CASE STUDY

WATER AND WASTEWATER PLANNING FOR RESILIENCE

MARYLAND – The Cities of Cambridge and Crisfield and the Town of Chesapeake Beach

The US EPA's Creating Resilient Water Utilities (CRWU) initiative assisted the City of Cambridge, the City of Crisfield, and the Town of Chesapeake Beach with a climate change risk assessment using its Climate Resilience Evaluation and Awareness Tool (CREAT). The assessment brought together individuals from Cambridge, Crisfield, Chesapeake Beach, and CRWU to think critically about climate change impacts, vulnerable utility assets, potential adaptive measures, and the monetized risk reduction that could result from implementing the adaptive measures.

ABOUT

Cambridge manages a public wastewater system that borders the Choptank River and serves 16,000 residents. It treats an average flow of about 4 million gallons per day (MGD).

Crisfield provides stormwater services for a population of approximately 2,400 located on the Tangier Sound, an arm of the Chesapeake Bay. The system is designed to handle flow from an average storm of about 1 million gallons per day (MGD).

The Chesapeake Beach Water Reclamation Treatment Plant (CBWRTP) services Chesapeake Beach and the Town of North Beach, as well as portions of Calvert County and Anne Arundel County. It is an enhanced nutrient removal plant that treats an average flow of 1 MGD.

CLIMATE CHANGE CHALLENGES

Many coastal communities in the Chesapeake Bay region have historically faced flooding threats, which are expected to worsen due to climate change. The three coastal municipalities of Cambridge, Chesapeake Beach, and Crisfield face ongoing flooding impacts from a combination of coastal storm surge, intense precipitation events, tidal flooding, and sea level rise. Flooding is increasingly overwhelming the municipalities' stormwater systems and affecting the ability of the wastewater systems to provide reliable services.

While each of the three municipalities face significant flooding challenges, their profiles and priorities differ. Cambridge borders the Choptank River and focused the CREAT assessment on flood impacts to three wastewater pump stations. Nearly all of Crisfield lies in the floodplain, so the city used CREAT to evaluate a particularly vulnerable section of their ditch-based stormwater management system. Chesapeake Beach focused on their water reclamation treatment plant, which serves multiple jurisdictions and faces both accessibility and operations challenges due to flooding events.

RESILIENCE STRATEGIES AND PRIORITIES

Cambridge, Chesapeake Beach, and Crisfield have already implemented several current adaptive measures to address flooding and are considering implementing additional potential adaptive measures to further enhance their resilience to climate change.

Current Adaptive Measures – Cambridge

- Pump Station Inspection and Monitoring: Monitor and inspect pump stations to inform assessments.

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- Control Elevation: Raise controls higher off ground to reduce impacts from flooding.
- Back-Up Power: Trenton Street Pump Station includes an on-site generator for backup power supply.

Potential Adaptive Measures – Cambridge

- Further Elevate Controls: Further elevate controls to account for projected increases in flooding inundation height.
- Low-Cost Flood-Proofing: Make manhole cover watertight and add communication system to provide flood alert for Belvedere Avenue Pump Station; add waterproof door for Bay Street Pump Station; seal masonry and openings for Trenton Street Pump Station.
- High-Cost Flood-Proofing: Add perimeter flood wall or other barrier around the building to protect against higher flood elevations for Bay Street Pump Station; add perimeter flood barrier (wall or berm) around both the pump station building and grit chamber for Trenton Street Pump Station

Current Adaptive Measures – Chesapeake Beach

- Alternate Wastewater/Stormwater Capabilities: Off-site storage for high-flow events to divert flow during peak infiltration and inundation (I&I) events.
- Back-Up Power: Alternate on-site back-up power supply.
- Infrastructure Inspection: Conduct inspections of infrastructure to assess failure risk under projected climate conditions.
- Sea Level Rise & Storm Surge Models: Model sea level rise and storm surge to inform protection of critical infrastructure.
- Wetlands for Flood Protection: Maintain natural wetlands for additional flood protection.

Potential Adaptive Measures – Chesapeake Beach

- Additional Access Road to Facility: Construct additional access road to the facility at higher elevations to ensure site accessibility during flooding events.
- Flow Isolation: Mitigate high flow rates by installing physical control measures.
- Stakeholder/Partner Engagement: Develop relationships and shared decision-making tools with stakeholders/partners to improve response to I&I and high-flow events.
- Weather Forecast Monitoring: Integrate weather forecast monitoring into system operations.

FINANCING

The federal government has made unprecedented levels of funding available for reinvesting in our Nation's drinking water, wastewater, and stormwater infrastructure through the Bipartisan Infrastructure Law. Building knowledge and experience in adaptation planning can empower communities to pursue funding to implement their resilience plans. Federal programs, such as EPA's Clean Water and Drinking Water State Revolving Fund programs, can be used to fund eligible projects that increase climate resilience, particularly for communities that have historically faced challenges in accessing available funds, such as smaller utilities, underserved communities, and tribal entities.

All three Maryland Municipalities can utilize their CREAT results as supplemental materials to support grant applications. This additional information may give granting agencies more reason to fund a project. Crisfield, for example, could use the CREAT results to both 1) further justify investment in ditch maintenance to improve short-term resilience and, 2) make the case for funding conversion to a closed system to bolster longer-term resilience.

Current Adaptive Measures – Crisfield

- Infrastructure Monitoring and Inspection: Monitor and inspect infrastructure to inform drainage assessments.
- Reactive Ditch Dredging: Resolve drainage issues based on community complaints.
- Existing Tide Gates and Stormwater Pumping Station: Regulate flow of stormwater and reduce nuisance flooding from incoming tidal water.

Potential Adaptive Measures – Crisfield

- Ditch Maintenance: Annual dredging of ditches throughout the system, to include: securing easements for ditches, grading for flow, purchasing equipment to perform dredging, and maintenance implementation by staff or contractor.
- Convert to Closed System: Convert the stormwater drainage system from an open system to a closed system.

The adaptive measures were analyzed under both a Baseline Climate Scenario, which is based on historical climate observations, and a Projected Climate Scenario with higher rainfall, more-intense storms, and sea level rise. While not all the adaptive measures would be cost effective under the Baseline Climate Scenario, the CREAT assessment results suggest that all the potential adaptive measures across all three municipalities could result in a positive return on investment under a Projected Climate Scenario. For example, while the costs to implement the Convert to Closed System plan for Crisfield would exceed potential risk reduction benefits under the Baseline Climate Scenario, the benefits are expected to exceed the implementation costs under the Projected Climate Scenario. Both Cambridge's low-cost and high-cost flood-proofing plans would be cost-effective under the Projected Climate Scenario, with the higher-cost plan resulting in even greater returns on investment. For Chesapeake Beach, grouping all the potential adaptative measures into a single all-inclusive plan was not cost effective under the Baseline Climate Scenario, but results in significant monetized risk reduction under the Projected Climate Scenario.

IMPLEMENTING RESILIENT INFRASTRUCTURE PROJECTS

Each municipality is interested in using their CREAT assessment results to improve existing projects and grant proposals. For Cambridge, the CREAT results can inform implementation of their *Shoreline Resilience Plan* and the *Make Cambridge Resilient Flood Mitigation Community Development Program*. The CREAT results can help shape the process for determining which improvements are feasible, cost-effective, and beneficial for improving the resilience of the three pump stations. Chesapeake Beach can use their CREAT results to help prioritize projects to improve resilience of the CBWRTP, and to inform discussions with other jurisdiction stakeholders. Crisfield has developed a *Drainage Assessment Report* to examine fifteen of the highest priority areas for flooding. The report outlines project options to address the increasing flooding risk and build resilience for critical infrastructure and the community. Crisfield's CREAT results can help determine the cost effectiveness of ditch maintenance and other measures proposed in the report.