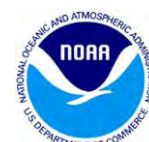


Sea Level Rise Study

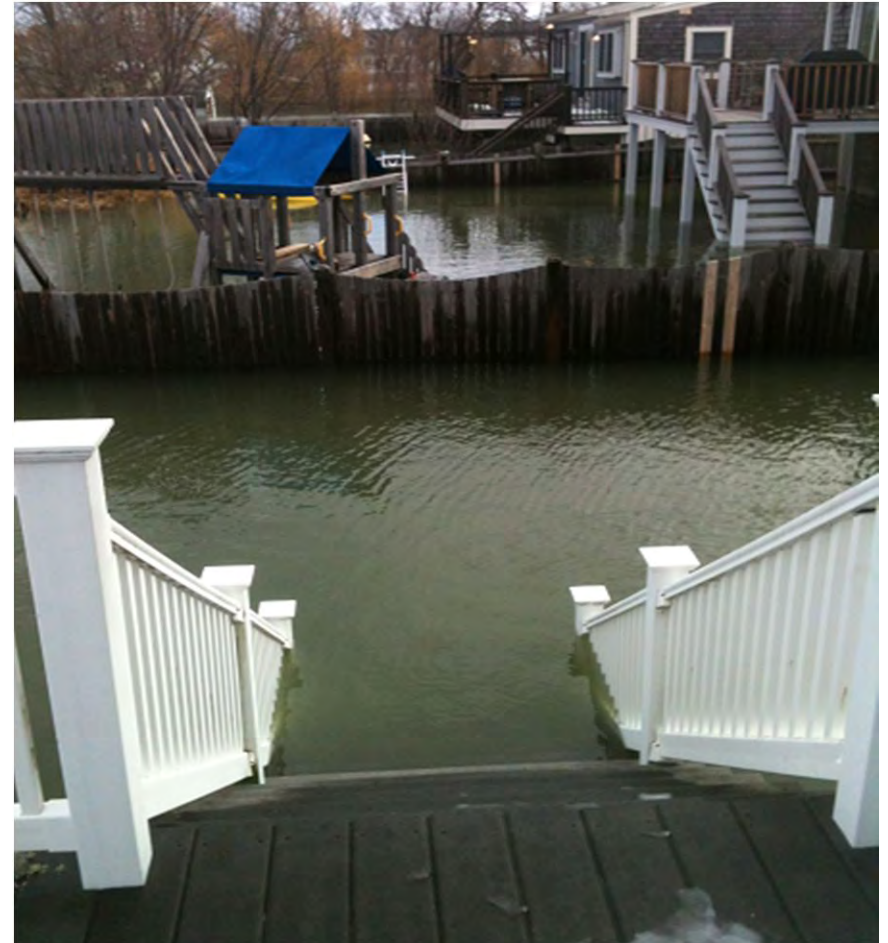
Duxbury, Marshfield, Scituate, MA

Scituate Harbor Community Building

May 16, 2013



Richard W. Murray, PhD; Selectman, Town of Scituate



Introduction to the Project and Team Members

*Paul Halkiotis, AICP, Town
Planner, Marshfield*

Introduction to the Project and Team Members

Overview of Project Methodology

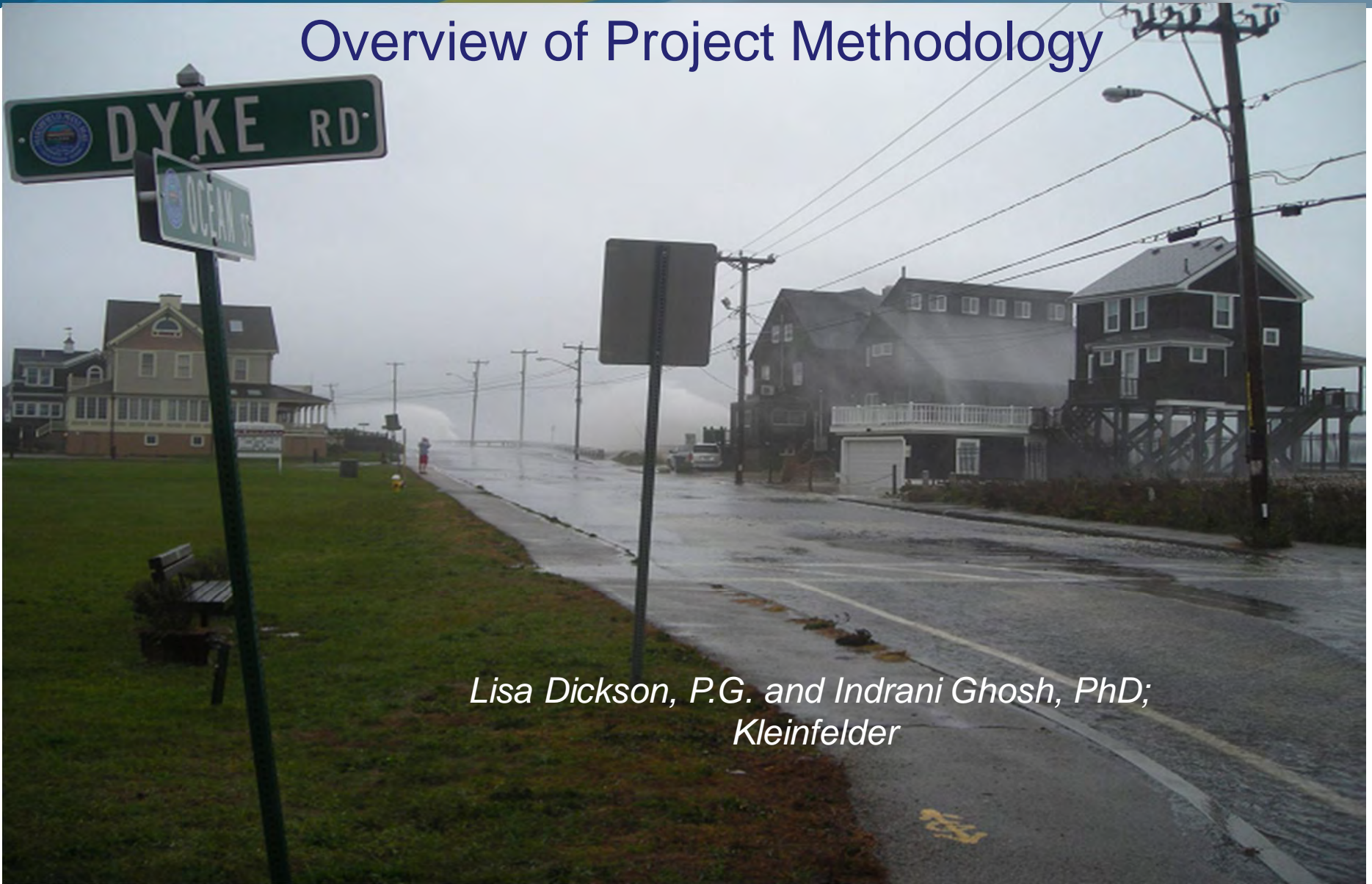
Results of Inundation Modeling

How the Results Will be Used

Next Steps

Discussion/Q&A

Overview of Project Methodology



*Lisa Dickson, P.G. and Indrani Ghosh, PhD;
Kleinfelder*



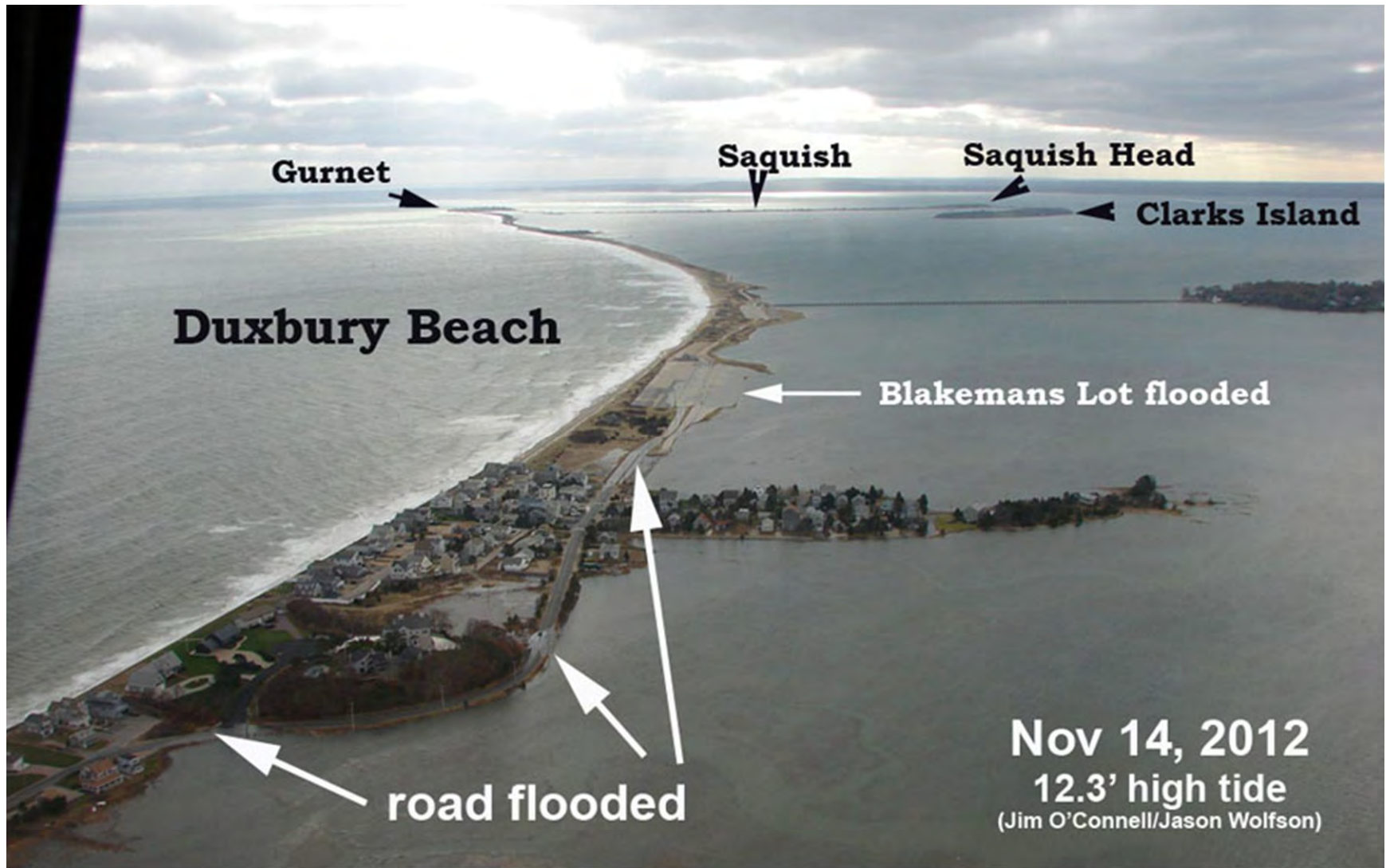
Army National Guard



MASSPORT

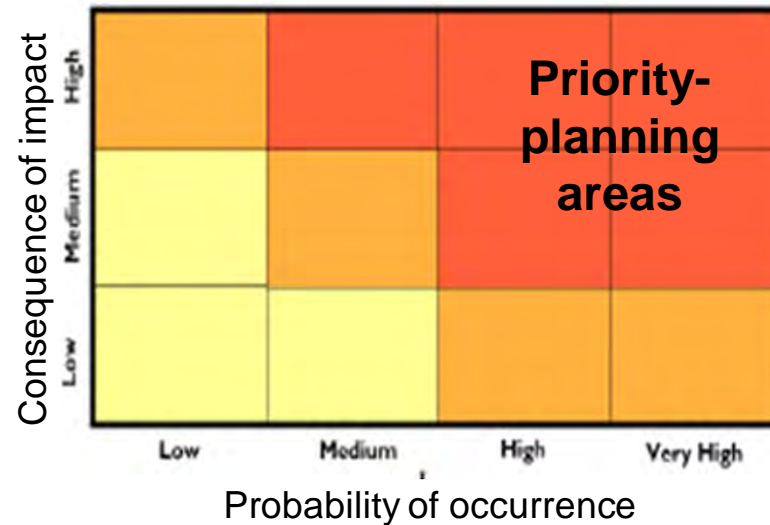


City of Cambridge



Primary goals

- **Produce high-quality maps/graphics**
- **Vulnerability assessment**
- **Identify potential adaptation strategies**
- **Public outreach and education**



Step 1

Climate Projections

Scenario Development

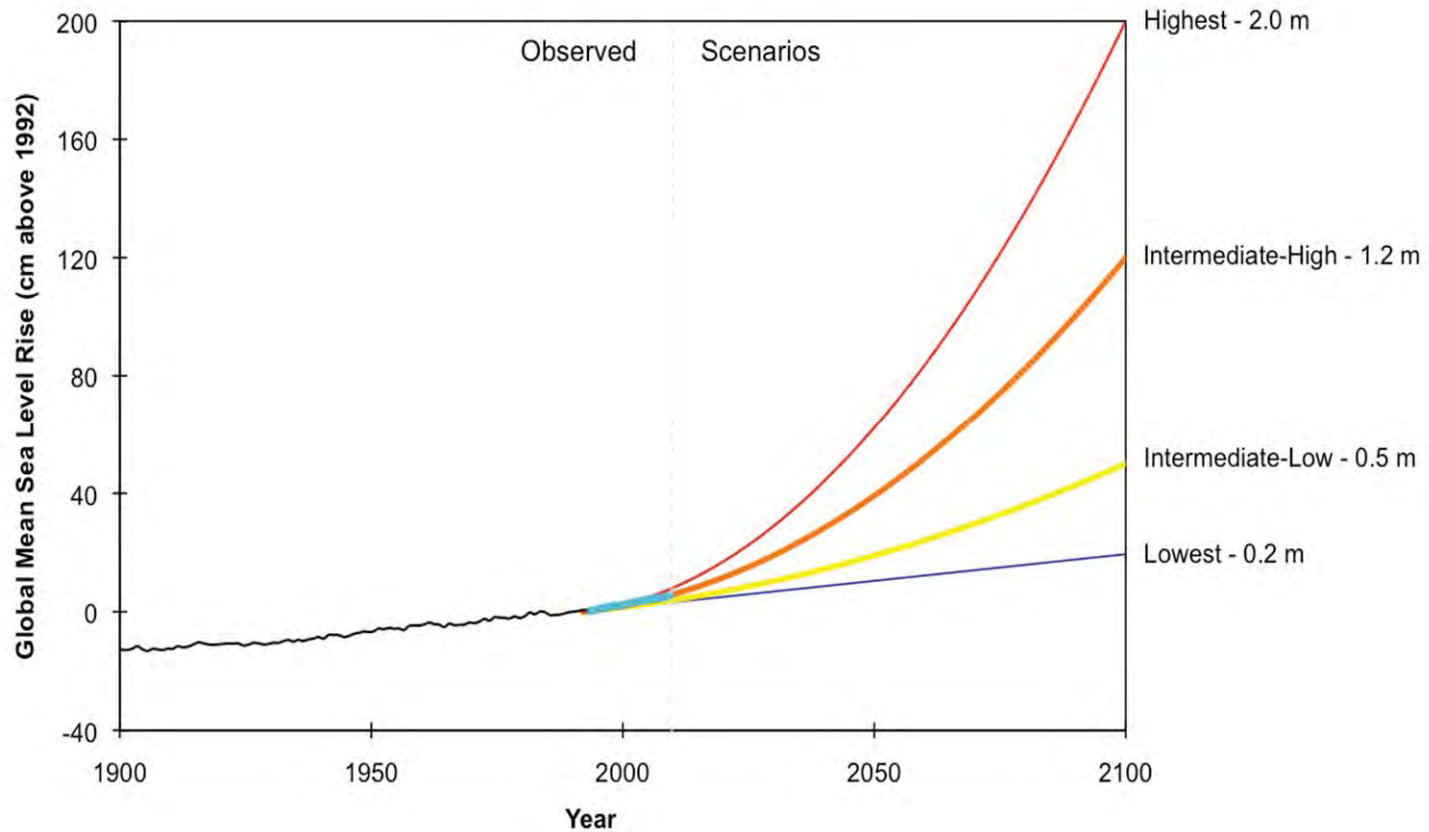
Step 2

Vulnerability Assessment

Risk Assessment

Step 3

Adaptation Planning



Global mean sea level rise scenarios provided by NOAA as part of the National Climate Assessment report published in December 2012. The “Highest” scenario with local subsidence was used for inundation modeling in South Shore.

Infrastructure Impacts



Natural Resources Impacts



Salt Marsh/Wetland Migration



Impacts on Aquaculture



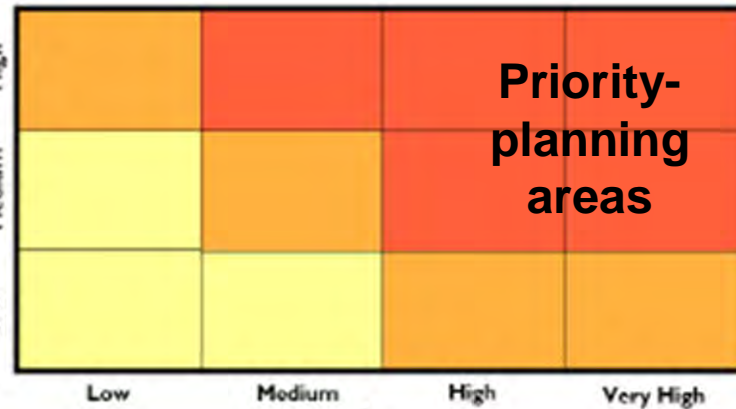
Wildlife



Beaches



Consequence of impact



Probability of occurrence

**Priority-
planning
areas**



Step 1

Climate Projections

Scenario Development

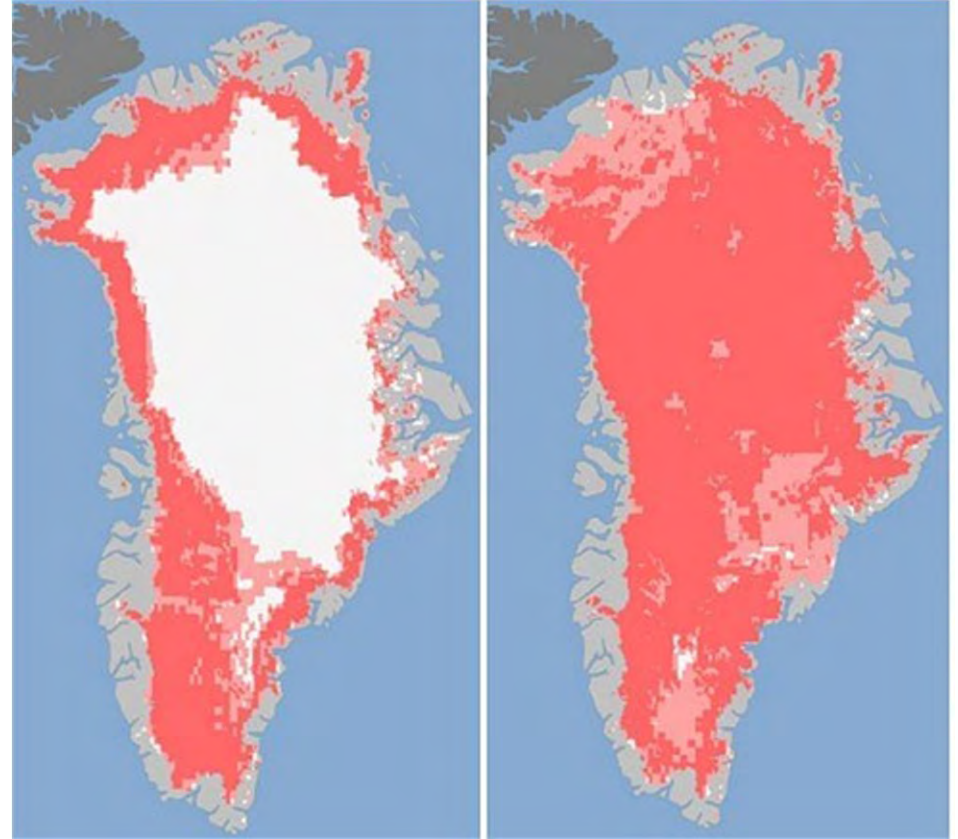
Step 2

Vulnerability & Risk Assessment

Step 3

Adaptation Planning

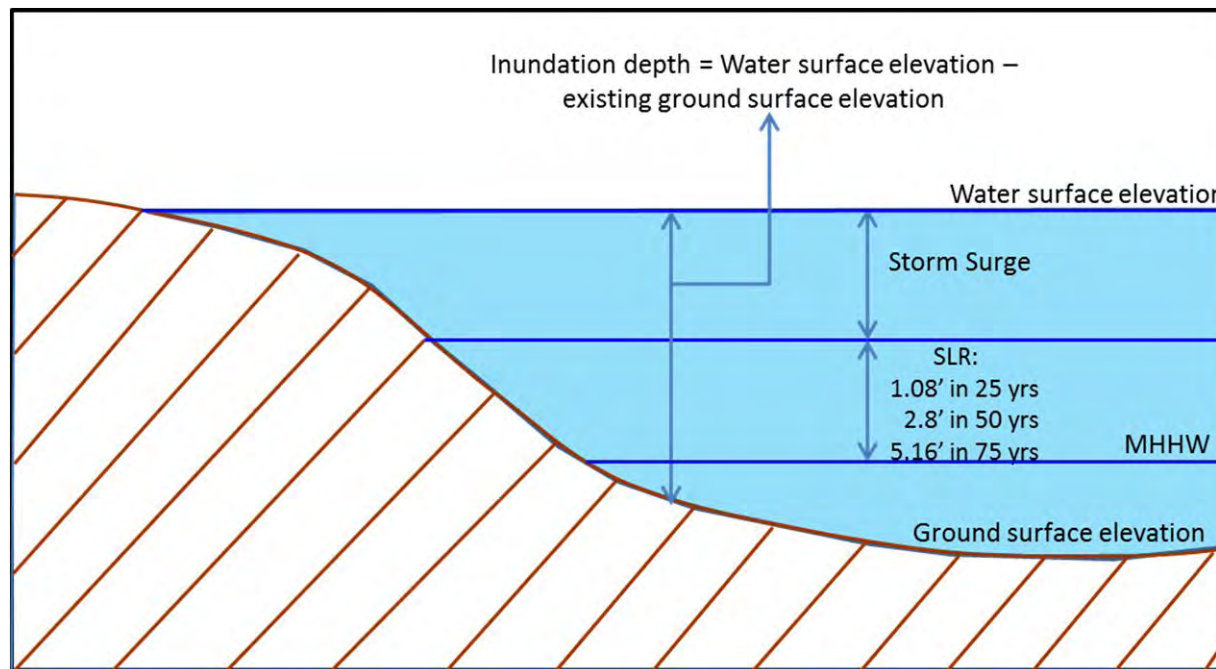
- Global Sea Level Change
 - Thermal expansion
 - Freshwater addition from melting of glaciers
- Local Sea Level Change
 - Land subsidence
 - Changes in wind



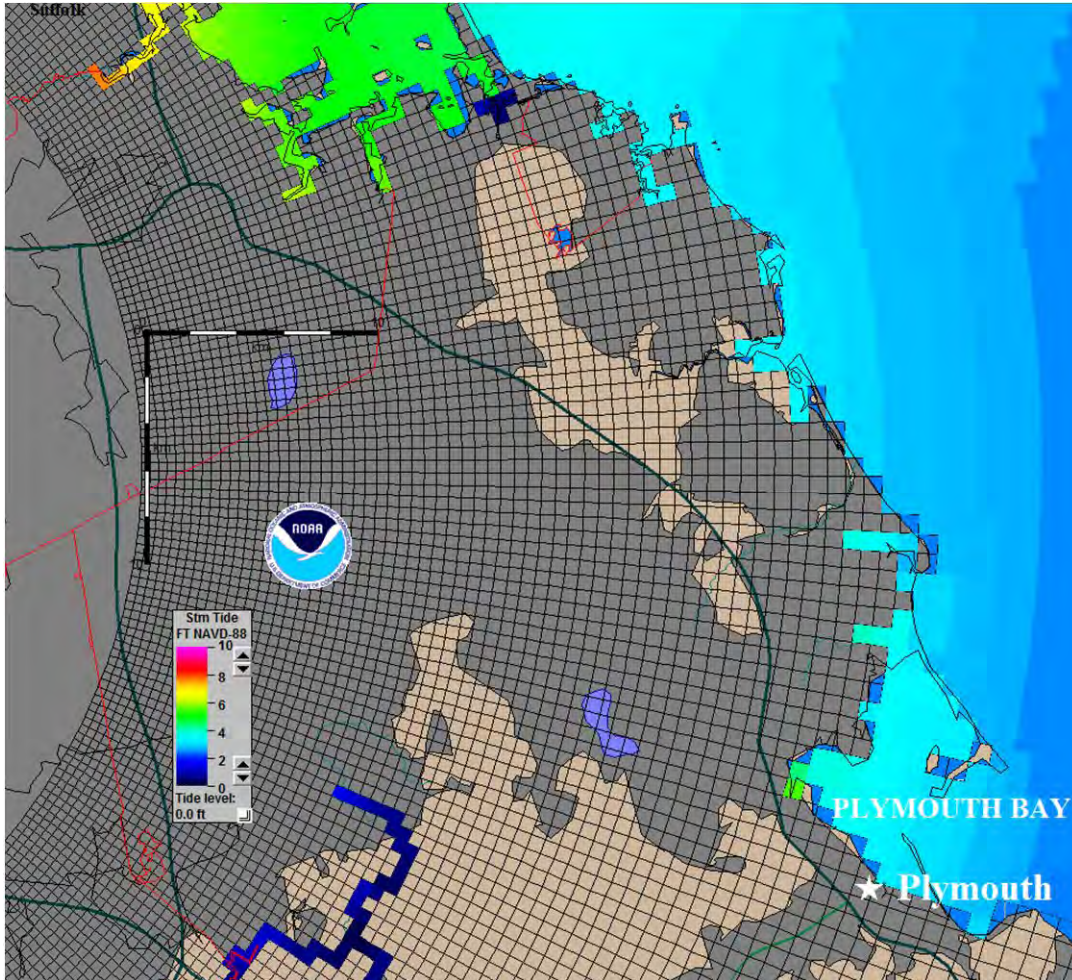
Source: NASA Earth Observatory, July 2012

Input

- Ground elevation data
- Tidal surface elevation data
- SLR values
- Storm surge values



Storm Surge - SLOSH

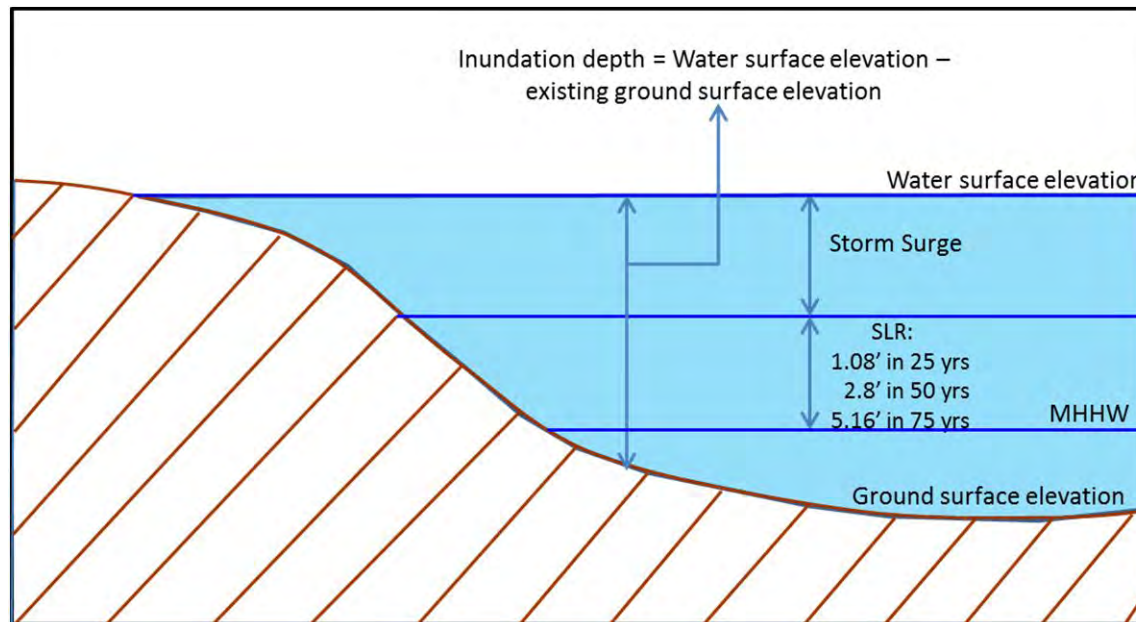


Model runs used:

- 2010 updated SLOSH basin
- Category 1 MOM
- Wind forward speed: 10-60 mph
- Angle of approach to coast: N, NE, NNE

Results of Inundation Modeling

Andre Martecchini, P.E., Kleinfelder



Scituate:

Scituate Harbor
Humarock
Wastewater treatment plant
Avenues

Marshfield:

WWTP/Dyke Rd Area
Brant Rock
Intersection of Ocean St and Winslow Rd
Rexhame Rd Area

Duxbury:

Blue Fish River and proposed school
Duxbury Beach
Snug Harbor



Sea Level Rise Only



SLR of 1.08 ft by 2038

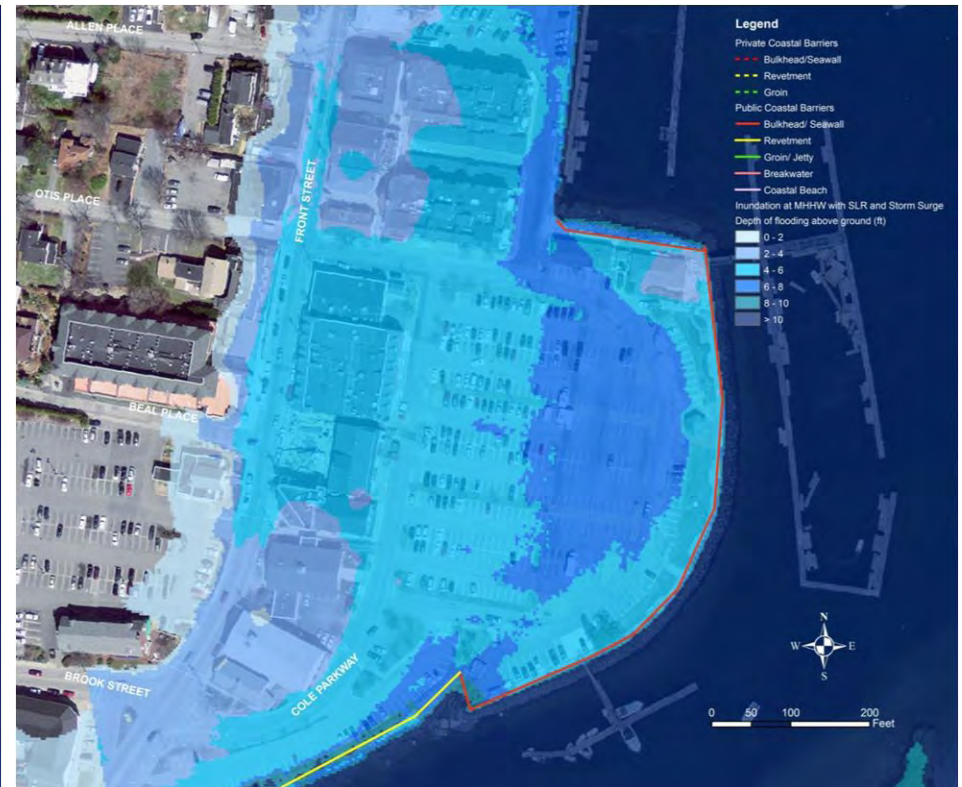


SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

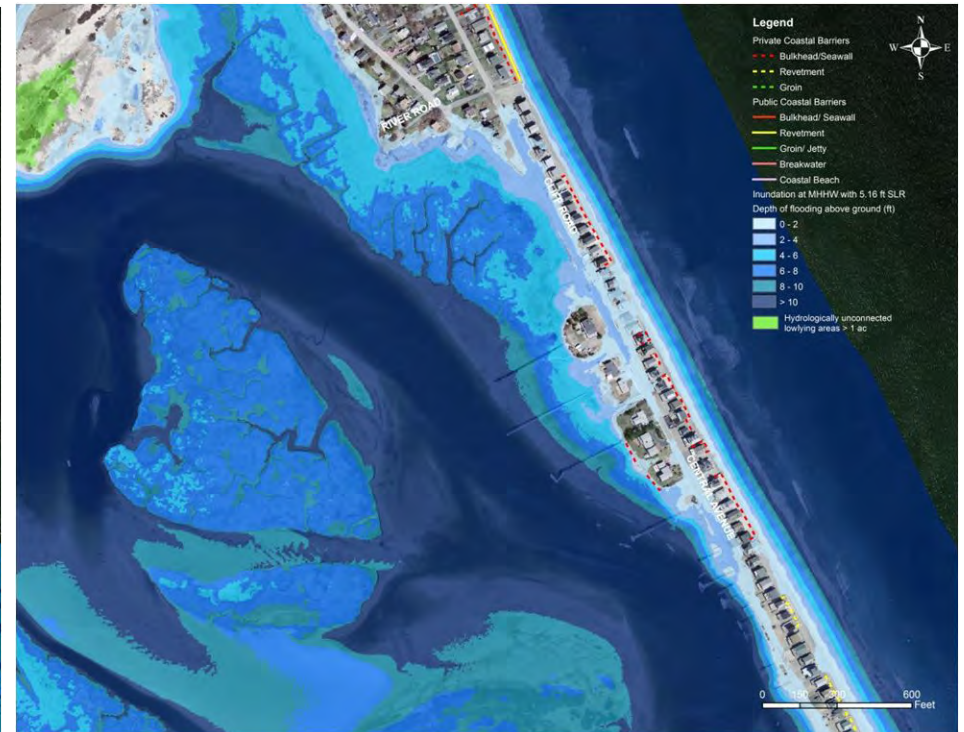


SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only



SLR of 1.08 ft by 2038

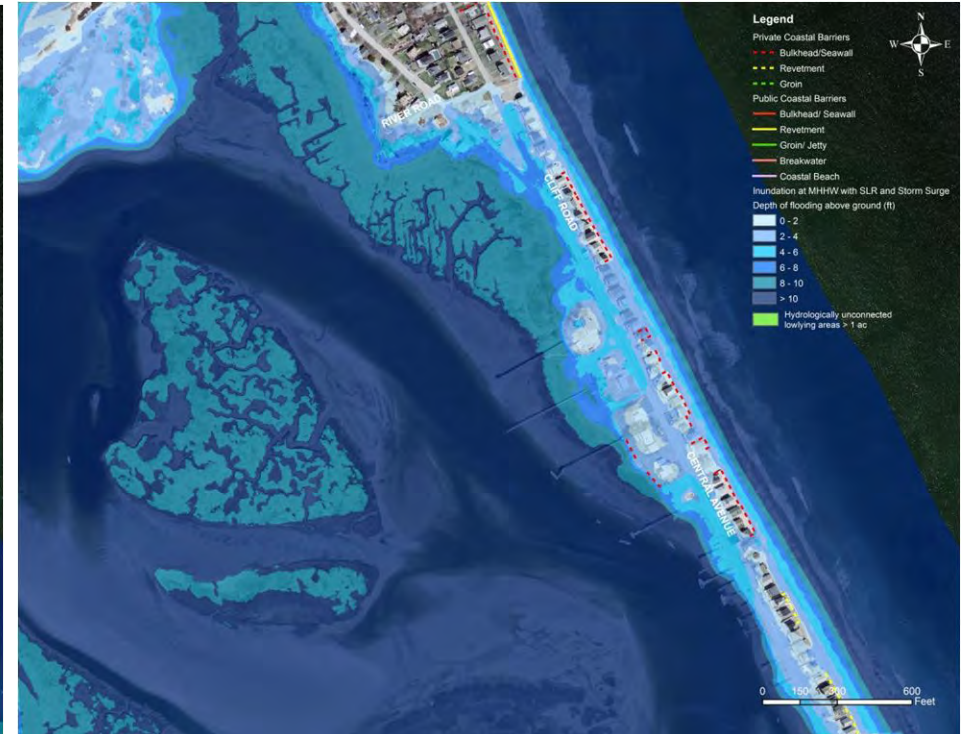


SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

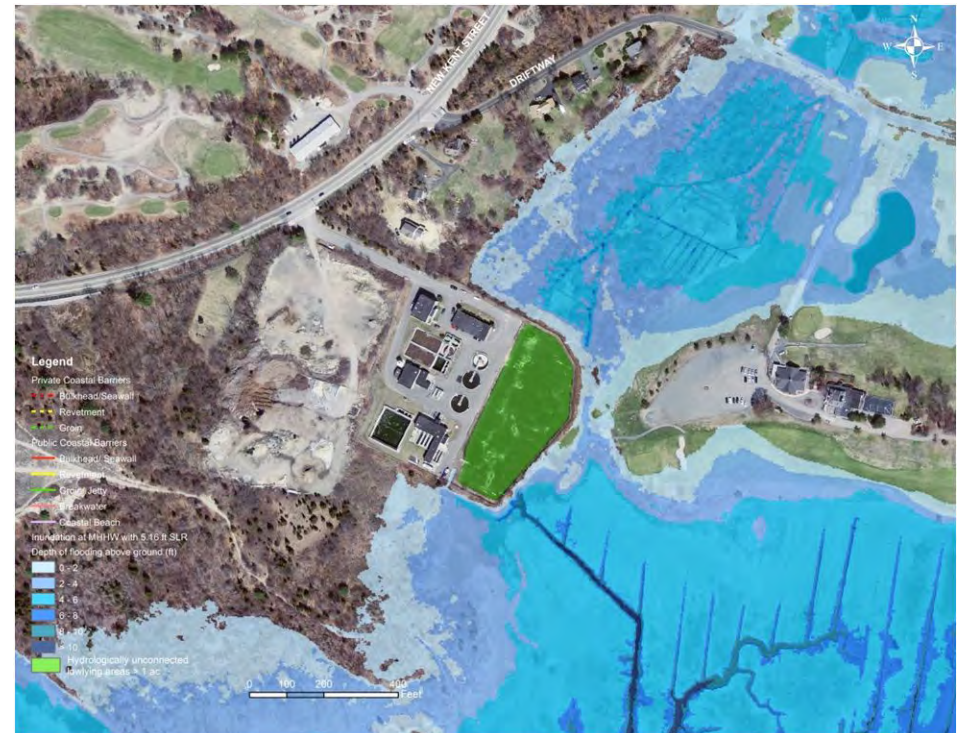


SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only



SLR of 1.08 ft by 2038

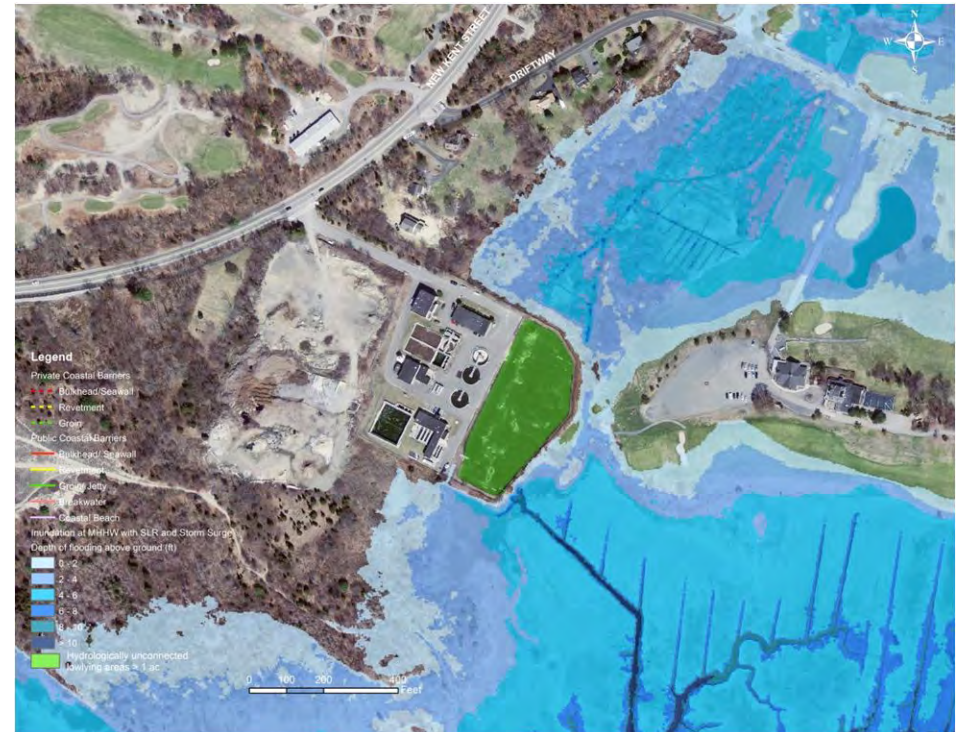


SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge

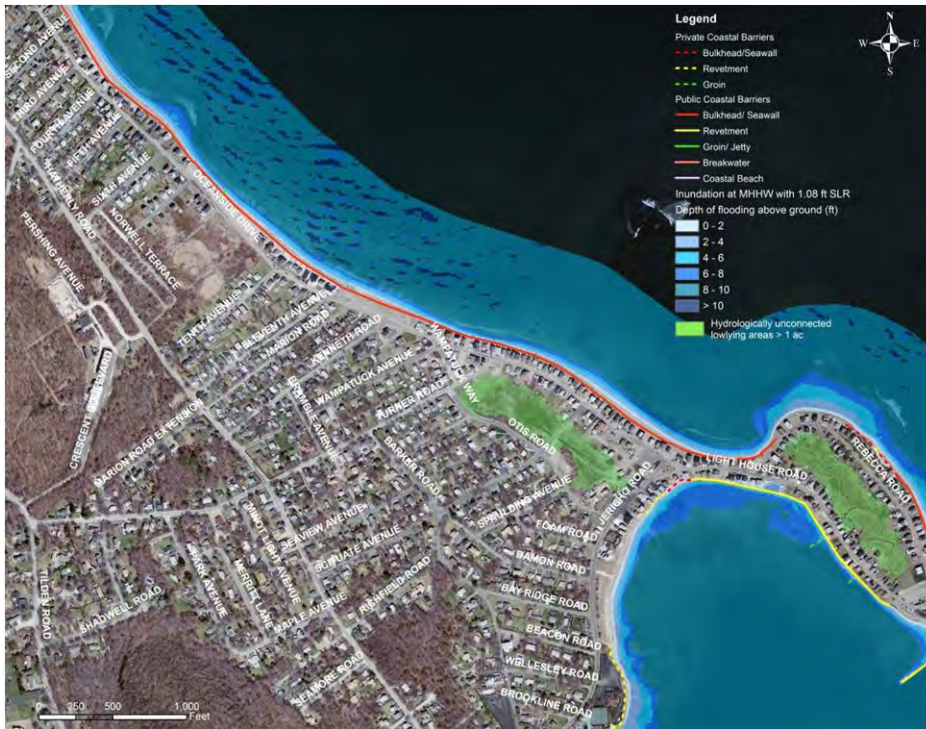


SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only

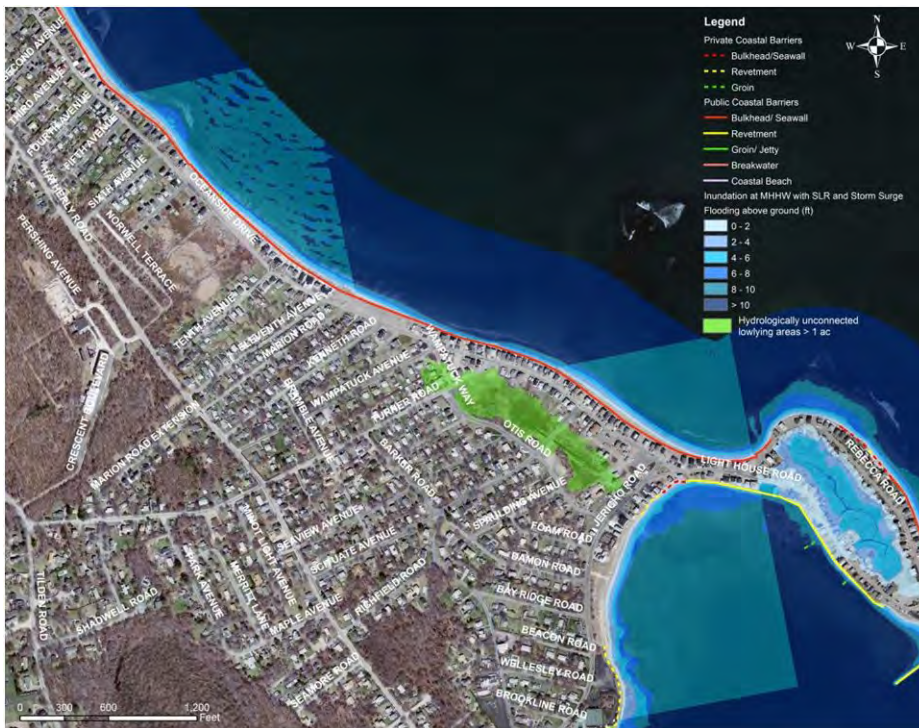


SLR of 1.08 ft by 2038

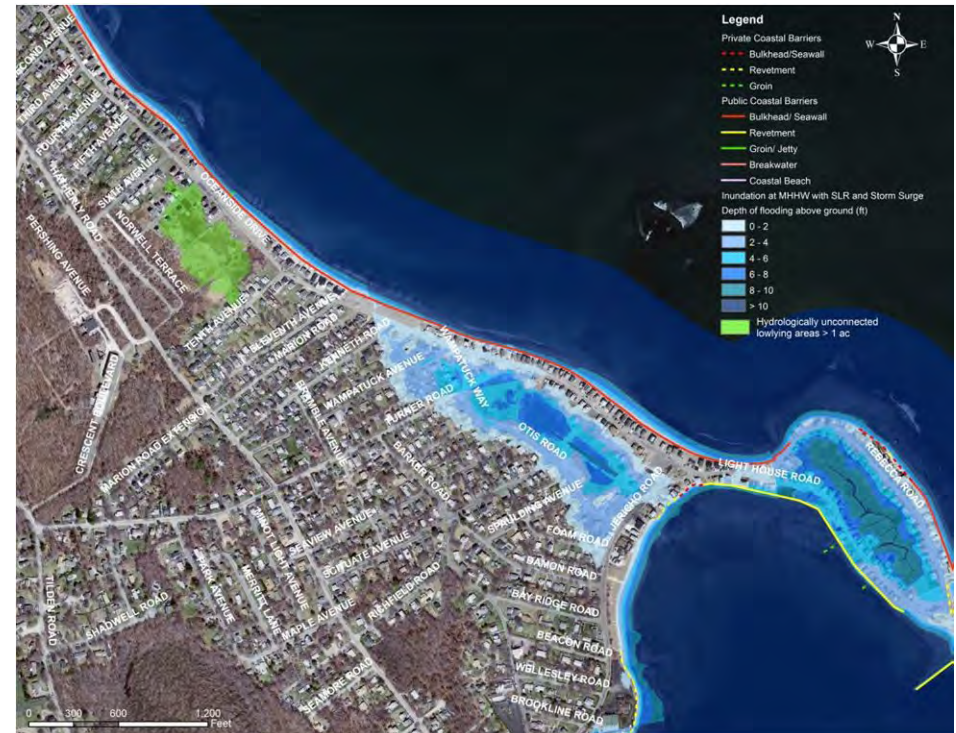


SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Dyke Road and WWTP, Marshfield

Sea Level Rise Only



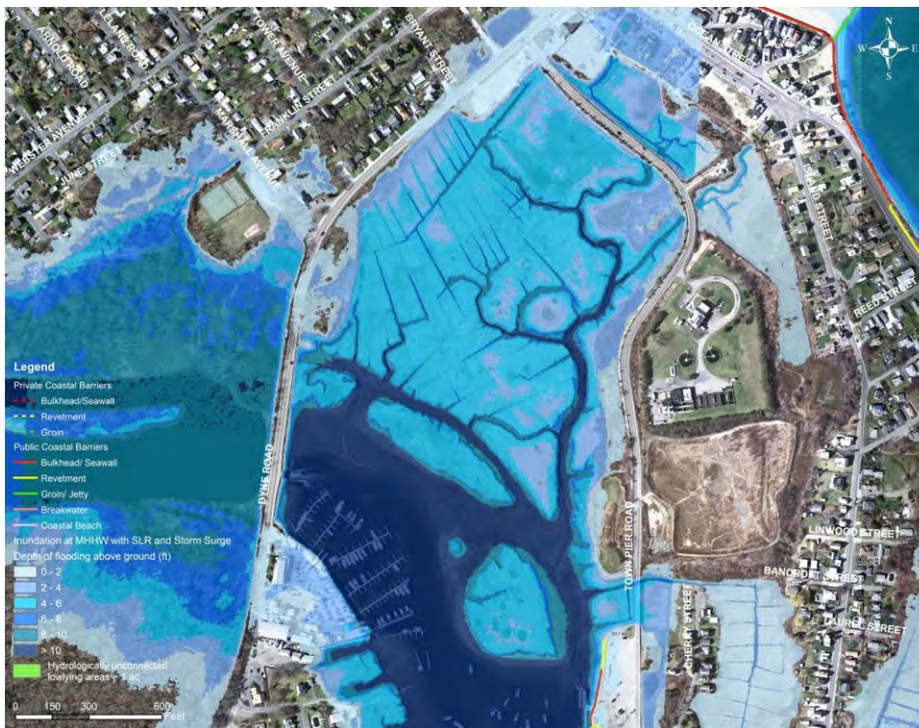
SLR of 1.08 ft by 2038



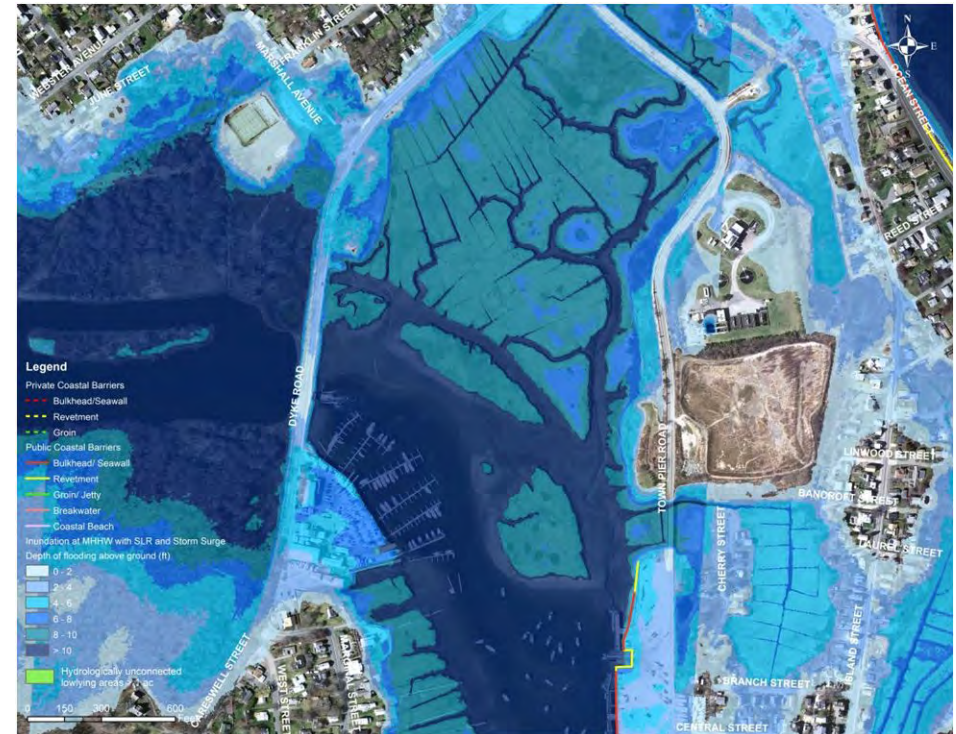
SLR of 5.16 ft by 2088

Dyke Road and WWTP, Marshfield

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only



SLR of 1.08 ft by 2038



SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

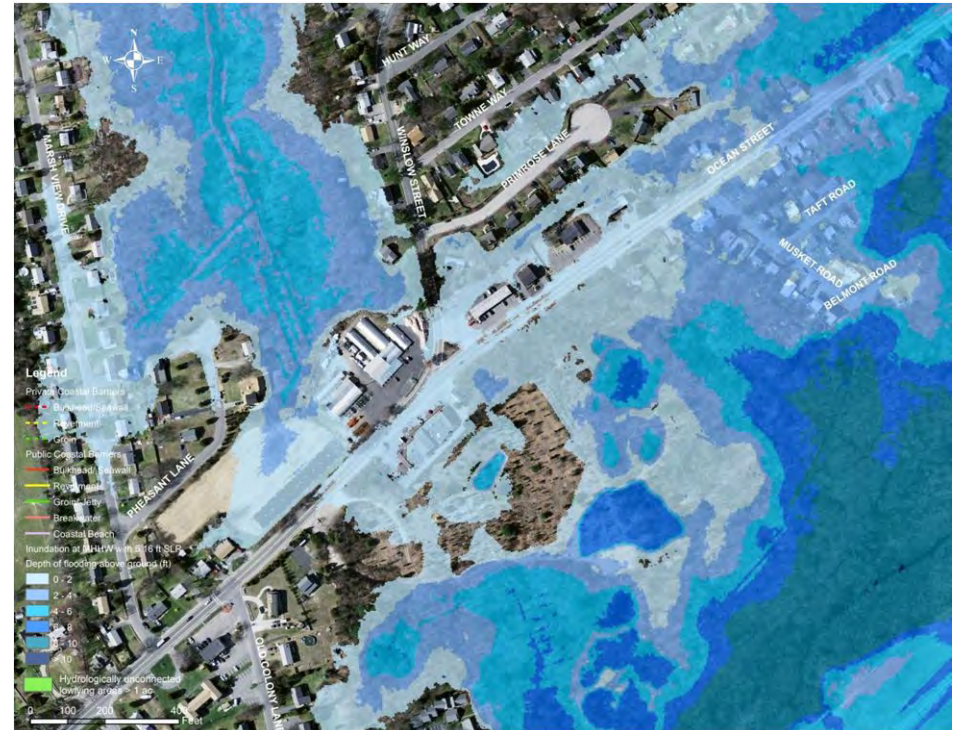


SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only



SLR of 1.08 ft by 2038



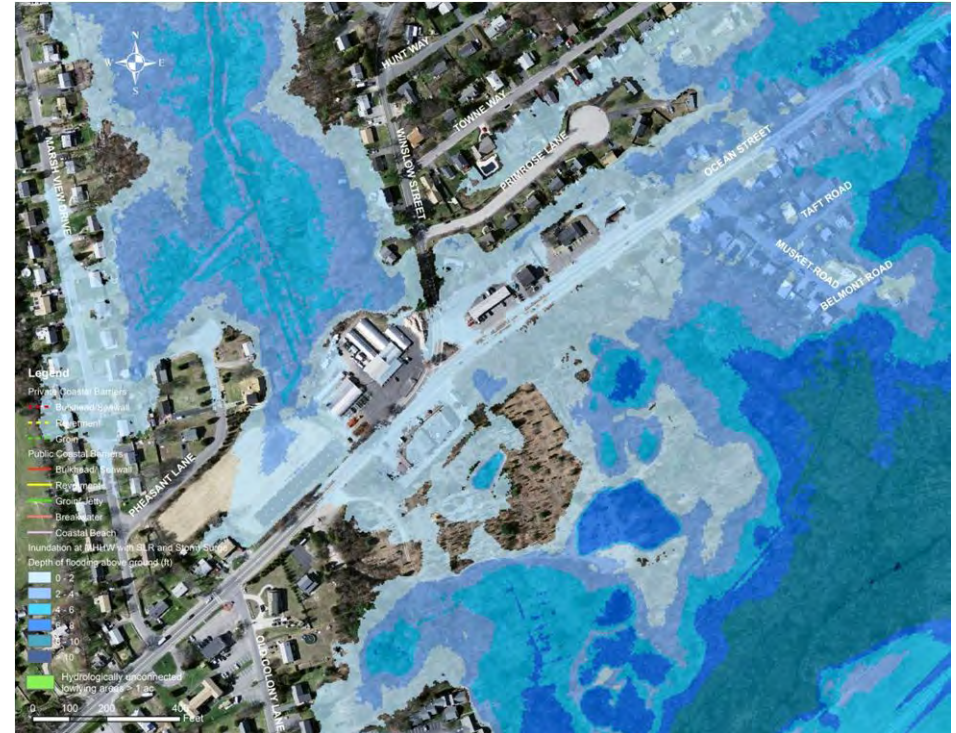
SLR of 5.16 ft by 2088

Ocean St / Winslow St, Marshfield

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



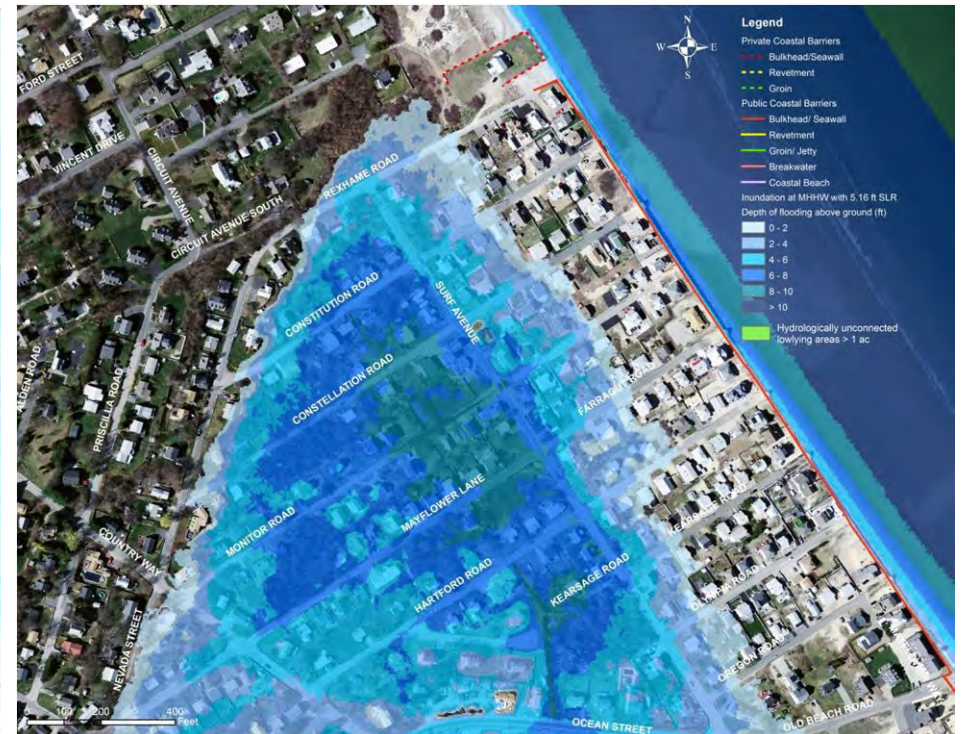
SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Rexhame Road, Marshfield

Sea Level Rise Only



SLR of 1.08 ft by 2038



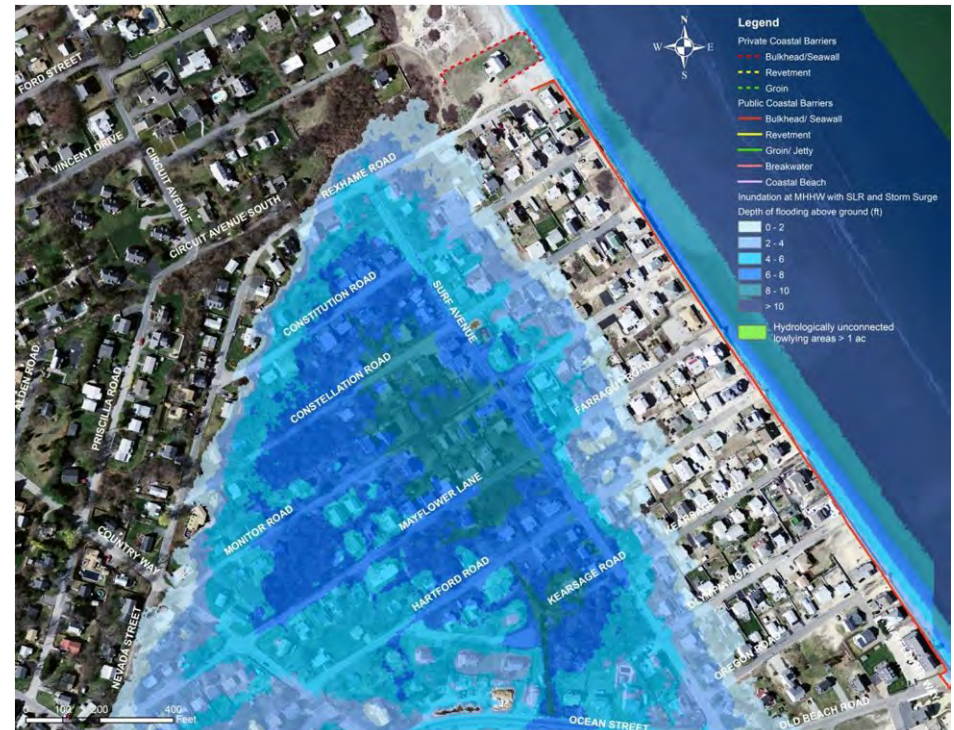
SLR of 5.16 ft by 2088

Rexhame Road, Marshfield

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Blue Fish River, Duxbury

Sea Level Rise Only

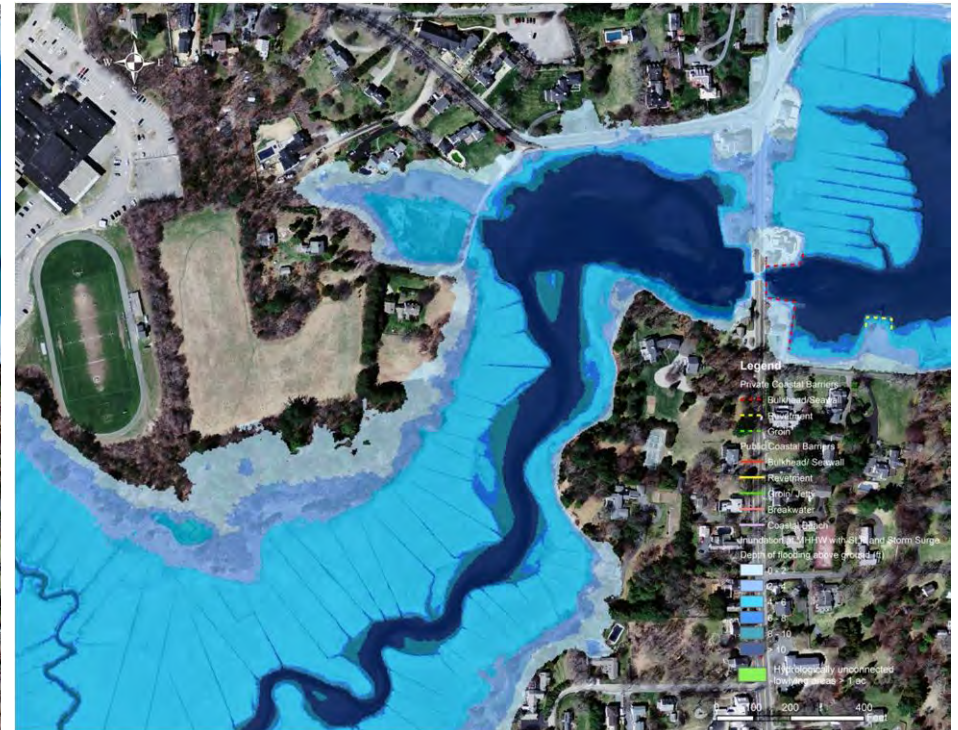


Blue Fish River, Duxbury

Sea Level Rise & Storm Surge

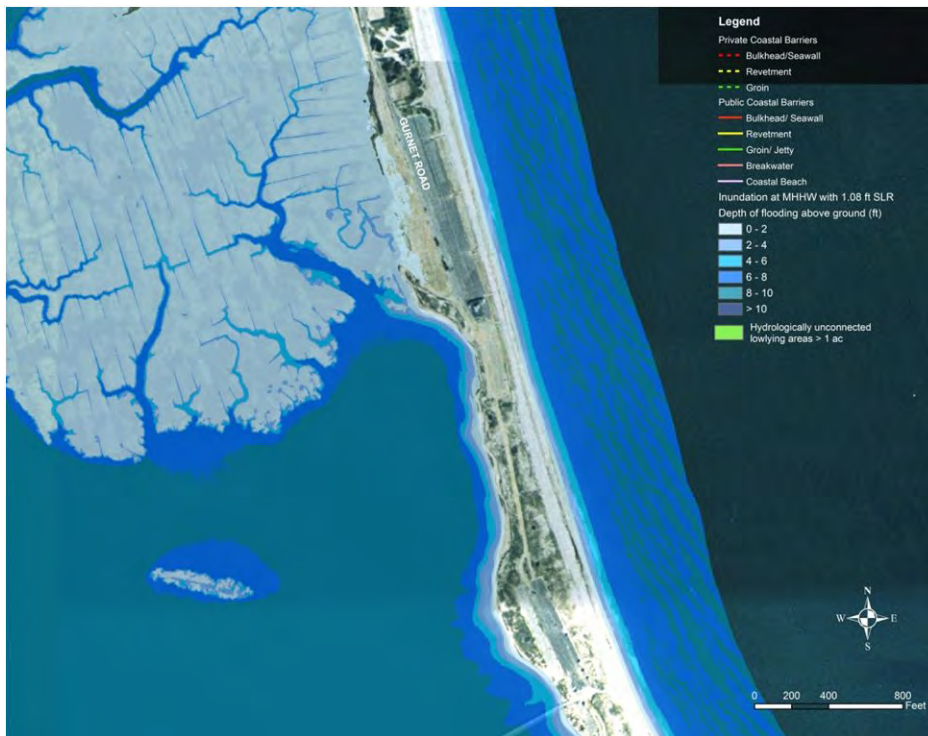


SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

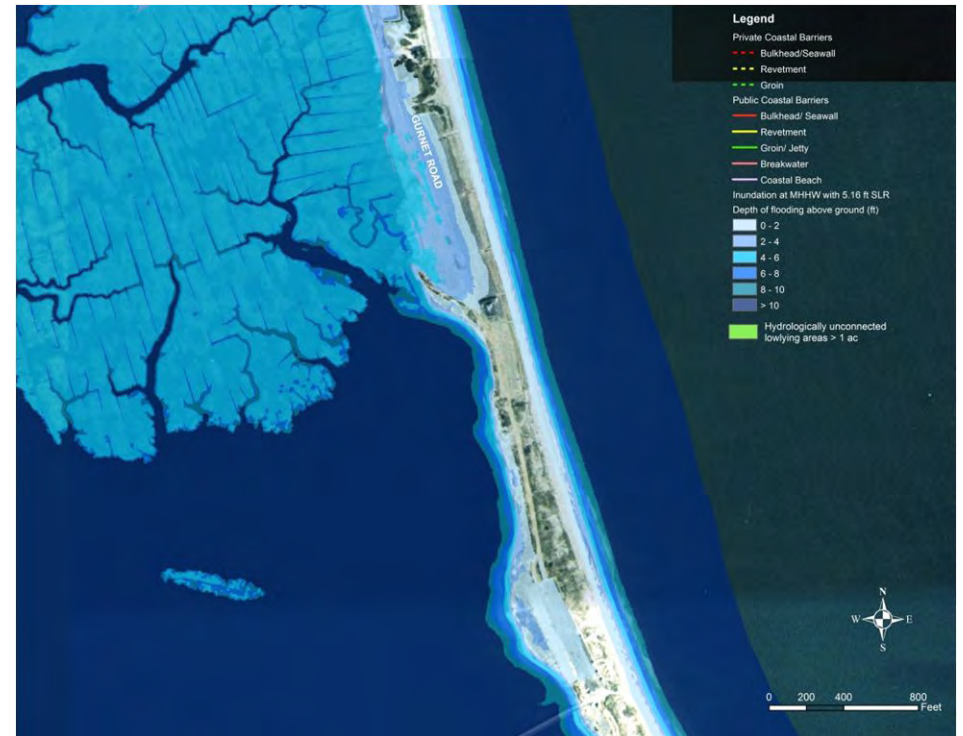


SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only

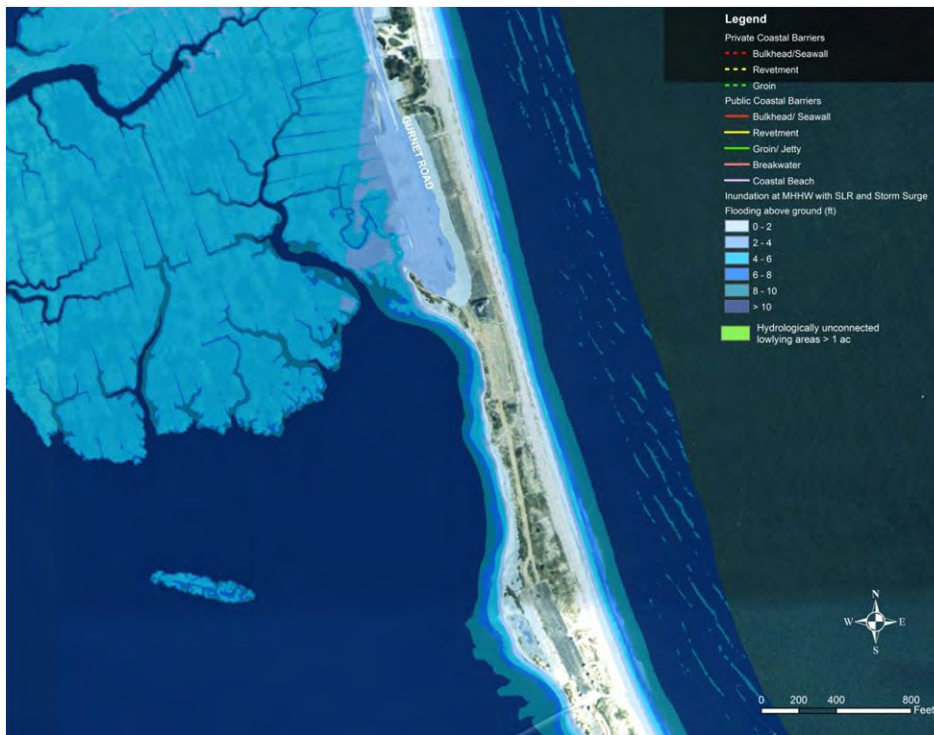


SLR of 1.08 ft by 2038

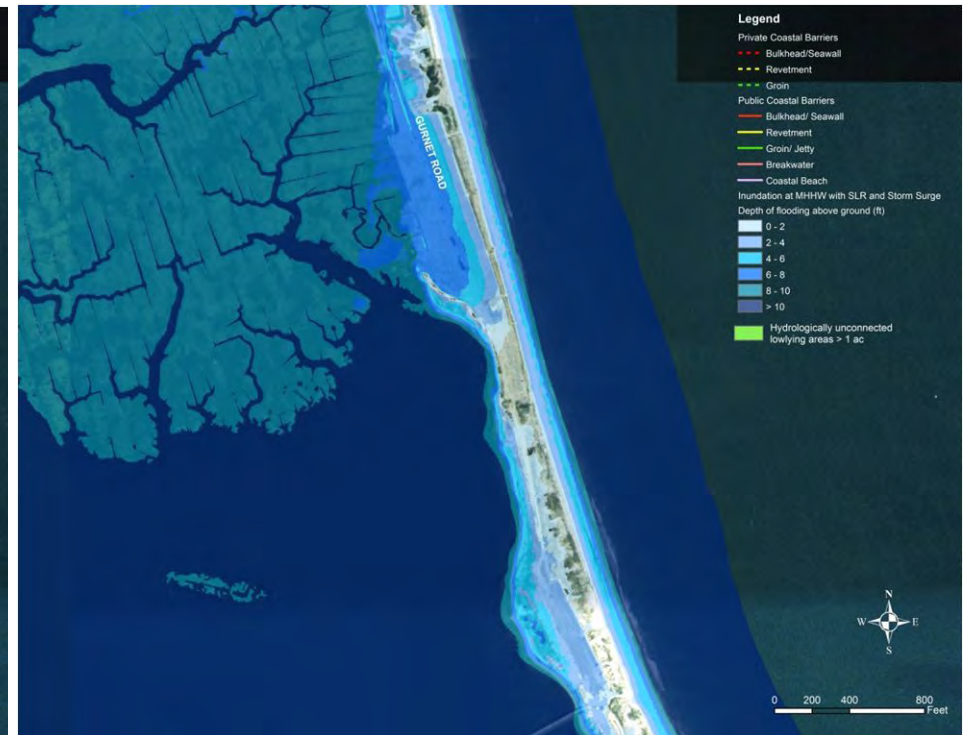


SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Sea Level Rise Only



SLR of 1.08 ft by 2038



SLR of 5.16 ft by 2088

Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.16 ft by 2088 and
Storm Surge from Category 1 Hurricane

Next Steps

Lisa Dickson, P.G., Kleinfelder





Present

*2020 with SLR and
Storm Surge*

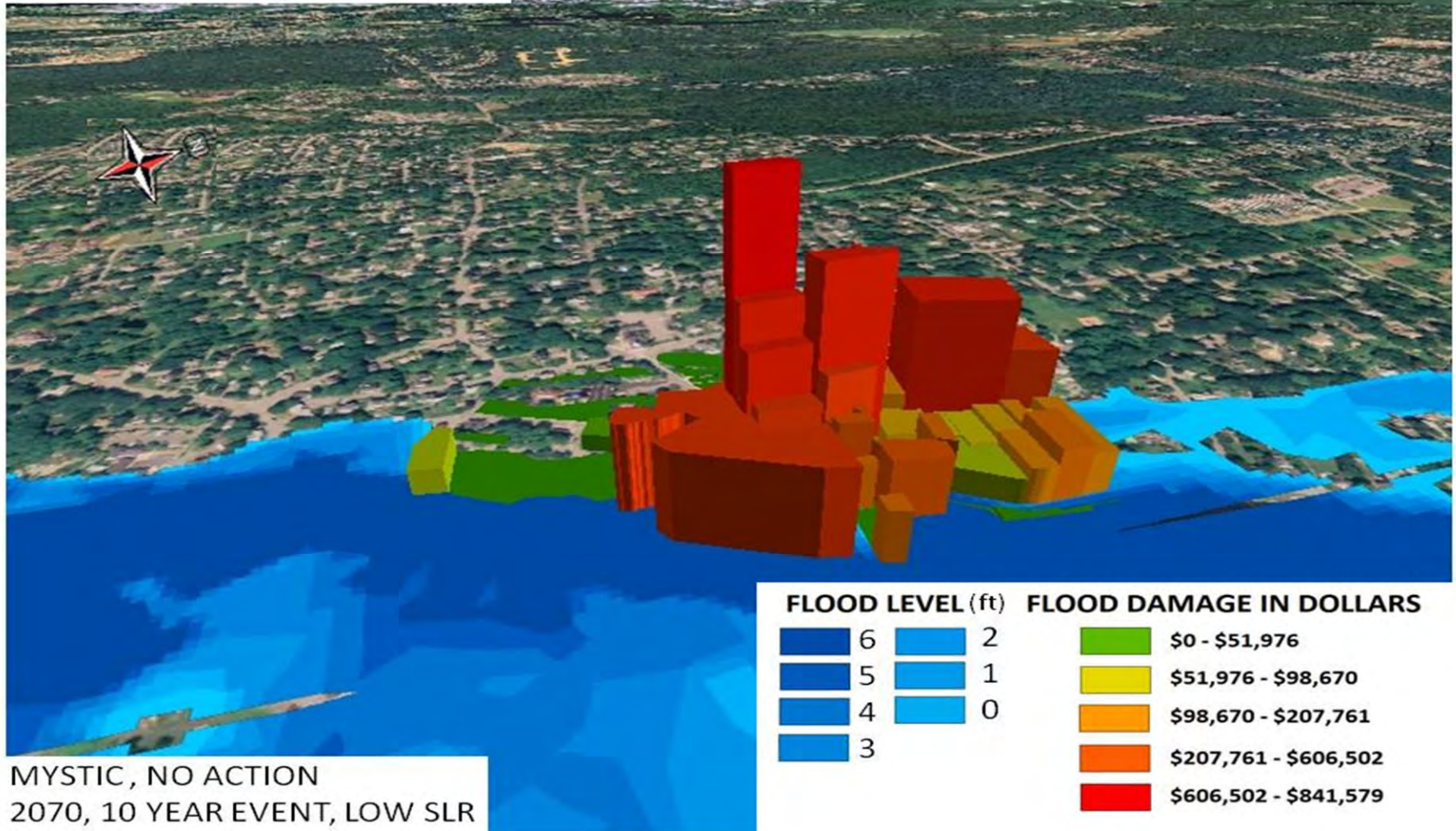


- 1) Consequences appear far off in time.
- 2) Cost-benefit relationships are ambiguous.
- 3) Possible actions are complex.
- 4) Doing nothing is far, far easier.



Cumulative Damage: \$8,768,776

1 CENTIMETER = 50 METERS



Adaptation Strategies

Potential Adaptation Strategy	Relative Cost	Synergy with other efforts	Regulatory Constraints	Implications for:		
				Tax Base	Aquaculture	Habitat
Beach Nourishment						
Coastal Structures						
Upsizing Culverts						
Zoning Changes						
Structure Elevation						
Building Code Changes						
Bioengineering						
Living With Water						

How will the results be used?

Educational Outreach



Informing planning decisions,
focus of actions



