City of Virginia Beach Comprehensive Sea Level Rise and Recurrent Flooding Response Plan

Study Overview

December 6, 2017
SLR and Recurrent Flooding

Last 50 years = ~0.9 ft increase in Hampton Roads
SLR and Recurrent Flooding

In 1950, it would take a considerable amount of water caused by a large storm such as a hurricane to cause nuisance flooding. Nuisance flooding was infrequent.

In 2010, with higher relative sea level, it no longer takes a strong storm or hurricane to cause flooding. Now, nuisance flooding is frequent and can be caused merely by high tide.

How is local elevation important to nuisance flooding? The relationship between local elevation and the high tide line determines the rate of nuisance flooding. If they are close to the same in elevation, flooding is frequent. If they are not close, flooding is infrequent.
City Response to Recurrent Flood Issues

- Virginia Beach City Council provided funding for a comprehensive sea level rise and recurrent flooding assessment and response plan in FY15
- Dewberry, a national consultant firm, retained by the City to conduct study in January 2015
- City awarded $850k grant from NOAA in March 2016
- Collaborative effort with Stormwater Master Plan
Study Goal and Outcomes

Goal:
Produce information and strategies that will enable Virginia Beach to establish long-term resilience to sea level rise and associated recurrent flooding

Outcomes:

• A full understanding of flood risk and anticipated changes over planning and infrastructure time horizons

• Risk-informed strategies, including engineered protection and policy to reduce short and long-term impacts

• City-wide and watershed “action plans” for strategy implementation

• A fine-tuned public outreach process to advance resilience initiatives
Watershed Level Plans

• Economic and environmental diversity require 4 distinct plans

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<tr>
<th>Planning Area/ Natural Resources</th>
<th>Defining Characteristics</th>
<th>Challenges</th>
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<tr>
<td>Lynnhaven / Tidal sheltered bay, estuarine, fringing marsh</td>
<td>Mixed residential, military, commercial, lower elevation properties with high tax base. High quality natural resources. Assets at vulnerable elevations.</td>
<td>Addressing repetitive losses from recurrent flooding and preservation of low-lying natural resources.</td>
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<tr>
<td>Oceanfront / Ocean, headland beaches, tidal inlet, bay</td>
<td>Dense commercial and residential development. Tourism as primary economic driver. Redevelopment opportunities. USACE Civil Works flood risk reduction project.</td>
<td>Protecting existing development and economic base while instilling resilience as a keystone in redevelopment.</td>
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<tr>
<td>Elizabeth River / Estuarine, fringing marshes</td>
<td>Dense residential, commercial, industrial development. Aging infrastructure.</td>
<td>Upgrading infrastructure and maintaining water-based industrial economy with higher sea levels.</td>
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<td>Southern / Ocean, barrier beaches, back bays and extensive marshes</td>
<td>Light residential, military, rural, recreational, waterfowl and land preserves. Agriculture important economic concern. Low elevation gradients.</td>
<td>Establishing land use strategies that preserve resources and limit new development and infrastructure in areas susceptible to future flooding.</td>
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Comprehensive SLR Study Approach

1. Sea Level Rise/ Recurrent Flooding Impacts
   Defining the problem

2. Adaptation Strategies
   Tailoring the solutions

3. Implementation
   Planning the actions
Combined Flooding

- Higher coastal water levels diminish stormwater system performance

- Coastal Flooding

- Stormwater Conveyance

- Combined Flooding
Flood Assessment Conditions

- **Tidal**
  - Daily tidal flooding
  - Future permanent inundation
  - Defined by NOAA, Mean Higher High Water

- **Nuisance**
  - Wind-driven surge, extreme tide events
  - Repetitive losses/
    loss of function or service
  - Defined by water level analysis

- **Storm Surge**
  - Nor’easters, tropical storms, hurricanes
  - 10-, 25-, 50-, 100-, 500-yr recurrence intervals
  - Defined by probabilistic analysis
Phase 1: Flooding Impacts

Flood Mapping

- 10-yr Recurrence Interval

Legend:
- Today
- 1.5 ft SLR
- 3 ft SLR

Flood Risk Analysis

Legend:
- Total Loss
  - Low
  - Mild
  - Moderate
  - High
  - Severe
## Phase 2: Adaptation Strategies

### Planning & Policy

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<td>Short and Long-term Planning</td>
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<td>Government Operations and Administration</td>
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<td>Regulatory</td>
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<td>Spending</td>
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<tr>
<td>Tax and Market-Based Incentives</td>
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<td>Public Awareness and Education</td>
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<td>Funding</td>
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### Engineering

![Engineering Images]
Phase 3: Implementation

- Design & Costs
- Funding
- Response Plans
- Coordination Outreach

Implementation

RESILIENCY
Public Engagement

• Capturing Perceptions, Increasing Awareness
  Winter 2017

• Solution Perspectives
  Summer to Fall 2018

• Plan Outreach
  Fall 2018 to Spring 2019
Points of Contact

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