Managing Stormwater within the Road Right-of-Way: An Urban NAI Approach

Turgay Dabak, Joni Calmbacher, Sara DeGroot, Andrea Ryon
Presentation Outline

- Project Background
- Project Overview
- BMPs Evaluated and Final Design
- Analysis Results and Findings
- Conclusions
The project was funded by Fairfax County Department of Public Works and Environmental Services and was conducted under the guidance and direction of Stormwater Planning Division staff Matt Meyers, Dipmani Kumar, Martin Chang, and John Palmer.
INTRODUCTION
No Adverse Impact (NAI) is an approach that ensures the action of any community or property owner, public or private, does not adversely impact the property and rights of others.

NAI Can Reduce Impacts

- Types of adverse impacts:
  - Reduced flood water storage
  - Water quality degradation
  - Bank erosion
  - Health and safety
  - Economic loss
Impact of LID Retrofits on Flood Storage

Storage Deficit
PROJECT BACKGROUND
Drainage Area = 35 Acres
1997

2014
PROJECT OVERVIEW
**Project Goals**
- Reduce local flooding
- Collect runoff at the source
- Improve water quality
- Improve stream stability

**Design Parameters**
- Design cost-effective, sustainable solution
- Use innovative & functional designs
- Incorporate into landscape
- Remain within VDOT public right-of-way
- Improve hydrology to
  - Achieve predevelopment condition at 90% storm
  - Convey 10-year storm
  - Stabilize receiving stream
Existing Neighborhood Characteristics
- Older residential neighborhood
- Inadequate stormwater conveyance
- Infill development and redevelopment

Desired Stormwater Practice Characteristics
- Fit into existing neighborhood
- Collect and filter stormwater
- Retain and infiltrate
- Safely convey runoff through neighborhood
- **VDOT Right-of-way**
  - Average 50-foot right-of-way width
  - Pavement widths vary (16-25 feet wide)

- **Infiltration Rates**
  - Subsurface exploration was conducted to determine the properties of the underlying soils
  - Favorable infiltration rates were found along Patton Terrace, Kenbar Ct., and upper MacArthur Dr.
  - Infiltration rates are limited along the lower portion of MacArthur Dr.
### How Do You Implement LID Practices in the Public Right-of-Way?

<table>
<thead>
<tr>
<th>Category</th>
<th>Miles</th>
<th>Feet</th>
<th>Feet</th>
<th>SF</th>
<th>Acres</th>
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**ROW Area as a % of DC Land Area: 26%**
BMPs EVALUATED AND FINAL DESIGN
Alternatives Evaluated

- Infiltrating swale
- Infiltration trench
- Storage under road
- Chamber storage along road
- Parking pads
- Improved swale
- Bioretention cell
- Porous pavement
<table>
<thead>
<tr>
<th>Features of Practices</th>
<th>Promotes Infiltration</th>
<th>Conveys Water</th>
<th>Filters Pollutants</th>
<th>“Green Practice” that includes Landscaping</th>
<th>Narrow Width</th>
<th>Provides Underground Storage</th>
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<td>Amended Swale</td>
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Stormwater Management Practices

- Infiltrating swales
- Stormwater chambers
- Regraded / resized road
- Resized/new culverts
- Parking pads
  - Permeable pavers
  - Public spaces

Example Permeable Pavers
- Infiltrating swales
- Some new driveway culverts
ANALYSIS RESULTS AND FINDINGS
Note: The portion of Upper MacArthur above the red dashed line will drain to the pipe in the cul-de-sac at the end of MacArthur Blvd, and the portion below the red dashed line will drain to the pipe at the intersection of Patton Terrace and MacArthur Blvd.
• Hydro-CAD
• Employs NRCS method
• Type II, 24-hr rainfall
• Discharges computed for each sub-basin

<table>
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<th>STORM</th>
<th>DEPTH (IN)</th>
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<td>2-yr</td>
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<td>WQ-95%</td>
<td>1.5</td>
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<tr>
<td>WQ-90%</td>
<td>1.06</td>
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## Peak Existing Stormwater Discharges

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<th>Rainfall Event</th>
<th>Total Catchment</th>
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<td>Existing Conditions</td>
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<tr>
<td>10-Year</td>
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<td>9.82</td>
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<td>1.75</td>
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<tr>
<td>Rainfall Event</td>
<td>Total Watershed</td>
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<td>---------------</td>
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<tr>
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<td>Proposed* Conditions</td>
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<tr>
<td>WQ-95%</td>
<td>5.53</td>
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<tr>
<td>WQ-90%</td>
<td>0.87</td>
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We Make a Difference

Adequate Outfall Analysis
Water Quality Benefits

- **WQ 90% Runoff**
  - All infiltrated through BMPs

- **Phosphorous Removal**
  - Approximately 13 pounds of phosphorus are removed annually
  - Based on 0.44 pounds/acre/year and 90% efficiency
CONCLUSIONS
✓ Attained cost-effective and sustainable design
✓ Remained within VDOT public ROW
✓ Incorporated into landscape
✓ Addressed localized flooding
✓ Improved water quality
✓ Reduced cumulative discharges