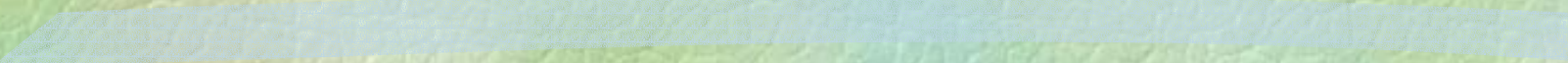


# Proper Construction and Maintenance of Biofiltration Treatment BMPs

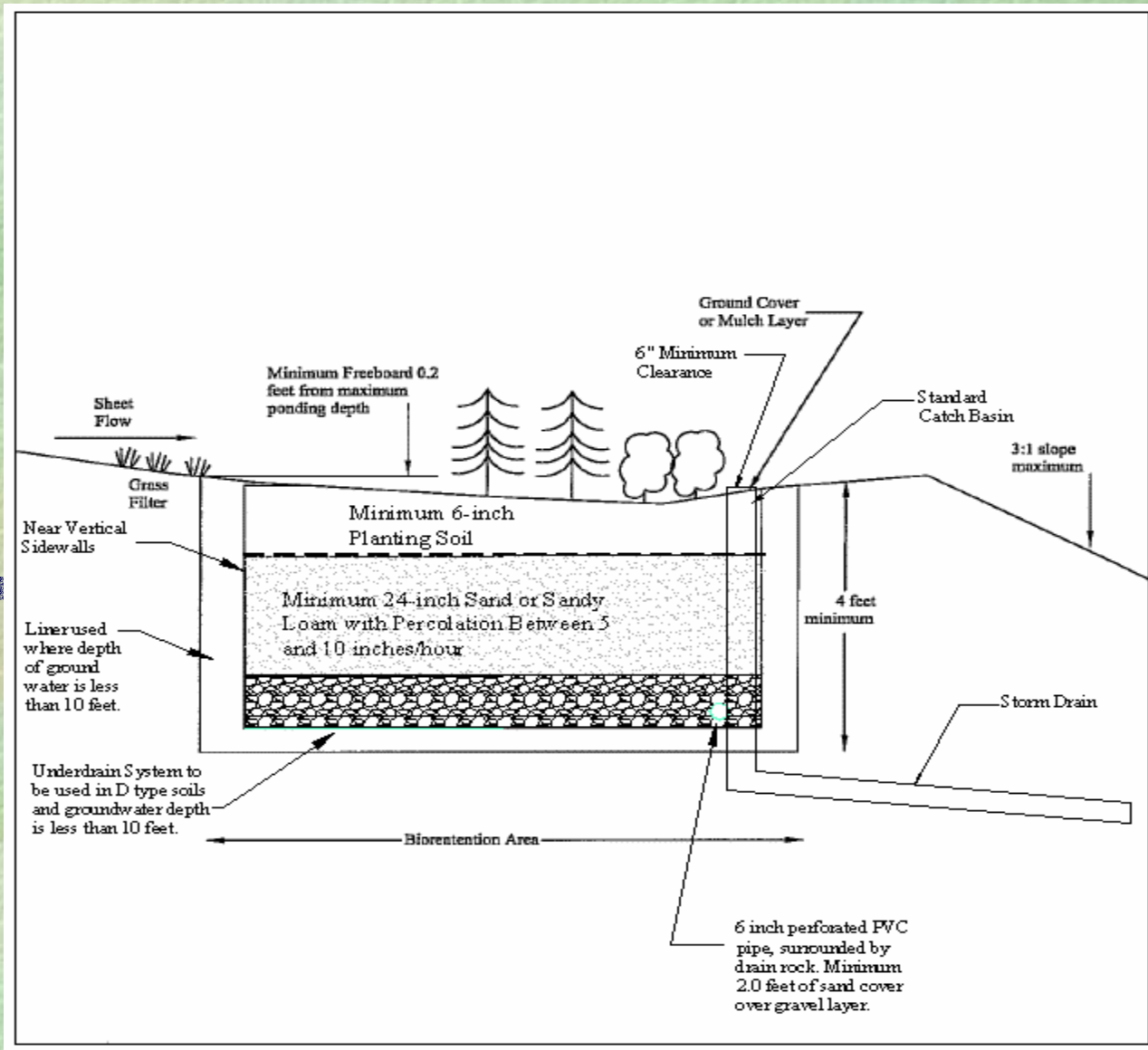
Vegetated Swales and Bioretention  
Lessons Learned



By  
Edward Boscacci, Jr  
BKF Engineers  
June 2006

# Key Issues

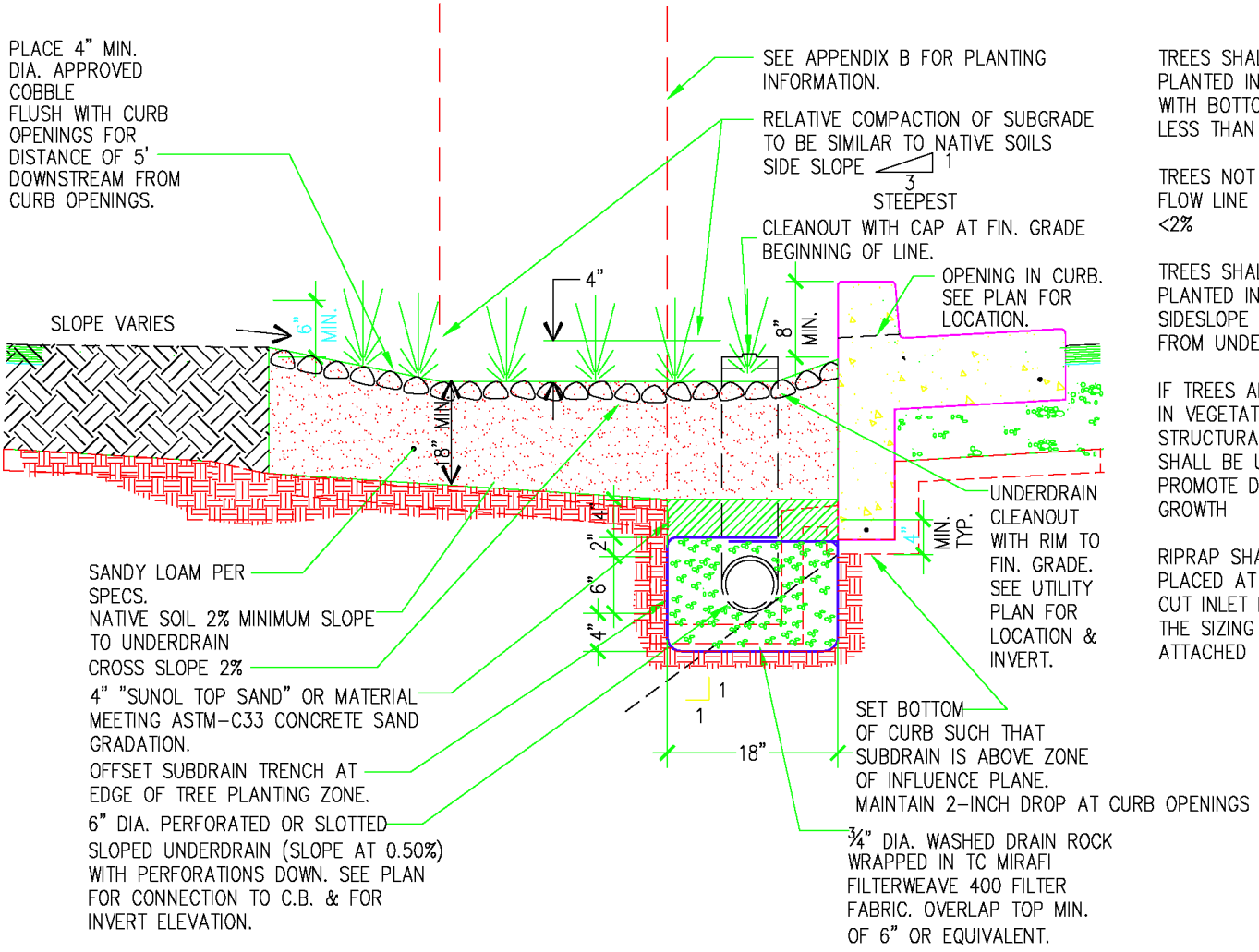
- Provide Subdrain System
  - Import or Use Admixtures for Planting Soil
  - Account for Trees
  - Check Grades
- 
- Get Flow into Swale
  - Use a Mulch that does not Float
  - Select Grasses for Treatment





# Subdrain System

- Use a 4 to 6-inch Diameter Perforated Pipe within a Drain Rock Layer
  - Surround Rock Layer with a **Permeable** Filter Fabric
- 
- Provide a Cleanout for Maintenance.
  - Cover with a Minimum 18-inch Thick layer of Sand or Sandy-Loam
  - Mosquito Abatement is Necessary. Test to Demonstrate that Runoff will not Pond at Depressions in the Subgrade.



PLACE 4" MIN. DIA. APPROVED COBBLE FLUSH WITH CURB OPENINGS FOR DISTANCE OF 5' DOWNSTREAM FROM CURB OPENINGS.

SEE APPENDIX B FOR PLANTING INFORMATION.

RELATIVE COMPACTION OF SUBGRADE TO BE SIMILAR TO NATIVE SOILS



CLEANOUT WITH CAP AT FIN. GRADE BEGINNING OF LINE.

OPENING IN CURB. SEE PLAN FOR LOCATION.

TREES SHALL NOT BE PLANTED IN SWALES WITH BOTTOM WIDTHS LESS THAN 4- FEET

TREES NOT ALLOWED IN FLOW LINE IF SLOPE <2%

TREES SHALL BE PLANTED IN TOE OF SIDESLOPE FARTHEST FROM UNDERDRAIN,

IF TREES ARE PLANTED IN VEGETATED SWALE, STRUCTURAL SOIL SHALL BE USED TO PROMOTE DEEP ROOT GROWTH

RIPRAP SHALL BE PLACED AT THE CURB CUT INLET FOLLOWING THE SIZING WORKSHEET ATTACHED

SLOPE VARIES

SANDY LOAM PER SPECS. NATIVE SOIL 2% MINIMUM SLOPE TO UNDERDRAIN CROSS SLOPE 2%

4" "SUNOL TOP SAND" OR MATERIAL MEETING ASTM-C33 CONCRETE SAND GRADATION.

OFFSET SUBDRAIN TRENCH AT EDGE OF TREE PLANTING ZONE.

6" DIA. PERFORATED OR SLOTTED SLOPED UNDERDRAIN (SLOPE AT 0.50%) WITH PERFORATIONS DOWN. SEE PLAN FOR CONNECTION TO C.B. & FOR INVERT ELEVATION.

SET BOTTOM OF CURB SUCH THAT SUBDRAIN IS ABOVE ZONE OF INFLUENCE PLANE. MAINTAIN 2-INCH DROP AT CURB OPENINGS

3/4" DIA. WASHED DRAIN ROCK WRAPPED IN TC MIRAFL FILTERWEAVE 400 FILTER FABRIC. OVERLAP TOP MIN. OF 6" OR EQUIVALENT.

UNDERDRAIN CLEANOUT WITH RIM TO FIN. GRADE. SEE UTILITY PLAN FOR LOCATION & INVERT.

# Planting Soil

- Import or Use Admixture for a Permeable Planting Soil
  - Select a Soil and Plant Palette that does NOT Require Fertilizer or Pesticides
- 
- Mosquito Abatement is Necessary. Place Temporary Barriers in Swale. Test Again with the Finished Grade to Demonstrate that Runoff will not Pond at Ponds Created by Temporary Barriers

# Account for Trees

- Locate Trees away from Low Flow Section
  - Use a Structural Soil to Encourage Root Growth Downward, away from the Subdrain
- 
- Consider a Root Barrier in the Upper 30-inches to Encourage Root Growth Downward, and away from Subdrain

# Check Grades

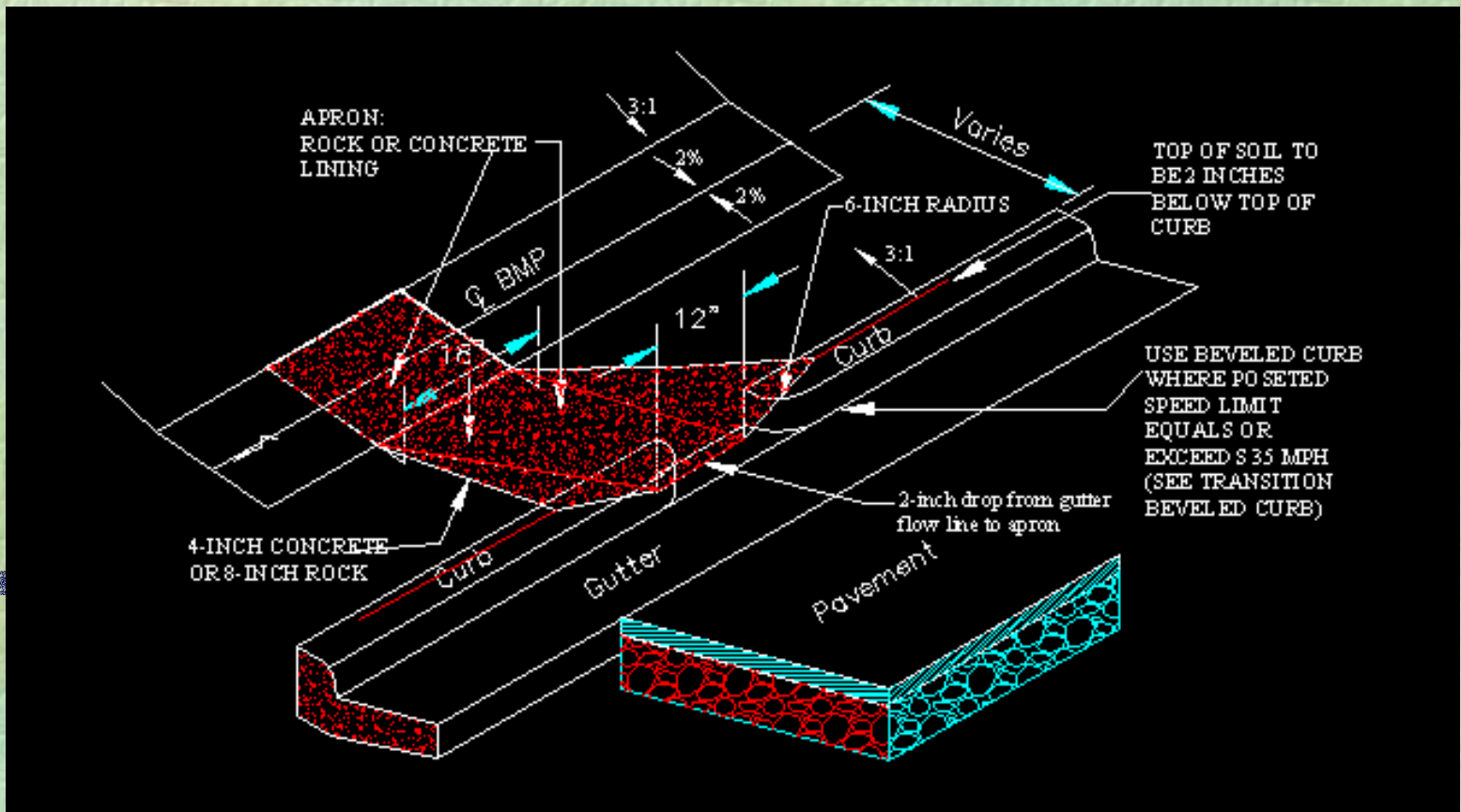
- Check Elevations of Subgrade to Assure Sufficient Vertical Grade for Planting Soil
  - Check that Grades with Planting Soil allows Runoff to Flow as Shown on Plans
- 
- Provide a Positive Slope to the Discharge Points. Do not Rely on Percolation

# Get Flow into Swale

- Provide a 2-inch Drop from Pavement into Swale
  - Curb Openings should be 12-inches Wide to Reducing Leaves
- 
- Perforated Pipes with a Bubble-up Allow Peak Flows to Enter the Swale, with Low Flows Percolating through the Pipe
  - Energy Dissipation is Needed where Concentrated Flows Enter the Swale
  - Consider Pumping Flows into Bioswale. Gravity may not Work.

# Maintain Swale

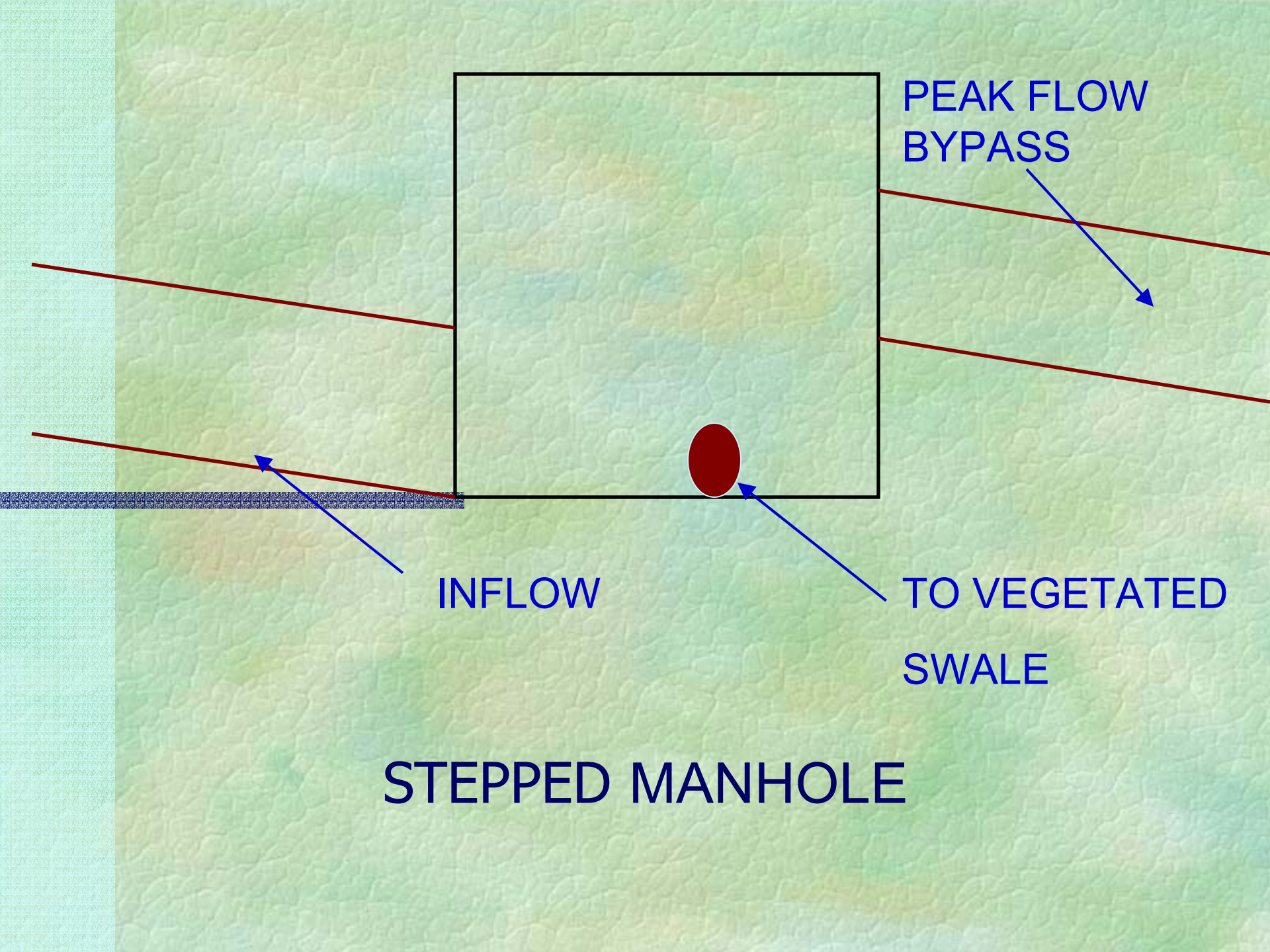
- Keep Sediment Out During Construction.
  - Clean Deposited Sediments from Clogging Permeable Soils
  - If Excess Erosion Occurs, Remove Deposits.
  - Cut Grasses as Needed for Fire Control
- 
- Check Standpipe and Clear Line if Standing Water is Observed in Standpipe
  - Clear Garbage from Swale



# Use a Mulch that does not Float

- Tan Bark Floats. Floating Mulch will Clog Grates and Storm Drain Systems.

- Mulches that do NOT Float include BFI Bark.



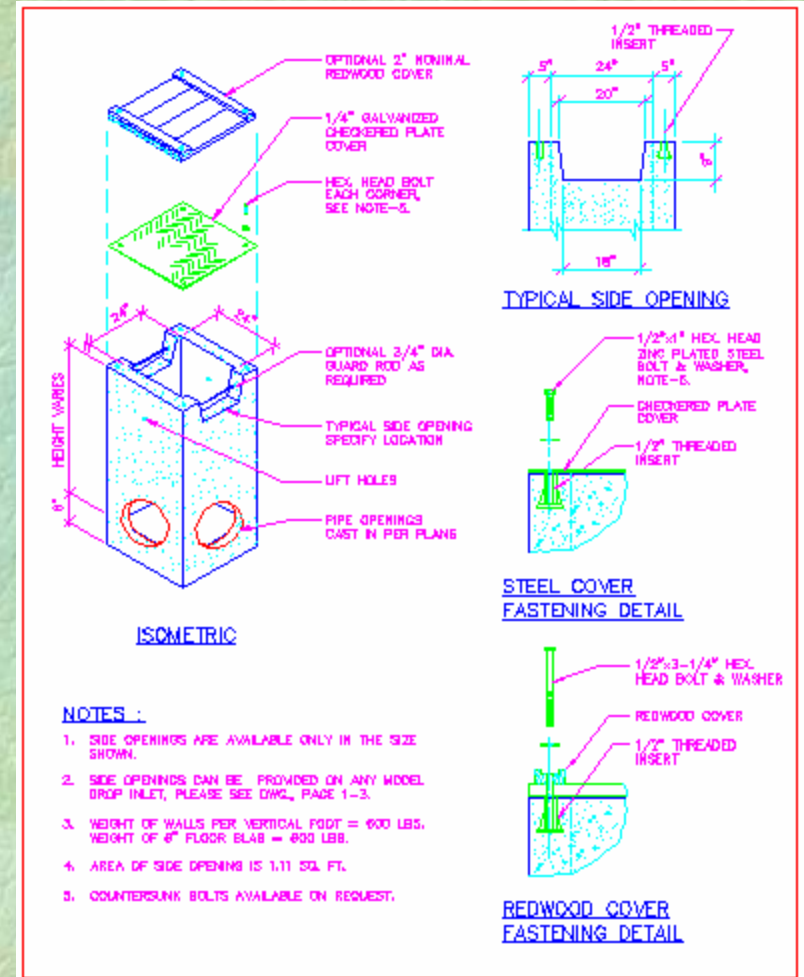


# Select Grasses for Treatment

- The Goal is a Thick Coat of Grasses
  - Grasses should be 6-inches long
  - A Manicured Lawn is NOT Desired for a Vegetated Swale.
- 
- Size Vegetated Swales Using a Roughness Coefficient of 0.200 to 0.250. This is VERY Rough.

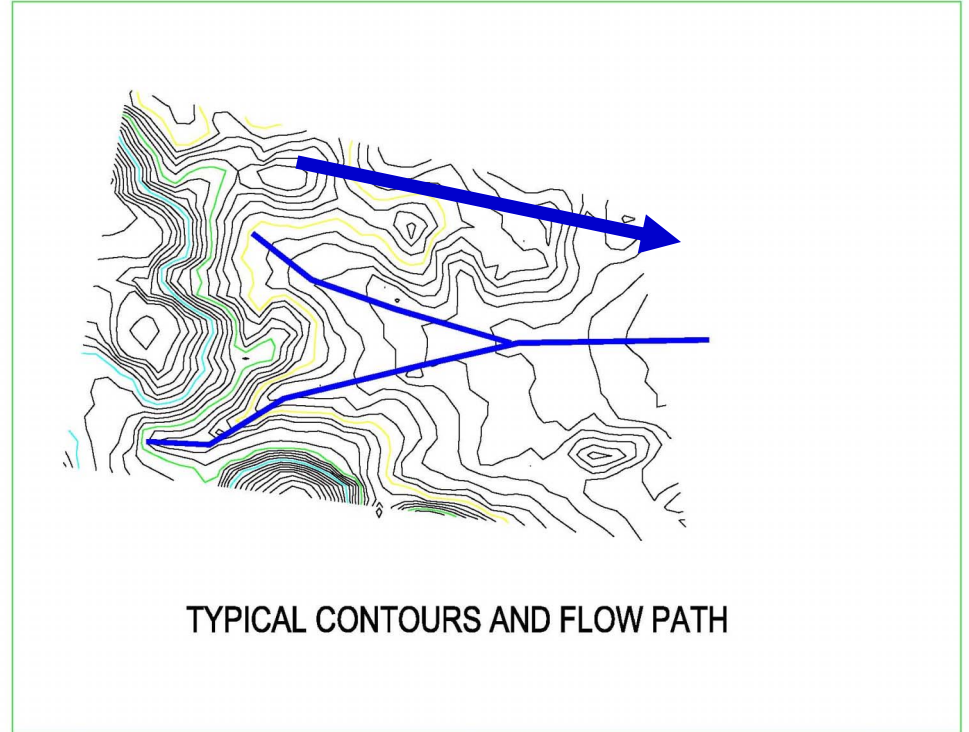
# Getting Flow Out of Vegetated Swale

Side Opening Inlets Make Most Sense  
Standard Grated Catch Basin can be Used



# LOCATION OF VEGETATED SWALE: EXAMPLE

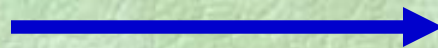
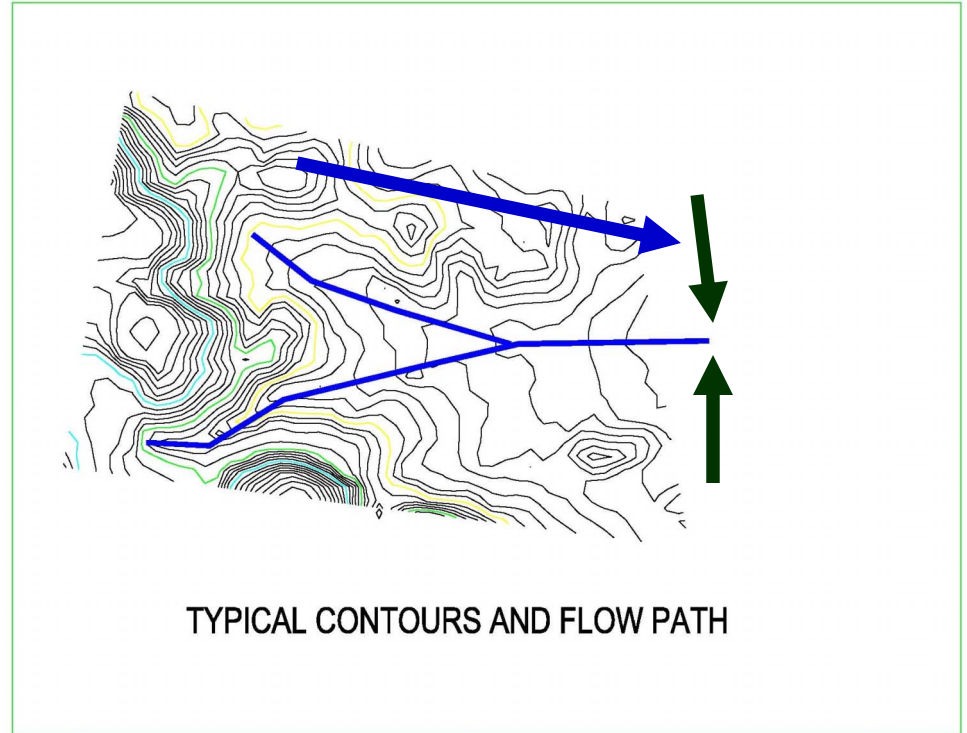
Where should the Vegetated Swale be Placed?



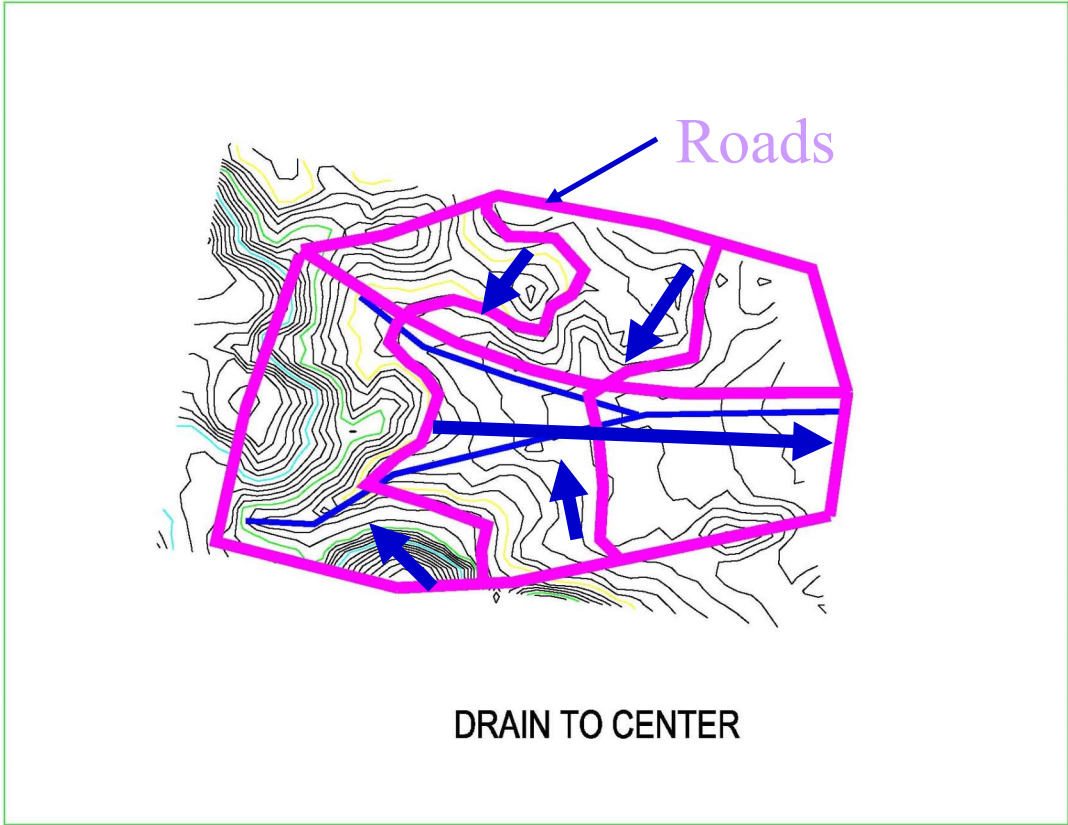
Flow Direction

# LOCATION OF VEGETATED SWALE: EXAMPLE

Where should the Vegetated Swale be placed?

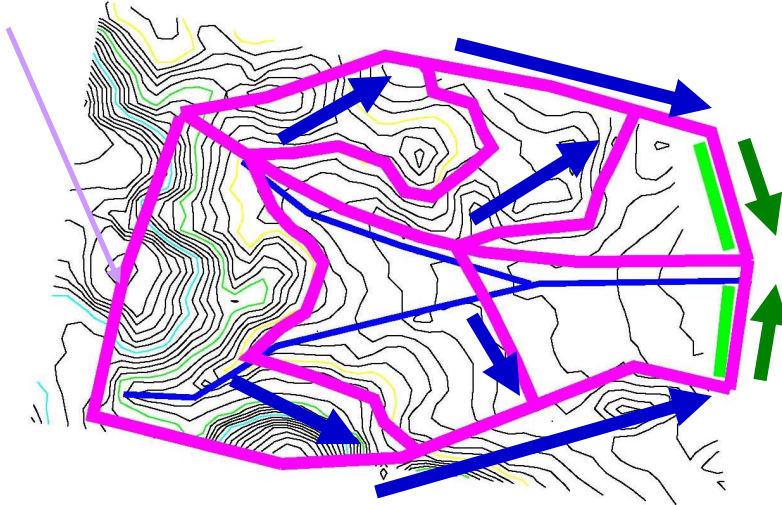


Flow Direction



Flow Direction

Roads



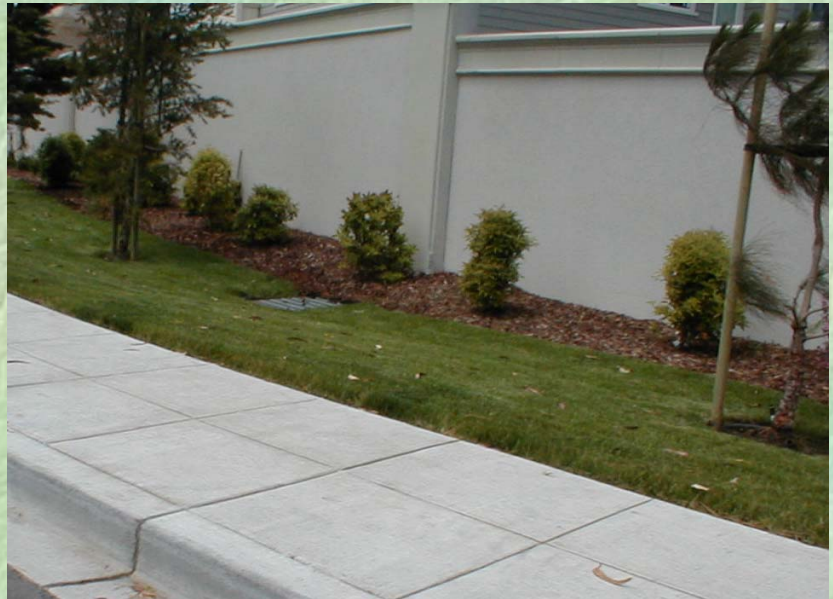
DRAIN TO PERIMETER



Direction of Flow



Bioswale Flow Direction



# Conclusions

- Vegetated Swales will Work if Properly Sized, Designed, Constructed and Inspected
- 
- Vegetated Swales are Frequently Installed with Landscaping.
  - Coordination between Improvement Plans and Implementation is Critical.

**QUESTIONS**  
**?**

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