05 Geographic Information Systems (GIS) Flood Mapping

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SCR uses geospatial models to evaluate the effects of flooding in the four study regions. Coastal elevation and bathymetric data were combined using Geographic Information Systems (GIS) software to create a "topobathy" model. Topobathy allows the study of continuous changes in elevation from the seafloor, a method that is especially useful in analyzing the effects of sea level rise and flooding on coastal structures.

The SCR geospatial maps and models were created using the projection system favored by the US Geological Survey (USGS), FEMA, the Department of Homeland Security (DHS), and other agencies. The quarter-quadrangle (QQ) and quarter-quarter quadrangle (QQQ) grid reference systems, which are related to the USGS 7½ minute quadrangle index maps, were then combined with coarse- and fine-grained computational basins from Sea, Lake, and Overland Surges from Hurricanes (SLOSH) models to create a baseline geospatial framework for SCR.

SLOSH already uses topographic data; however it is only updated periodically as new SLOSH basins are released. In this stage of the project, the original SLOSH basins will be used to model synthetic storm tracks, however in the future, the topobathy models produced by SCR will be used in conjunction with hydrodynamic models to more accurately model storm surge. The topobathy models will also be used to create highly-detailed floodplain and inundation maps for use during later stages of the project.

These inundation analyses will complement methods used by FEMA, such as the Flood Rate Insurance Maps (FIRMs) and Wave Height Analysis for Flood Insurance Studies (WHAFIS). However, the SCR maps will include a more extended set of return periods and also map the effects of climate change. Maps will be produced for 100, 500 and 2,500 year return periods and for current climate conditions as of 1980-1999 and estimated future conditions as of 2080-2099 and an intermediate condition at 2050 for a total of nine design performance scenarios. A preliminary set of maps based on Aerts et al (2013) is shown for nine scenarios in Jamaica Bay, NY in Figure 5.1. In this study, local mean sea level rise projections for New York City, developed in Kopp et al (submitted), are used to simulate future climate conditions. The same set of maps is shown in Figure 5.2, including the flood protection measures proposed in A Stronger More Resilient New York (SIRR) by The City of New York (2013) for South Brooklyn and South Queens with the addition of a storm surge barrier across the Rockaway Inlet.

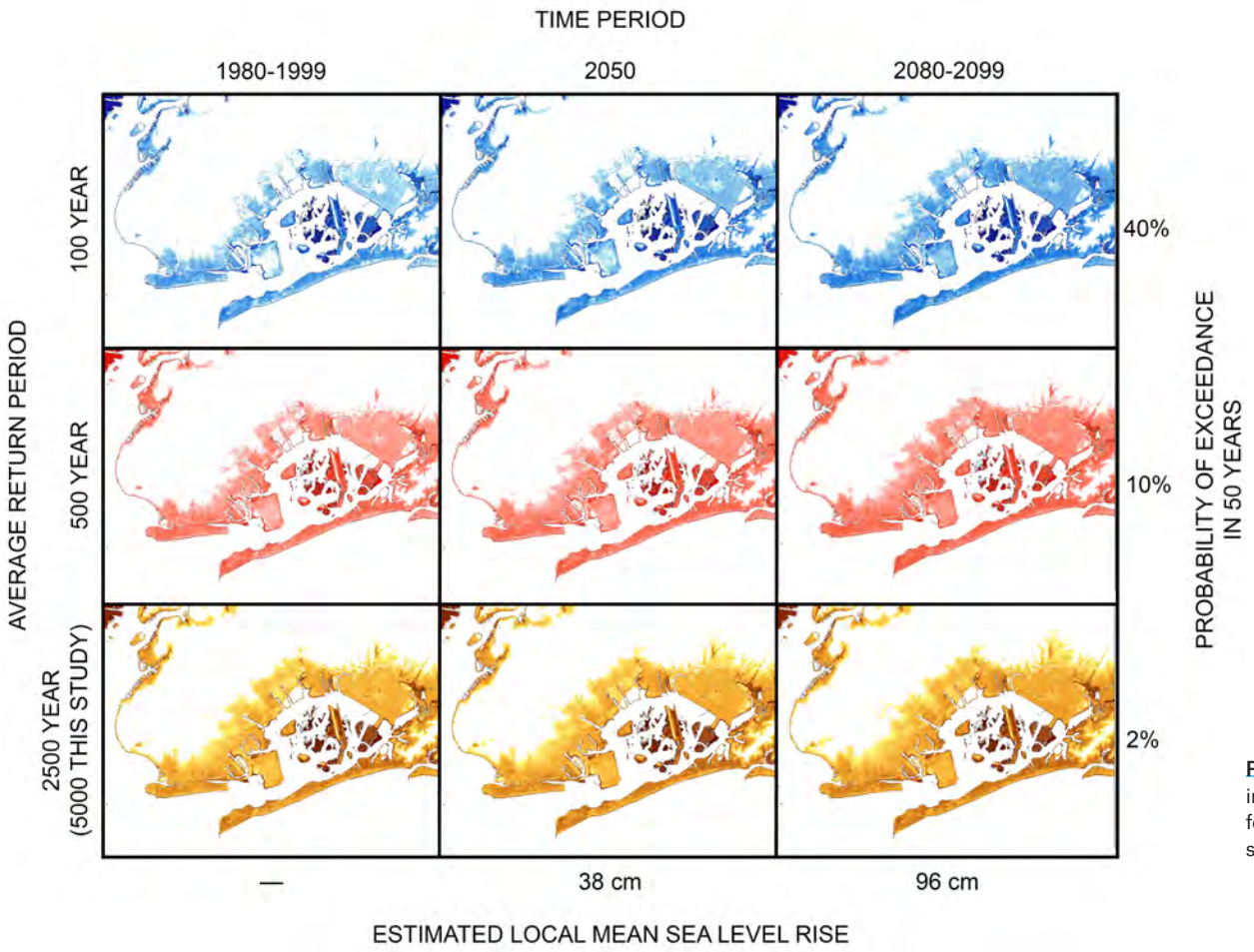

Figure 5.1: ADCIRC inundation matrix for Jamaica Bay, NY study region

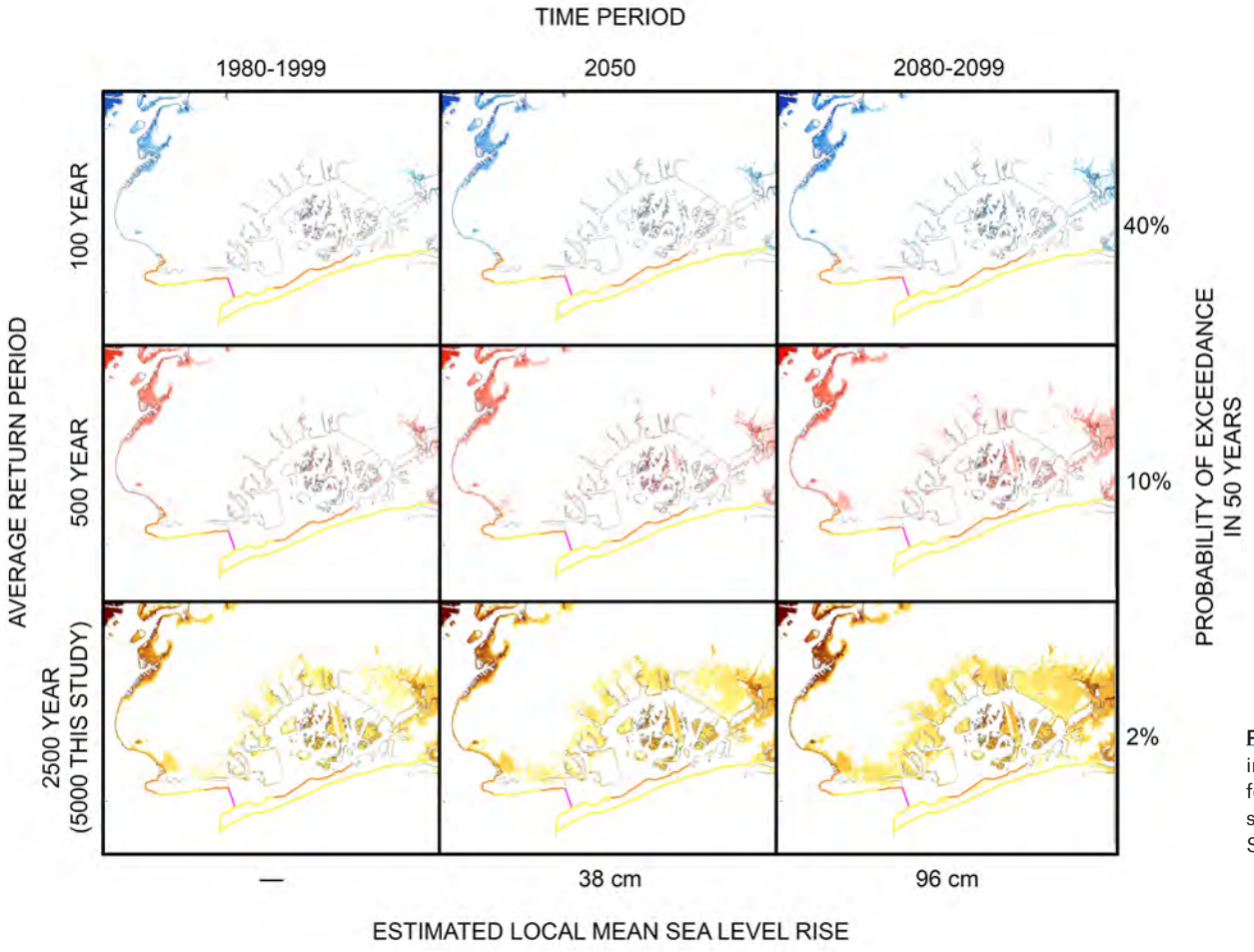

Figure 5.2: ADCIRC inundation matrix for Jamaica Bay, NY study region, with SIRR intervention