

Small Storm Hydrology **The Integration of Water Quality and** **Drainage Design Objectives**

Modeling Flow and Pollutant **Sources**

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Urban Stormwater Hydrology History

ÉEarly focus of urban stormwater was on storm sewer and flood control design using the Rational Method and TR-55 (both single event, òdesign stormö methods).

ÉThe Curve Number procedure was developed in the 1950s by the (then) SCS as a simple tool for estimating volumes generated by large storm events in agricultural areas, converted to urban uses in mid 1970s (TR55 in SCS 1976). Data based on many decades of observations of large storms in urban areas, at Corps of Engineers monitoring locations. Data available from the Rainfall-Runoff database report prepared by the Univ. of Florida for the EPA.

ÉWater quality focus results form Public Law 92-500, the Clean Water Act, 1972. Stormwater quality research started in the late 1960s, with a few earlier interesting studies. Big push with Nationwide Urban Runoff Program (NURP) in late 70s and early 80s. Most still rely on earlier drainage design approaches.



Many stormwater monitoring configurations used over the years

Importance of Site Hydrology in the **Design of Stormwater Controls**

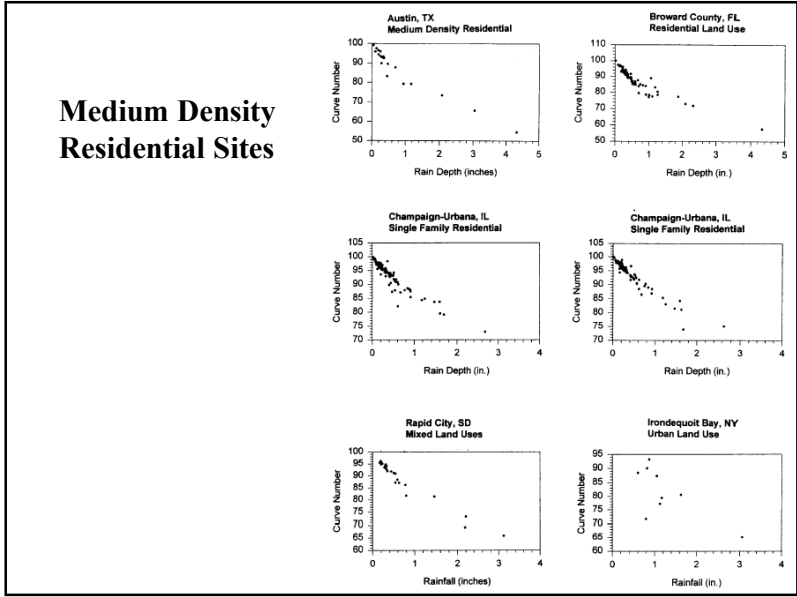
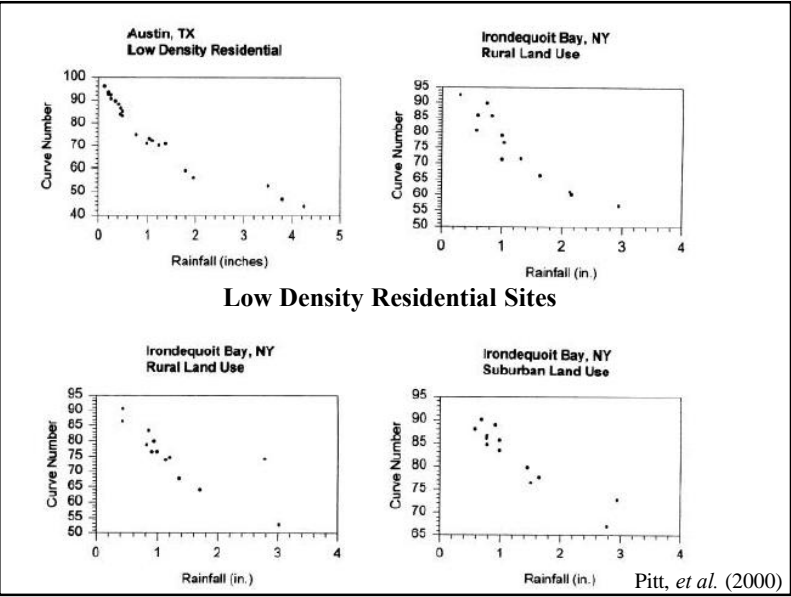
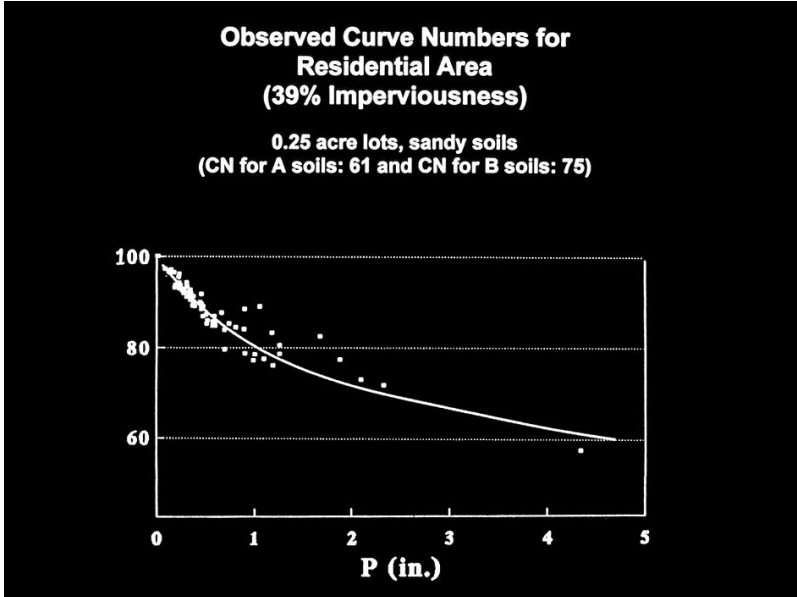
ÉDesign of stormwater management programs requires knowledge of site hydrology

ÉUnderstanding of flows (variations for different storm conditions, sources of flows from within the drainage area, and quality of those flows), are needed for effective design of source area and outfall controls.

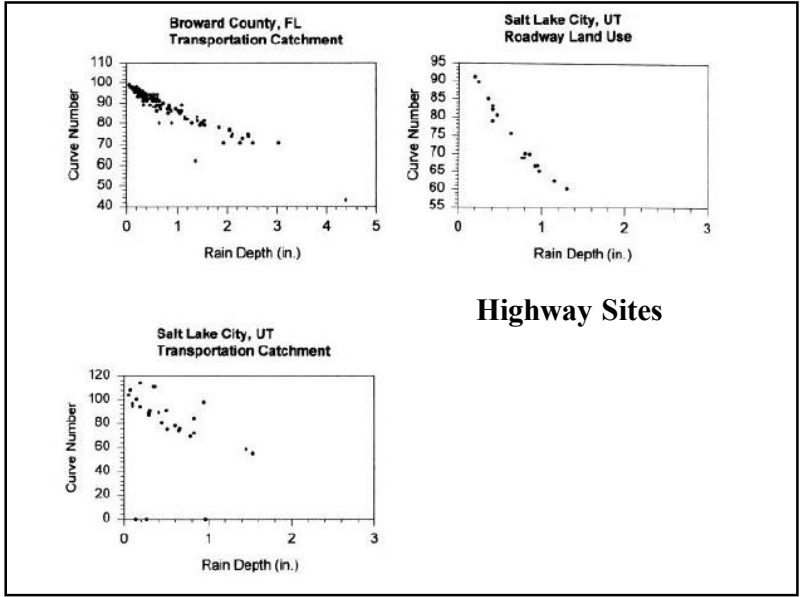
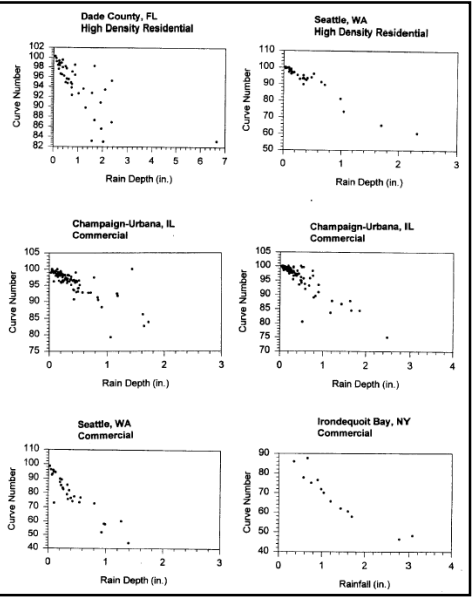
The following equation can be used to calculate the actual NRCS curve number (CN) from observed rainfall depth (P) and runoff depth (Q), both expressed in inches:

$$CN = 1000/[10+5P+10Q-10(Q^2+1.25QP)^{1/2}]$$

The following plots use rainfall and runoff data from the EPA's NURP projects in the early 1980s (EPA 1983), and from the EPA's rainfall-runoff-quality data base (Huber, *et al.* 1982).



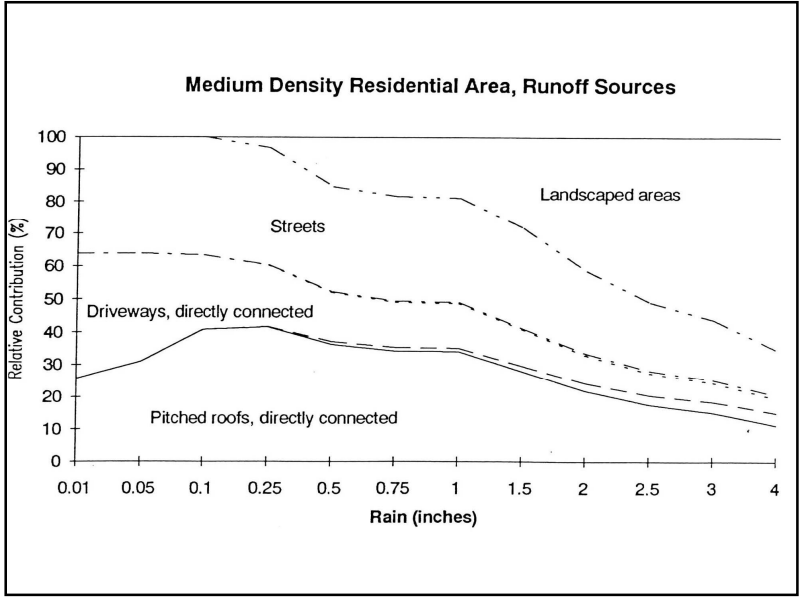
High Density Residential Sites



Highway Sites

Knowing the Runoff Volume is the Key to Estimating Pollutant Mass

- É There is usually a simple relationship between rain depth and runoff depth.
- É Changes in rain depth affect the relative contributions of runoff and pollutant mass discharges:
 - ó Directly connected impervious areas contribute most of the flows during relatively small rains
 - ó Disturbed urban soils may dominate during larger rains



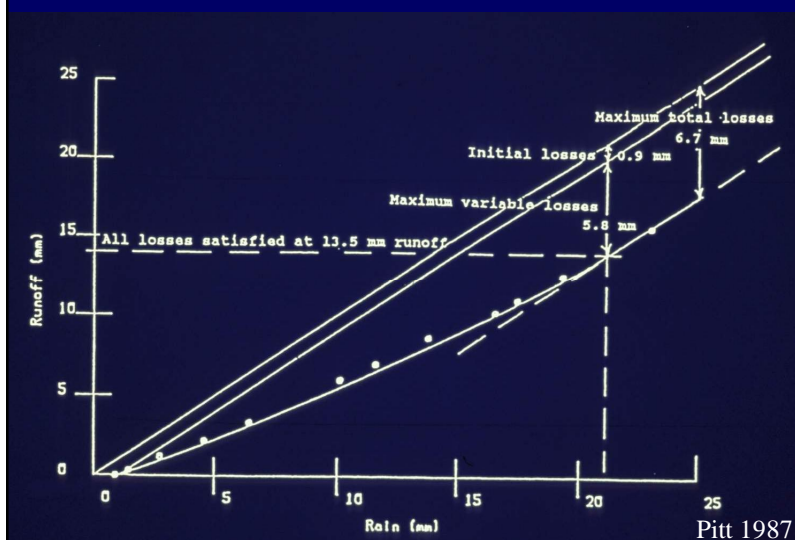
Source Characteristics of Stormwater Pollutants

- É Quality of sheetflows vary for different areas.
- É Need to track pollutants from sources and examine controls that affect these sources, the transport system, and outfall.

Street dirt washoff and runoff test plot, Toronto



Runoff response curve for typical residential street, Toronto



Ponding during very intense rain in area having sandy soils.



Disturbed Urban Soils during Land Development



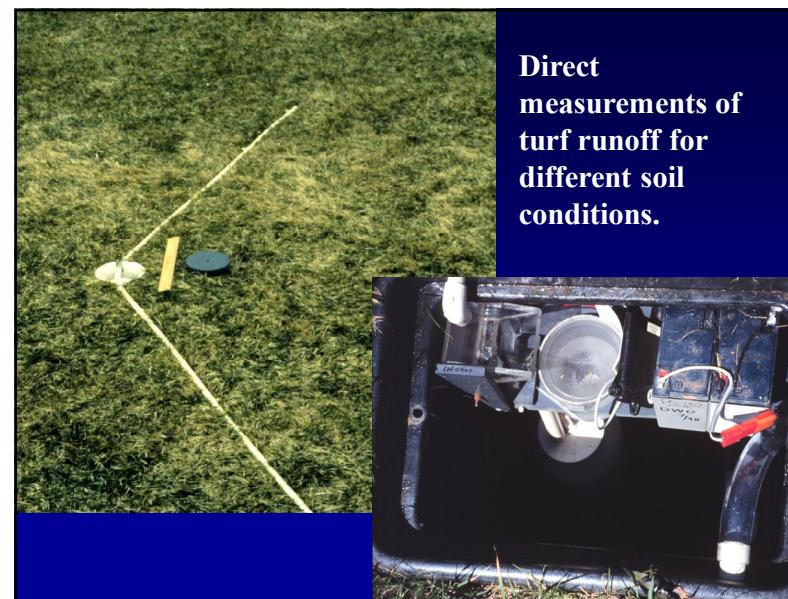
Road shoulder soil compaction due to parked cars along road.



Soil modifications can result in greatly enhanced infiltration in marginal soils.



Direct measurements of turf runoff for different soil conditions.



WI DNR Double-Ring Infiltrometer Test Results (in/hr), Oconomowoc (mostly A and B soils)

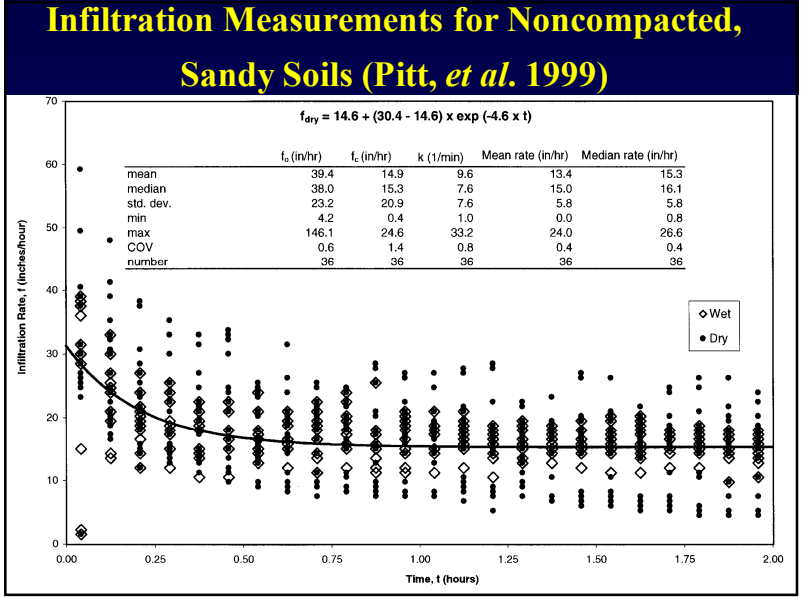
Initial Rate	Final Rate	Range of Observed Rates
25	15	11 to 25
22	17	17 to 24
14.7	9.4	9.4 to 17
5.8	9.4	0.2 to 9.4
5.7	9.4	5.1 to 9.6
4.7	3.6	3.1 to 6.3
4.1	6.8	2.9 to 6.8
3.1	3.3	2.4 to 3.8
2.6	2.5	1.6 to 2.6
0.3	0.1	0 to 0.3
0.3	1.7	0.3 to 3.2
0.2	0	0 to 0.2
0	0.6	0 to 0.6
0	0	all 0
0	0	all 0

Infiltration Rates in Disturbed Urban Soils (AL tests)

Sandy Soils

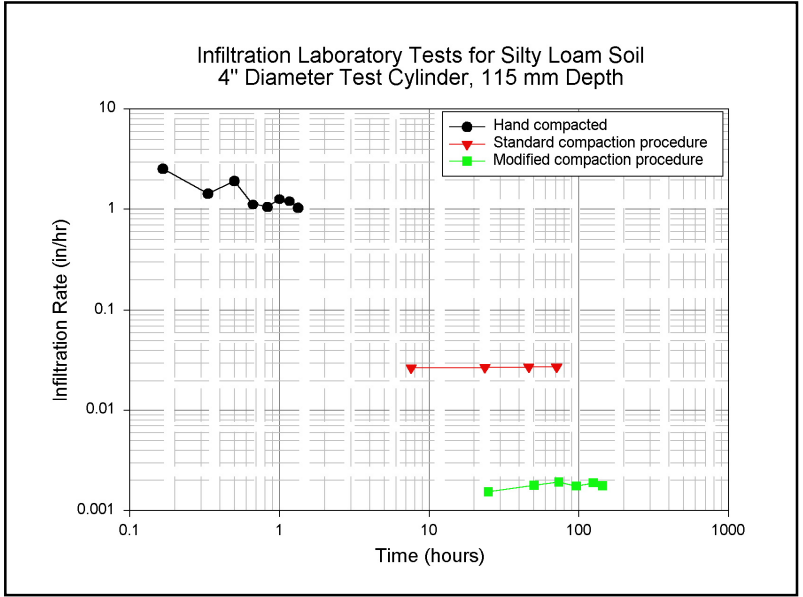
Clayey Soils

Recent research has shown that the infiltration rates of urban soils are strongly influenced by compaction, probably more than by moisture saturation.



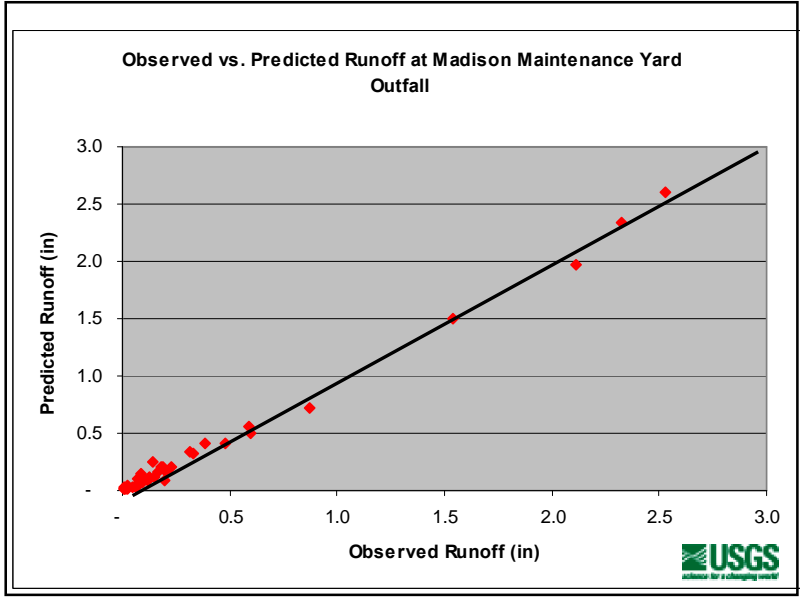
Infiltration Rates during Tests of Disturbed Urban Soils

	Number of tests	Average infiltration rate (in/hr)	COV
Noncompacted sandy soils	36	13	0.4
Compacted sandy soils	39	1.4	1.3
Noncompacted and dry clayey soils	18	9.8	1.5
All other clayey soils (compacted and dry, plus all wetter conditions)	60	0.2	2.4



Long-Term Sustainable Average Infiltration Rates (3 of 15 textures tested)

Soil Texture	Compaction Method	Dry Bulk Density (g/cc)	Effects on Root Growth (per NRCS)	Long-term Average Infiltr. Rate (in/hr)
Sand	Hand	1.451	Ideal	Very high
	Standard	1.494	Ideal	Very high
	Modified	1.620	May affect -	80
Silt	Hand	1.508	May affect	18
	Standard	1.680	May affect +	0.9
	Modified	1.740	Restrict	0.08
Clay	Hand	1.241	May affect	3.0
	Standard	n/a	n/a	0
	Modified	n/a	n/a	0



Download WinSLAMM version 9.4

<http://www.winslamm.com/>

PV & Associates
Making the first one million count a lot better

<ul style="list-style-type: none"> Home WinSLAMM WinDETPOND Purchase Software Download Software FAQ Training Upcoming Features References Send Documentation Support Links About Us 	<p>Announcements</p> <ul style="list-style-type: none"> • WinSLAMM v 9.4.0 Trial Version updated to website. See Download Software page for details. (posted 0/20/09) • WinSLAMM v 9.4.0 released. See Download Software page for details. (posted 0/17/09) • WinSLAMM v 9.2.0 and v 9.3.0 available for download from Download Software page. (posted 0/30/09) • "Modeling Practices in Series using WinSLAMM" reference updated to Sales/Documentation page. (posted 0/30/09) • "PVA User List Created." From time to time, notifications regarding updates to the program and upcoming training are announced. To be added to the WinSLAMM and WinDETPOND notification list, please send an email to the PVA Users List with your contact information and "Please Add" in the subject line. We will not share your contact information. (posted 0/30/09) • Beta Testing Group created. See the Support page for more information. (posted 0/30/09) <p>Introduction</p> <p>PV & Associates, LLC is a small business that develops the urban water quality software programs — WinSLAMM and WinDETPOND. Both programs are updated as new research data becomes available.</p> <p>The programs were originally developed as subgrants of early stormwater research conducted for the US EPA and other agencies. We realized that the monitored data did not correspond to many assumptions that were the basis for available stormwater quality models, and therefore decided to create a new program that better reflected research results and was more focused on stormwater quality management than on drainage design.</p> <p>The vast majority of model development is supported through software sales. However, model development has been partially supported by organizations such as the Environmental Protection Agency (EPA), Oregon Ministry of the Environment, Environment Canada, Wisconsin Department of Natural Resources (WDNR) and the United States Geological Survey (USGS). For a complete list of organizations that have supported model development, see the WinSLAMM History page on this web site.</p> <p>WinSLAMM Current Release - v 9.4.0 WinSLAMM (Source Loading and Management Model for Windows) was developed to evaluate nonpoint source pollutant loadings in urban areas using small storm hydrology. The model determines the runoff from a series of normal rainfall events, calculates the pollutant loading from each individual source area using rainfall events. This is also able to apply a series of stormwater control practices, such as infiltration/bioretention, street sweeping, wet detention ponds, grass swales, porous pavement, catchment basins, or various proprietary devices to determine how effectively these practices remove pollutants. Since its origin in the 1970's, the program's use has extended across North America and overseas.</p> <p>WinSLAMM is based largely upon Dr. Robert Pitt's research and studies conducted in the United States and Canada and by research studies conducted through the WDNR and the USGS.</p> <p>WinDETPOND Current Release - v 9.4.0 WinDETPOND was developed to perform continuous simulations of wet stormwater detention ponds. This continuous simula is important to understand the storm to storm variation and long term performance for typical rain conditions. WinDETPOND was developed using many years of detention pond data obtained from the Monroe Street detention pond monitored by the WDNR in the USGS.</p>
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Installing the program

NEW INSTALL

- É Place the WinSLAMM CD in your CD Drive
- É On your CD drive, go to the -WinSLAMM\ Folder
- É Double-click on the -SETUP.EXE\ file
- É The program will install just like any other Windows program
- É We recommend that you use the default folder settings when you install the program

PV & Associates LLC

SLAMM for Windows

SLAMM for Windows

Source Loading and Management Model

Version 9.3

by

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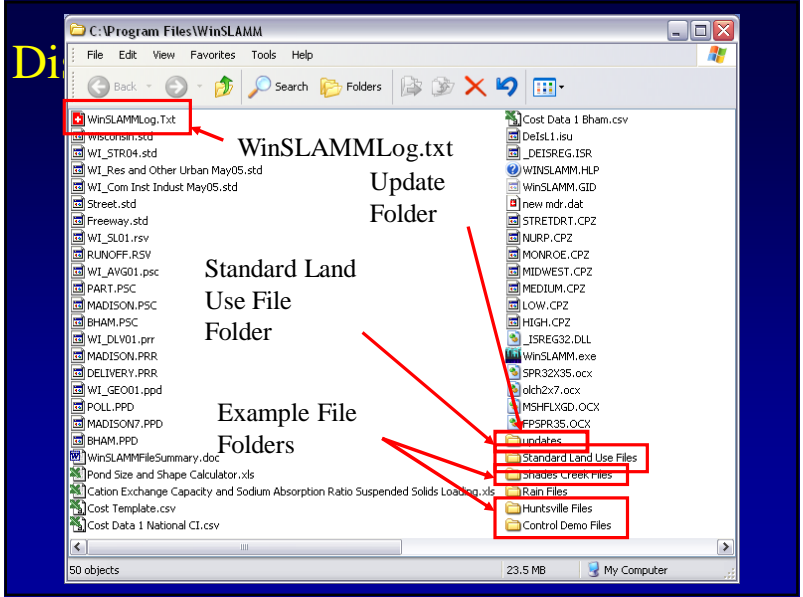
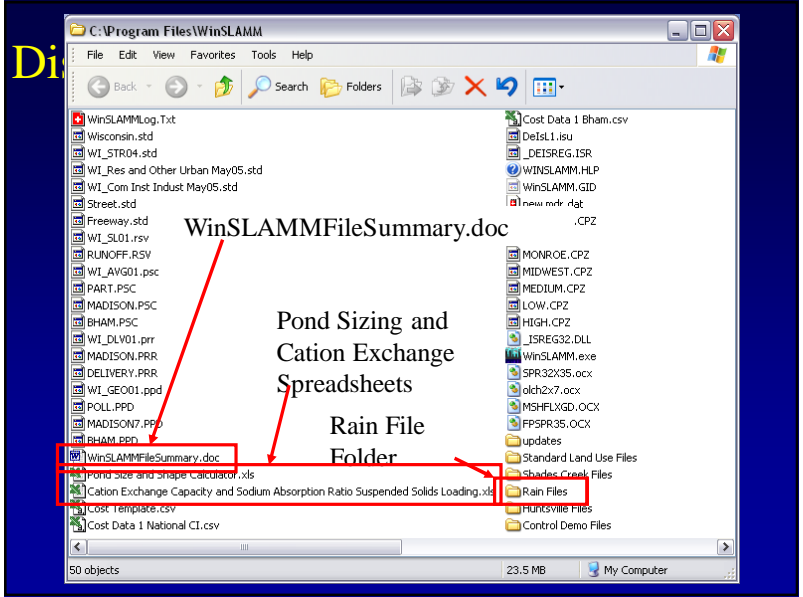
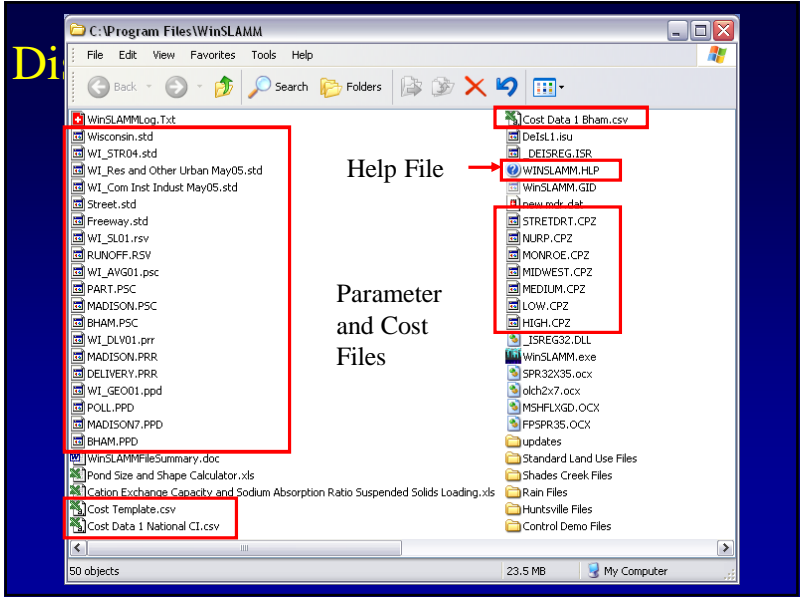
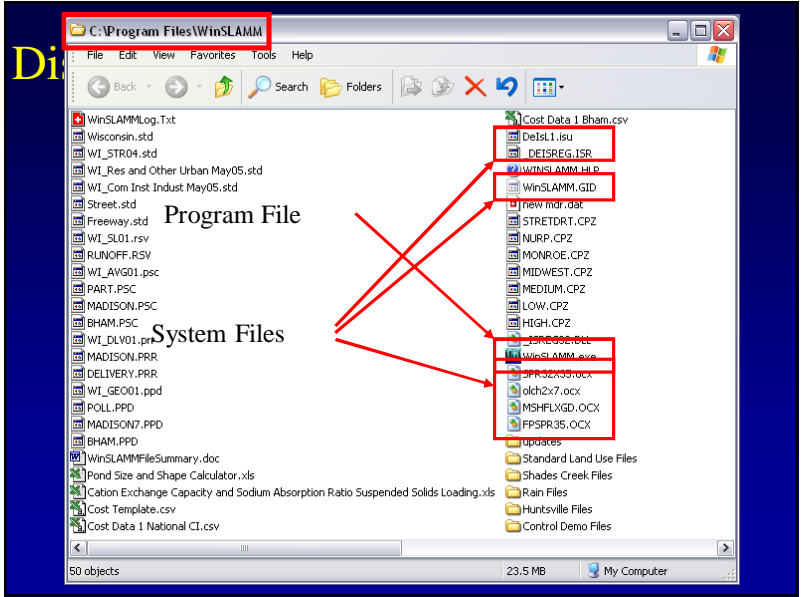
Caroline J. Burger, PE
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Middleton, Wisconsin 53562

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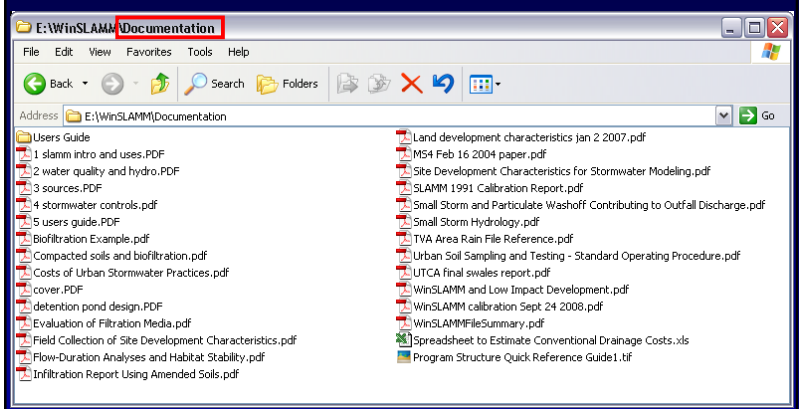
Exit Program
Enter Main Screen

Disk contents and file structure

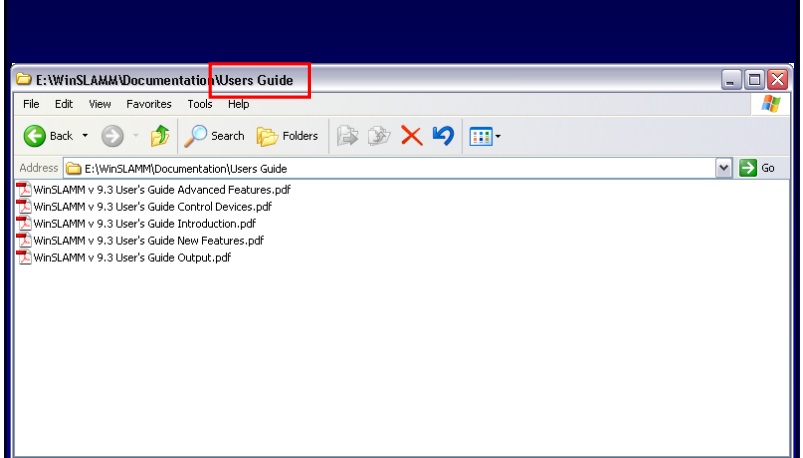
- É Executable program (WinSLAMM.exe)
- É Miscellaneous System Files
- É Parameter and Cost Files
- É Help File (WinSLAMM.HLP)
- É Documentation
- É WinSLAMMFile Summary.doc
- Pond Sizing and Cation Exchange Spreadsheets
- Rain Files
- Example File and Standard Land Use Folders
- Update Folder
- WinSLAMMLog.txt
- Users Guides



CD Contents - Documentation

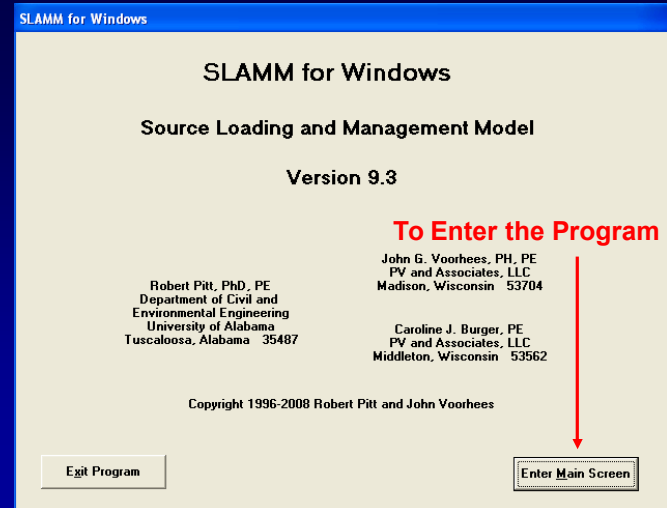
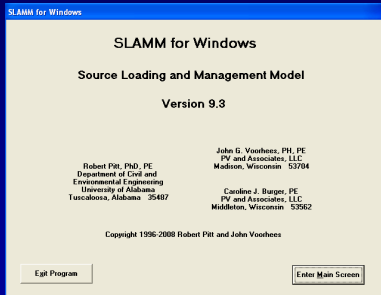


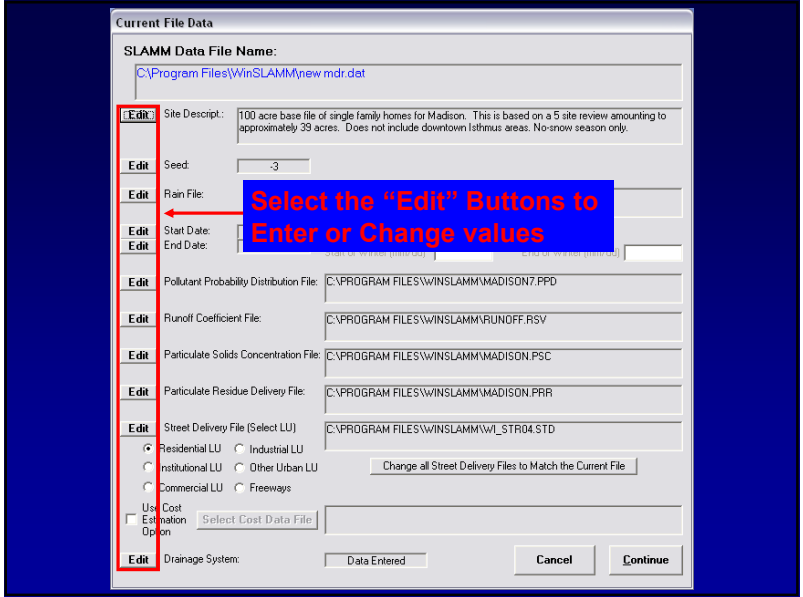
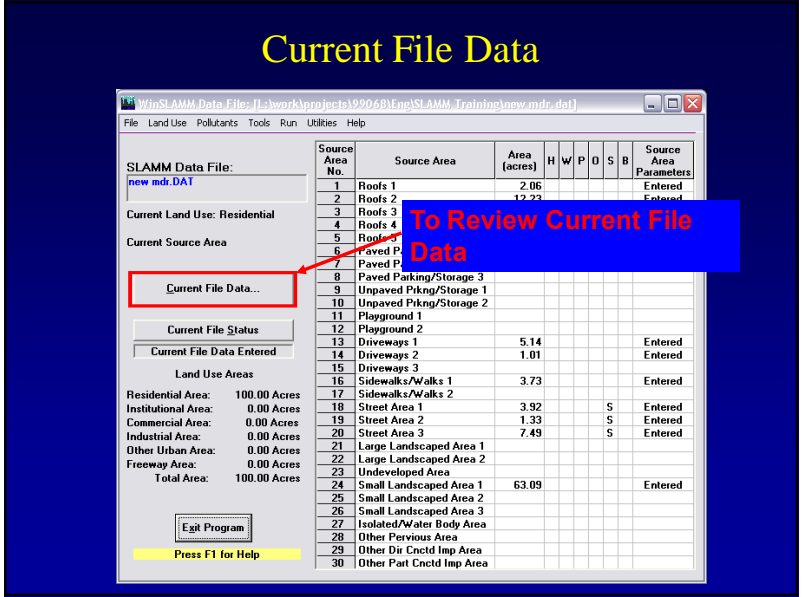
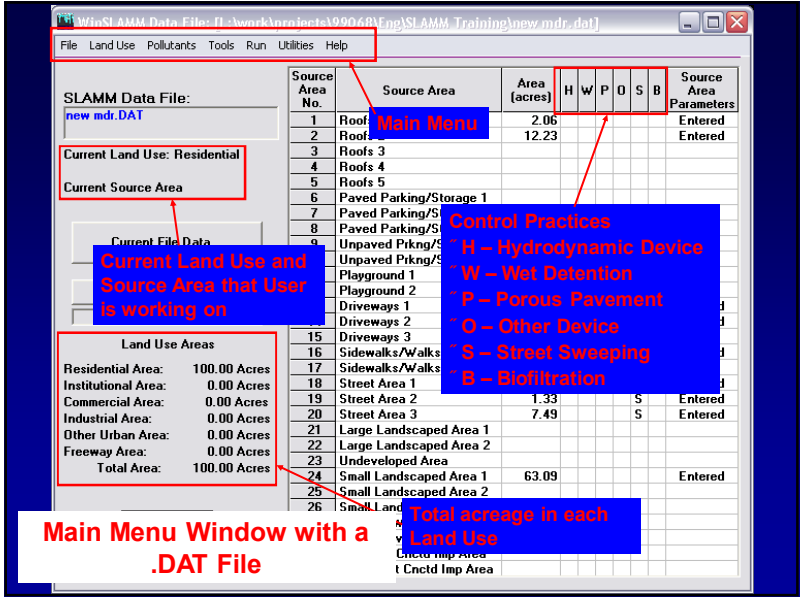
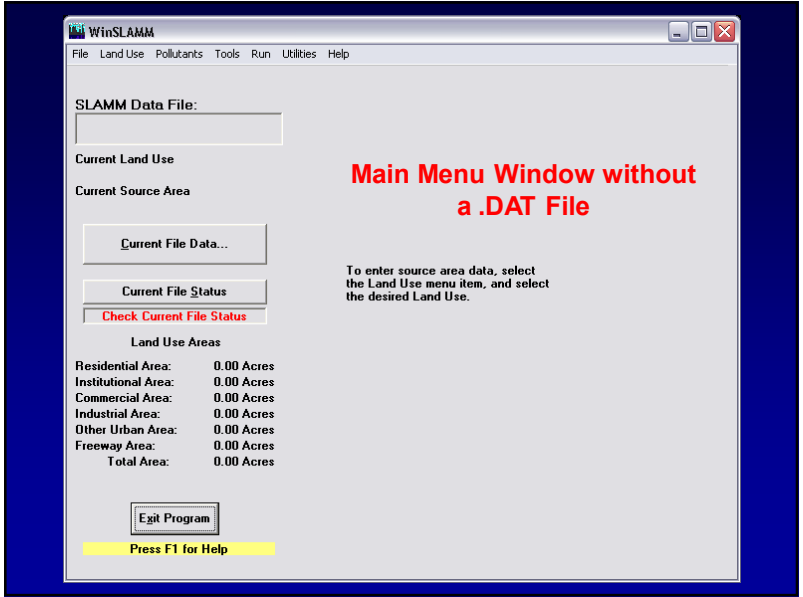
CD Contents ó Users Guides



Outline

- É Main Screen
- É Current File Data
- É Toolbar Selections
 - ó File
 - ó Pollutants
 - ó Tools
 - ó Utilities
 - ó Help
 - ó Land Use
 - ó Run
- É Land Use
 - ó Land Uses
 - ó Control Practices
- É Output





Current File Data

SLAMM Data File Name:
C:\Program Files\WinSLAMM\new.mdr.dat

Site Description: 100 acre base file of single family homes for Madison. This is based on a 5 site review amounting to approximately 39 acres. Does not include downtown Isthmus areas. No-snow season only.

Seed: -3

Rain File: [Empty]

Start Date: 03/01/81 Winter Season Range
End Date: 11/30/81 Start of Winter (mm/dd) End of Winter (mm/dd)

Parameter Files and Drainage System Data

Pollutant Probability Distribution File: C:\PROGRAM FILES\WINSLAMM\MADISON7.PPD

Runoff Coefficient File: C:\PROGRAM FILES\WINSLAMM\RUNOFF.RSV

Particulate Solids Concentration File: C:\PROGRAM FILES\WINSLAMM\MADISON.PSC

Particulate Residue Delivery File: C:\PROGRAM FILES\WINSLAMM\MADISON.PRR

Street Delivery File (Select LU): C:\PROGRAM FILES\WINSLAMM\WL_STR04.STD

Residential LU Industrial LU
Institutional LU Other Urban LU
Commercial LU Freeways

Use Cost Estimation Option: Select Cost Data File

Drainage System: Data Entered

Buttons: Cancel, Continue

WinSLAMM Data Files [J:\work\projects\99068\Eng\SLAMM_Training\new.mdr.dat]

File Land Use Pollutants Tools Run Utilities Help

SLAMM Data File: new.mdr.DAT

Current Land Use: Residential

Current Source Area

Current File Data...

To Review Current File Data Status

Current File Status

Current File Data Entered

Source Area No.	Source Area	Area (acres)	H	W	P	O	S	B	Source Area Parameters
1	Roofs 1	2.06							Entered
2									
3									
4									
5									
6									
7									
8	Paved Parking/Storage 3								
9	Unpaved Pkng/Storage 1								
10	Unpaved Pkng/Storage 2								
11	Playground 1								
12	Playground 2								
13	Driveways 1	5.14							
14	Driveways 2	1.01							
15	Driveways 3								
16	Sidewalks/Walks 1	3.73							
17	Sidewalks/Walks 2								
18	Street Area 1	3.92						S	Entered
19	Street Area 2	1.33						S	Entered
20	Street Area 3	7.49						S	Entered
21	Large Landscaped Area 1								
22	Large Landscaped Area 2								
23	Undeveloped Area								
24	Small Landscaped Area 1	63.09							
25	Small Landscaped Area 2								
26	Small Landscaped Area 3								
27	Isolated/Water Body Area								
28	Other Pervious Area								
29	Other Dir Cnctd Imp Area								
30	Other Part Cnctd Imp Area								

Land Use Areas

Residential Area: 100.00 Acres
Institutional Area: 0.00 Acres
Commercial Area: 0.00 Acres
Industrial Area: 0.00 Acres
Other Urban Area: 0.00 Acres
Freeway Area: 0.00 Acres
Total Area: 100.00 Acres

Buttons: Exit Program, Press F1 for Help

Current File Data Entry Status

File Version Number: V9.3

Status	Required Data
Entered	Data File Name
Entered	Start Date
Entered	End Date
Entered	Rain File
Entered	Pollutant Probability Distribution File
Entered	Runoff Coefficient File
Entered	Particulate Solids Concentration File
Entered	Particulate Residue Delivery File
Entered	Source Area Data Entered
Entered	Street Delivery File
Entered	Drainage System
4	Output Printing Option Selected

Buttons: Continue

File

WinSLAMM Data Files [C:\Program Files\WinSLAMM\new.mdr.dat]

File Land Use Pollutants Options Run Utilities Help

New...
Open...
Save...
Save As...
Save Input Data...
Output Options...

Input Data Printout
Output Options

C:\Program Files\WinSLAMM\new.mdr.dat
C:\Files\SLAMM\WinSLAMM\Bugs\ET\Caroline B Biofilter\STR Clay Biofilter.2.dat
C:\Files\SLAMM\WinSLAMM\Bugs\Horwath USGS\2005 Apr 26 Catchbasin Cleaning\catch5yr.dat
C:\Files\SLAMM\WinSLAMM\Bugs\ET\Caroline B Biofilter\STR Clay Infl Device.dat

Exit

Current File Status

Current File Data Entered

Land Use Areas

Residential Area: 100.00 Acres
Institutional Area: 0.00 Acres
Commercial Area: 0.00 Acres
Industrial Area: 0.00 Acres
Other Urban Area: 0.00 Acres
Freeway Area: 0.00 Acres
Total Area: 100.00 Acres

Buttons: Exit Program, Press F1 for Help

	P	O	S	B	Source Area Parameters
11					
12					
13					Entered
14					Entered
15					
16					Entered
17					
18					S Entered
19					S Entered
20					S Entered
21					
22					
23					
24					Entered
25					
26					
27					
28					
29					
30					

Output Format Options

1. Source Areas by Land Use for Each Rain - Complete Printout

2. Source Area Totals and Outfall Summaries

3. Outfall Data Only for Each Rain

4. Outfall Summaries Only

5. One Line per Event Runoff and Flow Summary

6. Continuous Hydrograph With 6 Minute Time Increments

7. Continuous Hydrograph With 15 Minute Time Increments

8. Continuous Hydrograph With 60 Minute Time Increments

Water Balance Summary of All Detention Ponds

Save Outfall Runoff and Particulate Loading for WinDETPOND Analysis

Save Model Output for Input into CE-QUAL-RIV1

File Name: [Empty]

Buttons: Continue

Pollutants

Pollutant Selection

	Particulate	Dissolved	Total
Solids	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phosphorus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nitrates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TKN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fecal Coliform Bacteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chromium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Copper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zinc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cadmium (ug/L)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pyrene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The pollutants listed above are in the file
 C:\PROGRAM FILES\WINSLMM\WL_GEO01.PPD
 Select a pollutant to evaluate it.

Select All Clear All **Continue**

Tools

WINSLMM Data File: [Path] | WINSLMM Model Run: Montana SM 8 Single Run

File Land Use Pollutants **Tools** Run Utilities Help

Access Cost Data
 Combine .dat Files
 Detailed Output Options

Source Area	Area (acres)	H	W	P	O	S	B	Source Area Parameters
1 Roofs 1	43.46							Entered
2 Roofs 2	61.39							Entered
3 Roofs 3	14.12							Entered
4 Roofs 4	20.64							Entered
5 Roofs 5								Entered
6 Paved Parking/Storage 1	0.54							Entered
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17 Sidewalks/Walks 2								
18 Street Area 1	77.14							Entered
19 Street Area 2	24.99							Entered
20 Street Area 3								
21 Large Landscaped Area 1								
22 Large Landscaped Area 2								
23 Undeveloped Area								
24 Small Landscaped Area 1	190.14							Entered
25 Small Landscaped Area 2								
26 Small Landscaped Area 3								
27 Isolated/Water Body Area								
28 Other Pervious Area								
29 Other Dir Cnctd Imp Area								
30 Other Part Cnctd Imp Area								

Current Land Use: Residential
 Current Source Area: [Value]

Land Use Areas

Residential Area:	543.25 Acres
Institutional Area:	0.00 Acres
Commercial Area:	0.00 Acres
Industrial Area:	0.00 Acres
Other Urban Area:	0.00 Acres
Freeway Area:	0.00 Acres
Total Area:	543.25 Acres

Buttons: Current File Data..., Current File Status, Current File Data Entered, Exit Program, Press F1 for Help

- Combine .dat Files
- Access Cost Data
- Access Detailed Output Options

Control Practice Cost Data

Summary Data

Select File: C:\FILES\SLMM\WINSLMM\TEST FILES\COST FILES\COST TEMPLATE.CSV

File Description: Cost File Template for Pre-Determined Costs - Birmingham Cost Index

Save File Interest Rate on Debt Capital: 5 % Project Life (Years): 20

Save File As...

Cost Index Selection

Use User Defined Cost Index Values Use City Cost Index Values

Baseline Cost Index Value: [Field] City Cost Index: [Field] City Cost Index Multiplier: 0.7

Current Year Cost Index Value: [Field] Baseline National Cost Index: 7314.74 Current City Cost Index: 5135.56

User Defined Cost Index Multiplier: [Field]

Exit

Detailed Output Options

Detailed Output Options

Biofilters

- Stage-Outlet File
- Detailed Biofilter Output File
- Stochastic Seepage Rate Detail File
- Water Balance File

Catchbasins

- Stage-Outlet File
- Performance by Event Output File
- Performance by Step Output File
- Stage-Inflow Data File

Porous Pavement

- Water Balance File
- Stage-Outlet File
- Surface Seepage Rate File
- Detailed Output File
- Stochastic Seepage Rate Detail File

Wet Detention Ponds

- Stone Weeper Detailed Output File
- Stage-Outlet File
- Outfall Discharge Hydrograph File
- Detailed Output File
- Water Balance Summary of All Ponds
- Pond Stage-Area-Volume Data

Street Cleaning

- Street Dirt Removal File
- Washoff or Street Cleaning Detail File
- Street Dirt Plot File

Freeway Data

- Freeway Washoff Detail File

Hydrodynamic Devices

- Performance By Event
- Detailed Output File
- Stage-Inflow File
- Stage-Outlet File

Flow Duration Curve Data

- Plotting Calculations
- Detailed Data

Grass Swales

- Hydraulics Detailed Output File
- Particulate Reduction Output File
- Incremental Performance Output File
- Hydraulics and Concentration by Event
- Irreducible Concentration Detailed Output

Default Peak Flow to Average Flow Ratio: 3.8

Default Model Options

- Suppress Control Practice Review Warning Messages
- Suppress 'No Street Cleaning with Catchbasin Cleaning' Warning Message
- Turn 'Save File Upon Exit' Message Off
- Turn 'Save Outfall Runoff and Particulate Loading for WinDETPOND Analysis' Output Option On

File Update Options

- Uncheck All Detailed Output Options
- Check All Detailed Output Options

Buttons: Cancel Changes, Save .INI File

Utilities

WinSLAMM Data File: [C:\Program Files\WinSLAMM\new mdr.dat]

File Land Use Pollutants Options Run Utilities Help

SLAMM Data File: new mdr.DAT

Current Land Use: Residential

Current Source Area

Current File Data...

Current File Status

Current File Data Entered

Land Use Areas

Residential Area: 100.00 Acres
 Institutional Area: 0.00 Acres
 Commercial Area: 0.00 Acres
 Industrial Area: 0.00 Acres
 Other Urban Area: 0.00 Acres
 Freeway Area: 0.00 Acres
 Total Area: 100.00 Acres

Exit Program

Press F1 for Help

No.	Parameter Files	S	B	Source Area Parameters
1	Roofs 1			Entered
2	Roofs 2			Entered
3	Roofs 3			Entered
4	Roofs 4			Entered
5	Roofs 5			Entered
6	Paved Parking/Storage 1			
7	Paved Parking/Storage 2			
8	Paved Parking/Storage 3			
9	Unpaved Parking/Storage 1			
10	Unpaved Parking/Storage 2			
11	Playground 1			
12	Playground 2			
13	Driveways 1	5.14		Entered
14	Driveways 2	1.01		Entered
15	Driveways 3			
16	Sidewalks/Walks 1	3.73		Entered
17	Sidewalks/Walks 2			
18	Street Area 1	3.92	S	Entered
19	Street Area 2	1.33	S	Entered
20	Street Area 3	7.49	S	Entered
21	Large Landscaped Area 1			
22	Large Landscaped Area 2			
23	Undeveloped Area			
24	Small Landscaped Area 1	63.09		Entered
25	Small Landscaped Area 2			
26	Small Landscaped Area 3			
27	Isolated Area			
28	Other Pervious Area			
29	Other Dir Cnctd Imp Area			
30	Other Part Cnctd Imp			

Parameter File Editors

Critical Particle Size Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\MIDWEST.CPZ

File Description:

Save File: Enter Particle Size (100 - 0)

Save File As...

Print to Text File

View Text File

Continue

Cancel

Use Shift plus the arrow keys to move through the grid

Entry Number	Particle Size (microns)	Percent Greater Than Particle Size
1	1	100
2	2	97
3	3	93
4	4	91
5	5	89
6	6	86
7	7	84
8	8	82
9	9	80
10	10	78
11	11	75
12	12	73
13	13	71
14	14	69
15	15	68
16	20	62
17	25	57
18	30	53
19	35	49
20	40	47

Street Delivery Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\STREET.STD

File Description: Judy and Roger's Wisconsin data

Fraction Reduction in Street Washoff Yield for Different Sized Rains

Rain Depth (in)	0.04	0.08	0.12	0.20	0.39	0.59	0.79	0.98	1.2	1.6	2.0	2.4	2.8	3.2
Rain Depth (mm)	1	2	3	5	10	15	20	25	30	40	50	60	70	80
Smooth Textured Streets	0.97	0.96	0.92	0.91	0.82	0.70	0.56	0.33	0.20	0.00	0.00	0.00	0.00	0.00
Intermediate Textured	0.97	0.96	0.92	0.91	0.82	0.70	0.56	0.33	0.20	0.00	0.00	0.00	0.00	0.00
Rough Textured Streets	0.97	0.96	0.92	0.91	0.82	0.70	0.56	0.33	0.20	0.00	0.00	0.00	0.00	0.00
Very Rough Textured	0.97	0.96	0.92	0.91	0.82	0.70	0.56	0.33	0.20	0.00	0.00	0.00	0.00	0.00

Use Shift plus the arrow keys to move through the grid

Print to Text File Save File Save File As... Cancel Continue

Runoff Coefficient Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\W1_SL01.RSV

File Description: Data from lawn runoff study in Madison.

Area Types (AT):

- AT 1: Connected flat roofs
- AT 2: Connected Pitched Roofs
- AT 3: Directly connected impervious areas
- AT 4: Directly connected unpaved areas
- AT 5: Pervious areas - Sandy soils
- AT 6: Pervious areas - Silty soils
- AT 7: Pervious areas - Clayey soils
- AT 8: Smooth textured streets
- AT 9: Intermediate textured streets
- AT 10: Rough textured streets

Runoff Coefficient Data

Drainage Efficiency Coefficient Data

Volumetric Runoff Coefficients for Rains (in. and mm.)

Rain (in)	0.01	0.08	0.12	0.20	0.39	0.59	0.79	0.98	1.2	1.6	2.0	2.4	2.8	3.2	3.5	3.9	4.9
Rain (mm)	1	2	3	5	10	15	20	25	30	40	50	60	70	80	90	100	125
AT 1	0.00	0.15	0.45	0.64	0.77	0.79	0.83	0.84	0.86	0.88	0.90	0.91	0.93	0.94	0.94	0.95	0.96
AT 2	0.25	0.63	0.75	0.85	0.93	0.95	0.96	0.97	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99
AT 3	0.35	0.44	0.49	0.56	0.64	0.69	0.73	0.77	0.81	0.86	0.89	0.91	0.92	0.93	0.94	0.94	0.95
AT 4	0.00	0.00	0.00	0.00	0.47	0.64	0.72	0.77	0.81	0.86	0.89	0.91	0.92	0.93	0.94	0.94	0.95
AT 5	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
AT 6	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09
AT 7	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.12	0.13
AT 8	0.35	0.49	0.54	0.59	0.65	0.69	0.72	0.76	0.80	0.85	0.90	0.91	0.93	0.93	0.94	0.95	0.95
AT 9	0.26	0.43	0.49	0.55	0.60	0.64	0.67	0.70	0.73	0.80	0.84	0.86	0.88	0.90	0.91	0.92	0.93
AT 10	0.18	0.39	0.47	0.53	0.60	0.64	0.67	0.70	0.73	0.80	0.84	0.86	0.88	0.90	0.91	0.92	0.93

Use Shift plus the arrow keys to move through the grid

Print to Text File Save File Save File As... Cancel Continue

Rainfall Parameter File

File

Rain File Name: C:\FILES\SLAMM\WINSLAMM\DISTRIBUTION\STANDARD DATA FILES\RAINFILES\GREEN BAY W1 82.RAN

January 1982

Rain Number	Julian Starting Date	Starting Date	Ending Date	Ending Time	Rainfall Depth (in)	Duration (hrs)	Intensity (in/hr)	Interevent Time (days)	
1	0.46	01/02/82	11:00	01/03/82	00.00	0.20	13.00	0.02	1.08
2	2.08	01/04/82	02:00	01/04/82	13.00	0.46	11.00	0.04	9.08
3	11.63	01/13/82	15:00	01/13/82	16.00	0.01	1.00	0.01	0.71
4	12.38	01/14/82	09:00	01/14/82	12.00	0.04	3.00	0.01	1.13
5	13.63	01/15/82	15:00	01/15/82	20.00	0.05	5.00	0.01	2.21
6	16.04	01/18/82	01:00	01/18/82	07.00	0.07	6.00	0.01	0.96
7	17.25	01/19/82	06:00	01/19/82	09.00	0.03	3.00	0.01	1.13
8	18.50	01/20/82	12:00	01/20/82	23.00	0.17	11.00	0.02	0.42
9	19.38	01/21/82	09:00	01/21/82	10.00	0.01	1.00	0.01	0.83
10	20.25	01/22/82	06:00	01/22/82	07.00	0.01	1.00	0.01	0.33
11	20.63	01/22/82	15:00	01/23/82	13.00	0.17	22.00	0.01	0.29
12	21.82	01/23/82	20:00	01/23/82	21.00	0.01	1.00	0.01	2.22

Start Date: 01/02/82
End Date: 12/27/82

Particulate Solids Concentration Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\W1_AVG01.PSC

File Description: Change based on several source areas dec. 1999

Area Types (AT):

- AT 1: Roofs
- AT 2: Paved Parking
- AT 3: Unpaved Parking, driveways, and walkways
- AT 4: Paved Playgrounds
- AT 5: Paved Driveways
- AT 6: Paved Sidewalks and Walkways
- AT 7: Large Landscaped Areas
- AT 8: Small Landscaped Areas
- AT 9: Undeveloped Areas
- AT 10: Other Pervious Areas
- AT 11: Other Partially Connected Pervious Areas
- AT 12: Other Partially Connected Impervious Areas
- AT 13: Paved Lane and Shoulder Areas

Residential Land Use
 Commercial Land Use
 Open Space Land Use
 Institutional Land Use
 Industrial Land Use
 Freeways Land Use

Particulate Solids Concentration (mg/L) Values for Rains (in. and mm.)

Rain (in.)	0.04	0.08	0.12	0.20	0.39	0.59	0.79	0.98	1.2	1.6	2.0	2.4	2.8	3.2
Rain (mm)	1	2	3	5	10	15	20	25	30	40	50	60	70	80
AT 1	37	37	37	37	37	37	37	37	37	37	37	37	37	37
AT 2	130	130	130	130	130	130	130	130	130	130	130	130	130	130
AT 3	154	154	154	154	154	154	154	154	154	154	154	154	154	154
AT 4	154	154	154	154	154	154	154	154	154	154	154	154	154	154
AT 5	154	154	154	154	154	154	154	154	154	154	154	154	154	154
AT 6	75	75	75	75	75	75	75	75	75	75	75	75	75	75
AT 7	227	227	227	227	227	227	227	227	227	227	227	227	227	227
AT 8	227	227	227	227	227	227	227	227	227	227	227	227	227	227
AT 9	16	16	16	16	16	16	16	16	16	16	16	16	16	16
AT 10	227	227	227	227	227	227	227	227	227	227	227	227	227	227
AT 11	154	154	154	154	154	154	154	154	154	154	154	154	154	154
AT 12	154	154	154	154	154	154	154	154	154	154	154	154	154	154

Particulate Residue Reduction Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\DELIVERY.FRR

File Description: example delivery

Drainage System Types (DST):

- DST 1: Grass Swales
- DST 2: Undeveloped Roadside
- DST 3: Curb and Gutters, valleys, or sealed swales in poor condition (or very flat)
- DST 4: Curb and Gutters, valleys, or sealed swales in fair condition
- DST 5: Curb and Gutters, valleys, or sealed swales in good condition (or very steep)

Particulate Residue Reduction to Delivery for Different Sized Rains (in. and mm.)

Rain (in.)	0.04	0.08	0.12	0.20	0.39	0.59	0.79	0.98	1.2	1.6	2.0	2.4	2.8	3.2
Rain (mm)	1	2	3	5	10	15	20	25	30	40	50	60	70	80
DST 1	0.99	0.98	0.97	0.94	0.85	0.74	0.61	0.44	0.25	0.07	0.02	0.00	0.00	0.00
DST 2	0.99	0.98	0.97	0.94	0.85	0.74	0.61	0.44	0.25	0.07	0.02	0.00	0.00	0.00
DST 3	0.98	0.96	0.92	0.85	0.61	0.46	0.31	0.22	0.13	0.04	0.01	0.00	0.00	0.00
DST 4	0.98	0.95	0.90	0.80	0.48	0.32	0.16	0.11	0.07	0.02	0.00	0.00	0.00	0.00
DST 5	0.98	0.95	0.88	0.75	0.36	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pollutant Parameter File

Select File: C:\PROGRAM FILES\WINSLAMM\W1_GEO01.FPD

File Description: Update of the pollutant file using USGS monitored number from several projects.

Particulate Pollutants:

- Phosphorus
- TKN
- COD
- Chromium
- Copper
- Lead
- Zinc
- Cadmium
- Pyrene
- Other 3
- Other 4
- Other 5
- Other 6

Filterable Pollutants:

- Solids
- Phosphorus
- Nitrate
- TKN
- COD
- Fecal Coliform Bacteria
- Chromium
- Copper
- Lead
- Zinc
- Cadmium
- Other 2
- Other 3
- Other 4
- Other 5
- Other 6

Pollutant Units: (mg/kg)

Pollutant: Particulate Copper (mg/kg)

Land Use =>	Residential	Institutional	Commercial	Industrial	Other Urban	Freeway
Roofs - Mean	91.30	96.00	96.00	859.00	91.30	859.00
Roofs - CDV	1.32	1.01	1.01	0.86	1.32	0.86
Paved Parking/Storage - Mean	84.20	84.20	84.20	64.00	84.20	64.00
Paved Parking/Storage - CDV	0.69	0.69	0.69	0.80	0.69	0.80
Unpaved Parking/Storage - Mean	62.20	62.20	62.20	62.20	62.20	62.20
Unpaved Parking/Storage - CDV	1.04	1.04	1.04	1.04	1.04	1.04
Playground - Mean	62.20	62.20	62.20	62.20	62.20	62.20
Playground - CDV	1.04	1.04	1.04	1.04	1.04	1.04
Driveways - Mean	62.20	62.20	62.20	62.20	62.20	62.20
Driveways - CDV	1.04	1.04	1.04	1.04	1.04	1.04
Sidewalks/Walks - Mean	62.20	62.20	62.20	62.20	62.20	62.20
Sidewalks/Walks - CDV	1.04	1.04	1.04	1.04	1.04	1.04
Street Areas - Mean	34.40	105.00	105.00	67.30	34.40	200.00

Help

The screenshot shows the WinSLAMM Main Menu on the left and the Help Topics dialog box in the center. The dialog box has a search field and a list of topics. The 'Land Use' section is highlighted in the main menu.

Land Use

The screenshot shows the WinSLAMM Data File window with the Land Use tab selected. A tree view on the left shows 'Residential' expanded. The main area displays a table of source areas and their parameters.

Source Area No.	Source Area	Area (acres)	H	W	P	O	S	B	Source Area Parameters
1	Roofs 1	2.06							Entered
2	Roofs 2	12.23							Entered
3	Roofs 3								
4	Roofs 4								
5	Roofs 5								
6	Paved Parking/Storage 1								
7	Paved Parking/Storage 2								
8	Paved Parking/Storage 3								
9	Unpaved Pkng/Storage 1								
10	Unpaved Pkng/Storage 2								
11	Playground 1								
12	Playground 2								
13	Driveways 1	5.14							Entered
14	Driveways 2	1.01							Entered
15	Driveways 3								
16	Sidewalks/Walks 1	3.73							Entered
17	Sidewalks/Walks 2								
18	Street Area 1	3.92					S		Entered
19	Street Area 2	1.33					S		Entered
20	Street Area 3	7.49					S		Entered
21	Large Landscaped Area 1								
22	Large Landscaped Area 2								
23	Undeveloped Area								
24	Small Landscaped Area 1	63.09							Entered
25	Small Landscaped Area 2								
26	Small Landscaped Area 3								
27	Isolated/Water Body Area								
28	Other Pervious Area								
29	Other Dir Cnctd Imp Area								
30	Other Part Cnctd Imp Area								

This screenshot shows the WinSLAMM Data File window with several blue annotations explaining the interface. A red box highlights the 'SLAMM Data File: new.mdr.DAT' field. Another red box highlights the 'Current Land Use: Residential' field. A third red box highlights the 'Current Source Area' field. A fourth red box highlights the 'Current File Data Entered' section. A fifth red box highlights the 'Land Use Areas' section. A sixth red box highlights the 'Exit Program' button. A seventh red box highlights the 'Press F1 for Help' button. A blue box with text explains that the 'Source Area' column is double-clicked to enter or change values. Another blue box explains that the 'Source Area Parameters' column is double-clicked to change or review values. A third blue box explains that the 'Source Area Number' increments by 30 for each Land Use.

This screenshot shows the WinSLAMM Data File window with a different set of source areas. A red box highlights the 'SLAMM Data File: Example 2 Drainage Basin C Cross Section 5.DAT' field. Another red box highlights the 'Current Land Use: Freeways' field. A third red box highlights the 'Current Source Area' field. A fourth red box highlights the 'Current File Data Entered' section. A fifth red box highlights the 'Land Use Areas' section. A sixth red box highlights the 'Exit Program' button. A seventh red box highlights the 'Press F1 for Help' button. A blue box with text explains that the 'Source Area' and 'Source Area Parameters' columns are double-clicked to change or review values. A third blue box explains that the 'Source Area Number' increments by 30 for each Land Use.

Source Area Parameters

Source Area Parameters

Land Use: Residential
Source Area: Roofs 1
Total Area: 2.06 acres

Roofs: Flat Roof Pitched Roof

Is the Source Area:
 Directly Connected or Draining to a Directly Connected Area
 Draining to a Pervious Area (partially connected impervious area)

Soil Type: Sandy Silty Clayey

Building Density: Low Medium or High

Alleys present: Yes No

Continue

Street Source Area Parameters

Current Land Use: Residential
Current Source Area: Street Area 1
Total Area: 3.92 acres

Total street length in the study area (curb-miles): 2.13
The estimated street width, in feet, is: 30.4

Street Texture:
 1. Smooth 2. Intermediate
 3. Rough 4. Very Rough (including oil and screens)

Street Dirt Accumulation:
 1. Use value calculated by program based upon land use and street texture
 2. Enter accumulation equation coefficients

Equation Form: $y = mx + b$ where $m =$ Accumulation Rate $m =$ 15
 $y =$ loading (lbs/curb mile) $b =$ Intercept Load, $x=0$ $b =$ 225
 $x =$ time (days) $C =$ Maximum Load $C =$ 1500

Initial Street Dirt Loading (lbs/curb-mi)
 1. Use value calculated by program based upon land use and street texture
 2. Specify value: 235.40

Initial Street Dirt Loading at End of Winter Season (lbs/curb-mi):

Cancel Continue

Freeway Source Area Parameters

Current Land Use: Freeways
Current Source Area: Pavd Lane_Shldr Area 1
Total Area: 34 acres

Freeway Drainage System:
 1. Grass Swales
 2. Curb and Gutters, Valleys, or Sealed Swales in poor condition or very flat
 3. Curb and Gutters, Valleys, or Sealed Swales in fair condition
 4. Curb and Gutters, Valleys, or Sealed Swales in good condition or very steep

Freeway Length (miles): 3.00

Average Daily Traffic (# vehicles/day): 4500

Initial Freeway Dirt Loading (lbs/curb-mi)
 1. Use value calculated by program based upon average daily traffic and freeway length
 2. Specify value: 262.23

Continue

Used to Apply Freeway Delivery File Values

Pre-Development Areas and Curve Numbers (CN)

Pre-Development Areas and CN

Description	Area (ac)	CN
1	77.00	84
2	23.00	92
3	0.00	0
4	0.00	0
5	0.00	0
6	0.00	0
7	0.00	0
8	0.00	0
9	0.00	0
10	0.00	0
Total Area (ac)	100.00	
Composite CN		85

Total Model Area (ac): 100.00

Continue Cancel Clear

Control Practices

Biofiltration Control Device

Land Use: Freeways

Biofilter Number 1

Device Properties

Top Area (ft)	1500
Bottom Area (ft)	1000
Total Depth (ft)	4.00
Typical Width (ft) (Cut est. only)	10.00
Native Soil Infiltration Rate (in/hr)	0.300
Native Soil Infiltration Rate COV	N/A
Infil. Rate Fraction Bottom (0-1)	1.00
Infil. Rate Fraction Sides (0-1)	1.00
Rock Filled Depth (ft)	1.00
Rock Fill Void Ratio (0-1)	0.30
Engineered Soil Type	Peat Sand
Engineered Soil Infiltration Rate (in/hr)	3.00
Engineered Soil Depth (ft)	2
Engineered Soil Void Ratio (0-1)	0.30
Percent solids reduction due to Engineered Soil (0-100)	23
Inflow Hydrograph Peak to Average Flow Ratio	3.80
Number of Devices in Source Area or Land Use	2

Outlet/Discharge Options

- 1. Sharp Crested Weir
- 2. Broad Crested Weir
- 3. Vertical Stand Pipe
- 4. Evaporation
- 5. Plain Barrel/Culvert
- 6. Underdrain Outlet

Source Areas from Land Use that Contribute Runoff to Biofiltration Control Device(s)

- Rooftop 1
- Rooftop 2
- Rooftop 3
- Rooftop 4
- Rooftop 5
- Paved Parking/Storage 1
- Paved Parking/Storage 2
- Paved Parking/Storage 3
- Unpaved Parking/Storage 1
- Unpaved Parking/Storage 2
- Paved Land and Shoulder 1
- Paved Land and Shoulder 2
- Paved Land and Shoulder 3
- Paved Land and Shoulder 4
- Paved Land and Shoulder 5
- Playground 1
- Playground 2
- Driveways 1
- Driveways 2
- Sidewalk/Walks 1
- Sidewalk/Walks 2
- Street Area 1
- Street Area 2
- Street Area 3
- Large Landscaped Area 1
- Undeveloped Area
- Small Landscaped Area 1
- Small Landscaped Area 2
- Small Landscaped Area 3
- Other Pervious Area
- Other Dr. Crd'd Imp Area
- Other Part Crd'd Imp Area
- Large Turf Areas
- Undeveloped Areas
- Other Pervious Area
- Other Deeply Concd Imp
- Other Partly Concd Imp

Selected Outlets

- 1 - Broad Crested Weir
- 2 - Vertical Stand Pipe
- 3 - Underdrain Outlet

Change Geometry

Copy Biofilter Data **Paste Biofilter Data**

Select Native Soil Infiltration Rate

- Sand - 0.5 in/hr
- Loamy sand - 2.5 in/hr
- Sandy loam - 1.0 in/hr
- Loam - 0.5 in/hr
- Silty loam - 0.3 in/hr
- Sandy silt loam - 0.2 in/hr
- Clay loam - 0.1 in/hr
- Silty clay loam - 0.05 in/hr
- Sandy clay - 0.05 in/hr
- Silty clay - 0.04 in/hr
- Clay - 0.02 in/hr
- Rain Barrel/Culvert - 0.00 in/hr

Use Random Number Generation to Account for Infiltration Rate Uncertainty

Select Particle Size File C:\Program Files\WinSLAMM\NURP.CPZ

Fraction of Runoff from Selected Source Areas Routed to Land Use Biofilters (0 - 1)

Biofilter Geometry Schematic

Refresh Schematic **Delete** **Cancel** **Continue**

Catchbasin Control Device

Total Basin Area: 100

1. Area served by catchbasins (acres): 100.00

2a. Catchbasin density (cb/ac): 0.5

2b. Number of Catchbasins: 50

3. Average sump depth below catchbasin outlet invert (ft): 3.00

4. Depth of sediment in catchbasin sump at beginning of study period (ft): 0.00

5. Typical outlet pipe diameter (ft): 1.00

6. Typical outlet pipe Manning's n: 0.013

7. Typical outlet pipe slope (ft/ft): 0.020

8. Typical catchbasin sump surface area (sf): 6.0

9. Catchbasin Depth from Sump Bottom to street level (ft): 6.0

10. Inflow Hydrograph Peak to Average Flow Ratio: 3.8

11. Leakage rate through sump bottom (in/hr): 0.00

12. Select Critical Particle Size file name: C:\PROGRAM FILES\WINSLAMM\medium.CPZ

Typical Catchbasin Densities

- Low density residential (0.25 inlets/acre)
- Medium density residential (0.5 inlets/acre)
- High density residential (1 inlet/acre)
- Strip commercial (1.2 inlets/acre)
- Shopping center (1.2 inlets/acre)

Catchbasin Flow Bypass Data

Maximum Flow to In-Line Sump **Flow Inlet Diversion Elevation**

0.00 **Maximum Flow to In-Line Sump (cfs)**

Select

Catchbasin Cleaning Dates

Catchbasin Cleaning No.	Catchbasin Cleaning Date (mm/dd/yy)
1	
2	
3	
4	
5	

OR

Diameter of Orifice that Controls Flow to In-Line Sump (ft)

Inflow Orifice Invert Elevation (ft)

Length (ft) of Overflow Structure Acting as a Sharp-Crested Weir

Elevation of Overflow Structure to Bypass In-Line Sump (ft above sump base)

Clear and Exit **Continue**

Inflow Bypass Data **Continue** **Clear** **Cancel** **Delete Control**

Hydrodynamic Device

Land Use: Institutional

Source Area: Paved Parking/Storage 2

Model Hydrodynamic Device with Lamella Plates or Settling Tubes

For Device Cleaning, Select Either

Device Cleaning Dates

Device Cleaning No.	Device Cleaning Date (mm/dd/yy)
1	
2	
3	
4	
5	

OR

Device Cleaning Frequency

- Monthly
- Three Times per Year
- Semi-Annually
- Annually
- Every Two Years
- Every Three Years
- Every Four Years
- Every Five Years
- Never

Or Use Proprietary Hydrodynamic Control Device Information

Manufacturer - Model

Single Chamber Device Characteristics

- 1 - Average Sump Depth below Device Outlet Invert (ft): 4.00
- Depth of Sediment in Device at Beginning of Study Period (ft): 0.00
- 2 - Typical Outlet Pipe Diameter (ft): 1.00
- Typical Outlet Pipe Manning's n: 0.013
- 3 - Typical Outlet Pipe Slope (ft/ft): 0.0500
- Typical Device Sump Surface Area (sf): 6.0
- 4 - Device Depth from Sump Bottom to Street Level (ft): 10.00
- Inflow Hydrograph Peak to Average Flow Ratio: 3.8
- 5 - Minimum Allowable Scour Depth Below Outlet Invert (ft): 1.0
- Maximum Flow to In-Line Sump (cfs): N/A - Click to Activate
- 6 - Diameter of Orifice that Controls Flow to In-Line Sump (ft): 0.25
- 7 - Inflow Orifice Invert Elevation (ft): 6.00
- 8 - Length (ft) of Overflow Structure Acting as a Sharp-Crested Weir: 2.00
- 9 - Elevation of Overflow Structure to Bypass In-Line Sump (ft above sump base): 7.00

Delete Control **Cancel** **Continue**

Grass Swales

Grass Swale Data	Combined Land Uses	Residential Land Use	Institutional Land Use	Commercial Land Use	Industrial Land Use	Other Urban Land Use	Freeway Land Use
Total Area in Land Use (ac)				14.01			
Area Served by Swales (ac)				5.00			
Swale Density (ft/ac)				481.08			
Total Swale Length (ft)				2405.4			
Average Swale Length to Outlet (ft)				700			
Typical Bottom Width (ft)				8.0			
Typical Swale Side Slope (ft H : 1 ft V)				4.0			
Typical Longitudinal Slope (ft/ft, V/H)				0.001			
Swale Retardance Factor				D			
Typical Grass Height (in)				12.0			
Swale Dynamic Infiltration Rate (in/hr)				0.050			
Typical Swale Depth (ft) for Cost Analysis (Optional)				0.0			

Use One Swale System For All Land Uses

Select Critical Particle Size File **Particle Size Distribution File Data Grid**

Total area served by swales (acres): 5.00 **Total area (acres):** 14.01

Select infiltration rate by soil type

- Sand - 4 in/hr
- Loamy sand - 1.25 in/hr
- Sandy loam - 0.5 in/hr
- Loam - 0.25 in/hr
- Silty loam - 0.15 in/hr
- Sandy silt loam - 0.1 in/hr
- Clay loam - 0.05 in/hr
- Silty clay loam - 0.025 in/hr
- Sandy clay - 0.025 in/hr
- Silty clay - 0.02 in/hr
- Clay - 0.01 in/hr

Select Swale Density by Land Use

- Low density residential - 240 ft/ac
- Medium density residential - 350 ft/ac
- High density residential - 375 ft/ac
- Strip commercial - 410 ft/ac
- Shopping center - 90 ft/ac
- Industrial - 250 ft/ac
- Freeways (shoulder only) - 480 ft/ac
- Freeways (center and shoulder) - 540 ft/ac

Delete **Cancel** **Continue**

Drainage System

Drainage System

Enter the fraction of each type of drainage system serving the study area:

- Grass Swales**
 - Enter swale data immediately
 - Note: The grass swale drainage system fraction is calculated from the areas of the drainage system that are served by swales. These areas are entered in the Grass Swale control practice
- Undeveloped Roadside:**
- Curb and Gutters, Valleys, or Sealed Swales in poor condition or very flat**
- Curb and Gutters, Valleys, or Sealed Swales in fair condition**
- Curb and Gutters, Valleys, or Sealed Swales in good condition or very steep**

The total must equal 1. Total: 0.000
The balance left is: 1.000

Porous Pavement Control Device

Land Use: Residential
Source Area: Paved Parking/Storage 1
Total Area: 10 Porous Pavement Number 1

Porous pavement area (acres):
Inflow Hydrograph Peak to Average Flow Ratio:

Pavement Geometry and Properties

1 - Pavement Thickness (in)	04
Pavement Void Ratio (0-1)	4
2 - Aggregate Bedding Thickness (in)	3
Aggregate Bedding Void Ratio (0-1)	3
3 - Aggregate Base Reservoir Thickness (in)	12
Aggregate Base Reservoir Void Ratio (0-1)	35

Outlet/Discharge Options

Perforated Pipe Underdrain Diameter, if used (inches)	3
4 - Perforated Pipe Underdrain Outlet Invert Elevation (inches above Datum)	6
Number of Perforated Pipe Underdrains	1
Subgrade Seepage Rate (in/hr) - select below or enter	0.30
Use Random Number Generation to Account for Uncertainty in Seepage Rate	<input type="checkbox"/>
Subgrade Seepage Rate COV	1.20

Select Subgrade Seepage Rate

Sand - 8 in/hr Clay loam - 0.1 in/hr
 Loamy sand - 2.5 in/hr Silty clay loam - 0.05 in/hr
 Sandy loam - 1.0 in/hr Silty clay - 0.05 in/hr
 Loam - 0.5 in/hr Silty clay - 0.04 in/hr
 Silt loam - 0.3 in/hr Clay - 0.02 in/hr
 Sandy silt loam - 0.2 in/hr

Surface Pavement Layer Infiltration Rate Data

Initial Infiltration Rate (in/hr)	8.00
Percent of Infiltration Rate After 3 Years (0-100)	50.0
Percent of Infiltration Rate After 5 Years (0-100)	25.0
Percent of Original Infiltration Rate Upon Cleaning (0-100)	75.0
Time Period Until Complete Clogging Occurs (yrs)	8.0

Restorative Cleaning Frequency

Never Cleaned
 Three Times per Year
 Semi-Annually
 Annually
 Every Two Years
 Every Three Years
 Every Four Years
 Every Five Years
 Every Seven Years
 Every Ten Years

Street Cleaning Control Device

Land Use: Commercial Total Area: 12.82
Source Area: Street Area 1

Select Street Cleaning Dates OR Street Cleaning Frequency

Line Number	Street Cleaning Date	Street Cleaning Frequency
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Model Run Start Date: 01/01/81 Model Run End Date: 12/31/81

Final cleaning period ending date (MM/DD/YY):

Type of Street Cleaner

Mechanical Broom Cleaner
 Vacuum Assisted Cleaner

Street Cleaner Productivity

1. Coefficients based on street texture, parking density and parking controls
 2. Other (specify equation coefficients)

Equation coefficient M (slope, M < 1)
 Equation coefficient B (intercept, B > 1)

Parking Densities

1. None
 2. Light
 3. Medium
 4. Extensive (short term)
 5. Extensive (long term)

Are Parking Controls Imposed?
 Yes No

Wet Detention Control Device

Outfall Control

Total Area: 14.01 acres

Pond Number 1

Select Particle Size Distribution File: C:\PROGRAM FILES\WINSLAMM\NURP.CPZ

Stage (ft)	Area (acres)	Cumulative Volume (ac-ft)
0	0.00	0.000
1	0.01	0.039
2	1.00	0.049
3	2.00	0.192
4	3.00	0.210
5	4.00	0.293
6	7.00	0.325
7	8.00	0.359
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Initial Stage Elevation (ft):
 Peak to Average Flow Ratio:
 Optional - Maximum Inflow into Pond (cfs) Enter 0 or leave blank for no limit:

Enter fraction (greater than 0) that you want to modify all pond areas by and then select 'Modify Pond Areas' button:

Outlet Options

1. Sharp Crested Weir
 2. V-Notch Weir
 3. Orifice
 4. Seepage Basin
 5. Natural Seepage
 6. Evaporation
 7. Other Outflow
 8. Water Withdrawal
 9. Broad Crested Weir
 10. Vertical Stand Pipe
 11. Stone Weeper

Edit Existing Outlet

Selected Outlets: (Max 5) Double Click to Edit or Delete

1 - Broad Crested Weir
 2 - Broad Crested Weir
 3 - V-Notch Weir
 4 - V-Notch Weir
 5 - Broad Crested Weir

Flow

Recalculate Cumulative Volume

Warning Messages

Potential Control Practice Conflicts

- Street Cleaning and Catchbasins control practices are not allowed in the same drainage basin.
- Wet Detention Ponds, Street Cleaning, Catchbasins and non-infiltrating Biofilters in Source Areas or Land Uses and End-of-Pipe Regional practices such as Wet Detention Ponds and Infiltration Basins may be redundant.
- Non-infiltrating Source Area control practices such as Biofilters that do not infiltrate or Wet Detention Ponds should not be combined with other such practices at the source area level.
- Street Cleaning typically is not allowed with Grass Swales unless the street system that drains to swales is a curb and gutter system.
- The model assumes that any catchbasins or hydrodynamic devices are in parallel and not in series. If they are constructed in the field in series, they will probably not perform as well as the model results indicate.

Practices that are marked with a red X or ? indicate that there may be potential problems or conflicts with the combinations of control practices in this .dat file either from a performance point of view or with a Regulatory Agency. Review the practices, and if appropriate either consult with your Regulatory Agency or modify the file to remove the potential problem.

To prevent this message from appearing, from the Main Menu go to 'Tools/Detailed Output Options' and check the 'Suppress Control Practice Warning Messages' box.

Continue

Run/Run Culation Module...

WinSLAMM Data File: [C:\Program Files\WinSLAMM\WinSLAMM\Distribution\Standard Data Files\new m...]

File Land Use Pollutants Options Run Utilities Help

SLAMM Data File: new mdr.DAT

Source Area No. 1 Roofs 1 2.06 Entered
2 Roofs 2 12.23 Entered
3 Roofs 3

Current Land Use: Residential

Current Source Area

Current File Data... Save File and Execute

Current File Status Save File with a Different Name and Execute

Current File Data Entered Cancel Program Execution

Land Use Areas

Residential Area: 100.00
Institutional Area: 0.00
Commercial Area: 0.00
Industrial Area: 0.00
Other Urban Area: 0.00
Freeway Area: 0.00 Acres
Total Area: 100.00 Acres

Large Landscaped Area 2 63.09 Entered
Undeveloped Area 23
Small Landscaped Area 1 24
Small Landscaped Area 2 25
Small Landscaped Area 3 26
Isolated Area 27
Other Pervious Area 28
Other Dir Cnctd Imp Area 29
Other Part Cnctd Imp 30

Exit Program

Press F1 for Help

Output

WinSLAMM Model Output

File View

Runoff Volume Particulate Solids Pollutants Output Summary

File Name: C:\Program Files\WinSLAMM\Control Demo Files\DetentionDemo\mdr1.dat

Drainage System and 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
Source Area Total without Controls	2.384E+06	0.00%	0.20	131.0	19478	
Outfall Total without Controls					4302	77.91%
Current File Output: Total Before Drainage System	2.384E+06	0.00%	0.20	131.0	19478	
Current File Output: Total After Drainage System	2.384E+06	0.00%	0.20	131.0	19478	
Current File Output: Total After Outfall Controls	2.384E+06	0.00%	0.20	28.93	4302	77.91%
Current File Output: Annualized Total After Outfall Controls	2.390E+06				4314	
Total Area Modeled (ac)	100.00	Years in Model Run:	1.00	Append has overflowed during a model run. Review outfall runoff volume event-by-event output to determine which pond it is.		

Print Output Summary to Text File

Total Control Practice Costs

Capital Cost	\$ 88794
Land Cost	\$ 9450
Annual Maintenance Cost	\$ 2384
Present Value of All Costs	\$ 127956
Annualized Value of All Costs	\$ 10267

Receiving Water Impacts Due To Stormwater Runoff (CWP Impervious Cover Model)

	Calculated Rv	Approximate Urban Stream Classification
Without Controls	0.20	Poor
With Controls	0.20	Poor

Perform Flow Duration Curve Calculations

Runoff Volume Tab

Source Area

Runoff Volume Particulate Solids

Runoff Volume (cu ft) Source Area Runoff Volume Contribution

Data File: Live Output Demo.DAT
Run File: MS1951.RAN
Date: 03/04/04 Time: 9:42:11 PM
Site Description: SLLU/CLAY/LiveLight Industrial wet detention biofilter

Start Date	Rain Total (inches)	Roofs 1	Roofs 2	Paved Parking/Storage 1	Unpaved Parking/Storage 1	Sheet Area 1	Sheet Area 2	Large Landscaped Area 1	Other Part Cnctd Imp Area	Land Use Total	Rv	Total Losses (in)	Calculated CV
07/04/81	0.05	151.0	0.0	0.0	0.0	130.0	482.0	0.0	0.0	762.2	0.06	0.05	96.6
07/11/81	0.50	2006.6	129.3	3491.1	356.0	2243.0	9793.0	199.0	12.0	7676.6	0.95	0.22	97.4
07/12/81	0.14	5241.0	0.0	2267.0	0.0	518.0	2235.0	0.0	0.0	10261.0	0.26	0.10	96.2
07/12/81	0.86	53379.0	440.0	72809.0	1228.0	4220.0	18495.0	690.0	41.0	15125.0	0.63	0.31	96.6
07/13/81	1.32	65211.0	861.0	115294.0	2455.0	7209.0	31389.0	1332.0	80.0	24276.6	0.67	0.44	95.4
07/14/81	0.12	4061.0	0.0	1771.0	0.0	434.0	1958.0	0.0	0.0	8124.0	0.24	0.09	96.3
07/15/81	0.07	698.0	0.0	0.0	0.0	215.0	895.0	0.0	0.0	1688.0	0.09	0.06	98.3
07/16/81	0.12	4061.0	0.0	0.0	0.0	434.0	1958.0	0.0	0.0	6355.0	0.19	0.10	98.8
07/20/81	0.54	31954.0	152.0	38223.0	424.0	2452.0	10715.0	235.0	14.0	84765.0	0.57	0.23	97.7
07/20/81	0.10	2323.0	0.0	3075.0	0.0	345.0	1457.0	0.0	0.0	7208.0	0.26	0.07	98.7

Summary for All Events

Minimum: 0.05 151.0 0.0 0.0 0.0 0.0 130.0 482.0 0.0 0.0 762.2 0.06 0.05 96.6
Maximum: 1.32 65211.0 861.0 115294.0 2455.0 7209.0 31389.0 1332.0 80.0 24276.6 0.67 0.44 95.4
Average: 0.38 23962.0 175.7 29675.0 345.0 1150.0 4850.0 2050.0 50.0 14.0 7676.6 0.31 0.12 96.5
Total: 3.82 215925.0 1991.0 2903.0

Total Area, with Drainage and Outfall Controls: Runoff Volume (cu ft)

Start Date	Rain Total (inches)	Total Before Drainage System	Total After Drainage System	Total After Outfall Controls
07/04/81	0.05	762.2	762.2	0.0
07/11/81	0.50	7676.6	7676.6	0.0
07/12/81	0.14	10261.0	10261.0	0.0
07/12/81	0.86	15125.0	15125.0	41854.0
07/13/81	1.32	24276.6	24276.6	281625.0
07/14/81	0.12	8124.0	8124.0	0.0
07/15/81	0.07	1688.0	1688.0	0.0
07/16/81	0.12	6355.0	6355.0	0.0
07/20/81	0.54	84765.0	84765.0	0.0
07/20/81	0.10	7208.0	7208.0	0.0
Total				Outfall

The runoff volume is listed for each event, for each source area.

The model also calculates the land use runoff coefficient (Rv), the total losses, and the SCS Curve Number for each event.

Particulate Solids Yield Source Area Percent Contribution Summary

Start Date	Rain Total	Roofs 1	Roofs 2	Paved Parking/ Storage 1	Unpaved Parking/ Storage 1	Street Area 1	Street Area 2	Large Landscaped Area 1	Other Part Credit Imp Area	Land Use Totals
07/04/01	0.05	1.5	0.0	0.0	0.0	17.2	81.3	0.0	0.0	100.0
07/11/01	0.50	2.8	0.0	28.1	0.2	12.0	56.7	0.1	0.0	100.0
07/12/01	0.14	4.3	0.0	15.4	0.0	14.1	85.9	0.0	0.0	100.0
07/12/01	0.86	3.7	0.0	41.6	0.4	3.4	44.5	0.4	0.0	100.0
07/13/01	1.32	4.7	0.0	52.5	0.7	7.3	34.3	0.6	0.0	100.0
07/14/01	0.12	5.0	0.0	18.3	0.0	12.4	83.3	0.0	0.0	100.0
07/15/01	0.07	3.7	0.0	0.0	0.0	16.8	79.5	0.0	0.0	100.0
07/18/01	0.12	4.8	0.0	0.0	0.0	16.6	79.5	0.0	0.0	100.0
07/20/01	0.54	2.9	0.0	29.9	0.2	11.7	56.1	0.2	0.0	100.0
07/20/01	0.10	3.0	0.0	33.3	0.0	11.1	52.5	0.0	0.0	100.0

The model also calculates the percentage contribution of particulate solids from each source area, for each land use.

Print Detailed Output

Change Output View

Output Option 5 One Line per Event Summary

Event Number	Rain Start Date	Rain Start Time	Rain Start Julian	Rain Duration (hrs)	Rain Interevent Period (days)	Rain Duration (hrs)	Rain Depth (in)	Rain Volume (cu ft)	R sub v
52	07/04/01	12:00	10,777.54	1.99	6.32	2.39	0.05	0	0.00
53	07/11/01	13:00	10,784.54	1.99	0.42	2.39	0.50	0	0.00
54	07/12/01	01:00	10,788.04	2.99	0.50	3.59	0.14	0	0.00
55	07/12/01	15:00	10,788.67	0.99	0.33	1.19	0.86	41,654	0.17
56	07/13/01	01:00	10,786.04	1.99	1.46	2.39	1.32	281,625	0.77
57	07/14/01	14:00	10,790.58	2.01	0.46	2.41	0.12	14,001	0.42
58	07/15/01	03:00	10,788.12	4.00	3.25	4.80	0.07	27,341	1.41
59	07/16/01	13:00	10,791.54	1.99	1.50	2.39	0.12	6,518	0.20
60	07/20/01	03:00	10,793.12	2.00	0.37	2.40	0.14	31,546	0.21
61	07/20/01	14:00	10,793.58	2.01	0.00	2.41	0.10	11,108	0.40

Output option 5 is a summary of the outfall results, by event, along with a number of statistics for each parameter.

WinSLAMM Parameter Files for Alabama (based on regional model calibration and verification)

Particle Solids Concentrations:
 É BHAM_PSC_CALIB_June07.psc

Pollutant Probability Distributions:
 É BHAM_PPD_CALIB_June07.ppd

Drainage System Solids Delivery:
 É Delivery_BHAM.ppr

Cost Analysis File:
 É Bham Cost Data.csv

Runoff Coefficient File:
 “ Runoff.rsv

Street Particulate Delivery Files (by land use):
 É Street_BHAM RES.std
 É Street_BHAM INST and OTHER URBAN.std
 É Street_BHAM COM and IND.std
 É Freeway_BHAM.std

Example Land Development Conditions for a Residential Area

Source Area No.	Source Area	Area (acres)	H	W	P	O	S	B	Source Area Parameters
1	Roofs 1	2.06							Entered
2	Roofs 2	12.23							Entered
3	Roofs 3								
4	Roofs 4								
5	Roofs 5								
6	Paved Parking/Storage 1								
7	Paved Parking/Storage 2								
8	Paved Parking/Storage 3								
9	Unpaved Prkng/Storage 1								
10	Unpaved Prkng/Storage 2								
11	Playground 1								
12	Playground 2								
13	Driveways 1	5.14							Entered
14	Driveways 2	1.01							Entered
15	Driveways 3								
16	Sidewalks/Walks 1	3.73							Entered
17	Sidewalks/Walks 2								
18	Street Area 1	3.92							Entered
19	Street Area 2	1.33							Entered
20	Street Area 3	7.49							Entered
21	Large Landscaped Area 1								
22	Large Landscaped Area 2								
23	Undeveloped Area								
24	Small Landscaped Area 1	63.09							Entered
25	Small Landscaped Area 2								
26	Small Landscaped Area 3								
27	Isolated/Water Body Area								
28	Other Pervious Area								
29	Other Dir Cnctd Imp Area								
30	Other Part Cnctd Imp Area								

Parameter Files for Alabama Conditions (note rain file for special source area calculations)

Current File Data

SLAMM Data File Name: C:\Program Files\WinSLAMM\new mdr.dat

Site Descript.: 100 acre base file of single family homes for Madison. This is based on a 5 site review amounting to approximately 39 acres. Does not include downtown Isthmus areas. No-snow season only.

Seed: -3

Rain File: C:\Program Files\WinSLAMM\Rain Files\AL Birmingham Source Special Rains.RAN

Start Date: 01/01/99 Winter Season Range
 End Date: 12/01/99 Start of Winter (mm/dd) End of Winter (mm/dd)

Pollutant Probability Distribution File: C:\Program Files\WinSLAMM\BHAM_PPD_CALIB_June07.ppd

Runoff Coefficient File: C:\Program Files\WinSLAMM\RUNOFF.RSV

Particulate Solids Concentration File: C:\Program Files\WinSLAMM\BHAM_PSC_CALIB_June07.psc

Particulate Residue Delivery File: C:\Program Files\WinSLAMM\DELIVERY_BHAM.ppr

Street Delivery File (Select LU): C:\Program Files\WinSLAMM\Street_BHAM.RES.std
 Residential LU Industrial LU
 Institutional LU Other Urban LU
 Commercial LU Freeways

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

Drainage System: Data Entered

Change output format options (under “file”) to option 1) Source Areas by Land Use for Each Rain

Output Format Options

1. Source Areas by Land Use for Each Rain - Complete Printout

2. Source Area Totals and Outfall Summaries

3. Outfall Data Only for Each Rain

4. Outfall Summaries Only

5. One Line per Event Runoff and Flow Summary

6. Continuous Hydrograph With 6 Minute Time Increments

7. Continuous Hydrograph With 15 Minute Time Increments

8. Continuous Hydrograph With 60 Minute Time Increments

Water Balance Summary of All Detention Ponds

Save Outfall Runoff and Particulate Loading for WinDETPOUND Analysis

Save Model Output for Input into CE-QUAL-RIV1

File Name: []

After oRuno Select Detailed Model Output:

WinSLAMM Model Output

Data File: new mdr.DAT
 Rain File: AL Birmingham Source Special Rains.RAN
 Date: 09-01-09 Time: 20:00:07
 Site Description: 100 acre base file of single family homes for Madison. This is based on a 5 site review amounting to approximately 39 acres. Does not include down

Residential - Source Area Percentage Contribution of Runoff Volume

Start Date	Rain Total	Roofs 1	Roofs 2	Driveways 1	Driveways 2	Sidewalks/Walks 1	Street Area 1	Street Area 2	Street Area 3	Small Landscaped Area 1	Land Use Totals
01/01/99	0.01	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
02/01/99	0.05	9.9	0.0	21.4	0.0	15.6	16.3	5.5	31.2	0.0	100.0
03/01/99	0.10	12.5	0.0	20.9	0.0	15.1	15.9	5.4	30.3	0.0	100.0
04/01/99	0.25	7.9	6.1	12.8	0.5	9.3	9.8	3.3	18.6	31.6	100.0
05/01/99	0.50	6.8	7.4	11.2	0.6	8.1	8.6	2.9	16.4	38.0	100.0
06/01/99	0.75	6.3	7.7	10.9	0.6	7.9	8.3	2.8	15.8	39.7	100.0
07/01/99	1.00	6.1	7.9	10.6	0.7	7.7	8.1	2.7	15.5	40.7	100.0
08/01/99	1.50	5.5	7.7	11.1	0.6	8.1	8.5	2.9	16.2	39.5	100.0
09/01/99	2.00	5.1	8.0	10.7	0.7	7.8	8.2	2.8	15.7	41.1	100.0
10/01/99	2.50	4.7	8.4	10.2	0.7	7.4	7.8	2.6	14.9	43.4	100.0
11/01/99	3.00	4.4	8.6	9.9	0.7	7.2	7.6	2.6	14.5	44.5	100.0
12/01/99	4.00	3.9	9.3	9.1	0.8	6.6	6.9	2.4	13.3	47.8	100.0

Summary for Runoff Producing Events

	Rain Total	Roofs 1	Roofs 2	Driveways 1	Driveways 2	Sidewalks/Walks 1	Street Area 1	Street Area 2	Street Area 3	Small Landscaped Area 1	Land Use Totals
Minimum:	0.01	3.9	6.1	9.1	0.5	6.6	6.9	2.4	13.3	31.6	100.0
Maximum:	4.00	100.0	9.3	21.4	0.8	15.6	16.3	5.5	31.2	47.8	100.0
FltWt Ave:	1.31	4.7	8.5	10.1	0.7	7.3	7.7	2.6	14.6	43.8	100.0

Detailed output option for particulate solids:

WinSLAMM Model Output

Data File: new mdr.DAT
 Rain File: AL Birmingham Source Special Rains.RAN
 Date: 09-01-09 Time: 20:00:07
 Site Description: 100 acre base file of single family homes for Madison. This is based on a 5 site review amounting to approximately 39 acres. Does not include down

Residential - Source Area Percentage Contribution of Particulate Solids Yield

Start Date	Rain Total	Concentration		Yield		SA Yield Contribution					
		Roofs 1	Roofs 2	Driveways 1	Driveways 2	Sidewalks/Walks 1	Street Area 1	Street Area 2	Street Area 3	Small Landscaped Area 1	Land Use Totals
01/01/99	0.01	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
02/01/99	0.05	0.1	0.0	28.0	0.0	21.0	15.3	5.2	29.3	0.0	100.0
03/01/99	0.10	0.2	0.0	18.5	0.0	13.5	20.8	7.1	39.8	0.0	100.0
04/01/99	0.25	0.1	0.1	2.3	0.1	1.7	4.6	1.6	8.8	80.8	100.0
05/01/99	0.50	0.1	0.1	2.1	0.1	1.5	4.6	1.6	8.9	80.9	100.0
06/01/99	0.75	0.1	0.1	2.0	0.1	1.5	7.1	2.4	13.5	73.2	100.0
07/01/99	1.00	0.1	0.1	1.8	0.1	1.3	8.2	2.8	15.6	69.9	100.0
08/01/99	1.50	0.1	0.1	2.0	0.1	1.5	7.3	2.5	14.0	72.3	100.0
09/01/99	2.00	0.1	0.1	1.9	0.1	1.4	7.1	2.4	13.7	73.1	100.0
10/01/99	2.50	0.1	0.1	1.8	0.1	1.3	6.6	2.3	12.6	75.2	100.0
11/01/99	3.00	0.1	0.1	1.7	0.1	1.2	6.2	2.1	11.9	76.4	100.0
12/01/99	4.00	0.1	0.2	1.6	0.1	1.1	4.7	1.6	9.0	81.6	100.0

Summary for Runoff Producing Events

	Rain Total	Roofs 1	Roofs 2	Driveways 1	Driveways 2	Sidewalks/Walks 1	Street Area 1	Street Area 2	Street Area 3	Small Landscaped Area 1	Land Use Totals
Minimum:	0.01	0.1	0.1	1.6	0.1	1.1	4.6	1.6	8.8	69.9	100.0
Maximum:	4.00	100.0	0.2	28.0	0.1	21.0	20.8	7.1	39.8	81.6	100.0
FltWt Ave:	1.31	0.1	0.1	1.8	0.1	1.3	6.1	2.1	11.7	76.7	100.0

You can then plot the data in Excel (after copying output to file and then importing the data into Excel) and label the most significant sources. Look for which source areas most important for different rain ranges of most interest. Can also do for other pollutants contained in the *.ppd file, but start with runoff volume and solids.

