The Infiltration Swale: An ALDOT LID Practice

The Downside of Development
- From pervious natural surface to more impervious developed surface
- Runoff in greater volumes & at higher velocities
- Increased erosion & sedimentation potential
- Increased flood risk

The ALDOT MS4 Permit
- NPDES permit issued by ADEM to regulate MS4 stormwater discharges in particular urban areas
- “Post-Construction Stormwater Management” is required by the MS4 permit

Post-Construction Stormwater Management
- Managing impacts of development
  - Mimic pre-development hydrology to maximum extent practicable
    - For 95th-percentile rain event & events of less rainfall
- Methods encouraged
  - Minimize impervious surfaces
  - Preserve & promote vegetation
  - Low-Impact Development (LID) & Green Infrastructure (GI)

ALDOT Post-Construction Policy
- GFO 3-73

Post-Construction Design Guidance
- Estimate changes in peak flow & runoff volume due to development
Post-Construction Practices to Fit ALDOT

- Unique challenges for ALDOT
  - Roads are linear
  - ALDOT owns limited property alongside roads
  - Motorist safety
  - Maintaining a vast network of roadways throughout Alabama
- ALDOT post-construction BMP needs
  - Promote infiltration
  - Small footprint
  - Safe for motorists
  - Minimal maintenance requirements
- One option to meet the needs: Infiltration Swale

Infiltration Swale Basics

- A vegetation-lined, “bottomless” ditch
- Adapted fundamentals from the Alabama LID Handbook to meet ALDOT needs
- Trial-and-error
  - Learning with each new project
  - No official special drawing yet
- Design Options
  - “Standard”
  - “Enhanced” (for slower infiltration rates)
  - Others being considered
- Installed after other construction completed
  - Sediment resulting from other construction could clog media & inhibit infiltration

ALDOT Post-Construction BMPs in the Works

- As of now, 10 projects in MS4 areas let after 1 April 2015 will have post-construction practices implemented
- Of those 10 projects, BMPs for at least 5 projects will include infiltration swales
- One project that is implementing infiltration swales is Memorial Parkway (US-231) in Huntsville [NHF-0053(530) / NHF-0053(531)]

Memorial Parkway Post-Construction Case

- Memorial Parkway is located in a highly-developed urban area
- Project expected to add significant development
  - 4 additional thru-lanes
  - 10 thru-lanes total (mainline and service roads)
  - Qualifies as “Re-Development” (MS4 permit / GFO 3-73)
- Major revision to project plans
  - Project was on the shelf for years
  - Let after post-construction policy in effect
  - Determined adding infiltration swale feasible
  - Made good-faith effort before granting exception per GFO 3-73
- On-average soil characteristics
  - NRCS Soil Survey: HSG B (well-drained)
  - Sufficient infiltration potential
Project Number NHF-0053(530) Madison County

- Grade, Drain, base, Pav, Bridges, Signing, and Lighting on SR-53 (US-231/Memorial Parkway) From Just North of Whitesburg Drive to Just South of Golf Road
- Total Original Contract Price $53,882,864.27
- Key Points:
  - Highly Urbanized Area With Limited ROW
  - Adding Additional Lanes and Increasing the Impervious Surface Area

**Construction Requirements**

- Infiltration Swale is to be Constructed in Right Ditch From STA. 77+80.00 to STA. 82+80.00 (500 meters)
- Infiltration Swale Must be Constructed After Final Stabilization is Achieved

**Construction Requirements**

1. Geometry of the Infiltration Swale to Match Proposed Ditch
2. Excavate Ditch Four (4) Foot Wide by Approximately Four (4) Foot Deep
3. Scarp Ditch Bottom
4. Add Eight (8) Inches of Washed #57 Sand
5. Place Geotextile Fabric Across Ditch Bottom and Staple Back at the Top of the Ditch (Sand must in line with and draped over a minimum of Two (2) Foot Overlap of Washed Gravel to Boulders)
6. Add Thirty (30) Inches of Clean Sand Media and Encapsulate with Geotextile Fabric (Crimp at Overlap)
7. Add Six (6) Inches of Permeable Topsoil (Sandy Topsoil) and Permeable Topsoil Baffles every One Hundred (100) Feet
8. Place Solid Sod

**Why?** To prevent sediment from collecting in the Infiltration Swale and preventing its intended purpose.
• Scarify Ditch Bottom

• Place Geotextile Fabric Across Ditch Bottom and Staple Back at the Top of the Ditch (Sand has to be Fully Encapsulated and a Minimum of two (2) Foot Overlap at the Finished Grade of Sand Media

• Add Thirty (30) Inches of Clean Sand Media and Encapsulate with Geotextile Fabric (Crimp at Overlap)
Construction Requirements

- Total Cost of Construction (SWALE) $74,777.92
- Approximately $149.56/Meter

(Not an accurate Bid Price Due to Most of the Work Being Performed by Force Account)

Final Stage: Place Topsoil and Sod

After 1-3/4" Rain Event (Project still in construction phase)