Design and Installation of Innovative Stormwater Structures at Washington Navy Yard

Pollution Prevention
Sustainable Development
Tradition Stormwater Management

- Traditional Engineering solution - Convey the storm water as quickly to the river as possible.
- Treat water at the end of pipe.
- As urbanization continues (over decades) the resulting flow in rivers is a shorter duration and higher peak flow causing erosion/deposition and degrade water quality (TSS, BOD, etc).
- Increased need for irrigation
Reduced CSO inflow
What are Sustainable Features

- Features used to control non point source discharges by means of
  - Filtering - using permeable pavers and sand beds that filter out sediments.
  - Phytoremediation - natural indigenous plants to remove or neutralize contaminants
  - Retention of peak storm events to reduce down stream erosion and improve groundwater recharge.
Bio “Retention”  Capture and Processes

A major tool to maximizing the use of uplands areas for management and treatment

**Processes and Functions**

**Physical** (Sedimentation / Filtration / Volatize)

**Chemical** (CE / Adsorption / Chelation ……)

**Biological** (Cycling, Uptake, Transformation…)

**Hydrological** (Evaporation / Infiltration / Timing)
Bioretention Applications

- Landscape Islands
- Streetscape
- Existing Forested Areas
- Forest Fringe
- Open Space (Meadows)
- Open Swales (Off-line)
- Landscape Trees
- Gardens

“Hydrophytobiochemo-retention”
Pilot Projects

- Willard Park Parking Area
- Power Plant Parking Lot
- Street Tree Filters
- Street Sweeping Demonstration
- Roof Leader Disconnect
- Museum Bioretention Retrofit
- Inlet Floatables Removal
- Inlet Timing Project
- Inlet Ponding Modification
- Permeable Pavers Installation

Navy Yard
Storm Water Retrofits
Design Construction, Cost and Maintenance Issues

- Design Requirements
  - Look at State, Federal, Mission, NPDES,
  - Hydrologic Analysis
    - Peak runoff discharge
    - % infiltration, Is the pipe large enough
    - Practical Design Considerations (New or Retrofit)
      - Need pipe depth but can engineer around
      - Available Space
TREE FILTER SCHEMATIC

- Tree Box Filter
- Tree
- Side Walk
- Inlet
- Curb
- Street
- Storm Drain
- High Rate Biofilter
Retrofit With Biofiltration Strips
Floatables Removal
This prevents oils, grease, and trash from entering the storm drain system.

Vortex Flow Control
Installed at Structure D-3 for control of peak flows. The restricted opening reduces the peak flow rate, and eliminates debris from entering the system.
Rail Barrels
Maintenance Issues

- Maintenance - Usually required for the design approval from water quality division
  - This design then becomes the requirement for O&M budgets.
  - In general O&M is lower cost than traditional storm water features that are often out of site.
    - Sand filters, Retention Ponds,
  - Most Common O&M Requirements
    - Landscaping plans to maintain the plants
    - Sweeping annually-monthly inspections
Benefits

- Reduced irrigation
- Reduced TSS
- Reduced storm sewer network and POTW Capacity
- Improved water quality to mimic predevelopment runoff quality.
- Recharge of groundwater
- Reduced inlet plugging
Urban Lot Level Control Opportunities

- Roofs
- Buildings
- Down Spouts
- Water Use
- Yards
- Sidewalks
- Parking
- Landscape Areas (trees / vegetation)
- Open space
- Pollution Prevention
- Conventional BMP’s

**Multifunctional Infrastructure**

* Receiving Water Protection / Restoration
* CSO Control (Flow / Frequency / Quality)
* TMDL’ Impaired Waters
Runoff Use
Runoff Storage

National Airport
Buildings

Downspouts
Disconnect / Water Use

[Image of buildings and storage tank]
Gray water reuse
High Rate Bio-filtration