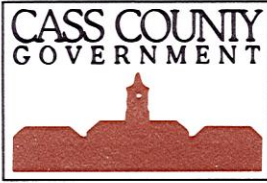


WESTERN CASS FLOOD INSURANCE STUDY
MAP APPEAL COSTS

SUGGESTED MOTION:

Move to reimburse the Southeast Cass Water Resource District for 50% of additional costs in the amount of \$26,218.05 for the Western Cass Flood Insurance Study.



November 15, 2019

Cass County
Joint Water
Resource
District

Mary Scherling
Chair
Cass County Commission
P.O. Box 2806
Fargo, ND 58108-2806

Dan Jacobson
Chairman
West Fargo, North Dakota

Dear Chair Scherling:

Rodger Olson
Manager
Leonard, North Dakota

RE: Western Cass Flood Insurance Study

Ken Lougheed
Manager
Gardner, North Dakota

As approved by the Cass County Commission at the March 4, 2019, meeting, the Cass County Joint Water Resource District respectfully requests reimbursement in the amount of \$90,673.04 (50% of \$181,346.08) for costs associated with the Western Cass Flood Insurance Study.

Jacob Gust
Manager
Fargo, North Dakota

The likelihood of additional costs was suggested in my September 11, 2019, email to county officials and later discussed at the Cass County Flood Sales Tax meeting on November 4, 2019. An accounting report is included with this letter setting out the costs incurred to-date on this project in the amount of \$207,564.13. The additional \$26,218.05 is due to the extensive modeling required for the appeals submitted to FEMA. We anticipate there will be additional costs, but until we receive comments back from FEMA on the appeals, we do not have a good estimate for the work that will be required. We request your consideration for additional funding to support completion of the project for the benefit of residents in Cass County.

Keith Weston
Manager
Fargo, North Dakota

If you have any questions, please feel free to contact us. Thank you.

Sincerely,

Carol Harbeke Lewis
Secretary-Treasurer

1201 Main Avenue West
West Fargo, ND 58078-1301

701-298-2381
FAX 701-298-2397
wrld@casscountynd.gov
casscountynd.gov

CASS COUNTY JOINT WATER RESOURCE DISTRICT

Carol Harbeke Lewis
Secretary-Treasurer

Enclosure

**REGULAR MEETING OF CASS COUNTY BOARD OF COMMISSIONERS
MARCH 4, 2019**

1. MEETING CALLED TO ORDER

Chairwoman Mary Scherling called the meeting to order at 3:30 PM with all members present as follows: Rick Steen, Vern Bennett, Duane Breitling, and Mary Scherling. Chad Peterson was present via conference call.

2. PLEDGE OF ALLEGIANCE

Heather Worden led the Pledge of Allegiance.

3. MINUTES APPROVED

MOTION, passed

Mr. Steen moved and Mr. Breitling seconded that the minutes of the previous meeting be approved as written. Motion carried.

4. AGENDA, Order approved

MOTION, passed

Mr. Steen moved and Mr. Bennett seconded to approve the order of the agenda with the addition of a contract to the consent agenda. Motion carried.

5. CONSENT AGENDA APPROVED

MOTION, passed

Mr. Bennett moved and Mr. Steen seconded to approve the consent agenda as follows, including a correction to the amount in the contract with Central Specialties based on an error found by the State's Attorney. On roll call vote, the motion carried unanimously.

- a. Approve a special event permit for Brewtus' Brickhouse to serve alcoholic beverages from 4:00 PM to midnight on March 15, 2019, for a West Fargo Hockey Association benefit to be held at the Hartl Ag Building, Red River Valley Fairgrounds in West Fargo, North Dakota.
- b. Approve a fireworks display permit for Starr Fireworks to be held at 9:00 PM on May 4, 2019, at Starr Fireworks, 10908 38th Street South in Horace, North Dakota.
- c. Receive and file Indemnity Bond on Lost Instrument for Ashley Kasson Therapy LMFT PLLC; and authorize the county auditor and county treasurer to issue a duplicate check.
- d. Authorize the Red River Valley Fair Association to list Cass County as the fiscal agent on a grant application for funding through the Garrison Diversion Conservancy District.
- e. Authorize the chair to sign the North Dakota Department of Transportation Local Match Certification for Federal Aid Project BRO-0009(047) to certify the county has paid the local match for this bridge project in Section 3 of Dows Township.
- f. Contract approval
 - Central Specialties, Inc.—subgrade repair projects on three county highways.

6. PUBLIC COMMENT

Mrs. Scherling asked for public comment and hearing none, moved on to the regular agenda items.

7. WESTERN CASS FLOOD INSURANCE STUDY, County to reimburse half of study costs

Robert Wilson, County Administrator, was present for the meeting via conference call. The Commission received a funding request from the Cass County Joint Water Resource District for costs associated with the Western Cass Flood Insurance Study (FIS). This item was tabled at the last meeting so Carol Lewis, Secretary-Treasurer for the Cass County Water Resource Districts, could be present to answer questions.

In 2013 the Cass County Joint Water Resource District (CCJWRD) agreed to serve as the coordinating agency for the Western Cass FIS to update flood insurance rate maps to accurately illustrate flood risks. In 2013 the Cass County Commission authorized a 50% cost share to the CCJWRD not to exceed \$40,000 for the study.

Mr. Wilson said Mrs. Lewis provided an account of project-related expenses through March of 2018 which totaled \$141,346.08 plus an additional \$40,000 to cover remaining costs. The CCJWRD requests the Commission consider reimbursing previously incurred and future costs in the amount of \$181,346.08.

There was discussion on the significant increase in the cost over the past six years. County Engineer Jason Benson was present via conference call and said a lot of the changes to the flood insurance rate maps and modeling reviews added to the study costs since 2013.

Mr. Steen said \$127,000 was approved for study costs according to minutes from the Cass County Joint Water Resource District and questioned the disparity between this figure and the request of \$181,346.08. He also asked why the Commission did not hear about any additional costs since 2013.

Rodger Olson serves on the CCJWRD. He said water board members thought the expenses would be reimbursed through the Flood Sales Tax Committee and wanted to complete the project before expenses were submitted for consideration. This is why the issue was submitted to the Flood Sales Tax Committee last year and not submitted to the Cass County Commission.

Mrs. Lewis reviewed the amounts that were included in the Southeast Cass Water Resource District (WRD) General Fund budgets for the Western Cass FIS. The CCJWRD does not have its own budget, so funds were funneled through the Southeast Cass WRD. She said \$25,000 was budgeted in 2013 with \$8,550 spent; \$100,000 in 2014 with \$43,800 spent; \$23,675 in 2015 with \$50,620 spent; \$25,000 in 2016 with \$8,370 spent; \$25,000 in 2017 with \$19,170 spent; \$25,000 in 2018 with \$37,500 spent; and \$20,000 in 2019 with \$440 spent to date.

Mr. Steen said funds for the Western Cass FIS were included in the Southeast Cass WRD budgets, so he does not support the county contributing additional funds other than \$20,000 approved in 2013 as part of the 50/50 cost share with the CCJWRD.

Mr. Bennett questioned why the flood sales tax cannot be used for the project since it has provided a cost savings to residents who do not have to pay for flood insurance. Mr. Steen said the FIS does not fit the criteria outlined in county policy for projects eligible for sales tax funds. Mr. Steen said the cost should be paid through the General Fund or the Highway Fund.

Mr. Peterson said all the bills have been paid for the study, so to him it is a philosophical question. He has some difficulty in how it was presented and the significant cost increase from the original \$40,000 expense, but would not object to reimbursing the CCJWRD for 50% of the total cost. He said there is a broader benefit from the project beyond Southeast Cass WRD. Mr. Benson said the study has benefitted all of the water resource districts as well as rural townships and cities in Cass County.

MOTION, passed

Mr. Peterson moved and Mrs. Scherling seconded to reimburse the Southeast Cass Water Resource District for 50% of the requested \$181,346.08 in costs for the Western Cass Flood Insurance Study. Discussion: Mr. Wilson said the county share would amount to \$90,673.04. Mr. Steen has issues with spending money that was already budgeted and requesting reimbursement from the county six years later. On roll call vote, the motion carried with Mr. Peterson, Mrs. Scherling, Mr. Bennett, and Mr. Breitling voting "Yes"; and Mr. Steen voting "No".

Lewis, Carol

From: Lewis, Carol
Sent: Wednesday, September 11, 2019 4:42 PM
To: {Cass}-Commissioners; Wilson, Robert; Benson, Jason; Voigt, Barrett
Cc: Kurt Lysne
Subject: FW: Western Cass FIS Appeal - City of Arthur, FEMA Case No. 10-08-0041S - email 1 of 2

This is the first of two emails with appeals submitted to FEMA regarding the Western Cass Flood Insurance Study.

As you may recall, the Cass County Commission approved at the March 4, 2019, meeting, to reimburse Southeast Cass Water Resource District for 50% of the requested \$181,346.08 in costs for the Western Cass Flood Insurance Study. Expenses to-date total \$176,039.13. Due to the extensive modeling involved, it is likely costs will exceed the total estimated cost. We will submit a request for 50% of the total cost approved earlier this year when we reach that total. At that time, we can also discuss how any anticipated costs over that amount should be addressed. Please feel free to contact us if you have any questions. Thank you.

Carol

Carol Harbeke Lewis
Secretary-Treasurer
Cass County Water Resource Districts
1201 Main Avenue West
West Fargo, ND 58078-1301
Phone: 701-298-2381
Fax: 701-298-2397
Lewisc@casscountynd.gov



From: Kurt Lysne <kurt.lysne@mooreengineeringinc.com>
Sent: Friday, September 6, 2019 2:49 PM
To: r8commentsandappeals@fema.dhs.gov; David Sutley <David.Sutley@fema.dhs.gov>
Cc: Lewis, Carol <Lewisc@casscountynd.gov>; Horner, Laura M. <lmhorner@nd.gov>; McGlone, Matthew L. <mcloneml@cdmsmith.com>
Subject: Western Cass FIS Appeal - City of Arthur, FEMA Case No. 10-08-0041S

Hi David,

I am submitting an appeal to the Revised Preliminary FIRM and FIS that was developed for the City of Arthur, North Dakota. Moore Engineering, working on behalf of the Cass County Joint Water Resource District and the City of Arthur, has completed a technical report in support of the appeal. This document, as well as other supporting information

Funds 1000-1000, AND ACCT=441070

Fund/Account/ Doc/Line #	Description	Vendor/Receipt From	Acct. Period	Debit	Credit
1000 SOUTHEAST CASS WATER RESOURCE DISTRICT					
441070 WESTERN CASS FIS (2013)					
304 LEGAL FEES-MAPLE RIVER					
CL 7783 5 120915	Floodplain Management	OHNSTAD TWICHELL, P.C.	6/13	115.20	
CL 7910 22 122104	Floodplain Management	OHNSTAD TWICHELL, P.C.	7/13	33.35	
	Object Total:			148.55	
305 LEGAL FEES-NORTH CASS					
CL 7783 6 120915	Floodplain Management	OHNSTAD TWICHELL, P.C.	6/13	57.60	
CL 7910 23 122104	Floodplain Management	OHNSTAD TWICHELL, P.C.	7/13	16.68	
	Object Total:			74.28	
306 LEGAL FEES-RUSH RIVER					
CL 7783 7 120915	Floodplain Management	OHNSTAD TWICHELL, P.C.	6/13	57.60	
CL 7910 24 122104	Floodplain Management	OHNSTAD TWICHELL, P.C.	7/13	16.68	
	Object Total:			74.28	
401 LEGAL FEES					
CL 7783 1 120915	Floodplain Management	OHNSTAD TWICHELL, P.C.	6/13	345.60	
CL 7910 21 122104	Floodplain Management	OHNSTAD TWICHELL, P.C.	7/13	100.06	
	Object Total:			445.66	
402 ENGINEERING FEES					
CL 7785 46 5451	Western Cass FIS Review	MOORE ENGINEERING INC	6/13	3,497.50	
CL 8321 39 6692	Western Cass FIS Review	MOORE ENGINEERING INC	11/13	4,109.10	
CL 8500 39 7080	Western Cass FIS Review	MOORE ENGINEERING INC	1/14	3,505.00	
CL 8608 39 7246	Western Cass FIS Review	MOORE ENGINEERING INC	2/14	2,207.50	
CL 8775 39 7505	Western Cass FIS Review	MOORE ENGINEERING INC	4/14	187.50	
CL 9338 39 8722	Western Cass FIS Review	MOORE ENGINEERING INC	10/14	12,560.00	
CL 9502 41 9007	Western Cass FIS Model R	MOORE ENGINEERING INC	11/14	15,800.00	
CL 9611 41 9316	Western Cass FIS Model R	MOORE ENGINEERING INC	12/14	9,537.50	
CL 9927 41 9733	Western Cass FIS Model R	MOORE ENGINEERING INC	3/15	2,497.50	
CL 10321 41 10321	Western Cass FIS Model R	MOORE ENGINEERING INC	6/15	7,527.50	
CL 10540 41 10594	Western Cass FIS Model R	MOORE ENGINEERING INC	7/15	350.00	
CL 10700 41 10807	Western Cass FIS Model R	MOORE ENGINEERING INC	8/15	935.00	
CL 10831 41 11073	Western Cass FIS Model R	MOORE ENGINEERING INC	9/15	17,162.50	
CL 10936 42 11279	Western Cass FIS Model R	MOORE ENGINEERING INC	10/15	17,064.10	
CL 11076 42 11577	Western Cass FIS Model R	MOORE ENGINEERING INC	11/15	4,650.00	
CL 11149 42 11777	Western Cass FIS Model R	MOORE ENGINEERING INC	12/15	435.00	
CL 11316 42 11983	Western Cass FIS Model R	MOORE ENGINEERING INC	1/16	1,132.50	
CL 11497 42 12342	Western Cass FIS Rev-Stu	MOORE ENGINEERING INC	3/16	2,590.00	
CL 11611 46 12566	Western Cass FIS Model R	MOORE ENGINEERING INC	4/16	2,955.16	
CL 11889 55 13295	Western Cass FIS Review	MOORE ENGINEERING INC	7/16	702.50	
CL 11987 55 13462	Western Cass FIS Review	MOORE ENGINEERING INC	8/16	165.00	
CL 12063 55 13645	Western Cass FIS Review	MOORE ENGINEERING INC	9/16	165.00	
CL 12239 147 14230	Western Cass FIS	MOORE ENGINEERING INC	11/16	660.00	
CL 12459 55 14495	Western Cass FIS Review	MOORE ENGINEERING INC	1/17	1,650.00	
CL 12459 61 14622	Western Cass FIS Review	MOORE ENGINEERING INC	1/17	441.10	
CL 12748 60 15132	Western Cass FIS-Arthur	MOORE ENGINEERING INC	4/17	817.50	
CL 12812 56 15334	Western Cass FIS Review	MOORE ENGINEERING INC	4/17	200.00	
CL 13043 66 15853	Western Cass FIS Review	MOORE ENGINEERING INC	7/17	1,287.50	
CL 13113 60 16161	Western Cass FIS Rev-Art	MOORE ENGINEERING INC	7/17	7,633.85	
CL 13208 60 16373	Western Cass FIS Rev-Art	MOORE ENGINEERING INC	8/17	2,315.00	
CL 13303 63 16725	Western Cass FIS Rev-Art	MOORE ENGINEERING INC	9/17	1,800.00	

11/13/19
10:47:06

CASS COUNTY WATER RESOURCE DISTRICTS
Detail Ledger Query
For the Accounting Periods: 1/10 - 11/19

Page: 2 of 2
Report ID: L091

Funds 1000-1000, AND ACCT=441070

Fund/Account/ Doc/Line #	Description	Vendor/Receipt From	Acct. Period	Debit	Credit
1000 SOUTHEAST CASS WATER RESOURCE DISTRICT					
441070 WESTERN CASS FIS (2013)					
402 ENGINEERING FEES					
CL 13383 63 16953	Western Cass FIS Rev	MOORE ENGINEERING INC	10/17	3,025.00	
CL 13651 57 17536	Western Cass FIS Rev-COA	MOORE ENGINEERING INC	1/18	7,662.50	
CL 13693 57 17663	Western Cass FIS-City Ar	MOORE ENGINEERING INC	1/18	3,375.00	
CL 14064 90 18468	Western Cass FIS Review-	MOORE ENGINEERING INC	6/18	587.50	
CL 14317 83 19166	Western Cass FIS Rev-St	MOORE ENGINEERING INC	9/18	2,455.00	
CL 14478 93 19706	Western Cass FIS-Studies	MOORE ENGINEERING INC	11/18	12,597.00	
CL 14546 101 19894	Western Cass FIS-Studies	MOORE ENGINEERING INC	12/18	10,823.05	
CL 14753 101 20111	Western Cass FIS-Studies	MOORE ENGINEERING INC	1/19	442.50	
CL 14997 94 20605	Western Cass FIS Rev-Stu	MOORE ENGINEERING INC	4/19	1,527.50	
CL 15163 93 21020	Western Cass FIS-Study &	MOORE ENGINEERING INC	6/19	175.00	
CL 15329 95 21535	Western Cass FIS Rv-RR F	MOORE ENGINEERING INC	8/19	6,085.50	
CL 15536 95 22015	Western Cass FIS Rv-RR F	MOORE ENGINEERING INC	10/19	24,057.50	
CL 15653 96 22267	Western Cass FIS Rv-RR F	MOORE ENGINEERING INC	11/19	7,467.50	
	Object Total:			206,821.36	
	Account Total:			207,564.13	
	Fund Total:			207,564.13	0.00
	Grand Total:			207,564.13	0.00

Mr. Lysne said a 20% contingency was requested, but the state only approved a 10% contingency, which is the reason why the two figures do not total \$45,000. The request of the committee is for a 50% cost share of \$10,313.10.

Kathy Auka was present and said their property was flooded this past spring because of ice jams along the Rush River. Mr. Benson said this project will provide a benefit to this property that is located outside the Flood Diversion footprint.

MOTION, passed

Mr. Steen moved and Mr. Montplaisir seconded to approve 50% of the local cost share in the amount of \$10,313.10 for the Dan and Kathy Auka Ring Levee Project. On roll call vote, the motion carried unanimously.

Maple River Dam Site T-180 Safety Improvements Project

Mr. Lysne discussed a request from the Maple River Water Resource District for the T-180 Dam, located on a tributary of the Maple River in Section 24 of Highland Township northeast of Enderlin. There are deficiencies in the dam and upgrades are needed to the principal spillway pipe to ensure stability of the dam. The total project cost is \$320,000. A request for cost share assistance was submitted to the State Water Commission that will be addressed at their February 2020 meeting. The Red River Joint Water Resource District has also been asked for funding. Mr. Lysne said the project includes maintenance items, which are not covered by cost share funding through either the State Water Commission or Red River Joint Water Resource District. The request today is for a 75% cost share of \$34,140.89.

AMENDED MOTION, passed

Mr. Olson moved and Mr. Steen seconded to approve the Maple River Dam Site T-180 Safety Improvements Project at 75% of the local cost share in the amount of \$34,140.89. Discussion: Mr. Steen said Cass County policy does not cover maintenance costs either and believes the motion should be amended to eliminate the maintenance costs from the local cost share. Mr. Lysne said these costs total \$9,375.00. Mrs. Scherling moved and Mr. Steen seconded to amend the motion and change the cost share to reflect the removal of maintenance costs of \$9,375.00 for a total of \$24,765.89. On roll call vote, the motion on the amendment to the main motion carried with Mrs. Scherling, Mr. Steen, Mr. Wilson, Mr. Montplaisir and Mr. Benson voting “Yes”; and Mr. Olson voting “No”.

MAIN MOTION, passed

On roll call vote, the motion carried on the main motion to approve the project with Mrs. Scherling, Mr. Steen, Mr. Wilson, Mr. Montplaisir and Mr. Benson voting “Yes”; and Mr. Olson voting “No”.

6. ADDITIONAL COSTS FOR PREVIOUSLY APPROVED PROJECTS

Western Cass Flood Insurance Study Map Appeal

Mrs. Lewis said in March of this year the Cass County Commission approved a reimbursement to the Southeast Cass Water Resource District for 50% of an additional \$181,346.08 in costs for the Western Cass Flood Insurance Study (FIS).

Mr. Lysne said since that time, the City of Arthur has submitted an appeal to the Revised Preliminary Flood Insurance Rate Map (FIRM) and FIS, resulting in additional modeling associated with the study. The total cost to date is \$207,564.13 or \$26,218.05 in additional expenses. Mr. Lysne said additional costs may be incurred as a result of the map appeal.

The committee again recommended this request be forwarded to the Cass County Commission since this project is not eligible for funding under the current flood sales tax policy for consideration by this committee.

Lake Bertha Flood Control Project No. 75

The committee approved a 50% cost share of \$66,215.45 for Lake Bertha Flood Control Project No. 75 in 2016. The final cost exceeded the estimate by around \$16,000 due to an abandoned railway line, CRP land, and flood easements that added to the project scope. The Cass County Joint Water Resource District is asking for an additional cost share on the local costs of \$8,733.97.

MOTION, passed

Mr. Steen moved and Mr. Wilson seconded to approve an additional cost share of \$8,733.97 for the Lake Bertha Flood Control Project No. 75. On roll call vote, the motion carried unanimously.

7. OTHER BUSINESS

Red River Basin Commission Executive Director Ted Preister provided a brief presentation on a drainage connectivity project, which is completely voluntary and if landowners are not interested, the project will not proceed. The Red River Basin Commission will not move forward unless enough money is raised to cover 25% of the tile cost for participating landowners. The proposed study area is between Drain 70 and Drain 30 in Berlin Township. He is not asking for funding assistance today, but may ask for the committee to consider funding the cost of 1½ miles of infrastructure in the future.

Mrs. Scherling said the county is in a unique position to demonstrate this type of project and perhaps some of the costs may be relative to the goals of this committee.

8. ADJOURNMENT

The chairwoman declared the meeting adjourned at 2:01 PM.

Minutes prepared by Heather Worden, Commission Administrative Assistant

11/04/19
10:37:11

CASS COUNTY WATER RESOURCE DISTRICTS
Detail Ledger Query
For the Accounting Periods: 1/11 - 11/19

Page: 2 of 2
Report ID: L091

Funds 1000-1000, Accounts 441070-441070

Fund/Account/ Doc/Line #	Description	Vendor/Receipt From	Acct. Period	Debit	Credit
1000 SOUTHEAST CASS WATER RESOURCE DISTRICT					
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CL 14064 90 18468	Western Cass FIS Review-	MOORE ENGINEERING INC	6/18	587.50	
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CL 15329 95 21535	Western Cass FIS Rv-RR F	MOORE ENGINEERING INC	8/19	6,085.50	
CL 15536 95 22015	Western Cass FIS Rv-RR F	MOORE ENGINEERING INC	10/19	24,057.50	
	Object Total:			199,353.86	
	Account Total:			200,096.63	
	Fund Total:			200,096.63	0.00
	Grand Total:			200,096.63	0.00
	Pending invoice:			7,467.50	
	Adjusted total:			207,564.13	
	Total costs on which 50% cost-share was approved:			<u>181,346.08</u>	
	Additional costs to-date:			26,218.05	
	Additional costs anticipated			??	

**REGULAR MEETING OF CASS COUNTY BOARD OF COMMISSIONERS
MARCH 4, 2019**

1. **MEETING CALLED TO ORDER**
Chairwoman Mary Scherling called the meeting to order at 3:30 PM with all members present as follows: Rick Steen, Vern Bennett, Duane Breitling, and Mary Scherling. Chad Peterson was present via conference call.
2. **PLEDGE OF ALLEGIANCE**
Heather Worden led the Pledge of Allegiance.
3. **MINUTES APPROVED**
MOTION, passed
Mr. Steen moved and Mr. Breitling seconded that the minutes of the previous meeting be approved as written. Motion carried.
4. **AGENDA, Order approved**
MOTION, passed
Mr. Steen moved and Mr. Bennett seconded to approve the order of the agenda with the addition of a contract to the consent agenda. Motion carried.
5. **CONSENT AGENDA APPROVED**
MOTION, passed
Mr. Bennett moved and Mr. Steen seconded to approve the consent agenda as follows, including a correction to the amount in the contract with Central Specialties based on an error found by the State's Attorney. On roll call vote, the motion carried unanimously.
 - a. Approve a special event permit for Brewtus' Brickhouse to serve alcoholic beverages from 4:00 PM to midnight on March 15, 2019, for a West Fargo Hockey Association benefit to be held at the Hartl Ag Building, Red River Valley Fairgrounds in West Fargo, North Dakota.
 - b. Approve a fireworks display permit for Starr Fireworks to be held at 9:00 PM on May 4, 2019, at Starr Fireworks, 10908 38th Street South in Horace, North Dakota.
 - c. Receive and file Indemnity Bond on Lost Instrument for Ashley Kasson Therapy LMFT PLLC; and authorize the county auditor and county treasurer to issue a duplicate check.
 - d. Authorize the Red River Valley Fair Association to list Cass County as the fiscal agent on a grant application for funding through the Garrison Diversion Conservancy District.
 - e. Authorize the chair to sign the North Dakota Department of Transportation Local Match Certification for Federal Aid Project BRO-0009(047) to certify the county has paid the local match for this bridge project in Section 3 of Dows Township.
 - f. Contract approval
 - Central Specialties, Inc.—subgrade repair projects on three county highways.
6. **PUBLIC COMMENT**
Mrs. Scherling asked for public comment and hearing none, moved on to the regular agenda items.
7. **WESTERN CASS FLOOD INSURANCE STUDY, County to reimburse half of study costs**
Robert Wilson, County Administrator, was present for the meeting via conference call. The Commission received a funding request from the Cass County Joint Water Resource District for costs associated with the Western Cass Flood Insurance Study (FIS). This item was tabled at the last meeting so Carol Lewis, Secretary-Treasurer for the Cass County Water Resource Districts, could be present to answer questions.

In 2013 the Cass County Joint Water Resource District (CCJWRD) agreed to serve as the coordinating agency for the Western Cass FIS to update flood insurance rate maps to accurately illustrate flood risks. In 2013 the Cass County Commission authorized a 50% cost share to the CCJWRD not to exceed \$40,000 for the study.

Mr. Wilson said Mrs. Lewis provided an account of project-related expenses through March of 2018 which totaled \$141,346.08 plus an additional \$40,000 to cover remaining costs. The CCJWRD requests the Commission consider reimbursing previously incurred and future costs in the amount of \$181,346.08.

There was discussion on the significant increase in the cost over the past six years. County Engineer Jason Benson was present via conference call and said a lot of the changes to the flood insurance rate maps and modeling reviews added to the study costs since 2013.

Mr. Steen said \$127,000 was approved for study costs according to minutes from the Cass County Joint Water Resource District and questioned the disparity between this figure and the request of \$181,346.08. He also asked why the Commission did not hear about any additional costs since 2013.

Rodger Olson serves on the CCJWRD. He said water board members thought the expenses would be reimbursed through the Flood Sales Tax Committee and wanted to complete the project before expenses were submitted for consideration. This is why the issue was submitted to the Flood Sales Tax Committee last year and not submitted to the Cass County Commission.

Mrs. Lewis reviewed the amounts that were included in the Southeast Cass Water Resource District (WRD) General Fund budgets for the Western Cass FIS. The CCJWRD does not have its own budget, so funds were funneled through the Southeast Cass WRD. She said \$25,000 was budgeted in 2013 with \$8,550 spent; \$100,000 in 2014 with \$43,800 spent; \$23,675 in 2015 with \$50,620 spent; \$25,000 in 2016 with \$8,370 spent; \$25,000 in 2017 with \$19,170 spent; \$25,000 in 2018 with \$37,500 spent; and \$20,000 in 2019 with \$440 spent to date.

Mr. Steen said funds for the Western Cass FIS were included in the Southeast Cass WRD budgets, so he does not support the county contributing additional funds other than \$20,000 approved in 2013 as part of the 50/50 cost share with the CCJWRD.

Mr. Bennett questioned why the flood sales tax cannot be used for the project since it has provided a cost savings to residents who do not have to pay for flood insurance. Mr. Steen said the FIS does not fit the criteria outlined in county policy for projects eligible for sales tax funds. Mr. Steen said the cost should be paid through the General Fund or the Highway Fund.

Mr. Peterson said all the bills have been paid for the study, so to him it is a philosophical question. He has some difficulty in how it was presented and the significant cost increase from the original \$40,000 expense, but would not object to reimbursing the CCJWRD for 50% of the total cost. He said there is a broader benefit from the project beyond Southeast Cass WRD. Mr. Benson said the study has benefitted all of the water resource districts as well as rural townships and cities in Cass County.

MOTION, passed

Mr. Peterson moved and Mrs. Scherling seconded to reimburse the Southeast Cass Water Resource District for 50% of the requested \$181,346.08 in costs for the Western Cass Flood Insurance Study. Discussion: Mr. Wilson said the county share would amount to \$90,673.04. Mr. Steen has issues with spending money that was already budgeted and requesting reimbursement from the county six years later. On roll call vote, the motion carried with Mr. Peterson, Mrs. Scherling, Mr. Bennett, and Mr. Breitling voting "Yes"; and Mr. Steen voting "No".

Worden, Heather

From: Wilson, Robert
Sent: Wednesday, September 11, 2019 5:19 PM
To: Worden, Heather
Subject: FW: Western Cass FIS Appeal - City of Arthur, FEMA Case No. 10-08-0041S - email 1 of 2

From: Lewis, Carol <LewisC@casscountynd.gov>
Sent: Wednesday, September 11, 2019 4:42 PM
To: {Cass}-Commissioners <Cass-ADM-Com@casscountynd.gov>; Wilson, Robert <WilsonRo@casscountynd.gov>; Benson, Jason <BensonJ@casscountynd.gov>; Voigt, Barrett <VoigtB@casscountynd.gov>
Cc: klysne <klysne@mooreengineeringinc.com>
Subject: FW: Western Cass FIS Appeal - City of Arthur, FEMA Case No. 10-08-0041S - email 1 of 2

This is the first of two emails with appeals submitted to FEMA regarding the Western Cass Flood Insurance Study.

As you may recall, the Cass County Commission approved at the March 4, 2019, meeting, to reimburse Southeast Cass Water Resource District for 50% of the requested \$181,346.08 in costs for the Western Cass Flood Insurance Study. Expenses to-date total \$176,039.13. Due to the extensive modeling involved, it is likely costs will exceed the total estimated cost. We will submit a request for 50% of the total cost approved earlier this year when we reach that total. At that time, we can also discuss how any anticipated costs over that amount should be addressed. Please feel free to contact us if you have any questions. Thank you.

Carol

Carol Harbeke Lewis
Secretary-Treasurer
Cass County Water Resource Districts
1201 Main Avenue West
West Fargo, ND 58078-1301
Phone: 701-298-2381
Fax: 701-298-2397
Lewisc@casscountynd.gov



From: Kurt Lysne <kurt.lysne@mooreengineeringinc.com>
Sent: Friday, September 6, 2019 2:49 PM
To: r8commentsandappeals@fema.dhs.gov; David Sutley <David.Sutley@fema.dhs.gov>
Cc: Lewis, Carol <LewisC@casscountynd.gov>; Horner, Laura M. <lmhorner@nd.gov>; McGlone, Matthew L.

<mcgloneml@cdmsmith.com>

Subject: Western Cass FIS Appeal - City of Arthur, FEMA Case No. 10-08-0041S

Hi David,

I am submitting an appeal to the Revised Preliminary FIRM and FIS that was developed for the City of Arthur, North Dakota. Moore Engineering, working on behalf of the Cass County Joint Water Resource District and the City of Arthur, has completed a technical report in support of the appeal. This document, as well as other supporting information (letter of community endorsement, hydraulic models, GIS shapefiles, plan drawings, etc.) can be downloaded from the following FTP location:

<ftp://ftp.mooreengineeringinc.com>

Username: FEMA

Password: P01UcgwPE1qa

Please let me know if you have trouble accessing the files or need additional supporting documentation.

Have a great weekend,
Kurt

Kurt Lysne, PE*, CFM
Water Resources Group Leader
moore engineering, inc.

*Licensed in ND & MN

Phone 701.282.4692 | Fax 701.282.4530

Direct 701.499.5856 | Cell 218.205.3324

444 Sheyenne Street, Suite 301, West Fargo, ND 58078

kurt.lysne@mooreengineeringinc.com | www.mooreengineeringinc.com

Worden, Heather

From: Benson, Jason
Sent: Tuesday, September 17, 2019 5:55 PM
To: Wilson, Robert; Worden, Heather
Subject: RE: Western Cass FIS Appeal - Noble and Wiser Township, FEMA Case No. 10-08-0041S
- email 2 of 2

Robert,

I've review these two documents and they appear to be good in providing critical analysis of these areas and proposing a new map. I think we need to be prepared to discuss these at the next ½ Cent Sales Tax meeting. I also think these reviews ensure the new map doesn't adversely affect property causing the owner to have to purchase flood insurance or to trigger a larger, more costly flood control project.

*Jason Benson, P.E.
County Engineer
Cass County Highway Department
1201 Main Ave West
West Fargo, ND 58078
701-298-2372*

From: Wilson, Robert <WilsonRo@casscountynd.gov>
Sent: Thursday, September 12, 2019 8:34 AM
To: Worden, Heather <WordenH@casscountynd.gov>
Cc: Benson, Jason <BensonJ@casscountynd.gov>
Subject: RE: Western Cass FIS Appeal - Noble and Wiser Township, FEMA Case No. 10-08-0041S - email 2 of 2

I need to read it a little closer – and bounce it off Jason. I cruised through these as I was looking at about 60 emails after being in training yesterday.

-Robert

From: Worden, Heather <WordenH@casscountynd.gov>
Sent: Thursday, September 12, 2019 7:28 AM
To: Wilson, Robert <WilsonRo@casscountynd.gov>
Subject: RE: Western Cass FIS Appeal - Noble and Wiser Township, FEMA Case No. 10-08-0041S - email 2 of 2

I assume this will need to be discussed at the next Flood Sales Tax Committee meeting.



Heather Worden
Administrative Assistant
Cass County Commission Office
211 9th Street South
PO Box 2806
Fargo ND 58108-2806
wordenh@casscountynd.gov
D: 701-241-5609

From: Wilson, Robert <WilsonRo@casscountynd.gov>
Sent: Wednesday, September 11, 2019 5:19 PM

Cass County, ND Western Cass FIS Noble and Wisner Township Floodplain Map Appeal

Prepared for
David Sutley, PE, FEMA Region VIII

September 2019

Prepared by:
Kurt Lysne, PE, CFM
Stu Dobberpuhl, PE (MN)
Alexa Ducioame, PE, CFM



444 Sheyenne St Ste 301
West Fargo, ND 58078

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Kurt Lysne
Kurt Lysne, PE, CFM
PE-6871
Date: 9/6/19



Alexa Ducioame
Alexa Ducioame, PE, CFM
PE-10599
Date: 9/6/19

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1. Background

Moore Engineering was hired by the Cass County Joint Water Resource District to perform a technical review of the preliminary regulatory floodway as delineated for the Western Cass Flood Insurance Study (FIS) as mapped by AECOM. This memorandum is specific to the steady-state model updates in the northeast part of the county through Noble and Wiser Townships shown in Figure 1 and represents the technical basis for an appeal to the preliminary modeling and mapping efforts.

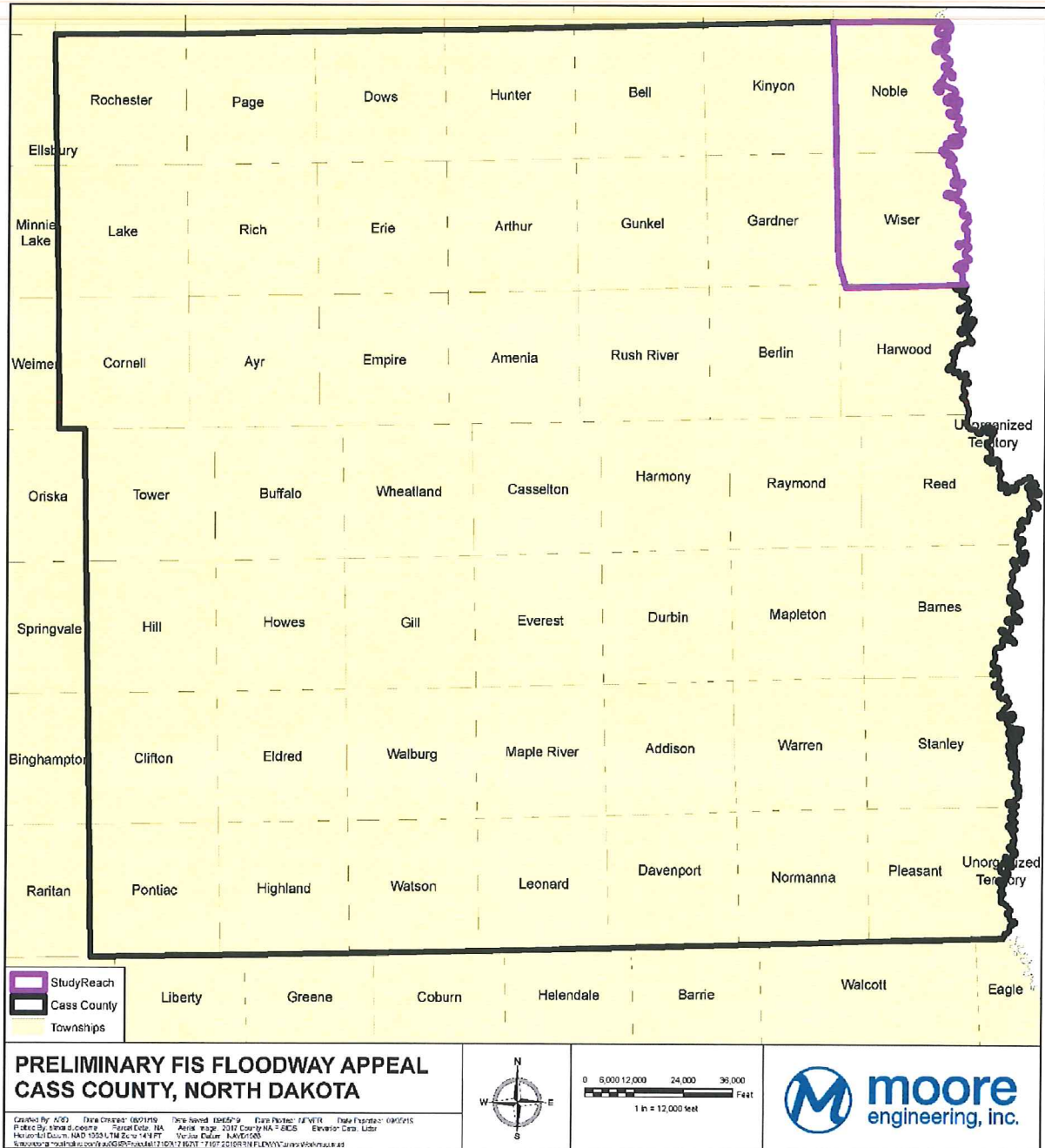


Figure 1 - Study Reach Location

2. Data Sources

Several different models were available for the area, as shown in Table 1. AECOM modeled the northern 1/3rd of the Red River in Cass County using the Eldred to Perley model, and Michael Baker modeled the southern 2/3^{ds} using the Fargo Oakport model. AECOM leveraged the first three models listed for their study from the U.S. Army Corps of Engineers (USACE) and Houston Engineering. Moore also referenced the last two models for the review. The Norman County FIS was obtained from the Minnesota Department of Natural Resources and the Houston Moore Group is modeling the FM Diversion. The Perley through Fargo model was updated to create the Fargo Oakport model, and the Oakport model was used for the preliminary Western Cass FIS. AECOM reran the Eldred to Perley model in HEC-RAS v4.1 and made several minor changes from the original model.

To put it concisely, the proposed regulatory floodway through Noble and Wiser Townships of Cass County was completed using two separate models – the Eldred to Perley model and the Fargo Oakport model – rather than one continuous model along the Red River of the North.

Table 1 - Existing HEC-RAS Models

Model	Affected ND Counties	Cross Sections ¹	RAS version	Source	Projection	Datum
Eldred to Perley	Cass & Traill	279-217	3.0.1	2001 USACE	NAD1983 UTM Zone14N m	NGVD29
Perley through Fargo	Cass	279-?	3.0.1	2003 USACE	NAD1983 UTM Zone14N m	NGVD29
Fargo Oakport	Cass	279-415	4.1	2007 Houston	NAD1983 ND State Plane South feet	NAVD88
Norman County MN FIS	Cass & Traill	282-237	4.1	2011 Houston	NAD1983 UTM Zone14N m	NAVD88
FM Diversion Phase 9.1 ²	Cass & Traill		5.0.6	2019 HMG	NAD1983 UTM Zone14N feet	NAVD88

¹Cross sections listed are not in river miles. The FM Diversion model encompasses the area the other three models cover, but river stationing uses distances in feet.

²FM Diversion model is the only unsteady state model with shorter cross sections and storage areas for overland flow

The NGVD29 to NAVD88 datum conversion was checked at several points along the Red River using NOAA's VertCon and averaged to be 1.10 feet.

3. Hydraulic Model Revisions

To ensure that Cass County has a usable, continuous model within the extents of the FIS, a portion of the Fargo Oakport model was added to the upstream end of the Eldred to Perley model to create a single model that spanned the study reach of Argusville to the Cass/Trail County line. The model was run in the latest version of HEC-RAS v5.0.7 for use of advanced mapping features. The change from v4.1 to v5.0.7 caused a maximum increase in the water surface elevation of 0.02 feet. These updates to the hydraulic model ensure a simplified model utilizing the latest version of the HEC-RAS software, and are referenced in this memorandum as the "appeal model". This is a major benefit to Cass County and the Townships administering the floodplain, as well as the Office of the State Engineer which has regulatory authority over the floodway.

3.1 Coordinate System and Datum

The Preliminary FIS models used a coordinate system in meters, but the cross section station elevation data, reach lengths, etc. were all in feet. This created issues with georeferencing and exporting data from the model for mapping. The appeal model updated the coordinate system from NAD1983 UTM Zone 14N meters to feet. This change makes the model more functional for simple analyses that will be completed for small projects in the coming years.

The Fargo Oakport, Norman County MN FIS, and FM Diversion models are all in NAVD88, while the Eldred to Perley model being used for the preliminary FIS was still in NGVD29. The Light Detection and Ranging (LiDAR) Digital Elevation Model (DEM) data for the area is all in NAVD88. The appeal model was converted to NAVD88 for simplicity in mapping and comparing model results.

3.2 Data Collection

LiDAR from 2008 was available for the entire model area. There was also 2017 LiDAR available for the area south of County Road 26. The 2008 LiDAR was used for results mapping, with the exception of a few road raises and ring levees that appeared in the 2017 LiDAR. This is discussed further in Section 4.1.

The Red River bridge at County Road 26 was redesigned in 2007 and the road was raised. The Eldred to Perley model used for the preliminary FIS did not reflect this change. The design firm, Erickson Engineering, was contacted for plans, which included the bridge as well as the modified channel geometry. Survey was also collected by Moore at the new bridge and along the road centerline for the extent of the cross sections.

3.3 Hydrology

The review found that the steady flow models and FIS reports for Norman, Clay, and Cass Counties had consistent hydrology. Moore did not adjust any hydrology from the preliminary FIS for this appeal.

3.4 Geometry

3.4.1 Cross Sections

It was immediately noted during Moore's review that cross section 274 was not located properly. Cross sections should be drawn perpendicular to the flow lines. This cross section was removed and 274.3 and 274.6 were added in its place, as shown in Figure 2. Several other cross sections were also added to the model to reduce the downstream reach lengths and more accurately model and map the floodplain.

The cross sections in the Eldred to Perley model all had less than 100 points for cross sections approximately three miles wide. HEC-RAS v5.0.7 allows up to 500 points each. The cross sections were recut using LiDAR and compared to the original Eldred to Perley model, Norman County FIS, and FM Diversion model to combine the best available data. Cross section 273 is shown in Figure 3. The black line is from the Preliminary FIS geometry, and the pink line is the new cross section. It is clear that the lower number of points compromised some of the detail. Figure 4 shows one of the cross sections at the County Road 26 bridge and the new channel geometry.



Figure 2 - Cross Section 274 update map

The use of a coordinate system in meters, but measurements in feet caused issues as the model was originally developed. Changes previously made to the cross sections were not reflected accurately in the GIS cut lines, resulting in differences with a maximum of 2,151 feet at cross sections 276 and 278. This creates errors when exporting cross sections and inundation areas. When the Eldred to Perley cross sections were recut, the lengths were corrected.

The ineffective flow areas were also updated with the cross sections to better represent high ground limiting effective flow, as well as contraction and expansion of flow at the bridges.

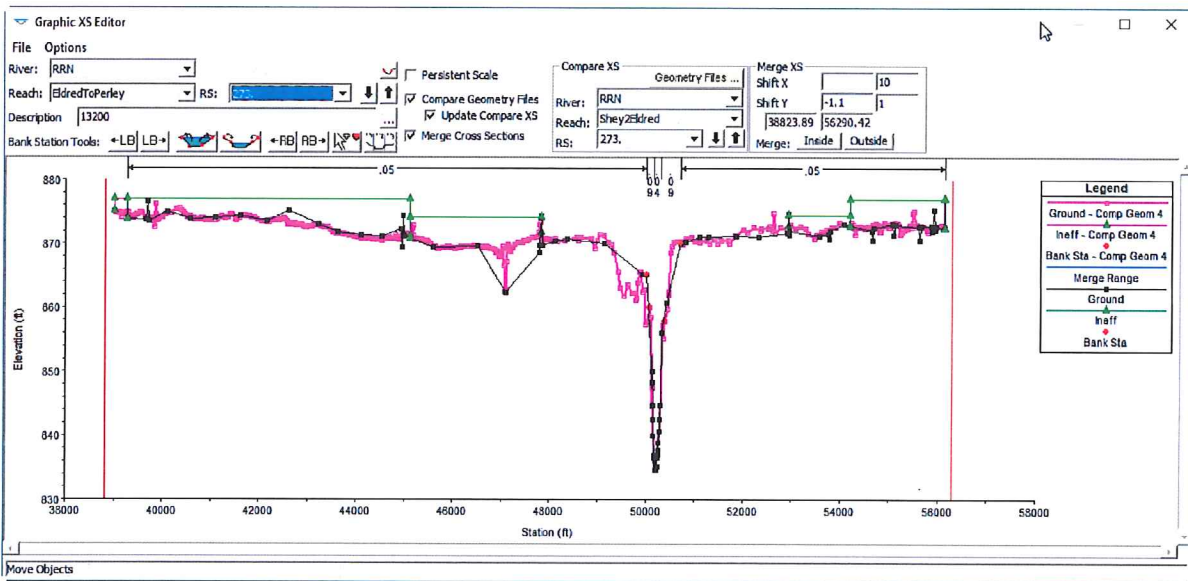


Figure 3 - Comparison of old and new cross section 273

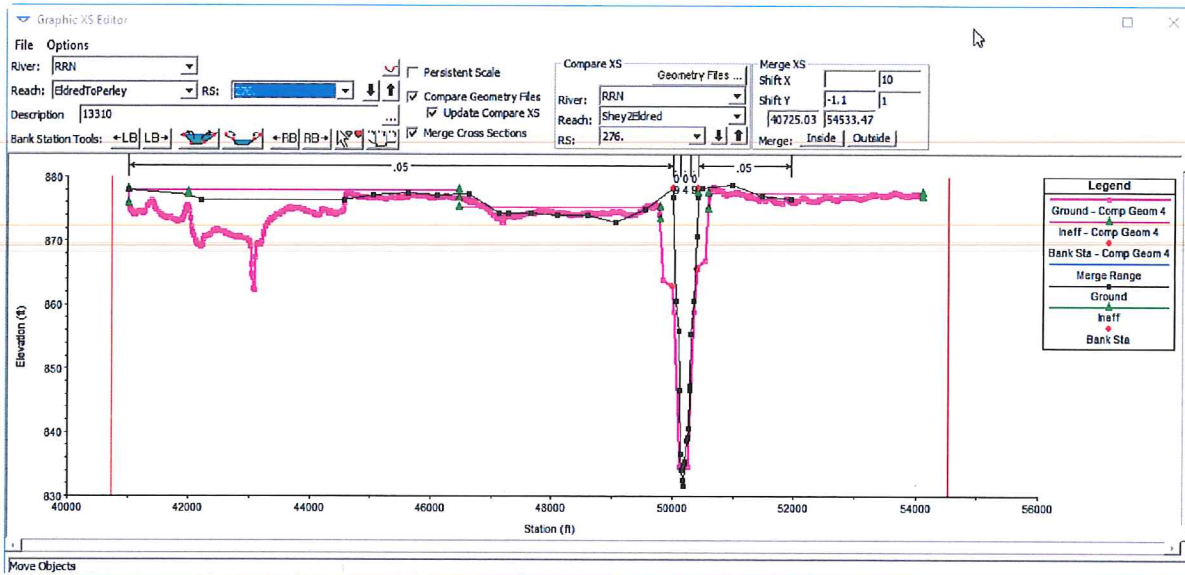


Figure 4 - Comparison of old and new cross section 276

3.4.2 County Road 26 Bridge

As mentioned in Section 3.2, plans and survey were collected for the County Road 26 road raise, new bridge, and channel modifications. Figure 5 shows the Preliminary FIS bridge, while Figure 6 shows the updated bridge in the appeal model. The channel and bridge shape and pier placement have a dramatic difference. There is also a considerable difference in the road elevations. This is further illustrated in the plot in Figure 7.

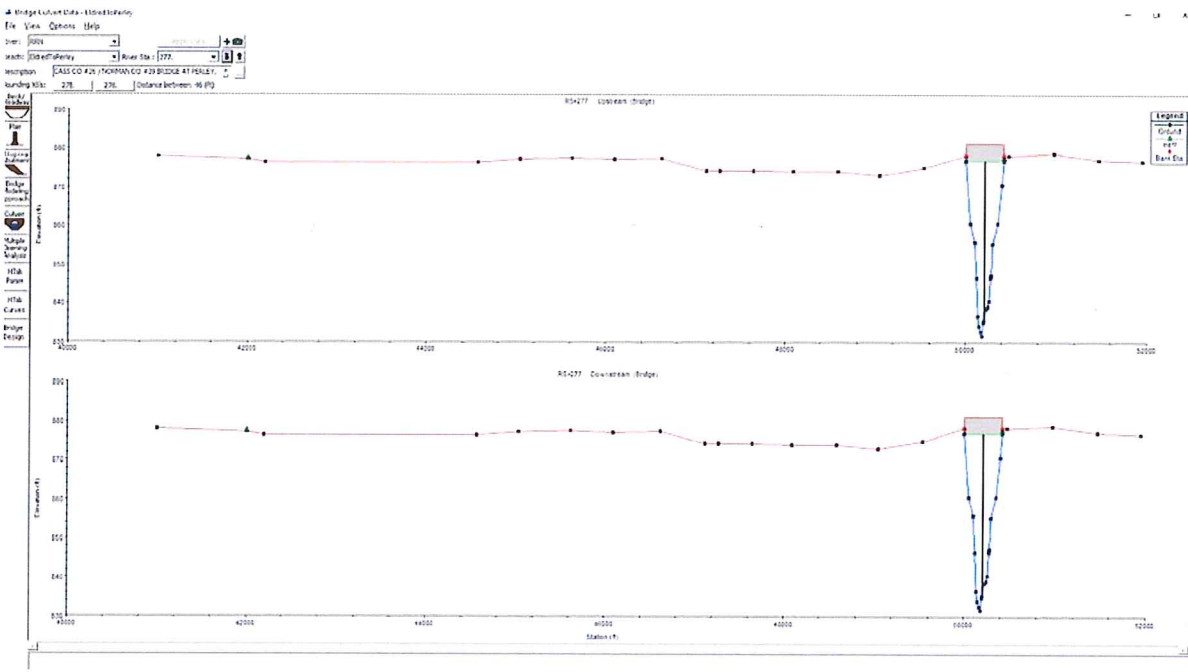


Figure 5 - Preliminary FIS County Road 26 Bridge

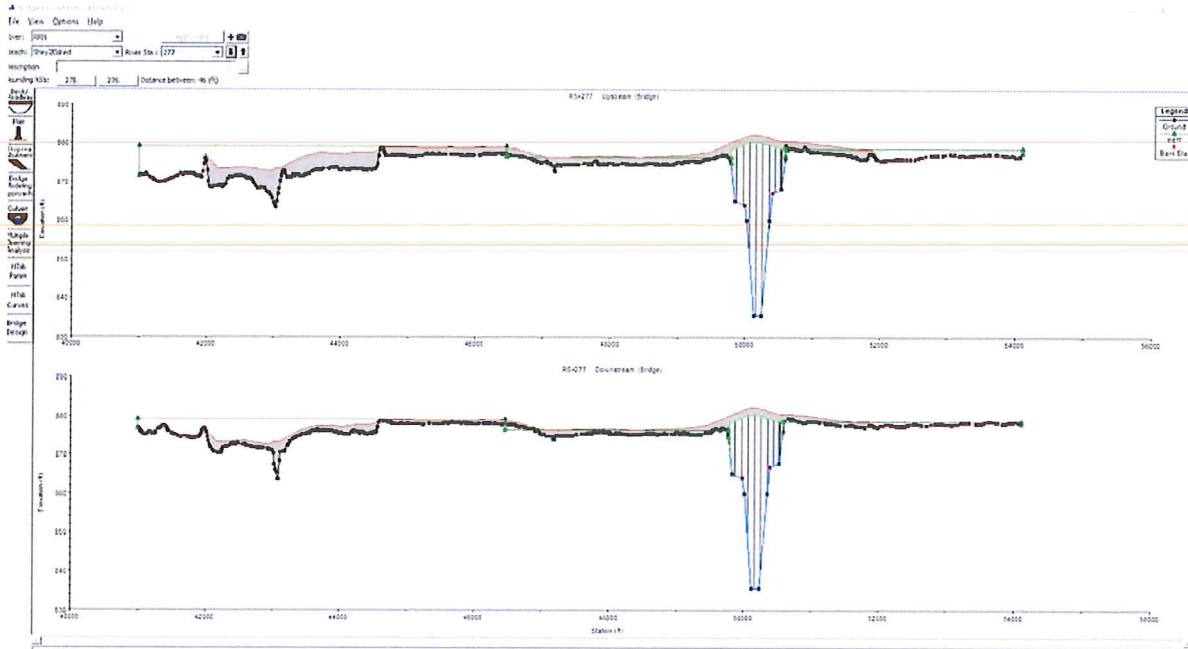


Figure 6 - Preliminary FIS Appeal County Road 26 Bridge

County Road 26 Bridge at Red River

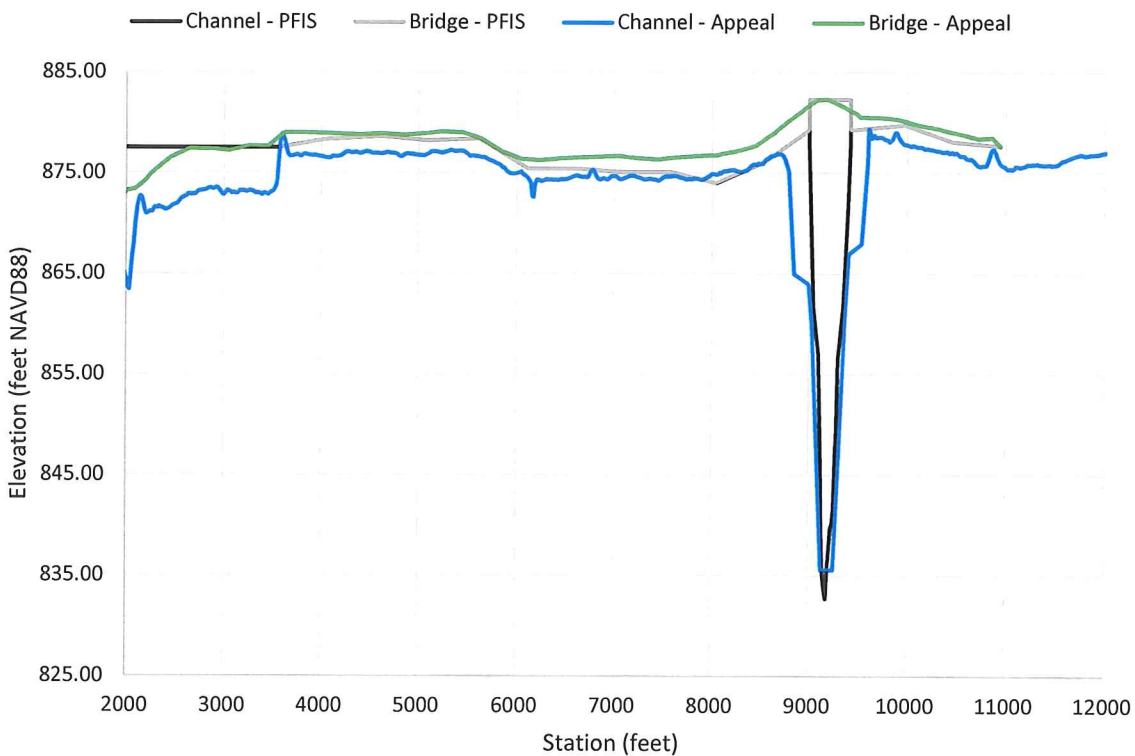


Figure 7 - Preliminary FIS vs Appeal County Road 26 Bridge

3.5 Floodway

"Regulatory Floodway means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height." (44 CFR 59.1)

The National Flood Insurance Program (NFIP) requires that the designated height be a maximum of one foot. Several states have adopted more stringent standards, such as Minnesota, which limits the allowable surcharge to 0.5 feet. The allowable surcharge in North Dakota is one foot. Through a joint agreement between the states of North Dakota and Minnesota, the allowable surcharge on the Red River of the North is 0.75 feet.

The Preliminary FIS floodway generally followed 172nd Ave SE, except for a mile and a half just north of County Road 26 where it crosses over to the west. The local landowners and township officials noted that this area is not effective flow, so the floodway was looked into in more detail. The Preliminary FIS model surcharge north of the Cass/Trail County Line has a maximum of 1.26 feet, well over the allowable 0.75 feet. This is outside of the project reach, but this constriction was causing the cross sections within the project reach to need a very wide floodway in order to stay below the 0.75 feet surcharge requirement. Essentially, for the preliminary floodway currently proposed as part of the Western Cass FIS, tailwater from Trail County is impacting Cass County in such a way that Cass County would have to mitigate excessive floodway height from downstream reaches and be required to have an unreasonably wide floodway.

Additionally, FEMA's map service center shows no effective floodway for Trail County at the Cass County line, so there are no tie-in requirements to an existing floodway. For the appeal, the floodway model was truncated one cross section downstream of the Cass/Trail County Line, and a downstream boundary condition of a known water surface elevation was set at 0.75 feet above the 1% Annual Chance water surface elevation to allow for a future floodway. This ensures that, for this appeal, Cass County's floodway will account for any future downstream floodway that could become effective in Trail County. The encroachments on the Minnesota side were set to match the effective floodway stations from the effective Norman County and Clay County studies, and the proposed floodway stations on the North Dakota side were adjusted through multiple iterations to get as close to the maximum surcharge as possible.

The Minnesota encroachments are very close to the Red River in several locations, so the North Dakota floodway still needed to be wide. One example of this is near County Road 26, as shown in Figure 8. The elevation at the border of the floodway is around 873-874 feet on both sides of the river. However, the floodplain is very flat, so it is also that elevation a mile to the east. Table 2 shows the lengths and percentage split between the two states. Cross section 279 upstream of County Road 26 has the largest split with 97% in ND and 3% in MN.

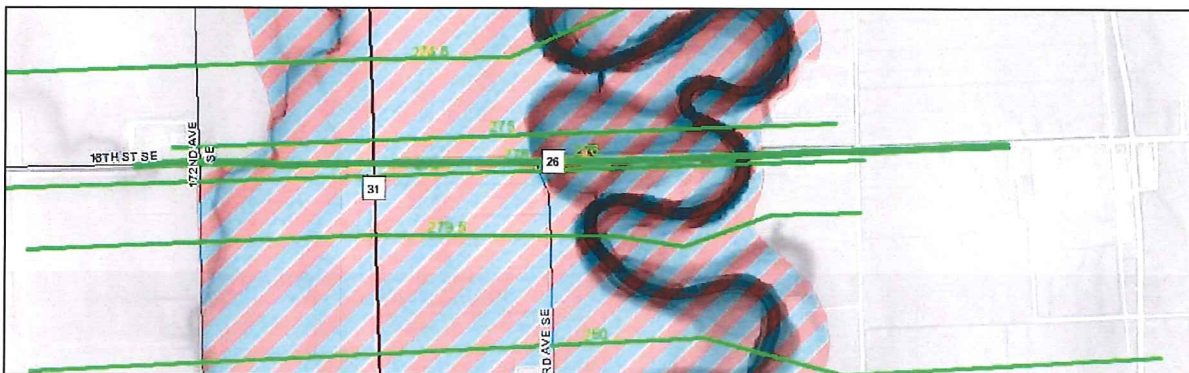


Figure 8 - Minnesota vs North Dakota Floodway near CR26

Table 2 - Floodway Split between North Dakota and Minnesota

Cross Section		FW Width				
Letter	Station	Total	ND		MN	
A	270	7,472	4,851	65%	2,621	35%
B	271	9,522	5,645	59%	3,877	41%
C	272	5,520	2,663	48%	2,857	52%
D	273	5,404	2,355	44%	3,049	56%
E	274.3	7,739	7,247	94%	492	6%
F	275	7,411	6,731	91%	680	9%
G	279	8,413	8,198	97%	215	3%
H	280	9,394	8,488	90%	906	10%
I	281	7,827	5,265	67%	2,562	33%
J	282	5,995	3,320	55%	2,675	45%
K	283	7,788	5,764	74%	2,024	26%
L	284	7,350	4,779	65%	2,571	35%
M	285	5,250	2,706	52%	2,544	48%
N	286	5,588	3,777	68%	1,811	32%
O	290	6,826	4,869	71%	1,957	29%
P	291	5,676	5,325	94%	351	6%
Q	292	7,635	4,594	60%	3,041	40%
R	293	5,743	3,355	58%	2,388	42%
S	294	5,955	2,599	44%	3,356	56%

MAX: 97% 56%
MIN: 44% 3%
Average: 69% 31%

4. Results

The Floodway Data Table (FWDT) in the Preliminary FIS report was compared to the PFIS model and some differences were found, as shown in Table 4. This table also shows the results from the appeal model and the comparison to the PFIS model for the width, section area, velocity, regulatory water surface elevation, floodway, and surcharge. The elevation differences could be attributed to rounding or a different datum conversion used. The 100-year floodplain increased a maximum of 0.3 ft at cross sections D and E, and decreased a maximum of 0.3 ft at cross section B. The proposed FWDTs with the appeal model results are shown in Table 5 and Table 6 for cross sections A-S.

The Preliminary FIS flood hazard zones are shown in Figure 10, while the appeal model redelineated floodplain and floodway are shown in Figure 11. The floodplain administrators and local landowners had concerns that the Preliminary FIS floodway did not reflect realistic conveyance of the river. The floodway area in the project area was reduced by 1,231 acres from 8,097 to 6,866, but is still a floodway of significant size due to the flat topography of the Red River valley. Figure 12 shows the layers overlaid to compare. The 500-year floodplain didn't change much, but the PFIS 100-year floodplain was held to the section lines, and the appeal model mapping updates the floodplain to extend farther west, which is more consistent with the topography.

4.1 Manual Editing

The model cross sections are narrower than the floodplain. In order to map the floodplain, the cross section lines were extended and water surface elevations for each cross section were used to create a surface that was then compared to the LiDAR surface. The outer extents of the cross section overbanks are modeled as ineffective flow areas in the model, so this extension does not need to be modeled. This methodology was also used by AECOM for the Preliminary FIS floodplain delineations.

As mentioned in Section 3.2, the elevations at several locations had changed from the 2008 to 2017 LiDAR. Figure 13 shows these locations, which include newly constructed ring levees and road raises. The high ground was removed from the applicable floodplains, as noted in Figure 13. Ring leveed areas were removed from the floodway because they do not provide conveyance within their footprint during flood event, but they remain in the 1% Annual Chance Floodplain since they are not certified levees.

4.2 Tie-ins

FEMA's Contiguous Community Matching Guidance Document 45 states that different hydraulic models can be used for different stream segments, as long as the water surface elevation ties in within 0.5 feet. When backwater computations are used, water surface elevations must tie in exactly. Table 3 shows the tie-ins are less than 0.5 feet for the study reach in Noble and Wisner townships when compared to the effective reaches in Cass and Traill Counties that are outside the extents of the Western Cass FIS.

As mentioned in Section 3.5, there is no effective floodway in Traill County downstream of the study reach. At the upstream end of the study reach, the floodway was delineated to tie into the effective floodway, as shown in Figure 9.

Table 3 - 100-year Water Surface Elevation Tie-ins

Cross Section		Effective 100-year	Appeal 100-year	Proposed-Effective	Tie-Ins	
Study Reach	X	269	874.37	874.36	-0.01	---
	A/AM	270	874.87	874.78	-0.09	0.41
	S	294	---	884.31	---	-0.39
	T	295	884.70	884.87	0.17	---

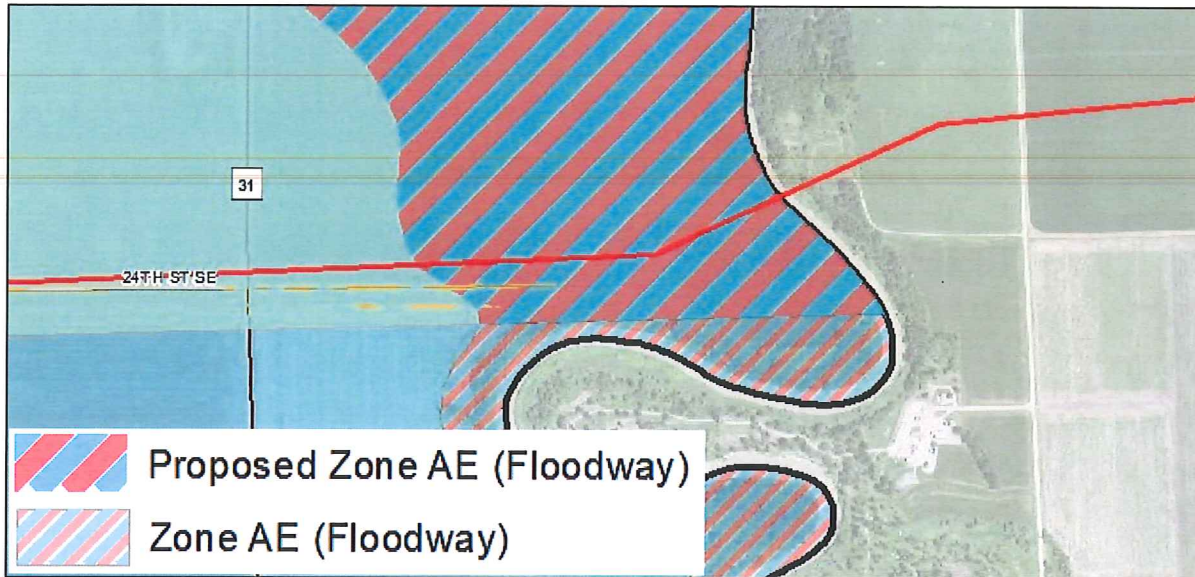


Figure 9 - Proposed Floodway Tie-in at Wisser/Harwood Township line

5. Conclusion

The models used for the Preliminary FIS in Noble and Wisner townships were combined into one model and the coordinate system and datum were updated to match the FIS report using feet and the NAVD88 datum. The model geometry was updated with new bridge plans, survey, and LiDAR ground elevations and the model was run in the latest version of HEC-RAS 5.0.7. This simplified model is a major benefit to Cass County and the Townships administering the floodplain, as well as the Office of the State Engineer which has regulatory authority over the floodway. The township floodplain administrators support the appeal results as being more accurate.

The following supporting documentation will be included in this appeal submittal:

- Letters from Noble and Wisner Township floodplain administrators
- County Road 26 Bridge plans
- Models
 - 9 plans for comparison
 - Eldred to Perley original: Historic, FIS flows, and Floodway plans (3)
 - Eldred to Perley WCass FIS: FIS flows and Floodway plans (2)
 - Fargo Oakport: FIS flows and Floodway (2)
 - Eldred to Argus Appeal: FIS flows and Floodway (2)
 - 2 plans for future regulatory use
 - Eldred to Argus Appeal: FIS flows and Floodway (2)
 - RASmapper files
- Map Package
 - Survey points
 - LiDAR surface
 - Proposed flood hazard zones, cross sections, and BFE line shapefiles
 - Aerial imagery
 - ND Roads

Table 4 - Comparison of Preliminary FIS Report, PFIS Model, and Appeal Model Floodway Data Table

Letr	Cross Section			PFIS Floodway Data Table (FWDT)					PFIS Model					PFIS Model-FWDT Difference					Appeal Model					Appeal - PFIS Difference								
	PFIS Station	Appeal Station	Width	Section Area	Mean Vel	100-year	Flood way	Increase	Width	Section Area	Mean Vel	100-year	Flood way	Increase	Width	Section Area	Mean Vel	100-year	Flood way	Increase	Width	Section Area	Mean Vel	100-year	Flood way	Increase	Width	Section Area	Mean Vel	100-year	Flood way	Increase
A	270	270	10,050	55,417	1.0	874.8	875.6	0.8	10,050	55,368	1.01	874.9	875.6	0.73	0	-49	0.0	0.1	0.0	-0.1	7,472	47,840	1.17	874.8	875.5	0.73	-2,578	-7,528	0.2	-0.1	-0.1	0.0
B	271	271	8,900	52,764	1.1	875.4	876.2	0.8	8,900	52,732	1.06	875.5	876.2	0.71	0	-32	0.0	0.1	0.0	-0.1	9,522	48,756	1.15	875.2	876	0.75	622	-3,976	0.1	-0.3	-0.2	0.0
C	272	272	7,700	53,053	1.1	876.1	876.8	0.7	7,693	53,032	1.06	876.1	876.9	0.74	-7	-21	0.0	0.0	0.1	0.1	5,520	38,980	1.44	876.2	876.8	0.6	-2,173	-14,052	0.4	0.1	0.0	-0.1
D	273	273	7,350	61,478	0.9	876.6	877.3	0.7	7,350	61,462	0.91	876.6	877.3	0.68	0	-16	0.0	0.0	0.0	0.0	5,404	43,532	1.29	876.9	877.5	0.59	-1,946	-17,931	0.4	0.3	0.2	-0.1
E	274	274.3	8,300	57,001	1.0	876.9	877.6	0.7	8,300	56,986	0.98	877	877.6	0.63	0	-15	0.0	0.1	0.0	-0.1	7,739	52,962	1.06	877.3	878	0.69	-561	-4,024	0.1	0.3	0.4	0.1
F	275	275	8,600	71,004	0.8	877.4	878	0.6	8,589	70,758	0.79	877.5	878	0.55	-12	-246	0.0	0.1	0.0	-0.1	7,411	51,248	1.09	877.7	878.4	0.72	-1,178	-19,510	0.3	0.2	0.4	0.2
G	279	279	8,650	67,896	0.8	877.8	878.5	0.7	8,647	66,029	0.85	877.8	878.4	0.54	-3	-1,867	0.1	0.0	-0.1	-0.1	8,413	74,584	0.75	877.8	878.6	0.74	-234	8,555	-0.1	0.0	0.2	0.2
H	280	280	9,400	58,892	1.0	878	878.7	0.7	9,392	58,892	0.95	878	878.7	0.68	-8	0	0.0	0.0	0.0	0.0	9,394	59,805	0.94	878.1	878.8	0.72	2	913	0.0	0.1	0.1	0.0
I	281	281	7,240	52,338	1.1	878.5	879.2	0.7	7,240	52,338	1.07	878.5	879.2	0.68	0	0	0.0	0.0	0.0	0.0	7,827	54,745	1.02	878.6	879.3	0.7	587	2,406	-0.1	0.0	0.1	0.0
J	282	282	7,190	59,634	0.9	879.4	880	0.6	7,190	59,974	0.94	879.4	880.1	0.64	0	340	0.0	0.0	0.1	0.1	5,995	54,658	1.03	879.5	880.2	0.7	-1,195	-5,316	0.1	0.0	0.1	0.1
K	283	283	7,700	42,152	1.3	880.6	881.1	0.5	7,700	42,295	1.33	880.6	881.1	0.5	0	143	0.0	0.0	0.0	0.0	7,788	43,997	1.27	880.7	881.3	0.62	88	1,702	-0.1	0.0	0.1	0.1
L	284	284	7,350	43,298	1.2	881.6	882.3	0.7	7,350	43,375	1.24	881.6	882.3	0.68	0	77	0.0	0.0	0.0	0.0	7,350	43,881	1.22	881.6	882.3	0.74	0	506	0.0	0.0	0.1	0.1
M	285	285	5,250	55,001	1.0	881.7	882.4	0.7	5,250	55,053	0.98	881.7	882.4	0.7	0	52	0.0	0.0	0.0	0.0	5,250	55,399	0.97	881.7	882.5	0.75	0	345	0.0	0.0	0.1	0.1
N	286	286	5,600	24,377	2.2	881.9	882.6	0.7	5,587	24,431	2.20	881.9	882.6	0.66	-13	54	0.0	0.0	0.0	0.0	5,588	24,789	2.17	881.9	882.6	0.71	1	357	0.0	0.0	0.1	0.1
O	290	290	6,883	30,270	1.8	882.2	882.8	0.6	6,883	30,333	1.77	882.2	882.8	0.64	0	63	0.0	0.0	0.0	0.0	6,826	31,697	1.69	882.2	882.9	0.69	-57	1,365	-0.1	0.0	0.1	0.0
P	291	291	5,500	37,366	1.4	883	883.6	0.6	5,489	37,401	1.44	883	883.6	0.66	-11	35	0.0	0.0	0.0	0.0	5,676	38,029	1.41	883	883.6	0.67	187	629	0.0	0.0	0.0	0.0
Q	292	292	7,740	46,128	0.9	883.4	884.1	0.7	7,740	46,168	0.91	883.4	884.1	0.68	0	40	0.0	0.0	0.0	0.0	7,635	45,736	0.91	883.4	884.1	0.7	-105	-432	0.0	0.0	0.0	0.0
R	293	293	6,320	31,522	1.5	884	884.7	0.7	5,741	28,857	1.45	884	884.7	0.68	-579	-2,665	0.0	0.0	0.0	0.0	5,743	28,954	1.44	884	884.7	0.71	3	97	0.0	0.0	0.0	0.0
S	294	294	7,275	36,396	1.3	884.3	885	0.7	7,275	31,460	1.33	884.3	885	0.68	0	-4,936	0.0	0.0	0.0	0.0	5,955	26,515	1.58	884.3	885	0.72	-1,320	-4,945	0.3	0.0	0.0	0.0

Table 5 - Appeal Floodway Data Table: Cross Sections A-J

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET) ²	SECTION AREA (SQ FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	243.17	7,472/ 4,851	47,840	1.2	874.8	874.8	875.5	0.7
B	245.23	9,522/ 5,645	48,756	1.2	875.2	875.2	876.0	0.8
C	247.72	5,520/ 2,863	38,980	1.4	876.2	876.2	876.8	0.6
D	250.16	5,404/ 2,355	43,532	1.3	876.9	876.9	877.5	0.6
E	251.94	7,739/ 7,247	52,962	1.1	877.3	877.3	878.0	0.7
F	254.33	7,411/ 6,731	51,248	1.1	877.7	877.7	878.4	0.7
G	254.47	8,413/ 8,198	74,584	0.8	877.8	877.8	878.6	0.7
H	255.79	9,394/ 8,488	59,805	0.9	878.1	878.1	878.8	0.7
I	257.32	7,827/ 5,265	54,745	1.0	878.6	878.6	879.3	0.7
J	261.02	5,995/ 3,320	54,658	1.0	879.5	879.5	880.2	0.7

¹Stream distance in miles above International Border
²Total floodway width/ width within jurisdiction

PROPOSED

TABLE 1	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	CASS COUNTY, ND	FLOODING SOURCE: RED RIVER OF THE NORTH
	ALL JURISDICTIONS	

Table 6 - Appeal Floodway Data Table: Cross Sections K-S

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET) ³	SECTION AREA (SQ FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
K	264.04	7,788/ 5,764	43,997	1.3	880.7	880.7	881.3	0.6
L	265.79	7,350/ 4,779	43,881	1.2	881.6	881.6	882.3	0.7
M	266.20	5,250/ 2,706	55,399	1.0	881.7	881.7	882.5	0.8
N	266.66	5,588/ 3,777	24,789	2.2	881.9	881.9	882.6	0.7
O	266.75	6,826/ 4,869	31,697	1.7	882.2	882.2	882.9	0.7
P	267.92	5,676/ 5,325	38,029	1.4	883.0	883.0	883.6	0.7
Q	269.00	7,635/ 4,584	45,736	0.9	883.4	883.4	884.1	0.7
R	270.74	5,743/ 3,355	28,954	1.4	884.0	884.0	884.7	0.7
S	271.14	5,955/ 2,599	26,515	1.6	884.3	884.3	885.0	0.7
T	372.75/ 205.61 ²	2,570	33,729	1.6	884.7	884.7	885.5	0.8

PROPOSED

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	CASS COUNTY, ND ALL JURISDICTIONS	FLOODING SOURCE: RED RIVER OF THE NORTH

¹Stream distance in miles above International Border
²Inaccurate stream distance in miles above International Border
³Total floodway width/ width within jurisdiction

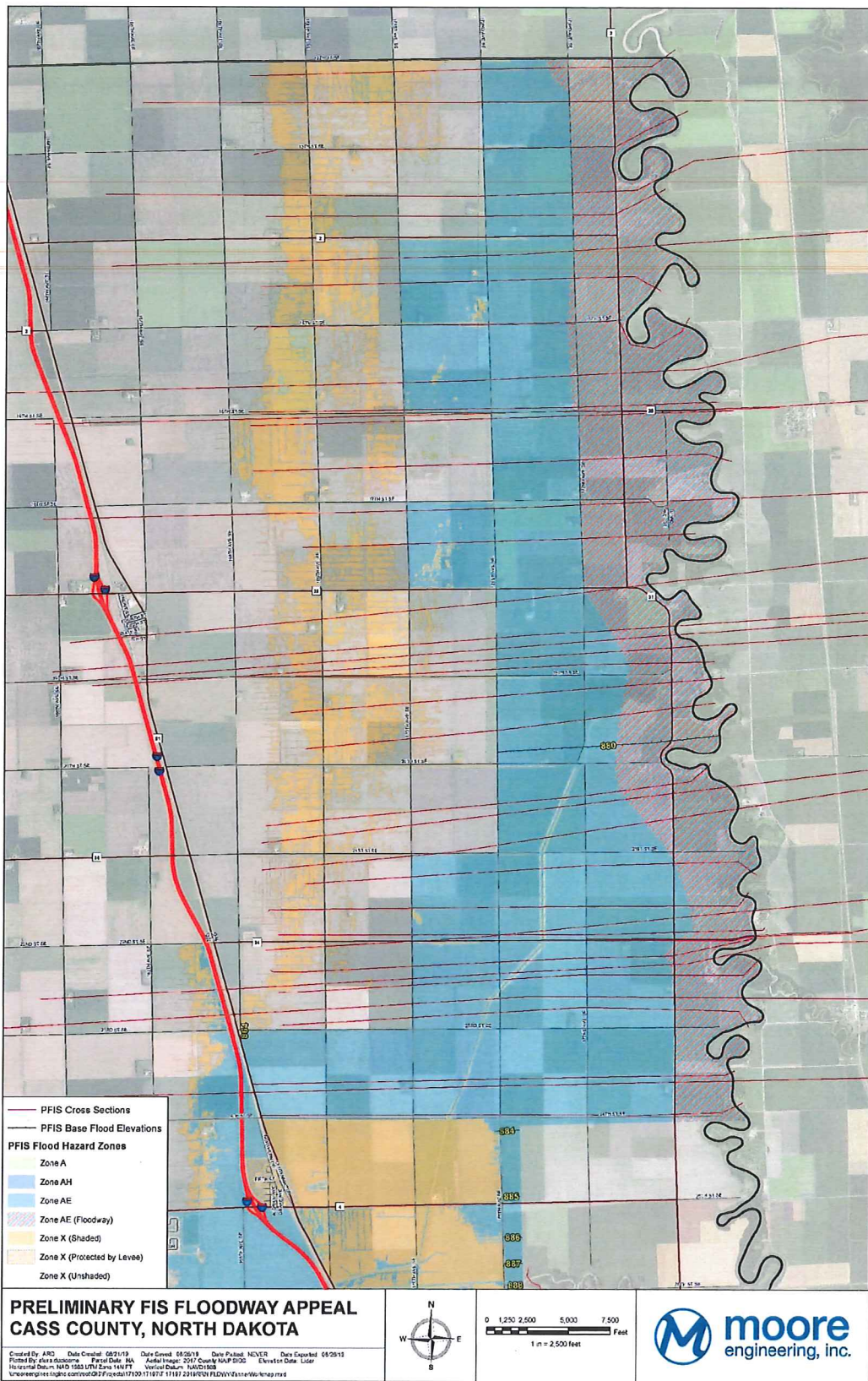


Figure 10 - Preliminary FIS Flood Hazard Areas

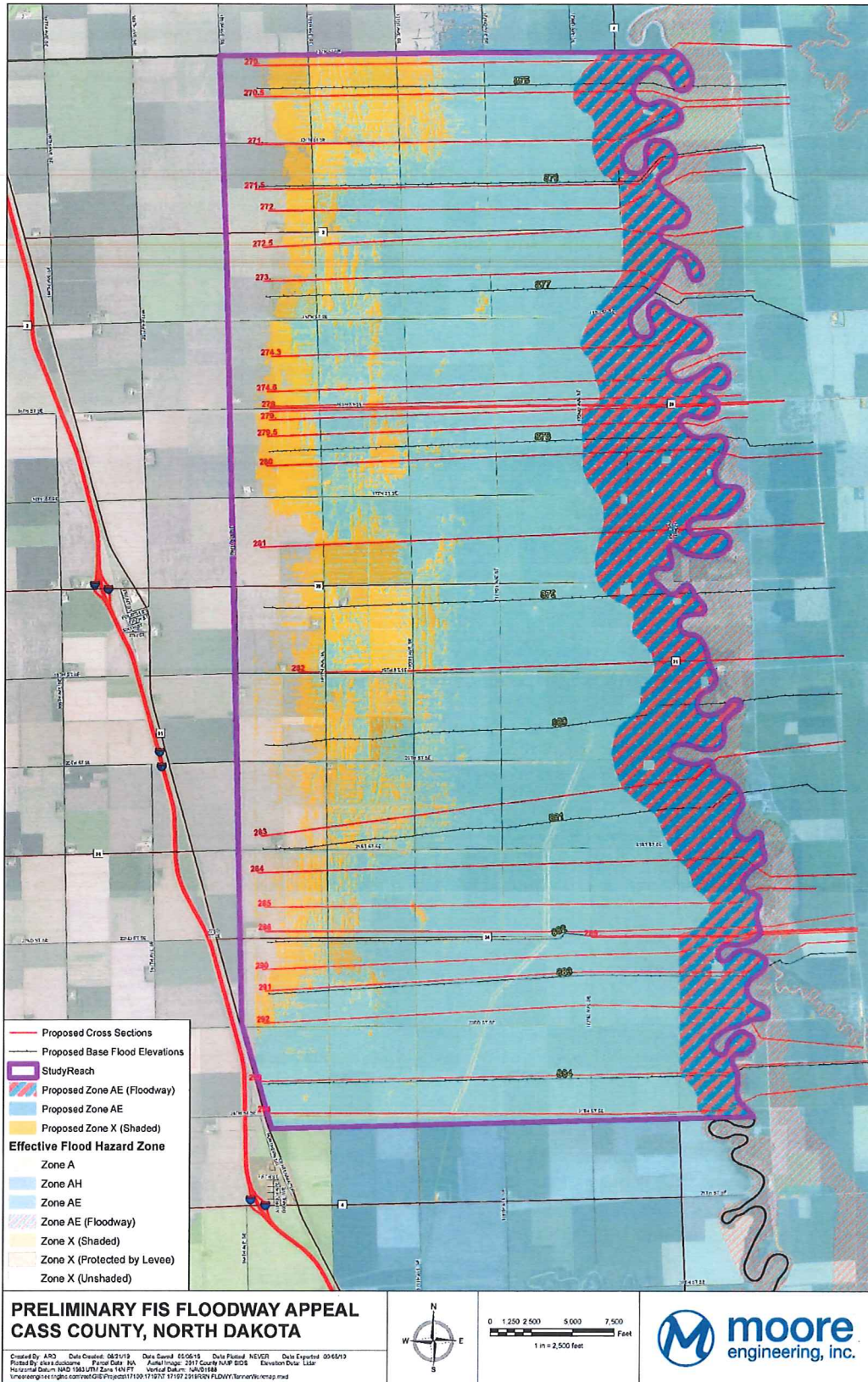


Figure 11 - PFIS Appeal Flood Hazard Areas

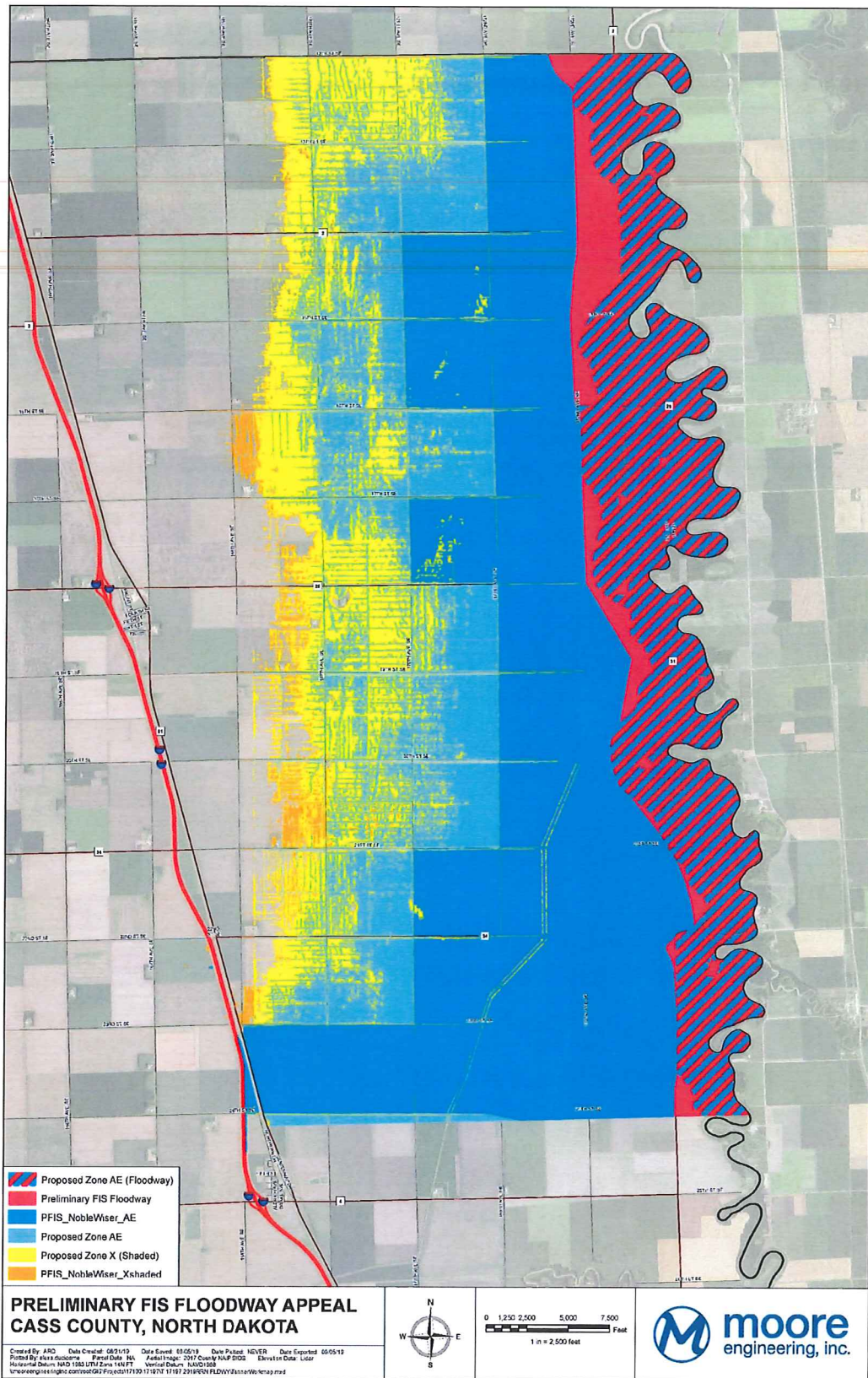


Figure 12 - PFIS vs Appeal Flood Hazard Zone Comparison

Cass County, ND City of Arthur Floodplain Map Appeal

Prepared for
David Sutley, PE, FEMA Region VIII

September 2019

Prepared by:
Kurt Lysne, PE, CFM
Stu Dobberpuhl, PE (MN)
Alexa Ducioame, PE, CFM



444 Sheyenne St Ste 301
West Fargo, ND 58078

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Kurt Lysne
Kurt Lysne, PE, CFM
PE-6871
Date: 9/6/19

Alexa Ducioame
Alexa Ducioame, PE, CFM
PE-10599
Date: 9/6/19

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1. Background

The north and south branches of an unnamed coulee run through the city of Arthur, then converge and flow east to the Elm River, a tributary of the Red River of the North. A general layout of the coulee and street names is shown in Figure 1.

The Effective Flood Insurance Rate Map for Arthur has mapped area along this coulee as Zone A. Zone A is an area where the 1 – percent annual chance (100-yr) floodplain has been mapped, but the 100-yr Base Flood Elevation (BFE) has not been defined. As part of the Western Cass Flood Insurance Study (FIS), a model was created for an approximate study and a new Zone A flood hazard area was proposed. The Effective and Preliminary FIS floodplains are shown in Figure 2.

Moore Engineering was contracted by the Cass County Joint Water Resource District and the City of Arthur to investigate the mapping updates and create a refined model to more accurately delineate the floodplain.

All elevations are in the NAVD88 vertical datum.

2. Hydrology

The Preliminary FIS report stated that U.S. Geological Survey (USGS) *Water-Resources Investigations Report 92-4040* for streams in **South Carolina** was used for the hydrology for approximate streams [1].

Moore delineated the contributing area and watershed slope based on LiDAR using the HEC-GeoHMS extension within Arc-GIS. The USGS *Scientific Investigations Report 2015-5096* for streams in North Dakota was used to calculate the 1% Annual Chance (100-yr) event discharges for the area with regression equations [2].

This method produced a discharge over 300 cfs at the upstream end of the north branch, however there is a single 36 inch culvert through the abandoned Highway 18 and the same through the new Highway 18. It would not be valid to ignore the attenuating effect of these culverts and road embankments. CulvertMaster ® was used to calculate a maximum discharge that could pass through the culverts assuming the upstream headwater was equal to the top of road elevation for the highway. This is conservative since the highway has never overtopped from large-volume snowmelt events, which have a much higher volume of runoff than summer rainfall events and the culvert discharge is much more dependent on volume than peak discharge. A flow of 65 cfs was determined and used for the upstream limit discharge on the north branch. Additional local drainage comes in downstream of the Highway 18 crossing, so the flow increases to 95 cfs at that location. This is reasonable close to the Preliminary FIS model discharge of 111 cfs.

The USGS equations resulted in a calculated flow of 219 cfs at the upstream end of the south branch, this is considerably higher than the Preliminary FIS discharge of 137 cfs.. The south branch has larger culverts through the Old and New Highway 18 crossings, so a similar check in CulvertMaster ® found that all of the flow could pass through. The flow for the downstream reach was determined by adding together the north and south branches.

Table 1 shows a comparison of flows calculated from the regression equations chosen for the FIS

and Moore models.

Table 1 - 1% Annual Chance (100-year) Flow Rates

Reach	Location	River Station	Flow (cfs)	
			FIS	Moore
Upstream North	US limit	4426	100	334 (65)
	DS of Hwy 18	1450	111	95
Upstream South	US limit	8067	137	219
	US of 6th Ave	4211	142	
Downstream	US limit	3138	225	314

US=Upstream DS=Downstream

3. Hydraulic Analysis

The Preliminary FIS model used the Hydrologic Engineering Center River Analysis System (HEC-RAS) v4.0. This approximate study used DSS-WISE as a preprocessor to create a HEC-RAS model from the terrain data. An automated routine in WISE was used to place cross sections, but no structures (bridges or culverts) were added to the model. Manning's n channel roughness values were set at 0.04 in the channel and 0.09 in the overbanks. The model was then run to route flood discharges. No historical data was available, so no calibration was performed on the models. However, the results were reviewed for dam effects and compared against the effective floodplain.

Moore used the GeoRAS extension within ArcGIS and GeoHECRAS software to create new channel cross sections and structures to update the HEC-RAS model in v5.0.3. The elevation data came from a combination of Light Detection and Ranging (LiDAR) data from 2008 and survey collected along the south branch in May of 2015 and along the north branch and downstream reach in June of 2017. Bridges and culvert crossings were added into the model using survey data. Manning's n values of 0.032 in the channel and 0.045 in the overbanks were used to represent a clean channel with grass or crop overbanks [3]. Flooding is more likely to occur in the spring with less vegetation, so these values are conservative. Normal depth was used as the downstream boundary condition. A comparison of the FIS and Moore model layouts is shown in Figure 3.

The buried pipe shown as a dashed line in Figure 3 was undersized when the Flood Insurance Study began. Recent flooding events caused components of that current storm sewer system to degrade and fail. The pipe was completely rusted with many holes and portions completely missing. A September 2017 storm washed out part of a street, and the pipe bedding was also being undermined by erosion. The storm sewer system was no longer able to convey drainage as it was originally designed to do. In addition, the area between 2nd and 4th Avenues would have been mapped into the 100-year floodplain because the existing buried pipe did not have the capacity to convey that event. An upgraded system with a single concrete 65x40 inch arch pipe was installed in 2019 to provide an adequate storm sewer and reduce the risk of flooding for homeowners.

4. Results

Figure 4 shows a comparison of the Preliminary FIS and Corrected floodplains. The appeal model

floodplain was edited manually upstream of the old County Road 18 on the north branch to reflect the flow restricted by the 36 inch culvert. The floodplain was also edited immediately downstream of Highway 18 and a few other small areas where it was crossing contour lines.

The Preliminary FIS is mapped in red and the Corrected floodplain is in blue. The layers are transparent to show the background imagery. Where the two floodplains are the same it appears as purple. There are a few small blue areas that show an increase in the floodplain. The red areas show a decrease in the floodplain from the Preliminary FIS to the Corrected model. This is due to improved cross sections, the new 65x40 inch arch pipe, and corrected Manning's n values.

The following supporting documentation will be included in this appeal submittal:

- Letter from Mayor of Arthur
- HEC-RAS model
- New 65x40 inch arch pipe record drawing
- Map Package
 - Survey points
 - LiDAR surface
 - Proposed Zone A and cross sections
 - Aerial imagery
 - ND roads

Bibliography

- [1] L. R. Bohman, "Determination of Flood Hydrographs for Streams in South Carolina: Volume 2. Estimation of Peak-Discharge Frequency, Runoff Volumes, and Flood Hydrographs for Urban Watersheds - Water-Resources Investigations Report 92-4040," U.S. Geological Survey, Columbia, South Carolina, 1992.
- [2] T. Williams-Sether, "Regional Regression Equations to Estimate Peak-Flow Frequency at Sites in North Dakota Using Data through 2009 - Scientific Investigations Report 2015-5096," U.S. Geological Survey, Reston, Virginia, 2015.
- [3] V. T. Chow, Open Channel Hydraulics, New York: McGraw-Hill, 1959.

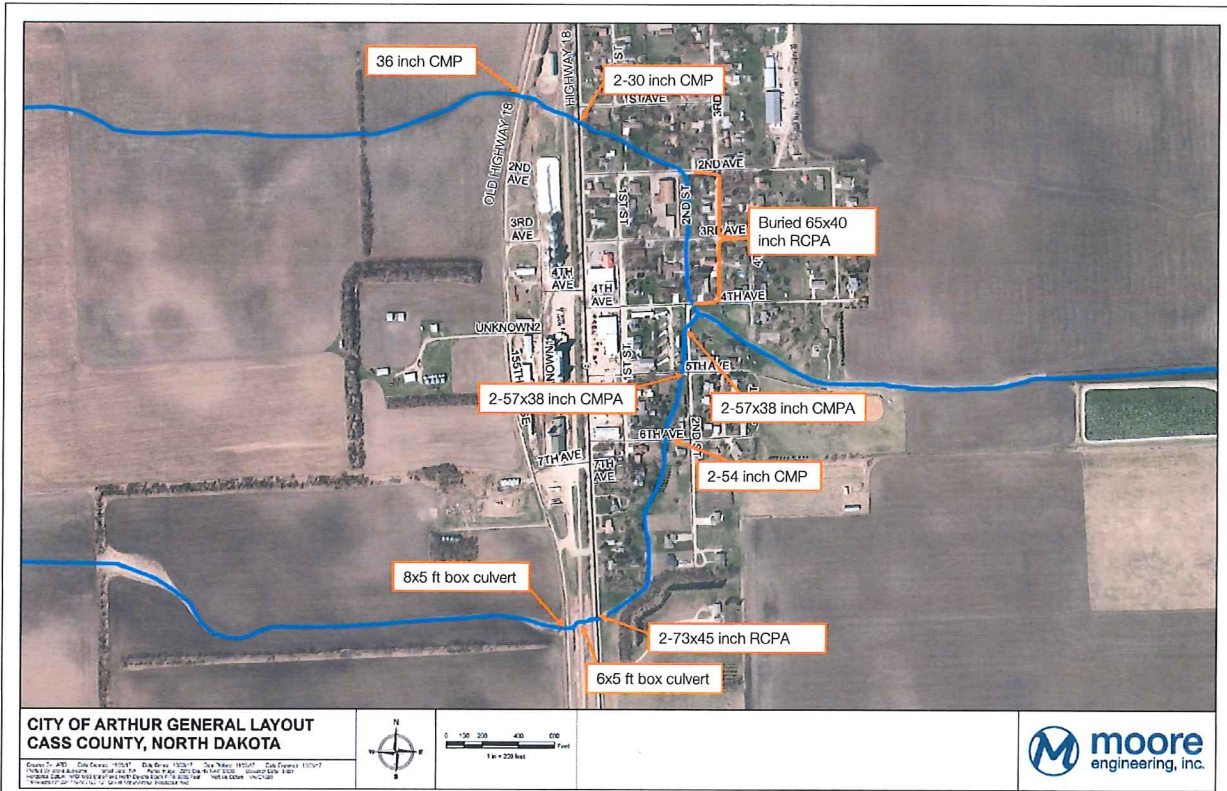


Figure 1 - City of Arthur General Layout

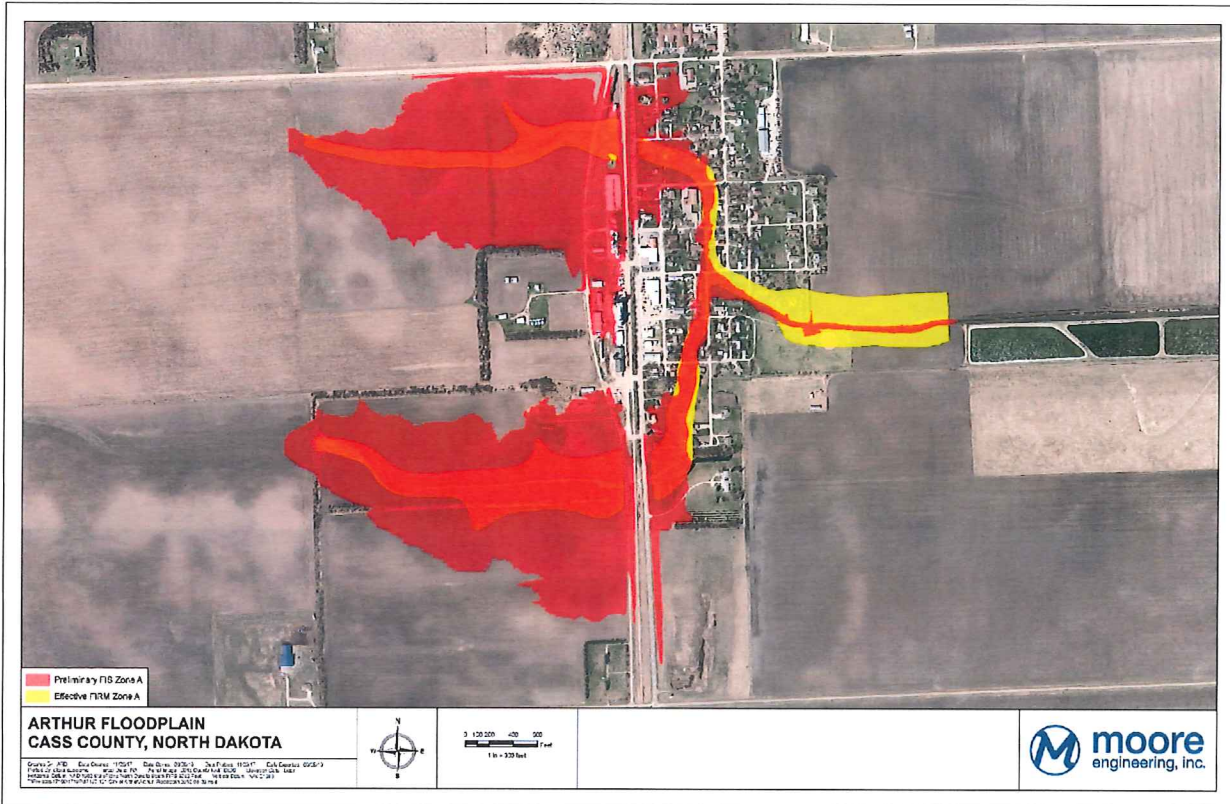


Figure 2 - Effective and Preliminary FIS Floodplains

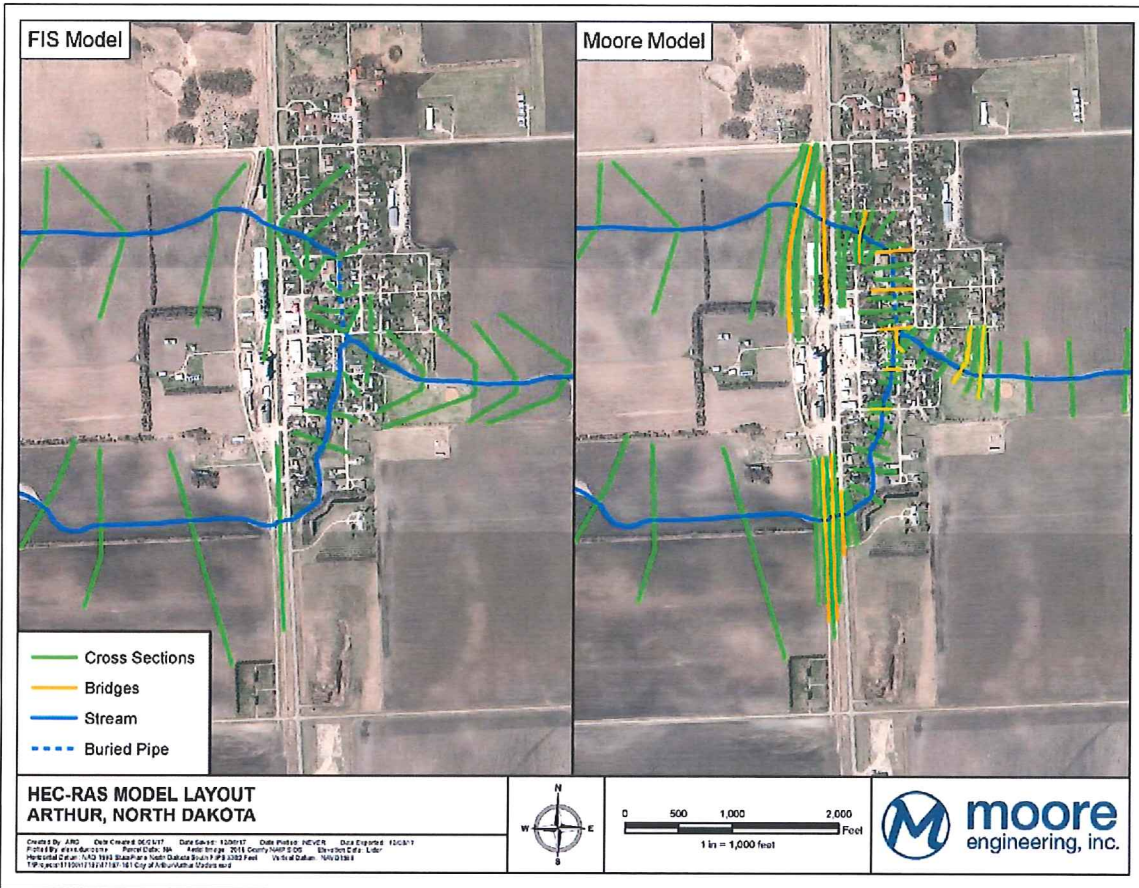


Figure 3 - FIS and Moore Updated HEC-RAS Model Layouts

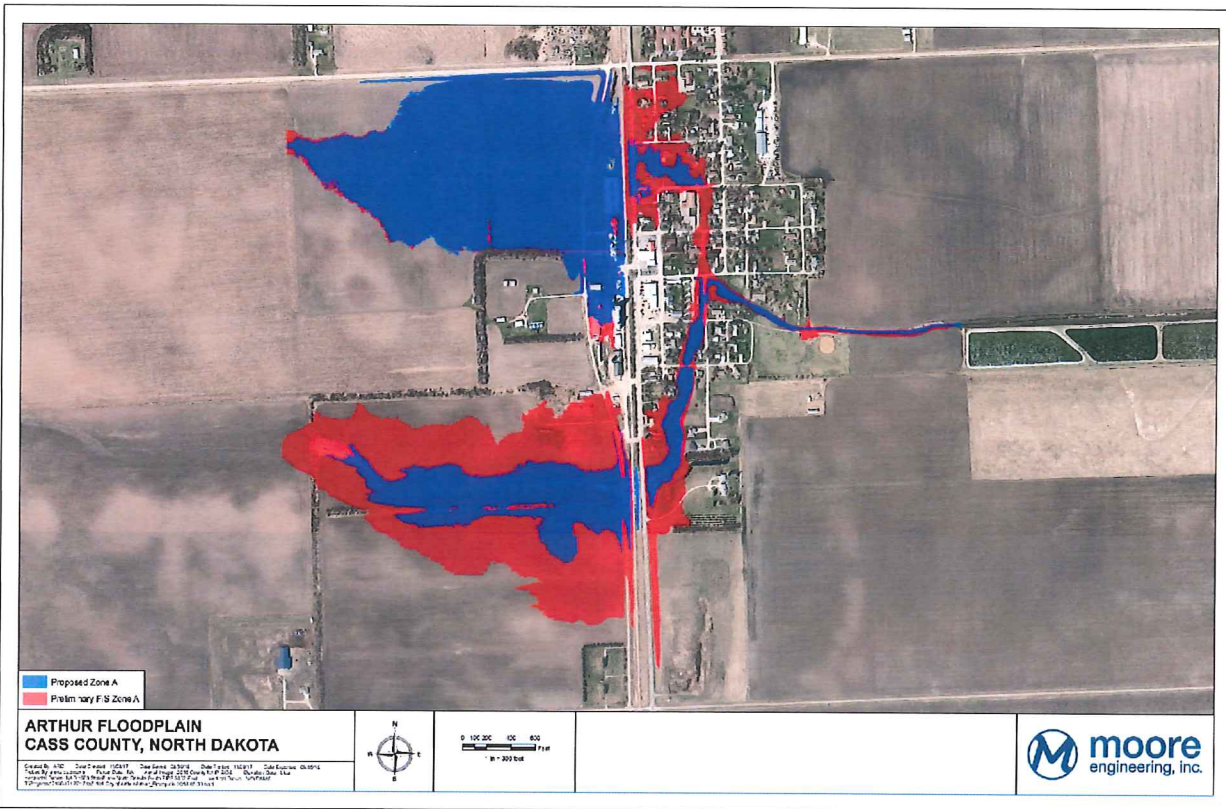


Figure 4 - Preliminary FIS and Corrected Floodplains
 City of Arthur Floodplain Map Appeal