



Modelling of water flow in rivers

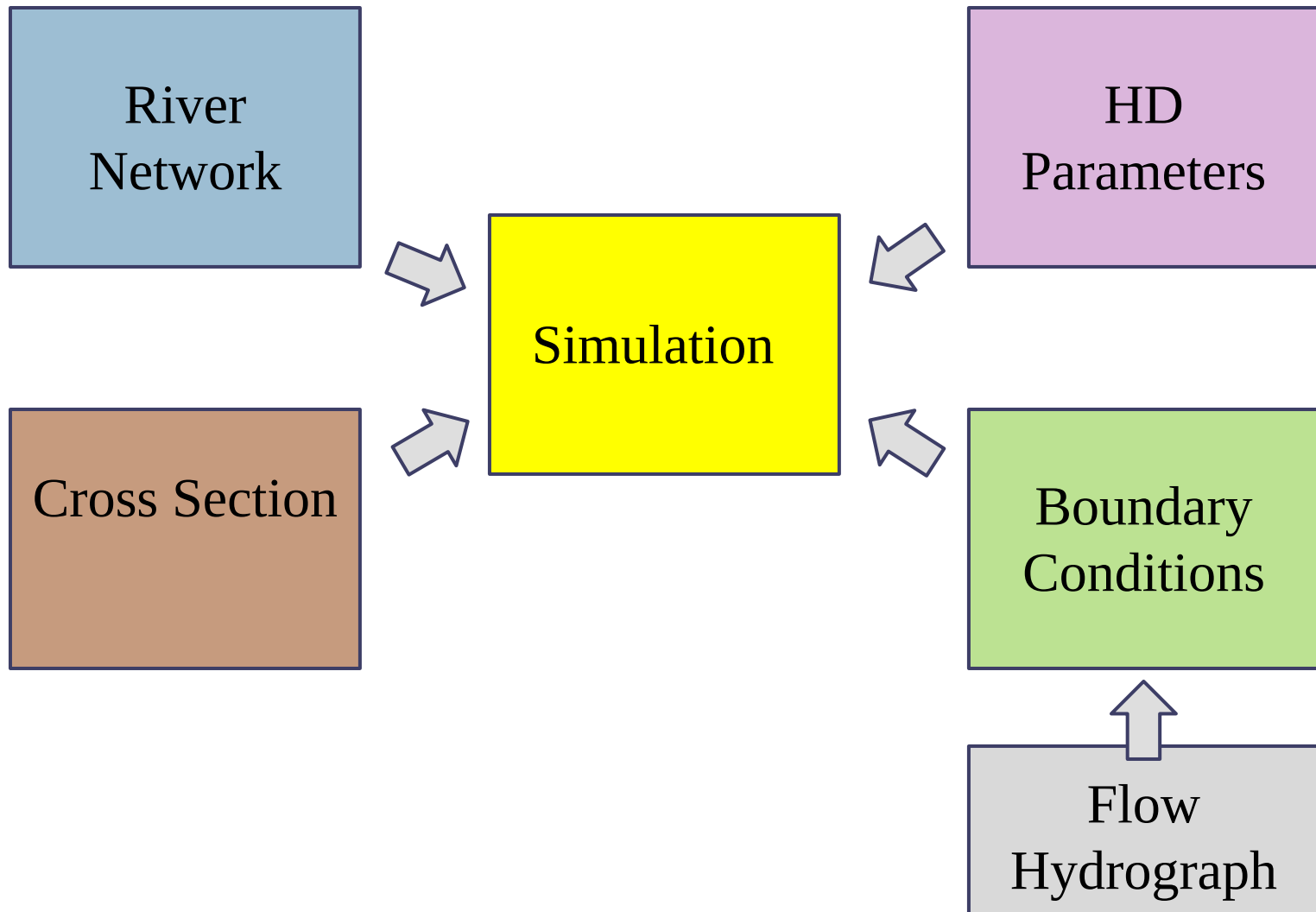
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MIKE11 structure



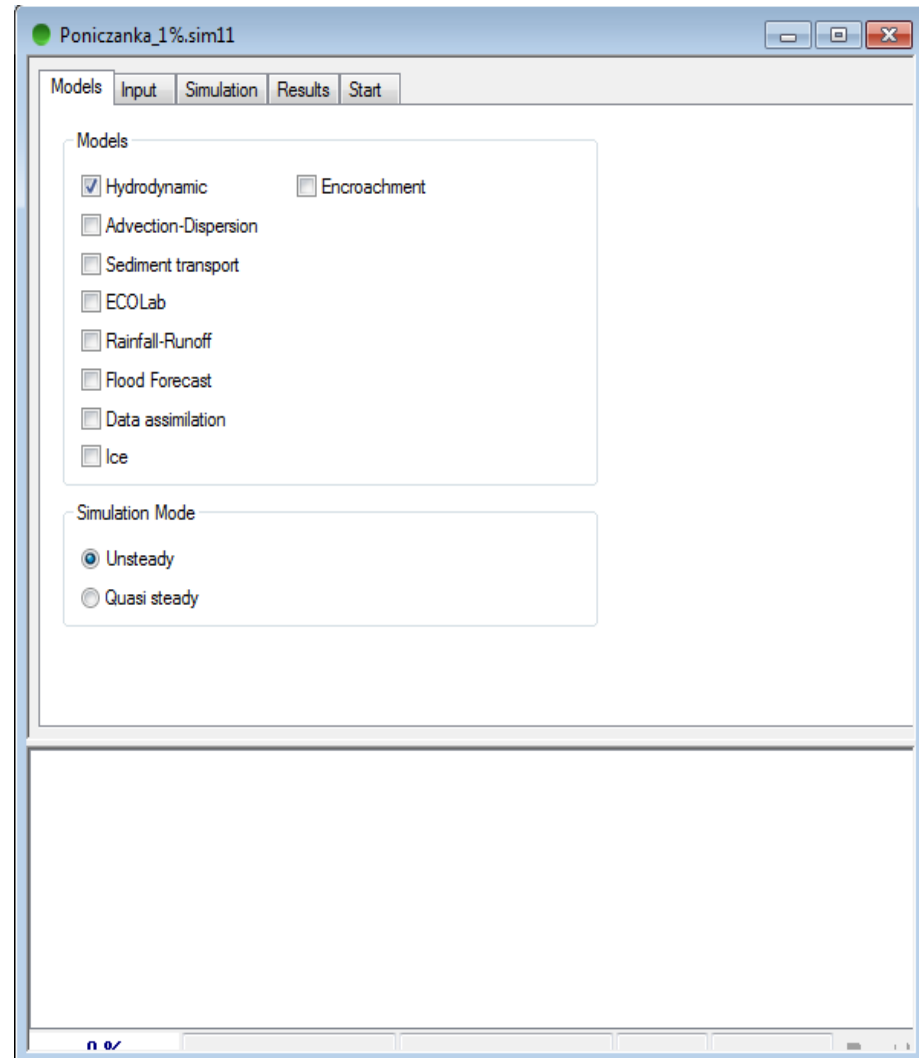
Simulation editor

Models

The simulation editor serves three purposes:

1. It contains the simulation and computation control parameter
2. It is used to start the simulation
3. It provides a link between the network editor and the other Mike11 editors.

The editing of cross section is a typical example of this link, where the graphical view of the network editor is used to select cross section from the cross section editor.

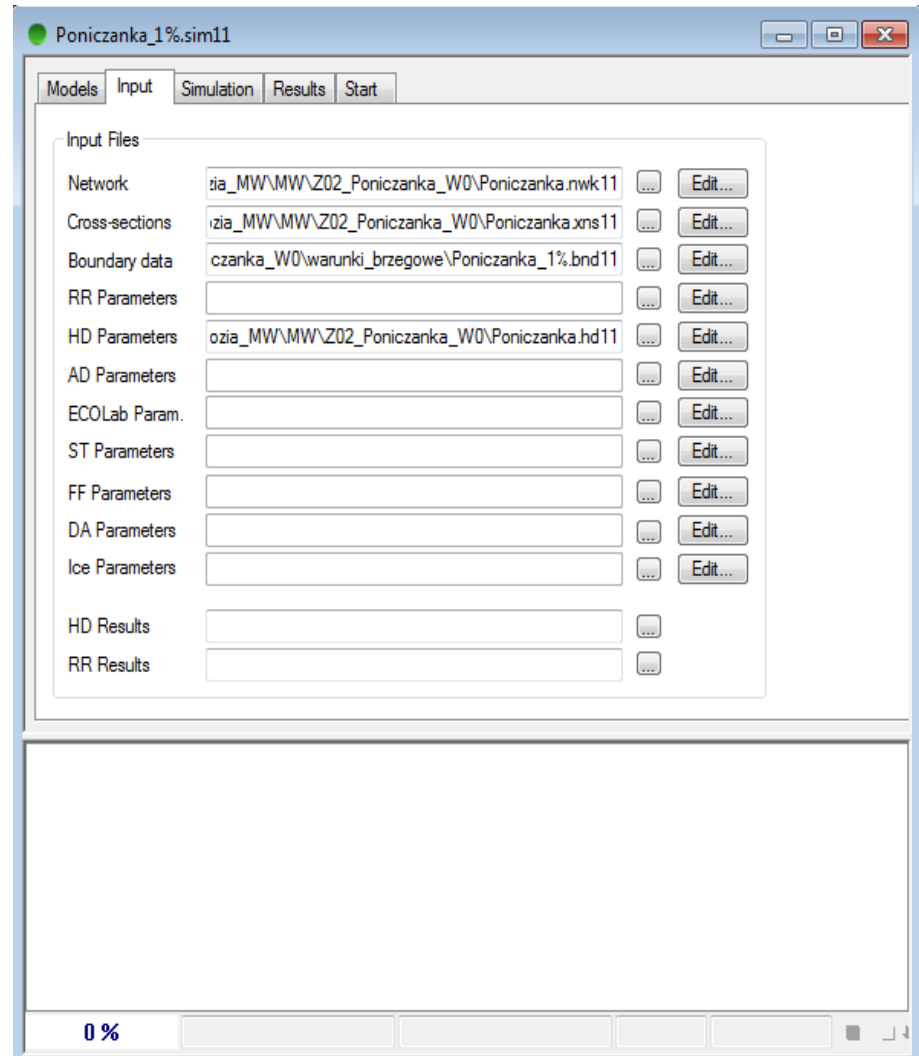


Simulation editor

Input

Here the user is required to specify a range of input files:

- Network
- Cross-section
- Boundary data
- HD Parameter

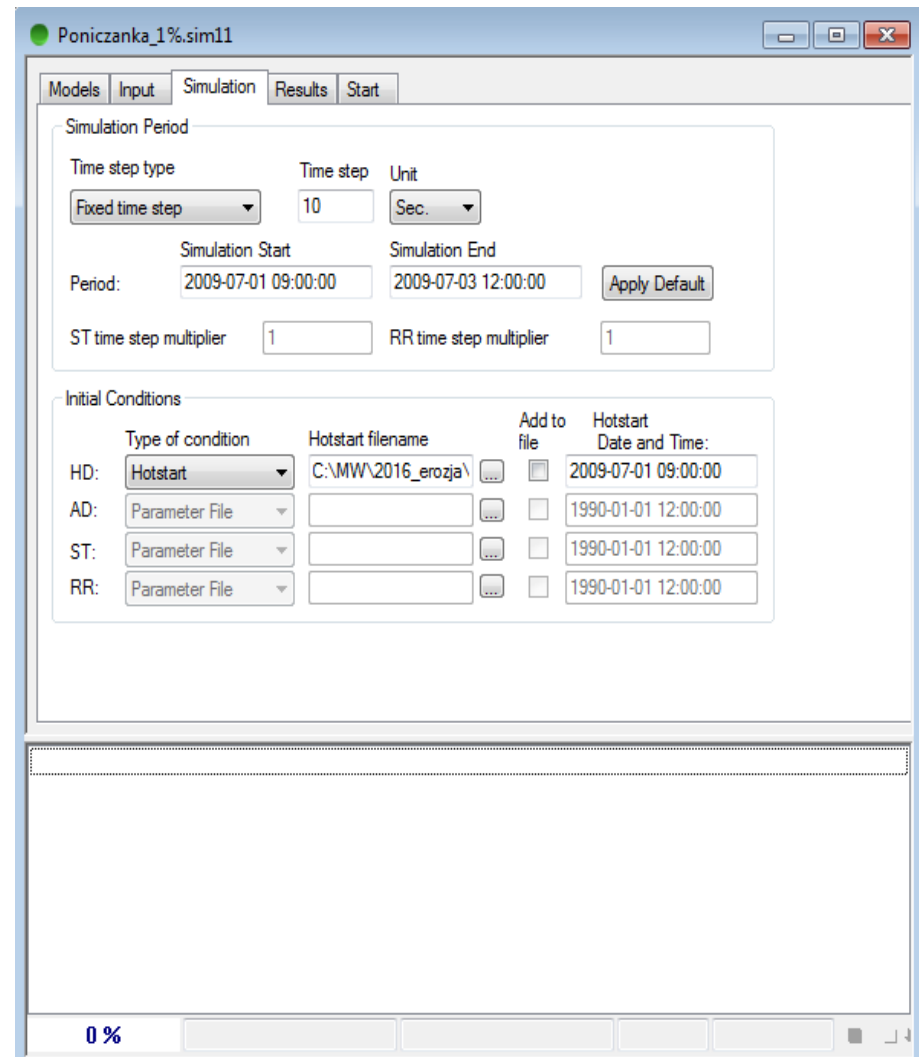


Simulation editor

Simulation

The simulation property page contains details of simulation time, time stepping specification and initial conditions for each of the chosen types of model.

- Time step type
- Simulation start and end
- Initial conditions

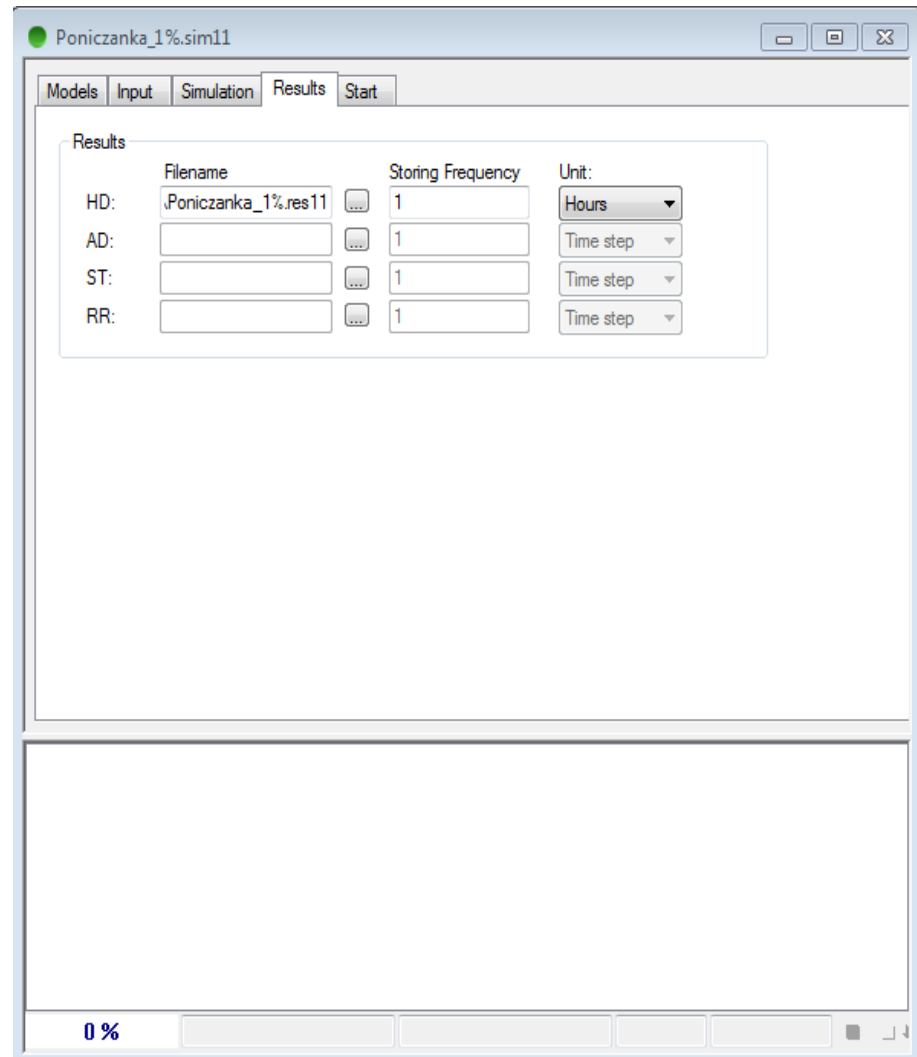


Simulation editor

Results

The user should specify a filename for saving of the simulation results..

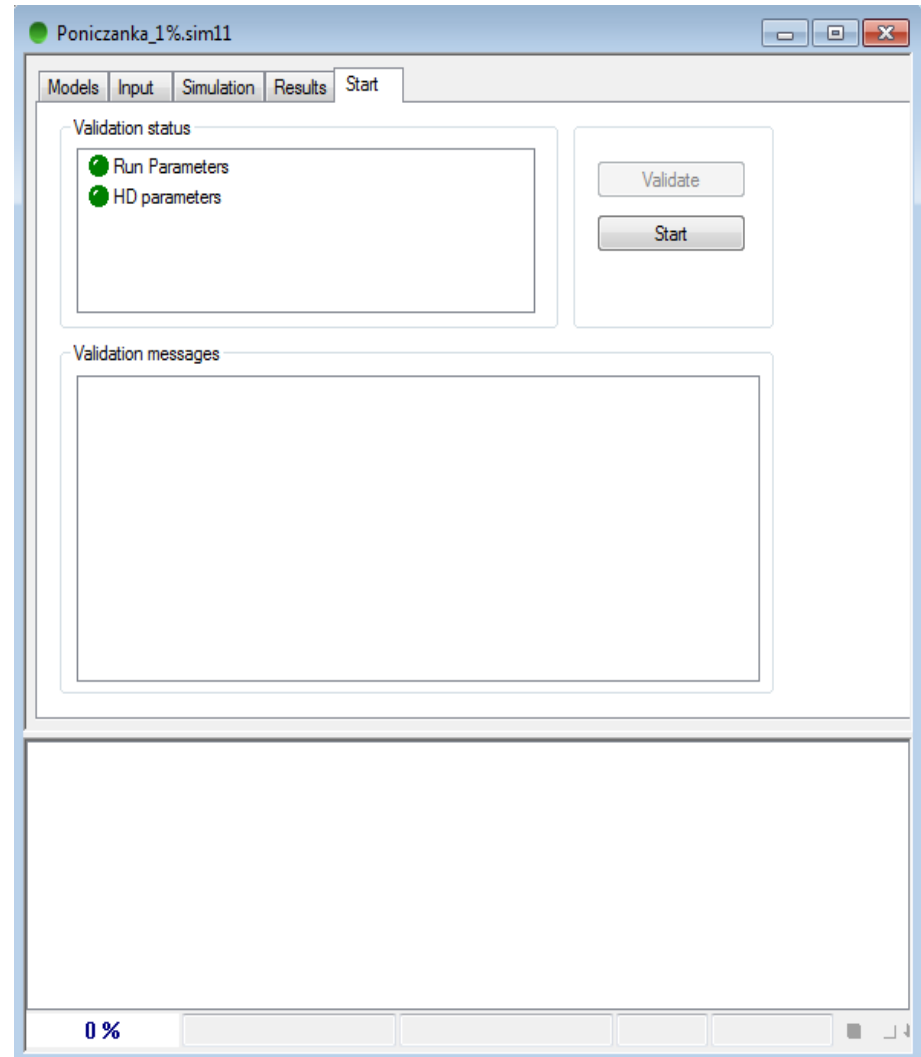
- ❑ Filename – name of the file and folder
- ❑ Storing Frequency: to limit the size of the results files the user can specify a save step interval.



Simulation editor

Start

If all specified input files exist, the “Start” button can be pressed and the simulation will commence. The simulation will take place as a separate progress. Any error or warning message from the simulation will pop up in the Validation message window.



River Network Editor

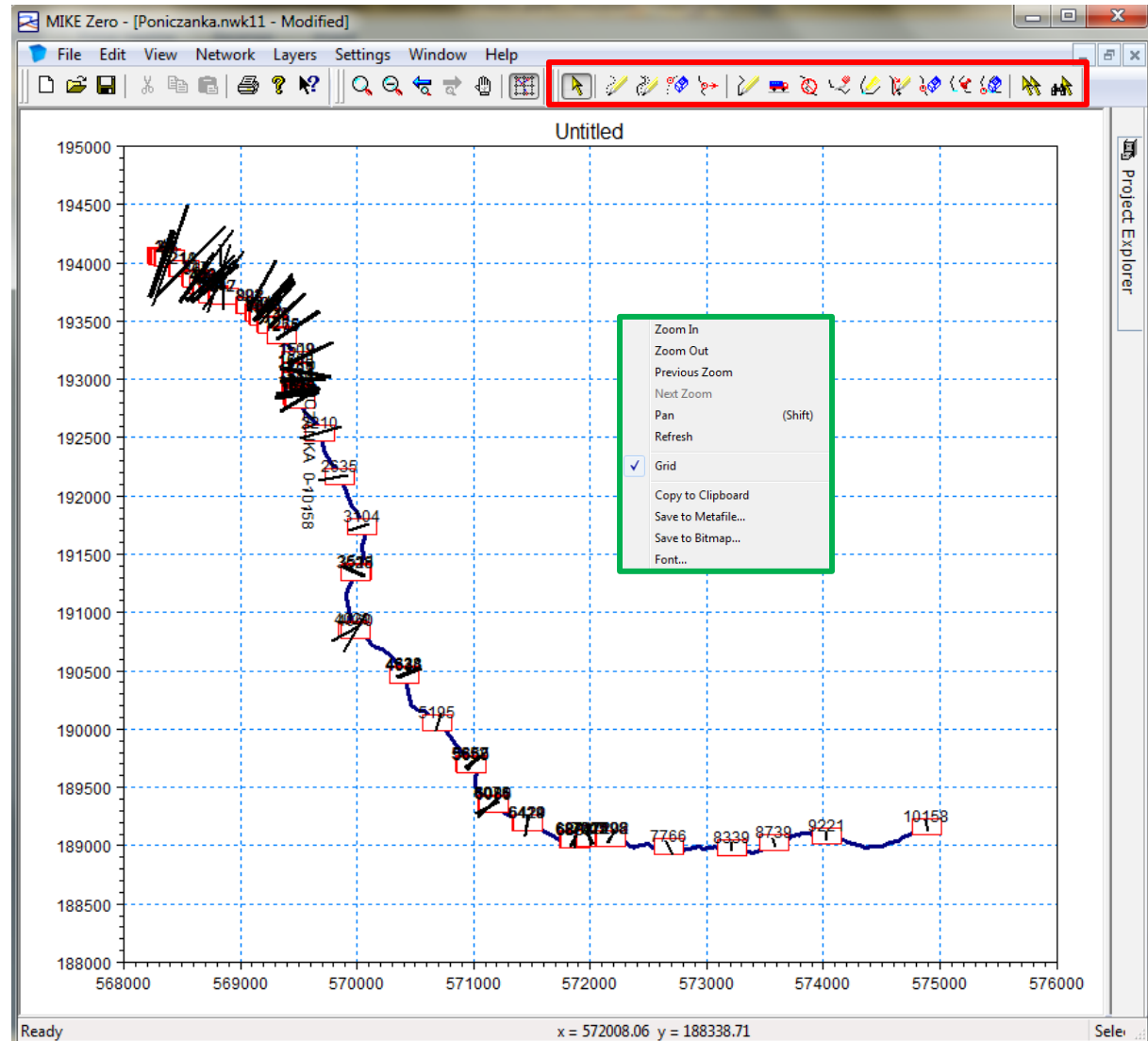
Graphical view

The graphical view is the default view and will be activated automatically when a river network file is opened or created.

Editing of the river network (points and branches) is undertaken using the Graphical

Editing Toolbar. Editing tools

are also found using Pop-Up Menu (right mouse button) these include insert, edit and delete functions.



River Network Editor

Tabular view - Points

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The tabular view gives an overview of branches, structures, rainfall catchments etc.

MIKE Zero - [Poniczanka.nwk11:2 - Modified]

File Edit View Network Layers Settings Window Help

Overview

- Network
 - Points (188)
 - Branches (1)
- Structures
- Routing
- Runoff/groundwater links
- Grid points

Definitions

X-Coordinate: 568328.74 Y-Coordinate: 194060.2

Attributes

Branch: PONICZANKA Chainage: 0

Chainage Type: User Defined

Overview

	X Coord.	Y Coord.	Branch	Chainage Type	Chainage
1	568328.74	194060.2	PONICZANKA	User Defined	0
2	568391.47	194038.19	PONICZANKA	System Defined	66.578832
3	568503.68	193964.62	PONICZANKA	System Defined	200.95739
4	568538.57	193929.93	PONICZANKA	System Defined	250.23177
5	568642.05	193854.96	PONICZANKA	System Defined	378.2066
6	568684.27	193811.65	PONICZANKA	System Defined	438.78094
7	568727.95	193756.91	PONICZANKA	System Defined	508.91732
8	568766.34	193729.84	PONICZANKA	System Defined	555.96189
9	568833.65	193706.8	PONICZANKA	System Defined	627.2125
10	568853.41	193707.88	PONICZANKA	System Defined	647.03163
11	568968.16	193693.63	PONICZANKA	System Defined	762.83623
12	569005.08	193681.19	PONICZANKA	System Defined	801.85404
13	569096.85	193629.25	PONICZANKA	System Defined	907.46099
14	569231	193514.64	PONICZANKA	System Defined	1084.1669
15	569353.31	193383.2	PONICZANKA	System Defined	1263.9803
16	569472.87	193194.93	PONICZANKA	System Defined	1487.3394
17	569487.35	193164.93	PONICZANKA	System Defined	1520.701
18	569484.75	193112.74	PONICZANKA	System Defined	1573.034
19	569476.48	193069.88	PONICZANKA	System Defined	1616.7499
20	569474.76	193001.86	PONICZANKA	System Defined	1684.8936
21	569476.75	192947.46	PONICZANKA	System Defined	1739.4115
22	569490.6	192855.58	PONICZANKA	System Defined	1832.4687
23	569511.44	192820.95	PONICZANKA	System Defined	1872.9463
24	569532.65	192756.08	PONICZANKA	System Defined	1941.2979

Project Explorer

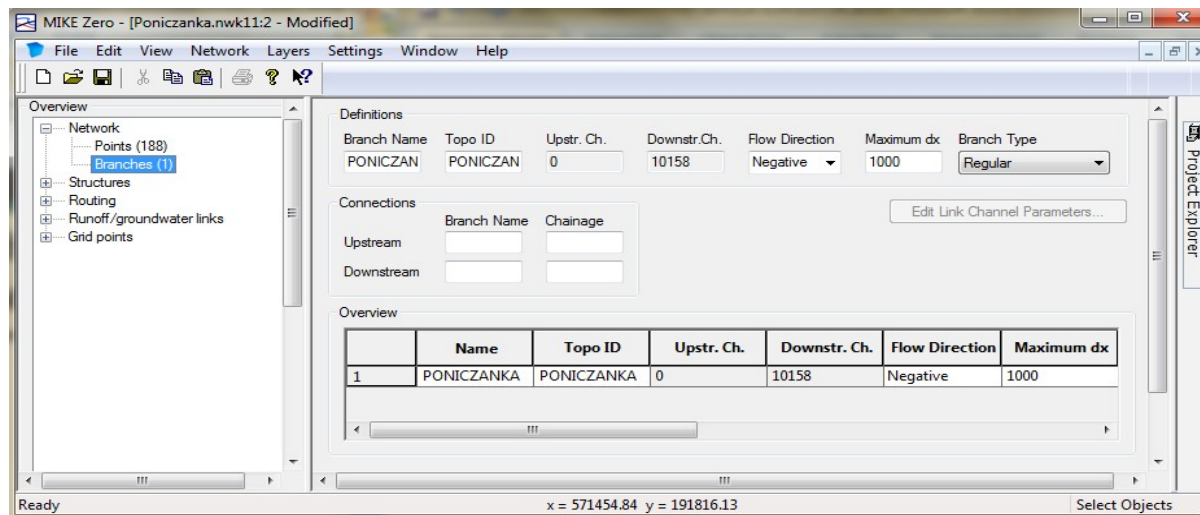
Ready x = 571454.84 y = 191816.13 Select Object

River Network Editor

Tabular view - Branches

Definitions

- Branch name: Name of the branch
- Topo ID
- Upstr. Ch: The chainage of the first point in the branch.
- Downstr. Ch: The chainage of the last point in the branch.
- Flow Direction: If specified as positive, simulated discharge will be positive when the flow direction is from upstream chainage to downstream chainage. Vice versa if the flow direction is defined as negative.
- Maximum dx: Maximum distance between adjacent h-points.
- Branch Type: Regular – minimum one cross section is required,
 Link Channel – No cross are required.



Cross Section Editor

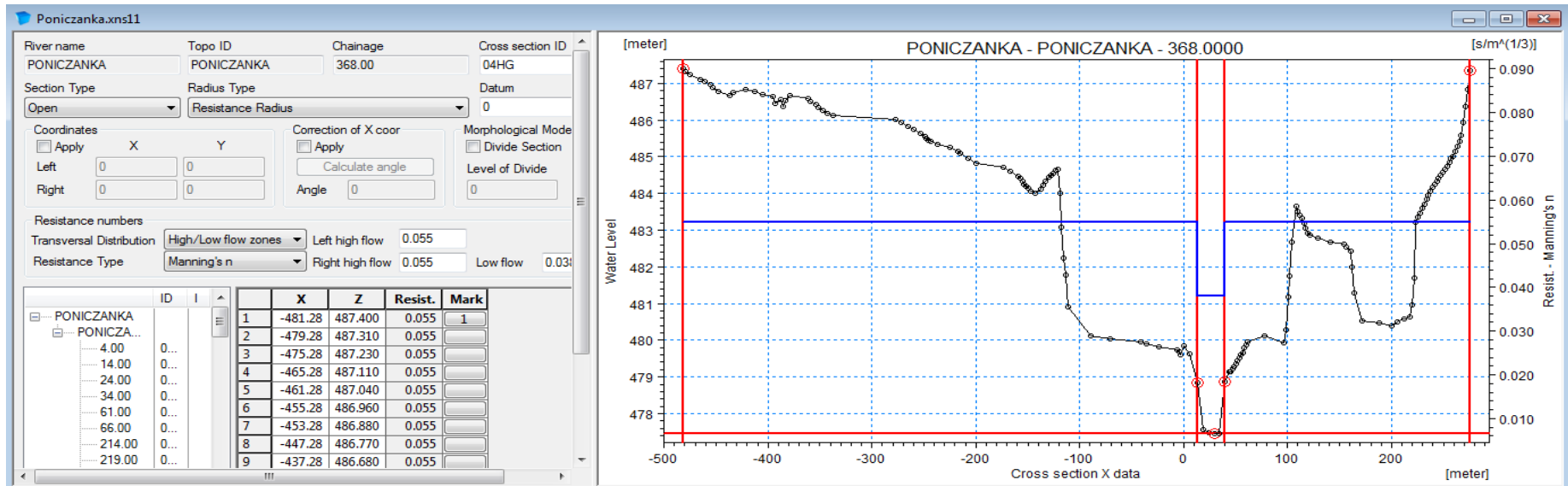
The Cross Section Editor manages stores and displays all model cross section information.

There are two types of cross section data:

- The raw data describes the shape of the cross section and the typically comes from a section survey of the river.
- The processed data is derived from the raw data and contains all information used by the computer model (e.g. level, cross section area, flow width, hydraulic/resistance radius). The processed data can be calculated by the cross section editor or entered manually.

Each cross section is uniquely identified by the following three keys:

- River Name: The name given to the river branch.
- Topo ID: Topographical identification name.
- Chainade: River chainage of cross section.



Cross Section Editor

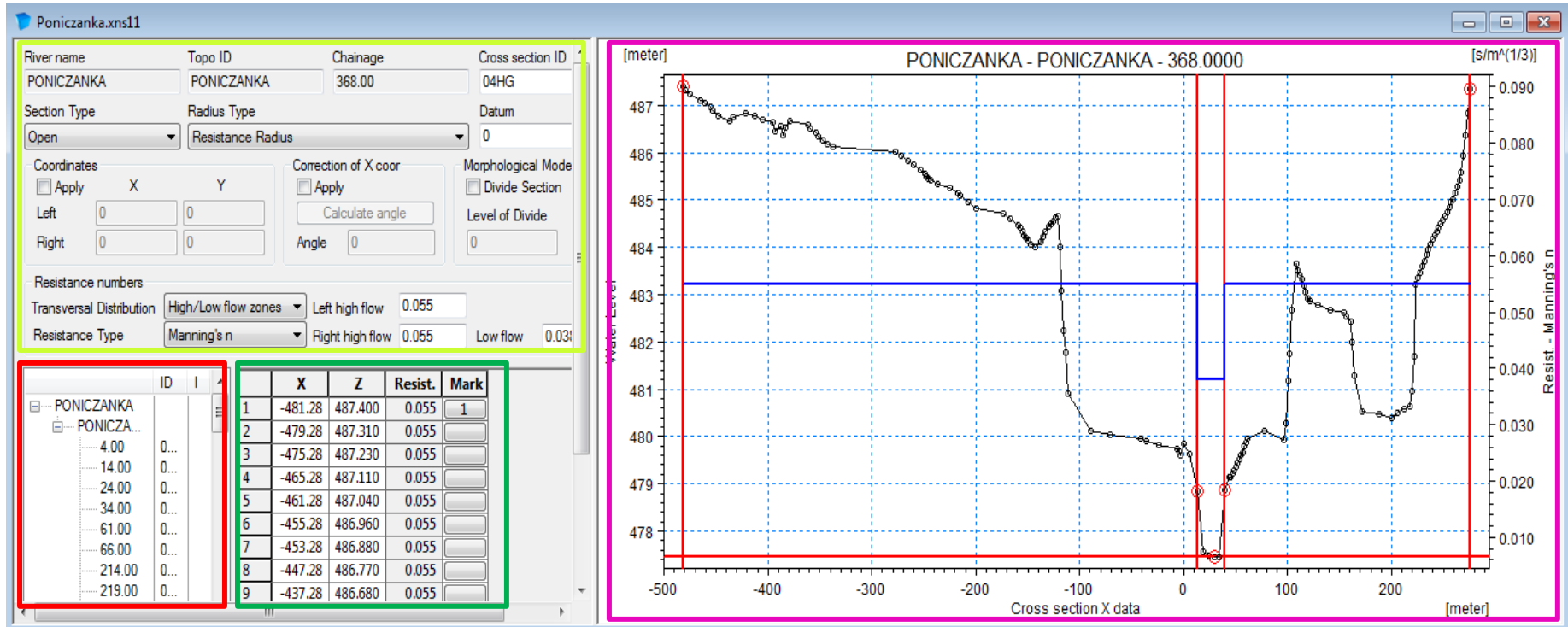
Raw data

The raw editor is made up by three views plus a number of additional dialog boxes.

Tree view: Provides the list of all cross section file. The list is displayed using a tree structure with three levels. The upper level contains the river names, the second contains the Topo-IDs, and the third contains cross section chainage.

Tabular view: Selecting cross section with the left mouse button will display the section information in the tabular view.

Graphical view: An x-z-plot of the cross sectional data with markers and Resistance values.



Cross Section Editor

Raw data – dialog box

- River Name, Topo ID and Chainage: Non-editable information of the river name, the topographical identification tag and the chainage along the river. These values may be changed by selecting the appropriate level in the tree view using the rename facility
- Cross section ID: An identification tag may be entered here. This tag is subsequently displayed in MIKE View and does not influence the calculations
- Section Type: The type of section is set here. Four possibilities are listed:
 - Open section
 - Closed irregular
 - Closed circular
 - Closed rectangular
- Radius Type: The type of hydraulic radius formulation is set here
- Datum: We may change the elevation of the whole crosssection by adding values in meters

River name	Topo ID	Chainage	Cross section ID
PONICZANKA	PONICZANKA	368.00	04HG
Section Type	Radius Type	Datum	
Open	Resistance Radius	0	
Coordinates		Correction of X coor	Morphological Model
<input type="checkbox"/> Apply	X	Y	<input type="checkbox"/> Divide Section
Left	0	0	Level of Divide
Right	0	0	0
Resistance numbers		Angle	0
Transversal Distribution	High/Low flow zones	Left high flow	0.055
Resistance Type	Manning's n	Right high flow	0.055
		Low flow	0.038

Cross Section Editor

Raw data – Dialog box – Resistance number

Resistance numbers

Transversal Distribution High/Low flow zones ▼

Resistance Type Manning's n ▼

Left high flow 0.055

Right high flow 0.055 Low flow 0.038

Transversal distribution: The distribution of resistance number is set here. We have three options:
Uniform, High/Low flow zones, Distributed

Resistance type: Relative resistance
Manning's n
Manning's N
Chezy number
Darcy Weisbach

Values of resistance number when Uniform or High/Low flow zones were selected.

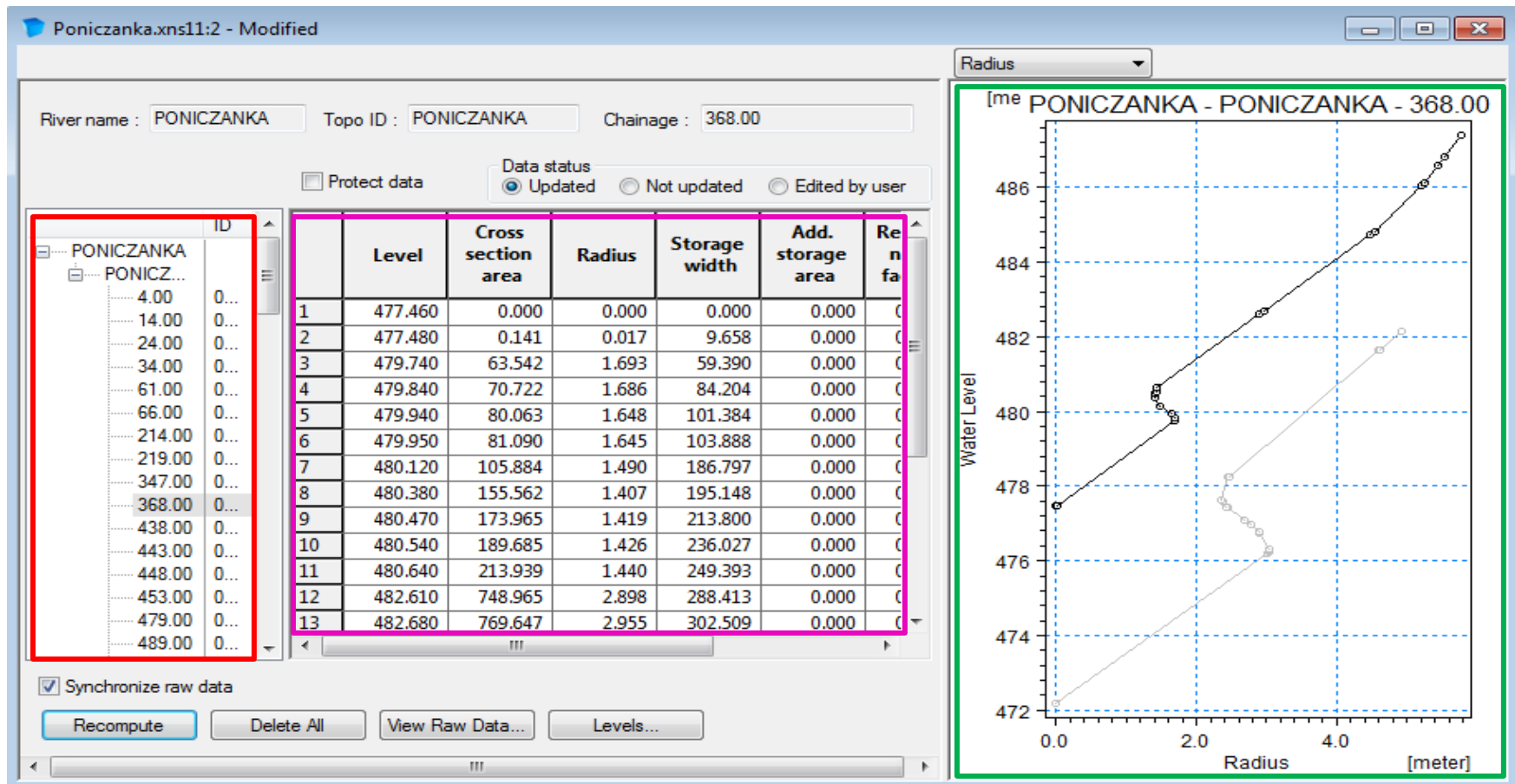
	X	Z	Resist.	Mark
52	-137.30	484.120	0.055	<input type="checkbox"/>
53	-135.30	484.220	0.055	<input type="checkbox"/>
54	-133.30	484.320	0.055	<input type="checkbox"/>
55	-129.30	484.440	0.055	<input type="checkbox"/>
56	-127.30	484.500	0.055	<input type="checkbox"/>
57	-125.30	484.560	0.055	<input type="checkbox"/>
58	-123.30	484.620	0.055	<input type="checkbox"/>
59	-121.30	484.670	0.055	<input type="checkbox"/>
60	-119.30	484.000	0.055	<input type="checkbox"/>
61	-117.30	483.090	0.055	<input type="checkbox"/>

For distributed option resistance values are put in Tabular view window

Cross Section Editor

Processed data

The processed data view is similar to the raw data display. A tree view exists on the left where the required cross section can be selected. A tabular view provides all processed data and a graphical view displays the processed data graphically.



Boundary Data Editor

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The boundary editor is used to specify boundary conditions to a Mike11 Model.

The Boundary File window consists of three split windows.

The top split window is used to specify the overall boundary conditions. Each boundary condition appears as a row in a Boundary Table in this window. The table lists all boundaries included in a model set up. There is no limit to the number of rows (boundaries) that can be included in the table.

The contents of the second and third split windows depend on the specifications of the active row (row number highlighted) in the Boundary Table. Additional information needed in order to specify the boundary conditions are entered in the second and third split windows.

The screenshot shows the 'Poniczanka_1%.bnd11' window. It features a table with the following data:

	Boundary Description	Boundary Type	Branch Name	Chainage	Chainage	Gate ID	Boundary ID
1	Open	Inflow	PONICZAN	10158	0		górný warunek
2	Distributed Source	Inflow	PONICZAN	10158	4030		Qg_Rdzawka
3	Point Source	Inflow	PONICZAN	4030	0		Rdzawka
4	Distributed Source	Inflow	PONICZAN	4030	24		Rdzawka_ujście
5	Open	Water Level	PONICZAN	0	0		rzędna z Raby w km 110725

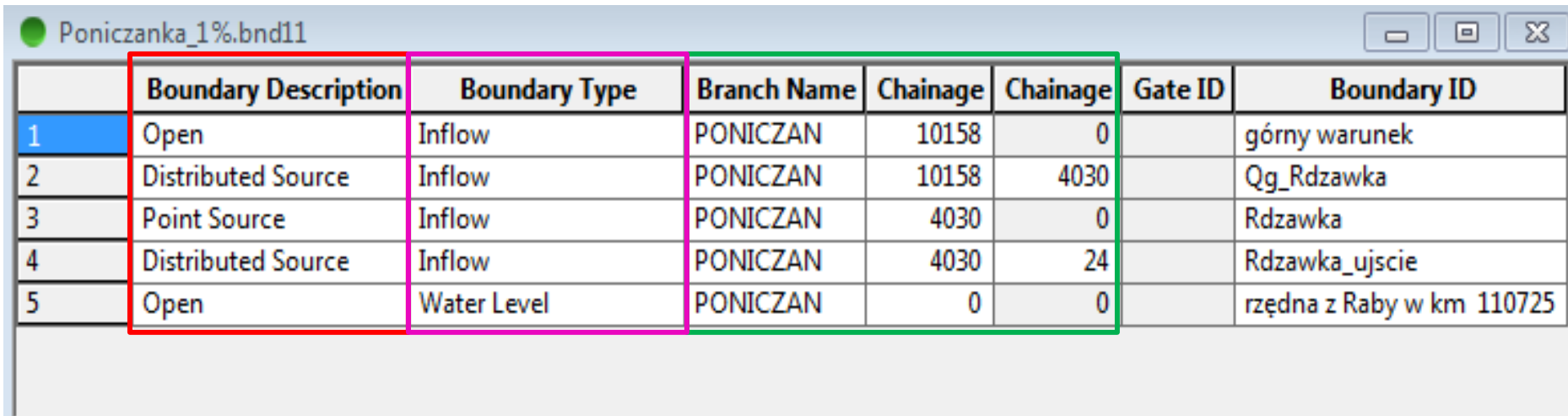
Below the table, there are two checkboxes: Include HD calculation and Include AD boundaries.

At the bottom, there is a table for the selected row (1):

	Data Type	TS Type	File / Value	TS Info
1	Discharge:	TS Fil	..\dfs0\Poniczanka_... Edit	p=1%

Boundary Data Editor

The Boundary Table shown in the split windows gives an overview of the boundaries included in the model set up. The information required is the Boundary Description, the Boundary Type and the Location of the Boundary.



The screenshot shows a window titled "Poniczanka_1%.bnd11" with a table of boundary data. The table has the following columns: Boundary Description, Boundary Type, Branch Name, Chainage, Chainage, Gate ID, and Boundary ID. The rows are numbered 1 to 5. The first two columns of each row are highlighted with a red box, the third and fourth columns with a pink box, and the fifth and sixth columns with a green box.

	Boundary Description	Boundary Type	Branch Name	Chainage	Chainage	Gate ID	Boundary ID
1	Open	Inflow	PONICZAN	10158	0		górnny warunek
2	Distributed Source	Inflow	PONICZAN	10158	4030		Qg_Rdzawka
3	Point Source	Inflow	PONICZAN	4030	0		Rdzawka
4	Distributed Source	Inflow	PONICZAN	4030	24		Rdzawka_ujście
5	Open	Water Level	PONICZAN	0	0		rzędna z Raby w km 110725

In the third table Data Type and Input Files are loaded. Loaded files may be changed by using Edit button.

	Data Type	TS Type	File / Value	TS Info
1	Discharge:	TS Fil	..\dfs0\Rdzawka.dfs ... Edit	p=1%

Time series

The Time Series window is used to define:

type of boundary condition,

period of time,

number of time step

File Properties

General Information

Title: Rdzawka

Axis Information

Axis Type: Non-Equidistant Calendar Axis

Start Time: 2009-07-01 06:00:00

Time Step: 0 [days]
00:00:10 [hour:min:sec]
0.000 [fraction of sec.]

No. of Timesteps: 62

Axis Units:

Item Information

	Name	Type	U
1	p=0.2%	Discharge	m ³ /s
2	p=1%	Discharge	m ³ /s
3	p=20%	Discharge	m ³ /s
4	p=25%	Discharge	m ³ /s
5	p=30%	Discharge	m ³ /s
6	p=40%	Discharge	m ³ /s

Insert Append Delete Item Filtering...

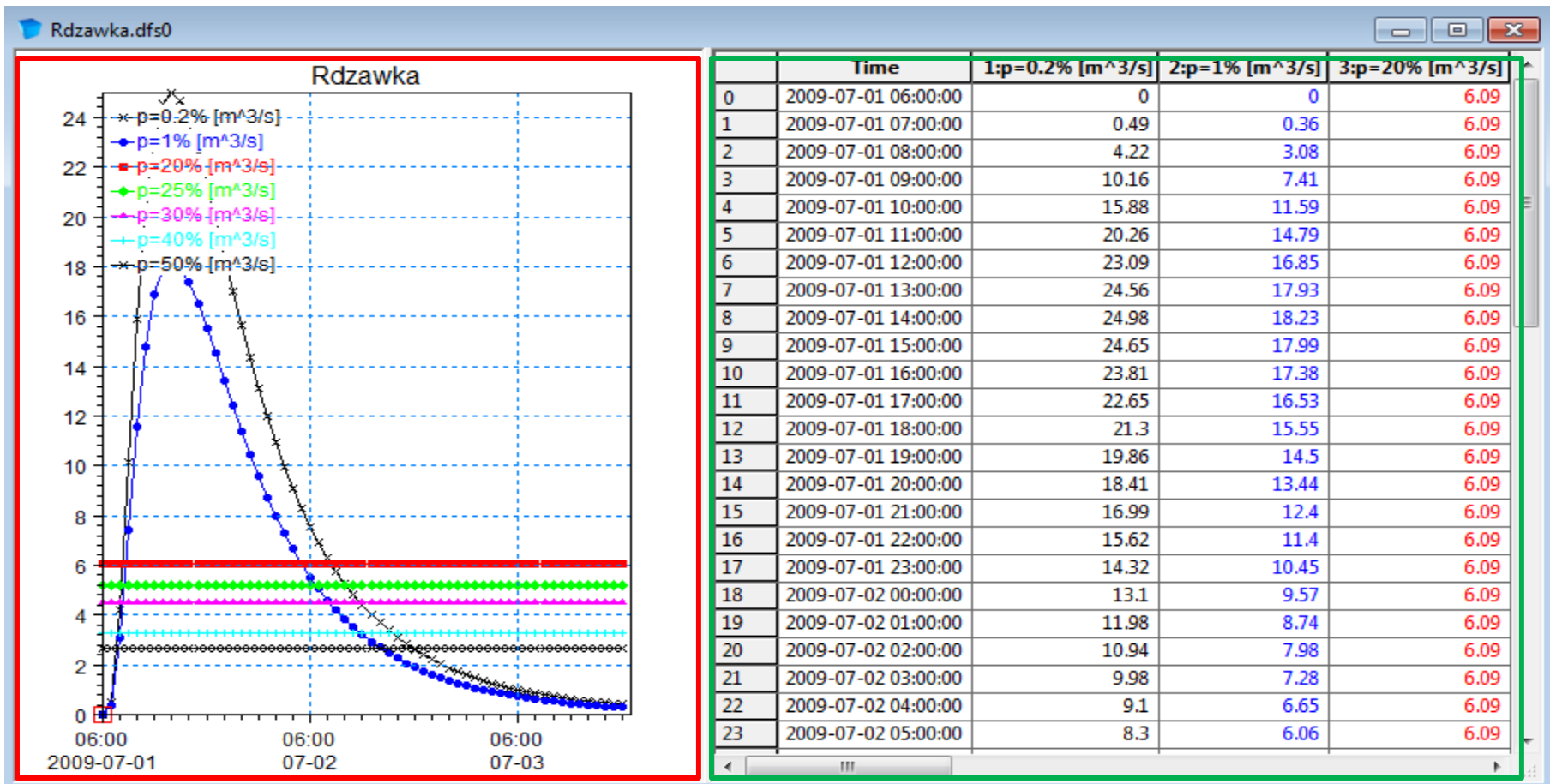
In the Item Information Table the number of flow hydrograph may be defined.

Time series

The Flow Hydrograph window is made up by two views :

table view window with values of flow

graphical view window displays the table view data graphically,

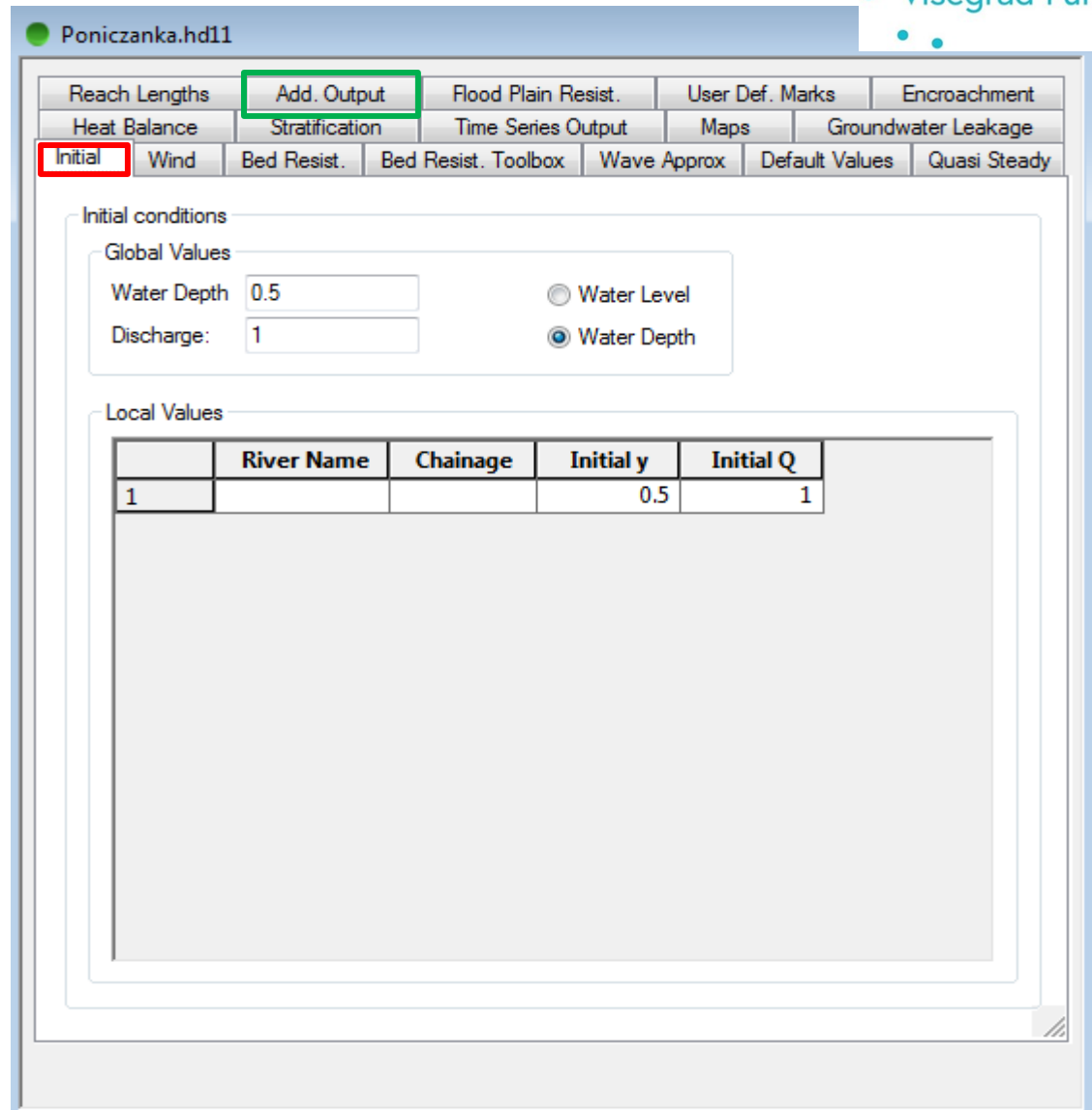


Hydrodynamic Editor

The Hydrodynamic parameters editor (HD-editor) is used for setting sub-plementary data used for the simulation. The Editor has a number of tabs. In our model we will use only two from those tabs:

Add. Output

Initial



Hydrodynamic Editor

Add. Output

The number of simulated parameters can be selected for storage in the additional output results file (with the file name extension 'Ress11').

The parameters are saved for each save step at each h/q point of the river system. Time series and longitudinal profiles of the parameters can be viewed in the same same way as normal MIKE11 result file in MIKE VIEW.

Poniczanka.hd11

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Heat Balance	Stratification	Time Series Output	Maps	Groundwater Leakage		
Initial	Wind	Bed Resist.	Bed Resist. Toolbox	Wave Approx	Default Values	Quasi Steady
Reach Lengths	Add. Output	Flood Plain Resist.	User Def. Marks	Encroachment		
	H or Q points	H and Q points	Total	Structures		
Velocity		<input checked="" type="checkbox"/>		<input type="checkbox"/>		
Discharge	<input checked="" type="checkbox"/>					
Cross Section Area	<input checked="" type="checkbox"/>					
Flow Width	<input checked="" type="checkbox"/>					
Radius	<input checked="" type="checkbox"/>					
Resistance	<input type="checkbox"/>					
Conveyance	<input type="checkbox"/>					
Froude Number	<input checked="" type="checkbox"/>					
Volume	<input type="checkbox"/>		<input type="checkbox"/>			
Flood Area	<input type="checkbox"/>		<input type="checkbox"/>			
Mass Error	<input type="checkbox"/>		<input type="checkbox"/>			
Accumulated Mass Error			<input type="checkbox"/>			
Lateral Inflows	<input type="checkbox"/>					
Water level slope	<input type="checkbox"/>					
Energy level slope	<input type="checkbox"/>					
Energy level	<input checked="" type="checkbox"/>					
Bed shear stress	<input checked="" type="checkbox"/>					
Groundwater head	<input type="checkbox"/>					
Time Step			<input type="checkbox"/>			

Hydrodynamic Editor

Initial

Initial conditions for the hydrodynamic model are specified on this page. The initial values may be specified as discharge and as either water level or water depth.. The global values are applied over the entire network at the start of the computation. Specific local values can be specified by entering river name, chainage and initial values. Local values will override the global specification.

Poniczanka.hd11

Heat Balance	Stratification	Time Series Output	Maps	Groundwater Leakage		
Reach Lengths	Add. Output	Flood Plain Resist.	User Def. Marks	Encroachment		
Initial	Wind	Bed Resist.	Bed Resist. Toolbox	Wave Approx	Default Values	Quasi Steady

Initial conditions

Global Values

Water Depth: Water Level

Discharge: Water Depth

Local Values

	River Name	Chainage	Initial y	Initial Q
1			0.5	1