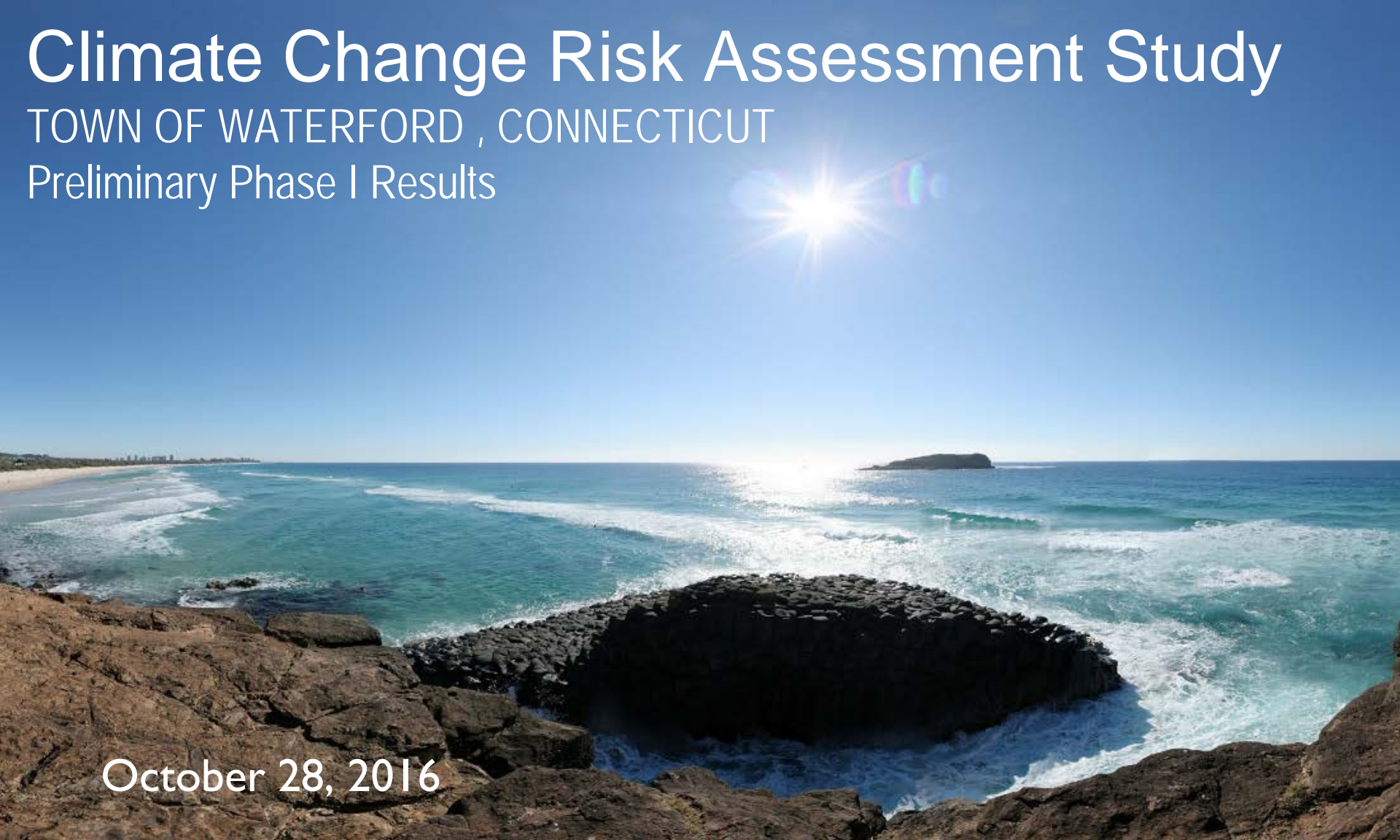


# Climate Change Risk Assessment Study

TOWN OF WATERFORD, CONNECTICUT

Preliminary Phase I Results



October 28, 2016



# Phase I: Establish Parameters

- Goal: Develop appropriate climate change scenarios for:
  - Tide
  - Storm surge
  - Heavy rainfall



# Time Horizons

2016

Present

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- Baseline climate conditions
- Priority adaptation strategies

2030

Medium Term

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- More certain climate change projections
- Incremental and opportunistic adaptation strategies

2070

Longer Term

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- Less certain climate change projections
- Large, complex, costly adaptation strategies

# IMPACT OF SEA LEVEL RISE ON TIDE AND STORM SURGE

# National Climate Assessment: Global Sea Level Rise (SLR) Scenarios

Scenarios	Assumptions	
	Glacier and ice sheet melt	Ocean thermal expansion
<b>Highest SLR</b>	High	High
<b>Intermediate-High SLR</b>	Low	High
<b>Intermediate-Low SLR</b>	Low	Low

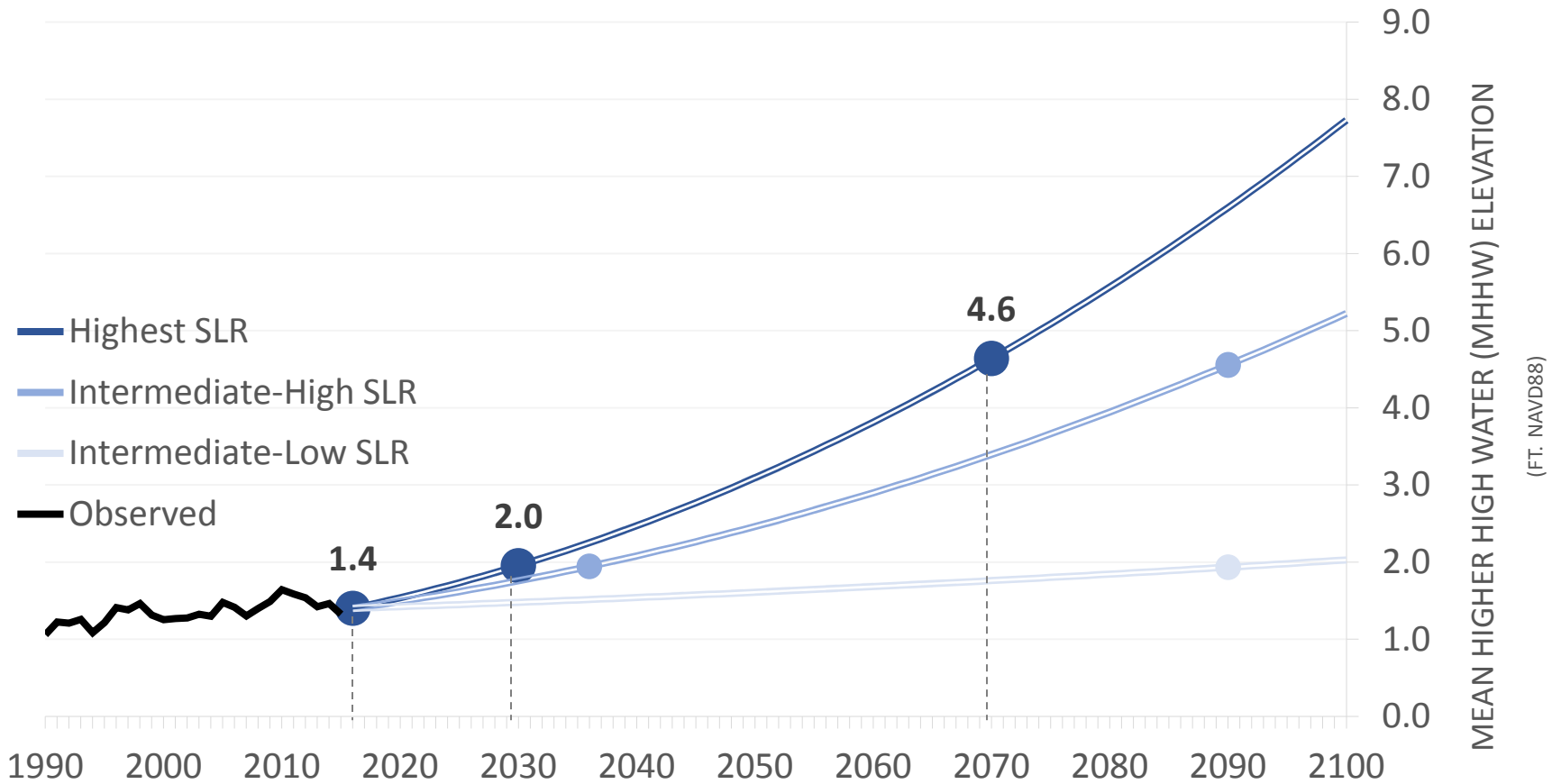
# Relative SLR Projections for Waterford (2016-2100)

Time horizons (year) and projections (feet)

Scenarios	2020	2030	2040	2050	2060	2070	2080	2090	2100
<b>Highest SLR</b>	0.1	0.6	1.1	1.7	2.4	3.2	4.2	5.2	6.3
<b>Intermediate-High SLR</b>	0.1	0.4	0.7	1.1	1.5	2.0	2.5	3.2	3.8
<b>Intermediate-Low SLR</b>	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6

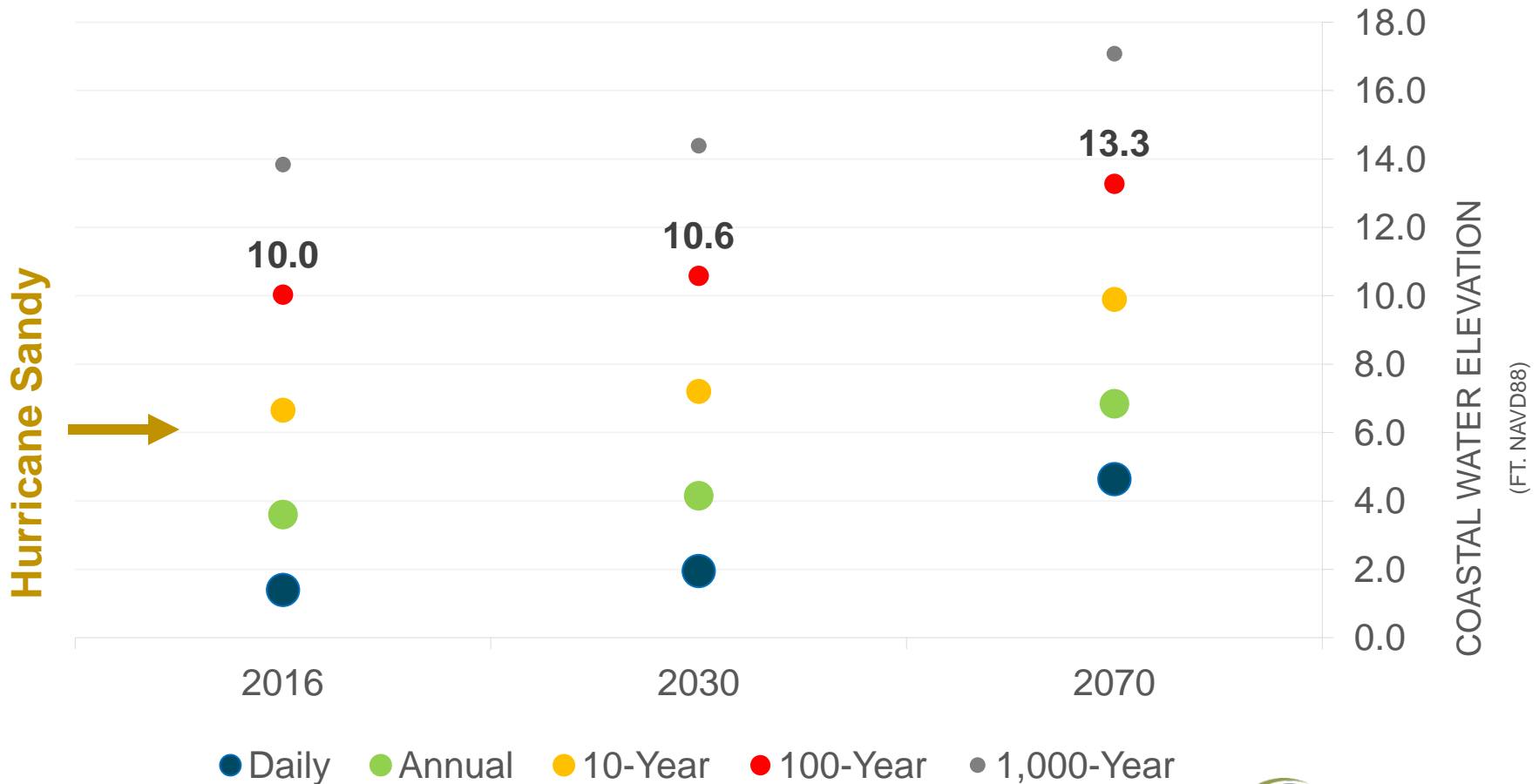
Table reports feet of relative sea level rise since 2016.

# Daily High Tide with SLR



Observed data are from the NOAA tide gage in New London, CT.

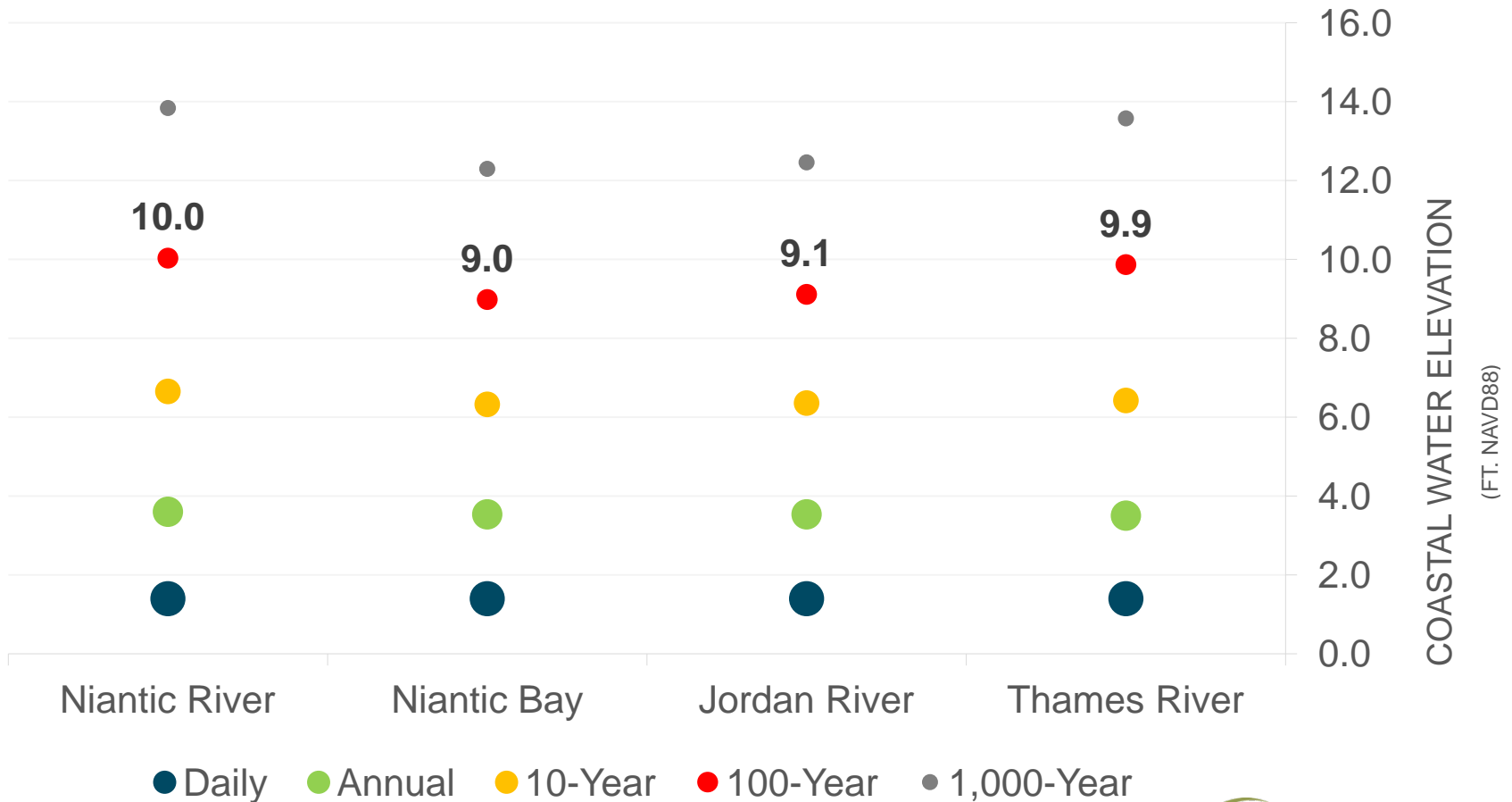
# Niantic River Coastal Water Elevations: Storm Surge with SLR



Preliminary projections



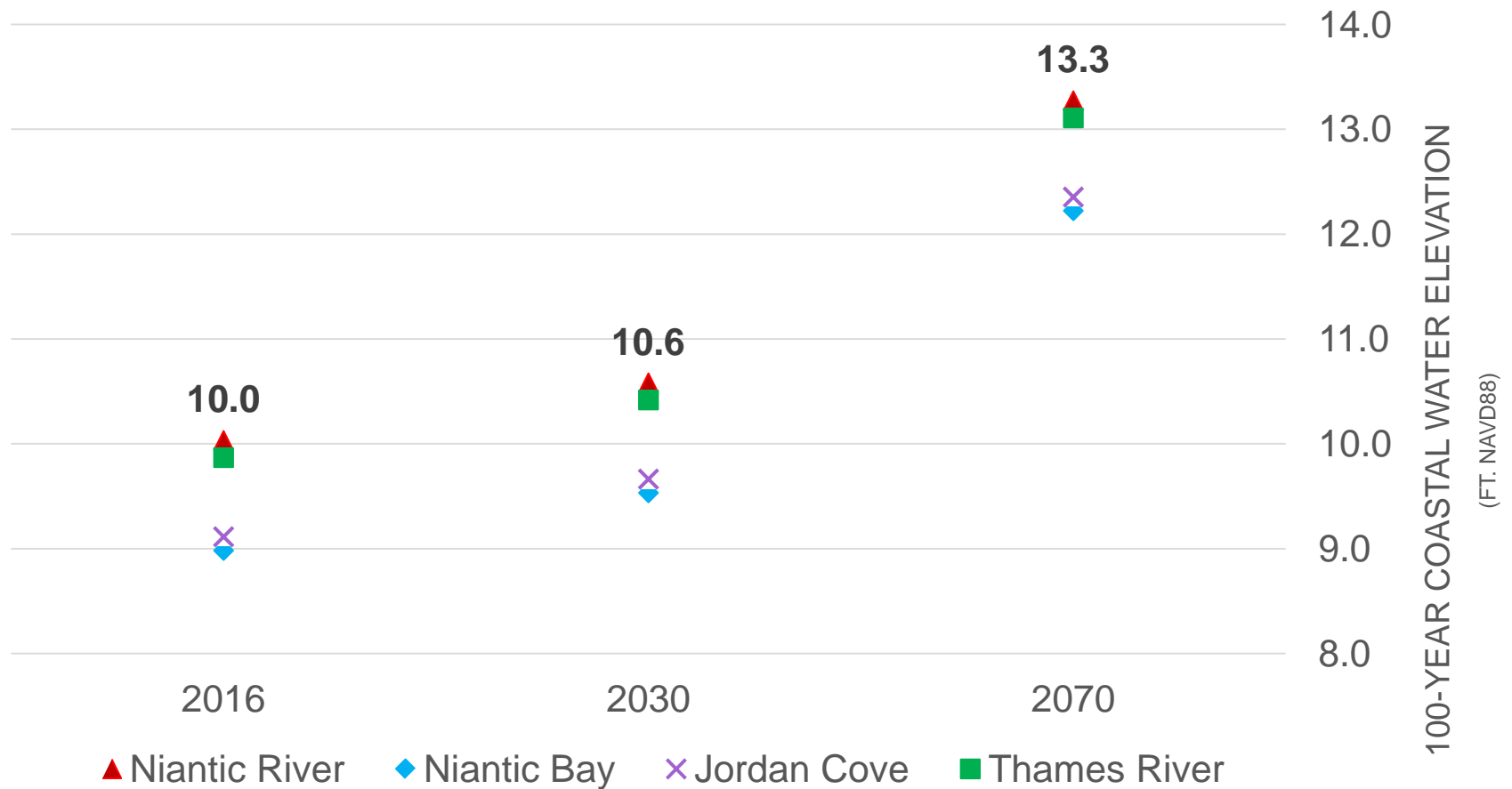
# Present Coastal Water Elevations Across Waterford



Preliminary projections



# 100-Year Coastal Water Elevations Across Waterford: Storm Surge with SLR



▲ Niantic River    ◆ Niantic Bay    ✕ Jordan Cove    ■ Thames River

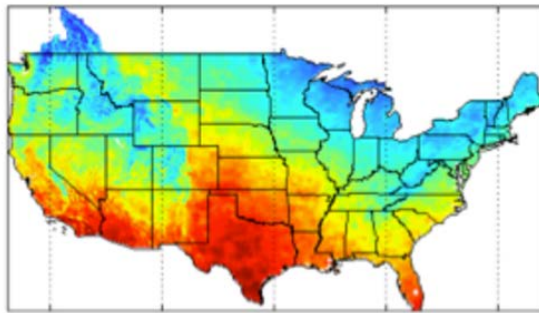


# Developing Climate Change Projections for Heavy Rainfall

1. Downscaled Data Sources
2. Geographic Scope
3. Emissions Scenarios
4. Global Climate Models
5. Temporal Variability

# Downscaled Data Source

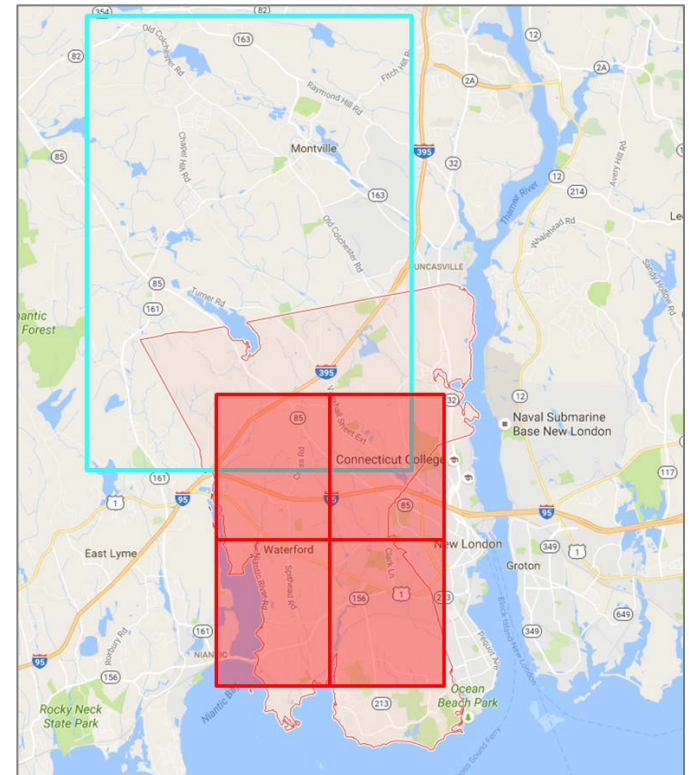
University  
of Idaho



MACA - CMIP5 Future Climate Dataset

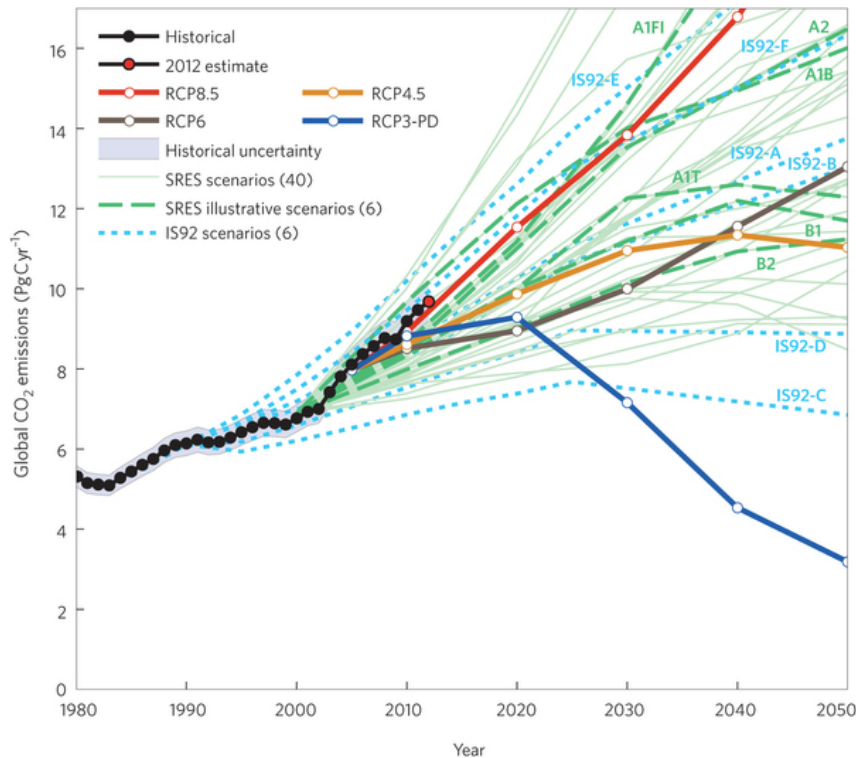
- Baseline period  $\approx$  NOAA Atlas 14 design storms
- Higher resolution model

## Geographic Scope



# Climate Models and Scenarios

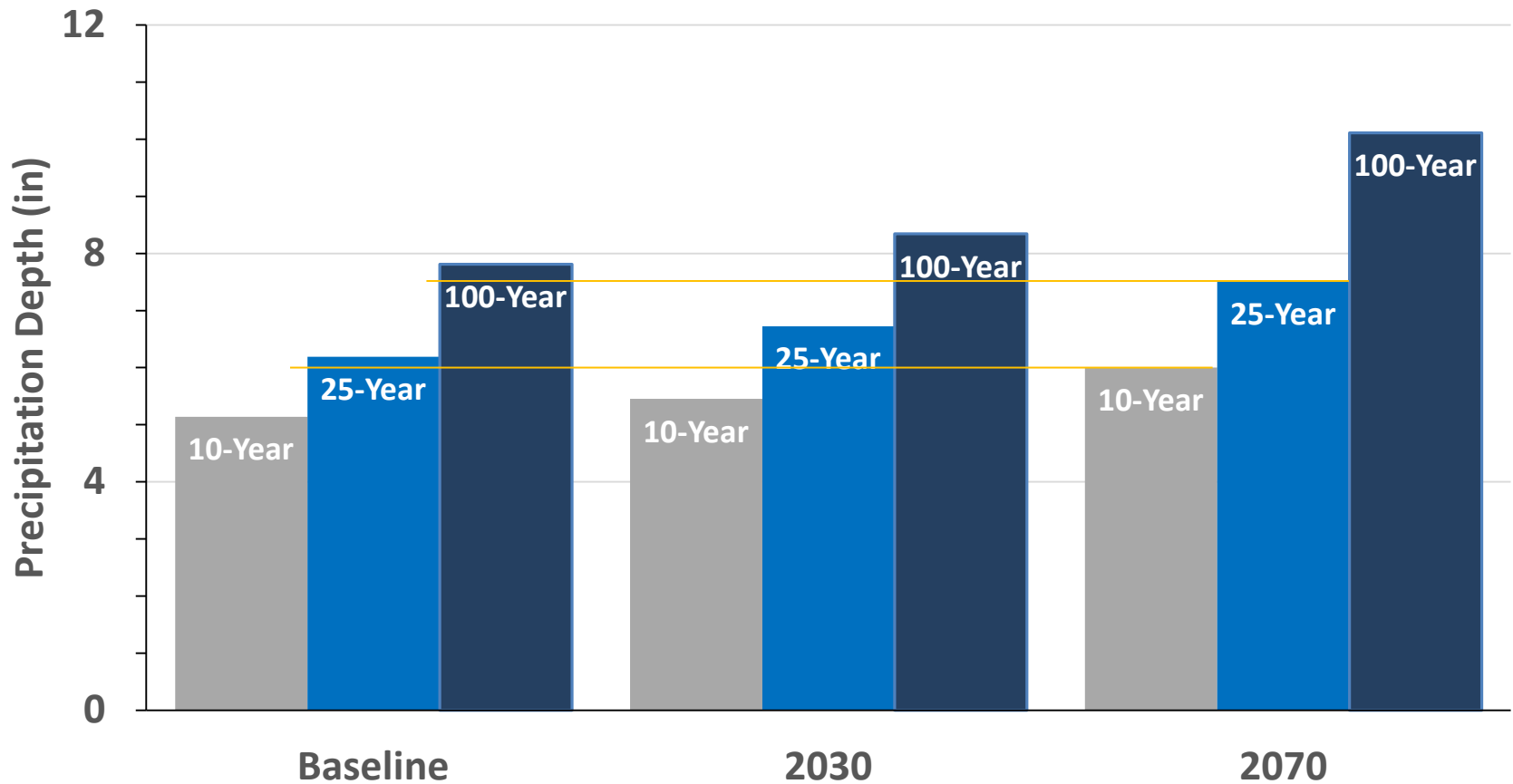
## Emissions Scenarios



## Global Climate Models

1. bcc-csm1-1-m
2. CanESM2
3. CCSM4
4. CNRM-CM5
5. CSIRO-Mk3-6-0
6. GFDL-ESM2M
7. HadGEM2-CC365
8. inmcm4
9. IPSL-CM5A-MR
10. MIROC5
11. MRI-CGCM3

# Baseline and Projected Rainfall Design Storms in Waterford



# Percent Increase from Baseline

Median					
Storm	NOAA	% Increase from baseline for 2030	2030 depth (in)	% Increase from baseline for 2070	2070 depth (in)
10-Year	5.14	6.1%	5.45	16.8%	6.00
25-Year	6.19	8.6%	6.73	21.4%	7.51
100-Year	7.81	6.8%	8.34	29.5%	10.11

# Maps to be Produced in Phase II for Study Time Horizons

- Flood depth:
  - Mean higher high water (tide) with SLR
  - 100-year coastal water elevation (storm surge) with SLR
  - 100-year 24 hour rainfall design storm
- Flood probability
  - Coastal water elevation (storm surge) with SLR