

DEPARTMENT OF HOMELAND SECURITY  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**RIVERINE STRUCTURES FORM**

**O.M.B. NO. 1660-0016**  
**Expires February 28, 2014**

**PAPERWORK BURDEN DISCLOSURE NOTICE**

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

**PRIVACY ACT STATEMENT**

**AUTHORITY:** The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

**PRINCIPAL PURPOSE(S):** This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

**ROUTINE USE(S):** The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

**DISCLOSURE:** The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: [Red River of the North](#), [Wild Rice River](#), [Sheyenne River](#), [Maple River](#), [Rush River](#), and [Lower Rush River](#)

Note: Fill out one form for each flooding source studied.

**A. GENERAL**

Complete the appropriate section(s) for each Structure listed below:

- Channelization.....complete Section B
- Bridge/Culvert.....complete Section C
- Dam.....complete Section D
- Levee/Floodwall.....complete Section E
- Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure [Please see CLOMR Support Document Section 1.5 and Tables 1-1 through 1-4 for Project features and details.](#)

1. Name of Structure: \_\_\_\_\_  
Type (check one):     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: \_\_\_\_\_  
Downstream Limit/Cross Section: \_\_\_\_\_  
Upstream Limit/Cross Section: \_\_\_\_\_
2. Name of Structure: \_\_\_\_\_  
Type (check one):     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: \_\_\_\_\_  
Downstream Limit/Cross Section: \_\_\_\_\_  
Upstream Limit/Cross Section: \_\_\_\_\_
3. Name of Structure: \_\_\_\_\_  
Type (check one)     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: \_\_\_\_\_  
Downstream Limit/Cross Section: \_\_\_\_\_  
Upstream Limit/Cross Section: \_\_\_\_\_

**NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.**

B. CHANNELIZATION

Flooding Source: [Red River of the North, Wild Rice River, Sheyenne River, Maple River, Rush River, and Lower Rush River](#)

Name of Structure: [FM Area Diversion](#)

1. Hydraulic Considerations

The channel was designed to carry 20,000 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

- Subcritical flow
- Critical flow
- Supercritical flow
- Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

- Inlet to channel
- Outlet of channel
- At Drop Structures
- At Transitions
- Other locations (specify): \_\_\_\_\_

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

Please see [Appendix C – FEIS, Appendix D – Supplemental EA, and Appendix G – Diversion Design](#) for design information on the [Diversion channel](#).

3. Accessory Structures

The channelization includes (check one):

- Levees [Attach Section E (Levee/Floodwall)]
- Drop structures
- Superelevated sections
- Transitions in cross sectional geometry
- Debris basin/detention basin [Attach Section D (Dam/Basin)]
- Energy dissipator
- Weir
- Other (Describe): [Gated Control Structure and Aqueducts](#)

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport?  Yes  No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered. [Sediment transport has been analyzed as a part of Project design. Please see Appendix C - FEIS and Appendix D – Supplemental EA for discussion on the accounting for sedimentation for the Project.](#)

C. BRIDGE/CULVERT

Flooding Source: [Red River of the North, Wild Rice River, Sheyenne River, Maple River, Rush River, and Lower Rush River](#)

Name of Structure: [FM Area Diversion Bridges \(Multiple New\)](#)

1. This revision reflects (check one):

- Bridge/culvert not modeled in the FIS
- Modified bridge/culvert previously modeled in the FIS
- Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): [HEC-RAS](#)

If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- Dimensions (height, width, span, radius, length)
- Distances Between Cross Sections
- Shape (culverts only)
- Erosion Protection
- Material
- Low Chord Elevations – Upstream and Downstream
- Beveling or Rounding
- Top of Road Elevations – Upstream and Downstream
- Wing Wall Angle
- Structure Invert Elevations – Upstream and Downstream
- Skew Angle
- Stream Invert Elevations – Upstream and Downstream
- Cross-Section Locations

The design levels vary from Feasibility to 95%. Please see [Appendix G – Diversion Design and Appendix C – FEIS \(Consultant Report\)](#) for design information for the various bridge structures for the project

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport?  Yes  No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation. [Please see Appendix G – Diversion Design, Appendix C - FEIS, and Appendix D – Supplemental EA for discussion on sediment transport analysis for the Project and bridges.](#)

**D. DAM/BASIN**

Flooding Source: [Red River of the North and the Wild Rice River](#)  
 Name of Structure: [FM Area Diversion](#)

1. This request is for (check one):  Existing dam/basin  New dam/basin  Modification of existing dam/basin  
 2. The dam/basin was designed by (check one):  Federal agency  State agency  Private organization  Local government agency

Name of the agency or organization: [USACE](#)

3. The Dam was permitted as (check one):  Federal Dam  State Dam

Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

Permit or ID number Pending Permitting Agency or Organization NDSWC, MNDNR

- a.  Local Government Dam  Private Dam

Provided related drawings, specification and supporting design information.

[Please see Appendix C – FEIS, Appendix D – Supplemental EA, and Appendix F – PFSA and Wild Rice River Micrositing for design information on the dam.](#)

4. Does the project involve revised hydrology?  Yes  No

If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

Yes, provide supporting documentation with your completed Form 2.

No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis?  Yes  No [Please see Appendix C – FEIS and Appendix D – Supplemental EA for discussion on sediment transport analysis for the Project.](#)

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change?  Yes  No

If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin	
	FIS-ECM	REVISED
10-year (10%)	<a href="#">909.85</a>	<a href="#">909.85</a>
50-year (2%)	<a href="#">913.82</a>	<a href="#">920.91</a>
100-year (1%)	<a href="#">914.5</a>	<a href="#">922.34</a>
500-year (0.2%)	<a href="#">915.57</a>	<a href="#">922.47</a>
Normal Pool Elevation	<a href="#">N/A</a>	<a href="#">N/A</a>

[Since the dam will not be constantly in operation there is no normal pool elevation for the project](#)

7. Please attach a copy of the formal Operation and Maintenance Plan [An O&M Plan is currently being developed and will be provided as a part of a future LOMR submittal.](#)

**E. LEVEE/FLOODWALL**

1. System Elements Please see CLOMR Support Document Sections 1.5.1, 1.5.2, 1.5.3, and 1.5.4 along with Tables 1-1 through 1-4 for details on Project components that include levees and floodwalls.

a. This Levee/Floodwall analysis is based on (check one):

- upgrading of an existing levee/floodwall system       a newly constructed levee/floodwall system       reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

- earthen embankment, dike, berm, etc.      Station \_\_\_\_\_ to \_\_\_\_\_  
 structural floodwall      Station \_\_\_\_\_ to \_\_\_\_\_  
 Other (describe): \_\_\_\_\_      Station \_\_\_\_\_ to \_\_\_\_\_

c. Structural Type (check one):     monolithic cast-in place reinforced concrete     reinforced concrete masonry block     sheet piling  
 Other (describe): \_\_\_\_\_

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

Yes     No

If Yes, by which agency? \_\_\_\_\_

e. Attach certified drawings containing the following information (indicate drawing sheet numbers): [Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.](#)

- 1. Plan of the levee embankment and floodwall structures. Sheet Numbers: \_\_\_\_\_
- 2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: \_\_\_\_\_
- 3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: \_\_\_\_\_
- 4. A layout detail for the embankment protection measures. Sheet Numbers: \_\_\_\_\_
- 5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: \_\_\_\_\_

2. Freeboard [Please see Appendix K for profile sheets that show the Project features and the freeboard for the profiles.](#)

a. The minimum freeboard provided above the BFE is:

Riverine

- 3.0 feet or more at the downstream end and throughout  Yes  No
- 3.5 feet or more at the upstream end  Yes  No
- 4.0 feet within 100 feet upstream of all structures and/or constrictions  Yes  No

Coastal

- 1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).  Yes  No
- 2.0 feet above the 1%-annual-chance stillwater surge elevation  Yes  No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE?  Yes  No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures [Please see CLOMR Support Document Table 2-7 for Closures information for the Project](#)

a. Openings through the levee system (check one):  exists  does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection. Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.

- a. The maximum levee slope land side is: \_\_\_\_\_
- b. The maximum levee slope flood side is: \_\_\_\_\_
- c. The range of velocities along the levee during the base flood is: \_\_\_\_\_ (min.) to \_\_\_\_\_ (max.)
- d. Embankment material is protected by (describe what kind): \_\_\_\_\_
- e. Riprap Design Parameters (check one):       Velocity       Tractive stress  
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D <sub>100</sub>	D <sub>50</sub>	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

- f. Is a bedding/filter analysis and design attached?     Yes     No
- g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability. Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.

a. Identify locations and describe the basis for selection of critical location for analysis:  
\_\_\_\_\_

Overall height: Sta.: \_\_\_\_\_, height \_\_\_\_\_ ft.

Limiting foundation soil strength:

Strength  $\phi$  = \_\_\_\_\_ degrees, c = \_\_\_\_\_ psf

Slope: SS = \_\_\_\_\_ (h) to \_\_\_\_\_ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):  
\_\_\_\_\_

c. Summary of stability analysis results:

**E. LEVEE/FLOODWALL (CONTINUED)**

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

- d. Was a seepage analysis for the embankment performed?  Yes  No  
 If Yes, describe methodology used:
- e. Was a seepage analysis for the foundation performed?  Yes  No
- f. Were uplift pressures at the embankment landside toe checked?  Yes  No
- g. Were seepage exit gradients checked for piping potential?  Yes  No
- h. The duration of the base flood hydrograph against the embankment is \_\_\_\_\_ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.

- a. Describe analysis submittal based on Code (check one):  UBC (1988)  Other (specify): \_\_\_\_\_
- b. Stability analysis submitted provides for:  Overturning  Sliding If not, explain: \_\_\_\_\_
- c. Loading included in the analyses were:  Lateral earth @  $P_A =$  \_\_\_\_\_ psf;  $P_p =$  \_\_\_\_\_ psf
- Surge-Slope @ \_\_\_\_\_,  surface \_\_\_\_\_ psf
- Wind @  $P_w =$  \_\_\_\_\_ psf
- Seepage (Uplift); \_\_\_\_\_  Earthquake @  $P_{eq} =$  \_\_\_\_\_ %g
- 1%-annual-chance significant wave height: \_\_\_\_\_ ft.
- 1%-annual-chance significant wave period: \_\_\_\_\_ sec.
- d. Summary of Stability Analysis Results: Factors of Safety.  
 Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)  
Note: (Extend table on an added sheet as needed and reference)

**E. LEVEE/FLOODWALL (CONTINUED)**

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		



f. Foundation scour protection  is,  is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin?  Yes  No

b. The computed range of settlement is \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

c. Settlement of the levee crest is determined to be primarily from :  Foundation consolidation  Embankment compression  
 Other (Describe): \_\_\_\_\_

d. Differential settlement of floodwalls  has  has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage Interior Drainage for components of In-Town Levees, the OHB levee, and Comstock Levee are described in Sections 1.5.2, 1.5.3, and 1.5.4 and Tables 1-2 through 1-4 of the CLOMR Support Document. Design information for any pump stations is included in Appendix H – OHB Design, Appendix I – In-Town Levee Design, and Appendix J – Comstock Levee Design.

a. Specify size of each interior watershed:

Draining to pressure conduit: \_\_\_\_\_ acres

Draining to ponding area: \_\_\_\_\_ acres

b. Relationships Established

Ponding elevation vs. storage  Yes  No

Ponding elevation vs. gravity flow  Yes  No

Differential head vs. gravity flow  Yes  No

c. The river flow duration curve is enclosed:  Yes  No

d. Specify the discharge capacity of the head pressure conduit: \_\_\_\_\_ cfs

e. Which flooding conditions were analyzed?

- Gravity flow (Interior Watershed)  Yes  No
- Common storm (River Watershed)  Yes  No
- Historical ponding probability  Yes  No
- Coastal wave overtopping  Yes  No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection.  Yes  No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is \_\_\_\_\_ cfs

h. The length of levee system used to drive this seepage rate in item g: \_\_\_\_\_ ft.

### E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage?  Yes  No

If Yes, include the number of pumping plants: \_\_\_\_\_ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic?  Yes  No

If the pumps are electric, are there backup power sources?  Yes  No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

Please See Appendix C – FEIS, Appendix D – Supplemental EA, Appendix G – Diversion Design, Appendix H – OHB Design, Appendix I – In-Town Levees Design, and Appendix J – Comstock Levee Design for designs and plans for Project features.

a. The following items have been addressed as stated:

Liquefaction  is  is not a problem

Hydrocompaction  is  is not a problem

Heave differential movement due to soils of high shrink/swell  is  is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?

Yes  No Attach supporting documentation

Please see the CLOMR Support Document, Appendix A which defines the CLOMR revision reach, and Appendix M for more information on the Hydraulic Modeling performed for this project and the HEC-RAS models.

d. Sediment Transport Considerations:

Sediment transport has been analyzed as a part of Project design. Please see Appendix C – FEIS and Appendix D – Supplemental EA for discussion on the accounting for sedimentation for the Project.

Was sediment transport considered?  Yes  No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

An O&M Plan is currently being developed and will be provided as a part of a future LOMR submittal.

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations?  Yes  No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?

Yes  No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?

Yes  No If the answer is No to any of the above, please attach supporting documentation.

**E. LEVEE/FLOODWALL (CONTINUED)**

11. Maintenance Plan

Please attach a copy of the formal maintenance plan for the levee/floodwall

An O&M Plan is currently being developed and will be provided as a part of a future LOMR submittal.

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

An O&M Plan is currently being developed and will be provided as a part of a future LOMR submittal.

**CERTIFICATION OF THE LEVEE DOCUMENTATION**

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: \_\_\_\_\_ License No.: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

Company Name: \_\_\_\_\_ Telephone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**F. SEDIMENT TRANSPORT**

Flooding Source: \_\_\_\_\_

Name of Structure: \_\_\_\_\_

Sediment transport has been analyzed as part of Project design. Please see Appendix C – FEIS and Appendix D – Supplemental EA, along with the more detailed design documents included in Appendices G, H, I, and J for details.

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume \_\_\_\_\_ acre-feet

Debris load associated with the base flood discharge: Volume \_\_\_\_\_ acre-feet

Sediment transport rate \_\_\_\_\_ (percent concentration by volume)

Method used to estimate sediment transport: \_\_\_\_\_

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: \_\_\_\_\_

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: \_\_\_\_\_

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.