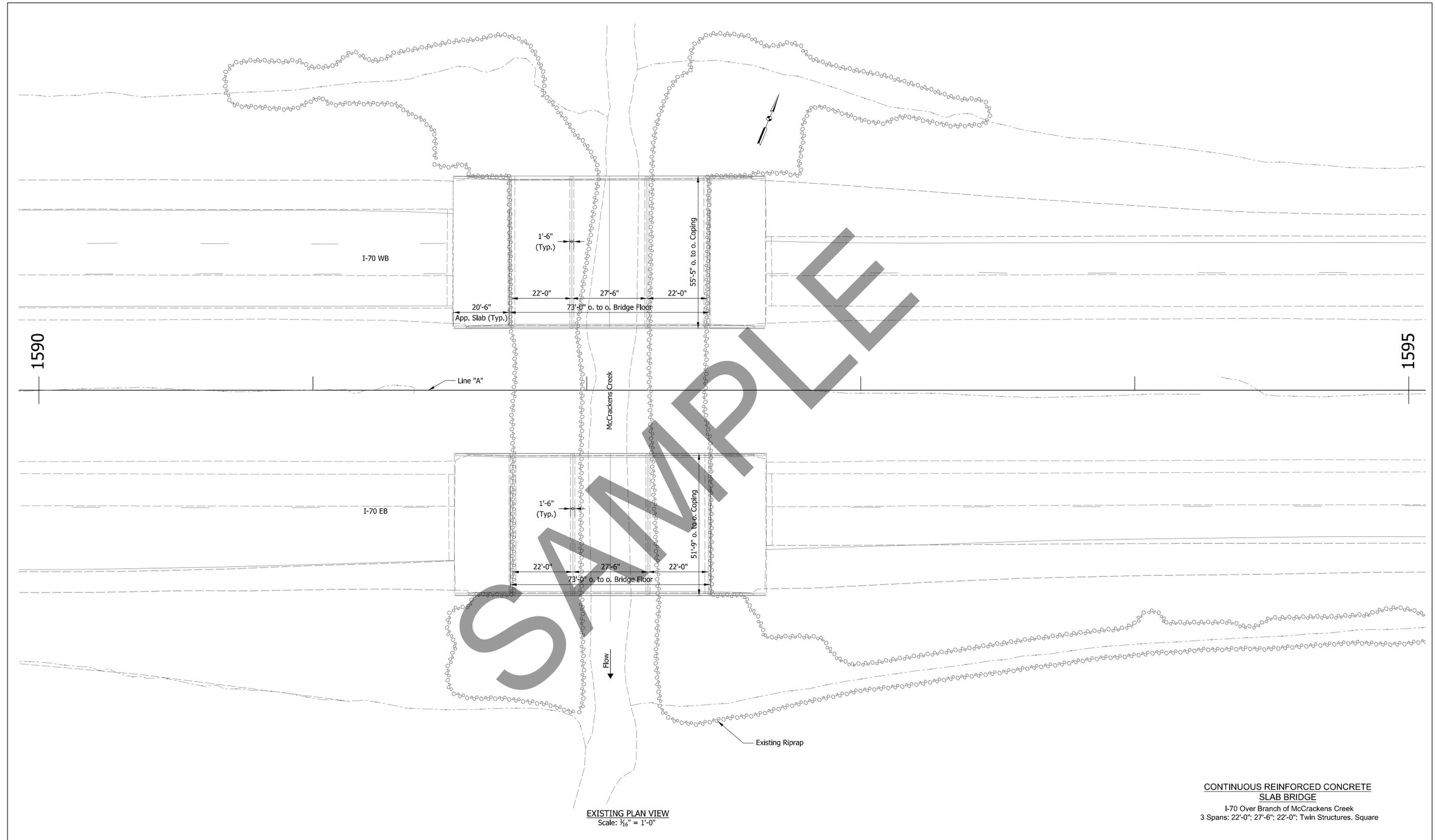


RECOMMENDED FOR APPROVAL _____	DESIGN ENGINEER _____	DATE _____
DESIGNED: _____	DRAWN: _____	
CHECKED: _____	CHECKED: _____	

ELEVATION	
-----------	--

SCALE	BRIDGE FILE
	DESIGNATION
DRAWING NUMBER	SHEETS
of	1 of 3
CONTRACT	PROJECT

\$FILES



EXISTING PLAN VIEW
Scale: 1/16" = 1'-0"

CONTINUOUS REINFORCED CONCRETE
SLAB BRIDGE
I-70 Over Branch of McCrackens Creek
3 Spans: 22'-0"; 27'-6"; 22'-0"; Twin Structures. Square

Plot: 9/21/2016 10:44 AM



RECOMMENDED FOR APPROVAL	DESIGN ENGINEER	DATE
DESIGNED: _____	DRAWN: _____	
CHECKED: _____	CHECKED: _____	

EXISTING PLAN

SCALE	BRIDGE FILE
	DESIGNATION
DRAWING NUMBER	SHEETS
of	2 of 3
CONTRACT	PROJECT

\$FILE\$



CONTINUOUS REINFORCED CONCRETE
SLAB BRIDGE
I-70 Over Branch of McCrackens Creek
3 Spans: 22'-0"; 27'-6"; 22'-0"; Twin Structures. Square

Plot: 9/21/2016 10:44 AM



RECOMMENDED FOR APPROVAL	DESIGN ENGINEER	DATE
DESIGNED: _____	DRAWN: _____	
CHECKED: _____	CHECKED: _____	

PROPOSED PLAN

SCALE	BRIDGE FILE
	DESIGNATION
DRAWING NUMBER	SHEETS
of	3 of 3
CONTRACT	PROJECT

\$FILES\$