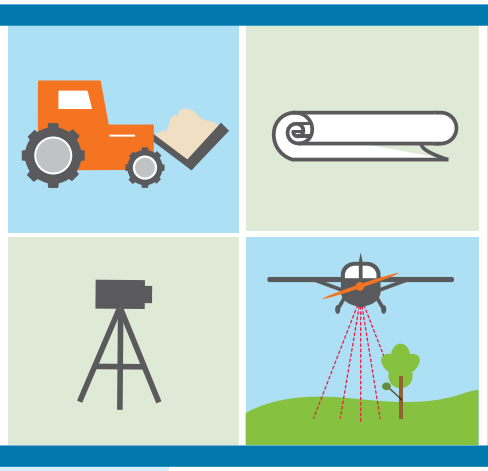
The Coastal Flood Risk Analysis and Mapping Process

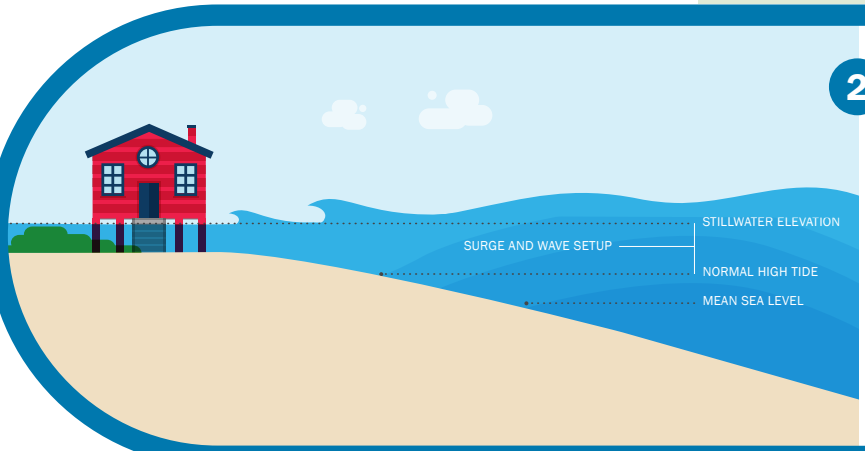
FEMA identifies coastal flood hazards, assesses flood risks, and provides accurate flood risk data to help drive communities toward mitigation actions and achieve greater resilience. As part of the coastal mapping process, FEMA conducts flood hazard analysis and mapping studies to produce FIRMs (Flood Insurance Rate Maps). These flood maps are used to administer the National Flood Insurance Program and they provide information to communities for the adoption and enforcement of floodplain management measures to help mitigate the effects of flooding.

While each coastal study and Region is unique, the coastal flood hazard analysis and mapping process generally includes the following steps:

1 DEFINE BASE TOPOGRAPHY

FEMA collaborates with local, State, and Federal governments to identify all available topographical data in the study area, and may also collect new data if no existing information is available. FEMA encourages communities to share new or updated topographic information as it becomes available to ensure maps have the most up-to-date data to support mitigation decisions.



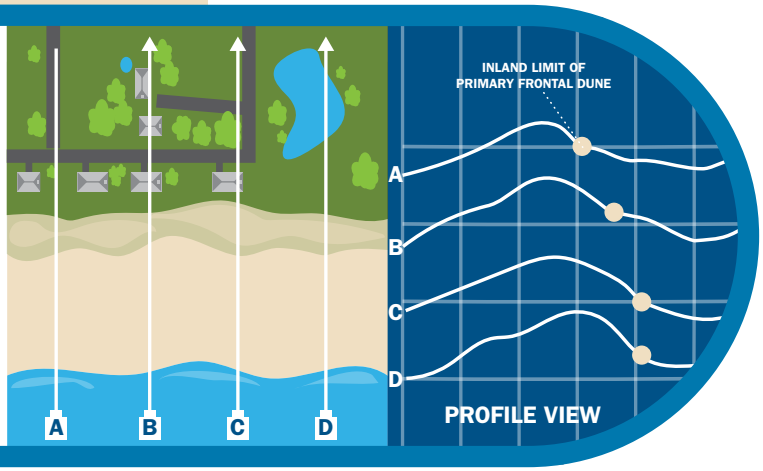


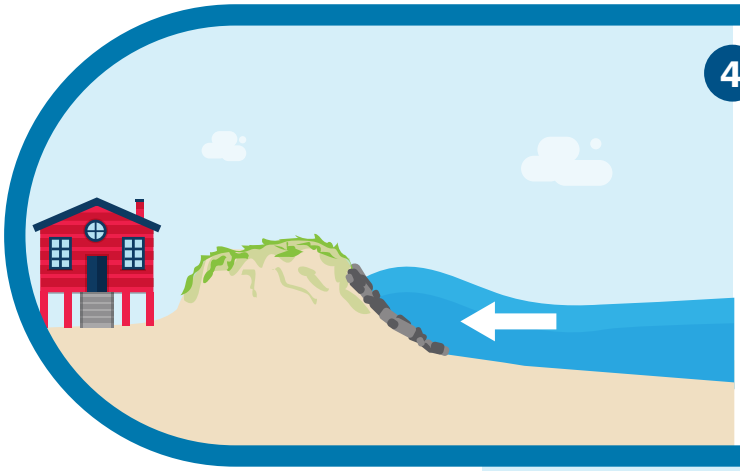
2 EVALUATE WATER LEVELS AND STORM SURGE

In order to identify coastal flood hazards, FEMA analyzes sea level, tides, wave setup, and storm surge. Storm surge is the water that is pushed toward the shore by strong winds during a storm. Wave setup is the increase in water level caused by the onshore movement of water due to waves breaking.

3 DEFINE CROSS-SHORE TRANSECTS AND IDENTIFY THE PRIMARY FRONTAL DUNE

Engineers and surveyors divide the shoreline into segments and represent each segment with a cross-shore transect to characterize the study area's topography, development, and land use. The Primary Frontal Dune (PFD), defined as a continuous or nearly continuous ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach, is identified for each shoreline segment.



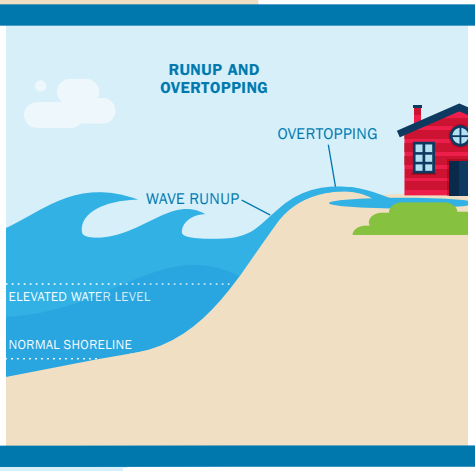


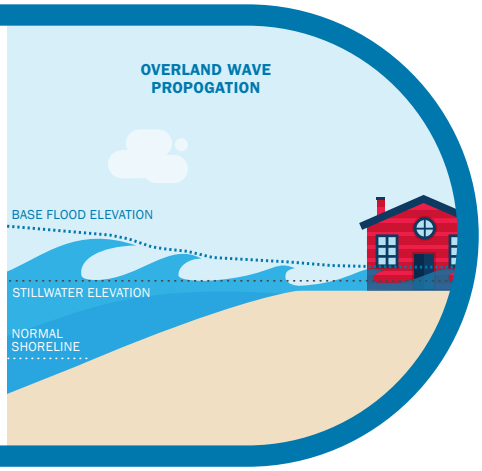
4 EVALUATE STORM-INDUCED EROSION AND SHORE PROTECTION STRUCTURES

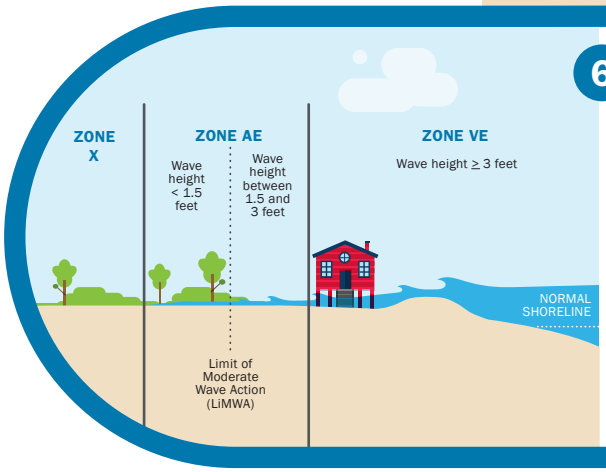
FEMA evaluates natural features, such as dunes and bluffs, and man-made features, such as seawalls, revetments (rock armoring), and beach nourishment for their ability to protect upland areas from flood hazards. Man-made dunes that are well-established with long-standing vegetative cover are included in the erosion analysis.

5 WAVE HAZARD MODELING

During a flood, waves ride on elevated water levels and can impact buildings located on land that is normally high and dry. FEMA conducts wave hazard modeling to evaluate the risks from overland wave propagation, runup, and overtopping and to determine base flood elevations (BFEs).

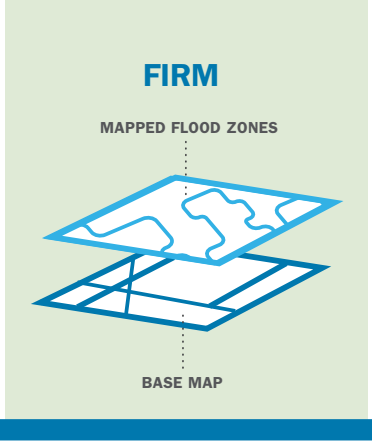






6 COASTAL FLOOD HAZARD MAPPING

Results of the coastal flood hazard assessment are used to create flood maps. The maps include flood zone designations that indicate areas at high-risk for flooding, e.g., Zone VE and Zone AE. Zone VE indicates a coastal high hazard area where wave action and/or high-velocity water can cause structural damage during severe storms. Zone VE is also assigned to areas identified as the Primary Frontal Dune. Zone AE is mapped for inundated areas with less hazardous wave action. Each zone has a base flood elevation (BFE), which is the elevation to which floodwater is anticipated to rise during the 1-percent-annual-chance flood. The Limit of Moderate Wave Action (LiMWA) may also be mapped to indicate the inland limit of waves 1.5 feet or greater for floodplain management purposes.

7 FIS AND FIRM PRODUCTION

Once the coastal flood hazard analysis and mapping process is completed, a flood map, or FIRM, is created by merging the coastal mapping with any inland riverine floodplain mapping and overlaying the flood zones on a base map that shows roads and other features to help with location identification. During this step, FEMA also prepares the Flood Insurance Study (FIS) report, which describes the study area, summarizes the engineering methods, and presents results from the study.