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City of Harrisonburg, Virginia
**Cooperating Technical Partner
Mapping Activity Statement**

Agreement CTP01-1 - Hydraulic Analyses and Floodplain Mapping

In accordance with the Cooperating Technical Partner (CTP) 2000 Memorandum of Agreement between City of Harrisonburg, Virginia and the Federal Emergency Management Agency (FEMA), Mapping Activity Statement CTP01-1 is as follows:

- 1. Objective and Scope:** The objective of this Mapping Activity is to develop detailed hydraulic analyses and floodplain and floodway mapping in the City of Harrisonburg. Hydraulic analyses and floodplain mapping will be completed for approximately 21 linear miles of flooding, including the following flooding sources: Blacks Run, Tributaries 1,2,3,4 of Blacks Run, Sunset Heights Branch and West Fork Sunset Heights Branch.

The expected result from the grant amount and community contribution established below at a minimum is to create a composite hydraulic model from existing FEMA models, resolve ambiguities between these models and supplant sections of these models with improved information available through submitted map revisions to FEMA and or information available at the City offices. This is defined in more detail under *Milestone 3*. The completion of LOMRs leading to Physical Map Revisions (PMR) is the ultimate goal of this project but may require resources and time beyond the on-year scope of this agreement. Subsequent agreements will be considered pending the availability of FEMA funding and City resources.

GIS-based hydrologic and hydraulic modeling and mapping techniques will be applied to develop GIS data sets in support of the automation or semi-automation of modeling and floodplain mapping.

- 2. Period of Performance:**

This Mapping Activity will begin on October 1, 2001 and will be completed no later than September 30, 2002. This Mapping Activity may be terminated at the option of FEMA or the City of Harrisonburg in accordance with the provisions of the 2000 CTP Memorandum of Agreement. The period of performance will be in accordance with Agreement Article II.

- 3. Funding/Cost-Sharing:** For this Mapping Activity Statement, FEMA will provide funding in the amount of \$15,000.00 and City of Harrisonburg will provide professional services equal to the amount of \$15,000.

- 4. Standards:** The following standards and documents are relevant to this Mapping Activity:
 - Detailed hydrologic and hydraulic analyses and floodplain mapping will follow the standards set forth in FEMA 37, *Guidelines and Specifications for Study Contractors* (January 1995), and Title 44 of the Code of Federal Regulations (CFR), Part 65. FEMA 37 is available at FEMA's Web site at http://www.fema.gov/mit/tsd/EN_reg.htm. Title 44 of

the CFR is available at FEMA's Web site at www.access.gpo.gov/cgi-bin/cfrassemble.cgi?title=199944.

- Computer models used for hydrologic and/or hydraulic analyses will meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage* (http://www.fema.gov/mit/tsd/EN_modl.htm).
- Topographic mapping used to delineate floodplains and floodways will be of adequate scale and topographic definition to provide reasonable accuracy. Planimetric features will be compatible with the base map (with respect to horizontal accuracy) selected by FEMA for Digital FIRM production. Topographic mapping taken from aerial photogrammetry or surveys will comply with the requirements of Appendix 4 of FEMA 37. The selection of the topographic mapping source to be used will be coordinated with the FEMA Regional Project Officer prior to analysis and mapping.
- Any levee or dike systems to be shown on the community's FIRM as providing protection from the 1% annual chance flood will comply with the requirements of 44 CFR 65.10. Chapter 7 of FEMA 37 provides guidelines for evaluating levee and dike systems.
- Flood elevations and floodplain and floodway boundaries will reasonably tie in to non-revised information in accordance with 44 CFR 65.6(a)(2).
- The floodway will be established in accordance with 44 CFR 65.7, as well as any applicable state and/or community requirements.
- Digital mapping will comply with the requirements of Chapter 9 and Appendix 7 of FEMA 37.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping will be documented and provided to FEMA to ensure that they are consistent with the standards outlined above. Digital data sets (such as elevation, basin, or land use data) will be documented and provided to FEMA for approval prior to performing the analysis to ensure that they meet minimum requirements. If non-commercial (i.e., custom developed) software is used for the analysis, then full user documentation, technical algorithm documentation, and the software will be provided to FEMA for review prior to performing the scope of work.
- Digital Elevation Models (DEMs) and field survey data will meet vertical accuracy requirements contained in Appendix 4 of FEMA 37.

5. Products: The City of Harrisonburg will make available items outlined in Chapter 11 of FEMA 37 in the Technical Support Data Notebook (TSDN) format. These include:

- Digital 1% and 0.2% annual chance floodplain and floodway boundaries;
- Digital profiles of the 10%, 2%, 1%, and 0.2% annual chance water-surface elevations, representing existing conditions;
- Flood Insurance Study (FIS) report;
- Floodway data tables;
- Digital copies of all hydrologic and hydraulic modeling (input and output files); and
- All back-up data used in the analyses or mapping.

For GIS-based modeling and mapping, The City of Harrisonburg will deliver all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the Digital Flood Insurance Rate Map (DFIRM) database structure.

6. Schedule and Milestones:

Milestone 1 (Scoping Phase): Products for the first milestone to be provided to the FEMA Project Officer include:

- Annotated copies of effective FIRMs depicting limits of proposed study.
- Documentation of the proposed source of topographic data, scale, contour interval, source/methodology, date of survey/data collection, vertical and horizontal datums, and comparison of planimetric features with the DFIRM base map selected by FEMA for DFIRM production.
- A written summary of the initial data research, proposed analysis methodologies, and a work plan.
- Documentation of digital data sets to be used (such as elevation, basin, and land use data). Full user documentation, technical description of methodologies and algorithms, and a copy of the source codes and custom-developed software applications for GIS-based modeling will also be provided.
- Copies of topographic maps depicting proposed cross section locations.

Milestone 2 (Hydrology Phase): N/A

Milestone 3 (Hydraulics Phase): Products for the third milestone to be provided to the FEMA Project Officer include the hydraulic models and sample floodplain mapping in accordance with TSDN format.

Previous Years Tasks:

- Compile all FEMA Flood Insurance Study Hydraulic models and all accepted and Submitted Letter of Map Revision Applications along with all applicable information available from the City.
- Prepare a composite HEC-RAS model of the available information noting and resolving ambiguities discovered and noting areas where significant information is needed.
- Develop a plan to acquire the needed information to improve the model

This year and following years:

- Obtain additional information by way of field survey and other means to improve the composite model.
- Evaluate the effects of the Norfolk District hydrology study on the improved composite model
- Use the model to address identified problem areas of the effective Flood Insurance Study and Flood Insurance Rate Map and prepare Letters of Map Amendment application where necessary in anticipation of a future Flood Insurance Study.
- Draft map revisions sufficient for submittal with LOMRs.

Milestone 4 (Final Products): Final products to be provided to the FEMA Project Officer include:

- The completed TSDN and accompanying data containing the information outlined in Section 5 of this Mapping Activity Statement.
- A QA/QC report documenting the results of the independent review of all computational and data processing procedures.

Final products will be made available in accordance with the Period of Performance described in Section 2 of this Mapping Activity Statement.

7. Certification: The following certifications apply to this Mapping Activity (as appropriate):

- Hydrologic and/or hydraulic analyses and data will be certified by a registered Professional Engineer or Licensed Land Surveyor in accordance with 44 CFR 65.6(f).
- Topographic information will be certified by a registered Professional Engineer or Licensed Land Surveyor in accordance with 44 CFR 65.5(c).
- If fill is to be considered in the mapping to raise land areas to or above the 1% annual chance flood elevation, certification of the fill will be provided in accordance with 44 CFR 65.5(a)(6) by the community's NFIP permit official, a registered Professional Engineer, or a Licensed Land Surveyor.
- Any levee systems to be accredited as discussed in Section 4 of this Mapping Activity Statement will be certified in accordance with 44 CFR 65.10(e).

8. Technical Assistance and Resources: The City of Harrisonburg may obtain copies of FEMA-issued Letters of Map Change (LOMCs), archived engineering back-up data, and data collected as part of the Mapping Needs Assessment Process from FEMA's Mapping Coordination Contractor (MCC). The MCC may be contacted at 1-877 FEMA MAP (1-877-336-2627). General technical and programmatic information, such as FEMA 265, the Quick-2 computer program, and the MT-2 forms, can be downloaded from FEMA's Flood Hazard Mapping Web site (www.fema.gov/mit/tsd/). Specific technical and programmatic support may be provided through FEMA's MCC; such assistance should be requested through the FEMA MCC Project Officer specified in Section 12 of this Mapping Activity Statement.

The City of Harrisonburg may also consult with the FEMA Project Officer to request support in the areas of selection of data sources, digital data accuracy standards, assessment of vertical data accuracy, data collection methods or sub-contractors, and GIS-based engineering and modeling training.

9. Contractors: N/A

10. Quality Assurance/Quality Control (QA/QC) Procedures: Dewberry & Davis will undertake internal QC reviews to ensure that the products described under Section 5 of this Mapping Activity Statement conform with the standards outlined under Section 4 of this Mapping Activity Statement. Additionally, an independent review for compliance with these standards will be undertaken Dewberry & Davis.

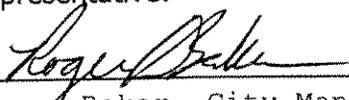
For GIS-based, automated modeling, QA/QC activities should ensure automated calculations are reasonable and in compliance with standard flood modeling and mapping approaches.

The City of Harrisonburg will document internal QA/QC procedures to ensure all calculations and data processing were reviewed.

Reporting: Reporting requirements will be in accordance with Agreement Articles V & VI.

11. Points of Contact: The FEMA Regional Project Officer is Jon Janowicz and the CTP Project Manager is Daniel Rublee, or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities. If it is necessary, the assistance of FEMA's MCC should be requested through the FEMA MCC Project Officer, Jeff Smith.

Each party has caused this Mapping Activity Statement to be executed by its duly authorized representative.



Roger Baker, City Manager
City of Harrisonburg, Virginia

9/17/01
Date



Robert J. Gunter
Division Director

9/19/01
Date