Blueprint Clintonville Integrated Solutions Project
Pilot Area Technical Committee (PATC) Approach and Interim Findings

One Water – Ohio WEA-AWWA 2014 Technical Conference & Expo
August 28, 2014
What is Blueprint Columbus?

- Potentially a better approach addressing sanitary and stormwater
- Columbus’ version of USEPA Integrated Planning Framework (June 2012)
- How?
  - Get the rain water out of the sanitary sewer
  - Get the rain water clean (green infrastructure)
• Mandatory Lateral Lining and Sewer Main Lining
• Voluntary Sump Pump Program
• Mandatory and Select Roof Leader Redirection
• Green Infrastructure in Right-of-Way
Blueprint Clintonville

- Very familiar to us & EPA
- Six sub-areas; six consultants
- 1000 Acres - 3000 homes
- Homes from 1920’s to 1950’s
- Ravines
- Engaged property owners
- Survey crews in field now
- How do we define goals?
Identification of GI Level of Service

• Pilot Area Technical Committee (PATC) created by Steering Committee

• Three Levels of Service were identified:
  – LOS - Water Quality
  – LOS – Stormwater Quantity
  – LOS - Stream Degradation

• Establish process of identifying target LOS’s for use in future Blueprint areas
Performance Curve for Bio-retention
TSS Removal vs. Cost per 10 Acres
Medium Density Residential
0.01 Exfiltration Rate

65% TSS Reduction – Lower Olentangy TMDL

58% TSS Reduction

$39,000/acre

$15,000/acre

Limit of bio-retention application (3%)
LOS – Stormwater Quantity Determination

- Lateral Lining and downspout/sump pumps decreases existing LOS
- Must maintain existing LOS
- Potential opportunity for improving LOS via additional green or gray?
- GI offers detention; gray transports downstream
- Evaluated two pilot areas in SWMM to establish modeling parameters
- GI needed to obtain 58% TSS removal still improves LOS Stormwater

Pilot Area 1: Chatham Rd
Area ~ 30 acres
Surface Slope ~ 2.6%
Manhole Flooding Recurrence ~ 1.5 years

Pilot Area 2: Weisheimer Rd
Area ~ 30 acres
Surface Slope ~ 1.2%
Manhole Flooding Recurrence ~ 5 months
LOS - Stream Degradation Determination

- The I/I work results in increased runoff
- HECRAS model used to analyze stream
- Result: Design constraint set to not allow peak flow rate increase at storm outfalls
PATC Recommendations

- GI can cost effectively improve water quality and flooding level of service for an approximate cost of $15k per acre of drainage area
- Validated that a Knee of the Curve analysis can be used to establishing site specific target levels of service
- Water quality and flooding improvements can be optimized using iterative modeling process for combinations of green and gray alternatives
- Individual areas may have greater opportunities or constraints – one area may compensate for another to meet the target level of performance
- Process ensures consistency, but allows for flexibility and varying levels of service based on economic feasibility
- Generated Technical Memo to summarize findings and provide process map for use in future Blueprint areas
- Ultimately, Steering Committee to decide on LOS
Design Constraints

- Infiltration rates (or lack thereof) for native soils
- Underdrains are required
- 24-40 hour detention time
- 3:1 side slopes for rain gardens
- 5:1 impervious to pervious for porous pavements
- Siting and Design Guidelines
  - 22 ft curb to curb
  - Parking spaces
  - Distances from intersections
  - Trees
- SWDM compliance for disturbed area
- Coordination with other utilities
- And many others
Model Construction

• Received SWMM model from SSCM modeling consultant
• Received stormwater drainage boundary delineations from FCSWCD
• Each consultant further refined delineations
  – Reduced size of catchments to ~300 ft for scenario comparison
  – Incorporated topographic and field survey data
• Reconciled overlap of project areas
• Three scenarios:
  – Existing, - 50% of roof to street
  – Baseline, - 100% of roof to street
  – Proposed – GI to address additional water
• 0.06 in/hr infiltration rate for native soils
• Modeled gutters as channels and inlets as orifices
• Used 19 years of continuous rainfall data
• GI modeled as storage units
• Represented land cover and land use in high detail
Alternative development

- Each consultant approached this differently
  - Some used sector based approach, others area wide
- Varying amounts of existing stormwater infrastructure
- Some areas had large amounts of ravine
- Gray Infrastructure only where necessary
- Main tools were Rain Gardens and Pervious Pavers
- Some areas had opportunities for regional GI facilities (most cost effective)
Rain Gardens

Layout focused on getting sidewalks on one side of the street and connecting to existing sidewalks/crosswalks (promoting pedestrian access to the local schools)
Bump Outs
Pervious Pavement
Alternative evaluation

• Three tiered approach to alternative screening:
  – Spreadsheet ➔ 1 year model run ➔ 19 year model run validation

• 30 Year Lifecycle analysis

• Unit Prices – uniform capital and OM costs were provided to all

• TBL – social and environmental
Example Alternative
Alternative selection

- Many consultants, many styles and approaches
Knee of the Curve

- Visual – can perform on any curve, highly subjective, influenced by scale
- $3M Range!
Knee of the Curve

- 1:1 slope – Objective, requires logarithmic best fit curve, tends to be high
Knee of the Curve

- “Kneedle” – Objective, works on any curve, requires broad spectrum of data points
## Alternative Results

<table>
<thead>
<tr>
<th>Area</th>
<th>Acres</th>
<th>Recommended Alternative Construction Cost</th>
<th>Cost per Acre</th>
<th>%TSS Removal</th>
<th>Lbs. TSS Removed per Year</th>
<th>Construction $/LB</th>
<th>Lbs Removed per Year per Acre</th>
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<tr>
<td>Overbrook Chatham</td>
<td>149</td>
<td>$2,009,140.00</td>
<td>$13,479.64</td>
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<td>Blenheim Glencoe</td>
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<td>30701</td>
<td>$128.80</td>
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<tr>
<td>Weisheimer Indian Springs</td>
<td>177</td>
<td>$7,087,686.69</td>
<td>$40,043.43</td>
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<td>Cooke Glenmont</td>
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<tr>
<td>Morse Dominion</td>
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<td>Schreier Springs</td>
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<td>Average</td>
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<td><strong>$34,660.67</strong></td>
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<td>Total</td>
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<td>NA</td>
<td><strong>105492.4</strong></td>
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Lessons Learned (so far)

• Costs are higher than anticipated and TSS removal is lower than anticipated
  – 58% at $15k/acre vs 45% at $34k/acre

• Made many conservative assumptions
  – % stormwater capture lower than anticipated
  – % roof area to street
    • Increase “Existing”, decrease “Baseline”
  – Rain garden side slope
  – Rain garden retention time
  – Tree drip lines

• Revisit Siting and Design Guidelines
Looking Forward

- Re-evaluate design constraints which may result in revised alternative analysis
- Refine unit price assumptions
- Compare alternatives based on effectiveness
- Present revised alternatives to the public
- Apply to Future Blueprint areas
  - Approximately 1000 acres per year
    - Linden
    - Miller/Kelton and Early Ditch
    - West Fifth
    - Livingston/James