



Federal Emergency Management Agency

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MEMORANDUM FOR: Regional Engineers, Regions I-X

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[Original signed]

SUBJECT: HEC-RAS Version Updates

Background: Developed by the U.S. Army Corps of Engineers (USACE), HEC-RAS is a widely used hydraulic model for the development and revision of flood studies. It is updated periodically. FEMA issued a memorandum dated April 30, 2001, on the use of HEC-RAS for the National Flood Insurance Program (NFIP). For your convenience, this memorandum is posted on FEMA's Flood Hazard Mapping website at http://www.fema.gov/pdf/fhm/frm_hrpy.pdf.

In April 2003, the HEC-RAS 2.2 version was removed from FEMA's Nationally Accepted Models list and replaced with the HEC-RAS 3.0 and 3.1 versions. HEC-RAS Version 3.1.1 was released by the USACE in May 2003 and the latest version, HEC-RAS 3.1.2, was released in June 2004. In addition to adding new features, errors found in earlier versions were also corrected. The USACE no longer supports HEC-RAS 2.2. The HEC-RAS program may be downloaded from the USACE website at <http://www.hec.usace.army.mil/software/hecras/hecras-download.html>.

Issue: HEC-RAS 3.0 and later versions (HEC-RAS 3.0+) produce different water-surface elevations (WSELs) and floodway surcharges than HEC-RAS 2.2 with the same channel geometry and flow rates. For some cases, HEC-RAS 3.1.1 produces different WSELs and floodway surcharges than HEC-RAS 3.0.1. Key issues include:

1. The WSELs and floodway surcharges are often higher in HEC-RAS 3.0+ models than in HEC-RAS 2.2 models.
2. At times, floodway surcharges significantly increase between HEC-RAS 2.2 and HEC-RAS 3.0+ estimates, violating maximum surcharge standards.
3. The issue of varying WSELs and floodway surcharges is directly related to the quality of the bridge modeling in a simulation. Models with bridges that are coded according to the

HEC-RAS User's Manual are the least susceptible to differences in WSELs and floodway surcharges. In contrast, models with bridges originally imported from HEC-2 models and not upgraded to HEC-RAS standards are the most susceptible to differences in WSELs and floodway surcharges. Models with bridges coded in the HEC-2 special bridge format are especially susceptible to differences.

4. A large number of FEMA's effective studies are based on HEC-RAS 2.2 or HEC-RAS 3.0.1.
5. HEC-RAS 2.2 has been used to design flood-control projects; if WSELs increase as a result of HEC-RAS version changes, these projects may be decertified due to inadequate freeboard.

Action Taken: The purpose of this Memorandum is to establish and clarify the decision-making processes that flood mapping partners apply to flood map revision requests involving HEC-RAS.

Final Procedure: The following steps are recommended:

1. The latest version of HEC-RAS, accepted by FEMA for NFIP studies, is to be used for all new modeling in studies, restudies, and Letters of Map Changes (LOMCs). After the date of this Memorandum, new modeling in studies, restudies, and LOMCs must use HEC-RAS 3.1.1 or a later version.
2. Studies and restudies that are in progress (e.g., submitted to or contracted by FEMA) at the date of this Memorandum and that use versions of HEC-RAS prior to 3.1.1 will be completed in the submitted or scoped HEC-RAS version. The flood mapping partner responsible for model review will compare the models in the submitted or scoped version of HEC-RAS and HEC-RAS 3.1.1 or the latest version accepted by FEMA, and document the differences. Differences between versions exceeding the following criteria are to be monitored with the FEMA Project Officer:
 - WSEL: Differences of more than ± 0.50 foot.
 - Floodway width: Differences of more than five percent of the map scale.
 - Floodway surcharge: Differences exceeding State surcharge standards.
3. Where previous versions of HEC-RAS are used in the certification of flood-control structures, the flood mapping partner responsible for model review will operate the models in the submitted or scoped version of HEC-RAS and the latest accepted version, and will document the differences in WSELs relative to the flood-control structure freeboard. Where available freeboard is reduced below the requirements of 44 CFR 65.10(b)(1) as a result of a change in HEC-RAS version, the criteria of 44 CFR 65.10(b)(1)(ii) will be reviewed, documented, and satisfied. The additional review is not required if the flood-control structure continues to be certified in accordance with 44 CFR 65.10(e).

3

4. LOMC requestors are required to use the latest accepted version of HEC-RAS. Differences in WSELs or floodway surcharges must be incorporated into the final LOMC product.
5. The next update of the Nationally Accepted Models list will include only HEC-RAS 3.1.1 and later versions. HEC-RAS 3.0 and 3.1 will be removed from the list.