MAGNET Storm Water Network Analysis

Quick Tutorial

MAGNET4WATER



Based on: EPASWMM5 Tutorial with Images for SWMM 5.1.014 by Robert Dickinson



EPASWMM5 Tutorial with Images for SWMM 5.1.014

Browse to:

https://www.magnet4water.net/stormnet/

This site hosts the complete, integrated platform for storm water network modeling, analysis, and visualization.

The default interface environment is shown here.



Create an account:

Sign Up [Menu Bar] > Complete Form

*The email you provide is used for resetting your password should you forget it.

Sign Up	User Account	File	Edit	View	Project	Report

New User Sign Up Form	۲
First Name Zachary	Last Name Curtis
Required * / Position/Title	Required *
Water Resource Engineer	
User Name curtisza	Password
Required * Email	Required *
zach@magnet4water.com Required * Organization	
Hydrosimulatics	
Required * Purpose of Use Education	
Required *	
Sign Up Cancel	

User Account:

User Account [Menu Bar] > ...

Use this menu to change request a password reset, update your email, user type, etc., or view and/or download previously executed models for later use.

ount File	Edit
gged in as cur	isza
ssword	
Models	

Add Subcatchments:

Hydrology > Subcatchments > Start Drawing

The cursor turns into a blue circle, indicating 'Drawing Mode' is active.

Use a single-click to add the first corner (vertex) of the subcatchment to the map display. Use additional single-clicks to add the other corners.

A double-click "closes" the subcatchment.



Repeat the steps on the previous slide to add the 2nd and 3rd subcatchments to the map display.



Edit Subcatchments:

Hydrology > Subcatchments > Edit Subcatchments

*A single-click on any map object also launches its Editor menu.

Select the first subcatchment by its Subcat. ID/Name (1 for this example).

Default values are provided, but you can assign different values (next slide).



The Area and Width in this subcatchment and all others should be set to 4 and 400, respectively.

The percentage of impervious land cover should be set to 50%.

Make sure the Subarea Routing is set to OUTLET and the Percent Routed is 100.

SubCatchment Para	meters Infiltra	tion/Pollutants/Land Uses	Low Impact Design	Groundwater
Property	Value	Property	Value	
Subcat. Id/Name:	Select a Subcatchm 1	ent		
Name:	1	Description:	Description	
X-Coordinate:	X-Coordinate	Dstore-ImPerv	0.05	
Y-Coordinate:	Y-Coordinate	Dstore-Perv	0.05	
Rain Gage:	Select: 🔻	%Zero-Imperv	25	
	Outlet node 🔻		Select:	
Outlet:		Subarea Routing	OUTLET 🔻	
	Select: 🔻			
Area:	4	Percent Routed	100	
Width:	400	Snow Pack	Select: 💌	
% Slope:	0.5	Curb Length	0	
% imperv:	50	N-Perv Pattern	Select: 👻	
N-Imperv	0.01	Dstore Pattern	Select: 💌	
N-Perv	0.1	Infil. Pattern	Select: 🔻	

Still within the Subcatchment Editor, navigate to the Infiltration/Pollutants/Land Uses tab.

Select MODIFIED_GREEN_AMPT as the Infil. Method under Infiltration Data.

Assign a Suction head of 3.5, a Conductivity of 0.5, and an Initial Deficit of 0.26

Click 'Save' to finalize changes before exiting the Subcatchment Editor ('X' button).

Subcatchment					۲
SubCatchment Parameters Infiltrat	ion/Pollutants/Land Uses	Low Impact Design	Groundwater		
	Land Use % of Area		Initial Buildup Pollutant	Ini. Buildup(kg/ha)	-
Max. Infil. Rate 3.3					
Min infil. Rate 0.5 Decay Constant 4					
Max. Volume 0					
		-			-

Subcatchment						8
SubCatchment Parameters	Infiltration/Pollutant	s/Land Uses	Low Impact Design	Groundwate	er	
Infiltration Data	Land Us	e % of Area e % of Area	a	Initial Buildup Pollutant	Ini. Buildup(kg/ha)	*
Suction Head 3.5 Conductivity 0.5 Initial Deficit 0.26			Ţ			Ŧ

Add Junctions:

Hydraulics > Nodes > Junctions > Start Drawing

The cursor turns into a blue circle, indicating 'Drawing Mode' is active.

Use a single-click to add the first junction to the map display. Then use additional clicks to add the remaining junctions while in Drawing mode.







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Edit Junctions:

Hydrology > Nodes > Junctions > Edit Junctions



Select the different junctions by their Junction ID (4-7 for this example) for attribute editing.

The invert elevation (Invert El) in Junction 4 should be set to 700ft. The Max Depth should be set to four.

Click 'Save' to finalize changes before selecting a new junction for editing: Junction 5, edit attributes, Save; Junction 6, edit, Save; and so on...

After updating and saving all of the junctions, close the Junction Data Editor window ('X' button).

Junction	Invert El
4	96
5	90
6	93
7	88

Junction Data Editor		۲
Property	Value	
Junction Id:	4 v	
X-Coordinate:	10507632.8720	
Y-Coordinate:	5123448.78250	
Description:	Description	
Inflows:	NO	
Treatment:	NO	
Invert EI:	96	
Max .Depth:	4	
Initial Depth:	0	
Surcharge Depth	0	
Ponded Area	0	
Save	Remove	

Add Conduits:

Hydraulics > Links > Conduits > Start Drawing

Again, the cursor turns into a blue circle, indicating 'Drawing Mode' is active.

Click once on Junction 4 to snap the conduit's starting position to it. A blue line will extend from the node as you move the cursor.

Double click on Junction 5 to snap the conduit's ending position to it.

*Once a link is started (i.e., snapped to the starting node), a single click only places a vertex for drawing purposes. The link is still "open" (not snapped to an end node).

**A link must have a starting and ending node. "Bad" pipes are deleted from the map display.

***Conduits should be drawn from the upstream Junction to the downstream Junction (i.e., from higher to lower elevation).







Repeat the steps from the previous slide to add Conduit 2 (connecting Junction 5 and 7) and Conduit 6 (J3 to J7).



Add Outfall:

Hydrology > Nodes > Outfalls > Start Drawing

The cursor turns into a blue circle, indicating 'Drawing Mode' is active.

Use a single-click to add the outfall to the map display.





Edit Outfall:

Hydraulics > Nodes > Outfalls > Edit Outfalls

Select the outfall by its ID (8 for this example) for attribute editing.

The invert elevation (Invert El) of the outfall should be 85. All other default values can be used.

Remember to Save before closing the Outfall Editor.

• Ну	draulics	
•	Nodes	
	Junc	tions
	Outfa	
	Divid	e Start Drawing
	Stora	g O Stop Drawing
٠	Links	Edit Outfalls
	Cond	uits

utfall Editor		۲
Property	Value	
ld:	Select:	
X-Coordinate:	-7836947.8812	
Y-Coordinate:	-3824430.5660	
Description:	Description	
Inflows:	NO	
Treatment:	NO	
Invert EI:	85	
Tide Gate:	Tide Gate:	
Route To:	Ture	
Туре:	FREE	
Fixed Outfall		
Fixed Stage:	0	
Tidal Outfall		
Curvo Nomo:	•	•
s	ave Remove	

Add Last Conduit:

Hydraulics > Links > Conduits > Start Drawing

Connect Junction 7 to the Outfall (ID=8) using a Conduit (Conduit ID=4).



Edit Conduits:

Hydraulics > Links > Conduits > Edit Conduit

Select the different Conduits by their Conduit ID (1-4) in this example.

Assign a Length of 400 for all Conduits. Assign a Max Depth of 1 for Conduits 1-3, and a Max Depth of 1.5 for Conduit 4,

The Shape of the Conduits is circular (default shape).

Remember to Save before closing the Outfall Editor.



Add Subcatchment Outlets:

Hydrology > Subcatchments > Edit Subcatchments

Select Subcatchment 1 and assign Junction as the Outlet node Type. Then select Junction 4 as the Outlet for Subcatchment 1.

Save the changes, then change to Subcatchment 2 to assign Junction 5 as the outlet. Subcatchment 3 uses Junction 6 as its outlet.

SubCatchment Para	meters Infilt	tration/Pollutants/Land Uses	Low Impact Design	Groundwater
Property	Value	Property	Value	
Subcat. Id/Name:	Select a Subcatch	iment		
Name:	1	Description:	Description	
X-Coordinate:	X-Coordinate	Dstore-ImPerv	0.05	
Y-Coordinate:	Y-Coordinate	Dstore-Perv	0.05	
Rain Gage:	Select: 🔻	%Zero-Imperv	25	
Outlet:	Outlet node type: Junctions Select: 4	Subarea Routing	Select: OUTLET 🔻	
Area:	4	Percent Routed	100	
Width:	400	Snow Pack	Select: 💌	
% Slope:	0.5	Curb Length	0	
% imperv:	50	N-Perv Pattern	Select: 💌	
N-Imperv	0.01	Dstore Pattern	Select: 💌	
N-Perv	0.1	Infil. Pattern	Select: 💌	

Save the changes, then change to Subcatchment 2 to assign Junction 5 as the outlet. Subcatchment 3 uses Junction 6 as its outlet.









Edit Rain Gage:

Hydrology > Rain Gages > Edit Rain Gage

Select the Rain Gage by its ID (9 for this example) for attribute editing.

The Time Interval should be changed to one hour (1:00). Then select the default Series Name (2hr), which you will edit in the next step.

Make sure the Rain Format used is INTENSITY and the Rain Unit is IN (inches).

Remember to Save before closing the Rain Gage Editor.



Rain Gage	۲
Property	Value
ld/Name:	Select: 9 💌
X-Coordinate:	X-Coordinate
Y-Coordinate:	Y-Coordinate
Description:	Description
Tag:	tag
Rain Format:	Select: INTENSITY
Time Interval:	Select: 1:00
Snow Catch Factor:	1 Select:
Data Source:	TIMESERIES 💌
Series Name:	2hr 👻
Station Id:	*
Rain Unit:	<u>IN</u>
Save	Remove

Edit Time Series:

Time Series > Edit Time Series

Select Edit from Edit Mode, then select 2Hr from the Time Series Name drop-down menu.

This is the default Time Series that we will customize / edit for this example.



Time Series Editor

Time Series Name: Description :

Add New Row

Delete

Delete Selected Record

Id Date(M/D/Y) Time(H:M)

1 Choose a d... 🖻 0:00

2 Choose a d... 🖻 0:01

3 Choose a d... 🖬 0:02

4 Choose a d... 🖻 0:03

Save Record

Edit Mode:



Elapsed Time(hours)

Use the Delete button to remove the existing entries from the Time Series Table. Then use the Add New Row button to create 7 empty entries.

For each entry, use a date of 1/1/2002. Then enter the following data pairs:

Time (H:M)	Value
0:00	0
1:00	0.5
2:00	1.0
3:00	0.75
4:00	0.5
5:00	0.25
6:00	0

Click Save Record to save the changes, then close the Time Series Editor.



Edit Simulation Options

Options > Edit Options

Make sure the Rainfall/Runoff and Flow Routing Process Models are checked / enabled. The Kinematic Wave Routing Model should be used.

Change the Infiltration Model to Modified Green Ampt, the	n
click Save.	

	Options		
	Climato	Edit Options	
٠	Hydrolog	ЭУ	

Simulation Options				
General	Dates	Time Steps	Dynamic W	ave
General				
Process Models Rainfall/Runoff Rainfall Dependent 1/1 Snow Melt Groundwater Flow Routing		Infiltration Model Horton Modified Horton Green Ampt Modified Green Ampt Curve Number	I	
Water Quality Routing Model Steady Flow Kinematic Wave Dynamic Wave		Routing Option Allow Ponding	(%)	
Flow Units CFS	•	Link Offsets DEPTH	Ŧ	
Save Cancel				

Still within Simulation Options, navigate to the Dates tab, and use 1/1/2002 as the date for Start Analysis on, Start Reporting on, and End Analysis on.

The Time (H:M) for Start Analysis and Start Reporting should be 12:00 AM.

The Time for End Analysis should be 12:00pm (12 hour simulation duration).

General	Dates	Time Steps	Dynamic Wave
	Date (M/D/Y)	Time (H:M)	
tart Analysis on	1/1/2002	12:00 AM	
tart Reporting on	1/1/2002	12:00 AM	
nd Analysis on	1/1/2002	12:00 PM	
tart sweeping on	01/01		
nd sweeping on	12/31		
ntecedent day days	5		

Still within Simulation Options, navigate to the Time Steps tab tab, and use a Reporting Step of 5 minutes (0:05:00), and Dry Weather Runoff Step of 1 hour (1:00:00), and a Wet Weather Runoff Step of 15 minutes (0:15:00).

The Time (H:M) for Start Analysis and Start Reporting should be 12:00 AM.

The Time for End Analysis should be 12:00pm (12-hour simulation duration).

Simulation Options				۲
General	Dates	Time Steps	Dynamic Wave	
	Days	Tim	ne (H:M:S)	
Reporting Step	0		0:05:00	
Duration(Hours):				
Runoff Step: Dry dry Weather	0		1:00:00	
Runoff Step: Wet Weather	0		0:15:00	
Control Rule Step:			00:00:00	
Routing Step(Seconds)		00:0	00:60	
Steady Flow Period	S			
Skip Steady Flow Periods				
System Flow Tolerance(%) 5	Late	eral Flow Tolerance(%)	5	
Save Cancel				

Save Model:

File > Save Model

Rim Simulation:

Project > Run Simulation

File	View	Project
New P	roject	
Save N	Iodel	
Upload	ł	Þ
 Export	Model	•
View I	NP	
View R	PT	
Downlo	oad JSON N	/lodel



After the model is executed, the Status Window will appear.

This window indicates if there were any errors found in the model, and if the process models are balanced (water coming in equals water going out), among other information, at different times.

Status Window	۲	
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)	A	

NOTE: The summary statistics displayed in this report are		1
based on results found at every computational time step,		
not just on results from each reporting time step.		

Analysis Options		

Flow Units CFS	-	
	•	

۲ Status Window ****** Volume Depth Runoff Quantity Continuity acre-feet inches ****** ----------Total Precipitation 3.000 3.000 Evaporation Loss 0.000 0.000 Infiltration Loss 1.750 1.750 Surface Runoff 1.246 1.246 Final Storage 0.016 0.016 Continuity Error (%) -0.386 ***** Volume Volume Flow Routing Continuity acre-feet 10⁶ gal ***** ы

Visualize Results Across the Network:

Go to Browser Window:

View > Map Browser

Select Runoff as the Subcatchment Parameter. Select Head as the Node Parameter.

Select Velocity as the Link Parameter

Select 01/01/2002 as the Date

Select '6:20:00' as the Time.

The map objects will then be color-coded based on the parameter values at 6 hours and 20 minutes of simulation. Note the legend that automatically appears.



Visualize Results Along a Profile:

Report > Graph > Profile

Double-click on Junction 4 in the map display, then click the + button next to Start Node. This makes Junction 4 the start Node of the profile.

Similarly, double-click on Junction 8 and click the + button next to End Node to make Junction 8 the End Node of the profile.



Click the 'Flow Path' button. A profile path will automatically be generated along the flow path from the Start Node to the End Path. The path is indicated on the map display as a yellowish-orange line.

The path is also listed in the Path List Format table (Node -> Link -> Node -> Link ...).

Click on the '3D Profile' button to launch the 3D profile plots (next slide).





This slide shows the 3D visualization of the Pipe Network and 2D Water Profile along the selected path.

Visualize Results in the Conduits at all Times:

Report > Graph > Time Series

Select Link as the Object Type.

Select Flow as the Parameter.

Double-click on Conduit 1 in the map display, then click the + button next to add the conduit to the Feature ID list. Repeat for Conduit 2.

Click the 'Show Timeseries Plot'.

View Project	Report Help	
	Status	
	Summary	
Profile	Graph 🕨	
Time Series	3D Plot	
Scatter	Table By Object	
	Table By Variable	
	Statistics	



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Visualize Results in the Conduits at all Times:

A plot will automatically be generated showuing the flow results in Conduits 1 and 2 over the entire simulation duration.



Saving the Model File:

User Account > View My Models

This opens a list (table) of previously executed models linked to your user account.

Click 'Download Model' to download an.inp (model input) file to your local machine's Downloads folder.

The .inp file can be uploaded back into MAGNET Pipe Network Analysis with:

File > Upload > INP





Questions / Comments / Issues?

Use: [Menu Bar] > Support > Contact Us

Or directly email: support@magnet4water.com

Contact Us		
First Name	Last Name	
Required *	Required *	
Email		
Required *		
uestion/Comments:		