MIKE
Powered by DHI

# MIKE URBAN+

## Guide to existing MIKE URBAN Users

### Migration

**DHI A/S**
Agern Allé 5
DK-2970 Hørsholm
Denmark

+45 4516 9200 Telephone
+45 4516 9333 Support
+45 4516 9292 Telefax

mike@dhigroup.com
www.mikepoweredbydhi.com

Company Registration No.: DK36466871

# PLEASE NOTE

# CONTENTS

# 1 Introduction

MIKE URBAN+ is the new and future modelling platform for modelling all urban water systems. It is introduced as a full featured urban modelling package for modelling Water Distribution and Collection System. MIKE URBAN+ is the successor of the current MIKE URBAN.

The MIKE 2020 Release will include both MIKE URBAN+ and MIKE URBAN. MIKE URBAN 2020 will be the last release of MIKE URBAN.

The current document targets existing MIKE URBAN users with the aim of informing about the current contents and features of MIKE URBAN+ as well as outlining the main steps involved in migrating from MIKE URBAN to MIKE URBAN+.

# 2 Release and License Information

MIKE URBAN+ is our primary urban software product for sale with the MIKE URBAN+ Release 2019 and forward.

MIKE URBAN will be included with MIKE URBAN+ until the last release of MIKE URBAN 2020. New purchases of MIKE URBAN+ model licenses will include access to both MIKE URBAN+ and MIKE URBAN. The MIKE URBAN+ and MIKE URBAN can coexist on the PC and run simultaneously.

MIKE URBAN+ comes in two versions:

- MIKE URBAN+
- MIKE URBAN+ ArcGIS

The difference between the two version is that the MIKE URBAN+ ArcGIS includes license for ArcGIS Pro, ArcGIS and one seat for ArcGIS Online as well as installation files for ArcGIS Pro.

In both MIKE URBAN+ and MIKE URBAN+ ArcGIS, there is an ArcGIS integration option by which integration with ArcGIS Pro is possible. This integration requires a license for ArcGIS Pro.

Existing users of MIKE URBAN with a valid Service and Maintenance Agreement (SMA) will get access to MIKE URBAN+ ArcGIS version without additional fees.

## 2.1 Releases

MIKE URBAN+ will be released in two parts:

- the first release in May 2019, MIKE URBAN+ 2019 includes for water distribution and collection systems
- the second release in November 2019, MIKE URBAN+ 2020 includes:
    - 2D Overland flood modelling
    - Culvert Structures

- Sediment Transport
- Import of existing MIKE URBAN Scenarios
- Enhanced LTS functionality
- Improved result presentation workflow

# 3 Getting Started with MIKE URBAN+

This chapter provides a quick introduction to MIKE URBAN+. MIKE URBAN+ supports both Collection System and Water Distribution modelling.

Examples files for both Collection System and Water Distribution is provided with the installation in both SI and US units.

In the following illustration of a Collection System model, Sirius is used as an example.

## 3.1 Open MIKE URBAN+ model and explore MIKE URBAN+ GUI

1. Start MIKE URBAN+

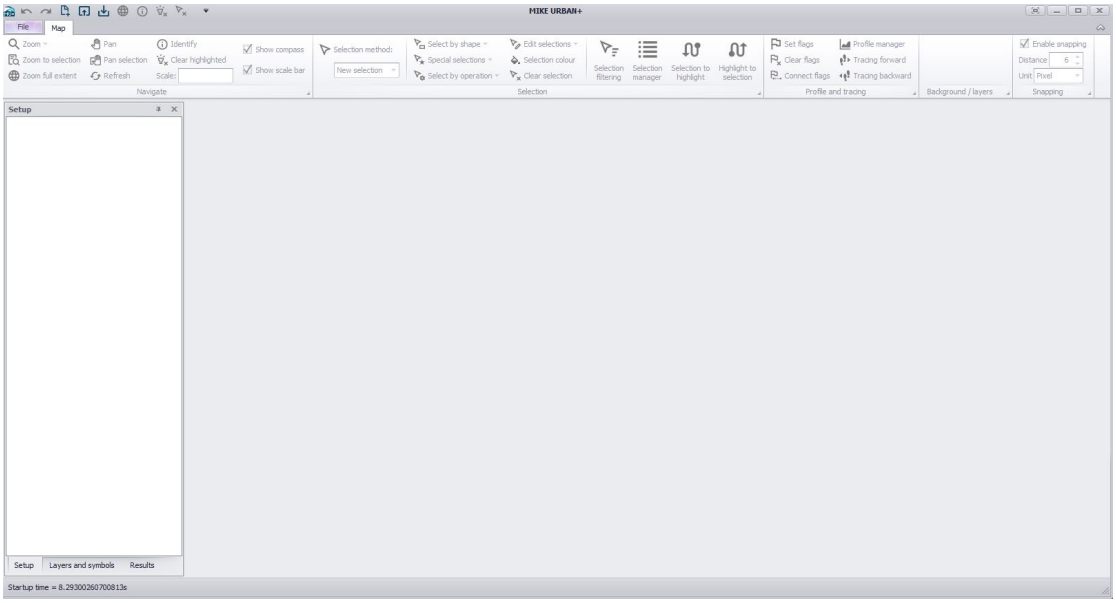


Figure 3.1 Start screen

2. Open the model Sirius.mupp

    a. File/Open

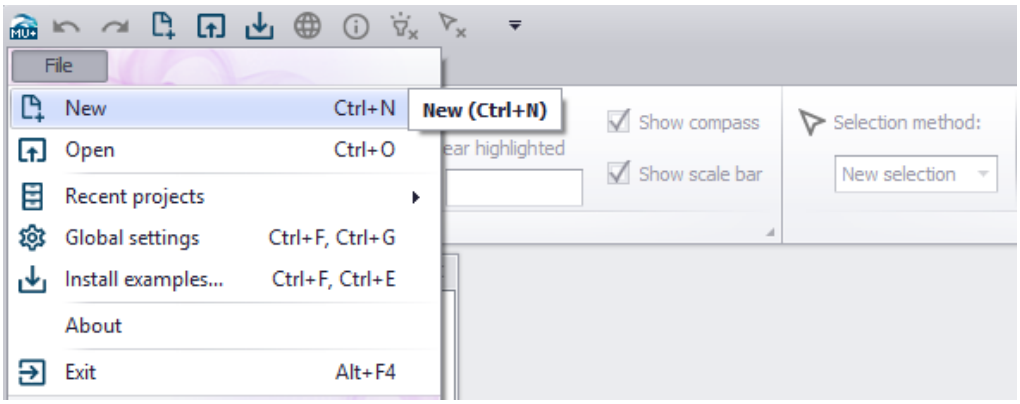


Figure 3.2 File | New

b. Browse to the MIKE URBAN+ project file Sirius.mupp and click “Open”

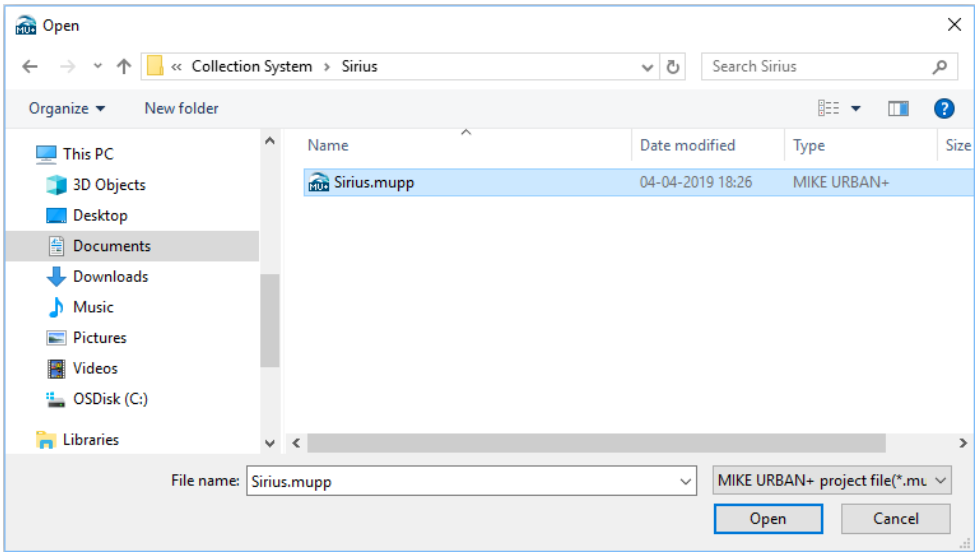


Figure 3.3 Browse for MIKE URBAN+ project file, *.mupp

c. Review the application window

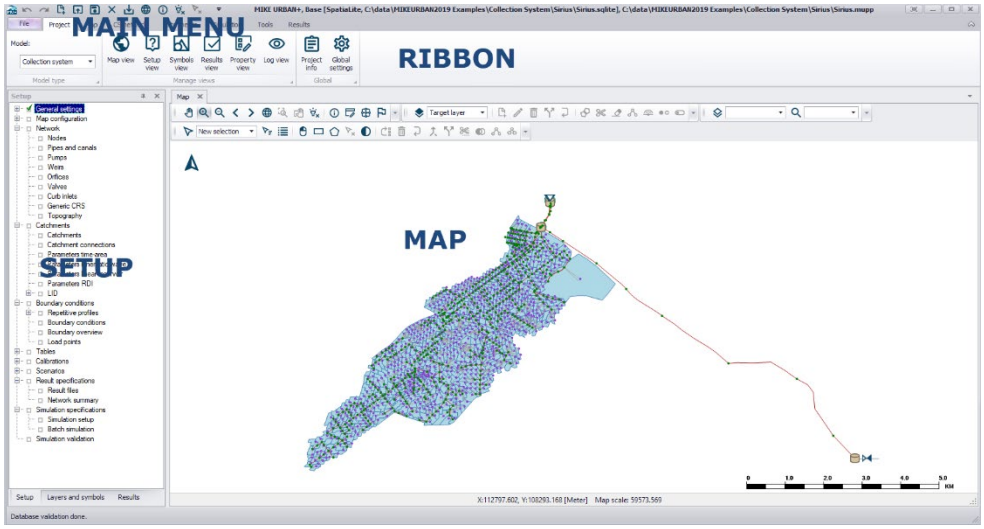


Figure 3.4 Overview application window

MAP: map view of the model with default symbology

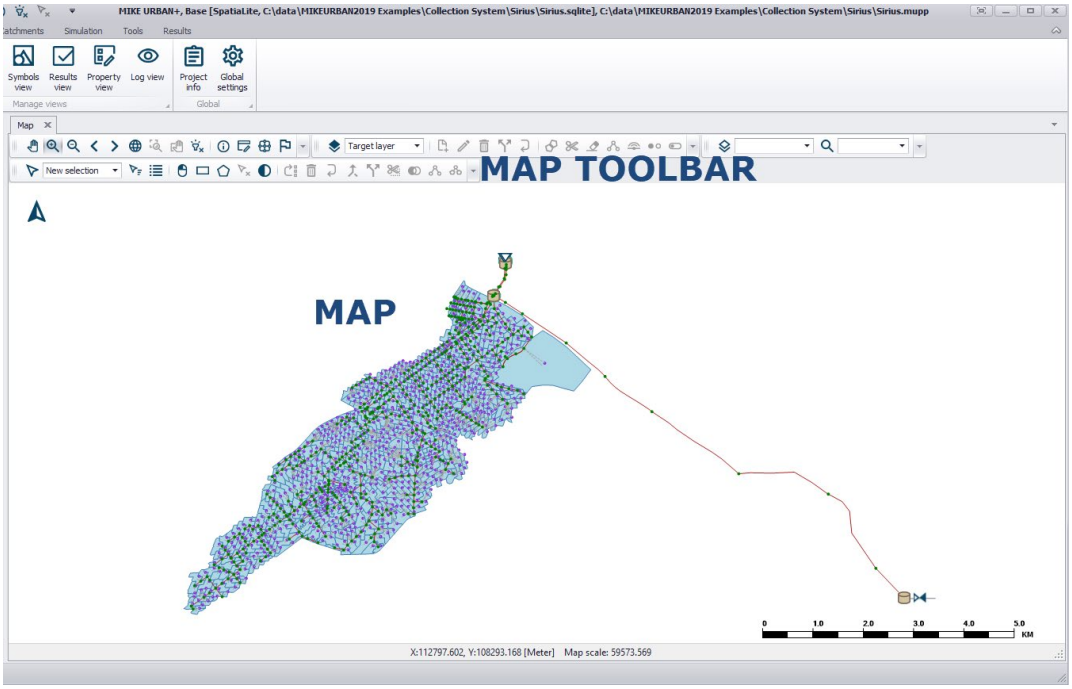


Figure 3.5 Map and toolbar window

The map is per default ‘docked’, but can be ‘floated’ (right ‘click’ + Float).

The map is brought to the front by clicking on the ‘Map’ tab)

Setup: One of three ‘Table of contents’:

- **Setup**: Access to model setup editors
- **Layers and Symbols**: Configuring map symbols
- **Results**: Result presentation

Context-sensitive contents – only editors associated with currently active modules are shown (controlled by ‘Modules’ editor)

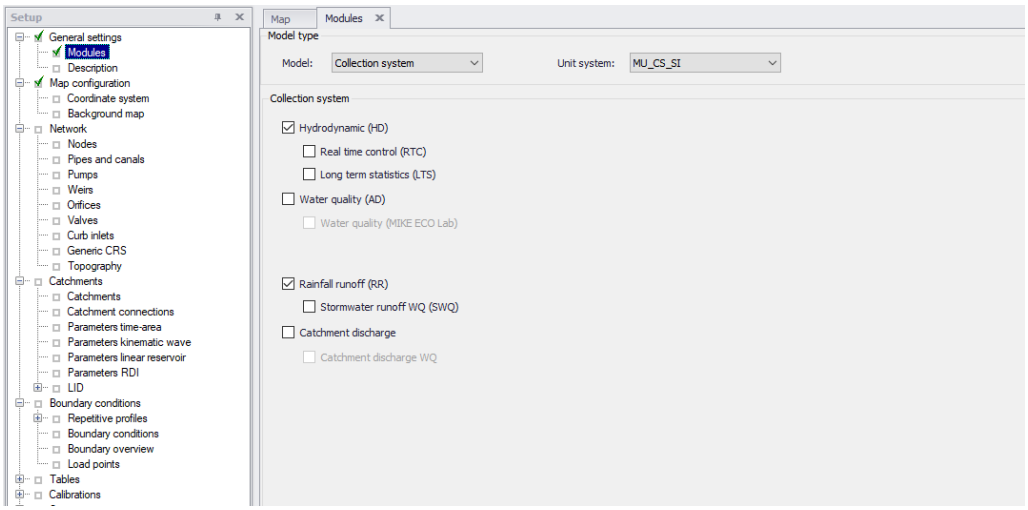

Figure 3.6 Modules selection
Logical workflow sequence, entries organised in modules and groups

Data validation:
Green: all OK
Red: Some data is incomplete or incorrect

## 3.2 Project Info: provides a general information on the project contents

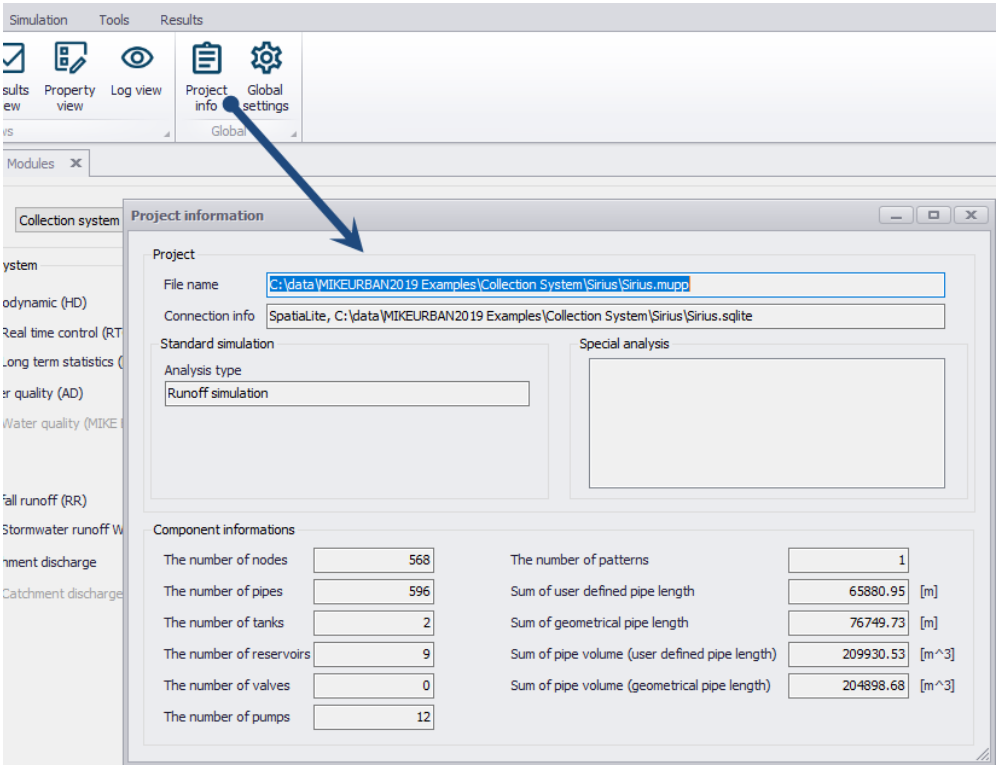


Figure 3.7 Project information

### 3.2.1 Find about editors functionality

#### General features

A click on any group entry folds/unfolds a group.

A click on any low-level entry opens an editor and per default docks it as a tabbed document.

'Docked' editors are displayed one at a time. Any editor can be brought to the front by clicking on its tab.

When 'Floated', editors are displayed in a stack, with the active editor on top.

MIKE URBAN+ GUI with 'floating' editors:

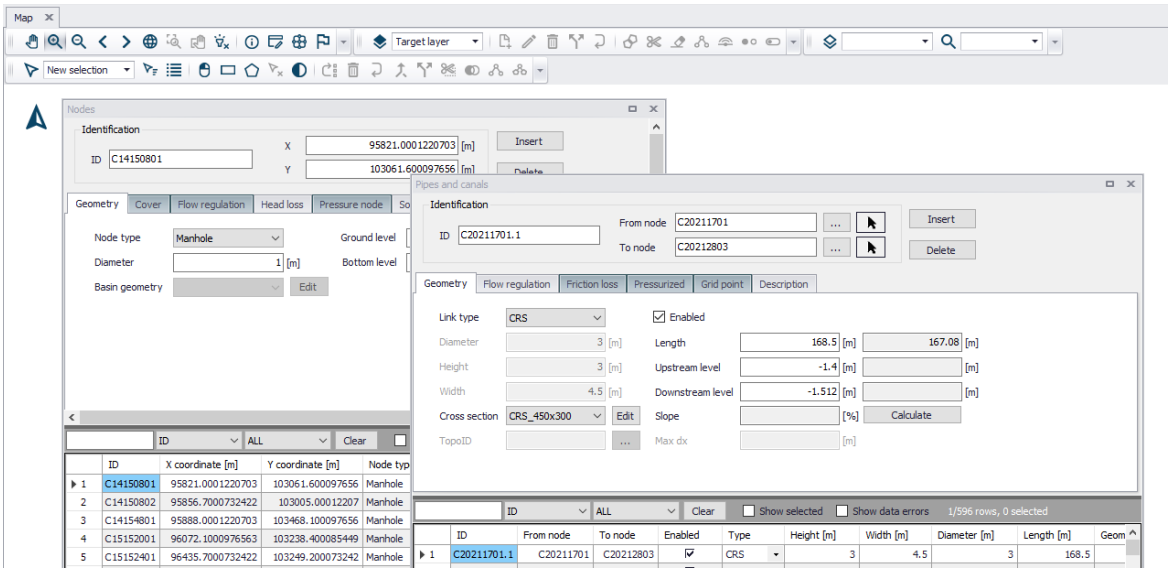

Figure 3.8 Dialogs floating

MIKE URBAN+ GUI with all editors ‘docked’. Only the active ‘Catchment Connections’ editor is visible:

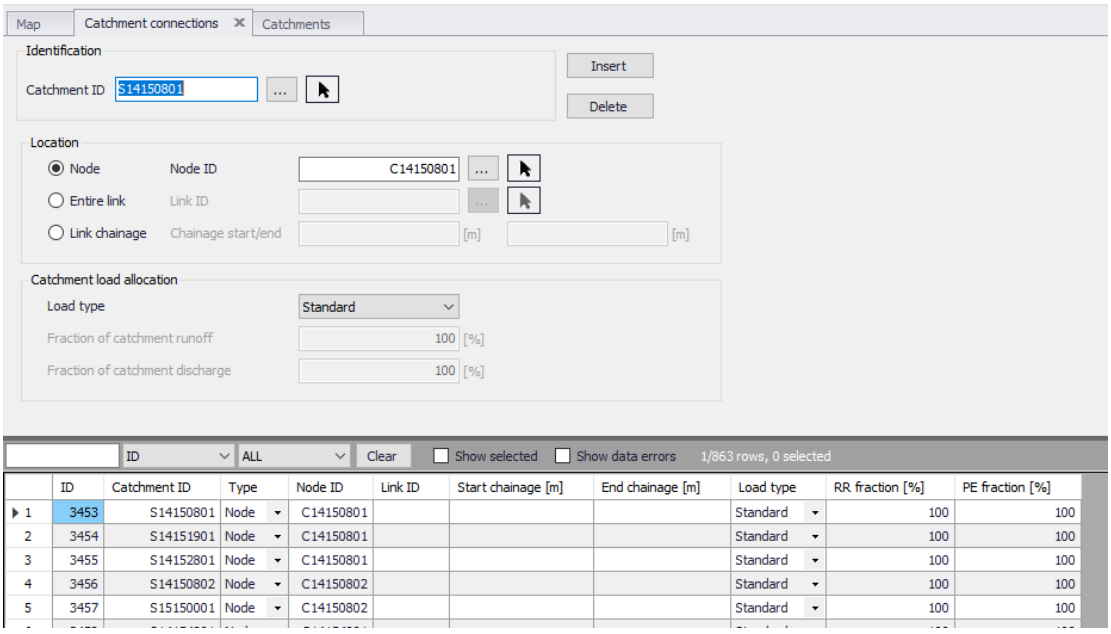

Figure 3.9 Dialogs docked

## 3.2.2 Editor Functionality

### Error validation

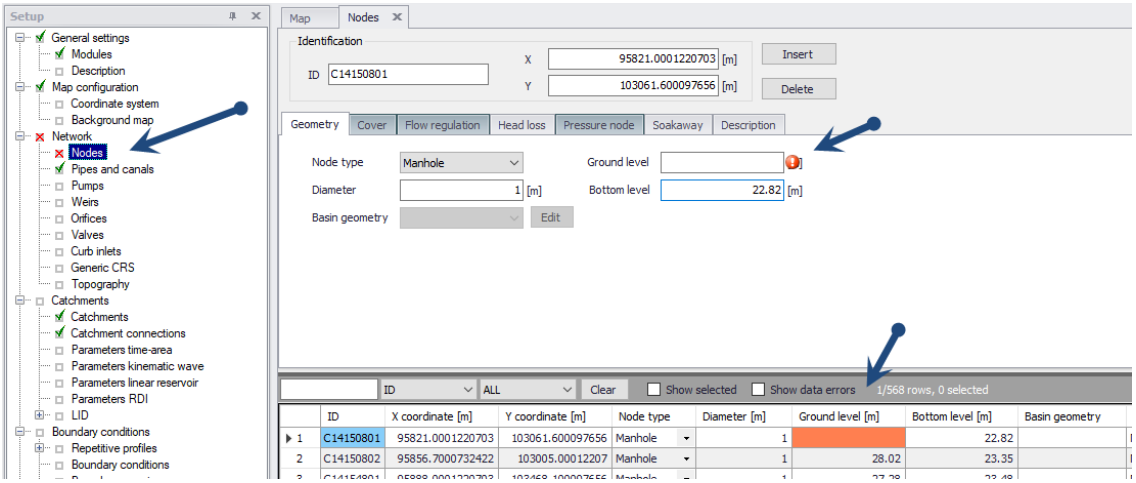


Figure 3.10 On-the-fly data validation

### Filtering

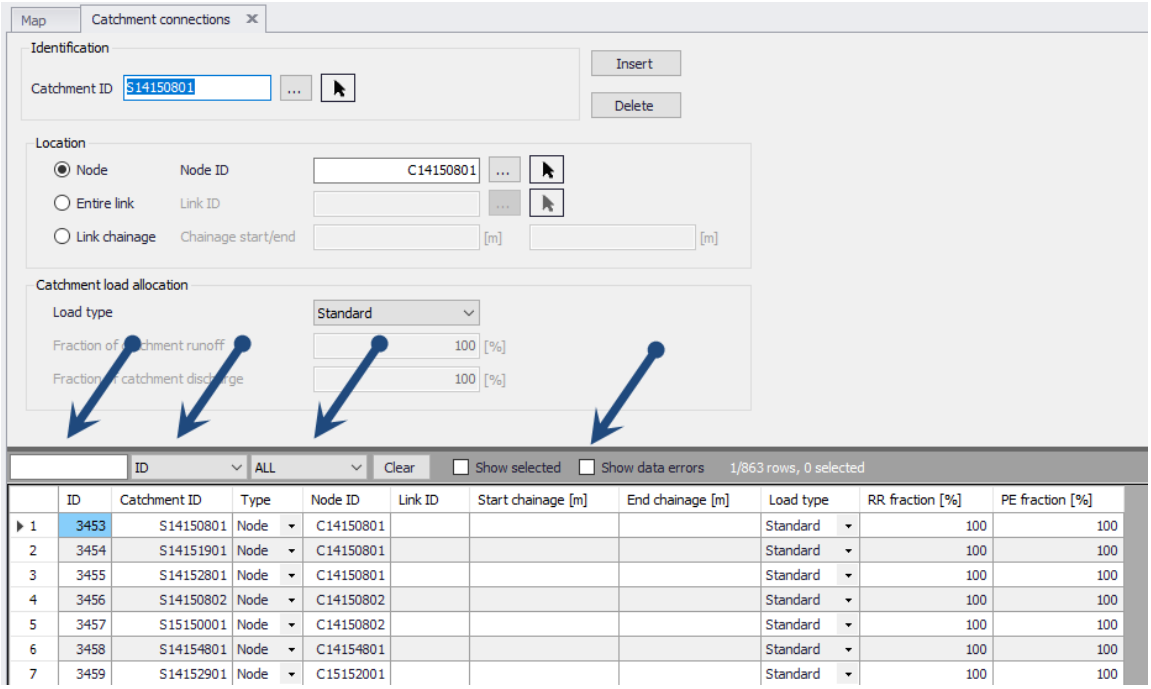


Figure 3.11 Catchment Connections

### Other functions

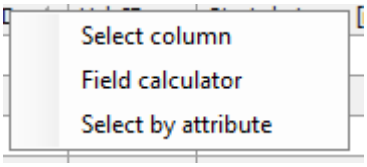


Figure 3.12 Grid functions (1)

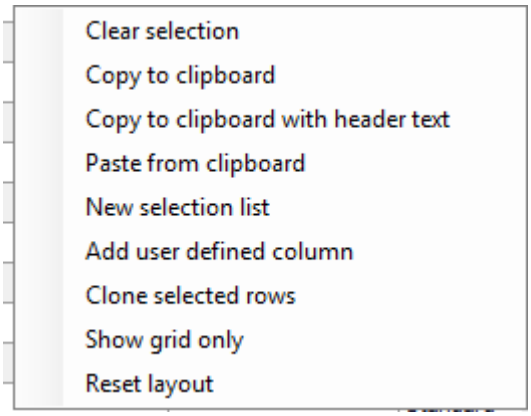


Figure 3.13 Grind functions (2)

## 3.3 Project info

Provides some basic information about project contents.

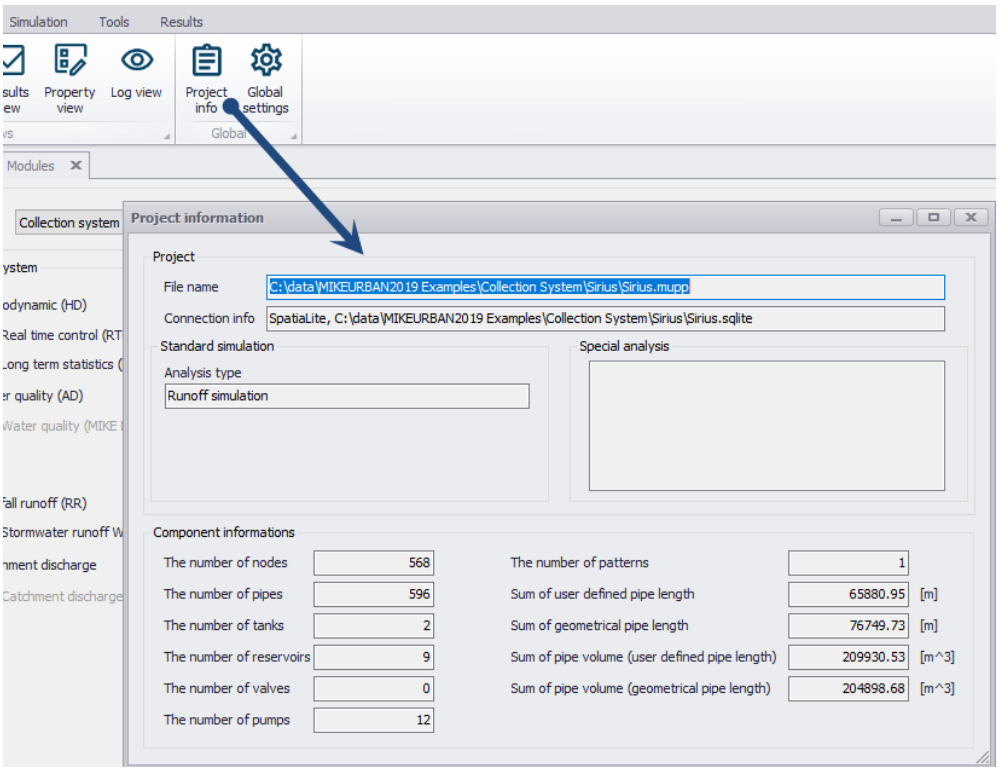


Figure 3.14 Project Info

## 3.4 Boundary conditions

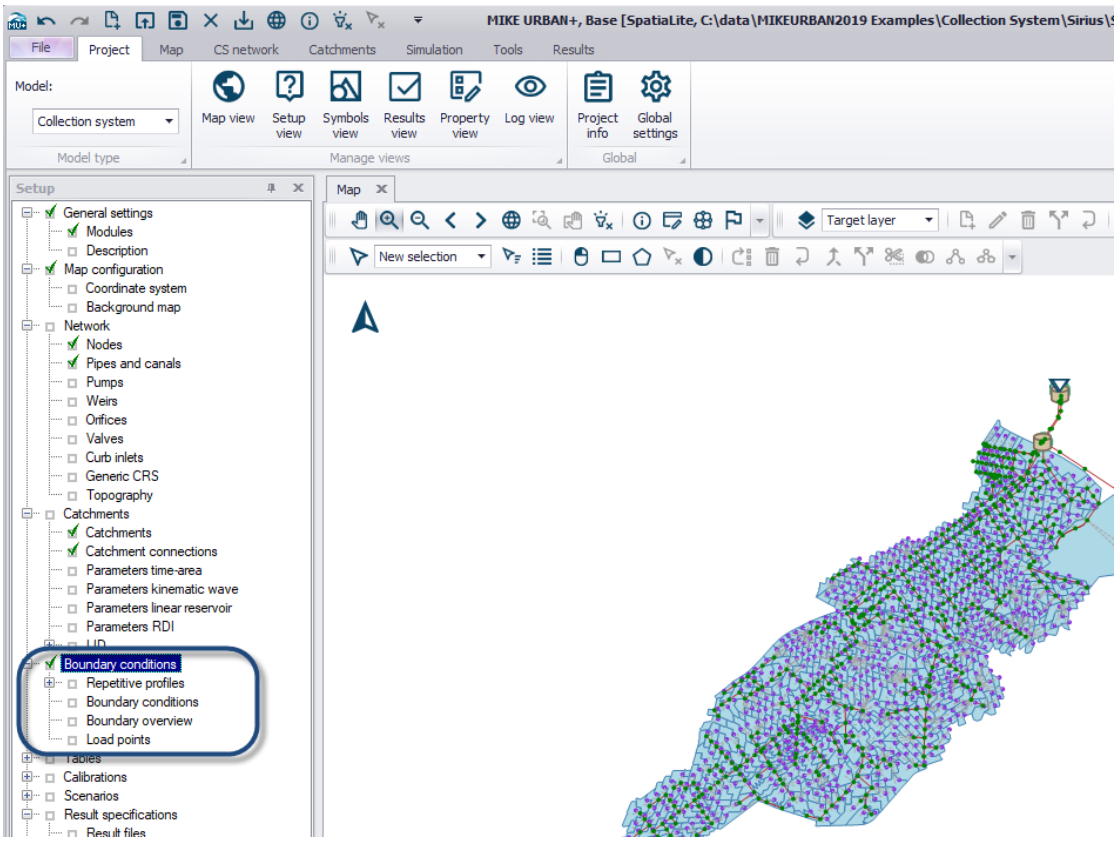


Figure 3.15 Boundary Conditions

### 3.4.1 Boundary Conditions Editor

#### ‘Identification’ box

BC ‘passport’: Identifier (name), Type, Activity

Serves all types of BC.

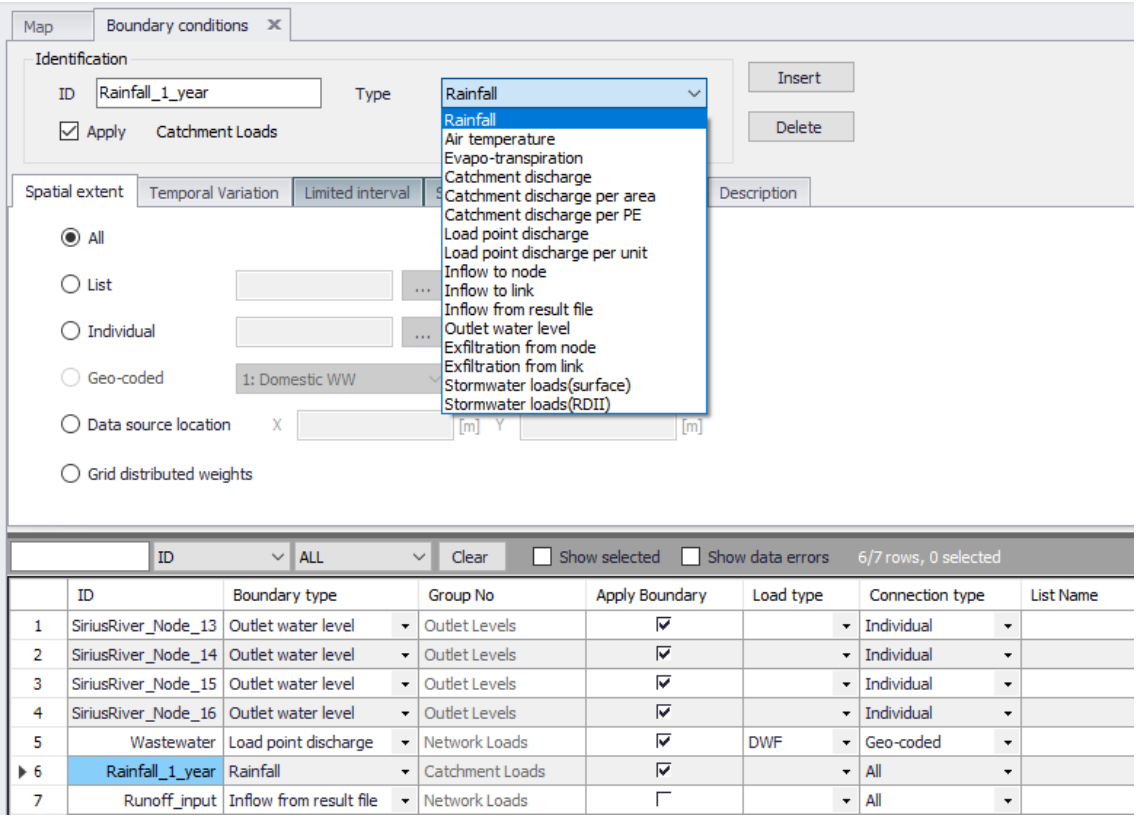


Figure 3.16 Boundary Conditions

## ‘Spatial extent’ TAB

Linking of the actual BC with the model

- All – entire model

- List (selection): reference to a sub-set of model elements, defined in a ‘selection manager’ (in MU Classic: ‘*.mus’ file)
- Individual: reference to individual model element
- Geo-coded: applies for load points associated with individual model elements
- Data source location: applies for meteorological stations ( e.g. rain gauges)
- Grid-distributed weights: applies for rainfall supplied as RADAR grid data

## ‘Temporal variation’ TAB

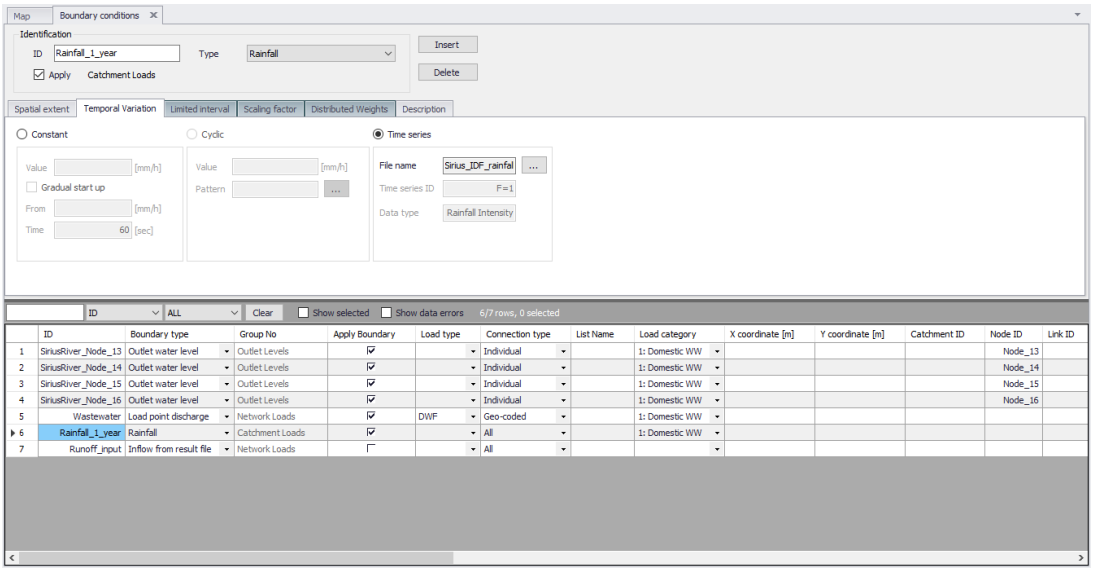


Figure 3.17 Temporal Variations

Provides information about quantities and temporal variation

- Constant
- Cyclic
- Time series

## ‘Limited interval’ TAB

Per default, a BC applies during entire simulation period. Activating ‘Limited interval’ restricts the BCs activity for the specified time interval only

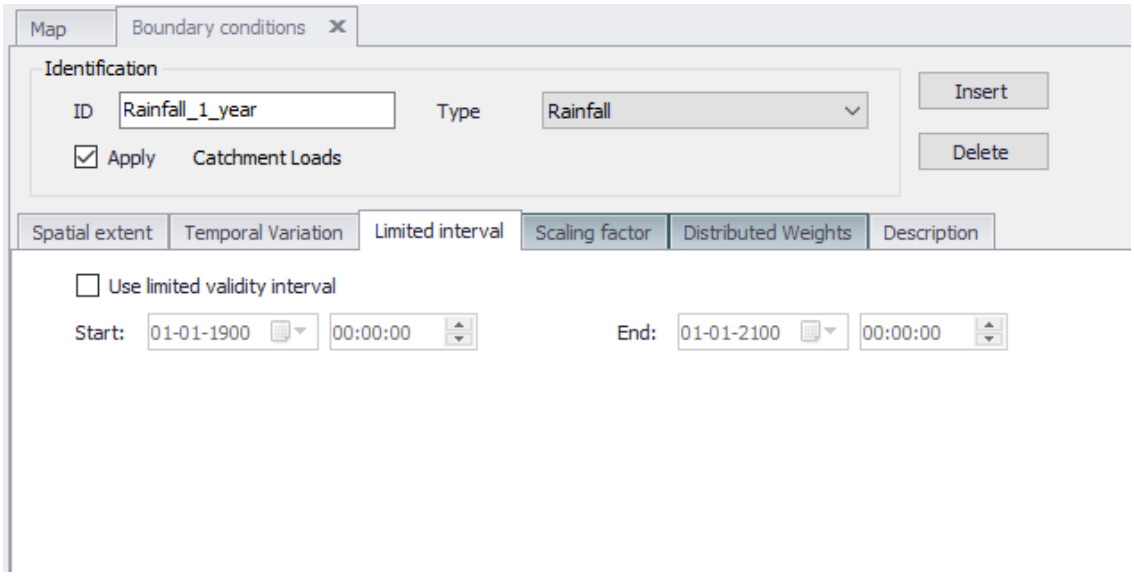


Figure 3.18 Limited interval

## Scaling factor 'TAB'

'Scaling factor' other than '1' scales the specified BC quantity up or down.

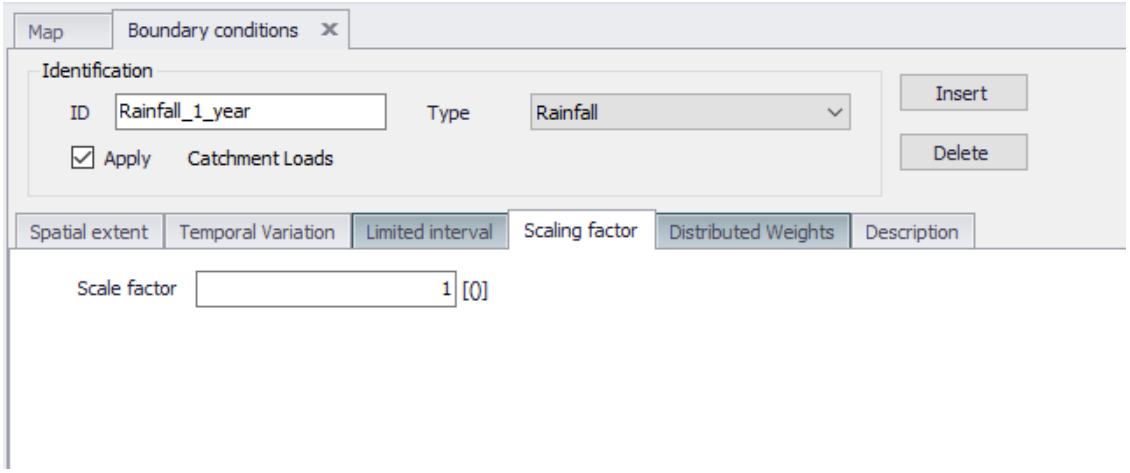


Figure 3.19 Scaling factor

## 'Distribute weights' TAB

Contains user-specified or automatically computed 'weighting factors', i.e. contributions of RADAR grid cells to each catchment in the model. Note that the sum of weights for each catchment must be one. Data validation automatically controls that the data are correct.

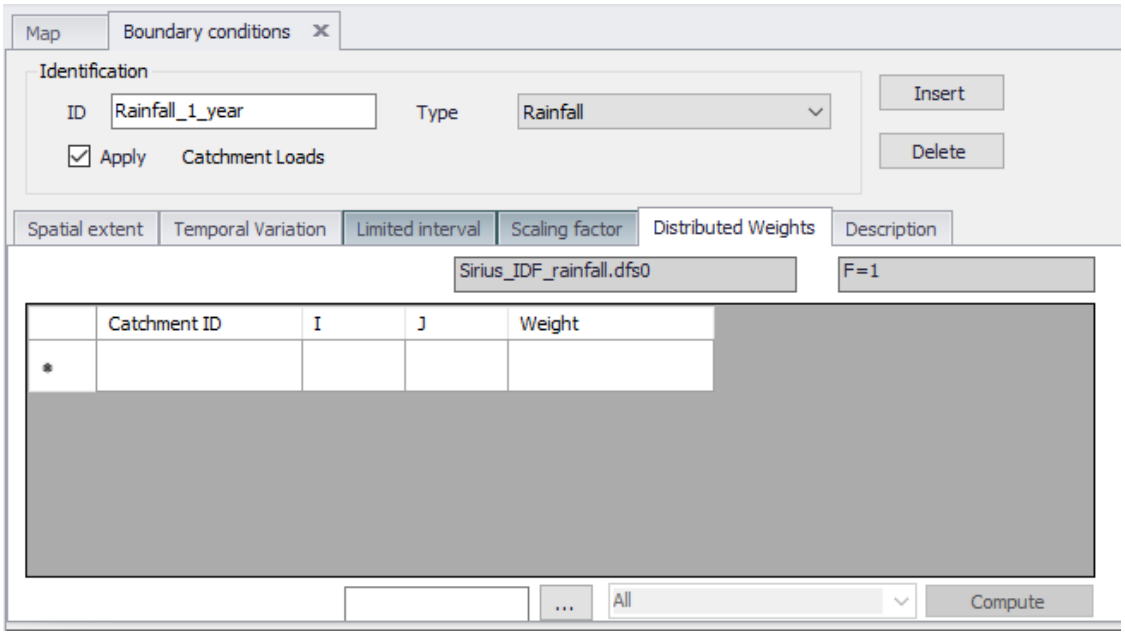


Figure 3.20 Distributed Weights

## 'Description' TAB

Contains user-specified description of the actual BC. Good as a reminder!

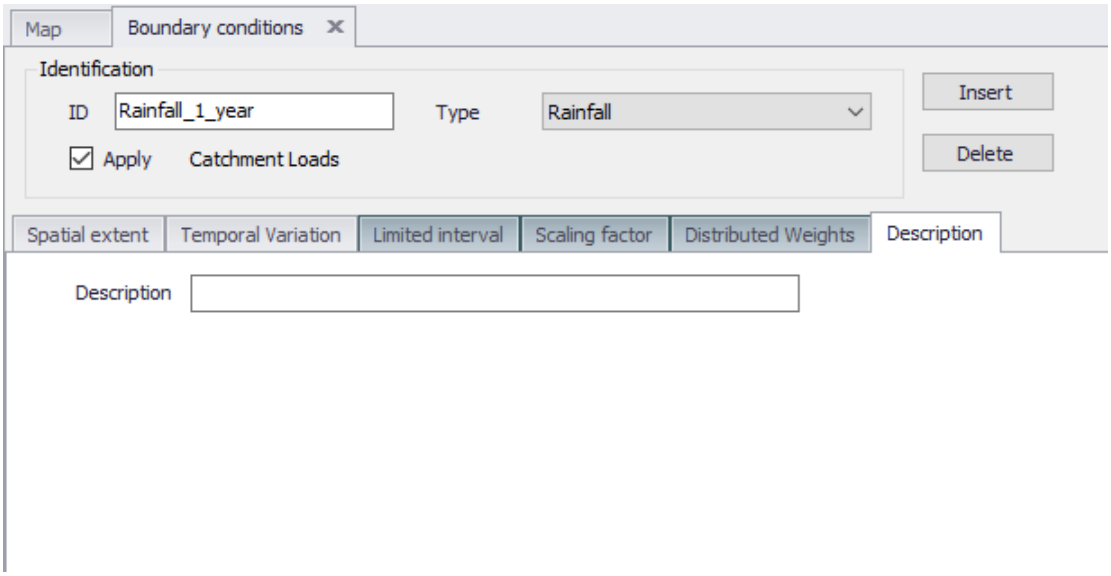


Figure 3.21 Boundary Conditions - Description

## 3.5 Result specification

### 3.5.1 Result Files

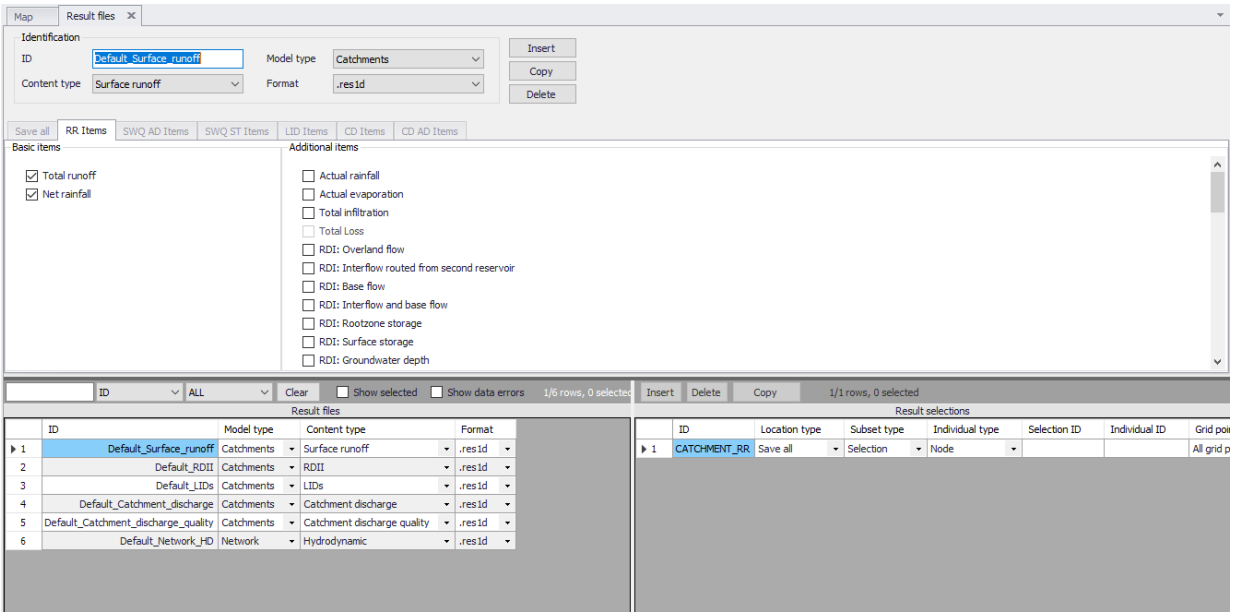


Figure 3.22 Result files

### ‘Identification’ box

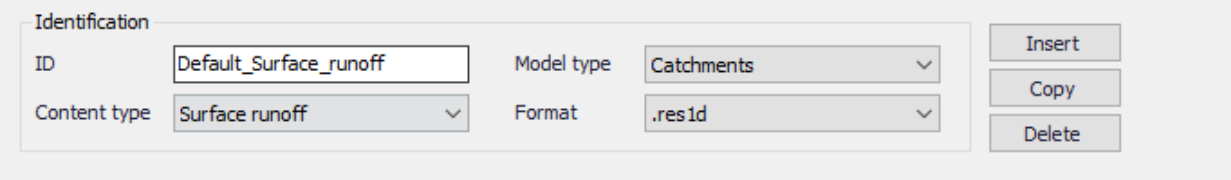


Figure 3.23 Identification box

Contains basic information about the result file:

- ID: ResultFileID is a part of the unique result file name, which is created as: SimulationID+ScenarioID+ResultFileID+format extension
- Model Type: Makes a distinction between ‘Catchments’ model and ‘Network’ model. This distinction controls possible contents types and formats.
- Content type: Each of the above model types can generate various contents. Result file may contain just one type of contents (keeps various types of results in separate files), or the contents may be mixed (puts various types or results in one result files)
- Format: various types or results may be saved in various formats: res1d and dfs0

### Default result files

For each model type, MIKE URBAN+ database contains several definitions for default result file contents for each type of simulation.

Simulation results are distinguished as ‘basic items’ and ‘additional items’

Default content may be user-modified to include or exclude specific result items.

Default result files contain results for the entire model.

List of accessible default result file definitions adjusts dynamically, depending on the activate modules.

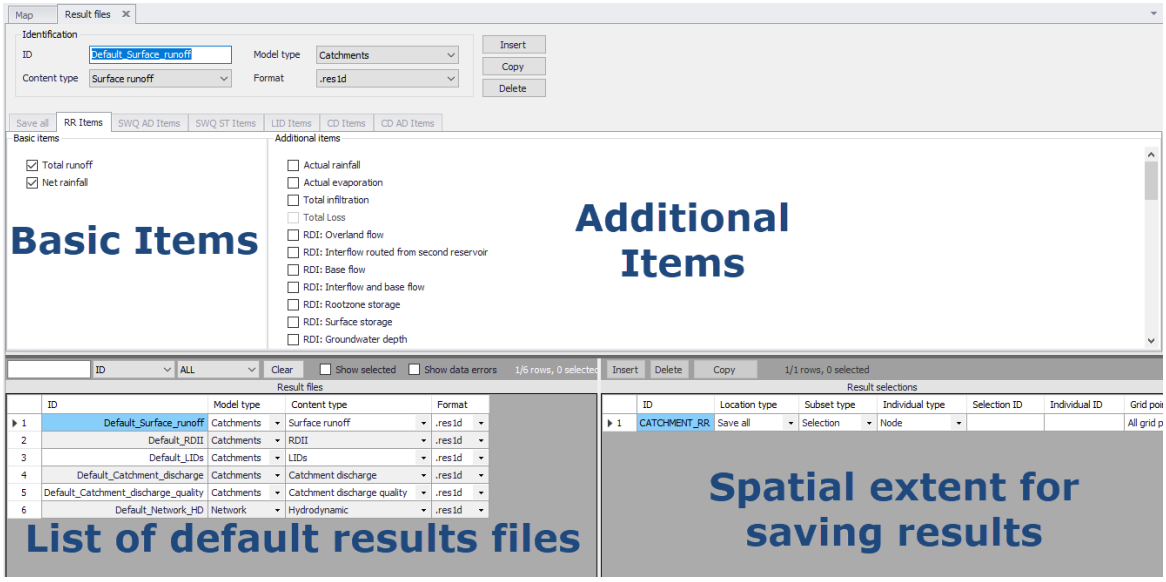


Figure 3.24 Result files

## User-specified result files: Contents type

The default list of result files can be extended to include any number of result file definitions, distinguished by the format, contents type and geographical extensions.

User-specified result files may include mixed-contents from the same model type. E.g., a mixed-content result file may include both runoff and surface pollutant results in one file. Of course, user-specified result file may be limited to include only one type of content.

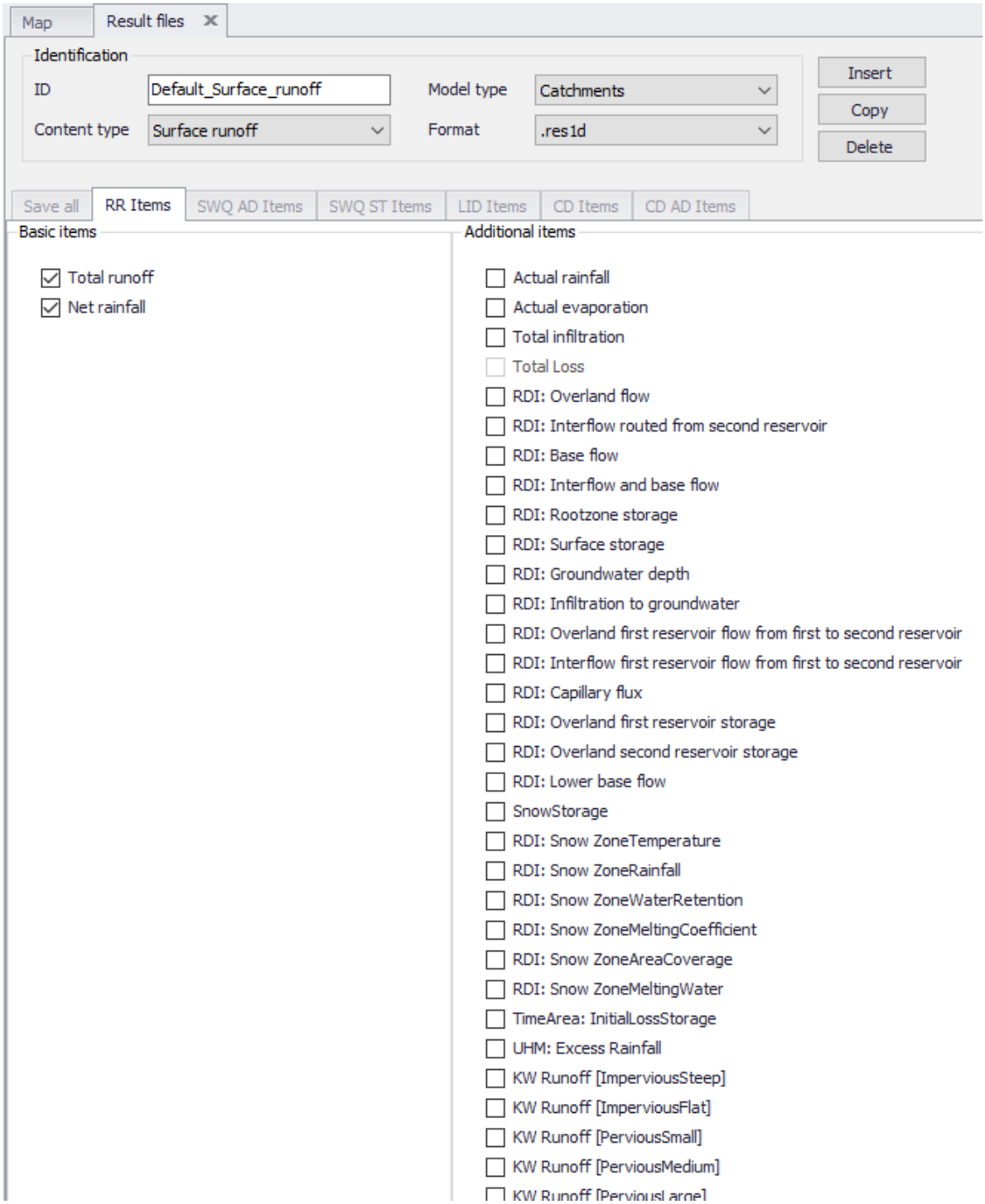


Figure 3.25 Additional Results

Various result items are accessible through currently active TABS. The TABs activity depends on the selected model type, contents type and active modules.

## User- specified result file: Location

All specified results will be saved only as the specified locations

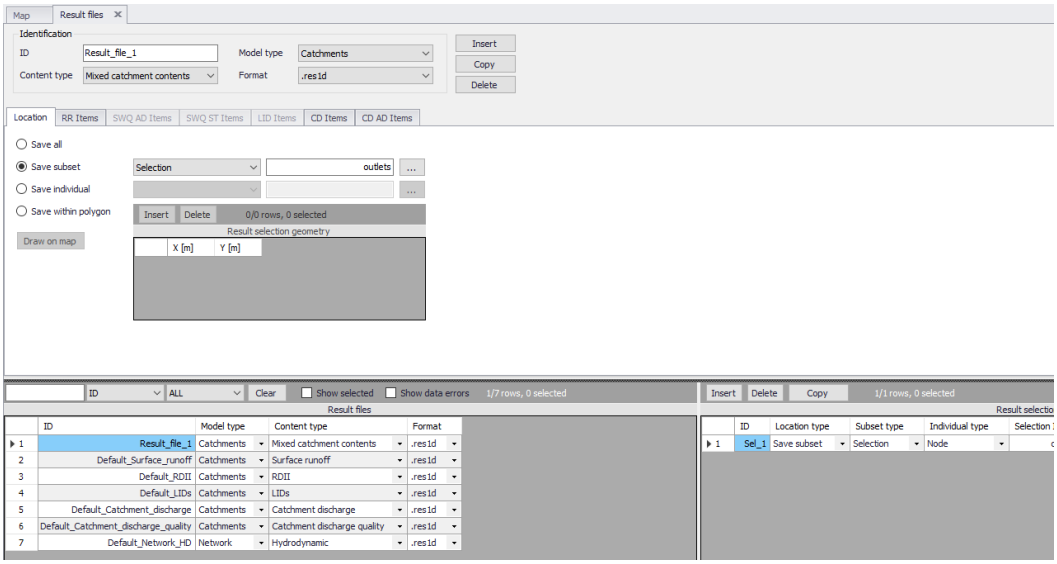


Figure 3.26 Result files location

Saving result may be specified at:

- Save All: saves the wanted results at all model elements
- Save subset: saves the wanted results for model elements included in the chosen selection
- Save individual: saves the wanted results for the specified individual model element
- Save within polygon: saves the wanted results for the model elements located within a polygon drawn on the map

'Location' for one result file may be defined by any number of location definitions. Overlapping location definitions are ignored (the results are saved only once).

### 3.5.2 Network summary

Any number of summary contents can be specified and associated with network model simulations

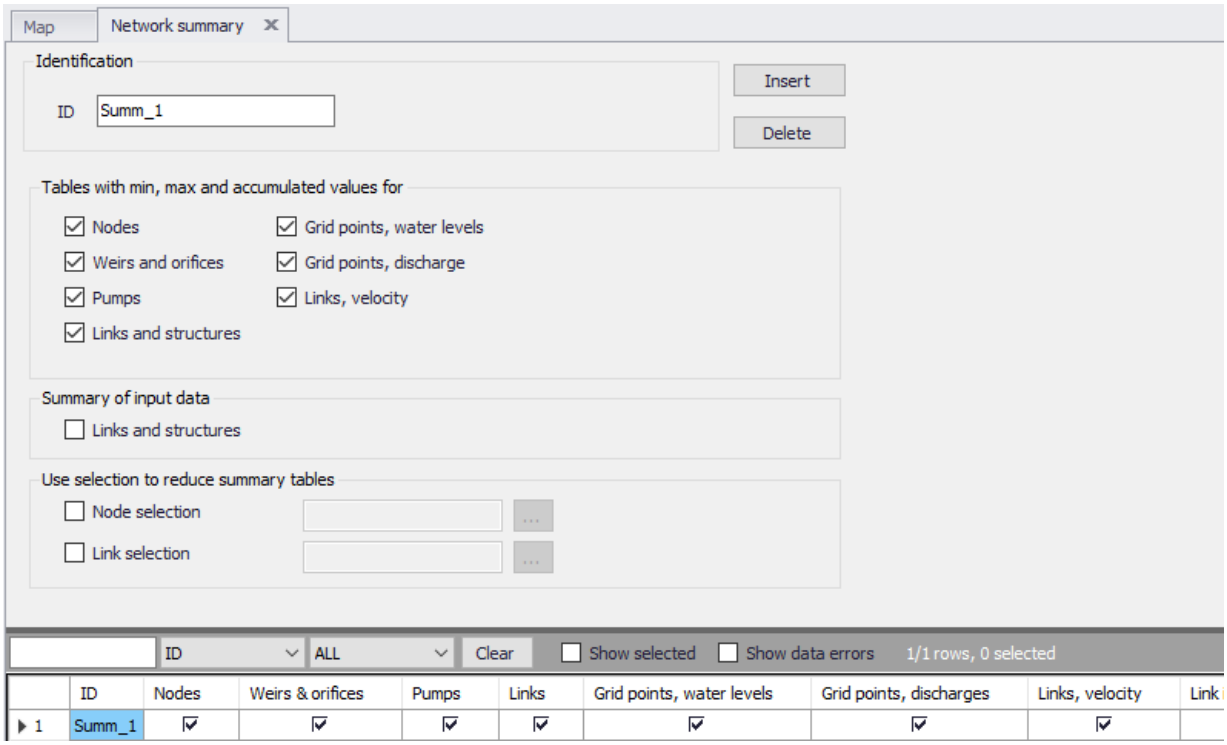


Figure 3.27 Network summary

## 3.6 Simulation setup

### 3.6.1 'Identification' box and function buttons

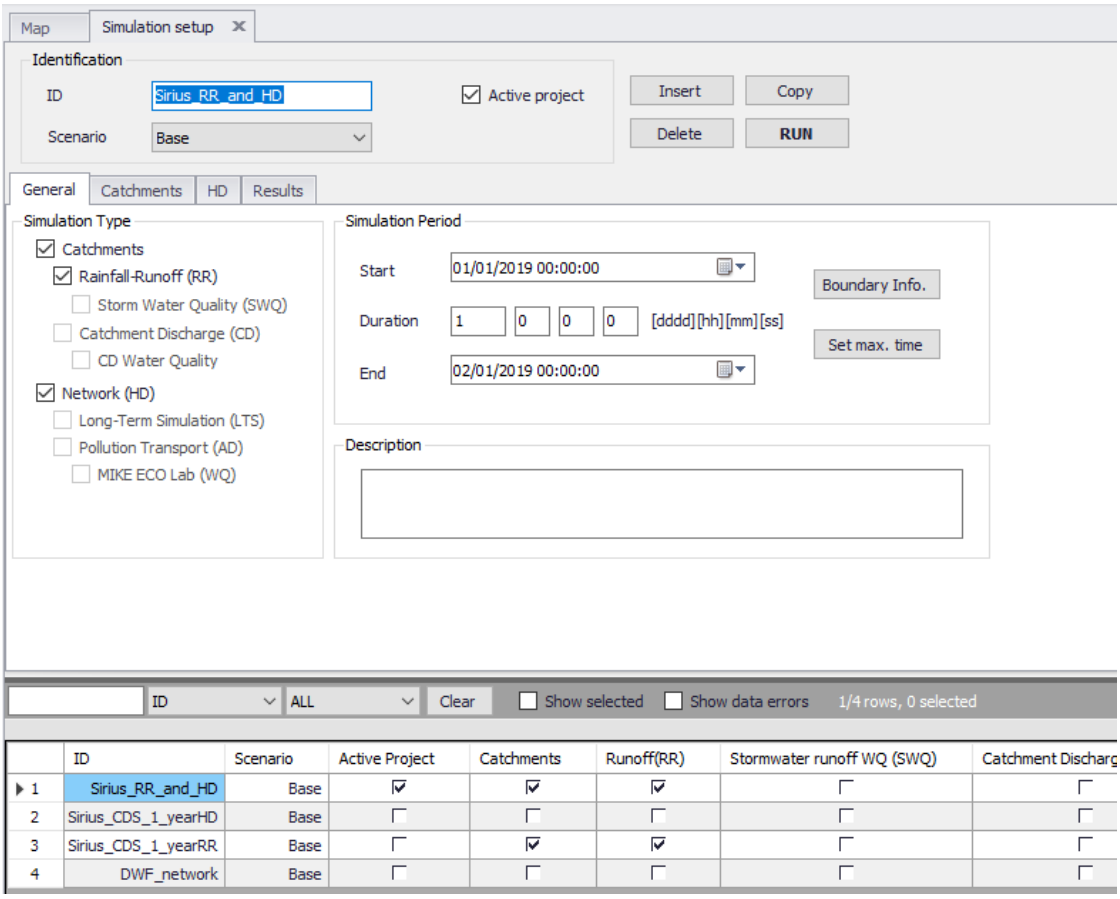


Figure 3.28 Simulation setup

- ID: Unique simulation ID, used in the result file name
- Scenario: Scenario to be used for the current simulation. In some cases, model setup based on selections (e.g. requested result outputs, boundary conditions, etc.) may conflict with the contents of the selected scenario
- Active project: Automatically set to the last simulation setup executed.
- Insert button: Inserts a new simulation setup
- Copy button: copies a specified simulation setup (increased productivity)
- Delete button: deletes actual simulation setup record
- RUN button: Executes the actual simulation setup record

Access to various functionalities related to executing simulations, under 'Simulations'

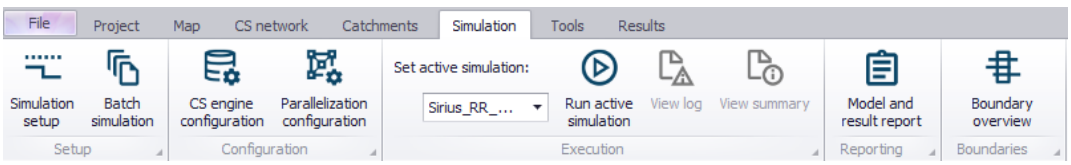


Figure 3.29 Simulation ribbon tools

### 3.6.2 'General' TAB

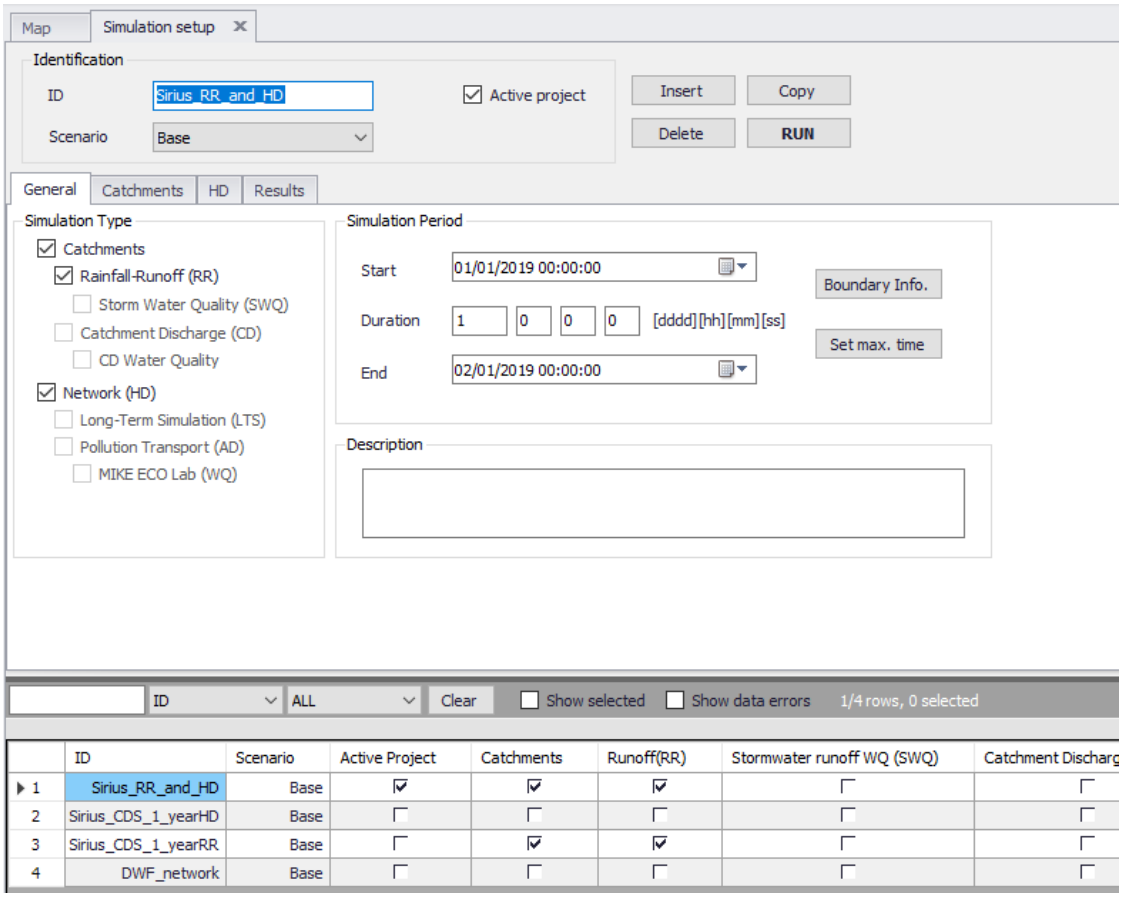


Figure 3.30 Simulation setup

- Simulation Type: Choice of modules to be included in the simulation. Accessible modules depend on module activation, model setup data and module dependency
- Simulation Period: start and end time for the simulation, limited by the active boundary conditions (note some exceptions!)
- Description: user-specified reminder information about the actual simulation
- Boundary Info: provides overview of the extent of the active boundary conditions
- Set max. time: sets the maximum extent of the simulation (the earliest possible start time and the latest possible end time), based on active boundary conditions

### 3.6.3 Module TABS

- Catchments TAB: Contains data for any catchment simulation (runoff, SQW, catchment discharge)
- HD TAB: Contains data for network hydraulics simulation setup
- AD and WQ: Contains pollution transport and WQ – specific data for network simulation setup
- LTS: Contains LTS-specific simulation setup data

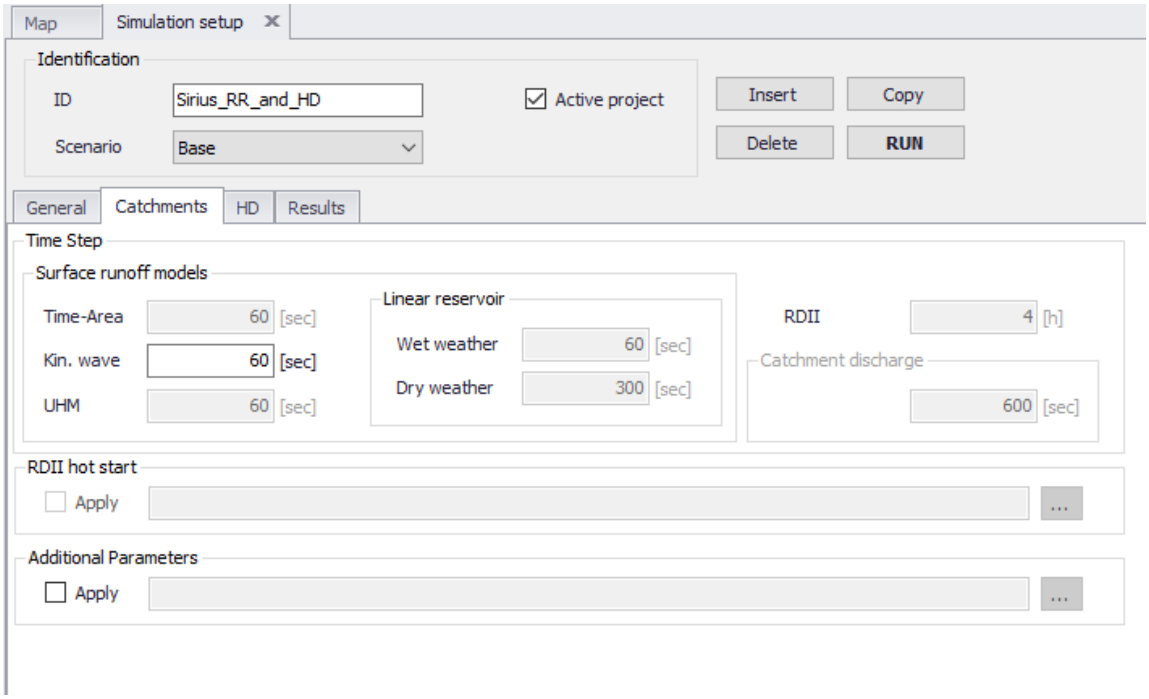


Figure 3.31 Simulation setup

## 3.6.4 'Results' TAB

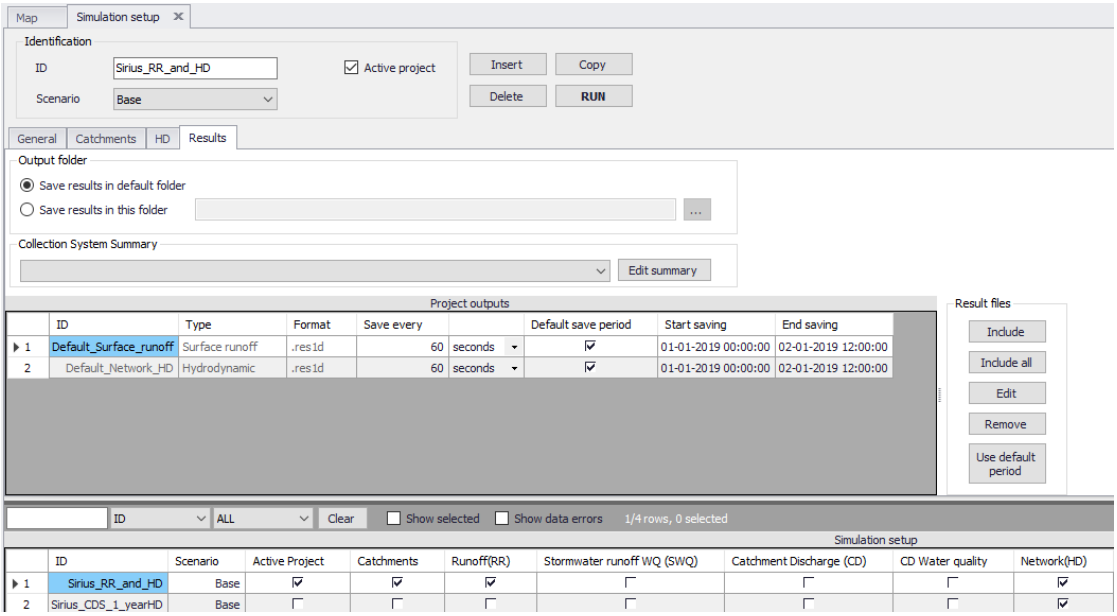


Figure 3.32 Results specifications

- Output folder: Default (= Project folder) or user-specified location
- Summary: reference to a network summary definition
- Result files: List of selected result files. Initially, the output list include default result files for all modules included in the simulation. This list can be modified by deleting the unwanted result files and including user-specified result files.

## 3.7 Results

Result presentation supports ‘ordinary’ time series result presentation, as well as LTS statistics.

### 3.7.1 Loading result files

Per default, results from current simulations are automatically loaded for the presentation. This feature can be toggled ON/OFF in ‘General Settings’:

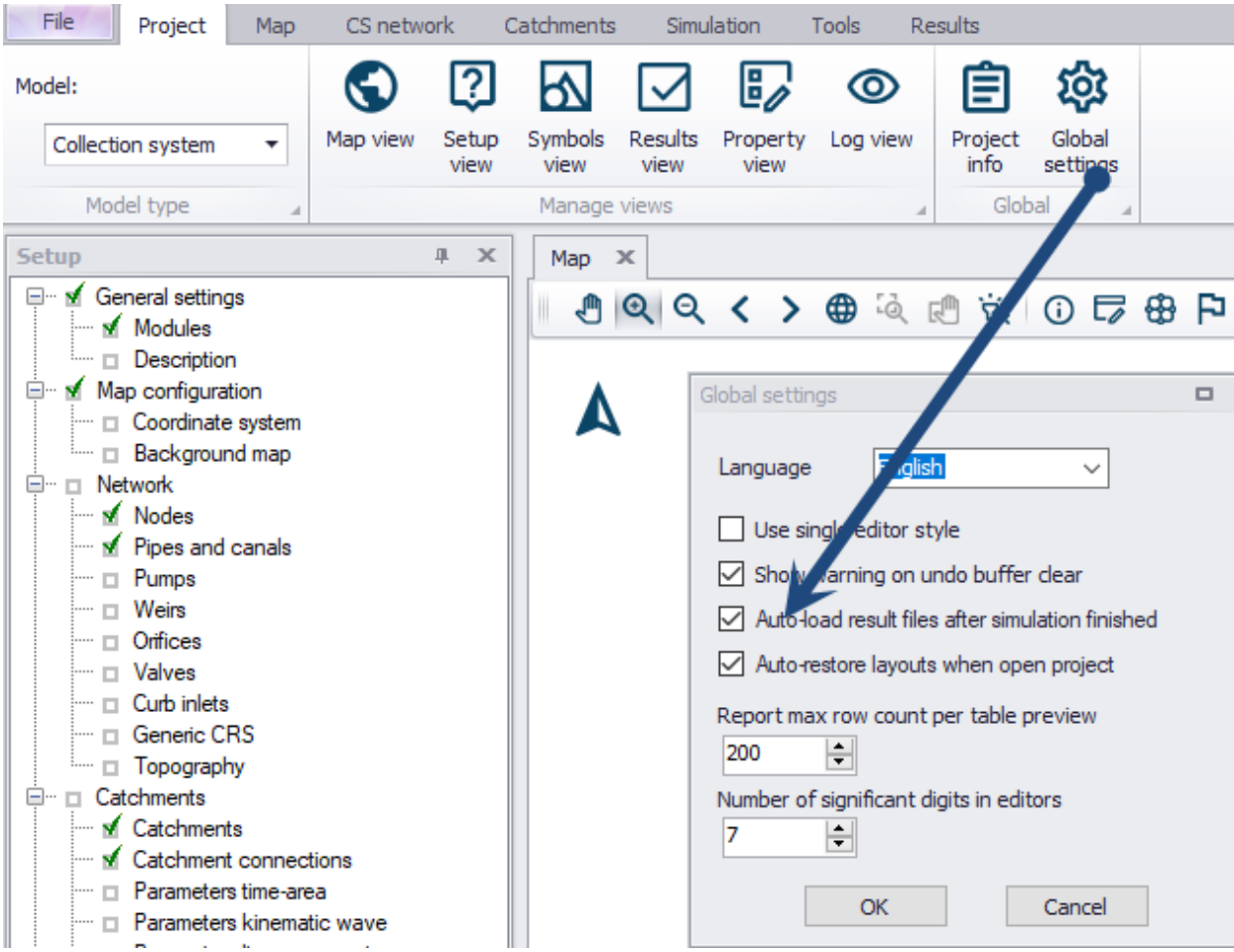


Figure 3.33 Global settings

Results are accessible through ‘Result View’.

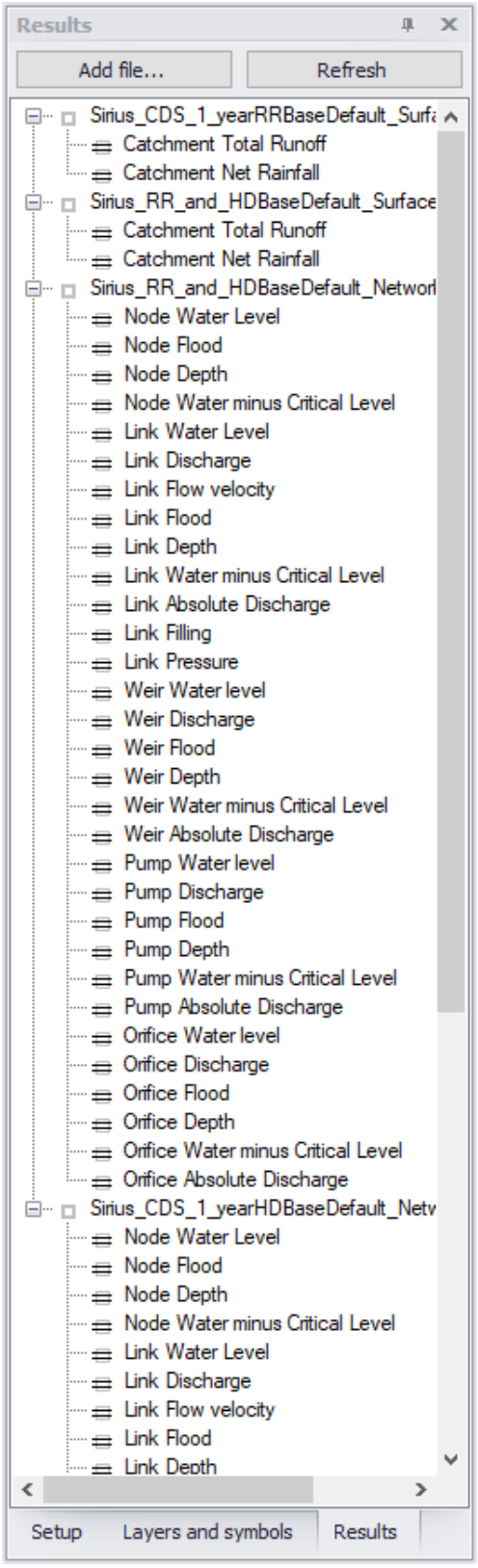


Figure 3.34 Results selection

### 3.7.2 Results in the map

- Animation
- Minimum
- Maximum
- Average
- Single time step
- LTS results

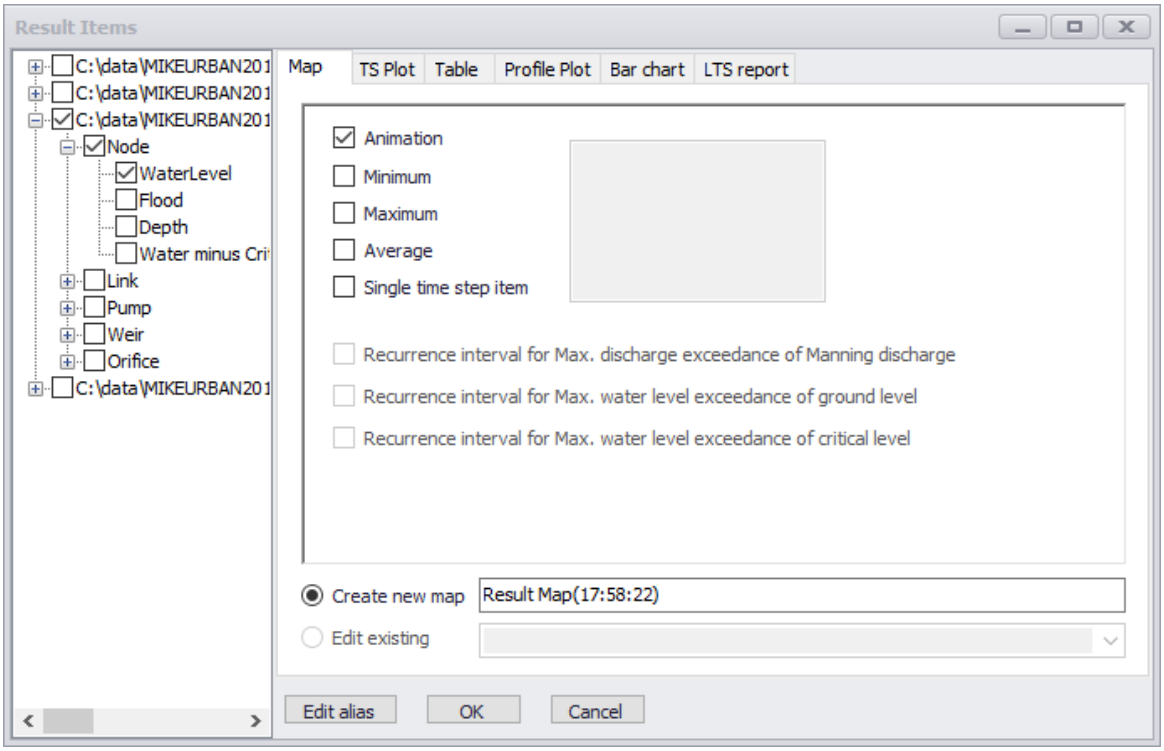


Figure 3.35 Results presentation

### 3.7.3 Results TS Plot & table

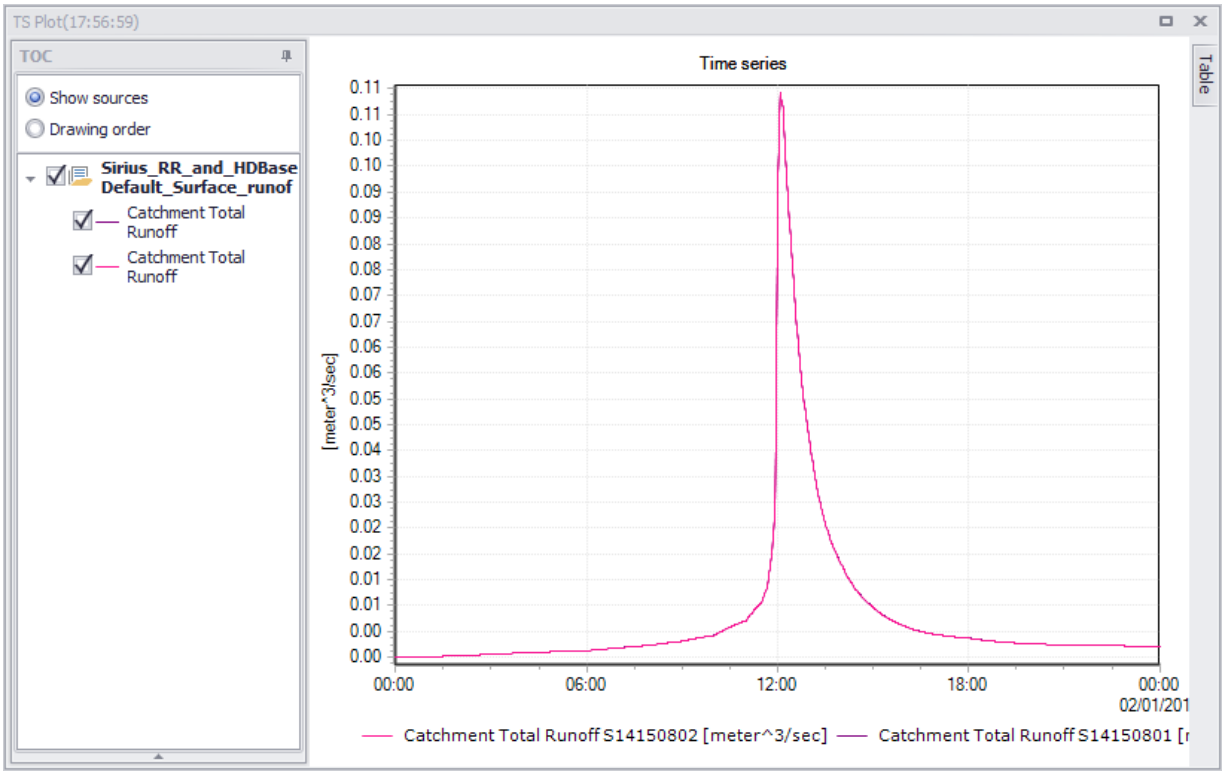


Figure 3.36 Time series plot

Map | Table(17:58:22)

ID | All | Search | Clear | Transfer to map

| ID | Type | Node Wate... |
|---|---|---|
| C14150801 | Node | 22.851572... |
| C14150802 | Node | 23.368041... |
| C14154801 | Node | 23.510080... |
| C15152001 | Node | 21.724218... |
| C15152401 | Node | 22.389865... |
| C15153101 | Node | 20.846149... |
| C15154301 | Node | 19.902170... |
| C15155001 | Node | 22.885961... |
| C15155101 | Node | 22.595947... |
| C15155401 | Node | 19.366319... |
| C15155701 | Node | 22.697895... |
| C15156101 | Node | 22.628671... |
| C15156501 | Node | 18.845485... |
| C15156602 | Node | 18.378391... |
| C15156701 | Node | 21.057430... |
| C15157401 | Node | 22.801229... |
| C15157501 | Node | 22.405593... |
| C15157701 | Node | 18.092987... |
| C15158201 | Node | 22.991365... |
| C15158301 | Node | 23.080783... |
| C15158703 | Node | 17.960773... |

568 of 568 records Sirius_RR_and_HDBaseDefault_Network_HD.res1d

| Statistics | Node Wate... |
|---|---|
| Min | -3.4858014... |
| Max | 23.510080... |
| Avg | 8.6629198... |
| Sum | 4920.5384... |

| Overall sta... | Node Wate... |
|---|---|
| Min | -4.1088314... |
| ID | PS_To_WWTP |
| Time | 01-01-2019... |
| Max | 28.381422... |
| ID | C14150802 |
| Time | 01-01-2019... |

Figure 3.37 Tabular results

### 3.7.4 Results in Long profile

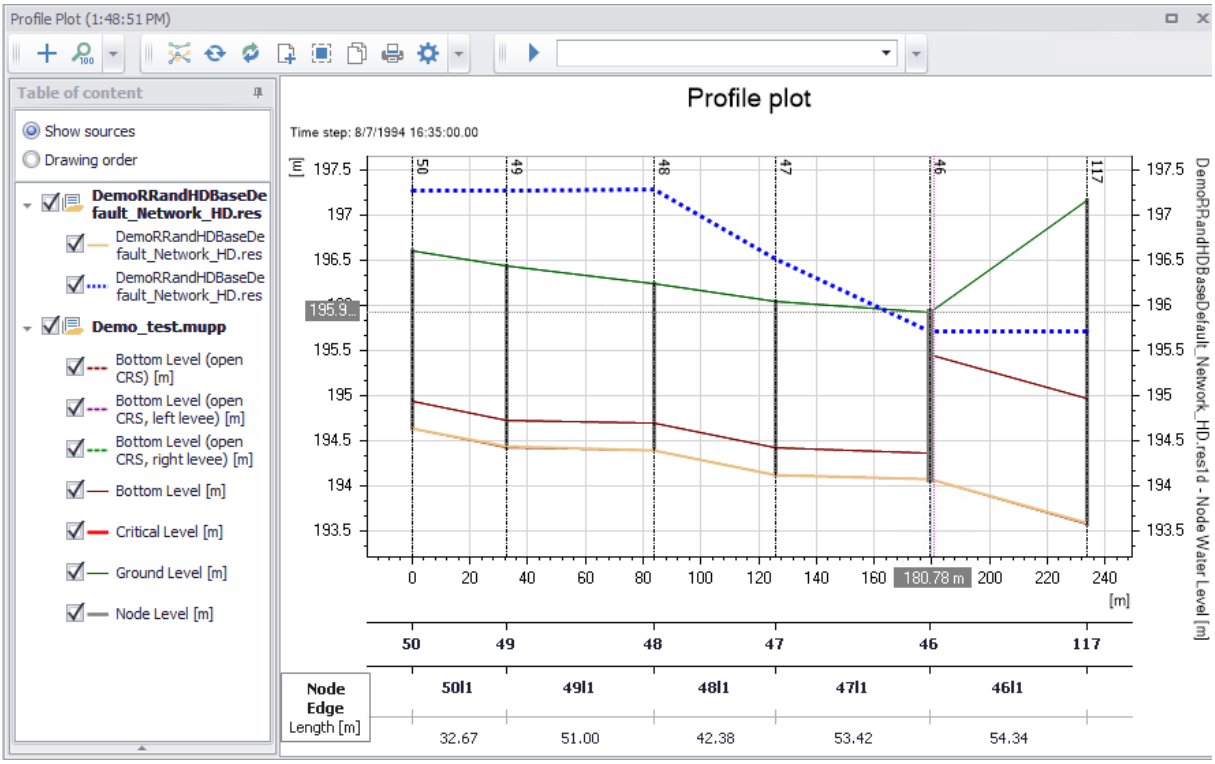


Figure 3.38 Longitudinal profile and results

### 3.7.5 Results in Bar-chart

Used for LTS chronological results (annual and monthly statistics)

### 3.7.6 Results: LTS reports

Used for reporting LTS statistics results in tabular form.

# 4 Import MIKE URBAN model to MIKE URBAN+

A step-by-step description is provided on how to import existing models into MIKE URBAN+.

The first step is to open MIKE URBAN+ and then follow the steps described in the following.

## 4.1 Modules Overview

A modules overview of MIKE URBAN+ is provided in the figure below

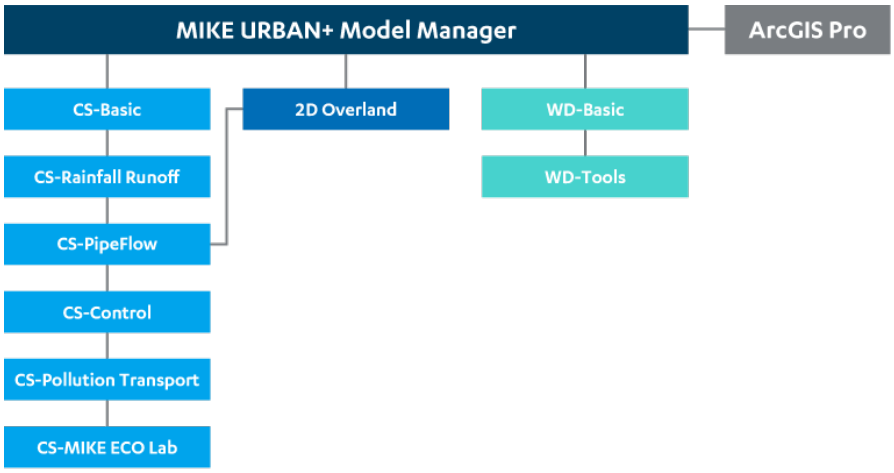


Figure 4.1 MIKE URBAN+ module overview

The MIKE URBAN+ supports in its first version the MIKE 1D and DHI EPANET hydraulic engines. The 2D Overland module is included in the MIKE URBAN+ 2020 release and the SWMM5 is planned to be added to the CS-Basic module in a later release.

## 4.2 Prerequisites

As the first step, before importing existing MIKE URBAN models to MIKE URBAN+, the MIKE URBAN model needs to be updated to MIKE URBAN 2020 version. This is the case for both MIKE URBAN Water Distribution, MIKE URBAN Collection System and Urban flood models.

## 4.3 File | New

Under File you have various options available:

- New (project)
- Open (an existing project)
- Recent projects,
- Global Settings (i.e. chose language)
- Install Examples

- About
- Exit (application)

Chose File | New to create a new project.

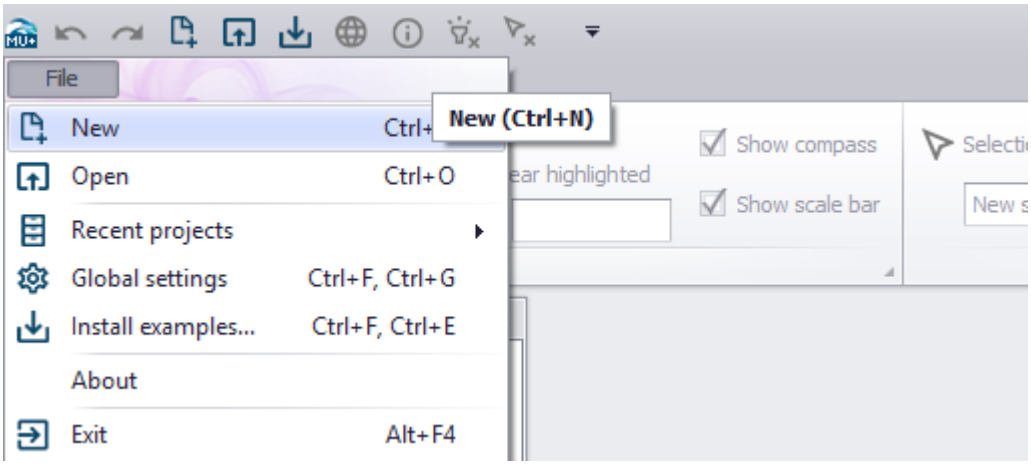


Figure 4.2 File | New

### 4.3.1 Module Selection

In the Module Selection tab, you have the following options:

- Model type: Water Distribution or Collection System
- Unit system:
  - Selection of unit system for the model, SI or US.
- Database type: Two options available
  - SQLite (installed with MIKE URBAN+)
  - PostGIS (installed separately – please follow the installation guide)
- Database setting: File path for model database
- Project setting: Project file (*.mupp)

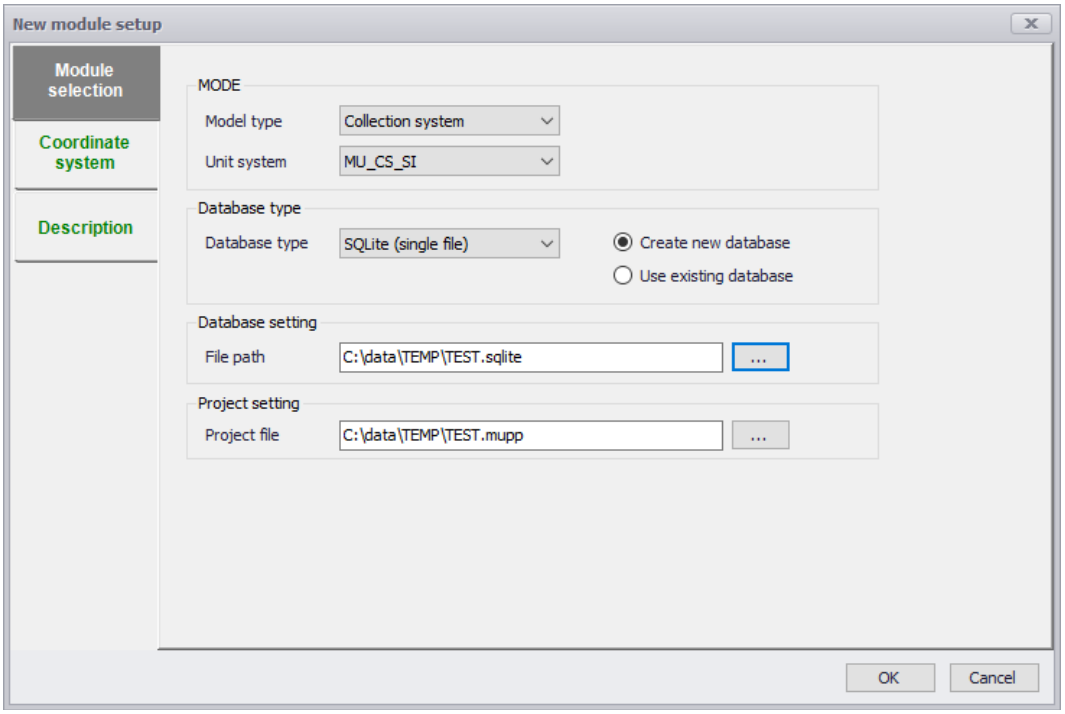


Figure 4.3 Selection of module, unit and database

### 4.3.2 Coordinate System

At the Coordinate System tab, the local coordinate projection can be set or it is possible to choose to use the projection set to the projection for the MIKE URBAN being imported or another MIKE URBAN.

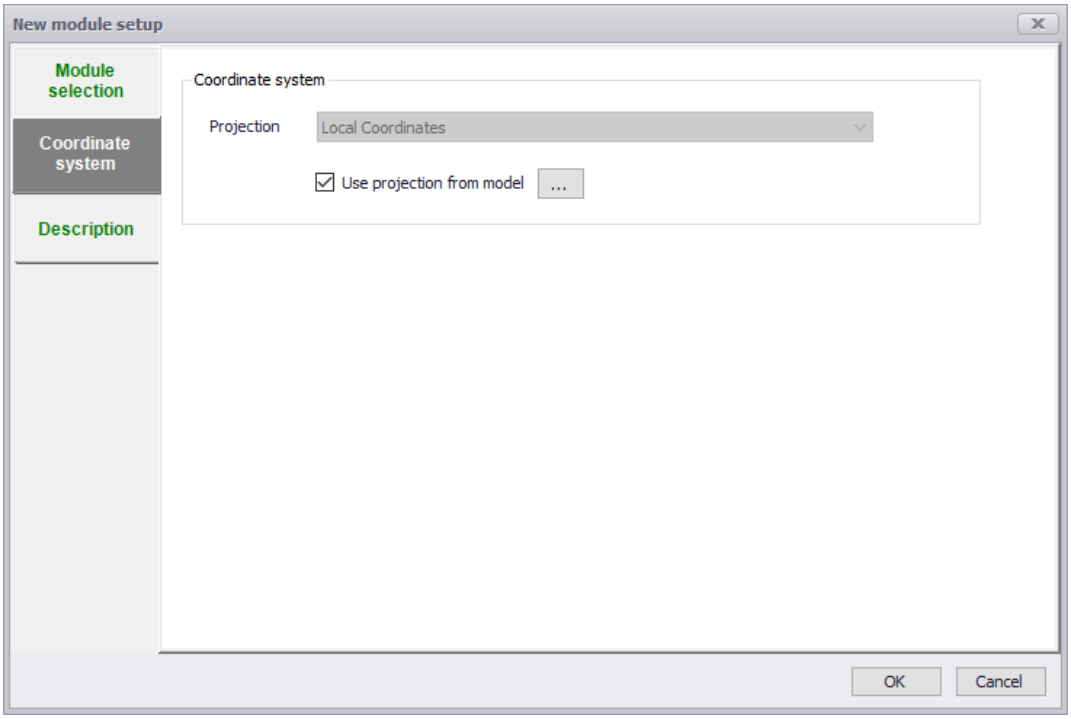


Figure 4.4 Selection of projection or use from existing model (to be imported or another model)

### 4.3.3 General settings | Modules

In the General settings, Modules, the different modules available for Collection System or Water Distribution can be activated for the model to get the complete overview of the data groups available.

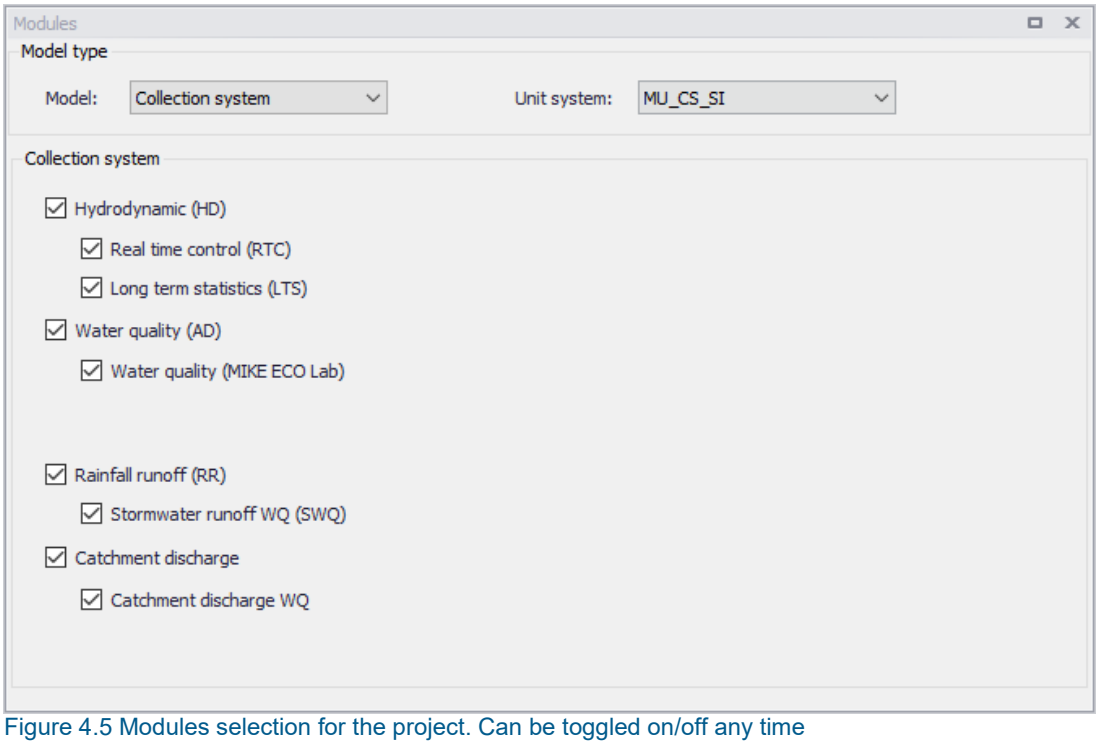


Figure 4.5 Modules selection for the project. Can be toggled on/off any time

## 4.4 File | Import

The File | Import provides a quick access to import existing models:

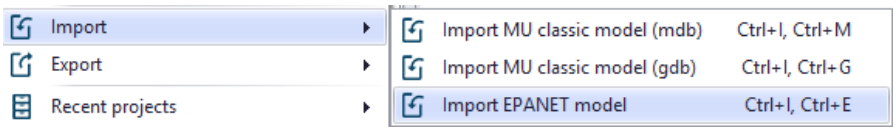


Figure 4.6 Fast import options of existing models

- Import MU Classic model (mdb) requires that MIKE URBAN is installed.
- Import MU Classic model (gdb) does not require that MIKE URBAN is installed.
- Import EPANET model just import

These imports have been developed to make it is easy for users to import existing MIKE URBAN models. If customised imports are required, then the general Import and export found under Tools tab can be used.

When clicking on i.e. 'Import MU Classic model (mdb)', the dialog below appears for selecting the MIKE URBAN.

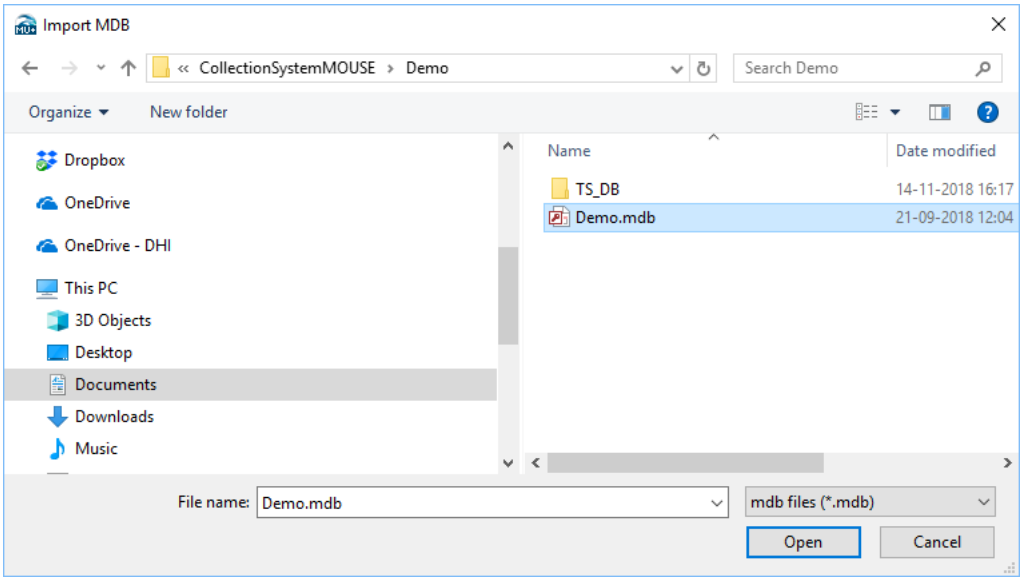


Figure 4.7 Browser for selecting MIKE URBAN+ model

The import process starts after clicking Open.

After import of the MIKE URBAN model, then it could look like this.

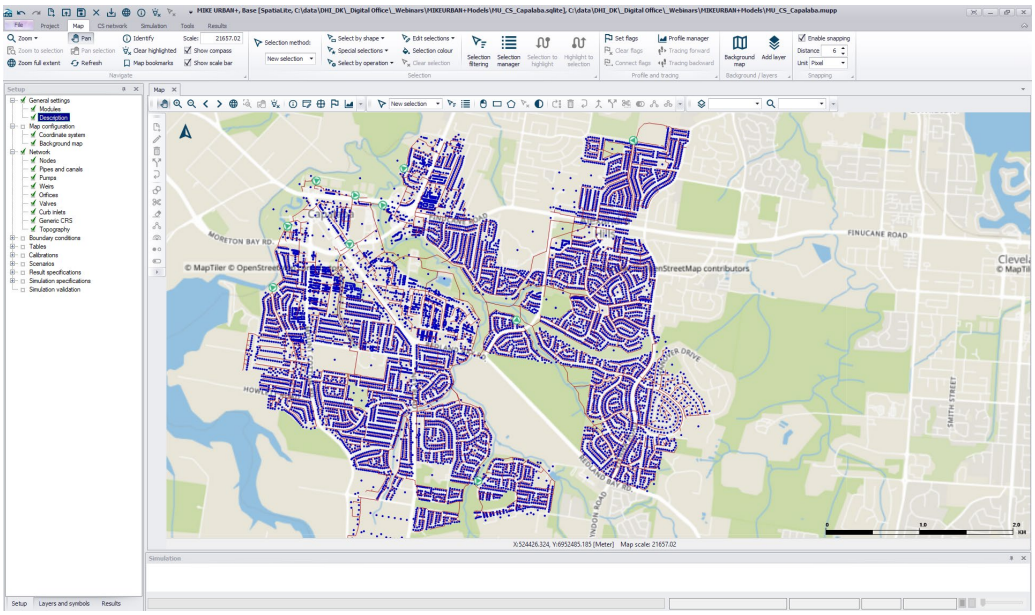

Figure 4.8 Imported MIKE URBAN model to MIKE URBAN+

At the right side in the setup tree, data has been grouped and instant data validation is performed. If there are any errors in the data, a red cross will appear. If there are no errors in the data, a green check mark or no marker will be displayed.

## 4.5 Status after import

All features in Water Distribution except from Water Hammer is supported in MIKE URBAN+, so all models that run in MIKE URBAN 2019 or EPANET 2.0 should be imported into MIKE URBAN+ without data errors and ready to run.

For Collection System and 2D Urban Flood models, it is expected that most running MIKE URBAN 2019 models based on either MOUSE or MIKE 1D will be running in MIKE URBAN+ MIKE 1D with the exception of models including features listed in 4.6.

Collection System models based on MIKE URBAN SWMM5 cannot be imported in MIKE URBAN+ yet.

## 4.6 MIKE URBAN+ unsupported features in first release

In Table 4.1, the features which are not supported in MIKE URBAN+ are listed.

Table 4.1 Overview of features have limited support in MIKE URBAN+

| Feature | Status |
|---|---|
| SWMM5 | Not supported - Expected in later release. |
| Water Hammer | Not supported in MIKE URBAN+. |
| MOUSE UWC (User Written Control) | If MOUSE UWC has been applied, this cannot be transferred to MIKE 1D. Those UWC controls needs to be recoded into MIKE SDK. The MIKE 1D is in general much more open for user control than MOUSE. |
| MOUSE Storage Nodes | Not supported in MIKE URBAN+. |
| Special feature: MOUSE PCS | Not supported in MIKE 1D. Expected to be developed later. |
| Special feature: Pump Emergency Storage (.adp file) | Not supported in MIKE 1D. Expected to be developed later. |
| MIKE 1D – RTC | Imports existing models using RTC. However, if some Actions have been reused, then they have to be added manually as individual Actions. This is an improvement of how Actions are handled in the model with unique ids, but it is impossible to update the model automatically. |
| MIKE 1D - SWQ | SWQ is brand new with a new concept for flexible definitions of different land uses etc. Models having used the previous concepts in SRQ and SWQ needs to be converted manually. The data amount that needs to be converted is limited. |