

Guidance for Flood Risk Analysis and Mapping

Coastal Data Capture

May 2014



FEMA

This guidance document supports effective and efficient implementation of flood risk analysis and mapping standards codified in the Federal Insurance and Mitigation Administration Policy FP 204-07801.

For more information, please visit the Federal Emergency Management Agency (FEMA) Guidelines and Standards for Flood Risk Analysis and Mapping webpage (<http://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping>), which explains the policy, related guidance, technical references, and other information about the guidelines and standards process.

Nothing in this guidance document is mandatory other than standards codified separately in the aforementioned Policy. Alternate approaches that comply with FEMA standards that effectively and efficiently support program objectives are also acceptable.

Document History

Affected Section or Subsection	Date	Description
First Publication	May 2014	Initial version of new transformed guidance. The content was derived from the <i>Guidelines and Specifications for Flood Hazard Mapping Partners</i> , Procedure Memoranda, and/or Operating Guidance documents. It has been reorganized and is being published separately from the standards.

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1.0 Overview

This document describes the type and format of data that must be submitted to FEMA for the coastal Flood Risk Project, as required by the *Data Capture Technical Reference*. All data must be submitted in digital format. Coastal data for the entire project (area studied) contracted should be submitted by the Mapping Partner. Ultimately, all of the data needed for a qualified 3rd party to reproduce all aspects of the study results should be retained. When there is question, the Mapping Partner should engage the Region with questions.

Many of the directories required by the *Data Capture Technical Reference* include a ReadMe file within the submitted data. These files are simple text files which describe the organization of the files within the directory, explain the file naming convention, provide confirmation of the units and datum(s) relevant to any raw data files within the directory, and any additional explanation or guidance needed to allow a third party to understand and use the data within the directory in the same manner in which it was used during the study process.

Per FEMA Standards 8 and 36, the Coordinated Needs Management Strategy (CNMS) database must be updated, as applicable, based on the information and data collected and revised as part of this guidance. The data model provided in the *CNMS Technical Reference* must be used to enter the data and update CNMS.

As required by Standard 182, the submitting Mapping Partner must retain copies of all project-related data for a period of three years. The submitting Partner will need these data for responding to the following:

- Questions from FEMA or the receiving Mapping Partner during the review of the final draft materials
- Comments and appeals submitted to FEMA during the 90-day appeal period
- Other concerns and issues that may develop during the processing of the revised Flood Insurance Study (FIS) Report and Flood Insurance Rate Map (FIRM)

2.0 Data Capture Folder Guidance

The following sections provide guidance on the information and files that should be captured in each of the folders specified in the *Data Capture Technical Reference*. Subsections correspond to folder structures and names from the technical reference. The intent of the guidance is to capture all relevant model output or calculation results used for the determination of flood hazard information for the study and all data and model input files required to produce that information. All outputs from one phase of a study that are used in subsequent phases of the study as inputs should be captured.

Where analyses utilize desktop calculation methods such as are commonly used for response-based wave runup studies or statistical analyses of water levels and waves, a sample calculation should be provided that demonstrates the calculation procedure(s).

2.1 General

The following data files and reports should be submitted for coastal studies. For coastal studies, the body of work performed often spans many counties. In this case, the bulk of the data may be stored in one county and referenced, where applicable, with ReadMe files that specifically describe which data should be accessed and where it is located.

As described in the *Data Capture Technical Reference*, the following items should be submitted in the General folder, as applicable to the project:

- White Papers, Technical Memos, etc. related to Coastal Analyses and Mapping – Word and PDF
- Draft FIS Coastal Hydrology and Coastal Hydraulic Analysis Sections (typically 5.1 and 5.3) – Word and PDF
- FIS Graphics (e.g., Stillwater Elevation (SWEL) contour map, transect location map) – PDF/JPEG
 - A contour map of the flood study area for the 1-percent-annual-chance total stillwater elevation (storm surge plus wave setup) should be provided in the FIS Report narrative. The map scale should be chosen for clarity of depicting 1-foot contours for the entire overland Flood Risk Project area. This map should be submitted in a JPEG or PDF file format, named “SWEL_Contours.***.” The standards for 1-Percent-Annual-Chance Total Stillwater Elevation Contour Map are provided in the *FIS Report Technical Reference*.
 - Transect Location Map: A transect location map illustrates the location of transects used in coastal analyses and should be provided in the FIS Report narrative. This map should be submitted in JPEG or PDF file format, named “Transect_Location.***.” Transect location maps are not required in the FIS when transects are shown on the FIRM. If a transect location map is included in the FIS, only transects used for mapping should be shown. The guidelines for the transect location map are provided in the *FIS Report Technical Reference*.
- FIS Tables – MDB/XLS/XLSX/DBF
- FIS Coastal Profiles – PDF/JPEG and DXF/DWG
 - Calculating the 0.2-percent-annual-chance wave height is an optional coastal Flood Risk Project task. When included as part of the coastal studies, profiles showing the 0.2-percent-annual-chance wave envelope and ground elevations are added to the end of the FIS. All profiles should be submitted using a file name convention of “County_TransectNumber***,” in a DXF, DWG or a spatially compatible file format, to allow for graphic format changes, and as a PDF or JPEG file for the FIS narrative report.
- Project Narrative – Word. A project narrative describing the Statement of Work (SOW), direction from FEMA, issues, information for the next Mapping Partner, etc. This requirement may be met in part by content within existing intermediate data submittal (IDS) documentation for the study, in which case the narrative here can freely reference the relevant portions of the IDS submittals.
- Certification – PDF
 - FEMA-funded (including Cooperating Technical Partner (CTP)-funded projects if they are a part of FEMA’s flood mapping program) coastal work must be certified by a professional engineer (Standard 74). The work must also be certified for completeness, via the certification forms provided in

<http://www.fema.gov/library/viewRecord.do?id=7577> (Standard 174). Submittal of these certifications at the “Perform Coastal Analysis” workflow step is required if this is the last task to be performed by the Mapping Partner. Mapping Partners that are contracted to perform multiple mapping tasks can submit the certifications at the completion of the final task being performed by the Mapping Partner. A PDF of the form should be submitted digitally with the original signature, date, and seal affixed to the form.

- Metadata – XML
- Coastal Intermediate Data Submittals
 - All relevant coastal IDS documentation completed for the project, (see *Coastal Study Documentation and Intermediate Data Submittals Guidance*) including appendices and QA/QC documentation will be submitted as required by the *Data Capture Technical Reference*. Only the final reports and associated documentation and literature should be contained in these folders; all relevant data and modeling files should be captured within the file structures related to the following sections.

2.2 Correspondence

Standard 183 requires that a directory that compiles general correspondence be submitted by the Mapping Partner performing coastal analysis. General correspondence is the written correspondence generated or received by the Mapping Partner assigned to fulfill the requirements of performing coastal analysis. Correspondence includes any documentation generated during this task such as: letters; transmittals; memoranda; general status reports and queries; Special Problem Reports, listing of all Scientific Resolution Panel (SRP) process actions and resolutions with associated documentation (see the guidance on appeals); technical issues that need to be documented; and any correspondence capturing direction from FEMA. Contractual documents, such as a signed SOW or Mapping Activity Statement (MAS), are not to be submitted as a part of the Data Capture submittal.

2.3 Stillwater_Data

This directory documents and archives all stillwater elevation data used within the study effort. These are study inputs rather than study outputs. This will include all tidal water level data and high water mark data analyzed through the study effort. Reference to can be made to information contained within the IDS reports as applicable.

2.3.1 Tidal_Water_Data

This directory contains tide gage water level information if gage data is used in the study. Station information should be provided that describes the maintaining agency, gage name or number and location, period(s) of record, units of measure, and vertical datum.

2.3.2 High_Water_Mark_Data

This directory contains high water mark data for the study area. Information provided should include data source(s), date of data collection, and unit of measure and vertical datum. Available documentation on pertaining to data collection methods and data quality should also be provided.

2.4 Stillwater_Analysis

This directory documents and archives the approach and analysis performed with respect to determining the stillwater elevation(s) that were used within the flood study. Reference may be made to the appropriate IDS for any documentation needs that are met by the IDS reporting files located in the General folder.

2.4.1 Stillwater_Analysis_Approach

This directory consists of a brief description of the nature of the analysis which was used to determine the stillwater elevations used within the flood study.

2.4.2 Desktop_Hydro_Analysis_Name

For those studies which use an analysis method other than 2-D computer modeling, this directory is populated with a set of fully worked example calculations that illustrate what analysis was performed. The example problem will be accompanied by the input and output data for the problem itself. This directory will also contain all output from the stillwater analysis and all input data needed to reproduce these results. The folder name should be chosen to reflect the type of analysis used for the study, for example "Tide_Gage_Analysis."

2.4.3 2-D_Hydro_Modeling_Analysis_Name

This directory is populated for those studies which employ a 2-D computer modeling to analyze stillwater levels within the study. The folder name should reflect the name of the hydrodynamic model used for the study, e.g., "ADCIRC," or "MIKE21."

2.4.3.1 Hydro_Model_Geometry

This directory consists of a ReadMe file, the final model mesh and the final Digital Elevation Model (DEM) or other elevation data set which was used to establish nodal elevations within the model. The data in this directory, together with the data submitted within Tidal_Calibration, Hydro_Historic_Storm_Verification, and Hydro_Production_Runs referenced below, should be sufficient to rerun all of the tidal calibration, historic storm validation and production simulations performed within the study. The folder name should reflect the name of the model, e.g., "ADCIRC_Geometry."

2.4.3.2 Tidal_Calibration

This directory consists of a ReadMe file and all of the model input files needed to reproduce the final tidal calibration simulations. All tidal calibration model output files needed to verify model results will also be included here.

2.4.3.3 Hydro_Historic_Storm_Verification

This directory consists of a ReadMe file and all of the model input files needed to reproduce the final historic storm validation simulations. The ReadMe file should explicitly provide a key to the relationship between file naming convention and identification of the individual historic storms. All historic storm validation model output files needed to verify model results will also be included here. The folder name should reflect the model name, e.g., "ADCIRC_Historic_Storm_Verification."

2.4.3.4 Hydro_Production_Runs

This directory consists of a ReadMe file and all of the model input files needed to reproduce the final production storm simulations. All production model output files will also be included here. Output needed to reproduce results from the statistical water level analysis should be captured. Additional output such as full time varying water level elevations may not be required if they are not used in subsequent components of the study, but may be included if available. The folder name should reflect the model name, e.g., “ADCIRC_Production_Runs.”

2.4.3.5 Hydro_Statistical_Analysis

This directory contains a ReadMe file and a set of fully worked example calculations that illustrate the analysis techniques used to calculate the return period water levels (e.g. 1-percent- and 0.2-percent-annual-chance). The example problem will be accompanied by the input and output data for the problem itself. The data in this directory, together with the documentation within the relevant IDS reports, should be sufficient to recreate the return period water levels within the study area. The folder name should reflect the model name, e.g., “ADCIRC_Statistical_Analysis.”

2.4.3.6 Hydro_Supplemental_Data

This directory contains a ReadMe file and any additional data used in the water level modeling of this flood risk study. The folder name should reflect the model name, e.g., “ADCIRC_Supplemental_Data.”

2.4.3.7 Hydro_Spatial_Files

This directory contains a ReadMe file and the final 0.2-percent- and 1-percent-annual-chance surge surfaces used as input for the transect based wave analysis. The folder name should reflect the model name, e.g., “ADCIRC_Spatial_Files.”

2.5 Wave_Analysis

2.5.1 Wave_Analysis_Approach

This directory consists of a brief description of the approach used to determine regional wave conditions for use in performing the Flood Insurance Study (e.g., 2-D wave modeling within JPM-OS, 2-D wave modeling for multi-decadal hindcast, desktop analysis for multi-decadal hindcast, etc.). This will include an explanation of how different ocean/regional/coastal scale wave domains were linked.

Reference may be made to the appropriate IDS for any documentation needs that are met by the IDS reporting files located in the General folder.

2.5.2 Desktop_Wave_Analysis_Name

For those studies which use an analysis method other than 2-D computer modeling, this directory will be populated with a set of fully worked example calculations that illustrate the analysis performed. The example problem will be accompanied by the input and output data for the problem itself. This directory will also contain all output from the wave analysis and all input data needed to reproduce these results. The folder name should be chosen to reflect the type of analysis used for the study, for example “Wave_Transformation_Calcs.”

2.5.3 2-D_Wave_Modeling_Analysis_Name

This directory is populated for those studies that employ 2-D computer modeling to analyze wave conditions within the study. The folder name should be chosen to reflect the name of the wave model used for the study, for example, “SWAN,” or “GROW.”

2.5.3.1 Wave_Model_Geometry

This directory consists of a ReadMe file, the final model mesh and the final DEM or other elevation data set which was used to establish nodal elevations within the model. The data in this directory, together with the data submitted within the Wave_Historic_Storm_Verification and Wave_Production_Runs referenced below, should be sufficient to rerun all of the historic storm validation and production simulations performed within the study. The folder name should reflect the model name, e.g., “SWAN_Model_Geometry.”

2.5.3.2 Wave_Historic_Storm_Verification

This directory consists of a ReadMe file and all of the model input files needed to reproduce the final historic storm validation simulations. All historic storm validation model input and output files will also be included here along with those wave data which were used to compare with model results. This directory will also include a written description of how different ocean/regional/coastal scale wave domains were linked. The folder name should reflect the model name, e.g., “SWAN_Historic_Storm_Verification.”

2.5.3.3 Wave_Production_Runs

This directory consists of a ReadMe file and all of the model input files needed to reproduce the final production storm simulations. All production run output files necessary to develop the 1-percent- and 0.2-percent- annual-chance wave levels will also be included here. The folder name should reflect the model name, e.g., “SWAN_Production_Runs.”

2.5.4 Wave_Supplemental_Data

This directory contains a ReadMe file and any additional data used in the wave modeling within this flood risk study. The folder name should reflect the model name, e.g., “SWAN_Supplemental_Data.”

2.6 Transect_Based_Wave_Hazard_Analysis

This directory contains the data from the onshore wave hazard analyses. Reference may be made to the appropriate IDS for any documentation needs that are met by the IDS reporting files located in the General folder.

2.6.1 Wave_Statistical_Analysis_Event

This directory is populated for studies that use the 2-D wave modeling output as a source of starting wave conditions for an event-based flood hazard analysis.

This directory consists of a ReadMe file and fully worked example calculations that illustrate the analysis techniques used to determine the input wave conditions for use within the transect based wave analysis. The example problem will be accompanied by the input and output data for the problem itself. The data in this directory, together with the documentation within the relevant IDS reports, should be sufficient to recreate the wave conditions used in the transect-based wave hazard analysis.

2.6.2 Wave_Hazard_Model_Name

The folder name should be chosen to reflect the name of the wave model used for the study, for example, “WHAFIS,” or “CSHORE.” Multiple Wave_Hazard_Model_Name folders may be necessary within the Transect_Based_Wave_Hazard_Analysis if more than one wave mode is used to evaluate wave hazards. If more than one method is used to calculate wave runup, it is recommended that a “Runup” parent folder be created to contain the Wave_Hazard_Model_Name folder for each runup method.

2.6.2.1 Simulations

This directory consists of a ReadMe file and all input and output files for WHAFIS 1-D wave calculations, all wave envelope files, and all input and output for wave runup and overtopping calculations.

1-Percent-Annual-Chance Wave Analysis

All input and output files related to the analysis of the 1-percent-annual-chance overland wave hazard.

A 1-percent-annual-chance wave envelope profile for each transect should be submitted showing the wave heights, wave runup elevation, SWELs, zone gutter locations, and where applicable, the location of primary frontal dunes, pre-and post-eroded ground profile, and the location of coastal structures included in analyses. If the modeled transect numbers differ from those shown on the FIRM, then a transect key, correlating the modeled transects to the mapped transects, should also be submitted.

0.2-Percent-Annual-Chance Wave Analysis

All input and output files related to the analysis of the 0.2-percent-annual-chance overland wave hazard.

2.6.2.2 Spatial_Files

This directory consists of a ReadMe file and all field survey, land-use and other reference files for WHAFIS 1-D wave calculations. This directory should include all transect layout files as well as any terrain or DEM data which has been developed specifically for use within the 1-D analysis.

2.6.2.3 Supplemental_Data

This directory contains a ReadMe file and any additional data used in the transect-based analysis within this flood risk study.

2.7 Spatial_Files

This directory contains the FIRM database files required for Coastal Analysis task of a coastal study, as described in the *FIRM Database Technical Reference* Table 3.

2.8 Coastal_Flood_Risk_Spatial_Files

This directory consists of a ReadMe file and all final coastal Flood Risk products produced for the study. This would include all depth grids, erosion hazard, or similar Flood Risk work products from the study.

3.0 Acceptable File Formats

Per Standard 185, PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the Mapping Partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. Standard 176 requires that Esri shapefiles and Geodatabase feature classes must be projected (refer to *FIRM Database Technical Reference* for additional information).

4.0 Transfer Media

Mapping Partners should submit files via the internet by uploading to the MIP (<http://www.hazards.fema.gov>) or on one of the following electronic media:

- CD-ROM
- DVD
- External Hard Drive (for very large data submissions with a mailing label for return to the Mapping Partner)

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted should be labeled with the following information:

- Mapping Partner name
- Community name and State for which the FIS was prepared
- Coastal data
- Date of submission (formatted mm/dd/yyyy)
- Disk [*sequential number*] of [*number of disks*]. The media should be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

5.0 Transfer Methodology

Coastal Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (<https://hazards.fema.gov>).

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