

MIKE HYDRO

Note to Existing MIKE 11 Users



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1 Introduction

MIKE HYDRO is the recently introduced, state-of-art Graphical User Interface platform for some of the MIKE Powered by DHI Water Resources products.

Presently, MIKE HYDRO includes two modules:

- MIKE HYDRO Basin, and
- MIKE HYDRO River

MIKE HYDRO River is the new and future modelling platform for MIKE Powered by DHI river applications, introduced as a full-featured river modelling package with Release 2016. MIKE HYDRO River is the future successor of the current classic MIKE 11 user interface for river modelling. Release 2019 includes both MIKE 11 and MIKE HYDRO River.

The current document targets existing MIKE 11 users with the aim of informing about the current contents and features of MIKE HYDRO River

2 Licence Information

MIKE HYDRO River is our primary river module for sale with Release 2016 and forward. MIKE 11 is still included and supported, and new purchases of river model licenses will include access to both MIKE HYDRO River and MIKE 11 modules.

MIKE HYDRO River module is automatically included for existing MIKE 11 users upgrading to MIKE Powered by DHI Release 2019, and the license hence contains modules supporting both MIKE 11 classic and MIKE HYDRO River.

It is therefore possible for existing MIKE 11 users with a valid Service and Maintenance agreement to use MIKE HYDRO River for project applications without additional fees.

3 MIKE HYDRO River – Unsupported MIKE 11 Features

The current release of MIKE HYDRO River includes almost all features and add-on modules available in MIKE 11. Most river applications will therefore be possible to conduct using MIKE HYDRO River in Release 2019.

A few MIKE 11 features have not been included in Release 2019, which may influence a decision whether to apply MIKE HYDRO River or MIKE 11 for specific applications.

Referring to model features available in the classic MIKE 11 GUI system, the following features are not included/supported in MIKE HYDRO River, Release 2019:

- Simulation editor:
 - Quasi-steady state simulation option
 - Hotstart options: 'Add to hotstart file'
 - 'Change ratio' for adaptive time step is replaced by 'Maximum increase factor'

- Network editor
 - Regulating structures
 - User defined structures
 - Grid points
- HD parameter editor
 - Default values – parameters: Dh Node, Struc Fac, Node Compatibility
 - User defined marks
 - Bed resistance – triple zones
- AD Parameter editor
 - Cohesive sediment
 - Sediment layers
 - Some AD Additional output
- ST parameter editor

The Sediment Transport module has been fully revisited compared to the classic MIKE 11 version. The functionalities and the scientific theory used in MIKE HYDRO River therefore do not strictly match those from MIKE 11. Parameters and options available in MIKE 11 may also be available in MIKE HYDRO River, but may be used differently during the simulation. The features not supported at all are:

 - Initial dune dimensions
 - Preset distribution of sediments in nodes
- DA parameter editor
 - FF option excluded from MIKE HYDRO River. Forecasting modelling is conducted with Data Assimilation.

MIKE HYDRO River utilises the new MIKE 1D computational engine only and is not capable of using the classic MIKE 11 simulation engine. Hence, any functionality currently not supported by the MIKE 1D engine is therefore not supported in the current version of MIKE HYDRO either. For details about functionality in MIKE 1D engine please see '*What is included in MIKE 1D?*' located in the MIKE 11 documentation index.

4 Refined and Relocated Features

Compared to the classic MIKE 11 user interface there are some parameters and features, which have been renamed or located differently in MIKE HYDRO. Changes have been implemented to give a better overview of your input data. Hence, the described functionality is still available, but found at a different location.

Please note that, in general, MIKE HYDRO does not allow for latent elements, which is allowed in the MIKE 11 Graphical User Interface. Latent elements are e.g. elements such as structures, local values for bed resistance, initial conditions, etc. and these cannot be attached to non-existing branches in the setup. Thus, you should bear in mind that when you delete a branch, all connected elements will also be deleted. The only exceptions to this behaviour are cross sections which are saved in a separate file and not automatically deleted when deleting a river branch.

Cross sections are generally shown on the map in the same way as in MIKE 11. The only exception is that if a cross section has user specified coordinates, these are only used if both coordinate-sets are different from (0, 0).

The most significant changes in features and parameter locations when comparing the contents of MIKE 11 Classic editors with the contents of MIKE HYDRO are described in the following sections.

4.1 Simulation editor

Most of the functionalities of the simulation editor are located in the tree view under 'Simulation specifications'.

You will find the specifications of result files under 'Result specifications' in the tree view.

Specifications of initial conditions are found under 'Initial conditions' in the tree view.

Note that some changes have been made to the initial condition options:

- It is now possible to specify multiple hotstart files
- It is now possible to run a simulation using a hotstart file, which does not include all calculation points in the model
- It is now possible to define initial conditions from a state file, which contains more information than a hotstart file.

For further details, see the '*MIKE HYDRO User Guide*'.

4.2 Network editor

Most of the functionalities of the network editor are located in the tree view under 'River network'.

You will find the definition of maximum dx for the branches under 'Simulation specifications' | 'Computation control parameters' on the 'Grid spacing' tab.

Note that the maximum dx is now a global parameter for all branches, but can be overwritten by local values for individual branches.

The option for definition of points can be found under 'River network' | 'Branches' on the 'User defined chainage points' tab.

You should be aware of the fact that the concepts of user defined chainages have changed slightly. In MIKE HYDRO, we have branch vertices and user defined chainage points as separate features, and these two elements have replaced the functionality for 'Points' and 'user defined'/system defined chainages' in MIKE 11.

Creation of a branch: The shape of a branch in MIKE HYDRO comes from individual vertices (digitation points where the river bends). Vertices can only be inserted and deleted when editing the branch on the map view.

The chainage of a vertex is calculated as a function of the location on the map view and the distance to up- and downstream vertices. This is similar to points with a system defined chainage in MIKE 11, but in MIKE HYDRO the individual vertices are not visible in a table form, and the chainages are only used internally to show the map view correctly.

When you need to specify a chainage at a precise location (points with user defined chainage), you must to insert a user defined chainage point on the branch as a separate element. This is done from the 'Branches' ribbon in the map view. See details in the '*MIKE HYDRO User Guide*'.

The weir types have been given different names, but the implementation is the same:

- 'Weir Formula 1' renamed to 'Villemonste Formula'
- 'Weir Formula 2 (Honma)' renamed to 'Honma Formula'
- 'Weir Formula 3 (Extended Honma)' renamed to 'Extended Honma Formula'

The weir type 'Special weir' has been removed from MIKE HYDRO. However, an identical functionality can be achieved by setting the weir type to 'Broad Crested' and unchecking the flag 'Allow for recalculation' on the 'Flow conditions' tab. The same tab is then used for specifying the Q/h relations in the same way as the 'Special weir' in MIKE 11.

For weirs and structures it is possible to specify a structure geometry from the cross section database in MIKE HYDRO, e.g. to refer to a geometry in the cross section file (*.xns11). In MIKE 11, the geometry was always taken from the cross section with the same branch name and chainage as the structure. In MIKE HYDRO the cross section used is user specified and must be defined in the 'Structure' dialogue.

In MIKE HYDRO, applying a valve regulation (only positive flow, or only negative flow) to culverts and weirs takes into account the branch's flow direction. For example, applying only a positive flow to a structure located on a branch with a negative 'Flow direction' will allow water to flow only in the direction of decreasing chainage values. This is the opposite of what the MIKE 11 Classic engine does. Therefore, after importing a MIKE 11 model, which used to be run with the MIKE 11 Classic engine into MIKE HYDRO, it is necessary to change the flow direction for culverts and weirs, if any 'Valve' regulation is applied and if the branch is set to negative 'Flow direction'.

4.3 HD parameter editor

You will find the parameters of the 'Initial' page under 'Initial conditions' | 'HD Initial conditions'. Note that the initial conditions definition in MIKE HYDRO now includes definition of both Global and Local values as well as hotstart file definition.

The parameters of the 'Wind' page can be found under 'Boundary conditions' | 'Wind scaling factors'. Note that the wind scaling factors will only be shown in the tree view if the flag 'Include wind shear stress' is checked on the 'Modules' page. The 'Topographical factor' is now renamed to 'Wind scaling factor', but has the same functionality.

The parameters of the 'Bed Resist' page can be found under 'Hydrodynamic parameters' | 'Bed resistance'.

You will find the parameters of the 'Wave Approx.' page under 'Simulation specifications' | 'Computational control parameters'.

The parameters of the 'Default Values' page can be found under 'Simulation specifications' | 'Computational control parameters' on the tab 'Computation parameters'.

4.4 Cross sections editor

MIKE HYDRO River stores the cross sections in the same file as MIKE 11 (file with extension .xns11). MIKE HYDRO River however comes with a new cross section editor, which is available as an embedded editor from within MIKE HYDRO River (in the Cross sections menu) or as a standalone editor to open only the cross sections.

This new editor offers some tools to edit the cross sections, which are available in the 'Tools' toolbar in MIKE HYDRO, and in the 'Tools' tab in the standalone editor. These tools comprise the functionality from the previous MIKE11 editor to edit multiple cross sections simultaneously, as well as new tools to edit cross sections. Note that when using the standalone editor, some of the tools are not available, because they require input data from the MIKE HYDRO map, which is not available in the standalone editor.

This new editor is now the default one to open a file with extension xns11, even for MIKE 11 model setups. Even though this new editor may also be used with MIKE 11, it is also possible to continue using the previous MIKE 11 editor. This requires that you change the file association in the menu File | Options | User settings, and select MIKE 11 Cross Sections in the File Associations tab, for .xns11 files. Note that, regardless the choice of default editor, creating a new .xns11 file from File | New | File | MIKE 11 will always open the file in the previous MIKE 11 editor, whereas creating a new .xns11 file from File | New | File | MIKE HYDRO will always open the file in the new editor.

Also note the following changes with the new cross section editor:

- Cross sections can now have polyline shapes, which means that cross sections do not need to be straight lines any more. The polylines' coordinates can be edited from the new editor but not from the MIKE 11 editor.
- In the previous MIKE 11 editor, it was possible to apply a minimum and a maximum level of processed data. This will not be supported any longer. Therefore, when the minimum level and/or maximum level were applied to a cross section, changing the processed data levels from the new editor will at the same time deactivate these two parameters for the cross section.
- The Level of divide parameter, used for morphological simulations, is now called Floodplain level definition.

4.5 ST parameter editor

All parameters related to sediment transport, for both cohesive and non-cohesive sediments, are now found at a common place, in the 'Sediment transport parameters' page. The Sediment Transport module in MIKE HYDRO River has been fully revisited compared to its MIKE 11 version. The functionalities and the scientific theory used in MIKE HYDRO River are therefore different: some MIKE 11 functionalities may not be supported any more in MIKE HYDRO, whereas new functionalities are added. When converting a MIKE 11 model to MIKE HYDRO River, it is therefore expected that significant differences of sediment transport results are encountered, which may require that you adjust the model definition if needed. Please refer to the '*MIKE HYDRO User Guide*' and '*MIKE 1D Reference Manual*' for more information about the new Sediment Transport module.

4.6 MIKE11.ini file

The MIKE11.ini file is not used when running a simulation in MIKE HYDRO. Note that some of the parameters of the MIKE11.ini file are transferred to the tab 'Computation parameters' on the 'Computational control parameters' page.

When importing a MIKE 11 setup, the parameters from the MIKE11.ini file are not imported to MIKE HYDRO and should be set manually.

When exporting a MIKE HYDRO setup to MIKE 11, the parameters in the MIKE11.ini file are not automatically set and should be manually changed.

5 Importing Existing MIKE 11 Setups

Transferring your existing MIKE 11 setups to MIKE HYDRO is quite simple, and it is done through the menu 'File | Import | Import from MIKE 11'.

Any functionality not supported by MIKE HYDRO will be removed from the setup during the import. That means, if your setup contains features not supported by MIKE HYDRO, data will be removed from the setup (cf. section 3 for details about functionalities not supported by MIKE HYDRO). Accordingly, if a specific feature becomes available in a later release version you will have to reimport the data or specify it again in MIKE HYDRO.

MIKE HYDRO does not support latent elements e.g. elements such as structures, local values for bed resistance, initial conditions, etc. attached to non-existing branches. Only elements for existing branches will be imported. Therefore, if you import the network file (*.nwk11) and the HD parameter file (*.hd11) separately, it is important to import the network file first. It is recommended to import the entire setup at once by importing the sim11-file.

Elements attached to an existing branch, but at a non-existing chainage, will still be imported and provide a warning in the validation check.

Note that when importing the sim11-file, the time step will be shown in seconds. The time step length is the same as in MIKE 11, but the display value and unit will be in seconds. This can manually be changed to the requested unit.

Note that when importing the hd11-file, the triple zone approach is not supported. If the hd11-file specified a triple zone approach, the following is changed during the import:

- the approach is set to "Uniform section"
- the global resistance number is taken from the global Zone 1 value
- the local resistance numbers are set from the local Zone 1 values

MIKE HYDRO River can use only the MIKE 1D engine during the simulations, which is also available in MIKE 11. MIKE 1D engine sometimes has more restrictive validations of input data than the MIKE 11 Classic engine, which means that you may sometimes need to adjust input data used by simulations made with MIKE 11 Classic engine, before these simulations can also run with MIKE 1D. If the MIKE 11 simulation cannot run with the MIKE 1D engine, you will also get errors when importing this model setup in MIKE HYDRO River. For this reason, the recommended steps to convert a MIKE 11 model to MIKE HYDRO River are:

- Run the MIKE 11 model setup using the MIKE 1D engine
- Eventually adjust the model setup definition, according to the reported error messages, if any
- Import in MIKE HYDRO, when the simulation runs with MIKE 1D engine.

6 Exporting MIKE HYDRO Setups to MIKE 11

When working with MIKE HYDRO River, if for any reason you need to use MIKE 11 instead, it is very easy to export the MIKE HYDRO setup to MIKE 11 files and continue working in MIKE 11. The export facility is found through the menu 'File | Export | Export to MIKE 11'.

Most parameters in MIKE HYDRO are exported to MIKE 11 files. Warning messages are provided in case parameters not supported are being exported. The main exception is the Sediment Transport module which cannot be exported to MIKE 11 format due to the many conceptual differences.

7 MIKE 11 GIS Functionality

Many of the MIKE 11 GIS tools are transferred to MIKE HYDRO and can be found in the MIKE HYDRO menu 'Tools' (see the '*MIKE HYDRO User Guide*' for details).

Since several of these tools somehow manage and edit cross section data in the xns11-file, it is very easy to utilise these tools, also if you are still working in MIKE 11.

The xns11-file format is shared between MIKE 11 and MIKE HYDRO, so when using the tools in MIKE HYDRO to add or modify your cross sections, changes will automatically be included in your MIKE 11 setup.

