DRAFT REGIONAL COASTAL RESILIENCY DESIGN STANDARDS

HRPDC Coastal Resiliency Committee
September 25, 2020

Agenda

Background

Supporting documents

Design standards

Next Steps

Background

OCTOBER 2018

HRPDC adopts regional sea level rise scenarios

FEBRUARY 2020

VDOT Structure and Bridge Division adopts "Consideration of Climate Change and Coastal Storms"

MAY 2020

Virginia Beach considering new Public Works Design Standards with sea level rise and precipitation projections

THE PROBLEM

- Design standards are based on historic data
- Climate research suggests that conditions will continue to change into the future
- Recent research and analysis suggests that environmental conditions have changed since the major guidance documents
- Therefore, we are building in a way that will add to our existing and future flooding challenges

Adopting higher standards will be more expensive, but keeping the same standards will increase risk. Either way, there is a cost.

Resilient Design Guidelines

PROJECTIONS OF FUTURE CONDITIONS

Sea level rise - adopted October 2018

- 1.5' for 2020-2050
- 3.0' for 2050-2080
- 4.5' for 2080-2100

Precipitation - *DRAFT*

RECOMMENDATIONS FOR POLICIES AND REGULATIONS

Stormwater Management - *DRAFT*

- Design storm frequencies
- Design tailwater elevations
- Joint probability events

Floodplain Management - *DRAFT*

- Floodplain mapping
- Design Flood Elevations

Supporting Efforts

Virginia Beach

Public Works Design Standards Manual

Joint Occurrence and Probabilities of Tides and Rainfall

VDOT

Considerations of Climate Change and Coastal Storms

VTRC

Incorporating Potential Climate Change Impacts in Bridge and Culvert Design

U.S. Army Corps of Engineers

North Atlantic Coast Comprehensive Study

PRECIPITATION PROJECTIONS

NOAA	VDOT	VIRGINIA BEACH	NOTHING
PROS: Already referenced in local codes. Authoritative.	PROS: Already in some local codes. Would apply to county secondary streets.	PROS: Already drafted and under consideration.	PROS: No cost or effort required.
CONS: May not include future conditions. Unknown if/when will occur.	CONS: Wide adoption not expected until 2021. Statewide standard may not reflect conditions in Hampton Roads.	CONS: May conflict with later updates to VDOT or NOAA standards.	CONS: Does nothing to improve resiliency of region to current or future flood risk.

Other Resilient Standards

Virginia Beach

NOAA Atlas 14 + 20%

Public Works Design Standards Manual 2020

VDOT Structure and Bridge Division

NOAA Atlas 14 + 20%

Consideration of Climate Change and Coastal Storms

Draft Recommendation

Localities should adopt local standards reflecting a 20% increase in the 24-hour duration rainfall above local conditions in NOAA Atlas 14

Format: tables for each locality with existing and recommended rainfall values

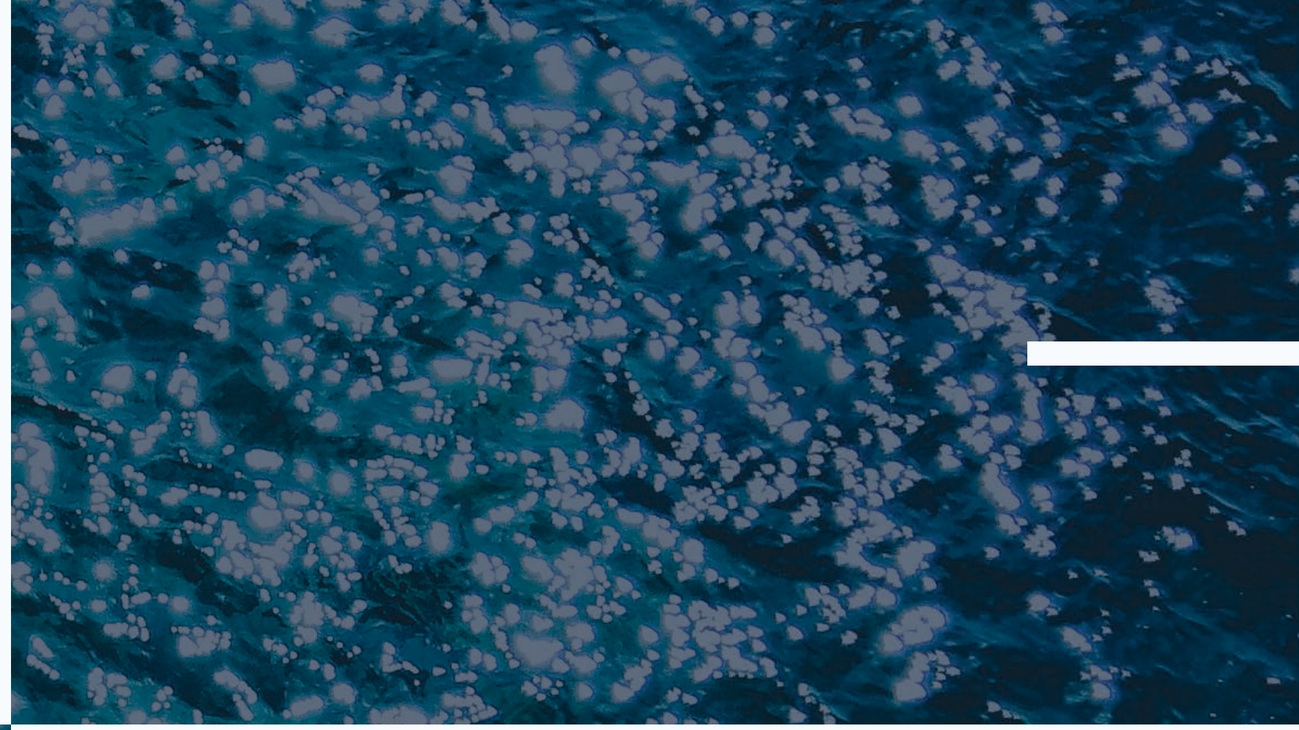
Design Storm Frequencies

Local governments and state agencies adopt design storm frequency requirements based on the scale and type of development

Most localities require a 10-year design storm

Chesapeake

< 200 Acres	10-year storm
≥ 200 Acres	50-year storm



Virginia Beach

< 300 Acres	10-year storm
300-500 Acres	25-year storm
≥ 500 Acres	50-year storm
Critical Infrastructure	100-year storm

Draft Recommendation

Localities should adopt higher standards for larger projects that reflect larger contributions to runoff and additional capacity for mitigation

Format: policy statement and standard

Design Tailwater Elevations

VDOT

No tidal elevation specified. 0.8 * pipe diameter default.

Norfolk

1.7' NAVD88

Chesapeake

3.6' NAVD88 (tidal)

2.3' NAVD88 (non-tidal)

Virginia Beach

Individual elevations for 9 tidal and non-tidal water bodies

Design Tailwater Elevations

Sea Level Rise

Virginia Beach has incorporated sea level rise into each design tidal elevation.

- 1.5' for non-critical infrastructure
- 3.0' for critical infrastructure

This includes a non-linear adjustment for some watersheds and some return periods.

Draft Recommendations

Localities should adopt design tailwater elevations for individual watersheds

Localities should incorporate sea level rise and non-linearity into design tailwater elevations

Format: tables for each locality with design tailwater elevations for HUC12 watersheds

COMPOUND FLOODING

- Most communities use a single combination of precipitation and tidal conditions as the design storm:
(10-year rainfall + 1-year tide)

- Virginia Beach has adopted a suite of "Design Storm/Tide Joint Probability Pairs"

10-YR Design		25-YR Design		50-YR Design		100-YR Design	
Tide	Rain	Tide	Rain	Tide	Rain	Tide	Rain
10-YR	1-YR	25-YR	1-YR	50-YR	1-YR	100-YR	1-YR
1-YR	10-YR	2-YR	25-YR	2-YR	50-YR	3-YR	100-YR

Draft Recommendation

Hampton Roads localities should adopt multiple joint probability design storms that include both precipitation and tailwater conditions

Format: policy statement and standard

Floodplain Mapping

Most localities only map and regulate development in the current FEMA-designated Special Flood Hazard Area

Current FEMA floodplains do not account for rainfall flooding or sea level rise

Draft Recommendations

Localities should regulate development in the 0.2% annual chance floodplain

Localities should incorporate future probabilistic floodplains with sea level rise into their comprehensive plans and floodplain ordinances

Format: policy statement and standard; mapped future floodplains (GIS and static)

Design Flood Elevations

Minimum NFIP standards only require development in floodplains to be built to the base flood elevation or 1% annual chance flood

Current FEMA base flood elevations do not account for sea level rise

Draft Recommendations

Localities should adopt a minimum freeboard of 2' above the base flood elevation (3' for critical structures)

Localities should adopt design flood elevations based on location, expected lifespan, and criticality

Format: policy statement and standard

Next Steps

Finalize draft deliverables (tables, GIS data layers, etc.) and distribute to localities for review and comment

Review comments and revised deliverables at December Coastal Resiliency Committee meeting (12/11/20) for recommendation

Present to HRPDC Board Q1 2021 (tentative) for adoption