The Great Lakes Coastal Flood Study

THE LETTER OF MAP REVISION PROCESS

The new flood maps produced by the recent Great Lakes Coastal Flood Study provide a powerful tool to help communities make more informed decisions to increase safety and resiliency against flood damage. Although Flood Insurance Rate Maps (FIRMs) are based on the most accurate information available at the time they are produced, FEMA readily welcomes new information that would make the mapped flood hazards even more accurate.

This resource is intended to assist community officials with understanding how mapped information may be revised once the FIRM is effective. Communities should understand that the Letter of Map Revision (LOMR) process is used to revise effective (or final) FIRMs and not preliminary flood maps. While the new flood study maps are still draft or preliminary, communities are encouraged to share feedback and technical data with FEMA during the designated comment and appeal periods.

What is a LOMR?

A LOMR is FEMA's official modification to an effective FIRM. LOMRs can result in physical changes to the flood zone designations, the effective Base Flood Elevations (BFEs), and/or the Special Flood Hazard Area (SFHA).

All requests for changes to effective maps, other than those initiated by FEMA, must be made in writing by the Chief Executive Officer (CEO) of the community or an official designated by the CEO (typically the floodplain administrator). Because a LOMR officially revises the effective flood map, it is a public record that the community must maintain. Any LOMR should be noted on the community's master flood map and filed by panel number in an accessible location.

What part of the Great Lakes Coastal Flood Study could a LOMR typically revise?

Flooding on the Great Lakes is a product of combined offshore, nearshore, and shoreline processes that affect lake levels and waves. The interrelationships of these processes are complex, and their relative effects on flood hazards vary significantly from one lake to another and even from one stretch of shoreline to another.

In summary, the Great Lakes Coastal Flood Study is a two-phase modeling effort:

- **Phase 1** includes two-dimensional (2D) lake wide storm surge and wave modeling. The model ADCIRC was used for the storm surge modeling; the model used for the lake wide wave modeling varied by lake depending on lake characteristics.
- **Phase 2** includes one-dimensional (1D) transect-based onshore wave hazard analysis to evaluate erosion, wave runup and overtopping, and overland wave propagation, where appropriate.

For additional details on the study approach and methods used for the Great Lakes Coastal Flood Study analysis and mapping, see the table below and FEMA's Great Lakes Coastal Guidelines, Appendix D.3 Update (January 2014).

Typically, LOMR requests will revise the Phase 2 analysis by providing more detailed site-specific data, analysis, and mapping. Revisions are often based on better topographic and bathymetric data, information about shore protection structures, and other refinements for specific areas or properties.

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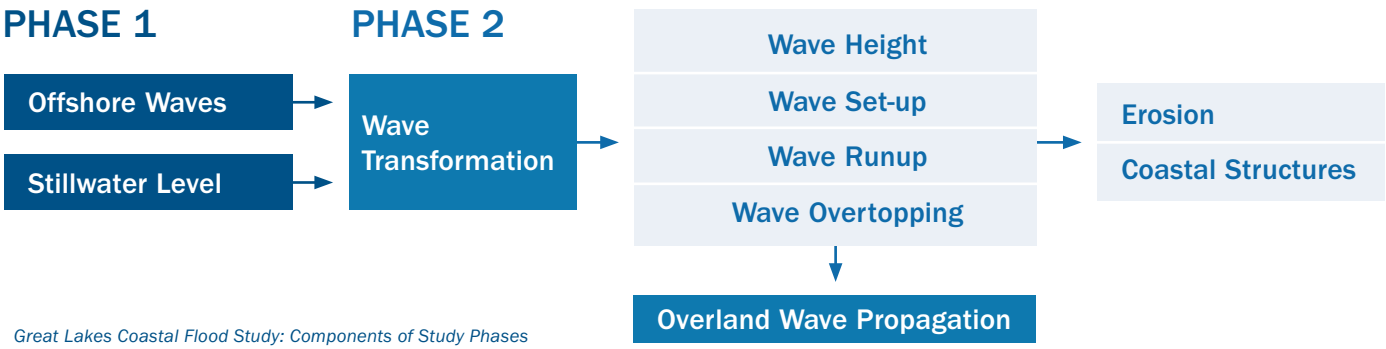

Great Lakes Coastal Flood Study: Components of Study Phases

Great Lakes Coastal Study Flood Hazard Analysis Components

Phase	Phase 1: 2D lakewide storm surge and wave modeling	Phase 2: 1D transect-based onshore wave hazard analysis
Models and Methods Used	**Storm Surge:** ADCIRC **Waves:** • Lake St Clair: WAM and STWAVE • Lakes Huron, Michigan, Superior, and Erie: SWAN	**Erosion:** CSHORE **Wave Runup and Overtopping:** Varies based on local shoreline conditions **Overland Wave Propagation:** WHAFIS
Required Input Information for Analysis	Meteorological records for 50-year period, lake level and ice cover data, bathymetry, topography, other.	Transect locations, water level (ADICRC) and wave model results, bathymetry, topography, land cover information, other.
Outputs/Results	**Storm Surge:** • Hourly water level elevations for ~150 storm events at each model node • Statistical Stillwater elevations (i.e. 1-percent and 0.2-percent-annual-chance lake levels) **Waves:** Hourly wave heights, periods, and directions for ~150 storm events at each model node	*For each transect:* **Erosion:** Eroded profile elevations (where erosion is applicable) **Wave Runup and Overtopping:** Wave runup elevation, overtopping depth and extent. **Overland Wave Propagation:** Wave heights and wave crest elevations along the transect

FEMA's Great Lakes study uses a statistical or response-based approach for estimating wave runup. It is calculated at each transect using appropriate hydrodynamic equations, simulating an event for every time step captured for select storms using the ADCIRC-SWAN record, and runs through all historic storm samples identified as having lake-wide ("regional") impact. A statistical analysis is performed on the maximum runup results at each transect to obtain the 1-percent-annual-chance runup elevation.

Refer to FEMA's Great Lakes Coastal Guidelines, Appendix D.3 Update (January 2014) for additional details on the study approach and methods. The document is available online and can be found at https://www.fema.gov/media-library/assets/documents/130318.

How do I obtain study data for use in my LOMR?

Since LOMRs typically seek to replicate the effective study methods while incorporating new technical data, applicants will need to obtain the study data for their area. The following is a general list of information that would be useful to request in order to conduct a LOMR that updates components of the transect-based onshore wave hazard analysis of the Great Lakes Coastal Flood Study:

- Coastal Summary Report (documentation of study methods)
- Surge and wave model results to be used as input for the transect modeling
- Transect information (locations and profiles)
- Coastal transect analysis data
- Topographic/bathymetric data
- Floodplain mapping

Effective modeling data can be requested from the FEMA Engineering Library using the FIS Data Request Form, available online.

Can an individual or organization in a community submit a map revision request?

Map revisions must be requested by or through the Chief Executive Officer (CEO) of the community. This requirement is in place because the community is responsible for adoption of the revised flood hazard information into their floodplain management ordinances and regulations. For LOMRs, this requirement is met through completion of the Overview and Concurrence Form.

What forms are needed to apply for a LOMR within a coastal area?

Application forms for the LOMR process are available on the FEMA website at https://www.fema.gov/media-library/assets/documents/1343.

The following forms are included with a LOMR application.

- Form 1: Overview and Concurrence Form — This required form covers basic information on the revision requests being submitted. This form must be submitted with each request.
- Form 4: Coastal Analysis Form — This required form documents the steps taken by the requester during the process to prepare the revised models or analyses and the resulting revised Flood Insurance Study (FIS) information.
- Form 5: Coastal Structures Form — This form, required when applicable, is used when the revision request is based on coastal structures being credited as providing protection from the base flood and not causing an increase in flood hazards to adjacent areas.
- Payment Information Form — All information about required fees can be viewed at https://www.fema.gov/flood-map-related-fees. Although requests based on the submission of more detailed data are fee exempt, there may be fees associated with obtaining a printed copy of the required documents to accompany the application.
- Additional information required as part of the LOMR process includes:
  – Local topographic/bathymetric data
  – Site-specific modeling
  – Revised mapping based on new site-specific modeling
  – Certification by a Registered Professional Engineer and/or Land Surveyor

How should LOMR documentation and data be submitted?

To assist community officials in submitting map revision requests, FEMA has established the Online Letter of Map Change (LOMC) process. Online LOMC is a web-based tool that allows applicants to easily request a revision to a FIRM. It is a convenient way for applicants to upload all information and supporting documentation and check the status of their application online. Users can submit LOMC requests and pay any associated fees through this tool instead of filing the required paper forms from the MT-2 application forms package.

Communities in Illinois that choose to submit the paper forms should mail the forms, required supporting data, and fees to:

Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820
Attn: Chris Hanstad

Communities in other states should mail the forms, required supporting data, and fees to:

LOMC Clearinghouse
3601 Eisenhower Avenue,
Suite 500
Alexandria, VA 22304-6426

ADDITIONAL TIPS

You may also contact the FEMA Map Information eXchange (FMIX) by telephone, toll-free, at (877) 336-2627, option 1, or by chat at http://www.floodmaps.fema.gov/fhm/fmx_main.html.

KEY TERMS

Key terms associated with map revisions in coastal study areas are defined below.

ADCIRC Coastal Circulation and Storm Surge Model is a system of computer programs for solving time-dependent, free surface circulation and transport problems in two and three dimensions. These programs use the finite element method in space allowing the use of highly flexible, unstructured grids

Bathymetry is submarine topography in lakes and oceans that shows the depth and shapes of the underwater terrain.

BFE: Base Flood Elevation

Coastal Base Flood Elevations are the 1-percent-annual-chance flood elevations shown on a FIRM within the coastal floodplain. Coastal BFEs include the effects of waves in areas where waves are a component of the flood hazard.

Coastal High Hazard Area (CHHA) is a special flood hazard area extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high-velocity wave actions from storms or seismic sources.

CSHORE Model is a one-dimensional time-averaged nearshore profile model for predictions of wave height, water level, wave-induced steady currents, and profile evolution.

FIRM: Flood Insurance Rate Map

LOMR: Letter of Map Revision

Seawall is a solid barricade, often concrete or stone, built at the water's edge to protect the shore and to prevent inland flooding. Generally built parallel to the shore, a seawall is typically more massive and capable of resisting greater wave forces than a bulkhead.

SFHA: Special Flood Hazard Area

Simulating WAves Nearshore (SWAN) Model is a third-generation, stand-alone (phase-averaged) model for the simulation of waves in waters of deep, intermediate, and finite depth. It is also suitable for use as a wave hindcast model.

Stillwater Flood Elevation (SWEL) is the projected elevation that floodwater would assume in the absence of waves resulting from winds and larger scale lake level fluctuations.

Storm Surge is the water that is pushed toward land from the high winds of a major storm.

Topography is information about the elevation of the surface of the Earth.

Transect is a cross section taken perpendicular to the shoreline to represent a segment of coast with similar topographic and land use characteristics.

Wave Height is the vertical distance between the highest part of a wave (wave crest) and the lowest part of a wave (wave trough).

Wave Height Analysis for Flood Insurance Studies (WHAFIS) is a computer program that uses representative transects to analyze overland wave propagation hazards including wave heights and wave crest elevations

Wave Runup is the rush of water up a slope or structure.