BMPs for Constrained Roadway Projects

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Agenda

• Goals
• Pollutants of Concern
• How Pollutants of Concern are Treated
• Design Constraints
• Evolution of Design
• Suite of Selected BMPs
• Lessons Learned
Goals

Directed by the Tollway to develop a suite of BMPs for future projects that would, to the extent practicable, minimize the impact on the environment through the implementation of a number of onsite Best Management Practices.

Any selected BMPs must be:

• Safe for the traveling public
• Sustainable
• Be capable of being maintained by Tollway maintenance personnel who are provided with additional training
• Provide a quantifiable net benefit
Pollutants of Concern

- Oils
- Total Suspended Solids (TSS)
- Metals
- Nutrients
- Chlorides
How Pollutants are Treated?

• Oils – Soil contact – Filtering – Capture
• TSS – Filter – Settling
• Metals – Filter – Settling
• Nutrients – Plant Nutrient Uptake

Infiltration provides an effective means of creating the physical movement of water to promote - Soil Contact, Filtering, Capture, Settling and Nutrient Uptake
But Jeff, what about the Chlorides?

- Well…..
- Based on data collected to date there has been a net decrease in chloride concentrations….but we don’t know if this will be a temporary or permanent reduction.
- It is expected that the BMPs will provide an attenuation of chloride concentrations rather than a genuine reduction in chlorides
Design Constraints

- Narrow ROW
- No land acquisition for the purpose of BMPs
- Temporary Construction Easements would take as long to acquire as new land parcels
- Very flat ground
- Clay soils
So...where do you do it?

• Given the limitations of the work space, the natural location is within the adjoining drainage swales and ditches.
• Miles of adjoining green space...
• Maximize the filtering and infiltration capabilities of the swales and ditches.
• Develop and install Bioswales
You have to start somewhere!

- The “Greening” of the Tollway began with the I-294 Bioswale Demonstration Project.
- I-294 was identified as the first location to test out the bioswales.
- In 2008, 2im Group was tasked with developing Bioswales to retrofit existing Tollway ditches.
PROJECT LIMITS

TOTAL FEET OF BIOSWALES = 29,226 FT. OR 5.54 MILES
Bioswale Types

- Typical Roadway Ditch – Conveyance, No Water Quality
- Typical Highway Ditch – Conveyance, No Water Quality
- Filtration/Infiltration – Opportunity
- Surface Detention/Vegetation – Opportunity

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring, FHWA, MAY, 2002; Figure 17
Bioswale Design

• Depending on the slope of the swale you may need to slow the water down to promote infiltration and filtration.
• Use ditch checks to pond water +/-8” deep
• Slopes between 1% - 2%
Bioswale Evolution

Original Design used a ditch check with a pipe to control flow. But pipes are prone to clogging.

A completely new unique design was developed for I-90, that still slows down the flow to promote infiltration but is less likely to clog.
We still haven’t used all the green space!!!!!

• The shoulder of the highway isn’t all ditch
• There is still room for more BMPs
Furrows

• On embankments, water generally flows down the slope very quickly before reaching the ditch line.

• Install slope breaks – Furrows on contour across the embankments to:
  – Slow down the flow
  – Promote sheet flow
  – Capture sediment
  – And promote additional infiltration
Furrows
Call now and we can double your order.

- We have covered the embankments and ditch lines with BMPs – what else can we do?
- Provide additional stormwater capture
- Capturing a water quality volume provides a quantifiable reduction in discharge and pollutants from the ROW.
Stormwater Quantity

- Water Quality Volume:
  - Rainfall from 80% of annual events
  - Rainfall from 90% of annual events
  - 2-year 24-hour event

80% = 0.6 in
90% = 0.9 in
Water Quality Volume

• I-90 reconstruction and the new Elgin O’Hare Western Access projects are the first to incorporate a Water Quality Volume into their designs.

• I-90 is capturing the first 0.75 inches of rainfall and retaining it onsite. A ¾ inch event translates into approximately 88% of all rain events recorded at O’Hare
Water Quality Volume

- The Elgin O’Hare Western Access project will capture the first 1.25 inches of rainfall which correlates to 98% of all rain events recorded at O’Hare.
- Theoretically, there would be zero discharge from the sites with lesser events meaning zero discharge on the surface of pollutants.
Water Quality Volume – Where are we putting it.

• In the bioswale sub-base
  – As surface ponding
• Within detention ponds
  - Vaults
  - Stone sub-base
    - Interesting Story – Elgin O’Hare Western Access
      - Wildlife deterrents
      - No surface water beyond 48 hours
      - Need effective storage that will not attract wildlife...
But wait there’s more!!!

- There is still room left to fit in more BMPs
- Manholes below embankments can be made leaky.
- Manholes are designed with leaky bottoms to promote additional infiltration when clear of pavement.
Vegetation

• Typically we use Salt Tolerant grass from shoulder to ROW fence

• NOW:
  – Salt Tolerant (Class 2E) for the first 20’ beyond edge of shoulder
  – Low Profile Prairie (Class 4F) all other upland areas
  – Bioswale Seed Mixture 1 adjacent to waters
    Little Blue Stem Side-oats grama
    Prairie Dropseed Indian grass
Other design initiatives

- Placing underdrain outlets at least 100’ upstream of Waters/Wetlands
- Using Floc Logs at underdrain outlets adjacent to Waters/Wetlands to minimize fines entering waterways
- Using Shock Logs (when required) to rebalance pH levels due to recycled concrete in sub-base
Lessons Learned
(...or why this matters for non-Tollway projects)

• Proper application of BMPs really does require multi-disciplinary cooperation
• Education, education, education...
• Follow-up on design. What works, what doesn’t and why?

• Questions?