



Waukesha County Storm Water Workshop

MS4 compliance using Swale Infiltration Testing

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Outline



Village of Hales Corners, WI

- Regulations
- DNR Approvals
- Field Work / Considerations
- Testing Rate Variability
- Results and TSS Reduction

Regulations

- ASTM D3385
- DNR Technical Standards
- DNR MS4 Modeling Guidance
 - Process to assess and model grass swales, November 24, 2010 memorandum
 - Swale data
 - Modeling requirements
 - Field Procedure



City of Verona, WI

DNR Approvals

- DNR Approvals
 - Pre-Test (approval of # and location of test sites)
 - Process to assess swales
 - Post-Test (approval of final infiltration rates for model application)



City of Fond du Lac, WI

Field Equipment

- Rings
- Water & Source
- Ruler
- Stopwatch
- Sledge Hammer
- Data Sheets
- Camera
- Safety Equip.



City of New Berlin, WI

Field Considerations

- Underground Utilities: Water, Sanitary, Storm, Other
- Visible Obstructions
- Measure Geometry
- Observe Vegetation Type
- Leakage
- Maintain Water Level
- Adequate # of Measurements

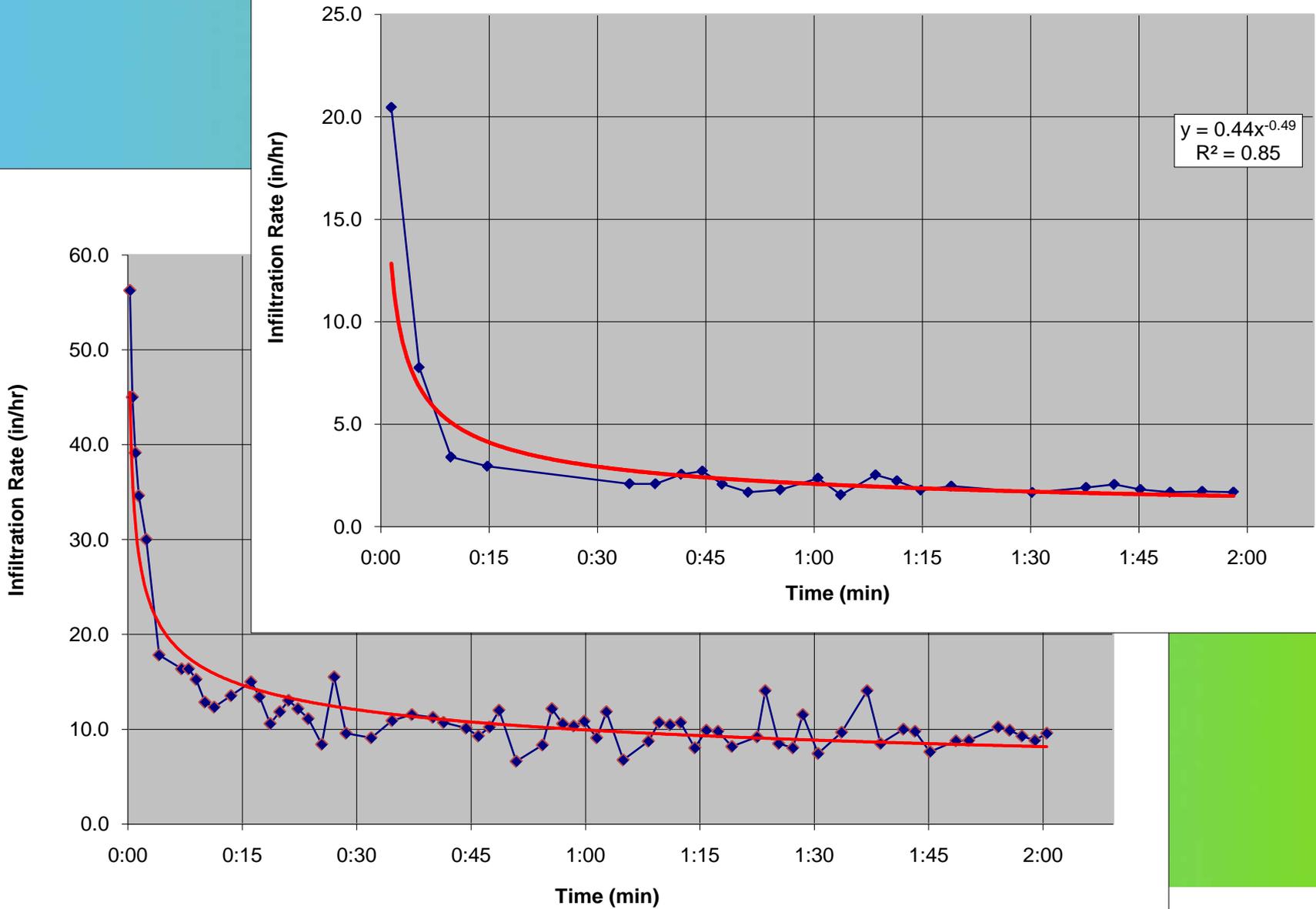


City of Oak Creek, WI



Source: John Voorhees AECOM, Roger Bannerman WDNR, Jim Bachhuber AECOM

Infiltration Rate Plot for 104th Street



Rate Comparison

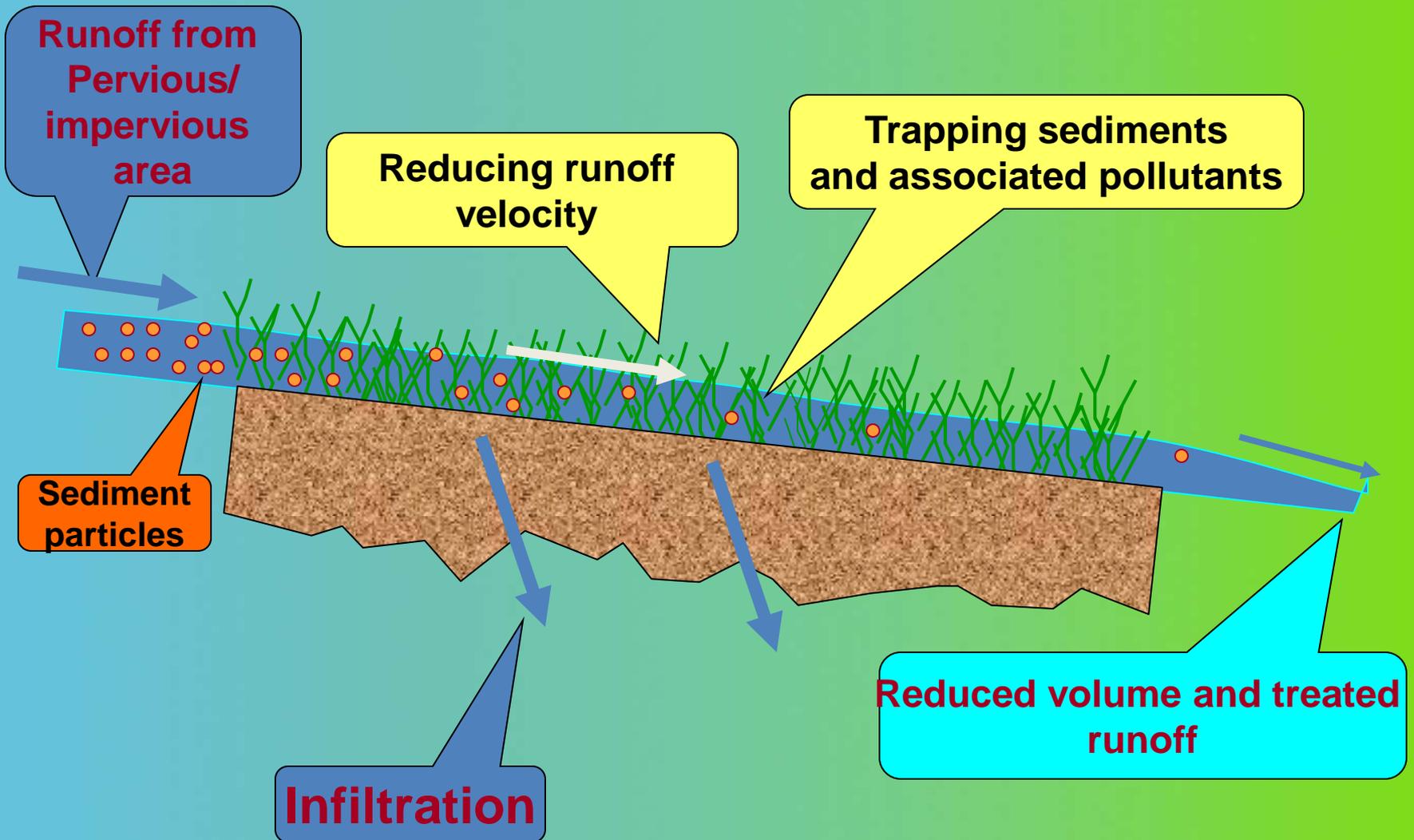
Soil Texture¹ Design Infiltration Rate Without Measurement, inches/hour

Sand	3.60
Loamy sand	1.63
Sandy loam	0.50
Loam	0.24
Silt loam	0.13
Sandy clay loam	0.11
Clay loam	0.03
Silty Clay loam	0.043
Sandy clay	0.04
Silty clay	0.07
Per WDNR Tech STD 1002	

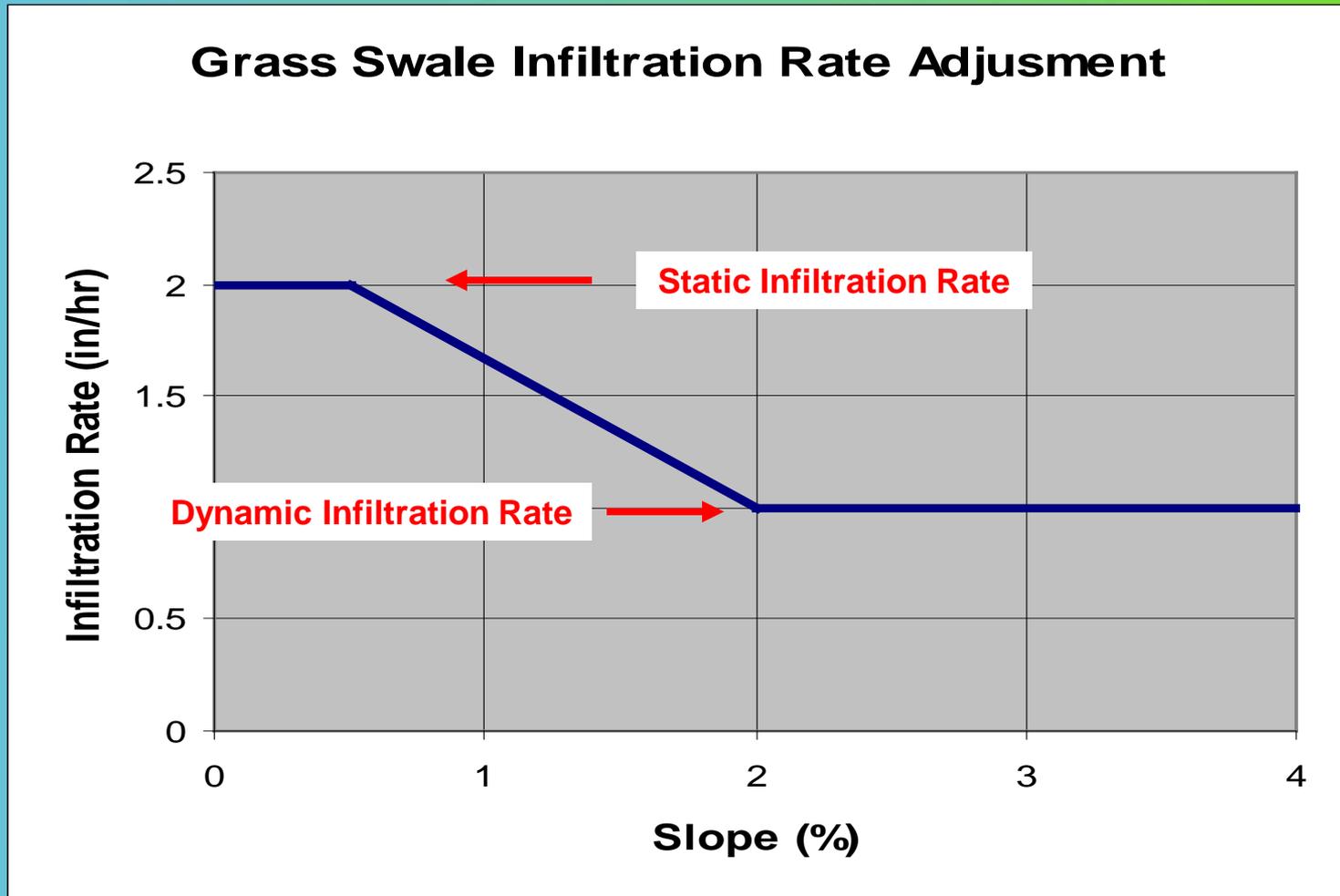
Measured (Static) Infiltration Rate for Select Wisconsin Communities (inches/hour)

Village of Hales Corners	
Clay	2.28
City of New Berlin	
Clay	2.65
City of Oak Creek	
Clay	0.70
City of Fond du Lac	
Clay	2.28
City of Verona (East View Greenway)	
Clay	3.06
Town of Westport	
Silt	4.8
Clay	1.0
City of Janesville (Greenbelts)	
Silt	7.0

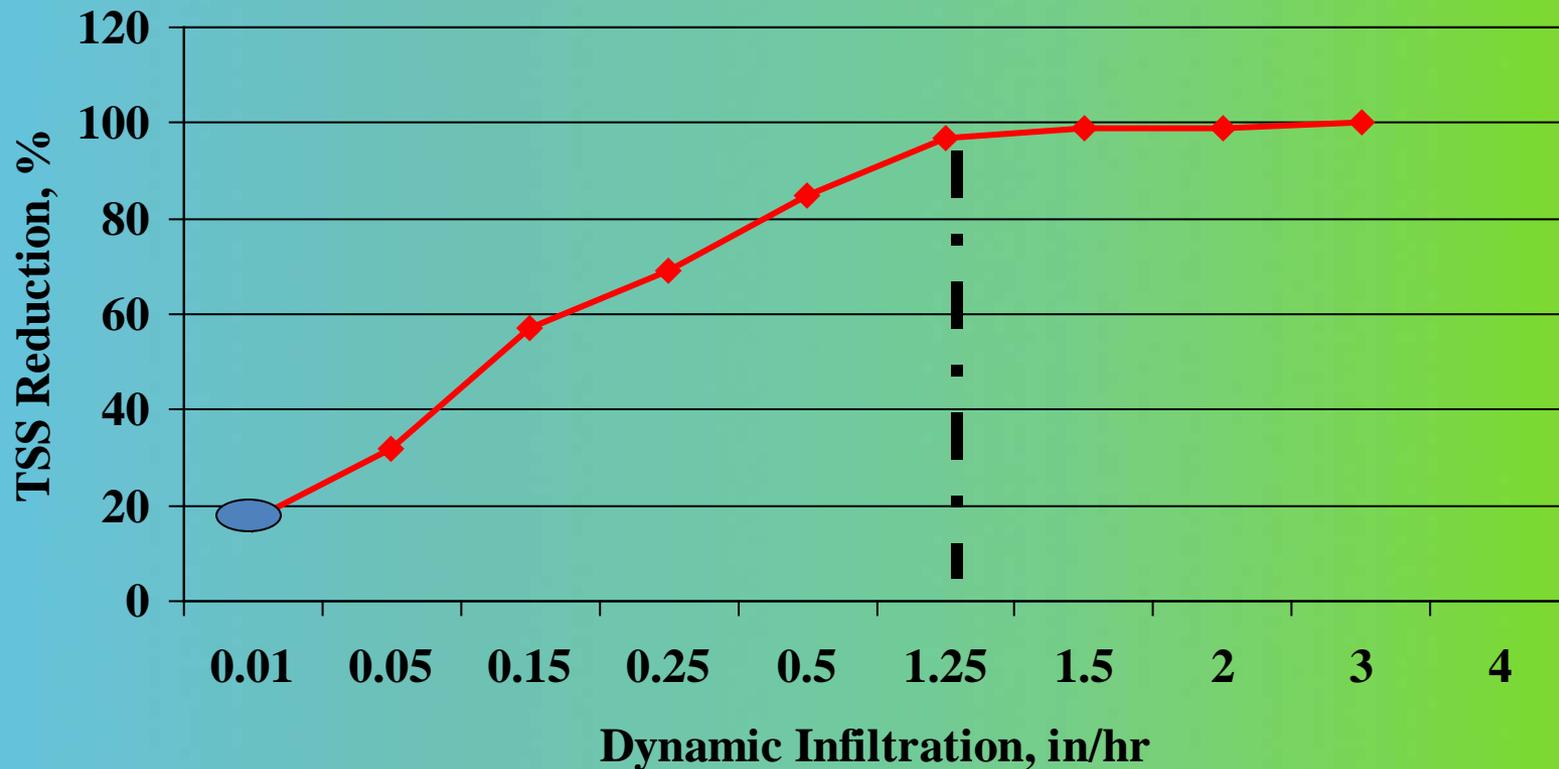
Pollutant Control in Grass Swales



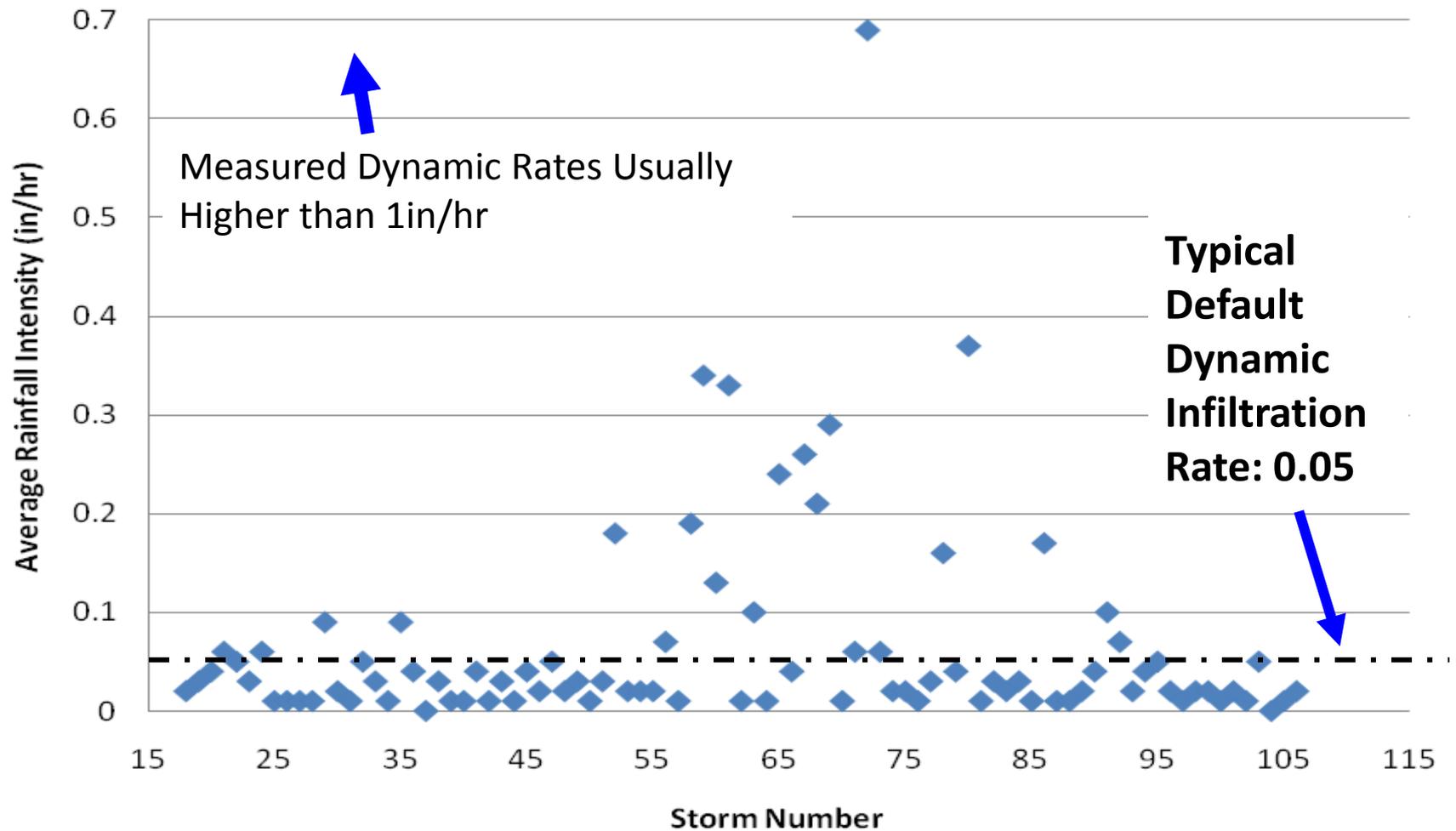
Infiltration Rate Adjustment



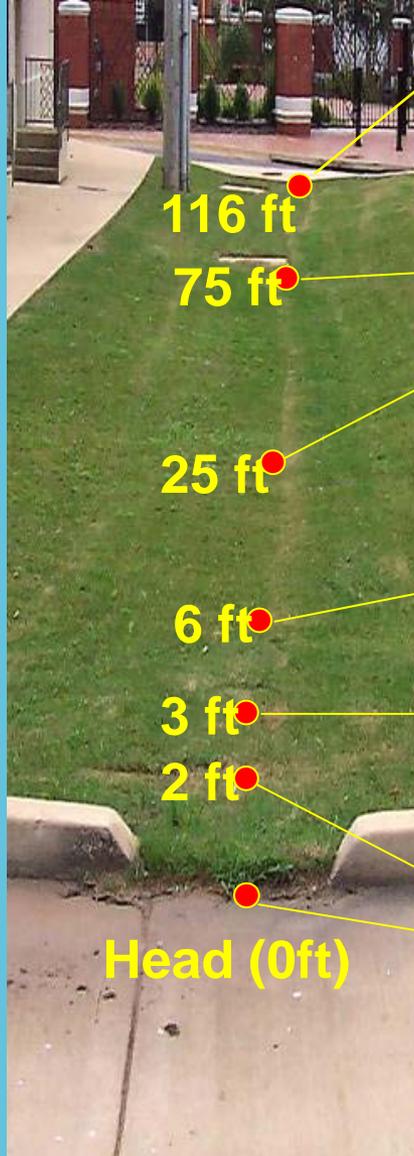
TSS Reduction with Increasing Dynamic Infiltration Rate for Grass Swales in Medium Density Residential Area



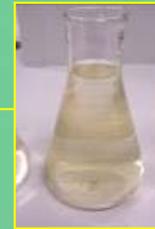
Average Intensities for Milwaukee Annual Rainfall File



Date: 10/11/2004



TSS: 10 mg/L



TSS: 20 mg/L



TSS: 30 mg/L



TSS: 35 mg/L



TSS: 63 mg/L



TSS: 84 mg/L



TSS: 102 mg/L

University of Alabama swale
test site at Tuscaloosa City Hall

Effects on TSS Removal

Without Measured Rate, TSS removal %		With Measured Rate, TSS removal %	
City of Janesville	23	City of Janesville	35
Town of Westport	23	Town of Westport	58
City of Verona (East View Greenway)	27	City of Verona (East View Greenway)	65
Village of Hales Corners	20	Village of Hales Corners	68 (72)

- Note: (x) indicates final TSS reduction after other major Best Management Practices
- Infiltrating testing costs vs structural BMP costs...Priceless!

Thank You



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City of New Berlin, WI

AECOM