Michigan Department of Environmental Quality
Federal Emergency Management Agency
Cooperating Technical Partners
Mapping Activity Statement

State of Michigan
Department of Environmental Quality

Agreement 2001-01 Hydrologic and Hydraulic Analyses and Floodplain Mapping for the Macatawa, Grand and Boardman Rivers

In accordance with the Cooperating Technical Partners (CTP) Memorandum of Agreement dated January 2, 2001 between the Michigan Department of Environmental Quality (MDEQ) and the Federal Emergency Management Agency (FEMA), Agreement 1 is as follows:

1. **Objective and Scope:** The objective of this Mapping Activity is to develop detailed hydrologic and hydraulic analyses and floodplain and floodway mapping for the following:

   - The Macatawa River in Holland Township, Zeeland Township, the City of Holland, and the City of Zeeland, all in Ottawa County, Michigan. Hydrologic analyses will be completed for approximately 110 square miles of drainage area and hydraulic analysis and floodplain mapping for approximately 20 linear miles of flooding.

   - The Grand River in Spring Lake, Grand Haven, Crockery, Robinson, and Allendale Townships, all in Ottawa County, Michigan. Hydrologic analyses will be completed for approximately 400 square miles of drainage area and hydraulic analysis and floodplain mapping for approximately 20 linear miles of flooding.

   - The Boardman River in Traverse City, Garfield Township, Blair Township, and Paradise Township, all in Grand Traverse County, Michigan. Hydrologic analyses will be completed for approximately 100 square miles of drainage area and hydraulic analysis and floodplain mapping for approximately 18 linear miles of flooding.

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

2. **Period of Performance:**
   The period of performance will begin on January 2, 2001 and end by September 30, 2002, subject to availability of funds, and in accordance with Article 2 of the Memorandum of Agreement.

3. **Funding/Cost-Sharing:** Existing work on the mapping activities identified herein was initiated with support received from Hazard Mitigation Grant Program funds. The MDEQ and FEMA will support the completion of this Mapping Activity Statement under the authorities of the January 2, 2001 Memorandum of Agreement subject to the availability of funds and staffing.

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 will meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage.*
   - 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 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 Project Officer prior to analysis and mapping.
   - 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.
   - 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 for approval 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 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 MDEQ 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 MDEQ will deliver all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DFIRM database structure.

6. **Schedule and Milestones:**

Milestone 1 (Scoping Phase): Upon completion, products for the first milestone will be provided to the FEMA Project Officer. These include:

- Annotated copies of effective FIRMs depicting limits of proposed study.
- Documentation of the proposed source of topographic data, including: scale; contour interval; source/methodology; date of survey/data collection; vertical and horizontal datums; and comparison of planimetric features with the Digital FIRM base map planned for use by FEMA.
- 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 cross section locations.

Milestone 2 (Hydrology Phase): Upon completion, products for the second milestone will be provided to the FEMA Project Officer. This includes draft hydrologic analyses in accordance with the TSDN format.

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

Milestone 4 (Final Products): Upon completion, final products will be provided to the FEMA Project Officer. These 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

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 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.

8. **Technical Assistance and Resources:** The MDEQ may obtain copies of LOMCs, archived engineering back-up 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 packages 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. 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 Mapping Activity Statement.

   The MDEQ 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 or sub-contractors, GIS-based engineering and modeling training.

   FEMA will provide the following support:

   - Assist in the coordination, management, and review of the CTC agreement and related activities
   - Technical review and assistance as needed to the MDEQ for all H&H and mapping products
   - Any required post preliminary processing and final production of the Flood Insurance Study and DFIRM panels
   - Work with the MDEQ to improve guidance and procedures for the quality control and vertical accuracy assessment of the LIDAR data sets
   - Printing and distribution of map panels

9. **Subcontractors:** Procurement of subcontractors using Federal funds provided as part of this Mapping Activity will comply with the requirements of 44 CFR 13.36.

10. **Quality Assurance/Quality Control (QA/QC) Procedures:** The QA/QC 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 FEMA.

    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 MDEQ will document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed.

11. **Reporting:** Reporting requirements will be in accordance with Articles 5 & 6 of this agreement.

12. **Points of Contact:** The FEMA Project Officer is Mr. Eric Berman and the MDEQ Project Manager is Mr. Richard C. Sorrell, P.E., or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities.

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

Richard C. Sorrell, Chief, Hydrologic Studies Unit
Land & Water Management, MDEQ

8 Jan 2001
Date

Terry Fell, Chief, Hazard Identification and
Risk Assessment Branch, FEMA Region V

12/28/00
Date