

# Town of Essex, Massachusetts Modeling Future Effects of Coastal Storms and Sea Level Rise

## Introduction

Like many communities along the North Shore of Massachusetts, the Town of Essex is vulnerable to climate-driven hazards, including sea level rise and storm surge. Predicted sea level rise and increased storm surge have the potential to significantly impact the town's coastal economy and the natural systems that the community depends upon. Understanding where and how these hazards are likely to impact the community is a necessary first step in addressing vulnerability.

Given its exposure to climate-driven hazards, the Town of Essex took part in a mapping effort to identify areas that are particularly vulnerable to coastal inundation. This poster highlights the results of this effort and is intended to help support the Town of Essex as it works to identify adaptation strategies that reduce its vulnerability to sea level rise and storm surge.

# Mapping Coastal Flooding

These maps illustrate current (2013) and future (2070) probability of coastal inundation in Essex, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). Note: This data does not take into account inland freshwater flooding.

This advanced hydrodynamic model incorporates:



Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti, R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. Global Sea Level Rise Scenarios for the United States National Climate Assessment. NOAA Tech Memo OAR CPO-1. Silver Spring, MD: National Oceanic and Atmospheric Administration, 37.

Created by the National Wildlife Federation with funding provided by the Massachusetts Office of Coastal Zone Management through their Coastal Community Resilience Grant Program.

## **Coastal Inundation Probability**

Probability of inundation is defined as the likelihood that at least 2 inches of flood water will encroach on the land at a particular location at least once in a calendar year. Note that the 1% probability of inundation shown on the present day maps (2013) roughly corresponds to the Federal Emergency Management Agency's (FEMA) 100-year storm.

#### How much sea level rise?

- Present day (considered 2013) results incorporate existing sea level conditions
- ✤ 2070 results incorporate 3.4 feet of sea level rise, which is also approximately the "Intermediate-High" scenario for 2090 (Figure 1)



Figure 1. Global Mean Sea Level Rise Scenarios. The highest, or worst case, scenario is based on estimated rise in ocean temperatures leading to thermal expansion combined with maximum melting of the glaciers and ice sheets. The lowest scenario assumes a historical rate of sea level rise with no increase due to climate change. Adapted from the US National Climate Assessment (Melillo et al. 2014) and NOAA (Parris et al. 2012).





### **Percent Risk of Coastal Flooding**





Data Source: Bosma, K., E. Douglas, P. Kirshen, K. McArthur, S. Miller and C. Watson. 2016. MassDOT-FHWA Pilot Project Report: Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery. Photo Science, Inc. (2012). State of Massachusetts (Raster DEM): LIDAR for the North East – ARRA and LiDAR for the North East Part II. (USGS Contract: G10PC00026, ARRA LIDAR Task Order Numbers) USGS Contract: G10PC00026 Task Order Number: G10PD02143 Task Order Numbers: G10PD01027 (ARRA) and G10PD02143 (non-ARRA). Aerial Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001. Maps created by the National Wildlife Federation using: ArcGIS 10.3 for Desktop (v10.30.1332)

#### **Downtown Essex**















