Overview of FY2019 – FY2028 CIP
Environmental Quality and Operations Committee
October 17, 2019
Adam Ortiz, Committee Chair
District of Columbia Water and Sewer Authority
Leonard Benson, Senior Vice President and Chief Engineer

Small Diameter Water Main unlined Cast Iron pipe

10th St at Otis St, NE (10" VCP, deformed, broken)

Budget Theme: Stewardship, Accountability & Sustainability
• Build remaining tunnels to continue to dramatically improve the health of the District waterways, meet the consent decree requirements and reduce the flooding risk in Northeast DC

• Rehabilitate wastewater treatment facilities to ensure we continue to meet our permit requirements and protect the Potomac River and Chesapeake Bay.

• Achieve 1% replacement of water lines per year, to improve water quality, maintain fire protection and help reduce the number of water main breaks

• Ramp up to 1% rehabilitation of sewer pipes per year, and upgrade pump stations to prevent failures and service disruptions

• Maintain equipment reliability for operational facilities, large vehicles, renovations, and technology software/hardware projects to ensure delivery of critical water and sewer services

• Address critical infrastructure needs at the Washington Aqueduct to continue to meet EPA safe drinking water requirements

• Replace HVACs & Roofs, and upgrades to Main & O Seawall, historic restoration work and other non-process facilities

• Rehabilitate the stormwater pump stations that protect low lying roadway from flooding.
1) FY19 & FY20 Total spending for each year has been kept at FY18-27 board approved baseline levels to remain congruent with previously approved 5% rate increases

2) Ramp-up to modified Baseline CIP beginning in FY21

<table>
<thead>
<tr>
<th>Service Area ($000's)</th>
<th>FY19</th>
<th>FY20</th>
<th>FY21</th>
<th>FY22</th>
<th>FY23</th>
<th>FY24</th>
<th>FY25</th>
<th>FY26</th>
<th>FY27</th>
<th>FY28</th>
<th>10-Yr Total</th>
<th>Last Year's CIP</th>
<th>(Increase)/Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater Treatment</td>
<td>69,979</td>
<td>66,620</td>
<td>76,510</td>
<td>97,635</td>
<td>110,047</td>
<td>82,434</td>
<td>81,249</td>
<td>133,338</td>
<td>123,351</td>
<td>978,738</td>
<td>855,948</td>
<td>(122,790)</td>
<td></td>
</tr>
<tr>
<td>Clean Rivers</td>
<td>187,859</td>
<td>147,208</td>
<td>139,786</td>
<td>191,573</td>
<td>151,411</td>
<td>64,415</td>
<td>55,689</td>
<td>144,295</td>
<td>97,067</td>
<td>1,262,589</td>
<td>1,313,196</td>
<td>50,607</td>
<td></td>
</tr>
<tr>
<td>Combined Sewer</td>
<td>7,491</td>
<td>4,219</td>
<td>9,444</td>
<td>8,015</td>
<td>8,646</td>
<td>13,520</td>
<td>8,852</td>
<td>5,800</td>
<td>5,593</td>
<td>7,598</td>
<td>79,178</td>
<td>119,151</td>
<td>39,973</td>
</tr>
<tr>
<td>Stormwater</td>
<td>4,220</td>
<td>8,571</td>
<td>8,118</td>
<td>8,586</td>
<td>3,725</td>
<td>4,987</td>
<td>7,564</td>
<td>7,494</td>
<td>7,593</td>
<td>10,012</td>
<td>68,608</td>
<td>24,452</td>
<td>(44,156)</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>44,927</td>
<td>43,646</td>
<td>57,249</td>
<td>85,588</td>
<td>97,220</td>
<td>98,194</td>
<td>115,011</td>
<td>140,020</td>
<td>957,135</td>
<td>532,490</td>
<td>(424,645)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>61,884</td>
<td>71,720</td>
<td>96,300</td>
<td>101,039</td>
<td>84,395</td>
<td>96,491</td>
<td>103,325</td>
<td>106,145</td>
<td>118,378</td>
<td>945,015</td>
<td>730,672</td>
<td>(214,343)</td>
<td></td>
</tr>
<tr>
<td>Capital Equipment</td>
<td>34,518</td>
<td>26,823</td>
<td>36,907</td>
<td>33,086</td>
<td>32,725</td>
<td>36,680</td>
<td>35,540</td>
<td>35,426</td>
<td>34,339</td>
<td>34,279</td>
<td>340,324</td>
<td>198,133</td>
<td>(142,191)</td>
</tr>
<tr>
<td>Washington Aqueduct</td>
<td>12,930</td>
<td>15,532</td>
<td>15,909</td>
<td>15,536</td>
<td>35,006</td>
<td>14,830</td>
<td>32,731</td>
<td>9,034</td>
<td>12,298</td>
<td>23,321</td>
<td>187,127</td>
<td>120,052</td>
<td>(67,075)</td>
</tr>
<tr>
<td>ADDITIONAL CAPITAL PROGRAMS</td>
<td>47,448</td>
<td>42,355</td>
<td>52,816</td>
<td>48,622</td>
<td>67,731</td>
<td>51,509</td>
<td>68,272</td>
<td>44,461</td>
<td>46,637</td>
<td>57,600</td>
<td>527,450</td>
<td>318,185</td>
<td>(209,265)</td>
</tr>
<tr>
<td>Last Year's CIP</td>
<td>439,118</td>
<td>420,342</td>
<td>402,681</td>
<td>445,647</td>
<td>385,312</td>
<td>326,284</td>
<td>318,360</td>
<td>349,427</td>
<td>375,004</td>
<td>4,002,126</td>
<td>(954,655)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FY19-28 CIP Overview

1. Modified Baseline CIP

   1) FY19 & FY20 Total spending for each year has been kept at FY18-27 board approved baseline levels to remain congruent with previously approved 5% rate increases.

   2) Ramp-up to modified Baseline CIP beginning in FY21.
## Asset Management Based Investment Needs

<table>
<thead>
<tr>
<th>Service Area</th>
<th>Replacement Value ($M)</th>
<th>Min. Annual Investment (%)</th>
<th>Min. Annual Investment ($M)</th>
<th>Average Annual Asset Management Based Investment ($M)</th>
<th>Average Annual BOD Approved Modified AM Investment ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater</td>
<td>$4,786</td>
<td>2.0%</td>
<td>$96</td>
<td>$120</td>
<td>$107</td>
</tr>
<tr>
<td>Water</td>
<td>$5,599</td>
<td>1.5%</td>
<td>$84</td>
<td>$134</td>
<td>$83</td>
</tr>
<tr>
<td>Sewer</td>
<td>$9,967</td>
<td>1.5%</td>
<td>$149</td>
<td>$180</td>
<td>$98</td>
</tr>
<tr>
<td>Facilities</td>
<td>$229</td>
<td>2.0%</td>
<td>$5</td>
<td>$7</td>
<td>$7</td>
</tr>
</tbody>
</table>

Does not include all CIP programs such as DC Clean Rivers

1 – 2019 dollars
2 – Includes Minimum Investment as well as asset management recommended investment required due to age of the system
3 – Approved by DC Water BOD on April 4, 2019
<table>
<thead>
<tr>
<th>Service Area</th>
<th>Current Baseline $3.8B</th>
<th>Modified Baseline $4.4B</th>
<th>Asset Management $5.4B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Rivers</td>
<td>Fully funded to meet Consent Decree</td>
<td>Fully funded to meet Consent Decree</td>
<td>Fully funded to meet Consent Decree</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Generally funded to meet NPDES Permit and established levels of service</td>
<td>Fully funded to meet NPDES Permit and established levels of service</td>
<td>Fully funded to meet NPDES Permit and established levels of service</td>
</tr>
<tr>
<td>Stormwater</td>
<td>Underfunded</td>
<td>Fully funded</td>
<td>Fully funded</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump Stations &amp; Storage Facilities</td>
<td>Generally funded to current service levels</td>
<td>Generally funded</td>
<td>Fully funded</td>
</tr>
<tr>
<td>Small Diameter WMs</td>
<td>Underfunded; (Funded to meet 1% replacement/rehab goal [11 mi/year]), but only 0.7% a year at full replacement</td>
<td>Underfunded; (Funded to meet 1% per year replacement level - increased cost is due to switch to full replacement [11 mi/year])</td>
<td>Fully funded to ramp up to 2% replacement level [22 mi/year]</td>
</tr>
<tr>
<td>Large Diameter WMs</td>
<td>Generally funded</td>
<td>Generally funded</td>
<td>Generally funded</td>
</tr>
<tr>
<td>Sewer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Underfunded</td>
<td>Fully funded</td>
<td>Fully funded</td>
</tr>
<tr>
<td>Sewer Lines &lt; 60” dia.</td>
<td>Substantially underfunded [0.35%; 6.2 mi/year]</td>
<td>Underfunded (Funded to ramp up to 1.0% per year rehabilitation level [17.5 mi/year] by FY23</td>
<td>Fully funded to ramp up to 2.3% rehabilitation level [40 mi/year]</td>
</tr>
<tr>
<td>Sewer Lines ≥ 60”</td>
<td>Generally Funded</td>
<td>Generally Funded</td>
<td>Generally Funded</td>
</tr>
<tr>
<td>Non Process</td>
<td>Fully funded for HQ, Fleet and Sewer Operations Facilities, Otherwise Underfunded</td>
<td>Fully funded</td>
<td>Fully funded</td>
</tr>
</tbody>
</table>

'Generally Funded' = What we know or expect to find can be rehabilitated
'Underfunded' = What we know or expect to find is not all funded
‘Fully Funded’ = All needs known or expected are met
What we achieve with the Modified Baseline Plan in FY21 and beyond?

The Modified Baseline CIP balances financial and affordability concerns with additional investment in our assets that begin to address aging water and sewer infrastructure during this 10 year period.

- **Non Process Facilities** - $58 million increase
  - Additional facilities needs including HVAC and roof rehabilitation
- **Wastewater** - $95 million increase
  - Upgrades to Effluent Filters, Secondary and Nitrification treatment processes
- **Stormwater** - $35 million increase
  - Upgrading of storm water pump stations, increasing from $1M/year to an average of $5M/year from FY20 onwards
Sanitary Sewers - $314 million increase

- Condition Assessment:
  - Local Sewers (<60-in), from 35 mi/year to 69 mi/year (50-year cycle to 25-year cycle)
  - Major Sewers (≥60-in), from 7 mi/year to 11 mi/year (25-year cycle to 15-year cycle)

- Rehabilitation:
  - Local Sewers (<60-in), 6 mi/year to 17.5 mi/year
  - Major Sewers (≥60-in), funds address what we know or expect to find
  - Sewer On-going (funding for emergency repairs), increased by 32% (from $11M/year to $14.5M/year)

Water - $154 million increase

- Rehabilitation:
  - Small Dia. Water Mains (<16-in), from 8 mi/year to 11 mi/year
  - Lead Service Lines Replacement, from 150 to 1,000 in public space
  - Water On-going (funding for emergency repairs), increased by 45% (from $11M/year to $16M/year)
Vertical assets (pump stations and treatment processes)
- Use a Reliability Centered Maintenance to extend asset life
- Focus dollars on critical assets using analytical techniques

Water Distribution system (pipes) Inspections and replacements
- Based on calculated Consequence and Likelihood of Failure
- Small diameter water mains based on water quality complaints and break history
- Large diameter water mains based on condition assessment results

Sewer Collection system (pipes) Inspections and rehabilitation
- Based on calculated Consequence and Likelihood of Failure
- Based on condition assessment results

Facilities rehabilitation based on condition assessment results
Average Age: 82 years

- Brick/CP-L: 11 mi; 1.6%
- Brick/CP-S: 26 mi; 3.8%
- RCP-L: 42 mi; 6.2%
- RCP-S: 45 mi; 6.6%
- VCP/Other-L: 12 mi; 1.8%
- VCP/Other-S: 541 mi; 80%

Years: 0 10 20 30 40 50 60 70 80 90 100 110 120 130

Service Life Expectancy - [Red Bar]
Average Age - Current - [Black Bar]
Consequence of Failure (COF) and Likelihood of Failure (LOF) Scores
Combined, Sanitary and Storm Sewer Systems - Pipe Size Distribution

- SMALL PIPES (6" ≤ Diameter ≤ 24")
- LARGE PIPES (24" < Diameter ≤ 60")
- VERY LARGE PIPES (60" ≥ Diameter)

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Risk Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest</td>
<td>1 - 15</td>
</tr>
<tr>
<td>Lower</td>
<td>15.01 - 27</td>
</tr>
<tr>
<td>Moderate</td>
<td>27.01 - 37</td>
</tr>
<tr>
<td>Higher</td>
<td>37.01 - 48</td>
</tr>
<tr>
<td>Highest</td>
<td>48.01 - 100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size Category</th>
<th>Number of Segments</th>
<th>Length in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>61,792</td>
<td>1,291</td>
</tr>
<tr>
<td>Large</td>
<td>20,512</td>
<td>396</td>
</tr>
<tr>
<td>Very Large</td>
<td>6,012</td>
<td>208</td>
</tr>
</tbody>
</table>

Risk Score = 48
Risk Score = 37
Risk Score = 27
Risk Score = 15

*Risk analysis results current as of May 2016
Sewer Collection System Failures

Watergate Center
Overflow
MH 36870 Firth Stirling
Basement Backup
Basement Backup
Small Diameter Water Mains

Average Age and Service Life Expectancies by SDWM Cohort type - FY2018

- **Ductile Iron**: Average age 81 Years
  - 148 mi; 14%
  - 19 years remaining service life

- **Lined Spun Cast Iron**:
  - 215 mi; 20%
  - 369 mi; 35%

- **Unlined Spun Cast Iron**:
  - 331 mi; 31%
  - 14 years remaining service life

- **Unlined Pit Cast Iron**:
  - Years
  - Service Life Expectancy
  - Average Age
Consequence of Failure (COF) and Likelihood of Failure (LOF) Scores®
Water System - Pipe Size Distribution

- **SMALL PIPES** (Diameter ≤ 12")
- **LARGE PIPES** (12" < Diameter ≤ 48")
- **VERY LARGE PIPES** (48" < Diameter )

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Risk Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest</td>
<td>1 - 14.99</td>
</tr>
<tr>
<td>Lower</td>
<td>15 - 21.99</td>
</tr>
<tr>
<td>Moderate</td>
<td>22 - 25.99</td>
</tr>
<tr>
<td>Higher</td>
<td>26 - 31.99</td>
</tr>
<tr>
<td>Highest</td>
<td>32 - 100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size Category</th>
<th>Number of Segments</th>
<th>Length ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>55,349</td>
<td>902</td>
</tr>
<tr>
<td>Large</td>
<td>10,207</td>
<td>206</td>
</tr>
<tr>
<td>Very Large</td>
<td>73</td>
<td>9</td>
</tr>
</tbody>
</table>

Risk Score = 32 *Risk Analysis Results Current as of September 2016
Water Distribution System Failures

Q St. NW
Q St. NW
Q St. NW
6th St SW
6th St SW
Proactive investment strategy minimizes direct (DC Water) cost and social & environmental (community impact) costs:

- Reactive approach has about a 1.5-fold to over 15-fold increase in direct costs to DC Water when compared to a proactive (planned) approach
- Reactive approach has about a 5-fold to 19-fold increase in socioeconomic costs to the community, when compared to a proactive (planned) approach

Emergency repairs on linear assets do not extend the service life of the repaired asset
- Generally does not address the root problem or cause
- Is wasted money when more comprehensive proactive project is done

Repeated emergency repairs and associated impacts can negatively impact DC Water’s reputation and customer confidence
CIP Risks/Sensitivities (Unfunded)

- **Washington Aqueduct**
  - FY2019-2030 Proposed CIP ($291M, DC Water share = $218M)
  - Federally Owned Water Main Repairs ($86M, all DC Water)
  - Travilah Quarry Acquisition & Outfitting ($284M, cost sharing unknown)
  - Advanced Treatment Facilities ($540M, DC Water share = $405M)

- **Blue Plains Process Optimization & Revenue Opportunities**
  - Full Plant Deammonification (> $60M)
  - Resource Recovery (Hot Water Heating Loop; Sludge Drying)

- **Water and Sewer**
  - Lead Service Replacement Program
  - Second Water Source
  - Pepco DC Power Line Undergrounding (DC PLUG) – ($57M, DC Water Share is 50% = $28M)
  - Condition assessment of large sewers could lead to additional CIP needs
Regulatory/Consent Decree/Permitting:

- E. Coli Total Maximum Daily Load (TMDL) – lawsuit by environmental groups seeking more restrictive TMDL
- MS4 permit - repair of Stormwater Outfalls, total scope and cost unknown (currently $5M approved)
- National Parks Service permitting requirements for sewer projects
- Anacostia River Sediment Clean-up
- Chesapeake Bay TMDL – Phase 3 Watershed Implementation Plans being prepared, possible TMDL reassessment in the future
- Green Infrastructure (GI) Practicability Assessment - Clean Rivers practicability assessment of GI to be performed in 2020. Currently, construction of GI in the District is more expensive than originally estimated
- SSOs – risk of SSO Consent Decree
- Blue Plains Odor Control