

## Questions and Answers from the July 14, 2020 CTP Webinar: 2D Floodways - Proposed Revisions to FEMA Floodway Guidance

### **1. Can we have link to 2013 document (Floodway Encroachment Standard: Minimizing Cumulative Adverse Impact)?**

<https://www.floodsciencecenter.org/projects/floodway-encroachment-standard-minimizing-cumulative-adverse-impact/>

### **2. Are there models that show the extent of the 1-foot surcharge beyond the flood fringes?**

Although we're not aware of models that automatically do this, this could be accomplished through various GIS mapping processes. Please also consider the FEMA BFE plus one flood risk products which can help address the impacts of surcharge.

### **3. Are negative surcharges only allowed for 2D models? Or will this also apply to 1D models?**

Revised guidance with respect to negatives surcharges was specifically written based on the evaluation of 2D models. The appropriateness of a negative surcharge in a 1D model should be verified following the recommendations in guidance and discussed with your FEMA project officer. Negative surcharges in 1D models may indicate other stability problems within the model. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

### **4. What is the definition of shallow flooding for floodway purposes? Is it a designated depth or flow condition?**

For the purposes of the NFIP, shallow flooding is defined as flooding with an average depth limited to 3.0 feet or less where no defined channel exists. Generally, the average flow depth at a cross section in a shallow flooding (Zone AO) area is obtained by dividing the flow area with the water-surface top width. A weighted average of all the average flow depths at all cross sections within a selected reach length would be used to define the extent of the shallow flooding zones. (see Shallow Flooding Analyses and Mapping Guidance for additional information)

### **5. Can an equivalent encroachment consideration include other areas within the floodplain such as public spaces, roads, and improvements that will not be changed over time?**

Equitable consideration means that both overbanks are treated consistently, rather than encroaching primarily only on one overbank to avoid having to encroach as much on the other overbank. As the floodway is a community floodplain management tool, decisions on where and how to encroach have some latitude when working directly with the communities involved, as long as regulations and standards are met. (see Floodway

Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**6. Basic question- on a 2D model, what about the different elevations across a cross-section?**

In a 1D model, a single elevation is reported at each cross section when displayed on or in FEMA products. Between cross sections, the interpolated water surface elevations are most reliable along the profile baseline. 2D models have the ability to calculate different elevations both longitudinally and laterally within a floodplain. BFE lines and evaluation lines in a 2D model still represent lines of constant elevation, but are contoured based on the variable water surface elevation grid calculated by the 2D model.

**7. Does FHWA accept HEC-RAS 2D?**

FHWA published a technical briefing in 2019 noting that HEC-RAS is an acceptable modeling technique, however, FEMA would recommend the user coordinate with FHWA on specific project related questions prior to choosing any model. A link to the technical briefing is provided below.

<https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif19058.pdf>

**8. SID 128 - any estimate of what will the creating separate flood profiles cost?**

The cost would vary from floodplain to floodplain, as it would be driven by the number of flood profiles required to properly reflect the modeled elevations. The hope is that most areas can be accurately addressed by Water Surface Elevations at evaluation lines, BFE lines on the FIRMs, or a form of FIS Report grid insert, and that flood profiles would be the exception rather than the norm.

**9. This may come up later. If you model an unmapped area in 2D for a new bridge. If the center of channel is less than one-foot rise but the overbanks are over one foot of rise. Is this in or out of compliance?**

The surcharges would need to be verified along the evaluation lines, as discussed in the presentation and outlined in guidance. (see SID 65 and Floodway Analysis and Mapping Guidance for additional information)

**10. In Maricopa County, Arizona, we are providing BFE raster data online and instructing users to use the highest BFE raster that touches a structure to determine the BFE. I like this approach.**

Several best practices related to 2D models and BFEs have been submitted. Maricopa County could consider submitting the approach described as a best practice where BFE raster data is available online for communities and community officials. Requests for additional materials to be added as best practice should be directed to [FEMA-GS@fema.dhs.gov](mailto:FEMA-GS@fema.dhs.gov).

**11. For 2D will the BFE be calculated to the nearest one tenth of a foot over the 1D one-hundredth of a foot? 2D model variations within hundredths of a foot often appear to be model noise.**

The water surface elevations within the 2D model may be calculated to the hundredths of a foot, but would be reported on BFEs, floodway data tables, and other regulatory products to the nearest one tenth of a foot as is current practice with 1D models based on current guidance and standards. (see SID 346 for additional information)

**12. As you were considering the use of velocity X depth for delineation of the floodway, was there a consideration that if you developed a forested region, that would likely mean clearing trees or at a minimum undercutting? Hence you can expect changes to the friction. I have not seen sensitivity analysis if you are using an "index strategy" that it may be a net zero change that as you reduce the friction you increase the velocity but likely decrease the depth; so the index change may be minimal. But I am concerned about the potential clear cutting implications for wider floodplains that currently have forests that you may modify the floodway as the land is cleared.**

The use of depth times velocity as discussed in guidance is merely one of the initial encroachment screening methods used to establish equitable distribution of floodway encroachments. Final compliance for 2D floodways is still determined based on surcharge through an interactive process. Once a floodway is established proposed changes to the floodway are reviewed and approved by the local community who is responsible for floodplain management. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**13. Will an evaluation line (or transect) replace cross section lines for 2D since the BFE along a cross section will vary?**

2D models will typically not have cross sections since the modeled area is represented by a computational mesh or grid. Evaluation lines are expected to most commonly be based on BFE lines that are contoured from the output water surface elevation grid, and therefore will show a consistent elevation. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**14. Would BFE lines every 0.1-ft on the DFIRM be an acceptable replacement for the profile for a 1-D HEC-RAS model.**

BFE lines that can reproduce the modeled water surface elevation grid to a 0.1-foot resolution would capture the same level of resolution as a 1D profile. If a 1D model is used, a profile should be generated for "Each modeled significant split or diverted flow path modeled in 1D and mapped as Zone AE or AH...". When a stream with a clear centerline modeled with 1D methodologies uses a profile, it can provide more definition to the answers than just BFE lines on a map would, so it is not the preference. However, if there is consideration for not including a profile for a 1D model, coordination with the FEMA project officer would be required and an exception must be granted. (see SID 66 and Flood Profiles Guidance for additional information)

**15. It appears some of these concepts could be used to determine impacts of projects in coastal areas. Can these concepts and guidance be used in coastal areas?**

These concepts were developed primarily with the riverine flooding in mind. Some concepts may be applicable for coastal flooding but would likely need additional evaluation.

**16. Is there a requirement where the evaluation lines are placed? It seems you could place them strategically to make sure you meet the requirements.**

The revised guidance proposed through this Fall's maintenance updates, specifically Section 5 of the "Floodway Analysis and Mapping" document includes guidance on the placement of evaluation lines to help ensure evaluation lines show an accurate representation of the impacts of a project. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**17. Is there any place that a FIRM has been published with the 2D lines and FIS insert?**

There are no locations with evaluation lines published on the FIRM. The example FIS insert presented during the webinar was from a FIS report in Harris County, TX.

**18. Would placing BFEs at a maximum distance apart be a reasonable approach?**

If used in place of a profile, BFEs would need to resolve the water surface to 0.1 feet, matching the resolution of 1D flood profiles. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**19. How about using something like D times V or D times V squared for floodway?**

Hazard based floodway delineations have been discussed but would likely require a change to the Code of Federal Regulations. These concepts and several other long-term decisions surrounding the future of floodways will be a continued part of FEMA IPT discussions moving forward. (see Floodway Analysis and Mapping Guidance, Section 5.4 for additional information. Further description is included with this Fall's G&S maintenance updates)

**20. Please explain how a depth\*velocity (hazard) scheme does not consider conveyance in both banks.**

Depth times velocity does have direct ties to conveyance, however, compared to a true equal conveyance approach selecting a specific DxV range for initial floodway screening does not necessarily mean an equal amount of conveyance is removed on either side of the floodplain which is a critical tenet in the development of a floodway for regulatory purposes. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**21. Our FIRMs are based on 1-D. It would take FEMA a very long time to revise all the maps to 2D. How do you envision communities coordinating compliance?**

1D models will still be appropriate and useful in many locations. The updates to the standards and guidance discussed during the presentative are allowing for someone to utilize a 2D model where appropriate, but FEMA is not prescribing that one approach must be used in favor of another. Furthermore, regulations (specifically section 65.6) state that effectives models should be used unless it is proven that they are not appropriate for the analyzed area. Moving forward FIRMs will continue to have both 1D and 2D model results represented, it is just envisioned that the number of locations where 2D models are used will likely continue to increase in the future.

The increased use of 2D models will require additional training for community floodplain regulators and a 2D model may not be the correct solution for some communities. The selection of a 2D model for a study can not be done without coordination with impacted communities (See SID 620 and Code of Federal Regulation, Section 65.6 for additional information)

**22. BFE for mountainous areas? Not practical.**

The spacing and resolution of BFEs would change depending on stream slope and several other factors to ensure the map can be easily read by users. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**23. For clarification, in a 2D floodplain, how are you calculating the encroachment or determining if you exceed the criteria? How are you determining the floodway extents?**

The surcharge at each computational element is determined by comparing the water surface between the base flood and floodway analysis runs. Surcharges are then averaged along evaluation lines to ensure the surcharge criteria are met. As discussed in revised guidance, individual cells surcharges are also evaluated for compliance where insurable structures are impacted. The final floodway extents would be equal to the encroachment boundaries where both the evaluation line average surcharges and individual cell surcharges at insurable structures meet the criteria. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**24. Will guidance for FWs along levees consider the actual modeling and not violate the definition of a FW?**

Guidance on floodway evaluation with levees was updated in 2019 (see "Levee" guidance document, November 2019). The guidance updates discussed during the presentation do not update that floodway guidance pertaining to levees. The final model produced should match with the final mapping. (see Levees Guidance for additional information)

## **25. How is stationing done for the FWDT in a 2D case?**

Where the evaluation lines intersect the profile baselines a station can be determined. If an evaluation line does not intersect the profile baseline a station would not be calculated. For all evaluation lines, a letter will be included to link the mapped lines to entries on the FWDT. (see FIS Report Template for additional information. Further examples are included with this Fall's G&S maintenance updates)

## **26. Why force the 2D floodway information into an outdated FWDT format? Users rarely utilize data outside of two or three of the columns. Why not use more language of maximum, average, minimum, or approximate to better convey message of inaccuracies?**

Additional revision to the FWDT format may be considered in the future. The current revisions are aimed at making the use of 2D models easier, while also maintaining some consistency with existing products so as to help with users that are familiar with existing products. (see FIS Report Template for additional information. Further examples are included with this Fall's G&S maintenance updates)

## **27. Where will the Evaluation lines be stored in the DB?**

Evaluation lines will be stored in the S\_XS spatial layer. (see FIRM Database Guidance for additional information. Further description is included with this Fall's G&S maintenance updates)

## **28. Does any of the 2D FW analysis require Congressional action?**

The 2D floodway analyses do not require Congressional action. Standards and guidance updates are within FEMA's mandates. As the IPT reviews and discusses ideas for future components or considerations with regard to floodways, those issues may require changes to the Code of Federal regulations, which would require congressional action.

## **29. So then would there be a minimum number of evaluation lines? Minimum spacing? etc. There could be just that "one" evaluation line that shows a rise while the others don't... Andy speaking to this now, thx**

There is guidance included in the revised documents that speaks to the placement of evaluation lines to ensure adequate detail is captured. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**30. Can a state stop a new FEMA study or CLOMR/LOMR with an existing floodway from being modelled using a 2D model?**

Any new FEMA initiated study requires community engagement during scoping/discovery and coordination of model type is included. Any CLOMR/LOMR also requires community sign off. (see SID 620 and Discovery Guidance for additional information)

**31. How is a BFE to be interpolated with curvy 2D BFE lines? Will a procedure/guidance to interpolate between curvy BFE lines be produced?**

BFEs should be linearly interpolated between two BFE lines. Additional guidance on this procedure will be discussed for this Fall's maintenance cycle. Guidance on 2D models and their output products will continue to evolve as 2D model use become more frequent. (see MT-1 Guidance for additional information. Further description is included with this Fall's G&S maintenance updates)

**32. Will the proposed 2D FP/FW analysis recognize overbank storage/attenuation? Encroachment will negate overbank storage/attenuation, thus increasing Q and BFE. Will this be captured in the analysis?**

The treatment of overbank storage and attenuation is dependent on whether a steady state or unsteady state analysis is used. At this time, neither is prescribed for 2D floodway analyses, but instead the choice of which process is evaluated on a case by case basis. Additional investigation into differences between steady and unsteady state 2D based floodways is underway. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**33. Is the USACE onboard to add 2D floodway design function in HEC-RAS in the future?**

Several updates to HEC-RAS to more easily calculate and evaluate 2D floodways have been discussed and are in development for future versions of HEC-RAS.

**34. How would the surcharge be evaluated between floodway mapping creation and floodplain development permit analysis for changes and improvements?**

Guidance on surcharge evaluation for permit analyses is included in the Floodway Analysis and Mapping document. (see Floodway Analysis and Mapping Guidance, Section 11 for additional information. Further description is included with this Fall's G&S maintenance updates)

**35. What standard (or maximum) grid cell sizing is to be prescribed for 2D mapping?**

At this time no maximum grid cell size is prescribed for 2D mapping, but instead that will need to be determined on a case by case basis. This topic will be considered for additional guidance in the future. (see Hydraulics: Two-Dimensional Analysis Guidance for additional information).

**36. Ex. 3 for BFE determination with grids: Can you use discretion because if it was closer to 100.4' that might trend towards 100.4'?**

The final determination will be based on user discretion for properties that do not fall directly on a reported BFE in the FIS Grid Insert. (see MT-1 Guidance, Section 4 for additional information. Further description is included with this Fall's G&S maintenance updates)

**37. What other software programs are approved for 2d floodway analysis in addition to HEC-RAS**

All programs on FEMA's approved software list that include 2D functionality can be used for 2D floodway analysis. (see Accepting Numerical Models for Use in NFIP for additional information. List of approved hydraulic models can be found at the following link: <https://www.fema.gov/hydraulic-numerical-models-meeting-minimum-requirement-national-flood-insurance-program>)

**38. 1-D floodway uses left side and right side encroachments. Can 2-D floodway be distributed?**

2D floodway encroachments will still originate from the left and right side of the base floodplain. Inclusion of encroachments in the middle of the floodplain should be discussed with FEMA on a case by case basis. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**39. To the same question. Velocity changes within the channel due to sinuosity**

Floodways should be continuous regardless of whether they are based on 1D or 2D modeling. Multiple split flows may be captured within the same model. That may be a topic for consideration in future guidance updates. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**40. How is no-rise affected by 2D modeling? Does no rise apply to every single point in the 2D model grid or can it be averaged over a region consistent w/prior 1D cross section density?**

In general, the guidance is being updated to evaluate the floodway along the evaluation lines including some additional checkpoints. The additional guidance on no-rise analyses with 2D models is discussed in the revised guidance documents that will be included in this Fall's maintenance update ((see Floodway Analysis and

Mapping Guidance, Section 11 for additional information. Further description is included with this Fall's G&S maintenance updates).

**41. Are those documents accessible to the public for download?**

The public comment period for revised guidance documents will begin in August. Please email [FEMA-GS@fema.dhs.gov](mailto:FEMA-GS@fema.dhs.gov) to be included on all future guidance and standards notifications.

**42. Can the presenters discuss situations where equal depth times velocity encroachments would not be considered equitable and another method should be used?**

Placing encroachments at equal depth times velocity values on either overbank would be considered appropriate in establishing "equitable" encroachments along both overbanks. As more 2D floodways are delineated and tools evolve, other methods (e.g. equal volume reduction, equal discharge reduction, etc.) may be created that would also produce a floodway that would be equitably considerate of both overbanks. Guidance may be updated over time as other methods are discovered/created. (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**43. What about probabilistic modeling of flood studies and how it impacts the floodplain and floodway regulation?**

The relation between floodway modeling and probabilistic modeling will require additional attention in the future.

**44. How many future studies do you estimate will be modeled in 2D?**

FEMA is not prescribing whether or 1D or 2D model should be used. The decision on model type should be made in conjunction with the impacted community and its flooding characteristics. (see SID 620 for additional information)

**45. How can we get involved in testing??**

Please refer to the answer to question 10 regarding best practices. In additional, please consider emailing [FEMA-GS@fema.dhs.gov](mailto:FEMA-GS@fema.dhs.gov) to sign up for the FEMA G&S list serve and be made aware of updates and periods for open comments and participation.

**46. Should another hazard zone standard be created base on the depth/velocity relationship to be applied for life safety versus a floodway standard that is based on preserving a particular flow corridor? The two may overlap but one is for life safety and the other for property protection.**

Depth times velocity datasets can be used to generate non-regulatory products that can be beneficial for communities that would like to use that additional information to regulate and promote safety within their community's flood hazard areas. The depth times velocity dataset could be symbolized a number of different ways into different categories, based on the vulnerability being communicated (e.g. impact to structures, impact to people, impact to vehicles, etc.) (see Floodway Analysis and Mapping Guidance, Section 5 for additional information. Further description is included with this Fall's G&S maintenance updates)

**47. Most of the 2D flood studies are primarily done by FEMA in rural areas where there is no flood maps available. How practical these guidelines affect small communities in terms of no-rise analysis?**

The choice of 2D models should be made in conjunction with the local communities. Additional training will also be a topic of considerations as 2D studies become more common. (see SID 620 for additional information)

**48. Is there a plan to incorporate the 2D Floodway into the Probabilistic Floodplain Risk Assessment (PFRA) where thousands of models of run to develop the flood hazard?**

The relation between floodway modeling and probabilistic modeling will require additional attention in the future.

**49. Will you share your HEC-RAS work with other software developers so they can build in the same toolkits?**

HEC-RAS is a public software. Any development of new tools related to floodway evaluations would be subject to the same public sharing policies already in place. The objective of the guidance updates was to provided language that is not specifically tailored to any one software package, but instead covers that general concepts that can applied in any approved software package.

**50. Will SRH 2D be an acceptable FEMA model or is HEC-RAS 2D the only acceptable 2D model?**

Yes, SRH 2D is on the FEMA approved model list. (see Accepting Numerical Models for Use in NFIP for additional information. List of approved hydraulic models can be found at the following link:

<https://www.fema.gov/hydraulic-numerical-models-meeting-minimum-requirement-national-flood-insurance-program>)

**51. The guidance appears to be based on HEC-RAS. Will they also be adapted to other FEMA approved programs such as SMS and XPSWMM?**

The guidance is written such as to accommodate any program where 2D floodways can be calculated. It is not specific to HEC-RAS.

**52. Can you show us a real effective riverine floodway vs a proposed 2D-based floodway?**

Testing on differences between 1D steady state floodways and 2D based floodways is underway.

**References:**

Guidelines and Standards, Main Page:

- <https://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping>

Latest Standards:

- <https://www.fema.gov/media-library/assets/documents/35313>

Latest Guidance:

- <https://www.fema.gov/media-library/assets/documents/34953>