Flexible Treatment Options: Potential performance goal for sites with restrictions and calculator results

February 17, 2012

MIDS Work Group Meeting

Presentation Outline

- Address comments from last meeting
- Use example performance goal for D soil sites to determine BMP options that achieve goal
- Summarize results
- Present draft performance goal for new developments with restrictions for discussion and possible vote in March

What is the TP load from a natural D soil site? And, what TP% reduction for a developed site is needed to match that load?

Pollutant Loading Basics

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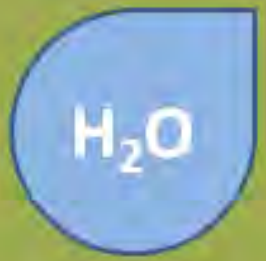

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Pollutant Load	Runoff Volume	Pollutant Concentration
Pounds		

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From the MN Stormwater Manual

Table 8.7 Typical Event Mean Concentrations for Total Phosphorus	
Land Cover/Land Use	**Total Phosphorus (mg/L)**
Cropland[1]	0.32
Forest/Shrub/ Grassland[1]	0.04
Open Water[1]	0.01
Wetlands[1]	0.01-0.04*
Freeways[2]	0.25
Commercial[1,2]	0.22
Farmsteads[1]	0.46
Industrial[1,2]	0.26
Residential[2]	0.30
Multi-Family Residential[1,2]	0.27-0.32
Park and Recreation[1]	0.04
Open Space[1,2]	0.31
Public/Semi Public (Institutional)[1,2]	0.18

[1] Minnehaha Creek Watershed District, 2003
[2] Robert Pitt *et al.*, 2004
* Average for large wetlands and wetland complexes. Individual wetlands should be monitored to determine source/sink behavior

Treatment needed to match natural load (pounds)

- To match concentrations, need 87% reduction from developed site–if the runoff volumes are the same
- Developed site will have more runoff volume than natural site
- Reduction would need to be greater than 87%

Why was the B soil site chosen as the site to try to match treatment?

What is % TP reduction at sites with A, B, and C soils when a development conforms to the agreed-upon volume control performance goal?

Using Beta Calculator….

10 Acre Site 50% Impervious		HSG			
		A	B	C	D
Developed without BMPs	TP (lbs)	10.5	10.9	11.1	

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% Reduction	TP	92%	89%	87%	

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Developed without BMPs	TP (lbs)	10.5	10.9	11.1	
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% Reduction	TP	92%	89%	87%	89%

What about stream, shallow lake, and lake standards?

Stream, shallow lake, and lake standards

- In Twin Cities, the TP in these waters needs to be 100 (draft), 60, and 40 µg/L, respectively

- Assuming stormwater runoff has a TP of 300 µg/L, need 67, 80, and 87% reductions, respectively

Summary

- Looking at needed TP reductions various *simple* ways:
  - Minimum: 67% reduction
  - Maximum: 92% reduction

- Is goal of ~75% TP reduction, prudent and feasible?

One D-Soil Site Example
10 acre site, 50% Imperviousness

BMP(s)	Assumptions

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3. Tree Boxes	25% of tributary

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3. Tree Boxes	25% of tributary
4. Simple Rooftop Disconnection	12.5% of impervious surface can conform to standard

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1. Pond	Entire site is tributary
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5. Pond (#1) and Irrigation	Entire site is tributary

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BMP(s)	Assumptions
1. Pond	Entire site is tributary
2. Biofiltration Basin	Entire site is tributary & same footprint as pond
3. Tree Boxes	25% of tributary
4. Simple Rooftop Disconnection	12.5% of impervious surface can conform to standard
5. Pond (#1) and Irrigation	Entire site is tributary
6. Grass Swale & #2	Assumptions above

Clay Soil Site No. 1: BMP = Pond (Dead Storage Volume = Runoff from 2.5" Event)

TP % Reduction	50
DP% Reduction	0
TSS% Reduction	84
Construction Cost (no land)	$1X

Clay Soil Site No. 2A: BMP = Biofiltration Basin

TP % Reduction	65
DP% Reduction	20
TSS% Reduction	80
Construction Cost (no land)	$2.6X

Clay Soil Site No. 2B:
BMP = Biofiltration Basin with Iron

TP % Reduction	80
DP% Reduction	55
TSS% Reduction	80
Construction Cost (no land)	$2.7X

Clay Soil Site No. 3:
BMP = Tree Boxes (25% of drainage area)

TP % Reduction	15
DP% Reduction	3
TSS% Reduction	20
Construction Cost (no land)	$4.4X

Clay Soil Site No. 4:
BMP = Simple Rooftop Disconnection
(12.5 % of impervious area)

TP % Reduction	3
DP% Reduction	0
TSS% Reduction	8
Construction Cost (no land)	$0.1X

Clay Soil Site No. 5: BMP = Pond & Irrigation

TP % Reduction	75
DP% Reduction	50
TSS% Reduction	95
Construction Cost (no land)	$2.1X

Clay Soil Site No. 6:
BMP = Grassed Swale with Checks and Amended Soils to Biofiltration Basin

TP % Reduction	75/90
DP% Reduction	30/75
TSS% Reduction	96/98
Construction Cost (no land)	$3.9X & $4.0X

Comparison of Results from potential future MIDS Calculator

BMP(s)	TP % Reduction	Dissolved P % Reduction	TSS % Reduction	Approx. Annualized Cost (no land)
Pond	50	0	84	$1X
Biofiltration (w/o & w/ iron)	65 & 80	20 & 55	80 & 80	$2.6X & $2.7X
Tree Boxes	15	3	20	$4.4X
Simple Rooftop Disconnection	3	0	8	$0.1X

Comparison of Results from potential future MIDS Calculator

BMP(s)	TP % Reduction	Dissolved P % Reduction	TSS % Reduction	Approx. Annualized Cost (no land)
Pond & Irrigation	75	50	95	$2.1X
1) Grass swale w/ checks & amended soils, 2) Biofiltration (w/o & w/ iron)	75 & 90	30 & 75	96 & 98	$3.9X & $4.0X

Summary

- Achieving 75% TP reduction is feasible
- Is it prudent?

Possible Flexible Treatment Performance Goal (Handout)

- For sites with restrictions and when infiltration and/or reuse and/or evapotranspiration BMPs cannot achieve the MIDS new development performance goal, the MIDS Flexible Treatment Performance Goal is to achieve 75% removal of the annual TP load.

Draft Performance Goal for Sites with Restrictions (Handout)

For sites with restrictions and when infiltration and/or reuse and/or evapotranspiration BMPs cannot achieve the MIDS new development performance goal, the MIDS Flexible Treatment Performance Goal is to achieve 75% removal of the annual TP load.

First preference is to employ as much infiltration, reuse/harvesting, and evapo-transpiration as feasible.

Secondary preference is to employ filtration BMPs to achieve this standard. BMPs that employ enhanced filtration methods for the removal of total and dissolved phosphorus are encouraged.

For instances where this is not feasible and prudent due to site constraints and regional treatment limitations or excessive costs (as determined by the local authority), then equivalent off-site mitigation (including banking or cash, as determined by local authority) can be used so as to protect the downstream water body that would receive the site runoff.

This flexible treatment goal, in tandem with the MIDS New Development Performance Goal, is being proposed to satisfy prudent and feasible in the context of antidegradation applications for Minnesota Stormwater management.