Design and Installation of Innovative Stormwater Structures at Washington Navy Yard

Pollution Prevention

Sustainable Development

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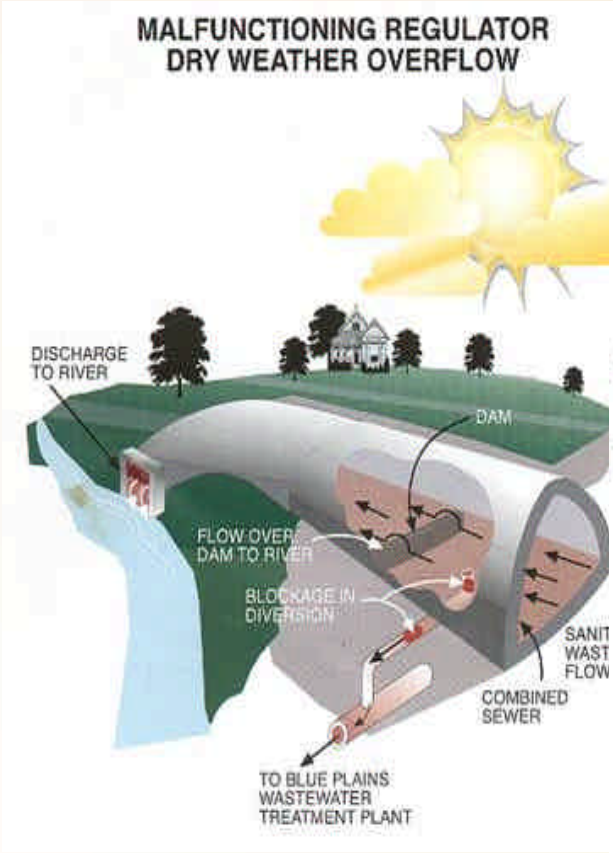
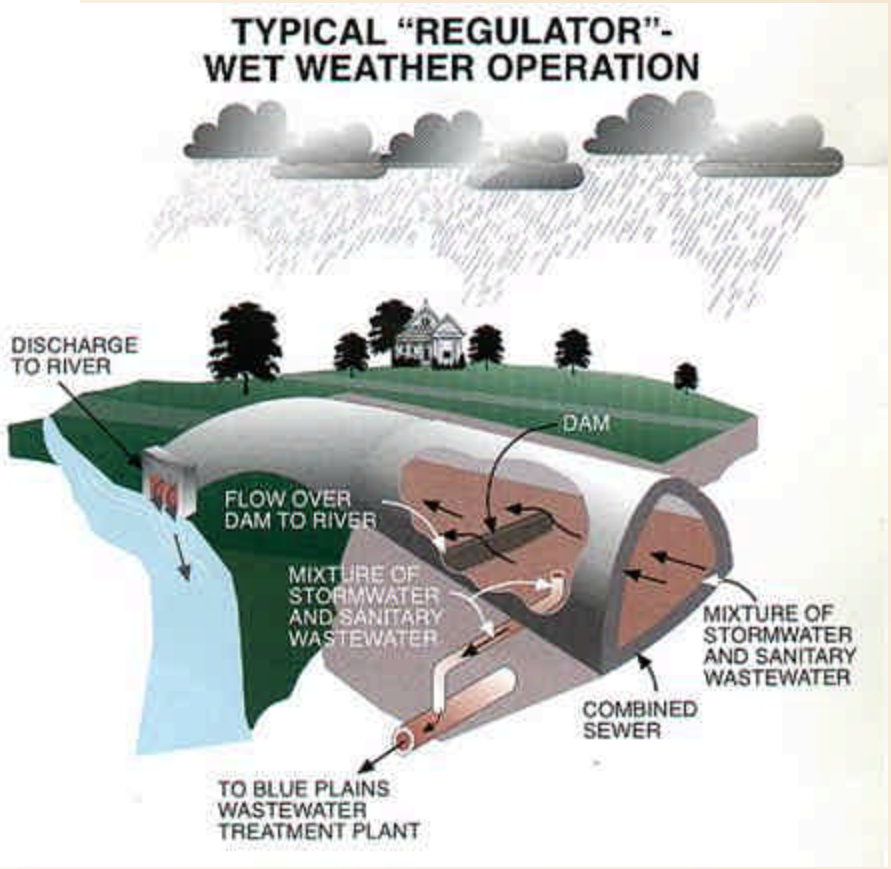
Tradition Stormwater Management

- 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

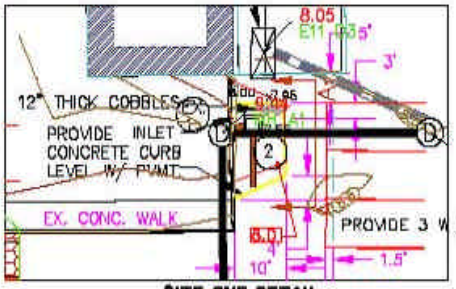
SITE FOUR
SITE ONE
SITE THREE
SITE TWO
DA 1
0.19 AC.
DA 2
0.21 AC.
DA 3
0.35 AC.
DA 4
0.11 AC.
DA 5
0.22 AC.
DA 6
0.19 AC.
DA 7
DA 8
0.09 AC.
DA 9
0.11 AC.
DA 10
0.24 AC.
DA 13
DA 14
EXISTING ASPHALT
OHM Remediation Services Corp.
THE LOW IMPACT DEVELOPMENT CENTER, INC.

LANDSCAPE PLAN

SCALE: 1" = 20'-0"

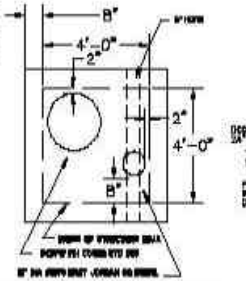
PLANT LIST

KEY	QUANT	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
A	4	QUERCUS PALUSTRIS	PIN OAK	2½"-3" CAL	B & B
B	4	ACER RUBRUM	RED MAPLE	2½"-3" CAL	B & B
C	4	CORNUS FLORIDA	FLOWERING DOGWOOD	1½"-2" CAL	B & B
D	4	CERCIS CANADENSIS	EASTERN REDBUD	1½"-2" CAL	B & B
E	4	AMELANCHIER CANADENSIS	SHADBLOW SERVICEBERRY	1½"-2" CAL	B & B
F	4	CRATAEGUS CRUS-GALLI INERMIS	THORNLESS COCKSPUR HAWTHORN	1½"-2" CAL	B & B
G	4	ILEX OPACA	AMERICAN HOLLY	6'-7' HT	B & B
H	4	MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	6'-7' HT	B & B
I	4	PINUS STROBUS	EASTERN WHITE PINE	6'-7' HT	B & B
J	4	THUJA OCCIDENTALIS	AMERICAN ARBORVITAE	6'-7' HT	B & B



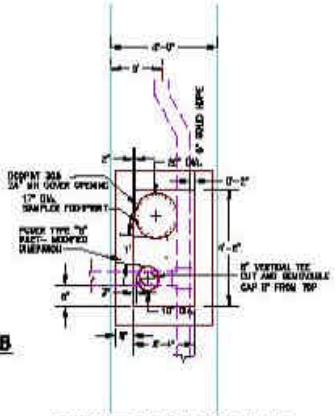
SITE ONE DETAIL

SCALE: 1" = 10'-0"



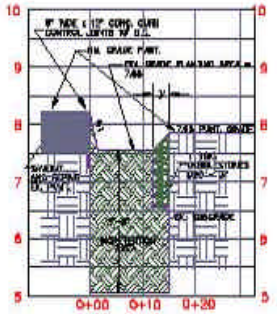
STRUCTURE #4 TOP SLAB

NOT TO SCALE



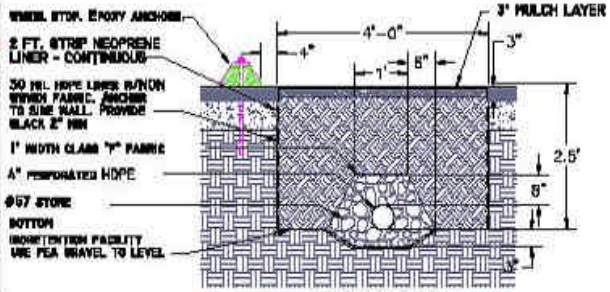
STRUCTURE #6 TOP SLAB

NOT TO SCALE



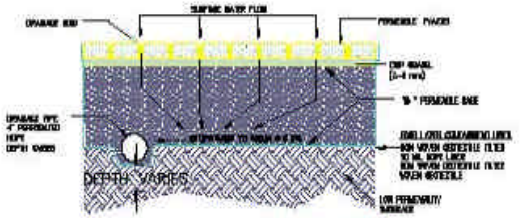
SECTION A-A1

HORIZONTAL: 1" = 10'-0"
VERTICAL: 1" = 1'-0"



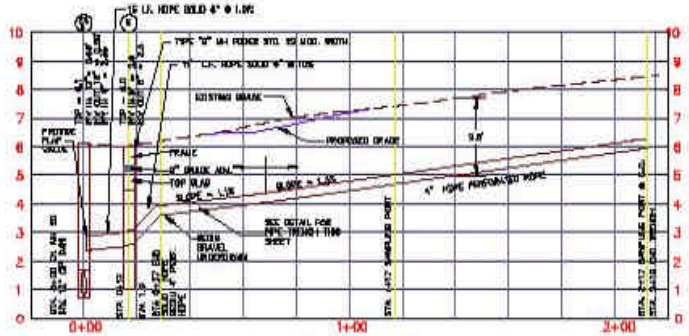
TRENCH DETAIL

NOT TO SCALE



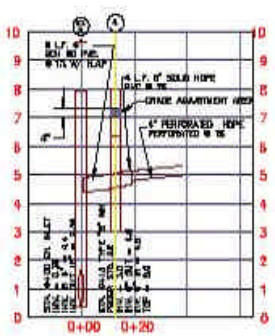
PERMEABLE PAVEMENT SECTION

NOT TO SCALE



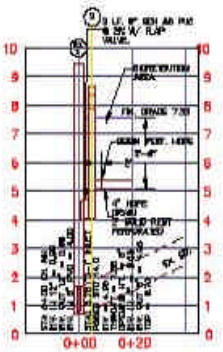
PROFILE SITE TWO

SCALE: HORIZONTAL 1" = 20'
VERTICAL: 1" = 2'



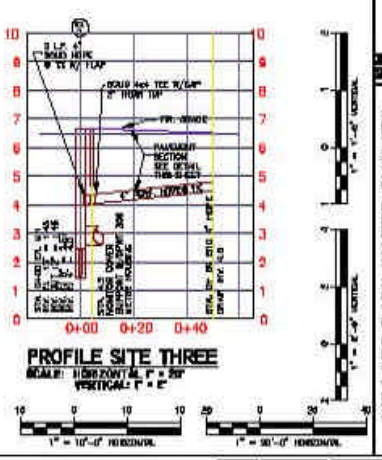
PROFILE SITE FOUR

SCALE: HORIZONTAL 1" = 20'
VERTICAL: 1" = 2'



PROFILE SITE ONE

SCALE: HORIZONTAL 1" = 20'
VERTICAL: 1" = 2'



PROFILE SITE THREE

SCALE: HORIZONTAL 1" = 20'
VERTICAL: 1" = 2'

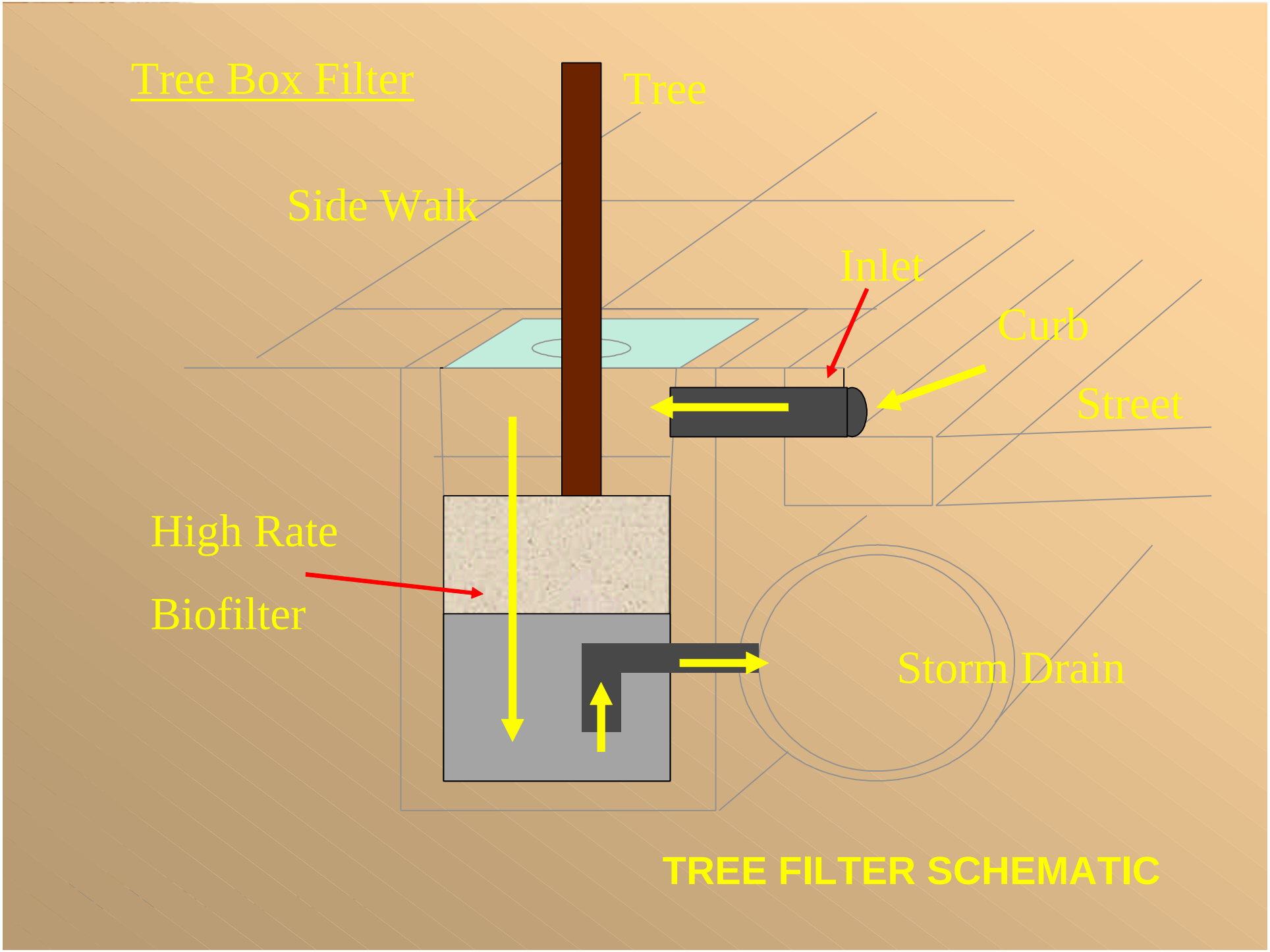
OHM Remediation Services Corp.

200 HORIZON CENTER BOULEVARD
TRENTON, NEW JERSEY 08691
PHONE: (609) 584-0500

THE LOW IMPACT DEVELOPMENT CENTER, INC.

WILLARD PARK WATER QUALITY IMPROVEMENT PROJECT

DETAILS AND PROFILES


Tree Box Filter
Tree
Side Walk
Inlet
Curb
Street
High Rate
Biofilter
Storm Drain
TREE FILTER SCHEMATIC

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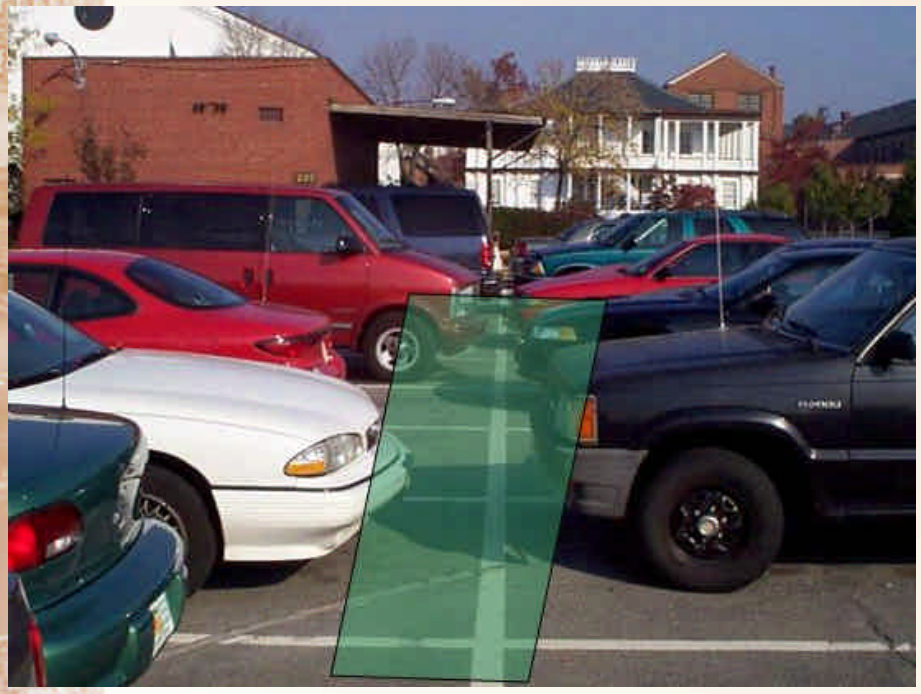
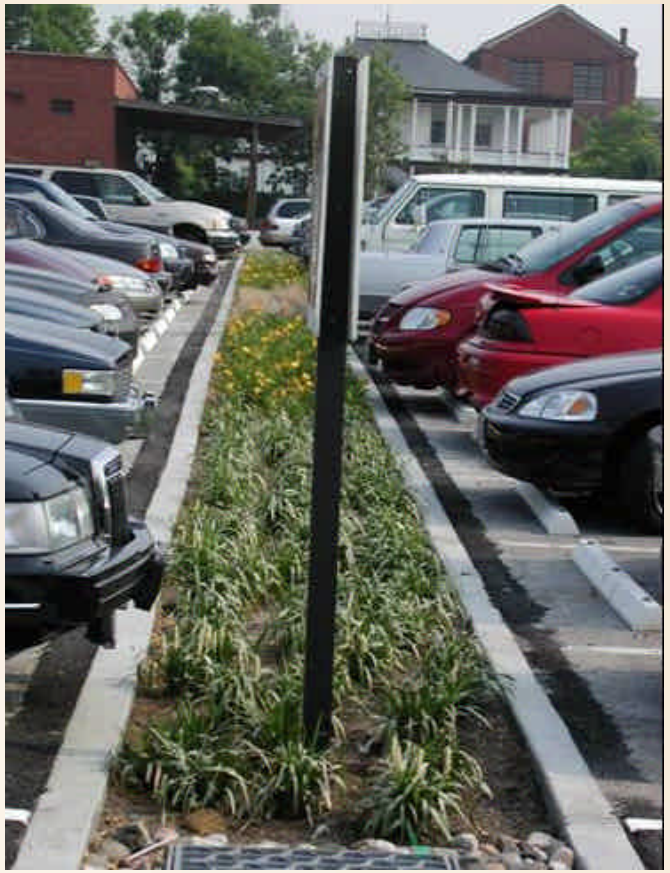
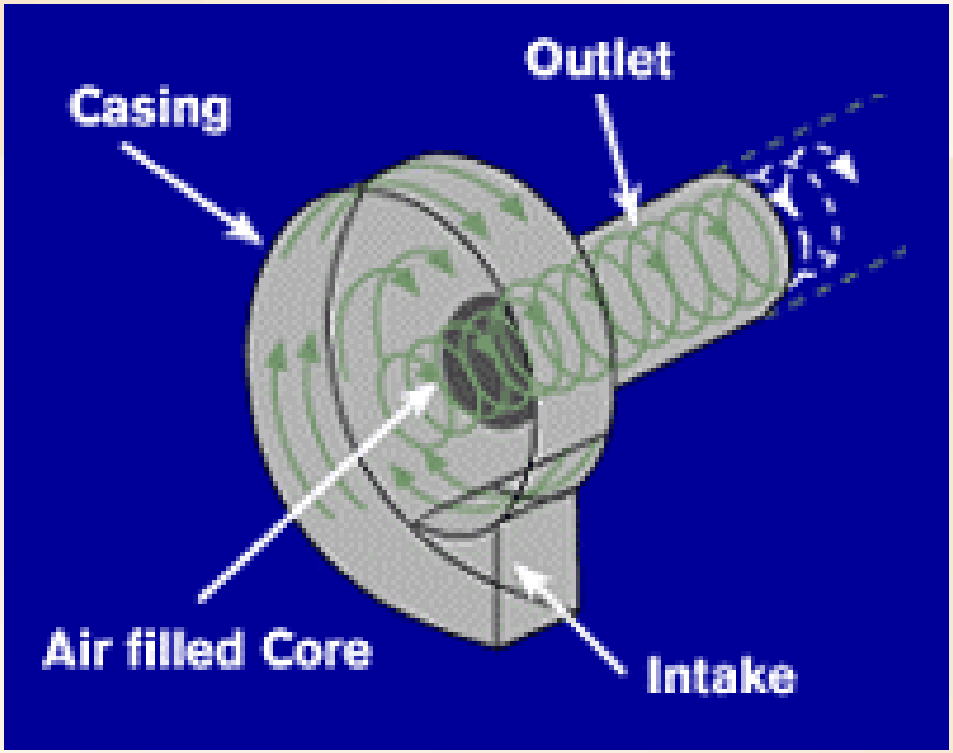
Retrofit With Biofiltration Strips







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.

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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

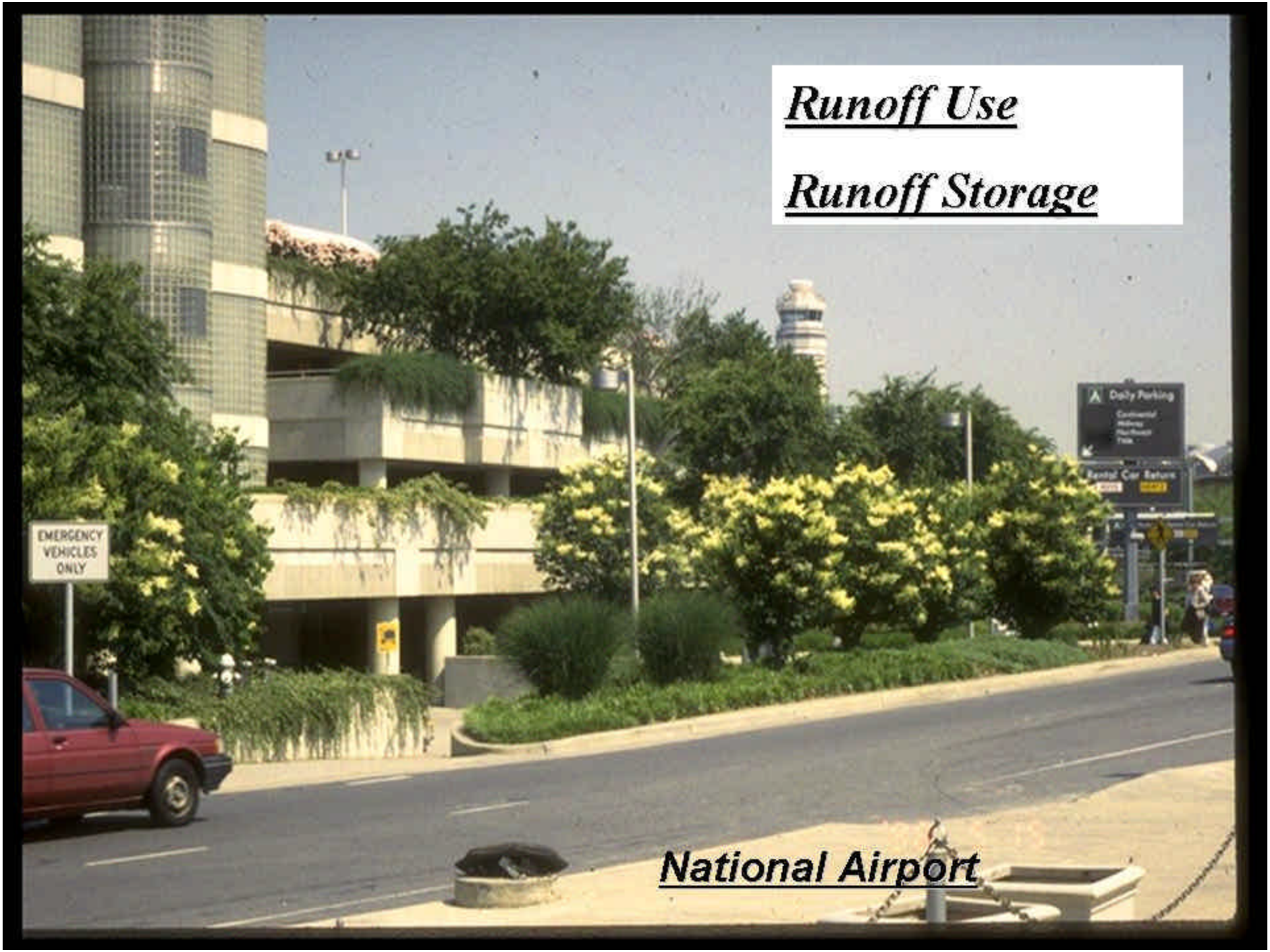
- Roofs
- Buildings
- Down Spouts
- Water Use
- Yards
- Sidewalks
- Parking
- Landscape Areas (trees / vegetation)
- Open space
- Pollution Prevention
- Conventional BMP's

Multifunctional Infrastructure

* Receiving Water Protection / Restoration

* CSO Control (Flow / Frequency / Quality)

* TMDL' Impaired Waters


Runoff Use
Runoff Storage
EMERGENCY VEHICLES ONLY
A Daily Parking
Rental Car Return
National Airport

Downspouts
Disconnect / Water Use

Buildings

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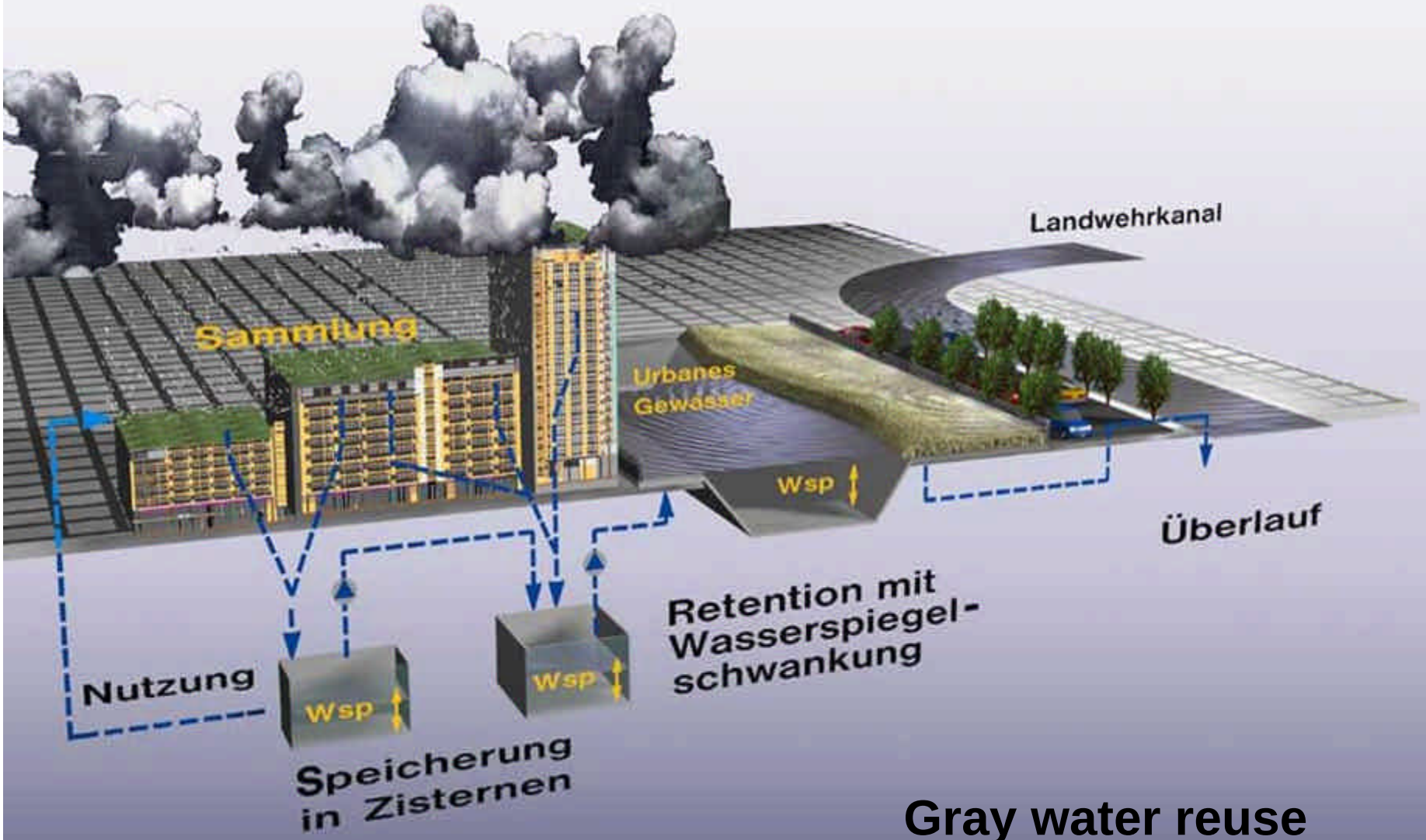
Herbert Dreiseitl - ww.dreiseitl.de



Gray water reuse

High Rate Bio-filtration