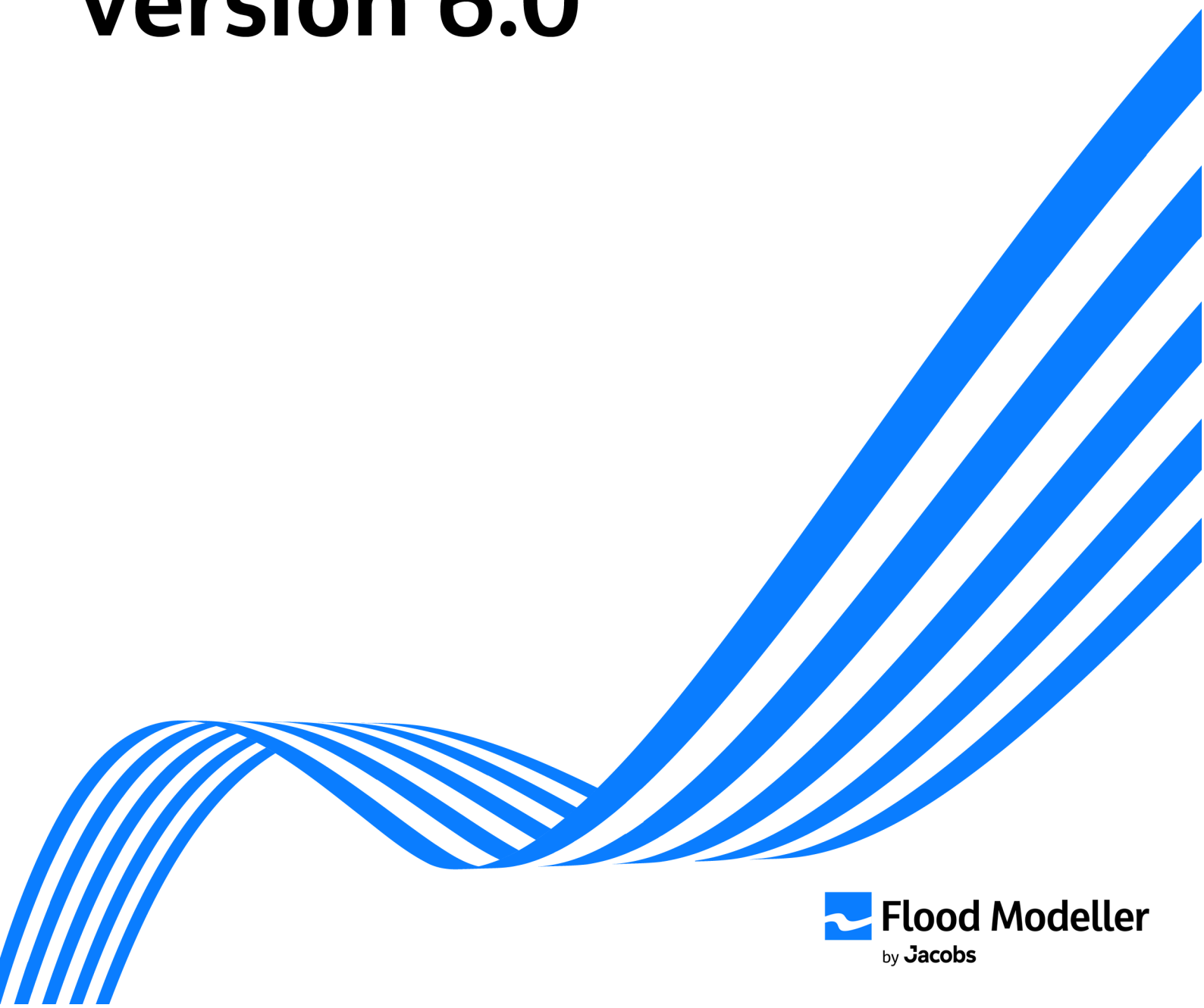
Release Notes
Version 6.0



Flood Modeller
by Jacobs

Flood Modeller v6.0 Release notes

Flood Modeller v6.0 introduces a range of new features (compared to v5.1) and addresses a number of issues identified in previous versions.

This document contains the following sections:

1 Changes to Flood Modeller in v6.0

a) New licencing model

To provide new and existing users with more functionality, greater flexibility, and further cost savings, we have launched a new licensing structure as part of Flood Modeller v6.0.

Four editions of the software are now available on a monthly, annual or lifetime basis, each one provides customers with everything needed to undertake fully integrated catchment modelling. Existing customers should contact customer support to arrange for the additional features, that they are now entitled to, to be added to their licence.

Key features	LITE	STANDARD	PROFESSIONAL	UNLIMITED
1D Nodes	40	400	1,000	Unlimited
2D Cells	40,000	400,000	1,000,000	Unlimited
Simulations	1	2	3	4
Graphical User Interface	✓	✓	✓	✓
1D River Solver	✓	✓	✓	✓
1D Urban Solver	✓	✓	✓	✓
1D Sediment Transport	✓	✓	✓	✓
1D Water Quality	✓	✓	✓	✓
Viewer	✓	✓	✓	✓
2D ADI Solver	✓	✓	✓	✓
2D TVD Solver		✓	✓	✓
2D FAST Solver		✓	✓	✓
2D GPU Solver			✓	✓
Damage Calculator			✓	✓
	Suited to site specific flood risk studies.	Ideal for small scale catchment analysis.	Best for large scale catchment analysis.	For when you need to model without limits.

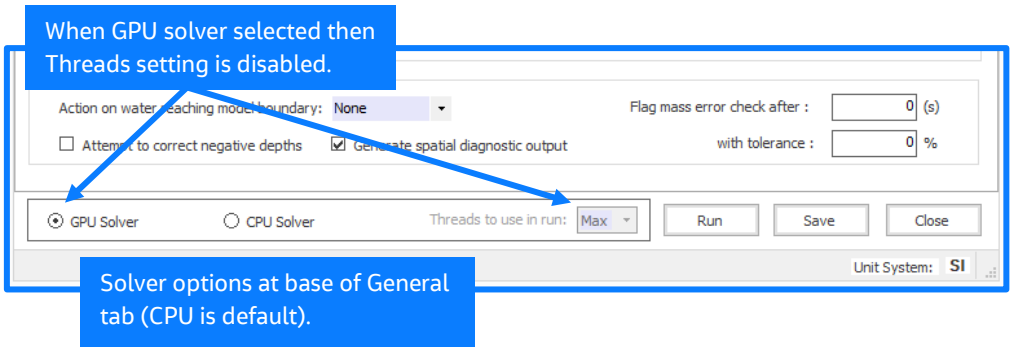
b) Enhanced 2D GPU solver

In v5.1, the 2D GPU solver was introduced as a beta version. Since this release the solver has been enhanced to make it more stable and robust. Some known issues have been addressed relating to errors in results when selecting some output formats (xmdf or netCDF formats). A summary of the enhancements is as follows:

- Corrected error in mass-balance calculations from models with (direct) rainfall inputs
- Enhanced writing of 2D outputs to ensure GPU solver uses correct units.
- Improved model links between 2D TVD-GPU and 1D River and 1D Urban.
- Corrections made to the estimation of rain gross volume by the TVD-GPU solver in mass balance summary file.
- Fixed memory-related problems manifested in the GPU solver in cases of very large models.
- Corrected the output format of flowline calculations within the 2D TVD-GPU solver.
- Enabled the normal-depth-slope boundary condition within the 2D TVD-GPU solver and corrected to some errors within this implementation.
- Improved the general (numerical) stability of the 2D TVD-GPU solver
- Trailing space removed from contents of the SUP file generated by the GPU solver (could cause issues when displayed results as extra space in names not expected)
- Streamlined the calculated extent of active area when grids are rotated, and hence reduce the input computational area, improving model performance

The GPU solver uses the same underlying mathematics as the original TVD-CPU solver but utilises the power of your GPU card enabling the same outputs to be obtained significantly faster. The time saving is dependent upon the graphics card in your computer. In our benchmarking we have typically found that simulation runtime reduces by 80% and in some cases as much as 95%.

Changing a model to use the GPU is simply a of case changing a setting in the revised 2D model interface:



c) Bed shear calculations

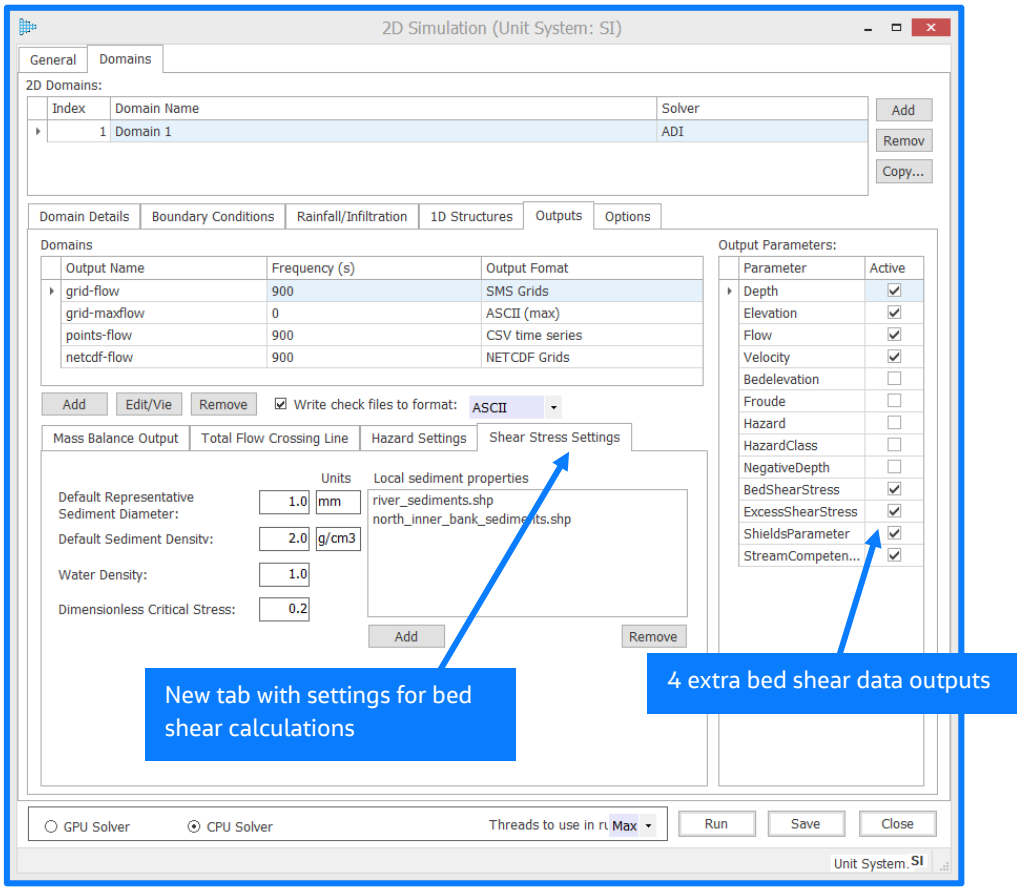
The 2D solver now calculates bed shear stress outputs. There are four parameters that can be calculated, which are:

- Bed shear stress
- Excess shear stress
- Shields parameter
- Stream competence

These are written to the user selected 2D time series grid format, i.e. SMS .2dm/.dat/.sup, .xmdf or .netCDF. In addition, the calculated maximums (i.e. 9999 timestep) will be output to either ASCII or geoTIFF grid format (as specified by the user).

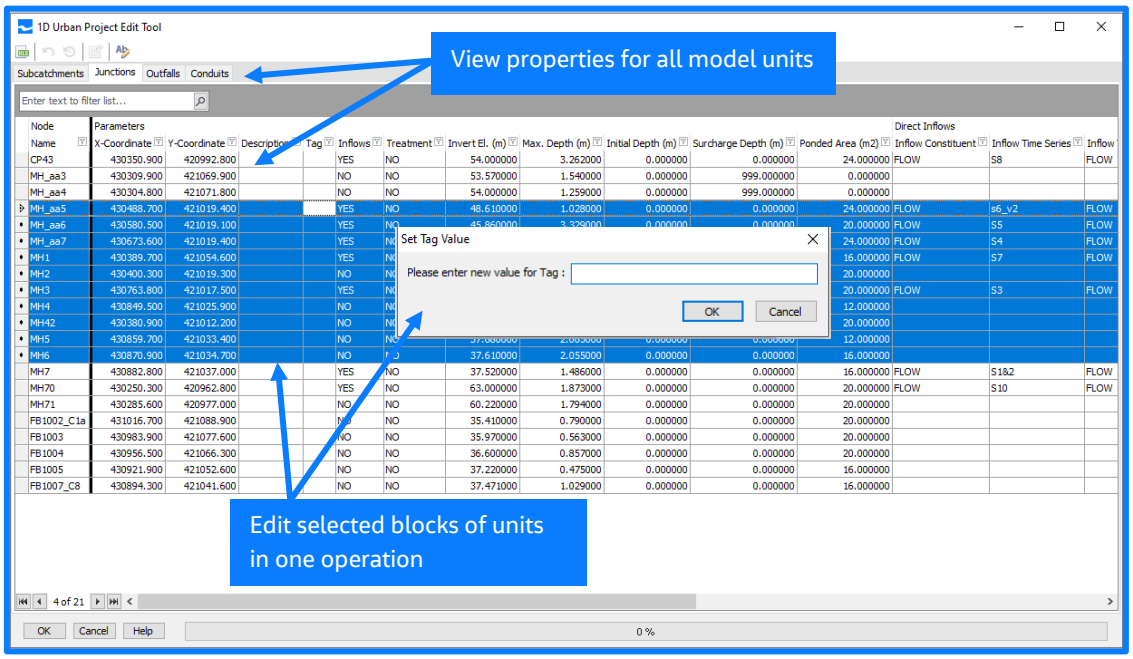
The user guide has also been updated to explain the theory used to calculate these new outputs.

2D model interface offers option to output bed shear stress data. These outputs are specified in the same way as other time series grid outputs (e.g. depth, velocity, etc.). Tick the required bed shear stress outputs on the Domains > Outputs sub-tab (for the relevant 2D domain(s) in your model).



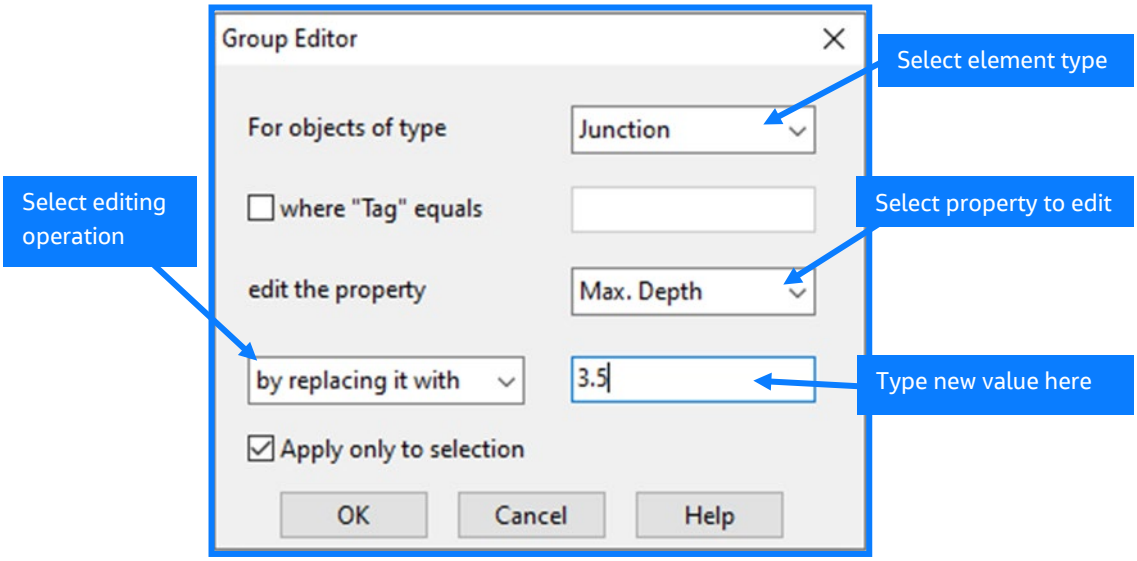
d) 1D urban multi-edit tool

This tool presents all properties data together in tabular form for all elements of the active urban network in the Flood Modeller interface. This enables quick and easy inspection of the properties data for an entire network. It also allows user selected blocks of data in the tables to be edited in one go, modifying all cells to the same value or adjusting them by the same factor. Changes made in the table are then saved back into the underlying active network.



e) 1D urban group edit tool

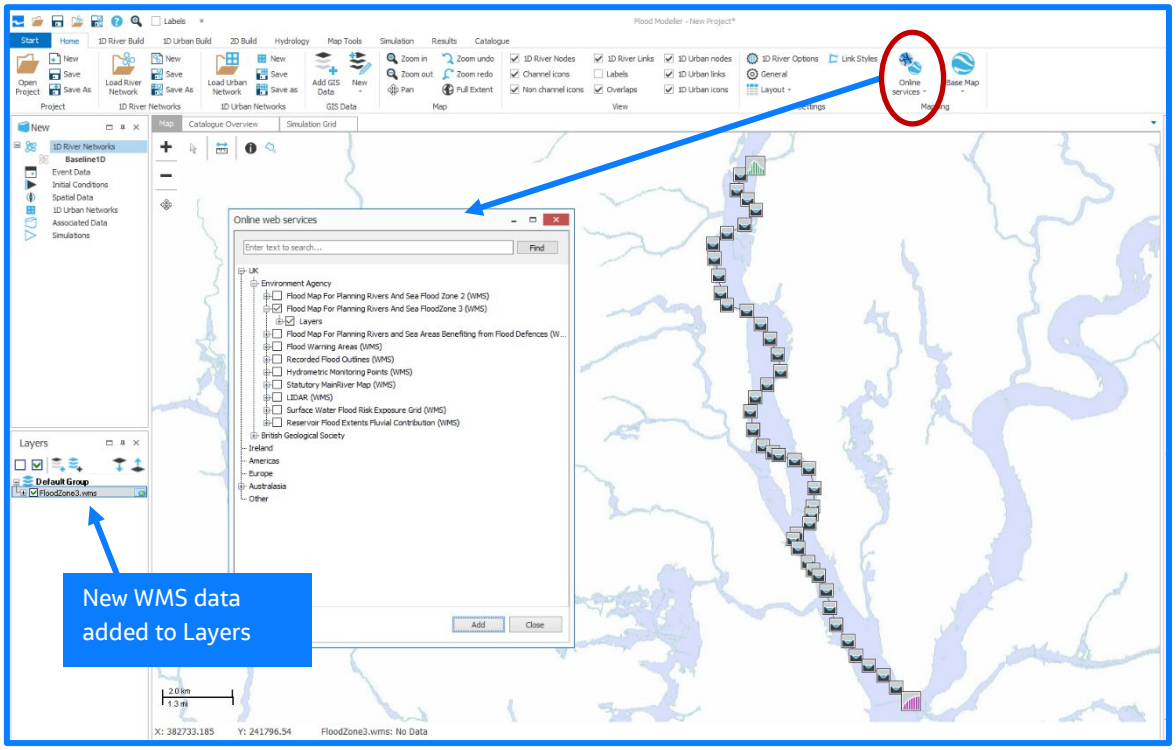
Flood Modeller now provides multiple options for editing the properties data of 1D urban model elements. The 1D urban group edit tool enables a single selected element property to be changed for all elements of this type selected in the map view.



f) Direct access to selection of online mapping data in WMS format

A suite of predefined map layers have been incorporated in the user interface. These are categorised by global region and connect the user with useful, freely available inline map datasets. For example, the UK map options include flood related map layers provided by the Environment Agency.

Note in this release the list of predefined map layers is not editable. However, the user interface retains the functionality that enables users to define new WMS layers in addition to this predefined list. Furthermore, "favourites" can be selected in the provided dataset list and these are added to a drop-down list in the main toolbar. They are stored in this list to provide quick access in future sessions.

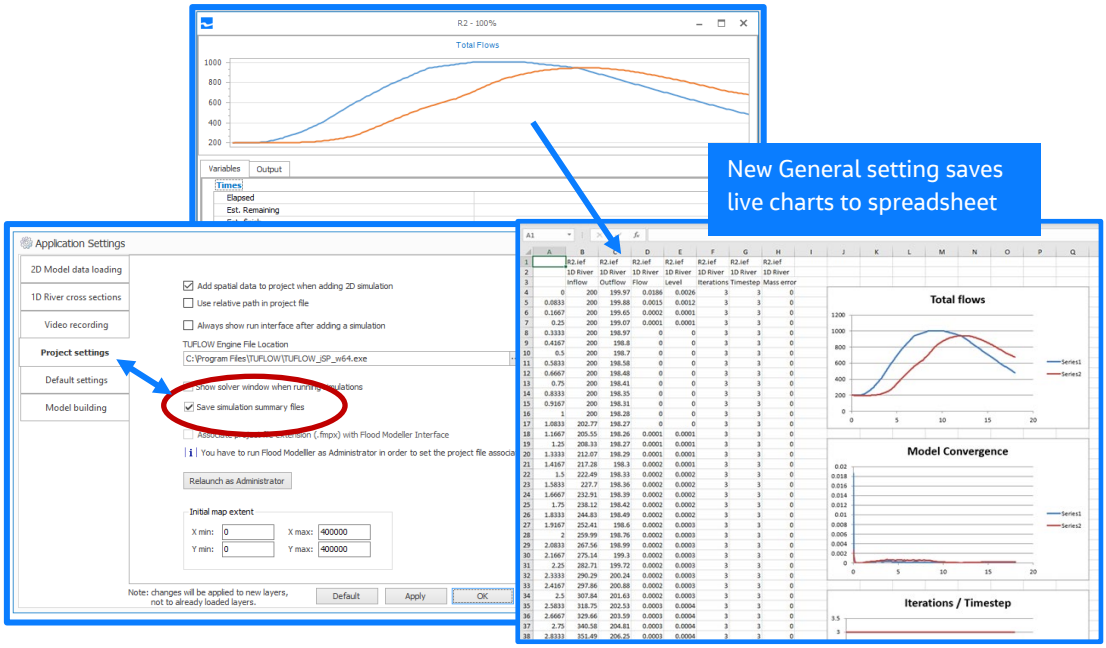


g) Additional base mapping options

The list of base mapping options has been enhanced with the addition of Ordnance Survey Maps (in addition to Bing maps and Open Street Map). Note that Ordnance Survey map access requires the entry of a key in General settings. A (free) key can be obtained by registering to the Ordnance Survey online data hub.

h) Live charts

The live charts displayed during model simulations can now be saved, together with the underlying time series data, to MS Excel spreadsheet files. This option is a new addition to the General settings window, on the Project settings tab. All charts plotted in the live progress window are added to the same spreadsheet, together with the time series data. These data are saved for all Flood Modeller solvers (i.e. 1D river, 1D urban and 2D).



For the 1D river solver, these outputs are in addition to the bitmap image files that are automatically produced containing multiple charts and summary metadata from each simulation.

i) Revised user guide

The user guide is now only available online. This will enable us to issue more frequent updates. The “F1” key access to the help, together with access via “Help” menu items, will work as before with the only difference being that the operation now takes the user to the relevant page in the online help.

j) Enhanced user guidance for global bed elevation adjustment tool

This useful tool for bulk editing of 1D river sections previously had minimal guidance provided in the help. A dedicated section has now been added to the latest user guide to explain where to find the tool and how to use it.

k) Upgraded grid processing tools

Selected user interface grid processing tools have been enhanced to be compatible with GeoTIFF format. The upgraded tools are:

- Reservoir generator
- Spill generator

Note: In some cases, these tools were partially working in the previous versions and bugs have been addressed in v6.0.

l) Improved error message reporting

Further enhancements to error messaging from the Flood Modeller solvers have been implemented in v6.0. An example in the 1D river solver is the removal of a misleading error message that was written to the diagnostics if any referenced remote nodes within

weir units were invalid (a generic error message was produced that did not indicate the precise cause of failure). The solver now produces a specific error that references the weir unit where the problem is located (implemented for crump, flat-V and labyrinth weir types).

m) Solvers - complier updates

All solvers in the v6.0 release have been compiled using the latest Intel Fortran and C++ compilers. In previous versions of Flood Modeller, the solvers were compiled with earlier versions of these compilers.

It is possible that the upgrade of the compilers may lead to slightly different results compared to simulations run using earlier versions of the software (using the same settings). This will usually equate to differences measured in fractions of a mm, however in some cases (where a model is particularly sensitive to small changes) bigger differences may be seen.

2 Bug fixes included in v6.0

This section details the key bug fixes implemented for v6.0. These relate both to the user interfaces and solvers within the software:

a) Issues with displaying and handling of rotated GeoTIFF grids have been addressed.

b) The 1D river simulation interface had outdated logic that prevented Flood Modeller being set to double precision when the linked TUFLOW element was set to single precision. This combination is now often used for linked Flood Modeller – TUFLOW HPC models, therefore the logic in the interface has been enhanced to allow this combination to be set (previously this required a manual model setup outside the Flood Modeller user interface).

c) The 1D river ReFH boundary unit has been enhanced to enable changes to be saved when the observed rainfall option is selected.

Previously, if a user opened the 1D river ReFH boundary properties window and set this to use observed rainfall (+ published report setting), they can then specify a rain time series but cannot save the changes or discard the changes as all controls to close the property window stop working. Equally, if an existing ReFH boundary with observed rainfall defined is opened then the rainfall time series table is empty and again the property window is locked. In both cases Task Manager was needed to close Flood Modeller.

d) Issue displaying 2D XMDF output in user interface has been addressed. This issue only affected outputs from the Flood Modeller 2D solver and not XMDF format data from other sources. Corrections were made in both the user interface and 2D solver code to fix this problem.

e) Plotting tools not handling levee data correctly. Issues that have been addressed are summarised as follows:

- Highlight points did not work with Special Markers on (for those points with Special Markers)
- Sometimes moving the mouse (not dragging), after clicking on a point on the cross section, caused the "draw zoom window" to be activated (as if you were dragging)
- Paging through the cross section plots sometimes caused incorrect displays of results (levee data missing when it should be displayed)
- Sometimes no results data were displayed
- Sometimes normal, correct results displayed, apart from the fact that maximum stage had not been calculated for the right-hand Floodplain

f) Levee results data were not written to the results file (zzx file) when using the 1D river direct method. This issue has now been addressed.

g) An issue with rotated check grids not being written out correctly to GeoTIFF format by the 2D solver has been addressed.

h) A problem in 2D models with the handling of embedded structures correctly when the input grid(s) are rotated has been fixed.

i) 2D simulations previously could fail to write results if the requested output format was XMDF. Fixes in the 2D solver now ensure the data is correctly written out when XMDF format is requested.

j) FAST solvers incompatible with versions of their dependencies used in v5.1. In v6.0 the FAST solvers have been recompiled to use the same updated versions of shared dependencies as the other 2D solvers. This fixes issues with running FAST solver simulations that appeared in v5.1.

k) A bug discovered in the implementation of normal depth boundaries in all 2D solvers (i.e. ADI/TVD-CPU/TVD-GPU) has been fixed.

l) The calculation of volumetric mass balance error (%) and instantaneous mass balance error (m3/s) in the mass balance output file has been corrected.

3 Known issues in v6.0

The ongoing enhancements to our solvers has highlighted two selected scenarios where the user should take care. In some cases, a workaround may be required. These scenarios are as follows:

a) 2D models (all solvers) using head-time boundaries, normal depth boundaries or rainfall inflow boundaries

These models may report incorrect mass balance data. The mass balance output csv file will contain correct data. The following calculation can be used to check mass balance.

- Sum Q->1D, Q BC->2D and Q BC<-2D (columns D, E and F) and multiply by data frequency (timestep in col A)

- Add final Trapped Volumes (last entries in columns K and L)
- Compare to final 2D V (last entry in column H) – the difference in this comparison is the final mass error

b) 2D ADI models using a normal depth boundary

If this boundary is extended over a long distance (more than a few grid cells) then it can fail to let flows through (reflecting flow back). The issue can be resolved by replacing the normal depth boundary with a head-time boundary (head-time relationship may be determined using an estimate of expected outflow with Manning's Equation).

These issues will be addressed in the next release.

Previous releases

Flood Modeller 5.1.1

Flood Modeller 5.1