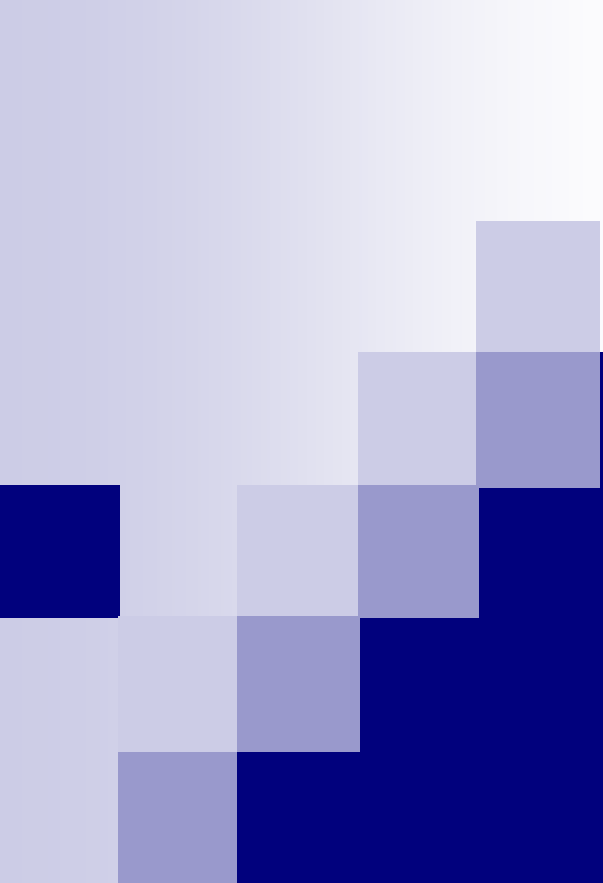


# Enhanced Water Quality Swales and Other BMPs For Greater Cleveland



Cuyahoga  
Soil and Water  
**Conservation**  
District

Todd A. Houser, CPESC, CPSS  
Storm Water Program Manager



# What are *Structural* Post-Construction BMPs?



# Concept and Need for Water Quality BMPs

- Impervious surfaces (and *compacted soils*) quickly convey runoff and associated pollutants
- Fortunately, there are BMPs that minimize sediment, metals, nutrients, hydrocarbons, bacteria and peak flow discharges
- In order to maximize effectiveness, we need to select the BEST management practice for the site and soil conditions

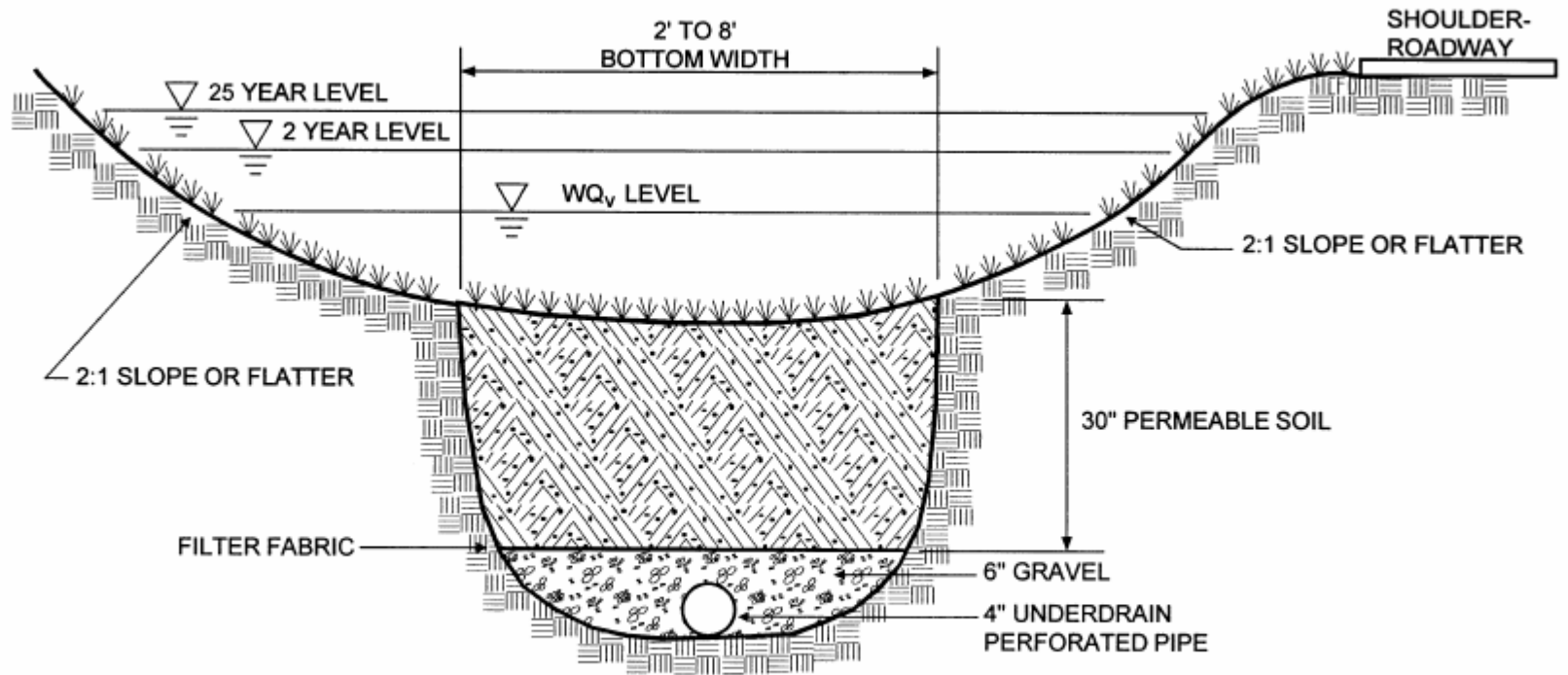




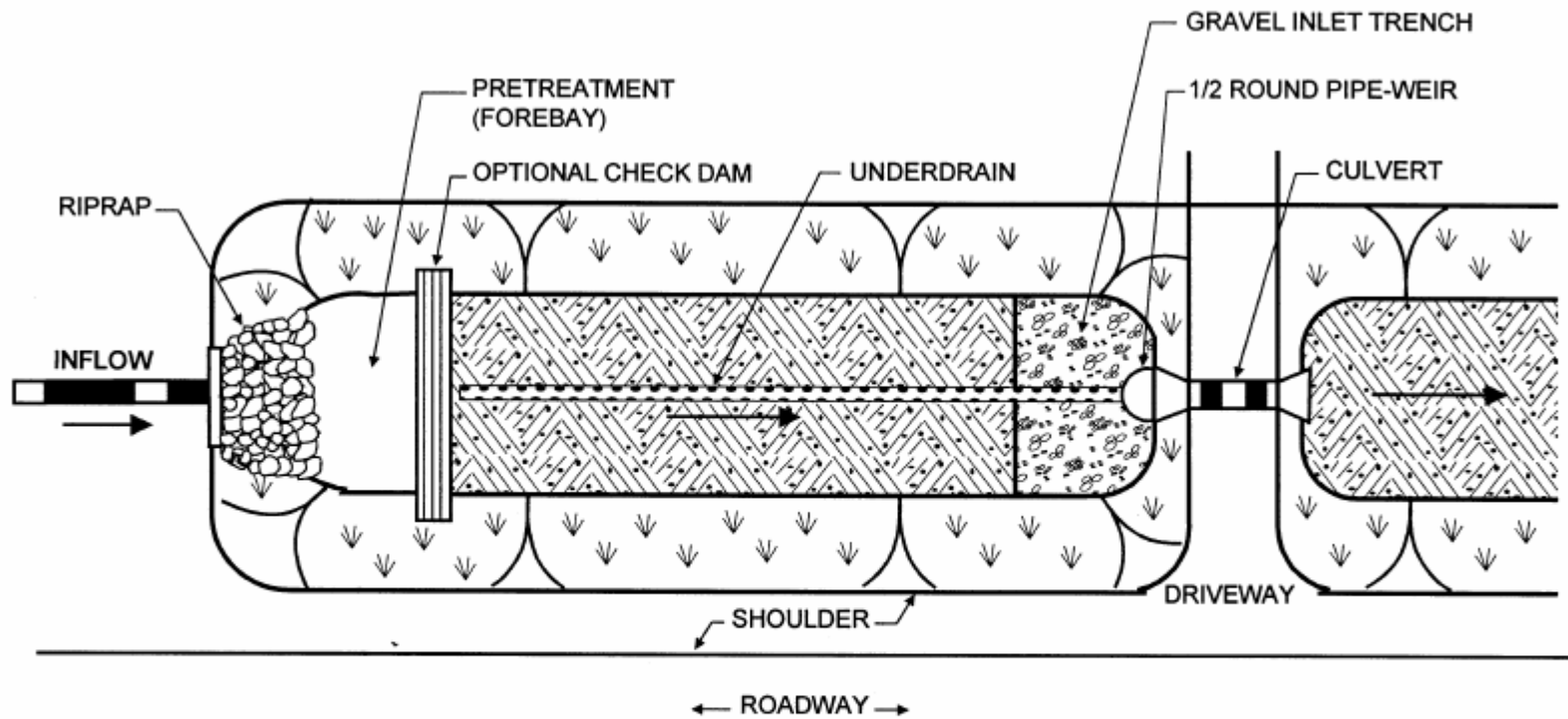
# Enhanced Water Quality Swales (Cells)

# Enhanced Dry Swale (Cell)

- Conveyance (<4% slope) with a filter bed of loose medium over an underdrain
- 5 acres or less contributing drainage area
- 3-5 ft. elevation difference (depth) needed from inflow to outflow
- Sized to store the entire WQv (24 hr. target draw-down)
- Check Dams create multiple cells to store the WQv
- **Appropriate soil drainage classes:** well drained



**SECTION**

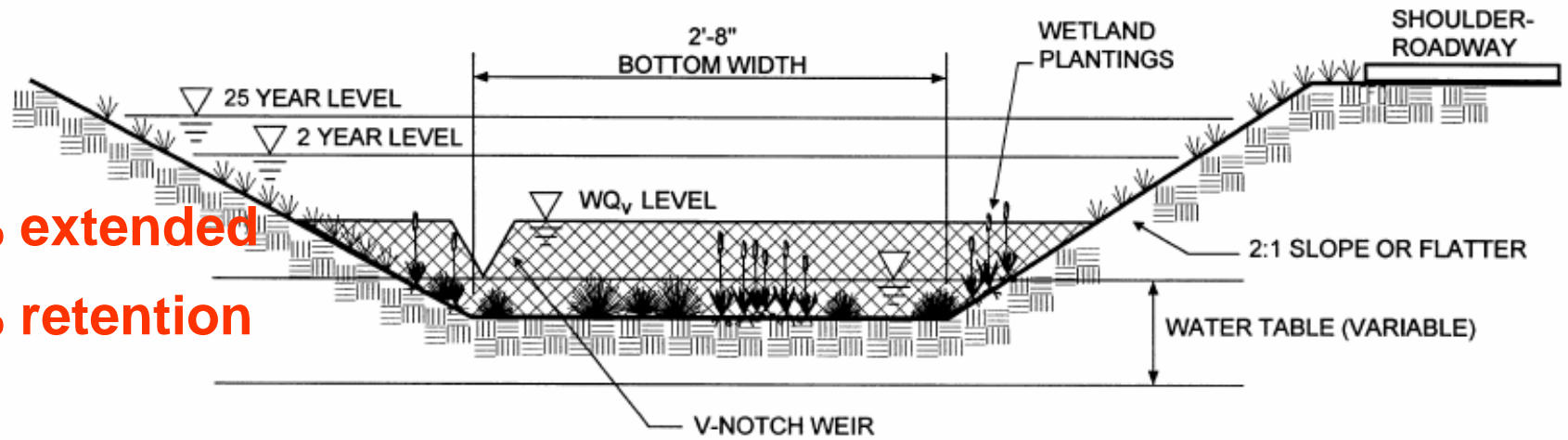


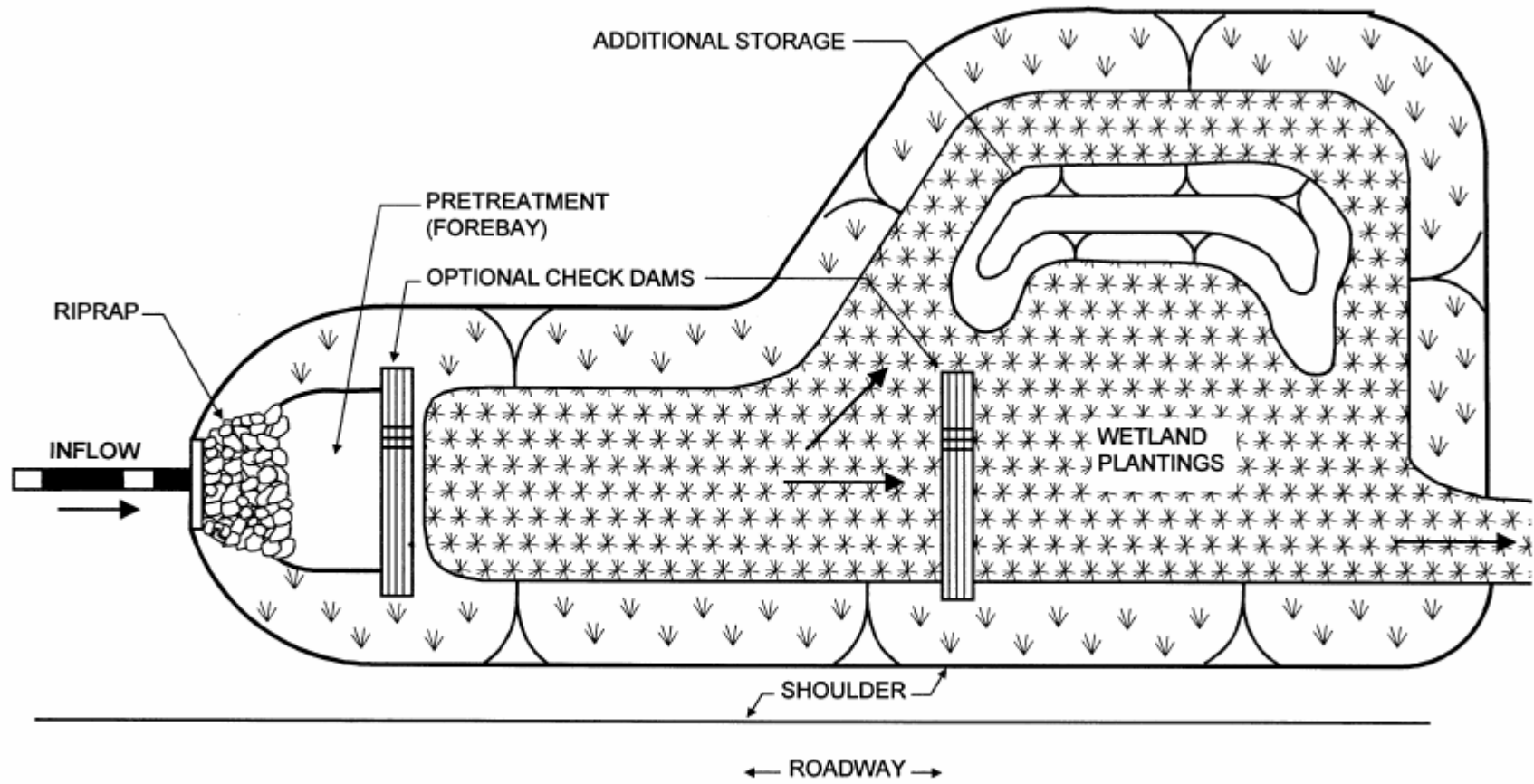
**PLAN VIEW**

# Enhanced Wet Swale (Cell)

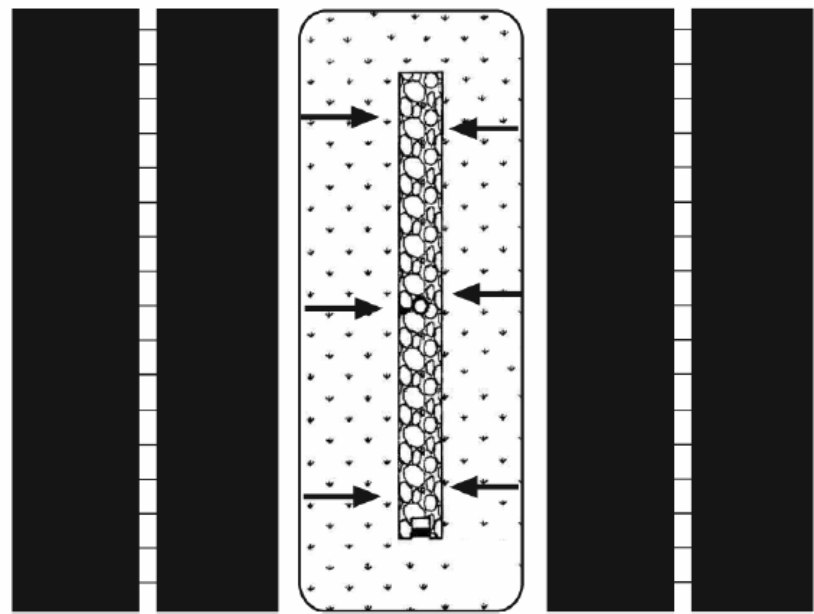
- Conveyance (<4% slope) excavated to a perched or seasonally high water table
- 5 acres or less contributing drainage area
- 1 ft. elevation difference (depth) needed from inflow to outflow
- Sized to store the entire WQv (24 hr. target draw-down)
- Check dams create multiple wetland cells to store the WQv
- Appropriate soil drainage classes: somewhat poorly and poorly drained

50% extended  
50% retention



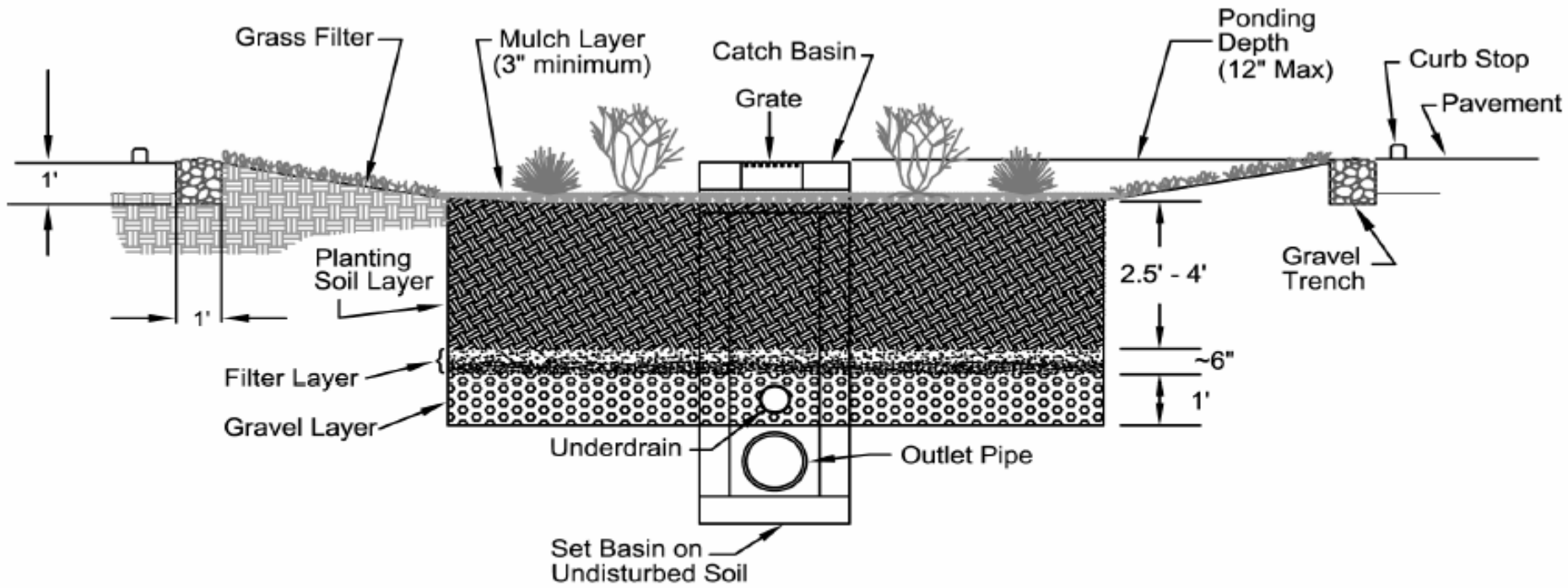


**PLAN VIEW**



# Bio-Retention Cell

- Capture and temporarily store the WQv using manufactured medium and vegetation
- 5 acres or less contributing drainage area (0.5 to 2 acres preferred)
- 5 ft. elevation difference (depth) needed from inflow to outflow
- Sized to store the entire WQv (40 hr. target draw-down)
- **Appropriate soil drainage classes:** well drained
  - If perched or seasonally high water table is 30-40 inches, cell needs to be lined. If upper expression is shallower, a wet BMP is needed!



**CROSS SECTION**  
(Not to Scale)

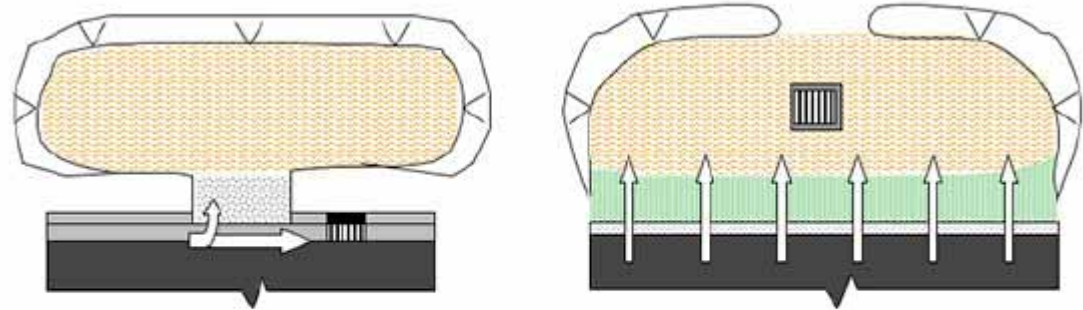


Figure 2.10.1. Flow into offline versus inline facilities. Offline facilities receive flow then are bypassed by runoff, while in-line facilities receive all contributing runoff.

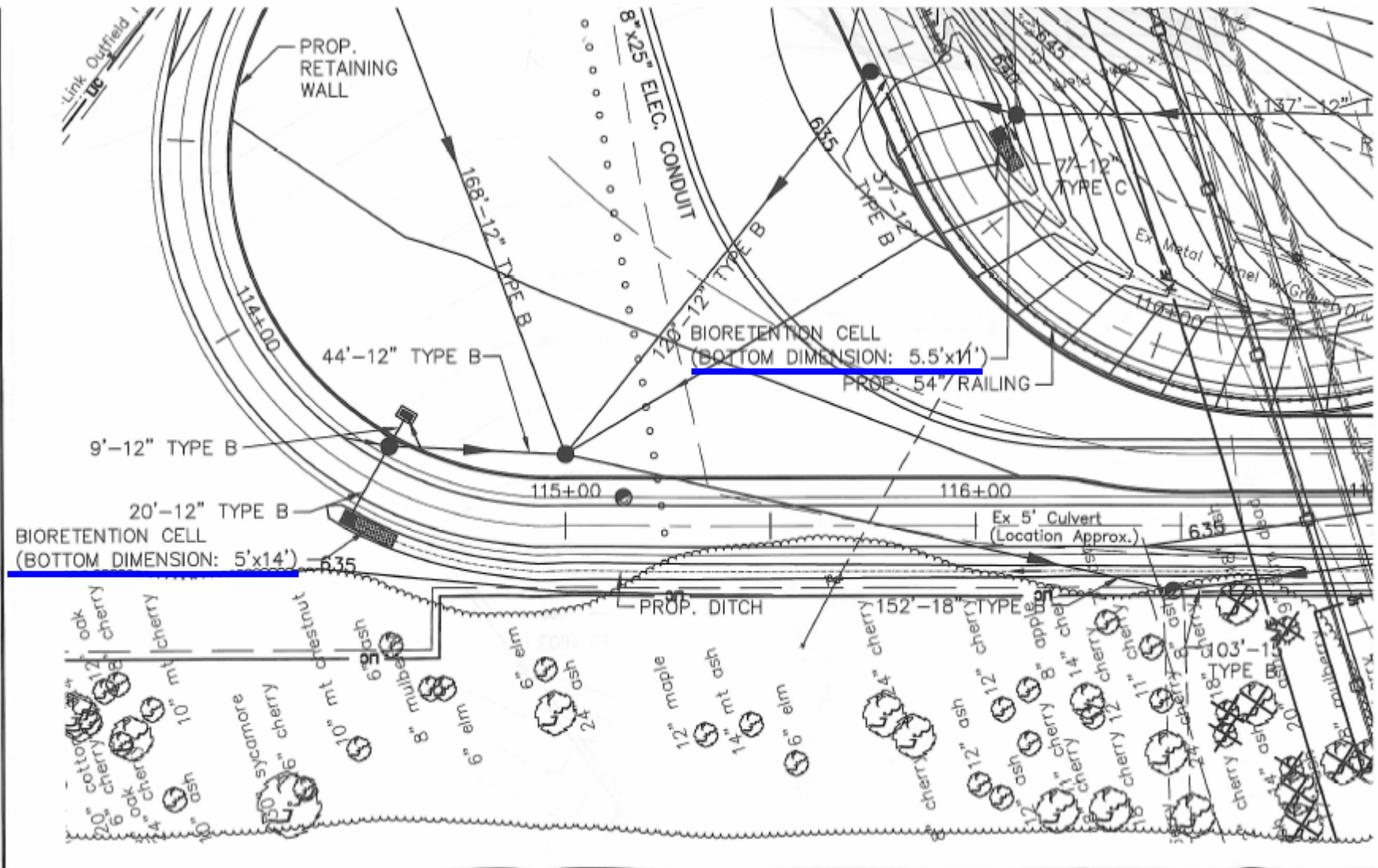



**Tree Box Filters**

# CUY - FULTON RD. (BR-251)

RECONSTRUCTION OF EXISTING SEPARATED CROSSING  
WITH THE CSX AND NORFOLK SOUTHERN RAILROAD

CITY OF CLEVELAND  
STATE OF OHIO





Across the country, water quality BMPs  
are becoming increasingly common...



**Northeast...  
Maryland**



**Northwest...  
Washington**

10.26.2004



**Southeast...  
North Carolina**




Midwest...

Berea, Ohio

# Parma, Ohio

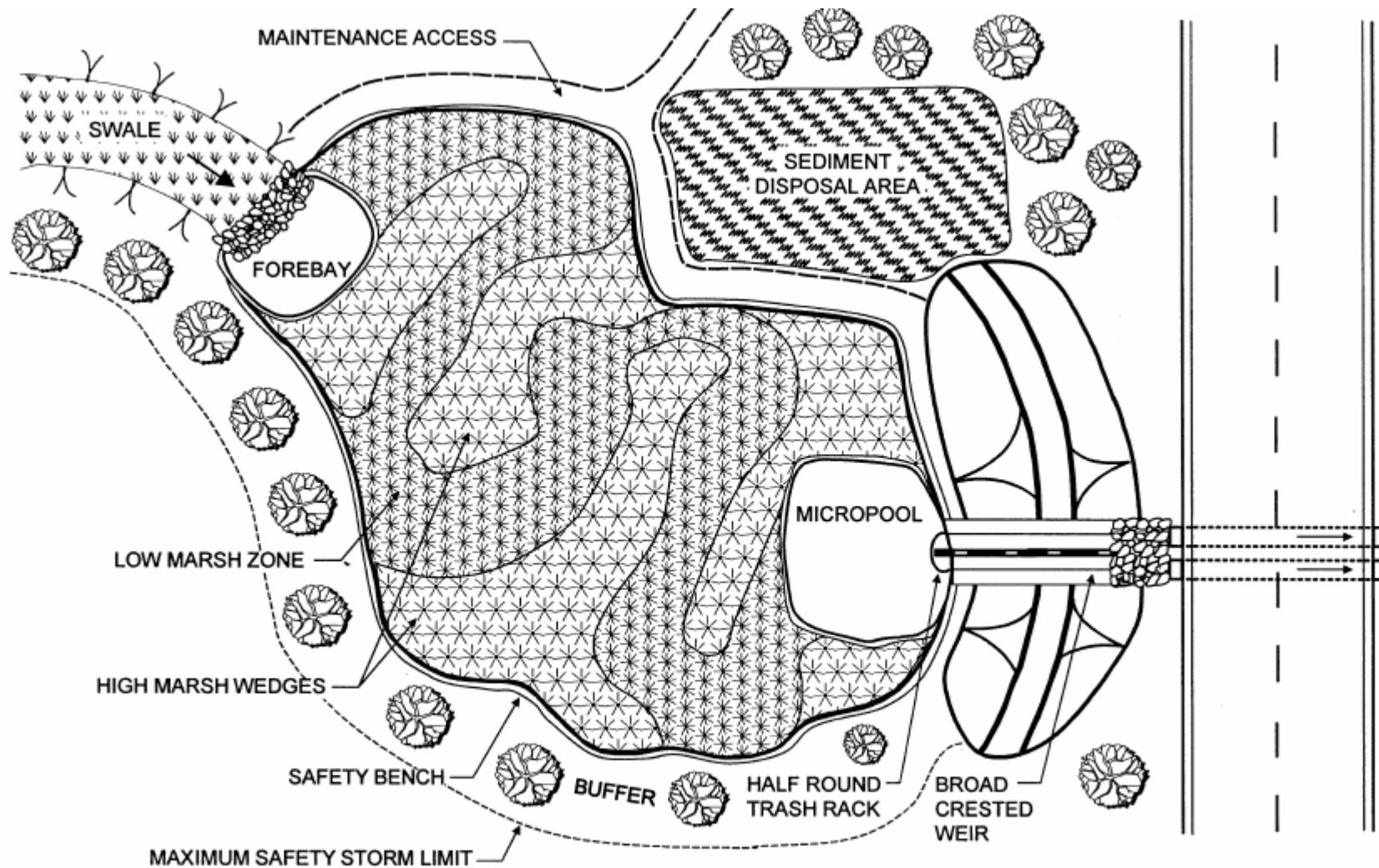




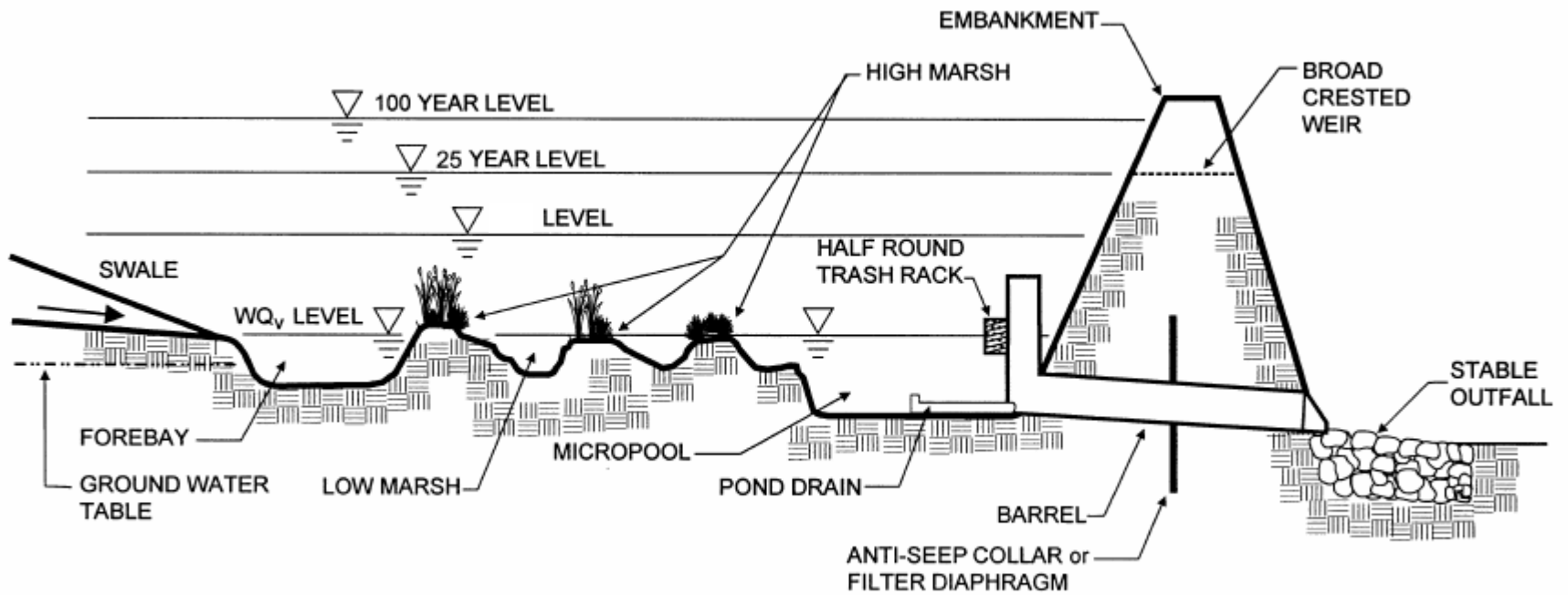
...and many more are planned and designed to be constructed across the Greater Cleveland area!

# Storm Water Wetlands

- Constructed shallow marsh systems ( $\leq 8\%$  slope)
- 3:1 flow length (inflow to outflow) *Rainwater and Land Development*
- 1 acre or more contributing drainage area
- 2-5 ft. elevation difference (depth) needed from inflow to outflow
- Sized to store the entire WQv (24 hr. target draw-down)
- **Appropriate soil drainage classes: somewhat poorly, poorly, and very poorly drained**



**PLAN VIEW**



**PROFILE**



# Resources for Soil Information

- Planning Tool:  
Natural Resources Conservation Service, USDA  
- Web Soil Survey  
(<http://websoilsurvey.nrcs.usda.gov/app/>)
- On-Site Investigations:  
Association of Ohio Pedologists  
(<http://www.ohiopedologist.org/Information/ConsultantBrochure.pdf>)



# Take Home Message



**Better BMPs = Better Water Quality**

# Photograph Credits

- Cuyahoga Soil and Water Conservation District  
<http://www.cuyahogaswcd.org>
- University of Maryland Water Resources Research Center  
<http://www.civil.umd.edu/~apdavis/Bioongoing.htm>
- University of Washington  
<http://www.engr.washington.edu/epp/cee/fieldtrips.html>
- North Carolina State University – Biological & Agricultural Engineering  
[www.bae.ncsu.edu/stormwater/downloads.html](http://www.bae.ncsu.edu/stormwater/downloads.html)

# Resources for These Standards

- Cuyahoga Soil and Water Conservation District <http://www.cuyahogaswcd.org>
- Ohio's "Rainwater and Land Development" manual  
<http://www.dnr.state.oh.us/water/rainwater/default/tabid/9186/Default.aspx>
- Georgia's "Stormwater Policy Guidebook"  
<http://www.georgiastormwater.com/>
- ODOT's "Location and Design" manual  
<http://www.dot.state.oh.us/se/hy/LD2/Sec1100/sec1100bookmarked.pdf>