

# Federal GIS. Connections

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GIS for Federal Government

## GIS Enables FEMA's Flood Map Modernization

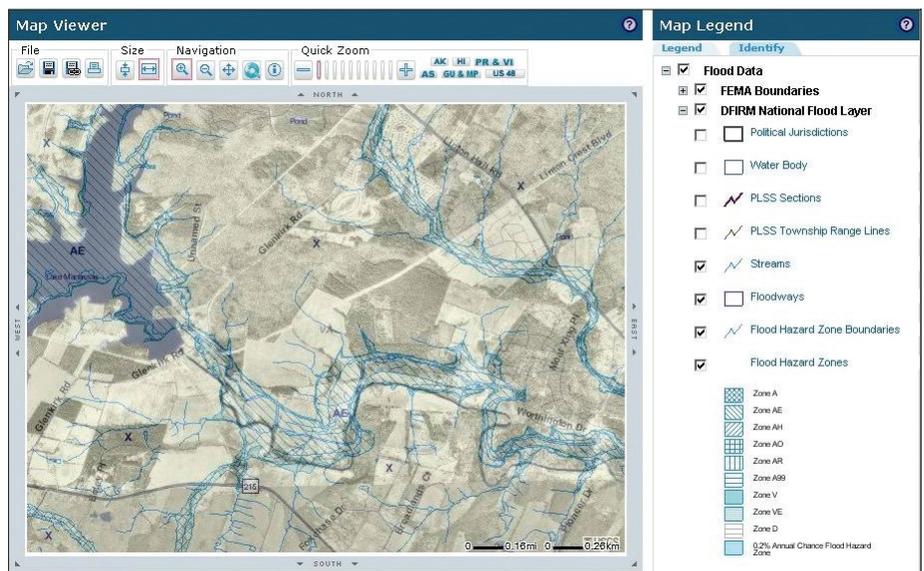


The Federal Emergency Management Agency (FEMA) manages federal response and recovery efforts after any national incident as well as various preparedness and mitigation programs before disaster strikes. In 2003, FEMA became part of the U.S. Department of Homeland Security (DHS).

Often, FEMA works in partnership with other organizations that are part of the nation's emergency management system. These partners include state and local emergency management agencies, federal agencies, and the American Red Cross.

FEMA initiates proactive mitigation activities, trains first responders, and manages the National Flood Insurance Program (NFIP). FEMA is responsible for administering NFIP, which currently serves five million policyholders. It provides coverage for more than \$800 billion in insured assets to at least 20,000 communities.

Working with U.S. flood maps that were out of date, FEMA could no longer accurately gauge flood risks in many areas. As a result, many properties in danger of flooding were not insured because their owners or mortgage lenders did not recognize the risk. FEMA knew it needed to update the country's flood maps, but its prior mapping process was nei-



The public can easily visualize flood-related information on top of USGS orthophotography via a Web browser.

ther digital nor automated. Therefore, FEMA looked for a way to automate the full life cycle mapping process to create digital flood maps.

FEMA developed a five-year plan, Flood Map Modernization (Map Mod), to update the NFIP's Digital Flood Insurance Rate Maps (DFIRMs). DFIRMs depict potential flood hazard risk for communities throughout the United States and its territories. FEMA uses DFIRMs to delineate a community's special flood hazard areas and risk premium.

Because flood hazard conditions are dynamic, DFIRM data needs to be continually updated. FEMA contracts with state, local, and regional mapping partners to keep flood hazard maps current and to produce maps. FEMA needed an integrated software solution that could manage these updates and changes.

FEMA chose to manage data for the DFIRMs by integrating flood hazard maps with a GIS database that makes data available over the

Internet. ESRI strategic alliance partner IBM hosts the portal (<https://hazards.fema.gov>) to provide the public with fast, easy access to online information on disasters and hazards.

The tools are based on the ESRI Production Line Tool Set (PLTS) for ArcGIS. This software was specifically developed for high-volume database production, maintenance, quality control (QC), and cartographic production such as this.

The development of the DFIRMs begins with Job Tracking for ArcGIS (JTX), a workflow management application designed to improve the efficiency of multiuser GIS projects. Through JTX, FEMA mapping partners create flood hazard products by progressing through a FEMA-defined set of best practices workflow steps. The ability of JTX to facilitate the assignment of work among users allows mapping partners to efficiently manage their DFIRM projects.



Many of the DFIRM workflow steps require the use of ArcMap, an application within ArcGIS Desktop, for data development and review. Upon launching ArcMap via JTX, the user can get the toolbars and layers necessary to perform FEMA-specific tasks.

FEMA manages symbology requirements with ESRI GIS Data ReViewer Valid Value Tables (VVT). These tables are accessed and synchronized via PLTS for ArcGIS tools and extend the core functionality of ArcGIS Desktop. VVTs allow features to be rendered by a symbology set designed to facilitate the QC process in data review. The final map is symbolized according to a set compliant with FEMA specifications. VVTs also highlight invalid attribute combinations in the flood hazard data.

Next, ESRI GIS Data ReViewer condition table (CNT) allows users to employ a set of predefined complex attribute checks to review both spatial layers and business tables. These checks mimic FEMA's independent QC process because users can detect and correct errors early in the DFIRM production process. These checks also help ensure that FEMA-compliant data is created.

GIS Data ReViewer Error Table tools allow different members within the mapping partner group (including QC, engineering,

and mapping) to review the spatial data. The engineers and QC analysts use notepad features and comments in the Error Table tools to indicate areas in need of revision, which the mapping analysts then correct. GIS Data ReViewer Error Table tools also facilitate the spatial integration of engineering data.

FEMA is now able to easily track the mapping process for its flood hazard mapping projects and create the final DFIRM database through best practices using ESRI PLTS for ArcGIS. PLTS for ArcGIS streamlines the product development process and allows FEMA mapping partners to work together by project reassignment using JTX within the DFIRM tools environment.

PLTS for ArcGIS also facilitates the spatial and attribute validation process. Using GIS Data ReViewer VVT, FEMA can effectively highlight attribute errors. The GIS Data ReViewer Error Table tools allow QC analysts to locate areas in need of revision in the flood hazard database, track the mapping process of projects, and revise the database.

Once updated, the DFIRMs are stored digitally on FEMA's Mapping Information Platform (MIP), which can be viewed on the agency's Web site at <https://hazards.fema.gov>.

The MIP portal Web site contains a MapViewer portal application designed spe-

cifically to display final DFIRM and other hazards information. Public users can visit the MapViewer page and look up flood information by address. Users have flexibility to zoom in and out or add or remove display layers. Users also have options to print or save the flood map information as well as display other hazard information in the map. Authenticated users can perform metadata searches and display dashboards showing geographically the progress of flood map studies, revision, or amendment projects.

The MIP MapViewer portal application was developed jointly by ESRI and IBM. It is powered by IBM WebSphere Portal and IBM WebSphere Application Server. The dynamic maps are generated using ESRI ArcIMS software. MapViewer is integrated with third-party Web Mapping Service (WMS) services such as TerraServer and USGS through ESRI GIS Portal Toolkit. The MIP portal also features WMS for DFIRM layers. The entire portal is hosted within the IBM Service Delivery Center (SDC). Currently the MIP MapViewer is accessed more than 20,000 times per month and WMS is accessed 2,000 times per month.

For more information, contact Grace Rock, IBM, at [grock@us.ibm.com](mailto:grock@us.ibm.com), or Paul Huang, FEMA, at [Paul.Huang@dhs.gov](mailto:Paul.Huang@dhs.gov).



**ESRI**  
380 New York Street  
Redlands, California  
92373-8100 USA  
  
Phone: 909-793-2853  
Fax: 909-793-5953  
E-mail: [info@esri.com](mailto:info@esri.com)

## For More Information

**1-800-GIS-XPRT** (1-800-447-9778)

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