



The new data components for media types include:

- Flow rate equations based on media type, organic content, texture, and uniformity
- Regression equations for removal of several particle size ranges
- Flow rate reduction and clogging due to particulate retention
- Filterable and particulate pollutant retention
- Filterable pollutant retention based on contact time (coming)
- Breakthrough of pollutants as media retains filterable pollutants (coming)

Incorporating these data significantly expands the ability to compare alternative biofilter design options.

We will cover . . .

- **Biofilter Design Concepts and Issues**
- **Biofilter Model Algorithms**
- **Entering Biofilter Data into the Model**

The biofiltration control option uses full routing calculations associated with pond storage.

The “outlet” devices include natural soil infiltration (considering the wide range of variability in infiltration rates in urban soils), evaporation, surface discharges through overflows (a stand pipe or weirs), or through a rain barrel/cistern.

Biofiltration controls are usually numerous in an area and can be represented in the model individually or by specifying how many of each unit is treating the flow from an individual or combination of source areas.



Modeling Notes

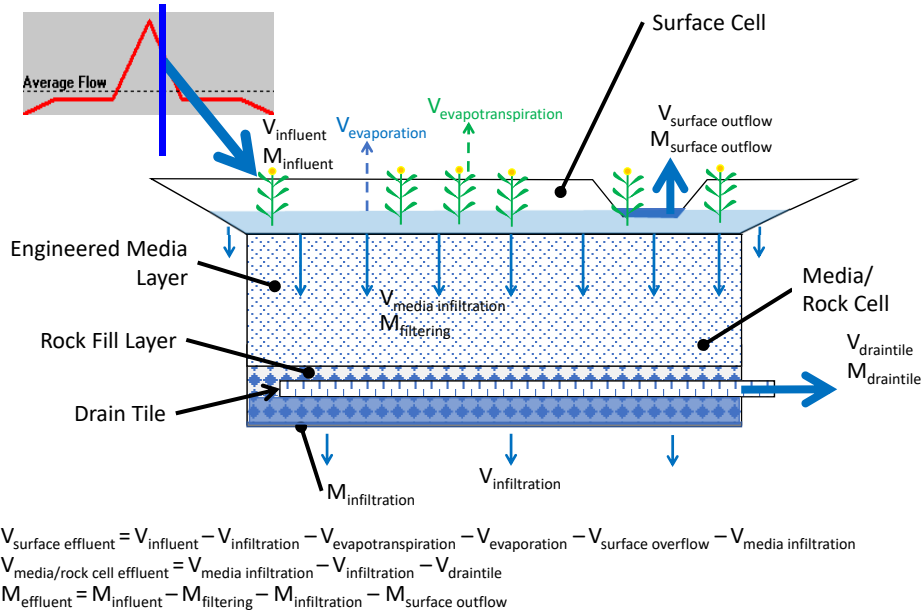
- **Biofilter routing is performed using the Modified Puls Storage – Indication Method.**
- **Time increments are established by the user**
- **Yield reductions due to:**
 - **Runoff volume reduction through infiltration**
 - **Filtering through engineered soil**

Biofilters can be used as control devices in individual source areas, in land uses, and as a part of the drainage system or at the outfall.

To model biofilters in a source area, describe the geometry and other characteristics of a typical biofilter. Then enter the number of biofilters you want to model in the source area. The model divides the runoff volume by the number of biofilters in the source area, creates a triangular hydrograph that it routes through that biofilter, and then multiplies the resulting losses by the number of biofilters to apply the results to the source area.

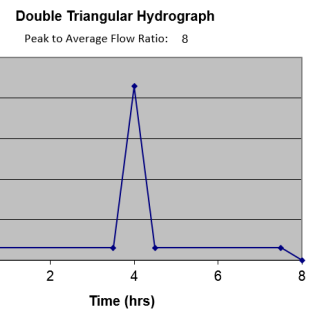
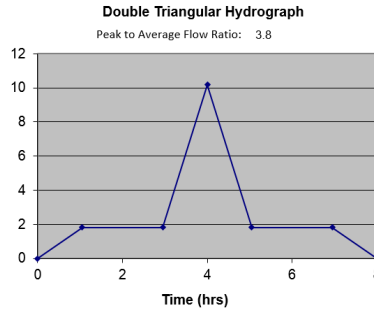
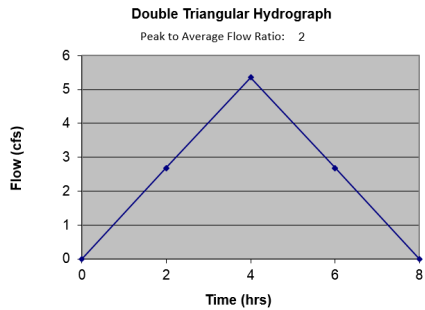


Biofilter Runoff and TSS Removal Processes



Biofilter Hydrograph Creation

- Flow rate calculated using Complex Triangular Hydrograph
 - Runoff Volume calculated from WinSLAMM
 - Runoff Duration = 1.2 times rainfall duration
 - Peak to Average Flow Ratio set by user

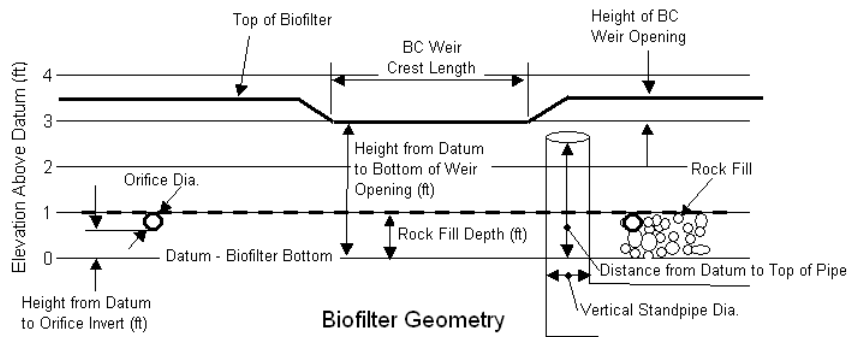


Four Components to Modeling Biofilters

1. Structure Geometry
2. Outlet Information
3. Infiltration Data
4. Hydrograph and Flow Routing Information

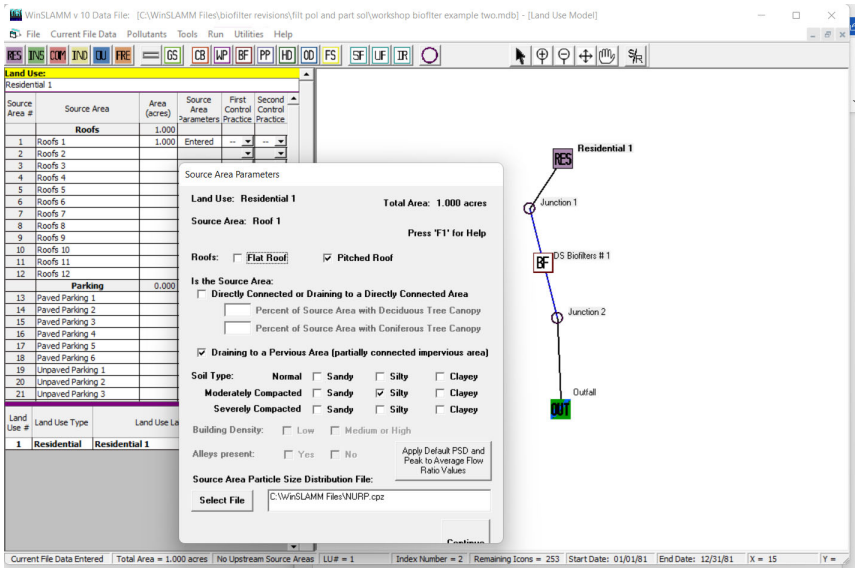


Biofilter Geometry



Biofilter Datum is always zero ft.

Basic WinSLAMM Layout and Source Area Descriptions



This is not a very reasonable design but is used in this example for its simplicity.

The example shown here is very basic for a total of 1 acre of pitched residential roofs (multiple buildings), draining to silty soils of moderate compaction).

Data Parameter Files used in Example

Current File Data

SLAMM Data File Name:
 C:\WinSLAMM Files\biofilter revisions\fit pol and part soft\workshop biofilter example two.mdb

Site Descript: biofilter workshop demo

Seed: -42

Rain File: C:\WinSLAMM Files\Rain Files\WisReg - Madison W1 1981.RAN

Start Date: 01/01/81
 End Date: 12/31/81
 Winter Season Range
 Start of Winter (mm/dd): 12/02
 End of Winter (mm/dd): 03/12

Pollutant Probability Distribution File: C:\WinSLAMM Files\W1_GE003.ppd

Runoff Coefficient File: C:\WinSLAMM Files\W1_SL06 Dec06.rvx

Particulate Solids Concentration File: C:\WinSLAMM Files\v10.1 W1_AVG01.pscx

Street Delivery File (Select LU):
 Residential LU
 Other Urban LU
 Institutional LU
 Freeways
 Commercial LU
 Industrial LU
 Change all Street Delivery Files to Match the Current File

Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\WURP Source Area PSD Files.csv

Use Cost Estimation Option:
 Select Cost Data File: C:\WinSLAMM Files\Cost Files\Cost Data UWEPDMO.csv

Replace Default Values with these Current File Data Values
 Use Default Values
 Replace all Source Area Particle Size Distribution Files with the Source Area PSD and Peak to Average Flow Ratio File Listed Above

Cancel Continue

Control Practice Cost Data

Summary Data: 1 - Detention Pond, 2 - Filter Strips, 3 - Porous Pavement, 4 - Hydrodynamic Device, 5 - Street Cleaning, 6 - Biofiltration Device, 7 - Catchbasin Cleaning, 8 - Upflow Filter, 9 - Grass Swales

6 - Biofiltration Device

Use Pre-Determined Costs
 Use User Defined Costs

Depth (ft)	Capital Costs in Dollars per LF		Maintenance Costs in Dollars/LF/Year	
	m	B	m	B
3.0	6.53	44.09	0.45	1.97
4.0	8.15	49.56	0.52	2.02
5.0	9.43	54.99	0.57	2.26
6.0	11.30	58.90	0.66	2.12
8.0	14.36	65.61	0.79	2.21
10.0	17.76	70.75	0.91	2.65
12.0	20.94	83.29	1.05	2.84

Crushed Stone Fill (\$/CY): 28.01

Equation Form: $y = m \cdot x + B$
 where: $y = \text{Cost}$
 $x = \text{Biofilter Width (ft)}$

2011 Costs - National Average

Item Description	Unit	\$/Unit	Quan	Cost (\$)
Cut/Fill Volume	CY	0.00	0	0.00
		0.00	0	0.00
		0.00	0	0.00
		0.00	0	0.00
		0.00	0	0.00

Total Unit Cost: \$ 0.00 /cy

LF: Linear Feet
 SY: Square Yards
 CY: Cubic Yards
 EA: Each

Annual Routine Maintenance Cost (\$/SY): 0

Land Cost Site Area Multiplier: 1

Exit

Biofilter Data Entry Form

Biofilter geometry and media

Outflow structure information

Rough schematic of biofilter drawn as geometry data entered

Biofilter Data Entry Form

Evapotranspiration daily rates and plant type selection

ET Plant Type Variables		
Plant Type	Root Depth (ft)	ET Crop Adjustment Factor
User-Defined		
Turfgrass	1	0.80
Trees	3	0.70
Annuals	1	0.65
Shrubs	2	0.50
Other Grasses	1	0.55
Prairie Plants	6	0.50

Biofilter Media Selection

The screenshot shows the 'Biofiltration Control Device' interface. On the left, the 'Drainage System Control Practice' window is open, showing 'Biofilter Number 1' with various properties. The 'Engineered Media Type' is set to 'Media Data', and the 'Engineered Media Infiltration Rate' is 13.00. The 'Engineered Media Depth (ft)' is 2.0, and the 'Engineered Media Porosity (0-1)' is 0.39. The 'Inflow Hydrograph Peak to Average Flow Ratio' is 3.80. The 'Number of Devices in Source Area or Upstream Drainage System' is 1. The 'Estimated Surface Drain Time' is 0.46 hrs. The 'Soil, Media Mixtures and Components Table' is open, showing a list of soil types and their properties. The 'Composite Soil Mixture Properties' are: Saturation Water Content % (Porosity) 56.2, Field Capacity (Percent) 36.8, Permanent Wilting Point (Percent) 7.0, Infiltration Rate (in/hr) 0.0, and Fraction of Soil Type Texture in Engineered Soil (0-1) 1.000. The 'Biofilter Media Mixture' is selected as 'Kansas Clay' with a value of 40. The 'Composite Soil Mixture Properties' are: 56.2, 36.8, 7.0, 0.0, 1.000. The 'Apply' buttons for Porosity, Field Capacity, Wilt Point, Infiltration Rate, and All Values are checked.

Soil Type Texture	Saturation Water Content % (Porosity)	Field Capacity (Percent)	Permanent Wilt Point (Percent)	Infiltration Rate (in/hr)	Fraction of Soil Type Texture in Engineered Soil (0-1)
Clay Loam	50	34.5	17	0.1	
Silty Clay Loam	50	34.5	17	0.1	0.100
Sandy Clay	40	34	17	0.05	
Silty Clay	55	33.5	18	0.015	
Clay	55	33.5	18	0.015	
Other Media					
Fine Rhyolite Sand	38	8	2.5	13	
Fine Sand	38	8	2.5	13	
Filter Sand	38	8	2.5	13	
Coarse Sand	32	4	0	40	
Gravel	32	4	0	40	
Light Media for Green Roofs	50	20	5	13	
Chemically Active Amendments					
Activated Carbon	32	4	0	40	
Fine Zeolite (SMZ)	32	4	0	40	
Coarse Zeolite	32	4	0	40	
Compost	61	55	5	Varies	
Peat Moss	78	59	5	Varies	0.400
User Defined Amendments					
User Defined Media 1					
User Defined Media 2					
Pre-Defined Media Mixtures					
Rhyolite Sand - SMZ	43	4	0	25	
Rhyolite Sand - SMZ-GAC	41	4	0	25	
Rhyolite Sand - SMZ-GAC-PM	43	10	0.5	25	
Iron Fillings (5%) / Sand	38	8	2.5	13	
Biofilter Media Mixture					
Kansas Clay	40	12	10	55	
Wisconsin 2	40	10	5	20.5	
North Carolina	40	7	5	18.7	
Composite Soil Mixture Properties	56.2	36.8	7.0	0.0	1.000

Media data filled in when media selected (components must equal 1.0) and "apply all values" to use in model. Media depth also needed by user

The screenshot shows the 'Biofiltration Control Device' interface with the 'Evaporation' and 'Evapotranspiration' options. The 'Evaporation' option is selected, and the 'Evapotranspiration' option is also selected. The 'Evapotranspiration' table shows monthly values: Jan (0.00), Feb (0.00), Mar (0.20), Apr (0.40), May (0.40), Jun (0.60), Jul (0.80), Aug (0.80), Sep (0.60), Oct (0.40), Nov (0.20), Dec (0.00). The 'Plant Types' are set to 'Prairie P.' and 'Annuals'. The 'Biofilter Geometry Schematic' shows a cross-section of the biofilter with a top layer of 10.00' and a bottom layer of 0.25' (Top of Rock Fill) and 1.00' (Top of Engineered Media). A warning dialog box is open, stating: 'Media Filters will clog unless they are vegetated and properly sized. To model vegetated media select the Evapotranspiration outlet option and enter values for at least one Plant Type'. The 'Estimated Surface Drain Time' is 0.46 hrs. The 'Save or Delete Biofilter Data to Database File' and 'Get Biofilter Data From Database File' buttons are visible.

Reminder to add vegetation thru the evapotranspiration (ET) option to enhance biofilter useful life (incorporates added silt into root zone instead of concentrating on surface, for example).

Calculation Output Summary

Outfall Output Summary

	Runoff Volume (cu. ft.)	Percent Runoff Reduction	Runoff Coefficient (RV)	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of All Land Uses without Controls	82380		0.71	37.00	190.3	
Outfall Total with Controls	23263	71.76 %	0.20	28.29	41.09	78.41 %
Current File Output: Annualized Total After Outfall Controls	23327		Years in Model Run: 1.00		41.20	

Receiving Water Impacts Due To (CWP Impervious Cover Model)

Pollutant	Concentration - No Controls	Concentration - With Controls	Pollutant Yield - No Controls	Pollutant Yield - With Controls	Pollutant Yield Units	Percent Yield Reduction
Particulate Solids	37.00	28.29 mg/L	190.3	41.09 lbs		78.41 %
Total Phosphorus	0.1618	0.1283 mg/L	0.8323	0.1863 lbs		77.62 %

Total Control Practice

Capital Cost	\$ 13276
Land Cost	\$ 550
Annual Maintenance	\$ 794
Present Value of All	\$ 25646
Annualized Value of All	\$ 1723

Tabs to select output tables (summary shown here)

Basic performance data for runoff and particulate solids

Performance data for selected constituents

Life cycle cost data (if selected)

Receiving water impacts associated with runoff amounts (based on Center for Watershed Protection Impervious Cover Model)

Control Practices Summary Tab Information

Land Uses		Junctions		Control Practices				Outfall			Output Summary	
Runoff Volume		Part. Solids Yield (lbs)		Part. Solids Conc. (mg/L)				Summary Table				
Data File: C:\WinSLAMM Files\shop biofilter example two.mdb												
Rain File: WisReg - Madison WI												
Date: 01-12-22 Time: 7:00:17 PM												
Site Description: biofilter workshop												
Col. #:	2	4	5	6	7	8	9	10	11	12	13	14
Control Practice No.	Control Practice Type	Total Inflow Volume (cf)	Total Outflow Volume (cf)	Percent Volume Reduction	Total Influent Load (lbs)	Total Effluent Load (lbs)	Percent Load Reduction	Flow Weighted Influent Conc (mg/L)	Flow Weighted Effluent Conc (mg/L)	Percent Conc. Reduction	Influent Median Part. Size (microns)	Effluent Median Part. Size (microns)
1	Biofilter	82380	23264	71.76	190.3	41.09	78.41	37.00	28.29	23.530	7.80	5.67
15	Notes	Maximum Stage (ft)	Hydraulic Volume Out (cf)	Treated Volume (cf)	Maximum Surface Ponding Time (hrs)	Maximum Subsurface Ponding Time (hrs)	Volume Infiltrated (cf)	Underdrain Discharge Vol. (cf)	Evapo-Transpir. Vol. (cf)	Minimum Soil Moist. (frac)		
	No Biofilter Overflows:	3.54	23566	81919	71.3	5.73	51850.26	8604	4608.62			
33	Surface Discharge Bypass Vol. (cf)	14767.10										
34	Evap. Vol. (cf)											
35	Volume Supplement. Irrig. (cf)											
36	Final Surface Infiltration Rate (in/hr)		12.041									
39	Surface Ponding Events > 72 hrs (Count)			0								
54	Residence Time in Media (hrs)				1.12							
61	Ttl. Mass Trapped in Media (lbs)					114.27						
62	Ttl. Mass Infiltrated (lbs)						376.21					
91	Runoff Producing Events/Ttl. Rains								23/90			

Each control is shown on a row. Since only one biofilter in this example, only one row is shown. Different controls have different columns, depending on summary information (biofilters are the most complex).

Examples of summary tables for other data tabs

Runoff Volume (cu. ft.)							Source Area Runoff Contribution (%)	
Start Date	Rain Total (in.)	Land Use Totals	Roots 1	Rv	Total Losses (in.)	Calculated CV		
01/01/81	-	-	-	-	-	-	-	-
01/06/81	-	-	-	-	-	-	-	-
01/15/81	-	-	-	-	-	-	-	-
01/31/81	-	-	-	-	-	-	-	-
02/05/81	-	-	-	-	-	-	-	-
02/06/81	-	-	-	-	-	-	-	-
02/08/81	-	-	-	-	-	-	-	-
02/09/81	-	-	-	-	-	-	-	-
02/10/81	-	-	-	-	-	-	-	-
02/21/81	-	-	-	-	-	-	-	-
02/23/81	-	-	-	-	-	-	-	-
02/27/81	-	-	-	-	-	-	-	-
03/10/81	-	-	-	-	-	-	-	-
03/25/81	0.07	138.6	139	0.95	0.03	99.6		
03/29/81	0.05	64.00	64	0.35	0.03	99.5		
03/29/81	0.06	97.82	98	0.45	0.03	99.5		
03/29/81	0.07	138.6	139	0.95	0.03	99.6		
04/03/81	0.02	9.220	9	0.13	0.02	99.6		
04/03/81	0.26	756.3	756	0.80	0.05	99.5		
04/07/81	0.71	2081	2081	0.81	0.14	98.7		
04/08/81	0.41	1197	1197	0.80	0.08	99.2		
04/10/81	1.06	3114	3114	0.81	0.20	98.1		
04/12/81	0.13	361.1	361	0.77	0.03	99.7		
04/13/81	0.32	932.3	932	0.80	0.06	99.4		

Yield (lbs)							Concentration (mg/L)		Source Area Yield Contribution (%)	
Start Date	Rain Total (in.)	Land Use Totals	Roots 1							
01/01/81	-	-	-	-	-	-	-	-	-	
01/06/81	-	-	-	-	-	-	-	-	-	
01/15/81	-	-	-	-	-	-	-	-	-	
01/31/81	-	-	-	-	-	-	-	-	-	
02/05/81	-	-	-	-	-	-	-	-	-	
02/06/81	-	-	-	-	-	-	-	-	-	
02/08/81	-	-	-	-	-	-	-	-	-	
02/09/81	-	-	-	-	-	-	-	-	-	
02/10/81	-	-	-	-	-	-	-	-	-	
02/21/81	-	-	-	-	-	-	-	-	-	
02/23/81	-	-	-	-	-	-	-	-	-	
02/27/81	-	-	-	-	-	-	-	-	-	
03/10/81	-	-	-	-	-	-	-	-	-	
03/25/81	0.07	0.3203	0.3203							
03/29/81	0.05	0.1478	0.1478							
03/29/81	0.06	0.2259	0.2259							
03/29/81	0.07	0.3203	0.3203							
04/03/81	0.02	0.02130	0.02130							
04/03/81	0.26	1.747	1.747							
04/07/81	0.71	4.807	4.807							
04/08/81	0.41	2.765	2.765							
04/10/81	1.06	7.194	7.194							
04/12/81	0.13	0.8340	0.8340							

Selection of Optional Detailed Data in Separate Spreadsheets

Program Options

Detailed Output File Options	Default Model Options	Default Current File Data
<p>Biofilters</p> <input type="checkbox"/> Detailed Biofilter Output <input type="checkbox"/> Pollutant Concentration Detailed Output <input type="checkbox"/> Particulate Reduction Output <input type="checkbox"/> Stage-Outlet <input type="checkbox"/> Stochastic Seepage Rate Detail <input checked="" type="checkbox"/> Water Balance <input type="checkbox"/> Evapotranspiration Detail <p>Catchbasins</p> <input type="checkbox"/> Performance by Event Output <input type="checkbox"/> Performance By Step Output <input type="checkbox"/> Stage-Inflow Data <input type="checkbox"/> Stage-Outlet <p>Cisterns</p> <input type="checkbox"/> Detailed Output <input type="checkbox"/> Outfall Discharge Hydrograph <input type="checkbox"/> Water Balance <p>Filter Strips</p> <input type="checkbox"/> Hydraulics and Concentration by Event <input type="checkbox"/> Hydraulics Detailed Output <input type="checkbox"/> Incremental Performance Output <input type="checkbox"/> Irreducible Concentration Detailed Output <input type="checkbox"/> Particulate Reduction Output <p>Flow Duration Curve Data</p> <input type="checkbox"/> Detailed Data <input type="checkbox"/> Plotting Calculations <input type="checkbox"/> Critical Particle Size Calculation Detailed Output File <input type="checkbox"/> Tree Canopy Detailed Output	<p>Freeway Data</p> <input type="checkbox"/> Freeway Washoff Detail <p>Grass Swales</p> <input type="checkbox"/> Hydraulics and Concentration by Event <input type="checkbox"/> Hydraulics Detailed Output <input type="checkbox"/> Incremental Performance Output <input type="checkbox"/> Irreducible Concentration Detailed Output <input type="checkbox"/> Particulate Reduction Output <p>Hydrodynamic Devices</p> <input type="checkbox"/> Detailed Output <input type="checkbox"/> Performance by Event <input type="checkbox"/> Stage-Inflow <input type="checkbox"/> Stage-Outlet <p>Porous Pavement</p> <input type="checkbox"/> Detailed Output <input type="checkbox"/> Stage-Outlet <input type="checkbox"/> Stochastic Seepage Rate Detail <input type="checkbox"/> Surface Seepage Rate <input type="checkbox"/> Water Balance <p>Street Cleaning</p> <input type="checkbox"/> Street Dirt/Accumulation Plots <input type="checkbox"/> Street Dirt Removal <input type="checkbox"/> Washoff or Street Cleaning Detail	<p>Wet Detention Ponds</p> <input type="checkbox"/> Detailed Output <input type="checkbox"/> Pond Stage-Area-Volume Data <input type="checkbox"/> Stage-Outlet <input type="checkbox"/> Stone Weeper Detailed Output <input type="checkbox"/> Water Balance Summary of All Ponds <p>Media Filters and Settling Practices</p> <input type="checkbox"/> Detailed Time Step Output <input type="checkbox"/> Stage-Outlet Data <input type="checkbox"/> Stage-Area-Storage Data <input type="checkbox"/> Device Effluent Concentrations <input type="checkbox"/> Performance by Event <input type="checkbox"/> Puls Routing Detail <input type="checkbox"/> Iteration Information <p>Green Roofs</p> <input type="checkbox"/> Time Step Output <input type="checkbox"/> Irreducible Concentration Calculations <input type="checkbox"/> Particulate Reduction Output <input type="checkbox"/> Stage-Area-Outlet <input type="checkbox"/> Water Balance <input type="checkbox"/> Evapotranspiration Detail <p>Pipes</p> <input type="checkbox"/> Detailed Hydraulic Output <input type="checkbox"/> Pipe Output by Event

Uncheck All Detailed Output File Options
 Check All Detailed Output File Options

File Update Options Cancel Changes Save .INI File

This shows the water balance optional spreadsheet selected for biofilters

Example of Detailed Data Spreadsheets for Biofilter Water Balance (1 of 2)

BioF Number	Rain Number	Rain Depth (in)	Rain Duration (days)	Time (Julian Date)	Rainfall Date	Maximum BioF Stage (ft)	Minimum BioF Stage (ft)	Event Peak Inflow (cfs)	Event Peak Outflow (cfs)	Surface Ponding Duration (hrs)	Total Ponding Duration (hrs)	Event Inflow Volume (cf)	Event Hydraulic Outflow (cf)	Event Total Inflow (cf)	Event Inflow BG (cf)	Event Inflow AG (cf)	Event Evaporation (cf)	Event Evaporation Inflow (cf)	Event Orifice Outflow (cf)	Event Standpipe Outflow (cf)	Event Vertical Weir Outflow (cf)	Event BC Weir Outflow (cf)
1	1	434	0.03	0.04	14523	10/06/83	3.597	0	0.1277	0.0064	6	5.7	149.7822	0	146.0702	141.0423	5.0279	0	0	0	0	0
3	1	435	0.06	0.17	14524	10/07/83	3.753	0	0.0951	0.0071	16.4	12.9	433.2603	0	394.8032	359.7266	35.0764	0	0	0	0	0
4	1	436	0.14	0.08	14524	10/07/83	4.044	0	0.5694	0.6303	28.1	26.6	1300.086	611.0956	729.7667	621.1223	108.645	0	0	0	0	611.0956
5	1	437	1.29	0.67	14528	10/11/83	4.062	0	1.0604	1.0553	38.1	22.4	19290.61	18073.97	1056.518	825.6942	230.8213	0	0	0	0	18073.97
6 Summary Statistics																						
7		Rain Depth Rain Duration (days)				Maximum Minimum		Event Peak	Event Peak	Surface Ponding	Total Ponding	Event Inflow	Event Hydraulic	Event Total	Event Inflow	Event Inflow	Event Evaporation	Event Evaporation	Event Orifice	Event Standpipe	Event Vertical	Event BC
8	Number of Events	4	4	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
9	Total	111.89	70.55	-	-	-	-	-	-	88.6	67.6	21173.74	18685.06	2327.158	1947.585	379.571	0	0	0	0	0	18685.06
10	Equivalent Annual Tot	1.52	0.96	-	-	-	-	-	-	6522.157	4976.278	1558672	1375472	171310.1	143368.5	27941.49	0	0	0	0	0	1375472
11	Minimum	0.03	0.04	-	-	3.597	0	0.095	0.006	6	5.7	149.782	0	146.07	141.042	5.028	0	0	0	0	0	0
12	Maximum	1.29	0.67	-	-	4.062	0	1.06	1.055	38.1	26.6	19290.61	18073.97	1056.518	825.694	230.821	0	0	0	0	0	18073.97
13	Average of All Events	0.38	0.24	-	-	3.86	0	0.46	0.42	22.15	16.9	5293.43	4671.27	581.79	486.9	94.89	0	0	0	0	0	4671.27
14	Median	0.1	0.13	-	-	3.9	0	0.35	0.32	22.25	17.65	866.67	305.55	562.28	490.42	71.86	0	0	0	0	0	305.55
15	Std. Deviation	0.61	0.29	-	-	0.23	0	0.45	0.51	13.95	9.41	9344.27	8939.78	396.69	299.21	100.53	0	0	0	0	0	8939.78
16	COV	1.6	1.21	-	-	0.06	0.85	0.98	1.21	0.63	0.56	1.77	1.91	0.68	0.61	1.06	0	0	0	0	0	1.91
17	First Rain Date:	10/06/83																				
18	Last Rain Date:	10/11/83																				
19	Total Time Period (yrs):	1.358448E-02																				
20																						

Example of Detailed Data Spreadsheets for Biofilter Water Balance (2 of 2)

Event SC Weir Outflow (cf)	Event Other Outflow (cf)	Event Surface Drain Outflow (cf)	Event Total Outflow (cf)	Event Water Volume Balance (cf)	Cum. Water Balance (cf)	Moisture Content at Event Start	Volume Reduction Fraction	TSS Concentration Reduction Fraction	Event Residence Time (hrs)	Biofilter Influent Conc (mg/L)	Eng. Media Effluent Conc (mg/L)	Total Weighted Effluent Conc (mg/L)	Clogging Mass Retained on Media (lbs)	Cum Mass Retained on Media (lb/sf)	Infiltration Reduction Fraction	Eng Media Infil Rate (in/hr)	
0	0	0	146.0702	3.7119	3.7119	0	1	0.1547	38.7	130	27.71942	0	0.9	6.89E-04	0.999664	0.2	
0	0	0	394.8032	38.4571	42.169	0	1	0.1547	38.7	130	37.93419	0	2.3	2.45E-03	0.998806	0.2	
0	0	0	1340.862	-40.7756	1.3934	0	0.5443	0.1547	38.7	130	90.42951	0	1.4	3.54E-03	0.998273	0.2	
0	0	0	19130.48	160.1328	161.5262	0	0.0552	0.1547	38.8	130	125.7093	0	0.3	3.74E-03	0.998174	0.2	
Event SC V Event Othr Event Surf Event Tot Event Wat Cum. Wat Moisture C Volume Re TSS Conce Event Resi Biofilter In Eng. Medi Total Weig Clogging M Cum Mass Infiltration Eng Media																	
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	Number of Events
0	0	0	161.526	161.526	1.309	-	-	-	-	-	-	-	-	-	-	-	Total
0	0	0	1546781	11890.5	96.35	-	-	-	-	-	-	-	-	-	-	-	Equivalent Annual Total
0	0	0	146.07	-40.776	-0.085	0	0.055	0.155	38.7	130	27.71942	0	0.9	6.89E-04	0.999664	Minimum	
0	0	0	19130.48	160.133	1.101	0	1	0.155	38.767	130	125.7093	0	1.4	3.54E-03	0.998273	Maximum	
0	0	0	5253.05	40.38	0.33	0	0.65	0.15	38.73	130	37.93419	0	2.3	2.45E-03	0.998806	Average of All Events	
0	0	0	867.83	21.08	0.15	0	0.77	0.15	38.73	130	90.42951	0	1.4	3.54E-03	0.998273	Median	
0	0	0	9265.92	86.17	0.54	0	0.45	0	0.03	0	0	0	0	0	0	Std. Deviation	
0	0	0	1.76	2.13	1.65	0	0.69	0	0	0	0	0	0	0	0	COV	

**The next presentation will walk you thru the
biofilter input screens.**

**Any further comments John, Doug, or
Caroline**

Any questions?