



## DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, U.S. ARMY CORPS OF ENGINEERS  
Phillip Burton Federal Building  
Post Office Box 36023  
450 Golden Gate Avenue  
SAN FRANCISCO, CALIFORNIA 94102

CESPD-PDP (FRM-PCX)

20 December 2024

### MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Certification of the Hydrologic Engineering Center's Flood Damage Reduction Analysis Software Version HEC-FDA v2.0

#### 1. References:

- a. Engineer Circular (EC) 1105-2-412, Assuring Quality of Planning Models, 31 March 2011
- b. Planning Bulletin (PB) 2013-02, Assuring Quality of Planning Models (EC 1105-2-412), 31 March 2013
- c. Memorandum, CECW-P, Delegation of Model Certification, 11 May 2018

2. The Flood Risk Management Planning Center of Expertise (FRM-PCX), in accordance with references 1.a, 1.b, and 1.c, has completed the certification review process for HEC-Flood Damage Reduction Analysis model (HEC-FDA) v2.0. HEC-FDA v2.0 is the latest iteration of HEC-FDA software and the first in the 2.0 version series.

3. HEC-FDA v2.0 is a major version update and a significant improvement from the currently certified version 1.4.3, aggregating more than a decade's worth of improvements into a single overhaul of the currently certified version. HEC-FDA v2.0 is a modern risk analysis software with a contemporary user interface and incorporates several changes to the Flood Damage Reduction Analysis software. The primary changes are discussed below.

- a. HEC-FDA v2.0, like previous versions, generates the aggregated stage damage function through a Monte Carlo process where for any given stage (x-axis) there will be thousands of associated damages generated through random sampling on the y-axis. Previous versions of HEC-FDA would fit a normal distribution to the aggregated stage damage function computed through this process. HEC-FDA v2.0 represents the uncertainty as an empirical uncertainty distribution, or as the aggregated stage damages at that given stage would be.
- b. Occupancy type level sampling in previous versions was sampled independently from structure to structure. That would allow for two structures in the same neighborhood, with the same dimensions and materials, to receive two different stage percent damage curve samples in the same model realization. HEC-FDA v2.0 accounts for correlation in the occupancy type level sampling and in the scenario above, these structures would receive the same stage percent damage curve samples for each model realization.

CESPD-PDP (FRM-PCX)

SUBJECT: Certification of the Hydrologic Engineering Center's Flood Damage Reduction Analysis Software Version HEC-FDA v2.0

- c. HEC-FDA v2.0 enforces monotonicity in cases where a sampled curve is initially not monotonically increasing. Previous versions included monotonicity testing and would alert the user if a curve was not monotonically increasing in the mean but would allow samples of a curve with uncertainty (with a monotonic mean) that were themselves not monotonically increasing.
- d. HEC-FDA v2.0 is compliant with *Guidelines for Determining Flood Flow Frequency Bulletin 17C*.

For a complete discussion of the new software, see the release notes available here:

<https://www.hec.usace.army.mil/confluence/fdadocs/fdareleasenotes/version-2-0-111840004.html>

4. The transition to HEC-FDA v2.0 will take place immediately. A transition plan is enclosed with this memorandum that describes the specifics of the migration depending on where a study is in the feasibility phase. The HEC-FDA v2.0 Support Team (comprised of HEC personnel and field experts) and the FRM-PCX are available to support study teams during the transition. Coordinate HEC-FDA v2.0 support needs with Dr. Richard Nugent ([Richard.J.Nugent@usace.army.mil](mailto:Richard.J.Nugent@usace.army.mil)) at HEC and until 21 February 2025 with Ms. Susie Byrd ([Susannah.E.Byrd@usace.army.mil](mailto:Susannah.E.Byrd@usace.army.mil)) at the FRM-PCX; after 21 February 2025 coordinate with Mr. Jesse Morrill-Winter ([Jesse.E.Morrill-Winter@usace.army.mil](mailto:Jesse.E.Morrill-Winter@usace.army.mil)). Other support resources are available during this transition and include:

- a. At least one Planning CoP Webinar
- b. Two iterations of PROSPECT #209 in Fiscal Year 2025
- c. FRM CoP Spotlight Webinar

5. HEC conducted an investigation to compare HEC-FDA v2.0 results with ten HEC-FDA v1.4.3 studies. Through an iterative process that included quality assurance from a subject matter expert several data input issues were discovered in HEC-FDA v1.4.3 models that had gone through the Agency Technical Review (ATR) process. This key finding highlights the need for continued emphasis on the importance of effectively executing our internal review processes to support critical study decisions. The FRM-PCX and HEC will share lessons learned and best data input practices with the field in 2025.

6. The FRM-PCX hereby certifies HEC-FDA v2.0 for a period of seven years. This memorandum supersedes the September 2021 HEC-FDA v1.4.3 certification memorandum. HEC-FDA v2.0 replaces HEC-FDA v1.4.3 as the latest certified version of HEC-FDA, although HEC-FDA v1.4.3 certification remains active.

CESPD-PDP (FRM-PCX)

SUBJECT: Certification of the Hydrologic Engineering Center's Flood Damage Reduction Analysis Software Version HEC-FDA v2.0

7. The point of contact for this memo is Ms. Susie Byrd, Acting FRM-PCX Economics and Risk Analysis National Technical Specialist, 412-735-0037 and [Susannah.E.Byrd@usace.army.mil](mailto:Susannah.E.Byrd@usace.army.mil).

Encl:  
FDA Transition Plan

JOSEPHINE R. AXT, Ph.D.  
Director, Flood Risk Management  
Planning Center of Expertise

DISTRIBUTION:

CECW-PC (Strahan)  
CECW-PC (Gruber)  
CECW-P (Bush)  
CEIWR-HEC (Adams)  
CENAD-PD-X (Vietri)

CF:

REGIONAL ECONOMIST, GREAT LAKES AND OHIO RIVER DIVISION (CELRD)  
REGIONAL ECONOMIST, MISSISSIPPI VALLEY DIVISION (CEMVD)  
REGIONAL ECONOMIST, NORTH ATLANTIC DIVISION (CENAD)  
REGIONAL ECONOMIST, NORTHWESTERN DIVISION (CENWD)  
REGIONAL ECONOMIST, PACIFIC OCEAN DIVISION (CEPOD)  
REGIONAL ECONOMIST, SOUTH ATLANTIC DIVISION (CESAD)  
REGIONAL ECONOMIST, SOUTH PACIFIC DIVISION (CESPD)  
REGIONAL ECONOMIST, SOUTHWESTERN DIVISION (CESWD)

**Transition Plan – HEC-FDA 1.4.3 to HEC-FDA 2.0.** The plan to transition from the currently certified version of the Hydrologic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA) software to the new version, HEC-FDA 2.0, was informed by coordination among the FRM-PCX, HQUSACE, and HEC.

HEC-FDA 2.0 represents the contemporary method for estimating economic risk from flooding for Flood Risk Management projects. It is a significant improvement from the previous version, HEC-FDA 1.4.3, providing a more accurate representation of economic risk from flooding than previous versions of HEC-FDA. Estimates from HEC-FDA 2.0 will be used for decision-making if results from other versions of HEC-FDA are also available.

- 1. New studies.** All new feasibility studies that include use of HEC-FDA will use HEC-FDA 2.0. This includes, but is not limited to, Continuing Authorities Program (CAP) studies and post-authorization studies resulting in General Reevaluation Reports (GRRs).
- 2. Existing studies.** All studies that can shift to HEC-FDA 2.0 without impact to overall schedule and budget should do so immediately upon certification of HEC-FDA 2.0. If a shift to HEC-FDA 2.0 would impact project delivery based on the current project schedule or budget, the rules defined below will inform when HEC-FDA 2.0 must be used. However, if the HEC-FDA 1.4.3 results are not driving study decision-making, coordinate with the FRM-PCX and Office of Water Project Review Economics Team to determine the need to transition to HEC-FDA 2.0.
  - a. Existing studies pre-TSP.** Studies that have not held a Tentatively Selected Plan (TSP) milestone at the date of HEC-FDA 2.0 certification will transition to HEC-FDA 2.0. Any potential impacts to the study schedule or budget shall be promptly coordinated with the vertical team.
  - b. Existing studies post-TSP.** Studies that have held a TSP milestone, but not the Agency Decision Milestone (ADM), and used HEC-FDA 1.4.3 will conduct a sensitivity analysis to inform whether transitioning to HEC-FDA 2.0 is required. The sensitivity analysis shall be coordinated with the FRM-PCX and the Office of Water Project Review Economics Team. It will focus on the area(s) driving flood risk in the study and compare the risk estimates between HEC-FDA 1.4.3 and HEC-FDA 2.0. If any of the below conditions are met, transitioning to HEC-FDA 2.0 is required. Any potential impacts to the project schedule or budget shall be promptly coordinated with the vertical team.
    - i.** If the findings of the sensitivity analysis demonstrate a greater than 5% change in risk estimates between HEC-FDA 1.4.3 and HEC-FDA 2.0.

- ii. If study modeling is being updated post-TSP. This includes changes to the hydrologic inputs, updates to hydrologic inputs, changes to system response functions, and/or changes to the economic inputs.
- iii. If a full technical review of the HEC-FDA 1.4.3 model and modeling inputs during concurrent review of the draft identifies an error that could impact plan selection or the viability of a federal investment. Those inputs include but are not limited to: flow/stage frequency curves, water-surface profiles, transform functions, stage-damage functions, occupancy data (including values) and associated uncertainty distributions and system response functions where levees are included.

c. **Existing studies post-ADM.** Existing studies post-ADM will continue to use results from HEC-FDA 1.4.3. If a final ATR has not yet been completed post-ADM, ATR will ensure accuracy of model inputs mentioned in Section 2.b.ii and 2.b.iii above. Additionally, if any of the below conditions are met, transitioning to HEC-FDA 2.0 is required. Any potential impacts to the project schedule or budget shall be promptly coordinated with the vertical team.

- i. If a final ATR takes place post-ADM (as described in Section 2.c above) and the review identifies an error in the HEC-FDA 1.4.3 model or modeling inputs that could impact plan selection or the viability of a federal investment. See Section 2.b.ii and 2.b.iii above.
- ii. If the modeling or recommended plan changes, the study team needs to transition to HEC-FDA 2.0.

3. **Economic updates for previously authorized projects.** Economic updates for previously authorized projects must use the latest certified version of HEC-FDA (version 2.0) per guidance (Director of Civil Works' Policy Memorandum CWPM 12-001, Subject: Methodology for Updating Benefit-to-Cost Ratios (BCR) for Budget Development, 8 March 2012). See considerations below.

- a. If it is cost prohibitive to transition to HEC-FDA 2.0 from HEC-FDA 1.4.3, the District will need to seek approval from the Chief of Office of Water Project Review, HQUSACE to continue using results from HEC-FDA 1.4.3.
- b. Versions older than HEC-FDA 1.4.3 must be updated to HEC-FDA 2.0 unless approval from the Chief of Office of Water Project Review, HQUSACE is given to update to HEC-FDA 1.4.3.