State of Maryland
Department of the Environment
Federal Emergency Management Agency
Cooperating Technical Community
Mapping Activity Statement

Agreement CTC99-1- Hydrologic and Hydraulic Analyses and Floodplain Mapping

In accordance with the Cooperating Technical Community Memorandum of Agreement dated August 30 ,1999, between the Technical and Regulatory Services Administration (TARSA) of the Maryland Department of the Environment (MDE) and the Federal Emergency Management Agency (FEMA), Agreement CTC99-1 is as follows:

1. **Objectives and Scope**: The objective of this Mapping Activity is to develop digital DFIRM mapping of Saint Mary's County, Maryland on the existing County topographic data, and the completion of a detailed hydrologic and hydraulic analysis with floodplain mapping in the St. Clement's Creek watershed. Analysis will be of the 10%, 2%, 1%, and 0.2% annual chance floods (10-year, 50-year, 100-year, and 500-year storm events) and floodway representing existing conditions. Hydrologic analyses will be completed for the approximately 23.4 square miles of drainage area for St. Clement's Creek. The hydraulic analysis and detailed floodplain mapping covers approximately 6.5 linear miles of flooding along the main stem of St. Clement's Creek. Delineations will be provided for the 1% and 0.2% annual chance floodplains (100-year and 500-year) and floodway and will be used by FEMA, the Maryland Department of the Environment, and Saint Mary's County, Maryland to revise the 1973 FIRM Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for Saint Mary's County, Maryland.

   In addition, the existing detailed study streams in Saint Mary's County (Saint Mary's River, Chaptico Creek, and McIntosh Run) will be mapped onto the existing Saint Mary's County 5-foot topographic data, and will include the re-mapping of all the designated A-Zone areas in the County.

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

2. **Period of Performance**: The period of performance will be in accordance with Agreement Article II.

3. **Funding/Cost-Sharing**: The Federal Emergency Management Agency will provide funding in the amount of The State of Maryland will provide in-kind services for this project. In-kind services provided by the State include project management, oversight, review, and implementation of the digital floodplain data. In addition previously acquired digital data (Digital Orthophoto Quarter Quads, County 5-foot topographic data, soils data, land use/land cover information and hydrography) will be utilized in this project.

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.
- Computer models used for hydrologic and/or hydraulic analyses must meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage* (see http:www.fema.gov/mit/tsd/EN modl.htm).
- Topographic mapping used to delineate floodplain and floodway boundaries 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) to be used by FEMA or the Maryland Department of the Environment for Digital FIRM (DFIRM) production. Topographic mapping taken from aerial photogrammetry or surveys will comply with the requirements of FEMA 37, Appendix 4. The topographic mapping to be used for this project is the existing 5-foot contour based topographic map from the Saint Mary's County Department of Public Works and has been identified as the best data available. The selection of this data source in conjunction with the State of Maryland's Digital Orthophoto Quarter Quads (DOQQ) will be coordinated with the FEMA 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 (100-year) must comply with the requirements of 44CFR 65.10. Chapter 7 of FEMA 37 provides guidelines for evaluating levee systems.
- Flood elevations and floodplain and floodway boundaries will reasonably tie-in to non-revised information in accordance with 44 CFR 65.6 (a)(6).
- The floodway will be established in accordance with 44 CFR 65.7, as well as any applicable state requirements.
- Digital mapping will comply with the requirements of Chapter 9 and Appendix 7 of FEMA 37 unless superseded by D-FIRM Standards.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping will be documented and provided to ensure 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 prior to performing the analysis to ensure 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 must be submitted 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 Maryland Department of the Environment will provide to the FEMA Project Officer the items outlined in Chapter 11 of FEMA 37 in a Technical Support Data Notebook (TSDN) format. These include, but are not limited to:
   - Digital floodplain and floodway boundaries for the 1% and 0.2% (100year, &500year) annual chance storm event.

- Digital profiles of the 10%, 2%, 1%, and 0.2% annual chance (10year, 50year, 100year, & 500year) 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).
- All backup data used in the analyses and mapping.

For GIS-based modeling and mapping, the State of Maryland will provide all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DFIRM structure.

6. **Schedule and Milestones**: Upon completion, products from each milestone will be provided to the FEMA Project Officer.

Milestone 1 (Scoping Phase): Tasks to be completed for this milestone include:

- Final selection of flooding sources and limits to be studied.
- Initial data research to compile information such as effective FIS modeling; historical flood data, gage records, and high-water marks; copies of historical Letters of Map Change (LOMCs); and "as built" construction plans. Guidance for such research is contained in FEMA 37, Chapter 3.
- Selection of suitable topographic data for floodplain delineation, including comparison of planimetric features (such as roads) to the base map to be utilized by the FEMA and the Department of the Environment for DFIRM production.
- Selection of analysis methodologies, including hydrologic and/or hydraulic computer models to be utilized in the study of Saint Clement' Creek.
- Determine cross section locations for hydraulic modeling.

Products for the first milestone include:

- Annotated copies of effective FIRMs depicting limits of the proposed study.
- Documentation of the topographic data source, including: scale; contour interval; source/methodology; date of survey/data collection; vertical and horizontal datum; and comparison of planimetric features with the digital DFIRM base map planned for Saint Mary's County, Maryland.
- 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 custom-developed software applications for GIS-based modeling.
- Copies of topographic maps depicting proposed cross section locations.

Milestone 2 (Hydrology Phase): The second milestone is the completion of the hydrologic analysis. Second milestone products include the draft hydrologic analysis for Saint Clement's Creek, the existing detailed study streams, and the approximate A-Zones for the entire County in accordance with the TSDN format.

Milestone 3 (Hydraulics Phase): Third milestone products include completing the hydraulic analyses and preparing sample floodplain mapping. Third milestone products include the completed hydraulic modeling and sample floodplain mapping in accordance with the TSDN format

Milestone 4 (Final Products): Fourth milestone products include completion of the floodplain mapping, generation of flood profiles, compilation of the FIS report, and completion of the TSDN. The final product will be the completed TSDN and accompanying data. A QA/QC report documenting the results of the independent review of all computation and data processing procedures will also be submitted.

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

   - A registered professional engineer in accordance with 44 CFR 65.6(f) will certify hydrologic and/or hydraulic analyses and data.
   - Topographic information collected for a registered professional engineer or licensed land surveyor in accordance with 44 CFR 65.5 (c) will certify this mapping activity.
   - If fill is to be considered in the mapping to raise land areas 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 system 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 Maryland Department of the Environment or its agent may obtain copies of LOMCs, archived engineering backup data, and data collected as part of the Five-Year Mapping Needs Assessment from FEMA's Mapping Coordination Contractor (MCC)/ Technical Evaluation Contractor (TEC) as part of the initial data research. Copies of FEMA's rule-based engineering software package such as CHECK-2 to evaluate HEC_2 models and FISPLOT, an automated flood profile plotting software package, may also be obtained through the MCC/TEC. The MCC/TEC may be contacted at 1-877 FEMA MAP, and general technical and programmatic information can be downloaded from FEMA's Flood Hazard Mapping website (www.fema.gov/mit/tsd/). Specific technical and programmatic support may be provided through FEMA's MCC/TEC; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this agreement.

   The Maryland Department of the Environment, its agent, or the Saint Mary's County Department of Planning and Zoning may also consult with the FEMA Project Officer to request support in the areas of: recommended data sources, recommended digital data accuracy standards, assessing vertical data accuracy, data collection methods, sub-contractors, GIS-based engineering and modeling training.

9. **Subcontractors:** A Consultant will be selected by the Maryland Department of the Environment to perform the services outlined in this Mapping Activity. Procurement of any subcontractors using Federal funds provided as part of this Mapping Activity will comply with the requirements of 44 CFR 13.36.

10. **FEMA Approvals:** FEMA will provide written approval, comments, and recommended changes to the State of Maryland in a timely manner as defined in Agreement Article XI. Significant delays encountered due to FEMA's review will result in an extension in the performance time specified in this Mapping Activity Statement.

11. **QA/QC Procedures**: The Quality Assurance procedures outlined in chapter 10 of the *Guidelines and Specifications for Study Contractors* should be followed during the development of the hydrologic and hydraulic analyses and floodplain mapping. Analyses and mapping should be independently reviewed for compliance with the standards defined in Section 4 of this Mapping Activity Statement. This independent review will be conducted by the Water Management Administration of the Maryland Department of the Environment.

    For GIS-based, automated modeling, QA/QC tasks should ensure automated calculations are reasonable and in compliance with standard flood modeling and mapping approaches. The Maryland Department of the Environment will document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed.

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

13. **Points of Contact.** The FEMA Project Officer will be Eric Rourke; the State of Maryland's Project Officer will be William Parrish. The technical contact and QA/QC reviewer will be David Guignet from the Water Management Administration of the Maryland Department of the Environment.

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

Maryland Department of the Environment representative — date

FEMA authorized representative — August 30, 1999 — date

Maryland NFIP Coordinator — Aug. 19, 1999 — date