# FEMA

# SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
# COOPERATING TECHNICAL PARTNERS
# MAPPING ACTIVITY STATEMENT

## Mapping Activity Statement No. FY06.07 – Digital Flood Insurance Rate Map Production and Development of Updated Flood Data

In accordance with the Cooperating Technical Partners (CTP) Partnership Agreement dated September 20, 1999 between the South Carolina Department of Natural Resources (SCDNR) and the Federal Emergency Management Agency (FEMA), Mapping Activity Statement (MAS) No. FY06.07 is as follows:

## SECTION 1—OBJECTIVE AND SCOPE

The objective of the Flood Map Project documented in this MAS is to: 1.Develop a Digital Flood Insurance Rate Map (DFIRM) and Flood Insurance Study (FIS) report for Charleston County (restudy) and Georgetown County (restudy); and 2. Perform a coastal surge modeling for the lower southeast coastline of South Carolina in Jasper County. The DFIRM and FIS reports will be produced in the FEMA Countywide format. The vertical datum for these studies will be NAVD 1988. The horizontal datum will be NAD 1983 and Universal Transverse Mercator projection methods will be utilized.

Existing Geographic Information System (GIS) data and study needs for the community will be researched, obtained, organized, and provided in accordance with the Scoping Activity. Scoping will be necessary to determine the final scope of work for this project. In addition, the Mapping Partners involved in this project will develop new and/or updated flood hazard data, as summarized in Table 1.1, Flooding Sources to be Studied.

**Table 1.1 Flooding Source(s) to be Studied**

| Flooding Source | Reach Limits | Reach Length | Detailed Riverine | | Detailed Coastal | | | | | Limited Detail Study | Redeline-ation of SFHAs Using Effective Profiles and New Topography | Refine/ Establish Zone A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hydrology | Hydraulics | Stillwater | Set up | Wave Height | Wave Runup | Erosion | | | |
| Charleston County | TBD | 132 * | X | X | X | X | X | X | X | X | X | X |
| Georgetown County, SC | TBD | 503* | X | X | X | X | X | X | X | X | X | X |
| Southeast SC Coastline (Jasper County) | TBD | 10 | | | X | | | | | | | |
| | | | | | | | | | | | | |

* Indicated reach lengths are approximate. Actual reach length per study type will be determined during the scoping process and is contingent on approval by the FEMA Regional Project officer of the Scoping Report.

This Flood Map Project will be completed by the following Mapping Partner:

- South Carolina DNR

SCDNR will utilize study contractors as necessary and prudent to accomplish the work included in this MAS. Potential sub contractors include:

- URS Corporation;
- Watershed Concepts;
- Woolpert (for LiDAR acquisition if specifically approved and authorized by FEMA)
- Other subcontractors as necessary

FEMA will also participate in the completion of these studies from a document review, outreach, and overall project management standpoint.

The Mapping Partner shall notify FEMA and/or its contractor by e-mail of all meetings with community officials at least one week prior to the meeting (with as much notice as possible). FEMA and/or its contractor may or may not attend the community meetings.

The activities for this Flood Map Project, including required Quality Assurance/Quality Control (QA/QC) reviews, and the Mapping Partners that will complete them are summarized in Table 1.2, Flood Mapping Project Activities. The sections of this MAS that follow the table below describe the specific mapping activities, responsible Mapping Partner(s), FEMA standards that must be met, and resultant map components.

**Table 1.2 Flood Mapping Project Activities**

| Activities | CTP | FEMA (or its Contractor) |
|---|---|---|
| Scoping | X | |
| Outreach | X | |
| Field Survey | X | |
| Independent QA/QC Review of Field Survey | X | |
| Topographic Data Development | X | |
| Independent QA/QC Review of Topographic Data | X | X[2] |
| Base Map Acquisition and Preparation | X | |
| Hydrologic Analyses (Charleston & Georgetown Counties Only) | X | |
| Independent QA/QC Review of Hydrologic Analyses (Charleston & Georgetown Counties Only) | X | X[2] |
| Hydraulic Analyses (including Levee Evaluation, if applicable) (Charleston & Georgetown Counties Only) | X | |
| Independent QA/QC Review of Hydraulic Analyses (Charleston & Georgetown Counties Only) | X | X[2] |

| Activities | CTP | FEMA (or its Contractor) |
|---|---|---|
| Coastal Flood Hazard Analyses (including Levee Evaluation, if applicable) | X | |
| Independent QA/QC Review of Coastal Hazard Analyses | X | X[2] |
| Floodplain Mapping (Detailed Riverine or Coastal Analysis, Redelineation Using Effective Flood Profiles and Updated Topographic Data[1], Refinement or Creation of Zone A, Redelineation (digitization) of Non-Revised Areas[1], Merge Revised and Non-Revised Information) (Charleston & Georgetown Counties Only) | X | |
| Independent QA/QC Review of Floodplain Mapping (Charleston & Georgetown Counties Only) | X | X[2] |
| Develop DFIRM Database (including Graphic Specifications) (Charleston & Georgetown Counties Only) | X | |
| Independent QA/QC Review of DFIRM Database and Graphics (Charleston & Georgetown Counties Only) | X | X[2] |
| Produce Preliminary Map Products (Charleston & Georgetown Counties Only) | X | X[2] |
| Post-Preliminary Processing (Charleston & Georgetown Counties Only) | X | X[2] |

[1]These sub-tasks can be performed and reported in the Management Information Portal (MIP) Work Flow as part of Floodplain Mapping activity or Redelineation activity.

[2] CTP has main responsibility for this activity. FEMA is an assistance or audit authority only.

FEMA has developed tools to assist in the development of the flood hazard data studies and DFIRMs if the CTP wishes to use them. FEMA will provide all CTPs access to and training in these tools. The tools available at this time include WISE software and the DFIRM production tools. The use of these tools will improve the Flood Map Modernization and efficiency of all mapping partners.

QA/QC review activities may be performed by the CTPs or FEMA's contractor at the discretion of FEMA. If the CTP will be utilizing its contractors to do the QA/QC review, this should be identified

during scoping. The CTP will need to submit its QA/QC plan with checklist to the Regional Project Officer for approval. Please note FEMA will also be performing periodic audits and overall study/project management to ensure study quality.

FEMA will be providing download/upload capability for intermediate data submittals through the MIP. Data submittals uploaded via the MIP will include the same data required prior to the existence of the MIP, with the addition of Metadata profiles required for search and retrieve capabilities. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance.

Metadata profiles are to be included with each of the following four activities that must satisfy Data Capture Standards; Base Map Data, Topographic Data, Hydrologic Data, and Hydraulic Data. The metadata profiles are available from FEMA.

## Scoping

Responsible Mapping Partner: SCDNR

Scope: Charleston, Georgetown, and Jasper Counties will be scoped under this MAS. This task involves collecting data from a variety of sources including community surveys, other Federal and State Agencies, National Flood Insurance Program (NFIP) State Coordinators, Community Assistance Visits (CAVs), and FEMA archives. SCDNR or its mapping subcontractor will evaluate the effective FIS report and Flood Insurance Rate Maps (FIRMs) to see if it needs to be updated. Lists of mapping needs will be obtained from the WISE Scoping Tool, MNUSS database, community surveys, and CAVs, if available.

Data collection will include obtaining the best available base map materials (corporate limits, roads, orthophotos, etc) along with stream centerline files. The acquired data will be imported into the Scoping Tool and used during the Scoping Task. In the Scoping Tool, all streams should have unique names, the limits of the effective FEMA studies should be identified, Letter of Map Change (LOMC) areas should be identified, and community requests should be identified. This task also includes populating the streamlines with existing pipeline and scoped studies currently underway.

SCDNR or its mapping contractor will request information to identify all stream/coastal reaches where levees are shown as providing protection against the 1-percent-annual-chance flood. SCDNR or its mapping contractor will request the information specified in Title 44 Code of Federal Regulations (CFR) 65.10, Mapping of areas protected by levee systems, from the community or other party seeking continued recognition of the levee.

In cooperation with the FEMA Region, a Project Management Team will be established consisting of the SCDNR, FEMA's regional engineer, Charleston County, Georgetown County, and other appropriate officials. The Project Management Team will be responsible for coordinating the activities of this project and completing all tasks identified in this MAS. The MIP shall be updated with Scoping status as appropriate.

If the Special Flood Hazard Area (SFHA) is proposed to be mapped as contained by a levee on a new FIRM then the requirements of 44 CFR 65.10 must be provided to FEMA regardless if the flooding source is proposed to be restudied or not. All levee systems impacting existing and proposed SFHAs shall be identified during this task and relevant information on the levee's ownership, structure (including freeboard, stability, seepage, closure, etc.), maintenance, operations, and interior drainage shall be obtained and inventoried. For all levees proposed to be shown on the new FIRM as providing protection

from the 1-percent-annual-chance flood (i.e., those known to have adequate freeboard, available as-built plans, adequate maintenance, and operation plans, etc.) that do not have certification documentation available, the levee owner and/or community(s) protected shall be contacted by FEMA via letter requesting the missing requirement(s) of 44 CFR 65.10. During this step, the time frame for providing the requested data shall be established in coordination with the FEMA Regional Office. If certification, plans, etc. are not provided within the established timeframe, then the need for new flood hazard analysis/mapping shall be documented. At the end of this task, FEMA's Flood Levee Inventory System must be updated for all levees identified by SCDNR or its mapping contractor.

Preliminary Research Activities can be separated into two categories—researching effective information and researching available data for the Flood Map Project. The following tasks shall be completed to research effective information: inventory the FEMA archives for effective FIRM panels, Flood Boundary Floodway Map (FBFM) panels, FIS reports, and other flood hazard data or existing study data; summarize the information in the WISE Scoping Tool and/or MNUSS database; summarize contiguous community agreement checks; review CAV and Community Assistance Contact files; and develop a "scoping map" and an overview of the results of the research.

SCDNR will coordinate, setup, and hold the Scoping Meeting. This includes identifying a time, place, and participants. The purpose of this meeting is to present the current information to the local officials (State, county, and municipal) and coordinate on prioritization and identification of study areas. SCDNR or its mapping subcontractor shall be responsible for compiling the necessary information for the meeting. These items may include: the FIS and FIRM for affected communities; United States Geological Survey quads for the study area; best available community base map(s); effective FIRM summary; Available Data Inventory; Scoping Map; Scoping Meeting Agenda/Minutes form; Aerial photos/topographic mapping, if available; existing drainage studies or other H&H data; Community Master Plan(s)/Drainage Master Plan(s); Zoning Maps; Street Maps; As-built plans; and Floodplain Ordinance(s).

The project management team shall review the initial mapping needs list, review the research findings, and make selections of proposed methods for obtaining/producing flood data. Any additions or changes to the needs list shall be discussed with all members. All needs shall also be prioritized. In general, highest priority shall be given to the following areas: areas of dense existing or anticipated development including areas where new road crossings have been constructed over stream(s); areas affected by flood-control structures and/or channelization; areas where natural physical changes in the floodplain have been significant (due to subsidence or extreme erosion, for example); areas that were studied by approximate methods and unmapped areas especially those with development pressure; areas where the community has experienced flooding outside mapped floodplains with severe damage to buildings and/or infrastructure; areas where mapped flood hazards do not match those shown on contiguous FIRMs (unless those FIRMs are not considered to be accurate); and areas where flood data (Base Flood Elevations (BFEs), floodplains, and regulatory floodways) are likely to be changed the most by a restudy.

Based on the discussion of mapping needs, SCDNR and the FEMA Project Officer will finalize the areas to be included in the project (based on recommendations provided by the Project Team). Areas to be studied by detailed, limited detail and approximate methods shall be identified. The following issues will be discussed and refined: Review and Refinement of Flood Hazard Identification Methodologies, Review of Proposed Paneling Scheme, Review and Refinement of Base and Topographic Map Source, and Finalization of Map Production and Database Options.

The SCDNR will be acting as the Consultation Coordination Officer for this flood study as identified in 44 CFR Part 66. At this point, the CTP will prepare and setup the Community Case File and Flood

Elevation Docket for the maintenance of all communication and coordination throughout the project as outlined in 44CFR Parts 66 and 67.

Standards: All Scoping work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables:

- The Final Scoping with all of the components as laid out in the attached "Partner Flood Map Modernization Program Scoping Report" template in Appendix A, or an approved alternate, will be delivered in accordance with the schedule outlined in Section 6 - Schedule to the Regional Project Officer for approval.

- QA/QC Plan for the review of the mapping project outlined in this MAS. This will include the checklists developed for that review in accordance with the schedule included in Section 6 - Schedule.

- MNUSS population of revised needs and unmet needs; and the WISE Scoping Tool (optional) population.

## OUTREACH

Responsible Mapping Partner: SCDNR

The outreach activities for a Flood Map Project can best be understood as a process that begins during the Project Scoping phase and continues through the map production and post-preliminary phases. A regulatory overview of required activities is followed by a description of tools that can be used in working with stakeholders to keep them informed and to solicit their input.

The overarching goal for conducting outreach is to create a climate of understanding and ownership of the mapping process at the State and local levels. Well-planned outreach activities can reduce political stress, confrontation in the media, and public controversy, which can arise from lack of information, misunderstanding, or misinformation. These outreach activities also can assist FEMA and other members of the Project Team in responding to congressional inquiries.

The SCDNR will work with the Regional Office during the initiation of this activity to determine an Outreach Plan for implementation throughout the mapping project. The Regional Office will have access to many outreach tools that have been developed for this process that can be utilized or customized.

All communication with local governments will be done in accordance with 44 CFR Part 66.

- Upon determination of an Outreach and Coordination Approach the SCDNR or its mapping subcontractor shall deliver the following to the FEMA Regional Project Officer in accordance with the schedule outlined in Section 6 - Schedule:
    - A report detailing outreach and coordination activities
    - Backup or supplemental information used in writing this report

## Field Survey

Responsible Mapping Partner: SCDNR

Scope: To supplement any field reconnaissance conducted during the Project Scoping phase of this project, SCDNR or its mapping subcontractor shall conduct a detailed field reconnaissance of the specific study area to determine conditions along the floodplain(s), types and numbers of hydraulic and/or flood-control structures, apparent maintenance or lack thereof of existing hydraulic structures, locations of cross sections to be surveyed, and other parameters needed for the hydrologic and hydraulic analyses.

In addition to the initial field reconnaissance, SCDNR or its mapping subcontractor shall conduct field surveys, including obtaining channel and floodplain cross sections, identifying or establishing temporary bench marks, and obtaining the physical dimensions of hydraulic and flood-control structures. SCDNR or its mapping subcontractor also shall coordinate with other Mapping Partners that are involved in the Topographic Data Development process.

Field measurements shall be conducted for limited detail studies to obtain approximate dimension of hydraulic structures.

Standards: All Field Survey work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the Technical Support Data Notebook (TSDN) format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- A report summarizing the findings of the field reconnaissance;
- Maps and drawings that provide the detailed survey results;
- Survey notebook containing cross sections and structural data;
- Documentation of the Datum;
- Format Survey Database or Data Delivery consistent with the Data Capture Standards– Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*, and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Topographic Data Development

Responsible Mapping Partner: SCDNR

Scope: To supplement the field surveys conducted under this MAS, SCDNR or its mapping subcontractor shall obtain additional topographic data of the overbank areas of the flooding sources studied to delineate floodplain boundaries. SCDNR or its mapping subcontractor shall gather information on what topographic data is available for the given community and what accuracy and currency it meets. SCDNR or its mapping subcontractor shall use this topographic data that is better than that of the original study. No FEMA funds shall be expended on new topographic data unless prior approval is given by the Regional Project Officer after analyzing the request submitted during the scoping period.

Standards: All Topographic Data Development work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable so that Watershed Concepts can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 - Schedule. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital topographic maps;
- Report summarizing methodology and results;
- Mass points and breaklines data;

- Digital work maps with contours;
- Checkpoint analyses to assess the accuracy of data, including Root Mean Square Error calculations to support vertical accuracy;
- Identification of remote-sensing data voids and methods used to supplement data voids;
- National Geodetic Survey data sheets for Network Control Points used to control remote-sensing and ground surveys;
- Metadata compliant with Federal Geographic Data Committee standards;
- Documentation of the Datum;
- Format Terrain Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Topographic Data

Responsible Mapping Partner: SCDNR and FEMA

Scope: SCDNR or its mapping subcontractor shall review the mapping data generated by Charleston, Georgetown, or Jasper County under Topographic Data Development to ensure that these data are consistent with FEMA standards and standard engineering practice, and are sufficient to prepare the DFIRM. If SCDNR utilizes a contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original analyses. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer.

Standards: All Topographic Data Development work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- If data changed during review, then updated deliverables from previous tasks will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Base Map Acquisition

Responsible Mapping Partner: SCDNR

Scope: Base Map Acquisition consists of obtaining the digital base map for the project. Charleston County and Georgetown County shall provide the digital base map to SCDNR or its mapping subcontractor for use as a base map for the FIRM. The required activities are as follows:

- Obtain digital files (raster or vector) of the base map.
- Secure necessary permissions from the map source to allow FEMA's use and distribution of hardcopy and digital map products using the digital base map, free of charge.
- Certify that the digital data meets the minimum standards and specifications that FEMA requires for DFIRM production.

Standards: All Base Map Acquisition work shall be performed in accordance with the standards specified in Section 5 - Standards. The Data Capture Standards must be met for this deliverable to be acceptable.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR, through its subcontractors, shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. SCDNR and its subcontractors shall make the following products available to FEMA in accordance with the schedule outlined in Section 6 – Schedule.

- Written certification that the digital data meet the minimum standards and specifications;
- Documentation that FEMA can use the digital base map; and

- Documentation of the Datum, if appropriate.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Base Map

Responsible Mapping Partner: SCDNR and FEMA

Scope: SCDNR or its mapping subcontractor shall review the base map to ensure it includes data consistent with FEMA standards and sufficient to include on the DFIRM.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR, through its subcontractors, shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- If data changed during review, then updated deliverables from previous tasks will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Hydrologic Analyses

Responsible Mapping Partner: SCDNR

Scope: SCDNR or its mapping subcontractor shall perform hydrologic analyses for the flooding source(s) listed earlier in Table 1.1. SCDNR or its mapping subcontractor shall calculate peak flood discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance storm events using appropriate USGS Regional Regression Equations for detailed study streams. For limited detail studies, the peak flood discharges for the 1-percent annual chance storm events shall be calculated using appropriate USGS Regional Regression Equations. These flood discharges will be the basis for subsequent Hydraulic Analyses performed under this MAS. In addition, SCDNR or its mapping subcontractor shall address all

concerns or questions regarding the hydrologic analyses that are raised during the independent QA/QC review performed during the QA/QC review.

If GIS-based modeling is used, SCDNR or its mapping subcontractor shall document automated data processing and modeling algorithms, and provide the data to FEMA to ensure these are consistent with the standards outlined above. Digital datasets (such as elevation, basin, or land use data) are to be documented and provided to FEMA for approval before performing the hydrologic analyses to ensure the datasets meet minimum requirements. If non-commercial (i.e., custom-developed) software is used for the analysis, then SCDNR or its mapping subcontractor shall provide full user documentation, technical algorithm documentation, and the software to FEMA for review before performing the hydrologic analyses.

Standards: All Hydrologic Analyses work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable so that SCDNR or its QA/QC subcontractor can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 - Schedule. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

The following are the deliverables required for detail and limited detail studied streams:

- Digital copies of all hydrologic modeling (input and output) files for the 10-, 2-, 1-, and 0.2-percent-annual-chance storm events for detail studied streams; Digital copies of all hydrologic modeling (input and output) files for 1-percent-annual-chance storm events for limited detail studied streams;
- Digital Summary of Discharges Tables presenting discharge data for the flooding sources for which hydrologic analyses were performed;
- Digital draft text for Hydrologic Analyses Section of the FIS report;
- Digital versions of all backup data used in the analysis including work maps;
- Format Hydrology Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan.
- For GIS-based modeling, deliverables shall include all input and output data, intermediate data processing products, and GIS data layers.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Hydrologic Analyses

Responsible Mapping Partner: SCDNR and FEMA

Scope: SCDNR or its mapping subcontractor shall review the technical, scientific, and other information specific to the hydrologic analyses to ensure that the data and modeling are consistent with FEMA standards and standard engineering practice, and are sufficient to prepare the DFIRM. If SCDNR utilizes a contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original analyses. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the submittal for technical and regulatory adequacy, completeness of required information, and supporting data and documentation. The technical review is to focus on the following:
  - Use of acceptable models;
  - Use of appropriate methodology(ies);
  - Correctly applied methodology(ies)/model(s), including QC of input parameters;
  - Comparison with gage data and/or regression equations, if appropriate; and
  - Comparison with discharges for contiguous reaches or flooding sources.
- Maintain records of all contacts, reviews, recommendations, and actions and make the data readily available to FEMA;
- Maintain an archive of all data submitted for hydrologic modeling review. (All supporting data must be retained for three years from the date funding recipient submits its final expenditure report to FEMA, once the study is effective all associated data should be submitted to the FEMA library); and
- If data changed during review, then updated deliverables for previous tasks will be submitted at this time.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR, through its subcontractors, shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure

compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review and
- Recommendations to resolve any problems that are identified during the independent QA/QC review.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Hydraulic Analyses

Responsible Mapping Partner: SCDNR

Scope: SCDNR or its mapping subcontractor shall perform detailed hydraulic analyses for flooding sources listed earlier in Table 1.1. The modeling will include the 10-, 2-, 1-, and 0.2-percent-annual-chance events based on peak discharges computed under Hydrologic Analyses. The hydraulic methods used for this analysis will include HEC-RAS version 3.1.3.

SCDNR or its mapping subcontractor shall use the cross-section and field data collected during Field Survey to perform the detailed hydraulic analyses. The detailed hydraulic analyses will be used to establish flood elevations and regulatory floodways for the subject flooding sources.

SCDNR or its mapping subcontractor shall use the FEMA CHECK-2 or CHECK-RAS checking program to verify the reasonableness of the hydraulic analyses. To facilitate the independent QA/QC review, SCDNR or its mapping subcontractor shall provide explanations for unresolved messages from the CHECK-2 or CHECK-RAS program, as appropriate. In addition, SCDNR or its mapping subcontractor shall address all concerns or questions regarding the hydraulic analyses that are raised by SCDNR or its QA/QC subcontractor during the independent QA/QC review.

SCDNR or its mapping subcontractor shall document automated data processing and modeling algorithms for GIS-based modeling and provide the data to FEMA for review to ensure these are consistent with the standards outlined above. Digital datasets are to be documented and provided to FEMA for approval before performing the hydraulic analyses to ensure the datasets meet minimum requirements. If non-commercial (i.e., custom-developed) software is used for the analyses, then SCDNR or its mapping subcontractor shall provide full user documentation, technical algorithm documentation, and software to FEMA for review before performing the hydraulic analyses

SCDNR or its mapping subcontractor shall also perform limited detail hydraulic analyses. The modeling will include the 1-percent-annual-chance events based on peak discharges computed under Hydrologic Analyses. The hydraulic methods used for this analysis will include HEC-RAS version 3.1.3.

SCDNR or its mapping subcontractor shall use the measured field data collected during Field Survey to perform the limited detailed hydraulic analyses. The limited detailed hydraulic analyses will be used to establish flood elevations for the subject flooding sources.

Standards: All Hydraulic Analyses work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, URS shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable so that Watershed Concepts can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 - Schedule. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record. The following deliverables will be provided for all detail and limited detail studied streams, except as specifically noted:

- Digital profiles of the 10-, 2-, 1- and 0.2-percent-annual-chance water-surface elevations representing existing conditions using the FEMA RASPLOT program or similar software for detailed studied streams only;
- Digital Floodway Data Tables for each flooding source studied by detailed methods that is compatible with the DFIRM database;
- Digital hydraulic modeling (input and output) files;
- Digital tables with range of Manning's "n" values;
- Explanations for unresolved messages from the CHECK-2 or CHECK-RAS program, as appropriate;
- Digital versions of all backup data used in the analyses;
- Digital versions of draft text for inclusion in the FIS report;
- Format Hydraulic Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan.
- For GIS-based modeling, deliverables include all input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DFIRM database structure;

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Hydraulic Analyses

Responsible Mapping Partner: SCDNR and FEMA

Scope: SCDNR and FEMA shall review the technical, scientific, and other information submitted by SCDNR or its mapping subcontractor under Hydraulic Analysis to ensure that the data and modeling are

consistent with FEMA standards and standard engineering practice, and are sufficient to revise the FIRM. If SCDNR utilizes a contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original analyses. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the submittal for technical and regulatory adequacy, completeness of required information, and supporting data and documentation. The technical review is to focus on the following:
    - Use of acceptable model(s);
    - Starting water-surface elevations;
    - Cross-section geometry;
    - Manning's "n" values and expansion/contraction coefficients;
    - Bridge and culvert modeling;
    - Flood discharges;
    - Regulatory floodway computation methods; and
    - Tie-in to upstream and downstream non-revised Flood Profiles.
- Use the CHECK-2 or CHECK-RAS program, as appropriate, to flag potential problems and focus review.
- Maintain records of all contacts, reviews, recommendations, and actions and make the data readily available to FEMA.
- Maintain an archive of all data submitted for hydrologic modeling review. (All supporting data must be retained for three years from the date funding recipient submits its final expenditure report to FEMA, once the study is effective all associated data should be submitted to the FEMA library); and
- If data changed during review, then updated deliverables for previous tasks will be submitted at this time.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR, through its mapping subcontractor, shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 -

Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- If the data changed during the Hydrologic and/or Hydraulic Analyses QA/QC process, then the updated and verified deliverables from these activities will be resubmitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Coastal Flood Hazard Analyses

Responsible Mapping Partner: SCDNR

Scope: SCDNR or its mapping subcontractor shall perform coastal flood hazard analyses for the shoreline along the Atlantic Ocean. The number of transects is to be determined. These analyses are to include: Stillwater elevation determination, wave setup, wave height analysis, erosion analysis, and wave runup and primary frontal dune. In addition, SCDNR or its mapping subcontractor shall address all concerns or questions regarding the Coastal Flood Hazard Analyses that are raised during the independent QA/QC review.

Note: Coastal stillwater elevation determination accomplished under this MAS is anticipated to be accomplished as part of a statewide effort to establish stillwater elevations along the entire coastline of South Carolina. The schedule for the coastal analyses conducted under this MAS will thus be coordinated with similar analyses conducted for coastal studies of counties conducted under MAS's 6 and 8.

Standards: All Coastal Flood Hazard Analyses work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR through its mapping subcontractor, shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable so that SCDNR's QA/QC contractor can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 - Schedule. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Draft digital work maps showing the 1- and 0.2-percent-annual-chance floodplain boundaries, BFEs, and flood insurance risk zones;

- Digital wave envelope profiles for each transect representing the 1-percent-annual-chance Stillwater elevation including setup wave crest or run-up elevations, location of the heel of the Primary Frontal Dune (PFD), and ground profile conditions including eroded dune profile;
- Digital FIS report materials;
- Draft work maps showing each transect located accordingly;
- Digital coastal modeling (input and output files);
- Digital versions of any other supporting computations;
- All backup data used in the analyses;
- Format Coastal Hydrology Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan.

In addition, SCDNR or its mapping subcontractor shall submit a coastal study technical documentation notebook with all backup data, description of methodology, and input and output files used in the analyses and mapping as discussed in Appendix D of *Guidelines and Specifications for Flood Hazard Mapping Partners*. According to Appendix D of *Guidelines and Specifications for Flood Hazard Mapping Partners*, documentation of the procedures for the following tasks is required prior to completing the tasks:

- Storm Surge calibration
- Storm Surge Analysis
- WHAFIS Analysis (Charleston and Georgetown Counties)
- WHAFIS Results Mapping (Charleston and Georgetown Counties)

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Coastal Hazard Analyses

Responsible Mapping Partner: SCDNR & FEMA

Scope: SCDNR shall review the technical, scientific, and other information submitted by URS under Coastal Flood Hazard Analyses to ensure that the data and modeling are consistent with FEMA standards and standard engineering practice, and are sufficient to prepare the DFIRM. If SCDNR utilizes a

contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original analyses. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work is to include, at a minimum, the activities listed below.

- Review the submittal for technical and regulatory adequacy, completeness of required information, and supporting data and documentation. The technical review is to focus on the following:
    - Use of acceptable models;
    - Use of appropriate methodology(ies);
    - Correctly applied methodology(ies)/model(s) including QC of input parameters.
    - Comparison with gage data, if appropriate; and
    - Comparison with contiguous reaches or flooding sources.
- Maintain records of all contacts, reviews, recommendations, and actions and make the data readily available to FEMA.
- Maintain an archive of all data submitted for coastal modeling review. (All supporting data must be retained for three years from the date funding recipient submits its final expenditure report to FEMA, once the study is effective all associated data should be submitted to the FEMA library).

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review.
- Recommendations to resolve any problems that are identified during the independent QA/QC review.
- If the data changed during the QA/QC process, then the updated deliverables from the Coastal Flood Hazard Analyses will be resubmitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Floodplain Mapping

Responsible Mapping Partner: SCDNR

**Scope for Detailed Riverine or Coastal Analysis**: SCDNR or its mapping subcontractor shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries and the regulatory floodway boundaries (if required) for the flooding sources for which detailed hydrologic, hydraulic, and/or coastal analyses were performed in Charleston and Georgetown Counties. SCDNR or its mapping subcontractor shall incorporate all new or revised hydrologic, hydraulic, and/or coastal modeling and shall use the topographic data acquired under Topographic Data Development to delineate the floodplain and regulatory floodway boundaries on a digital work map.

**Scope of Redelineation of Detailed Floodplain Boundaries Using Updated Topographic Data:**

*(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Redelineation, if preferred)*

SCDNR or its mapping subcontractor shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries, regulatory floodway boundaries, and coastal high hazard zones (if required) for the flooding sources listed earlier in Table 1.1 for Charleston and Georgetown Counties. SCDNR or its mapping subcontractor shall use the topographic data acquired under Topographic Data Development to delineate the floodplain and regulatory floodway boundaries, as appropriate, on a digital work map. If the new topographic data do not reflect the same hydraulic characteristics as in the effective study, SCDNR or its mapping subcontractor shall evaluate the topographic data to determine if changes are significant enough to invalidate the floodplain boundary and regulatory floodway boundary redelineations. If so, SCDNR shall contact the FEMA Regional Project Officer, identified in Section 12 – Points of Contact, with a recommendation.

Coastal redelineation involves the following steps: redelineate the landward extent of the coastal flooding based on existing Stillwater elevations and the new topography. All gutters (elevation change lines between open water and the landward extent of the coastal flooding) need to be digitized (these lines are not directly related to the topography so should be digitized directly). If converting between NGVD and NAVD and the difference is close to 1.0 foot, the elevation can be changed on the map and the gutters will stay at the same location. If the difference between NGVD and NAVD is between 0.1 and 0.9 foot, or greater than 1.1 feet, contact FEMA and the Regional Management Center (RMC) for guidance on how to move the gutters.

If the PFD VE Zone has not been mapped this must also be done during redelineation. PFD involves using the best available topographic data and mapping the heel or landward side of the PFD. The VE zone shall then be extended landward to that line.

**Scope for Limited Detail Study**: SCDNR or its mapping subcontractor shall delineate the 1- percent-annual-chance floodplain boundaries for the flooding sources for which limited detailed hydrologic and hydraulic analyses were performed for Charleston and Georgetown Counties. SCDNR or its mapping subcontractor shall incorporate all new or revised hydrologic and hydraulic modeling and shall use the topographic data acquired under Topographic Data Development to delineate the floodplain boundaries on a digital work map. The results of the limited detail studies will be the creation of Zone AE including BFE's and cross section labeling. No floodways will be generated and no profiles or floodway data tables will be published. A BFE Table will be provided in the FIS Report.

**Scope for Refinement or Creation of Zone A**: SCDNR or its mapping subcontractor shall delineate the 1-percent-annual-chance floodplain boundaries for the flooding sources listed earlier in Table 1.1 or in the subsequent Scoping Report for Charleston and Georgetown Counties . SCDNR or its mapping subcontractor shall use existing topographic data or the topographic data acquired under Topographic Data Development to delineate the floodplain boundaries on a digital work map. SCDNR or its mapping subcontractor may expand on the approaches for analyzing Zone A areas outlined in *Guidelines and Specifications for Flood Hazard Mapping Partners* and in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas* (April 1995), and/or develop new approaches. Such approaches must be coordinated with the FEMA Regional Project Officer identified in Section 12 – Points of Contact, before analysis and mapping begin.

**Scope for Non-revised Areas**:

*(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Redelineation, if preferred)*

For all flooding sources except those segments for which updated flood data will be developed, or its mapping subcontractor shall convert the information shown on the effective FIRM and FBFM panels for all incorporated and unincorporated areas of Charleston and Georgetown Counties to digital format in conformance with FEMA DFIRM specifications. SCDNR or its mapping subcontractor shall use the acquired base map for the conversion. SCDNR or its mapping subcontractor shall digitize FIRM panels as needed. SCDNR or its mapping subcontractor shall not digitize the flood theme for those segments of flooding sources for which updated flood data will be developed.

**Scope for Merging Revised and Non-Revised Information**: Upon completion of the floodplain mapping activities for the revised and non-revised areas, SCDNR or its mapping subcontractor shall merge the digital floodplain data into a single, updated DFIRM. This work is to include tie-in of flood hazard information for areas that were not studied as part of the Flood Map Project documented in this MAS. SCDNR or its mapping subcontractor also shall tie in the revised and non-revised Flood Profiles, floodplain boundaries, and regulatory floodway boundaries with contiguous communities that were not studied as part of the Flood Map Project documented in this MAS. SCDNR shall coordinate with FEMA and any additional Mapping Partners responsible for other components of Floodplain Mapping, as necessary, to resolve any potential tie-in issues.

SCDNR or its mapping subcontractor shall incorporate the results of all effective LOMCs for all affected communities on the DFIRM. Also, SCDNR or its mapping subcontractor shall address all concerns or questions regarding Floodplain Mapping that are raised during the independent QA/QC review.

Standards: All Floodplain Mapping work shall be performed in accordance with the standards specified in Section 5 - Standards. Mapping quality standards should be consistent with Procedure Memorandum No. 38, dated September 2, 2005. {Insert responsible Mapping Partner} may expand on the approaches for analyzing Zone A areas outlined in *Guidelines and Specifications for Flood Hazard Mapping Partners* and in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas* (April 1995), and/or develop new approaches. Such approaches must be coordinated with the FEMA Regional Project Officer before analysis and mapping begin.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, and upon completion of floodplain mapping for flooding sources to be determined, SCNDR or it mapping subcontractors shall upload the digital data to the MIP or submit by using other digital media if the MIP is unavailable at time of delivery so that SCDNR or its QA/QC subcontractor can access it for the independent QA/QC review. The NFIP

approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The mapping for the remaining flooding sources including any non-revised digital panels and all merged revised and non-revised floodplain mapping data is to be submitted for a final QA/QC review at the completion of this activity. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital work map showing the Coastal High Hazard Area (V zone) delineated along the Atlantic Ocean shoreline, transect locations, 1- and 0.2-percent-annual-chance floodplain boundary delineations, regulatory floodway boundary delineations, cross sections, BFEs, flood insurance risk zone designation labels, and all applicable base map features;
- DFIRM mapping files prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Metadata files describing the DFIRM data, including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in the approved QA/QC Plan;
- Any backup or supplemental information including supporting calculations and assumptions used in the mapping required for the independent QA/QC review of Hydrologic, Coastal and /or Hydraulic Analyses and Floodplain Mapping;
- An explanation for the use of existing topography for the studied reaches, if appropriate.
- Written summary of the analysis methodologies;
- Digital versions of input and output for any computer programs that were used;
- Format Mapping Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- If automated GIS-based models are applied, all input data, output data, intermediate data processing products, and GIS data layers shall be submitted.
- For limited detail studies, a digital work map showing the 1- percent-annual-chance floodplain boundary delineations, BFEs, cross sections, flood insurance risk zone designation labels, and all applicable base map features;

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of Floodplain Mapping

Responsible Mapping Partner: SCDNR & FEMA

Scope: SCDNR or its QA/QC subcontractor shall review the floodplain mapping submitted by SCDNR or its mapping subcontractor under Floodplain Mapping to ensure that the results of the analyses performed are accurately represented, the redelineation of existing data on new, updated topography is appropriate, and to ensure that the new DFIRM panels accurately represent the information shown on the effective FIRMs and FBFMs for the unrevised areas that are mapped.. If SCDNR utilizes a contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original floodplain mapping. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- For the coastal flood hazard analyses, review the setup and runup height elevations shown on the work map to ensure the data agree with those shown on the data table(s), and Stillwater elevations are shown where coastal and riverine flooding studied in detail join.
- Review the cross sections for proper location and orientation on the work map and agreement with the Floodway Data Table.
- Review the BFEs shown on the work map for proper location and agreement with the results of the hydraulic modeling.
- Review the regulatory floodway widths for agreement with the widths shown in the Floodway Data Table and the results of the hydraulic modeling.
- Review the floodplain boundaries for agreement with the flood elevations shown in the Floodway Data Table, the contour lines, and other topographic information shown on the work maps.
- Review the floodplain widths at cross sections as shown on the work maps to ensure the data matches the Floodway Data Table.
- Review the floodplain boundaries as shown on the work maps to ensure the data matches the Flood Profiles.
- For non-revised floodplain areas, the 1- and 0.2-percent-annual-chance floodplain boundaries agree with the floodplain boundaries shown on the FIRM, the contour lines, other topographic information, and planimetric information shown on the DFIRM base.
- Road and floodplain relationships are maintained for all unrevised areas.
- Review the flood insurance risk zones as shown on the work maps to ensure the data are labeled properly.
- Review the DFIRM mapping files to ensure the data were prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners.*
- Review the metadata files to ensure the data includes all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners.*

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- A Summary Report that describes the findings of the QA/QC review, noting any deficiencies in or agreeing with the mapping results;
- Recommendations to resolve any problems that are identified during the independent QA/QC review;
- An annotated work map with all questions and/or concerns indicated, if necessary; and
- If data changed during review, then updated deliverables for previous tasks will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## DFIRM Database

Responsible Mapping Partner: SCDNR

Scope: SCDNR or its mapping subcontractor shall apply the final FEMA DFIRM graphic and database specifications to the DFIRM files produced under Floodplain Mapping and/or Redelineation. This work shall include adding all required annotation, line pattern, area shading, and map collar information (e.g., map borders, title blocks, legends, and notes to user). SCDNR or its mapping subcontractor will be preparing the database for this project in the Standard format. The database shall be produced in accordance with Appendix L of the *Guides and Specifications for Flood Hazard Mapping Partners*. SCDNR or its mapping subcontractor shall coordinate with those Mapping Partners responsible for Floodplain Mapping and/or Redelineation, as necessary, to resolve any problems that are identified during development of the DFIRM Database and graphics.

Standards: All DFIRM Database work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the

FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- DFIRM mapping files prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Metadata files describing the DFIRM data including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Complete set of plots of DFIRM panels showing all detailed flood hazard information at a suitable scale;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan; and
- Format DFIRM Database or Data Delivery consistent with the Data Capture Standards–Appendix N of the *Guidelines and Specifications for Flood Hazard Mapping Partners*.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Independent QA/QC Review of DFIRM Dbase

Responsible Mapping Partner: SCDNR & FEMA

Scope: Upon completion of the floodplain mapping and redelineation activities, SCDNR or its QA/QC subcontractor shall review the DFIRM spatial database to determine if it meets current FEMA database specifications. In addition, SCDNR or its QA/QC subcontractor shall review the DFIRM to ensure it meets current FEMA graphic specifications. SCDNR or its mapping subcontractor shall coordinate with other Mapping Partners, as necessary, to resolve any problems identified during this QA/QC review. If SCDNR utilizes a contractor to perform the QA/QC, the contractor must be a different contractor than who performed the original analyses. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall ensure that the requirements below are met.

- All required DFIRM features are accurately and legibly labeled and follow the examples shown in the FEMA DFIRM specifications. This includes all flood insurance risk zones, BFEs, cross sections, studied streams, mapped political entities, and all roads within and adjacent to the 1-percent-annual-chance floodplains.
- All DFIRM features are correctly symbolized with the appropriate symbol, line pattern, or area shading and follow the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

- All map collar information is complete, correct, and follows the requirements specified in *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- DFIRM mapping files are in a GIS file and database format as specified in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*, and conform to those specifications for content and attribution.
- DFIRM database files are in one of the database formats specified in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*, and conform to those specifications for content and attribution.
- Metadata files describing the DFIRM data include all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

Standards: All DFIRM Database Development work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule.

- A Summary Report that describes the findings of the QA/QC review noting any deficiencies in or agreeing with the mapping results and the results of all automated or manual QA/QC steps taken during the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- An annotated copy of the DFIRM with all questions and/or concerns indicated, if necessary.
- If the data changed during the QA/QC process, then the updated deliverables from Floodplain Mapping and Redelineation will be resubmitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Produce Preliminary Map Products

Responsible Mapping Partners: SCDNR

Scope: This task will be performed for Charleston and Georgetown Counties only. Preliminary Map Products consists of the final preparation, review, and distribution of the Preliminary copies of the DFIRM and FIS report for community officials and the general public review and comment. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. The activities to be performed are summarized below.

*Preliminary Transmittal Letter Preparation*: The SCDNR or its mapping subcontractor shall prepare letters and transmit the Preliminary copies of the DFIRM and FIS report and related enclosures to all affected communities, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA. This letter will be prepared for signature by FEMA and SCDNR.

*Distribution of Preliminary DFIRM and FIS Report:* The SCDNR or its mapping subcontractor shall distribute the Preliminary copies of the DFIRM and FIS report to all affected communities, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA.

*News Release Preparation:* The SCDNR or its mapping subcontractor shall prepare news release notifications of BFE changes for all affected communities, if appropriate, and perform QA/QC reviews of the notices for accuracy and compliance with FEMA format requirements. The SCDNR or its mapping subcontractor shall file the notifications for later submittal to FEMA for review.

*Preliminary Summary of Map Actions (SOMA) Preparation:* The SCDNR or its mapping subcontractor shall prepare Preliminary SOMAs for all affected communities, if appropriate. The SOMA shall list pertinent information regarding LOMCs that will be affected by the issuance of the DFIRM (i.e., superseded, incorporated, and revalidated).

Standards: All Preliminary Map Products work shall be performed in accordance with the standards specified in Section 5 - Standards. Mapping quality standards should be consistent with Procedure Memorandum No. 38, dated September 2, 2005. The Data Capture Standards must be met for this deliverable to be acceptable.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- Preliminary transmittal letters shall be prepared and transmitted. These letters and any additional letters requested by FEMA shall be prepared in accordance with the current version of the FEMA *Document Control Procedures Manual* and in conjunction with Guidance provided by the Region and/or its contractor.

- The FIS report is prepared in the FEMA Countywide Format as documented in Appendix J of *Guidelines and Specifications for Flood Hazard Mapping Partners.*
- Preliminary copies of the DFIRM and FIS report, including all updated data tables and Flood Profiles shall be mailed to the Chief Executive Officer (CEO) and floodplain administrator of each affected community, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA.
- Preliminary SOMAs, prepared in accordance with FEMA requirements, shall be provided as appropriate.
- If appropriate, revised DFIRM mapping and database files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*, shall be provided by uploading the digital data to the MIP or submitting it by using other digital media if the MIP is unavailable at the time of delivery.
- The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance.
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the final preparation of the preliminary DFIRM shall be provided as outlined in the approved QA/QC Plan.
- SCDNR will submit a summary of outreach activities and any changes made in the outreach approach based on the actual implementation.

## Independent QA/QC of Preliminary Map Products

Responsible Mapping Partners: SCDNR & FEMA

Scope: This task will be performed for Charleston and Georgetown Counties only.

*Final QA/QC Review of Preliminary DFIRM and FIS Report:* The SCDNR or its QA/QC subcontractor shall perform a final QA/QC review of the Preliminary DFIRM and FIS report including all data tables, Flood Profiles, and other components of the FIS report. The QA/QC review procedures shall be consistent with the *Guidelines and Specifications for Flood Hazard Mapping Partners* and the QA/QC report submitted for approval at the end of scoping.

*Discrepancy Resolution:* The SCDNR or its mapping subcontractor shall work to resolve discrepancies identified during the final QA/QC review.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting as work on

the activity is accomplished (at least monthly if progress has been made) and when the activity is complete. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule.

- A Summary Report that describes the findings of the QA/QC review noting any deficiencies in or agreeing with the mapping results and the results of all automated or manual QA/QC steps taken during the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- An annotated copy of the DFIRM with all questions and/or concerns indicated, if necessary.
- If data changed during review, then updated deliverables for previous tasks will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm*.

## Post-Preliminary Processing

Responsible Mapping Partners: SCDNR and FEMA

Scope: This task will be performed for Charleston and Georgetown Counties only. Post-Preliminary Processing includes coordination with FEMA and the Community to schedule a Community Meeting(s) for review of the Preliminary DFIRM, if required. This activity consists of finalizing the DFIRM and FIS report after the Preliminary copies of the DFIRM and FIS report have been issued to community officials and the public for review and comment. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. The activities to be performed are summarized below.

*Community Coordination Meeting*: SCDNR shall arrange for and verify that the following activities are completed:

- Establish invitee list,
- Schedule meeting data and place,
- Complete and Distribute Meeting Notice/Letter,
- Record Meeting Minutes, and
- Identify any/all communities with BFE changes for required appeal period.

*Initiation of Statutory 90-Day Appeal Period:* When required, upon completion of a 30-day community comment period and/or final coordination meeting with the affected communities, SCDNR or its mapping subcontractor shall arrange for and verify that the following activities are completed in accordance with the current version of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners* and *Document Control Procedures Manual*:

- Proposed BFE determination letters are sent to the community CEOs and floodplain administrators.

- The SCDNR or its mapping subcontractor shall prepare the appropriate notices (Proposed Rules) that are to be published in the *Federal Register*. The SCDNR or its mapping subcontractor shall then deliver those notices to FEMA for publication.

- Upon verification that the *Federal Register* notice has been published, news release notifications of BFE changes will be published in prominent newspapers with local circulation in accordance with 44 CFR. FEMA's Web-Based BFE notification process may be used to reduce the required newspaper notification size as a cost-saving measure.

- When SCDNR or its mapping subcontractor holds public meetings to present and discuss the results of this Flood Map Project, FEMA may attend the meetings and assist where possible, if requested.

*Resolution of Appeals and Protests:* SCDNR or its mapping subcontractor shall review and resolve appeals and protests received during the 90-day appeal period. For each appeal and protest, the following activities shall be conducted as appropriate:

- Initial processing and acknowledgment of submittal;

- Technical review of submittal;

- Preparation of letter(s) requesting additional supporting data;

- Performance of revised analyses; and

- Preparation of a draft resolution letter for co-signature with FEMA and SCDNR or its mapping subcontractor and revised DFIRM and FIS report materials for FEMA review.

SCDNR or its mapping subcontractor shall mail all associated correspondence upon authorization by FEMA. SCNDR's role in supporting the appeal and protest process includes up to 80 hours of technical support. If the SCDNR's required level of effort exceeds 80 hours total (in all three counties) SCDNR will coordinate with FEMA for resolution options.

*Preparation of Special Correspondence:* SCDNR or its mapping subcontractor shall support FEMA in responding to comments not received within the 90-day appeal period (referred to as "special correspondence") including drafting responses for FEMA review when appropriate and finalizing responses for co-signature. SCDNR or its mapping subcontractor also shall mail the final correspondence (and enclosures, if appropriate) and distribute appropriate copies of the correspondence and enclosures upon receipt of authorization from FEMA. If SCDNR's required level of effort significantly exceeds 80 hours, SCDNR will coordinate with FEMA for resolution options.

*Revision of FIRM and FIS Report:* If necessary, SCDNR or its mapping subcontractor shall work together with FEMA to revise the DFIRM and FIS report and shall distribute revised Preliminary copies of the DFIRM and FIS report to the CEO and floodplain administrator of each affected community, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA. If the revised DFIRM and FIS cover major modifications of more than 2 DFIRM panels per county, SCDNR will coordinate with FEMA regarding resolution options.

*Final SOMA Preparation:* SCDNR or its mapping subcontractor shall prepare Final SOMAs for the affected communities with assistance from FEMA, as appropriate.

*Processing of Letter of Final Determination:* The SCDNR shall work with FEMA to establish the effective date for the DFIRM and FIS report, and shall prepare Letters of Final Determination (LFDs) for each affected community for FEMA review in coordination with the Region and its contractor, and in accordance with the FEMA *Document Control Procedures Manual.* FEMA or its designated contractor shall mail the final signed LFDs and enclosures and distribute appropriate copies of the signed LFDs.

*Processing of Final DFIRM and FIS Report for Printing:* SCDNR or its mapping subcontractor shall prepare final reproduction materials for the DFIRM and FIS report and provide these materials to FEMA or the NSP for printing by the United States Government Printing Office. SCDNR or its mapping subcontractor shall also prepare the appropriate paperwork to accompany the DFIRM and FIS report (including Print Processing Worksheet, Printing Requisition Forms, and Community Map Actions Form) and transmittal letters to the community CEOs.

*Revalidation Letter Processing.* SCDNR or its mapping subcontractor shall prepare and distribute letters for FEMA signature to the community CEOs and floodplain administrators to notify the affected communities about LOMCs for which determinations will remain in effect after the DFIRM and FIS report become effective.

*Archiving Data:* SCDNR or its mapping subcontractor shall ensure that technical and administrative support data are packaged in the FEMA required format and stored properly in the library archives until transmitted to the FEMA Engineering Study Data Package Facility. In addition, the SCDNR or its mapping subcontractor will maintain copies of all data for a period of no less than three years.

Standards: All Post Preliminary DFIRM work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, SCDNR or its mapping subcontractor shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. The NFIP approved Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. The MIP shall be updated for status reporting as work on the activity is accomplished (at least monthly if progress has been made) and when the activity is complete.

- Documentation that the news releases were published in accordance with FEMA requirements;
- Documentation that the appropriate *Federal Register* notices (Proposed and Final Rules) were published in accordance with FEMA requirements;
- Draft and final Special Correspondence (and all associated enclosures, backup data, and other related information) for FEMA review and signature, as appropriate;

- Draft and final Appeal and Protest acknowledgment, additional data, and resolution letters (and all associated enclosures, backup data, and other related information) for FEMA review and signature, as appropriate;
- Draft and final LFDs (and all associated enclosures, backup data, and other related information) for FEMA review and signature;
- DFIRM negatives and final FIS report materials including all updated data tables and Flood Profiles;
- Paperwork for the final DFIRM and FIS report materials;
- Transmittal letters for the printed DFIRM and FIS report;
- LOMC Revalidation Letters, if appropriate;
- Completed, organized, and archived technical and administrative support data; and
- Completed, organized, and archived case files and flood elevation dockets.

## SECTION 2—TECHNICAL AND ADMINISTRATIVE SUPPORT DATA SUBMITTAL

The Project Team members for this Flood Map Project that have responsibilities for activities included in this MAS shall comply with the data submittal requirements summarized below.

All supporting documentation for the activities in this MAS shall be submitted in the TSDN format in accordance with Appendix M of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners*, dated April 2003. Appendix M may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/pdf/fhm/frm_gsam.pdf*. Table 2-1 indicates the sections of the TSDN that apply to each mapping activity.

If any issues arise that could affect the completion of an activity within the proposed scope or budget, the responsible Mapping Partner shall complete a Special Problem Report (SPR) as soon as possible after the issue is identified and submitted to FEMA. The SPR is to describe the issue and propose possible resolutions. (For additional information on SPRs, refer to Appendix M, Subsection M.2.1.1 of *Guidelines and Specifications for Flood Hazard Mapping Partners*.)

## Table 2-1. Mapping Activities and Applicable TSDN Sections

| TSDN Section | Mapping Activities | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Scoping | Field Survey | Topo Data | QA/QC of Topo | Base Map | Hydrology/ Coastal | QA/QC of Hydrology/ Coastal | Hydraulic Analysis | QA/QC of Hydraulics | Flood-plain Mapping (and Re-delineation) | QA/QC of FP Mapping | DFIRM Database | Preliminary Map Products | Post-Preliminary |
| **General Documentation** | | | | | | | | | | | | | | |
| Special Problem Reports | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Telephone Conversation Reports | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Meeting Minutes/ Reports | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| General Correspondence | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **Engineering Analyses** | | | | | | | | | | | | | | |
| Hydrologic Analyses | | X | | | X | X | X | X | X | X | X | | | |
| Hydraulic Analyses | | X | | | X | X | X | X | X | X | X | | | |
| Key to Cross-Section Labeling | | X | | | X | X | X | X | X | X | X | | | |
| Key to Transect Labeling | | X | | | X | X | X | X | X | X | X | | | |
| **Draft FIS Report** | | | | | X | X | X | X | X | | | | | |
| **Mapping Information** | X | | X | X | | | | | | X | X | X | X | X |
| **Miscellaneous Reference Information** | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

## SECTION 3—PERIOD OF PERFORMANCE (for CTPs)

The mapping activities outlined in this MAS will begin upon receipt of funding and notice to proceed, and will be completed within 36 months or no later than later than September 30, 2009 The mapping activities may be terminated at the option of FEMA or SCDNR in accordance with the provisions of the Partnership Agreement dated September 20, 1999. If these mapping activities are terminated; the remaining funds from uncompleted activities, provided by FEMA for this MAS, will be returned to FEMA.

## SECTION 4—FUNDING/LEVERAGE (FOR CTP)

FEMA is providing funding, in the amount of SCDNR for the completion of this Flood Map Project. SCDNR shall provide any additional resources required to complete the assigned activities for this Flood Map Project. During the scoping process, additional needs may be identified. Activities associated with any additional needs would be performed based on availability of additional funds. More detailed leverage information will be determined during the detailed scoping process and reported back to FEMA at that time.

| Funding for Project | FEMA Contribution | CTP Contribution | % Leverage | Total Project Cost |
|---|---|---|---|---|
| Charleston County | | | | |
| Georgetown County | | | | |
| Jasper County | | | | |

The FEMA funds identified above are available to be used for the activities included in Table 4.1.

Table 4.1 FEMA funds identified above are available to be used for the following activities*:

| Activities | FUNDABLE? |
|---|---|
| Scoping | Yes, up to 10 percent of total cost |
| Outreach | Yes |
| Field Surveys and Reconnaissance | Yes |
| Topographic Data Development | No, unless approval given during scoping phase by Regional Project Officer |
| Independent QA/QC Review of Topographic Data | No, unless approval given during scoping phase by Regional Project Officer |
| Base Map Acquisition | No |
| Hydrologic Analyses | Yes |
| Independent QA/QC Review of Hydrologic Analyses | Yes |
| Hydraulic Analyses | Yes |
| Independent QA/QC Review of Hydraulic Analyses | Yes |
| Coastal Flood Hazard Analyses | Yes |
| Independent QA/QC Review of Coastal Hazard Analyses | Yes |
| Floodplain Mapping (Detailed Riverine or Coastal Analysis; Redelineation Using Effective Flood Profiles and Updated Topographic Data; Refinement or Creation of Zone A; Redelineation/digitization of Non-Revised Areas; and Merging Revised and Non-Revised Areas) | Yes |
| Independent QA/QC of Floodplain Mapping | Yes |
| Optional: Redelineation (Redelineation Using Effective Flood Profiles and Updated Topographic Data; Refinement; and Redelineation (digitization) Non-Revised Areas) | Yes |
| Independent QA/QC of Redelineation | Yes |
| DFIRM Database and Graphic Specifications | Yes |
| Independent QA/QC Review of DFIRM Database and Graphic Specifications | Yes |
| Produce Preliminary Map Products | Yes |
| Post-Preliminary Processing | Yes |

*This table is for information purposes only.

# SECTION 5—STANDARDS

The standards relevant to this MAS are provided in Tables 5-1 and 5-2. Information on the correct volume, appendix, section, or subsection of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners* to be referenced for each mapping activity are summarized in Table 5-2.

These guidelines may be downloaded from the FEMA Flood Hazard Mapping website at *http://www.fema.gov/fhm/dl_cgs.shtm* .

## Table 5-1. Applicable Standards for Project Activities

| Applicable Standards | Activities | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Scoping | Field Survey | Topo Data | QA/QC Topo Data | Base Map | Hydrology/ Coastal | QA/QC Hydrology/ Coastal | Hydraulic Analysis | QA/QC of Hydraulic Analysis | Floodplain Mapping (inc. Redelineation | QA/Qc Flood-plain Mapping | DFIRM Dbase | QA/QC DFIRM Database | Preliminary Map Products | Post-Preliminary Processing |
| *Guidelines and Specifications for Flood Hazard Mapping Partners*, April 2003 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| American Congress on Surveying and Mapping Procedures | X | X | X | X | | | | | | | | | | | |
| Global Positioning System (GPS) Surveys: National Geodetic Survey (NGS-510), "Guidelines for Establishing GPS-Derived Ellipsoid Heights," November 1997 | X | X | X | X | | | | | | | | | | | |
| Engineer Manual 1110-1-1000, *Photogrammetric Mapping* (USACE), July 1, 2002 | X | X | X | X | | | | | | | | | | | |
| Engineer Manual 1110-2-1003, *Hydrographic Surveys* (USACE), January 1, 2002 | X | X | | | | | | | | | | | | | |
| "Numerical Models Accepted by FEMA for NFIP Usage," Updated April 2003 | X | | | | X | X | X | X | X | | | | | | |
| *Content Standard for Digital Geospatial Metadata* (Federal Geographic Data Committee), 1998 | X | | X | X | | | | | | X | X | X | X | X | X |
| *Document Control Procedures Manual*, December 2000 | X | | | | | | | | | | | | | X | X |
| *44 Code of Federal Regulations Part 66 and 67* | X | | | | | | | | | | | | | X | |

## Table 5-2. Project Activities and Applicable Portions of FEMA Guidelines and Specifications

| Activity Description | Applicable Volume, Section/Subsection, and Appendix |
|---|---|
| Scoping | Appendix I, Scoping Report document attached in Appendix A to this Mapping Activity Statement; 44 Code of Federal Regulations Part 66 and 67 |
| Field Survey | Volume 1, Section 1.4 (specifically Subsection 1.4.2.1)<br>Appendix A, Sections A.4, A.5, A.6, A.7, and A.8<br>Appendix F, Section F.3<br>Appendices B, C, and M |
| Topographic Data Development | Volume 1, Section 1.4 (specifically Subsection 1.4.2.1)<br>Appendix A, Sections A.2 , A.3, A.7, and A.8<br>Appendix M |
| Independent QA/QC Review of Topographic Data | Volume 1, Section 1.4 (specifically Subsections 1.4.1 and 1.4.2.1)<br>Appendix A, Sections A.2, A.3, A.7 (specifically Subsection A.7.5), and A.8 (specifically Subsection A.8.6)<br>Appendix M |
| Base Map Acquisition and Preparation | Volume 1, Section 1.3 (specifically Subsection 1.3.1.8) and 1.4 (specifically Subsections 1.4.3.1 and 1.4.3.2)<br>Appendix A, Section A.1 (specifically Subsection A.1.1) |
| Hydrologic Analyses | Volume 1, Section 1.4 (specifically Subsections 1.4.2.2 and 1.4.2.4)<br>Appendix A, Section A.4<br>Appendix C, Sections C.1 and C.7<br>Appendices E, F, G, H, and M |

| Activity Description | Applicable Volume, Section/Subsection, and Appendix |
|---|---|
| Independent QA/QC Review of Hydrologic Analyses | Volume 1, Section 1.4 (specifically Subsection 1.4.1)<br>Appendix A, Section A.4<br>Appendix C, Section C.2<br>Appendices E, F, G, H, and M |
| Hydraulic Analyses | Volume 1, Section 1.4 (specifically Subsections 1.4.2.2 and 1.4.2.4)<br>Appendix A, Section A.4 (specifically Subsection A.4.7)<br>Appendix C, Sections C.3 and C.7 |
| Independent QA/QC Review of Hydraulic Analyses | Volume 1, Section 1.4 (specifically Subsection 1.4.1)<br>Appendix A, Section A.4 (specifically Subsection A.4.7)<br>Appendix C, Section C.5 |
| Levee Evaluation (if appropriate) | Appendix H<br>Procedure Memorandum 34 (and related PMs)<br>44 CFR 65.2, 44 CFR 65.10 |
| Coastal Hazard Analyses | Appendix A, Section A.4 (specifically Subsection A.4.7)<br>Appendix C, Section C.5<br>Appendices B, D, and M |
| Independent QA/QC Review of Coastal Hazard Analyses | Volume 1, Section 1.4 (specifically Subsection 1.4.1)<br>Appendix A, Section A.4<br>Appendices B, D, and M |

| Activity Description | Applicable Volume, Section/Subsection, and Appendix |
|---|---|
| Floodplain Mapping | Volume 1, Section 1.4 (specifically Subsections 1.4.2.2, 1.4.2.3, and 1.4.3.2)<br>Appendix C, Sections C. 4 and C.6 (specifically Subsection C.6.1.3)<br>Appendix D, Sections D.2 (specifically Subsection D.2.7) and D.3 (specifically Subsection D.3.7)<br>Appendices E, F, G, H, K, L, and M |
| Perform Redelineation | Volume 1, Section 1.4 (specifically Subsections 1.4.2.2, 1.4.2.3, and 1.4.3.2)<br>Appendix C, Section C.6 (specifically Subsection C.6.1.3)<br>Appendices K. L, and M |
| Independent QA/QC Floodplain Mapping (including Redelineation/Digitization) | Volume 1, Section 1.4 (specifically Subsections 1.4.1 and 1.4.2.3)<br>Appendix C, Sections C.4 and C.6<br>Appendix D, Sections D.2 (specifically Subsection D.2.7) and D.3 (specifically Subsection D.3.7)<br>Appendices E, F, G, H, K, L, and M |
| Independent QA/QC Review of DFIRM Database and Graphic Specs | Volume 1, Section 1.4 (specifically Subsections 1.4.2.3, 1.4.3.3, 1.4.3.9, and 1.4.3.10)<br>Appendices K, L, and M |
| Production of Preliminary Map Products | Volume 1, Sections 1.4 (specifically Subsections 1.4.2 and 1.4.3) and 1.5 (specifically Subsection 1.5.1)<br>Appendices J, K, L, and M |
| Post-Preliminary Processing | Volume 1, Section 1.5 (specifically Subsection 1.5.2)<br>Appendices J, K, L, and M |

# SECTION 6—SCHEDULE

The activities documented in this MAS shall be completed in accordance with the project schedule below. If changes to this schedule are required, the responsible Mapping Partner shall coordinate with FEMA and the other Mapping Partners in a timely manner.

**Table 6.1 Mapping Activities Schedule**

| Activities | RESPONSIBLE PARTNER(S) | DATE DUE |
|---|---|---|
| Contracting activities leading up to issuance of a Notice To Proceed (NTP) to mapping subcontractor | SCDNR | 120 days after final MAS signatures & funding authorization |
| Scoping | SCDNR | 120 days after NTP |
| Field Surveys | SCDNR | 60 days after Scoping Report Approval |
| Topographic Data Development | SCDNR | 30 days after Scoping Report Approval, or 60 days after new LiDAR data acquisition |
| Independent QA/QC Review of Topographic Data | SCDNR/FEMA | 30 days after data development |
| Base Map Acquisition | SCDNR | 30 days after receipt of all data from State / FEMA / County / Community for use in Base Map |
| Hydrologic Analyses | SCDNR | 30 days after approval of topographic data. |
| Independent QA/QC Review of Hydrologic Analyses | SCDNR/FEMA | 30 days after completion of hydrologic analysis |
| Hydraulic Analyses<br>• Levee Evaluation (if appropriate) | SCDNR | 60 days after approval of hydrologic analysis |
| Independent QA/QC Review of Hydraulic Analyses | SCDNR/FEMA | 30 days after |

| Activities | RESPONSIBLE PARTNER(S) | DATE DUE |
|---|---|---|
| | | completion of hydraulic analysis |
| Coastal Flood Hazard Analyses (includes interim submittals per Appendix D, Section D.1.4)<br>• Storm Surge Calibration<br>• Storm Surge Analysis<br>• WHAFIS Analysis<br>o includes Levee Evaluation (if appropriate) | SCDNR | 360 days after approval of topographic data |
| Independent QA/QC Review of Coastal Hazard Analyses | SCDNR/FEMA | 30 days after receipt of WHAFIS analysis |
| Floodplain Mapping:<br>• Detailed Riverine or Coastal Analysis<br>• Refinement or Creation of Zone A<br>• Merging Revised and Unrevised Areas<br><Floodplain Mapping or Redelineation><br>• Redelineation Using Effective Flood Profiles and Updated Topographic Data<br>• Redelineation/Digitization of Non-Revised Areas | SCDNR | 60 days after Independent QA/QC comments on hydrology, hydraulic, and coastal analyses have been resolved. |
| Independent QA/QC Review of Floodplain Mapping | SCDNR/FEMA | 30 days after completion of floodplain mapping |
| Redelineation<br><Floodplain Mapping or Redelineation><br>• Redelineation Using Effective Flood Profiles and Updated Topographic Data<br>• Redelineation/Digitization of Non-Revised Areas | SCDNR | Concurrent with completion of floodplain mapping |
| Independent QA/QC Review of Redelineation | SCDNR/FEMA | Concurrent with completion of |

| Activities | RESPONSIBLE PARTNER(S) | DATE DUE |
|---|---|---|
| | | QA/QC of floodplain mapping |
| DFIRM Database (including Graphic Specifications) | SCDNR | 60 days after receipt of database |
| Independent QA/QC Review of DFIRM Database | SCDNR/FEMA | 30 days after receipt of DFIRM database |
| Produce Preliminary Map Products (including 1/3 Outreach) | SCDNR | 60 days after DFIRM database approval, (540 to 720 days after NTP) |
| Post-Preliminary Processing of Georgetown and Charleston Counties (including 1/3 Outreach) | SCDNR/FEMA | 1095 days after NTP |
| | | |

# SECTION 7—CERTIFICATIONS

**Field Surveys and Topographic Data Development**

A Registered Professional Engineer or Licensed Land Surveyor shall certify topographic data in accordance with 44 CFR 65.5(c). Certification of topographic data by the American Society for Photogrammetry and Remote Sensing is also acceptable.

**Base Map Acquisition and Preparation**

- A community official or responsible party shall provide written certification that the digital data meet FEMA minimum standards and specifications.
- The responsible Mapping Partner shall provide documentation that the digital base map can be used by FEMA. Please note that uploading base map data to the MIP does not constitute agreement that the digital base map can be used by FEMA. Documentation that the digital base map can be used by FEMA will still be required.

Certifications must be made at the time the intermediate data is submitted. For example, if hydrologic data is submitted, certification will be required at the time it is submitted.

**Hydrologic Analyses, Hydraulic Analyses, and Floodplain Mapping**

- A Registered Professional Engineer shall certify hydrologic and hydraulic analyses and data in accordance with 44 CFR 65.6(f).
- A Registered Professional Engineer or Licensed Land Surveyor shall certify topographic information in accordance with 44 CFR 65.5(c).
- Any levee systems to be accredited will be certified in accordance with 44 CFR 65.10(e).

**Floodplain Mapping, Independent QA/QC Review of Floodplain Mapping and DFIRM Database**

The DFIRM metadata files shall include a description of the horizontal and vertical accuracy of the DFIRM base map and floodplain information.

# SECTION 8—TECHNICAL ASSISTANCE AND RESOURCES

Project Team members may obtain copies of FEMA-issued LOMCs, archived engineering backup data, and data collected as part of the Mapping Needs Assessment Process from FEMA and/or your Regional Project Officer.

General technical and programmatic information, such as FEMA 265 and the Quick-2 computer program, can be downloaded from the FEMA website at *http://www.fema.gov./fhm/*. Specific technical and programmatic support may be provided through FEMA and/or its contractor; such assistance should be requested through the FEMA Project Officer specified in Section 12 – Points of Contact.

Project Team members also may consult with the FEMA Regional 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 subcontractors, and GIS-based engineering and modeling training.

## SECTION 9—CONTRACTORS (CTP)

SCDNR intends to use the services of URS as a contractor for this Flood Map Project. SCDNR shall ensure that the procurement for all contractors used for this Flood Map Project complies with the requirements of 44 CFR 13.36.

## SECTION 10—REPORTING (CTP)

FINANCIAL REPORTING:

Because funding has been provided to SCDNR by FEMA, financial reporting requirements for SCDNR will be in accordance with Cooperative Agreement Articles V and VI.

SCDNR shall provide financial reports to the FEMA Regional Project Officer and Assistance Officer in accordance with the terms of the signed Cooperative Agreement for this MAS.

STATUS REPORTING:

Status reports will be submitted on a quarterly basis in accordance with the financial reporting submittals. At a minimum, these reports will include a summary of the work as outlined in the CTP/Map Modernization Project Quarterly Report located in Appendix B of this MAS. The Project Officer, as needed, may request additional information on status. There is a report currently under development in the MIP that may be used to satisfy this requirement when completed.

SCDNR will meet with FEMA and/or its contractor as often as necessary to review the progress of the project in addition to the quarterly financial and status submittals. These meetings will alternate between FEMA's Regional Office, the SCDNR office, and conference calls, as necessary.

## Section 11—Project Coordination

Throughout the project, all members of the Project Team will coordinate, as necessary, to ensure the products meet the technical and format specifications required and contain accurate, up-to-date information. Coordination activities shall include:

- Meetings, teleconferences, and video conferences with FEMA and other Project Team members as needed;
- Telephone conversations with FEMA and other Project Team members on a scheduled or as needed basis;

- Updates to the MIP and other FEMA status information systems in accordance with requirements in Volumes 1 and 3 of *Guidelines and Specifications for Flood Hazard Mapping Partners*; and

- E-mail, facsimile transmissions, and letters, as required.

## SECTION 12 – POINTS OF CONTACT (CTP)

The points of contact for this Flood Map Project are Laura Algeo, the FEMA Regional Project Officer; Lisa Jones, the Project Manager for SCDNR; or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities. When necessary, any additional FEMA assistance should be requested through the FEMA Regional Project Officer.

Each party has caused this MAS to be executed by its duly authorized representative.

Lisa Jones
Director, Flood Mitigation Program
South Carolina Department of Natural Resources

10/16/06
Date

Laura Algeo
Regional Project Officer
Federal Emergency Management Agency, Region

10/18/06
Date