Resource Recovery at DC Water

National Association of State Energy Officials

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Director of Resource Recovery

District of Columbia Water and Sewer Authority

September 18th, 2017
NUTRIENTS and CARBON RECYCLING

FARMING
Provides carbon and nutrients valued at $300.00 per acre.

SILVICULTURE
Increase yield and improve understory.

RECLAMATION
Recover mine sites and provide wildlife habitat.

URBAN RESTORATION
Grow trees and reduce runoff.

BLUE PLAINS ADVANCED WASTEWATER TREATMENT PLANT: A RESOURCE RECOVERY FACILITY

water • nutrients • carbon • energy

BLUE PLAINS SERVICE AREA
DC Water receives and treats wastewater collected from the District of Columbia
and wastewater from the Maryland and Virginia suburbs. On an average day, more than 100
million gallons of raw sewage flows into the Blue Plains Advanced Wastewater Treatment
Plant from area jurisdictions.

BLUE PLAINS

DRAINING WATER SOURCE: POTOMAC RIVER AT GREAT FALLS AND LITTLE FALLS

DC METRO AREA

AGRICULTURAL: RED CORN, GRASSES, HAY ETC.

CARBON NUTRIENTS

CARBON NUTRIENTS

CARBON NUTRIENTS

CARBON NUTRIENTS

ENERGY

CLEAN WATER

POTOMAC RIVER

CHESAPEAKE BAY

GREEN ENERGY

BIORENEWABLES

POWER FROM THE PEOPLE

THERMAL HYDROLYSIS PROCESS (THP) AND DIGESTION FACILITY

DC Water will be the first in North America to use thermal hydrolysis for wastewater treatment. When completed, this facility will be the largest plant of its kind in the world.

GREEN BENEFITS:
- Produce combined heat and power, generating 13 MW of electricity
- Save DC Water $10 million annually by cutting grid demand by a third (DC Water is the largest consumer of electricity in the District)
- Reduce carbon emissions by approximately 50,000 metric tons of CO₂ per year.
- Reduce trucking by 1.7 million miles per year.
- Save $10 million in biosolids trucking costs.
- Produce Class A biosolids to grow trees, sequester carbon and reduce runoff.

dcwater.com/biosolids
Agriculture
Anaerobic Digestion / Thermal Hydrolysis
Process Schematic

Gravity Thickeners

DAFTs

Biogas Treatment and CHP

Biogas

Power

Emissions

Steam

Screening and Pre-Dewatering

Cambi™ THP

Mesophilic Anaerobic Digestion

Final Dewatering

Recycle Processing

Loadout

Class A

Blend Tank

Dewatering

Mix

Store & Loadout

Class B
Bloom Soil Amendment Product
Program Benefits

Reduce biosolids quantities by more than 50%

Improve product quality (Class A and more)

Generate 10 MW of clean, renewable power

Cut GHG emissions dramatically

Save millions of dollars annually
DC Water Energy Map
Sewer Heat Recovery

Gateway Theatre
Utility room supplies 50,000 ft² building in Vancouver, BC

Southeast False Creek
Providing 3 MW of heat energy to local neighborhood via hot water pipeline
Sewer Heat Recovery Potential

- Stable daily temperatures (2°F cycle)
- Significant seasonal cycle (58°F - 78°F)
- Significant variation site-to-site
- Weather has varying impact
- **For each 1 MGD, ~1 MW of thermal energy**
- 200 MGD baseflow = 200 MW available
- Possibly “sweetspots”
Offsite Solar Potential

FORT STANTON: 2.0-2.5 ACRES (500kW)

FORT RENO: 6.0-7.8 ACRES (1 MW+)

BRENTWOOD RESERVOIR: 2.0-2.75 ACRES (500kW+)
Potential Grid Power Draw Reductions

Blue Plains Grid Power Draw During Sunlight Hours

- ENR
- digestion
- Blue Plains solar array
- off-site solar
- alternative nitrogen removal
- co-digestion

<table>
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<tr>
<th>Year</th>
<th>Grid Power Draw (MW)</th>
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<tr>
<td>2006</td>
<td>~30</td>
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<tr>
<td>2025</td>
<td>~3</td>
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FY 2017: Where does your money go?

How does DC Water spend each $1.00 received from the average residential customer?

**DC Pass Through Fees**
- ROW: $0.01
- PILOT: $0.03
- Stormwater: $0.03

**Operations & Maintenance**
- Water: $0.13
- Sewer: $0.21

**Capital Investments**
- Clean Rivers: $0.22
- All Other Capital Projects: $0.37

Total: $0.59
## CAP

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<tr>
<th>Water / Sewer Retail Rates</th>
<th>$54.56</th>
<th>$57.25</th>
<th>$60.13</th>
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<tr>
<td>Clean Rivers IAC</td>
<td>$20.30</td>
<td>$22.24</td>
<td>$25.18</td>
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<tr>
<td>Customer Metering Fee</td>
<td>$3.86</td>
<td>$3.86</td>
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<tr>
<td>Water System Replacement Fee</td>
<td>$6.30</td>
<td>$6.30</td>
<td>$6.30</td>
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<td>DC Water Subtotal</td>
<td>$85.20</td>
<td>$89.65</td>
<td>$95.47</td>
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<td>PILOT</td>
<td>$2.91</td>
<td>$2.98</td>
<td>$3.04</td>
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<td>Right-of-Way Fee</td>
<td>$1.05</td>
<td>$1.05</td>
<td>$1.12</td>
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<tr>
<td>Stormwater Fee</td>
<td>$2.67</td>
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<tr>
<td>District Subtotal</td>
<td>$6.63</td>
<td>$6.70</td>
<td>$6.83</td>
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<tr>
<td><strong>Total Bill</strong></td>
<td>$91.65</td>
<td>$96.35</td>
<td>$102.30</td>
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<tr>
<td><strong>Total Bill Percent Increase</strong></td>
<td>13.7%</td>
<td>5.1%</td>
<td>6.2%</td>
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<td>Less: CAP Discount (4 Ccf per month)</td>
<td>($36.64)</td>
<td>($38.36)</td>
<td>($40.24)</td>
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<tr>
<td>Water System Replacement Fee (WSRF)</td>
<td>($6.30)</td>
<td>($6.30)</td>
<td>($6.30)</td>
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<tr>
<td><strong>Total Amount Appearing on Bill</strong></td>
<td>$48.71</td>
<td>$51.69</td>
<td>$55.76</td>
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<tr>
<td>Increase / Decrease over prior year</td>
<td>$5.09</td>
<td>$2.98</td>
<td>$4.07</td>
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<td>CAP Discount Percent of Total</td>
<td>-46.9%</td>
<td>-46.4%</td>
<td>-45.5%</td>
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SPLASH Program
Serving People by Lending a Supporting Hand (SPLASH)

Administered by the Greater Washington Urban League, using funds collected from customers and DC Water employees.

In FY 2015, SPLASH helped 351 households with $115,683 in contributions, including $28,678 from DC Water employees.
There is no such thing as waste, only wasted resources.

www.bloomsoil.com
www.dcwater.com

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Thermal Hydrolysis Process

- **Raw Sludge**: Living bacteria, Dead bacteria, Inert suspended solids (SS), EPS

- **Thermal Hydrolysis**:
  - **Pulper**: Preheated to ~97°C, and homogenized. Retention time ~1.5 h
  - **Reactor**: Batch process 185°C / 6 bar. Retention time 20 min. Reduces viscosity, Dissolves EPS
  - **Flash Tank**: Temp 102°C Retention time ~1.5 h. Steam explosion, Cell rupture
  - Process gases are cooled and compressed before sent to digesters to be broken down
  - Homogenized material 13 - 14% DS
  - Steam 11 bar
  - Hydrolyzed material 12 - 13% DS (1.5 - 2 bar)
  - Hydrolyzed material to digesters 8 - 12% DS

- **Hydrolyzed Sludge**: Hydrolyzed SS, Cell content, Cell wall, Inert suspended solids (SS), Hydrolyzed EPS

[Diagram showing the process with stages and components]