

DEPARTMENT OF HOMELAND SECURITY  
Federal Emergency Management Agency  
**RIVERINE STRUCTURES FORM (FORM 3)**

OMB Control Number: 1660-0016  
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**PAPERWORK BURDEN DISCLOSURE NOTICE**

Public reporting burden for this form is estimated to average 3.5 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 it displays a valid OMB control number. 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, 500 C Street, SW, Washington, DC 20472, 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 (NFIP); 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: \_\_\_\_\_

**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**

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: \_\_\_\_\_

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

### 1. Hydraulic Considerations

The channel was designated to carry \_\_\_\_\_ (cfs) and/or the \_\_\_\_\_ - 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 to 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.

### 3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections ☐ Energy dissipater

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Weir

☐ Other (Describe): \_\_\_\_\_

### 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.

## C. BRIDGE/CULVERT

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

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

### 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): \_\_\_\_\_

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):

- |   |  |
|---|--|
| <input type="checkbox"/> Dimensions (height, width, span, radius, length) | <input type="checkbox"/> Distance between Cross Sections                       |
| <input type="checkbox"/> Shape (culverts only)                            | <input type="checkbox"/> Erosion Protection                                    |
| <input type="checkbox"/> Material   | <input type="checkbox"/> Low Chord Elevations - Upstream and Downstream        |
| <input type="checkbox"/> Beveling and Rounding                            | <input type="checkbox"/> Top of Road Elevations - Upstream and Downstream      |
| <input type="checkbox"/> Wink Wall Angle                                  | <input type="checkbox"/> Structure Invert Elevations - Upstream and Downstream |
| <input type="checkbox"/> Skew Angle                                       | <input type="checkbox"/> Stream Invert Elevations - Upstream and Downstream    |
|   | <input type="checkbox"/> Cross-Section Locations                               |

### 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.

#### D. DAM/BASIN

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

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

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: \_\_\_\_\_

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 \_\_\_\_\_ Permitting Agency or Organization \_\_\_\_\_

a. ☐ Local Government Dam ☐ Private Dam

Provided related drawings, specification and supporting design information.

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

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.

##### Stillwater Elevation Behind the Dam/Basin

FREQUENCY (% annual chance)	FIS	REVISED
-----------------------------	-----	---------

10-year (10%)		
---------------	--	--

50-year (2%)		
--------------	--	--

100-year (1%)		
---------------	--	--

500-year (0.2%)		
-----------------	--	--

Normal Pool Elevation		
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7. Please attach a copy of the formal Operation and Maintenance Plan

#### E. LEVEE/FLOODWALL

##### 1. System Elements

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

<input type="checkbox"/> Upgrading of an existing levee/floodwall system	<input type="checkbox"/> A newly constructed levee/floodwall system	<input type="checkbox"/> Reanalysis of an existing levee/floodwall system
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b. Levee elements and locations are (check one):

☐ Earthen embankment, dike, berm, etc

Stationed \_\_\_\_\_ to \_\_\_\_\_

☐ Structured floodwall

Stationed \_\_\_\_\_ to \_\_\_\_\_

☐ Other (describe): \_\_\_\_\_

Stationed \_\_\_\_\_ to \_\_\_\_\_

### E. LEVEE/FLOODWALL (CONTINUED)

- 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):

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 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: \_\_\_\_\_
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

- 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

#### 3. Closures

- 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.)

### E. LEVEE/FLOODWALL (CONTINUED)

4. Embarkment Protection

- 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. Embarkment and Foundation Stability

- 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 embankment 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

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

☐ Surcharge-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)

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

- a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin?
- b. The computed settlement range 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

- a. Specify size of each interior watershed:  
Drainage to pressure conduit: \_\_\_\_\_ acres  
Drainage to ponding area: \_\_\_\_\_ acres
- b. Relationship Established:
- |                                    |                              |                             |
|------------------------------------|------------------------------|-----------------------------|
| Ponding elevation vs. storage      | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Ponding elevation vs. gravity flow | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Differential head vs. gravity flow | <input type="checkbox"/> Yes | <input type="checkbox"/> 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) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Common storm (River Watershed)    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Historical ponding probability    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Coastal wave overtopping          | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
- If No for any of the above, attach explanation.
- f. 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

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

d. Sediment Transport Considerations:

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

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

12. Operational and Maintenance Plan

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

**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: \_\_\_\_\_

**CERTIFICATION OF THE LEVEE DOCUMENTATION**

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

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

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 \_\_\_\_\_ acres-feet

Debris load associated with the base flood discharge: Volume \_\_\_\_\_ acres-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.