



This presentation was not given at the December 2021 meeting.

VIRGINIA INSTITUTE OF MARINE SCIENCE RECURRENT FLOODING STUDY

November 2021 Update to Commonwealth Transportation Board

Center for
Coastal
Resources
Management



VDOT/VIMS Partnership

“This Memorandum of Understanding (MOU) provides for coordination among the Virginia Institute of Marine Science (VIMS), the Chief Resilience Officer of the Commonwealth of Virginia (CRO) and the Virginia Department of Transportation (VDOT) in developing a proactive strategy for understanding and addressing sea level rise, land subsidence and recurrent flooding impacts on existing and planned road infrastructure as well as how that infrastructure will impact natural ecosystems in Virginia’s coastal zone as the climate changes.”

Study Goals

- 1) Assess climate vulnerability and adaptation of transportation infrastructure
- 2) Assess ecosystem use conflicts of transportation infrastructure under rising sea levels
- 3) Assess current policy and regulatory requirements potentially affecting VDOT

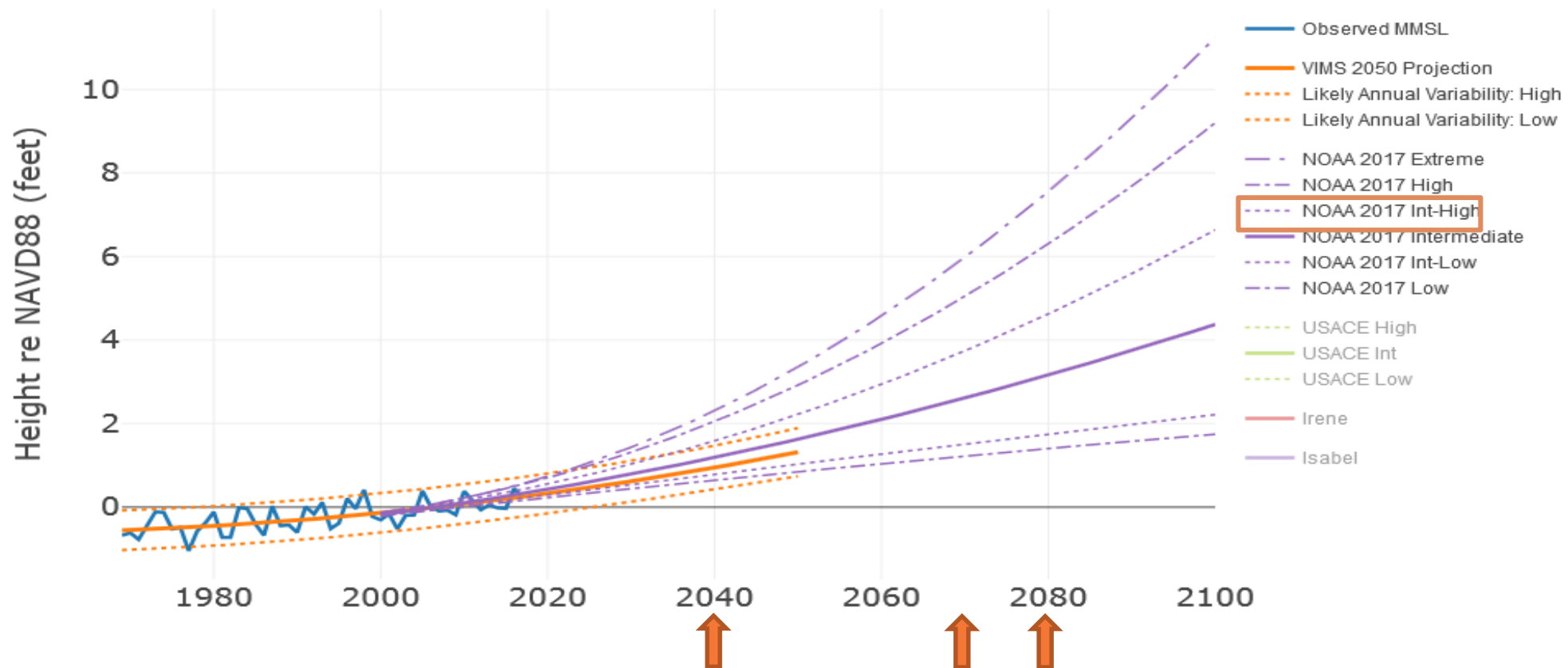
Project Details

- MOU between VDOT and Secretary of Natural Resources: signed June 2019
- Official start date: August 2019
- Anticipated completion date: August 2024
- Timeframe covered: 2020 – 2080
- Study Area: Virginia's Coastal Zone (Tidewater Virginia)
 - 46 localities: 29 counties and 17 cities
- Sea Level Rise Curve: NOAA 2017 Intermediate High

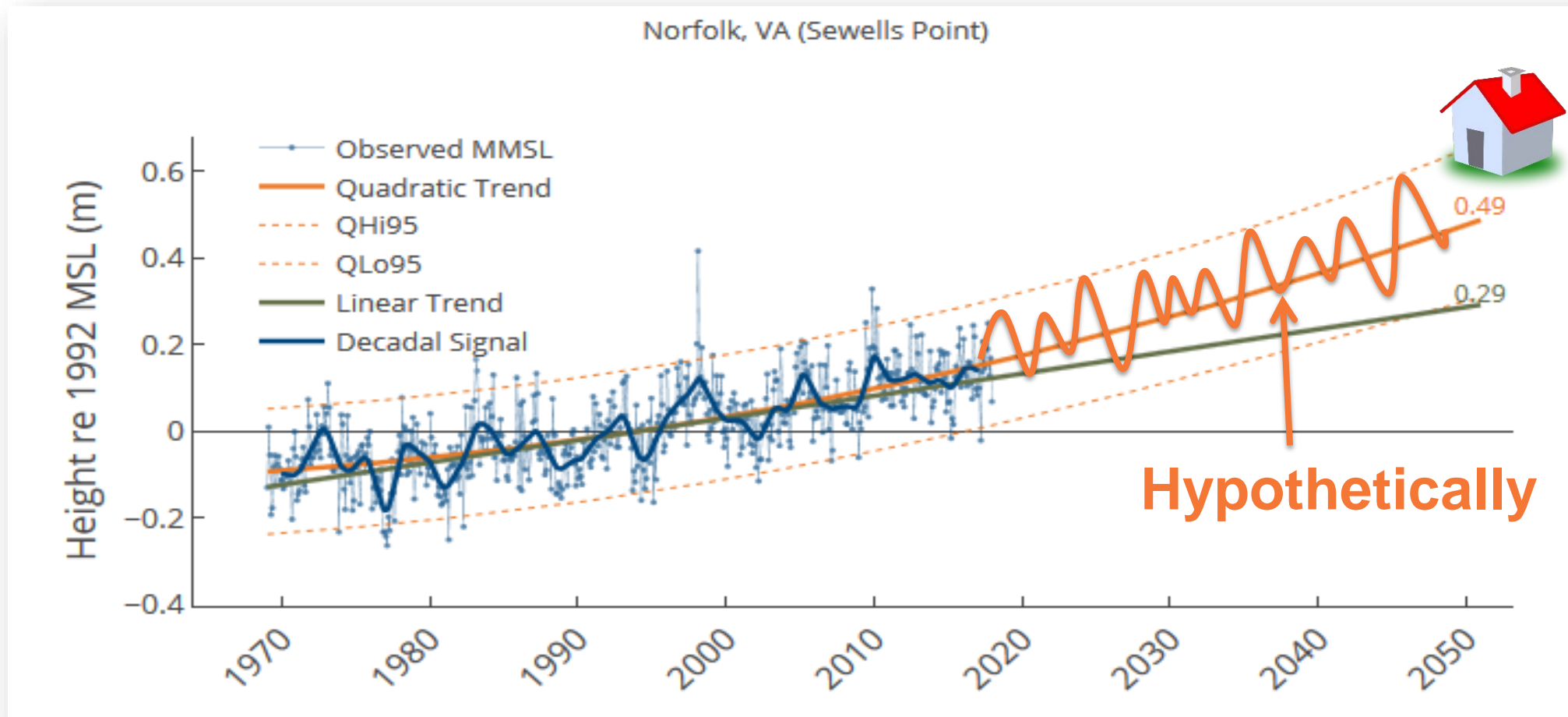
ROAD NETWORK ANALYSIS:

What sea level rise projection should we be using?

Norfolk, VA (Sewells Point)



ROAD NETWORK ANALYSIS: What sea level rise projection should we be using?



Related Efforts

- **VDOT**
 - House Bill 1217 – recurrent flooding affecting Planning District 8
 - Atlas 14 Update – update historical rainfall information
 - Intensity, Duration, and Frequency (IDF) Predictive Curve Development
 - OIPI / VTRANS
- **Other**
 - Virginia Coastal Resiliency Master Plan
 - PDC / Locality Efforts

Task 1. Determine Transportation Infrastructure Vulnerability

- Examine all roads with respect to FEMA Flood Hazard Zones
- Update recurrent road flooding maps
- Analyze road elevations and Return Flood Frequency (RFF) relative to the Best Available Tide Gauge data for the area
- Perform Road Network Analysis (RNA) to evaluate vulnerability of major VDOT infrastructure
- Determine most useful method of making data available – both for VDOT and those outside of VDOT

FLOODPLAIN ANALYSIS: Transportation in FEMA Flood Hazard Zones



FLOODPLAIN ANALYSIS: Flood Zone Summary Tables

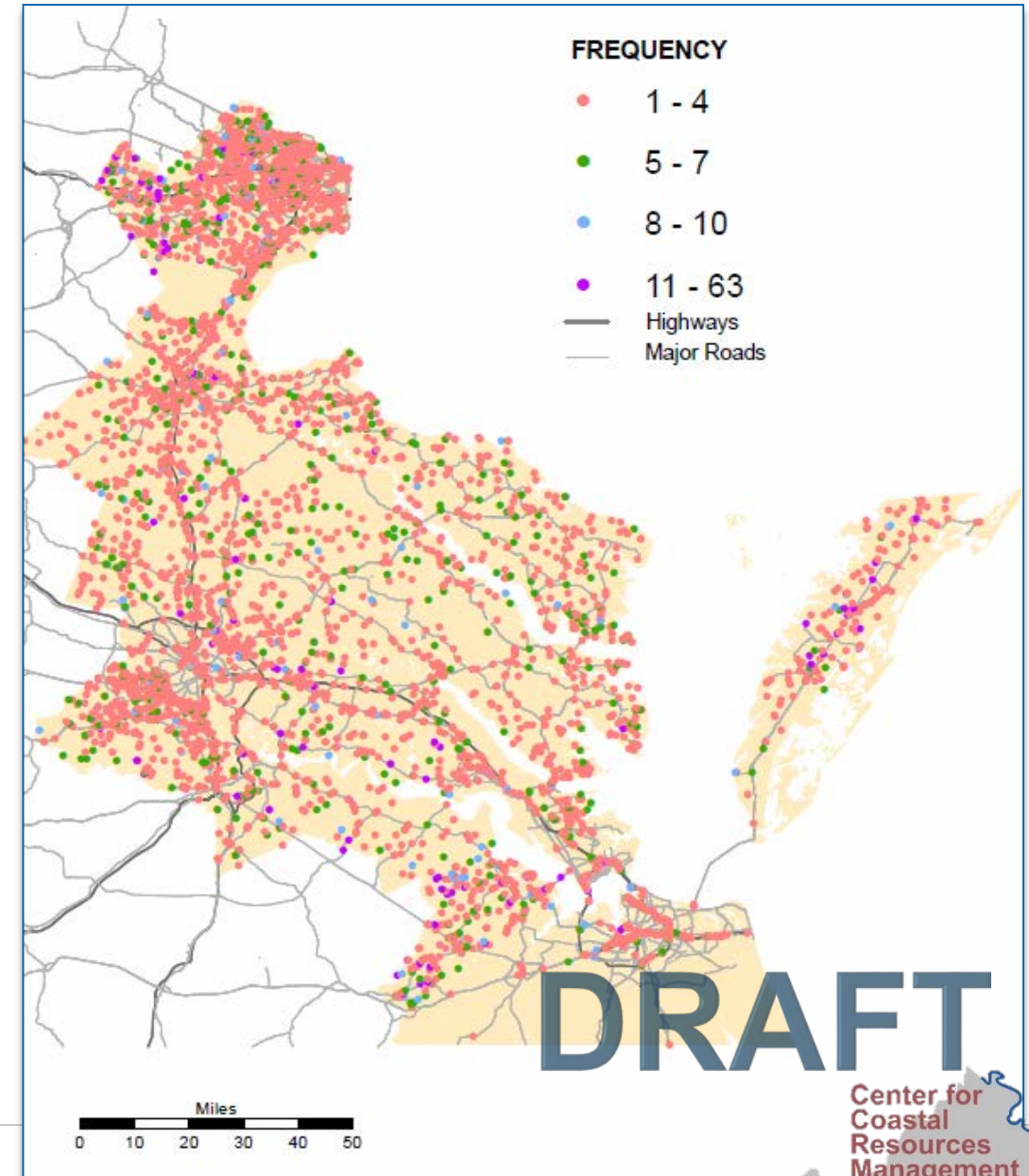
		Total Road Length (miles)	1% Annual Chance Flood Hazard (all A and V zones) (miles)	0.2% Annual Chance Flood Hazard (miles)	Area of Minimal Flood Hazard (miles)	Area of Undetermined Flood Hazard (zone D) (miles)
Summary	All Coastal Roads	58446	3048	1485	53863	50
	Road Type	Total Road Length (miles)	1% Annual Chance Flood Hazard (all A and V zones) (miles)	0.2% Annual Chance Flood Hazard (miles)	Area of Minimal Flood Hazard (miles)	
Accomack County	Local Main Arteries	153	21	14	118	
	Local Secondaries	1266	349	96	821	
	Ramp	<1			<1	
	US and VA Primary Highways	92	5	<1	88	
		1512	375	109	1027	
	Road Type	Total Road Length (miles)	1% Annual Chance Flood Hazard (all A and V zones) (miles)	0.2% Annual Chance Flood Hazard (miles)	Area of Minimal Flood Hazard (miles)	
Alexandria City	Alleys	2	<1	<1	2	
	HOV Lanes	4	<1	<1	4	
	Limited Access Highway	14	3	1	9	
	Local Main Arteries	53	4	3	47	
	Local Secondaries	382	13	18	352	
	Other	<1	<1	<1		
	Parking Lot Roads	29	1	1	26	
	Ramp	19	4	3	12	
	US and VA Primary Highways	44	2	1	41	
		547	27	27	493	

DRAFT

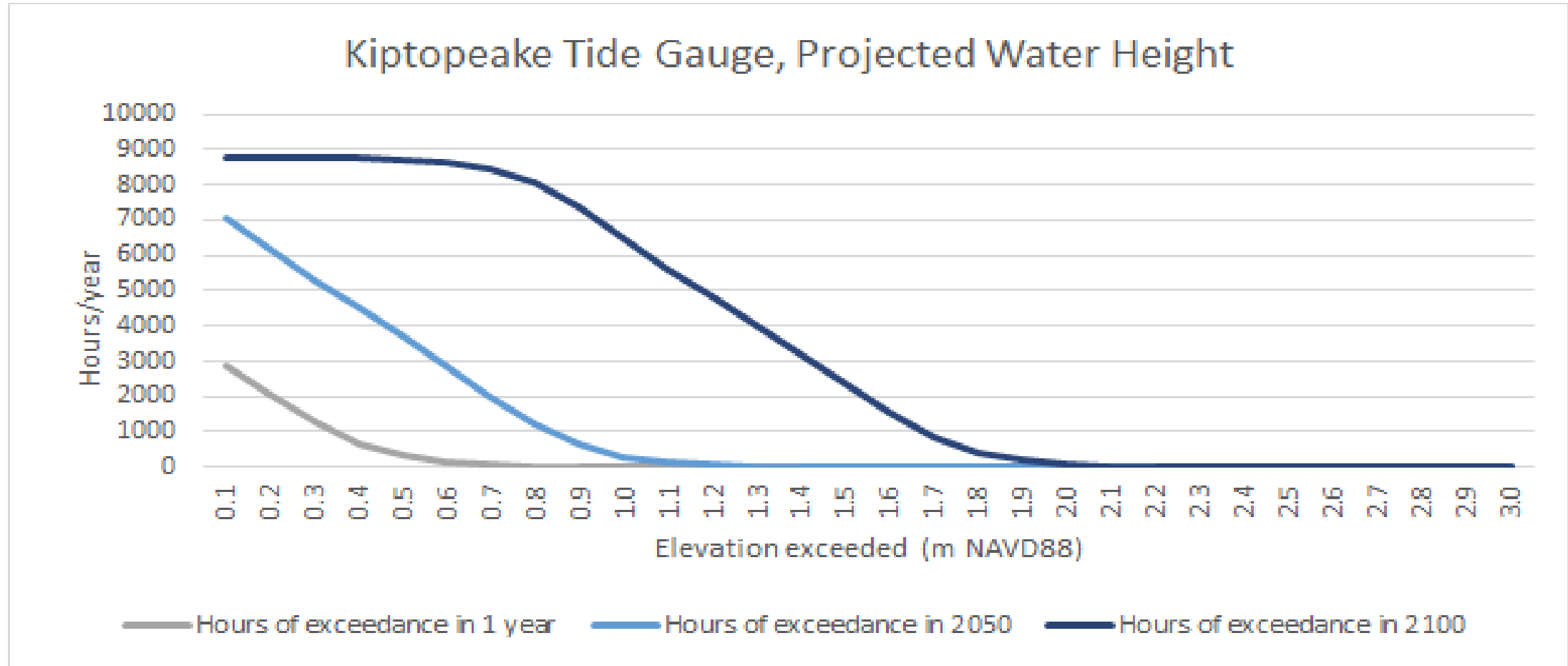
511 DATA ANALYSIS: Recurrent Road Flooding 2008-2019

DATA SOURCES:

- VDOT 511
 - Available for the entire state
 - Does not include city-owned roads
- WAZE
 - Available for select areas and years

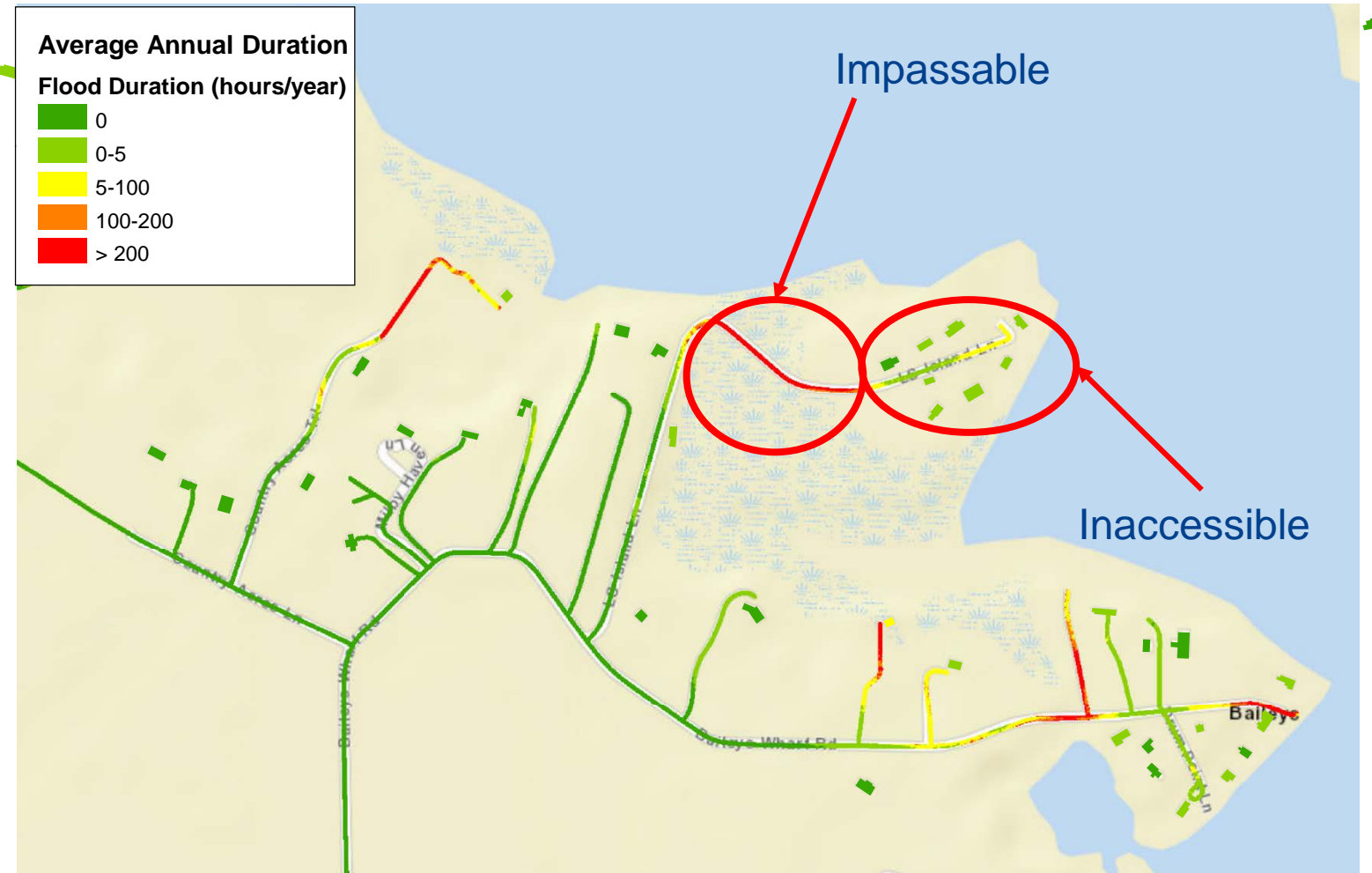


ROAD NETWORK ANALYSIS: Tide gauge water level analysis



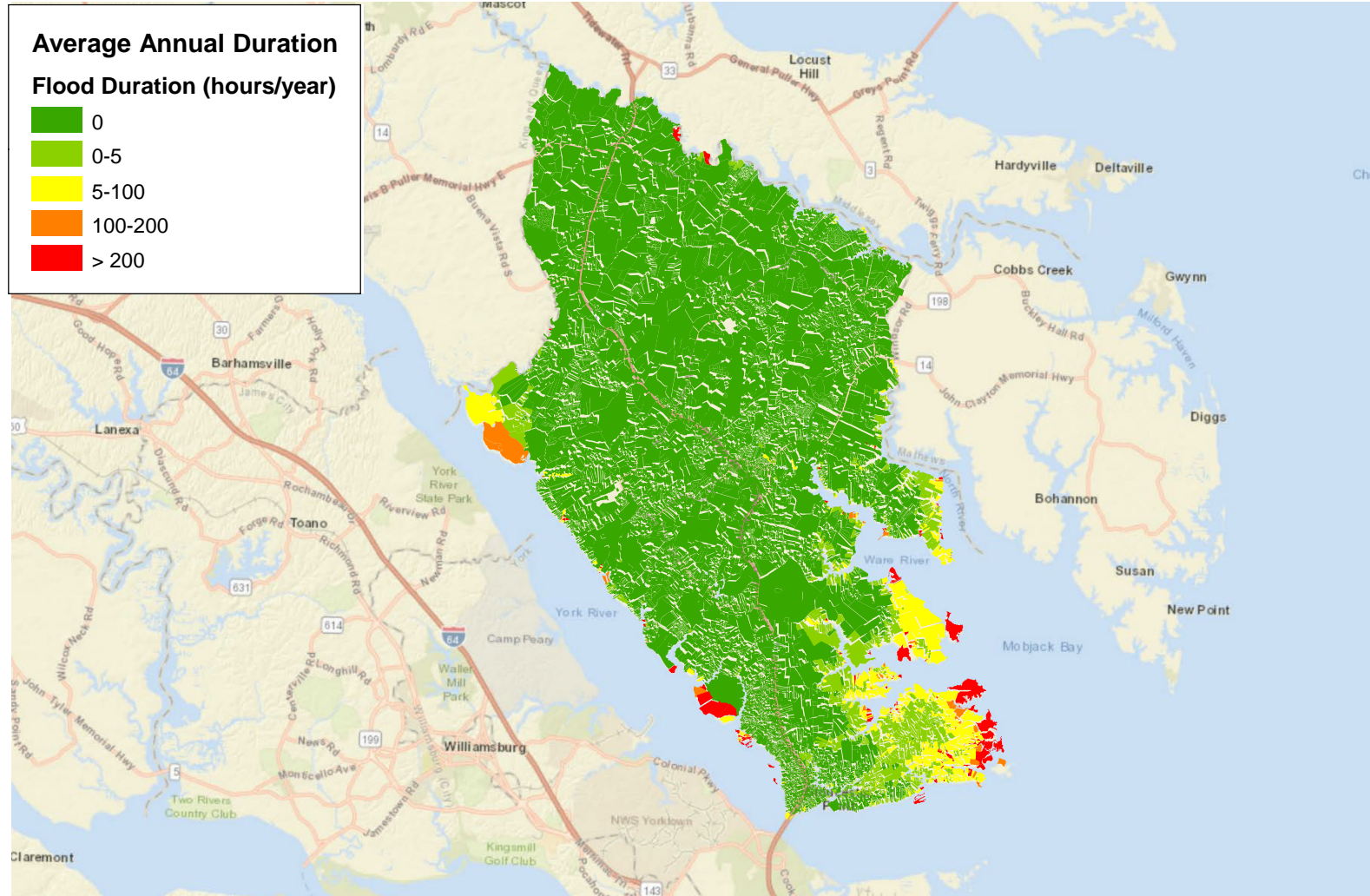
Example of water exceedances for different flood levels for flood frequency analysis

ROAD NETWORK ANALYSIS: What roads are likely to flood in the future?



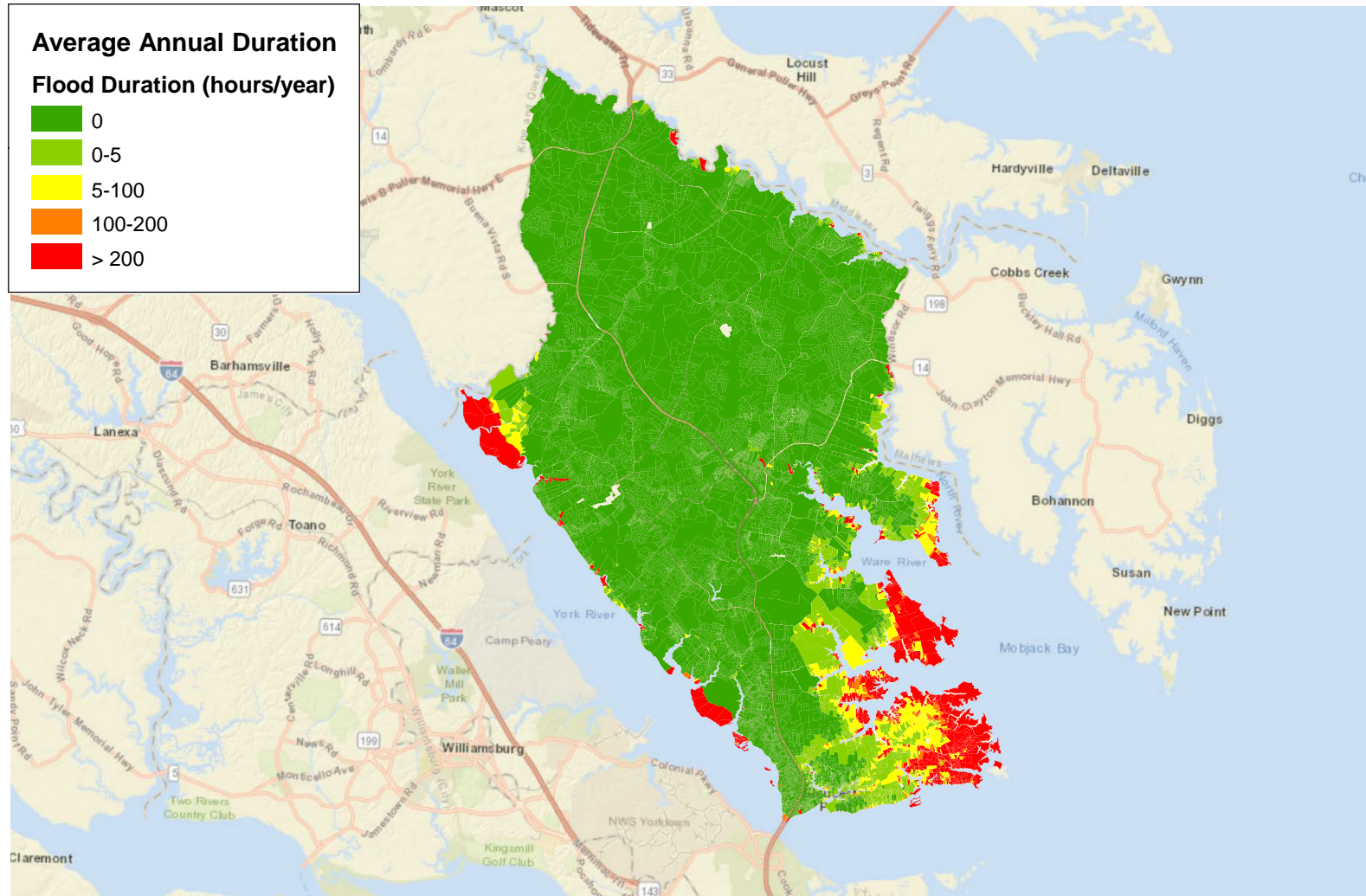
Average Annual Flooding: 2050

ROAD NETWORK ANALYSIS:



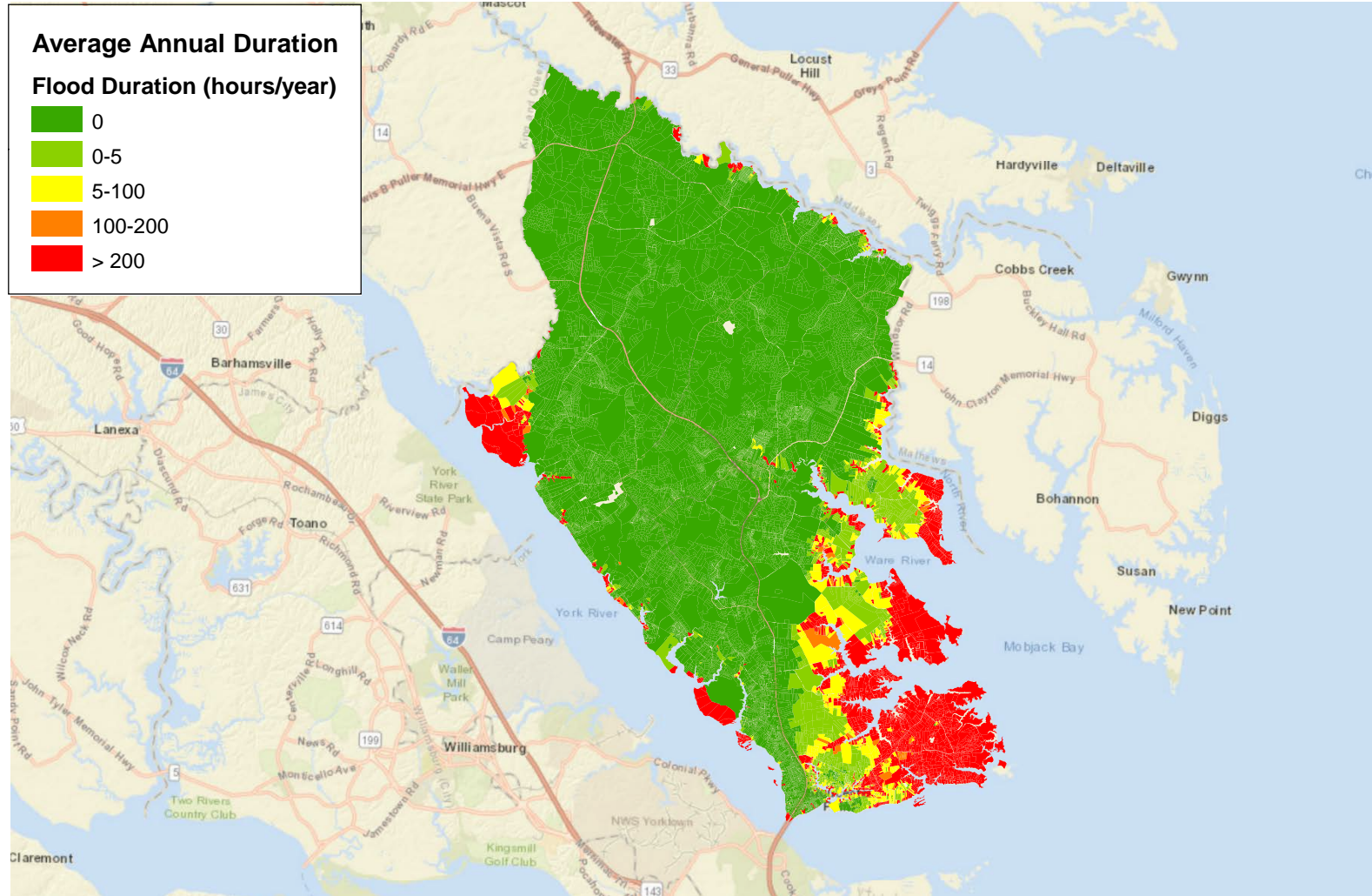
Average Annual Flooding: 2000-2017

ROAD NETWORK ANALYSIS:



Average Annual Flooding: 2050

ROAD NETWORK ANALYSIS:



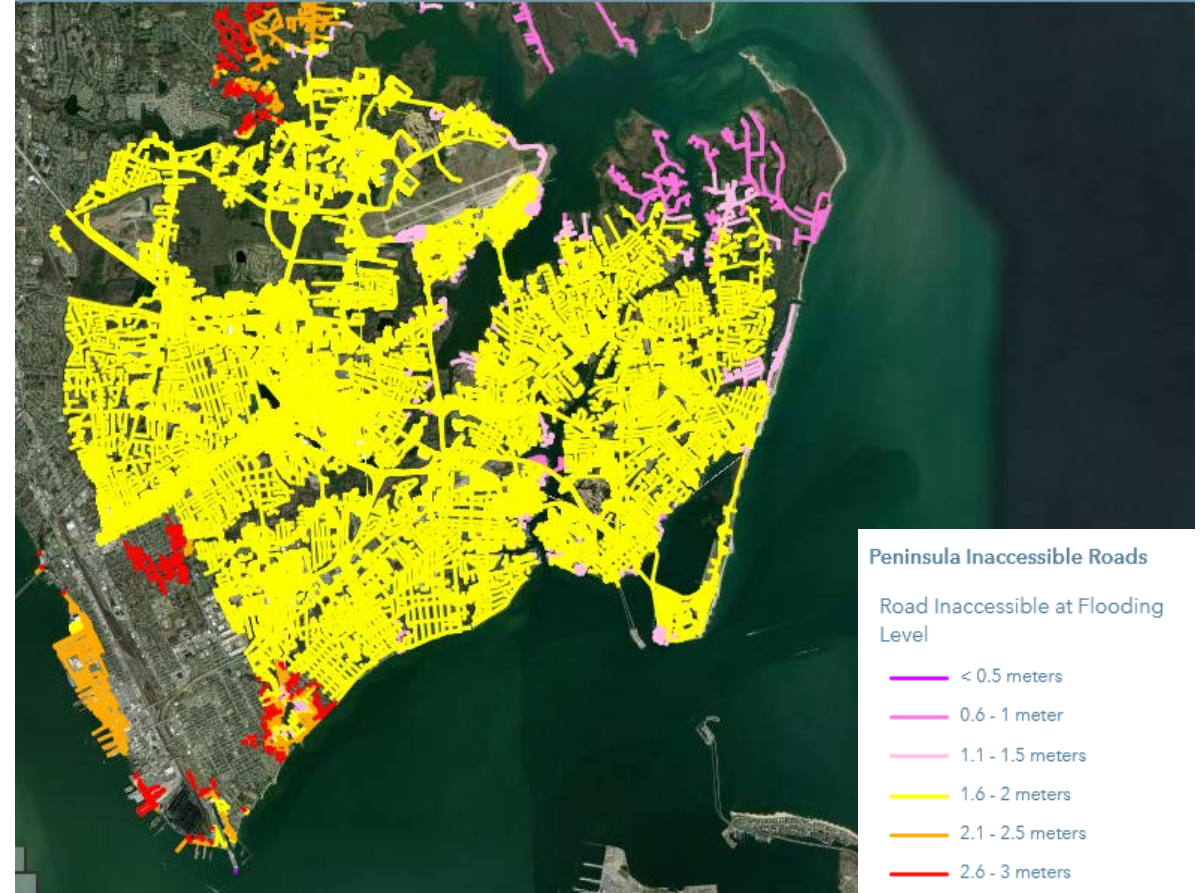
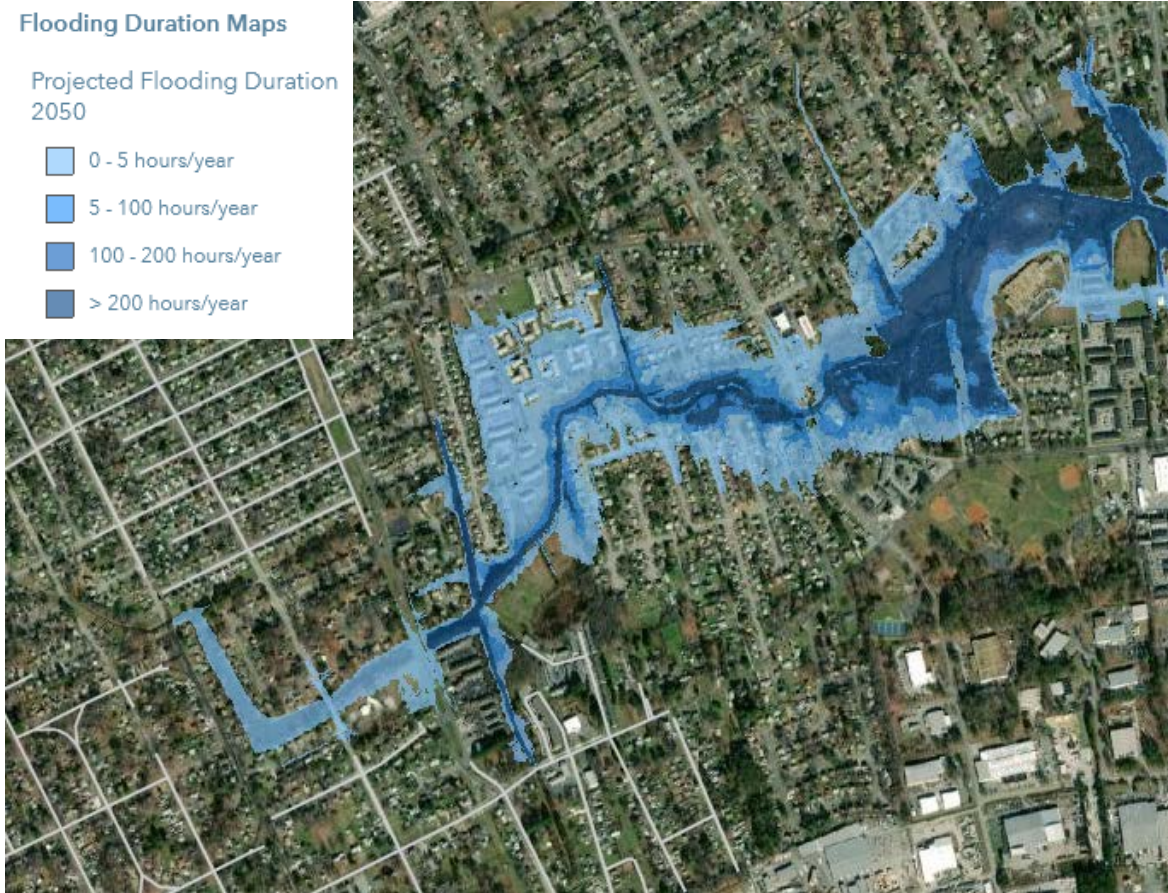
Average Annual Flooding: 2100

ROAD NETWORK ANALYSIS: Inaccessible roads

Flooding Duration Maps

Projected Flooding Duration
2050

- 0 - 5 hours/year
- 5 - 100 hours/year
- 100 - 200 hours/year
- > 200 hours/year



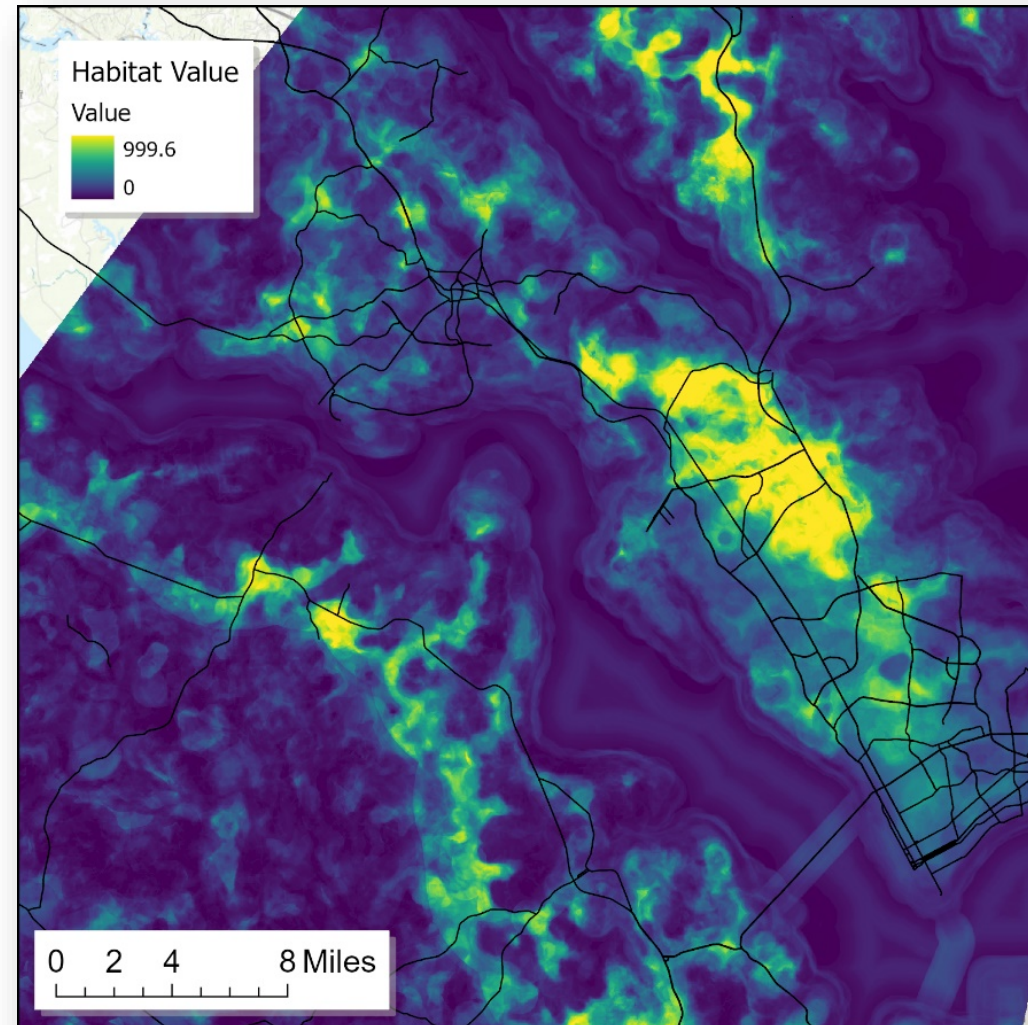
Peninsula Inaccessible Roads

Road Inaccessible at Flooding Level

- < 0.5 meters
- 0.6 - 1 meter
- 1.1 - 1.5 meters
- 1.6 - 2 meters
- 2.1 - 2.5 meters
- 2.6 - 3 meters

Task 2. Study Ecosystem Impacts of Transportation Infrastructure

- Modeling current habitat distribution for rare, threatened or endangered (RTE) and migratory bird species
- Forecasting habitat distribution shifts for target species
- Assess the potential conflicts for existing and planned local land use changes and transportation infrastructure



Task 3. Policy and Regulatory Requirements



- Determine how resiliency related policy and regulatory requirements have been handled by other states
 - Example: Chapter 51 of 2021 Acts of Assembly requirement to include resiliency in design standards; no formal definition
- Analyzing legal framework informing duties to maintain and authority to abandon

Additional Tasks Being Considered

- Utilize participatory mapping
 - Utilize local expertise
- Determine VDOT method of approval
 - Who reviews and accepts data?
 - What is the timing?
- Development of an interactive map for VDOT
 - Regional (PDC) level packaged for use by local governments

The screenshot displays the ADAPTVA website's 'Tools' section. The header includes navigation links for FORECASTS, ADAPTATIONS, TOOLS, DATA, and PLANNING & POLICY. The main heading is 'Tools' with the subtitle 'Evidence-based planning for changing climate'. A blue wrench icon is used to highlight that tools are available to help assess risk and vulnerability to climate impacts, build community resiliency against extreme events, and provide guidance to prepare and respond to a changing environment. Three tool cards are featured: 'FLOOD RISK' (with a hurricane image), 'SHORELINE MANAGEMENT' (with a wave image), and 'ADAPTVA INTERACTIVE MAP' (with a map image). Each card includes a brief description and a 'Learn more' or 'Launch Viewer' button. The 'FLOOD RISK' card also features a link to 'Virginia's Flood Risk Information System'.

