DIY FOA for the CTP

Glenn Heistand
Ryan Meekma

©2014 University of Illinois Board of Trustees. All rights reserved. For permission information, contact the Illinois State Water Survey.
First Order Approximations (FOA)

“...using best available data and automated techniques...”
Goal of FOA’s

- Title 42 CFR
  - Section 4101(e)
  every 5 years, evaluate whether FIRM reflects current risks in floodprone areas
- Validate Zone A’s
- Scale Results
What We’ll Cover

Main Steps Involved

1. Establish GIS data
2. Hydrology Automation
3. Hydraulic Automation
4. Floodplain Mapping
5. QA/QC
6. Statistical Analysis
7. Deliverables
Establish GIS Data

Layers Required for Modeling

• Water Line
• Cross Sections
• Bank Lines
• Land Use Raster Dataset
• Digital Elevation Model
Hydrology Automation

How Does it Work?

**INPUTS**
- Object ID
- Latitude
- Longitude
- Stream name
- Stream reach

**END PRODUCTS**
- Discharges
- Drainage area
- Shapefile

**SHAMP macro**
Hydrology Automation

1. Create flow point file in ArcGIS
2. Export GIS attribute table to Excel
3. VBA (Visual Basic for Applications) Macro Sends Latitude and Longitude to USGS StreamStats system
4. VBA Macro Returns:
   Discharges for each flow frequency.
   Shapefile of drainage area downloaded.
Hydraulic Automation

ArcGIS Geo-RAS → HEC-RAS 4.1.0
Hydraulic Automation

1. Extract GIS data using HEC-geoRAS
2. Run HEC-RAS modeling
3. Import model results back to GIS
4. Automated floodplain delineation, with manual adjustments
5. Create water surface elevation grid
Floodplain Mapping

November 2015 FOA Guidance:

• 2.3.1 Profiles to Map
  – “Because limited cleanup of the floodplains is required, the recommended default approach is to map all profiles that are computed.

• Mapped and Modeled Profiles:
  – 0.2%, 1%, 2%, 4%, 10%
  – +1%, -1%
Floodplain Mapping

Model Builder:
QA/QC

Check Results
1. Spot Check StreamStats results
2. Run Check-RAS
3. Manually inspect HEC-RAS cross-sections
4. Manually inspect floodplain delineation
5. Adjust as needed
6. Compile report
Statistical Analysis

Effective FIRM vs. FOA Floodplain

Black  Blue
Statistical Analysis

Effective FIRM on 2011 Digital Elevation Model
November 2015 FOA Guidance:

- See the Data Capture Guidance – Workflow Details document for information about submitting FOA data to the MIP.
Product Deliverables

November 2015 Data Capture – Workflow Details:

• Section 3.0 First Order Approximation Submittal Guidance
  – FOA Report
  – Metadata
  – Spatial Files
    • “format consistent with the current Technical References available on the FEMA website”
  – Hydrologic Models
  – Hydraulic Models
  – Supplemental Data

• Cross Sections:
  o Water Surface Elevation (WSEL) — all profiles clearly defined
  o Model name
  o Station
  o Flooding source name

• Profile Baseline
  o Flooding source name

• Floodplain Boundaries
  o Profile
Contact Information

Glenn Heistand, P.E., CFM
heistand@Illinois.edu
217-244-8856

Ryan Meekma, GISP, CFM
rmeekma@Illinois.edu
217-244-6627