Bioretention

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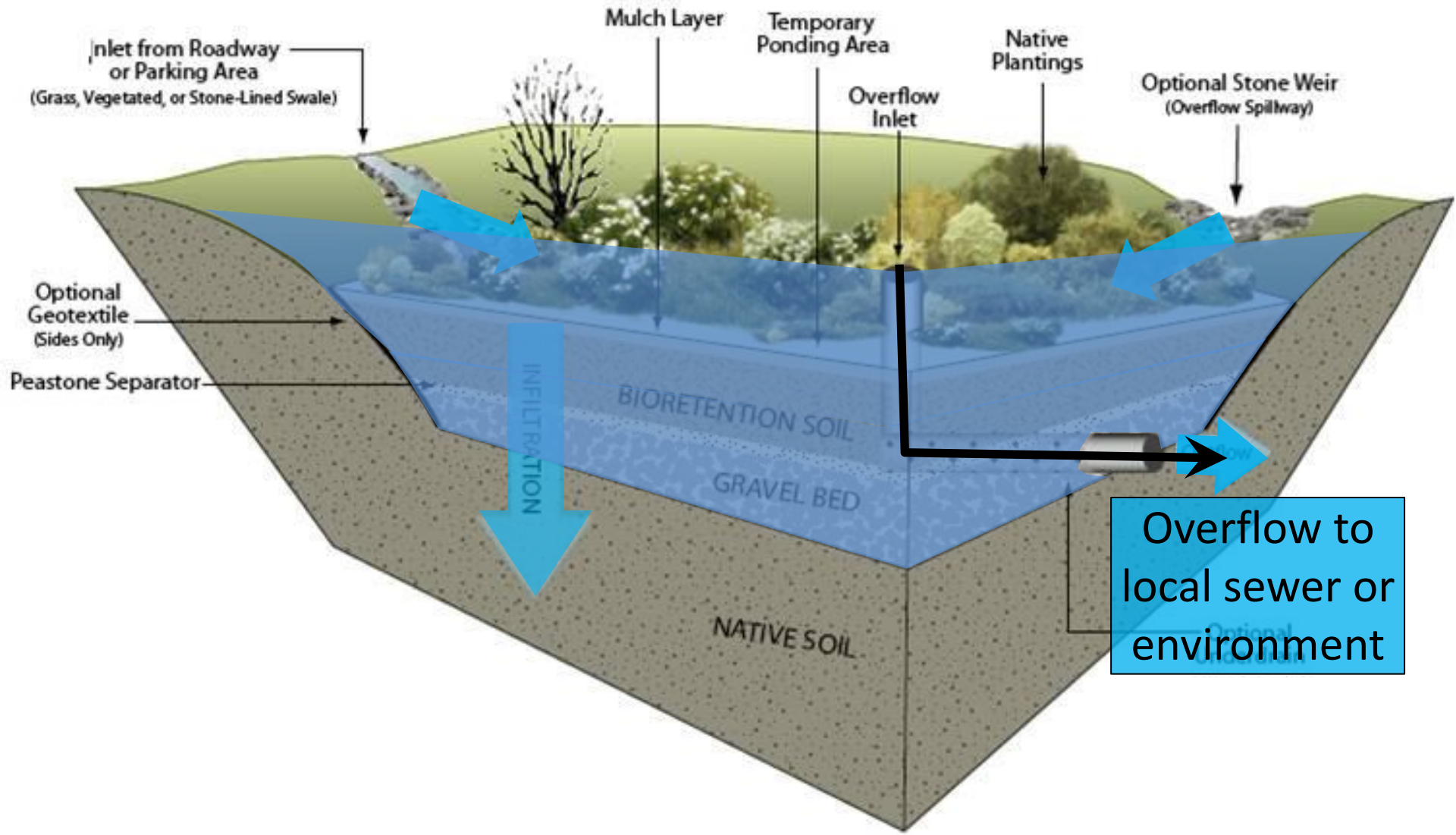
Stormwater Management Training for MS4 Municipal Employees

- Training Session Agenda
  - Pre-Training Survey
  - Presentation & Site Visit
  - Post-Training Survey

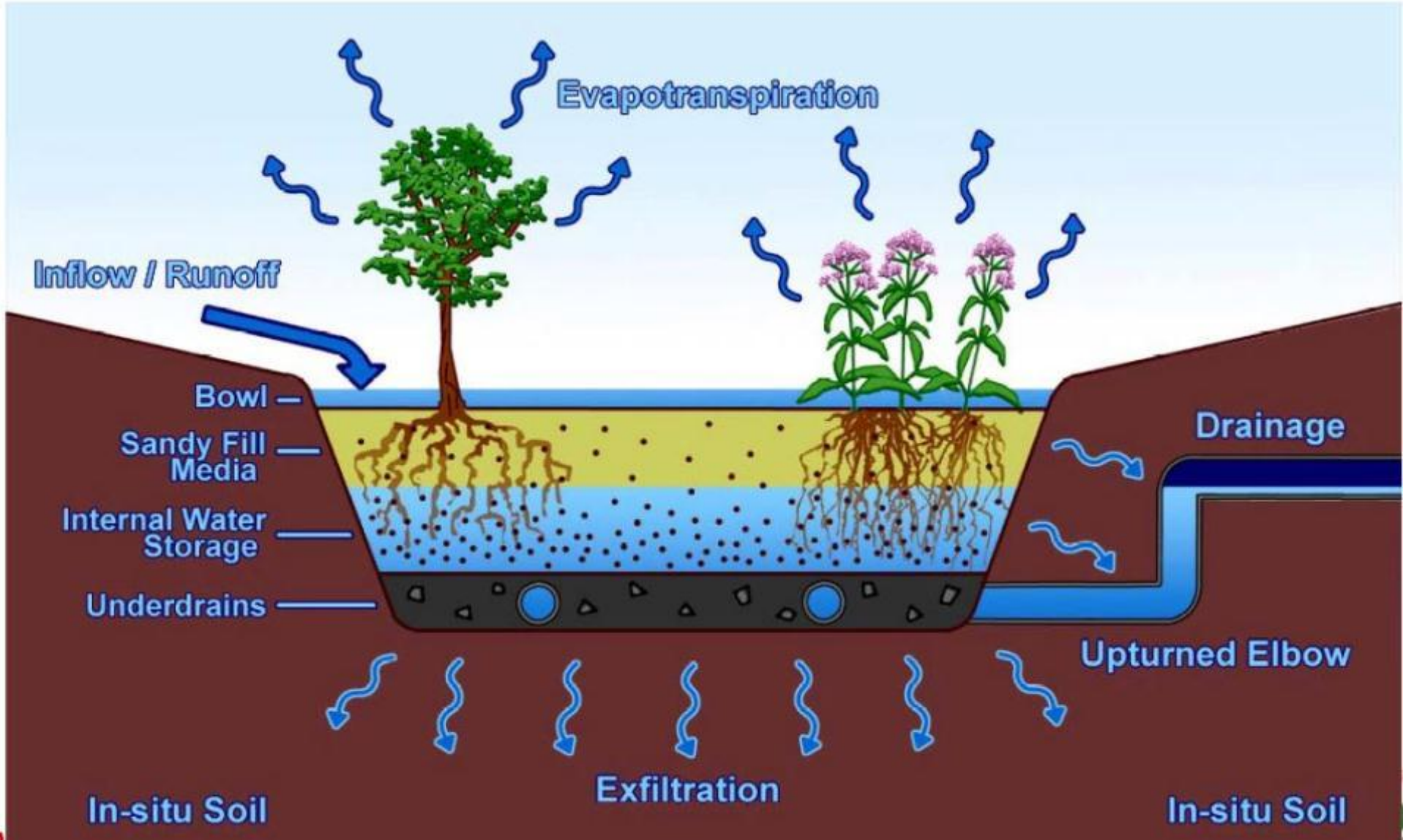
- Today's Selected SCM: Bioretention
  - Design features
  - Construction pitfalls
  - Operation & Maintenance activities

Stormwater Control Measure
Bioretention/Bioswale

Bioretention Concept



Internal Water Zone Bioretention Cell Schematic



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Bioretention/Rain Garden Design

Key Design Considerations/Features

- Hydrology
- Inlets and Outlets
- Materials
- Vegetation

Bioretention / Rain Gardens

- Uses soil media, mulch, and vegetation to reduce runoff and treat stormwater
- Treatment occurs through:
  - Sediment settling
  - Microbial breakdown
  - Nutrient uptake by plants
  - Infiltration
  - Detention

Bioretention/Rain Garden
Design Basics

- Designed to treat the Water Quality Volume
  - Water Quality Volume = runoff from the first ¾ inch of rainfall
  - Drain down in a day's time
  - May be constructed online or offline

Bioretenion/Rain Garden

Inlets

Distributes runoff into bioretention via:

- Curb cuts
- Trench Drain
- Grass swales or berm

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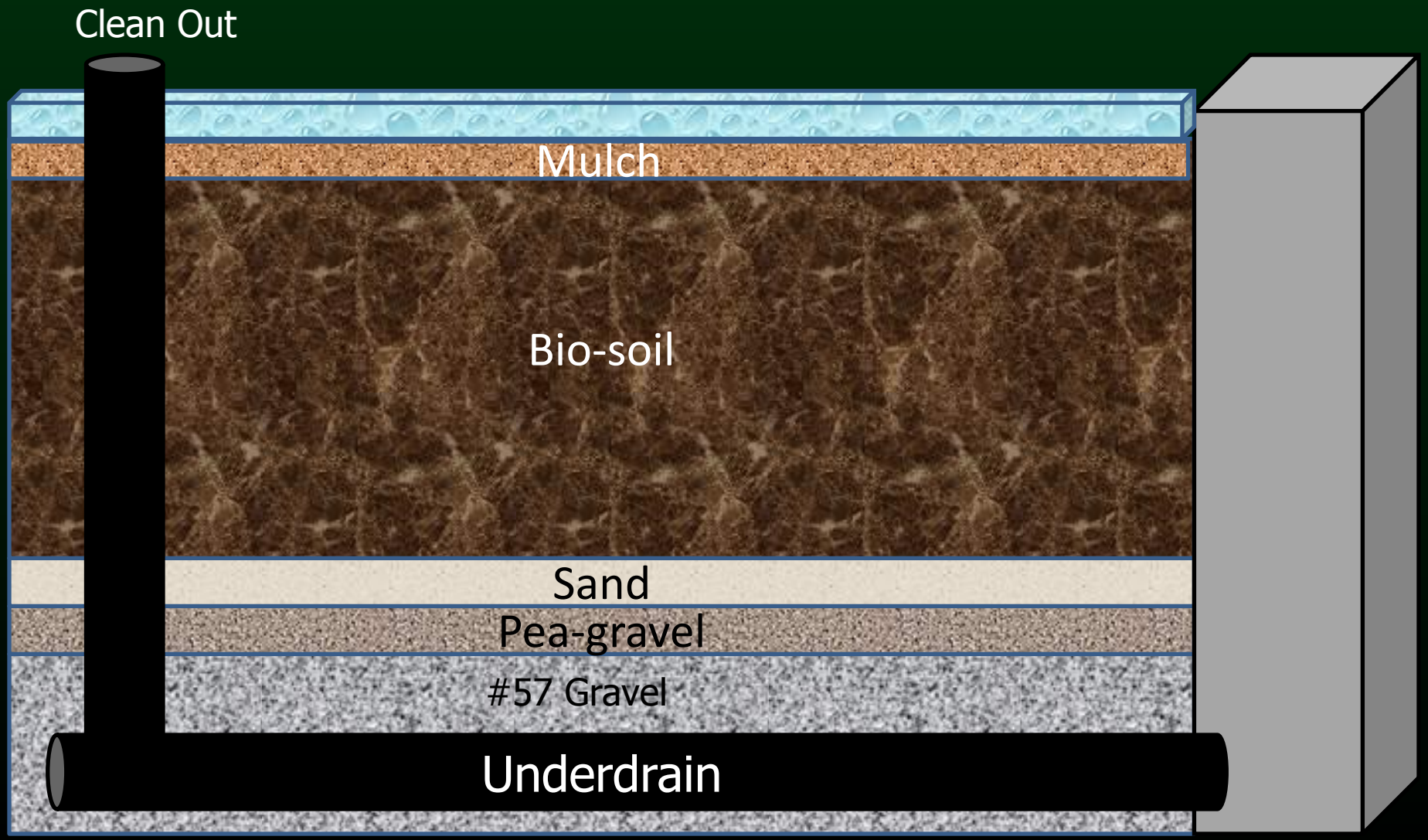
Bioretention/Rain Garden
Pre-Treatment

Reduce sediment loads

- Hydrodynamic separators
- Grass inlets
- Forebays

Bioretention/Rain Garden

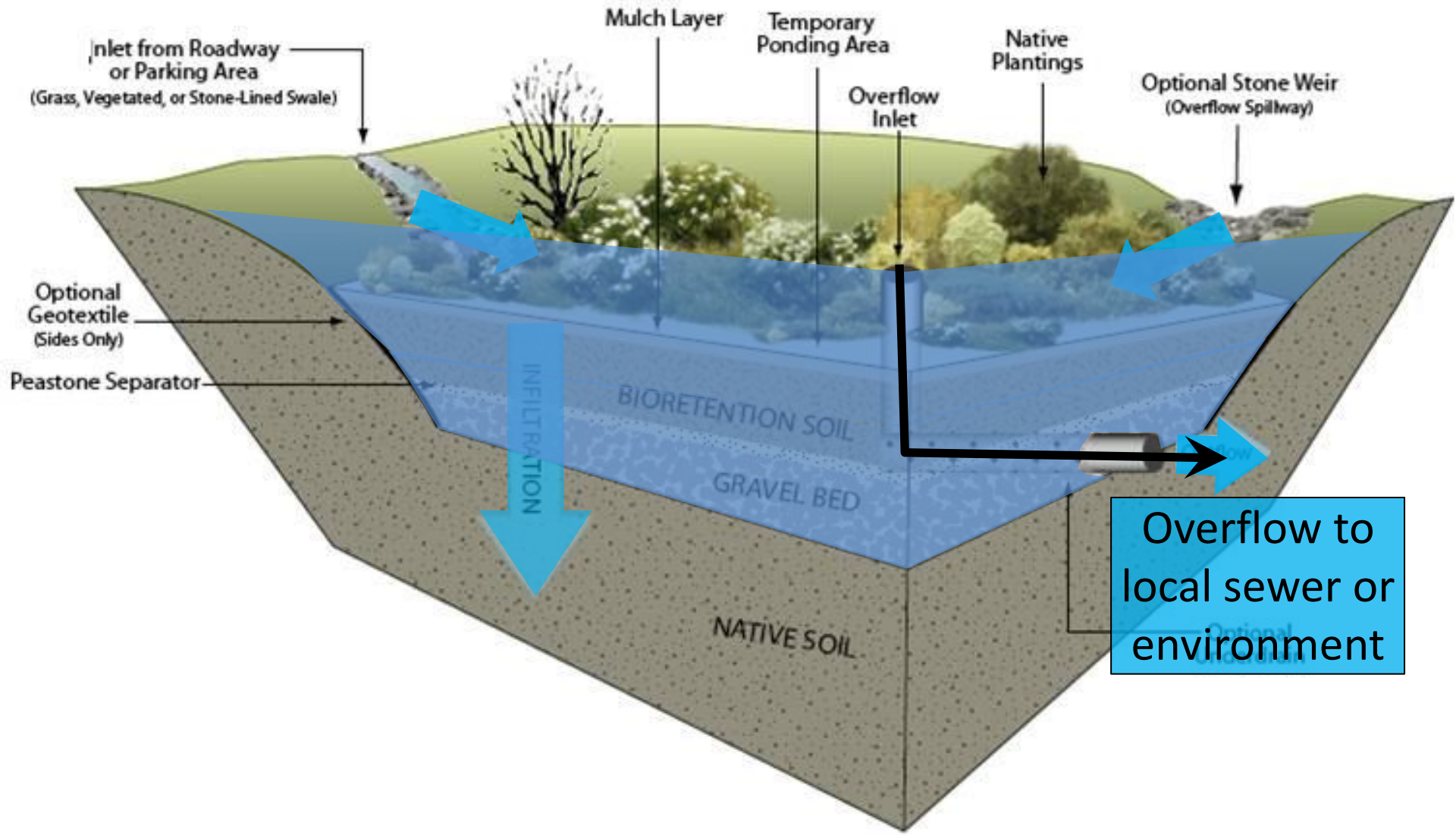
Treatment System



Bioretention
Ponding Depths

Should be 12 inches between the top of the bed and the top of the overflow

Bioretention Concept



Bioretention/Rain Garden

Mulch

- Double shredded hardwood
- 3” layer
- Keeps weeds down

Bioretention/Rain Garden
Soil Media

- Loamy Sand 2-4 feet
- By Volume
  - 75% Sand (AASHTO M-6 OR ASTM C-33)
  - 15% fines (Native soil)
  - 10% Organic Matter (Compost)
- pH 5.2-8.0
- Phosphorus 15-60 mg/kg

Bioretention
Filter Layer

- Prevents the planting soil from moving into the stone
- 3 inches of sand over 3 inches of pea gravel #78
- NO FILTER FABRIC

Bioretention

Gravel Layer/Underdrains

- May or may not be designed with underdrains
- 10-12 inch gravel bed of #57 washed stone
- Should be 3 inches of gravel above and below underdrain tile

Bioretention/Rain Garden

Vegetation

- Tolerate temporary inundation
- Natives or cultivars depending on look and function
- Can include trees and shrubs
- Best to plant in deliberate patterns and plants of the same type together to better identify weeds from intended plantings

Bioretention/Rain Garden

Construction

- Pre-Construction Meeting
- Timing
- Excavation
- Structural Components
- Planting
- Mulching

Bioretention/Rain Garden

Construction - Timing

Constructed AFTER the upstream drainage area is stabilized

- Avoid sealing off the native soils
- Avoid fines contamination of the bio-soil mix

Bioretention/Rain Garden
Construction - Timing

- Ideally construct during dry weather
- Do not leave open for extended periods of time

Bioretention/Rain Garden

Construction - Excavation

- Properly sized equipment
  - Work from the sides
  - Avoid bottom compaction
  - Excavate in steps

Bioretention/Rain Garden

Construction - Excavation

- Sides of cell vertical
- Bottom of cells level
- Use bucket teeth to scarify sides and bottom of cell

Bioretention/Rain Garden
Construction - Excavation

- Erosion and Sediment control critical
- Keep practice "off-line" for as long as possible
- Stabilize side-slopes ASAP
- Protect bio-soils with sheeting or geo-textile

Bioretention/Rain Garden
Structural Components

Inlet/outlet elevations critical to function

- Water needs to get into the practice
- Water needs to pond in the practice – Outlets will be elevated
- Underdrain may be elevated to encourage infiltration
- Cleanouts should be provided

What's wrong in the photo?

Bioretention/Rain Garden
Maintenance

Key points…

- "Reading the practice"
- Interpreting flow paths
- Listing of major maintenance components

Bioretention/Rain Garden

Maintenance

Key points…

- Shredded vs. pine bark mulch
- Routine vs. non-routine maintenance
- Vegetation maintenance

Bioretention/Rain Garden
Maintenance

Key points…

- Standing water, vegetation health, sediment & erosion
- Note sediment accumulations
- Note smaller orifice & outfall sizes
- Note shape of bioswale… problem?
- Note underdrain & inlet configuration

Bioretention/Rain Garden
Maintenance

Final tips…

- Refer to individual SCM project O&M Manual
- Obtain copies of As-Built Plans
- Maintain accurate map of feature's designed & constructed drainage area

Field Site: *place site image here*

Questions?

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