



# COUNTY WATER SYSTEMS: STRATEGIES FOR DEVELOPING RESILIENT INFRASTRUCTURE



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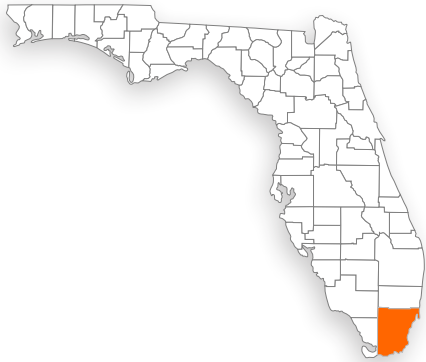
## INTRODUCTION

Water systems across the U.S. are rapidly aging and facing a growing number of unfunded federal and state mandates. With declining budgets, counties are struggling with how to upgrade and modernize their drinking water and wastewater systems to meet increased water quality and storm water management requirements. In 2012 alone, counties spent a total of \$32.3 billion on the management and maintenance of water, sewerage and/or solid waste facilities nationally.<sup>1</sup> To address this growing challenge, counties need to exercise creativity at the local level.

This publication highlights innovative county water infrastructure project case studies that bolster resiliency at the local level, while reducing overall costs. Miami-Dade County, Fla. and Prince George's County, Md. have both established strategic partnerships to determine how to most efficiently upgrade and construct more resilient water systems. In each case, the counties have found success in increased local stakeholder engagement and streamlined internal processes.

# Miami-Dade County, Florida

POPULATION: 2.6 MILLION



Miami-Dade County is an urban county in southeastern Florida that frequently experiences flooding. Sitting only six-feet above sea level, the county water system has 14,000 miles of underground pipes, 1,046 pump stations, three regional water treatment plants and five small auxiliary treatment facilities which are threatened by heavy rainfall, storm surges and sea level rise (SLR).<sup>ii</sup> These threats highlight the challenges facing Miami-Dade as they work to protect the county's water supply and the health of the surrounding Atlantic Ocean.

## THE CHALLENGE

In 2008, the state of Florida passed legislation requiring wastewater utilities in southeast Florida to stop discharging treated wastewater directly into the ocean by 2025. This was estimated to cost Miami-Dade County anywhere from \$4.4 billion to upgrade all existing facilities to \$7.6 billion to relocate one of the plants in a less flood prone area.<sup>iii</sup>

## THE PROJECT

In 2014, Miami-Dade County engaged CH2M, an engineering consulting firm, to oversee the county's 11-year, \$3.3 billion program to upgrade their water facilities. Together with CH2M, the county's Water and Sewer Department (WASD) undertook a comprehensive evaluation and analysis of the county's flood risk for SLR, precipitation, wind and storm surge.

To ensure the county weighed all factors closely, including potential costs, Miami-Dade County consulted with partners from both within and outside the county. These critical partners included:

- Southeast Florida Regional Climate Change Compact (the Compact), which coordinates mitigation and adaptation activities across Broward, Miami-Dade, Monroe and Palm Beach Counties;
- Miami-Dade County Department of Environmental Resources Management (DERM), which works to protect Miami-Dade's water quality, drinking water supply, air quality and natural resources; and
- Miami-Dade County Office of Resilience (formerly the Office of Sustainability), which works to protect and enhance the county's environmental quality and livability by integrating resilience concepts into county programs, operations and policy.

In 2015, WASD and CH2M released its "Facility Hardening Design Guidelines" that set out a variety of design options and potential costs for WASD staff to use in county wastewater

treatment and pump station design. Their recommendations focused primarily on repair, replacement, upgrade and capacity expansions of existing water systems in order to help county staff make effective decisions regarding the protection of county wastewater assets.

## THE OUTCOMES

As a result of the partnership and CH2M's work, WASD was able to identify several potential areas for action:

- **Flood modeling.** After the guidelines were completed, WASD concluded that the flood modeling data used was insufficient. The team is currently working to obtain higher resolution models in order to give WASD more accurate data on projected flood elevations.
- **Shorter planning horizon.** The original guidelines used a planning horizon of 2075. Based on feedback from WASD, the team decided to complete a new set of models for a planning horizon of 2040 to encompass fewer critical facilities and pump stations that have a shorter service life.



*An aerial photo of the WASD South District Waste Water Treatment Plant.*



- **Alternatives menu.** The guidelines include a section that provides WASD staff alternative options to protect a wastewater facility, such as putting a sandbag at the facility door or elevating and flood-proofing an electrical panel. The second version of the guidelines will include a more prescriptive matrix with a decision flow chart, allowing WASD staff to be more uniform in their decision making. For example, recommendations could include moving the facility out of the floodplain, raising the elevation of critical systems (i.e. electrical panels, pump motors, etc.) or, if moving the facility or raising the elevation are not possible, waterproofing the system by putting it in a watertight tank or adding a watertight door.

## THE LESSONS LEARNED

- **Don't get hung up in the science.** While some scenario planning is necessary, it is difficult to plan for every scenario. When possible, partner with other county departments or outside groups that have already undertaken comprehensive research and study. This could include a local science group that has measured a range of projections in your county. Partner with them instead of trying to reinvent the wheel.
- **Scenario planning is tied to asset management planning.** If your county has completed an asset management plan, your county is likely halfway done prioritizing climate resilience options. Most asset management plans include risk assessments, which are based on criticality and consequences of failure.
- **Engage local community groups.** It is important to partner with local organizations to have community input in the plan and to gain a variety of perspectives. Without local buy-in and feedback, it is less likely that plans will succeed.

## CRITICALITY

*To determine criticality, the County examined the sizes and types of neighborhoods that the assets and systems serve in order to minimize prolonged service interruption. For example, a system that serves several hundred thousand people and/or emergency shelters, first responders, hospitals or schools would have a higher criticality score.*

## CONSEQUENCES OF FAILURE

*County wastewater facilities include electrical systems, mechanical systems (pumps and motors), power supply and ingress/egress routes. To determine the consequences of a facility's failure to operate, the county examines what would be the damage to the economy, to the environment, to the county's reputation, etc. based on where the facility is located.*



## NATURE-BASED INFRASTRUCTURE SOLUTIONS

Miami-Dade is not focusing solely on gray infrastructure improvements but is also exploring nature-based (or green) infrastructure investments and non-structural measures, which include updating emergency response plans and land use planning. Networks of green infrastructure, in conjunction with gray infrastructure, can enhance community resiliency by increasing water supplies, reducing flooding and improving water quality.<sup>iv</sup> In a new partnership with The Nature Conservancy (TNC), the county is working to install nature-based “infrastructure” like oyster reefs and additional mangrove forests along its coastal shorelines, with the intent to better protect against storm surge and rising sea levels while providing improved coastal wetland habitats. In particular, this pilot study will be a model to evaluate the benefits of mangrove habitats as protection for wastewater treatment plants against future SLR and storm surge.<sup>v</sup>

### GRAY INFRASTRUCTURE

refers to man-made infrastructure, such as roadways and drainage pipes.

It is made of cement and asphalt, which prevent water from soaking into the soil and allow huge volumes of fast-moving storm water to flow directly into streams.

### GREEN INFRASTRUCTURE

refers to nature-based infrastructure solutions, such as rain gardens, green roofs, and regional conservation land planning. It uses vegetation, soils, and natural processes to create healthier environments.

# Prince George's County, Maryland

POPULATION: 909,535



Prince George's County, Maryland, a suburban county bordering the eastern edge of Washington, D.C., is located within the Chesapeake Bay Watershed. The county's landscape, which was once dominated by woodlands and open fields, is now encased in cement and asphalt. This transformation has led to increased water quality issues from storm water runoff of fertilizers, pesticides and motor oil. This runoff moves directly into the county's streams and rivers, which in turn flow into the Chesapeake Bay and endanger local water quality standards.

## THE CHALLENGE

The Chesapeake Bay Watershed is subject to the six-state Chesapeake Bay agreement. Under the agreement, Maryland, Delaware, New York, Pennsylvania, Virginia and West Virginia are charged to work together to clean up the bay by setting tighter water pollution limits on their residents, businesses and local governments. While Prince George's and



other local government jurisdictions within the watershed have been working to clean up the bay since the 1980s, the efforts to date have been deemed largely insufficient due to local infrastructure challenges and budget constraints.

In 2014, the state of Maryland reissued a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit to Prince George's County.<sup>vi</sup> As part of its renewed permit, the county is subject to more stringent storm-water requirements, including specific Total Maximum Daily Load (TMDL) water pollution limits. The county estimated that it would cost them \$100 million to meet the new MS4 requirements if they used traditional project delivery methods.<sup>vii</sup>

## THE PROJECT

To meet these new water quality requirements, the county decided to pursue an innovative model which allows the county to share risks and benefits with a private partner. Known as a community-based public private partnership (CBP3), this model gave the county an opportunity to bring new resources to the community. In March 2015, the county entered into a 30-year agreement with Corvias Solutions, commonly referred to as the Clean Water Partnership (CWP).

Corvias Solutions serves as the program manager; they manage the design, construction, operation, maintenance and outcomes of the program. Prince George's County Department of the Environment (DoE) is responsible for oversight and protection of the community's long term interests. Through the CWP, the county and Corvias Solutions focus on making tangible local impacts beyond regulatory compliance, particularly those that benefit the community. Instead of using traditional grey infrastructure, CWP uses smaller green infrastructure and low impact development projects that are pleasing to the eye such as rain gardens, permeable pavement and green roofs.

For the initial three years, the county has committed \$100 million for retrofit costs. To ensure the county has a benchmark to compare Corvias Solutions' new methods to the county's traditional methods, the county will continue to use existing procurement processes during this period.

## THE OUTCOMES

While it is too early to measure the impact CWP has had on Prince George's County's storm water discharge targets, some tangible outcomes have been observed. These include an increase in mini-partnerships with local stakeholders, such as:

- **Churches.** Early on, the county identified local churches as important to the success of the partnership. There are approximately 600 churches within the county, accounting for close to 300,000 parishioners combined. To access this audience, the county met early on with church leaders to explain storm water management in layman's terms in order to help them understand and educate their congregations about sustainability and stewardship.
- **Schools.** The county has engaged over 60 Prince George's County Public Schools in its education and campus improvement efforts. Not only is the county working with 18 schools on outdoor experiential educational opportunities such as school rain gardens, it is also redesigning its storm water templates to be more classroom-friendly.
- **Chesapeake Bay Trust.** In partnership with Chesapeake Bay Trust, the county has made \$2 million in grants available annually for private property owners to do their own storm water improvements, including planting new trees and other vegetation. The Trust will manage the grant process, saving the county time, money and human resources.



Churches can have a huge environmental impact on water infrastructure systems as a result of their expansive parking lots and roofs. Prince George's County has had 130 churches volunteer their properties for stormwater retrofit since the CWP began.



Additionally, Prince George's County has improved several of its internal government processes. Prior to the CWP, the county's Permitting, Inspections and Enforcement Office controlled all permitting processes. Once the CWP was established, in order to expedite the permitting timeline, DoE negotiated to gain authority over restoration permitting, allowing them to cut their permitting timeline from six to twelve months down to only six to eight weeks.

## THE LESSONS LEARNED

Adam Ortiz, the director of Prince George's County's Department of Environment, observed, "The government has limitations, so we need to leverage every possible stakeholder. Because we've had a very open and engaged approach we've gotten so much more done than ever before. We are quickly closing in on our goals and breaking records for production. We have received substantial grants money and have a multiplicity of partners working on different parts of the overall effort. Our success is not due to the government as the doer of everything, but as a partner and convener for authentic and broad engagement of a growing list of public, nonprofit, and private stakeholders."<sup>viii</sup> He summarized the county's lessons learned into three categories:

- **Political and social alignment.** The county learned the importance of keeping project goals broad, to include social goals and encourage broader community buy-in.
- **Internal administration and efficiencies.** The CWP has led to radical change within Prince George's County government. It required changes in both process and mentality, not only within the DoE, but also across other county departments. As with the permitting office, the county is currently working to increase efficiencies in invoicing and payment processing in order to ensure that Corvias Solutions is able to pay their small local and minority-owned subcontractors promptly.
- **Overestimate time needed for community engagement.** While the county always saw community engagement as a prerequisite for any project, it did not anticipate how much time it would take. Projects have required two to three times as many meetings as anticipated.

## CONCLUSION

Water and wastewater management are vital to a county's health, both for its residents and its environment. Whether in preparation for future disaster events or in response to common issues, counties must meet their mandated water quality and system requirements. Healthy water systems are crucial to the well-being of families and businesses. The counties highlighted in this report demonstrate the importance of partnerships and community involvement to county water infrastructure programs and projects. By engaging a variety of stakeholders and planning strategically for the short- and long-term, counties can best meet their budgetary needs and the needs of the community.





## ADDITIONAL RESOURCES

### MIAMI-DADE COUNTY

- [www.miamidade.gov/water/](http://www.miamidade.gov/water/)
- [www.ch2m.com/](http://www.ch2m.com/)
- [www.southeastfloridaclimatecompact.org/](http://www.southeastfloridaclimatecompact.org/)
- [www.miamidade.gov/environment/](http://www.miamidade.gov/environment/)
- [www.miamidade.gov/planning/resilience.asp](http://www.miamidade.gov/planning/resilience.asp)

### PRINCE GEORGE'S COUNTY

- [www.princegeorgescountymd.gov/179/Environment](http://www.princegeorgescountymd.gov/179/Environment)
- [www.corvias.com/government-partnerships](http://www.corvias.com/government-partnerships)
- [www.cbtrust.org/site/c.miJPKXPCJnH/b.5368633/k.BDEA/Home.htm](http://www.cbtrust.org/site/c.miJPKXPCJnH/b.5368633/k.BDEA/Home.htm)
- <http://lowimpactdevelopment.org/>

## ENDNOTES

<sup>i</sup> NACo Analysis of County Expenditures.

<sup>ii</sup> "Value of Water," Miami-Dade Water and Sewer Department, [www.miamidade.gov/water/library/flyers/value-of-water.pdf](http://www.miamidade.gov/water/library/flyers/value-of-water.pdf).

<sup>iii</sup> "Ocean Out Fall Legislation Compliance Plan," Miami-Dade Water and Sewer Department. 28 Jun. 2016.

<sup>iv</sup> "Green Infrastructure and Climate Change Collaborating to Improve Community Resiliency," U.S. Environmental Protection Agency, [www.epa.gov/sites/production/files/2016-08/documents/gi\\_climate\\_charrettes\\_final\\_508\\_2.pdf](http://www.epa.gov/sites/production/files/2016-08/documents/gi_climate_charrettes_final_508_2.pdf)

<sup>v</sup> "Building Climate Resilience with Nature," The Nature Conservancy, [www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/newsroom/florida-resilience-projects-at-wagner-creek-and-south-dade-wetlands.xml](http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/newsroom/florida-resilience-projects-at-wagner-creek-and-south-dade-wetlands.xml).

<sup>vi</sup> "About," Clean Water Partnership, <http://thecleanwaterpartnership.com/>.

<sup>vii</sup> Interview with Adam Ortiz, Director, Department of the Environment, Prince George's County, Md. 9 Nov. 2016.

# ABOUT THE NATIONAL ASSOCIATION OF COUNTIES

The National Association of Counties (NACo) unites America's 3,069 county governments. Founded in 1935, NACo brings county officials together to advocate with a collective voice on national policy, exchange ideas and build new leadership skills, pursue transformational county solutions, enrich the public's understanding of county government and exercise exemplary leadership in public service. More information at: [www.naco.org](http://www.naco.org).

# ABOUT NACo's RESILIENT COUNTIES INITIATIVE

Through the Resilient Counties initiative, NACo works with counties and their stakeholders to bolster their ability to thrive amid changing physical, environmental, social and economic conditions. Hurricanes, wildfires, economic collapse, and other disasters can be natural or man-made, acute or long-term, foreseeable or unpredictable. Preparation for and recovery from such events requires both long-term planning and immediate action.

NACo works to strengthen county resiliency by building leadership capacity to identify and manage risk, and allow counties to become more flexible and responsive. Through the use of sustainable practices and infrastructure, counties will be better prepared to address these issues in a manner that can minimize the impact on local residents and businesses, while helping counties save money. Within this practice area, NACo convenes public- and private-sector stakeholders, produces special reports, develops webinars, and hosts workshops.



## ACKNOWLEDGMENTS

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To request copies of this publication or other materials about the National Association of Counties, please contact: Jenna Moran, NACo program manager, [jmoran@naco.org](mailto:jmoran@naco.org), 202-942-4224.



660 NORTH CAPITOL ST. NW • SUITE 400 • WASHINGTON, D.C. 20001  
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