PLANNING FOR RESILIENT CRITICAL INFRASTRUCTURE IN NORTHERN VIRGINIA

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Senior Environmental Planner/Coastal Program Manager
Northern Virginia Regional Commission
NVRC’s Coastal Program

• Providing technical assistance to member local govts. on coastal issues for **over 30 years**

• Shoreline erosion, non-point source pollution, flooding, stormwater, land use, Potomac Heritage Trail, sea level rise, climate, **coastal resiliency**

• **Climate Stressors – Heat, Flooding, Sea Level Rise**

https://nvrc.maps.arcgis.com/apps/MapTour/index.html?appid=ed97f510ce38406682cebd790f767bee
## Qualities of Resilient Infrastructure

<table>
<thead>
<tr>
<th>Robust</th>
<th>Redundant</th>
<th>Multiple Benefits</th>
<th>Innovative</th>
<th>Prepared for Future Scenarios</th>
<th>Equitable</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
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*Images courtesy of various sources, including sources provided in the document.*
Northern Virginia Localities Are Taking Action

Arlington “Community Energy Plan” Will Commit County to total carbon neutrality by 2050

Working to Develop “Community-wide Climate and Energy Action Plan”

Alexandria “Environmental Action Plan” commits City to 80% to 100% reductions by 2050

City of Falls Church will reduce GHG emissions by 80% by 2050

City of Fairfax is developing a GHG inventory and formed an “Environmental Sustainability Committee”
Three Climate Stressors:
1) Heavy Rain Events
2) Extreme Heat
3) Sea Level Rise and Storm Surge

2016
Climate Resilience Summit

2017
NOVA Climate Resilience Team formed and met 5 times

2018
NVRC published “Resilient Critical Infrastructure: A Roadmap for Northern Virginia”

2018-2019
NOVA Climate Resilience Team met 4 more times

2020 and beyond
Continue planning
Resilient Design Guidelines Implementation

2019
Critical Infrastructure Risk Assessment Workshop
Stressor 1: Heavy Precipitation Events

Photo: Debbie Spiliotopolous

Sinkhole in Dale City
Stressor 2: Extreme Heat – More dangerous heat days and longer and hotter heat waves

As of Sept. 23, 2019; 59 days have hit 90 °F or more

<table>
<thead>
<tr>
<th></th>
<th>Low Emission Scenario</th>
<th>High Emission Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050’s</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>2080’s</td>
<td>40</td>
<td>75</td>
</tr>
</tbody>
</table>

Data from CLIMATE READY DC The District of Columbia’s Plan to Adapt to a Changing Climate
Stressor 3: Sea Level Rise and Storm Surge

Sea Level Rise Summary Dashboard

Sea Level Rise Interactive Map
Outcomes

The “Roadmap” outlines a set of actions that can be taken to plan for infrastructure resilience.
Risk Assessment Exercise* – A Few Key Findings

Inland Flooding Scenarios
- **Major Risk** for Transportation and Stormwater Infrastructure

Temperature Scenarios
- **Major Risk** to Energy Infrastructure and Vulnerable Populations

Sea Level Rise/Coastal Storm Surge Scenarios
- **Major Risk** to National Airport, GW Parkway, Four Mile Run, and Alexandria waterfront
- DOD Mission activities along shoreline (Langley Airfield, Navy Yard, Anacostia and Ft Belvoir)

*Workshop conducted in March 2019 in partnership with Booz Allen Hamilton
NVRC/GMU/AGU Partnership to Develop Flood Resilience Framework

What will global climate change plus increased urbanization mean for storm water infrastructure in northern Virginia?

Surface temperature change 1986–2015 (relative to 1901–1960); global mean 1.2°F (Courtesy NOAA NCEI)

* https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6
NVRC, GMU Center for Ocean-Land-Atmosphere Studies and Flood Hazards Research Lab working to develop a flood resilience framework for the region.

NLDAS air temperature at its native resolution and at the downscaled 1 km resolution across Northern Virginia on January 1, 2017.
Who is Affected by Rising Water Levels at 5 Feet of SLR?

- Approximately 917 households*
- Equity
- Vulnerable populations: Lower Income & Senior Citizens

*The Number of displaced households is an initial estimate and is subject to change pending outcome of additional mapping analysis that is ongoing.

Note: U.S. Census Bureau income data is not provided because it is unreliable for very small areas such as the flood impact areas due to the sample size of the data.

<table>
<thead>
<tr>
<th>Location</th>
<th>Displaced Households</th>
<th>Population Age 65 or Over % (2010 Census)</th>
<th>Minority Population(1) % (2010 Census)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parc Meridian Apartments at Eisenhower, Alexandria (high-rise)</td>
<td>505</td>
<td>0.7%</td>
<td>55.6%</td>
</tr>
<tr>
<td>Porto Vecchio Condominium of Alexandria (high-rise)</td>
<td>170</td>
<td>19.8%</td>
<td>28.4%</td>
</tr>
<tr>
<td>Old Town Alexandria</td>
<td>147</td>
<td>17.5%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Belle Haven neighborhood of Alexandria</td>
<td>64</td>
<td>11.0%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Bay St, Woodbridge</td>
<td>11</td>
<td>18.6%</td>
<td>25.5%</td>
</tr>
<tr>
<td>Huntington Metro area of Alexandria</td>
<td>8</td>
<td>4.0%</td>
<td>54.4%</td>
</tr>
<tr>
<td>Burke Dr, Alexandria (near Mount Vernon)</td>
<td>4</td>
<td>NA(2)</td>
<td>NA(2)</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>NA(2)</td>
<td>NA(2)</td>
</tr>
<tr>
<td>Total</td>
<td>917</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

(1) Minority is defined as anyone who identifies as hispanic/latino or non-white.

(2) The number of housing units impacted compared to the total number of housing units of the census block is too small to provide reliable age estimates for the impact area.
What is Affected by Rising Water Levels?

- At 5 ft., $778,849,477 of assessed property
  - Improved structures comprise the greatest impact
- Infrastructure
  - Roads
  - Railroad tracks
  - Parks
  - Parking garages (ground level and underground)
  - Street-side parked cars
  - Cultural and Historic Sites
EO-24 Increasing Virginia’s Resilience To Sea Level Rise And Natural Hazards

- Resilience Master Plan for all of coastal Virginia
- Intended to frame actions we need to take today
- Prioritizes Nature Based Features that provide multiple benefits
- NVRC is actively contributing to this plan

Rear Admiral Ann Phillips, Special Assistant to the Governor for Coastal Adaptation and Protection, State of Virginia
Balancing Grey and Green Infrastructure

Dewey’s Creek Stream Restoration in Prince William County won project of the year award from American Public Works Association.

Venlo City Hall: 21,500-square-foot living wall absorbs 30 percent of airborne sulfur and nitrogen oxides. The Netherlands: http://www.c2c-centre.com/project/venlo-city-hall
Deliverables Anticipated by November 2020

✓ Dashboard of Potential Future Scenarios for Heat, Precipitation, and Sea Level Rise for Northern Virginia
✓ Regional Heat Island Map
✓ Northern Virginia Flood Resilience Framework
✓ Proceedings from Northern Virginia Climate Resilience Workgroup
✓ Innovative pilot projects
✓ Development of innovative regional partnerships to strengthen collaboration
✓ Development of resilient projects database
✓ Recommendations for policy and infrastructure
✓ Recommendations for next steps including preparing Design Guidelines
Thank You
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