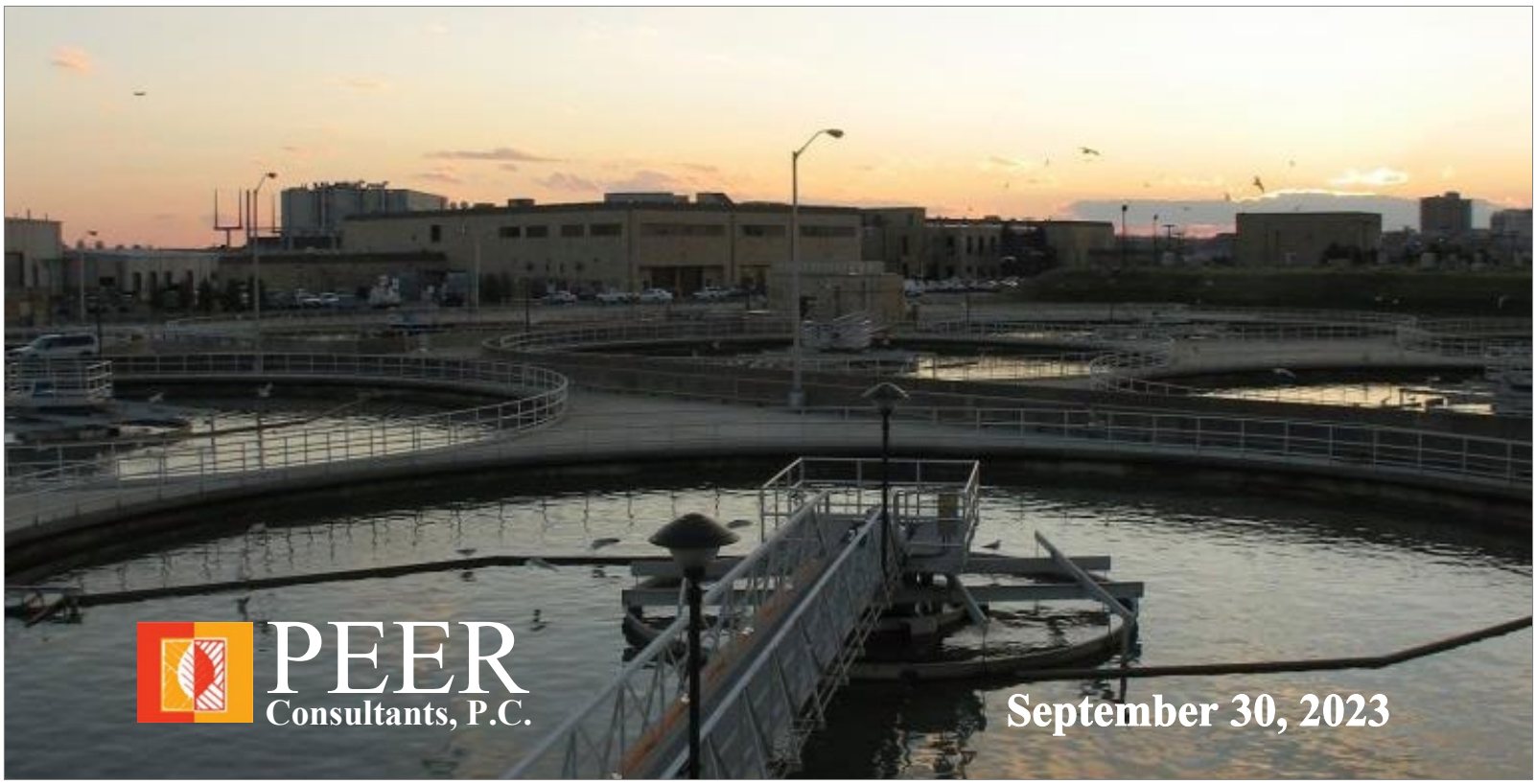
2023 Independent Engineering Assessment of the DC Water Wastewater and Water System



PEER Consultants, P.C.

September 30, 2023

Cover Photo (top): The DC Water headquarters building, named "HQO," opened in 2019 and was built atop the existing O Street Pumping Station, along the Anacostia River. It is a LEED-certified green building with a heating system that uses sewer heat from the pumping station. *(DC Water photo)*

Cover Photo (bottom): DC Water's Blue Plains Advanced Wastewater Treatment Plant is the largest facility of its kind in the world. *(DC Water photo)*

PEER
CONSULTANTS, P.C.
Est. 1978

PEER Consultants, P.C.
409 12th Street SW ● Suite 603 ● Washington, DC 20024
(202) 478-2060
Engineers ● Scientists ● Planners

September 30, 2023

Mr. Matthew Brown, Chief Financial Officer
DC Water
5000 Overlook Avenue, SW
Washington, DC 20032

RE: 2023 Independent Engineering Assessment of the DC Water Wastewater and Water System

Dear Mr. Brown:

PEER Consultants, P.C. is pleased to submit this Independent Engineering Assessment of the DC Water Wastewater and Water System.

The conclusions of the 2023 Assessment, performed by PEER pursuant to the stipulations of the Master Indenture of Trust, are in general agreement with numerous studies and reports referenced by PEER during our inspection. This 2023 Assessment finds DC Water continues to comply with all permit and consent decree requirements. In almost all areas, its performance is above average relative to its peers, and in some areas, its performance is at or near best in class. We also found the Authority is diligent in its efforts to meet future challenges.

The previous assessment was performed in 2017-2018. Shortly after publication, DC Water hired a new CEO with a new business philosophy and built a new highly qualified and diverse Senior Executive Team that immediately went to work. They implemented a utility-wide management approach based on best business practices from several government and for-profit sectors, while also building upon the organizational strength identified in the previous report. The new team's leadership produced a relatively smooth transition, and DC Water is already seeing award-winning results from these efforts.

Under normal circumstances, changing a company's structure and culture can be disruptive, but external events outside of DC Water's control have been particularly significant over the last five years. For example, the District of Columbia's climate change commitments directly impact DC Water as the District's single largest energy consumer. Climate change itself is also forcing DC Water to adapt to more frequent and intense storms and tidal effects impacting critical infrastructure. The COVID pandemic forced an overnight change in the way business was done to maintain uninterrupted high-quality service. The water utility industry, including DC Water, has a much older work force than other industries, and the difficulty of attracting younger workers to fill vacancies only increased in a highly competitive post-COVID labor market. DC Water was well positioned to successfully weather these outside forces and continues to proactively address them.

PEER draws these conclusions based on a review of more than 50 documents and over 20 webpages, responses to tailored questionnaires and self-assessments, interviews of over three dozen managers across the

organization, and 30-point site evaluations of 16 representative facilities. Utilizing and citing public sources of information provides the reader with the ability to check sources. Reviewing self-assessment responses and operational metrics, allowed us to evaluate DC Water's performance relative to peer performance reported in the 2022 AWWA Water and Wastewater Rate Survey, the 2022 QualServe Benchmarking report, the 2020 National Association of Clean Water Agencies (NACWA) Financial Survey, and other reports. Using benchmarking better conveyed the quality of utility management. In preparing the report, we presented historic as well as forecast capital expenditures to provide the context to understand our findings. We also Included a very detailed management and operations evaluation which benefits utility management as well as accurately conveying important findings.

The report starts with a description and evaluation of Authority-wide governance and management operations. We next provide a description of the Water, Wastewater and Stormwater systems, including an assessment of the existing condition of the assets; DC Water's approach to operating and maintaining those assets; system performance relative to best practices, regulations, permits and consent decrees; and the level of investment in repairing, rehabilitating, replacing, or expanding the system. We then present a similar assessment of three major initiatives – two of which are planned to be largely complete in 2030 – and of the Authority's physical and cybersecurity. The final section of the report looks at how well DC Water is positioned to meet challenges expected over the next five years – addressing climate change, new regulations, the tight labor market, changing customer expectations, and more.

The report summarizes our findings and makes recommendations. Among our findings are that DC Water exhibits best practice governance, budgeting, strategic planning, and intergovernmental relations. A handful of our recommendations address where performance is at or slightly below the median in comparison to DC Water's peers. Given DC Water's ambition to be best in class across the board, we also recommend ways in which they could move towards achieving that goal.

Our overall conclusion is that DC Water is a high-performing utility, is driven to be world-class, is correctly perceived as an innovative industry leader, and is well positioned to be successful in the coming years.

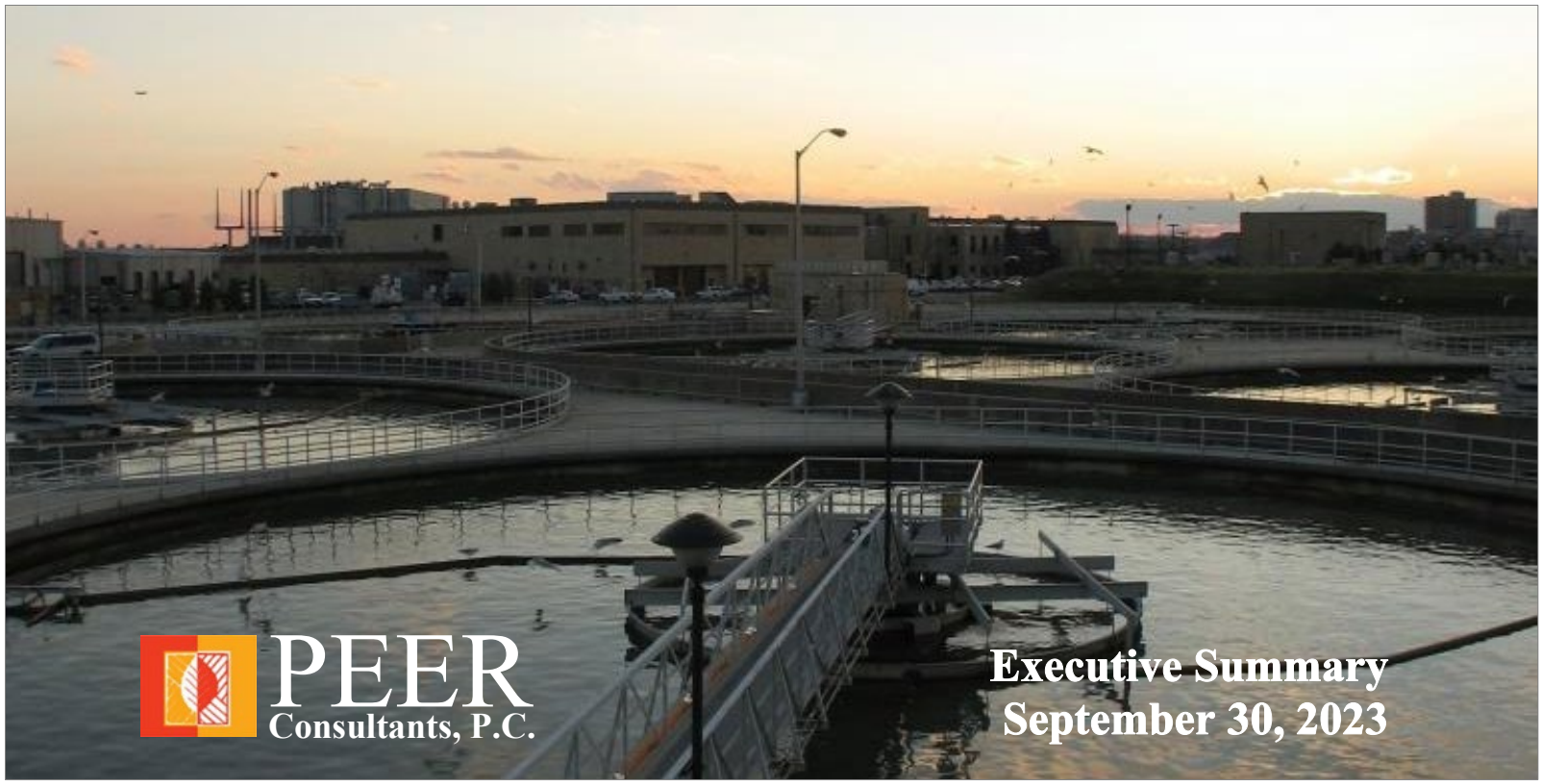
With this letter, an executive summary providing a condensed version of the report and the report itself, PEER has completed all the work required under this contract. We greatly appreciated the opportunity to be of service to the Authority and its stakeholders.

Sincerely,

John M. Corliss Jr., PE
Sr. Vice President and Chief Engineer

Myron Olstein
Lead Investigator

2023
Independent Engineering Assessment of the DC Water Wastewater and Water System



PEER Consultants, P.C.

Executive Summary
September 30, 2023

Cover Photo (top): The DC Water headquarters building, named "HQO," opened in 2019 and was built atop the existing O Street Pumping Station, along the Anacostia River. It is a LEED-certified green building with a heating system that uses sewer heat from the pumping station. *(DC Water photo)*

Cover Photo (bottom): DC Water's Blue Plains Advanced Wastewater Treatment Plant is the largest facility of its kind in the world. *(DC Water photo)*

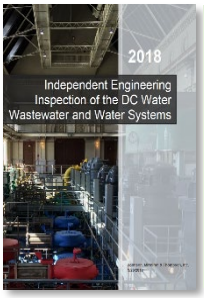
Table of Contents

Executive Summary

Introduction

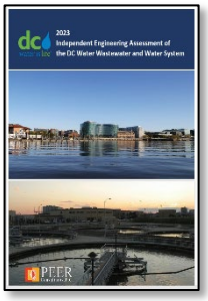
Under its Master Indenture of Trust, DC Water requires an Independent Engineering Assessment be prepared every five years. The purpose of the report is to provide potential bond investors with a description of the organization, an assessment of how well it is managed relative to industry standards, and an evaluation of the condition and maintenance of the built assets.

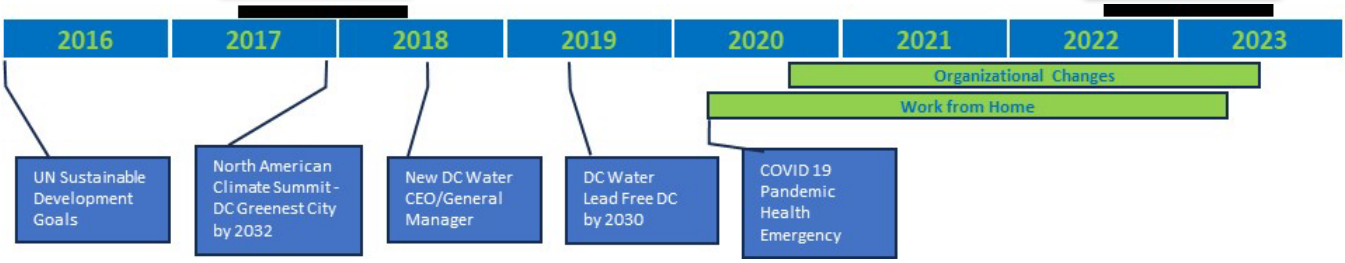
The previous assessment was performed in 2017-2018. The events between 2018 and today have been significant. In response to the United Nations Sustainable Development Goals, the District of Columbia made climate change commitments that directly impacted DC Water as the District's single largest energy consumer. Climate change itself is also forcing DC Water to adapt to more frequent and intense storms and tidal effects impacting critical infrastructure. Within months of the previous report's publication, a new general manager was hired, a new management approach was instituted, and a new corporate culture fostered. In addition, the COVID pandemic caused a major disruption and changed the way in which people work. Through all of this, like the previous report, our conclusion is that DC Water's performance is above average relative to its peers and, in some areas, is at or near best in class.



"Generally found all facilities to be operating at levels allowing DC Water to comply with permit requirements and to meet service commitments. The investigations and reports show the Authority to be diligent in its efforts to meet all challenges."

"DC Water continues to comply with all permit and Consent Decree requirements. In almost all areas, its performance is above average relative to its peers and in some areas, its performance is at or near best in class."





This executive summary presents the methodology used, highlights from the report, and a summary of key findings and recommendations.

Methodology

While performing this assessment, PEER Consultants, P.C., reviewed more than 50 documents and over 20 webpages. Relying mostly on data and information available on the internet provides the reader with the ability to check sources and reduced demands on DC Water personnel.

Data review summaries and tailored questionnaires were then provided before conducting interviews of more than three dozen senior managers. This improved interview productivity and the accuracy of the information

collected. Rigorous site evaluations were also performed using specific standardized criteria to provide a clearer, more objective assessment.

The data and information collected were then evaluated relative to peer performance reported in the 2022 AWWA Water and Wastewater Rate Survey, the 2022 QualServe Benchmarking report, the 2020 National Association of Clean Water Agencies (NACWA) Financial Survey, and others. Using benchmarking in this manner better conveyed the quality of utility management.

Conducted 16
30-factor site evaluations.

In preparing the report, historic as well as forecast capital expenditures were presented to provide context improving understand of the findings. A very detailed management and operations evaluation was included which benefits utility management as well as accurately conveying the importance of the findings.

Summary of the Report Sections

Overview

Governance

DC Water's governance structure is more complicated than most utilities. A 22-member Board of Directors establishes policies and guides the strategic planning process. The 22 members include 11 principal and 11 alternate members, each appointed for a staggered four-year term by different jurisdictions. There are eight standing committees and only the District members participate in those matters that affect District ratepayers.

Despite the legally required complexity of its structure, DC Water enjoys best practice governance and a well-deserved reputation for competent and astute oversight and management.

Management

Starting in FY21, the Senior Executive Team implemented a series of organizational changes aimed at leveraging organizational strengths to produce maximum results, promote a high-performing team culture, and provide the best employee experience. Initial changes made the organization flatter with clearer definition of a new Chief Operating Officer (COO) role.

Among the guiding principles of further organizational changes were facilitating continuous improvement, empowering staff to make decisions, reducing spans of control and layers within the organization, breaking down silos, and supporting data-driven decision-making. All considered best practices.

Following a comprehensive management study, a second set of changes in 2023 refined the role of the COO to enable better cross-unit and cross-cluster coordination and established a Chief Administrative Officer cluster to deliver strategic, data driven, and digitally enabled services across the organization.

Strategic Plan

Blueprint 2.0 (the 2022-2027 Strategic Plan) is a well-developed best practice strategic plan. Although the plan is in the early stages of implementation, this places DC Water on the path to becoming a strategy- and metrics-driven organization. Based on these early implementation efforts, it is expected DC Water will improve its standing relative to high performers as it proceeds through complete plan implementation.

Intergovernmental Relations

DC Water has special intergovernmental relationships with:

- U.S. Congress
- 7 federal agencies; and at times, all federal agencies
- 10 District of Columbia agencies; and at times, all agencies
- 3 states, 4 regional agencies, and suburban governments
- Environmental advocates
- Over 15 parties to intermunicipal agreements (federal, state, and local agencies and other organizations)
- 13 government and 15 non-government members of the DC Flood Task Force

No other retail utility in the country must deal with the U.S. Congress and as many governmental agencies and advocacy groups as DC Water. The Authority does an excellent job interfacing with governmental and non-governmental entities and fostering good relationships.

Recognition

DC Water is a visible expert in the water/wastewater industry. They continue to receive numerous awards for outstanding performance, and the Authority has been awarded nearly 90 patents over the last five years. DC Water personnel are extremely active in making presentations at regional and national association meetings and are prolific authors of technical papers.

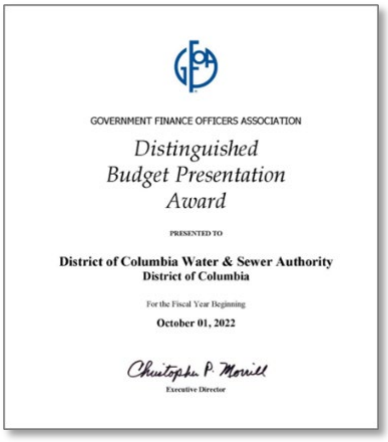
As a result, DC Water is recognized by peers as one of the best national and international utilities with a reputation as a high-quality innovator and helping to shape regulations and the industry.

DC Water Operations

The Senior Executive Team consists of the Chief Executive Officer/General Manager, the Chief of Staff, and six Executive Vice Presidents: the Chief Legal Officer, the Chief People Officer, the Chief Financial Officer, the Chief Communications Officer, the Chief Operating Officer, and the Chief Administrative Officer. This team provides direction and vision to the organization. Leadership was evaluated by comparing the self-assessment with the QualServe consensus best practices along 14 dimensions. DC Water placed in the top quartile for governing body relations, long-term financial planning, and risk management planning, and in the second quartile for optimized asset management and strategic planning. Based on progress being made in other areas, it is expected that DC Water's overall standing will improve in the future.

Financial and Capital Improvement Plan (CIP)

Each year, DC Water produces an annual operating budget and 10-year CIP, and a 10-year financial plan, surpassing the five-year minimum requirements. These award-winning documents are a best practice master class in transparency and thoroughness.


GOVERNMENT FINANCE OFFICERS ASSOCIATION

Distinguished Budget Presentation Award

PRESENTED TO

District of Columbia Water & Sewer Authority
District of Columbia

For the Fiscal Year Beginning

October 01, 2022

Executive Director

Due to historical and topographical factors, DC Water is very capital intensive – total asset value versus total revenue is the highest of 21 similarly-sized water systems (AWWA survey), and eighth of 94 wastewater utilities (NACWA survey). Through outstanding financial management and highly competent asset management, DC Water has inspired bondholder confidence and high-quality bond ratings that have kept rates affordable even with high capital intensity.

Workforce

Compared to other utilities, DC Water employees are older, better trained, and work in safer conditions. This is an indicator that the Authority is a desired employer. However, in the current post-pandemic labor market, DC Water takes longer than the industry average to fill vacant positions. They are taking aggressive steps to address this with a new People and Talent Executive Vice President and a revised approach to Talent Management.

The characteristics of desired employees are changing, as are their expectations of employers. Desired employees are now most likely technologically savvy with strong collaboration skills, and a stronger focus on social responsibility, training, career growth opportunities, and work-life balance. Different generations also require different recruitment and retention strategies and tactics. DC Water is making changes to ensure that jobs and career growth opportunities are consistent with market demands and is broadening its outreach for potential candidates.

Information Technology (IT)

In the past five years, DC Water has migrated all on-premises processing, except for PCS and SCADA, to the Cloud (for cybersecurity reasons these are isolated from the web). Large IT initiatives and upgrades have been implemented since 2015 including the enterprise resource planning (ERP) system for the Finance, Procurement, Human Resources, Benefits and Payroll functions. Upcoming initiatives include further upgrades and maintenance to existing systems, a new payment platform and an automatic meter reading (AMR) system upgrade.

DC Water's IT Department regularly performs scenario planning to anticipate and address potential risks to operation. The potential need to work from home for several possible reasons was one such scenario. DC Water was, thus, fully prepared and supported the seamless transition to remote work during the pandemic.

Customer Service

DC Water prioritizes customer service. The Customer Care Department serves customers by providing timely and accurate billing, appropriate meter replacement and maintenance, as well as responding to customer inquiries through multiple channels. DC Water has a robust Customer Assistance Program, which employs a large array of assistance types and funding sources.

The Authority provides above average levels of customer service. They perform extensive outreach to understand customer wants and needs, as well as use various types of customer feedback for continuous improvement.

Asset Management

DC Water is moving toward a "world class" asset management program. There is an asset management steering committee supported by the Engineering Department, with each operating unit responsible for implementing an asset management program tailored to its needs and consistent with the overall framework. They have transitioned from corrective to proactive maintenance and upgraded their enterprise-wide asset management systems. DC Water is now implementing a risk- and reliability-based asset management framework.

Drinking Water System

Serves more than 700,000 residents, businesses, and the federal government.

Water source: Potomac River – Washington Aqueduct (USACE).

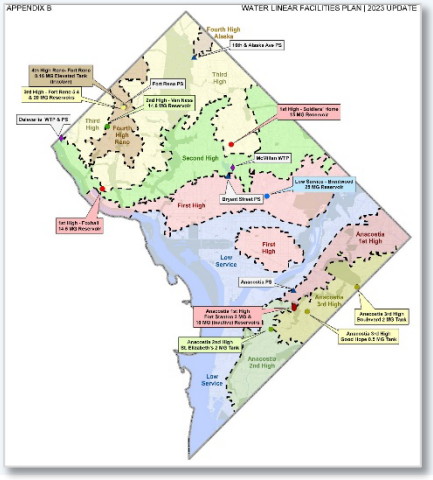
Across 9 pressure zones, DC Water is responsible for operating and maintaining:

- 1,350 miles of water pipes
- 4 pumping stations
- 5 underground reservoirs[1]
- 3 elevated tanks
- 9,500 public fire hydrants

Capital expenditures[2] last five years: $283M.

Planned FY23-FY32 capital expenditures[2]: $2B.

[1] Three additional underground reservoirs owned and operated by the Aqueduct.
[2] Includes Lead Free DC expenditures.



DC Water is committed to higher than federal standard water quality. Water compliance sampling and monitoring is conducted daily with regular communication with the Aqueduct so treatment adjustments can be made if indicated. The drinking water is in 100 percent compliance and the relationship between DC Water and the Aqueduct is a best practice. DC Water's Planned Maintenance ratio is within best practice target range.

Relative to QualServe Utilities, DC Water is:

- A top performer in available water supply and energy efficiency.
- Above average in hydrant out of service and short-term water disruptions.
- Below average for greater than four-hour disruptions.
- Above average non-revenue water (DC Water is working to reduce non-revenue water, including resolving supply chain limitations on their ability to meet small diameter water main replacement targets).

Wastewater System

Provides retail service: District of Columbia.

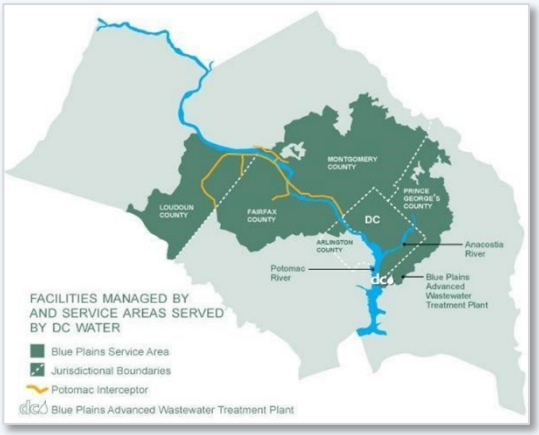
Provides wholesale services: adjacent MD and VA counties.

DC Water is responsible for operating and maintaining:

- 1,900 miles of sanitary and combined sewers
- 160 flow meters
- 9 wastewater pumping stations
- 12 inflatable dams
- Largest advanced wastewater treatment plant (AWWTP) in the world (384 MGD annual average flow and 800 MGD peak flow)

Capital expenditures last five years: $515M.

Planned FY23-FY32 capital expenditures: $3B.



Blue Plains is in full compliance with its August 2018 NPDES permit and is a regular recipient of National Association of Clean Water Agencies Performance Awards including a 2021 Peak Performance Award after 10 consecutive years of compliance. Enhanced Nutrient Removal and biosolids improvements at Blue Plains are well coordinated with the Total Nitrogen/Wet Weather Plan.

DC Water's self-assessment placed between competent and world class in all categories. Relative to QualServe Utilities, DC Water scores highly in regulatory compliance, plant staffing efficiency, and maintenance.

Stormwater System

Municipal Separate Storm Sewer System (MS4) permit issued to DC Government.

DC Water is responsible for combined sewer and sanitary sewer discharge points.

DC Water is designated lead for permit compliance coordination with DC agencies.

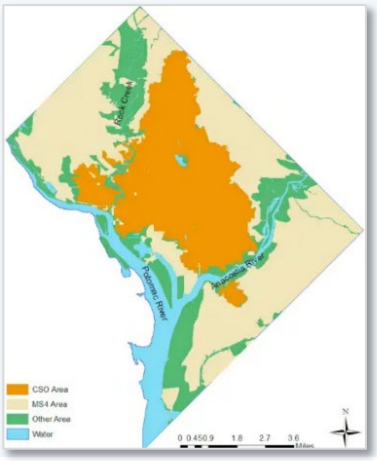
The stormwater sewer system consists of:

- Approximately 25,000 catch basins (14,000 in the MS4 area)
- 600 hundred miles of storm sewer pipes
- Over 400 storm sewer discharge points
- 16 stormwater pumping stations

Capital expenditures[1] last five years: $11M.

Planned FY23-FY32 capital expenditures[1]: $72B.

[1] Not including CSO and Clean Rivers project covered in the next section.



The successful modification of the Consent Decree has allowed DC Water to integrate the Combined Sewer Overflow-Long Term Control Plan and the Total Nitrogen/Wet Weather Plan activities – utilizing the enhanced nutrient removal advancements at Blue Plains to address Consent Decree stipulations. As described under the Clean Rivers Project, some of the largest capital projects in DC Water history have been implemented to address the stormwater requirements.

Major Initiatives

There are several special purpose programs that have been established. Clean Rivers and Lead Free DC are capital intensive programs to address specific regulatory and legal requirements over a relatively short, prescribed period. To avoid having to staff up for the program and then reduce staffing when completed, DC Water has employed the common practice of creating minimally staffed programs with contract support providing most of the labor. In addition, Blue Dot is a limited liability company that allows DC Water to monetize certain activities for the benefit of the ratepayers.

Clean Rivers Project

This program is directly under the COO.

- There is an emphasis on public outreach and transparency.
- 2005 Consent Decree stipulates schedule and reporting.
- The Clean Rivers Program is expected to be completed during FY30.
- The 2017 Northeast Boundary Tunnel design/build project was the largest in DC Water history.
- The Clean Rivers Project has accomplished significant milestones including:
  - Lower portion of the Anacostia River Tunnel facilities commissioned by March 23, 2018.
  - Anacostia River Tunnel system, including the Northeast Boundary Tunnel, is expected to be commissioned in Fall 2023, two years ahead of the Consent Decree schedule.

Capital expenditures[1] last five years: $870M.

Planned FY23-FY32 capital expenditures[1]: $1.06B.

[1] CSO program plus Clean Rivers which is expected to be completed during FY30.

DC Water entered a Consent Decree with the U.S. EPA in March 2005 for the Combined Sewer Overflow Long Term Control Plan (CSO-LTCP). The Total Nitrogen Removal/Wet Weather Plan, a highly complex undertaking at

Blue Plains, is linked to the CSO-LTCP in the goal of increasing water quality in the Chesapeake Bay watershed. Approximately one million pounds/year of nitrogen reduction is predicted from implementing these plans. A 2016 Consent Decree amendment required a Green Infrastructure (GI) pilot project and assessment. It was determined to be impractical to only rely on GI, so the Potomac Tunnel and a hybrid Rock Creek project were approved.

Lead Free DC Program

Launched the Lead Free DC by 2030 Program in 2019.

- Estimated 42,000 properties have lead or galvanized-iron service lines.
- Service lines are owned by the property owner and DC law requires DC Water to maintain the portion in the public space.
- Currently property owner participation is optional, and they may have to pay up-to 50% of the cost of replacing the portion of the line on their property.
- DC Water has outlined an aggressive construction approach in alignment with the Biden-Harris Administration's Justice 40 Initiative.
- Total estimated cost is $1.5B.

Capital expenditures[1] last five years: $40M.

Planned FY23-FY32 capital expenditures[1]: $612M.

[1] Lead Free DC portion of the previously stated Water System expenditures and budget.

DC Water hired an experienced lead service line replacement team to manage the Lead Free DC Program. District lawmakers are currently working on a mandate that requires property owners in the District to replace lead service lines. Current sources of funding include the Bipartisan Infrastructure Bill ($143M), The American Rescue Plan Act ($15M), and Ratepayer Funds ($470M). DC Water is actively seeking $885M in additional funding from various potential sources including Water Infrastructure Improvements for the Nation Act, Community Development Block Grants, EPA Drinking Water State Revolving Fund, EPA Water Infrastructure Finance and Innovation Act, and pending programs such as the Drinking Water and Wastewater Infrastructure Act of 2021 and the Moving Forward Act of 2020.

As of March 2023, 3,700 service lines have been replaced with 2,500 free or discounted, saving customers $6.7M. DC Water supports a legislative mandate to replace lead service lines in the District along with the support of increased funding for all replacements.

Blue Drop

Blue Drop is nonprofit limited liability company created by DC Water in 2016.

- Bloom: the marketing and sale of EPA-certified Class A Exceptional Quality biosolids.
- HQO Waterside Events: renting out spaces within DC Water's new state-of-the-art headquarters (HQO) for community events.
- Sale of software applications developed by DC Water through a marketing agreement with Layermark.
- *Wendy's Wonderful World*: sales of an award-winning children's book series.
- Cell Tower Leasing Program.

Net Revenues for FY22: $4M.

Blue Drop is a distinctive program that allows DC Water to monetize patents, products, property, and innovations for the benefit of customers. It was created to support customer rate relief; advance and promote innovative strategies and technologies; share knowledge, research, and expertise; and to promote resource recovery and conservation. Blue Drop has supported DC Water's Environment, Society and Governance

activities, and helped enhance its reputation in the industry. By providing HQO event space rentals, Blue Drop has raised DC Water's local visibility and is creating unique bonds with its customers.

Security Services

Physical safety is the responsibility of the Security Department, and Cybersecurity is the priority of the Information Technology Department.

Physical Security

Purpose: deliver best practice security services that safeguard and protect mission-critical resources and employees.

Mission: maintain a safe, welcoming customer-focused workplace for staff and visitors.

The department has developed and implemented a comprehensive Emergency Management Plan.

In 2019, became the first utility to achieve ANSI EMAP 4-2016 Emergency Management Standard accreditation.

Upgrading security at facilities system-wide since 2010.

Capital expenditures scheduled through FY25: $3.4M.

The Security Department exceeded Blueprint 2.0 performance measures. Relative to QualServe Utilities, DC Water is:

- Top quartile for Emergency Response Readiness Training.
- Above the median for Emergency Response Planning and EPA Baseline Information on Malevolent Acts.

Cybersecurity

Critical plant systems (SCADA and PCS) run on-premises with remote backup.

Remaining applications are cloud-based.

Member of the U.S. Cybersecurity and Infrastructure Security Agency's (CISA) Water/Wastewater cyber taskforce.

Implemented all CISA Cybersecurity Performance goals.

Uses NIST's Cybersecurity Framework as foundation of its Cyber Resiliency program.

Three separate networks are maintained: administrative applications, SCADA, and PCS. The networks are physically and logically separated – they cannot be accessed by the same device (physical) and the same ID and password cannot be used across the three networks (logical).

All security metrics are above the QualServe high performer median or in the top quartile.

Future Considerations

Effective management requires planning for and being able to respond to future events that can have major impacts on operations. This section reviews how DC Water approaches: addressing sustainability, customer expectations and customer awareness, customer outreach and social media, regulatory requirements and operating conditions, stormwater and watershed management, and automated and smart systems.

DC Water is already preparing for the next change or disruption whether it be stringent regulatory requirements, increasing technological advances, climate change impacts, risk assessment and response

preparedness, emergency response planning, grid disruptions, supply chain issues, or workforce market fluctuations.

Addressing Sustainability

Sustainability is one of the five Bluepoint 2.0 imperatives. In 2021, DC Water was the first Water/Wastewater Utility to release an Environmental, Social and Governance (ESG) Report. This was followed up by its 2022 ESG + Resilience (ESG+R) Report. Adapting to the effects of and mitigating its contributions to climate change is important to the sustainable operation of DC Water. It is a challenge the Authority has vigorously undertaken.

Adapting to the Impact of Climate Variability and Extremes

DC Water's Strategic Plan framework addresses climate variability and extreme events including flooding, drought, extreme temperatures, and tropical storm and hurricane winds.

Activities that DC Water undertakes in furtherance of the plan, include:

- Preparing annual all hazard assessments, participating in the Climate Ready DC plan, an AWWA J100 Risk and Resilience Assessment, and conducting an Enterprise Risk Management Assessment,
- Reviewing and upgrading of design standards – for example, 500-year storm (instead of 100-year storm),
- DC Water CEO co-chairing the DC Flood Task Force,
- Constructing the Blue Plains Treatment Plant floodwall,
- Planning for potential water shortages and temperature extremes, and
- Monitoring climate impacts with the District and DC Council of Governments.

Energy Efficiency and Renewable Energy

Since the 2018 Assessment, DC Water has improved efficiency and operations of its systems, reduced energy use, and worked to diversify energy resources. As the single largest DC energy user – over 431 GWh annually (85 percent at Blue Plains), DC Water is working with DC Government to meet the Clean Energy DC plan:

- Combined Heat and Power (CHP) facility, provides one-third of Blue Plains' electricity – saving $10M/year.
- Secondary Aeration System upgrade saved 4.5 GWh/year.
- 12,000 new solar panels will save nearly $4M over 20 years.
- 57.8 percent of Blue Plains energy use is satisfied by renewable energy.
- Phase II solar project will add 11 MW of capacity.
- Pursuing efficient building design and operation, modernized and renewable energy supply, electrification, and fuel switching.

An example of efficient building design and operation is DC Water's LEED Platinum Class A certified headquarters – one of the most energy-efficient structures in the District of Columbia, using 48 percent less energy and emitting 42 percent less greenhouse gases than a typical office building of its size.

Resource Recovery

The Wastewater Treatment Operations Resource Recovery Unit is responsible for beneficial reuse of biosolids and energy efficiency and generation optimization. Carbon produced and nutrients removed are treated as assets.

In FY22, the U.S. Department of Energy funded a research project for DC Water to investigate five potential treatment systems that could offer substantial energy and resource recovery benefits.

Resilience

The nature of challenges that DC Water will face going forward are evolving. To identify future potential threats, the Authority has a large library of plans—some required, some best practice—that are constantly updated. They base their planning efforts on the results of their vulnerability and risk assessments while making sure to still cover an "all hazards approach." DC Water is one of the only utilities in the United States with their own hazard mitigation plan and taskforce. America's Water Infrastructure Act requires risk and resilience assessments every five years. DC Water also participates in regional and national critical infrastructure protection initiatives.

In the 2022 QualServe Benchmarking Survey, DC Water received the highest rating for risk assessment and response preparedness; emergency response planning; recovery and mitigation; and cybersecurity preparedness. These marks place the Authority well above median when compared to the high performing QualServe cohort.

Customer Expectations, Awareness, Outreach, and Social Media

DC Water has an extensive customer outreach program and a sizeable social media presence. They are also expanding customer engagement and crisis communications capabilities. To do so, they monitor stakeholder preferences, other utilities' practices, and regional and national trends. As changes are identified, different outreach channels are implemented.

Regulatory Requirements and Operating Conditions

More stringent regulatory requirements (e.g., nutrient limits, CSO and SSO control) and various shifts in operating conditions are increasing complexity, cost, and risks in the utility operating environment and placing substantial pressure on revenue needs and revenue generating capacity. DC Water is prepared for near term changes, but large, expensive regulations are on the horizon. In response, they are joining advisory committees, submitting testimony on proposed regulations, conducting pilot studies, and participating in Water Research Foundation studies to understand and help shape the regulatory environment. The knowledge gained is used in scenario planning, incorporating sensitivity/vulnerability analysis to prepare for the future.

Watershed Management

Climate change impacts watershed supply and demand. More intense and frequent storms have the potential to cause flooding. Warmer temperatures can reduce water supply and increase the need for water. Changes in regulations will also impact both water supplies and treatment plant discharges to the watershed. Effective management requires constantly evaluating potential future challenges and opportunities, and developing strategies to deal with these challenges and opportunities as they arise.

Any consideration of a second water source to improve resilience will impact multiple entities within the Potomac River watershed. This requires watershed-wide engagement and continuous stakeholder interaction.

Automated and Smart Systems

DC Water prides itself as being a leading innovator in the water utility industry and has long been at the forefront of using automation and artificial intelligence to improve decision-making. State-of-the-art applications have been developed and are in use helping to improve efficiency.

Findings and Recommendations

Benchmarking and Self-Assessment

Of the areas covered in the self-assessment for which we received responses, none were lower than competent, and many were close to world class. These tables merge the self-assessment with the QualServe Benchmark results to provide an overall view.

Wastewater	
Treatment Process	Near World Class
Sludge Treatment	Near World Class
Crisis Management	Competent
Health & Safety	Near World Class
Organization Development	Competent
Performance Management	Near World Class
Financial Responsibility	Near World Class
Materials Management	Competent
Documentation	Near World Class

Water	
Distribution System	Competent
Materials Management	Competent
Documentation	Competent

Asset Management and Capital Delivery	
Asset Knowledge	Highly Competent
Risk Management – Criticality	World Class
Risk Mgt. – Asset Condition	Near World Class
Plant Maintenance Organization	Near World Class
Plant Maintenance – Quality	World Class
Document Management	Near World Class
Inventory Management	Competent
Financial Accountability	Near World Class
CIP Production	Near World Class
Capital Delivery	Near World Class

Customer Service	
Call Center	Competent
Billing	Competent
Payment Options	Competent
Collections & Revenue Protection	Competent
Performance Mgt. & Training	Competent
Customer Satisfaction	Competent
Organizational Effectiveness	No Response

Utility Services	
CMMS	Competent
Work Order Management	Highly Competent
Mapping/GIS	Competent
Work Planning	Insufficient Data
Organization Development	Work Scheduling
Capacity & Demand Management	Insufficient Data
Work Order Execution	Insufficient Data
Special Programs	Insufficient Data
Review Of Process	Insufficient Data
Inventory & Materials Management	Insufficient Data
SOPs, O&M Manuals	Competent

RCM Performance	
Reliability Centered Maintenance	World Class
Performance Management	Near World Class
Organization	Highly Competent
Information Reporting	Near World Class
Continuous Improvement	Highly Competent
Direction & Leadership	Highly Competent

Site Visits

Up to 30 factors were rated on a scale of 1-10 for each site. The average ratings are shown in the table. Overall, this is indicative of a well-maintained physical plant. It is also an indirect reflection on the quality of historic capital programs – quality assets are easier to keep in good physical condition.

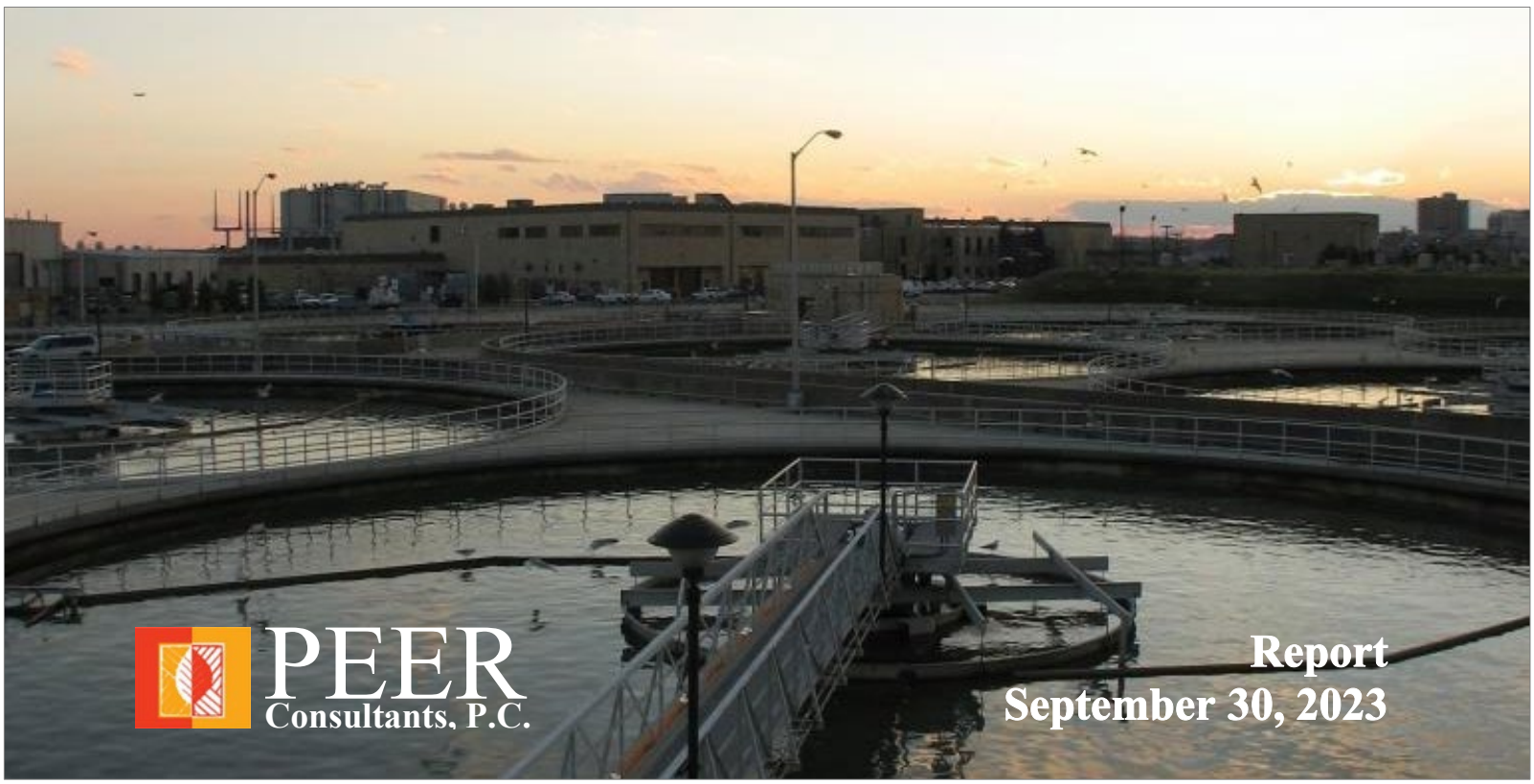
Activity	*Site*	*Average Score*
Non-Process	Headquarters Administration Building (HQO)	10
Drinking Water	Bryant Street Pumping Station	9.4
	Anacostia Pumping Station	9.3
	Fort Reno Reservoir	9.8
Wastewater	Blue Plains AWTP Control Center	10
	Blue Plains AWTP Preliminary Treatment	9.3
	Blue Plains AWTP Primary Treatment	9.3
	Blue Plains AWTP Secondary Treatment	9.5
	Blue Plains AWTP Advanced Treatment	9.5
	Blue Plains AWTP Solids Handling	9.0
	O Street Pumping Station	9.0
	Main Pumping Station	9.1
Stormwater	Blue Plains Treatment	10
	Blue Plains Tunnel	10
	Rock Creek Project B	9.8
	CSO 021 Diversion Facilities Projects	9.9

Key Recommendations

- Continue rollout of Blueprint 2.0, including a full suite of metrics to identify implementation success and achievement of reorganization goals.
- Improve customer satisfaction by "incorporating feedback from customer satisfaction surveys," "implementing customer survey and process improvements from survey results," and working with IT to create a Maximo system and data applications for tracking and addressing customer complaints.
- Follow up high-level organizational improvements with opportunities at lower levels in the organization – for example, centralizing asset management to ensure better uniformity of maintenance and capital decisions.

- Current performance management and metrics are centered primarily around the strategic plan and Environmental, Social and Governance – investigate other frameworks, such as Effective Utility Management.
- Given DC Water's world-class utility ambitions, consider pursuing the Malcolm Baldrige National Quality Award®.
- Pursue DC Water-identified opportunities for improvement, in particular:
  - Accelerating reduction of non-revenue water to peer utility average to mitigate rate pressures, and
  - Improve greater than four-hour disruption of service rates to increase customer satisfaction.
- Work with DC Government to reduce the cost of lead service line replacements for property owners and make replacement mandatory.
- In scenario planning, include the impact of more stringent PFAS regulations on the ability to sell biosolid products rather than incinerate or landfill.
- Consider water supply resiliency – multiple sources and system redundancy.

2023
Independent Engineering Assessment of the DC Water Wastewater and Water System



PEER Consultants, P.C.

Report
September 30, 2023

Cover Photo (top): The DC Water headquarters building, named "HQO," opened in 2019 and was built atop the existing O Street Pumping Station, along the Anacostia River. It is a LEED-certified green building with a heating system that uses sewer heat from the pumping station. *(DC Water photo)*

Cover Photo (bottom): DC Water's Blue Plains Advanced Wastewater Treatment Plant is the largest facility of its kind in the world. *(DC Water photo)*

Table of Contents

Table Exhibits

Table of Photos

1 Introduction

1.1 Purpose

This report presents the findings of an Independent Engineering Assessment of the District of Columbia Water and Sewer Authority's (here known as DC Water's or the Authority's) wastewater and water systems, pursuant to the requirements of the Authority's Master Indenture of Trust. The indenture stipulates that:

> *"The Authority shall cause an independent consulting engineer at least once every five years to inspect the system and make a written report thereof which shall include such independent engineer's findings and recommendations as to the maintenance of the system and the construction of additions, extensions and improvements to the system and capital replacements thereof."*

DC Water retained PEER Consultants, P.C., as the Independent Consulting Engineer to conduct this assessment. The previous Independent Engineering Assessment was prepared by JMT in 2018 (here known as the 2018 Assessment). This five-year recurring audit of the current state of facilities and DC Water's initiatives is executed to comply with the Master Indenture of Trust (*quoted above*). This report contains a summary of our findings and is based on information published through June 30, 2023.

1.2 Scope and Methodology

The 2023 Independent Engineering Assessment (here known as the 2023 Assessment) summarizes the findings and assessments of the Independent Consulting Engineer based on-site inspections, interviews with DC Water management personnel, and other data gathering methods, including use of publicly available data, benchmarking, data gathering instruments, and interview questions focused on the following topics related to water, wastewater and stormwater treatment and conveyance assets:

- Physical condition of assets
- Current and future capital programs
- Governance and management processes
- Operations and maintenance
- Cost and schedule performance of construction activities for capital projects
- Safety programs and risk management
- Consent Decree and permit compliance
- Security
- Emerging issues

Exhibit 1-1: Over 50 document and 20 website reviews

PEER also reviewed documents and reports prepared by or related to DC Water. Additional reports from agencies responsible for the Potomac River were instrumental in assessing the viability of the river as a dependable source of water. A comprehensive list can be found in the Bibliography at the end of this report. These reports include:

- FY 2024 Operating and Capital Budgets, adopted March 2, 2023
- DC Water FY22 ESG+R Report
- DC Clean Rivers Biannual Status Reports

- DC Water Board Resolution #22-44 and #21-84
- DC Water Annual Comprehensive Financial Report 2022
- Blue Plains 2018 Final Permit
- 2021 Pretreatment Annual Report
- 2018 NPDES Permit (Permit #DC0021199)
- 2018 Independent Engineering Inspection (2018 Assessment)

PEER's approach to the 2023 Assessment was to produce a stand-alone appraisal while incorporating key staff input. Independent research was conducted, and interviews were done with management and operational personnel. To minimize disruption of DC Water staff, all interviews were performed virtually. Detailed interview notes were taken, and field observations documented for inclusion in the report. All were verified with interviewees and site managers for accuracy. PEER also visited and inspected numerous facilities as listed in this section. It was observed that all safety measures were being followed at each facility, and asset condition and maintenance were evaluated using a standardized score sheet covering 30 factors.

The 2023 Assessment contains performance observations following up on the 2018 Assessment's documentation of considerable construction activities. The 2018 Assessment was conducted during a time in which DC Water undertook numerous projects and initiatives. The scope and ambition of these efforts are notable both within the history of DC Water and the overall water utility industry. During the intervening period, comprehensive and aggressive construction activities continued to meet scheduled milestones for the CSO Long-term Control Plan (CSO-LTCP) and Total Nitrogen/Wet Weather (TN/WW) consent decrees, and National Pollutant Discharge Elimination System (NPDES) permit requirements. While many construction projects were commissioned in response to the mandates of regulatory orders, consent decrees, and permit requirements, other organizational initiatives have been undertaken in the interest of increasing efficiency, improving management and operations, and providing significant improvements in customer service.

Not all facilities were inspected; however, efforts have been made to ensure a significant and representative sample of all operational facilities were observed during the inspections. PEER used professional judgment to ascertain where inspections were required versus where document research and interviews resulted in confidence in the condition of any other particular asset. All findings, conclusions, and recommendations incorporate professional judgments regarding the implications for future system performance and impacts on DC Water stakeholders.

A critical aspect of PEER's information-gathering process involved interviews with key DC Water staff, as listed in Exhibit 1-3. PEER also attended a DC Water Board of Directors meeting virtually to assess governance.

Exhibit 1-2: Over 3 dozen manager interviews

Exhibit 1-3: Interviews Conducted

Interview Topic	***Interviewee Name(s)/Title***
Blue Drop LLC	Thomas Kuczynski (President) and Francesca Valente (Vice President/General Manager)
Board of Directors	Meeting of the Environmental Quality and Operations Committee – March 2, 2023
CIP Info Management/Engineering	Paul Guttridge (Director, CIP Infrastructure Management)
Climate Change and Resilience	Matthew Ries (Vice President, Strategy & Performance) and Maureen Holman (Vice President, Shared Services)
Current Operations	Ivelisse Cassas (Director, DC Water Security) and Dusti Lowndes (Director, Emergency Management)
Customer Outreach	John Lisle (Vice President, Marketing and Communications)
Customer Care	Meisha Lorick (Acting Director, Customer Care)
DC Clean Rivers Project	Moussa Wone (Vice President, Clean Rivers)
Energy Efficiency, Renewable Energy and Resource Recovery	Chris Peot (Director, Resource Recovery) and Saul Kinter (Program Manager, Business Development)
Energy Systems	Richard Quaofio, (Program Manager, Facilities – Central Administration, Energy Systems)
Financial Office	Matthew Brown (Chief Financial Officer and Executive Vice President, Finance and Procurement)
General Counsel	Gregory Hope (Deputy General Counsel)
Information Technology, Cybersecurity and Smart Systems	Thomas Kuczynski (Vice President, Information Technology), Joe Edwards (Director, IT Enterprise Solutions), Nelson Sims (Director, Cybersecurity), and William Ryan (Webmaster)
Labor Relations and Compliance	George Spears (Vice President, Labor Relations and Compliance Program)
Lead Free DC	William Elledge (Director, Engineering and Technical Services
Management and Operations	Salil Kharkar (Vice President, Senior Operations Advisor)
Planning and Engineering Branch	Getachew Melsew (Senior Manager, Planning)
Procurement	Dan Bae (Vice President, Procurement and Compliance) and Rudy Gonzales (Director, Procurement, Capital Programs)
Rates and Revenue	Syed Khalil (Director, Rates and Revenue)
Sewer System	Aklile Tesfaye (Vice President, Wastewater Treatment Operations), Kendrick StLouis (Vice President, Sewer and Pumping Operations), Nicholas Passarelli (Vice President, Wastewater Operations), and Elkin Hernandez (Director, Maintenance Services)
Stormwater System	Sigi Sharp (Manager, Construction and Repair Services)
Strategy and Performance	Wayne Griffith (Chief Strategy and Performance Officer, and Executive Vice President, Strategy and Performance)
Engineering and Asset Management	David Parker (Vice President, Engineering)
Water System	Jason Hughes (Vice President, Water Operations) and Maureen Schmeling (Director, Water Quality)

PEER made extensive use of metrics and best practices analysis to not only determine how well DC Water was operating, but also to identify how DC Water's performance compared to other water and wastewater utilities. Some of the survey data included:

- 2022 QualServe Benchmarking: Focus on 168 high performing utilities.
- 2020 National Association of Clean Water Agencies (NACWA) Financial Survey: Focus on 109 wastewater utilities with a served population of more than 74 million.
- 2022 American Water Works Association (AWWA) Survey: Focus on survey population – 23 Group A water utilities; 56 Group B water utilities and 15 Group A wastewater utilities; 17 Group B wastewater utilities.

All three surveys include many utilities of a size comparable to DC Water. The QualServe utilities are a group of high-performing utilities that regularly participate in the annual AWWA Utility Benchmarking Survey. QualServe utilities include more than half of all Group A utilities (served population range of 900,000 to 8,000,000-plus) and more than half of all Group B utilities (served population of 100,000 to 900,000). The QualServe utilities are also disproportionately represented among winners of such national awards as the National Association of Clean Water Agencies (NACWA) Platinum and Gold awards, the Association of Municipal Water Agencies (AMWA) Gold and Platinum awards, and the Sustainable Water Utility Management Award. As of last year, the percentage of QualServe utilities winning one or more of the industry awards is 10 times higher than for water and wastewater utilities generally, and QualServe utilities make up about half of AMWA award-winning utilities. Additionally, more than half of the 13 U.S. utilities designated as "Leading Utilities of the World" are QualServe utilities. Finally, 92 percent of the QualServe utilities have a bond rating of prime or high grade. These comparisons establish QualServe utilities as "Best in Class" utilities. Except for those cases where we were able compute exact comparisons, our comparisons to other utilities were based on quartile rankings.

PEER also conducted two best practice surveys. The capital program best management practice survey was based on the consensus best practices identified from a review of more than 500 capital projects as reported by the California Multi-Agency Benchmarking Study. The other survey which examined capabilities and attributes of seven elements of utility operation was based on consensus best practices from analysis of hundreds of national and international water and sewer utilities. These are discussed in more detail in 3.1.1 Overall Assessment Tools. A summary of Management and Operations Findings is presented in Appendix A.

PEER conducted site visits and performed inspections of major facilities that were made accessible to its staff. The focus of facility inspections was on conformance to industry standards, applicable codes, and safety, using a 30-item site inspection scoring sheet. A summary of site visits can be found in Appendix B. Some of the 30 items might not be applicable depending on the site visited. Photographs were taken at the sites to document the visit and conditions inspected; however, PEER was sensitive to security concerns. Facility inspections conducted have been listed in Exhibit 1-5.

Exhibit 1-4: 16 site evaluations

Exhibit 1-5: Site Visits Conducted

Operations	
• Headquarters Administration Building (HQO)	
Drinking Water System	
• Bryant Street Water Pumping Station	• Fort Reno Reservoir
• Anacostia Water Pumping Station	
Wastewater System	
• Blue Plains AWWTP Control Center	• Blue Plains AWWTP Solids Handling
• Blue Plains AWWTP Preliminary Treatment	• Blue Plains AWWTP Solids Treatment
• Blue Plains AWWTP Primary Treatment	• O Street Wastewater Pumping Station
• Blue Plains AWWTP Secondary Treatment	• Main Wastewater Pumping Station
• Blue Plains AWWTP Advanced WW Treatment	
Stormwater System	
• Blue Plains Stormwater Treatment	• Rock Creek Project B
• Blue Plains Stormwater Tunnel	• CSO 021 Diversion Facilities projects

1.3 PEER Consultants, P.C. Qualifications

Founded in 1978, PEER is celebrating 45 years of delivering transformative and sustainable solutions to today's most challenging environmental problems on a local and global scale. Every day, we are realizing our vision as a prosperous and productive full-service environmental engineering consulting firm that exceeds the expectations of our clients and employees, while delivering high-quality services that enhance the natural and built environments. We currently stand at more than 70 engineers, scientists, planners, technicians, and administrative professionals in four offices nationwide.

PEER has expertise in Engineering Design, and Construction Management Services (water, wastewater, stormwater, and solar), Environmental Services (hazardous materials, environmental assessments, environmental permitting, and environmental justice), and Advisory Services (energy efficiency, asset management, process improvement, and benchmarking). Tailored to the specific project, we create multidisciplinary teams of experts to address the environmental challenges of our clients.

PEER's Advisory Services led the preparation of this report. This group includes senior consultants, each with more than 40 years of experience in public sector Industrial and Systems Engineering, Water/Wastewater Operations Research and Benchmarking, Water System Financial Management, and Public Administration. These experts are supported by our engineering and environmental services staff with subject matter experts in variety of areas including water/wastewater/stormwater capital improvements, watershed management, energy efficiency and renewable energy, asset management, information technology, and environmental regulation and permitting.

1.4 A Note of Thanks

The PEER team wishes to express its appreciation to the DC Water managers and staff who graciously took the time to discuss the Authority's achievements over the past five years while also conveying their professional pride and enthusiasm in the organization and its mission.

Photo 1-1: DC Water Leadership Town Hall, May 2023 (DC Water photo)

2 DC Water Overview

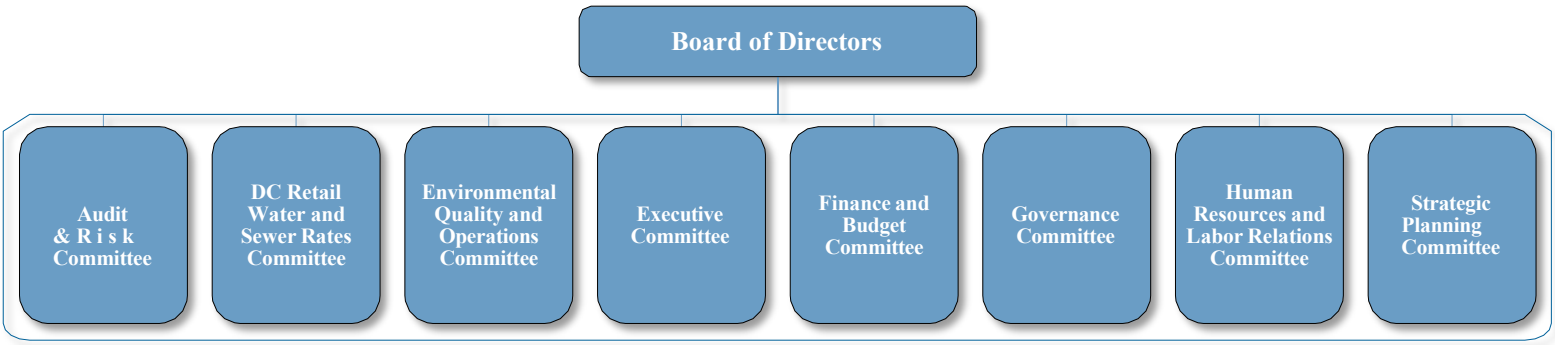
DC Water provides clean drinking water to residents of the District of Columbia, and wastewater treatment services to both District residents and wholesale customers in Maryland and Virginia. In this section, PEER reviews DC Water's Strategic Plan, its governance, intergovernmental relations, organization, and honors and recognition it has received.

2.1 Governance

DC Water's 22-member Board of Directors establishes policies and guides the strategic planning process. The Board consists of 11 principal and 11 alternate members, each appointed for a staggered four-year term. Six principal members (appointed by the Mayor of the District of Columbia, with the advice and consent of the DC Council) represent the District. Five principal members (appointed by the mayor on recommendations of the wholesale customers) represent the wholesale customers—two each from Prince George's and Montgomery counties (jurisdiction of Washington Suburban Sanitary Commission, or WSSC) in Maryland, and one from Fairfax County, Virginia. The powers of DC Water are vested in and exercised by the Board at meetings duly called and held where a quorum of at least six members is present. All Board members participate in decisions directly affecting the management of joint-use facilities which are those facilities used by all three jurisdictions. Only the District members participate in those matters that affect District ratepayers and in setting fees for services that affect only District residents. The Board meets monthly and operates through various committees.

The standing committees (per Article 5.0101 of the DC Water Board of Director's Bylaws) include Finance and Budget, District of Columbia Retail Water and Sewer Rates, Environmental Quality and Operations, Executive, Human Resource and Labor Relations, Audit, Governance, and Strategic Planning (Exhibit 2-1). The Board can create additional committees as it deems necessary; the principal duty of any committee shall be to recommend proposed action to the Board. Additional standing or ad-hoc committees may also be formed to serve specific functions not served by the current standing committees.

Exhibit 2-1: DC Water Board of Directors Committees



Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 11.

Article 3.01 of the DC Water Board of Director's Bylaws defines what a "meeting" is and how meetings are to be conducted in relation to the public. All meetings are open to the public and the news media. Meetings are required to be documented by transcription and/or by electronic recording devices, as well as video, and those documents are to be made available to the public. Article 4.01 of the DC Water Board of Director's Bylaws defines the officers of the Board, their duties, term in office and resignation and removal of officers. The selected Chairperson's duties include calling emergency meetings, determining agenda, presiding over meetings,

establishing committees, and appointing members to committees. A nominating committee elected Vice-Chairperson has the authority to execute the duties of the Chairperson in their absence.

Article 6.01 of the DC Water Board of Director's Bylaws gives the Board the authority to hire a General Manager who will be the chief administrative officer of DC Water. The General Manager candidate requires the affirmative vote of eight voting members to become the DC Water General Manager. The General Manager has supervisory and management responsibilities concerning DC Water's business, affairs, agents, and employees. The General Manager can be removed from his/her position by eight affirmative votes from the Board.

Members of the PEER team have attended numerous Board meetings over many years as part of their provision of consulting services to DC Water. These meetings were observed to be highly professional and well run. In support of this report, a representative from PEER attended the March 2, 2023, board meeting virtually. The meeting was indicative of a well-run and professional organization. DC Water ensures organizational transparency by making meeting schedules and materials available online and making meetings accessible to the public.

The meeting attended by PEER was viewed as representative of previous meetings based upon previous PEER attendance, review of earlier meeting handouts and minutes, and feedback given by DC Water staff during interviews.

Proper governance provides a level of accountability and transparency to stakeholders and can include items such as sharing information about the organization and explaining actions to stakeholders. Best practices include:

- Provide relevant and accessible information
- Timely and accurate reporting
- Performance standards
- Performance assessment
- Performance accountability through chief executive
- Addressing lagging performance
- Rewarding leading performance

Based on our observations, DC Water's Board provides best practice governance.

2.2 Organization

2.2.1 Change of Leadership and Management Philosophy

Photo 2-1: David Gadis, CEO and General Manager (DC Water photo)

A month after the 2018 Assessment was completed, David Gadis became the CEO and General Manager of DC Water. Prior to that, he worked as CEO and President of Veolia Water Indianapolis when the company operated the city's water utility. He brought to DC Water more than a decade of water utility executive experience from the perspective of a contract operator.

As DC Water CEO, Mr. Gadis immediately undertook the challenge of introducing new business practices to a more traditional public utility culture in order to accomplish his mission to "provide DC Water customers with access to affordable, safe and reliable utility infrastructure and services." [1] As described below, the Organizational Structure was redefined, the approach to procurement and the implementation of the capital improvement program was reengineered, information technology was acquired to improve operational and management decision-making, and the

[1] DC Water Approved FY 2024 Budget, page 293.

corporate culture was changed – all with an eye towards minimizing rate increases while maintaining or enhancing the quality of services provided to ratepayers.

In 2010, the DC Water and Sewer Authority (DC Water) initiated a rebranding campaign. The new management team fully embraced this rebranding universally adopting the name DC Water and the tagline "Water is Life." In 2019, DC Water opened a new headquarters building (HQO) built on top of the O Street Pumping Station to reuse the existing land and to capture the excess energy coming off the sewer lines below the station. This and other energy conscious design attributes make it one of the most energy-efficient structures in the city. DC Water did not stop there—the building is also a prominent waterfront landmark where ratepayers can rent event space. In this and other ways, DC Water is forging a unique, highly visible, bond with its customers.

2.2.1.1 Restructuring of Senior Management

Reflecting the change in management philosophy, DC Water has made organizational changes and improvements to enhance efficiencies, improve processes, and better utilize all assets with the goal of better serving the public and protecting the environment. Today, the Senior Executive Team is more diverse and reflective of the community DC Water serves and there are more women Authority leadership roles than ever before.

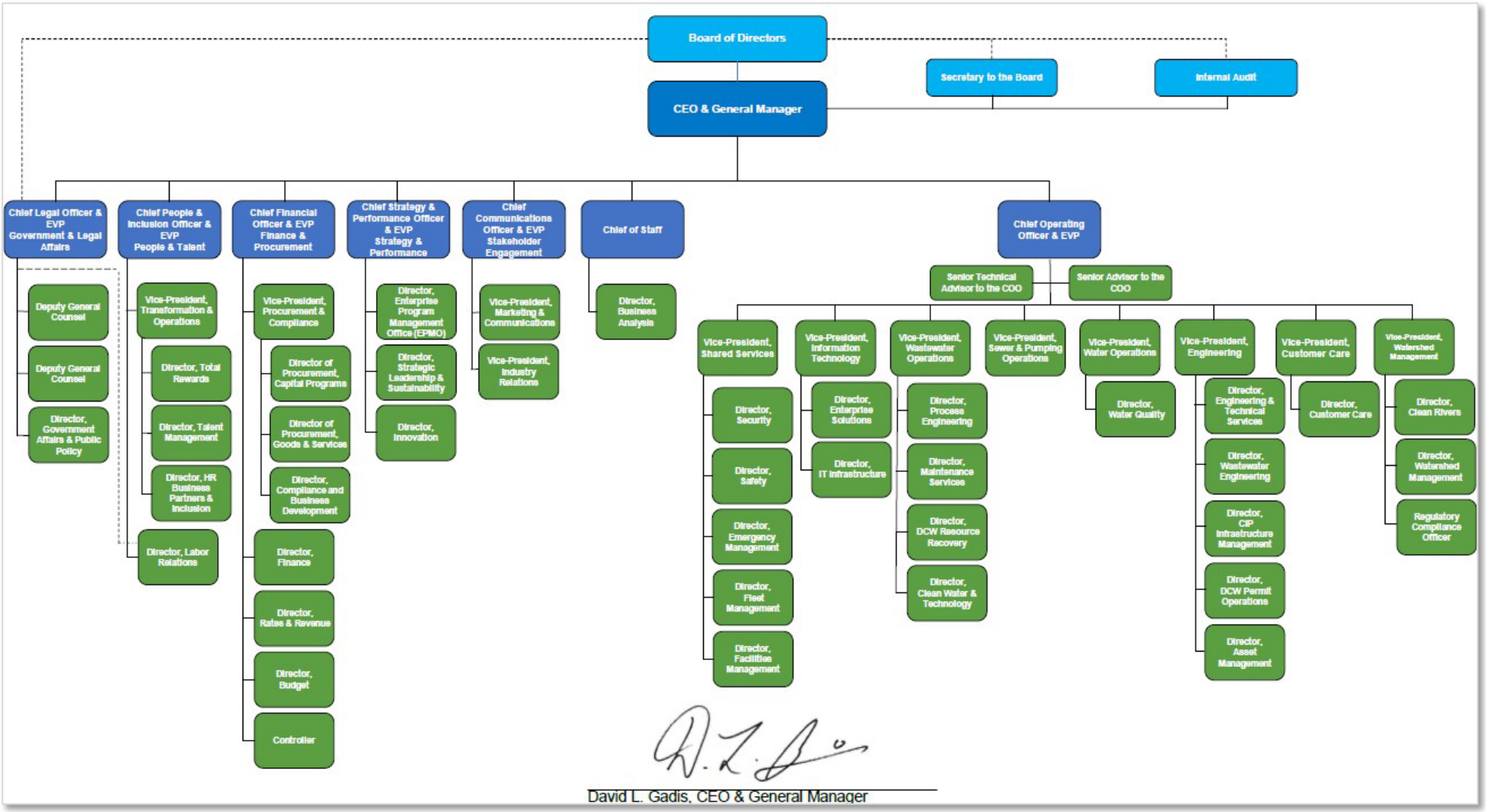
During FY21, DC Water's Senior Executive Team implemented an initial series of structural changes aimed at leveraging organizational strengths to produce maximum results, promote a high-performing team culture across all business units, and provide the best employee experience. These structural changes include the separation of the Information Technology from the Customer Care cluster – establishing it as a separate cluster, creation of a Watershed Management cluster and relocation of Clean Rivers Department from Operations and Engineering to Watershed Management.

DC Water's FY21 organizational chart is shown in Exhibit 2-2 and reflects structural changes for the following departments and cluster groups:

- Chief Executive Officer: This cluster is comprised of the Office of the Chief Executive Officer, Office of Chief Operating Officer, Board Secretary, and Internal Audit.
- Finance and Procurement: This cluster is comprised of Finance and the Procurement and Compliance departments. All goods, services and engineering procurement administration activities are consolidated under the Procurement and Compliance Department. This cluster is also responsible for the oversight of the Non-Ratepayer Revenue Fund.
- People and Talent: Human Capital Management is now the People and Talent department and includes Labor Relations and Compliance Programs under this cluster.
- Strategy and Performance: This cluster oversees the Innovation, Enterprise Program Management Office, Strategic Management and Business Performance Management functions.
- Legal Affairs: General Counsel is now the Office of Government and Legal Affairs.
- Marketing and Communications: External Affairs is now Marketing and Communications.

As part of this change, the Chief Operating Officer (COO) position was created in 2020 to "support and provide oversight, guidance and strategic direction for the Departments of the Administration, Customer Experience, and Operations and Engineering Clusters to ensure alignment with the vision and strategic direction cast by the CEO and Board of Directors, [and to] effectively, efficiently and reliably manage the core operations of the Authority to provide critical services to internal and external customers; oversight and direction for the

Exhibit 2-2: DC Water Organizational Leadership – March 2022



Source: DC Water Approved FY 2023 Budget, adopted March 3, 2022, page 11.

Authority's capital improvement program planning and implementation; and working to achieve resilience and mitigate risks to day-to-day operations and critical infrastructure." [2]

The COO had direct oversite of:

- Operations and Engineering: All operational and engineering functions are consolidated into a single cluster. This includes the Department of Engineering and Technical Services (DETS), Wastewater Engineering, Permit Operations, and CIP Infrastructure Management. The operations departments include Water Operations (includes Water Quality and Technology), Pumping and Sewer Operations, Wastewater Treatment Operations, Process Engineering, and Maintenance Services.
- Watershed Management: This new cluster is comprised of Clean Rivers (previously under engineering cluster), and new departments for Watershed Management and Regulatory Compliance functions.
- Customer Care: This department was previously part of the Customer Experience cluster.
- Information Technology: This department was previously part of the Customer Experience cluster and is comprised of Enterprise Solutions and IT Infrastructure functions.
- Shared Services (previously Administrative Services): This cluster includes the Shared Services Office, Security, Occupational Safety and Health, Office of Emergency Management, Fleet Management, and Facilities Management departments.

Under the new COO, a study was commissioned to increase efficiency and accountability of the operational unit. One result of the study was further revisions to the organization chart implemented in 2023 (see Exhibit 2-3). Among the guiding principles for these organizational changes were facilitating continuous improvement, empowering staff to make decisions, reducing spans of control and layers within the organization, breaking down silos, and encouraging data driven decision-making. All considered best practices.

The 2023 revisions changed the level and/or role of over a dozen positions, refined the role of COO to enable better cross-unit and cross-cluster connections, and established a Chief Administration Officer cluster to deliver strategic, data driven, and digitally enabled services across the organization.

DC Water's organizational structure is the mechanism for ensuring the organizational mission is achieved. The 2023 structure consists of departments that are defined primarily along functional roles and further grouped into reporting clusters. A member of the Senior Executive Team heads each cluster group and is accountable for service delivery and performance metrics of the departments within their cluster.

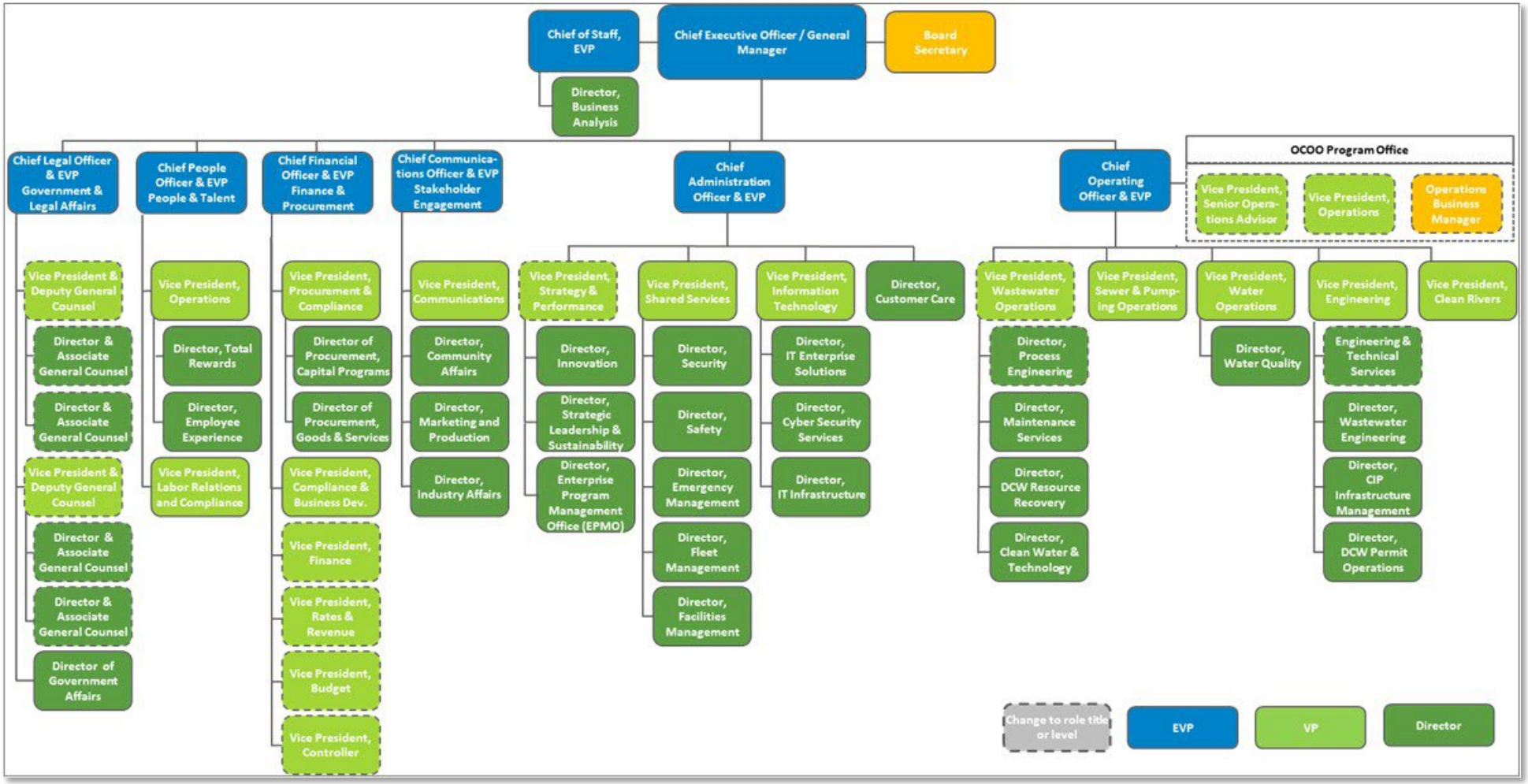
Operational departments report to the COO and include Wastewater Operations, Sewer and Pumping and Operations, and Wastewater Treatment services. These departments are responsible for the day-to-day operations and maintenance of DC Water's extensive infrastructure and facilities that provide direct services to the customers. Also reporting to the COO are Engineering and the Clean Rivers Project. These units are responsible for ongoing reinvestment in the system infrastructure, compliance with various mandates and providing services to the development community throughout the District of Columbia.

The newly defined Chief Administration Officer cluster includes Shared Services, Information, and Customer Care (these departments previously reported to the COO) and Strategy and Performance which previously reported directly to the CEO.

The other clusters provide critical legal, human resources, operations, and community relations support.

[2] DC Water Approved FY 2024 Budget, page 296.

Exhibit 2-3: DC Water Organizational Leadership – May 2023



Source: DC Water Leadership Town Hall, May 4, 2023.

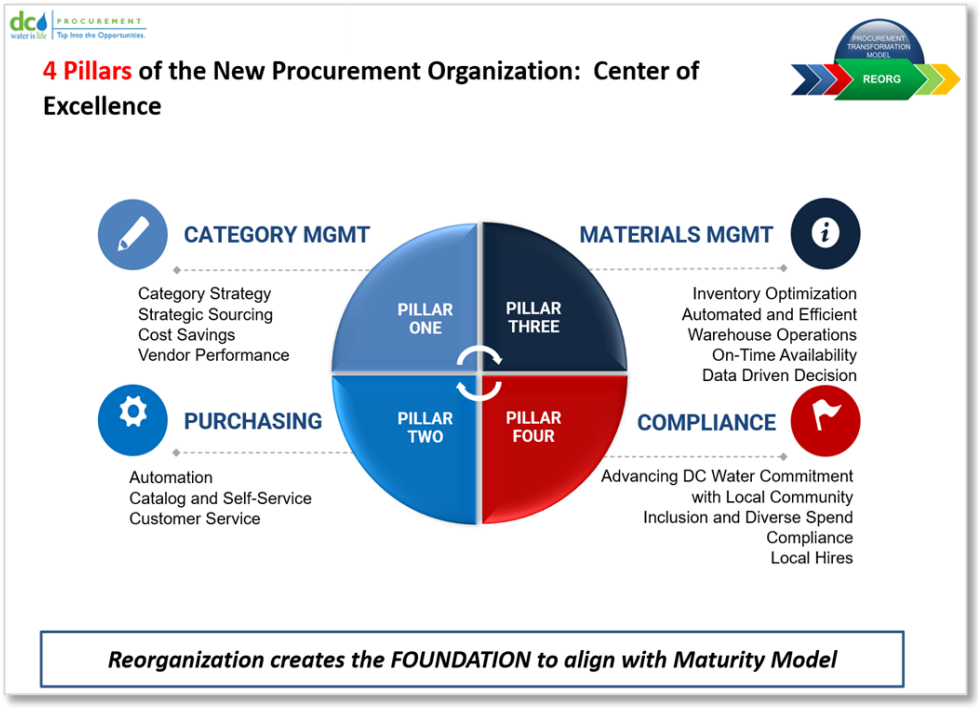
2.2.1.2 Reengineering the Procurement Process

Since the last Independent Engineering Assessment, significant efforts have been made to improve, modernize, and streamline the procurement and compliance process. This has included the development and implementation of both new procedures and new systems (Exhibit 2-4). As described in the next section, DC Water revamped the management structure of the department. The Vice President for Procurement and Compliance is now responsible for the functions shown in Exhibit 2-5. The department measures its success with the targeted performance measures related to the Blueprint 2.0 (Strategic Plan) Imperatives which are presented in Exhibit 2-6.

Modernizing procedures

New leadership in the department has private sector experience. Over the last five years, they have strived to implement best practices from other utilities and industries.

Exhibit 2-4: New Procurement Organization



Source: DC Water Procurement Center of Excellence PowerPoint.

Exhibit 2-5: Procurement and Compliance Functional Units

Central Administration (1 positions)	***Goods and Services Procurement (14 positions)***	***Engineering Services Procurement (7 positions)***	***Contract Compliance (7 positions)***	***Material Management (13 positions)***
Manage compliance to the Procurement Regulations and Manual. Provide the executive direction on procurement and contacting. Manage department employees and resources.	Manage the procurement process for products and services. Develop category and sourcing strategies. Mange vendor relationships.	Manage the procurement process for engineering services and capital projects. Develop category and sourcing strategies. Mange vendor relationships.	Manage DC Water's business development program and business diversity and inclusion programs. Manage the DC WaterWorks program. Mange Contract and Employment Compliance Program (CECP).	Manage the operational materials planning and warehousing. Administer the material control system and optimize inventory management. Provide direction and guidance on inventory policies and procedures.

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 306.

Exhibit 2-6: Procurement and Compliance Performance Measures

Targeted Performance Measures	*FY21 Results*	*FY22 Targets*	*FY23 Targets*	*FY24 Targets*	*Blueprint 2.0 Imperatives*
Timely processing of small purchases within 7 working days	95%	100%	95%	95%	Reliable
Issue Invitation for Bid and award contracts within 90 calendar days	95%	95%	95%	95%	Reliable
Issue Requests for Proposal and award contracts within 120 calendar days	95%	100%	95%	95%	Reliable
Issue Procurement request for inventory restock in one business day of approval	95%	95%	95%	95%	Reliable
System and physical issue of stock request within same day of authorized request	95%	95%	95%	95%	Reliable

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 307.

Goods and Services Procurement: Supply chain issues are not limited to the private sector. To address these issues, DC Water deployed total supply chain management which is a proactive approach. Procurement, which is a passive approach) is a subset of supply chain management as you can see in Exhibit 2-7. One major issue has been the availability of pipes – contractors have been reporting a one-year delay in delivery which could severely impact the start of critical, sometimes regulatory mandated, capital improvements. To address this, DC Water has now started procuring certain construction materials, like pipe, and providing this to the contractor.

Exhibit 2-7: Supply Chain Management

Source: Integrated Supply Chain Management Presentation to DC Water Environmental Quality and Operations Committee, and to Finance and Budget Committee, October 2022.

This allows DC Water to place orders earlier in the process, so materials are available when the Notice to Proceed is given to the eventually selected contractor. This approach has added benefits. The total requirements of all DC Water capital projects allow DC Water to get better prices from vendors than the individual contractors purchasing for a single project. It also allows DC Water to better manage vendor relationships ensuring that they are the customer of choice and facilitating timely service.

Engineering Services Procurement: Several major changes have been implemented over the past five years. As described in Section 5.4 Wastewater System Asset Management, DC Water is adopting a risk-based approach to much of its decision-making, including the criteria used in procuring engineering services. For projects considered highly complex and high risk with severe consequences if not implemented successfully, the proposer's experience, personnel, and approach will be weighted more highly. For projects that are simpler with low risk of failure, the proposer's price will be weighted more highly. Procurement staff now partner with engineering staff from the beginning of the process. This ensures that from the start, the Request for Proposals (RFP) is correctly prepared, reducing the time from budget approval to having the RFP issued. The procurement module of the new Oracle Enterprise Resource Planning (ERP) cloud-based applications has been in use since July 2020. This has resulted in the standardization of the way in which RFPs are organized, presented, and the format of responses. It has also eliminated paper proposals, with everything now submitted through an online portal. Not only is this a more sustainable practice, but it also allowed procurement to easily transition during the COVID pandemic. To improve the quality of the proposals received and to encourage a wider pool of respondents, DC Water now has added industry outreach meetings in advance of the issuing of RFPs, giving firms additional weeks and, for larger projects, months to begin assembling a team before the solicitation is published.

Compliance: DC Water has revamped its approach to compliance. There is a renewed emphasis on procuring goods and professional services from local, minority and/or woman-owned businesses and increasing opportunities for such businesses. As part of the procurement criteria, simply meeting the goals is not enough. Proposers must reach out to a wide range of certified businesses, perhaps discovering and teaming with firms they have not worked with before. The proposal documents must document substantive efforts in this regard, or the proposal will be rejected.

Continuous Improvement: The department has committed itself to continuous improvement. There is a Procurement Steering Committee to ensure feedback from internal clients. There are meetings with vendors where they have an opportunity to give feedback on ways in which the process can be made fairer and more streamlined. In response, improvements have been made, for example, to the way in which proposal documents are submitted.

2.2.2 Workforce

The FY 2024 Budget includes 1,342 authorized positions including 260 vacant positions. DC Water is committed to a strategic goal to achieve a lower vacancy rate. The approach entails a closer look and assessment of staffing requirements needed to maintain service levels, coupled with increased hiring efforts in areas of need and criticality throughout the Authority. To this end, aged and hard-to-fill vacant positions are deactivated to lower costs, and new positions added to better align with evolving needs. From the end of FY19 through FY23, 66 positions were deactivated and 117 were added for a net increase of 51. For the FY24 budget cycle, 17 new positions were added in the areas of greatest need to the Authority such as Safety, People and Talent, Maintenance, Pumping and Sewer Operations, and Biosolids Management. The authorized headcount reflects management's commitment to drive efficiency, fill critical

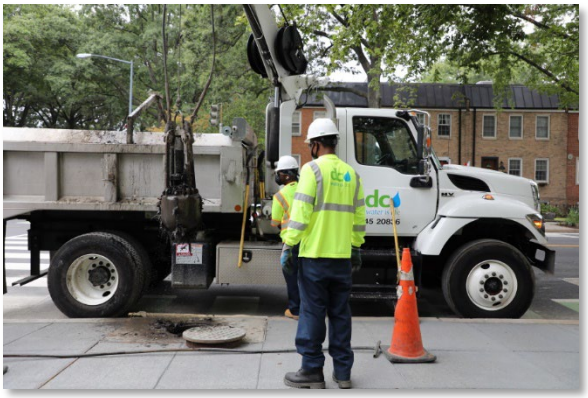


Photo 2-2: DC Water Workers (DC Water photo)

positions, and achieve a single-digit vacancy rate in the future. More information on DC Water's efforts to achieve these goals are included in Section 9.3 Employee Recruitment and Retention.

During interviews with engineering and operational managers, PEER found analyses being performed to balance in-house workloads and the outsourcing of engineering and contractual services.

DC Water provides its employees with comprehensive fringe benefit packages, including coverage for: health insurance, group term life insurance, dental care, vision care, disabilities, and retirement plans. It has also undertaken efforts to provide staff with modern office spaces that reflect the importance of their day-to-day missions.

DC Water's staffing levels compare favorably to other utilities. The wastewater system is efficiently staffed – at 0.81 FTE/MGD treated, and 0.11 FTE/100,000 people served, it is well below its peer Group A medians. Compared to other water systems that purchase treated water, DC Water is within staffing ranges, although on the high side. The below six percent overtime rate does not indicate understaffing, and the effectiveness measures shown in subsequent sections of this report reflect adequate staffing to achieve operational goals.

2.3 Strategic Plan

The DC Water Board of Directors adopted Blueprint 2.0 DC Water's 2022-2027 Strategic Plan on July 7, 2021, to take effect October 1 of that year. The plan is the successor to The Blueprint, launched in 2018, which pushed DC Water to operate as high-performing utility, improve employee engagement and the customer experience, better leverage technology, ensure a safe workplace, and enhance its readiness and resilience. The strategic plan consists of its vision and mission, values and five imperatives:

2.3.1 Vision and Mission

DC Water's vision is to be known for superior service, ingenuity, and stewardship to enhance the health and well-being of its diverse workforce and communities. The mission and primary objective is to achieve its vision by exceeding expectations and providing high quality water services in a safe, environmentally friendly, and efficient manner.

2.3.2 Values

DC Water's values of accountability, trust, teamwork, customer focus, safety and wellbeing guide its decision-making and reflect its culture enabling the Authority to deliver a vision and mission for the communities it serves.

2.3.3 Organizational Imperatives

Blueprint 2.0 sets out five Organizational Imperatives, which are defined outcomes essential to achieving strategic ambitions over the next five years and beyond (Exhibit 2-8). The imperatives have been developed through engagement with a cross

Photo 2-3: Blueprint 2.0 (DC Water graphic)

section of key stakeholders and are used to frame strategy and address upcoming challenges. They are defined in the document as follows:

Exhibit 2-8: Blueprint 2.0 Organizational Imperatives

Source: DC Water Blueprint 2.0, page 9.

Healthy, Safe and Well: Water is the life source of our community, and the essential services we provide at DC Water must be world-class. Our fundamental priority must be ensuring DC Water is safe for all – for our customers, our communities, our employees, and our contractors.

Reliable: A high performing network of systems and assets is critical to reliability, using real-time monitoring to inform better decision making. Our aim is to continue to deliver an excellent service for customers and ensure we minimize service disruption. This is enabled by ensuring we adopt an integrated and enterprise-wide approach to deliver services efficiently.

Resilient: To adapt to shocks and stresses to our system, we must secure assets through proactive maintenance and value-driven asset management.

Sustainable: Sustainability is about balancing the economic and social value we create with the environmental impact of doing so. Ensuring that we make efficient use of economic resources through operating efficiency and resource recovery and reuse is key.

Equitable: DC Water's desire to be an equitable organization touches on all parts of the Authority, starting with the decisions we make around infrastructure. Carefully considered infrastructure projects can greatly empower vulnerable communities and ensure that work happens in the areas where the negative impact of not doing it may be most felt.

Strategic planning is the process an organization uses to define the direction it is headed, the mechanism for allocation resources to pursue that direction, and the control mechanisms for guiding the implementation of the strategy. Strategic planning best practices include:

- Documented strategic plan
- Analysis and selection of strategies
- Short/long-term action plans
- Performance measures (KPIs) that are measured and reported on
- Process for strategic plan development that incorporates stakeholder input

Beginning with the Blueprint plan, a five-phase approach was used to gather insights and create the strategic plan, with input from the Board of Directors, DC Water leadership, key external stakeholders, and multiple internal workshops. This approach and the participants were grounded in established frameworks such as the

UN's Sustainable Development Goals[3], the City Water Resilience Framework[4], the Six Capitals[5], and Drivers of Change[6]. While the Blueprint provided a high level of strategic direction with its six strategic programs, the Blueprint 2.0 structure built off its diverse stakeholder engagement to create a tiered, strategic structure that provides a range of guidance, from visionary direction to specific, measurable goals. Fundamentally, the new strategy shifts the needle on thinking about the strategic plan in terms of "what we need to do" to thinking about the plan in terms of outcomes or "why and how we intend to make change in the community."

By defining the outcomes that are important to the community over the next strategic cycle, DC Water outlined five organizational "imperatives" to articulate the narrative of their strategy: Healthy, Safe, and Well; Reliable, Resilient, Sustainable, and Equitable. Each imperative is satisfied by the execution of three to seven cross-functional strategic "themes." To measure and assess performance, impact, and progress quantitatively over time, each theme is assessed by one or more "goals" with leading and lagging indicators. Periodic (monthly, quarterly, or annual) reporting on these goals will provide leadership, Board of Directors, and key stakeholders the opportunity to assess strategic performance.

As with any strategic plan, some goals are tangible and continue to advance crucial daily operational programs such as worker safety and the delivery of clean water. Other goals are aspirational and will require years if not decades to accomplish, such as improving the resilience of water supply and achieving collective carbon reduction goals. Blueprint 2.0 not only provides a new strategic structure for DC Water, but it also creates accountability with assigned leaders and requires cross-functional teams to advance strategy. Each of the five imperatives is led by an "Imperative Accountable Owner," a member of DC Water's Senior Executive Team. Each of the 25 themes is led by a "Theme Responsible Owner," a member of DC Water's leadership team. This process is led by the Director of Strategic Leadership and Sustainability, with oversight by the Executive Vice President of Strategy and Performance who reports to the CEO.

DC Water has just completed its first year of Blueprint 2.0 which has included a "mobilization" stage of developing and assigning metrics to each of the strategic plan themes. In the strategic plan structure, there are five imperatives, 25 themes, and approximately 110 goals. DC Water has quarterly Stat ("Status") meetings of Executives, Imperative Accountable Owners, Theme Responsible Owners, and Working Group members where there are regular reports on progress. The five imperatives and 25 themes are in the publicly available Blueprint 2.0 document. The 110 goals are not yet published but rather are managed via an internal spreadsheet. Exhibit 2-9 is an example of the Equitable Imperative and the first three themes.

The full implementation of Blueprint 2.0 will include such efforts as scenario planning as DC Water proceeds on its path to becoming a strategy- and metrics-driven organization.

Based on our criteria, DC Water's strategic plan is a best practice Strategic Plan. Compared to the high performing QualServe utilities DC Water is better than median for strategic planning and strategic plan

[3] United Nations, Department of Economic and Social Affairs Sustainable Development, THE 17 GOALS | Sustainable Development (un.org)
[4] United Nations, Department of Economic and Social Affairs Sustainable Development, City Water Resilience Approach (CWRA) | Department of Economic and Social Affairs (un.org)
[5] International Financial Reporting Standards Foundation. Get to grips with the six capitals | Integrated Reporting
[6] US AID, Drivers of Change approach developed by the UK Department of International Development (DFID). Drivers of Change | USAID Learning Lab

Exhibit 2-9: Example of Blueprint 2.0 Themes and Goals for the Equitable Imperative

Theme ID	*Goal ID*	*Theme*	*Goal*	*Goal KPIs*
EQU1	EQU 1.01	A totally engaged and aligned DC Water	Employees Townhall attendance	# of employees attended / total number of FTEs
EQU1	EQU 1.02	A totally engaged and aligned DC Water	Employee satisfaction rate	satisfied responses / total responses
EQU1	EQU 1.03	A totally engaged and aligned DC Water	Employee survey engagement	Total responses to employee engagement survey / total number of employees
EQU1	EQU 1.04	A totally engaged and aligned DC Water	Percentage of staff engaging with digital tools	IT People Experience KPI
EQU1	EQU 1.05	A totally engaged and aligned DC Water	Employee Turnover Rate	Total Number of Separations/Total FTE in a Quarter
EQU2	EQU 2.01	Embedding equitable infrastructure decision-making	Number DC Water Capital Projects with local impacts planned with equity-based tool or framework	# of new DC Water capital projects with local impacts planned with equity-based tool or framework
EQU2	EQU 2.02	Embedding equitable infrastructure decision-making	Number of new processes that incorporate equity-based principles	Capital spending per customer in high ADI neighborhoods / average capital spend per customer in all neighborhoods
EQU2	EQU 2.03	Embedding equitable infrastructure decision-making	Percentage of lead service lines in under-resourced communities	Total number of LSLs in high ADI neighborhoods / total number of service lines in high ADI neighborhoods - (FY22-FY27)
EQU3	EQU 3.01	Ensuring inclusive and diverse representation	Gender representation across the authority and in leadership (Grade A & above)	50% of score: Authority-wide (Total # of Female employees/Total FTEs) 50% of score: Leadership (Total women in Grade A and above / Total FTEs in Grade A and above)
EQU3	EQU 3.02	Ensuring inclusive and diverse representation	Race representation across the Authority and in leadership (Grade A & above)	50% of score: Authority-wide (Total # of Minority employees/Total FTEs) 50% of score: Leadership (Total Minority employees in Grade A and above / Total FTEs in Grade A and above)
EQU3	EQU 3.03	Ensuring inclusive and diverse representation	Percentage of division inclusion plans on target	(Total of Divisions in Green + Total of Divisions in Yellow) / Total of All Divisions

Source: FY 2022 Blueprint 2.0 Annual Report.

implementation. Based on the early implementation efforts, PEER expects DC Water will improve its standing relative to high performers as it proceeds through complete plan implementation.

2.4 Intergovernmental Relations

Being a successful utility requires the maintenance of productive relationships with a variety of governments. DC Water works with many governmental agencies at the federal, regional, and District level. Over the years, DC Water has developed strong partnerships with the DC Government, Congress, suburban jurisdictions, federal regulators, and environmental advocates. They are continuing to strengthen existing partnerships while reaching out to establish new relationships.

2.4.1 U.S. EPA and Regulatory Environment

DC Water is regulated by the U.S. Environmental Protection Agency (EPA), within EPA Region III, as the owner of a wastewater treatment plant, a provider of drinking water, and a discharger. It is also subject to a variety of federal workforce regulations. This is discussed in more detail in Section 4 The Drinking Water System and Section 5 The Wastewater System, respectively. The Blue Plains treatment plant discharges to the Chesapeake Bay drainage area placing DC Water under EPA regulation of the Chesapeake Bay Total Maximum Daily Load (TMDL). DC Water shares stormwater management responsibility with the District (described in Section 6 The Stormwater) and is under an EPA Consent Decree. A portion of DC Water's wastewater collection system is combined placing it under EPA regulations for combined sewer overflows (CSOs), discussed in more detail in Section 7.1 Clean Rivers Project.

2.4.2 District of Columbia

DC Water works cooperatively with virtually every agency of the District of Columbia. Exhibit 2-10 highlights some of those relationships.

DC Water also works with DC Silver Jackets, an interagency team comprised of regional, federal, and District of Columbia government agencies, as well as academia, leveraging resources to implement integrated solutions for reducing flooding risk. The DC Water CEO is co-chair of the DC Flood Task Force, which includes 13 government agencies and 15 other public and private organizations.

Exhibit 2-10: Primary District Agency Relationships

District Agency	*Areas of Cooperation*
DDOT	Coordinating street work
DDPW	Stormwater
DDOEE	Customer Assistance Program Lead Free DC Co-chair DC Flood Task Force
DC Auditor's Office	Bond issuance
DC Office of People's Counsel	Consumer rights, other issues
DC OCTO	Technology, cyber
DC Emergency Operations Center (JAHOC)	All hazards emergency operations
District of Columbia Police (MPDC)	Multiple
Office of the CFO DC	Budget submittal to Congress

Source: Various internet sites and an interview with Salil Kharkar.

2.4.3 U.S. ACE, Washington Aqueduct

Drinking water in the District of Columbia comes from the Potomac River. The U.S. Army Corps of Engineers (USACE), Washington Aqueduct (Aqueduct), is a federally-owned agency responsible for treating the drinking water. DC Water purchases water from the Aqueduct and is responsible for maintaining the distribution system that delivers drinking water to customers. DC Water distributes drinking water through 1,300 miles of pipes to more than 700,000 residents and businesses in the District of Columbia; the distribution system begins at the water treatment plant and ends at private service lines. Customer service lines connect to the mains in the

streets and deliver water to residents and commercial buildings, eventually reaching taps. Water is continuously moving through the distribution system, typically at a flow rate that keeps the water fresh. However, once the water leaves the main and enters a customer's service line, the flow of water is dependent on individual water usage.

DC Water conducts daily compliance monitoring to ensure water quality meets EPA standards. Technicians collect and analyze water samples for lead and copper, total coliform (bacteria), and disinfection byproduct levels. Compliance monitoring ensures that drinking water treatment effectively prevents pipe corrosion, removes bacteria and other contaminants, and minimizes potentially harmful treatment byproducts.

The Potomac River, the sole source of raw water for the Washington Aqueduct's two drinking water treatment plants (Dalecarlia and McMillan), supplies 78 percent of the Washington, D.C., metropolitan area's water, with public water supply intakes located in the river just upstream of the city. During a drought, water from three upstream reservoirs can be released if necessary to increase river flow. Public water suppliers in the region utilize the Potomac River as a source of raw water and distribute treated water to homes, businesses, and critical government facilities. Combined, they serve five million residents and more than three million workers in the District and surrounding Maryland and Virginia jurisdictions. The region depends on water for use by residents and workers for drinking, cooking, bathing, and flushing toilets, use by hospitals and other medical facilities, fire suppression, and cooling water for industrial air conditioning systems.

The region is very cognizant of the sensitivity to drought and the threat of contamination inherent in a river supply. The Interstate Commission on the Potomac River Basin (IPCRB) was created with an interstate compact established by Congress in 1940 to help the Potomac basin states and the federal government enhance, protect, and conserve the water and associated land resources of the Potomac River basin through regional and interstate cooperation. The IPCRB jurisdictions are represented by appointed Commissioners from Maryland, Pennsylvania, Virginia, West Virginia, the District of Columbia, and the federal government. In 2017, the ICRPB Commissioners undertook a study to determine if there might be advantages to proposing specific changes to the current Low Flow Allocation Agreement (LFA), which is an interstate agreement. The commissioners represent all the entities that are signatories to the agreement. The specific concerns within the LFA include the role of the moderator who is defined as the individual to settle disputes concerning allocations and whether the current agreement is protective of the river with respect to the amount of water to be allowed to flow over Little Falls Dam in times of drought.

ICPRB's 2017 study *Washington Metropolitan Area Water Supply Alternatives*, also evaluated a suite of options to address increased drought severity in the face of climate change and identified use of a local quarry to store an emergency backup supply of water as a recommended option. A subsequent ICPRB study, the *Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050* (2020), updated and refined the evaluation of benefits of additional supplemental storage.

Currently, ICPRB is vigorously pursuing funding for additional supplemental storage. The 2022 WRDA bill has $3M provision for a study related to securing supplemental storage.

2.4.4 Blue Plains AWWTP Intermunicipal Agreement

DC Water treats wastewater for approximately 1.6 million people in neighboring jurisdictions, including Montgomery and Prince George's counties in Maryland, and Fairfax and Loudoun counties in Virginia. Wastewater treatment services to User Jurisdictions are provided at the Blue Plains plant. The wholesale customers' share of operating costs at Blue Plains and other multi-jurisdictional use facilities are recovered in accordance with the Blue Plains Intermunicipal Agreement of 2012, effective April 3, 2013, (which replaces Blue

Plains Intermunicipal Agreement of 1985), the Potomac Interceptor Agreements and the Loudoun County Sanitation Authority Agreement.

DC Water is party to several agreements pertaining to wastewater collection and treatment. These contracts are summarized in Exhibit 2-11.

Exhibit 2-11: Summary of Intermunicipal Agreements

Agreement	*Date Signed*	*Parties*
Potomac Interceptor Agreement	1963	• The Authority • Dulles International Airport • Department of Navy • National Park Service • Town of Vienna
Chesapeake Bay Agreement	1983	• District of Columbia • Maryland • Pennsylvania • Virginia • U.S. Environmental Protection Agency • Chesapeake Bay Commission
Blue Plains Intermunicipal Agreement	2013 (current)	• The Authority • Fairfax County, VA • Montgomery County, MD • Prince George's County, MD • Washington Suburban Sanitary Commission
Loudoun County Sanitation Authority Agreement	1998	• The Authority • Loudoun County Sanitation Authority

Source: 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Data verified by DC Water staff.

2.4.5 Federal Government

The Chief Legal Officer oversees the newly named Office of Government and Legal Affairs. This office tracks legislative issues and lobbies for legislation.

DC Water interacts with federal agencies as customers (an example is the metering of the Pentagon) and as neighbors (the Naval facility next to Blue Plains).

For security and related matters, DC Water interacts with several agencies including:

- Federal Bureau of Investigation (FBI)
- Federal Emergency Management Agency (FEMA)
- U.S. Army Corps of Engineers (USACE)
- Department of Homeland Security (DHS)
- Cybersecurity and Infrastructure Security Agency (CISA)
- National Park Service

2.4.6 Regional Agencies

In addition to federal agencies identified above, DC Water interacts with:

- Water/Wastewater Agency Response Network (WARN)
- National Capital Region (NCR) Water Agency Response Network
- Washington Metro Area Transit Authority (WMATA)
- Metropolitan Washington Council of Governments

2.5 Recognition

2.5.1 DC Water Awards

DC Water has received numerous awards for outstanding performance during this review period. The following is a sampling of those awards:

Management and Operations

- Excellence in Management, Gold Level, NACWA
- Utility of the Future Today, Activity Area: Partnerships and Engagement, WEF/NACWA/et al.
- NACWA's Peak Performance Award
- Inaugural 2022 Trailblazer Award by the Institute of Supply Management (Transformation Award) in recognition of DC Water's outstanding Capital Procurement transformation
- 24th consecutive Certificate of Achievement for Excellence in Financial Reporting
- 22nd consecutive Distinguished Budget Presentation Award
- Rudy Gonzalez, Director of Procurement, Capital Programs was awarded the ACEC-Metropolitan Washington, Engineering Industry Leadership Award in recognition of the Capital Procurement Department's "Outstanding Public Service and Leadership" through inclusive expanded outreach and transparent communication of DC Water's CIP procurements to the DC Water business community

Water Works/Apprenticeship

- 2021 Apprenticeship Sponsor of the Year by the District of Columbia Apprenticeship Council (November 2021)
- 2022 Outstanding Partner for Workforce Development with the DC Infrastructure Academy (May 2022)

Contract Compliance (Business Diversity, Equity, and Inclusion)

- (David Gadis) 2022 Minority Business Enterprise Leaders and Legends Hall of Fame – Innovator Induction with the Capital Regional Minority Supplier Development Council (November 2022)
- Received the 24th consecutive unqualified audit opinion on financial statements for FY21, the first year of using the newly implemented ERP system
- Global Smart Water Project of the Year for 2022 for the Event Management System (IT)
- Best in Presentation for the Bloom presentation at the Tri-Con Biosolids Beauty Contest
- National Association of Fleet Administrators (NAFA) 100 Best Fleets #59

2.5.2 DC Water Technical Papers

The 2018 Assessment estimated DC Water personnel had submitted 1,000 abstracts during the previous 10 years. Neither PEER nor DC Water can confirm a similar estimate for this report. However, PEER has observed that DC Water personnel are extremely active in making presentations at regional and national association meetings and that they are prolific authors of technical papers. Our estimate of the total is well into the hundreds for the assessment period.

2.5.3 DC Water Patents

A leading innovator among U.S. utilities, DC Water staff efforts frequently lead to inventions which are awarded patents. DC Water has nearly 90 patents as owner or co-owner since the 2018 Assessment.

2.5.4 Recognition of DC Water Executives

As a highly regarded organization, DC Water personnel are frequently chosen for leadership positions in water industry associations and to act as spokesperson for the industry. The following is a brief sample:

CEO David Gadis currently serves on the boards of the National Association of Clean Water Agencies (NACWA), the National Forum of Black Public Administrators (NFBPA) and the DC Utility Infrastructure Advisory Council. Mr. Gadis has been a frequent presenter at utility and government services conferences, including the U.S. Conference of Mayors, speaking on both Underground Infrastructure and Managing Utilities, as well with the National League of Cities and the National Association of Public Private Partnerships. He was honored by World Leaders magazine by inclusion in Most Successful Black Corporate Leaders to Watch in 2022. He has been a keynote speaker at several events including City of the Future 2023. He was recently appointed by President Biden to the National Infrastructure Advisory Council.

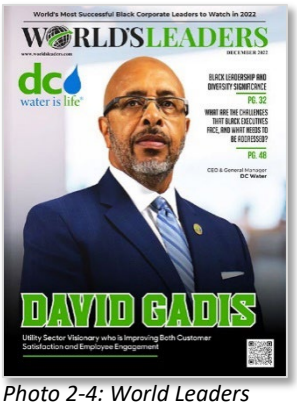


Photo 2-4: World Leaders magazine, December 2022.

2.6 Key Findings

Summarizing the areas reviewed in this section:

- Strategic Plan: Based on our enumerated best practice attributes, DC Water's Blueprint 2.0 is a well-developed best practice strategic plan. Some elements in the plan are in the early stages of implementation.
- Governance: Because of the formation of DC Water and the many governmental entities with which it is involved, they have a more complex governance structure than most water and wastewater utilities. However, DC Water has a well-deserved reputation for competent and astute governance. Based on our enumerated best practice attributes, DC Water enjoys best practice governance.
- Intergovernmental Relations: DC Water's service delivery structure requires interfacing with more governmental entities than most water and wastewater utilities that provide retail service – including the United States Congress. Based on our observations over a period of years, DC Water does an excellent job of managing these many relationships, some of which have divergent interests. A recent study performed by PEER benchmarked Intermunicipal Agreements (IMAs) throughout the country. The Blue Plains IMA ranked highly in this benchmarking study.

Photo 2-5: Some of the organizations with which DC Water collaborates.

- Organization: As is the case with most water and wastewater utilities, DC Water is organized along functional lines. The recent reorganization adds service-line and reporting-line overlays designed to produce a leaner and more responsive organization.
- Recognition: DC Water has received numerous industry awards and recognition as one of the better national and international utilities. Their stature is reflected in the many honors and positions held by its employees and its recognition as a leader through the many accepted abstracts over the years.
- The continued rollout of Blueprint 2.0 including a full suite of metrics will be important in identifying DC Waters success in strategic plan implementation.
- DC Water should focus on the development of metrics that will measure achievement of reorganization goals.

3 DC Water Operations

In Section 2 DC Water Overview, the strategic plan, organizational structure, and Board of Directors were reviewed, as well as identification of the many governmental and non-governmental agencies that DC Water works with. In this section, management and operations will be reviewed.

3.1 Overview

Within DC Water's organizational structure, management consists of the following departments and cluster groups:

- Chief Executive Officer/General Manager
- Chief Legal Officer
- Chief People Officer (Operations and Labor Relations)
- Chief Financial Officer (Finance and Procurement)
- Chief Communications Officer
- Office of the Chief Operating Officer
- Office of the Chief Administration Officer
  - Strategy and Performance
  - Shared services
  - Information Technology
  - Customer Care

The 2018 Assessment focused on budgeting, information technology, and customer service in their review of management. In this report, the focus is on the Senior Executive, Finance and Procurement, Information Technology, Customer Care, People and Talent, and Operations. Other management and support activities are cross-cutting and discussed elsewhere in this report (directly and/or indirectly).

Under DC Water's new structure, all operational functions (Wastewater Operations, Sewer and Pumping Operations, and Water Operations), Clean Rivers (including Watershed Management), and the Department of Engineering and Technical Services (DETS) reside under the Office of the Chief Operating Officer (COO). While DETS and overall Asset Management will be covered in this section, the remaining programs under the COO will be discussed in other sections of the report.

3.1.1 Overall Assessment Tools

PEER conducted two high-level self-assessments before our more detailed examination:

Practices and capability self-assessment: To assess management and operations, four modules were utilized with 31 elements and 367 points. These are described below:

- Asset Management and Capital Delivery (105 points)
  - Asset Knowledge
  - Risk Management – Criticality
  - Risk Management – Asset Condition
  - Plant Maintenance – Organization
  - Plant Maintenance – Quality
  - Document Management
  - Inventory Management
  - Financial Accountability
  - CIP Production Process
  - Capital Delivery
- Customer Service (92 points)
  - Call Center
  - Billing
  - Payment options
  - Collections and Revenue Protection
  - Performance Management and Training
  - Customer Satisfaction
  - Organization Effectiveness

- Reliability Centered Maintenance, Performance Management and Organization Utility Services (63 points)
    - Reliability Centered Maintenance (RCM)
    - Performance Management
    - Organization
    - Information Reporting
    - Continuous Improvement
    - Direction and Leadership

- Field Operations (107 points)
    - Computerized Maintenance Management System (CMMS)
    - Work Order Management
    - Mapping/GIS
    - Work Planning
    - Work Scheduling
    - Capacity and Demand Management
    - Work Order Execution
    - Special Programs

Because the above modules involved self-assessments, the results were supplemented by looking at metric performance data to ensure that it was consistent with the self-assessment. One metric assessment utilized was QualServe Benchmarking – a metric comparison to a peer group of high performing utilities utilizing industry developed metrics.

Capital Program Best Management Practices self-assessment: This consisted of 56 practices identified in the California Multi-Agency Benchmarking Study. This is a multi-decade benchmarking project that has examined more than 2,000 projects. The self-assessment utilized for DC Water was based on 557 projects.

All the above was supplemented by additional metrics developed by PEER team members, including some in Water Research Foundation studies directed by project team members.

3.2 Management

3.2.1 Executive Team

The Senior Executive Team consists of the Chief Executive Office/General Manager, the Chief of Staff, and six Executive Vice Presidents: the Chief Legal Officer, the Chief People Officer, the Chief Financial Officer, the Chief Communications Officer, the Chief Operating Officer, and the Chief Administrative Officer. This team provides direction and vision to the organization.

To measure organizational effectiveness, the QualServe organization best practices survey was reviewed. This self-assessment measures the implementation of consensus organizational best practices along 14 dimensions. DC Water placed highest in governing body relations (Top Quartile), long term financial planning (Top Quartile), risk management planning (Top Quartile), optimized asset management (Second Quartile), and strategic planning (Second Quartile). Based on progress being made in other areas, PEER expects DC Water's overall standing will improve in the future.

The rating agency reviews (conducted independently and before the PEER review) noted the same strengths:

- "The Authority's (management of) operating risk is assessed as very strong" (Fitch)
- The "ratings incorporate an excellent rate management track record, strong liquidity, and healthy coverage of debt service supported by steady revenue growth." (Moody's)

3.2.2 Finance and Procurement

Each fiscal year, DC Water produces an annual operating budget and a 10-year Capital Improvement Program (CIP). Both documents are subject to public review and comment prior to their approval by the Board of Directors.

As part of the annual budget process, DC Water will propose and the Board will approve a financial plan that includes a 10-year projection of capital and operating costs, rates required to support those costs, assumptions about current and projected debt to support the capital program, fund balances, and the use of PAYGO (Pay as You GO). The DC Water staff prepares reports that are reviewed monthly to ensure compliance with authorized budgets. Since its creation in 1996, DC Water's Board has adopted policies that support financial planning and promote reliable revenue forecasting. Given the Authority's substantial borrowing needs to support its capital projects and large-scale investment, DC Water's continuing adherence to these policies supports its ability to cost-effectively access the capital markets and retain credibility with customers and regulators.

Photo 3-1: DC Water FY 2024 Budget (DC Water graphic)

DC Water maintains financial practices and policies that are intended to preserve a high-quality investment grade bond rating to ensure the lowest practical cost of debt necessary to finance DC Water's long-term capital program. The current financial policies set by the Board through Resolution 21-84 are summarized below.

- DC Water will maintain strong levels of operating cash reserves that exceed the Indenture requirements and are equivalent to 250 days of projected operating expenses.
- The annual reserve amount is formally approved by the Board as part of its annual approval of the operating and capital budgets.
- The operating reserve requirement is reevaluated every five years by DC Water's independent rate consultant in conjunction with the Indenture-required system assessment.
- The operating cash reserve will include any reserve requirements contained in the Indenture, excluding any debt service reserve funds and the rate stabilization fund as follows:
  - Operating reserve: equivalent to 60 days of operating costs.
  - Renewal and replacement reserve: $35M. This reserve requirement will also be evaluated every five years by the independent rate consultant in conjunction with the Indenture-required system assessment.
- DC Water will maintain a minimum combined debt service coverage of 1.60x.
- Whenever possible, DC Water uses the least costly type of financing for capital projects, based on careful evaluation of DC Water's capital and operating requirements and financial position for each year.

- DC Water will attempt to match the period of debt repayment, in total, with the lives of the assets financed by any such debt.
- DC Water will use operating cash more than the board's operating cash reserve requirements, along with any significant one-time cash infusions for capital financing, repayment of higher cost debt, or non-recurring expenses that reduce ongoing costs.
- DC Water will use a combination of debt and cash for the capital program. The financial plan will include the projected annual cash balances and planned annual PAYGO financing of capital projects. The board may also consider using any net cash surplus for PAYGO.

DC Water has proven innovative in its capital financing. In 2014, DC Water issued its inaugural "green bond" to investors in funding a portion of the DC Clean Rivers Project. This $350M issuance marked the first green bond issued in the United States to be supported by an independent "Second Party Opinion" and the first 100- year "Century" bond issued by a municipal water utility. Six "green bonds" have been issued to date in support of the environmental mission of the Clean Rivers Project. In 2020, DC Water completed a $300M forward purchase agreement and achieved interest cost savings as well as budget savings. In 2021, DC Water applied for and received a $156M Water Infrastructure Finance and Innovation Act loan at a low interest rate of 2.33 percent for 40 years.

DC Water is highly capital intensive – total asset value versus total revenue. In the AWWA rates survey, DC Water ranks highest in assets per person served compared to 21 similarly sized water systems; in the NACWA financial survey, it ranked eighth out of 94 in assets per capita, more than 50 percent higher than the average for these 94 wastewater systems. This requires high levels of competence in finance and budget to inspire bondholder confidence and keep interest rates low on debt. To verify DC Water's budgeting and finance competence, we performed several metric and best practice analyses comparing DC Water to the high-performing QualServe cohort and performing comparisons to other Group A and Group B utilities. The following are the QualServe metric comparisons:

- Debt ratio – 0.48 (just below QualServe median but driven by the high capital intensity)
- Debt Service Coverage – 1.86 (this is below the QualServe median, but is an indicator of financial strength when coupled with its high bond rating)
- Operating Ratio – 0.43 (below median but the result of moderately high debt levels)
- Return on Assets – 2 percent (close to median)
- Bond rating – high grade (better than median)

These metrics alone fail to reflect how effective the budgeting and finance functions are at DC Water. They prepare a 10-year budget and financial forecast (most utilities forecast for five years), and consistently exceed budgeted revenues and while costs are consistently lower than budgeted.

Even with their large projected CIP, revenue Bonds and Commercial Paper/EMCP comprise only 36.31 percent of total CIP funding. DC Water has been praised by the rating agency S&P Global.

S&P Global:

Both financial and operational management is best in class.

Liquidity and reserves are very high levels and thoughtfully maintained based on potential contingencies.

We consider its management of environmental risks—and environmental, social, and governance (ESG) risks more generally—as best in class.

Exhibit 3-1: Customer Care Functional Units

Customer Experience Central Administration (3 positions)	*Collections and Escalations (15 positions)*	*Revenue Assurance (23 positions)*	*Contact Center (39 positions)*	*Center of Excellence (7 positions)*	*Meter Operations (35 positions)*
Leads customer service operations, initiatives, and programs. Provides strategic oversight of the customer experience.	Manages delin-quent accounts including liens, receivership, and tax sale. Handles disputes, hearings, and external escalated request tax sale. Administers the DC Water Customer Assistance Programs (CAP) and Servicing People by Lending a Supporting Hand (SPLASH).	Manages customer accounts and billing processes including bill exceptions, adjustments, and cancellations. Maintains imper-vious area GIS database, assuring accurate billing of impervious surfaces. Handles new account creation and customer move-ins/move-outs.	Provides timely responses to customer inquiries across multiple channels. Provides 24/7 Emergency customer call response and dispatch.	Provides business oversight for Customer Service systems (CIS): work order management, Advanced Metering Infrastructure (AMI), Interactive Voice Response (IVR), and website self-service. Conducts analysis of existing or new business processes and proposes/ implements solutions.	Maintains, installs, tests, repairs, and replaces meters. Obtains manual meter reads. Performs meter disconnections and turn-ons.

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 269.

Exhibit 3-2: Customer Care Performance Measures

Targeted Performance Measures	*FY21 Results*	*FY22 Results*	*FY23 Targets*	*FY24 Targets*	*Blueprint 2.0 Imperatives*
% of Bills issued on time (w/in 5 days)	97%	98%	97%	98%	Reliable
Estimated bills as a % of meters read	4%	4%	4%	3.5%	Reliable
Unbilled at the end of the month	1%	1%	1%	1%	Reliable

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 257.

3.2.3 Customer Care

The Customer Care Department serves customers by providing timely and accurate billing, appropriate meter replacement and maintenance, as well as responding to customer inquiries through multiple channels in compliance with District of Columbia laws and regulations. Customer Care consists of six functional units described in Exhibit 3-1. The department's targeted performance measures presented in Exhibit 3-2 are related to the Blueprint 2.0 (Strategic Plan) Imperatives.

The quality of customer service is demonstrated in accessibility, low complaint rates and outreach. We performed the following benchmarking comparing DC Water to the QualServe cohort:

Collections and Escalations

This department administers the DC Water Customer Assistance Program and Serving People by Lending a Supporting Hand (SPLASH) program. These are covered in more detail in the accompanying Rate Report. This is

one of the most comprehensive programs that PEER has examined. QualServe has begun benchmarking CAP and Low-Income Assistance programs. DC Water entered data for three categories:

- Low-Income assistance program offered – Top Quartile
- Customer Assistance – assistance types – Yes for 7 out of 7 categories
- Crisis relief – Level 2 – Top Quartile

Revenue Assurance

- Billing accuracy (errors/10,000 bills generated) – 1.58 errors per 10,000 bills generated – First Quartile
- Delinquency rate – 10.2 percent – Third Quartile

Contact Center

- Call Center – average talk time – 5.2 minutes (a good value)
- Call Center – average wait time – 0.2-minutes – Top Quartile
- Call Center – abandoned call ratio – 3.4 percent – Top Quartile
- Excellent overall performance.

Center of Excellence

This department provides business oversight for Customer Service systems and conducts analysis of existing or new business processes and proposes/implements solutions.

Complaint and satisfaction levels are:

- Customer service complaint rate – 13.55 (complaints per 1,000 accounts) (below median)
- Customer service complaints per population served – 5/1,000 (below median)
- Transactional satisfaction – 70 percent
- Branding survey – see below:

Customer Service completed branding and transactional surveys in FY21. Branding surveys are done at least annually and obtain the customer's overall feeling of DC Water. Transactional surveys are offered after email and call interactions to obtain the customer's feedback related to their recent transaction. The Authority is using the results from the transactional survey to provide coaching and development to the Call Center staff. This is still a newly implemented activity; therefore, DC Water is still reviewing data, and has not made any major changes relative to the information. In response to the results of the branding survey, DC Water implemented additional assistance programs and is looking for ways to reach additional eligible customers through marketing campaigns. The annual branding survey provides a baseline comparison for future surveys. Another survey was scheduled for 2022 to see if scores were more favorable. Finally, to ensure DC Water is asking the right questions, it will review past questions and add more specific questions to identify the exact reason for the unfavorable response. In the 2021 survey, many responses fell into the "other" categories of responses. As noted earlier in this section, Customer Service is working to make improvements in this area.

As part of their ongoing process of improvement, FY23 activities included:

- Upgrade to VxEngage Customer Portal (a fully hosted, managed, scalable and secure web)
- Upgrade Payment Vendor and Print and Mailing Vendor
- Incorporate feedback from FY22 customer satisfaction surveys
- Conduct FY24 Customer Satisfaction Survey
- Impervious area (a hard area that prevents water from seeping into the ground) data refresh

- Implement SAP S4/Hana (ERP software) to enhance customer relationship management functionality

For FY24, planned activities and changes include:

- Vertex One (V1) upgrade, including Customer Advantage upgrade and Kona Replacement
- Implement Customer Survey and Process Improvement from survey results

Meter Operations

- Metering prevalence – residential, commercial, and wholesale – 100 percent (Top Quartile)
- Frequency of meter reading (water) – better than 2-6 times daily for residential, commercial, and industrial – Top Quartile
- Meter reading success rate – residential 94.4 percent – Fourth Quartile
- Meter reading success rate – commercial 74.2 percent – Fourth Quartile

Below is our estimate of DC Water's likely placement in two other areas:

- Percentage participation in program – Top Quartile
- Customer Assistance Eligibility Criteria – Yes for all four categories

3.2.4 Information Technology

The Information Technology (IT) cluster (37 authorized positions) consists of six departments (authorized positions in parenthesis):

- Information Technology Central Administration (2)
- Enterprise Solutions (10)
- Infrastructure Services (13)
- Project Management (6)
- Information Security Services (3)
- Data and Analytic Services (3)

The IT cluster mission is "to provide a safe and reliable state-of-the-art information technology platform capable of adapting to the changing needs of our internal and external customers. To ensure that the Authority's mission is supported by state-of-the-art technology with an infrastructure capable of accommodating all traffic and connectivity demands, and a computing environment that encourages the development of efficient and cost-effective business processes."

Exhibit 3-3: Information Technology Performance Measures 2022

Targeted Performance Measures	*FY21 Results*	*FY22 Results*	*FY23 Targets*	*FY24 Targets*	*Blueprint 2.0 Imperatives*
98% Network uptime round the clock	99%	-	99%	99%	Reliable
96% of high priority tickets completed within 4 hours	96%	-	98%	98%	Reliable
90% Tickets closed by Tier 1 support	70%	-	71%	97%	Reliable
90% of Projects Completed on-time	90%	-	80%	90%	Sustainable
98% Network uptime during peak hours	100%	-	99.5%	99%	Reliable

Source: DC Water, FY 2024 Budget, adopted March 2, 2023, page 273.

This cluster measures its success with targeted performance measures related to Blueprint 2.0 (Strategic Plan) Imperatives presented in Exhibit 3-3.

IT related QualServe metrics include [7]:

- Risk assessment and response preparedness – better than median
- Recovery and mitigation – better than median
- Cybersecurity preparedness – better than median
- AWWA Cybersecurity Guidance Assessment Tool Use – better than median (estimate)
- EPA Baseline Information on Malevolent Acts – better than median (estimate)

Ongoing and Planned Initiatives

DC Water has implemented several large initiatives and upgrades since 2015 (e.g., Customer Billing system, Oracle ERP, Maximo, ArcGIS, etc.) as well as migrated all on-premises processing, apart from PCS and SCADA to the Cloud as part of its Cloud First initiative. All major systems have been replaced and/or upgraded and are maintained at supported levels as part of a comprehensive release and patch management program.

DC Water's upcoming IT initiatives include upgrades, maintenance, and patches to existing systems. Upgrades to ArcGIS (Geographic Information System) platform and to its SCADA (Supervisory Control and Data Acquisition) system are some notable upcoming upgrades. Upgrades and patches to its other enterprise systems, under managed services agreements, are included in vendor maintenance contracts. A new bill and payment platform is being implemented in FY23 as part of the Customer Information Systems improvement plan which will also include a new customer self-service portal. Finally, DC Water's automatic meter reading (AMR) system is being upgraded to advanced metering infrastructure (AMI) and the new head end system for collecting and processing meter reads is scheduled for replacement in 2023.

It is worth noting that DC Water's IT Department was fully prepared for and supported the seamless transition to remote work during the COVID pandemic. As of May 2023, Customer Service has transitioned to 100 percent remote. Cybersecurity and Resilience are covered in Section 8.2 Cybersecurity. Automated and Smart Systems are covered in Section 9.6.

3.2.5 People and Talent

This cluster's mission is "to deliver high quality, innovative, valued and timely labor resources that are responsive to the needs of DC Water employees and departments, in order to help facilitate employees to achieve their individual and organizational goals." The department is organized into the functional units shown in Exhibit 3-4. The department measures its success with the targeted performance measures related to the Blueprint 2.0 (Strategic Plan) Imperative presented in Exhibit 3-5.

Compared to peer utilities, DC Water has an older workforce, that is better trained and working in safer conditions. The good internal promotion rate reflects the quality of training, and that DC Water is considered a desirable employer. However, it takes longer than most to fill vacant positions. The Authority is working to address this issue. They have renamed the Talent and Development unit creating a new Employee Experience unit focused on recruitment, performance management, educational assistance, employee engagement, and recognition. See Section 9.3 Employee Recruitment and Retention for more information on these efforts.

Related QualServe metrics include:

- Training hours per employee – 22.7 – Top Quartile
- Vacancy Rate – 5.4 percent – just outside Top Quartile

[7] Bands were too wide to assign quartiles.

Exhibit 3-4: People and Talent Functional Units

Employee Experience (12 positions)	***Operations (12 positions)***	***Labor Relations (7 positions)***	***Executive Vice President's Office (3 Positions)***
Recruitment, onboarding, training, and development. Performance management, succession planning and employee engagement. Education assistance, internship, rewards and recognition.	Market analysis, performance pay, job evaluation and position control. Administration of Benefits, Wellness, American with Disabilities Act, Drug and Alcohol testing, Workers Compensation, and Employee Assistance Programs. Systems, data integrity, records management, and predictive analytics.	Oversee labor relations, arbitration, and grievance resolution. Manage employee relations. Oversee Equal Employment Opportunity and Workplace Violence.	Strategic initiatives. Change management. Management of resources and operations.

Source: DC Water Approved FY 2024 Budget, page 316.

Exhibit 3-5: People and Talent Performance Measures

Targeted Performance Measures	***FY21 Results***	***FY22 Results***	***FY23 Targets***	***FY24 Targets***	***Blueprint 2.0 (Strategic Plan) Imperatives***
120 days from job posting to hire	111	120	107	120	Equitable
Under the CBA we have 45 days to initiate disciplinary action	45	45	45	45	Equitable
14 days new hire benefit set-up	13	10	10	10	Reliable
22.5 Average number training hours per FTE	22.7	5	25	25	Equitable
Comparison DC Water Employees Compensation (100%) vs Market 50th-percentile	100%	100%	100%	100%	Equitable

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 317.

- Length of vacancy – 111 days – Fourth Quartile
- Employee Health and Safety Severity Rate – 2.4 – Top Quartile
- Recordable Incident Rate – 4.3 – just below median
- Average employee tenure – 13.15 – First Quartile, longest tenure
- Employee turnover rate – 6 percent – Top Quartile
- Employee Internal Promotion Rate – 49 percent – median

Recent activities of this cluster have included:

- Create Market-Based pricing for each DC Water position.
- Expand DC Water's Career Ladder Program
- Streamline DC Water's position reclassification process.
- Expand Non-Union Merit-Bonus program to also include a Salary Equity Review
- Develop DC Water's Market Pricing Initiative
- Expand Wellness Programs focused on the Healthy, Safe, and Well imperative
- Expand open season benefit fairs and site visits
- Implement an Enterprise Resource Program with systems integration across DC Water

- Develop robust analytics, diversity, and performance management scorecards
- Continue negotiations with the collective bargaining agreements

Additional activities planned for FY24 include:

- Enhance DC Water's position reclassification process
- Develop DC Water's Market Pricing Initiative
- Expand the Enterprise Resource Program with systems integration across DC Water

3.3 Operations

As noted earlier, under DC Water's structure, all operational and engineering functions are consolidated under the Chief Operating Officer. This includes Water Operations (covered in Section 4 The Drinking Water System), Wastewater Operations (covered in Section 5 The Wastewater System), Stormwater Operations (covered in Section 6 The Stormwater), and Watershed Management (covered in Sections 7.1 Clean Rivers Project and 9.5 Stormwater and Watershed Management). The Engineering cluster is discussed in this section including:

- Department of Engineering and Technical Services (136 authorized positions)
- CIP infrastructure management (32 authorized positions)
- Wastewater Engineering (21 authorized positions)
- Permit operations (29 authorized positions)

3.3.1 Department of Engineering and Technical Services (DETS)

This department has 136 authorized positions, only 99 of which are currently filled. DETS performs engineering planning, design, and construction management necessary to execute DC Water's CIP. Its mission is "to aid and advise operating departments and management on engineering aspects of the Authority's operation and facilities. To develop and maintain engineering documentation of the Authority's facilities and systems, and to assist the Authority with environmental policy." In addition to its role in design and construction management, DETS plays an important role in asset management, including:

- Performing studies and analyses to evaluate asset condition and performance
- Conducting condition assessments of major sewers and large diameter water mains
- Identifying rehabilitation needs for water and sewer linear assets
- Prioritizing linear assets for assessment and rehabilitation (validate and prioritize CIP projects using the Enterprise Asset Management framework)
- Implementing water and sewer facility plans and corresponding Asset Management plans

DETS is managing the drawdown of large projects and expects to bring some A/E work in house with the anticipation that costs to DC Water will be lowered. Initially, DETS is shifting three program management contracts to in house as a pilot.

3.3.2 Capital Improvement Program (CIP)

DETS, together with the CIP Infrastructure Management Department oversees the CIP process which supports the continuation of major capital asset investment in programs and projects that will upgrade the water distribution and sewer system as well as maintain compliance with federal mandates and improve the efficiency of operations. The CIP includes all mandated projects, rehabilitation of assets required to meet permit and other regulatory requirements, and projects to meet the immediate needs necessary to maintain existing service levels. The CIP is presented on two different bases: the 10-year disbursement plan and the lifetime budget.

10-Year Disbursement Plan – This category represents the actual cash disbursements – "cash out of the door" – for each project, excluding contingencies. It provides a more realistic approach and basis for forecasting the anticipated level of rate increases, as well as timing for pursuing capital financing. In addition, the 10-year disbursement plan includes projected completion dates, program management, and in-house labor costs.

Lifetime Budget – The lifetime budget reflects historical spending before, during, and beyond the current ten-year period, including in-house labor. Lifetime budgets represent projects active during the 10-year period and are the primary area of focus in budget development and day-to-day monitoring. In addition to "active" projects, the lifetime budget includes projects for which all activities have been completed during the previous fiscal year and are listed as "closed" in the CIP. Closed projects are dropped from the CIP in the next fiscal year, and new projects are continuously added, as needed, each Fiscal Year.

Capital Project – These projects have an average life of 30 years and are financed with long-term debt. Capital equipment has a life of at least three years, is financed with short-term debt or cash, and has an individual component cost of $5,000 or more. The cost of capital equipment purchases that are part of a clearly identified capital program can be aggregated. In which case, all costs relating to the capital program are capitalized at the project level regarding the individual component amount.

The Authority evaluates and prioritizes capital projects based on specific criteria. These criteria are fundamental in developing a CIP based on demonstrated needs and are set forth in Exhibit 3-6.

Exhibit 3-6: Demonstrated Need Measures of Priority

1A *Mandates*	*2A* *Health & Safety*	*2B* *Board Policy*	*2C* *Potential Failure*	*2D* *High Profile Good Neighbor*	*3A* *Good Engineer-ing High Payback*	*3B* *Good Engineer-ing Lower Payback*
Agreements, Regula-tory standards, Court orders, Issues and Permits requirements, Stipulated Agreements, etc.	Required to address Public Safety	Undertaken as a result of the Board's commitment to outside agencies 0%	Related to Facilities in danger of failing, or critical to meeting permit requirements	Address Public concerns	Need to fulfill Mission and upgrade Facilities	Lower priority Projects

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2024, page 158.

Approximately 18 percent of the current CIP 10-year disbursements are for large regulatory mandates which includes the Clean Rivers Project. As DC Water gets closer to the completion of the mandated projects, it will be able to increase investments in upgrading its aging water and sewer infrastructure.

3.3.3 Wastewater Engineering

Wastewater Engineering oversees the construction and rehabilitation of wastewater treatment, water, and sewer pumping facilities to meet all required National Pollutant Discharge Elimination System (NPDES) and Consent Decree requirements, and continued performance of critical assets. Among the activities underway or planned for FY24 are incorporating construction and program management functions in-house for cost savings and better knowledge retention, completing concept planning for a Blue Plains Microgrid/Power Monitoring and Control System, and completing the concept plan for Blue Plains floodwall to mitigate the potential impacts of a 500-year flood.

3.3.4 Permit Operations

Permit Operations manages DC Water's development and permit services through a coordinated effort with the District's Department of Buildings (DOB) [formerly the Department of Consumer and Regulatory Affairs (DCRA)], the District Department of Transportation (DDOT), and the Department of Environment and Energy (DOEE). This is done through the review and approval of plans for new construction and for renovations that effect the water or sewer system. Another function of the unit is the management of DC Water permits for construction work. Some of the major activities underway include reviewing and proposing new permit review fees that are adjusted as needed to meet future budgetary needs, and updating, automating, and streamlining receipt and deposit of fees, plan reviews, and construction inspection requests and refunds.

3.4 Asset Management

DC Water has prioritized establishing best management practices of its assets with the goal of maximizing service life while minimizing costs and ensuring sustainability. Asset management includes managing inventories of assets with supporting data that can be used to prioritize maintenance; used to prioritize capital projects; and assist long range decision-making and financial planning. DC Water employs a distributed asset management program with individual units directly responsible for program implementation consistent with an authority-wide process, procedures, and standards. The program is established with a goal of creating and implementing a "world class" asset management program. DC Water has replaced or upgraded most of its major software systems over the past five years including enterprise-wide asset management systems. For asset management, it utilizes its Geographical Information Systems (GIS) and Maximo, a Computerized Maintenance Management System or CMMS (originally used for treatment facilities). The program has integrated stakeholders into the program and prioritized training.

DC Water successfully made the transition from corrective maintenance to an effective proactive maintenance approach. Seeking to further improve, the Authority has commissioned studies of its asset management program – the most recent being an enterprise asset management plan in 2017. Over the last five years, DC Water has been implementing a risk- and reliability-based asset management framework. There is also an asset management steering committee supported by the Engineering Department, with each operating unit responsible for implementing an asset management program tailored to its needs and consistent with the overall framework.

3.5 COVID-19 Global Pandemic

DC Water was very well positioned for the unexpected COVID pandemic. Approximately a year before the pandemic, as part of its risk analysis, IT staff began looking beyond a physical event and considered the risks of staff not being able to get to work. They began installing Microsoft Teams and a remote work pilot study was underway in the Customer Care Department when COVID restrictions were instituted by the District of Columbia government. The technology in use and the lessons learned from the pilot were quickly applied to all staff whose physical presence was not required to perform their duties. There was a need to increase the scope of remote work support for phones and computers and identify where computers were from a cybersecurity perspective. The shift from desktop to laptop computers required reconfiguring software licensing agreements. Once everything was in place, there were some savings realized from the change.

Some projects were scaled back or delayed in response to reduced revenues as water and wastewater demands fell with fewer workers and tourists in the District each day. Some construction projects were accelerated with less traffic to slow down the work. The long-term impacts of the general move to remote or hybrid work by many District businesses is unknown as of this time.

For crews that had to report to the job site, DC Water implemented strategies such as splitting staff into two teams and having the teams work on-site on alternating weeks to reduce the risk of an infection spreading. They also increased the Personal Protective Equipment requirements.

As a result of the experience of the last three years, DC Water has discovered that for certain functions work from home has proven more productive and less costly for the employee and the Authority. For other functions that do not require full-time on-site presence, departments are choosing to implement a hybrid approach. This allows DC Water to leverage pandemic-related investments in technology to maintain or increase productivity and provide workers better work-life balance –an important selling point in a very tight labor market.

3.6 Key Findings[8]

As would be expected in any large organization such as DC Water, results varied across the organization.

Practices and Capability Self-Assessment: Results ranged from above competent to near world class.

QualServe Benchmarking: The QualServe assessment was partially limited due to incomplete metrics. Overall, DC Water compares favorably to the QualServe peer utility group, scoring high in regulatory compliance, sustainability, risk and resilience, available water supply and customer assistance.

Capital Program Best Management Practices: DC Water obtained one of the highest scores of the self-assessments we have administered.

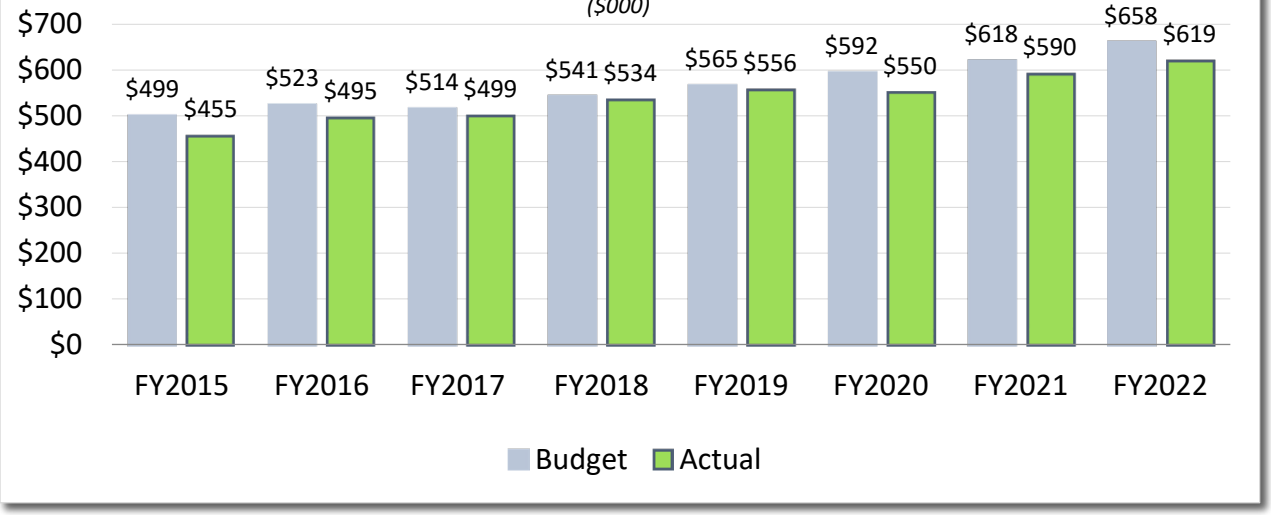
Additional metrics – Generally good results. These are referred to in subsequent below.

The following areas of management and operations stood out:

Budget – DC Water uses a 10-year planning period and forecasts with high accuracy – revenues always exceed expenses and revenues come in above forecast (See Exhibits 3-7 and 3-8). DC Water's budget has been

Exhibit 3-7: Expenditure Budget vs. Actual FY15-FY22

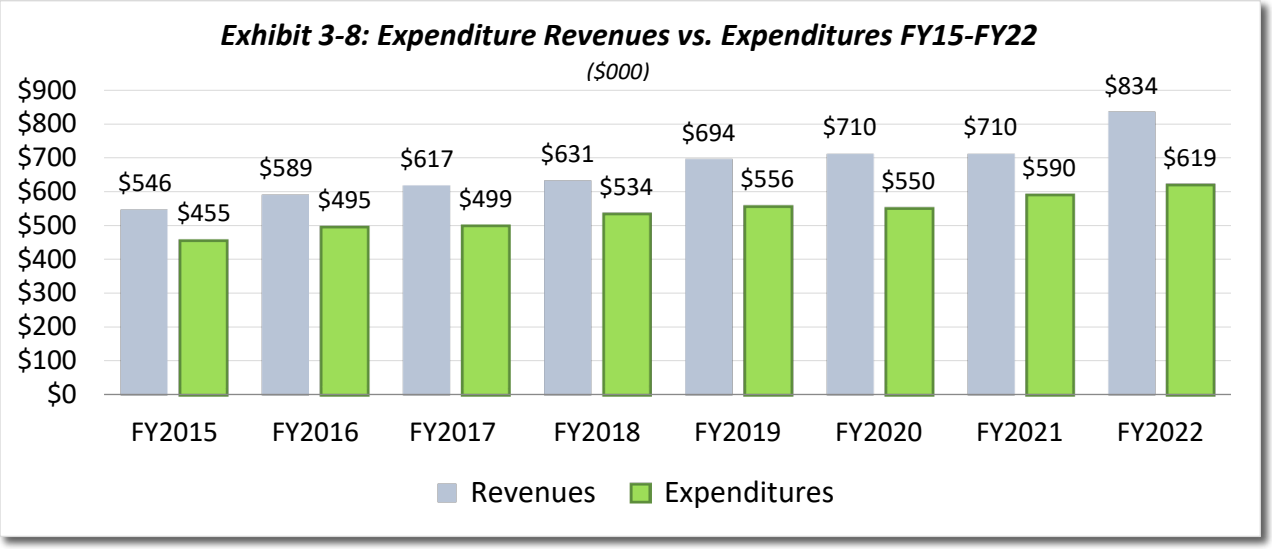
($000)



Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 90.

[8] NOTE: Specific water and wastewater operations assessments are presented in Section 4 Drinking Water System and Section 5 Wastewater System, respectively.

Exhibit 3-8: Expenditure Revenues vs. Expenditures FY15-FY22



Source: DC Water Approved FY24 Budget, adopted March 2, 2023, page 90.

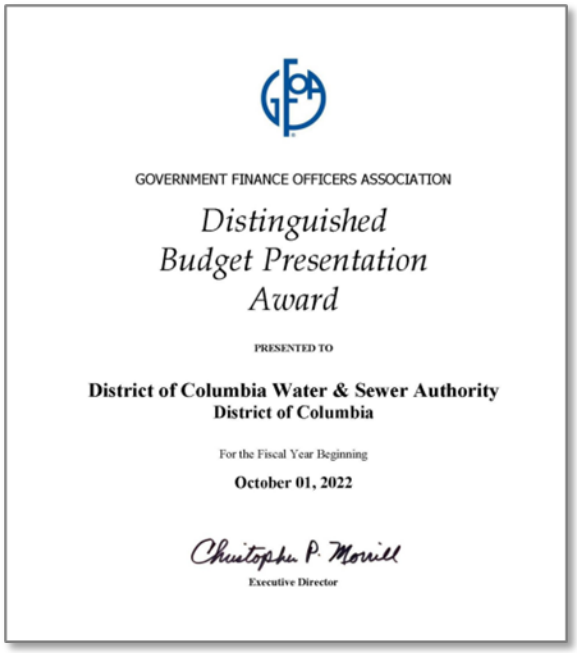
recognized by the Government Finance Officers Association (see Exhibit 3-9) and the FY24 version is a master class in transparency and thoroughness.

Finance – Given the large capital program of this capital-intensive organization, Finance has done an excellent job of keeping long-term debt to 36 percent of the program funding.

CIP Preparation and Capital Program Delivery – In addition to the high BMP score, as shown in Exhibit 3-10, DC Water has a high number of bidders per solicitation. These results are considered very good to excellent, the more bidders, the lower the price. This also reflects that DC Water is a desirable client and the procurement process is transparent.

Continuous Improvement (CI) – The FY 2024 Budget document reveals widespread use of CI methods including failure modes and effects analysis (FMEA), and root cause analysis (RCA).

Exhibit 3-9: Distinguished Budget Presentation Award


GOVERNMENT FINANCE OFFICERS ASSOCIATION

Distinguished Budget Presentation Award

PRESENTED TO

District of Columbia Water & Sewer Authority
District of Columbia

For the Fiscal Year Beginning

October 01, 2022

Christopher P. Morrill

Executive Director

Customer Assistance Programs (CAP) – DC Water has a robust CAP which employs a large array of assistance types and funding sources.

COVID Response – DC Water was very well positioned for the unexpected advent of the COVID pandemic. IT risk analysis staff began looking at the risks of staff not being able to get to work approximately a year before the pandemic and began making software changes to reduce these risks. A remote work pilot study was underway before COVID restrictions were instituted. The transition to work from home, therefore, went relatively smoothly.

Exhibit 3-10: Bidders per Solicitation

Fiscal Year	Construction	A/E Services
2021	5	8
2022	6	5
23 (YTD)	4	3

Source: DC Office of Procurement and Compliance.

During COVID, some projects were scaled back or delayed in response to reduced revenues and some projects under construction were accelerated. The long-term impacts of customer work patterns are currently unknown.

DC Water is leveraging its pandemic-related investments and experience to increase productivity, provide workers better work-life balance, and improve its standing as a desired employer in a very tight labor market.

Areas for improvement include:

As noted above, results varied throughout the organization. We were impressed to note that areas offering opportunities for improvement have been identified by DC Water and are being addressed. Some examples which should improve customer satisfaction levels include:

- DC Water has good disruption of service metrics for 0-to-4-hour segments but drops to Fourth Quartile for disruptions lasting more than four hours. This is primarily due to low priority repairs going unaddressed for long periods of time. Over time, small problems can become large problems, creating customer dissatisfaction. An FY23 planned activity for the Department of Water Operations is to "Improve customer experience by reducing response time for conducting low priority repairs."
- Only one customer satisfaction survey is reported by Customer Care with below median results. Customer Care's plans include "incorporating feedback from customer satisfaction surveys" and "implementing customer survey and process improvements from survey results."
- The Department of Water Operations is working with IT to create new Maximo and data applications for customer complaints.

DC Water has made some high-level organizational improvements. However, opportunities for improvement exist at lower levels in the organization. For example:

- Asset management is fragmented. Many of DC Water's peers utilize a centralized office of asset management to ensure better uniformity of maintenance and capital decisions.
- DC Water has an ambitious performance management and metrics program centered primarily around the strategic plan and ESG report. It could be useful to investigate other frameworks, such as Effective Utility Management (EUM). The EUM collaborating organizations are Association of Clean Water Administrators, American Water Works Association, National Association of Clean Water Agencies, American Public Works Association, Association of Metropolitan Water Agencies, Water Research Foundation, Water Environment Federation, National Association of Water Companies, and Association of State Drinking Water Administrators.

A useful performance framework worthy of DC Water's ambitions to be world class would be to pursue the Malcolm Baldrige National Quality Award®. This is the highest level of national recognition for performance excellence that a U.S. organization can receive, and the award focuses on performance in five key areas:

- Product and process results
- Customer results
- Workforce results
- Leadership and governance results
- Financial, marketplace and strategy results

Organizations don't receive the Baldrige award for specific products or services. To receive the award, an organization must have a system that ensures continuous improvement in overall performance in delivering products and/or services, and they must provide an approach for satisfying and responding to customers and stakeholders.

4 The Drinking Water System

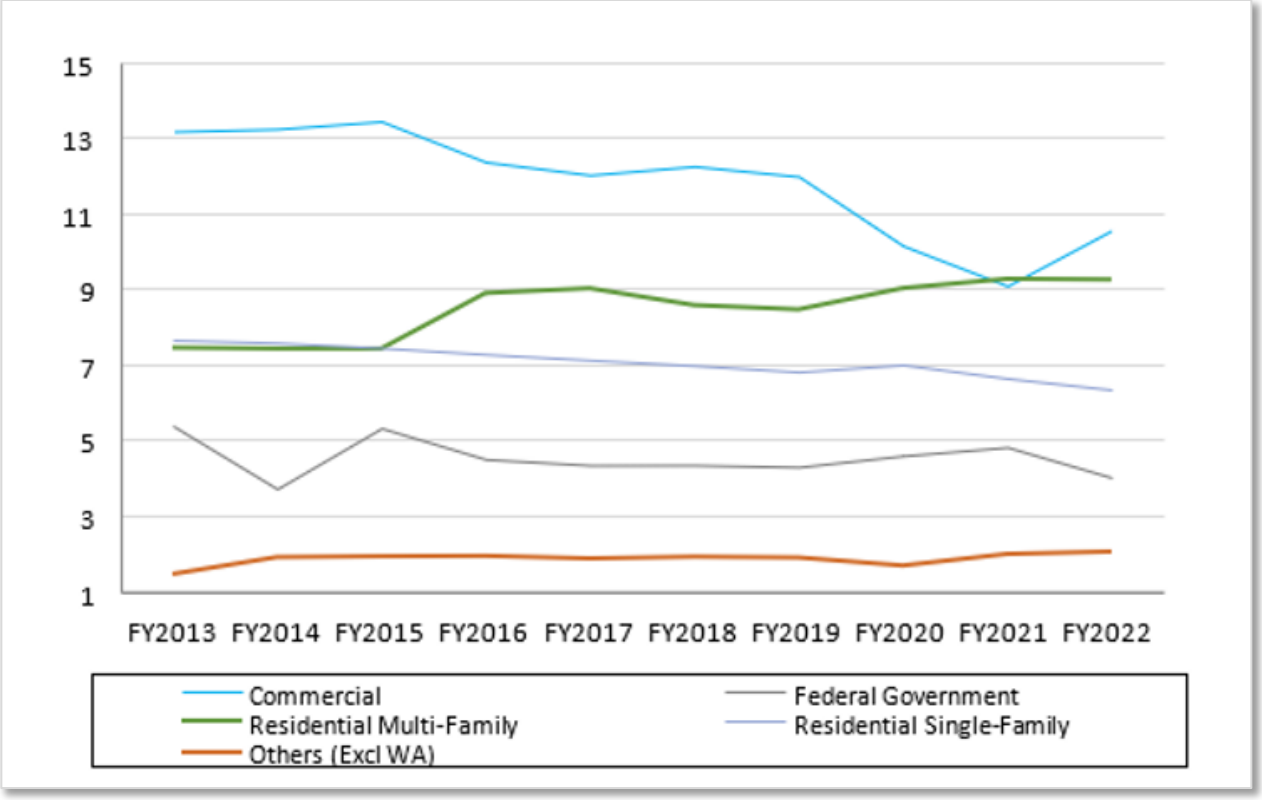
4.1 Overview

DC Water provides drinking water to more than 700,000 residents, businesses, and federal government facilities in the District of Columbia. The drinking water source is the Potomac River. The U.S. Army Corps of Engineers, Washington Aqueduct (Aqueduct), is a federally-owned agency responsible for treating the drinking water. DC Water purchases treated water from the Aqueduct and is responsible for maintaining the distribution system that delivers drinking water to customers. DC Water distributes drinking water through roughly 1,350 miles of interconnected pipes. Four pumping stations provide capacity to meet peak demand – Bryant Street, New Fort Reno, 16th and Alaska, and Anacostia. There is one Aqueduct pumping station with sufficient capacity to take over for the Bryant Street pumping if needed.

DC Water is committed to providing its customers with the highest quality drinking water and has set target water quality goals that go beyond federal standards. DC Water conducts compliance monitoring daily, collecting and analyzing samples for lead and copper, total coliform (bacteria) and disinfection byproduct levels. Compliance monitoring ensures that drinking water treatment effectively prevents pipe corrosion, removes bacteria and other contaminants, and minimizes potentially harmful treatment byproducts. DC Water is in regular communication with the Aqueduct so adjustments to the treatment process can be made if indicated by this testing.

Exhibit 4-1: Annual Retail Water Consumption by Customer Type FY13-FY22

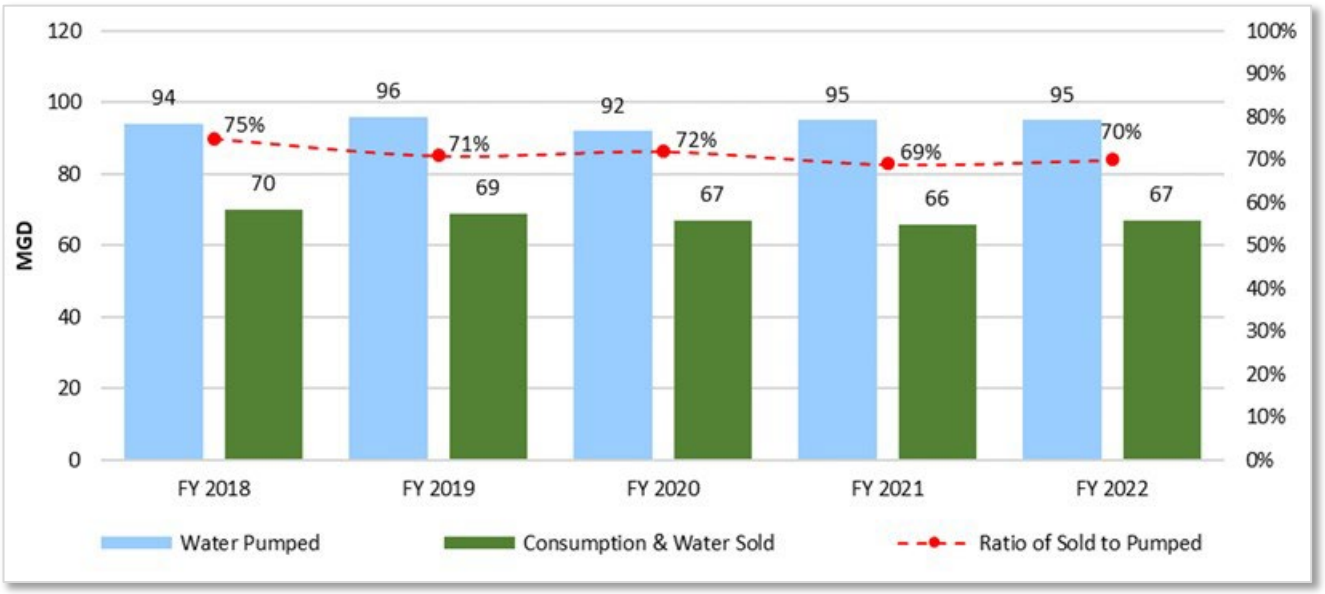
(Millions of Ccf)



Source: DC Water Approved FY 2024 Budget, adopted March 2, 2024, page 50.

In FY22, DC Water pumped an average of 95 million gallons per day (MGD) and sold 67 MGD, a non-revenue water percentage of 30 percent. Exhibit 4.1 presents annual retail water consumption by customer class from FY13 to FY22. Exhibit 4-2 presents water pumped versus water sold for the period FY18 to FY22.

Exhibit 4-2: Volume of Water Pumped vs. Sold FY18-FY22



Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 45.

4.2 The Washington Aqueduct

Photo 4-1: Dalecaria Reservoir, Treatment Plant and Pumping Station (DC Water photo)

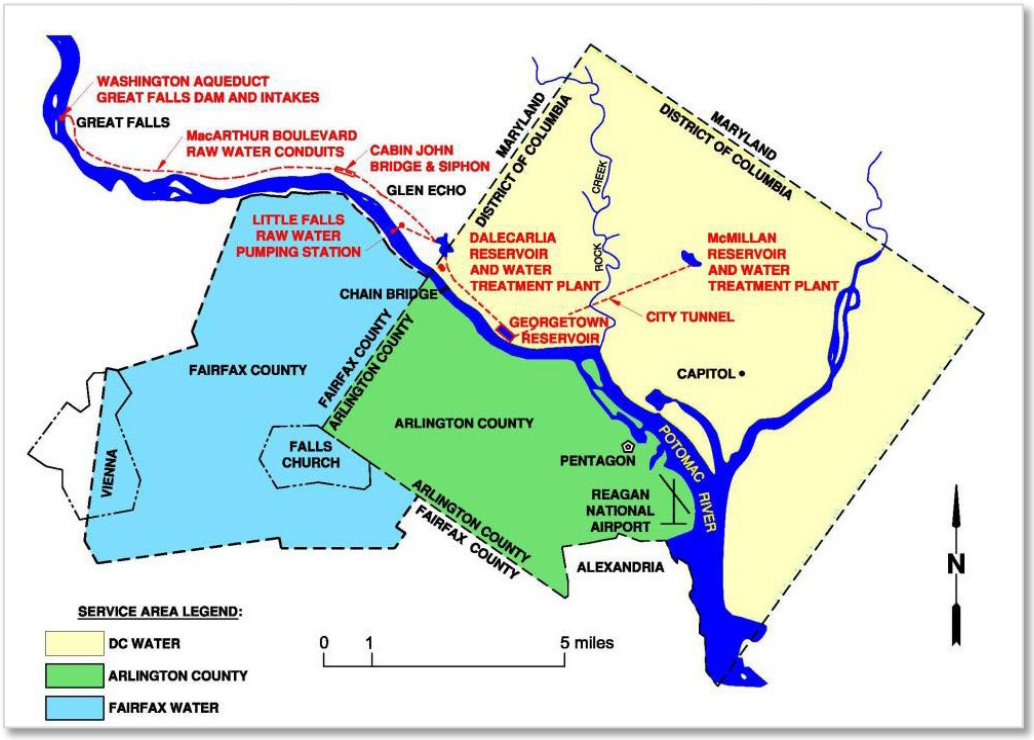
The Washington Aqueduct, managed by the U.S. Army Corps of Engineers (USACE), provides wholesale water treatment services to DC Water and wholesale customers in Northern Virginia (Arlington County and Fairfax County Water Authority). The Aqueduct's service area and facilities are shown in Exhibit 4-3.

DC Water purchases approximately 74 percent of the water produced by the Aqueduct's two treatment facilities, the Dalecarlia and McMillan treatment plants, and thus is responsible for approximately 74 percent of the Aqueduct's operating and capital costs. Under federal legislation and a memorandum of understanding enacted in 1997 and updated in 2013, when Fairfax Water replaced the City of Falls Church, DC Water and the Aqueduct's wholesale customers in Northern Virginia inherited a much greater role in oversight of the Aqueduct's operations and its Capital Improvement Program, than before 1997.

The USACE, in accordance with federal procurement regulations, requires DC Water to remit cash in an amount equal to the total project cost in advance of advertising contracts, and these funds are transferred immediately to a USACE/U.S. Treasury account to be drawn down during the execution of the project, through completion, with no interest going to DC Water.

DC Water's share of Washington Aqueduct's infrastructure improvements to achieve established service levels for FY23-FY32 is $338.5M. The increased investments fund Washington Aqueduct's risk-based asset management CIP, except for the following projects: Federally-Owned Water Mains, Travilah Quarry Acquisition Outfitting, and Advanced Treatment.

Exhibit 4-3: The Washington Aqueduct – Service Area and Major Facilities



Source: USACE (February 1, 2023) Washington Aqueduct Fact Sheet.

4.2.1 Washington Aqueduct Assessment

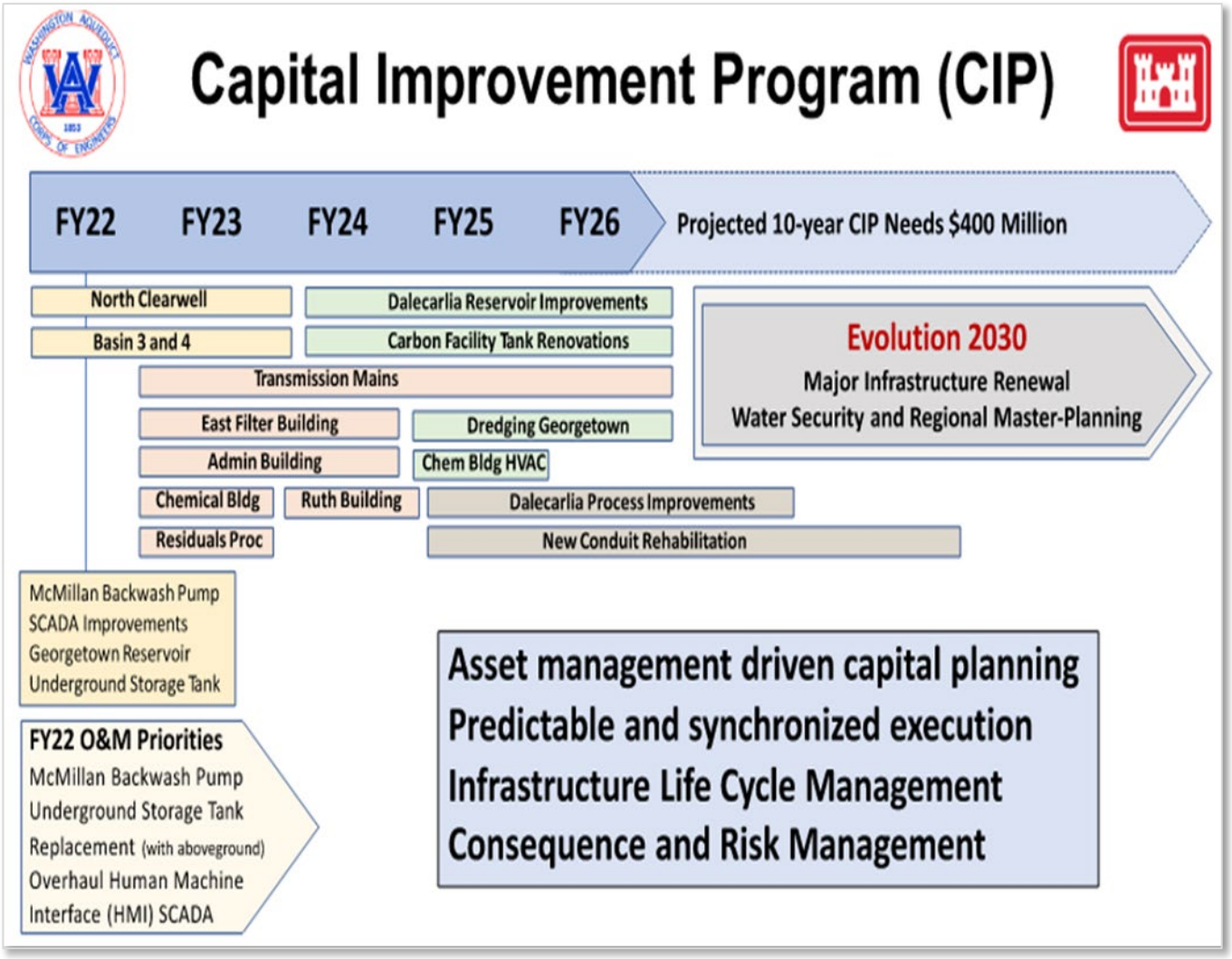
For security reasons, PEER was asked to perform its assessment using publicly available information. Our assessment is based on materials placed on the internet by the Washington Aqueduct, information from publicly available sources, previous work performed by PEER at the Aqueduct (described below), the 2018 Assessment, and a benchmarking of key metrics.

In June 2013, DC Water selected a Veolia/PEER team to conduct an independent and comprehensive study of the Aqueduct. The study's goal was to identify opportunities to foster the continued development of a world class operation at the Aqueduct with a focus on operational efficiency, quality, and reliability. As part of that study, PEER personnel, including the lead investigator for this study, visited and toured the facility. Included in the tasks performed by PEER personnel, and this study's project manager and lead investigator, were reviews of the financial system and the asset management system. The review was positive but identified opportunities for improvement in maintenance management. The second phase of the Veolia/PEER effort was focused on improvements in maintenance management using a computer-based maintenance management system. The Aqueduct committed itself to incorporating a maintenance management system into its activities. The 2018 Assessment reported successful implementation of improvements and indicated that a continuous improvement philosophy was in place.

Compliance reports are submitted regularly by the Aqueduct to EPA Region III in Philadelphia, PA. Permitting at the Aqueduct is different from other water agencies, as there is no formal permitting process for this unique federally-owned utility. Changes to the system are submitted to EPA Region III as written explanations. It should also be noted that DC Water submits compliance reports to EPA Region III, as it has different monitoring and reporting requirements than the Aqueduct.

The Aqueduct maintains and upgrades its infrastructure, in part to comply with regulations, through its Capital Improvements Plan (CIP). The 10-year 2018 to 2027 CIP projected $165,270,000 in capital improvements. Exhibit 4-4 shows the 10-year CIP from the Washington Aqueduct website.

Exhibit 4-4: Washington Aqueduct CIP FY22-FY26



Source: USACE Washington Aqueduct website.

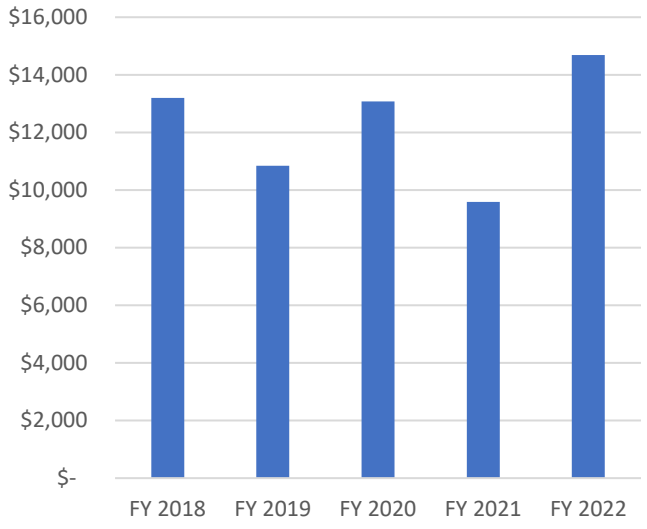
The Washington Aqueduct has implemented Strategic Initiatives towards modernization and resilience of its raw water source and is expected to participate in regional master planning process. This future resilience investigation will look to explore options to augment future structural, operations, and treatment opportunities.

Exhibit 4-5 shows actual CIP expenditures for the Aqueduct by DC Water over the last five years. The FY23-FY32 projected Washington Aqueduct CIP to DC Water totals $338.5M. The projected annual CIP by year for FY23-FY31 is shown in Exhibit 4-6.

Our assessment of the Washington Aqueduct is based on the four most important factors in a wholesale water provider/retail utility partnership – the agreement, product quality, supply adequacy, and efficiency.

Exhibit 4-5: DC Water Actual Aqueduct CIP Expenditures FY18-FY22

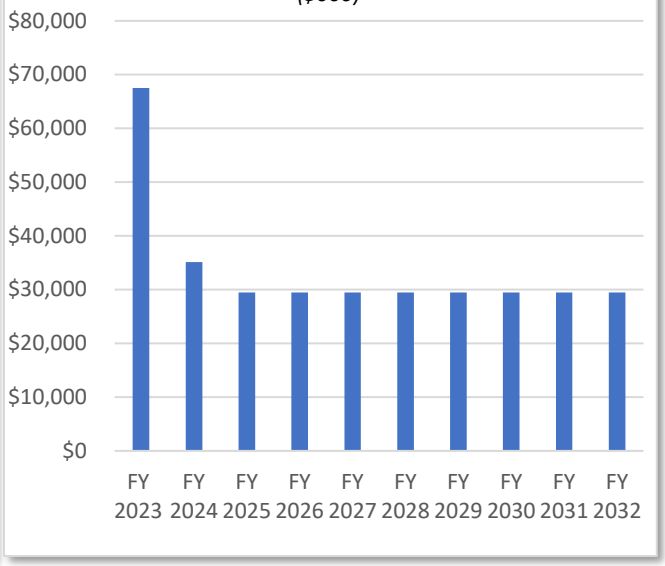
($000)



Source: Data from the DC Water.

Exhibit 4-6: DC Water Aqueduct CIP Disbursement Plan FY23-FY32

($000)



Source: Data from the DC Water Approved FY 2024 Budget, page 346.

4.2.2 Contractual and Operating Relationship

The USACE designed, built, and, in 1859, began operating the Aqueduct. Since then, the Aqueduct has substantially expanded and improved the capacity and function of the original 19th century infrastructure, which supplied raw river water to a sparsely populated District of Columbia service area. The current agreement between that Aqueduct and DC Water dates to a Memorandum of Understanding update in 2013.

Based on our interviews with DC Water personnel, this is a highly effective and constructive operating relationship. DC Water and Aqueduct staff work closely on CIP funding issues and to maintain high levels of water quality.

4.2.3 Product Quality

As noted above, there are excellent lines of communication between the Aqueduct and DC Water personnel. The Aqueduct staff meet quarterly with DC Water and their other customers (Arlington, VA, and Fairfax, VA). They will adjust the water treatment process based on water testing, changes in regulations, and needs of the water systems, always ensuring that treated water meets or exceeds federal standards. DC Water has achieved a 100 percent regulatory compliance water rating, placing it in the Top Quartile of QualServe utilities.

4.2.4 Supply Adequacy

The Potomac River is the sole source of raw water for the Aqueduct's two drinking water treatment plants: Dalecarlia and McMillan. In addition to Washington Aqueduct's demand on the river supply, the Potomac River is the main source of water for the region; the river also supplies Fairfax Water's Corbalis Water Treatment Plant (WTP) and the Washington Suburban Sanitation Commission's (WSSC) Potomac WTP. The region is very cognizant of the sensitivity to drought and the threat of contamination inherent in a river supply.

The Interstate Commission on the Potomac River Basin (IPCRB) was created with an interstate compact established by Congress in 1940 to help the Potomac basin states and the federal government enhance, protect, and conserve the water and associated land resources of the Potomac River basin through regional and

interstate cooperation. The IPCRB jurisdictions are represented by appointed commissioners from Maryland, Pennsylvania, Virginia, West Virginia, the District of Columbia, and the federal government.

In the 2022 QualServe survey, DC Water's Available Water Supply was 79 years, a Top Quartile result and so far above the Top Quartile threshold that we estimate it to be well into the best decile. (Note: The average available water supply is the annual water volume available based on current yield within regulated, authorized withdrawals, and delivery system or infrastructure limitations).

4.2.5 Efficiency

The price paid by the purchaser of treated wholesale water is a good indicator of efficient operation by the water provider. However, many local factors can affect total cost – source of supply, watershed management etc. Fortunately, there is one local very similar situation – Prince William County Service Authority (PWCSA) a water and sewer utility with half the served population of DC Water purchases all their water from Fairfax Water. In FY22, the non-capital costs to DC Water were $0.97 per thousand gallons. Under a similar pricing arrangement (i.e., separate capital and O&M charges), PWCSA paid $1.11 per thousand gallons. This price included some transmission costs. In a small survey of wholesale water prices performed several years ago, the range of prices was between $0.80 and $1.35 (these were not fully apples to apples comparison – the lower prices were no transmission configurations). The Aqueduct's price for O&M costs is very reasonable.

4.3 Water System

4.3.1 Overview and Organization

Drinking water in the District of Columbia comes from the Potomac River. The USACE, Washington Aqueduct is responsible for treating the drinking water. DC Water purchases water from the Aqueduct and is responsible for maintaining the distribution system that delivers drinking water to customers. The distribution system begins at the water treatment plant and ends at private service lines. Customer service lines connect to mains in the streets and deliver water to residents and commercial buildings, eventually reaching taps. Water pressure is maintained through four pumping stations that provide adequate capacity to meet peak demand (drinking water and fire demands) – Bryant Street, New Fort Reno, 16th and Alaska, and Anacostia. One Washington Aqueduct pumping station can take over for the Bryant Street pumping station, if needed. The distribution system operated by DC Water comprises 1,350 miles of interconnected pipes.

The Water Operations Department has 214 authorized positions and consists of six functional groups described in Exhibit 4-7.

4.3.2 Distribution System Overview

Potable drinking water is delivered to DC Water from the two Washington Aqueduct water treatment plants. The distribution system is a combination of DC Water-owned and controlled assets and facilities owned by the Aqueduct. DC Water serves its retail customers through a distribution network consisting of underground reservoirs, elevated tanks, pipes, valves, and various system appurtenances. Both DC Water and the Aqueduct own components of the distribution network. DC Water's distribution system consists of approximately 1,350 miles of pipe with more than 36,000 valves for controlling the flow. An important function of the system is to provide fire protection for the District of Columbia. The system includes about 9,500 public fire hydrants. DC Water maintains eight storage tanks – three elevated tanks and five ground reservoirs. In addition, there are five water pumping stations with the largest being the Bryant Street Station with a capacity of 194 MGD.

The water distribution system has been configured to provide a minimum service pressure of approximately 35 pounds per square inch (psi) at the curb. To maintain suitable pressures for domestic use, the water distribution

Exhibit 4-7: Water Operations Department

Distribution Control (91 Positions)	***Distribution Maintenance (51 Positions)***	***Construction Contract Management (27 Positions)***	***Linear Asset Management (6 Positions)***	***Water Quality & Technology (34 Positions)***	***Office of the Vice President (5 Positions)***
Preventative maintenance on the 43,000 system valves. Inspect, maintain, and replace 9,500 fire hydrants, in accordance with the Memorandum of Understanding (MOU). First responders to Investigate water system leaks emergencies.	Repair and replace water mains, service lines, valves, hydrants, and other linear assets. Coordinate emergency response for distribution system repairs. Perform all water services tap, and abandonments 2" and smaller, in the District of Columbia. Plan and execute small capital improvement projects using in-house resources to support Water Quality, Lead Free DC (LFDC), and operational initiatives.	Manage ongoing multifaceted contracts to support water and sewer infrastructure rehabilitation and replacement programs. Administer Public Space Restoration Program. Manage the acquisition of District Department of Transportation (DDOT) permits to facilitate emergency repairs and scheduled projects.	Manage ongoing multifaceted contracts to support water and sewer infrastructure rehabilitation and replacement programs. Optimize and prioritize capital program projects using condition assessment and analysis of Computerized Management Maintenance Software (CMMS). Provide technical support to design and construction of CIP. Support Voluntary Lead Service Program. Manage service line data in Maximo and Geographic Information Systems GIS databases and provide data analytics.	Environmental Protection Agency (EPA) drinking water compliance, monitoring, and reporting. Ensure water quality within the distribution system. Collaborate with District agencies to mitigate adverse health effects from drinking water contaminants fees. Assess online water quality data and models and enforce fire hydrant usage policies and regulations.	Provide oversight and ensure operational compliance with various MOUs. Manage departments operating and capital budgets and perform budget monitoring functions.

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 255.

system is now divided into nine Pressure Zones following topographical changes. The system grew from seven to nine zones in 2018. The current Pressure Zones are shown in Exhibit 4- 8 with details provided in Exhibit 4-9.

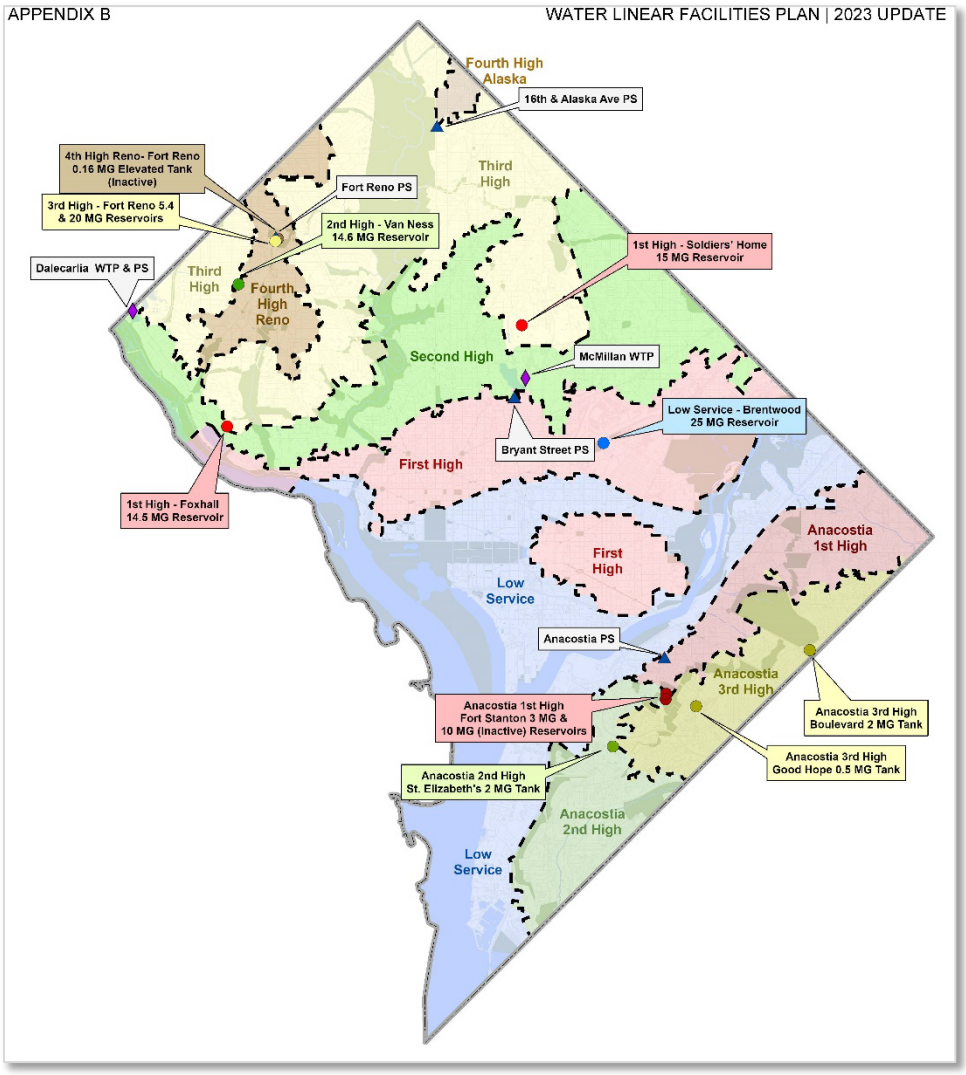
These Pressure Zones are served by a system consisting of five pumping stations, 11 reservoirs, and elevated tanks. One of the pumping stations is operated by the Washington Aqueduct Division as are three of the reservoirs.

Low Pressure Zone corresponds to places with ground elevations between 0 and 70 feet and includes areas along the Potomac and Anacostia rivers. This area is served by the Dalecarlia Pumping Station (operated by the Washington Aqueduct Division), and the Bryant Street Pumping Station. The pressure in the Low Pressure Zone is controlled by the water level in Brentwood Reservoir.

First High Pressure Zone is located on the west side of the Anacostia River where the ground elevations range between approximately 70 and 140 feet above sea level. This area is served by the Dalecarlia and Bryant Street pumping stations. The pressure in the First High Pressure Zone is controlled by the water levels in the Fox Hall

Reservoir and the Soldier's Home Reservoir. The Fox Hall Reservoir is owned by the Washington Aqueduct, while the Soldier's Home Reservoir is owned by DC Water.

Exhibit 4-8: Water System Pressure Zones



Source: 2023 Linear Water Facilities Plan – Appendix B.

Anacostia First High Pressure Zone serves communities located southeast of the Anacostia River and having ground elevations between 70 and 170 feet. Water to this zone is supplied by the Anacostia Pumping Station. The pressure in this area is controlled by the water level in Fort Stanton Reservoirs No. 1 and No. 2.

Anacostia Second High Pressure Zone serves communities located southeast of the Anacostia River and having ground elevations above 170 feet. Water to this zone is supplied by the Anacostia Pumping Station. The pressure in this area is controlled by the water level in the St. Elizabeth's Water Tower.

Second High Pressure Zone serves the area west of the Anacostia River between Rock Creek Park and Eastern Avenue with ground elevations between 140 and 210 feet. As with the First High Pressure Zone, this area is served by the Dalecarlia and Bryant Street pumping stations. The pressure in the Second High Pressure Zone is governed by the water level in the Van Ness Reservoir. The Van Ness Reservoir is owned and operated by Washington Aqueduct.

Anacostia Third High Pressure Zone serves the area located southeast of the Anacostia River along Southern Avenue and having ground elevations above 170 feet. This area is served by the Anacostia Pumping Station. The pressure in this area is controlled by the water level in the Good Hope Road Elevated Tank and the Boulevard Elevated Tank.

Third High Pressure Zone is located west of the Anacostia River with ground elevations between 210 and 350 feet above sea level. This area is served by the Dalecarlia and Bryant Street pumping stations. The water supply

to the Third High Pressure Zone comes from both the Dalecarlia Pumping Station and the Bryant Street Pumping Station. The service pressure is governed by the water level in Fort Reno No. 1, and Fort Reno No. 2 reservoirs. The Fort Reno Reservoir No. 2 is owned and operated by the Washington Aqueduct Division.

Exhibit 4-9: Water Pressure Zones

Pressure Zone	*Ground Elevation*	*Maximum Static Hydraulic Grade Line*
Low	0 to 70 feet	172 feet
First High	70 to 140 feet	250 feet
Anacostia First High	70 to 170 feet	258 feet
Anacostia Second High	Above 170 feet	310 feet
Second High	140 to 210 feet	335 feet
Anacostia Third High	Above 170 feet	382 feet
Third High	210 to 350 feet	424 feet
Fourth High Alaska	Above 350 feet	485 feet
Fourth High Reno	Above 350 feet	510 feet

Source: DC Water.

Fourth High Alaska Pressure Zone serves the area west of the Anacostia River, east of Rock Creek Park, bounded by Eastern Avenue and with ground elevation above 350 feet. It is supplied by the 16th and Alaska Pumping Station. This Pressure Zone does not have water storage facilities and relies on the variable speed pump in the Pumping Station to meet demands.

Fourth High Reno Pressure Zone includes the area west of the Anacostia River and Rock Creek Park, bounded by Western Avenue, and having ground elevations above 350 feet. The Fort Reno Pumping Station supplies this zone. Recently completed pump station improvement increased the HGL of this area as a result and the Fort Reno Elevated Tank No. 2 (0.16 MG) was taken out of service and the zone relies on the variable speed pumps in the pumping station to meet demands.

The DC Water distribution system has experienced some changes since the 2018 Assessment. Exhibit 4-9 summarizes the zone configuration.

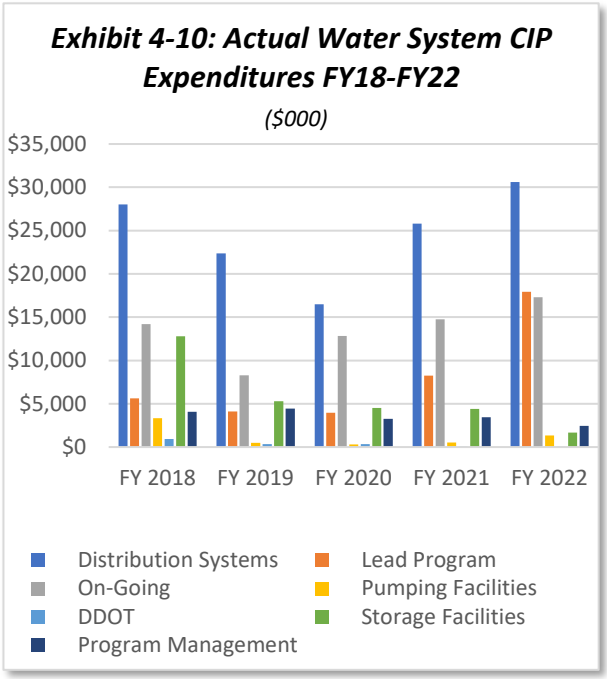
4.3.3 Water System Facilities Plan

DC Water's 2015 update to the Facilities Plan (originally developed in 2000) is the planning document presently guiding the elements of the Capital Improvement Program (CIP). The document presents a strategy for DC Water to continue providing safe, adequate, and reliable service to its customers. The 2015 Facilities Plan Update:

- Presents population and demand projections through the year 2035.
- Reviews current water quality data and proposed water quality regulations.
- Evaluates pumping, storage, transmission, and distribution infrastructure systems and identifies investment needs to meet system demands and water quality requirements over the next 20 years to continue providing a reliable supply at adequate flows and pressures.
- Presents a prioritized CIP for pumping, storage, transmission, and distribution.
- Identifies other recommendations including continuous improvement in Asset Management

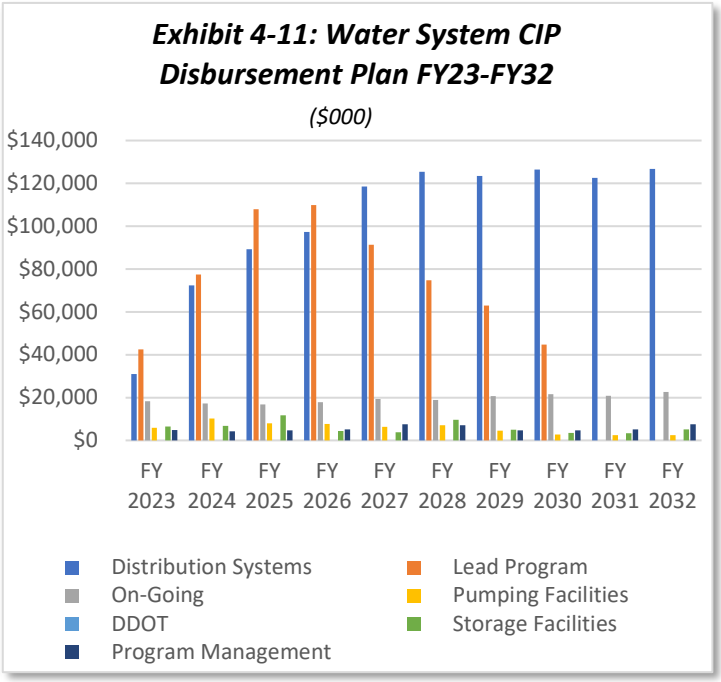
The 2015 Facilities Plan Update is comprehensive and current, though DC Water is planning updates starting in 2023. Exhibit 4-10 presents annual actual capital expenditures ($283M total) since the 2018 Assessment. Exhibit 4-11 presents annual planned CIP expenditures ($2.01B total) from the FY23-FY32 DC Water Disbursement Plan.

Exhibit 4-10: Actual Water System CIP Expenditures FY18-FY22



Source: Data provided by DC Water.

Exhibit 4-11: Water System CIP Disbursement Plan FY23-FY32



Source: Date from the DC Water Approved FY 2024 Budget, page 346.

4.3.4 Pumping Stations

Exhibits 4-12 summarizes the five pumping stations serving the Pressure Zones. One of these stations, the Dalecarlia Pumping Station, is owned and operated by the Aqueduct. As part of the regional water system serving the DC area, DC Water utilizes the pumping capabilities of the Aqueduct. Beyond the pressure levels served by the Dalecarlia pumping facility, DC Water maintains four pumping stations that draw water from lower pressure zones, pressurizing the water delivered to higher zones.

Exhibit 4-12: Drinking Water Pumping Facilities

Facility	***Commissioned***	***Pressure Zone***	***Capacity***
Dalecarlia Pumping Station (Aqueduct operated)	1928	Low, First High, Second High & Third High	310MGD
Bryant Street Pumping Station	1905	Low, First High, Second High & Third High	194MGD
Fort Reno Pumping Station	1977	From Third High to Fourth High Reno	15.7MGD
16th and Alaska Pumping Station	1993	From Third High to Fourth High Alaska	3.5MGD
Anacostia Pumping Station	2008	From Low to Anacostia First High, Anacostia Second High & Anacostia Third High	82.8MGD

Source: The 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Verified by DC Water staff.

4.3.4.1 Washington Aqueduct Pumping Capabilities—Dalecarlia Pumping Station

As part of the Dalecarlia Water Treatment Plant, this station was built in 1928. The pumping station has a firm capacity of 310 MGD and provides service to Low, First High, Second High, and the Third High Pressure Zones. In addition to serving these zones within the District of Columbia, this station also provides service to Arlington County (VA), and a portion of the Fairfax County (VA) Water service area.

4.3.4.2 DC Water Pumping Capabilities

4.3.4.2.1 Bryant Street Pumping Capability

Photo 4-2: Bryant Street Pumping Station (DC Water photo)

The Bryant Street Pumping Station was built in 1905 and pumps water to the Low, First High, Second High, and Third High Services Areas. At a capacity of 194 MGD, it is DC Water's largest water pumping station. As the central pumping operations and control facility, the Bryant Street Pumping Station is the nerve center of water distribution for DC Water. Ongoing renovations have made the station and its operating center both effective and efficient in the reliable delivery of drinking water.

DC Water has completed numerous capital projects for this historic facility. Exhibit 4-13 is a list of recent capital projects completed or programmed during this review period. These upgrades continue the operational efficacy of the facility, which supplies water to all pressure zones, and is the central control facility for the water system, housing many DC Water offices and functions. Interviews conducted with engineering and operation staff, along with several field visits and site inspections at the station, indicate the station is in excellent operational order, and the staff are well motivated.

The current condition of the Bryant Street Pumping Station was assessed during an interview and site inspection on March 13, 2023 (see Appendix B for the assessment report).

Exhibit 4-13: Bryant Street Pumping Stations CIP Projects

Proj. ID	*Project Title*	*Total Budget*	*Timeline*
HI	Bryant Street Pump Station Phase III	$6.6M	FY27-FY29
HV	Bryant Street Pump Station Spill Header Flow Control (Replacing manual PRVs with actuated)	$11.7M	FY13-FY26
JB	Bryant Street PS Improvements – Phase II	$12.2M	FY12-FY25
S6	Replace East and West Venturi Meters at Bryant Street. (Vault maintenance access improvements)	$2.4M	FY23-FY27

Source: DC Water Approved FY 2024 Budget, page 192.

4.3.4.2.2 Fort Reno Pumping Station

Photo 4-3: Fort Reno Pumping Station (PEER photo)

The Fort Reno Pumping Station was placed in service in 1977. It has a pumping capacity of 15.7 MGD and pumps water from the Third High Pressure Zone to the Fourth High Pressure Zone. The station is located on the same site as the Fort Reno Elevated Tank No. 2 and Fort Reno Reservoir Nos. 1 and 2. The Fort Reno Elevated Tank No. 2 has been placed out of service as the new variable speed pumping capabilities serve as the pressure controlling equipment for the Fourth High. The higher service pressure in the Fourth High is presently higher than the overflow level of the elevated tank. In addition, the abandoned former Fort Reno Pumping Station and Elevated Tank No. 1 are

located on the same site. The Fort Reno Pumping Station has a firm capacity of 15.7 MGD, which exceeds current and projected (2035) maximum demand conditions plus maximum fire flow demands. Capital Project ID #AY Upgrades to Fort Reno Pumping Station are expected to be completed in FY23 at a cost of $14.5M. Capital Project ID #OR, another Fort Reno Pumping Station improvement project, is currently in the planning phase with construction substantial completion planned for FY27 with planned costs at $6.4M. The scope of Project ID #OR includes major mechanical, electrical, and instrumentation upgrades.

DC Water has completed projects that remedied the structural and mechanical components of the Fort Reno Pumping Station. The upgraded pumping station is in like-new condition with redundant variable speed pumps with local and remote control and monitoring features. The new emergency power generator set is exercised and maintained on a programmed schedule.

4.3.4.2.3 Anacostia Pumping Station

Photo 4-4: Anacostia Pumping Station (PEER photo)

The Anacostia Pumping Station was placed into service in 2009 and has a firm capacity of 62.5 MGD. The pumping station supplies the Anacostia 1st, 2nd, and 3rd High Pressure Zones. In FY23, planning for Capital Project ID #HR Anacostia Pump Station Improvements will begin with construction substantial completion scheduled for FY28. The approved budget for this project is $4.7M. The scope of Project ID #HR includes major mechanical, electrical, and instrumentation upgrades. The current condition of the Anacostia Pumping Station was assessed during an interview and site inspection on March 17, 2023 (see Appendix B for the assessment report).

4.3.4.2.4 16th and Alaska Pumping Station

At 3.5 MGD capacity, the 16th and Alaska Pumping Station pumps water from the Third High Pressure Zone to the Fourth High Pressure Zone. The pumping station was built in 1993. The 16th and Alaska Pumping Station has a firm capacity of 3.5 MGD, which exceeds current and projected (2035) maximum demand conditions plus maximum fire flow demands. The upgrades to the pumping station were completed in FY15. The $4.6M project has increased the reliability and serviceability of the station that supplies water to the 4th High East from the 3rd High Pressure Zone. In FY26, planning for Capital Project ID #OV 16th and Alaska Pump Station Improvements will begin with construction substantial completion scheduled for FY30. The approved budget for this project is $3.1M. The scope of Project ID #HR includes major mechanical, electrical, and instrumentation upgrades. This site was not inspected during this review period.

4.3.5 Water Storage Facilities

Exhibit 4-14 summarizes the seven water storage facilities DC Water owns and operates. Four of these facilities are underground reservoirs and three are elevated tanks. Three additional underground reservoirs are owned and operated by the Aqueduct; these facilities are the Foxhall, Van Ness and Fort Reno Reservoir No. 2. These facilities combine for a total storage capacity of 102 million gallons and provide adequate storage for DC Water's Pressure Zone.

The four storage reservoirs and three elevated tanks operated by DC Water were originally constructed between 1926 and 1959 with an average age of approximately 75 years. St. Elizabeth was constructed in 2018 and serves the recently commissioned Anacostia Second High Pressure Zone. Apart from Anacostia Elevated Tank No. 1

(Good Hope) currently being upgraded, all the older facilities have undergone major rehabilitation in the past decade. Water Storage Facilities CIP projects are listed in Exhibit 4-15.

4.3.5.1 Washington Aqueduct Storage Facilities

4.3.5.1.1 Foxhall Reservoir

The Foxhall Reservoir stores drinking water for distribution in the First High Pressure Zone. This reservoir is a 14.5 MG, below-ground facility and was built in 1941. Water levels in the reservoir are operated to control pressure in the First High Pressure Zone.

4.3.5.1.2 Van Ness Reservoir

Built in 1931, the Van Ness Reservoir provides drinking water storage for delivery to the Second High Pressure Zone. This below-ground reservoir has a storage capacity of 14.6 MG and overflow elevation of 335 feet. The water level in this reservoir is operated to control pressure in the Second High Pressure Zone.

4.3.5.1.3 Fort Reno Reservoir No. 2

This reservoir was built as a 20 MG drinking water storage facility in 1955. Along with Fort Reno Reservoir No. 1 (owned and operated by DC Water), this reservoir provides water to the Third High Pressure Zone and is used to control pressure in this Pressure Zone. Fort Reno Reservoir No. 2 has an overflow elevation of 423.5 feet.

Exhibit 4-14: Water Storage Facilities

Facility Name	*Pressure Zone*	*Construction (Upgrade)*	*Capacity*
Brentwood Reservoir	Low Service	1959 (2015)	25 MG
Soldiers' Home Reservoir	1st High	1939 (2021)	15 MG
Fort Reno Reservoir No. 1	3rd High	1928 (2016)	5.4 MG
Fort Stanton Reservoir No. 1	Anacostia 1st High	1932 (2015)	3 MG
St. Elizabeth Elevated Tank	Anacostia 2nd High	2018	2 MG
Anacostia Elevated Tank No. 1 (Good Hope)	Anacostia 3rd High	1937 (2000, ongoing)	0.5 MG
Anacostia Elevated Tank No. 1 (Boulevard)	Anacostia 3rd High	1945 (2000, 2018, ongoing)	2 MG

Source: 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Data verified as current during interviews.

Exhibit 4-15: Water Storage CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
FA	Water Storage Facility Upgrades	$37,933	FY09-FY24
HW	Rehabilitation of Elevated Water Tanks	$7,000	FY23-FY29
MA	Saint Elizabeth Water Tank	$47,511	FY02-FY24
MQ	2MG 4th High Storage Tank	$20,266	FY04-FY27
MR	2nd High Water Storage	$17,043	FY09-FY29
QX	Anacostia First and Second High Storage	$19,171	FY19-FY32
RX	Water Storage Facility Upgrades Phase II	$17,800	FY26-FY36
SW	Water SCADA Replacement	$8,380	FY28-FY34

Source: DC Water Approved FY 2024 Budget, page 193.

4.3.5.2 DC Water Storage Reservoirs and Elevated Tanks

In a 2022 business case evaluation, DC Water stakeholders decided to construct a booster pumping station which eliminated the need to replace the Fort Reno Elevated Tank No. 2. A 2nd High Water Storage facility is being studied to augment Washington Aqueduct's Van Ness reservoir, Capital Project ID #MR. Redundancy in the system allows for the out-of-service rehabilitation of a storage facility. The 2nd High Storage Capital Project budget is $17M, and the project is expected to be completed in FY29. Separately, DC Water is in the early stages of evaluating system storage adequacy and resiliency for the entire distribution system. The findings of this evaluation may result in new future Capital Projects.

DC Water is following best practices in assessing the condition and security of water storage facilities. EPA regulations for protecting drinking water have been incorporated into the water storage capital improvements. The CIP adequately addresses DC Water's storage reservoir and elevated tank requirements. The operating budgets fund the ongoing cleaning and disinfection of the storage facilities performed by outsourced services on a three- to five-year cycle.

4.3.5.2.1 Brentwood Reservoir

Photo 4-5: Brentwood covered water reservoir (DC Water photo)

The Brentwood Reservoir is the drinking water storage facility serving DC Water's Low Pressure Zone The reservoir was built in 1959 and is a below-ground facility with storage capacity for 25 MG. Water levels in this reservoir are used to control pressure in the Low Pressure Zone. The reservoir has an overflow elevation of 172 feet. In scenarios where Brentwood Reservoir is temporarily taken out of service, the zone HGL is lowered to McMillan South Clearwell which has an overflow elevation of 158 feet.

This asset was last inspected by DC Water in Fall 2019. No EPA-related deficiencies were observed.

4.3.5.2.2 Soldiers Home Reservoir

The Soldiers Home Reservoir is one of the drinking water storage facilities serving DC Water's First High Pressure Zone. The reservoir was built in 1939 and is a below-ground facility with storage capacity of 15 MG. Water levels in this reservoir, along with Foxhall Reservoir, are used to control pressure in the First High Pressure Zone. The reservoir has an overflow elevation of 250 feet.

DC Water's last inspection of this asset was in 2020 (construction inspection). EPA-related deficiencies were addressed in Project ID #FA03 (cross connection, impermeable membrane).

4.3.5.2.3 Fort Stanton Reservoir No. 1

The Fort Stanton Reservoir No. 1 is the drinking water storage facility serving DC Water's Anacostia First High Pressure Zone. The reservoir was built in 1932 and is a below-ground facility with storage capacity for 3 MG. Water levels in this reservoir are used to control pressure in the Anacostia First High Pressure Zone. The reservoir has an overflow elevation of 258 feet.

DC Water inspected this asset in November 2022. No EPA-related deficiencies were observed. Under Project ID #QG03, this facility will be upgraded to reduce leakage along with other miscellaneous upgrades.

The current condition of the Fort Reno Reservoir was assessed during an interview and site inspection on April 6, 2023. PEER inspected the reservoir and found the sanitary measures stipulated by the EPA are in place and enforced. The green infrastructure roof is being maintained (see Appendix B for the assessment report).

4.3.5.2.4 St. Elizabeth Elevated Tank

The St. Elizabeth Elevated Tank is the drinking water storage facility serving DC Water's Anacostia Second High Pressure Zone. The facility was built in 2018 and is a welded carbon-steel water storage tank supported by a large diameter steel-reinforced concrete support tower [Composite Elevated Storage Tank (CET)] with storage capacity for 2 MG. Water levels in this tank are used to control pressure in the Anacostia Second High Pressure Zone. The tank has an overflow elevation of 310 feet.

DC Water did warranty-related inspection in June 2020. The tank had to be repainted and this was completed in 2021. A more recent warranty inspection in November 2022 confirmed the coating system in the bowl was in good condition. Tank is new and should not have any EPA deficiencies.

4.3.5.2.5 Anacostia Elevated Tank No. 1 (Good Hope)

The Anacostia Elevated Tank No. 1 (Good Hope) is one of the two drinking water storage facilities serving DC Water's Anacostia Third High Pressure Zone. The reservoir was built in 1937 and is an elevated steel water storage tank supported by steel H columns with storage capacity for 0.5 MG. Water levels in this tank, along with Anacostia Elevated Tank No. 2 (Boulevard), are used to control pressure in the Anacostia Third High Pressure Zone. The tank has an overflow elevation of 382 feet.

DC Water inspected this asset in April 2019 with an expected inspection in the Spring 2023. No official EPA deficiencies are on file, but Project ID #FA08 is in the construction phase and upgrades will be made to the facility (SCADA/WQ/Potential Cross Connection/internal coating).

4.3.5.2.6 Anacostia Elevated Tank No. 2 (Boulevard)

The Anacostia Elevated Tank No. 2 (Boulevard) is one of the two drinking water storage facilities serving DC Water's Anacostia Third High Pressure Zone. The facility was built in 1945 and is an elevated steel toro-pillar water storage tank supported by steel circular columns with storage capacity for 2 MG. Water levels in this tank, along with Anacostia Elevated Tank No. 1 (Good Hope), are used to control pressure in the Anacostia Third High Pressure Zone. The tank has an overflow elevation of 382 feet.

DC Water inspected this asset in November 2021. Internal coating had failed. Currently under construction for coating repair (Project ID #HW02) and a few other miscellaneous upgrades.

4.3.6 Transmission And Distribution – Mains and Appurtenances

4.3.6.1 Transmission Mains

DC Water owns and maintains approximately 250 miles of transmission mains (16-inch diameter and greater), and they have an existing Large Diameter Water Main Rehabilitation/Replacement Program (LDWMR). A detailed field analysis of existing transmission mains, prioritized in the 2015 Facilities Plan Update, continues. Under the Pipe Condition Assessment program five miles of high-risk pipes are inspected annually. Field inspections and leak detection are used to develop capital projects addressing specific sections of pipe in various transmission mains requiring rehabilitation or replacement.

Photo 4-6: Water Main Rehabilitation (DC Water photo)

Steel pipes in the system account for the highest number of breaks in the entire system when indexed on several breaks per unit length basis. It has been determined that the high occurrence of breaks in steel water mains is most probably because of corrosion to the pipe

Exhibit 4-16: Transmission Main CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
C9	Large Diameter Water Mains 1	$21M	FY14-FY25
F6	Steel Water Mains Rehabilitation Phase I (F602)	$12M	FY09-FY26
FT	Water Mains Rehab Phase II	$36M	FY14-FY26
K9	Large Diameter Water Main Replacement	$83M	FY31-FY32
JZ	Large Diameter Water Main Replacement (JZ02)	$99M	FY21-FY31
K7	Large Diameter Water Replacement	$89M	FY24-FY31

Source: DC Water Approved FY 2024 Budget, page 191.

material and couplings. As anticipated, very few of the pipelines surveyed were provided with corrosion protection systems, and the systems that were in place appeared to be in disrepair. This is typical for steel transmission mains that are not adequately protected against corrosion. DC Water annually inspects for cathodic protection and risk scores every asset. Project ID #F6, Steel Water Mains Rehabilitation Phase I, addresses cathodic protection upgrades to protect high priority mains. Noteworthy transmission main CIP projects are listed in Exhibit 4-16. Project ID #C9, Large Diameter Water Mains 1 (to be complete in FY25), calls for replacement of a 30-inch cast iron main installed in 1859.

DC Water uses a risk-based approach to prioritize large diameter water mains for inspection. The large diameter water main (LDWM) assessment program is now focusing on assessing and fixing valves to fully implement the planned LDWM assessments.

4.3.6.2 Distribution Mains

Photo 4-7: Small Diameter Water Main Replacement Program (DC Water photo)

The installation history and general material of construction of the distribution mains (12-inch diameter and smaller) is well documented in DC Water records. Approximately 740 miles of distribution mains are unlined cast iron pipe that are known to be tuberculated, which reduces hydraulic capacity and is a potential water quality concern. The 2015 Facilities Plan Update identified approximately 245 miles of pipe over 100 years old at that time. There are many factors that dictate replacement strategy; however, it is generally accepted that the useful life of water mains is 100 years. The 2015 Facilities Plan update continues the recommended one percent replacement per year. The FY17-FY26 CIP adheres to the one percent per year replacement as recommended. This replacement rate will be increased to 1.5 percent before the next five-year Assessment. The new replacement program began in FY10 with full implementation of the small water main program in FY14 and the large water main program in FY16. Distribution main projects are in Exhibit 4-17. The illustrated projects satisfy the one percent per year replacement target. Supply chain issues have made it difficult to meet this target. This has contributed to the changes to procurement approach discussed in Section 2.2.1.2 Reengineering the Procurement Process.

Condition Assessment

Condition assessments of small diameter water mains are not economically feasible except in very special cases. Accordingly, DC Water does not assess the condition of small diameter water mains. Replacement of small diameter water mains are determined by such factors as main breaks, water quality complaints, low pressure complaints and other operational and hydraulic reasons.

4.3.6.3 Appurtenances

4.3.6.3.1 Valves

Control valves are a vitally important distribution system component. The ability to isolate sections of water mains for repairs is essential to providing a safe and dependable supply of water. Larger transmission mains have substantially large valves which need to be operable to isolate line sections during repair conditions. These large valves are under considerable forces developed by the flow of water and system pressures. Functioning valves reduce the service interruption during emergencies. Most importantly, the number of customers affected

is greatly reduced as the isolation does not require expanding the shut-off zone to reach operable valves. The Water Operations interviews indicated improved reliability within the water system due to the CIP upgrades in critical areas. The system's reliability will further improve based on the planned projects like those listed in Exhibit 4-18.

4.3.6.3.2 Fire Hydrants

A Memorandum of Understanding (MOU) between DC Water and the District of Columbia, through the District of Columbia Fire and Emergency Medical Services Department, is in place and DC Water continually measures its performance against it. This agreement implements an improvement program in the operational level of fire hydrants within the District.

At the beginning of the current program, there were multiple models of hydrants. The target is to get down to two models. This program also replaces and upgrades fire hydrants. The replacement effort has been transferred from contractors performing the replacement to Water Operations personnel. In 2017, the goal of 500 replacements per year was achieved by Water Operations. Replacement and maintenance costs of hydrants are reimbursed by the DC Government. The goal has been lowered to 200-250 hydrants annually with a maintenance level target of 170.

Exhibit 4-17: Distribution Main CIP Projects

Proj. ID	Project Title	Cost	Timeline
DE	Small Diameter Water Main Rehabilitation 12	$46M	FY14 -FY25
F1	Small Diameter Water Main Rehabilitation 13	$42M	FY14-FY24
F2	Small Diameter Water Main Rehabilitation 14	$59M	FY17-FY28
GR	Small Diameter Water Main Rehabilitation 15	$61M	FY18-FY28
HX	Small Diameter Water Main Rehabilitation 16	$59M	FY18-FY28
KE	Small Diameter Water Main Rehabilitation 18	$48M	FY20-FY28
KF	Small Diameter Water Main Rehabilitation 19	$60M	FY22-FY29
KG	Small Diameter Water Main Rehabilitation 20	$68M	FY22-FY32
KH	Small Diameter Water Main Rehabilitation 21	$81M	FY22-FY29
KI	Small Diameter Water Main Rehabilitation 22	$95M	FY23-FY30
KJ	Small Diameter Water Main Rehabilitation 23	$104M	FY24-FY29
KK	Small Diameter Water Main Rehabilitation 24	$108M	FY25-FY32
KL	Small Diameter Water Main Rehab 25	$117M	FY27-FY32
MV	Small Diameter Water Main Rehabilitation 3	$16M	FY06-FY26
O1	Small Diameter Water Main Rehabilitation 9	$26M	FY12-FY21
O2	Small Diameter Water Main Rehabilitation 10	$39M	FY13-FY23
O3	Small Diameter Water Main Rehabilitation 11	$42M	FY14-FY24
KM	Small Diameter Water Main Rehab 26	$119M	FY27-FY33
KN	Small Diameter Water Main Rehab 27	$122M	FY28-FY32
KP	Small Diameter Water Main Rehab 28	$120M	FY29-FY32

Source: DC Water Approved FY 2024 Budget, page 191.

Exhibit 4-18: Large Valve Replacement CIP Projects

Proj. ID	Project Title	Cost	Timeline
I8	Large Valve Replacement (Contract 11-13)	$20M	FY12-FY22
S3	Large Valve Replacement (Contract 3-7)	$23M	FY99-FY24
KC	Large Valve Replacement (Contracts 26 - 27 & 28)	$21M	FY27-FY32
KD	Large Valve Replacement (Contracts 29 - 30 & 31)	$23M	FY30-FY32

Source: DC Water Approved FY 2024 Budget, page 191.

Photo 4-8: Automated Hydrant Flushing (DC Water photo)

DC Water is firmly committed to ensuring the availability and accessibility of public fire hydrants to the District of Columbia Fire Department so that they can provide superior fire protection within the District. DC Water has a Fire Hydrant Service Status Program (Water Hydrant Dashboard) that measures the performance of maintenance, repair, and replacement of public fire hydrants while simultaneously keeping the public informed. The report measures the number of public hydrants, identifies how many are out of service (OOS), maps the locations, indicates how many require repair or replacement, and recognizes the reason for being OOS. DC Water sends a list of OOS hydrants daily to FEMS and a detailed report and explanation is provided every month to the Environmental Quality and Operations Committee, and each quarter to the full Board of Directors.

DC Water has established the goal of one percent or less OOS for public fire hydrants. For the last full year, the hydrant OOS rate was 0.285 percent. This result places DC Water in the Second Quartile of QualServe utilities and very close to First Quartile.

The current CIP dedicates $29M to the Fire Hydrant Replacement Program (Project ID #GQ) to be completed in 2024.

To provide cost recovery and to ensure efficient use of fire hydrants by DC Water customers, the Authority has a robust system of fire hydrant fees and charges. On July 7, 2022, the Board of Directors approved new and amended fees for fire hydrant flow tests, a variety of charges related to fire hydrant rental and updated fire hydrant usage charges. These charges are regularly reviewed by outside consultants with the last such review occurring in 2022. As part of the review, DC Water's proposed rates were benchmarked and found to be in line with regional and national utility rates.

4.3.6.3.3 Ratepayer Metering

Photo 4-9: Water Meter (DC Water photo)

DC Water was one of the first utilities to adopt automated meter reading (AMR), a best practice. The automated meters use radio frequency and cellular phone technology to send water usage information from the meter to DC Water. In addition, an innovative application was developed in-house for notifying customers about their water use. The so-called High Use Notification Application (HUNA) tool analyzes daily water consumption and provides monthly and yearly averages on each account. It also allows customers to access daily meter readings via the web and has advanced features which alert customers of metering anomalies.

The AMR and the Customer Service Information and Billing System help DC Water minimize estimated billings; decrease meter investigations by field staff; reduce the cycle time to identify and correct erroneous billings; identify meter issues; and provide modern data analytics-based services. The meter CIP projects are shown in Exhibit 4-19.

Exhibit 4-19: Meter CIP Projects

Projects	*10-year total*
Ongoing AMR replacement	$33.8M
SDWM Meter Program	$4.1M

Source: DC Water Approved FY 2024 Budget, page 196

4.3.7 Pumping and Operations

Three of the functional units within the Pumping and Sewer Operations Department operate and maintain water pumping stations, water storage facilities, and water towers (Exhibit 4-20). Water system related ongoing or planned activities include completing SCADA communications upgrades between the Washington Aqueduct and the Department of Engineering and Technical Services, maintaining old/obsolete equipment still in use, operating pumpstations within requirements, installing an emergency connection for portable pumps at the Fort Reno Pump Station, and implementation of a Long-term Corrosion Prevention Program.

Exhibit 4-20: Water Pumping and Operations Functional Units

Pumping Operations (28 positions)	***SCADA PCS (12 Positions)***	***Maintenance (30 Positions)***
Operate Water, Sewer, and Stormwater Pumping Stations, Water Storage Facilities and Water Towers. Remove screenings and debris from pump stations and prepare work order for equipment in need of repair. Perform Stormwater Pollution Prevention Plan inspections and reports Inspect inflatable dams to maintain proper function during rain events.	Operate and maintain Supervisory Control and Data Acquisition (SCADA) computer system, Applications, Hardware, and Network Support. Operate and maintain all process instrumentation and controls, including completion of all related preventative and corrective maintenance. Ensure integrity of SCADA, disaster Recovery Planning, Implementation and Testing Administer and manage service contracts and special projects for department.	Plan and coordinate corrective, emergency, preventive, and predictive maintenance for pump stations. Maintain, troubleshoot, and repair mechanical and electrical process systems and equipment. Plan, schedule, and perform condition monitoring for process equipment, including vibration, infrared, and oil analysis.

Source: DC Water Approved FY 2024 Budget, page 261.

4.3.8 Water Operations

The Department of Water Operations (DWO) is charged with operating and maintaining the water distribution system, delivering potable water to the citizens and visitors to the District. DWO ensures compliance with the applicable regulations promulgated by the Safe Drinking Water Act within their six functional units (Exhibit 4-21).

Among the DWO's ongoing and planned initiatives are upgrading mobile computing solutions and expanding dashboard to visualize data and provide management insight, supporting water quality issue resolution and the Lead Free DC program, and addressing potential system issues due to deferred replacements having direct impact on operational spending in the form of overtime and capital equipment requests.

4.3.9 Water Loss

As shown previously in Exhibit 4-2, DC Water's non-revenue water (NRW) has increased to more than 30 percent. The key in developing a strategy for management of NRW, or unaccounted-for water, is to gain a better understanding of the reasons for NRW and the factors which influence its components. The components of NRW can be determined by conducting a water balance analysis. The International Water Association (IWA) provides a water balance calculation that gives guidance to estimate how much is lost as leakage from the network (physical losses), and how much is due to nonphysical losses. Further, IWA has established the Infrastructure Leakage Index (ILI), a performance indicator for comparisons of leakage management in water supply systems. ILI is the ratio between actual real losses and an estimate of the minimum real losses – calculated using the Unavoidable Annual Real Losses (UARL) formula – that could be technically achieved for the system operating pressure, average service connection length and service connection density.

DC Water annually performs an ILI calculation; the results as presented in the FY 2024 Budget are shown in Exhibit 4-22.

Exhibit 4-21: Water Operations Functional Units

Distribution Control (91 Positions)	*Distribution Maintenance (51 Positions)*	*Construction Contract Mgt (27 Positions)*	*Linear Asset Management (6 Positions)*	*Water Quality & Technology (34 Positions)*	*Office of the Vice President (5 Positions)*
Preventative maintenance on the 43,000 system valves. Inspect, maintain, and replace 9,500 fire hydrants, in accordance with the MOU. First responders to Investigate water system leaks emergencies.	Repair and replace water mains, service lines, valves, hydrants, and other linear assets. Coordinate emergency response for distribution system repairs. Perform all water services tap, and abandonments 2" and smaller, in the District of Columbia. Plan and execute small capital improvement projects using in-house resources to support Water Quality, Lead Free DC (LFDC), and operational initiatives.	Manage ongoing multifaceted contracts to support water and sewer infrastructure rehabilitation and replacement programs. Administer Public Space Restoration Program. Manage the acquisition of District Department of Transportation (DDOT) permits to facilitate emergency repairs and scheduled projects.	Manage ongoing multifaceted contracts to support water and sewer infrastructure rehabilitation and replacement programs. Optimize and prioritize capital program projects using condition assessment and analysis of Computerized Maintenance Management Software (CMMS) Provide technical support to design and construction of CIP. Support Voluntary Lead Service Program. Manage service line data in Maximo and Geographic Information Systems GIS databases and provide data analytics.	Environmental Protection Agency (EPA) drinking water compliance, monitoring, and reporting. Ensure water quality within the distribution system. Collaborate with District agencies to mitigate adverse health effects from drinking water contaminants fees. Assess online water quality data and models and enforce fire hydrant usage policies and regulations.	Provide oversight and ensure operational compliance with various MOUs. Manage departments operating and capital budgets and perform budget monitoring functions.

Source: DC Water Approved FY 2024 Budget, page 255.

The 2022 QualServe median value of ILI for combined water and sewer utilities was 2.05. Many utilities in the United States annually perform a water audit using the AWWA Water Audit software. The multiple water loss elements resulting from an AWWA Water Audit can be benchmarked through QualServe. DC Water has this software and performs trial calculations but does not publish the data because the source data is considered questionable.

A high ILI has many possible causes. We have noted the below median distribution system integrity (leaks and breaks), and the long clearance time for low priority disruption of service events. Exhibit 4-23 presents six metrics reported for some factors contributing to ILI. The ILI would be reduced if the water main replacement rate was closer to target (resulting in improved distribution system integrity) and if there were fewer estimated bills.

Exhibit 4-22: Infrastructure Leakage Index

Year	*ILI*
FY18	9.84
FY19	12.53
FY20	8.25
FY21	10.94
FY22	10.37

Source: DC Water FY 2024 Budget, page 45.

Exhibit 4-23: Infrastructure Leakage Index Related Metrics

CEO Report January 2023 Metrics	*Target*	*Aug. 22*	*Sep. 22*	*Oct. 22*	*Nov. 22*
Water Main Break Rate/100 mi.	25	34.81	36.28	36.57	34.37
% Unbilled	1%			3%	2%
Estimated Bills (% of meters read)	4%			4.1%	4.4%
AMI Transmission	95%			93.5%	93.1%
FY22 ESG+R Report Metrics		***FY 21***		***FY 22***	
Water Main Replacement Rate		0.64%		0.65%	
Volume Non-Revenue Real Losses		45,000,000 m3		40,000,000 m3	

Sources: CEO Report, dated January 2023 and the FY 2022 ESG+R Report.

Efforts are underway to identify leaks and reduce NRW. One promising approach utilizes artificial intelligence (AI). As the first project approved through the Innovation Refresh program, Water Operations staff have tested and validated advanced acoustic sensor and AI technology to detect water main leaks and defective water valves. By proactively identifying the location of large and medium-sized leaks, valuable time and resources were saved in making the necessary repairs. One such leak (now repaired) was discharging more than 200,000 MGD. Other efforts include:

- Leak detection is performed as part of the asset management program.
- A metering program is being piloted to identify leakage by Pressure Zone.

4.4 Water System Asset Management

DC Water has a mature asset management program. Major elements of that program are:

- Every asset has been inventoried in GIS, grouped by type, and indexed with a variety of relevant metrics such as age, length, diameter, estimated useful life, and replacement cost for each.
- Assets are subject to regular condition assessments and provided with a service level grade differentiated by such factors age, material, soil condition (if linear asset).
- Risk levels are estimated for each asset class.
- Cost benefit analysis determines appropriate action (rehabilitate or replace).
- Asset management needs are prioritized and populate forecast capital models, including funding sources.
- Capital investment needs are summarized by service line.
- The asset management program is supported by such systems as GIS, existing program level assessment databases, and Maximo (the enterprise asset management solution).

Some linear assets are rehabilitated, and some are too expensive to rehabilitate so DC Water relies on a planned replacement program:

- Small diameter water lines, currently at a one percent replacement rate target, will be increased to 1.5 percent in FY28.
- Small sewer lines will be rehabilitated at one percent in FY24.

DC Water is continually pursuing and evaluating tools and software systems that further its capabilities to perform these duties. In doing so, they have integrated its enterprise asset management software into mobile and vehicular applications that enhance its AM data collection abilities.

Organizationally, the Linear Asset Manager is responsible for the linear (distribution and collections) assets; however, similar functions exist in the Pumping and Operations, and in the Wastewater Treatment Plant

DC Water's Asset Management program is:

- **Customer focused** by meeting levels of service based on ratepayer and community preferences.
- **Whole life cycle-based** by considering asset resource and financial requirements from planning, design, construction/acquisition, and commissioning, through operation, maintenance, and renewal, to retirements and disposal.
- **Sustainable and forward-looking** by considering social, environmental, and financial aspects in present and future service commitments.
- **Transparent and defensible** by using formal, consistent, scalable, and repeatable approaches.
- **System-view** by managing assets as interrelated components in a unified system rather than as stand-alone assets.
- **Innovative** by continually improving asset management processes and procedures using innovative tools, techniques, and solutions.
- **Reliability-focused** by understanding consequences of asset failure and implementing appropriate maintenance process to reduce likelihood of asset failure.
- **Regulatory driven** by ensuring compliance with laws, regulations, permits, consent decrees, administrative orders, and other legal requirements.
- **Managed risk** by directing resources and priorities to achieve established levels of service while minimizing life cycle cost at an acceptable level of risk.

Source: DC Water website.

Operations. Additionally, the Department of Engineering and Technology Services is largely responsible for the strategic planning for these implementations. Vertical asset management is discussed in Section 5.4 of this report.

4.5 Key Findings

The contractual arrangement with the Washington Aqueduct provides DC Water with an ample supply of high-quality water, efficiently priced within an effective and constructive working agreement. Fitch, in its rating review, noted the low cost of Aqueduct treated water and the ample supply.

PEER performed two high level assessments of DC Water's water system operations:

- A practices and capability self-assessment. This 102-point self-assessment consists of seven elements. However, since our assessment of the Washington Aqueduct was done indirectly using best practices, this assessment of DC Water was limited to two elements – Production Capacity and Distribution System.
- The QualServe Water Operations metric comparison to a peer group of high performing utilities.

DC Water's self-assessment placed above competent, which is a very good result. The QualServe assessment was partially limited due to incomplete metrics. Overall, DC Water compares favorably to the QualServe peer utility group, scoring highly in regulatory compliance, energy efficiency and available water supply. Disruption of service was better than median for short term (0 to 4 hour) disruptions, but worse than median for longer term disruptions reflecting (in part) the age of DC Water's infrastructure. They placed at the Third Quartile break for

distribution system integrity (Note: DC Water recognizes this problem; it plans to increase the small diameter water main replacement rate to 1.5 percent).

Additional assessments include:

- DC Water is 100 percent in regulatory compliance for drinking water. Its relationship with the Washington Aqueduct with respect to achieving water quality is best practice.
- DC Water is First Quartile compared to QualServe utilities for water energy consumption efficiency (FY21)
- DC Water is Second Quartile for Hydrant Out of Service rate compared to QualServe utilities (FY21)
- DC Water is First Quartile for Available Water Supply (QualServe FY21)
- DC Water's Distribution System Integrity (Leaks and Breaks per 100 miles) is at the Third Quartile break (QualServe FY21)
- DC Water's Planned Maintenance ratio is within best practice target range.

Photo 4-10: Daily lead, copper, coliform and disinfection byproduct compliance monitoring (DC Water photo)

A review of DC Water's FY 2024 Budget reveals that it is aware of the opportunities for improvement in this area. PEER offers the following recommendations:

- DC Water should consider accelerating its efforts to reduce non-revenue water and improve its ILI. Improving close to peer utility averages would provide mitigation of rate increase pressures.
- DC Water should accelerate efforts to improve disruption of service rates in the more than four-hour disruptions. The Pumping and Sewer Operations reorganization should improve staff availability for low priority breaks (water and sewer line breaks are countercyclical – when one is high the other is low and vice versa). Low priority disruption of service events frequently involves small leaks. Improving disruption of service metrics would improve both ILI and customer satisfaction in addition to mitigating the need for rate increases.

5 The Wastewater System

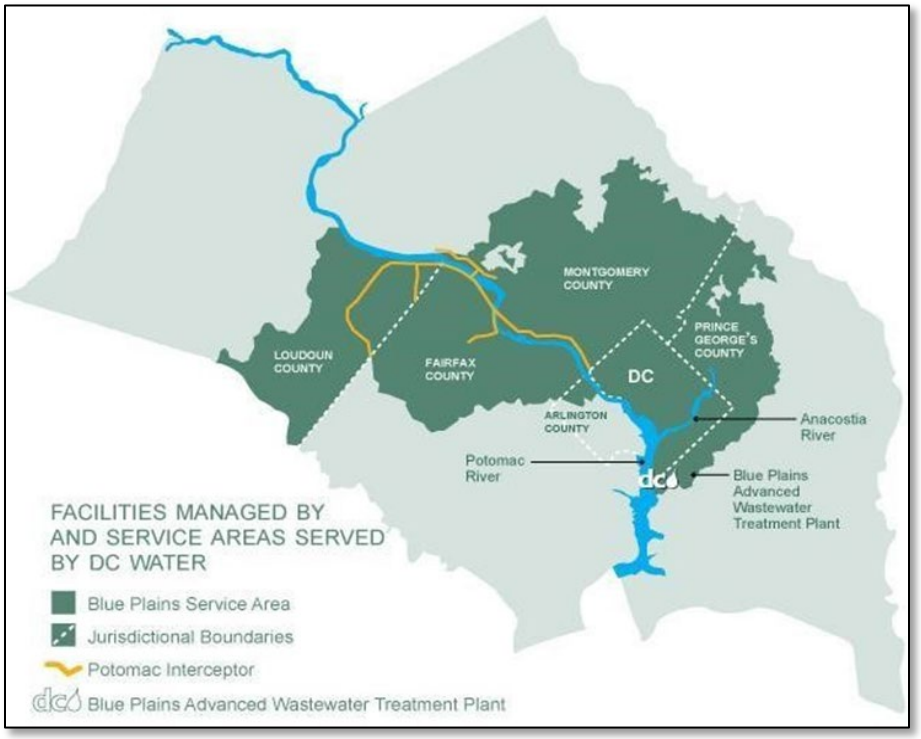
5.1 Overview

DC Water provides regional wastewater treatment and collection services to the District of Columbia and for wholesale customers in adjacent Maryland and Virginia counties. They operate 1,900 miles of sanitary and combined sewers, 160 flow meters, nine wastewater pumping stations, 16 stormwater pumping stations, and 12 inflatable dams. Wastewater treatment is performed at the Blue Plains Advanced Wastewater Treatment Plant, which is located at the southernmost tip of the District, covering more than 150 acres along the Potomac River. Blue Plains is the largest advanced wastewater treatment facility in the world.

According to DC Water's NPDES Permit #DC0021199, Blue Plains AWWTP is rated for an annual average flow of 384 MGD. During wet weather events, flows up to 555 MGD can receive treatment for a maximum of four hours. After the first four hours, the treatment capacity is reduced to 511 MGD to protect the biological process. Additional flows of up to 225 MGD receive treatment at the enhanced clarification facility after being pumped out of the Clean Rivers Tunnel System. Up to 100 MGD from this treatment system can be routed back to complete treatment or can be discharged at outfall 001.

Collected wastewater is conveyed to DC Water's Blue Plains AWWTP located in Southeast DC near the confluence of the Anacostia and Potomac rivers. The plant is located between Bolling Air Force Base and the Woodrow Wilson Bridge. Collected wastewater is conveyed, largely by gravity, through a complex system of pipes and tunnels, and by nine wastewater pumping stations. Wastewater from areas in Virginia and Maryland is conveyed via the Potomac Interceptor, Anacostia Force Main, and Rock Creek Main Interceptor**.** Treatment at Blue Plains includes liquid processes and residual solids processing.

Exhibit 5-1: DC Water's Wastewater Service Area



Source: DC Waterater.com DC Water At-A-Glance.

DC Water's wastewater service area includes the District of Columbia and significant portions of Montgomery and Prince George's counties in Maryland and Fairfax and Loudoun counties in Virginia (Exhibit 5-1).

DC Water's Clean Rivers Project manages the Long-Term Control Plan (LTCP) and is reviewed in Section 7 of this report. The combined sanitary and storm collection system, located within the older communities of Washington, D.C., are largely funded by the District and not by wholesale customers outside the District of Columbia.

5.2 Wastewater Agreements

DC Water is party to several agreements pertaining to wastewater collection and treatment. These agreements are summarized in Exhibit 5-2.

Exhibit 5-2: DC Water Wastewater Agreements

Agreement	*Date Signed*	*Parties*
Potomac Interceptor Agreement	1963	• The Authority • Dulles International Airport • Department of Navy • National Park Service • Town of Vienna
Chesapeake Bay Agreement	1983	• District of Columbia • Maryland • Pennsylvania • Virginia • U.S. Environmental Protection Agency • Chesapeake Bay Commission
Blue Plains Intermunicipal Agreement (IMA)	2013 (most recent)	• The Authority • Fairfax County, VA • Montgomery County, MD • Prince George's County, MD • Washington Suburban Sanitary Commission
Loudon County Sanitation Authority Agreement	1998	• The Authority • Loudoun County Sanitation Authority

Source: The 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Verified as current by DC Water staff.

In its 85-year history, the Blue Plains treatment plant has undergone several treatment upgrades and advances while expanding both the quality of treatment and the area of the metropolitan area served. Blue Plains comprises nearly half of the Washington, D.C. region's current wastewater treatment capacity, serving millions of residents, businesses, and visitors in its multi-jurisdiction service area.

Blue Plains has undergone a state of rapid change in treatment and energy recovery enhancements as significant construction has occurred to meet NPDES permit and Chesapeake Bay Agreement-related process improvements. These projects are described in more detail and subsequent sections of this report. Exhibit 5-3 shows the treatment facility layout for Blue Plains.

5.3 Blue Plains Advanced Wastewater Treatment Plant

5.3.1 Organization

The Blue Plains Advanced Wastewater Treatment plant organization is comprised of three departments:

- *Wastewater Treatment Operations* (126 authorized positions): Operates the Advanced Wastewater Treatment Plant at Blue Plains to produce treated effluent that meets stringent federal Clean Water Act (CWA) and local water quality requirements. Subdepartments are Plant Operations (101 positions), Resource Recovery (10 positions), and Clean Water Quality and Technology (15 positions).
- *Wastewater Treatment Process Engineering* (36 authorized positions): Assists in the operation of the Advanced Wastewater Treatment Plant at Blue Plains so that it produces treated effluent and Class A biosolids that meet stringent CWA and local water quality requirements. Subdepartments are Process Engineering (8 positions), Process Control Systems (15 positions) and Process Control Maintenance (13 positions).

Exhibit 5-3: Blue Plains Facility Layout

Source: The 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Data verified as current by DC Water staff.

- *Maintenance Services* (104 authorized positions): Maintains all mechanical and electrical equipment at the Blue Plains Advanced Wastewater Treatment Plant. Subdepartments are Electrical Maintenance (31 positions), Mechanical Maintenance (63 positions) and Mechanical Management (10 positions).

5.3.2 Permit Compliance

Blue Plains currently operates and subsequently discharges treated effluent into the Potomac River under an NPDES permit with an effective date of August 26, 2018. In interviews with Wastewater Treatment Operations personnel, PEER confirmed that DC Water follows its current permit requirements.

The 2018 NPDES permit established discharge limits for DC Water's two outfalls at Blue Plains in accordance with the provisions and implementing regulations of the federal Clean Water Act, or CWA. The permit standards governing the discharge are among the most stringent effluent limits.

The CWA prohibits discharges to United States waters that are not authorized under a NPDES permit. These permits set numerical discharge limits and establishes mandated action schedules for treatment plants to meet requirements. Permits also require monitoring and that monthly Discharge Monitoring Reports (DMR) be

submitted to EPA. In DC Water's case, when a permit violation occurs, the incident is reviewed by EPA Region III, which will require compliance and could resort to punitive measures.

DC Water has performed well, meeting the Blue Plains NPDES permit requirements and receiving recognition from the NACWA, which recognizes water agencies for their NPDES compliance. DC Water received a Platinum Award in 2016, following compliance for five consecutive years. DC Water received the Peak Performance Award again in 2021.

Two outfalls at Blue Plains are regulated by the NPDES permit. The requirements are designed to make allowances for Combined Sewer System Flow (CSSF) instances. Outfall 002 discharges effluent that has passed through complete treatment at Blue Plains, while outfall 001 is designated as an approved CSO-related bypass in the NPDES permit. During Dry Weather Flow (DWF), only Outfall 002 is utilized. Construction of the Enhanced Clarification Facilities, as well as upgrades to the Nitrification and Denitrification Facilities, was addressed in the permit with flow limits during construction at Outfall 002.

Exhibit 5-4 presents the NPDES effluent limitations and monitoring requirements for Outfall 2 and Exhibit 5-5 presents limitations and requirements for Outfall 1.

Exhibit 5-4: NPDES Permit Section B. Effluent Limitations and Monitoring Requirements Outfall 2

Effluent limitations are based upon the design capacity of 384 MGD for full treatment at the Blue Plains Advanced Wastewater Treatment Plant. During the period beginning on the effective date of the permit and lasting through the expiration date, the permittee is authorized to discharge from Outfall 002 to the Potomac River, subject to the following conditions, discharge limitations and monitoring requirements:

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	(lbs/day)		Other Units (specify)		Measurement Frequency	Sample Type
	Ave. Monthly	Ave. Weekly	Ave. Monthly	Ave. Weekly		
Flow/day (MGD) (1, 1a)	N/A (2)	N/A	N/L (3)	N/L	Continuous	Measured
Carbonaceous Biological	16,013	24,019	5.0 mg/l	7.5 mg/l	Daily	24-hour Composite
Total Suspended Solids (TSS)	19,603	29,404	6.1 mg/l	N/L	Daily	24-hour composite
Total Phosphorus (4)	530 (4)	1,080	0.17 mg/l (4)	0.34 mg/l	Daily	24-hour composite
Ammonia Nitrogen: Summer (5/1-10/31)	13,130	19,536	4.1 mg/l	6.1 mg/l	Daily	24-hour composite
Winter I (11/1 - 2/14)	40,993	61,809	12.8 mg/l	19.3 mg/l	Daily	24-hour composite
Winter 2 (2/15 - 4/30)	32,986	49,319	10.3 mg/	15.4 mg/l	Daily	24-hour composite
Dissolved Oxygen	5.0 mg/l minimum daily average. Not less than 4.0 mg/L at any time				Every 2 hours	
Total Residual Chlorine (mg/l) (6)	Non-detectable		Non-detectable		Every 2 hours	Grab
pH (S.U.) (7)	Within limits of 6.0 to 8.5 standard units				Continuous in-situ monitoring and recording	
Total Ortho-phosphate (mg/l)	N/A	N/A	N/L	N/L	Daily	24-hour composite

Effluent Characteristics	Discharge Limitations (lbs/day)		Other Units (specify)		Monitoring Requirements	
	Ave. Monthly	Ave. Weekly	Ave. Monthly	Ave. Weekly	Measurement Frequency	Sample Type
Alkalinity, total (CaC03) (mg/1)	N/A	N/A	N/L	N/L	Daily	24-hour composite
Hardness, total (CaC03) (mg/1)	N/A	N/A	N/L	N/L	Daily	24-hour composite
Nitrite (N02) (mg/1)	N/A	N/A	N/L	N/L	Daily	24-hour composite
Nitrate (N03) Total Kjeldahl	N/A	N/A	N/L	N/L	Daily	24-hour composite
Total Nitrogen (mg/l) (10)	N/A	N/A	N/L	N/L	Daily	24-hour composite
Cadmium (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24-hours
Copper (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24-hours
Iron (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24 hours
Mercury (total recoverable) (8)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24 hours
Lead (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24 hours
Nickel (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24 hours
Zinc (dissolved) (9)	N/A	N/A	N/L	N/L	Bimonthly	4 grabs/24 hours
PCBs (12)	N/A	N/A	N/L	N/L	2 wet and 2 dry weather samples quarterly	24-hour composite
E. coli (maximum 30 – day geometric mean for 5 samples minimum) (13)	N/A	N/A	126 cfu/100 ml Geometric	N/L	1 /day	Grab

Flow Condition and Period	Times	Measured Influent Flow Rates to Receive Complete Treatment
A. DWF, through permit expiration date	All times	Up to and including 511 MGD
B. CSSF		
1. From effective date of permit unless otherwise authorized or approved by EPA	First 4 hours After 4 hours	Up to and including 555 MGD Up to and including 511 MGD
2. During construction of the WWTF and tie-ins to the existing facilities and WWTF start-up and testing. Periods to be determined by permittee and EPA from completion of design and construction schedules.	First 4 hours After 4 hours	Up to and including 511 MGD Up to and including 450 MGD

Source: U.S. EPA (August 2018) DC Water Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES), pages 9-11.

DC Water's NPDES permit includes sections with detailed information on meeting the stipulated requirements. These sections relate to pretreatment, standard sludge conditions, chlorination/dichlorination, stormwater management, and biochemical oxygen demand (BOD) reduction. The permit also covers monitoring and operations for different flow conditions with respect to each outfall. Specific reporting requirements for public accountability are included in the permit for the combined sewer system, nine minimum controls (NMC) program, water quality-based requirements for CSOs, the long-term control plan, and CSO status reports and schedules. General conditions in DC Water's NPDES permit outline the duty to comply with the permit and penalties for violations of permit conditions. Subjects dealing with toxic pollutants, oil and hazardous

Exhibit 5-5: NPDES Section C. Effluent Limitations and Monitoring Requirements Outfall 1

Discharge from Outfall 001 to the Potomac River is approved as a CSO-related bypass, provided the permittee is in compliance with the LTCP implementation schedule requirements of the March 23, 2005 Consent Decree and the January 14, 2016 CD Amendment entered into in United States v. DCWASA, et al, Consolidated Civil Action No. 1: CVOO183TFH and any supplements or modifications thereto and subject to the following conditions, discharge limitations, and monitoring requirements.

Effluent Characteristics	Discharge Limitations (11)				Monitoring Requirements	
	Kg/day (lbs/day)		Other Units (specify)		Measurement Frequency	Sample Type (6)
	Ave Monthly	Ave Weekly	Ave Monthly	Ave Weekly		
Flow/discharge (MGD) (l) (1a)	N/A	N/A (2)	N/L (3)	N/L	Continuous	Measured
Carbonaceous Biochemical Oxygen Demand (5-day)	N/A	N/A	N/L	N/L	Per discharge	Composite (4)
Total Suspended Solids (TSS) (10)	N/A	N/A	N/L	N/L	Per discharge	Composite (4)
pH (S.U.)	N/A	N/A	N/L	N/L	Per discharge	Composite (4)
PCBs (9)			N/L	N/L	2 wet weather per quarter	Grab
E. coli (cfu/100 ml) (11)	N/A	N/A	N/L	N/L	Every 8 hours, not less than one sample per discharge	Grab
Total Residual Chlorine (mg/1) (5)	Non-detectable		Non-detectable		Every 2 hours, not less than one sample per discharge	Grab
Total Nitrogen (10)	N/A	N/A	N/L	N/L	Per discharge	Composite (4)
Total Phosphorus (10)	N/A	N/A	N/L	N/L	Per discharge	Composite (4)

FLOW CONDITION AND PERIOD	TIMES	MEASURED FLOW RATES FOR OUFALL 001
A. DWF	All times	No discharge permitted
B. CSSF		
1. From effective date of permit and lasting until the WWTF is placed in operation.	All times	Up to and including 336 MGD above rates to receive complete treatment under Part I.B for Outfall 002
2. Following the WWTF being placed in operation, for emptying the BPT under an operating routine that provides for:	All times	Up to a maximum of 225 MGD
a. Conveying flow from the BPT through the WWTF or transfer to Complete Treatment;		
b. Regulating the discharge of WWTF effluent to maintain a rate of 511 MGD through complete treatment while optimizing conditions for maintaining the availability of the storage volume in the BPT such that the occurrence of CSOs is minimized;		
c. No discharge of flow from the BPT from Outfall 001 when DWF conditions exist; and		
d. Limiting discharge of WWTF effluent from Outfall 001 to a maximum rate of 225 MGD; provided that any discharge of WWTF effluent from Outfall 001 shall not occur except for the purpose of maintaining the availability of storage volume in the BPT to the extent that the occurrence of CSOs is minimized (11).		

Source: U.S. EPA (August 2018) DC Water Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES), pages 14 -15.

substances, endangered species, and other liability issues are also described in the permit. Operation and Maintenance of Pollution Controls is specifically covered in the permit under the following topic areas:

- Proper operation and maintenance
- Bypass of treatment facilities
- Upset conditions.

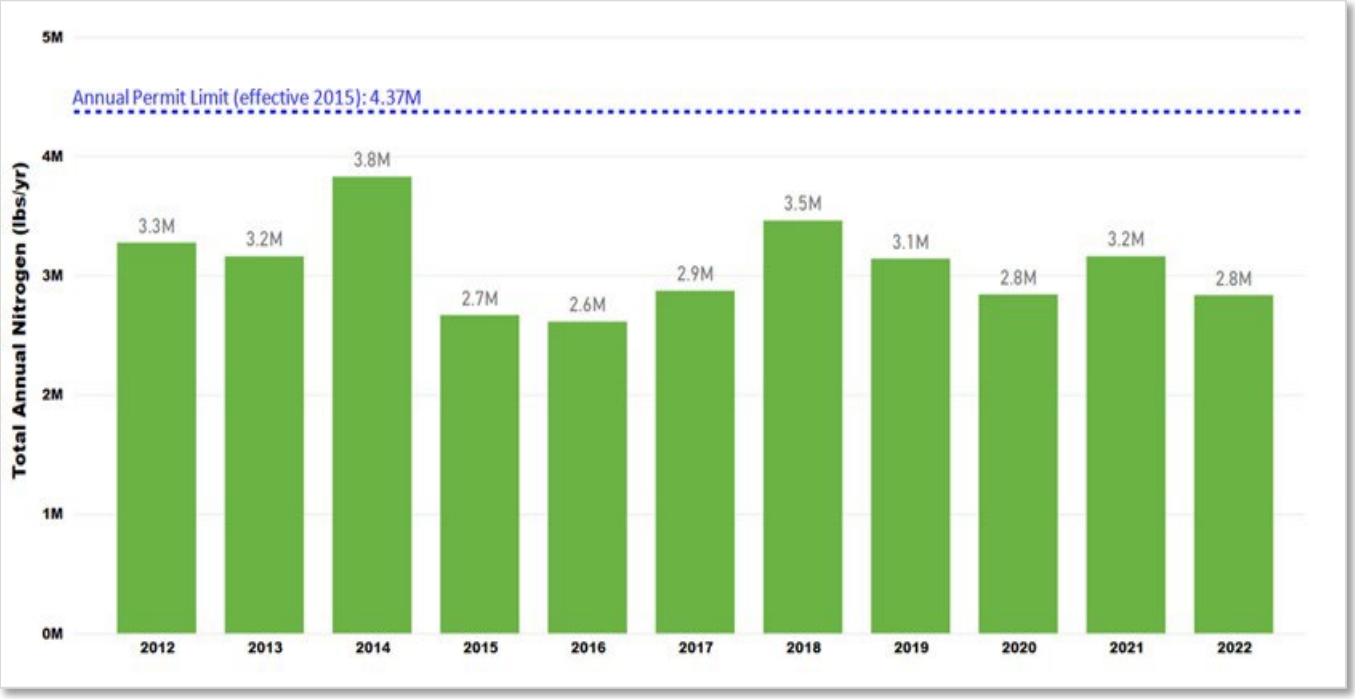
There are detailed explanations of definitions and specific actions necessary in handling these areas of operation and maintenance. There is also a section that covers the specifics on Monitoring and Records. Details are given under the following topic headings:

- Representative sampling
- Flow measurements
- Monitoring procedures
- Reporting of monitoring results
- Monitoring and analytical equipment maintenance
- Analytical quality control
- Additional monitoring by the permittee
- Retention of records
- Record contents
- Inspection and entry

The Authorization to Discharge under the NPDES permit #DC0021199 is a very comprehensive control for flow and water quality addressing Outfalls 001 and 002. The permit is structured like other NPDES permits, with specific stipulations and tiered compliance for Blue Plains operations based on the Consent Decree and Chesapeake Bay Agreement.

The Blue Plains treatment facilities are meeting or exceeding the permit and reporting requirements consistently, as evidenced by the NACWA Platinum Award. It is expected DC Water will continue to comply with the NPDES permit requirements by following through on schedule with the planned rehabilitation, replacement, and other capital improvements. Exhibit 5-6 shows how the NPDES Total Nitrogen load limit is consistently met by Blue Plains.

Exhibit 5-6: Blue Plains Wastewater Treatment Plant Annual Total Nitrogen Load 2012-2022

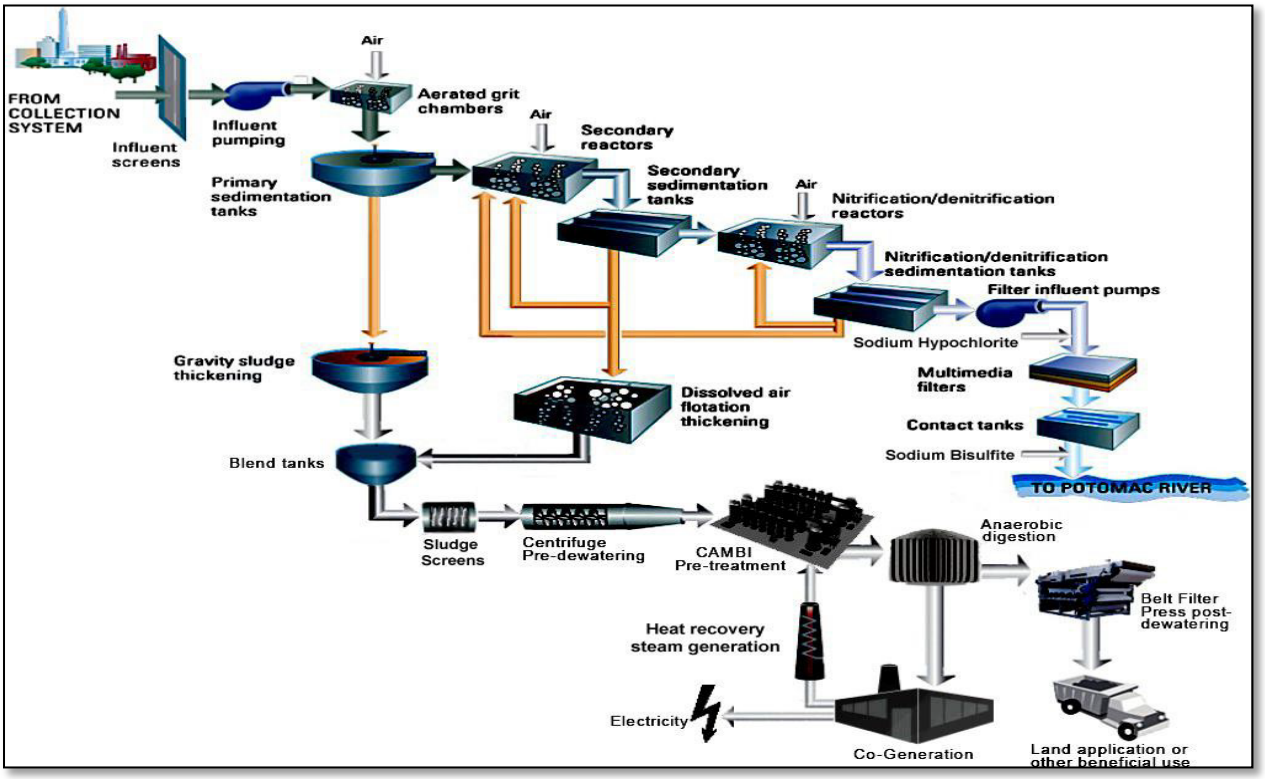


Source: DC Water Approved FY 2024 Budget, page 228.

5.3.3 Treatment Process

Exhibit 5-7 is a graphical representation of the Liquid Processing Treatment Program at Blue Plains. Each is described in more detail in subsequent sections.

Exhibit 5-7: Blue Plains Advanced Wastewater Treatment Plant Liquid Processing Program



Source: The 2018 Independent Engineering Inspection of the DC Water Wastewater and Water Systems. Data verified by DC Water staff.

5.3.4 Wastewater Pretreatment Program

The goals of DC Water's Industrial Pretreatment Program are to:

- Prevent the introduction of pollutants that will interfere with the operation of DC Water's wastewater treatment plant.
- Prevent the pass-through of pollutants to protect the Potomac River water quality and maintain compliance with DC Water's NPDES permit.
- Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.
- Protect the health and safety of the public and DC Water workers.

DC Water's approved Industrial Pretreatment Program is under the supervision of the EPA Region III office. The Authority issues wastewater permits under this program to regulate industrial wastewater discharged into the District of Columbia's sanitary and combined sewer system. The program meets its objectives by establishing discharge standards for pollutants of concern, through permitting certain industrial users, testing for compliance with permit limits and conducting facility inspections.

While neighboring jurisdictions discharge wastewater into DC Water's collection system, industrial users from Prince Georges, Montgomery, Fairfax, and Loudoun counties must follow the rules and regulations of their jurisdictional pretreatment programs, in addition to meeting the discharge standards for DC Water.

DC Water regulates Significant Industrial Users, Non-significant Industrial Users that have a potential to violate discharge standards, temporary dischargers, and waste haulers. If a business discharges non-domestic

wastewater, treated/contaminated groundwater, or water from temporary construction activities to the sanitary or combined sewer system, it needs to contact DC Water for permit information.

Businesses and government agencies that meet any of the following criteria are required to have a Significant Industrial User Wastewater Discharge Permit:

- Users with an average process wastewater flow of 25,000 gallons or more per day
- Users who contribute five percent or more of the total inflow or organic loading to Blue Plains AWWTP
- Federally mandated categorical industries
- Users who are determined to need regulation as determined by DC Water on the basis that the Industrial User has a reasonable potential of adversely affecting the operation of Blue Plains AWWTP or of violating any pretreatment standard or requirement, of harming the environment or of causing a threat to wastewater utility personnel.

DC Water may determine that some businesses and government agencies that fall into the last criteria should be classified as Non-Significant Industrial Users and issued a Non-Significant Industrial User Wastewater Discharge Permit. Types of businesses that may be issued this type of permit include hospitals, universities, printers, and research facilities. Businesses with contaminated groundwater sump discharges may also be issued this type of permit.

DC Water levies fees to cover the costs of their pretreatment oversight activities. The pretreatment group provides permitting, sampling, and inspections for designated industrial users of the wastewater system. These pretreatment fees include annual permitting and monitoring fees for industrial users and a permit fee for wastewater trucked or hauled to Blue Plains.

The Annual Pretreatment Program Reports, submitted to EPA by DC Water, were reviewed by PEER. The metrics reported by DC Water in the 2021 report indicate 48 Significant Industrial Users (SIUs) and 20 non-SIUs. Enforcement notes indicate active control by DC Water. The pretreatment program appears to be well managed and funded. The coordination between the pretreatment programs at DC Water and the wholesale user agencies of the Inter-Municipal Agreement is compliant and timely.

5.3.4.1 Fats, Oil and Grease (FOG) Program

DC Water also regulates FOG. This is sometimes referred to as FROG for fats, rags, oil, and grease. Beginning August 1, 2019, customers were billed $13.70 for each restaurant/food-serving establishment associated with their property. This fee will help prevent FOG from entering and damaging the sewer system. Only food-serving establishments licensed with the DC Department of Consumer and Regulatory Affairs are affected by this new monthly fee.

FOG operations are completely funded from FOG fees. The FOG Inspection Fee funds a program to enforce the installation and maintenance of FOG abatement systems as required by the plumbing code. Fees are assessed to food service establishments such as restaurants, bars, cafeterias, etc. There has been a decline in participants due to a DCRA database update and a pandemic related decline in food service establishments (Exhibit 5-8).

Exhibit 5-8: Fats, Oils and Grease Program

Year	*2018*	*2023*
Number of Participants	4,700	3,700
Annual Fee	$164.40	$224.00

Source: DC Water website.

5.3.5 Wastewater Treatment Capital Projects

Capital projects in the Wastewater Treatment Service Area are required to rehabilitate, upgrade, or provide new facilities at Blue Plains to ensure that it can reliably meet its NPDES permit requirements and produce a

consistent, high-quality dewatered biosolids product. DC Water's current NPDES permit is effective from August 26, 2018, through August 25, 2023. This permit requires wastewater treatment to a level that meets one of the most stringent NPDES discharge permits in the United States. Blue Plains treats an annual average flow of 300-320 MGD and has a design capacity of 384 MGD, with a peak wet weather design capacity to treat more than one billion gallons per day. Wastewater flows in from the District of Columbia, Montgomery and Prince George's counties in Maryland, and Fairfax and Loudoun counties in Virginia.

DC Water categorizes the capital projects at Blue Plains into four program areas:

- Liquid Processing
- Solids Processing
- Enhanced Nitrogen Removal Facilities
- Plantwide

Liquids Processing: Projects in this program area encompass upgrading and rehabilitating facilities involved in handling flows from the sanitary and combined sewer systems. These flows progress sequentially through the Plant processes and ultimately discharge the treated effluents into the Potomac River.

Solids Processing: Biosolids processing involves reductions in volume along with treatment to meet applicable federal, state, and local requirements for beneficial reuse of biosolids. Treatment is provided by a system of processing facilities that include gravity thickening of primary sludge, floatation thickening of the biological waste sludge produced by the secondary and nitrogen removal processes, pre-dewatering of blended thickened solids by centrifuge, pretreatment of solids by thermal hydrolysis, anaerobic digestion, and final dewatering of Class A biosolids by belt filter press.

Enhanced Nitrogen Removal (ENR) Facilities: Projects in this program include new facilities and upgrades to existing facilities needed at Blue Plains to meet the total nitrogen discharge limit assigned to DC Water. In addition to expansion of existing nitrification and denitrification processes, this includes a new wet weather treatment facility that simultaneously treats combined stored sewage and reduces the peak flow through the biological treatment system. The necessary facilities to meet the current NPDES permit are in operation. However, closeout activities continued into FY22, and an expansion will be required in the future to treat future increased influent load to the plant.

Plantwide: This program provides for upgrading, rehabilitating, or installing support systems and facilities that are required for both the liquid processing and solids processing programs.

Since the 2018 Assessment, nearly $350M has been spent on capital improvements (Exhibit 5-9). Planned annual capital expenditures for FY23-FY32 total $1.18B (Exhibit 5-10). The following sections present brief descriptions of each program area and detailed CIPs for each.

5.3.5.1 Liquid Processing

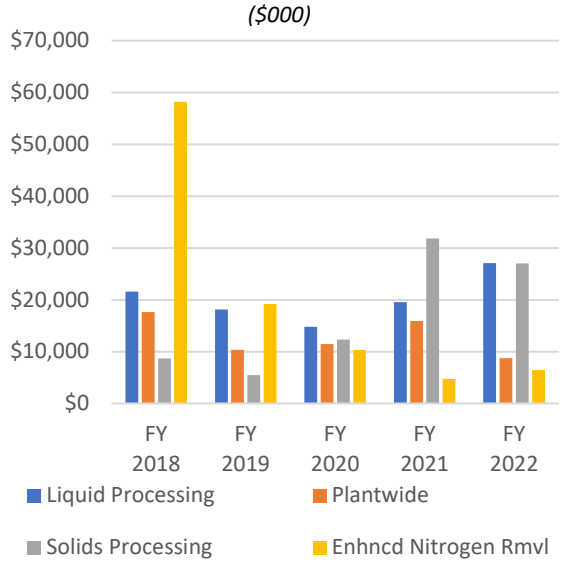
The **preliminary treatment** process at Blue Plains includes:

- Raw wastewater pumping
- Screening
- Grit removal

Wastewater flow collected from parts of the Maryland and Virginia suburbs is delivered to two raw wastewater pump stations (RWWPS1 and RWWPS2) by the Main (sometimes called Bolling) Outfall Sewer, the Potomac Combined Outfall, and the Potomac Sanitary Outfall sewers. Raw wastewater also enters the plant though the Upper and Lower Oxon Run sewers.

Exhibit 5-9: Blue Plains AWWTP CIP Expenditures FY18-FY22

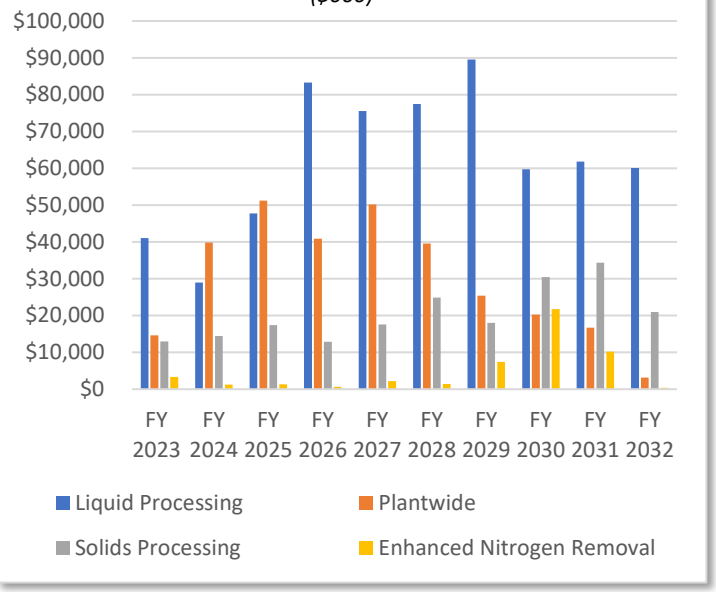
($000)



Source: Data provided by DC Water.

Exhibit 5-10: Blue Plains AWWTP CIP Disbursement Plan FY23-FY32

($000)



Source: Data from DC Water Approved FY 2024 Budget, page 346.

A system of interconnecting conduits ahead of the two pump stations (including the Equalizing Conduit inside the fence line) enables each station to receive its intended share of the total load. During preliminary treatment, incoming pumped raw wastewater is screened as it passes through coarse bar screens.

Following screening, the wastewater is pumped to aerated grit chambers that accelerate the settling of grit for collection and disposal. While the heavier grit settles, lighter organic solids remain in suspension for removal later in the treatment process. Screened material and grit are collected and trucked to a permitted landfill for disposal. Following preliminary treatment, the effluent wastewater proceeds to primary treatment where more suspended solids and some BOD are removed.

The preliminary processes are split during dry weather between the east side and west side. During peak wet weather flows, the west side screens and grit removal facilities treat a constant 280 MGD, while the east side screens and grit removal facilities treat up to 780 MGD. Once the Tunnel Dewatering Pumping Station (TDPS) and 225 MGD Enhanced Clarification Facility (ECF) are operational, these processes will assume a less stressful and higher performing wet weather capacity split, for a total plant capacity of 555 MGD for the first four hours of wet weather, with capacity for 511 MGD thereafter. This mode of operation provides a higher level of treatment to the wet weather discharge, made possible by the combined storage of the tunnel system and the added treatment capacity of the ECF.

The current condition of the Preliminary Treatment Facilities was assessed during an interview and site inspection on March 9, 2023 (see Appendix B for the assessment report).

The **primary treatment processes and facilities** are designed and constructed to remove particles from wastewater by exploiting the differences in density between the particles and water. The primary treatment processes and facilities at Blue Plains include oils/grease/scum separation and primary sedimentation.

Two separated primary treatment "trains" are in use at Blue Plains and are designated as the west side primary process and an east-side primary process, which total 36 primary sedimentation tanks.

Each tank is equipped with solids collection rakes to collect denser, settled wastewater solids. Scum skimming devices are used in each basin to collect the lighter floatable from the wastewater surface. To enhance the settling properties of wastewater suspended solids, metal salts are added to enhance coagulation. Adding metal salts, such as Ferric Chloride, has the added benefit of precipitating phosphorous from the wastewater. Phosphorus removal is a requirement of the Blue Plains NPDES discharge permit.

Photo 5-1: Blue Plains AWWTP Primary Sludge Pump (PEER photo)

Following primary treatment, the effluent is conveyed to the secondary treatment processes where biological processes reduce the BOD in wastewater. Primary solids (or sludge) settled in the primary sedimentation tanks are pumped to grit removal facilities. Following primary sludge degritting, the sludge is then pumped to the gravity thickeners and combined with other sludges produced throughout Blue Plains for treatment.

The current condition of the Primary Treatment Facilities was assessed during an interview and site inspection on March 9, 2023 (see Appendix B for the assessment report).

The **secondary treatment** facilities include:

- Step-Feed Aeration Basins (Reactors)
- Activated Sludge Return System
- Secondary Blower Facility
- Secondary Sedimentation Basins
- Waste Sludge Pumping System

Secondary treatment begins as a biological wastewater treatment process that converts dissolved or suspended materials into relatively dense flocs that can be separated and settled from the water being treated. Blue Plains uses a modified-aeration step-feed activated sludge process that produces a wastewater mixed liquor that flows to the secondary sedimentation basins for settling and separation. Oxygen is supplied to each reactor to support growth of microorganisms which biologically act to consume suspended and dissolved wastes from the wastewater. The secondary treatment process is an important step to remove the majority of BOD and remaining suspended solids from wastewater to meet the Blue Plains NPDES permit.

Photo 5-2: Blue Plains AWWTP Secondary Aeration Basin (PEER photo)

The secondary treatment process is divided into a west process train and an east process train, each receiving effluent from the respective west and east side primary sedimentation basin trains. The settled mixed liquor in the secondary sedimentation basins constitutes a sludge that is pumped to two different locations. A large percentage of the pumped sludge (activated sludge) is recycled back to the reactors with the goal to maintain a desirable concentration of microorganisms. The smaller, remaining percentage of sludge (waste sludge) is pumped to the plant's dissolved air flotation thickeners for treatment and disposal. See Section 5.3.5.2 Solids Processing Programs for a description of the solids treatment processes.

The current condition of the Primary Treatment Facilities was assessed during an interview and site inspection on March 9, 2023 (see Appendix B for the assessment report).

The **nitrification/denitrification** processes and facilities enable the removal of biological nitrogen. Biological nitrogen removal is an aerobic process whereby bacteria convert ammonia nitrogen to nitrate nitrogen.

Denitrification uses a different class of bacteria that thrives in an anaerobic environment and converts nitrite or nitrate ions to nitrogen gas bubbles. The bubbles attach to the biological flocs that float it to the surface of the secondary clarifiers.

Effluent from the secondary treatment process flows into a flow distribution basin at the head of the nitrification/denitrification reactors. Lime or sodium hydroxide is added to the distribution basin to maintain desired levels of alkalinity. The effluent is distributed to a set of 12 nitrification/denitrification reactors that are differentiated by odd/even numbering.

Nitrification/denitrification is accomplished by a suspended growth biological system. Each of the 12 reactors has five stages; nitrification takes place in the first three stages and denitrification in the last two. The conversion of nitrate to nitrogen gas in the denitrification process requires methanol as a supplemental carbon source in the reaction. Turbine aerators in each stage of the reactors keep dissolved oxygen at desired levels and provide mixing to ensure uniform distribution of solids.

The mixed liquor from the nitrification/denitrification reactors flows to 24 sedimentation basins, also differentiated by odd/even numbering. Waste-activated solids that settle in the sedimentation basin are recycled back to the reactors to maintain optimal biological activity. Excess biological solids are pumped to the plant's dissolved air flotation thickeners for treatment and disposal.

Photo 5-3: Blue Plains AWWTP Nitrification Return Sludge Gallery (PEER photo)

The final stage of treatment for Blue Plains effluent before discharge into the Potomac River is tertiary treatment comprised of filtration, disinfection, and chlorine removal. The treated plant flow is filtered through sand and anthracite. The flow is disinfected with sodium hypochlorite-based chlorination at the filter influent, and the residual chlorine is removed before discharge with sodium bisulfite. The final plant effluent has the same basic parameters as drinking water with the exception that the disinfectant (chlorine) is removed as the flora and fauna within the river do not require the chlorine residual required for public drinking water systems.

The filtration process includes multimedia filtration of effluent from the nitrification and denitrification process. The filtration facility consists of 40 granular sand and anthracite filters. The final effluent filters are part of the process which allows Blue Plains to meet the NPDES permit limits for phosphorus. Filters are routinely backwashed to remove clogging and solids from the filter media. Filter backwash is sent to the gravity thickeners for biosolids treatment.

The disinfection process begins in four disinfection tanks located beneath the 40 multimedia filters. Gaseous Chlorine is mixed with water and then injected into the disinfection tanks where sufficient contact time deactivates microbes. The disinfected water is then cleansed of the chlorine prior to discharge into the Potomac River.

The current condition of the Advanced Treatment Facilities was assessed during an interview and site inspection on March 9, 2023 (see Appendix B for the assessment report).

5.3.5.1.1 Liquid Processing and Plantwide Capital Projects

Exhibit 5-11 presents the Blue Plains Advanced Water Treatment Plan Liquid Processing CIP for FY23-FY32 and Exhibit 5-12 presents the Plantwide CIP for FY23-FY32.

5.3.5.2 Solids Processing Programs

Solids processing at Blue Plains consists of:

- Primary sludge screening, grit removal, and grinding
- Gravity thickening
- Dissolved Air Flotation (DAF) thickening
- Sludge digestion

Primary sludge from the West and East Sedimentation processes is pumped through screens to remove rags and debris from the sludge prior to the grit removal facility.

The gravity thickeners (GT) accept primary sludge from the screened and thickened sludge from the primary clarifiers. The primary sludge enters a central distribution chamber that distributes the sludge among GTs in operation. Each GT provides volume and residence time to allow the sludge to settle and thicken. Each thickener is equipped with a collector mechanism that pushes the thickened sludge toward a central well where the sludge is collected and pumped to the raw sludge blending tanks. Peripheral weirs and troughs collect clarified water from the surface of the thickeners and discharge it to the primary sedimentation effluent.

Exhibit 5-11: Blue Plains AWWTP Liquid Processing CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
A2	Liquid Processing Program Management	$84M	FY01-FY35
B6	Primary Sedimentation Tank Covers	$44M	FY26-FY32
B7	Primary Sedimentation Tank Odor Scrubbers	$46M	FY28-FY32
BC	Headworks Influent Structures	$19M	FY17-FY27
BQ	Grit and Screenings and Primary	$56M	FY18-FY27
BR	Nitrification/Denitrification Facility	$55M	FY06-FY27
BT	Filtration/Disinfection Facility Phase II	$24M	FY08-FY27
BV	Raw Wastewater Pump Station No. 2 Upgrades	$47M	FY13-FY23
I4	Grit Removal Facilities - 20 Year Rebuild	$52M	FY31-FY33
I5	Raw Water Pump Stations 1 and 2—20 Year Rebuild	$29M	FY24-FY29
I7	Primary Treatment—20 Year Rebuild	$55M	FY23-FY31
IY	Effluent Filter Upgrade	$170M	FY17-FY32
IZ	Replace/Upgrade Influent Screens	$82M	FY16-FY33
J2	Replace/Upgrade Primary Treatment Mechanisms	$29M	FY18-FY28
J6	Deammonification Project	$4M	FY13-FY26
JC	Secondary East and West—20 Year Rebuild	$96M	FY27-FY34
LF	Nitrification Reactor/Sedimentation—20 Year Rebuild	$140M	FY23-FY35
OZ	Grit Chambers 1 and 2 Upgrades	$15M	FY17-FY30
PD	Secondary East and West Upgrades	$10M	FY16-FY30
PE	Nitrification Reactor/Sedimentation Upgrades	$16M	FY17-FY26
RN	Liquids Processing Rehabilitation	$23M	FY20-FY28
RW	Long-term Concrete Rehabilitation Projects	$63M	FY26-FY31
UC	Filtration/Disinfection Facility	$97M	FY00-FY23
UF	Dual Purpose Sed Area Facilities 20 Year Upgrade	$13M	FY33-FY33
UJ	FIP Wall Pipe Replacement	$5M	FY24-FY27

Source: DC Water Approved FY 2024 Budget, page 169.

Exhibit 5-12: Blue Plains AWWTP Plantwide CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
AL	Plantwide Project Program Management	$66M	FY01-FY31
BY	Additional Chemical Systems Phase III	$4M	FY24-FY29
CH	Miscellaneous Facility Projects	$8M	FY04-FY22
CV	Laboratory Upgrades	$9M	FY06-FY23
CW	Security at Blue Plains	$7M	FY05-FY25
EI	Plantwide Painting of Steel Pipes	$6M	FY12-FY26
GP	Instrumentation and Control and Electric Program Management	$6M	FY09-FY23
GW	Control Systems Replacement	$37M	FY22-FY32
HL	DWT - Process and Operations Jobs	$9M	FY11-FY25
IC	Electrical Monitoring Systems	$26M	FY15-FY28
IT	Hauled Waste Receiving Facility	$5M	FY20-FY27
IU	Solar Photovoltaic System	$1M	FY20-FY23
IV	Blue Plains IT Backbone Fiber-Optic Cables Tubes	$6M	FY16-FY26
JF	Construction of Flood Seawall	$37M	FY19-FY27
LS	Miscellaneous Facility Projects FY13	$18M	FY13-FY30
LX	Process Control System Upgrade	$4M	FY21-FY24
OD	Plantwide Paving	$8M	FY15-FY29
OE	Plantwide Drainage and Runoff	$19M	FY16-FY26
OG	City Water and Sewer Upgrades at Wastewater Treatment Plant	$1M	FY22-FY26
OH	Plantwide Demolition	$11M	FY26-FY32
OP	Plantwide Sump Pump Rehabilitation	$1M	FY20-FY22
OQ	Plantwide Roofing Upgrades	$10M	FY22-FY27
OS	Plantwide Lighting Upgrades	$4M	FY17-FY24
PF	Chemical System/Building Upgrades	$27M	FY15-FY29
TZ	Electric Power System - Power Gear	$72M	FY01-FY29
U2	Wastewater Thermal Energy	$18M	FY20-FY32
US	Main Substation Hardening	$9M	FY24-FY29
V1	MFU8 - Rehabilitation and Emergency Response VIII	$10M	FY23-FY27
V2	MFU9 - Rehabilitation and Emergency Response IX	$10M	FY23-FY28
V3	MFU10 - Rehabilitation and Emergency Response—Plantwide X	$5M	FY23-FY28
YD	Miscellaneous Projects	$52M	FY99-FY29
XP	Efficiency Improvements	$25M	FY29-FY31

Source: DC Water Approved FY 2024 Budget, page 170.

Dissolved Air Flotation (DAF) Thickeners: Blue Plains has 18 flotation thickeners operationally arranged in groups of three or four units fed from a common splitter box. The DAF thickeners thicken biological waste activated sludge from the secondary sedimentation basins and the nitrification/denitrification sedimentation basins.

The DAFs also thicken scum from primary sedimentation and gravity thickening processes. Thickened sludge, oils and grease is pushed into a receiving wet well by collectors where pumps convey it to the sludge blending tanks.

DAF thickeners are used to thicken biological sludges and oils/grease that are less dense and more difficult to settle. They use a process of injecting fine bubbles into the influent sludge, the bubbles adhere to the suspended matter, causing the suspended matter to float to the surface. The "froth" layer containing sludge and oils/grease is then removed by a skimmer. Clarified water passes beneath a baffle and is recycled to the wastewater treatment process.

Photo 5-4: Blue Plains AWT Pre-Dewatering Centrifuges (PEER photo)

In the past, three DAF thickeners were used to thicken nitrification/denitrification sludge while the remaining units were used to thicken secondary waste activated sludge. Recently, Blue Plains has implemented a new single-stream processing scheme that reduces supplemental carbon (Methanol) injection for denitrification. The new scheme simplifies the process by sending nitrification/denitrification sludge to the secondary aeration basins. This reduces supplemental carbon (Methanol) by taking waste nitrifying/denitrifying bacteria, inserting them into the carbon-rich secondary aeration basins and giving them a "head start" to remove Nitrogen from wastewater. The secondary sludge, plus any nitrification/denitrification sludge settled in the secondary sedimentation basin, and then continues to the DAF Thickeners for thickening.

Sludge Digestion: The Walter F. Bailey Bioenergy Facility significantly reduces DC Water's carbon footprint. The innovative Cambi® thermal hydrolysis process uses intense heat and pressure to treat wastewater solids producing a much cleaner biosolid and onsite generation of up to one third of Blue Plains' electricity needs. This process, illustrated in Exhibit 5-13, has resulted in operational efficiencies in electricity, biosolids hauling and chemicals costs. The upgraded process nearly eliminates the need for lime sludge stabilization. The process produces Class A biosolids that expand disposal and reuse options. DC Water maintains the lime stabilization process that produces Class B biosolids as a redundant process for reliability in processing biosolids.

The current condition of the Solids Handling Facilities was assessed during an interview and site inspection on March 10, 2023 (see Appendix B for the assessment report).

Solids Processing Capital Projects

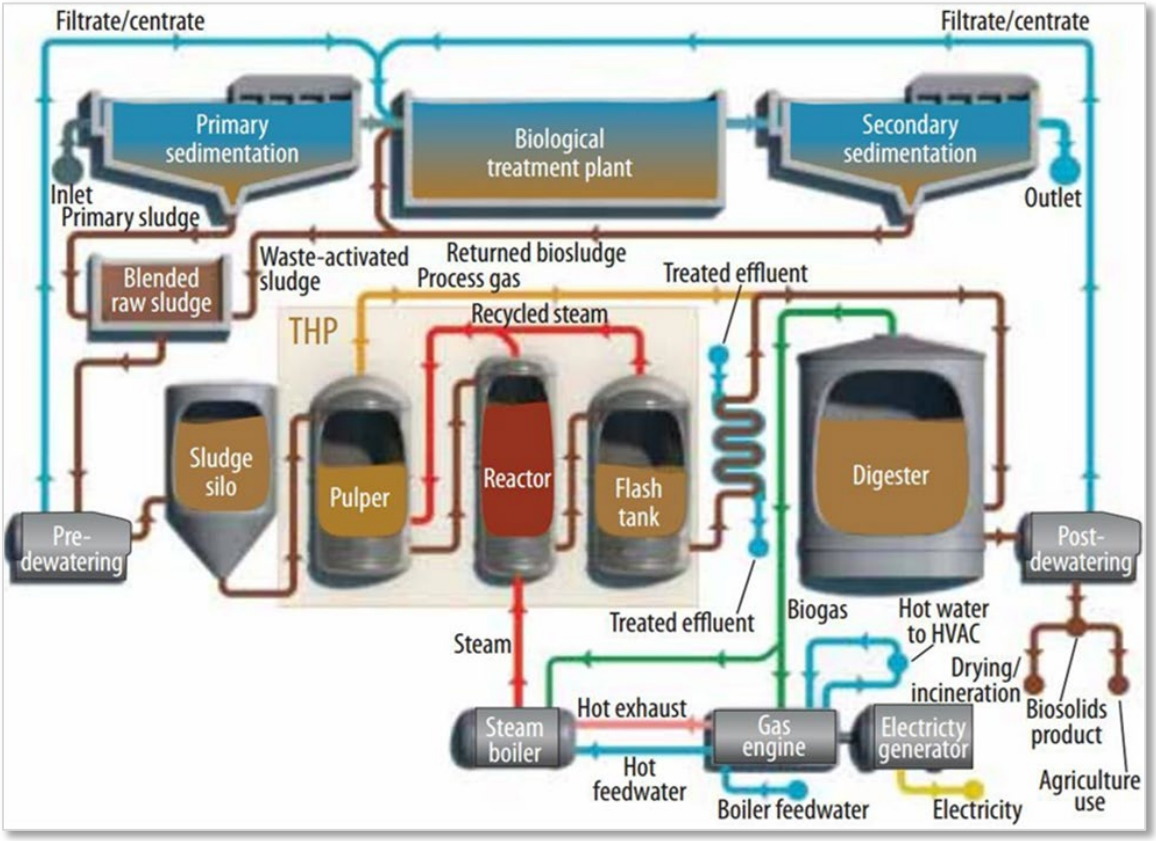
Exhibit 5-14 presents the Solids Processing CIP Projects for FY23-FY32 – two are new and 11 are ongoing.

5.3.5.3 Enhanced Nitrogen Removal Facilities

The Enhanced Nitrogen Removal (ENR) Facilities project reduces the level of nitrogen from the cleansed wastewater that DC Water discharges to the Potomac River. Nitrogen can act as a fertilizer in the river and Chesapeake Bay, creating unruly grasses that deplete oxygen needed by marine life to live and thrive.

With this project completed, Blue Plains produces effluent with some of the lowest levels of nitrogen in the country. The facilities include more than 40 million gallons of additional capacity for nitrogen removal, new post-aeration facilities, an 890 MGD lift station, new channels and conveyance structures and new facilities to store and feed multiple carbon sources. Exhibit 5-15 presents the Enhanced Nitrogen Removal CIP for FY23-FY32.

Exhibit 5-13: Typical Cambi® Thermal Hydrolysis Process



Source: Cambi.

Slurry Walls and Tanks Contract: The first contract package resulted in the construction of slurry walls and tankage and includes the following: excavation, slurry wall and facing walls, denitrification reactor, flow distribution chamber, post aeration tanks, and engineered fill. The contract valued at $69.5M was awarded in January 2011 and work on this contract is now complete.

Pump Station, Channels, and Process Contract: The second ENR contract provides for completion of the anoxic reactors,

Exhibit 5-14: Blue Plains AWWTP Solids Processing CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
AM	Solids Processing Program Management	$27M	FY01-FY31
BX	Gravity Thickener Upgrades Phase II	$84M	FY24-FY29
EV	Area Substation No.6	$22M	FY04-FY22
I3	Biosolids Blending Development Center	$12M	FY06-FY23
LD	Pre-Dewatering Additional Centrifuges	$10M	FY05-FY25
LE	High Strength Water Receiving Facility (includes FOG)	$6M	FY12-FY26
RM	Biosolids Rehabilitation	$80M	FY09-FY23
TH	THP/Digestion Facilities 20 yr Upgrade	$34M	FY22-FY32
XA	New Digestion Facilities	$553M	FY11-FY25
XD	Rehabilitation of Dewatered Sludge Loading Facility	$32M	FY15-FY28
XZ	Solids Processing Bldg/Dewatered Sludge Loading	$25M	FY20-FY27
XY	Process Control & Computer System	$54M	FY20-FY23
V4	MFU10 – Rehabilitation & Emergency Response Biosolids X	$5M	FY16-FY26

Source: DC Water Approved FY 2024 Budget, page 171.

including mixers; construction of large channels to convey process water, including a 250-foot-length, 12–foot-diameter tunnel under the existing nitrification equipment gallery; a new 890 MGD lift station; improvements to the existing nitrification/ denitrification tanks and aeration system; and a new alternative carbon receiving, storage, and feed system. The project also includes the demolition of an existing lime storage facility that is located where the new carbon storage facilities are to be constructed. In addition, the contract includes all installation of related electrical, mechanical, and control systems. The second contract valued at $98.9M was awarded in April 2011 and is now complete. The ENR facilities were placed into operation in 2014 to start compliance with the more stringent EPA nitrogen level requirements by January 2015. The completed ENR projects have significantly reduced biosolids as shown in Exhibit 5-15.

Enhanced Nitrogen Removal Facilities Capital Projects

Of the seven projects shown Exhibit 5-16 Enhanced Nitrogen Removal Capital Projects FY22-FY31, there are two expected to continue beyond FY23:

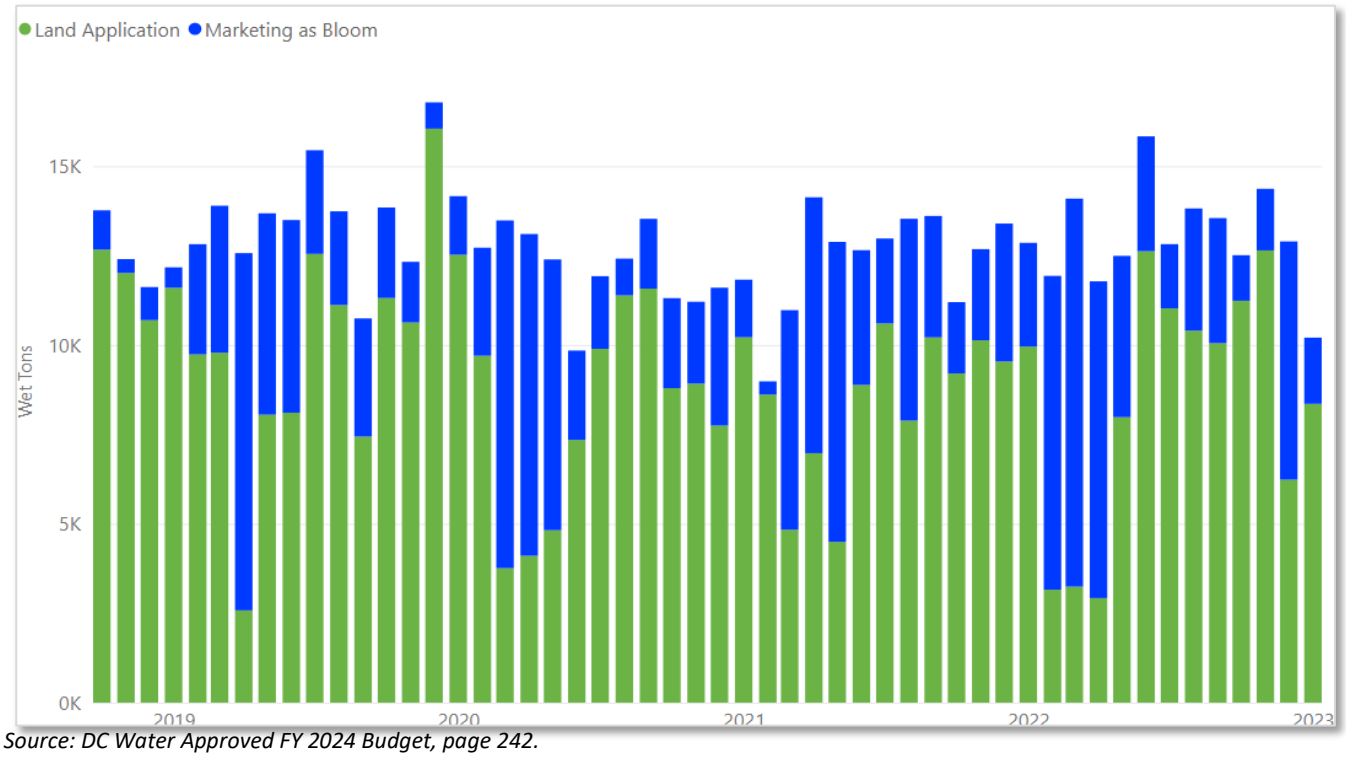
- Enhanced Clarification Facilities with a Lifetime Budget of $180.5M, expected to be completed in 2027.
- Secondary Treatment Upgrades for Total Nitrogen with a Lifetime Budget of $57.2M, expected to be completed in 2032.

5.4 Wastewater System Asset Management

Vertical asset management differs from horizontal asset management (described in Section 4.44.3.9 Water System Asset Management) in several ways – assessing condition is easier, and travel times (and costs) for reactive repairs are lower than for field work.

Asset management at Blue Plains began with a risk ranking of treatment process elements shown in Exhibit 5-17.

Exhibit 5-15: Blue Plains AWWTP Biosolids Production
October 2019-October 2023



Source: DC Water Approved FY 2024 Budget, page 242.

There are several high-risk processes, ones with both a high likelihood of failure coupled with high consequences of failure. The Blue Plains Asset Management (BPAM) group has visualized real-time asset data so the cluster can make data-driven decisions regarding risk, cost, and performance of the assets. A key fundamental to a value driven asset management program is accurate and accessible data. Starting in 2016, the BPAM group focused on refining the processes and procedures to ensure accurate data was collected for work execution and asset records. The data was then used to improve the preventative maintenance program through PM optimization and reliability-centered maintenance. A Management of Change program was initiated to track improvements and ensure data accuracy. After the asset data was accurate and optimized, the next step was visualizing the data in Power BI, so it is easily accessible for decision-making. One of the key KPIs at Blue Plains is the critical equipment availability, shown in Exhibit 5-18. This KPI gives the overall risk of the plant with regards to process equipment and an early warning to potential impacts on plant performance. Additional Power BI dashboards include live data from Maximo, Logger (plant logs), PCS (plant control system duplicate database), predictive technology data, and lab data to visualize cost, risk, and performance in supporting processes.

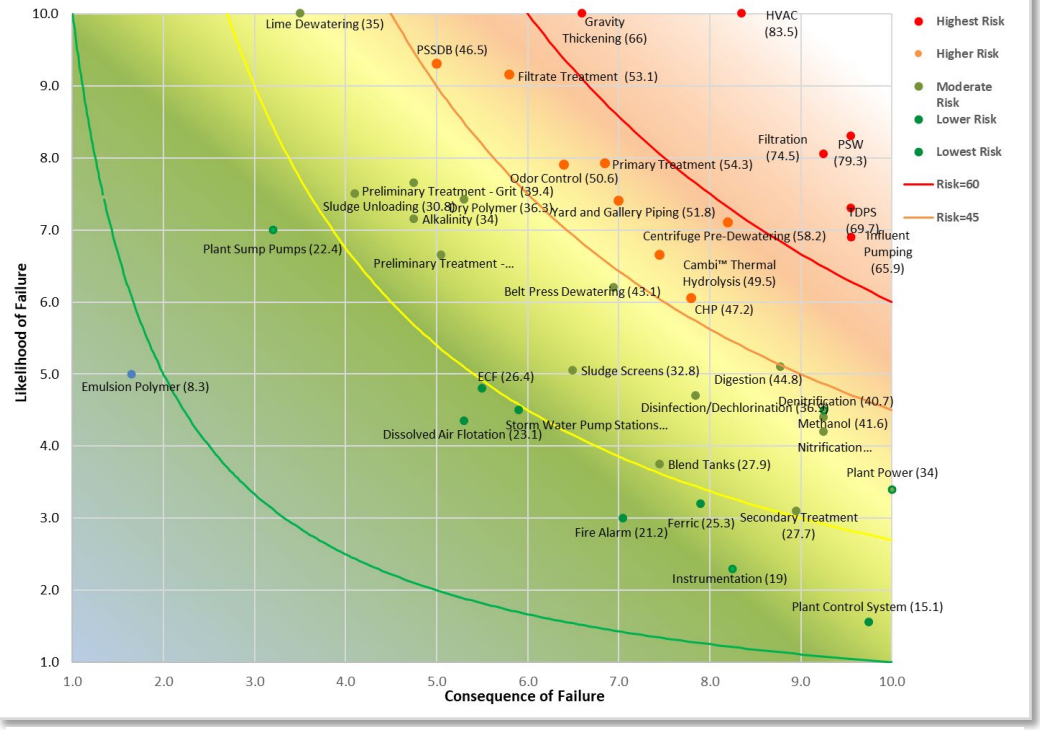
In addition to supporting the Wastewater Operations group, the BPAM group took over capital construction asset management activities from a contractor in 2019. In 2021, the BPAM group continued working with the

Exhibit 5-16: Blue Plains AWWTP Enhanced Nitrogen Removal CIP Projects

Proj. ID	Project Title	Cost	Timeline
BI	Enhanced Nitrogen Removal (ENR) North	$77M	FY08-FY22
E8	Enhanced Clarification Facilities	$180M	FY09-FY27
E9	Nitrogen Removal Facilities	$273M	FY08-FY22
EE	Filtrate Treatment Facilities	$108M	FY09-FY23
FG	Secondary Treatment Upgrades for Total Nitrogen	$57M	FY13-FY32
FR	Blue Plains Tunnel Dewatering Pumping Station	$36M	FY10-FY23
FS	Bolling Overflow & Diversion	$56M	FY10-FY23

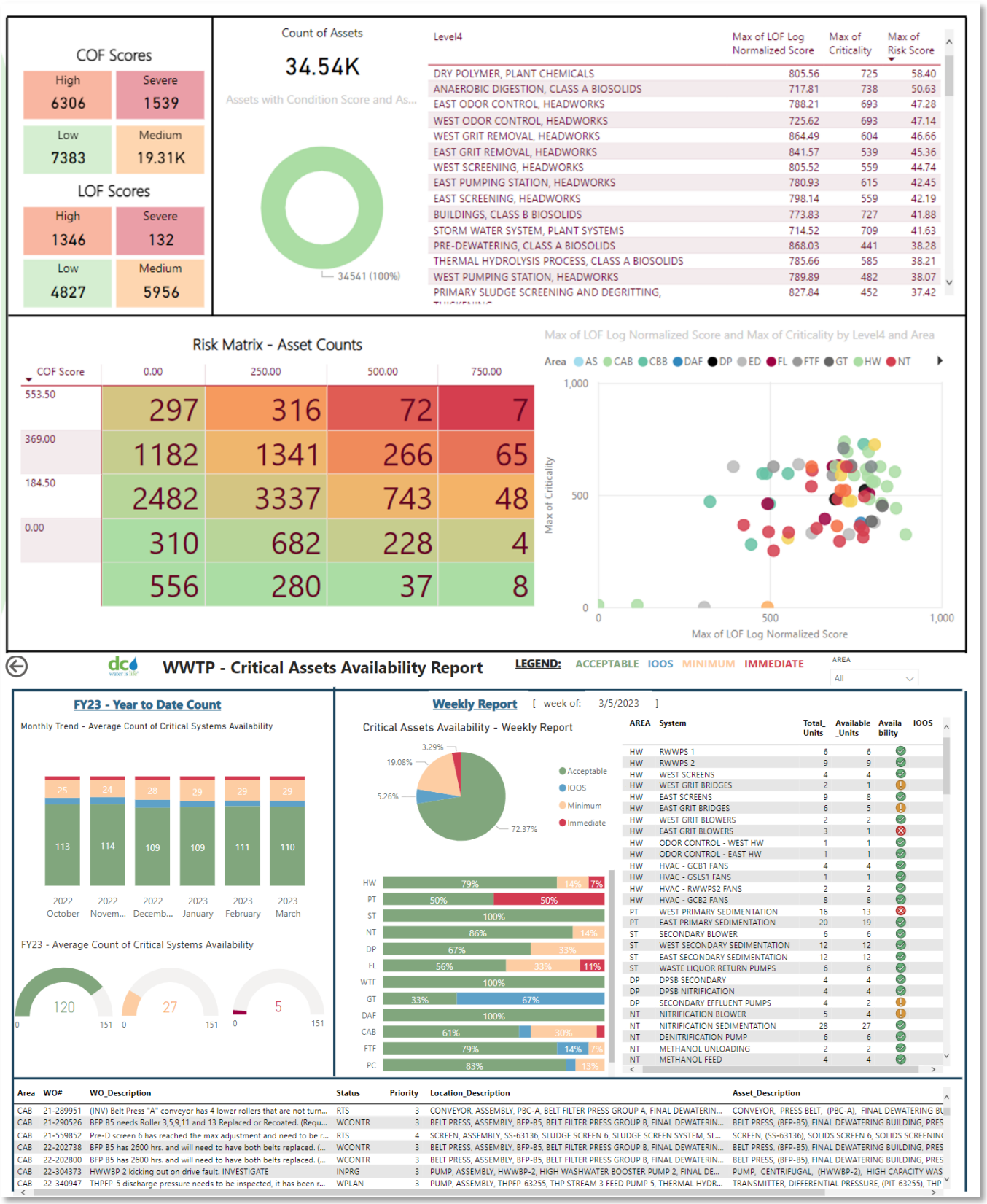
Source: DC Water Approved FY 2024 Budget, page 171.

Exhibit 5-17: Blue Plains AWWTP Consequences and Likelihood of Failure by Process



Source: DC Water/AECOM Wastewater Top-Down Risk Ranking.

Exhibit 5-18: Blue Plains AWT Critical Equipment Availability



Source: DC Water WWTP Critical Assets Availability Power BI Dashboard.

Wastewater Engineering group to optimize capital planning activities by providing asset risk data to move the discussion from a tribal knowledge driven discussion to a data driven discussion. BPAM continues to see opportunities to visualize data for faster decision-making and risk assessments. They are in current discussion with Finance to connect Oracle data to better manage the cost and risk of the assets and with the Wastewater Engineering department to visualize the Capital Planning budget alongside the operating asset data to continue to add granularity to asset lifecycle management process.

5.5 Collection and Conveyance

DC Water collects and conveys separate and combined wastewater to Blue Plains for treatment. This includes wastewater generated by jurisdictions included in the IMA, the Potomac Interceptor Agreement (PIA) and Loudoun Water. Wastewater conveyance systems include sanitary sewers and combined sewers and nine sewer pumping stations. In 2016, the first section of an elaborate and sophisticated wet weather storage tunnel system was placed in service that conveys wet weather sewage to Blue Plains. DC Water is responsible for operating, maintaining, and making improvements to sewer lines serving the District of Columbia and the major trunk sewers that convey wastewater from the IMA, PIA and Loudoun Water served communities.

5.5.1 Sewer Facilities Plan

DC Water prepares facilities plans for the sewer system every five years. The latest Sewer System Facilities Plan was prepared in 2015. COVID-related reasons delayed the next update. The Sewer System Facilities Plan is being updated and it is scheduled to be completed in 2023. The 2015 Sewer System Facilities Plan:

Photo 5-5: Sewer Rehabilitation (DC Water photo)

- Outlined the status of the DC Water sewer system.
- Provided an update of the sewer system inventory.
- Identified infrastructure improvement needs.
- Presented recommendations for the operation of the system.

5.5.2 Pumping and Sewer Operations Organization

In 2019, there was a realignment of Pumping and Sewer Operations. The current organization is described in Exhibit 5-19. The reorganization reflects trends in management of linear operations, eliminated divided responsibilities, allows source to tap risk management and provides integrated watershed management. A future vision is shown in Exhibit 5-20.

DC Water provides wastewater collection/conveyance and treatment for the District. DC water also provides wholesale treatment for more than 1.6 million people in Montgomery and Prince George's counties in Maryland, and Loudoun, and Fairfax counties in Virginia. Additional contributors include – Town of Vienna, Dulles Airport, NPS, and Navy Yard. The total services area covers approximately 725 square miles, 61 square miles of which are within the District.

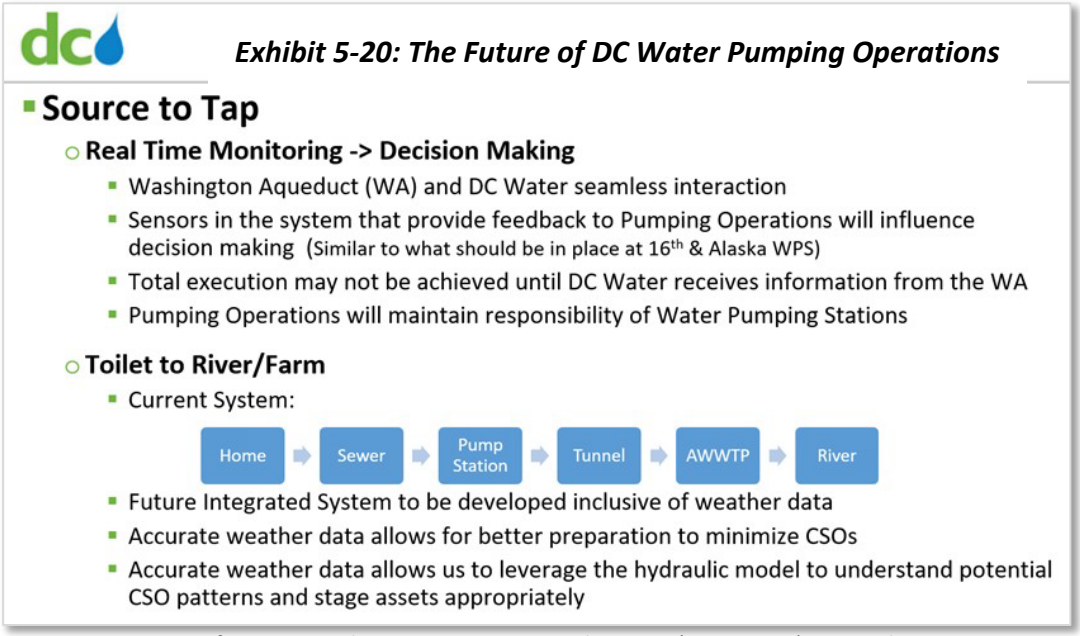
DC Water's sewer collection system within the District includes approximately 1,900 miles of combined, separate, and stormwater sewers; 50,000 manholes and 25,000 catch basins; 22 flow metering stations; nine sewage pumping stations; seven miles of 23-foot diameter, over 100-foot deep, tunnel; 11 Drop Shafts; 25 Diversion Chambers (including Diversion Sewers, Emergency Overflow Chambers, Tide Gate Chambers, and Discharge Connection Chambers); approximately 200 Green Infrastructure facilities; and 16 stormwater pumping stations.

Exhibit 5-19: Pumping and Sewer Operations Functional Units

Pumping Operations (28 positions)	***SCADA PCS (12 positions)***	***Maintenance (30 Positions)***	***Potomac Interceptor (5Positions)***	***Office of the Director (10 positions)***	***Sewer Investigation (47 positions)***	***Sewer Repair (49 Positions)***
Operate Water, Sewer, and Stormwater Pumping Stations, Water Storage Facilities and Water Towers. Remove Screenings and Debris from pump stations and prepare work order for equipment in need of repair. Perform Stormwater Pollution Prevention Plan inspections and reports. Inspect inflatable dams to maintain proper function during rain events.	Operate and maintain Supervisory Control and Data Acquisition (SCADA) computer system, Applications, Hardware, and Network Support. Operate and maintain all process instrumentation and controls including completion of all related preventative and maintenance. Ensure integrity of SCADA, Disaster Recovery Planning, Implementation and Testing. Administration and manage service contracts and special projects for the department.	Plan and coordinate corrective, emergency, preventive, and predictive maintenance for pump stations. Maintain, trouble-shoot and repair mechanical and electrical process systems and equipment. Plan, schedule and perform condition monitoring for process equipment including vibration, infrared, and oil analysis.	Operate and maintain Potomac Interceptor (PI) Sewer. Operate and maintain PI Flow Meter and odor control facilities and manholes. Manage Miss Utility service in Virginia and Montgomery County in Maryland. Monitor Right-of-Way to maintain integrity and prevent encroachment.	Directs Department of Pumping Operations. Plans and manages the capital equipment and operating funds. Manage Maximo operations and perform reviews to evaluate effectiveness of methods in relation to asset management, uptime, Mean Time to Repair (MTTR), and Mean Time Between Failure (MTBF) metrics.	Inspect public sewers and sewers laterals. Clean sewers and inlet outlet structures. Monitor and control operations. Removal of floatable debris. Enforcement of Fats, Rags, Oils and Grease (FROG) removal program. Operate and maintain sewer regulator structures.	Install and repair sewer mains and sewer laterals. Install and repair catch basins. Responsible for the cleaning and maintenance operations of regular catch basins, stormceptors and grate ponds. Oversees maintenance program for storm water structure, filter bio-retention and water quality catch basin cleaning.

Source: DC Water Approved FY 2024 Budget, page 261.

Exhibit 5-20: The Future of DC Water Pumping Operations



Source: Department of Pumping and Sewer Operations Re-Alignment (PowerPoint). September 2019, page 8.

Within the District, the sewer collection system dates to 1810, the year the sewer system began construction. DC Water collects wastewater from the District, covering a total of 61 square miles. Separate storm water and sanitary collection systems account for 41 square miles, while a combined storm water and sanitary sewer collection system covers 20 square miles.

Like most utilities around the country, DC Water is responsible for lateral sewer connections from the main sewer to the right-of-way/property lines regardless of the property owner. For large water and sewer users, DC Water meters each wholesale customer. Each wholesale customer permit/agreement establishes discharge limits with respect to the average wastewater flow rate and peak wastewater flow rate. Sewers constructed more than 50 years ago were constructed of vitrified clay, brick, and concrete. More recently, separated sewer installations use PVC, ductile iron, and concrete for sewer construction. The force mains are typically constructed of reinforced concrete or prestressed concrete pipes.

The condition of the aged sewer system is typical for a system of this size and age. Because many sewers date back to the late 1800s, DC Water will need to continually invest in repair, replacement, and rehabilitation. They have undergone a comprehensive risk assessment of linear assets to prioritize rehabilitation projects. The programmed Sanitary Sewer improvements are categorized into five components:

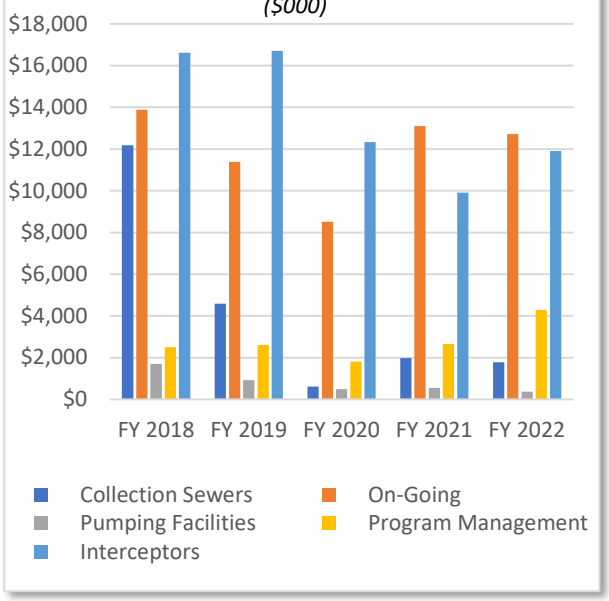
- Sanitary Collection System
- Sanitary Ongoing Projects
- Sanitary Pumping Facilities
- Sanitary Program Management
- Interceptor/Trunk Force Sewers

Collection Sewers projects include studies and projects to effectively eliminate stormwater, groundwater, and other infiltration and inflow to the sewer system; to separate stormwater flows; and to reduce other extraneous flows to Blue Plains. This category also includes projects to rehabilitate sanitary sewer pipes.

Exhibit 5-21 shows actual annual capital spending on sewer operations from FY18 to FY2, a total of $166M. Exhibit 5-22 shows the projected annual CIP for FY23-FY32, a 10-year total of $1.8B.

Exhibit 5-21: Sanitary Sewer CIP Expenditures FY18-FY22

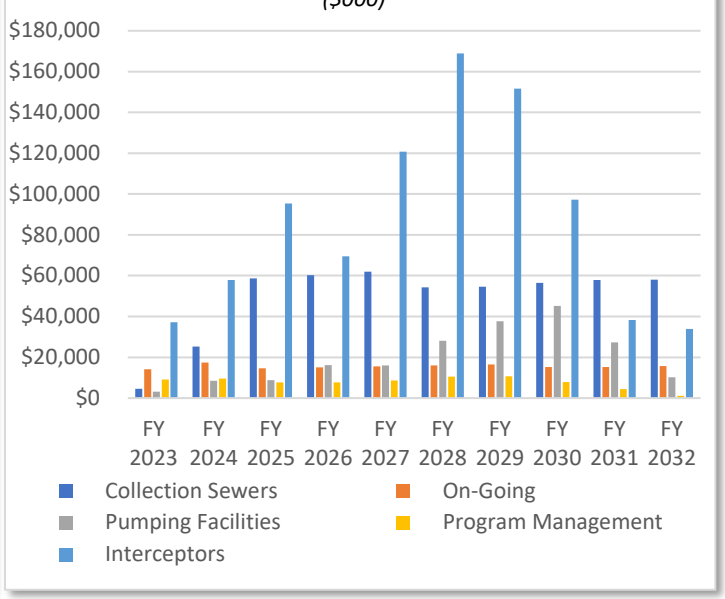
($000)



Source: Date provided by DC Water.

Exhibit 5-22: Sanitary Sewer CIP Disbursement Plan FY23-FY32

($000)



Source: DC Water Approved FY 2024 Budget, page 346.

The 2015 Sewer System Facility Plan, which remains the current plan, consisted of an in-depth study of the collection facilities, which included sewer inspections and condition assessments, development of a GIS database, and hydraulic monitoring and modeling to determine system capacity. Due to time and budgetary constraints, DC Water has limited inspections to sewers identified as critical due to their location, tendency to be problematic, and criticality in the system.

Sewer conditions were assessed using the National Association of Sewer Service Companies' (NASSCO) defect coding system. Uniform and consistent descriptions of pipe defects were accomplished using the Pipeline Assessment Certification Program. DC Water's Collection System Assessment plan is shown in Exhibit 5-23.

Exhibit 5-23: Collection System Assessment Plan

Sanitary and Combined Sewers	*Length (miles)*	*Inspection Frequency*	*Miles per year*	*Remark*
Small Local Sewers (8≤dia≤12-in)	774	10 years	77	DPSO
Local Sewers (12<dia. <60-in)	401	10 years	40	DETS
Major Sewers	180	15 years	12	DETS
Force Mains	14	10 years	NA	DETS, three assets inspected once every 10 years
Total	*1,956*		*152*	

Source: DC Water.

5.5.2.1 Interceptor/Trunk Force Main Sewers

The aging infrastructure concern is paramount for interceptor, trunk, and force mains within urban areas and the District's original sewers are no exception. Due to their roles within the sewer system, these pipes are often critical assets, with vulnerabilities and risks greater than those of a typical sewer pipe. The lifetime budget for Interceptor/Trunk Force CIP is just over $1B (Exhibit 5-24). One significant project is Project ID #LZ Potomac Interceptor Rehabilitation Phase 2. This regional interceptor is funded mainly by other jurisdictions with 3.29 percent funded by the District. The lifetime budget for the project is $226.924,000.

Photo 5-6: Potomac Interceptor (PI) Rehabilitation (DC Water photo)

5.5.2.2 Pumping Facilities

As noted in Section 5.4.2, sewer pumping facilities are the responsibility of Pumping and Sewer Operations. All the wastewater that is conveyed to Blue Plains, including the contribution from surrounding jurisdictions and federal facilities, must be pumped apart from Oxon Run flows. The force mains associated with these pumping stations discharge to large-diameter sewers for conveyance to Blue Plains. The sanitary pumping stations within the District are as follows:

Potomac Pumping Station (installed 1965): This station is designed to have a firm capacity of 460 MGD. It receives sanitary flow from the 108-inch Upper Potomac Interceptor Relief Sewer, and combined sewer flows from the 66-inch East Rock Creek Diversion Sewer and the 60-inch Easby Point Trunk Sewer from the Potomac/Rock Creek system. The pump station discharges to the dual Potomac Force Mains that cross East Potomac Park and travels under the Anacostia River to the Outfall Relief Sewers at Structure 2a, which conveys flow to Blue Plains AWWTP. This pumping station has five dry-pit vertical centrifugal pumps. Pumps 1 through 3 have a design capacity of 110 MGD and are controlled with variable frequency drives. Pumps 4 and 5 have a design capacity of 144 MGD and are constant speed pumps. The sanitary and combined sewers can be separated at the inlet channel to allow part of the pumping station to accommodate storm flows only, while the

Exhibit 5-24: Interceptor/Trunk Force CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
A4	Future Sewer System Upgrades	$46M	FY04-FY25
DR	Low Area Trunk Sewer Rehabilitation	$23M	FY07-FY22
FW	Rehab Piney Branch Trunk Sewer	$31M	FY11-FY25
G2	Sewer Structure Rehabilitation 1	$9M	FY10-FY24
G5	Sewer Rehab Near Creek Beds	$74M	FY10-FY30
G6	Sanitary Sewers Under Buildings 1	$7M	FY10-FY25
GH	Large Sewer Rehabilitation 3	$24M	FY12-FY26
HS	Rehabilitation of Influent Sewers	$37M	FY22-FY30
HT	Rehabilitation of Anacostia Force Main	$11M	FY12-FY32
IF	Sanitary Sewer Rehabilitation 2	$2M	FY15-FY22
IK	Potomac Force Main Rehabilitation	$6M	FY12-FY30
IL	Creekbed Sewer Rehabilitation 2	$64M	FY13-FY32
IM	Creekbed Sewer Rehabilitation 3	$25M	FY13-FY31
IN	Upper East Side Trunk Sewer Rehabilitation	$19M	FY12-FY27
J0	B Street New Jersey Avenue Trunk Sewer Rehab	$18M	FY04-FY22
LZ	Potomac Interceptor Projects—Rehab. Phase 2	$274M	FY15-FY30
PJ	Re-Activation of Anacostia Force Main/Gravity Main as Relief to Anacostia Force Main	$20M	FY18-FY27
RA	Major Sewer Assessment and Heavy Cleaning 1	$16M	FY21-FY26
RB	Major Sewer Assessment and Heavy Cleaning 2	$14M	FY26-FY29
RC	Major Sewer Rehabilitation 1	$83M	FY20-FY34
RD	Major Sewer Rehabilitation 2	$76M	FY21-FY29
RE	Major Sewer Rehabilitation 3	$88M	FY24-FY31
RJ	Creekbed Sewer Rehabilitation 4	$22M	FY28-FY30
RL	Potomac Interceptor Projects—Rehab Phase 3	$128M	FY29-FY32
W1	Major Sewer Rehab 4	$127M	FY28-FY35
WP	Major Sewer Assessment and Heavy Cleaning 3	$22M	FY26-FY33
WQ	Major Sewer Assessment	$41M	FY26-FY33

Source: DC Water Approved FY 2024 Budget, page 186.

other part conveys sanitary flows. Pumps 4 and 5 were originally intended for use as stormwater pumps, but the pumping station does not regularly operate in this separated configuration; during large rain events, all pumps are utilized to convey combined sewage. This station is staffed 24 hours a day, seven days a week.

Tunnel Dewatering Pumping Station:

Photo 5-7: Tunnel Dewatering Pump Station (DC Water photo)

This station is designed to have a firm capacity of 225 MGD, with five total pumps installed (three duty, two standby). It is connected to the downstream end of the tunnel system – all the overflow captured by the tunnel system flows by gravity down to this point. The system is comprised of two shafts constructed in a figure-8 arrangement, first shaft is 76 feet diameter; contains fixed vertical coarse screens to remove large solids and protect pumps and the second shaft is 132 feet diameter; contains pumping station to lift flow from deep tunnel to surface for treatment. The total depth is 165 feet to the lowest level.

Main Pumping Station:

Photo 5-8: Main Pumping Station (Governing.com photo)

This station (originally installed in 1905) is split into a sanitary side and a stormwater side. The sanitary side of the Main Pumping Station is screened and has three 90 MGD pumps and one 60 MGD pump. The sanitary side primarily handles dry weather flows. It receives wastewater from the Tiber Creek and B Street/New Jersey Avenue drainage areas, as well as flows from the Potomac/Rock Creek system that are diverted to the B Street/New Jersey Avenue Trunk Sewer. It also pumps these flows under the Anacostia River via two siphons to Blue Plains. The Main Pumping Station has a firm wastewater pumping capacity of 240 MGD. The storm side was formerly used during wet weather events to lift storm overflows into the Anacostia River and prevent flooding of basements and streets in the surrounding low-lying drainage areas. The six existing stormwater pumps have also been used to pump combined flow in the past, but they have not been in operation recently. All stormwater pumping responsibilities have been shifted to the O Street Pumping Station. There is room to install eight stormwater pumps. An upcoming capital improvement project for intermediate upgrades to the Main and O Street pumping stations includes rehabilitating the existing stormwater pumps and motors. This pumping station is staffed 24 hours a day, seven days a week.

The current condition of the Main Pumping Station was assessed during an interview and site inspection on March 15, 2023 (see Appendix B for the assessment report).

O Street Pumping Station (installed 1963): Like the Main Pumping Station, this station is split into sanitary and stormwater/combined sewage sides. Each side was designed to have a firm capacity of 45 MGD and 500 MGD, respectively. The sanitary side is screened and has four pumps, each with 17 MGD capacity. They pump wastewater from the Southwest Interceptor to the West Siphon that runs under the Anacostia River, to the twin (East and West) outfall sewers. These convey the flow to Blue Plains. The storm/combined side pumps have a capacity of 100 MGD each and deliver combined sewage from an overflow structure with inflatable dam connected to the B Street/New Jersey Avenue Trunk Sewer at Structure 15 and 15a, to the Anacostia River. This pump station is staffed 24 hours a day, seven days a week.

Photo 5-9: O Street Pumping Station Pump Room (PEER photo)

The current condition of the O Street Pumping Station was assessed during an interview and site inspection on March 9, 2023 (see Appendix B for the assessment report).

Poplar Point Pumping Station (installed 1915): This unstaffed station is permitted at a firm capacity of 55 MGD. This station has four dry-pit submersible pumps, each with a capacity of 18.33 MGD. It pumps combined wastewater from the Anacostia Main Interceptor (AMI) to the Main Outfall Sewers (MOS) that convey flow to Blue Plains. Wastewater flow to the pumps is screened. The AMI conveys the combined and sanitary flows from a part of the District east of the Anacostia River. There are two flow control structures associated with the Poplar Point Pumping Station (PP-PS): the Poplar Point Pumping Station Emergency Overflow Chamber (PP-PS-EOC) and the Poplar Point Pumping Station Discharge Chamber (PP-PS-DCC). Each of these structures is equipped with stop logs to control the amount and direction of flow. The stop logs in the PP-PS-EOC can be set in place to prevent the flow from the AMI from entering the tunnel system or to prevent the flow from entering PP-PS. The stop logs in the PP-PS-DCC can be placed to isolate either one of the dual pipes in the East and West Outfall Sewers from receiving flow from PP-PS.

East Side Pumping Station (installed 1967): This unstaffed station is designed to have a firm capacity of 45 MGD. It pumps sanitary wastewater from the East Side Interceptor Relief Sewer. Wastewater flow to the pumps is

screened. There are four vertical dry-pit submersible pumps, each with a capacity of 15 MGD. All flows are pumped through a force main under the Anacostia River to the 108-inch Anacostia Force Main.

Rock Creek Pumping Station (installed 1921): This unstaffed station is designed to have a firm capacity of 50 MGD and pumps unscreened combined wastewater from the Upper Potomac Interceptor to the Rock Creek Main Interceptor through a 48-inch force main. This station has three dry-pit submersible pumps, each with a capacity of 25 MGD.

Earl Place Pumping Station (installed 1926): This station is a two-pump facility with no screening. One pump is active, while the second pump is provided for redundancy. Each pump is designed to discharge 296 gallons per minute of flow. The pumps are dry-pit submersible pumps operated under constant speed as a fill-draw system.

Upper Anacostia Pumping Station (installed 1970): This unstaffed station is designed to have a firm capacity of 10 MGD. It pumps unscreened sanitary wastewater from the Upper Anacostia area through an 18-inch force main to the AMI. This station is configured as a wet-pit submersible pumping station with two submersible pumps in each of two wet wells. Each pump has a capacity of 3.36 MGD. Flows ultimately reach the Poplar Point Pumping Station.

Third Street and Constitution Avenue Pumping Station: This station was rehabilitated and used for bypass pumping purposes during the repairs on the Low Area Trunk Sewer. Once the bulkhead to the station is installed, the station will be placed in standby and maintained as needed for the future.

The combined pumping capacity of these pumping stations is approximately 1,200 MGD. The pumping stations are sized to handle both sanitary and combined sanitary and stormwater flows.

Several pump stations have recently been upgraded. These upgrades were in part to meet new code standards and regulations. The improvements have boosted the efficiency and effectiveness of the pump stations.

Preventive maintenance for both vertical and linear assets is the responsibility of the Department of Pumping and Sewer Operations (DPSO). SCADA has improved as funded by earlier capital projects and the Instrumentation and Controls section is well-trained and motivated. Monitoring responsibilities for the Combined Sewer Overflow (CSO) facilities have been assimilated into DPSO's operations and maintenance. The Potomac Interceptor is operated and maintained by DPSO, along with the metering, odor control, and easement stewardship for the asset along its alignment in Maryland and Virginia.

5.5.2.3 Sewer Collection System

5.5.2.3.1 Separate Sewer System

The separate sewer system covers 41 square miles (26,200 acres), or two-thirds of the District. The area, in general the newer sections of the District surrounding the older central portion, is served by a separate sewer system. The sanitary sewage is collected in a system of separate sanitary sewers that allow for gravity flow from basements of adjacent buildings. The stormwater is handled by the stormwater system. Two pump stations; namely, Earl Place Pumping Station, and Upper Anacostia Pumping Station, convey only sanitary sewage.

5.5.2.3.2 Combined Sewer System

A combined stormwater and sanitary sewer collection system covers 20 square miles (12,478 acres), or one-third of the District. The combined sewer system (CSS) generally serves the central, older portions of the District. Combined sewers are designed to convey both stormwater and sanitary flows in one piping system to the treatment plant. Approximately 66 percent of this area drains to the lower Anacostia River, with the remainder draining to Rock Creek and the Potomac River. There are 48 NPDES permitted combined sewer outfalls. Other components of the CSS include regulator structures, Green Infrastructure Facilities, and inflatable dams. The CSS

uses regulator structures and inflatable dams to direct flow to the plant under most weather conditions and, during high-intensity storms, to direct flows more than tunnel capacity and treatment plant capacity to CSO outfalls that discharge to receiving streams or rivers. The Clean Rivers tunnel system is seven miles of over 100-feet deep and 23-feet diameter tunnel with a total volume of more than 100 MG. The tunnel system flows to Blue Plains from Nationals Stadium and RFK Stadium and connects to all the overflow points along the Anacostia River. There are approximately 116 CSS regulator structures in addition to nine inflatable dams and 48 NPDES-permitted CSO outfalls.

An inventory of the locations, configurations, and status of all regulator structures, CSO outfalls, wastewater treatment plant and emergency relief outfalls, and inflatable dams is maintained in DC Water's Combined Sewer System Structures Book. The capacities of the regulator structures vary depending on flow levels in the CSS and the downstream interceptor(s). The capacities of the regulator structures, based on the modeling results developed for the CSO Long Term Control Plan (LTCP) Consent Decree, are included in the Nine Minimum Controls (NMC) Annual Report for Combined Sewer System. Regulator structures control the amount of flow diverted to interceptors and tunnels, which convey wastewater to Blue Plains. During dry weather, flows are conveyed to Blue Plains for treatment. During significant wet weather events when system capacities are exceeded, excess combined sewage is discharged to receiving waters through overflow pipe connections to outfalls. Release of the CSO to the outfalls prevents excess flow from overwhelming the treatment plant and causing flooding of homes, businesses, and streets. The frequency and volume of discharge from each of these structures vary depending on the relative capacity of the downstream interceptor, the hydraulic geometry of the overflow structure itself, a storm's intensity and duration, the size of the contributing drainage area, and the distribution of rainfall across the system.

DC Water uses inflatable dams at some regulator structures to manage its CSOs. The inflatable dams consist of multi-ply elastomeric fabric (i.e., "rubber") dams installed in major overflow conduits within the CSS. Each installation consists of the dam, attachment hardware, mechanical inflation equipment housed in a nearby vault, air piping and valves, over-pressure blow-off tank, and automatic control system. The objective of the inflatable dam installation is to increase the effective depth to which the sewage must rise in the combined sewer before overflows occur. The effect of the installation is to convey a greater volume of combined sewage flow resulting from low- to moderate-intensity storms to Blue Plains by maximizing storage within the sewer system. During higher intensity storms, when the full discharge capacity of the overflow conduit is required to prevent

upstream flooding, the dam is deflated automatically based on a signal from an upstream level sensor. During dry weather conditions, the dams are normally maintained fully inflated under low pressure. Many of the NPDES-regulated CSO outfalls also contain tide gates to prevent backflow as the tides change. The locations and number of inflatable dams in the sewer system along with their associated structure numbers are presented in Exhibit 5-25.

5.5.2.3.3 Potomac Interceptor

The Potomac Interceptor (PI) sanitary sewer system carries about 60 MGD of wastewater from areas the Washington Dulles International Airport to the Potomac Pumping Station in Washington, D.C. Flows from the pump station are then sent to the Blue Plains for treatment before discharge into the Potomac River. The PI serves the following jurisdictions:

- Town of Vienna
- Loudoun County (VA)
- Fairfax County (VA)
- Washington Dulles International Airport
- Washington Suburban Sanitary Commission (WSSC)
- National Park Services
- Navy Yard

Exhibit 5-25: Sewer System Inflatable Dams

Structure #	*Location*	*Combined Sewer*	*# of dams*	*Tidal Gate?*
14	Main Pumping Station – West Side	B St. – New Jersey Ave. Trunk Sewer	2	Yes
15	South Capitol and E Streets	B St. – New Jersey Ave. Trunk Sewer	1	Yes
15a	Half and L Streets SE	B St. – New Jersey Ave. Trunk Sewer	1	No
16	Main Pumping Station – East Side	Tiber Creek Trunk Sewer	2	Yes
34	23rd Street, north of Constitution Avenue NW	Easby Point Trunk Sewer	1	Yes
35	Kennedy Center - East Parking Lot	East Rock Creek Diversion Sewer	1	Yes
52	22nd Street, between M and N Streets NW	Slash Run Trunk Sewer	1	No
Total Number of Inflatable Dams			9	

Source: DC Water Website

The PI was built because of the enactment of Public Law 86-515 (the Act), by the 86th Congress, on June 12, 1960. The Act authorized the District of Columbia to plan, construct, operate, and maintain a sanitary sewer to connect Dulles Airport to the Washington, D.C., sewer system.

The PI system consists of four primary interceptor segments including the PI main trunk, the Upper Potomac Interceptor (UPI), the Upper Potomac Interceptor Relief Sewer (UPIRS), and the Maryland Upper Potomac Interceptor (MUPI). The PI main trunk is in Maryland and Virginia and includes the Sugarland Run Extension, the Difficult Run Extension, and the Upper Maryland Spur. The MUPI is in Montgomery County (MD) and conveys flows into the UPI at the District of Columbia line. The UPI starts at the Maryland/DC border and currently conveys flows from the MUPI and other service connections in Washington, D.C. to the UPIRS. The UPIRS begins at the DC border and conveys flow from the PI main trunk and other service connections to Blue Plains. DC Water operates and maintains the PI system except for the MUPI, which is operated and maintained by the WSSC.

The PI main trunk, a reinforced concrete pipe, varies in size from 30-inch to 96-inch diameter round pipe to 13-foot by 7.75-foot rectangular pipe. The original sewer design included provisions for interceptor at manholes and access shafts promote exhaustion of sewer gases.

However, between 2012 and 2015 DC Water constructed six odor control facilities along the PI to mitigate the release of sewer gases and odors to surrounding parks and public spaces, minimizing off-site impacts and the potential for odor complaints pertaining to the PI.

Between 2011 and 2022, DC Water inspected the entire PI (some segments twice). Inspection results revealed that some pipe segments show signs of corrosion, and a few show settled deposits. DC Water is rehabilitating corroded pipe segments, and cleaning pipe segments that have significant settled deposits. DC Water is taking corrosion prevention measures to reduce the rate of pipe corrosion.

Two CIP projects have been approved in the FY 2024 Budget to address the capital rehabilitation need of the Potomac Interceptor:

- Project ID #LZ Potomac Interceptor Rehabilitation Phase 2 started in 2015 and is slated to be complete in FY31 with a lifetime budget of $274M.
- Project ID #RL Potomac Interceptor Rehabilitation Phase 3 starts in 2029 and is slated to be complete in FY32 with a lifetime budget of $128M.

5.5.3 Emergency Operations Planning

On a regular basis, DC Water conducts scenario planning to identify how well the system will respond to a variety of stressors – select facilities out of service, extreme weather events, lack of power etc. For security reasons, we will not discuss them in detail. However, the scenarios utilized appeared to be appropriate to the system and reflect a comprehensive level of planning.

5.6 Key Findings

PEER performed two high level assessments before a more detailed examination:

- A practices and capability self-assessment. This 74-point self-assessment looks at seven elements:
  - Treatment Process
  - Sludge Treatment
  - Crisis Management
  - Health and Safety
  - Organization Development
  - Performance Management
  - Financial Responsibility
- The QualServe Wastewater Operations metric comparison to a peer group of high performing utilities

DC Water's self-assessment placed between competent and world class – a very good result. The QualServe assessment was somewhat limited due to incomplete metrics. We augmented this through analysis of the NACWA data. Overall, DC Water compares favorably to the QualServe peer utility group, scoring highly in regulatory compliance, plant staffing efficiency and maintenance.

A well-managed collection system will strive to minimize overflows. The Authority has both combined and separate sewers. The Exhibit 5-26 shows sanitary sewer overflows (SSOs) for the last five years (Combined Sewer Overflows (CSOs) are discussed in 7.1 Clean Rivers Project). In the January CEO report, two SSOs and no CSO were recorded during the period August to November 2022.

Exhibit 5-26: SSOs 2017-2022

Year	SSOs
2017	1
2018	1
2020	51
2021	39
2022	44

Source: DC Water website.

6 The Stormwater System[9]

6.1 Overview

Stormwater runoff occurs when rain or snowmelt flows over impervious surfaces or surfaces that do not allow it to soak into the ground such as roads, driveways, sidewalks, parking lots, and buildings. In 2000, EPA Region III issued a Municipal Separate Storm Sewer System (MS4) NPDES Permit to the District of Columbia government for management of the separate storm sewer system. The goal of the MS4 stormwater NPDES permitting program is to improve the quality of stormwater discharged to water bodies. The Department of Energy and Environment (DOEE) is the designated MS4 Permit Administrator for the District.

Pursuant to DC Water's enabling legislation, it is not responsible for the quality of stormwater runoff from the separate stormwater system, or MS4. DC Water was, however, designated the lead agency responsible for coordination of permit compliance activities with the DC Departments of Public Works and Health.

The District's MS4 permit requires the development of a Consolidated Total Maximum Daily Load (TMDL) Implementation Plan for all waste load allocations assigned to District MS4 discharges. Watershed Implementation Plans (WIPs) are roadmaps for how the District can achieve and maintain the TMDL limits necessary to meet water quality standards for the District's streams and rivers. DOEE has developed a Consolidated TMDL Implementation Plan that has been approved by the EPA as its WIP for the Anacostia River and its tributaries, the Potomac River, Oxon Run, and Rock Creek and its tributaries. Further, the District, along with the six other states in the Chesapeake Bay Watershed, has developed WIPs to meet pollution limits that support a healthy Chesapeake Bay.

The stormwater sewer system consists of approximately 25,000 catch basins, 600 hundred miles of storm sewer pipes, over 400 separate storm sewer discharge points, and 15 stormwater pumping stations; some of the stormwater sewer facilities were built more than 100 years ago. DC Water is responsible for maintenance and replacement of several combined stormwater and sanitary sewer facility discharge points on the Potomac River, Anacostia River, Rock Creek, and other water courses in the District.

6.2 Stormwater Operations and Maintenance

Exhibit 6-1: Pumping and Sewer Operations

Targeted Performance Measures	*FY21 Results*	*FY22 Results*	*FY23 Targets*	*FY24 Targets*	*Blueprint 2.0 (Strategic Plan) Imperatives*
Availability % of our critical assets	97.6%	98%	95%	95%	Reliable
Odor Complaints Sewer Overflows for the entire District of Columbia	189	180	0	0	Healthy, Safe, and Well
Odor Complaints Sewer Overflows for Potomac Interceptor Area	0	0	0	0	Healthy, Safe, and Well

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 262.

[9] This section does not include the DC Water Clean Rivers Project, which is covered in Section 7.1.

Within Pumping and Sewer Operations (PSO), Sewer Repair inspects, cleans, and repairs the 25,000 catch basins and storm mains associated with the combined sewers. Sewer Operations oversees the maintenance program for stormwater structures, filter bio-retention and water quality and catch basins. There are about 14,000 catch basins in the MS4 area. Within PSO, Pumping Operations operates stormwater pumping stations, and performs Stormwater Pollution Prevention Plan inspection and reports. Performance measures are shown in Exhibit 6-1.

6.3 Stormwater Capital Projects

Stormwater projects are categorized into five components within the CIP:

Local Drainage – This category includes several projects for investigation, design, and rehabilitation of local sewers to relieve local flooding and to address short term needs for improvements to storm sewers located in the separate and combined sewer areas.

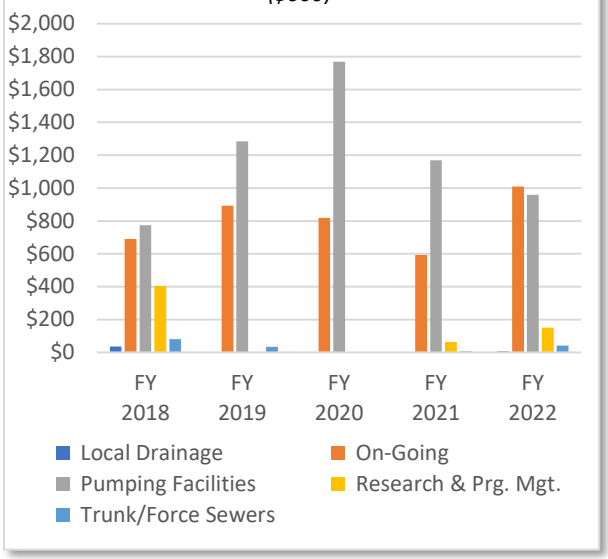
Ongoing – These include storm sewer rehabilitation projects carried out by DC Water's Department of Pumping and Sewer Operations. These annual projects also provide funding to assist in immediate storm sewer construction to alleviate flooding.

Pumping Facilities – DC Water's 16 stormwater pump stations serve critical areas of the District and are integral to the road network to maintain safe passage of vehicles through areas that do not drain without the assistance of mechanical means. DC Water has projects to upgrade all 16 of these stormwater pump stations to replace aging equipment and improve reliability, safety, and code compliance.

Program Management – DC Water provides engineering program management services for the stormwater service area capital projects and required technical assessments and hydraulic studies required to assess problems in the stormwater system. It also provides engineering services for condition assessment of the storm sewer system.

Exhibit 6-2: Stormwater CIP Expenditures FY18-FY22

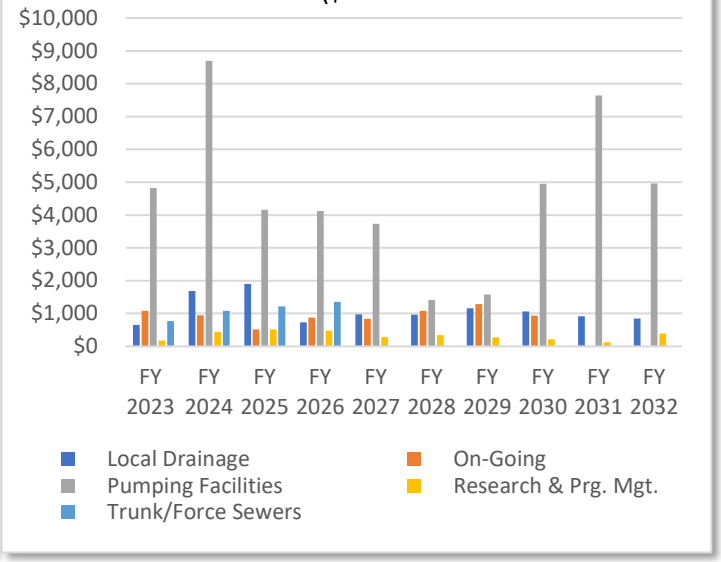
($000)



Source: Date provided by DC Water.

Exhibit 6-3: Stormwater CIP Disbursement Plan FY22-FY32

($000



Source: Data from DC Water Approved FY 2024 Budget, page 346.

Interceptor Trunk/Force Sewers – DC Water provides design and construction services for stormwater interceptors, trunk sewers and force mains that require upgrades. Sewers rehabilitated by this project are defined by the major planning and condition assessment program underway for the stormwater sewer system. As the assessment of the storm sewer system progresses and specific rehabilitation needs are identified, jobs will be created under this program area to remediate system problems.

Capital expenditures for the last five years totaled $10.8M. Annual expenditures by category are shown in Exhibit 6-2. The FY23-FY32 stormwater CIP totals $72.2M. The annual CIP Disbursement Plan is shown in Exhibit 6-3. Stormwater capital projects are listed in Exhibit 6-4.

Photo 6-1: Clean Rivers Project Northeast Boundary Tunnel B Street (DC Water photo)

Exhibit 6-4: Stormwater CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
GY	Storm Sewer Rehabilitation at Various Locations	$5.9M	FF13-FF27
IE	Storm Sewer Rehabilitation 3	$6.3M	FY20-FY27
RR	Local Storm Sewer Rehabilitation	$17.6M	FY25-FY32
WB	Local Storm Sewer Rehab 2	$44.3M	FY26-FY34
ZJ	Local Storm Sewer Assessment 1	$8.6M	FY26-FY33
JH	FY2020 - DSS Stormwater Projects	$0.8M	FY20-FY22
LO	FY2021 - DSS Stormwater Projects	$0.9M	FY21-FY24
M8	FY2022 - DSS Stormwater Projects	$0.8M	FY22-FY23
MG	FY2023 - DSS Stormwater Projects	$0.8M	FY23-FY24
NV	FY2024 - DSS Stormwater Projects	$0.9M	FY24-FY25
PI	FY2025 - DSS Stormwater Projects	$0.9M	FY25-FY26
QA	FY2026 - DSS Stormwater Projects	$0.9M	FY26-FY27
T7	FY2028 - DSS Stormwater Projects	$1M	FY28-FY29
T9	FY2027 - DSS Stormwater Projects	$1M	FY27-FY28
U6	FY2029 - DSS Stormwater Projects	$1M	FY29-FY29
U8	FY2030 - DSS Stormwater Projects	$1M	FY30-FY30
NG	Stormwater Pumping Station Rehabilitation	$64.2M	FY17-FY32
AT	Stormwater Program Management	$11.7M	FY01-FY26
RQ	Storm Water Program Management	$1.5M	FY25-FY30
ZT	Stormwater PM FY30	$2M	FY31-FY35
BO	Future Stormwater Projects	$15.5M	FY05-FY26
VJ	Major Storm Sewer Rehab 1	$15.8M	FY26-FY33
WV	MS4 Outfall Sewer Rehab 1	$3.2M	FY25-FY33
XS	Inspection of Stormwater Trunk Sewers	$10M	FY23-FY33

Source: DC Water Approved FY 2024 Budget, pages 178 and 179.

6.4 Key Findings

The successful modification of the Consent Decree has allowed DC Water to integrate the Combined Sewer Overflow—Long Term Control Plan (CSO-LTCP) with the enhanced nutrient removal advancements at Blue Plains to incorporate the Total Nitrogen/Wet Weather Plan (TN/WW Plan) capabilities to address the stipulations within the modified Consent Decree (see Section 7.1 Clean Rivers Project).

The DC Clean Rivers Project has accomplished the significant milestone of having the lower portion of the Anacostia River Tunnel facilities commissioned by March 23, 2018. The reduced nutrient loading and pollution abatement achieved is also discussed in Section 7.1 Clean Rivers Project.

In 2017, DC Water let the largest project in its history for the Northeast Boundary Tunnel (NEBT) design/build effort. DCCR during the past five years has met the schedule requirements of the modified Consent Decree. ENR and biosolids improvements at Blue Plains are well coordinated with the TN/WW Plan.

7 Major Initiatives

7.1 DC Clean Rivers Project

7.1.1 Overview

DC Water entered a Consent Decree with the EPA in March 2005 for the Combined Sewer Overflow—Long Term Control Plan (CSO-LTCP). The objective of the 2005 Consent Decree was to ensure DC Water's compliance with the Clean Water Act, all applicable federal and local regulations, the terms of DC Water's National Pollution Discharge Elimination System (NPDES) permit, and the 1994 EPA CSO objectives. To meet these objectives, the Consent Decree contains a stipulated schedule for implementation of the CSO controls, and reporting requirements. The requirements included in the Consent Decree and their current statuses are summarized in Exhibit 7-1. DC Water has met all Consent Decree obligations and has aggressively pursued the planning, financing, design, and construction of the remaining requirements in accordance with the multi-year schedule for the CSO-LTCP. A material modification of the Consent Decree was entered with the court in 2016, and a nonmaterial modification of the Consent Decree was signed by the parties in 2020. Section 7.1.2 addresses the modifications to the Consent Decree.

Photo 7-1: DC Clean Rivers (DC Water graphic)

The CSO-LTCP is a component of the overall Chesapeake Bay Program. DC Water (along with many other wastewater agencies within the Chesapeake Bay region) is required to improve wastewater treatment facilities and remediate combined wastewater system overflows to reduce BOD and nutrient rich wastewater loads to tributaries of the Bay. The improvements by DC Water (and other nutrient contributors) prevent these nutrients from entering the Bay. When a CSO event occurs, harmful bacteria and pollutants are released into the water system. The pollutants include floatable debris, BOD, and nutrients loads which can negatively impact the river, decreasing the dissolved oxygen content, raising turbidity, and lowering the water quality. The aesthetics of the river are affected by floating debris and algae blooms caused by the nutrient loads.

The Total Nitrogen Removal/Wet Weather Plan (TN/WW Plan) is a highly complex undertaking at Blue Plains. The CSO-LTCP and the TN/WW Plan are linked in the goal of increasing water quality in the Chesapeake Bay watershed. The CSO-LTCP has been modified to appropriately address the overall goals. The organizational structure of the program management for the CSO-LTCP was enhanced several years into the Consent Decree by DC Water.

The creation of the DC Clean Rivers Project (DCCR) placed the CSO-LTCP efforts directly under the DC Water's Chief of Operations Officer and enhanced public outreach and participation by providing a transparent organization. DCCR has a visible profile within the community and the project team is highly motivated in pursuing the completion of the remaining project components.

Approximately one million pounds/year of nitrogen reduction is predicted. The DCCR and TN/WW Plan combined efforts are summarized as:

- DC Clean Rivers Project: $2.992B
- Nitrogen Removal: $788M
- Total < $3.8B
- 25-year implementation (2005 – 2030)
- 96 percent reduction in CSO system and flood mitigation in Northeast Boundary Tunnel

Photo 7-2: Northeast Boundary Tunnel (DC Water photo)

Exhibit 7-1: Status of DC Clean Rivers Project Compared to Amended LTCP Consent Decree (November 2022)

Amended Consent Decree Item	***Requirements***	***Status***
System Wide		
Low Impact Development – Retrofit (LID-R)	Implement LID-R projects on DC Water facilities where feasible.	Complete
Anacostia River		
Rehabilitate Pumping Stations	Rehabilitate existing pumping stations: Rehabilitate Main Pumping Station to 240 MGD firm sanitary capacity. Rehabilitate Eastside and O Street Pumping stations to 45 MGD firm sanitary capacity	Complete
Storage/Conveyance Tunnel from Blue Plains to CSO 019	Minimum 105-million-gallon storage tunnel between Blue Plains and CSO 019	Complete
Northeast Boundary Storage/Conveyance Tunnels	Storage/Conveyance Tunnel in Northeast Boundary and First Street Branch Tunnel in area of First Street NW and Rhode Island Ave. The total system storage of these tunnels and Storage/Conveyance Tunnel from Blue Plains to CSO 019 shall not be less than 157 MG.	First Street Tunnel is completed, and North-east Boundary Tunnel is under construction
M Street (CSO 016 and 017) and CSO 018 Diversion Sewers	Consolidate the following CSOs in the Anacostia Marina area: CSO 016, 017 and 018	Complete
Separate CSO 006	Separate this CSO in the Fort Stanton Drainage Area	Complete
Poplar Point Pumping Station	Replace the existing Poplar Point Pumping station with a new facility	Complete
Rock Creek		
Separate Luzon Valley	Separate CSO 059 (Luzon Valley)	Complete
Separation	Separate CSOs 031, 037, 053, and 058.	Complete
Monitoring at CSO 033, 036, 047 and 057	Conduct monitoring to confirm prediction of overflows. If overflows confirmed, then perform the following Regulator Improvements: Improve regulators for CSO 033, 036, 047and 057	Complete
Rock Creek Green Infrastructure Project 1	Control 20 impervious acres to the 1.2” retention standard using green infrastructure and targeted sewer separation	Complete
Rock Creek Green Infrastructure Project B	Control 22 impervious acres to the 1.2” retention standard using green infrastructure and targeted sewer separation	Under Construction
Rock Creek Green Infrastructure Project C	Control 25 impervious acres to the 1.2” retention standard using green infrastructure and targeted sewer separation	Not Started
Rock Creek Green Infrastructure Project D	Control 25 impervious acres to the 1.2” retention standard using green infrastructure and targeted sewer separation	Not Started
Rock Creek Storage Facility	Storage facility to control CSO 049 to Piney Branch	Not Started
Potomac River		
Rehabilitate Potomac Pumping Station	Rehabilitate station to firm 460 MGD pumping capacity	Complete
Potomac Storage Tunnel	40 MG tunnel to control CSO 020, 021, 022, 024, 027, 028 and 029	In Procurement

CSO Outfall Separation	Separate CSO 025 and 026	Complete
Potomac Green Infrastructure Project 1	Control 44 impervious acres to the 1.2" retention standard using green infrastructure and targeted sewer separation	Complete
Blue Plains Wastewater Treatment Plant		
Wet Weather Treatment Improvements	Tunnel Dewatering Pumping Station and Enhanced Clarification Facility	Complete

Source: DC Water website.

7.1.2 Consent Decree Modifications

On January 14, 2016, the Court entered the First Amendment to the CD (Amended CD) in Consolidated Civil Action No. 1: CV00183TFH. The Amended CD extended the time for implementation of the controls from 20 years to 25 years (to 2030). The Amended Consent Decree also required DC Water to construct the first Green Infrastructure (GI) projects in the Potomac and in Rock Creek, to perform post construction monitoring for one year and then to determine the feasibility of GI. If GI was determined to be practicable, then DC Water was required to construct the remainder of the GI projects. If GI was determined to be impracticable, DC Water was required to construct gray controls.

The assessments were completed and approved by EPA with the following determinations:

- Potomac River – GI was determined to be impracticable, primarily due to the difficulty, high cost, and objections of agencies having jurisdiction to construct GI in the historic Georgetown area. As a result, DC Water is implementing the Potomac Tunnel to control CSO 020, 021, 022, 024, 027, 028 and 029 on the Potomac. The assessment was approved by EPA on February 8, 2021. No modification of the Decree was required because of this outcome.
- Rock Creek – Full scale implementation of GI was determined to be impracticable, primarily due to the high cost of capital and maintenance over the long term. In the assessment, DC Water proposed a hybrid approach, involving constructing GI to manage 92 impervious acres at 1.2-inch retention standard combined with a storage facility to control CSO 049 to Rock Creek. The plan combined the best attributes of both green and gray infrastructure and achieved equivalent CSO control to the original LTCP. EPA approved the assessment with the hybrid approach on November 23, 2020. The hybrid approach required a non-material modification of the Consent Decree, which was completed on December 22, 2020.

7.1.3 Amended Total Nitrogen Limit

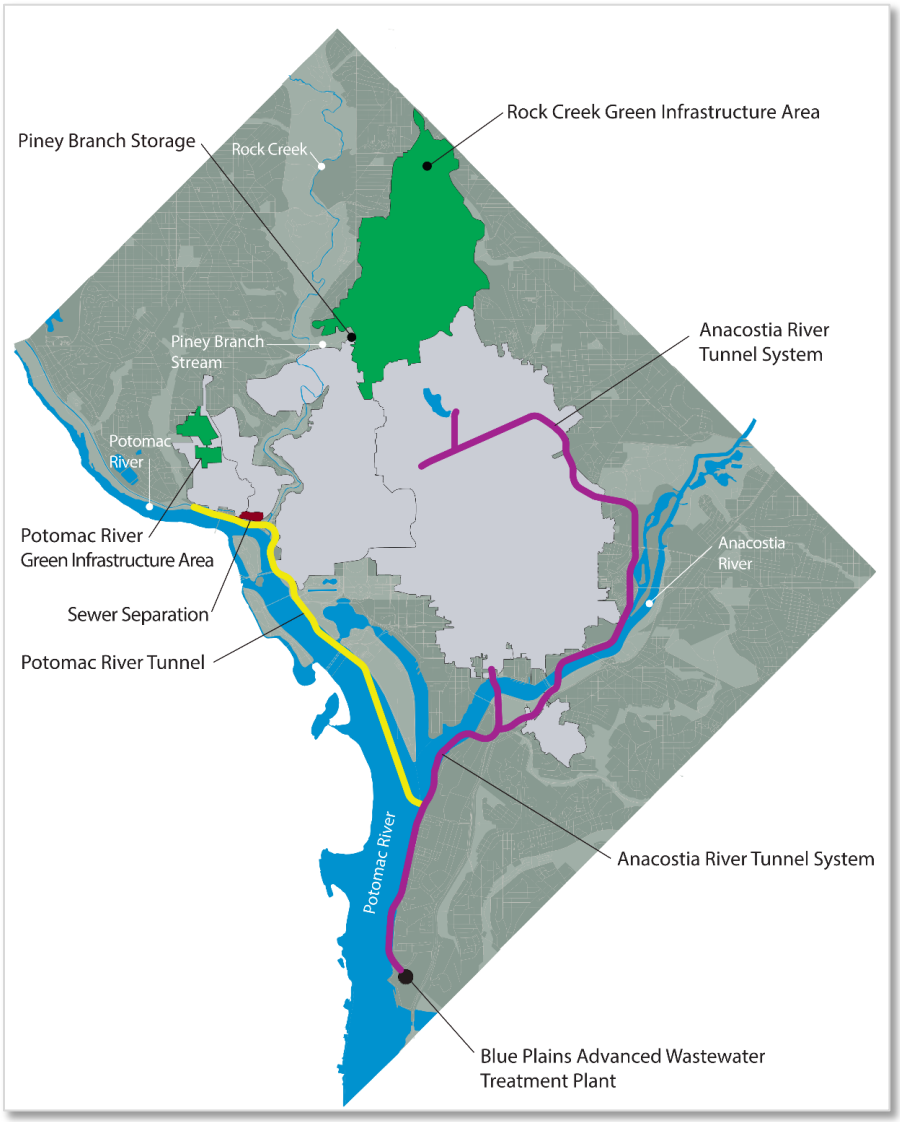
In addition to requiring a practicability assessment for substituting GI for gray controls, the 2016 Amendment to the Consent CD incorporated controls required to achieve a new total nitrogen (TN) effluent limit for Blue Plains of 4.689 million pounds per year. The TN limit was developed by EPA to achieve the goals of the Chesapeake Bay Total Maximum Daily Load (TMDL) for nutrient reductions. The TN/WW Plan incorporates these major components:

- Complete treatment capacity: Blue Plains will provide complete treatment up to 555 MGD for the first four hours and 511 MGD thereafter.
- Enhanced nitrogen removal (ENR): ENR facilities will be constructed with the capacity to provide complete treatment for the flow rates identified above and to meet the new TN effluent limit.
- Enhanced Clarification Facility (ECF) – A 225 MGD facility will be constructed at Blue Plains.
- Tunnel to Blue Plains and System Storage Volume – A new tunnel is being constructed from Poplar Point to Blue Plains. The total tunnel's system storage volume will be increased from 126 MG to 157 MG. This

new tunnel segment will not only serve as a flow equalization facility but will also allow a reduction in the required capacity of the ECF and the peak flow rates that receive complete treatment at the plant.

- Tunnel Dewatering Pumping Station (TDPS) – Under the Final LTCP, a tunnel dewatering pumping station was proposed to be constructed at the tunnel terminus at Poplar Point. As part of the TN/WW Plan, the same tunnel dewatering pumping station is relocated to the new terminus of the tunnel at Blue Plains. The TDPS will be sized to have a minimum firm capacity of 225 MGD, equal to the capacity of the ECF. In addition, the facility will have the ability to dewater the tunnel system up to the new ECF and be able to discharge ECF effluent to complete treatment and discharge at Outfall 002 or at Outfall 001.

Exhibit 7-2: DC Clean Rivers Project



Source: DC Water website.

A map of the Clean Rivers Project including both the 2016 Material Modification and the 2020 nonmaterial amended modification plan is presented in Exhibit 7-2.

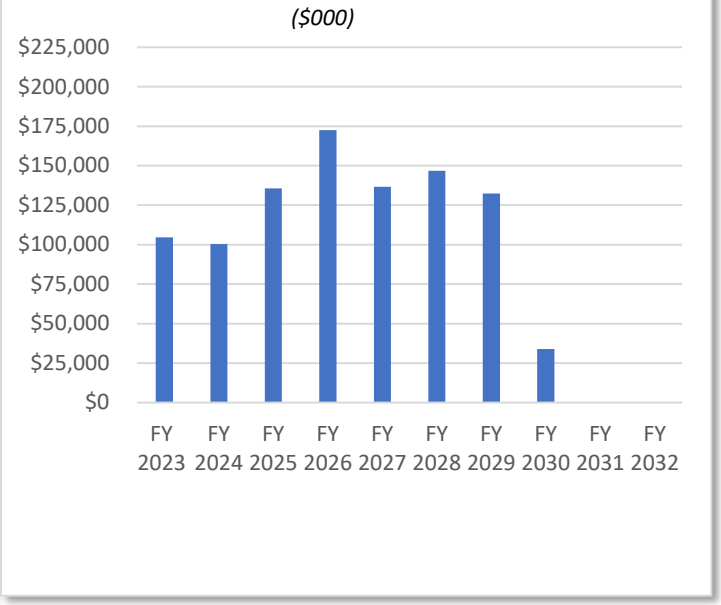
7.1.4 Projects

DCCR projects include a variety of improvements within the combined sewer system within the District. Like 750 cities across the United States, Washington, D.C., has a combined sewerage system that allows a mixture of storm water and sewage to overflow into the Anacostia and Potomac rivers and Rock Creek when it rains. The first phase of the Clean Rivers Project plan focused on reducing CSOs into the Anacostia River by constructing major elements of the Anacostia River Tunnel (ART) System. A large portion of the ART System was commissioned (placed in service) on March 20, 2018, ahead of the March 23, 2018, federal Consent Decree requirements which DC Water currently has with EPA, Department of Justice, and the District.

Exhibit 7-3: DC Clean Rivers Project CIP Expenditures FY18-FY22

Source: Data provided by DC Water.

Exhibit 7-4: DC Clean Rivers Project CIP Disbursement Plan FY23-FY32



Source: DC Water Approved FY 2024 Budget, page 346.

Exhibit 7-3 presents Clean Rivers annual Expenditures for F18-FY22, which totaled $870M. Exhibit 7-4 presents the annual FY23-FY32 CIP Disbursement plan, which totals $1.06B. The Clean Rivers program is expected to end in FY30 at a total lifetime expenditure of $2.99B on the three projects that make up the program Exhibit 7-5.

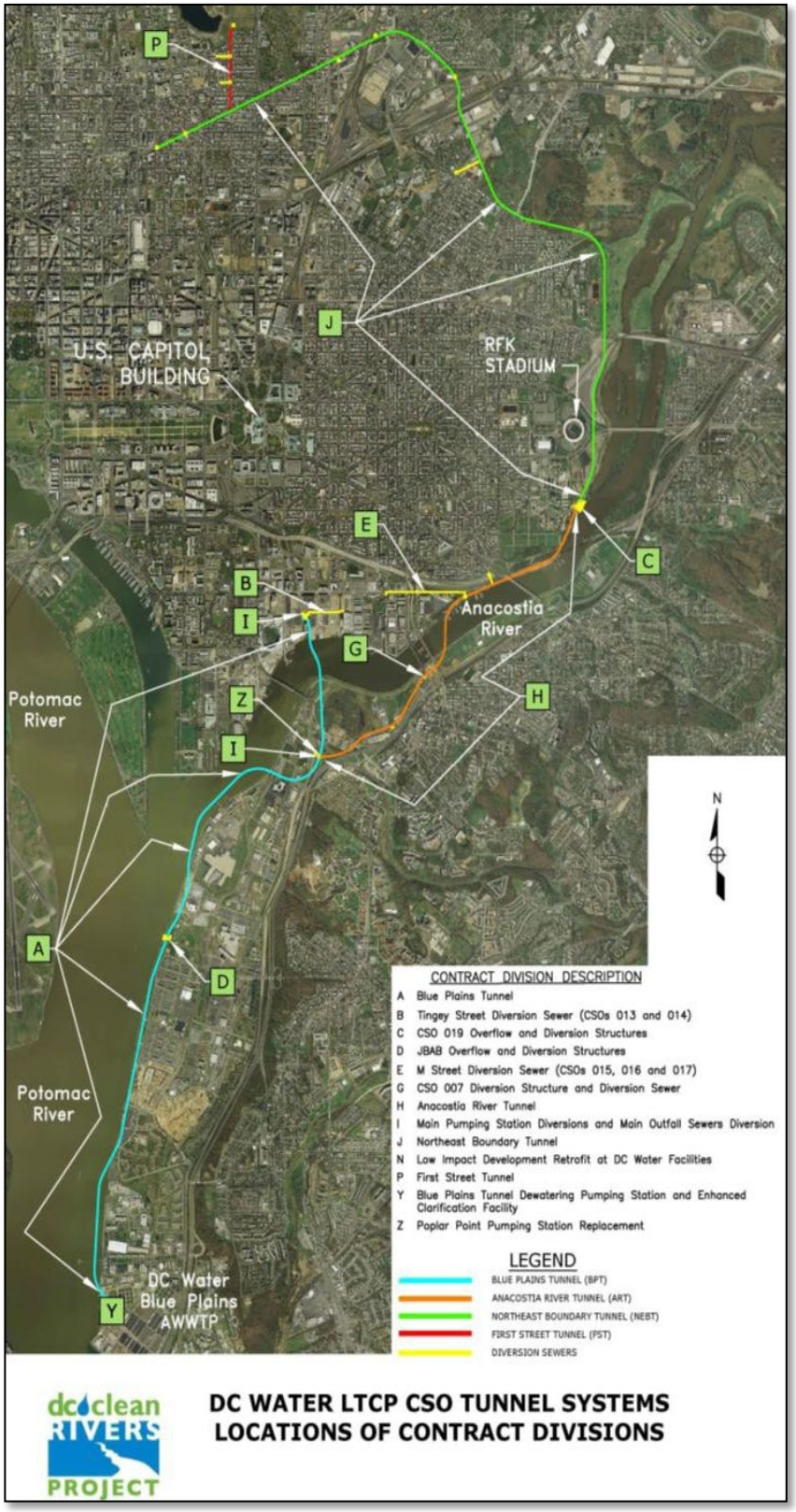
Exhibit 7-5: DC Clean Rivers Project CIP Projects

Proj. ID	*Project Title*	*Cost*	*Timeline*
CY	Anacostia Long Term Control Plan Projects	$1,928M	FY05-FY30
C Z	Potomac Long Term Control Plan Projects	$861M	FY10-FY30
DZ	Rock Creek CSS LTCP Project	$203M	FY10-FY30

Source: DC Water Approved FY 2024 Budget, page 171.

An example of one of the multi-phase Clean Rivers Projects is the ART System shown in Exhibit 7-6. The project is broken down into divisions. All ART System work from point C on the map to point Y was placed into service on March 20, 2018, ahead of the Consent Decree deadline. The Northeast Boundary Tunnel (Division J) is scheduled to be placed in operation in 2023, ahead of the March 23, 2025, Consent Decree deadline.

Exhibit 7-6: Anacostia River Tunnel (ART) System



Source: DC Water website.

7.2 Lead Free DC Project

7.2.1 Overview

DC Water consistently meets or exceeds federal regulations under the Safe Drinking Water Act for providing drinking water to its customers. The Authority voluntarily sets goals to make sure drinking water meets water quality levels that are much stricter than those required by the EPA.

In 2019, DC Water launched the Lead Free DC (LFDC) program to accelerate lead service line replacement and combine all lead reduction efforts under one banner. The program is designed to achieve the ambitious goal to remove all lead service lines equitably by 2030. DC Water estimates that approximately 42,000 homes have lead or galvanized-iron service lines in need of replacement with copper pipe.

Photo 7-3: Lead Free DC (DC Water graphic).

The water service line is the pipe that connects the public water supply, typically in the street, to a building. The property owner owns the full-service line; however, the District enacted DC Law 1-98 in 1977 which required DC Water to maintain the portion of the service line in public space. This required DC Water to inventory service lines into two segments — "public" and "private."

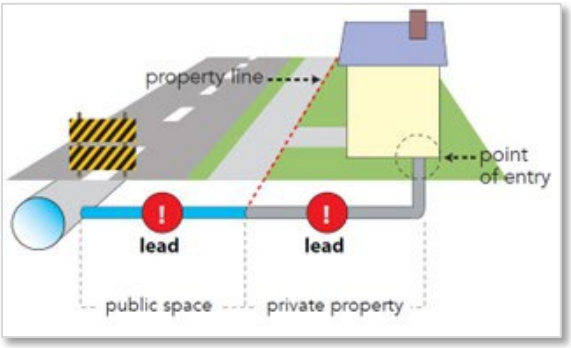


Photo 7-4: Water Service Lines (DC Water graphic).

DC Water has outlined an aggressive "construction approach which is in alignment with the Biden-Harris Administration's Justice 40 Initiative and prioritizes lead replacements in areas that have vulnerable population, a high number of service lines, and are historically underserved." [10]

While DC Water has secured some funding, acquiring additional sources of funding for this program is a major component of achieving their goal. The June 2023 lead service line replacement plan shares the current cost estimate for the program, explains what DC Water's current funding level will cover, and explores additional funding opportunities to equitably replace the remaining lead service lines by 2030.

7.2.2 Regulations

In 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR). Since 1991 the LCR has undergone various revisions,

The EPA released its Lead and Copper Rule Revisions (LCRR) under the Safe Drinking Water Act (SDWA) that went into effect on June 17, 2021. The latest revisions better protect children and communities from the risks of lead exposure by testing drinking water at elementary schools and child care facilities, getting the lead out of our nation's drinking water, and empowering communities through information. Improvements under the new rule include:

- Using science-based testing protocols to find more sources of lead in drinking water.
- Establishing a trigger level to jumpstart mitigation earlier and in more communities.
- Driving more and complete lead service line replacements.

[10] DC Water's Lead Service Line Replacement Plan, June 2023

- For the first time, requiring testing in schools and childcare facilities.
- Requiring water systems to identify and make public the locations of lead service lines. [11]

The agency also published the LCRR effective December 16, 2021, requiring all water systems to collect samples from homes with lead service lines if lead is present in the distribution system, provides new alternatives to corrosion control treatment for small systems, and requires all water systems to notify consumers within 24 hours of lead exceedances.

On August 4, 2022, EPA released *Guidance for Developing and Maintaining a Service Line Inventory* to support water systems with their efforts to develop inventories and to provide states with needed information for oversight and reporting to the agency. The guidance provides essential information to help water systems comply with the LCRR requirement to prepare and maintain an inventory of service line materials by October 16, 2024.

The Green New Deal for a Lead Free DC Amendment Act of 2023 currently under Council consideration:

- Requires DC Water to create an inventory of all water service lines as a first step to identifying lines made of unknown or misidentified materials that contain lead.
- Accelerates the removal of hazardous lead water service lines on public and private properties by requiring property owners to participate in a program administered by DC Water, by increasing financial assistance for voluntary removal of lead lines, and by creating a job training program at the DC Infrastructure Academy to grow the District's lead remediation workforce.

Photo 7-5: Replacing Lead Service Lines with Copper (DC Water photo)

- Requires the replacement of lead service lines from District public property and government-owned and government-leased buildings by 2028 — and requires private property owners to replace all lead service lines by 2030.
- Doubles the grant amount for voluntary remediation compliance to $5,000 and creates a new income tax credit for lead line replacement regardless of a property owner's income level for both commercial and residential property owners. Beginning June 2025, all private property owners who still have lead service lines in use on their property will be able to participate in the district's mandatory replacement program by paying a copayment.
- Expands the lead remediation specialist workforce by requiring the District to train at least 50 new lead remediation specialists in each cohort of a new job training program to be offered through the DC Infrastructure Academy. Capacity is a significant challenge to meeting the ambitious goal of removing all remaining lead service lines by 2030, because there is a limited supply of workers to do this work.
- Strengthens the District's job training programs by bringing unions to the table in meeting workforce development goals. In addition, it closes loopholes in District minimum wage and sick leave laws to ensure all people working in DC are paid fairly and all on-the-job learners can receive paid sick time to care for themselves and ensure healthy workplaces.

[11] EPA News Release, December 22, 2020, "EPA Finalizes Historic Action to Better Protect Children's Health."

7.2.3 Lead Service Line Replace Programs

Lead Free DC is managed by consultants who provide program management, public outreach, design, and construction management services. The program managers provide management and oversight of the following DC Water Programs:

7.2.3.1 Capital Improvement and Emergency Repair Replacement (CIPERR)

CIPERR is a free replacement program with three DC Water initiated options for lead service line replacement:

The **Block-By-Block Program** targets the replacement of all lead service lines on a District street. DC Water's criteria for scheduling construction includes factors that prioritize public health, social equity, and vulnerable populations.

The **Small Diameter Water Main Rehabilitation Program (SDWMR)** replaces all service lines on a street that is undergoing construction for a water main replacement. Each year, DC Water selects water mains for replacement according to their age and condition. The construction crew replaces lead service lines when replacing the water main.

The **Emergency Repair Program (ERP)** will replace lead service lines when emergency repairs are necessary.

7.2.3.2 Lead Pipe Replacement Assistance Program (LPRAP)

LPRAP is a customer-initiated discount for private-side only replacement (for cases where the service line from the water main to the property line is already copper). The LPRAP is co-administered by DC Water and DOEE. Starting in Summer 2023, all homeowners enrolled in LPRAP will receive a 100 percent discount for service line replacements on private property, due to funding recently obtained by the District and DC Water.

Photo 7-6: Lead Service Line being replaced (PEER photo)

There are two types of assistance to reach the 100 percent discount:

- **Income-Eligible Assistance:** The entire service replacement is paid for by the District's DOEE, depending on mean household income.
- **Standard Assistance:** The entire service replacement is paid for through a combination of District and DC Water Bipartisan Infrastructure Law (BIL) funds. District funds will cover the 50 percent replacement costs up to $2,500 and DC Water BIL funds will cover the remaining cost of the service line replacement, which was previously the homeowner's responsibility.

7.2.3.3 Early Voluntary Full Replacement Program (VFRP)

All homeowners in the District are eligible for the customer initiated the VFRP. DC Water pays 100 percent of public-side costs. The property owner pays 100 percent of the private-side replacement costs. In this way, homeowners can have their service line replaced sooner than under the DC Water initiated programs.

7.2.4 Equity-Based Approach

Although the use of lead pipes and fittings was phased out by the 1980s, the burden of replacing lead pipes on private property has fallen on homeowners. The cost to replace these has been a barrier for many of customers and disproportionally so for underserved areas of the District. To address this issue, DC Water's team developed a Prioritization Model that uses an equitable and data driven approach to identify high priority lead service replacements by block throughout the city where the likelihood of lead risk scores are in the highest 30 percent as determined by the model.

The model also uses service line inventory, water main condition data, water quality data, vulnerable populations, and socioeconomic data to prioritize future lead service line replacement projects. The vulnerable populations considered for prioritizing lead service line replacements are children, seniors, and pregnant women. The children under 18 data were considered representative of where families live in the District and therefore covering the census tracts most at risk to lead exposure. Licensed daycare facilities are also allocated a priority score. The model scores and ranks neighborhoods according to the health benefit and social impact of lead service line replacement so that projects can be prioritized.

7.2.5 Increasing Program Participation

7.2.5.1 Community Outreach

Photo 7-7: Door to door outreach (DC Water photo)

DC Water continues to educate and inform customers about the program through door-to-door direct engagements and indirect communications, stakeholder engagement, community-based organization engagement, targeted outreach, and marketing campaigns (Exhibit 7-7). DC Water uses a variety of methods, including a revamped program website with a construction dashboard and videos, blogs, mail notifications, phone calls, emails and text alerts, brochures and flyers, yard signs/door hangers, presentations to ANCs (Advisory Neighborhood Commission), mapping tools that use geographic information systems, and media. In addition, DC Water has forged relationships with local agencies to spread the word about LFDC including the DC Council, Office of the Deputy Mayor for Planning and Economic Development/Office of Planning, DDOT, Department of Human Services (DHS), Department of Health (DOH), Office of Racial Equity and the Mayor's Office of Community Relations and Services. A critical part of their outreach goal is to connect with vulnerable populations (e.g., children, women who are pregnant), and historically underserved communities.

7.2.5.2 Legislative Mandate

As described above, District of Columbia lawmakers are currently working the Green New Deal for a Lead Free DC Amendment Act of 2023 which among other things would require property owners in the District to replace lead service lines. Currently, all the LFDC programs are optional and require a signed agreement from the homeowner to complete the work. Ensuring that all such replacements are mandatory and preferably free to residents is fundamental to increasing homeowner participation and removing many barriers to a successful program.

Exhibit 7-7: Community Outreach Materials

Source: DC Water's Lead Service Line Replacement Plan, June 2023, page 13.

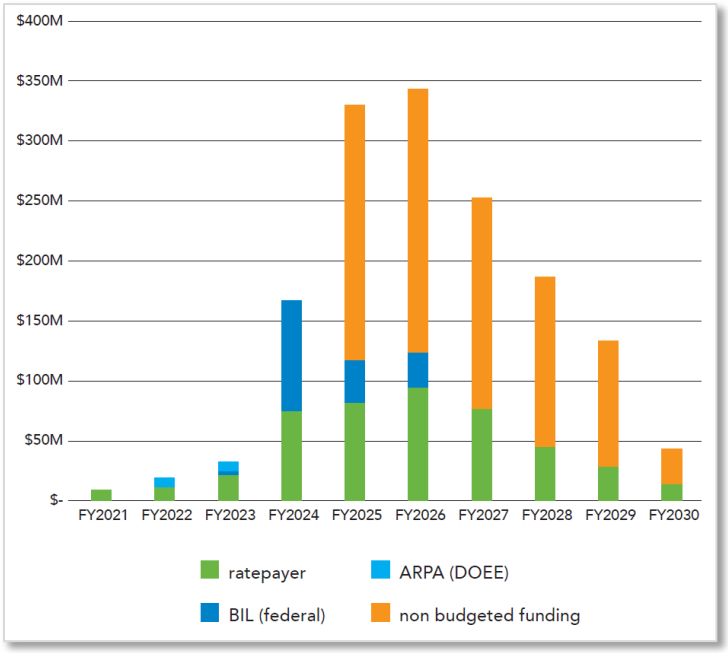
DC Water supports a legislative mandate to replace lead service lines in the District along with the support of increased funding for all replacements.

7.2.6 Estimated Costs and Funding Sources

7.2.6.1 Planning Level Construction Costs

In June 2023, DC Water updated the planning level cost estimate to a new total of $1.51B to fund the entire program. This cost estimate is primarily based on assumptions about the dollars recently spent in the District on previous service line replacement contracts. It includes assumptions about the future cost of program management, construction materials and labor. Projected projects program costs by year are presented in Exhibit 7-8.

Exhibit 7-8: Lead Free DC Program Costs by Source FY21-FY30



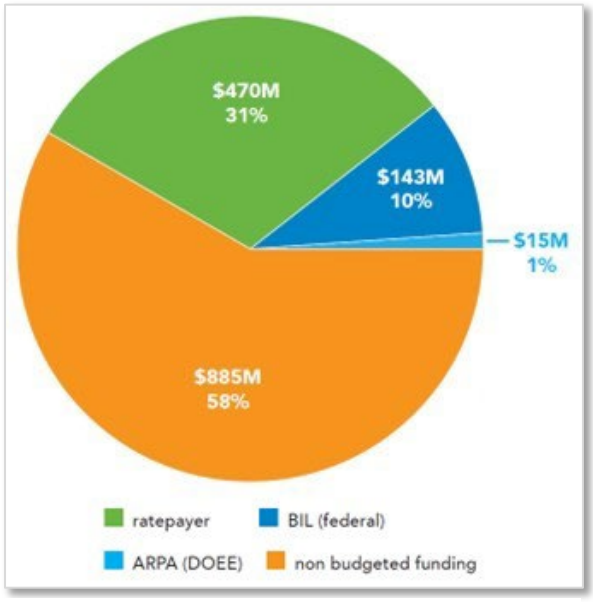
Source: DC Water's Lead Service Line Replacement Plan, June 2023, page 12.

7.2.6.2 Funding

Current funding is shown in Exhibit 7-9 and includes:

Bipartisan Infrastructure Law (BIL) Funds: The historic bipartisan Infrastructure Investment and Jobs Act is making significant investments in the health, equity, and resilience of American communities. With unprecedented funding to support national infrastructure. The Infrastructure Act delivers more than $50 billion to EPA to improve the nation's drinking water, wastewater, and stormwater infrastructure.

Exhibit 7-9: Lead Free DC Program Funding Sources



Source: DC Water's Lead Service Line Replacement Plan, June 2023, page 18.

EPA will award this funding in alignment with the goals of the Biden-Harris Administration's Justice40 Initiative, which seeks to deliver at least 40 percent of the benefits of certain federal investments to underserved communities.

DC Water has been allotted approximately $143M under the federal BIL. DC Water has submitted an Intended Use Plan which was approved by EPA and has completed the public comment review period with no comments. DC Water understands that in the future additional funds could be available from the BIL.

American Rescue Plan Act (ARPA) Funds: The District DOEE has received funding through APRA from the District and committed $15M for FY22 and FY23 to DC Water for lead service line replacements on private property. The District has not committed to providing additional funds through ARPA.

Ratepayer Funds: Approximately $470M has been allocated in DC Water's 10-Year CIP budget toward the

LFDC Program. DC Water is aggressively looking for additional sources of funding to reduce the program's impact on ratepayers.

Additional potential funding sources identified to date include:

1. District Funding for Private Side Replacements – DC Water cannot use ratepayer funds to make improvements on private property in the District. DC Water will explore a partnership to leverage District funds for sidewalk and pavement reconstruction.

2. Water Infrastructure Improvements for the Nation Act (WIIN Act) – This program assists disadvantaged communities with removing sources of lead in drinking water from drinking water systems and schools.

3. DC Department of Housing and Community Development (DHCD)'s Community Development Block Grant (CDBG), Capital Fund Formula Grants, National Housing Trust Fund, Preservation Fund, and Healthy Homes Production Grant Program.

4. EPA: Drinking Water State Revolving Fund – Base Program

5. EPA: Drinking Water State Revolving Fund – Infrastructure Investment and Jobs Act (IIJA) Enacted "General Supplemental" Funds

6. EPA: Water Infrastructure Finance and Innovation Act (WIFIA) – low interest rate loan

7. Potential funding under pending legislation including the Drinking Water and Wastewater Infrastructure Act (DWIA) of 2021 and The Moving Forward Act of 2020, HR 2.

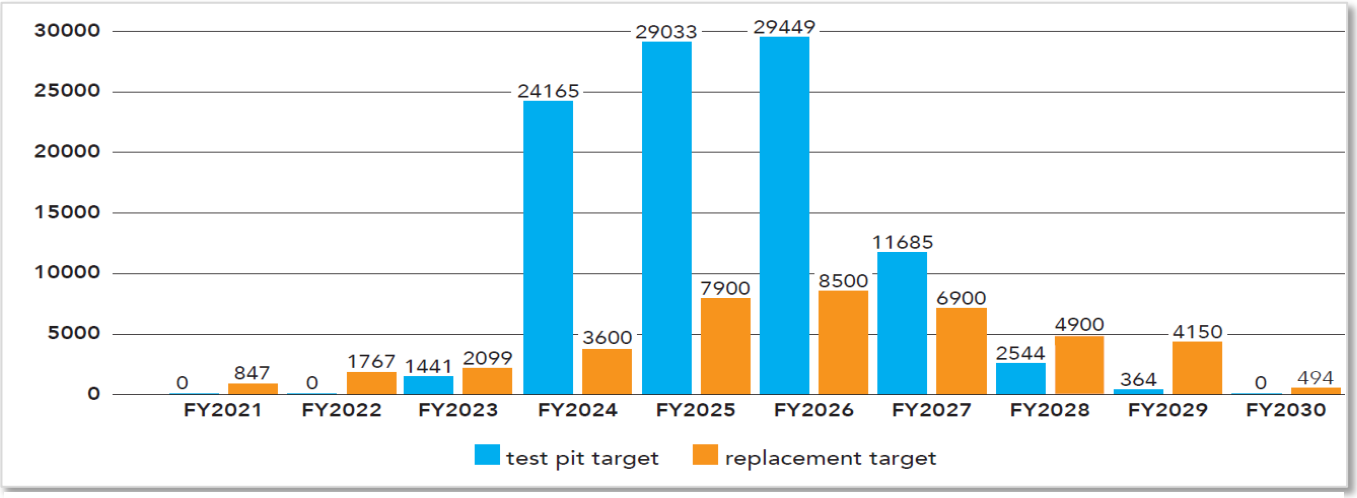
Exhibit 7-10: Lead Service Line Replacement Program Status through February 2023

Source: DC Water Lead Free DC PowerPoint Presentation, March 2023.

7.2.7 Program Schedule and Status

Progress to date is summarized in Exhibit 7-10. The number of lead service line replacements that DC Water aims to complete each year for the remainder of the program is presented in Exhibit 7-11, and the numbers shown for FY21 and FY22 are actual numbers not projections. The Test Pit Program will occur simultaneously to

Exhibit 7-11: Annual Targets for Lead Service Line Replacements and Test Pits FY21-FY30



Source: DC Water's Lead Service Line Replacement Plan, June 2023, page 11.

identify locations where there are lead services. DC Water plans to confirm the locations of at least 90 percent of the lead service lines in the District by January 1, 2027. In the last three years of the program, the remaining pipes will be replaced.

7.3 Blue Drop

7.3.1 Overview

In November 2016, a nonprofit organization called Blue Drop LLC was created by DC Water as a component unit of the Authority.

Blue Drop is legally separate from the Authority and was established to provide:

- Relief from rising rates, fees, and charges to DC Water's customers.
- Advancing and promoting innovative strategies and technologies in the treatment and delivery of potable water, the treatment and collection of wastewater, and related products and services.
- Improving the state of the water and wastewater treatment sectors by sharing knowledge, research, and expertise throughout the country and the world.
- Promoting resource recovery and conservation.
- Other purposes consistent with and complementary to the principles described in this Resolution.

7.3.2 Programs Blue Drop Supports

7.3.2.1 Bloom

Photo 7-8: One of the products available at boloomsoil.com (DC Water graphic)

DC Water markets and sells Bloom, an EPA-certified Class A Exceptional Quality biosolids product. Through DC Water's award-winning thermal hydrolysis and anaerobic digester system, DC Water can take the wastewater entering Blue Plains and generate energy, capture waste heat and steam, and earn Renewable Energy Certificates (RECs) all while achieving a higher standard of treatment. The output is clean water that enters the Potomac River and an EPA-certified Class A Exceptional Quality biosolids product. Bloom is a great soil conditioner that promotes healthy and resilient growing. Bloom works by slowly releasing nitrogen into plants as they grow, providing nutrients over time to stimulate consistent healthy growth. While Bloom's primary customers are farms in Maryland, soil blenders, landscapers, construction, and retailers throughout the DMV purchase Bloom. It is also provided to the community.

Per- and polyfluoroalkyl substances (PFAS) are a diverse group of thousands of chemicals used in hundreds of types of products and has become a worldwide concern. Scientific research in the United States has suggested PFAS can lead to a variety of negative health issues. The Centers for Disease Control and Prevention has shown

that most people in the U.S. have been exposed to some PFAS. Unlike industrial biosolids where PFAS levels are significantly higher, PFAS levels in Bloom test much lower and substantially below common sources of PFAS like household dust. The current EPA certifications do not currently include PFAS levels.

Bloom is an asset that reduces the carbon footprint, provides long term benefits to soils, protect the Chesapeake Bay by reducing the use of chemical fertilizers, and returns value to DC Water's ratepayers (Exhibit 7-12).

About 57,000 tons were sold in 2022, up from 10,000 tons sold in 2018. The average cost back to DC Water is $28 per ton versus nonmarket tonnage of $62 per ton. The goal for tonnage sold in 2023 is 58,000 tons.

Exhibit 7-12: Bloom Sales 2021-2023

Year	Bloom Sales	Reduction in Cost of Bloom Hauling
2021	$310,817	$2.0M
2022	$320,802	$1.8M
2023 (Forecast)	$338,960	$2.0M

Source: Blue Drop, LLC / 2022 Performance Oversight Report.

7.3.2.2 HQO Waterside Events

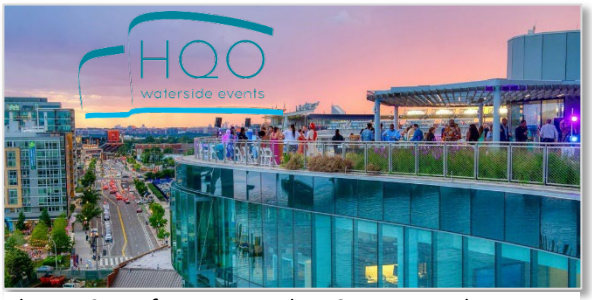


Photo 7-9: Rooftop Event at the DC Water Headquarters (Blue Drop photo)

In 2019, DC Water opened its state-of-the-art headquarters (HQO) and Blue Drop has made HQO an additional revenue resource by renting it out for events. This riverfront venue can accommodate large scale community events. The venue consists of two options, a first-floor patio and a rooftop venue that is 7,900 square feet and a green roof. The green roof reduces stormwater runoff by capturing water in a 40,000-gallon cistern at the site. The collected green roof water is used in 100 percent of the toilet flushing and irrigation needs of the headquarters facility.

The pandemic affected scheduling events in 2021—about 20 events were scheduled that had to be canceled, in addition the venue was shut down for year and a half. In 2022, the recovery was very positive with 60 events occurring. The goal for 2023 is to schedule another 100 events.

7.3.2.3 Mobile Work Management Applications Marketing

Photo 7-10: Mobility Application (Layermark photo)

Blue Drop also established an agreement with Layermark, a water utility software and solutions company in Washington, D.C. to market DC Water Mobile Work Management Applications.

7.3.2.3.1 Mobility Application

DC Water's Mobility Application enables accurate and effective inspection, cleaning, and preventive maintenance of all kinds of assets, such as catch basins, hydrants, and valves, with a seamless flow of data transfer. It integrates with multiple asset management systems, which allows work orders to be created and dispatched to field crews who report activities on mobile computers in real-time.

7.3.2.3.2 Event Management System

DC Water's Event Management System (EMS) manages customer incidents, monitors events as they develop in real-time, coordinate field resources, and maintains full situational awareness.

The EMS is an early warning system for non-routine events, allowing for a faster response while reducing overall recovery time. It includes:

- The Flood and Water Watch Dashboards.
- The Incident Tracking Tool.
- The Resource Management Tool.

7.3.2.4 Wendy's Wonderful World Children's Book Series

Photo 7-11: Wendy and the Water Cycle (DC Water photo)

The Blue Drop program also includes the children's book series, "Wendy's Wonderful World of Water," that won the Public Communication and Outreach Award from the Water Environment Federation (WEF). The series includes *Wendy and the Water Cycle*; *Wendy, Where Does Our Wastewater Go?* and *Wendy and the Curious Case of the Leak*. The stories are about water and wastewater treatment process for ages 6-10.

Copies of the Wendy Book Series are sold to the public and used in the local school system as well as school systems across the country. Ten percent of each sale is donated to the Authority's Serving People Lending a Helping Hand (SPLASH) Fund to help financially vulnerable customers maintain water and sewer services.

7.3.2.5 Cell Tower Leases

In FY20, Blue Drop took over the Authority's program to lease cell towers. In FY22, the program collected more than $263,000 in revenue surpassing the $245,000 target. There are a total of five cell towers to date.

7.3.3 Blue Drop Revenues

Overall, as shown in Exhibit 7-13, net earnings for FY22 were $4M.

Exhibit 7-13: Blue Drop Net Revenue FY21-FY22

Blue Drop Revenues	***2021***	***2022***
Revenues DC Water support-land application	$0.7M	$0.7M
Marketing Fees DC Water	$0.4M	$9.7M
Product and IP Revenues	$2.1M	$4.3M
Event Rentals	$0.02M	$0.3M
Bloom Revenue (net of Cost of goods sold)		($0,01)M
Other	$0.001M	$0.006M
Total Revenues	$3.4M	$6.2M
Blue Drop Expenses		
Operating Expenses	$1.6M	$2,2M
Net	**$1.8M**	**$4.0M**

Source: Blue Drop LLC –2022 DC Waters Financial Reporting/Annual Comprehensive Financial Reports/2. Financial Section.

7.4 Key Findings

The Clean Rivers and Lead Free DC projects are capital investments to address specific regulatory and legal requirements. Both have specific goals that are to be reached within a prescribed period. So as not to overtax staff responsible for the ongoing CIP, DC Water has employed a common practice of creating a separate program with minimal in-house staffing.

Due to the large tunnel projects that dominate the Clean Rivers Project, a design build strategy has been employed.

Given the need to coordinate and manage multiple programs dictated by the various funding sources employed and the unique expertise required to efficiently and cost effectively implement the service line replacement tasks, Lead Free DC has contracted with a firm to provide program management services.

The approaches used by DC Water to implement these two programs are consistent with good business practices employed by other utilities.

The Clean Rivers Project has been and expects to continue to make progress consistent with or ahead of the schedule prescribed in the consent decree.

The Lead Free DC program is a complex challenge. There are two key factors to its success in meeting the schedule. The first is adequate funding. The second is the need for property owners to participate. Currently, participation in the program is voluntary and property owners are in many cases required to pay some or all the $3,000 or more cost of replacing the lead service line from the property line to the meter. In locations where all line replacements have been completed quickly, participation was mandatory and often free to the property owner. The DC Government implementing the program under consideration that makes participation mandatory and increases funding would help ensure the success of the program.

Blue Drop is an innovative program. It is a separate limited liability company run by DC Water that both reduces costs and generates profits that are used to reduce Authority rate increases.

The conversion of solids from a wastewater treatment plant into commercial fertilizer is something done by several major wastewater utilities. In addition to being more environmentally sustainable, typically the costs associated with making and marketing fertilizer is less than other sludge disposal alternatives. The Bloom program is a well-run example of this. The only concerns moving forward are changes in regulations, especially related to PFAS, that might require that the sludge be incinerated or landfilled instead of pelletized and sold as fertilizer.

As was documented in Section 2.5.3, DC Water is leading innovator among U.S. utilities, and has been awarded nearly 90 patents as owner or co-owner. They have also developed award-winning software. As part of Blue Drop, DC Water has positioned themselves to monetize these achievements to the benefit of their ratepayers.

Since the 2019 opening of DC Water's state-of-the-art headquarters (HQO), Blue Drop has been renting out this riverfront venue for large scale community events. This not only provides DC Water with an alternative revenue stream, but it also raises the utility's visibility and creates a unique bond with its customers.

8 Security

8.1 Physical Security

8.1.1 Security Operations

Historically, DC Water has had a security presence at Blue Plains and other major facilities that is typical of other large and significant campuses in the DC metro area. Since the events of September 11, 2001, Vulnerability Assessments for water utility agencies have identified and developed best practices to safeguard the drinking water and wastewater facilities in the United States. Both DC Water and the Washington Aqueduct have invested significantly in physical security measures and have developed best practices with an increased presence of security personnel.

Photo 8-1: Blue Plains WWTP Visitors Center (DC Water photo)

For FY24, the Department of Security has seven authorized full-time employees – five in Security Operations and two in Security Programs. The Director of Security reports to the Vice President, Shared Services. The FY24 Operating Budget for the department is $9.2M, an increase of six percent from FY23. Security Operations is responsible for physical aspects of security, Emergency Management and First Response and community awareness training and Investigations, local and federal liaison, and security work order requests. Security Programs is responsible for the management of security related CIP projects, loss prevention, asset protection, vulnerability assessments, hazardous threat training awareness, information security, site surveys, key management, and electronic security asset testing. The department is well managed and maintains a high degree of training and high morale. The program strives to achieve the highest level of security for both staff and assets while maintaining a low risk of loss and liability to DC Water and its customers.

The department's purpose is to deliver best-in-practice security services that safeguard and protect DC Water's mission-critical resources and employees in meeting the enterprise commitment to its communities and the environment. The departmental mission is to support and maintain a safe and welcoming workplace that is customer focused and intended to enhance the well-being of staff and visitors.

The department has developed and implemented a comprehensive Emergency Management Plan (EMP) under the auspices of the Director of Emergency Management. EMP contains procedures and scenarios to safeguard the mission of DC Water under emergency conditions. EMP details how the Authority will respond to an emergency. It contains planned actions based on emergency conditions.

Security forces providing DC Water's security presence and measures are contracted to a licensed protective services firm. DC Water and its contractor have police powers to arrest within the District. Total contractual costs for security in FY23 are $6.2M. The Security Director estimates a cost of $365,000 per 24-hour manned station at the various facilities. The 90 security guards are armed.

The functions of staff and contractual services are:

- Identification and Badge Control Electronic security asset testing and maintenance
- Guard force and traffic management
- Management of the security-related CIP
- Emergency Management and First Response and community awareness/training

- Loss prevention, asset protection, vulnerability assessments, and hazardous threat training/awareness
- Investigations, local and federal liaison, and security work order requests
- Information security and site surveys

8.1.2 Securty Capital Improvements

Capital projects involved both water and wastewater security upgrades. Security upgrades started in FY10. Some components of the security improvements have been completed while others are scheduled for completion between FY23-FY25.

The projects upgrade security systems at DC Water facilities such as pumping stations, water storage reservoirs and elevated tanks, and other Authority system structures and sites. Components consists of installing CCTV cameras, access card readers, intrusion sensors, fencing, network and communications, and other control surveillance devices and systems to protect the water facilities and infrastructure against vandalism, criminal activity, and possible future terrorism while protecting DC Water personnel in accordance with the recommendations of the Vulnerability Assessment Study. The combined capital projects have a Lifetime Cost of $4.2M:

- Wastewater Lifetime Cost in the FY20-FY25 CIP is a combined $1.5M.
- Water Lifetime Cost in the FY20-FY27 CIP is a combined $1.6M.
- Sewer Lifetime Cost in the FY20-FY24 CIP is a combined $1.6M.

Capital equipment outlays in the FY23-FY26 CIP are $2.6M for the four-year program. These funds are for infrastructure connectivity, cameras, card readers, door/window/hatch sensors, fence-line detection systems, automated entry/exit data capture, and software support.

8.1.3 Facilities Condition Assessment

During our staff visits to various DC Water facilities, the level of security was equal to or better than other utility facilities we have visited. Security personnel we have encountered have always been thorough and professional.

8.2 Cybersecurity

8.2.1 Cybersecurity Operations

Information Security is a function of the Information Technology Department. Three positions are dedicated to designing and implementing the Cybersecurity strategy for the enterprise, testing, and validating Cyber protections, and supporting Disaster Recovery for the Authority.

Critical plant systems including SCADA, for distribution and conveyance, and Process Control (PCS), for Blue Plains operations, run on-premises. SCADA servers are hosted in DC Water's main data center and backup servers are hosted at DC Water's remote recovery location. PCS servers are located at the DC Water control center at Blue Plains and can be operated from any other location with connectivity in the plant.

Remaining applications from the Microsoft Suite of business software to the new Oracle ERP Applications and the Customer Information System are Cloud-based to improve productivity, streamline processes, reduce administrative costs, and improve cybersecurity.

DC Water maintains three separate networks, one for administrative applications, one for SCADA and a third for PCS; the three networks are physically and logically separated. The networks cannot be accessed by the same device (physical) and the same ID and password cannot be used across the three networks (logical).

DC Water is a member of the U.S. Cybersecurity and Infrastructure Security Agency's (CISA) Water/Wastewater cyber taskforce. As of January 2023, DC Water has implemented 22 of 22 Cybersecurity Performance goals

(Exhibit 8-1). As such DC Water is aware of the need for Cybersecurity and Cyber Resilience, the potential threats from the various actors (from nation states to hacktivists). DC Water uses the National Institute of Standards and Technology's Cybersecurity Framework (Identify, Protect, Detect, Respond and Recover) as the foundation of its Cyber Resiliency program and implements a zero trust, layered model for securing IT assets. Some aspects of this model include firewalls, multi-factor authentication for access, physical separation of SCADA networks, threat monitoring, awareness, and training.

A comprehensive patch management program is in place to ensure all software is maintained and upgraded as needed. Patches are reviewed and classified by the Cybersecurity team based on criticality and distributed for deployment. Per the Vulnerability Management Policy, the risk rating of the vulnerability determines the remediation timeframe (Exhibit 8-2).

Vendor-managed cloud systems are patched by the vendor, other systems are patched by DC Water staff.

Since DC Water has adopted a Cloud-first strategy, it closed its back-up data center, and reduced the footprint of its physical IT assets. While it maintains a few servers, many of its hardware assets consist of communication equipment.

Exhibit 8-1: Cybersecurity and Infrastructure Security Agency's (CISA) Performance Status (January 2023)

Cyber Controls	*Current Status*
1.1 Detection of Unsuccessful (automated) Login Attempts	Implemented
1.2 Changing Default Passwords	Implemented
1.3 Multi-factor Authorization (MFA)	Implemented
1.4 Minimum Password Strength	Implemented
1.5 Separating User and Privileged Accounts	Implemented
1.6 Unique Credentials	Implemented
1.7 Revoking Credentials of Departing Employees	Implemented
2.1 Hardware and Software Approval Process	Implemented
2.2 Disable Macros by Default	Implemented
2.3 Asset Inventory	Implemented
2.4 Prohibit Connection of Unauthorized Devices	Implemented
2.5 Document Device Configurations	Implemented
3.1 Log Collection	Implemented
3.2 Secure Log Storage	Implemented
3.3 Asset Inventory	Implemented
3.4 Secure Sensitive Data	Implemented
4.1 Organizational Cybersecurity Leadership	Implemented
4.2 OT Cyber Leadership	Implemented
4.3 Basic Cybersecurity Training	Implemented
4.4 OT Cybersecurity Training	Implemented
4.5 Improving IT and OT Cyber Relationships	Implemented
5.1 Mitigating Known Vulnerabilities	Implemented
5.2 Vulnerability Disclosure/Reporting	Implemented

Source: DC Water, Information Technology Department.

Exhibit 8-2: Vulnerability Management Policy Risk Ratings

Network	*Risk Rating*		
	Critical/ High	*Severe/ Medium*	*Important /Low*
Business (OA)	7 Days	30 Days	90 Days
Operational (SCADA/PCS)	30 Days	60 Days	60 Days

Source: DC Water CISA PowerPoint.

DC Water has Data Recovery policies in place. It conducts a data recovery exercise annually, with a recovery to operation target of four hours. Further, DC Water contracts with its IT vendors—Microsoft (including Azure Cloud), Oracle, VertexOne, and others—have contractual requirements for disaster recovery and resiliency requirements that help mitigate cybersecurity-related issues and provide additional resiliency.

8.3 Key Findings

The Security Department reports on three targeted performance measures from Blueprint 2.0 in the FY 2024 Budget:

- Percent of security investigations completed within 21 days – Actual (FY21) 95 percent; Targets (FY22 and FY23) – 95 percent
- Security Camera operational uptime (cannot go below 90 percent) – Actual (FY21) 95 percent; Targets (FY22 and FY23) – 90 percent
- Smart card readers operational uptime (cannot go below 90 percent) – Actual (FY21) 99 percent; Targets (FY22 and FY23) – 90 percent

Relevant QualServe metrics (comparison against high performers) include:

- Emergency Response Readiness Training – Top Quartile
- Emergency Response Planning * - Above Median
- Cybersecurity Preparedness * - Above Median
- AWWA Cybersecurity Guidance Assessment Tool Use * - Above Median
- EPA Baseline Information on Malevolent Acts * - Above Median

(Note metrics with * - response bands were too wide to estimate quartiles.)

In 2019, DC Water was the first utility to achieve ANSI EMAP 4-2016 Emergency Management Standard accreditation.

9 Future Considerations

Effective management requires planning for and being able to respond to future events that can have major impacts on operations. In this section, we review how DC Water approaches:

- Addressing sustainability
- Customer expectations and customer awareness
- Customer outreach and social media
- Employee recruitment and retention
- Regulatory requirements and operating conditions
- Stormwater and watershed management
- Automated and smart systems

Photo 9-1: ESG Report 2021 (DC Water graphic)

9.1 Addressing Sustainability

In 2021, DC Water was the first water/wastewater utility to release an Environmental, Social and Governance (ESG) Report. This was followed up by its FY22 ESG + Resilience (ESG+R) Report. Adapting to and mitigating climate change is important to the sustainable operation of DC Water, and it is a challenge the DC Water has vigorously undertaken.

9.1.1 Climate Variability and Extremes

Anticipating and dealing with climate variability and extremes is essential for a utility to succeed. There are two aspects to climate variability:

- Actions that the utility can take to mitigate its impact on climate change by reducing its carbon footprint, and
- Anticipating and adapting to the impacts of climate variability and extremes on the utility, its structures and assets, workforce, and customers.

9.1.1.1 Mitigating DC Water's Impact on Climate Variability

Scientifically speaking, greenhouse gas emissions add to climate variability. DC Water is working with the DC Government to meet their aggressive carbon reduction goal as outlined in the Clean Energy DC plan—a 56 percent reduction in greenhouse gases by 2032, compared with the 2006 baseline, and Net Zero by 2045. DC Water can play a significant role in accomplishing that goal as the user of over 431 GWh of energy annually. Blue Plains consumes 85 percent of DC Water's total energy use and therefore represents an area of focus to decrease emissions and be more resilient through reduced reliance on fossil fuels. DC Water is aligned with Clean Energy DC by using 57.8 percent renewable energy at Blue Plains.

Other aspects of DC Water's reduced climate impact are discussed in Sections 9.1.2 on Energy Conservation and Renewable Energy, and Section 9.1.3 on Resource Recovery.

9.1.1.2 Adapting to the Impact of Climate Variability and Extremes

The climate extremes that can affect DC Water include:

- Flooding events, including tidal activity
- Drought
- Extreme temperatures
- Tropical storm and hurricane winds

All of these are addressed within DC Water's Strategic Plan framework. Activities that DC Water undertakes in furtherance of the plan, include:

- The Office of Emergency Management (OEM) performing annual all hazard assessments
- Participating in the Climate Ready DC plan
- Performing an AWWA J100 Risk and Resilience Assessment
- Co-chairing the DC Flood Task Force
- Performing an Enterprise Risk Management assessment
- Reviewing and upgrading of design standards – for example, 500-year storm (instead of 100-year storm)

9.1.1.2.1 Flooding Events

DC Water's CEO, David Gadis, is co-chair of the DC Flood Task Force, which was established in September 2021, under the Office of the City Administrator (OCA) to ensure the appropriate measure of coordination and forethought is placed on ensuring flood risk and opportunities are addressed throughout the District of Columbia. The task force, which is comprised of at least 24 agencies, partners, and organizations, is led by DC Water and DOEE with the sole purpose to develop a comprehensive, equitable action plan that addresses flood risk while also educating and engaging communities on the issues. The task force, along with the sub-groups meet monthly, and all meetings are public. Meeting dates can be found on the Flood Task Force website at www.dcfloodtaskforce.org.

The task force is producing a report that includes an action plan for each of the following categories:

- Flood and sewer line backup insurance;
- Repairing flood damage in low-income homes and neighborhoods;
- Flood proofing of individual homes and facilities;
- Sewer line backups and backwater valve installation;
- Flood mitigation infrastructure projects;
- Regulations, legislation, compliance, and permitting;
- Mapping and modeling;
- Flood mitigation planning and coordination;
- Flood emergency planning, response, and recovery; and
- Any other category identified by the task force.

Photo 9-2: DC Flood Task Force (DC graphic)

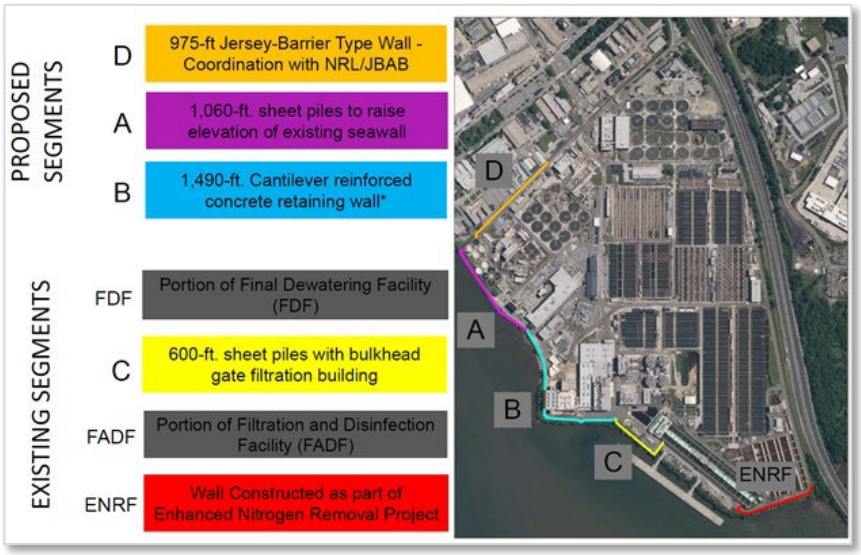
For each of these categories, the task force is:

- Identifying at least one action to implement;
- For each action, assigning a lead agency and a point of contact to oversee implementation;
- Estimating costs and proposing funding strategies for each action, considering equity, efficiency, practicability, and timing, as well as the District's debt cap and capital spending plan;
- Preparing a proposed timeline for implementation of each action; and
- Prioritizing actions within and for vulnerable communities.

The final report will constitute a single, integrated action plan that combines the action plans for each of the categories. After the final report is approved and released, the task force will continue to meet at least annually to track progress of the action plans.

Separately, DC Water is constructing a floodwall to protect Blue Plains from the Potomac River flood waters. The completed floodwall will protect the plant against a 500-year event, plus three feet of freeboard. The floodwall project (see Exhibit 9-1) and the heightened design standards should mitigate flooding and tidal impacts on DC Water's facilities.

Exhibit 9-1: Blue Plains AWWTP Floodwall Project



Source: www.DC Waterater.com/projects/blue-plains-floodwall.

9.1.1.2.2 Drought

DC Water and its water supply partners have and are addressing water supply resilience as discussed in Section 4 The Drinking Water System.

DC Water has robust plans for dealing with localized water supply restrictions (bottled water and water trucks) that can be implemented under supply restrictions.

9.1.1.2.3 Extreme Temperatures

Temperature extremes affect water use patterns as well as worker conditions. Water use variations are considered in the annual budget activities and in rate setting. DC Water has developed worker safety guidelines for extreme heat and cold conditions, including such activities as schedule adjustments, crew rotation, and additional work breaks.

9.1.1.2.4 Storms and Winds

As noted, earlier design standards have been expanded to a 500-year storm. Under that standard, the HQO building base floor elevation was raised during design and the Main Pump Station was protected and related, exposed equipment was also raised.

9.1.1.2.5 Identifying Trend Changes

DC Water is an active partner with numerous District agencies and surrounding areas in monitoring and planning for extreme climate events. In addition to the 24 agencies in the Flood Task Force, DC Water works with the District and the DC Council of Governments monitoring climate impact and modifying plans, as appropriate.

9.1.2 Energy Efficiency and Renewable Energy

9.1.2.1 Overview

Since the 2018 Assessment, DC Water has improved efficiency and operations of its systems, reduced energy use, and worked to diversify energy resources. This overview covers, in general, applied energy efficiency and renewable energy projects, their drivers, selection process, and any future plans.

DC Water operations must comply with the regulations of the federal Clean Water Act and the NPDES permit requirements. These requirements impose one of the most stringent effluent limits nationally. They also dictate the energy usage – the higher the levels of performance, the higher the energy consumption.

DC Water operates and maintains five pumping stations, five reservoirs, four elevated water storage tanks, 22 flow-metering stations, 25 waste/storm water pumping stations, and the Blue Plains AWWTP. Combining these facilities, DC Water is the largest consumer of electricity in the District (more than 431 GWh of energy used annually). The facility with the highest energy consumption is Blue Plains, consuming about 85 percent of total annual energy used by DC Water. This is the reason why Blue Plains became the focal point for implementing energy conserving measures, renewable energy resources, and for decreasing GHG emissions.

The Water Research Foundation has determined that plants with an average daily wastewater flows greater than 0.6 MGD are statistical outliers. On an average day, Blue Plains treats 300 to 320 MGD of wastewater. This amount of treated flow puts the plant outside any peer-reviewed group and makes it difficult to compare to any other facility. A high value is put on the plant's energy intensity use and there is a great focus to reduce energy consumption. When benchmarked in 2021, Blue Plains scored an excellent 87 Energy Star rating, and in the years since then, DC Water maintains that the plant has consistently scored above 80.

Energy consumption at Blue Plains can be divided into process-based (energy used to enable water and wastewater transportation and treatment) and non-process-based consumption (energy used for all other services, such as HVAC, lighting, plug loads, domestic water, etc.). The ratio between those two end-uses is 99:1.

9.1.2.2 Energy Efficiency

For the past decade, DC Water has been engaged in reducing their water and wastewater treatment process energy consumption. In 2015, the Combined Heat and Power (CHP) facility was deployed and since has been providing about a third of the electricity needs of Blue Plains (Exhibit 9-2). The installation of this facility significantly reduced the plant's operational costs, saving about $10M a year, according to the U.S. Department of Energy (DOE), and reduced the greenhouse gas emissions. In January 2019, the Secondary Aeration System upgrade was completed in collaboration with the DC Sustainable Energy Utility (Project DCSEU 7520-G949) and further reduced the operational cost and resulted in about 4.5 gigawatts (GWh) of annual energy savings.

9.1.2.3 Renewable Energy

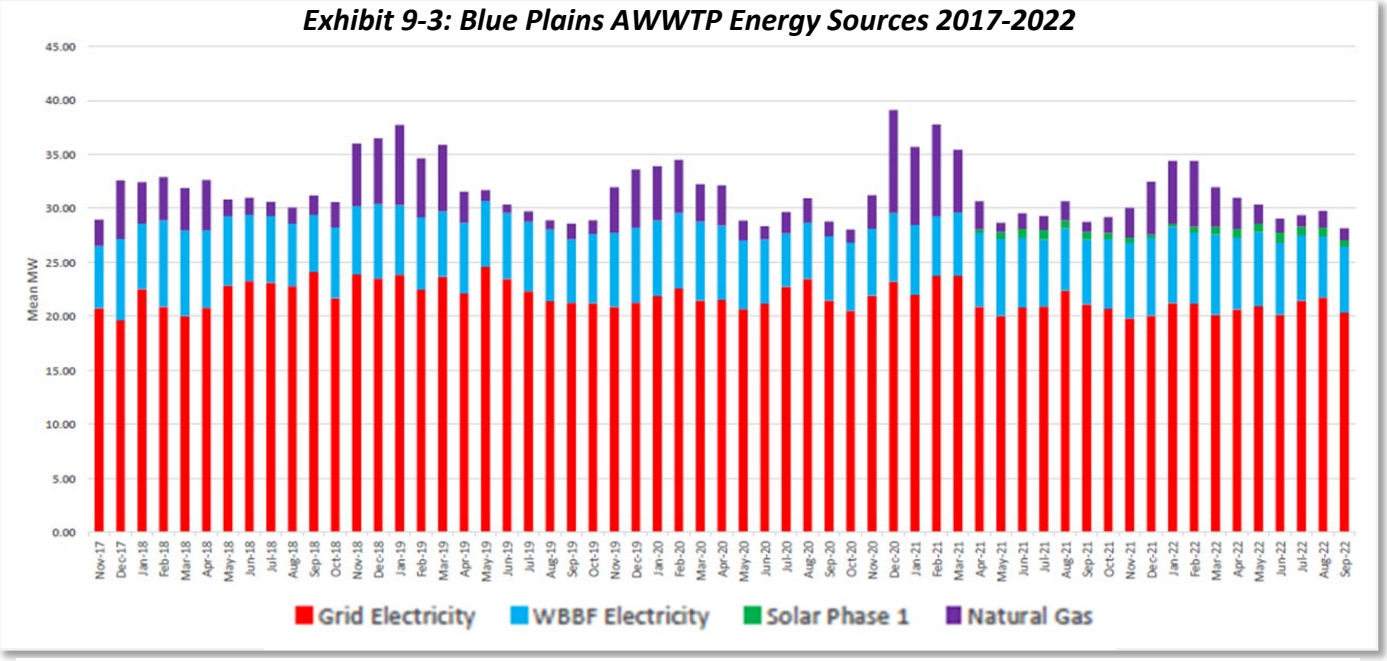
The existing renewable energy programs with 15 megawatts (MW) of generated electricity include waste-to-energy production, CHP facility coupled with onsite heat exchangers, and a solar farm. In addition to CHP, DC Water has been enriching its portfolio by installing multiple solar farms on the 150-acre Blue Plains campus. More than 12,000 solar panels have been installed over parking lots, rooftops, a few ground mounts, and a canopy structure on the Potomac River. This solar farm generates about 4 MW of electricity and is projected to save nearly $4M over the next 20 years. Currently, 57.8 percent of the plant's energy use is satisfied by renewable energy. An even more ambitious solar program, Phase II is in design, will place 11 MW of solar panels over the settling tanks with DC Water financing and owning the generated electricity. The sources of energy used at the Blue Plains AWWTP from 2017-2022 are shown in Exhibit 9-3.

Exhibit 9-2: Blue Plains AWWTP Energy Efficiency Performance Indicators

Indicator	*Value*
EnergyStar for Blue Plains AWWTP	87 (1-100 scale)
Bulk purchase efficiency	2.0 Wh/gallon
Water efficiency	0.68 Wh/gallon
Sewer efficiency	~0.22 Wh/gallon

Sources: 2022 Energy and Carbon at DC Water PowerPoint Presentation page 4, and ENERGY STAR Score for Wastewater Treatment Plants in the United States, applied filters, page 2-9.

Exhibit 9-3: Blue Plains AWWTP Energy Sources 2017-2022



Sources: 2022 Energy and Carbon at DC Water PowerPoint Presentation, page 7.

9.1.2.4 Efficient Building Strategy

Photo 9-3: Solar Canopy Construction at Blue Plains AWWTP (DC Water photo)

DC Water is simultaneously pursuing efficient building design and operation, modernized and renewable energy supply and electrification, and fuel switching. This efficient design is mirrored in the way the new headquarters was designed and built. In 2019, the building was completed on top of the O Street Pumping Station to reuse the existing land and to capture the excess energy coming off the sewer lines below the station. Through a wastewater thermal exchange system, the wastewater is used as a heat sink to cool the building. By adding other energy conscious design attributes, such as ultra-efficient floor-to-ceiling windows and motion-detection light controls, the DC Water headquarters is one of the most energy-efficient structures in the city, using 48 percent less energy and emitting 42 percent less GHGs than a typical office building of its size. The building is also LEED Platinum Class A certified, and recertification is on tap from the U.S. Green Building Council.

9.1.2.5 Capital Improvement Program

Reducing DC Water's carbon footprint and finding new revenue streams and cost savings are vital energy measures in the Capital Improvement Program (CIP). Solar produces Renewable Energy Credits (RECs), while thermal hydrolysis technology converts wastewater into both energy and a nutrient rich soil conditioner. DC Water has packaged the soil as the Bloom fertilizer product which has reduced biosolids operational costs. Between sales of Bloom and the REC revenue, DC Water hopes to offset 100 percent of the operational cost of the biosolids program at Blue Plains.

DC Water is continuously and consistently looking for ways to finance planned energy programs. In July 2022, they were awarded a grant from the Federal Emergency Management Administration (FEMA) for electrical improvements and the Microgrid Implementation Project. The project's main goals are to increase resiliency of Blue Plains, reduce operational and maintenance costs, and increase the plant's renewable energy portfolio.

The main drivers to pursue energy efficiency and renewable projects are the reduction of rate-payer's cost and risk mitigation. DC Water is looking at a whole spectrum of available options to reduce source-generated energy, including direct energy-conservation and better operational and process management. All proposed plans to reduce energy use or increase renewable production are evaluated based on the dollar-value.

A set of tools and systems was developed to inform decisions on what projects will move forward. There are no specific KPIs—they are hard to define since some variables which DC Water has no influence over, such as rainfall and NPDES permit rules, directly influence the energy use. Therefore, the greatest motivation is a financial one—cash positive Net Present Value (NPV) and a Return on Revenue (ROR) of a project. When financial circumstances change, these terms can be recalculated via those tools/systems and, if favorable, previously dropped plans can be revived and proposed again.

DC Water's 10-year CIP, starting with FY23, includes budget to upgrade and modernize the internal electrical distribution system and optimize the existing power generations at Blue Plains. Blueprint 2.0 continues to push the Authority toward high performance and to better leverage technology. The strategic plan also details promises and commitments to sustainability, resiliency, reliability over the next five years.

9.1.3 Resource Recovery

DC Water considers the carbon produced and the nutrients removed by Blue Plains to be assets, not waste in need of disposal. The six-person Resource Recovery unit within Wastewater Treatment Operations is charged with:

DC Water FY22 ESG+R Report

We utilize waste as a resource to minimize our footprint, increase revenue, reduce costs, and contribute to the circular economy.

- Biosolids storage, loading, hauling, and utilization/beneficial use (see Section 7.3.2.1 Bloom)
- Certification and marketing of Class A biosolids
- Outreach and partnership with surrounding jurisdictions on regulatory requests for biosolids applications
- Identifying, prioritizing, studying, and implementing energy generation and optimization options.

In FY22, the DOE awarded funding to the Water Research Foundation to allow DC Water to lead a $2.2M project to investigate five potential treatment systems at Blue Plains. For promising process technologies that offer substantial energy and resource recovery benefits, DC Water will develop and demonstrate data-driven process controls for full-scale wastewater treatment facilities.

9.1.4 Resilience

In today's market, utilities are confronting local and global challenges daily – financial concerns, the pandemic, workforce change, cybersecurity risks, natural disasters, and climate change, among others. Those challenges make resilience, the capacity to withstand or recover quickly from difficulties, essential to success for today's utility. America's Water Infrastructure Act of 2018 requires that risk and resilience assessments be conducted every five years.

Because of its size, numerous assets, and location in the District of Columbia, it is important for DC Water to be a highly resilient utility.

9.1.4.1 Current Activities

In the 2022 QualServe Benchmarking Survey, DC Water received the highest rating for risk assessment and response preparedness; emergency response planning; recovery and mitigation; and cybersecurity

preparedness. These marks place the Authority well above median when compared to the high performing QualServe cohort.

In 2019, DC Water was also the first utility to achieve EMAP accreditation from the American National Standards Institute (ANSI) using the EMAP 4-2016 Emergency Management Standard.

To continuously improve system and operational resilience, the Authority has multiple initiatives that complement each other and provide continuous resilience efforts:

- Implementing Blueprint 2.0 Resilience Imperative Goals.
- Incorporating resilience and sustainability goals into the Non-Process Facilities Master Plan.
- Implementation of the goals and initiatives within the DC Clean Energy Act, Sustainable DC 2.0, and Climate Ready DC plan.
- Complying with American's Water Infrastructure Act.
- Dedicating a position to Critical Infrastructure Protection.
- Annually updating to all nine emergency management plans.
- Requiring emergency planning and response training courses for staff members.
- Facilitating 60 emergency management training and exercises in 2022 with dedicated staff positions, contracts, and EPA support.
- Adding findings from risk and resilience assessments to hazard mitigation plan projects for tracking and implementation.
- Forming a Type 3 Incident Management Team to mitigate and manage emergencies.
- Collaborating with local and regional response partners to share capabilities and resources in planning for, training for, and responding to emergencies.
- Capturing and tracking After Action Improvement needs after incident management team activations and exercises.

9.1.4.2 Future Challenges

The nature of challenges that DC Water will face going forward are constantly evolving. To identify future potential threats, the Authority has a large library of plans—some required, some best practice—that are constantly updated. They base planning efforts on the results from their vulnerability and risk assessments while making sure to still cover an "all hazards approach." DC Water is one of the only utilities in the country with their own hazard mitigation plan and taskforce.

DC Water's Office of Emergency Management (OEM) is responsible for the upkeep of the Emergency Management Plan (EMP) and the hazard mitigation plan. OEM's Critical Infrastructure Program performs the following tasks:

- Provides education to staff on suspicious activities and threat response protocols.
- Conducts vulnerability, risk, and resilience assessments of Authority assets and facilitates mitigation planning.
- Establishes partnerships to protect its infrastructure assets and to protect its ability to provide service to its customers.
- Participates in regional and national critical infrastructure protection initiatives.

Additionally, DC Water has trained a group of employees to participate in staffing the DC Homeland Security and Emergency Management Agency's Emergency Operations Center during emergency activations and national special security events to coordinate DC Water activities with the District and other agencies involved in events.

9.2 Customer Expectations, Awareness, Outreach, and Social Media

9.2.1 Current Activities

DC Water has an extensive customer outreach program and a sizeable social media presence. The Marketing and Communications Department has three functional units with the responsibilities shown in Exhibit 9-4. They count success with the targeted performance measures related to the Blueprint 2.0 (Strategic Plan) Imperative presented in Exhibit 9-5.

Exhibit 9-4: Communications Functional Units

Production & Operations (6 positions)	***Communications (8 positions)***	***Public Outreach (4 Positions)***
Produce graphics, collateral, and videos that support a wide range of training, and programs across the Authority. Compose script for Stars of Water event. Manage the production of the Annual Report, Water Quality Report, newsletters, Leadership Updates, exhibits, marketing materials and the content of specific segments of the DC Water website. Produce Public Service Announcements, commercials, videos as well as produce live and archived webcasts of board meetings and manage stakeholder presentations. Manage plant tours. Develop departmental budget.	Prepare speeches, testimony, editorials, special reports, and stakeholder presentations. Produce content for and manage Authority's social media accounts. Respond to customer and stakeholder inquiries. Produce reports, newsletters, brochures, DC Water exhibits and materials. Provide editing support for other departmental communication projects and produce special high-profile project communications material. Respond to local and national media inquiries, manage website content; track and strategically influence relevant policy proposals.	Maximize partnerships with local agencies, organizations, and other critical community stakeholders. Manage the Authority's participation in a host of community outreach activities and initiatives; coordinate annual town hall meetings and special media events; manage speakers bureau. Manage outreach program to engage community stakeholders such as Mayor's Office of Community Relations and Services (MOCRS), DC Council, Advisory Neighborhood Commissioners (ANCs), civic associations, residents, and businesses about upcoming and ongoing construction projects, increase their understanding of the condition of our aged infrastructure, and better understand their needs and concerns relating to projects affecting quality of life. Coordinate stakeholder presentations and community events; conduct Sewer Science and other public-school programs.

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 310.

Exhibit 9-5: Communications Performance Measures

Targeted Performance Measures	***FY21 Results***	***FY22 Results***	***FY23 Targets***	***FY24 Targets***	***Blueprint 2.0 (Strategic Plan) Imperatives***
Publication of DC Water's Annual Report	1	1	1	1	Reliable
Publication of Customer Newsletter	4	4	4	4	Equitable
Publication of Clean Rivers Project Update	2	2	2	2	Equitable
Publication of Employee Newsletter	11	11	11	6	Healthy, Safe, and Well
Publication of Water Quality Report	1	1	1	1	Reliable
Community meetings outreach re: lead, rates, CSO CIP projects, etc.	114	114	100	100	Equitable

Source: DC Water Approved FY 2024 Budget, adopted March 2, 2023, page 311.

9.2.2 Planned Activities

- The Marketing and Communications Department is responsible for implementing a Strategic Communications Plan to support Blueprint 2.0. Staff members continue to expand the Authority's customer engagement and crisis communications capabilities, utilizing the additional support of an outside public relations firm when needed.
- Continue campaign efforts to demonstrate the value of DC Water's services and build support for needed investments in infrastructure.
- Work with the DC Clean Rivers Project team to engage with residents, businesses, and commuters impacted by construction on the Northeast Boundary Tunnel Project.
- Expand the Authority's internal (employee) engagement.
- Update unified planning calendar for all marketing and communications activities.

9.2.3 Identifying and Reacting to Trend Changes

Through extensive outreach efforts, DC Water continually monitors which channels are most effective as well as stakeholder preferences. Additional information is available through the regional and national association activities which identify changing trends being experienced by other utilities as well as broader national and regional trends. As this data identifies needed changes, the Authority will react by implementing different outreach channels (Exhibit 9-6).

Exhibit 9-6: DC Water Social Media Channels

Sources: DC Water Social Media pages.

9.3 Employee Recruitment and Retention

9.3.1 Current Activities

Employee recruitment and retention is the responsibility of the People and Talent Department. Talent development consists of acquiring, training, and development strategies. The department provides solutions and programs that motivate, engage, and educate employees to cultivate a high performing workforce. The vision of DC Water states that "we will be known for superior service, ingenuity, and stewardship to advance the health and well-being of our diverse workforce and communities." The Talent Management team supports this vision by leading the Healthy, Safe, and Well imperative of the Blueprint 2.0., and acts on the conviction that that water is the life source of the community, and that the essential services DC Water provides must be world-class. A fundamental priority is ensuring DC Water is safe for all –customers, the community, employees, and contractors. To achieve this objective, the Authority is connecting the strategies of leadership and employee development with tools and activities that build and support a culture of "coaching" based performance management. Effective coaching provides specific, timely, and actionable feedback to employees.

DC Water's activities and goals in employee recruitment and retention include:

- Optimize the employee experience by consistently engaging the employee throughout their lifecycle at DC Water.

- Improved individual performance through coaching.
- Increased trust and accountability by creating new possibilities for team members.
- Accountability for self and employees by removing obstacles in the way of success.
- Leading the ongoing development of the employees under their supervision

Other forms of talent development at DC Water include:

- In-house training – classes and programs designed in-house that may focus on nontechnical courses, skills development, or new processes.
- eLearning/on-demand training – online courses housed within the learning management system (LMS) called Cornerstone. The content for this site is developed in-house and by external vendors.
- External training – classes and programs developed by external vendors that support individual employee development needs and requirements, not designed by an external vendor.
- Learning events – conferences, retreats, and virtual programs. These events boost employee morale and help to increase productivity.
- Engagement activities – events held virtually or in-person that allow DC Water employees the opportunity to get to know each other through collaboration and fun.

In FY21, the department continued with Leading Blue Cohort V participants as well as the piloting of the DIRECT Program and Mentoring Circles. The feedback thus far has been very positive. The LEAD and LEARN series provided opportunities for interactive leadership and career development. Sessions were facilitated to forge connections across the authority, building essential career development skills for employees. The program created creative ways for different departments to inform, share and educate employees across the authority. The Authority continued to leverage college and university relationships through the Tuition Assistance Program and started creating a College Vendor Partner Program. The goal is to reduce tuition costs and establish paths to pay the schools directly, reducing paperwork and streamlining the payment process. In FY21, employees continued to pursue critical infrastructure certifications in the areas of Professional Engineering and Program Management, and a total of 133 employees participated in the Education and Tuition Assistance Reimbursement benefit programs. DC Water provided $498,000 to assist employees with their continued education programs.

Exhibit 9-7: DC Water Careers Portal

Sources: DC Water website.

9.3.2 Identifying and Reacting to Change

Going forward, DC Water expects that their sought-after employee will evolve – most likely toward a more technologically savvy person with strong collaborative skills. In addition, the target employees' needs and expectations will grow into a stronger focus on social responsibility, training and growth opportunities, and work-life balance (Exhibit 9-7).

The department is carefully monitoring how well its current initiatives are doing to identify changes in future directions. Since utility employees tend to be long tenured (the AWWA Research Foundation/Water Environment Research Foundation study "Succession Planning for a Vital Workforce in the Information Age" lists the average tenure at retirement as 26 years), DC Water realizes that recruitment and retention activities will likely be directed to different generations of employees, requiring different strategies and tactics.

Their internal monitoring of individual programs is augmented by networking with People and Talent peers at local institutions, other utilities nationwide, monitoring regional trends and research by utility and regional associations.

9.4 Regulatory Requirements and Operating Conditions

Effective management requires constantly evaluating potential future challenges and opportunities and developing strategies to deal with these challenges and opportunities as they arise.

9.4.1 Regulatory Requirements

More stringent regulatory requirements (e.g., nutrient limits or CSO and SSO control) and various shifts in operating conditions are increasing complexity, cost, and risks in the utility operating environment and placing substantial pressure on revenue needs and revenue generating capacity.

Some upcoming regulatory challenges include:

- The Clean Water Act requires the District to review and possibly update the water quality standards every three years (i.e., triennial review). Changes to water quality standards because of the review can present compliance challenges depending on the nature of the changes.
- Future adoption of an updated bacteria standard in the water quality standards to include a statistical threshold value (STV) in addition to a geometric mean.
- EPA is currently revising the TMDL for the bacteria and the TMDL for trash. Revision of these TMDLs entails some risk in terms of compliance with new requirements.
- The Anacostia River has contaminated sediment deposited over generations. Remediating or capping these sediments is an ongoing evaluation being performed by DOEE which presents a challenge in terms of allocation of responsibility for past discharges.
- EPA is reviewing the existing Chesapeake Bay TMDL which established limits for nutrients (TN, TP and TSS) for the drainage area, including Blue Plains. Revision of the TMDL that results in reduced allocation to jurisdictions in the Chesapeake Bay area presents regulatory risk and opportunity moving forward.
- Emerging contaminants and pollutants such as PCB and PFAS and new regulations regarding effluent limits for these parameters are a matter that DC Water is monitoring for future impacts.

The biggest challenge will be meeting new regulations as they are implemented in a cost-effective manner. While EPA conducts some baseline cost-benefit analyses, it usually errs on the side that the benefits outweigh the cost, with the cost being borne by DC Water customers. The Authority is prepared for near-term changes, but there are some larger, potentially expensive regulations on the horizon dealing with new contaminants. These challenges are not different from those faced by utilities around the country as regulations change.

To prepare for these upcoming challenges, DC Water does the following:

- Participates in advisory committees: DC Water participates in the Metropolitan Washington Council of Governments, the Interstate Commission on the Potomac River Basin, in various Water Environment Federation committees, the National Association of Clean Water Agencies, the Wet Weather Partnership and in other committees and organizations.

- Submits testimony on proposed regulations: DC Water engages with regulators to identify possible upcoming regulations and provides input on the impacts. They meet regularly with regulators during the process and provide written comments and testimony on proposed regulations.
- Conduct pilot studies: DC Water performs pilot studies as appropriate for new treatment technologies or process modifications at Blue Plains.
- Participate in Water Research Foundation studies: DC Water participates in research studies that affect core business and upcoming regulatory matters.

9.4.2 Operating Conditions

Some of the major trends that will affect DC Water operations include:

- Growth in population within the service area
- Climate change, increased storm intensity and increased duration of short duration storms
- Workforce issues – aging workforce, talent attraction and retention, increased need for technologically competent workforce
- Leveraging of data in driving decision making and optimizing efficiencies
- Renewal and replacement of aging infrastructure
- Security (considering DC Water's location in the Nation's capital, the provision of services to nationally sensitive operations, etc.)

Some of these trends are addressed elsewhere in this section.

Growth in population in the service area has typically not generated commensurate increases in wastewater flow volume, with the advent of low flow fixtures devices. Increases in pollutant concentration (i.e., mass) has occurred. This is likely to continue and to require assessment of treatment train processes driven by mass rather than volume such as solids handling facilities, aeration, and other facilities.

Facility growth and replacement of infrastructure with more advanced technologies will require increased preventive maintenance for new equipment and facilities and increased training for new facilities. DC Water continuously monitors training needs and monitors training effectiveness.

Many of DC Water's facilities adjoin waterways putting a focus on climate change and the increased intensity of short duration storms and their effect on operations challenges over the long term.

Dealing with these issues will require an increased level of monitoring, planning, and forecasting focusing on water demand, wastewater generation and composition. Increased intensity storms will place an emphasis on emergency response planning.

In addition to monitoring and reacting to trends (i.e., modify training, modify treatment processes etc.), DC Water utilizes scenario planning that includes sensitivity/vulnerability analysis. One typical use of scenario planning is to evaluate upcoming regulations or address a particular topic. This is common as part of alternatives evaluations for studies. Examples include nutrient removal at Blue Plains, CSO control alternatives, odor control alternatives, climate change impacts, and others.

9.5 Stormwater and Watershed Management

Effective stormwater and watershed management requires constantly evaluating potential future challenges and opportunities and developing strategies to deal with these challenges and opportunities as they arise.

9.5.1 Stormwater Management

As described in Section 6 The Stormwater System, DC Water has only partial responsibility for stormwater management, but this issue will provide them with an opportunity to expand their cooperation with the District regarding the use and effectiveness of different stormwater best management practices and how they could affect its infrastructure to ensure the District has a robust system of adaptation to protect system infrastructure.

The current consensus is that climate change will exacerbate storms that have the potential to cause flooding. Addressing flooding will become increasingly important and may necessitate capacity improvements in the system and adaptation plans will need to be developed which may include improvements to MS4 infrastructure. As the system ages and is stressed, there will be increased focus in the future on increasing maintenance, inspection, rehabilitation, and replacement of stormwater infrastructure.

The stormwater system will also be affected by activities on private property (a District responsibility). Since green infrastructure is part of the stormwater management system, effective maintenance going forward will be essential.

DC Water will be utilizing several measures to determine when action will be necessary and which steps to take:

- Assessing system capacity.
- Utilizing the asset management system to continually evaluate condition and maintenance requirements.
- Continue and enhance its cooperative relationship with the District.

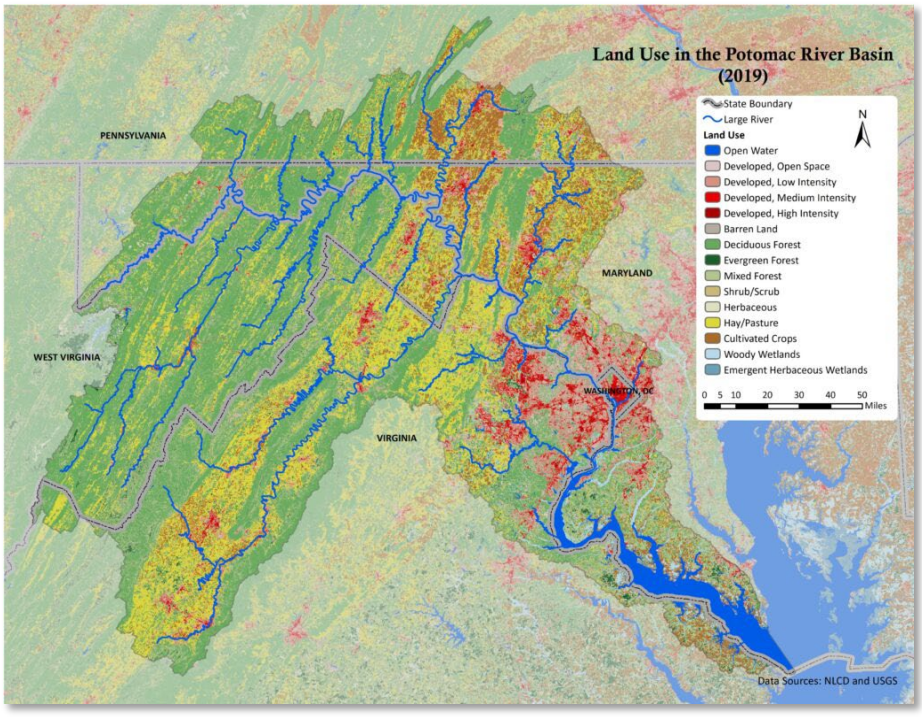
Staying on top or emerging issues in stormwater management and identifying innovative solutions which be achieved through:

- Monitoring the literature and research on stormwater issues.
- Attending conferences and communicating with managers in other utilities.

9.5.2 Watershed Management

DC Water is responsible for discharges from Blue Plains and the combined sewer system. They are not responsible for the discharge quality from the MS4 system or for pollution in the watershed coming into the District from other states at the Maryland and Virginia boundaries. The District is a relatively small part of the watershed and water quality is substantially affected by what happens upstream. Blue Plains

Exhibit 9-8: Potomac River Watershed



Source: www.potomacriver.org/potomac-basin-facts/

produces a high-quality effluent that meets water quality standards in stream. In addition, the Clean Rivers Project will bring CSOs into compliance with water quality standards when completed, subject to post-construction monitoring. With these two sources controlled, DC Water's contribution to water quality issues will be addressed (Exhibit 9-8).

However, there are upcoming challenges in terms of new regulatory requirements and emerging contaminants that may affect DC Water's discharges and management of those sources in the watershed. Examples include PCBs, PFAS, and others. To improve resiliency, there also has been discussions of developing a second water source (Potomac River is currently the only source) for the DC metro area. This is a watershed matter since multiple entities withdraw water from the Potomac for potable use. Some additional challenges include:

- Fit for purpose digital assets and its impact on the operation.
- People – skills development, availability including replacing retirees.
- Increase capital and operating costs and its impacts on rates.
- Ability to recover costs associated with managing the stormwater system.

DC Water anticipates remaining engaged in watershed issues to clarify the sources of remaining pollution sources and the anticipated water quality impact. This will be done through continuing interaction with watershed stakeholders.

9.6 Automated and Smart Systems

DC Water prides itself as a leading innovator in the water utility industry and has long been at the forefront of using technology to automate services and improve decision-making and hold down costs. As described in Section 7.3.2.3 Mobile Work Management Applications Marketing, DC Water has developed several applications that it markets to other utilities.

Photo 9-4: Water Quality Monitor featured at Microsoft Reston Customer Center (DC Water photo)

It is using Artificial Intelligence (AI) to improve efficiency and effectiveness. In 2019, in partnership with Wipro, DC Water developed Pipe Sleuth to analyze video footage captured inside the pipe and can detect root intrusion, cracks, breaks, deformities, and debris in pipes. It has dramatically reduced the time to analyze CCTV pipeline inspection tapes through the development of Pipe Sleuth and AI image detection applications. DC Water uses near real-time hydraulic modeling using meter, sensor, and SCADA data to improve operations decision making and has developed a prototype predictive main break application. The Water Quality Monitor provides a 24-hour forecast for water quality parameters at the pump stations to help proactively manage the distribution system and is featured in a display at the Microsoft Reston Customer Center.

DC Water has also invested in the development of a variety of dashboards supporting flooding related activities, water system operations, sewer crew utilization including automatic alerts to the crews, and other functions (for example, see Exhibit 5-19).

DC Water's Event Management System (see Section 7.3.2.3.2 Event Management System) is the first comprehensive outage management system for water/wastewater and won the 2022 Global Water Award for Smart Water Project of the Year and the CS Week 2023 Innovation in Field Automation Award.

9.7 Key Findings

DC Water is a forward-looking organization and has reaped benefits when facing events like the COVID pandemic. Managers throughout the organization are already preparing for the next change or disruption. A few of the things currently under review:

- PFAS, more stringent TMDL requirements, and other regulatory changes.
- Proactivity in information technology deployment.
- Artificial Intelligence and technology.
- Increasing pace of technological advances in computers, tablets, laptops, etc.
- Climate change impacts related sea level rise, flooding, and storm intensity.
- Aging industry work force in a highly competitive labor market.
- Risks of electrical grid disruptions.
- Impact of pipe supply chains on U.S. cities starting lead service line replacement programs.

Appendix A. Operations Findings Summary

Management Best Practice Findings

- ✓ *Although it has a more complex governance structure than most water and wastewater organizations, DC Water enjoys best practice governance and a well-deserved reputation for competent and astute governance.*
- ✓ *DC Water organized itself along functional lines. The recent reorganization adds service-line and reporting-line overlays designed to produce a leaner and more responsive organization.*
- ✓ *DC Water prioritized establishing best management practices of its assets with the goal of implementing a "world class" asset management program to maximize service life while minimizing costs and ensuring sustainability.*
- ✓ *DC Water successfully transitioned from corrective maintenance to an effective proactive maintenance approach. Over the last five years, they implemented a risk- and reliability-based asset management framework.*
- ✓ *DC Water received numerous industry awards and recognition as one of the better national and international utilities. Their stature is also enhanced by the many honors and positions held by its employees, and through many conference presentations, research papers, and patents.*
- ✓ *DC Water's Blueprint 2.0 is a well-developed best practice strategic plan.*
- ✓ *DC Water's service delivery structure requires interfacing with more governmental entities than most water and wastewater utilities that provide retail service. They do an excellent job of managing these many relationships, some of which have divergent interests. A recent study performed by PEER compared IMAs throughout the country based on best practices and the Blue Plains IMA ranked highly.*
- ✓ *Capital Program Best Management Practices – DC Water obtained one of the highest scores of the self-assessments we have administered.*
- ✓ *DC Water maintains financial practices and policies that are intended to maintain a high-quality investment grade bond rating to ensure the lowest practical cost of debt necessary to finance their long-term capital program.*
- ✓ *Engineering and operational managers were active developers of CIP initiatives and were well informed when speaking of decision-making within and based upon the CIP and Facility Plans.*
- ✓ *The FY 2024 Budget document is a master class in transparency and thoroughness.*
- ✓ *DC Water is very capital intensive, ranking highest in assets per person served compared to 21 similarly sized water systems in the American Water Works Association's rates survey and eighth out of 94 in the National Association of Clean Water Agencies financial survey. This requires high levels of competence in finance and budget to inspire bondholder confidence and keep interest rates on debt low.*
- ✓ *Branding surveys are done at least annually, and transactional surveys are offered after email and call interactions. Customer feedback is used to continually improve processes.*
- ✓ *DC Water is implementing Market-Based pricing for each position, expanding the Career Ladder Program, and streamlining the position reclassification process to attract and retain employees.*

Benchmarking and Self-Assessment Findings

Of the areas covered in the self-assessment for which we received responses none were lower than competent, and many were close to world class. The following table merges the self-assessment with QualServe Benchmark results to provide an overall view.

Asset Management and Capital Delivery	
Asset Knowledge	Highly Competent
Risk Management – Criticality	World Class
Risk Mgt. – Asset Condition	Near World Class
Plant Maintenance Organization	Near World Class
Plant Maintenance – Quality	World Class
Document Management	Near World Class
Inventory Management	Competent
Financial Accountability	Near World Class
CIP Production	Near World Class
Capital Delivery	Near World Class

RCM Performance	
Reliability Centered Maintenance	World Class
Performance Management	Near World Class
Organization	Highly Competent
Information Reporting	Near World Class
Continuous Improvement	Highly Competent
Direction & Leadership	Highly Competent

Customer Service	
Call Center	Competent
Billing	Competent
Payment Options	Competent
Collections & Revenue Protection	Competent
Performance Mgt. & Training	Competent
Customer Satisfaction	Competent
Organizational Effectiveness	No Response

Wastewater	
Treatment Process	Near World Class
Sludge Treatment	Near World Class
Crisis Management	Competent
Health & Safety	Near World Class
Organization Development	Competent
Performance Management	Near World Class
Financial Responsibility	Near World Class
Materials Management	Competent
Documentation	Near World Class

Water	
Distribution System	Competent
Materials Management	Competent
Documentation	Competent

Utility Services	
CMMS	Competent
Work Order Management	Highly Competent
Mapping/GIS	Competent
Work Planning	Insufficient Data
Work Scheduling	Insufficient Data
Capacity & Demand Management	Insufficient Data
Work Order Execution	Insufficient Data
Special Programs	Insufficient Data
Review of Process	Insufficient Data
Inventory & Materials Management	Insufficient Data
SOPs, O&M Manuals	Competent

Appendix B. Site Visit Findings Summary

Sixteen sites were inspected. The locations and scores on a 1 to 10 scale are presented below:

Activity	*Site*	*Average Score*
Non-Process	Headquarters Administration Building (HQO)	10
Drinking Water	Bryant Street Pumping Station	9.4
	Anacostia Pumping Station	9.3
	Fort Reno Reservoir	9.8
Wastewater	Blue Plains AWWTP Control Center	10
	Blue Plains AWWTP Preliminary Treatment	9.3
	Blue Plains AWWTP Primary Treatment	9.3
	Blue Plains AWWTP Secondary Treatment	9.5
	Blue Plains AWWTP Advanced Treatment	9.5
	Blue Plains AWWTP Solids Handling	9.0
	O Street Pumping Station	9.0
	Main Pumping Station	9.1
Stormwater	Blue Plains Treatment	10
	Blue Plains Tunnel	10
	Rock Creek Project B	9.8
	CSO 021 Diversion Facilities Projects	9.9

Overall, this is indicative of a well-maintained physical plant. It is also an indirect reflection on the quality of historic capital programs. Quality assets are easier to keep in good physical condition.

Operations

Headquarters Administration Building (HQO)

Site Inspection Score Sheet

Name: Marija Stefanovic

Date Visited: January 23, 2019 (was evaluated before this report, shortly after the building was completed)

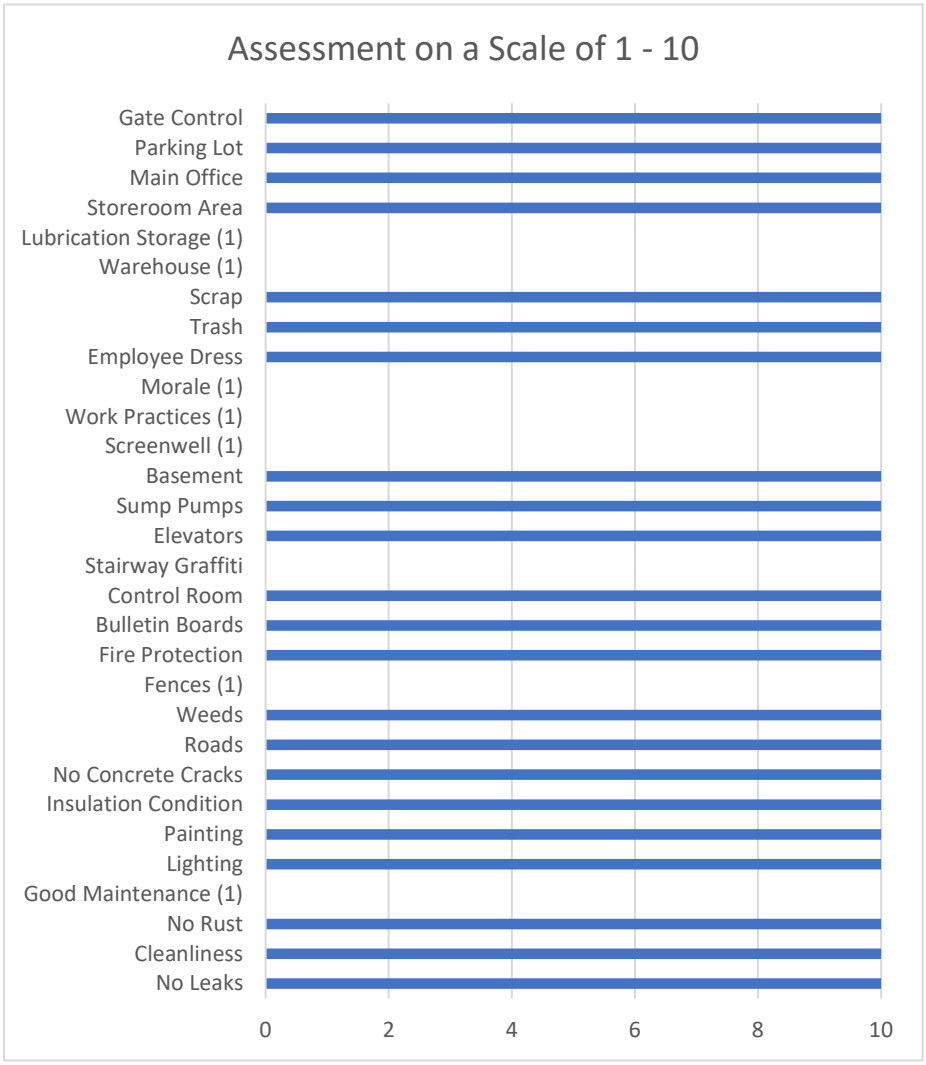
Guide Name: Brent Christ, Construction Supervisor

Positive Observations: The building was designed, constructed, and certified as LEED Platinum Class A.

Negative Observations: none

Average Score: 10

Photo A.1: DC Water Headquarters Administration Building (DC Water photo)



Note:
(1) Not Applicable, new building

Drinking Water System

Bryant Street Pumping Station

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 13, 2023

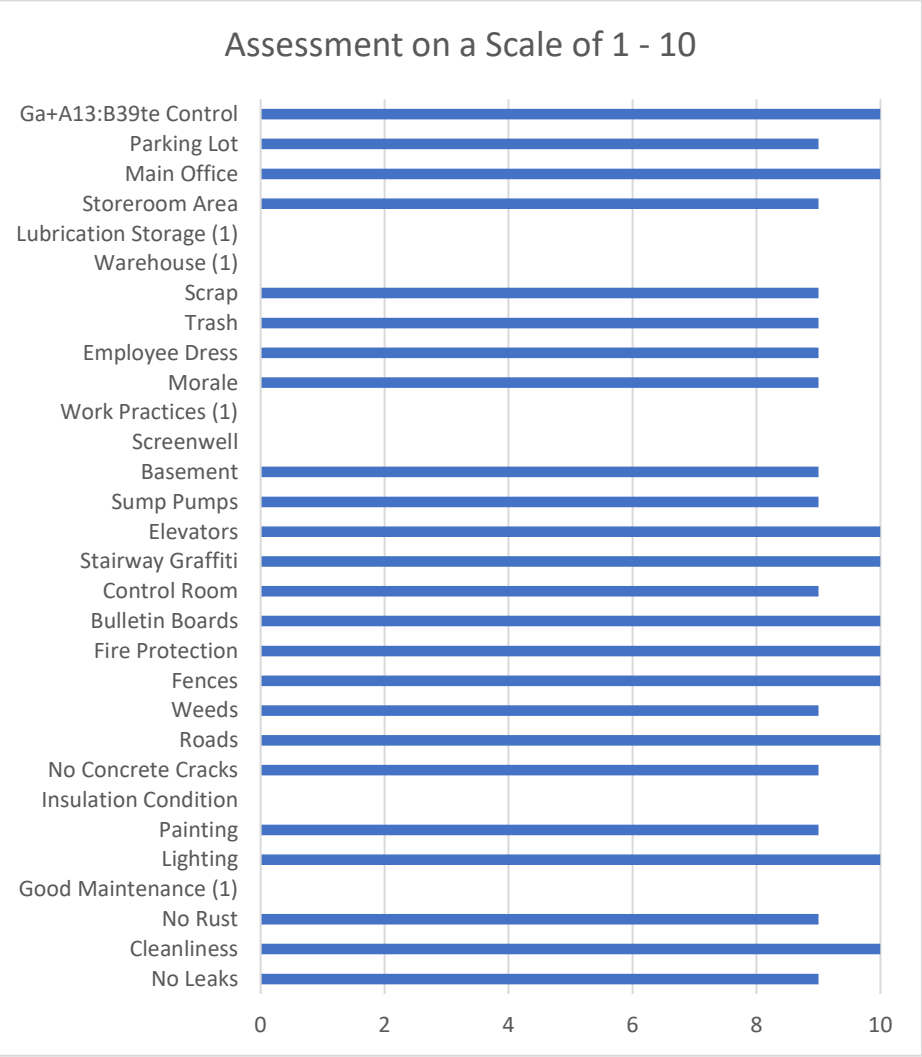
Guide Name: Kenrick StLouis, Vice President, Sewer and Water Pumping Operations

Positive Observations: Station is very clean and in good repair.

Negative Observations: None

Average Score: 9.4

Photo A.2: Bryant Street Water Pumping Station – pump motor assembly (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Anacostia Pumping Station

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 17, 2023

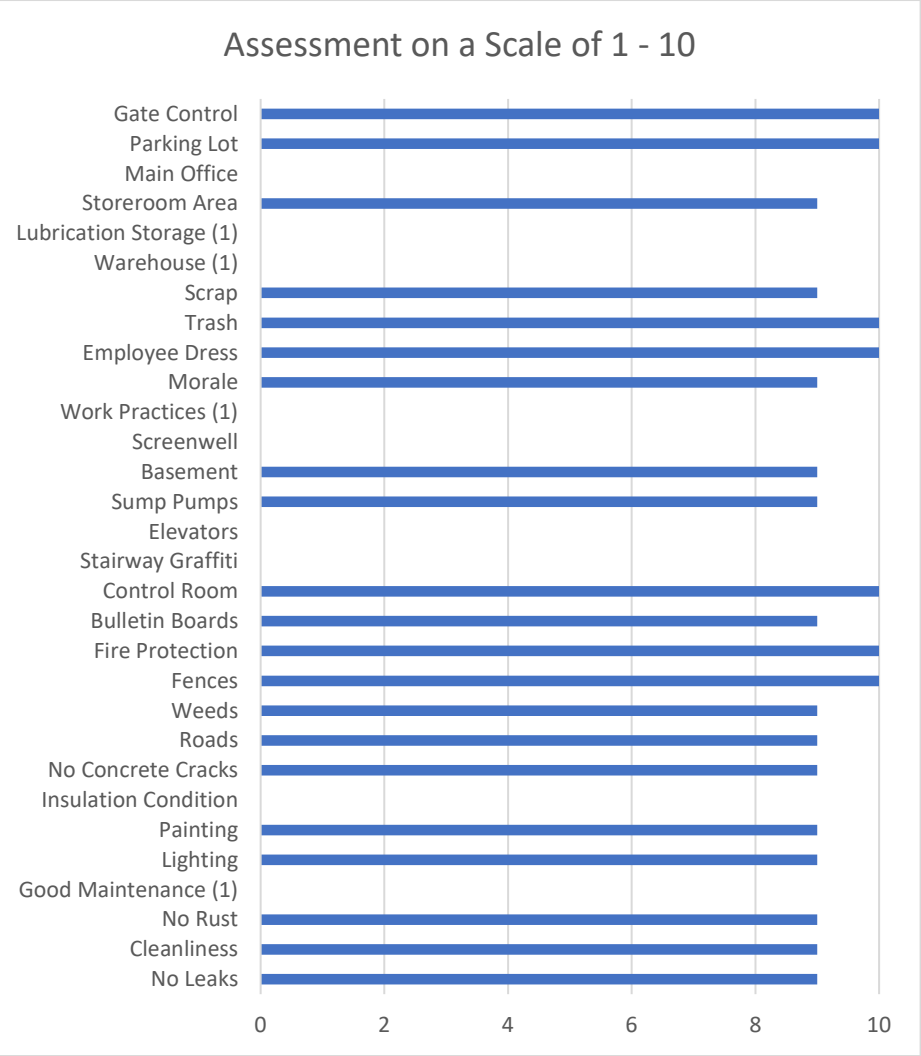
Guide Name: Calvert Wilson, Supervisor

Positive Observations: None

Negative Observations: None

Average Score: 9.3

Photo A.3: Anacostia Water Pumping Station – control room (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Fort Reno Reservoir

Site Inspection Score Sheet

Name: Thomas Chase

Date Visited: April 6, 2023

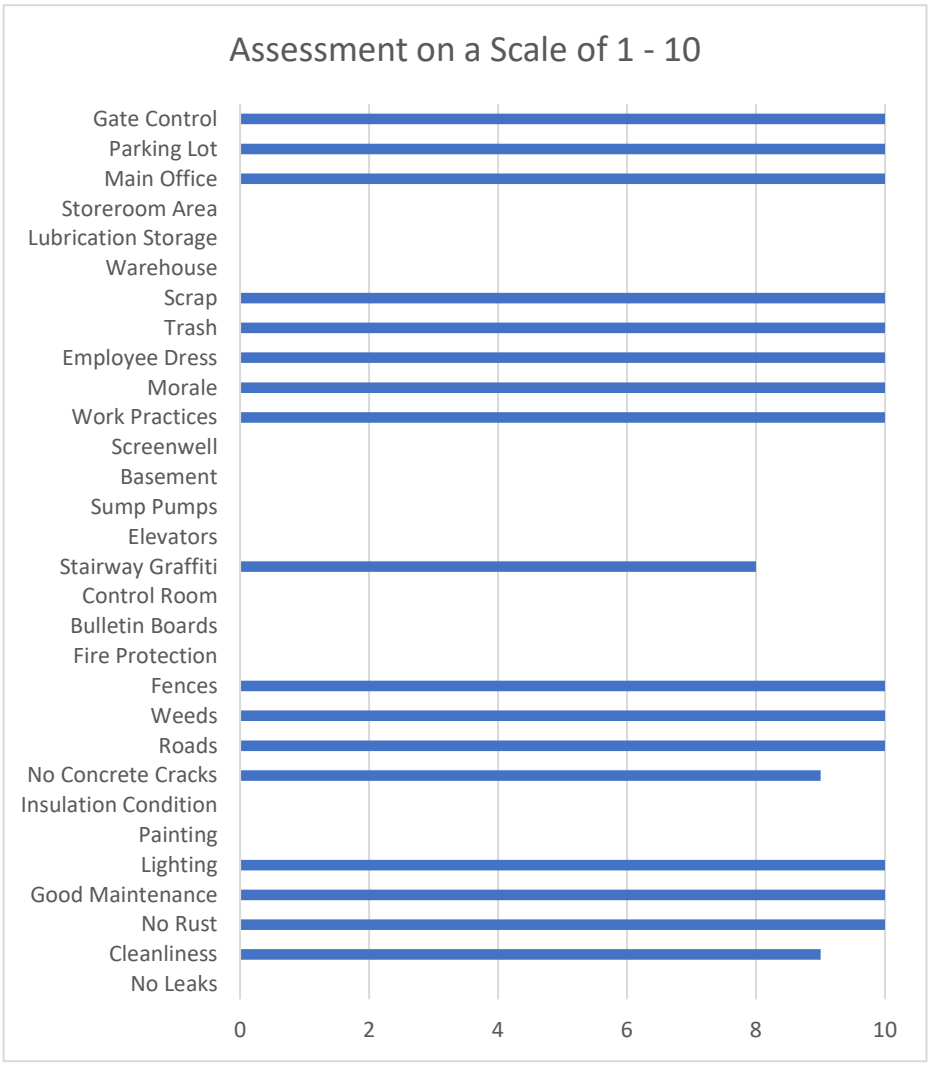
Guide Name: Seth Charde, Program Manager, Green Infrastructure, and John Beesley, Program Manager, Tunnel Construction

Positive Observations: Shared facility with secure government buildings.

Negative Observations: Minor cracks around stairs and some graffiti in adjacent park area.

Average Score: 9.8

Photo A.4: Fort Reno Covered Reservoir – green roof plantings and permeable walk pavers (PEER photo)



Wastewater System Facilities

Blue Plains AWWTP Control Center

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 9, 2023

Guide Name: Nick Passarelli, Vice President, Wastewater Operations

Positive Observations: The central control room is very clean, orderly, and well-staffed.

Negative Observations: None

Average Score: 10

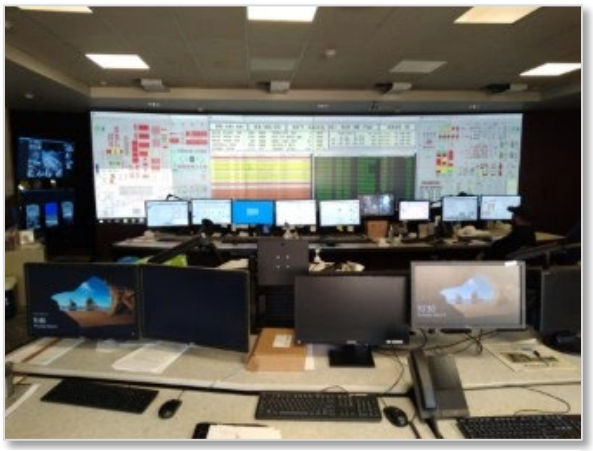
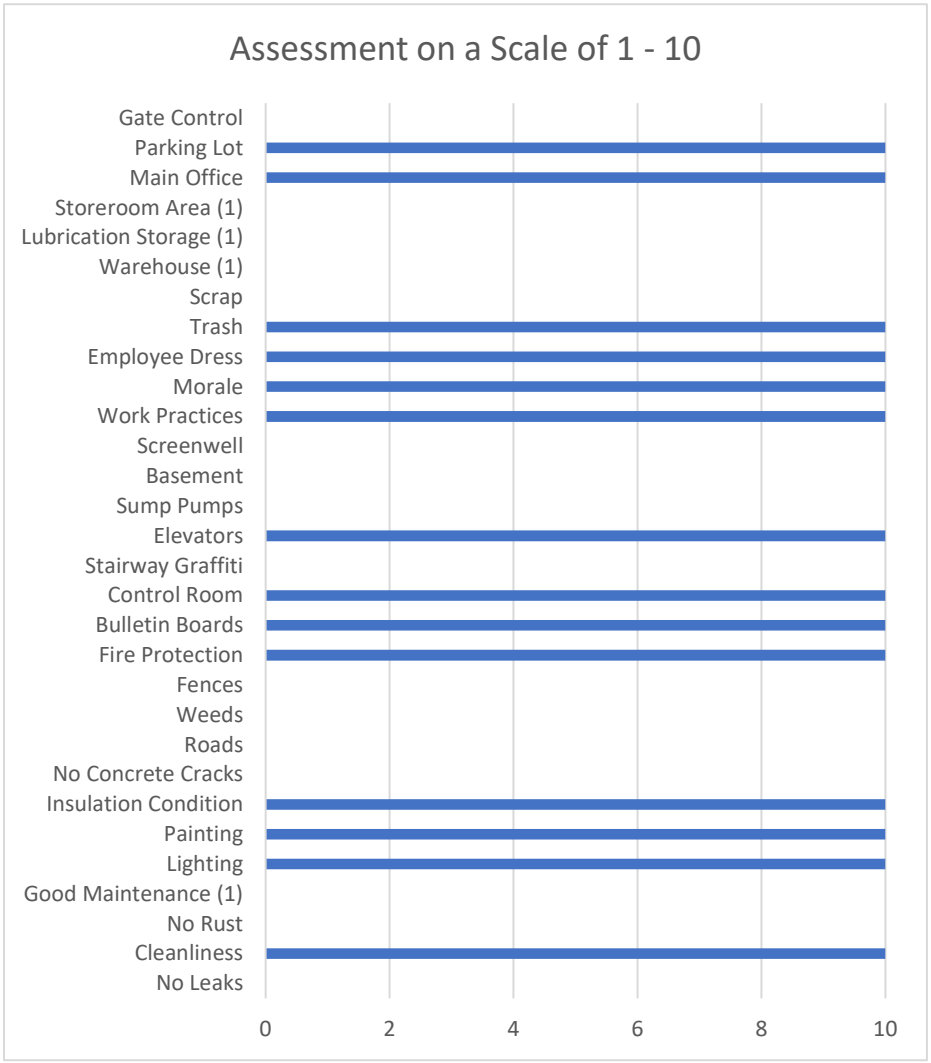


Photo A.5: Blue Plains AWWTP Central – control room (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains AWWTP Preliminary Treatment

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 9, 2023

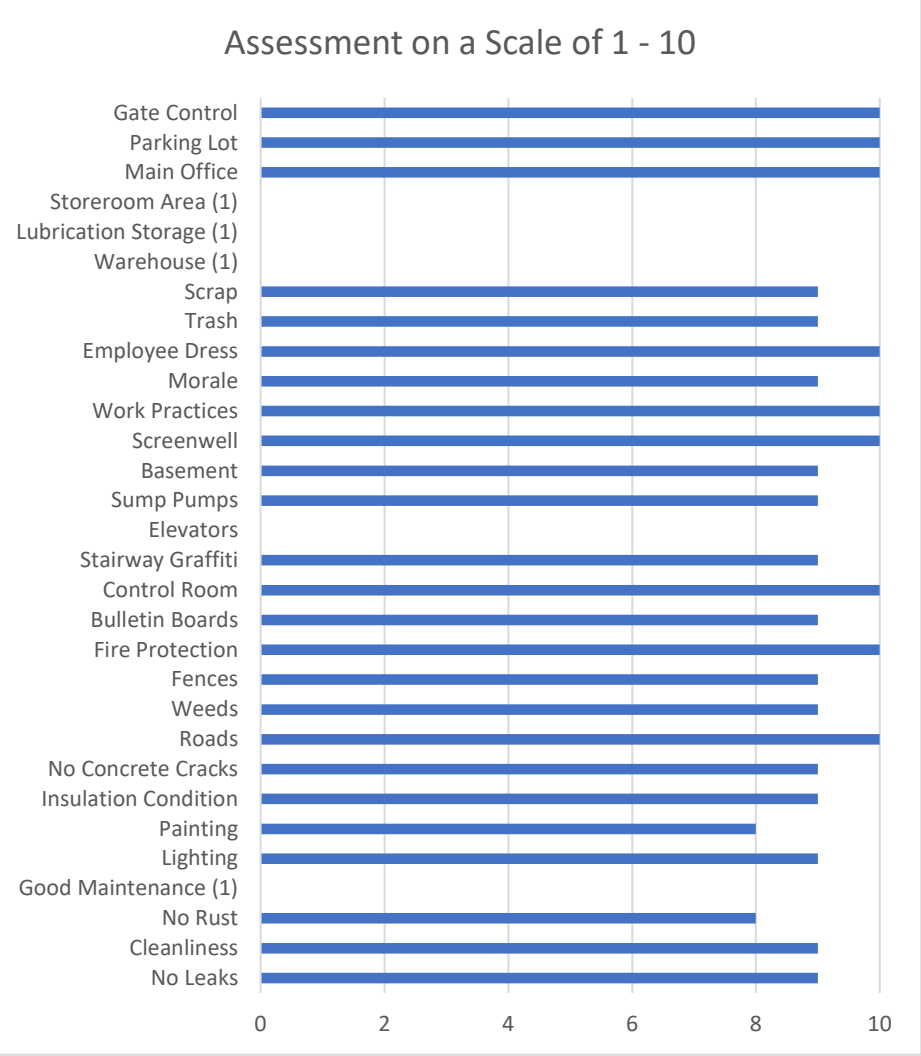
Guide Name: Nick Passarelli, Vice President, Wastewater Operations

Positive Observations: Overall process looks good.

Negative Observations: None

Average Score: 9.3

Photo A.6: Blue Plains AWWTP Raw Wastewater Pumping Station-1 – screening room area (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains AWWTP Primary Treatment

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 9, 2023

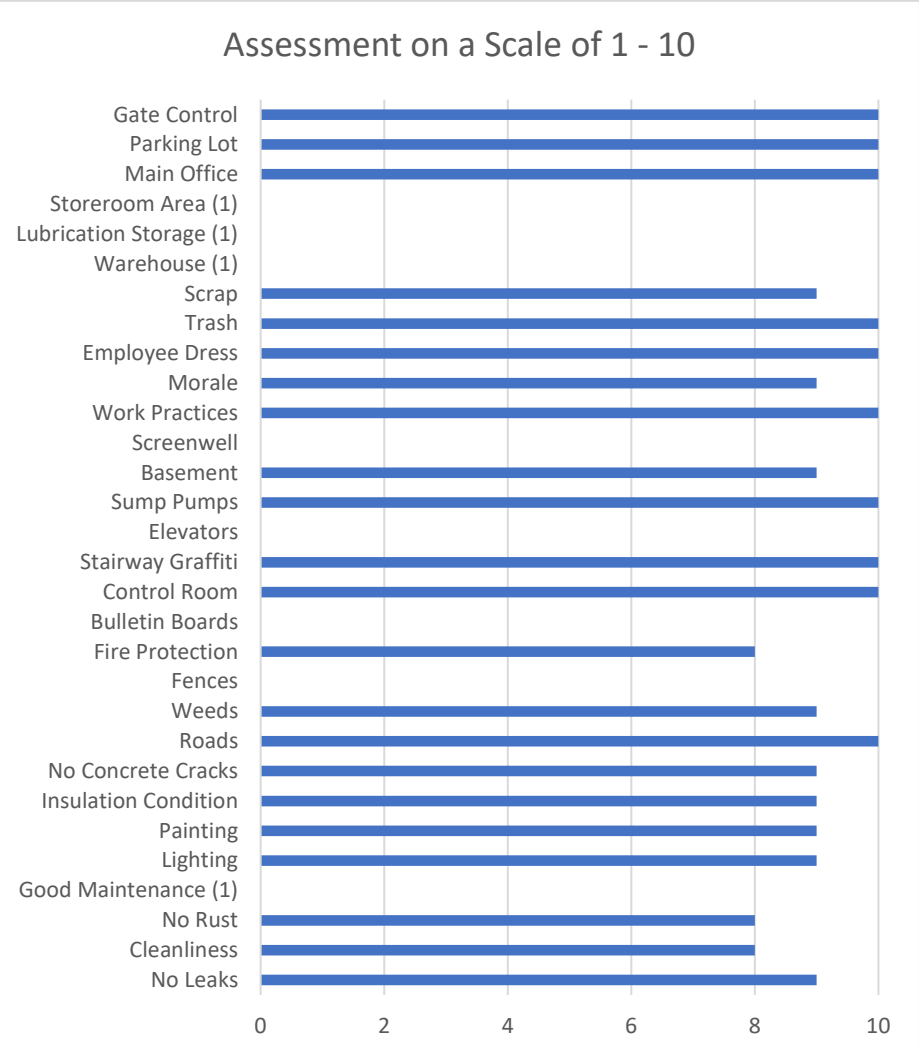
Guide Name: Nick Passarelli, Vice President, Wastewater Operations

Positive Observations: Overall process looks good.

Negative Observations: Clarifier weirs need cleaning.

Average Score: 9.3

Photo A.7: Blue Plains AWWTP Primary Clarifier – drive unit (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains AWWTP Secondary Treatment

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 9, 2023

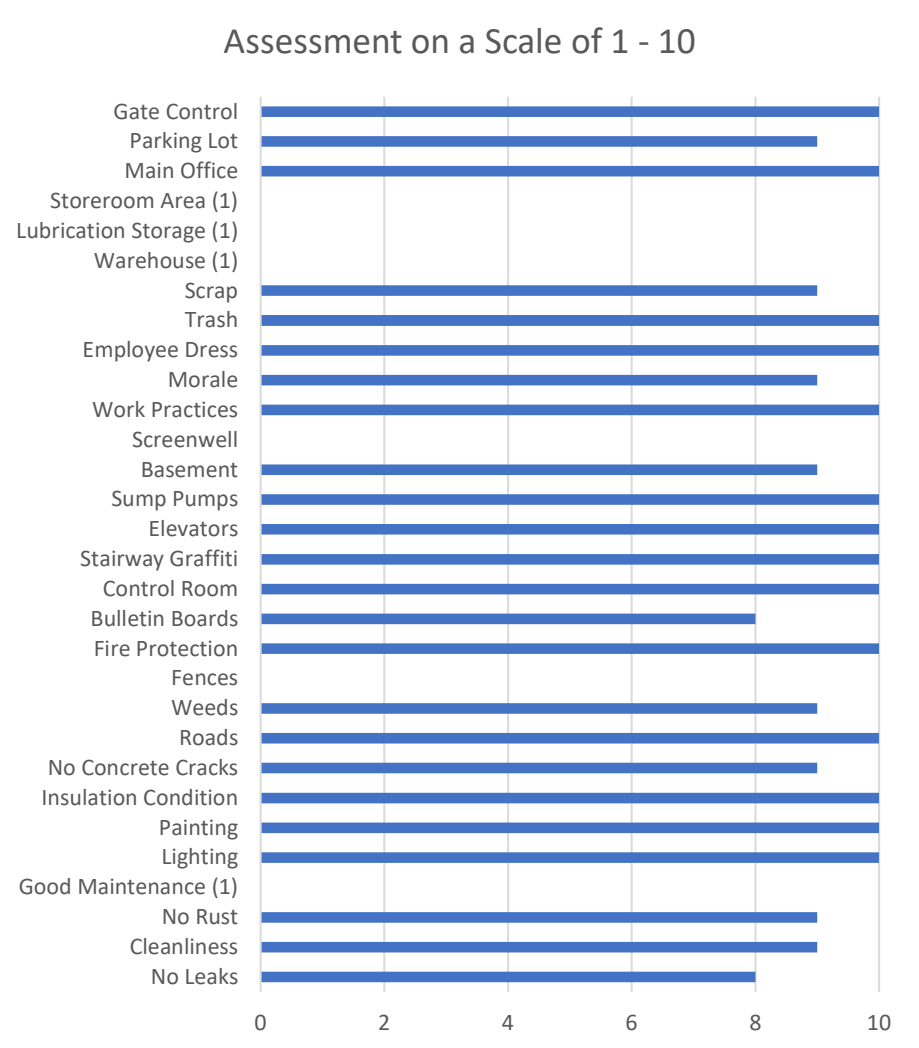
Guide Name: Nick Passarelli, Vice President, Wastewater Operations

Positive Observations: Overall process looks good.

Negative Observations: None

Average Score: 9.5

Photo A.8: Blue Plains AWWTP Secondary Blower Building – blower room (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains AWWTP Advanced Treatment

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 10, 2023

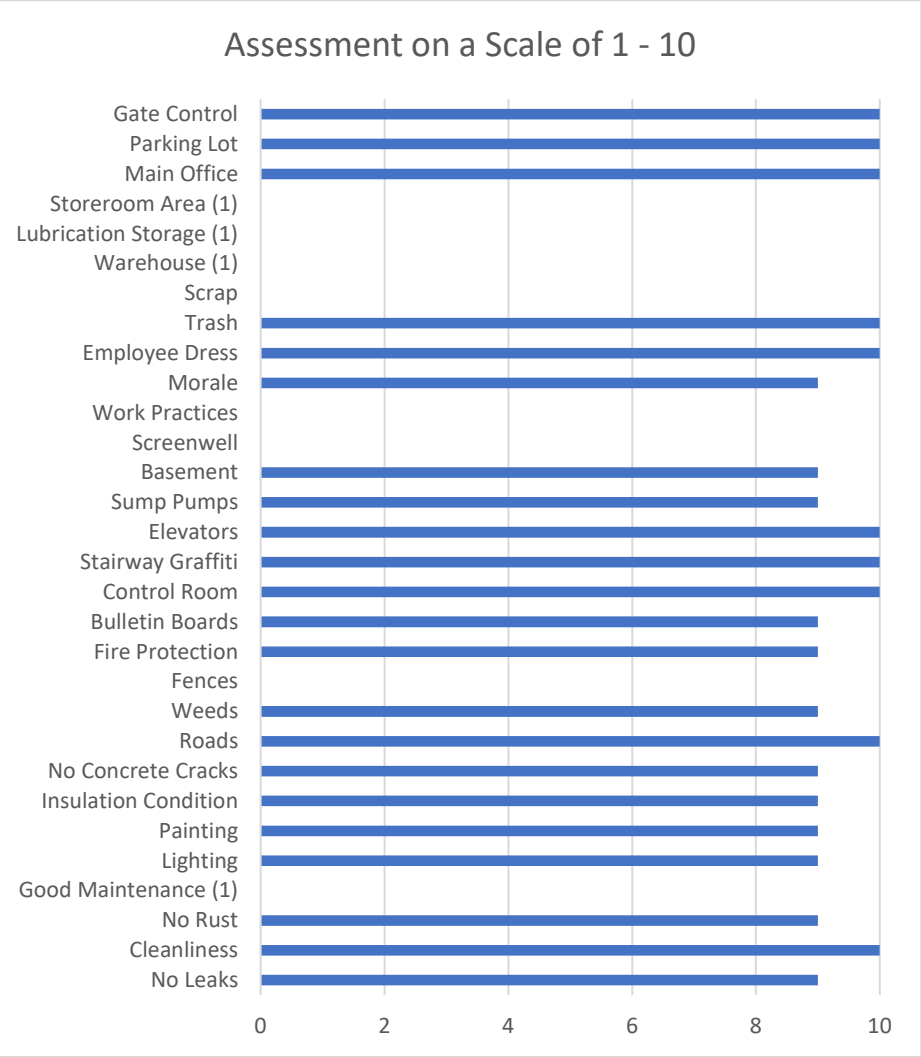
Guide Name: Ryu Suzuki, Manager, Process Engineering

Positive Observations: Overall process looks good.

Negative Observations: None

Average Score: 9.5

Photo A.9: Blue Plains AWWTP – nitrification blowers (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains AWWTP Solids Handling

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 10, 2023

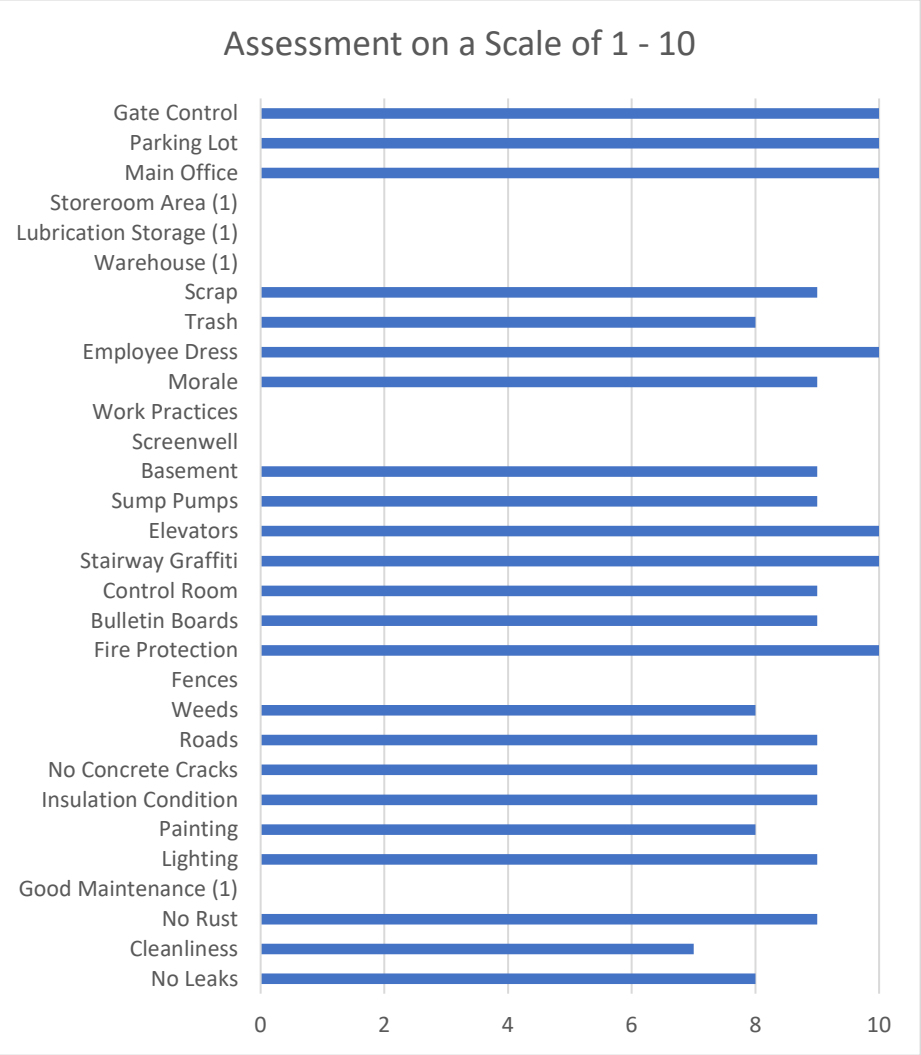
Guide Name: Ryu Suzuki, Manager, Process Engineering

Positive Observations: Staff are well trained in system(s) operations.

Negative Observations: In need of housekeeping improvements.

Average Score: 9.0

Photo A.10: Blue Plains AWWTP – belt filter press, gravity belt section (PEER photo



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

O Street Pumping Station

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 15, 2023

Guide Name: Mandy LaBlanc, Senior Manager, Pumping Operations

Positive Observations: None

Negative Observations: None

Average Score: 9.0

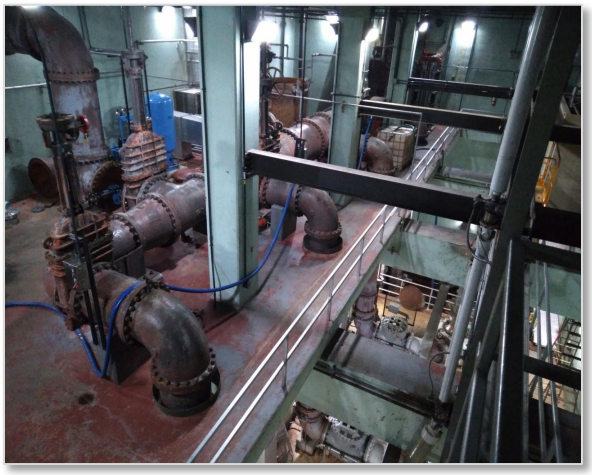
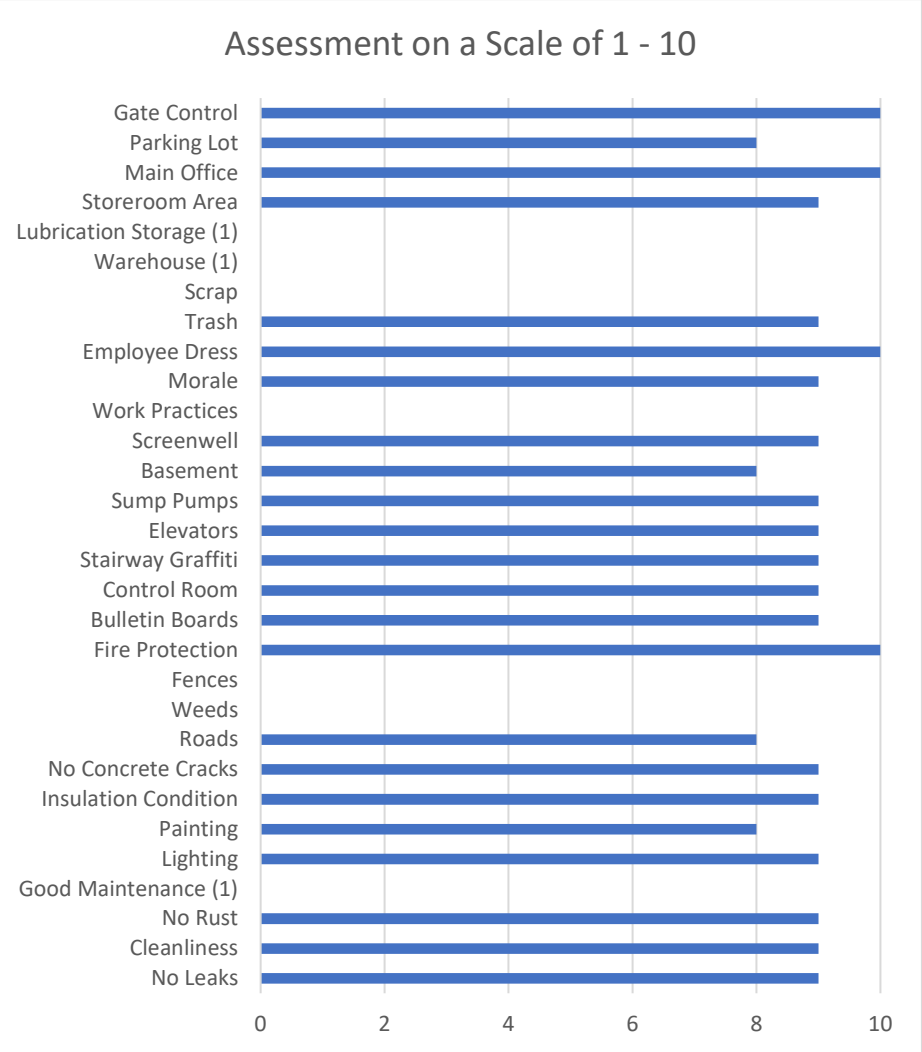


Photo A.11: O Street Pumping Station – pump room basement mezzanine (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Main Pumping Station

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 15, 2023

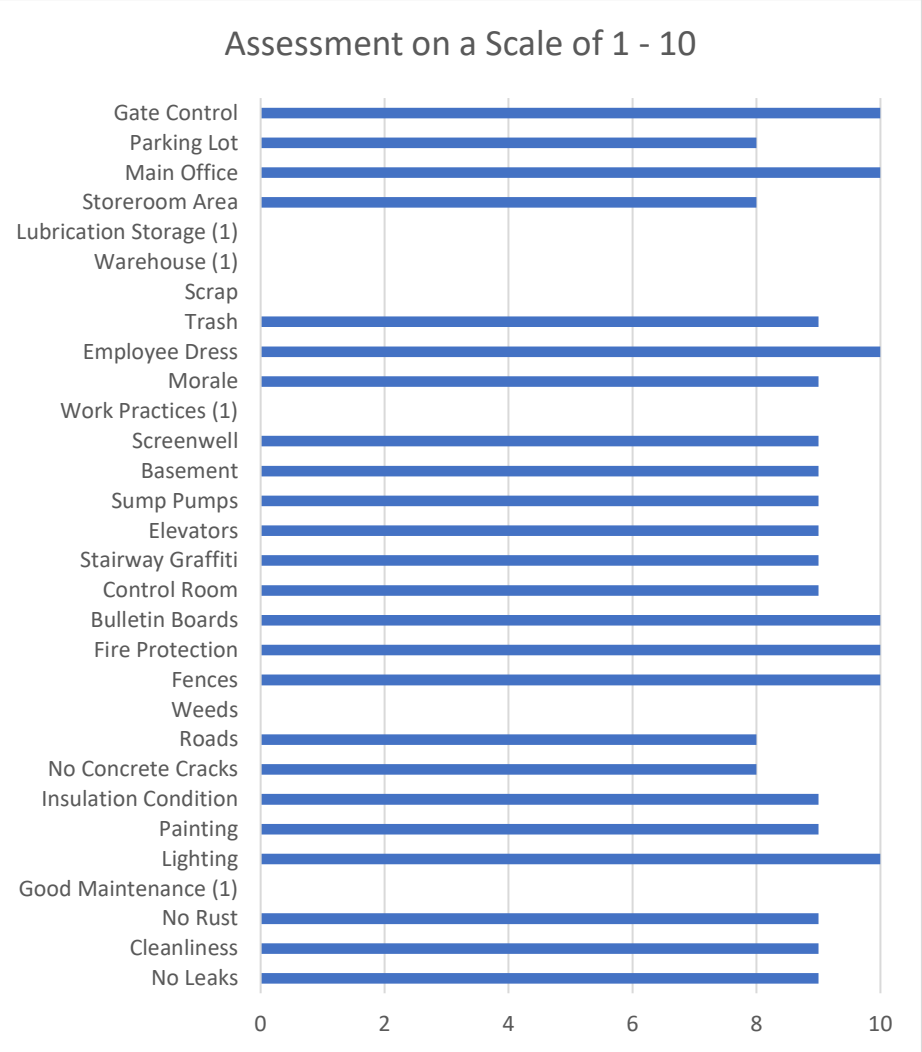
Guide Name: Mandy LaBlanc, Senior Manager, Pumping Operations

Positive Observations: None

Negative Observations: None

Average Score: 9.1

Photo A.12: Main Pumping Station – odor control (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Stormwater System Facilities

Blue Plains Treatment

Site Inspection Score Sheet

Name: Darryl Noakes

Date Visited: March 9, 2023

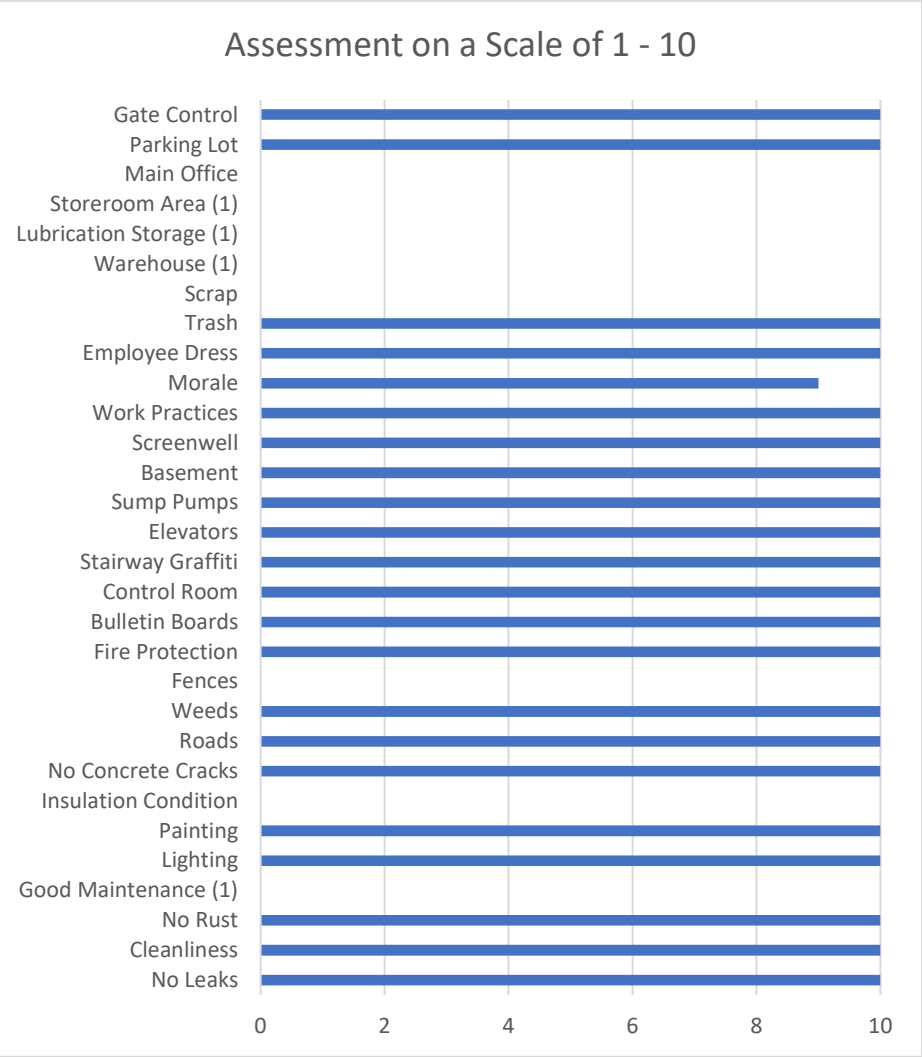
Guide Name: Ryu Suzuki, Manager, Process Engineering

Positive Observations: Facilities are very orderly and well maintained.

Negative Observations: None

Average Score: 10.0

Photo A.13: Blue Plains AWWTP Stormwater Tunnel Pumping Station – pump suction header (PEER photo)



Note:
(1) See DC Water: Asset Management brings value to the Wastewater Cluster

Blue Plains Tunnel

Site Inspection Score Sheet

Name: Thomas Chase

Date Visited: April 6, 2023

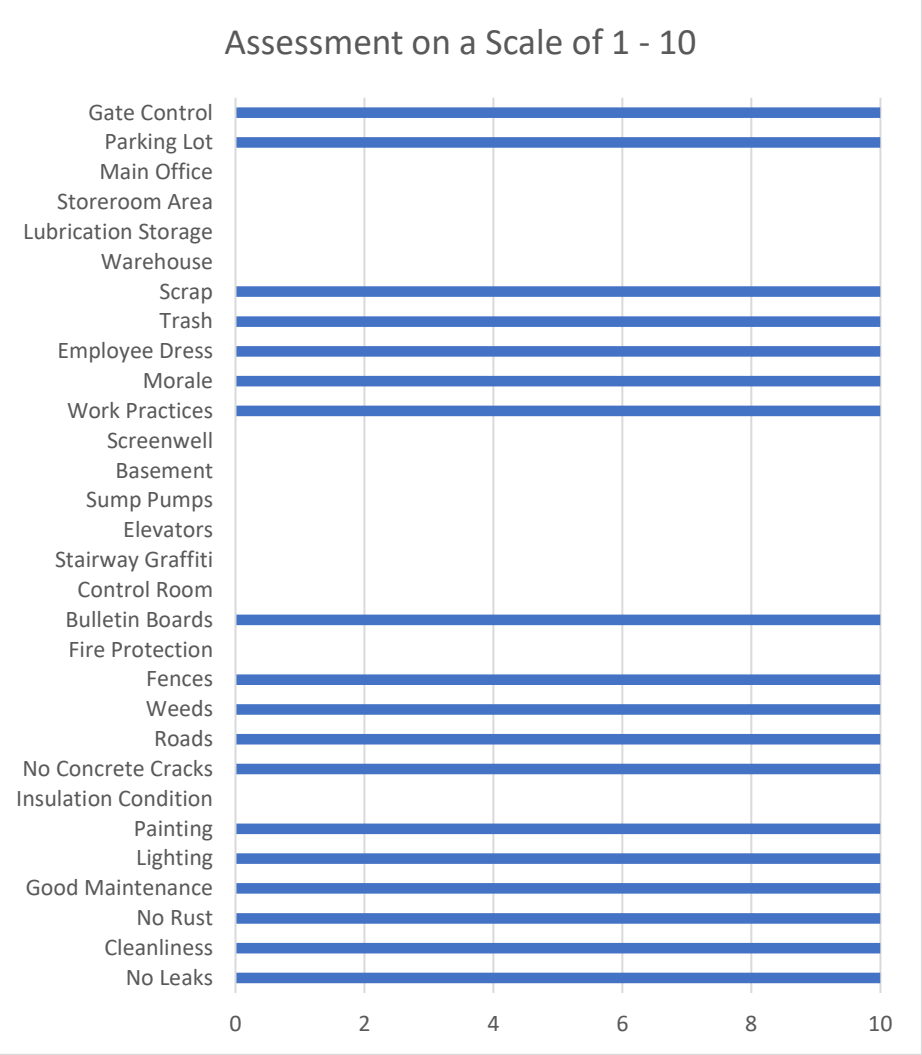
Guide Name: John Beesley, Program Manager, Tunnel Construction

Positive Observations: None

Negative Observations: None

Average Score: 10

Photo A.14: Blue Plains Tunnel Main Pump Station – drop shaft facility, tingly square (PEER photo)



Rock Creek Project B

Site Inspection Score Sheet

Name: Thomas Chase

Date Visited: April 6, 2023

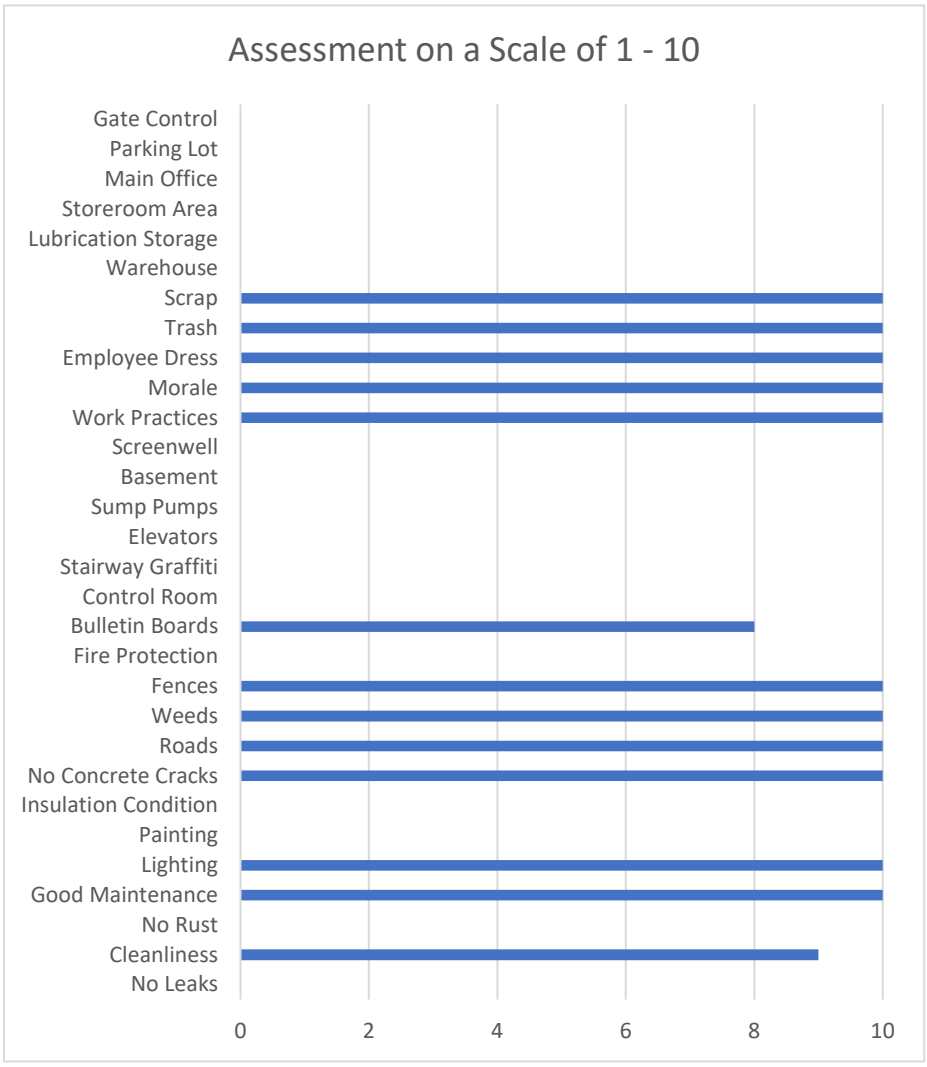
Guide Names: Seth Charde, Program Manager, Green Infrastructure, and John Beesley, Program Manager, Tunnel Construction

Positive Observations: Well-run construction program, using refined designs, with lessons learned incorporated.

Negative Observations: Minor debris at active construction site. No signage on completed project sites visited, but DC Water maintains robust public interaction campaign.

Average Score: 9.8

Photo A.15: Rock Creek Project B – permeable pavement installed in an alley (PEER photo)



CSO 021 Diversion Facilities Projects

Site Inspection Score Sheet

Name: Thomas Chase

Date Visited: April 6, 2023

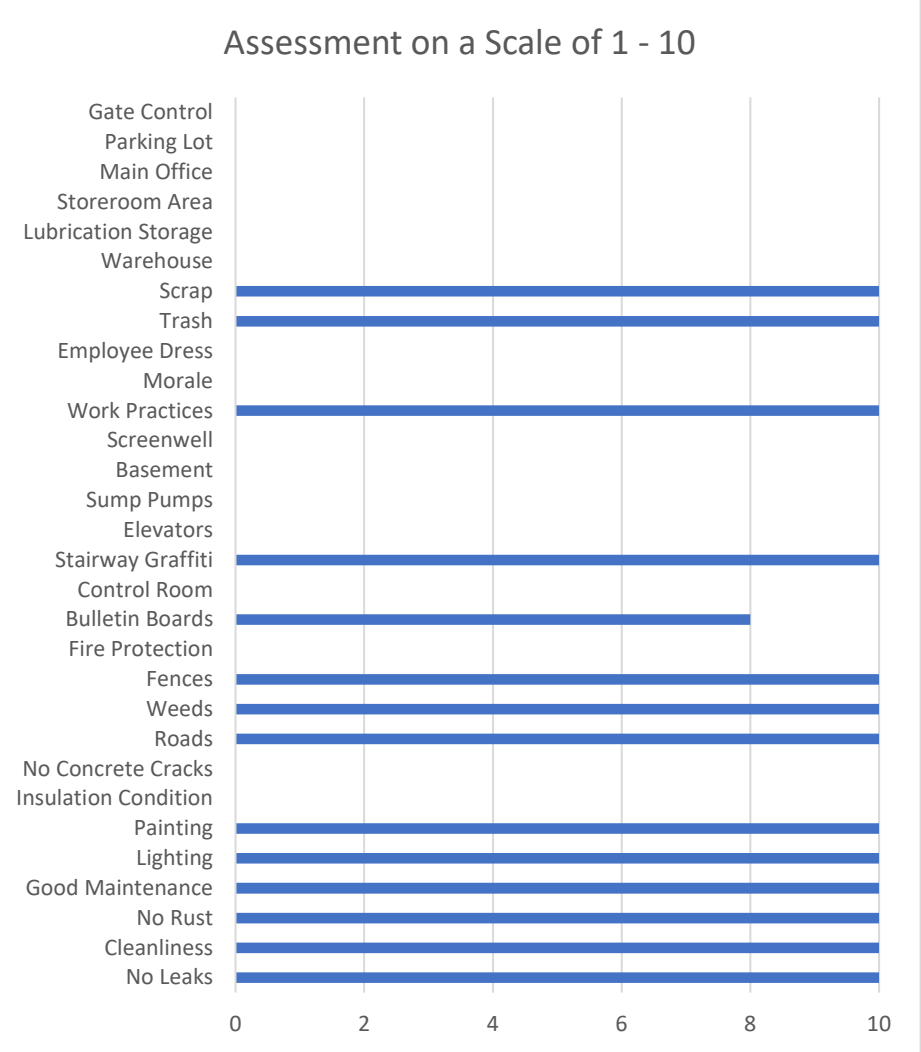
Guide Name: John Beesley, Program Manager, Tunnel Construction

Positive Notes: CSO 021 project visited during pause in construction. Three years estimated to final completion.

Negative Observations: Limited options for signage due to shared site with Kennedy Center.

Average Score: 9.9

Photo A.16: CSO 021 Diversion Facilities (DC Water photo)



Bibliography

Documents

AECOM for DC Water (2022), DC Water/AECOM Wastewater Top-Down Risk Ranking (PowerPoint).

American Water Works Association (2021), Water and Wastewater Rate Survey.

American Water Works Association (2022), Benchmarking Performance Indicators for Combined Utilities 2022 (FY21) Data Set – Final Participant Report.

Blue Drop LLC (2022), 2022 DC Water Financial Reporting/Annual Comprehensive Financial Reports.

Blue Drop LLC (2022), 2022 Performance Oversight Report.

DC WASA (2003), Annual Report for Fiscal Year 2003.

DC Water (2015), Water System Facilities Plan Update.

DC Water (2019, September), Department of Pumping and Sewer Operations Re-Alignment (PowerPoint).

DC Water (2021, April), Biannual Report April 2021 Combined Sewer Overflow (CSO) Control Activities, Clean Rivers Project.

DC Water (2021), 25-Year Journey to World Class – Annual Report 2021.

DC Water (2021), 2021 Pretreatment Annual Report.

DC Water (2021, July 24), Blueprint 2.0 – DC Water's 2022-2027 Strategic Plan.

DC Water (2021, October), Biannual Report October 2021 Combined Sewer Overflow (CSO) Control Activities, Clean Rivers Project.

DC Water (2021, December 23), ESG Report 2021 (Environmental, Social, and Governance).

DC Water (2022, April), Biannual Report April 2022 Combined Sewer Overflow (CSO) Control Activities, Clean Rivers Project.

DC Water (2022), 2022 Performance Oversight Questions and Responses.

DC Water (2022, December 30), DC Water's Office of Emergency Management (PowerPoint).

DC Water (2022, March 3), DC Water Approved FY 2023 Budget.

DC Water (2022, July 28), Board of Directors Audit and Risk Committee Agenda and Meeting Package.

DC Water (2022, June 14), New Procurement Organization: Center of Excellence (PowerPoint).

DC Water (2022, October), Biannual Report October 2022 Combined Sewer Overflow (CSO) Control Activities, Clean Rivers Project.

DC Water (2022, October), Integrated Supply Chain Management Presentation to DC Water Environmental Quality and Operations Committee, and to Finance and Budget Committee.

DC Water (2023), 2023 Linear Water Facilities Plan.

DC Water (2023, March 2), DC Water Approved FY 2024 Budget.

DC Water (2023, March 2), FY22 ESG+R Report (Environmental, Social, and Governance + Risk).

DC Water (2023, March 18), Energy and Carbon at DC Water (PowerPoint).

DC Water (2023, March), Lead Free DC (PowerPoint).

DC Water (2023, May), CEO's Report.

DC Water (2023, June), Lead Service Line Replacement Plan.

District of Columbia Water and Sewer Authority Board of Directors (2021, October 7), Approval of Revised Statement of Financial Policies and Debt Policy and Guidelines, Resolution #21-84.

District of Columbia Water and Sewer Authority Board of Directors (2022, July 7), Approval to Publish Notice of Final Rulemaking for New and Amended Fees and Charges, Resolution #22-44.

District of Columbia Water and Sewer Authority Board of Directors (2023, May 4), Meeting Agenda and Materials.

District Department of Energy and Environment (2016, August), Consolidated Total Maximum Daily Load (TMDL) Implementation Plan Report (Revised Draft)

Energy Star, U.S. Environmental Protection Agency and U.S. Department of Energy (2018, August), ENERGY STAR Score for Wastewater Treatment Plants in the United States (ENERGY STAR Score for Wastewater Treatment Plants in the United States).

Fitch Ratings (2022, January 27), Fitch Rates the District of Columbia Water & Sewer Authority's Revs at 'AA'; Outlook Stable

Gadis, David, Chief Executive Officer, and Brown, Matthew, Chief Financial Officer (2022, March 24), DC Water's Green Bond Report, Fiscal Year 2021.

Gadis, David, Chief Executive Officer, and Brown, Matthew, Chief Financial Officer (2021), DC Water's Annual Comprehensive Financial Report 2022 – Fiscal Years Ended September 30, 2022, and 2021.

Johnson, Mirmiran & Thompson Inc. for DC Water (2018, March 27), 2018 Independent Engineering Inspection of the DC Water Wastewater and Water System.

Kuczynski, Thomas, Vice President, Information Technology (2021, July 15), DC Water Cyber Security and Resilience (PowerPoint).

Metcalf & Eddy | AECOM (2007), Blue Plains Total Nitrogen Removal/Wet Weather Plan.

Moody's (2022, January 31), Moody's Assigns Aa2 to the DC Water and Sewer Authority's Public Utility Subordinate Lien Revenue Bonds Series 2022 B, C, D & E; outlook stable.

Mott MacDonald for DC Water (2022, July 22), Asset Management Buried Infrastructure (AMBI), Small Diameter Water Main Renewal Program, Planning Phase.

National Association of Clean Water Agencies (2021, July), 2020 Financial Survey members report provided by DC Water.

S&P Global (2022, February 1), District of Columbia Water and Sewer Authority, Washington, DC; CP; Water/Sewer.

Tesfaye, Aklile, Vice President, Wastewater Treatment Operations (2022, September 15), Blue Plains Complete Treatment Performance, Environmental Quality and Operations Committee (PowerPoint).

U.S. District Court for the District of Columbia (2015, May 19), First Amendment to the 2005 Long Term Control Plan Consent Decree.

U.S. District Court for the District of Columbia (2020, December 22), First Amended Appendix F Green Infrastructure Program for the Potomac and Rock Creek Sewersheds.

U.S. Army Corps of Engineers (2022, April 1), DC Water FY22 Water Rate.

U.S. Army Corps of Engineers (2023, February 1) Washington Aqueduct Fact Sheet.

U.S. Army Corps of Engineers (2023, January 12), Washington Aqueduct, Bill for Water Supplied to the District of Columbia.

U.S. EPA (2017, September 1), NPDES Permit Reissuance, District of Columbia Water and Sewer Authority Wastewater Treatment Plant at Blue Plains, Washington, DC, Permit No. DC0021199.

U.S. EPA (2018, August 26), Authorization to Discharge Under the National Pollutant Discharge Elimination System, Permit No. DC0021199.

Water Research Foundation (2005, August 11), Succession Planning for a Vital Workforce in the Information Age.

Wone, Moussa, Vice President, DC Clean Rivers Project (2023, March 30), DC Clean Rivers Project PEER –Bond Indenture Assessment (PowerPoint).

Interviews

Bae, Dan, Vice President, Procurement and Compliance, and Rudy Gonzalez, Director of Procurement, Capital Programs (2023, April 14). Procurement Interview. (Interviewers: Myron Olstein, John Corliss, and Larry Kulick)

Brown, Matthew, Chief Financial Officer and Executive Vice President, Finance and Procurement (2023, March 1). Financial Office Interview. (Interviewers: Myron Olstein, John Corliss, and Larry Kulick)

Elledge, William, Director of Engineering and Technical Services (2023, April 20). Lead Free DC Interview. (Interviewers: Myron Olstein, John Corliss, and Joyce McDonald)

Griffith, Wayne, Chief Administrative Officer and Executive Vice President (2023, March 14). Strategy and Performance Interview. (Interviewer: Myron Olstein)

Hope, Gregory, Deputy General Counsel (2023, February 2). General Counsel Interview. (Interviewers: Myron Olstein, John Corliss, and Larry Kulick)

Hughes, Jason, Vice President, Water Operations, and Maureen Schmeling, Director, Water Quality (2023, February 17). Water Systems Interview. (Interviewer: Myron Olstein)

Kharkar, Salil, Vice President, Senior Operations Advisor (2023, April 14), Management and Operations Interview (Interviewer: Myron Olstein)

Kuczynski, Thomas, President, Blue Drop LLC, and Francesca Valente, Vice President and General Manager, Blue Drop LLC (2023, March 29). Blue Drop Interview. (Interviewers: Myron Olstein, John Corliss, and Joyce McDonald)

Kuczynski, Thomas, Vice President, Information Technology, Joe Edwards, Director, Information Technology Enterprise Solutions, Nelson Sims, Director, Cybersecurity, and William Ryan, Webmaster (2023, March 14). Information Technology, Cybersecurity and Smart Systems. (Interviewers: Myron Olstein, John Corliss, and Chandra Vavilala)

Lorick, Meisha, Acting Director, Customer Care (2023, March 21). Customer Care Interview. (Interviewers: Myron Olstein, John Corliss, and Larry Kulick)

Parker, Dave, Vice President, Engineering (2023, March 15). Engineering and Asset Management Interview. (Interviewers: Myron Olstein and John Corliss)

Peot, Chris, Director, Resource Recovery, and Saul Kinter, Program Manager, Business Development (2023, March 13). Energy Efficiency, Renewable Energy, and Resource Recovery Interview. (Interviewers: Myron Olstein, John Corliss, and Marija Stefanovic)

Quaofio, Richard, Program Manager, Facilities—Central Administration, Energy Systems (2023, March 6). Energy Systems. (Interviewer: Marija Stefanovic)

Ries, Matthew, Vice President, Strategy and Performance, and Maureen Holman, Vice President, Shared Services, (2023, March 10). Climate Change and Resilience Interview. (Interviewers: Myron Olstein and John Corliss)

Sharp, Sigi, Manager, Construction and Repair Services (2023, March 5). Stormwater System Interview. (Interviewers: Myron Olstein and John Corliss)

Spears, George, Vice President of Labor Relations and Compliance (2023 March 20). Labor Relations and Compliance Interview. (Interviewers: Myron Olstein and John Corliss)

Tesfaye, Aklile, Vice President, Wastewater Treatment Operations, Kendrick StLouis, Vice President, Sewer and Pumping Operations, Nicholas Passarelli, Vice President, Wastewater Operations, and Elkin Hernandez, Director, Maintenance Services, (2023, March 31). Sewer Operations Interview. (Interviewers: Myron Olstein and John Corliss)

Wone, Moussa, Vice President, Clean Rivers Project (2023, March 20). DC Clean Rivers Project Interview. (Interviewers: Myron Olstein and John Corliss)

Site Evaluations

Beesley, John, Program Manager, Tunnel Construction (2023, April 6), Blue Plains Stormwater Tunnel Site Inspection. (Thomas Chase, Evaluator)

Beesley, John, Program Manager, Tunnel Construction (2023, April 6), CSO 021 Diversion Facilities Projects Site Inspection. (Thomas Chase, Evaluator)

Charde, Seth, Program Manager, Green Infrastructure, and John Beesley, Program Manager, Tunnel Construction (2023, April 6), Fort Reno Reservoir Site Inspection. (Thomas Chase, Evaluator)

Charde, Seth, Program Manager, Green Infrastructure, and John Beesley, Program Manager, Tunnel Construction (2023, April 6), Rock Creek Project B Site Inspection. (Thomas Chase, Evaluator)

Christ, Brent, Construction Supervisor (2019, January 1), Headquarters Administration Building (HQO) Site Inspection. (Marija Stefanovic, Evaluator)

LaBlanc, Mandy, Senior Manager, Pumping Operations (2023, March 15), Main Pumping Station Site Inspection. (Darryl Noakes, Evaluator)

LaBlanc, Mandy, Senior Manager, Pumping Operations (2023, March 15), O Street Wastewater Pumping Station Site Inspection. (Darryl Noakes, Evaluator)

Passarelli, Nick, Vice President, Wastewater Operations (2023, March 9), Blue Plains AWWTP Control Center Site Inspection. (Darryl Noakes, Evaluator)

Passarelli, Nick, Vice President, Wastewater Operations (2023, March 9), Blue Plains AWWTP Preliminary Treatment Site Inspection. (Darryl Noakes, Evaluator)

Passarelli, Nick, Vice President, Wastewater Operations (2023, March 9), Blue Plains AWWTP Primary Treatment Site Inspection. (Darryl Noakes Evaluator)

Passarelli, Nick, Vice President, Wastewater Operations (2023, March 9), Blue Plains AWWTP Secondary Treatment Site Inspection. (Darryl Noakes, Evaluator)

StLouis, Kenrick, Vice President, Sewer and Water Pumping Operations (2023, March 3), Bryant Street Water Pumping Station Site Inspection. (Darryl Noakes, Evaluator)

Suzuki, Ryu, Manager, Process Engineering (2023, March 9), Blue Plains Stormwater Treatment Site Inspection. (Darryl Noakes, Evaluator)

Suzuki, Ryu, Manager, Process Engineering (2023, March 10), Blue Plains AWWTP Advanced Wastewater Treatment Site Inspection. (Darryl Noakes, Evaluator)

Suzuki, Ryu, Manager, Process Engineering (2023, March 10), Blue Plains AWWTP Solids Treatment Site Inspection. (Darryl Noakes, Evaluator)

Wilson, Calvert, Supervisor (2023, March 17), Anacostia Water Pumping Station Site Inspection. (Darryl Noakes, Evaluator)

Websites

Cybersecurity and Infrastructure Security Agency (CISA), U.S. Department of Homeland Security (DHS), Cybersecurity best practices | Cybersecurity and Infrastructure Security Agency CISA

Cybersecurity and Infrastructure Security Agency (CISA), U.S. Department of Homeland Security (DHS), Critical Infrastructure Security and Resilience | Cybersecurity and Infrastructure Security Agency CISA

DC Water, About Our Projects, Projects | DCWater.com

DC Water, Blue Plains Floodwall Project, www.DCWaterater.com/projects/blue-plains-floodwall

DC Water, Blue Plains Wastewater Treatment Plant, The Largest Advanced Wastewater Treatment Plant in the World | DCWaterater.com

DC Water, Capital Improvement Dashboard Capital Improvement Dashboard | DCWater.com

DC Water, Clean Rivers Project, Clean Rivers Project | DCWater.com

DC Water, CSO 025 / 026 Sewer Separation Project, CSO 025 / 026 Sewer Separation Project | DCWater.com

DC Water, Open Data Portal, Open Data Portal | DCWater.com

DC Water, Pipe Materials Dashboard, Pipe Materials Dashboard | DCWater.com

DC Water, Sanitary Sewer Dashboard, Sanitary Sewer Dashboard | DCWater.com

DC Water Service Line Materials Dashboard, Service Line Materials Dashboard | DCWater.com

DC Water, Wastewater Collection System, Wastewater Flows From as far as Dulles Airport to Blue Plains | DCWater.com

DC Water, Water Hydrant Dashboard, Water Hydrant Dashboard | DCWater.com

DC Water, Water Main Breaks Dashboard, Water Main Breaks Dashboard | DCWater.com

District Department of Energy and Environment, Watershed Implementation Plans | doee (dc.gov)

International Financial Reporting Standards Foundation, Get to grips with the six capitals | Integrated Reporting

United Nations, Department of Economic and Social Affairs Sustainable Development, THE 17 GOALS | Sustainable Development (un.org)

United Nations, Department of Economic and Social Affairs Sustainable Development, City Water Resilience Approach (CWRA) | Department of Economic and Social Affairs (un.org)

U.S. Army Corps of Engineers, Baltimore District > Missions > Washington Aqueduct (army.mil)

USAID, Drivers of Change approach developed by the UK Department of International Development, Drivers of Change | USAID Learning Lab

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (2015, October 9), "A National First in Community Waste to Energy in our Nation's Capital," www.energy.gov/eere/articles/national-first-community-waste-energy-our-nations-capital