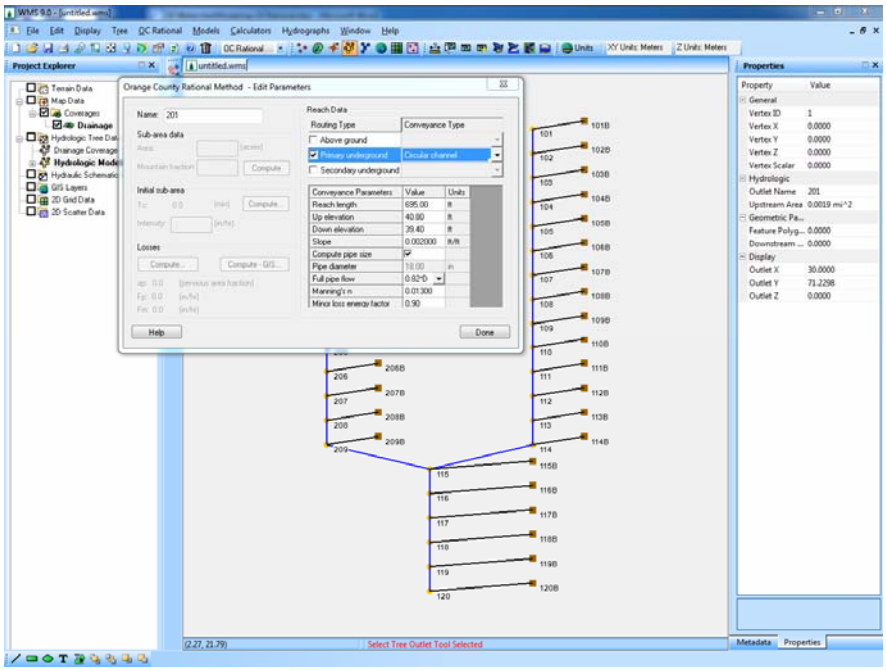
WMS

v. 9.0

WMS 9.0 Tutorial

Watershed Modeling – Orange County Rational Method

Build and run a rational method analysis based on methods in the Orange County (California) hydrology manual



Objectives

Completing this tutorial will demonstrate how to run an Orange County rational method analysis and design and explore options for printing results and saving report files. The first example is based on the example problem on page D-16 of the Orange County Hydrology Manual.

Prerequisite Tutorials

- None

Required Components

- Hydrologic Models

Time

- 15-30 minutes

AQUAVEO™

1 Contents

2 Introduction

It is possible to run Orange County rational analyses in either analysis mode or design mode, which automatically computes required pipe sizes. This exercise demonstrates the analysis mode of the Orange County rational method by opening a WMS project file that contains data for the example problem on page D-16 of the Orange County Hydrology Manual, running the Orange County rational analysis, and exploring options for printing results and saving files. An example of running the Orange County rational method in design mode is also provided.

3 Orange County Hydrology Manual Example

3.1 Open WMS Project File

1. Close all instances of WMS
2. Open WMS
3. Switch to the *Hydrologic Modeling* module
4. Select ***File* | *Open…***
5. Locate the ***OrangeCounty/Rational*** folder in your tutorial files. If you have used default installation settings in WMS, the tutorial files will be located in ***\My documents\WMS 9.0\Tutorials\.***
6. Open *"OCHMRational.wms"*

This file, shown in Figure 3-1, contains a basic schematic model, which is made up of topologic tree nodes that represent the connectivity of sub-areas and concentration points and store their respective data.

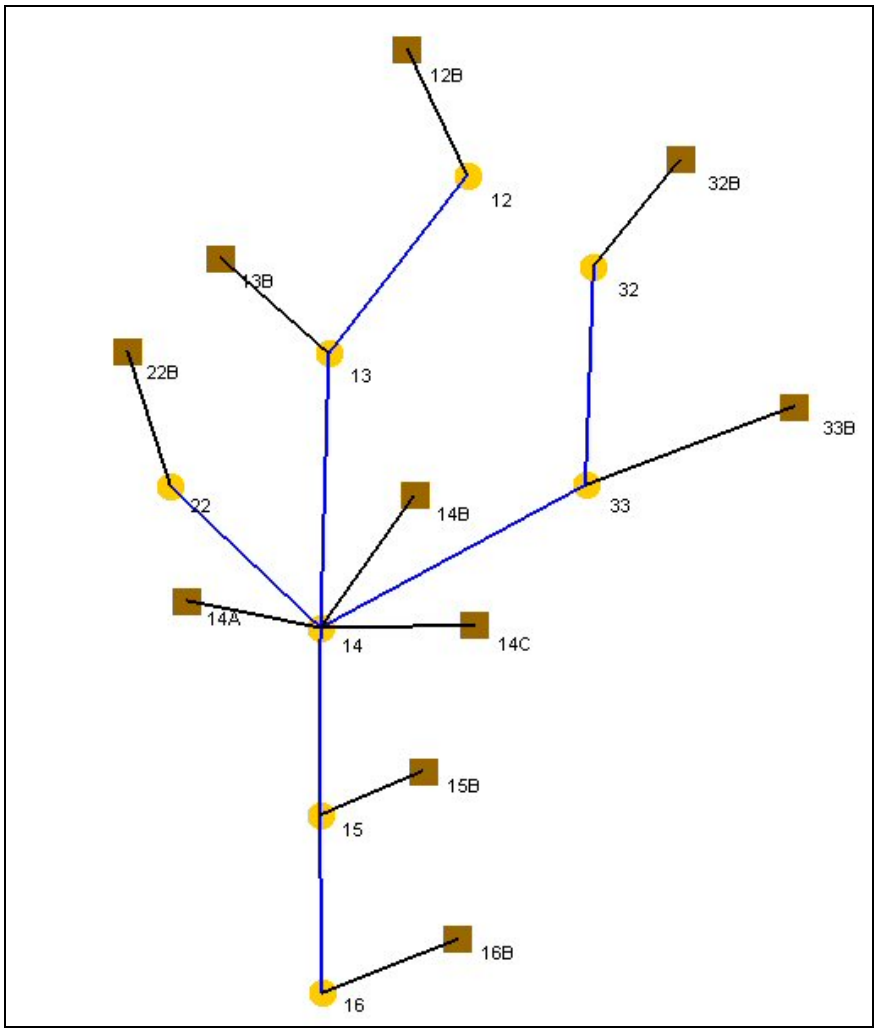


Figure 3-1: Schematic representation of example problem

3.2 View Data

1. Select any of the hydrologic tree nodes
2. Select ***OC Rational | Edit Parameters…***

Reach data are displayed if the selected hydrologic tree node is a concentration point and sub-area data (including initial sub-area parameters and losses) are displayed for hydrologic tree nodes representing sub-areas.

3. Select another hydrologic tree node on the screen and notice that the data in the *Orange County Rational Method – Edit Parameters* dialog are updated
4. Select *Done*

3.3 Tree Mapping

Concentration points are mapped to their associated downstream sub-areas in order to use the correct areas for performing travel time calculations. WMS automatically maps sub-

areas to concentration points if there is only one confluence point upstream from a concentration point. In this model, all concentration points are automatically mapped except for those labeled 22, 13, and 33, which are directly upstream of the confluence point labeled 14 (see Figure 3-1).

1. Select ***OC Rational | Tree Mapping…*** to access the Tree Mapping dialog shown in Figure 3-2

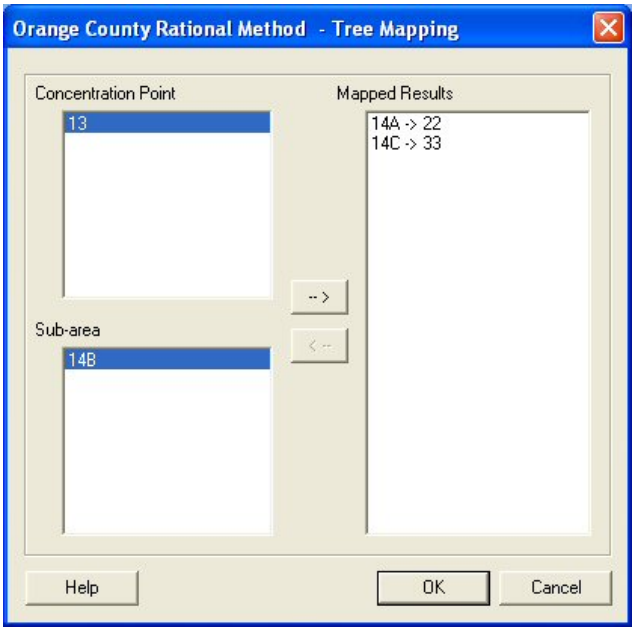


Figure 3-2: Tree Mapping dialog

This dialog contains a list of unmapped concentration points in the upper left-hand box. As one is selected, a list of unmapped sub-areas that are downstream of the selected concentration point will appear in the lower left-hand box. Simply select the appropriate pair to map and click the --> button.

2. Select concentration point 22
3. Select sub-area 14A
4. Click on the Map (-->) button
5. Map concentration point 13 and sub-area 14B
6. Map concentration point 33 and sub-area 14C
7. Select OK

4 Running the Simulation

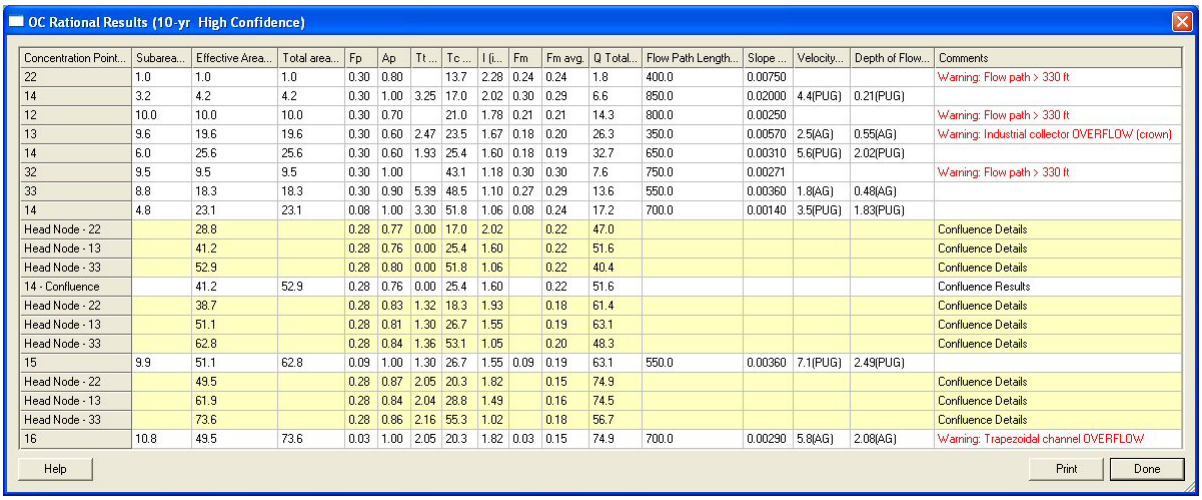
4.1 Running the Model

Once all of the concentration points have been mapped, the model can be run.

1. Deselect all concentration points by clicking somewhere on the screen

2. Select ***OC Rational | Run Simulation…***
3. For the detailed output file name enter "OCHMRational1.txt" and select Save

WMS runs the Orange County rational analysis and displays results in the OC Rational Results dialog shown in Figure 4-1.



Concentration Point...	Subarea...	Effective Area...	Total area...	Fp	Ap	Tt ...	Tc ...	I (i...	Fm	Fm avg.	Q Total...	Flow Path Length...	Slope ...	Velocity...	Depth of Flow...	Comments
22	1.0	1.0	1.0	0.30	0.80		13.7	2.28	0.24	0.24	1.8	400.0	0.00750			Warning: Flow path > 330 ft
14	3.2	4.2	4.2	0.30	1.00	3.25	17.0	2.02	0.30	0.29	6.6	850.0	0.02000	4.4(PUG)	0.21(PUG)	
12	10.0	10.0	10.0	0.30	0.70		21.0	1.78	0.21	0.21	14.3	800.0	0.00250			Warning: Flow path > 330 ft
13	9.6	19.6	19.6	0.30	0.60	2.47	23.5	1.67	0.18	0.20	26.3	350.0	0.00570	2.5(AG)	0.55(AG)	Warning: Industrial collector OVERFLOW (crown)
14	6.0	25.6	25.6	0.30	0.60	1.93	25.4	1.60	0.18	0.19	32.7	650.0	0.00310	5.6(PUG)	2.02(PUG)	
32	9.5	9.5	9.5	0.30	1.00		43.1	1.18	0.30	0.30	7.6	750.0	0.00271			Warning: Flow path > 330 ft
33	8.8	18.3	18.3	0.30	0.90	5.39	48.5	1.10	0.27	0.29	13.6	550.0	0.00360	1.8(AG)	0.48(AG)	
14	4.8	23.1	23.1	0.08	1.00	3.30	51.8	1.06	0.08	0.24	17.2	700.0	0.00140	3.5(PUG)	1.83(PUG)	
Head Node - 22		28.8		0.28	0.77	0.00	17.0	2.02		0.22	47.0					Confluence Details
Head Node - 13		41.2		0.28	0.76	0.00	25.4	1.60		0.22	51.6					Confluence Details
Head Node - 33		52.9		0.28	0.80	0.00	51.8	1.06		0.22	40.4					Confluence Details
14 - Confluence		41.2	52.9	0.28	0.76	0.00	25.4	1.60		0.22	51.6					Confluence Results
Head Node - 22		38.7		0.28	0.83	1.32	18.3	1.93		0.18	61.4					Confluence Details
Head Node - 13		51.1		0.28	0.81	1.30	26.7	1.55		0.19	63.1					Confluence Details
Head Node - 33		62.8		0.28	0.84	1.36	53.1	1.05		0.20	48.3					Confluence Details
15	9.9	51.1	62.8	0.09	1.00	1.30	26.7	1.55	0.09	0.19	63.1	550.0	0.00360	7.1(PUG)	2.49(PUG)	
Head Node - 22		49.5		0.28	0.87	2.05	20.3	1.82		0.15	74.9					Confluence Details
Head Node - 13		61.9		0.28	0.84	2.04	28.8	1.49		0.16	74.5					Confluence Details
Head Node - 33		73.6		0.28	0.86	2.16	55.3	1.02		0.18	56.7					Confluence Details
16	10.8	49.5	73.6	0.03	1.00	2.05	20.3	1.82	0.03	0.15	74.9	700.0	0.00290	5.8(AG)	2.08(AG)	Warning: Trapezoidal channel OVERFLOW

Figure 4-1: OC Rational Results dialog, complete analysis

4. Select Done

4.2 Viewing Detailed Output

1. Select ***File | Edit File…***
2. Open *"OCHMRational1.txt"*
3. Select OK to view the file in Notepad, if prompted
4. Close the file when done viewing it

4.3 Running the Model up to a Selected Concentration Point

There is also the option of terminating all calculations downstream of a selected concentration point in the model.

1. Use the *Select Outlet* tool to select the concentration point labeled 14
2. Select ***OC Rational | Run Simulation…***
3. For the detailed output file name enter "OCHMRational2.txt" and select Save
4. The OC Rational Results dialog will appear with the results from the simulation only up until the selected concentration point as shown in Figure 4-2.

Concentration Point...	Subarea...	Effective Area...	Total area...	Fp	Ap	Tt ...	Tc ...	I (i...	Fm	Fm avg.	Q Total...	Flow Path Length...	Slope ...	Velocity...	Depth of Flow...	Comments
22	1.0	1.0	1.0	0.30	0.80		13.7	2.28	0.24	0.24	1.8	400.0	0.00750			Warning: Flow path > 330 ft
14	3.2	4.2	4.2	0.30	1.00	3.25	17.0	2.02	0.30	0.29	6.6	850.0	0.02000	4.4(PUG)	0.21(PUG)	
12	10.0	10.0	10.0	0.30	0.70		21.0	1.78	0.21	0.21	14.3	800.0	0.00250			Warning: Flow path > 330 ft
13	9.6	19.6	19.6	0.30	0.60	2.47	23.5	1.67	0.18	0.20	26.3	350.0	0.00570	2.5(AG)	0.55(AG)	Warning: Industrial collector OVERFLOW (crown)
14	6.0	25.6	25.6	0.30	0.60	1.93	25.4	1.60	0.18	0.19	32.7	650.0	0.00310	5.6(PUG)	2.02(PUG)	
32	9.5	9.5	9.5	0.30	1.00		43.1	1.18	0.30	0.30	7.6	750.0	0.00271			Warning: Flow path > 330 ft
33	8.8	18.3	18.3	0.30	0.90	5.39	48.5	1.10	0.27	0.29	13.6	550.0	0.00360	1.8(AG)	0.48(AG)	
14	4.8	23.1	23.1	0.08	1.00	3.30	51.8	1.06	0.08	0.24	17.2	700.0	0.00140	3.5(PUG)	1.83(PUG)	
Head Node - 22		28.8		0.28	0.77	0.00	17.0	2.02		0.22	47.0					Confluence Details
Head Node - 13		41.2		0.28	0.76	0.00	25.4	1.60		0.22	51.6					Confluence Details
Head Node - 33		52.9		0.28	0.80	0.00	51.8	1.06		0.22	40.4					Confluence Details
14 - Confluence		41.2	52.9	0.28	0.76	0.00	25.4	1.60		0.22	51.6					Confluence Results

Figure 4-2: OC Rational Results dialog, partial analysis

5 Printing Results (optional)

The results are displayed in a spreadsheet format. To print them:

1. Click on the Print button

They can also be copied into a spreadsheet program such as Microsoft Excel© for formatting and printing.

2. In the OC Rational Results dialog highlight all of the contents and press Ctrl+C
3. Open Microsoft Excel© and paste the data into a spreadsheet using Ctrl+V

The results can now be formatted and printed.

4. Select Done

6 Saving/Reading an Orange County Project File

1. Select ***OC Rational | Save Simulation…***
2. Save the file with the name "OCHMSimaulation.ocr"

NOTE: The file will have an .ocr extension signifying that it is an Orange County Rational method file.

3. To read an Orange County file into WMS, select ***OC Rational | Read Simulation…*** In this case there is no need to open any file since we just created one

7 Newland Storm Channel Pipe Design Example

1. Select ***File | New***
2. Select No if prompted to save changes to the project
3. Switch to the *Hydrologic Modeling* module
4. Select ***OC Rational | Read Simulation…***
5. Open *"NewlandDesign.ocr"*

6. Use the *Select Outlet* tool to select the concentration point labeled 201
7. Select ***OC Rational | Edit Parameters…***

Notice the pipe diameter specified for this reach is 0.00 in and the compute pipe size option is toggled on.

8. Select Done
9. Deselect the concentration point labeled 201 by clicking somewhere on the screen
10. Select ***OC Rational | Run Simulation…***
11. For the detailed output file name enter "NewlandDesign.txt" and select Save
12. Select Done
13. Use the *Select Outlet* tool to select the concentration point labeled 201
14. Select ***OC Rational | Edit Parameters…***

It is possible to view the standard pipe sizes that WMS computes at each design node.