

Sewerage and Water Board of New Orleans

Written Response and Firm Profile
for Integrated Master Planning RFI





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Submitted via email to pwallace@swbno.org

February 18, 2020

Ms. Patti J. Wallace
Purchasing Director
Sewerage and Water Board of New Orleans
625 St. Joseph Street, Room 131
New Orleans, LA 70165

Subject: Written Response and Firm Profile for Integrated Master Planning RFI

Dear Ms. Wallace and Members of the Selection Committee:

With the Integrated Master Planning RFI, the Sewerage and Water Board of New Orleans (SWBNO) is to be commended for taking this important and ambitious first step to prepare for the next half century. Having worked side-by-side with you for more than 30 years, we understand that the integrated master plan is key to SWBNO's transformation into a more efficient and proactive utility. Jacobs is ready to help SWBNO realize your vision, as well as plan for meeting your long-range goals and challenges, over the next 50 years.

As innovators and problem solvers, we question and reimagine what's possible to help propel clients to reinvent tomorrow. Here's how we can partner with SWBNO to develop an innovative long-range integrated master plan for each key business line that will help solidify New Orleans' future, improve quality of life, and maximize value with multiple community benefits:

- **Industry Leaders Bring Lessons Learned and Best Practices to Share** | We offer experts in integrated master planning, stormwater/drainage, wastewater/sewerage, drinking water, conveyance, blue and green infrastructure, climate escalation, and other related disciplines. Having delivered similar projects around the world, our specialists understand the complicated network of infrastructure systems, natural systems, and social systems that connect us. We have the expertise to provide a holistic perspective.
- **Integrated Master Planning Experience Offers a Collaborative Approach to Address Your Challenges** | We have developed integrated master plans for utility clients around the globe with similar environments and circumstances to what SWBNO faces today. We understand that an integrated system plan will need to be flexible and adaptable so that SWBNO can continue to deliver community-focused outcomes regardless of future growth, climate change impacts, and regulatory requirements. In addition to our experience, we bring innovative ideas and approaches that are imperative for a long-range planning process involving stakeholders — we are collaborative, creative, flexible, and inclusive.

- **Working and Living in New Orleans Provides Local Insight** | Our local employees are the foundation of our project teams, providing invaluable input when building a complete picture of the community. We understand that one of the goals of your integrated master plan is to improve the quality of life for the community. As residents of New Orleans, we want to be part of the team that solves our region's toughest challenges. Currently, we are working with SWBNO on the Power Master Plan and our insights from this effort can be efficiently segued into this integrated master planning effort.

We are interested in participating in this RFI process and would be honored to have the opportunity to participate in any future workshops. As the primary contact, please contact me at 504-357-3375 or amanda.gaze@jacobs.com if you have any questions.

Sincerely,
Jacobs Engineering Group Inc.



Amanda Gaze
SWBNO Program Manager



Chrissy Thom
Global Solutions & Technology Leader

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Written Responses

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QUESTION

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What will be New Orleans' biggest **stormwater/drainage** challenges in 50 years and what is the best approach to integrated, long-range planning to address those challenges?

Challenges and Approach

The New Orleans stormwater and drainage system has a significant number of infrastructure challenges that will be under increased pressure due to regulatory changes and organizational constraints, community and customer expectations, operational challenges, and escalating climate impacts. An integrated approach can address these challenges as well as provide enhanced and expanded outcomes to New Orleans.

Infrastructure Challenges

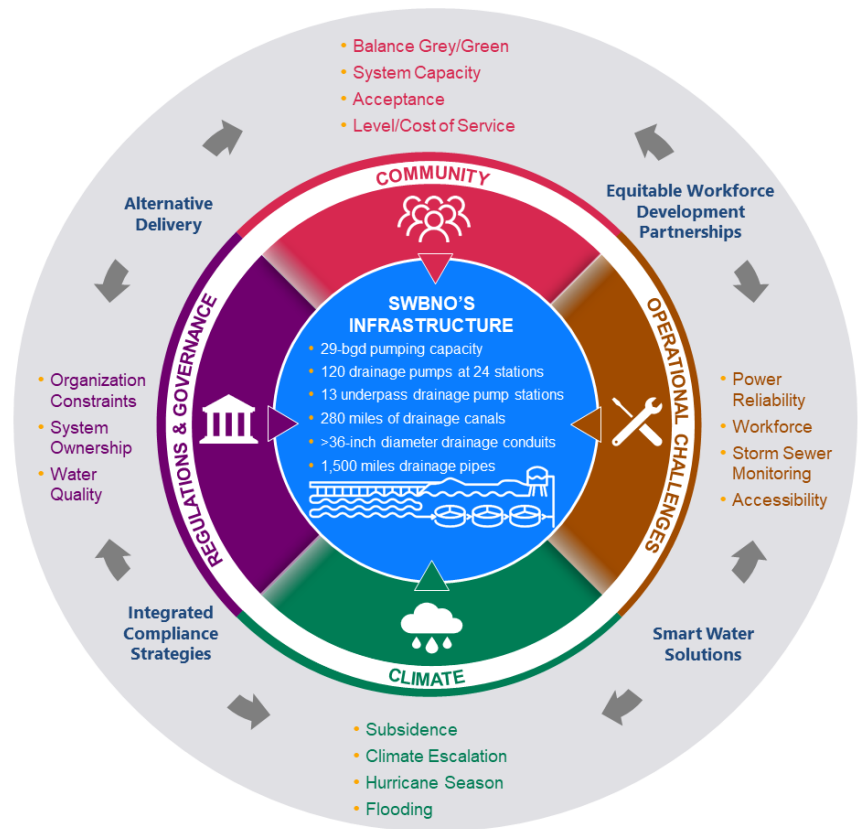
Insufficient System Capacity | System improvements continue to be made (e.g., the Southeast Louisiana Urban Flood Control Program) that provide added public health and safety benefits. More effort will be needed to address all system capacity needs. A tiered approach, such as prioritizing critical infrastructure and maintaining accessibility for emergency responders, can phase necessary capital improvements to maximize value within cost and implementation constraints.

Balancing Green, Gray and Blue Infrastructure | The Urban Water Plan offers a strong visioning document and framework for green infrastructure implementation into the New Orleans landscape. However, it lacks a gray infrastructure element to address peak events and support the proposed green infrastructure stormwater management solutions. Blending elements from both infrastructure approaches will be key to a stormwater management paradigm that responds to the environmental challenges of subsidence and climate escalation.

Community and Customer Expectations

To demonstrate maximum value to ratepayers, an integrated plan will need to align with the values of the community and expectations for level of service (LOS). A well-conceived and executed plan will engage the community and provide enhancements (including social equity) while maintaining affordability.

Exhibit 1. Key Challenges Impacting SWBNO's Stormwater and Drainage Infrastructure




The Lick Run urban waterway restoration in Cincinnati involved integration of water, sewer, stormwater, flooding, water quality, parks, brownfields, roadways, and revitalization of underserved neighborhoods; garnering strong community support.

	Community Challenge	Integrated Approach
Equity and Underserved Community Value	Because underserved communities often are the most vulnerable to floods and climate risks, they should have a role in decision-making and share in the benefits of improvements.	Employ a range of tools to identify key determinants of equity, engage community partners and champions, and develop measurable goals to evaluate how infrastructure investments can enhance equity in underserved areas.
Community Acceptance	Fully embracing concepts such as “living with water” (particularly due to concerns from the major flooding events related to 2005 levee breaches and 2017 storm events). However, community acceptance is critical for residents to support the fees necessary to improve the system.	Aligning with the comprehensive outreach campaign can foster a new shared understanding about temporary standing water, especially when the community-enhancing co-benefits of blue and green infrastructure are highlighted and demonstrated. Utilizing potential partnerships with the many local water and sustainability programs throughout the city can leverage multiple champions of the outcomes from the integrated master plan.
Level of Service	SWBNO will need to gain public consensus regarding the appropriate LOS to provide the community for managing stormwater.	Continue robust strategic community outreach to collaboratively weigh considerations such as risk and impacts versus cost of service. Examples include watershed charettes and planning activities pioneered by San Francisco to gauge community sentiment on these tradeoffs.
Cost of Service	SWBNO will need to adequately fund the stormwater enterprise at a cost that does not overburden ratepayers.	Combine detailed cost of service estimates with creative funding strategies and partnerships to share the burden of managing stormwater while enhancing community assets.

Equitable Workforce Development Partnerships • New Orleans is cultivating a small and disadvantaged business enterprise community that can implement small to large-scale green infrastructure projects, such as the Urban Conservancy and Launch NOLA Green. In a similar vein, Jacobs is working with the **Louisville Metropolitan Sewer District** to develop workforce and community benefits programs addressing job creation, economic inclusion, and disparity in under-represented and disadvantaged communities.

Operational Challenges

Even well-intentioned plans and infrastructure investments will suffer if operations are neglected. An integrated plan must consider a full range of operational challenges, including assuring the system can function in times of emergency, can easily be maintained, and is optimized to reduce annual costs.


	Operational Challenge	Integrated Approach
Aging Power Infrastructure	The City’s stormwater system will require improvements to both mechanical and power infrastructure. The 25 Hz power requires rehabilitation and replacement,	Opportunities exist to upgrade motors and feeders at each pump station to 60 Hz, decreasing procurement time and lifecycle cost while improving reliability. This aligns

	as it is not always reliable, with a reported 45%–70% capacity reduction during the August 2017 flooding event.	with the mission of the Climate Action for a Resilient New Orleans and the Power Master Plan problem statement and desired outcomes. A tiered approach will identify the most critical assets to upgrade first for improved reliability and impact.
Catch Basin and Storm Sewer Clogging	Before stormwater can be drained to the canals, it must first reach the drainage pump stations. This critical first step is often an issue as the inlets are clogged with debris. Catch basins along city streets must be cleared out and remain clear to ensure stormwater can effectively reach pump stations.	Create a risk reduction-based maintenance program for street and inlet cleaning, based upon the full drainage system (i.e., not bifurcated between <36" and >36". Pilot multiple catch basin inserts and technologies to provide more effective capture and removal of leaves, beads, trash, etc. Continue with community engagement of catch basin cleaning manage momentum.
Data Management	Advancements in metering and operational data have created a wealth of information available to improve operations. However, organizing and analyzing the data to develop actionable plans to improve system efficiency can be overwhelming and resource intensive.	Provide targeted real-time data through a network of low cost 'smart sensors' and edge-processing to inform maintenance protocols.

Smart Water Systems • We leveraged our experience in sensors selection, distributed systems, and multi-mode communication through IoT devices and data integration to provide **Cincinnati MSD** with near real-time visualization of conditions throughout their system and control of critical wet weather function. This system provides operations staff the ability to view multiple data streams in real time, creates actionable information, streamlines regulatory reporting requirements, and provides an optimized system that can adaptively be managed to the changing environment.

Climate and Environmental Challenges

The conditions that our cities and infrastructure face are continually changing — and that rate of change may be increasing. An integrated plan must consider this to build a robust and resilient system.

	Climate Challenge	Integrated Approach
Subsidence	Subsidence is a challenge faced by many coastal communities. Aggressive pumping of stormwater contributes to subsidence, further exacerbating infrastructure challenges.	Green infrastructure can increase groundwater recharge and help reduce subsidence while at the same time reduce flooding and improve water quality, as mentioned in the New Orleans Stormwater Strategic Pathways. Coordination with the gray infrastructure system will be necessary to maintain a balance of a higher water table with a nimble stormwater evacuation system.
Climate Escalation	New Orleans is a coastal city and will continue to face impacts associated with extreme tides and	Mitigation of these issues may be a combination of stormwater management and land protection approaches including eco-friendly floodwalls,


surge, increased rainfall intensity, and future sea level rise.

retention/detention basins, pump stations, green infrastructure, and expansion of drainage system components. Incorporating the effects of Hurricane & Storm Damage Risk Reduction System (HSRRS) now and adapting as this system evolves in the future will be a key element of the planning.

Regulatory and Jurisdictional Challenges

Maintaining compliance in an evolving regulatory environment can present a significant risk for utilities. Jurisdictional challenges such as not owning the full system or land where improvements are necessary can also complicate and constrain the ability to address these challenges. An integrated plan should begin by seeking partnerships and creative compliance strategies to meet regulatory requirements while leveraging opportunities and optimizing investments.

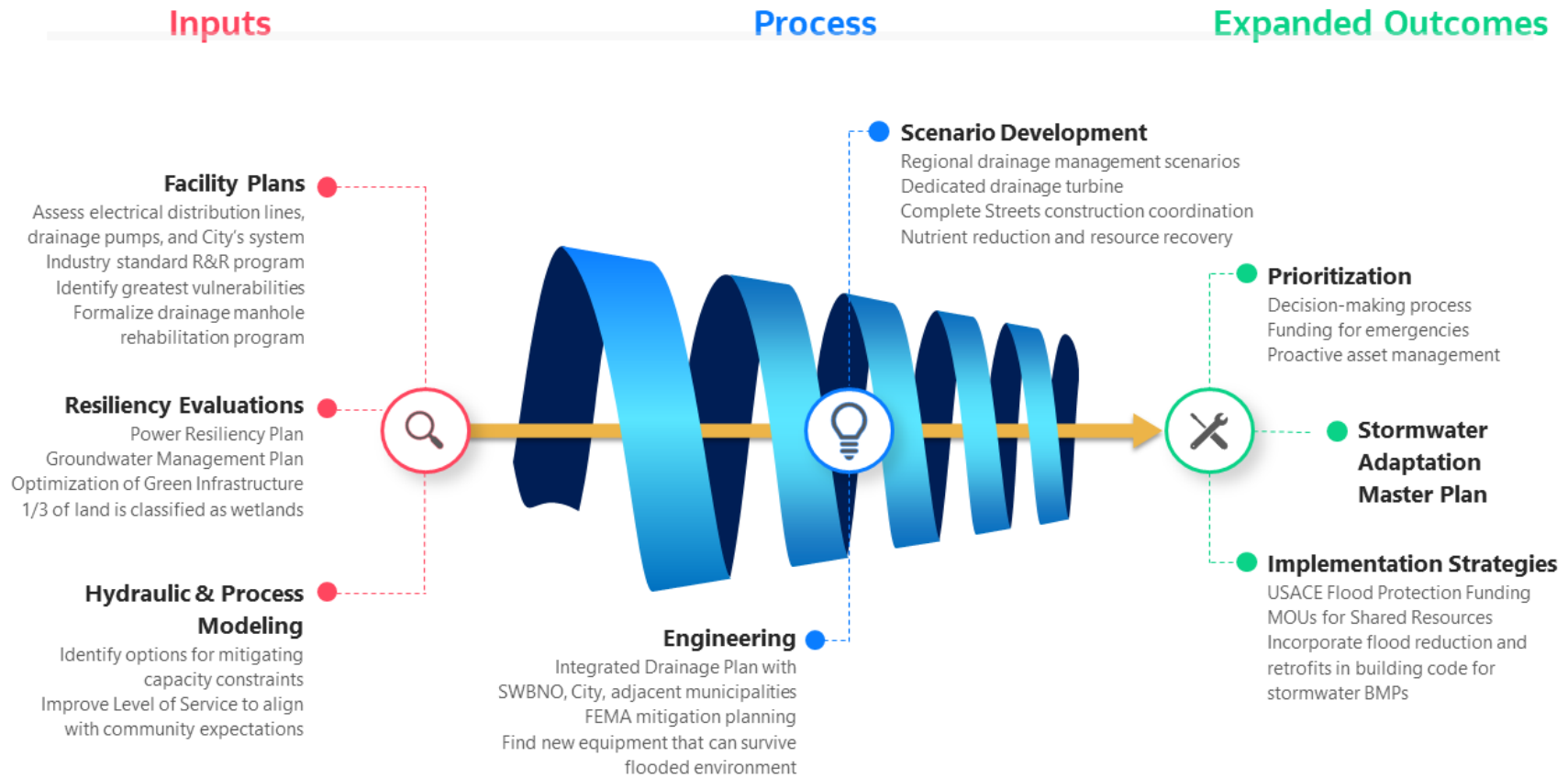
Integrated Compliance Strategies • Facing significant costs, an aggressive timeline, and a changing regulatory environment, the **City of Spokane, WA** assessed its plans to improve water quality in the Spokane River and meet Clean Water Act mandates. The City used the U.S. EPA’s Integrated Planning Framework to develop an **Integrated Clean Water Plan**. Jacobs provided stakeholder and regulatory agency coordination and strategic direction to the City throughout the project. An integrated approach required the City to study all pollutant sources to the river, consider all viable options to manage those sources, and develop a comprehensive, cost-effective solution. Essentially, this approach generates **enhanced results quicker** and at a **more affordable price**.

	Regulations Challenge	Integrated Approach
System Ownership	The stormwater system is currently bifurcated between the DPW of the City of New Orleans and SWBNO.	A state task force recommended the responsibility sit with a single agency (ideally SWBNO), to deliver a fully functioning drainage system that can be managed as a whole system. Integrated planning will support these potential organizational changes by evaluating capabilities, resources and funding needs, LOS, etc.
Water Quality	Stormwater currently receives little to no treatment before being discharged into the lake and represents a source of a variety of pollutants, as well as a potential future liability.	Traditional green infrastructure can have tremendous water quality benefits, along with newer strategies such as strategically placed floating wetland islands (FWIs). Jacobs has constructed FWIs in conjunction with local STEM programs for the City of St. Petersburg, FL, as well as in coastal canals in Terrebonne Parish.

Alternative Delivery and Financing • Significant innovations in alternative delivery and funding mechanisms have been developed in recent years to overcome challenges to deliver improved outcomes at lower costs. Jacobs is helping the **City of Atlanta Department of Watershed Management** in using an **Environmental Impact Bond (EIB)** as an innovative alternative delivery and financing mechanism to fund green infrastructure in the Proctor Creek Watershed. The EIB establishes target outcome metrics (stormwater volume) and performance thresholds that allow the issuer and investors to share in the benefits of increased performance.

Integrated Planning Approach

Exhibit 2. Stormwater and Drainage Integrated Master Planning Considerations. The common elements of integrated master planning are technical evaluations, innovation and scenario development, and prioritization and implementation.



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QUESTION

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What will be New Orleans' biggest **wastewater/sewerage** challenges in 50 years and what is the best approach to integrated, long-range planning to address those challenges?

Challenges and Approach

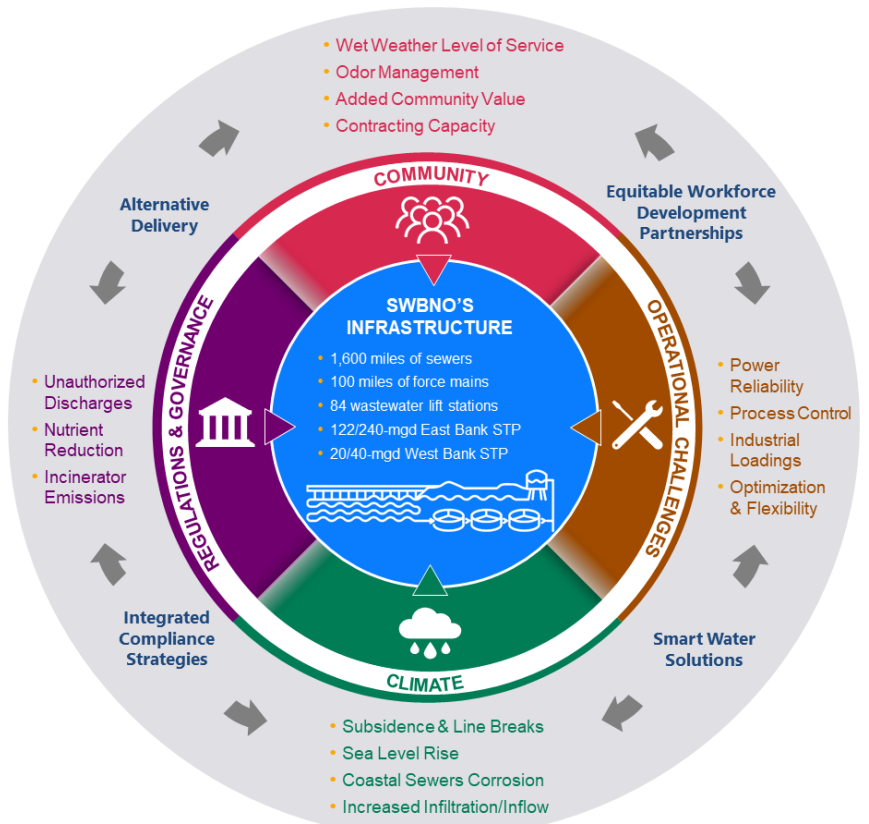
The challenges SWBNO will face over the next 50 years require advanced planning to enable you to meet increasing community expectations; equip your workforce with the tools necessary to operate the utility of the future; protect existing infrastructure from changing environmental conditions; and satisfy current and future regulations. A summary of key challenges anticipated with the wastewater and sewerage infrastructure is presented in Exhibit 3.


SWBNO can address, mitigate, and overcome these challenges through innovative approaches and by customizing business practices. The approaches must extend beyond forecasting the discrete replacement, repair, and rehabilitation of aging infrastructure. SWBNO requires business tools for increasing knowledge of conditions in real-time vs. after the fact, increasing the quality of planning and decision making as a result. Knowing where and when wet weather is entering the collection system will enable operations staff to use smart sewers, express sewers, and optimization tools to redirect flow to avoid unauthorized discharges. Balancing stormwater and wastewater system management will provide the community with the most efficient and economical approach for improving public safety by reducing overflows.

Community Challenges

New Orleanians want to see the value SWBNO provides to the community. This is a challenge because most wastewater infrastructure is buried or in non-public access locations. SWBNO understands the power of community engagement and the importance of ensuring the local workforce is supported by your capital program. On the following pages, we highlight some of the top challenges and potential integrated approaches to address those challenges.

Exhibit 3. Key Challenges Impacting SWBNO's Wastewater and Sewerage Infrastructure



	Community Challenge	Integrated Approach
Odor Management	The expectations from ratepayers is the utility infrastructure should not detract from property values or cause nuisance odors, noise, or lighting impacts. Air quality complaints and/or violations may result from odors originating from the wastewater collection system.	Specialized odor control technology may be warranted depending upon the industrial loadings received at manholes, pump stations, and sewage treatment plants (STPs). A comprehensive odor evaluation and mitigation plan should be developed to proactively address this situation.
Added Community Value	Ratepayers want a quantifiable value for the millions of dollars invested into utility infrastructure.	Constructed wetlands offer a park-like setting to polish effluent, improve water quality, and promote environmental stewardship. Wetland treatment systems may offer the additional benefit locally, if strategically placed, to address coastal erosion and subsidence challenges in addition to carbon sequestration.




Collection System Odor & Corrosion Modeling

Jacobs has completed more than 50 collection system odor and corrosion studies that have used sewer process modeling throughout the United States, Australia, Europe, and Asia. Many of these utilities had challenges like those faced by the SWBNO collection system. The Wastewater Aerobic/Anaerobic Transformations in Sewers (WATS) model was used to compare alternatives: liquid phase (chemicals), vapor phase, and changes in design and operation for mitigating odors and corrosion.

Operational Challenges

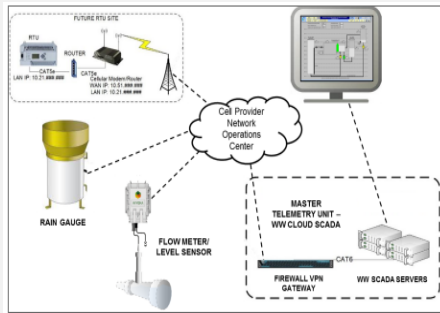
Sustainable and reliable wastewater operations will remain a challenge as SWBNO continues to operate original pump stations and treatment plants. A critical challenge will require converting to a reliable power system for the continuous steady operation of these facilities. Additionally, SWBNO has the opportunity to work smarter, not harder, in the future by using innovation and system optimization tools.

	Operational Challenge	Integrated Approach
Proactive Asset Management Plan	SWBNO's East and West Bank STPs and pump stations are original assets constructed decades ago. Aging assets mandate a reactive mode of operation, resulting in higher operating budgets and revised capital improvement program (CIP) budgets.	Develop a long-term CIP and operating budget forecast based on industry standard levels of investment for repair and/or replacement (R&R) of SWBNO's existing assets. Employ a reliability centered maintenance program then benchmark performance metrics for linear and vertical assets.
System Optimization	Collection system staff do not have the ability to proactively redirect wet weather flows to areas having	Smart sewer technology and express sewers provide staff working in the collection system, lift stations, and treatment plants with a clear

available storage and/or processing capacity. Additionally, staff do not have real-time water quality data to facilitate making treatment adjustments and optimizing system performance.

understanding of where flow is entering the system and the estimated travel time to key infrastructure. These systems assist with bypassing and diversion associated with operations, maintenance, or emergencies. Similarly, water quality networks can provide advance notice of heavy BOD or TSS loadings.


Smart Sewers, Metropolitan Sewer District of Greater Cincinnati, Ohio



Jacobs designed a smart sewer system for Cincinnati to better manage wet weather and prevent overflows. The system collects, processes, and displays data for staff to review in near real-time and provides remote control of flow control structures such as gates, valves, dams, and real-time control facilities — like what SWBNO could do with its sewerage system. Data collected includes sewer level, stream levels, sewer flow, and rainfall values from strategic locations throughout the collection system.

Climate and Environmental Challenges

As a coastal utility, SWBNO already knows the incredible challenges climate presents for wastewater systems. It is important to integrate lessons learned with local resiliency planning goals to provide the greatest benefit to the community. Treatment plants are intensive energy users and provide a means for readily incorporating clean energy options.

	Climate Challenge	Integrated Approach
<p>Management of Wet Weather Flow</p>	<p>SWBNO will need to update its LOS given climate change impacts such as increased frequency, intensity, and duration of rain events (including tropical storms and hurricanes) and increased volume of infiltration and inflow (I/I).</p>	<p>Upsized sewers and lift stations to provide additional capacity; optimizing peak flow management at the treatment plants; constructing wet weather storage facilities; and actively managing stormwater at key areas in the collection system. Potential remedies for I/I mitigation will vary by basin, degree of built systems, and hydraulics but may include sewer and manhole lining; wetwell enlargement; construction of curb and gutter systems; or localized stormwater or wastewater collection system capacity upgrades.</p>
<p>Greenhouse Gas Emissions & Clean Energy</p>	<p>SWBNO has committed to a local resiliency plan and to find opportunities to reduce greenhouse gas emissions 50% by 2030 and increase utilization of clean energy.</p>	<p>Potential approaches for reducing greenhouse gas emissions include replacing outdated equipment with energy efficient units; reducing the volume of truck traffic entering/leaving the treatment plants; and converting fleet vehicles from diesel/gasoline to natural gas. Potential approaches for using clean energy include: 1) installing photovoltaic systems at treatment plant sites; 2) powering remote electrical systems using solar, wind, geothermal, or hydro-driven technologies; and 3) converting biosolids to energy.</p>

**Mitigation of
Sea Level
Rise**

SWBNO's existing sewers and treatment plants are located near the coast. NOAA has forecasted an increase of 3 to 11 feet in sea level rise by 2100 resulting with intrusion of saltwater into utility corridors.

Approaches for preparing and hardening wastewater and sewerage infrastructure include elevating electrical, communications, and HVAC equipment; constructing eco-friendly floodwalls at treatment and pumping facilities; installing operable flood barriers at doors, vents, and other building penetrations; and incorporating wind mitigation measures into buildings including impact resistant windows, hurricane clips for roof trusses, and outward swinging doors.


Integrated Water Resources Master Plan, St. Petersburg, Florida

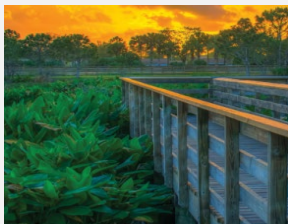


The City has 60 miles of coastline directly adjacent to wastewater treatment plants, lift stations, water mains, and sewers. Jacobs developed an Integrated Master Plan that incorporated similar issues faced by SWBNO including resiliency, sustainability, sea level rise, saltwater intrusion, tropical weather impacts for the City's potable water, wastewater, and stormwater infrastructure. Multiple approaches for mitigating the forecasted sea level rise (up to 3 feet) over 20 years were evaluated.

Regulatory and Jurisdictional Challenges

Assessment of long-term regulatory trends indicates that future regulations will mandate higher levels of water quality and system performance. Given the number of active Consent Decrees, U.S. EPA will likely continue to pass more stringent requirements for separating non-sanitary flow from sewerage systems.

	Regulations Challenge	Integrated Approach
Nutrient Reduction for the Mississippi River	Under Section 303 of the Clean Water Act, U.S. EPA is discussing establishing nutrient reduction total maximum daily loads (TMDLs) for the Mississippi River.	Stringent nutrient reduction limits may require SWBNO to construct new or upgraded treatment processes at the East and West Bank STPs. Constructed wetland systems also reduce nutrients.
Unauthorized Connections to Sewer System	SWBNO's sewerage system receives clean water discharges from multiple private sources including but not limited to driveway drains; floor drains; sump pumps; downspouts; etc.	SWBNO with the City of New Orleans may need to update the ordinance to provide an enforcement mechanism to address unauthorized discharges into the sewer system. This approach will increase the carrying capacity of the sewer system and defer the need for upsized or parallel pipes.

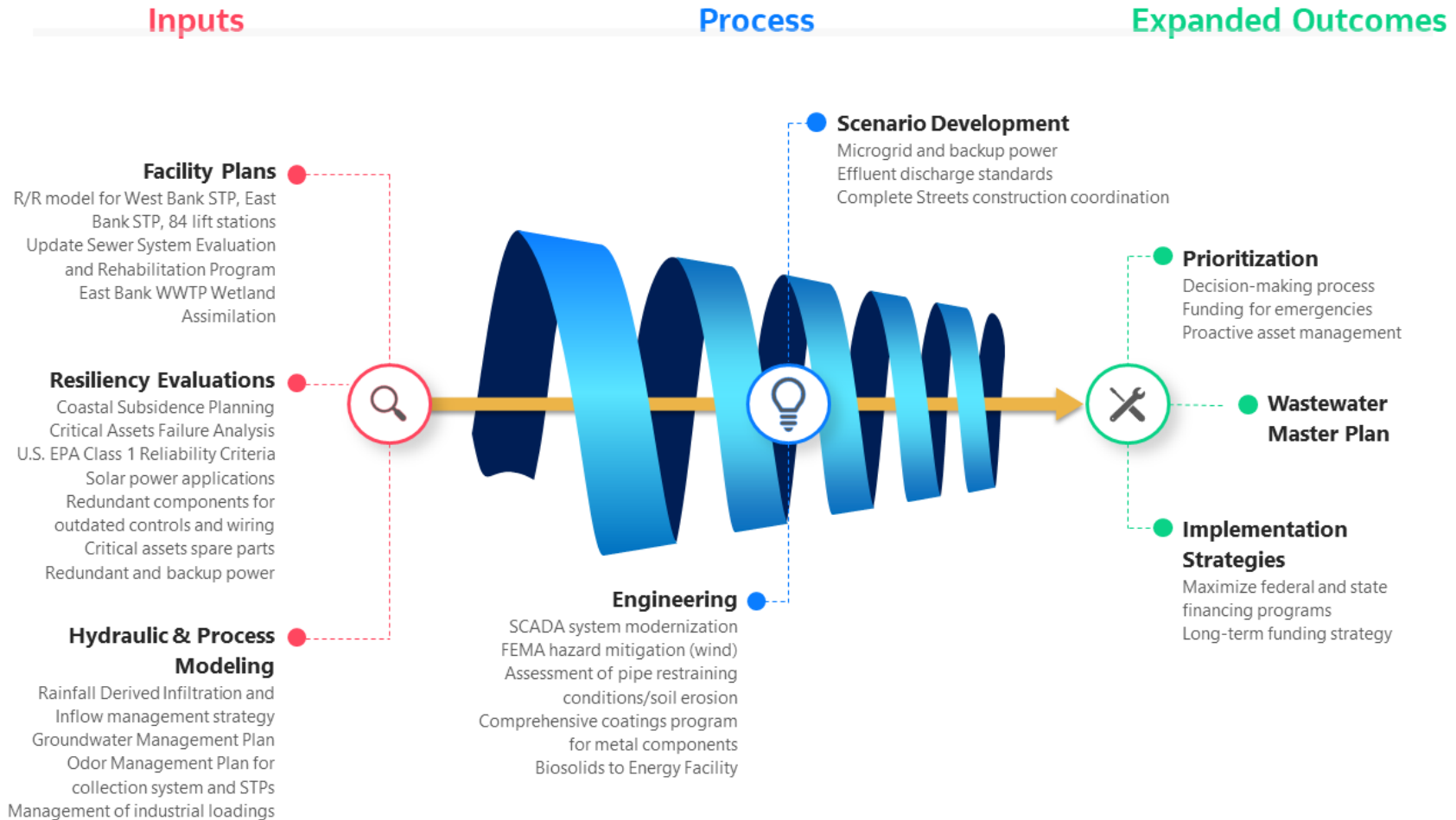


Nutrient Reduction Wetland, Palm Beach County, Florida

Jacobs designed the Caloosahatchee public wetland park that provides beneficial reuse of wastewater effluent for recreational, habitat, groundwater recharge, and water quality improvement (nutrient reduction). The facility was named "Best Park in Florida" in 2018 and is prized nationally and in the community for extraordinary wildlife photography and birding opportunities.

Integrated Planning Approach

Exhibit 4. Wastewater Collection and Treatment Integrated Master Planning Considerations. The common elements of integrated master planning are technical evaluations, innovation and scenario development, and prioritization and implementation.



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QUESTION

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What will be New Orleans' biggest **drinking water** challenges in 50 years and what is the best approach to integrated, long-range planning to address those challenges?

Challenges and Approach

As identified in the AWWA 2020 State of the Industry Report, the most critical challenge for all water systems, which aligns with SWBNO, is the renewal and replacement of critical infrastructure. The challenges that come with this are financing, capital planning, and maintaining the appropriate LOS. Other relevant issues New Orleans is facing include:

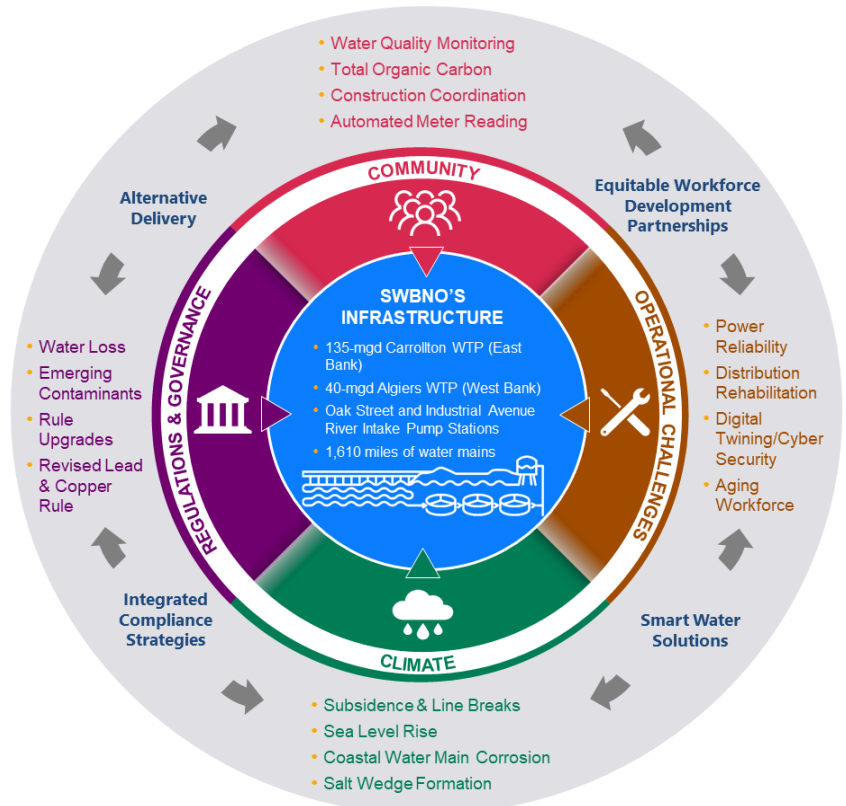
- Regulatory compliance for current and future regulations while concerned about non-point source pollution and “forever” compounds like per- and polyfluoroalkyl substances (PFAS)
- Enhanced water quality monitoring, especially on-line instrumentation to confirm delivery of high-quality water and alert operations staff to potential upsets
- Aging/diminishing workforce as staff having decades of institutional knowledge are approaching retirement

Additionally, we understand SWBNO faces some acute issues that are highly visible to the community that involve mitigating the cooling water cross-connection and addressing boil water incidents due to low water system pressure events.

A summary of key challenges anticipated with the drinking water infrastructure over the next 50 years is presented in Exhibit 5.


One of the largest issues associated with SWBNO's critical potable water delivery infrastructure is the age of the current infrastructure. The Carrollton Water Plant (CWP) dates back to the turn of the 20th century, with many critical components at the end of their useful life. Secondly, a major challenge is changing and increasing water quality monitoring needs. Water quality is the highest community expectation from SWBNO. Although it is often taken for granted, ratepayers demand a sustainable drinking water quality.

Exhibit 5. Key Challenges Impacting SWBNO's Drinking Water Infrastructure

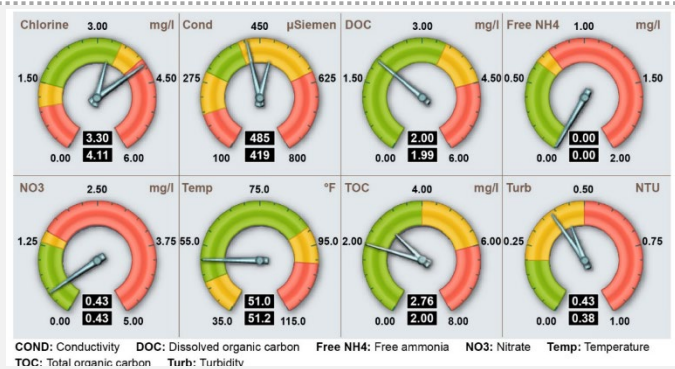


On the following pages, we feature some of the top challenges identified in Exhibit 5 and potential integrated approaches to address those challenges.

Community Challenges


	Community Challenge	Integrated Approach
Water Quality Monitoring	SWBNO will be faced with more acutely protecting and ensuring public health through safe drinking water, as regulators begin adding new constituents, and customers become more aware of drinking water safety.	With the advancement of the internet and low-energy wireless communication technologies, it is more affordable and reliable than ever to implement multi-spectrum water quality monitoring stations throughout the distribution system. The monitoring stations can immediately detect and notify staff regarding constituents of concern. SWBNO should incorporate data analytics capabilities, potentially with predictive analytics for early warning and triggering alerts. This transparency approach builds customer confidence that their drinking water is safe. This approach integrates with the Task Force recommendations published in January 2019.


Water Quality Surveillance, U.S. EPA
Jacobs and U.S. EPA developed the 2015 “Dashboard Design Guidance for Water Quality Surveillance and Response Systems.” The dashboard is an information management system that supports access and visualization of information created from water quality monitoring stations. SWBNO would benefit from implementing this system.




Operational Challenges

In order to address the aging linear infrastructure, SWBNO will need to provide a defensible capital prioritization plan. Jacobs sees the two biggest issues associated with SWBNO’s critical potable water delivery infrastructure as: 1) full water distribution infrastructure rehabilitation, and 2) preparing the next generation of water professionals. One of the main challenges is making sure that there is a competitive wage available to workers, so that they want to learn and grow and stay with SWBNO.

	Operations Challenge	Integrated Approach
Water Distribution System Rehabilitation Program	Previous engineering studies identified the need for full system rehabilitation of the water distribution infrastructure throughout SWBNO’s service area. Implementation challenges include: 1) how to sequence and prioritize areas, 2) how to secure funding, and 3) how to integrate with utility corridor improvements for drainage and sewerage systems.	Condition information is discovered via detailed inspection of the water lines, followed by selective rehabilitation where needed. SWBNO may desire to consider prioritization and sequencing of the rehabilitation through the implementation of district metered areas (DMAs). DMAs can be used to identify areas with the highest leakage. Combined with pipeline criticality and other factors, the water distribution DMAs can be sequenced for rehabilitation activities.

<p>Water Treatment Plant Age</p>	<p>CWP has undergone several phases of expansion and updating; however, many of the core components are currently past their useful life. Additionally, the fully manual plant creates vulnerabilities due to the aging workforce challenges.</p>	<p>A condition assessment and facility plan are needed for CWP to prioritize repairs, replacements, and enhancements.</p>	
<p>Digital Twins</p>	<p>The industry is moving towards more predictive models for optimizing potable water systems. Methods to rapidly train operations staff on new systems and to run what-if scenarios will be critical in the future to efficient onboarding and training of the new generation of workforce.</p>	<p>SWBNO will likely need to consider using new systems (referred to as digital twins) for evaluating its data and asset performance. Some utilities are exploring artificial intelligence applications for treatment and pumping operational decisions and/or maintenance frequencies.</p>	




Asset Management, City of Cocoa, Florida

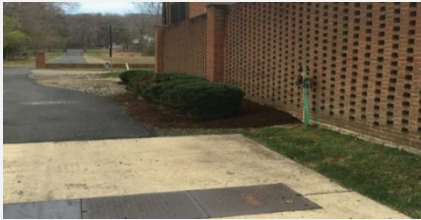
Jacobs uses various inspection technologies to assess the condition of water pipelines to determine appropriate rehabilitation techniques. Jacobs developed a Master Plan for the City's water system, similar to the plan needed by SWBNO. Specific services we provided included: water demand projections; planning criteria development; risk prioritization of assets; water treatment evaluation; water storage, pumping and distribution system evaluation; and capital plan development.

Climate and Environmental Challenges

Similar climate challenges facing the stormwater and wastewater infrastructure also apply to the drinking water system. All pipelines located adjacent to the coast are subject to accelerated rate of corrosion from salt water. Conditions are exacerbated in New Orleans due to the effect of subsidence.

	Climate Challenge	Integrated Approach
<p>Salt Wedge Formations</p>	<p>Rising sea level or low levels in the Mississippi River lead to salt water intrusion from the Gulf of Mexico, thereby creating a dense saltwater wedge that could reach the SWBNO raw water intake.</p>	<p>Leverage USACE to mitigate salt wedge formations to the greatest extent possible by revising channel slopes and constructing saltwater sills. Consider use of salinity barriers for raw water intake structures or harvesting salt wedges for commercial purposes.</p>
<p>Temperature Extremes</p>	<p>Subtropical climates like that of New Orleans are facing not just temperature highs as a result of climate escalation, but also temperature lows that are impacting critical infrastructure during freeze events.</p>	<p>Extreme cold events cause freeze/thaw cycles in the pavement and streets. Given the age of the water distribution system, any increased stresses on the network will result in main breaks and leaks. Prioritization of the infrastructure for repair using previously described asset management approaches is needed. In the transitional period of homeowners increasing their resiliency to freeze events,</p>

responsive distribution system valves and potentially increased capacity will be key.




Washington Suburban Sanitary Commission

Jacobs prepared climate change vulnerability assessment and adaptation plan for one of the largest utilities in the nation located outside Washington, DC. Similar to SWBNO's program, WSSC's system comprises both riverine and coastal water and wastewater infrastructure. The project addressed climate vulnerability and greenhouse gas emissions of all WSSC's water

and wastewater assets. The study integrated climate vulnerability assessments and the probability of failure estimates with WSSC's existing asset management system risk management metrics for consequence of failure and business risk exposure to prioritize climate adaptation efforts.

Regulatory and Jurisdictional Challenges

The most critical potable water issue facing SWBNO is the need to make sure the existing treatment plants can continue to meet drinking water regulations today and 50 years into the future. The source water for the water plants dictates the need to maintain adequate particulate removal and disinfection processes as critical assets are improved. Once every 5 years, U.S. EPA issues a new list of no more than 30 unregulated contaminants to be monitored by public water systems under the Fourth Unregulated Contaminant Monitoring Rule (UCMR4).

	Regulations Challenge	Integrated Approach
Disinfection Byproducts	The chloramination process used by SWBNO has been shown to minimize the formation of trihalomethanes (THMs) and haloacetic acids (HAAs), thereby offering a cost-effective means to comply with the Stage 2 disinfection/disinfection byproduct rule (Stage 2 D/DBPR).	Chloramines have been implicated in the formation of nitrosamines such as N-nitrosodimethylamine (NDMA). In the future, drinking water utilities using chloramines could face the challenge of achieving compliance with Stage 2 D/DBPR and other microbial regulations while minimizing nitrosamine formation in their systems.
Cyanotoxins and Perfluorinated Compounds (PFCs)	There are currently no U.S. EPA regulations for harmful, emerging contaminants such as cyanotoxins (algal toxins) and PFCs. Cyanotoxins are listed on CCL4 and are also included in the UCMR4.	U.S. EPA could move the UCMR4 cyanotoxins forward in the regulatory development process with the fourth round of regulatory determinations that is scheduled to be finalized in 2021. A cyanotoxins rule could be proposed 2 years later (in 2023), with the final rule approximately 2 years after the proposal, in 2025.

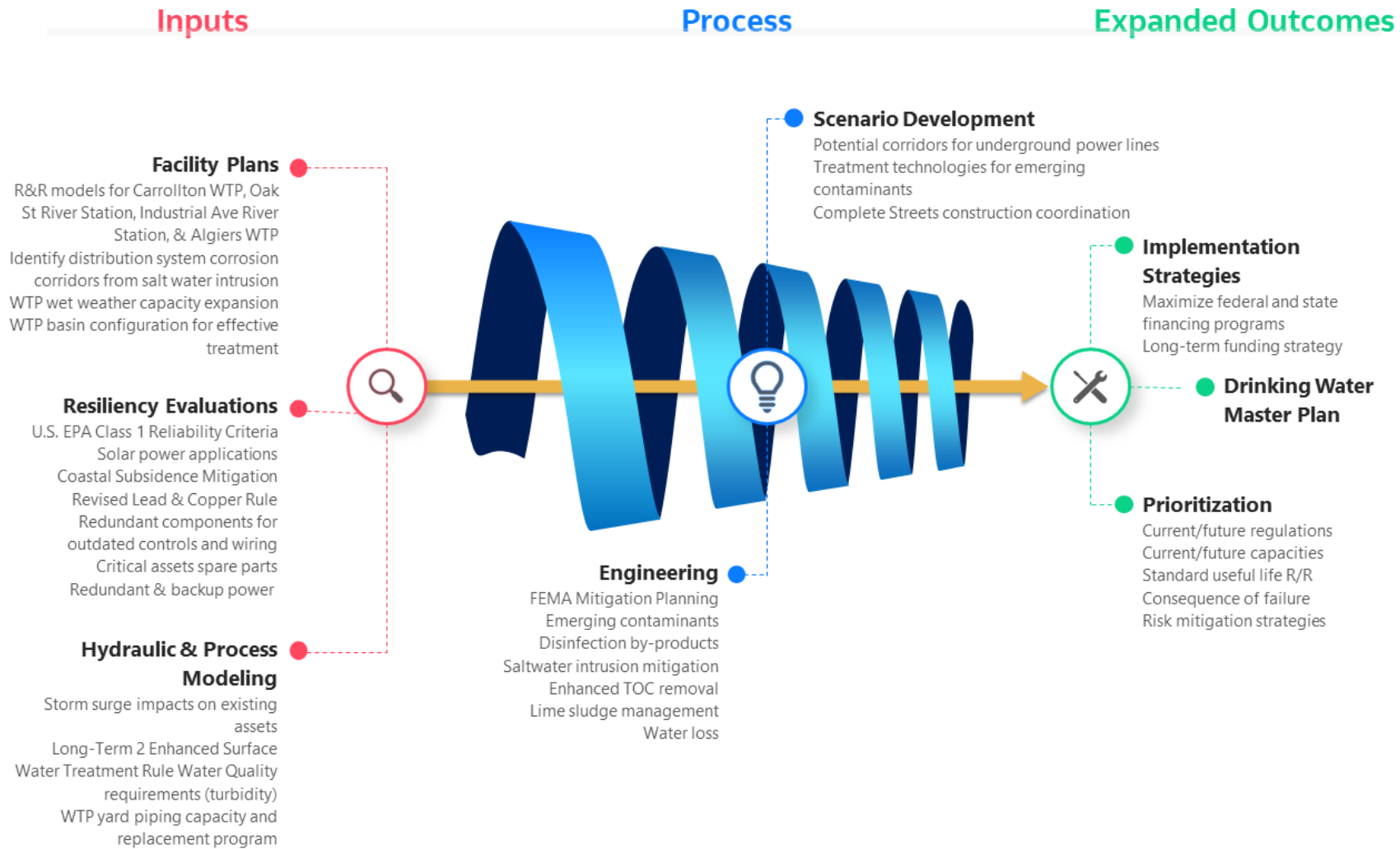


Future Regulations, Gwinnett County, Georgia

Jacobs prepared the County's potable water master plan and developed several advanced treatment alternatives including DAF and GAC, ozone-BAC at the Lanier WTP (150 mgd) and Shoal Creek WTP (98 mgd), which are similar in size to SWBNO's WTP. Both plants were reviewed for existing water treatment processes and water quality was evaluated to meet future water needs and regulations.

Integrated Planning Approach

Exhibit 6. Drinking Water System Integrated Master Planning Considerations. The common elements of integrated master planning are technical evaluations, innovation and scenario development, and prioritization and implementation.



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Firm Profile

Whether it's treating, distributing, or storing water, Jacobs reaches across boundaries and collaborates to successfully deliver customized, innovative solutions. We have worked with clients throughout the world to integrate master planning for the full water cycle — from source to tap to reclamation. Through our 73 years of experience, we have developed industry-leading tools and processes to evaluate multiple projects and factors to develop integrated master plans that focus on the key infrastructure issues facing each client. For some clients, the focus is on planning for water availability and supply. For others, the challenge is planning and prioritizing investments in the buried infrastructure. We have worked for very small communities with less than 10,000 residents to large communities with populations of more than 1 million people, including successfully completed work like the master plan process and potential related facilities and technologies SWNBO is proposing.

Where We Rank

We have held a top five position in the Top 500 list since *Engineering News-Record's* (ENR's) rankings began in 2003, and for a second consecutive year, we're ranked #1 in its list of Top 500 Design Firms in the world. We also took the top spots in 19 ENR market sectors. Our water experience is unparalleled, as recognized by ENR with numerous top rankings in various areas of water and wastewater infrastructure. In addition, Jacobs has been ranked on Fortune's 2020 World's Most Admired Companies list in its sector, securing the No. 1 spot this year for the second year in a row.

#1
Sanitary & Storm Sewers
Sewer & Waste
Wastewater
Treatment Plants
Water Transmission
Lines & Aqueducts (ENR)

#3
Water Supply
Water Treatment,
Desalination Plants
(ENR)

11
2018 Environmental
Business Journal/
Climate Change Business
Journal Awards

2015
Stockholm Industry
Water Award
(Stockholm International
Water Institute)

How We Support Your Process

Industry Leaders Bring Lessons Learned and Best Practices to Share

Our first client in Louisiana was SWBNO and we have partnered with you for more than 30 years. We have a history of bringing industry leaders with specialized experience to support SWBNO with some of the most complex projects related to critical infrastructure. This long-term planning opportunity will be no exception.

Our industry leaders specialize in integrated master planning, stormwater/drainage, wastewater/sewerage, drinking water, conveyance, climate escalation, and other related disciplines, bringing a diverse set of experiences to help address SWBNO's challenges and achieve your desired outcomes. Two industry leaders were recently named to Global Water Intelligence's 2019 Water Technology Power List, which highlights 40 of the industry's top influencers — Jacobs Conveyance and Storage Solutions Director Susan Moisio and Wastewater Solutions Director Julian Sandino.

Having delivered similar integrated master planning projects around the world, our staff understand the complicated network of infrastructure systems, natural systems, and social systems that connect us, and we have the expertise to provide a holistic perspective. We will leverage our combined local and global experience throughout SWBNO's integrated planning process. Sharing best practices and lessons learned from regional, national, and global programs will be instrumental in generating ideas and helping SWBNO define requirements during the next phases of the project.

Integrated Master Planning Experience Offers a Collaborative Approach to Address Your Challenges

As an innovator in water resource and demand-side management, we have developed forward-thinking integrated master plans for utility clients around the globe with environments and challenges similar to what SWBNO faces today. We understand that integrated planning is a process that considers all utility functions holistically including wastewater, reclaimed, storm, potable, and water resources. Based on our experience, we have developed a collaborative approach that keeps all parties engaged throughout the planning process to effectively perform integrated planning.

We have a track record of developing and maintaining effective working relationships with multiple parties including stakeholders, consultants, environmental groups, utility operations and engineering staff, policy makers, and regulatory agencies. Our team has coordinated the work of multiple departments, agencies, and stakeholders. We bring recent experience, local knowledge, and involvement with multiple parties in the New Orleans community related to infrastructure.

Working and Living in New Orleans Provides Local Insight

Local Knowledge + Global Perspective = Targeted Solution. We live in the communities where we work, such as New Orleans, where we've had an office for more than 30 years — so we're personally invested in doing what is right for New Orleans. Our technical expertise reflects a rich combination of local subject matter experts who have done in-depth work on SWBNO systems with SWBNO leaders, as well as industry leading professionals with global expertise. This dual perspective captures historical knowledge about SWBNO and the New Orleans community combined with the best practices worldwide when developing innovative solutions related to integrated master planning.

Our understanding of project challenges and risks focuses our effort on the right things. Our team has firsthand knowledge of SWBNO's key challenges based on our recent work on the Power Master Plan. This direct knowledge gives us a clear view of the possibilities that can be achieved with an integrated master plan.

Investing in the communities where we live, work, and play takes many forms. Working together, we create solutions that affect the way people live. Our sense of responsibility to others drive us to volunteer and give back to our communities. We've made an impact by:

- Working alongside Shell Pipeline Company and turning more than 96,000 plastic bottles into a natural infrastructure solution to help protect Louisiana's shrinking coastline and serve as a model for balancing coastal infrastructure integrity and an evolving natural environment.
- Supporting the small business community as invited participants in the Louisiana Economic Development Small Business Mentor-Protégé Program, which was initiated in 2018. We have also

Invested in New Orleans

Recently Amanda Gaze, Kaitlin Tymrak, and Monica Stochl from our New Orleans office spent their Saturday in support of Water Wise NOLA, building rain garden planter boxes and finalizing a French Drain at key community locations in the 7th Ward.



partnered with the Good Work Network to mentor minority and woman-owned businesses in New Orleans in water management and coastal work.

- Engaging with communities and building enduring partnerships, Jacobs donated more than \$2.7 million in 2019 as part of our global giving program.

Our Relevant Experience

Developing an innovative approach to create a long-term, integrated master plan for the next 50 years is critical to SWBNO’s transformation into a more efficient and accountable utility. This integrated system plan must be flexible and adaptable so that SWBNO can continue to deliver community-focused outcomes regardless of any future growth, climate change impacts, and regulatory requirements. This section includes descriptions of our experience in St. Petersburg, Miami Beach, and Clayton County as examples of how we’ve planned for uncertainty and built flexibility into an integrated system planning framework to accommodate growth and climate change impacts and how we’ve assisted our clients to take a more proactive approach to regulatory requirements through development of integrated regulatory strategies.

Similar Projects

Exhibit 7 summarizes three of our integrated master planning projects that align with the same SWBNO systems and address many of the same challenges that SWBNO faces today.

Exhibit 7. Projects with Characteristics Similar to SWBNO

Project, Utility	Asset Mgmt. R&R Model	Climate Change	Sea Level Rise	Future Regulations	GHG, Clean Energy	Level of Service	Potable Water	Wastewater	Stormwater
Integrated Water Resources Master Plan, City of St. Petersburg	●	●	●	●	●	●	●	●	●
Integrated Water Management Plan, City of Miami Beach		●	●	●		●	●	●	●
Strategic Master Plan, Clayton County Water Authority	●			●	●	●	●	●	●

St. Petersburg Integrated Water Resources Master Plan

The Integrated Water Resources Master Plan (IWRMP) originated from the Consent Order the City of St. Petersburg (City) executed with the Florida Department of Environmental Protection on July 26, 2017. The Consent Order was entered to mandate infrastructure improvements to mitigate unauthorized sanitary discharges. During 2015 and 2016, the City experienced tropical weather that overwhelmed the wastewater collection system and the water reclamation facilities. Because the unauthorized discharges were attributed to a combination of infrastructure challenges with the stormwater management and wastewater collection/treatment systems, an integrated planning approach was warranted to develop the appropriate long-term remedies to prevent similar discharges in the future. Additionally, investment for improving the City’s potable water infrastructure had been deferred due to funding availability. The City

desired to have an integrated plan that identified and prioritized all utility capital needs for the next 20 years.

The IWRMP extends beyond developing a plan that complies with the requirements of the Consent Order. In addition, the City desires to coordinate the IWRMP investments with multiple long-term City initiatives related to sustainability and resiliency. The City continues to advance initiatives targeted to improve the longevity, reliability, and management of the utility and its assets.



Jacobs prepared a comprehensive planning evaluation of the City's potable water system, wastewater collection system, wastewater treatment plants, reclaimed water distribution system, and stormwater management system. In total, \$3.1 billion of improvements were recommended to address aging assets, future regulations, sea level rise, and level of service considerations.

96%
Jacobs Client
Satisfaction
Survey Results

Based on October 2019
discussion with key St.
Petersburg leadership staff

Like SWBNO, St. Petersburg was seeking a team who recognized the value utility staff bring to an integrated planning effort. Jacobs integrated City staff into the project team and by doing so helped the City organizationally by 1) breaking down operational silos and causing people to work together for a common goal; 2) restoring trust by City leadership with the recommendations and day-to-day operations performed by City staff; and 3) developing a plan staff have ownership and look forward to implementing. The City's Director of Water Resources, John Palenchar, said: "The Jacobs team ensured participation from every level of the organization every step of the way. This degree of engagement was able to secure ownership of our integrated master plan, setting the organization firmly on the first step toward successful implementation."

Miami Beach Integrated Water Management Plan

Jacobs is supporting the City of Miami Beach to develop an overall Integrated Water Management Plan, with a key component focused on blue/green stormwater infrastructure (BGSi). Jacobs is analyzing and synthesizing relevant geospatial information, City guidelines, and findings from previous projects to inform City-wide policy frameworks for BGSi and neighborhood project prioritization. Jacobs' climate change projections indicate extreme events in Miami could increase 20%–40% by year 2075.

The City's blue/green infrastructure plan includes BGSi best practices, implementation strategies, concept plans and "Living with Water" renderings for the challenging conditions in Miami Beach (e.g., high density, historic building stock, shallow groundwater, rising sea levels, low topographic elevations, extreme and intensifying storm events).



Like SWBNO, one major challenge has been determining which combination of techniques will work best given the challenges of a highly urbanized and constrained landscape. Combinations of BGSi practices and innovative strategies are being evaluated, such as cistern-blue/green roof systems and floating island wetlands in existing waterbodies to enhance pollutant removal at outfalls. Another challenge is managing public expectations for BGSi; our support for the City's community outreach efforts includes a series of live and virtual public meetings, "Living with Water" concept renderings, and easy-to-understand graphics and figures.

Clayton County Water Authority Strategic Master Plan

Jacobs has assisted the Authority with their integrated master planning efforts involving water, wastewater, and stormwater for more than 15 years to meet the community's needs and maintain a high level of customer satisfaction at a reasonable cost. For the 2020 Strategic Master Plan (SMP), the Authority focused on maintaining their infrastructure investments to meet the community's needs, while striving to become more efficient in all aspects of operations and implementing areas of innovation. Eliminating obsolete infrastructure and consolidating operations to promote efficiencies and lower cost was a focus of this 10-year plan. We achieved the following project goals — similar to what SWBNO is looking to accomplish:

- Integrated the development of innovative strategies to focus priorities and identify project needs.
- Developed strategies that supported the Authority's overall mission and vision to evaluate the recommended projects.
- Prioritized the final projects list using the detailed scoring criteria that was bought into by all management staff.
- Created Authority-wide buy-in from all levels of the organization through collaborative project identification workshops.

This 10-year master planning process will drive activities over the following decade. This plan will also help to form a comprehensive financial plan that will include increased revenue generation and potential project financing. The plan strategically schedules all master plan projects over the period taking into consideration financial, staff, and consultant resources. The integrated master plan is designed to meet upcoming regulatory challenges and designed to accomplish all necessary projects with available resources.

