



Technical Documentation Version 7.4

Release Notes



Center for Advanced Decision Support for
Water and Environmental Systems (CADSWES)

UNIVERSITY OF COLORADO **BOULDER**

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Chapter 1

What's New in Version 7.4?

This document describes new features, enhancements, and changes in RiverWare Version 7.4.

Special Attention Notes

The section describes special attention notes, which indicate that functionality has changed that requires you to update models, that results may differ, or you might get a warning message when you first load a model in Version 7.4. If you have any questions, contact RiverWare-Support@Colorado.edu.

Reach Mass Balance Salinity

On the Reach Mass Balance Salt methods, a fix was made that could change model results for reaches where Salt Storage is in use and flows are small. See [“Reach Mass Balance Salinity” on Page 12](#) for details on this fix.

Storage Account Solution Mechanism

The Storage Account solution mechanism was modified to perform better when solving outside of a run. If you run an accounting model in this fashion, please test to ensure it is solving correctly.

Accounting

This section describes changes to RiverWare Accounting.

Additional Computational Subbasin Verification

In an accounting model that has a computational subbasin using the Prior Appropriation method, the first time the subbasin is used as part of the water rights solver, the objects and accounts are cloned. Now the verification methodology looks at each account in the subbasin and issues a warning if the following conditions are met for that account:

- The account water type is not the allocatable flow water type, and
- the account is a passthrough account, and
- the account has an inflow or outflow supply from a passthrough account whose water type is the allocatable flow water type.

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When this is the case, a warning message is posted to diagnostics, as the object containing this account is not in the water rights computational subbasin but probably should be. If you see this message, consider modifying your subbasin membership to include this object.

Data Management Interface

This section describes changes to the RiverWare Data Management Interface (DMI).

DSS Table Slot Import

For a DSS Data Management Interface dataset, support was added for improved import of table slot behavior. Now for importing table slot values you can choose whether to **Import and Resize** or **Import Available**. Previously, the behavior was to **Import and Resize**. Now, with the **Import Available** option, you can import only those values that have changed and not overwrite values further down the table. See [“Table Slot Data” in Data Management Interface](#) for more information.

Diagnostics

This section describes changes to RiverWare Diagnostics.

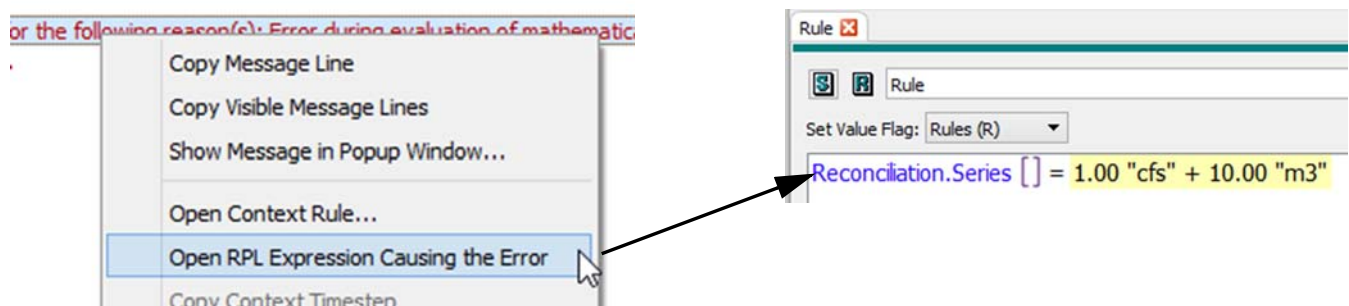
Diagnostic Window Open

Previously, the Diagnostic Output Window automatically opened after a model loaded. This was modified so that you no longer see the diagnostic window on model load. Only an aborted run automatically opens that dialog.

Navigation When RPL Error Occurs

To improve navigation, when an error occurs in RPL evaluation, you can now right-click on the diagnostic output window message and choose to **Open RPL Expression Causing the Error**. This action opens the appropriate RPL dialog and scrolls to and selects the expression that caused the error. [Figure 1.1](#) shows the menu item. See [“Diagnostic Output Window” in Diagnostics](#) for more information.

Figure 1.1 New menu that navigates from the diagnostic output to the RPL Expression causing the error



RPL Warning, Alert, Notice, and Stop Run Messages

The diagnostic output from RPL statements was enhanced as follows:

- Alert and Notice statements were added as described in “Alert and Notice Statements” on Page 8. Examples are shown in Figure 1.2. See “Notice, Warning and Alert Statements” in Diagnostics and “Statements” in RPL User Interface for more information.

Figure 1.2 Sample RPL Notice, Warning and Alert Statements displayed in diagnostic output

Context	Diagnostics Message
1:	----- Rulebased Simulation RUN STARTED -----
2:	"BighornBasin.mdl.gz at 15:30:40 November 20, 2018"
3:	-----
4: 24:00 April 30, 2017; RULE: (4) Flood Control Notice	Elk Reservoir is within 0.5 ft of the Flood Control Guide.
5: 24:00 May 31, 2017; RULE: (3) Flood Control Warning	Elk Reservoir is at the Flood Control Guide.
6: 24:00 December 31, 2017; RULE: (2) Flood Control Alert	Elk Reservoir is exceeding the Flood Control Guide!
7:	----- Rulebased Simulation RUN FINISHED -----

- The Warning statement diagnostic text color was modified to be black text with a pink background to distinguish it from the internally generated brown warning messages.
- The diagnostic output window color legend and search menu were modified with the new colors and statements.
- Within diagnostic messages issued by RPL Warning statements, the text “RPL Warning statement:” is no longer prepended before the user-specified message. Similarly, within messages issued by RPL Stop Run statements, the text “Run aborted by STOP RUN statement with value:” is no longer pre-pended before the user-specified message.
- When diagnostics are written to a file, messages from RPL Warning statements now have a line header of `_RPLWARN_` to distinguish them from internally generated warning messages, which still have a line header of `_WARNING_`.

Licensing

This section describes changes to RiverWare Licensing.

License Server Manager

When RiverWare uses a floating license, it now attempts to communicate with the license server at a fixed interval. If RiverWare is unable to do so, it assumes the license has been lost and attempts to reacquire the license. If it is unable to reacquire the license, RiverWare shuts down.

Model Files

This section describes changes to RiverWare Model Files.

Model Comparison Tool

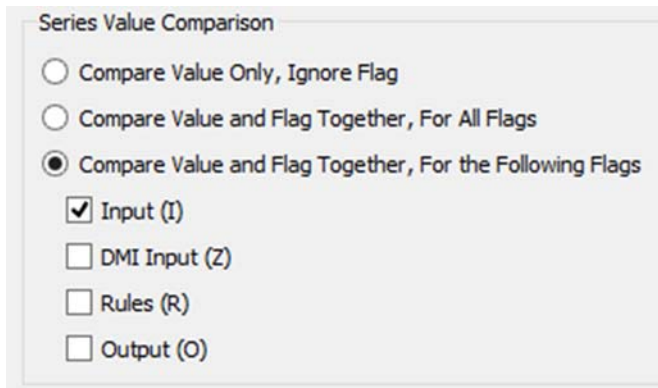
The Model Comparison Tool compares two models and presents the differences in a hierarchical tree. The tree allows you to identify and explore the differences between two models. The process is as follows:

1. You indicate which models you would like to compare and how to compare the series values.
2. The tool displays a table of contents for the two models, indicating which items are different.
3. You can select items to see how they differ in the two models.

See [“Comparing Models Using the Model Comparison Tool” in Model Files](#) for more information on this tool.

In RiverWare Version 7.4, the tool was enhanced as follows:

- Searching and filtering: You can now search for comparison results by name, type, or comparison status, and you can also limit the display to items that match one of these criteria. See [“Search and Filter tools” in Model Files](#) for more information.
- Selecting which series slot flags and values to compare: When choosing which models to compare, you can now choose from the options shown in the following screenshot.



- Added Content: The following additional content is now compared:
 - Accounts and account properties
 - Model version number
 - Table Slot row labels
 - RPL Sets saved in the model
- Ability to compare large models: An issue was addressed that prevented large models from being compared.

Objects

This section describes changes to RiverWare Objects.

Aquifer

A new *Aquifer* object was added to the palette. The Aquifer object solves the saturated groundwater flow equations at a user-specified timestep, which could be larger than the run timestep. Physical processes modeled include pumping and groundwater flow in up to six directions. Links are created between the Aquifer and the adjacent aquifers and up to one overlying groundwater object.

See [“Aquifer” in Objects](#), for more information on this new object.

Groundwater Storage Object

A new percolation method was added to work with the Aquifer object. The Head Based Linked Percolation adds the Deep Aquifer Elevation Previous which can be linked to the Aquifer object.

See [“Head Based Linked Percolation” in Objects](#) for more information.

Optimization

This section describes changes to RiverWare Optimization.

Optimizer License Indicator

The workspace no longer shows the CPLEX icon at the bottom-right corner of the workspace if the license supports optimization. You can still find this information by selecting **Help**, then **About**.

Output Devices

This section describes changes to RiverWare Output and Plotting.

Plotting: Mouse Button Actions

Mouse-wheel and button operations have been added to plots to improve panning and scrolling navigation.

- Mouse-wheel scrolling over the plot area zooms the plot in or out on all axes.
- Mouse-wheel scrolling over an axis scrolls only that axis. This single axis scroll not only improves ease of zooming a single axis, but also introduces a new capability of zooming an x or y plot axis independently from its opposing x or y axis, if one exists.
- Middle-mouse button click-and-drag action on the plot area pans the plot using a closed-hand cursor.

See [“Mouse Button Actions” in Output](#) for more information.

Output Canvas

Following are new features in the Output Canvas.

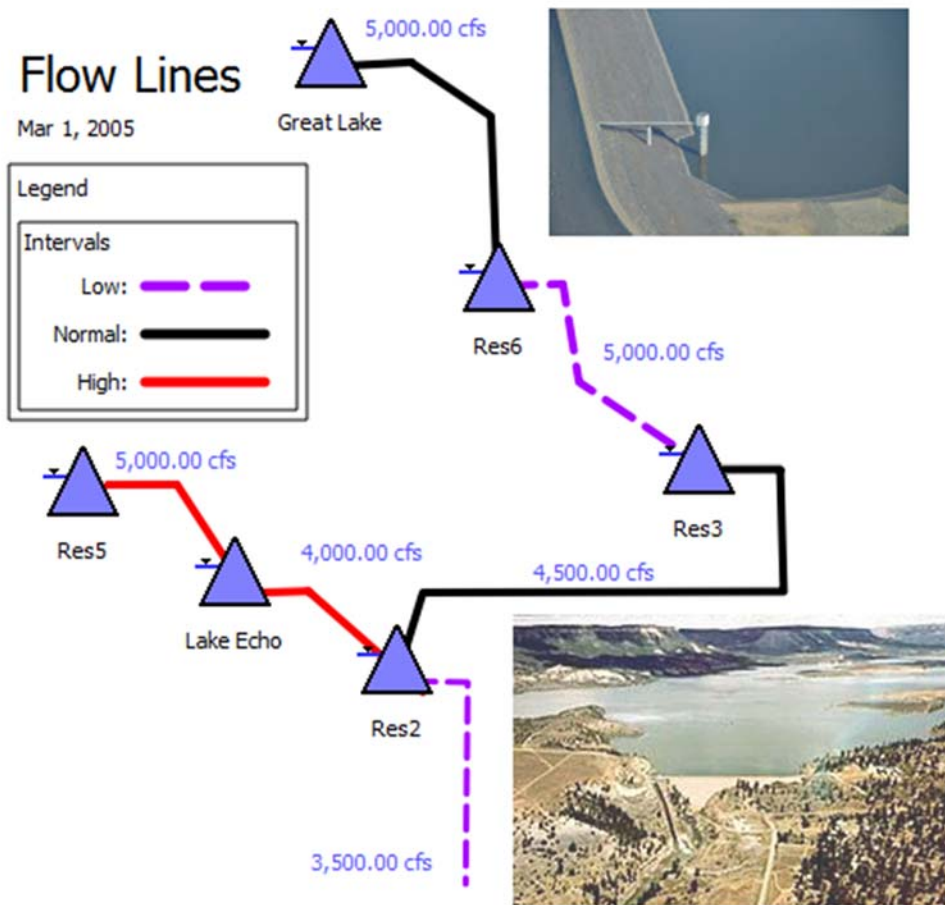
Export to Video

The Output Canvas animation can now be exported to a video file (MP4, WEBM, WMV, or GIF). See [“Export Video” in Output](#) for more information.

Flow Line Legend

On the Output Canvas, you can now show a Flow Line Legend as part of a Flow Line Group. Currently, the legend provides a key to the defined intervals on the Flow Line Group. [Figure 1.3](#) shows an output canvas with Flow Lines and a Flow Line Legend. See [“Flow Line Legend” in Output](#) for details. In the future, the legend will also provide a key to the thickness of the lines.

Figure 1.3 Flow Line Legend



RiverWISE

The RiverWare Interactive Scenario Explorer (RiverWISE) allows stakeholders to view an exported version of a RiverWare model and to explore alternative scenarios within constraints specified by the model developer. See

“[RiverWISE Model Developer Guide](#)” in [RiverWISE Model Developer Guide](#) for more information on RiverWISE. RiverWISE was modified as follows:

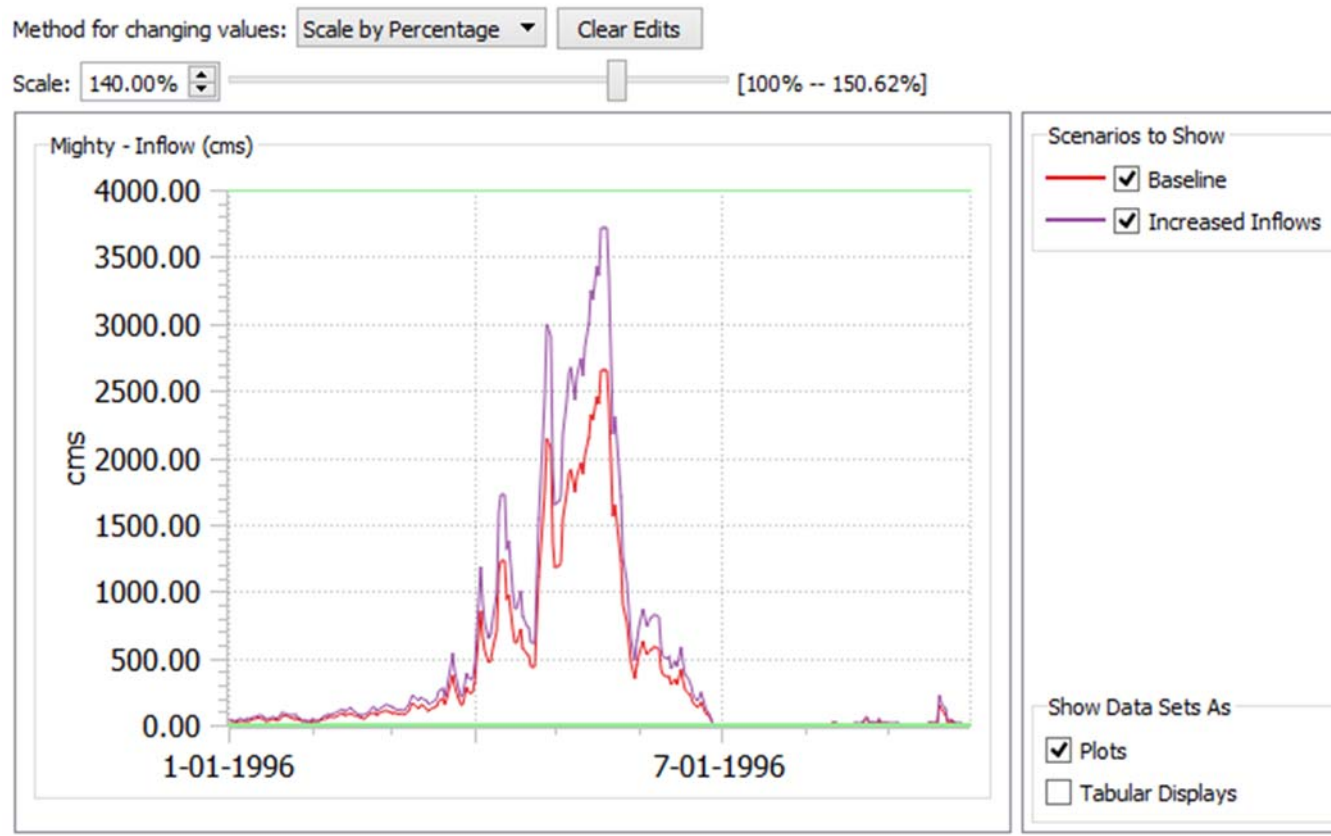
- Allows stakeholders to select multiple series input data sets at the same time.
- Allows stakeholders to adjust one or more series input data sets by a percentage or constant value.
- In terms of plotting, displays markers (horizontal lines) corresponding to the data set minimum and maximum values, when they exist.

The Export to RiverWISE from RiverWare was modified as follows:

- Default minimum and maximum values are provided for input series slots.
- Export of unsupported input slots, including Periodic Slots, Table Series Slots, and Statistical Table Slots, is prevented

Figure 1.2 shows a series slot that is scaled by a percentage using sliders. The plot also shows the minimum and maximum values.

Figure 1.4 RiverWISE input data set scaled by a percentage



RPL

This section describes changes to the RiverWare Policy Language (RPL).

Alert and Notice Statements

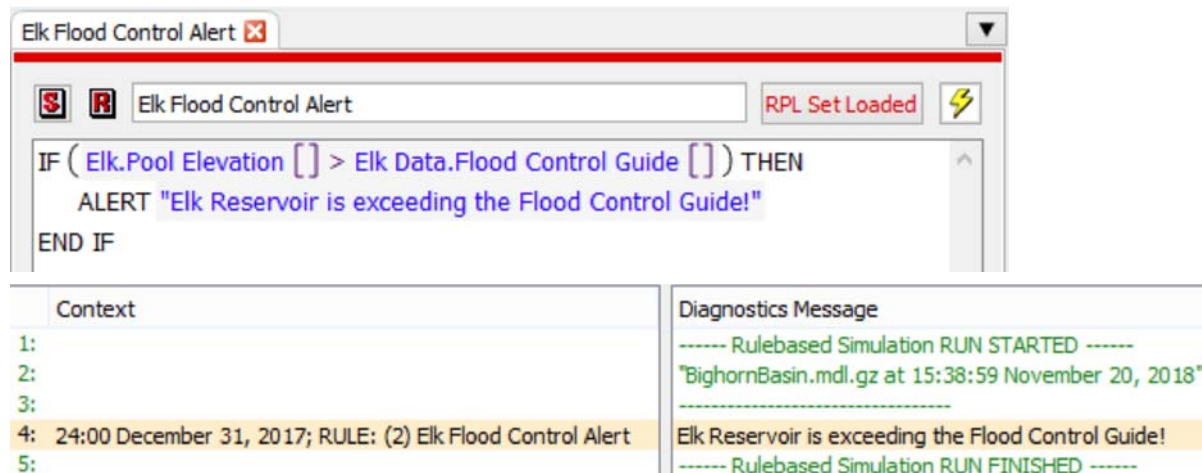
Two new statements were added to RPL:

- Alert
- Notice

These two statements post a message to the diagnostic output window just like the Warning statement. All three statements (Warning, Notice, and Alert) have unique colors as described under [“Notice, Warning and Alert Statements” in Diagnostics](#).

Figure 1.5 shows a sample use of an Alert statement. A Notice can be used in the same manner.

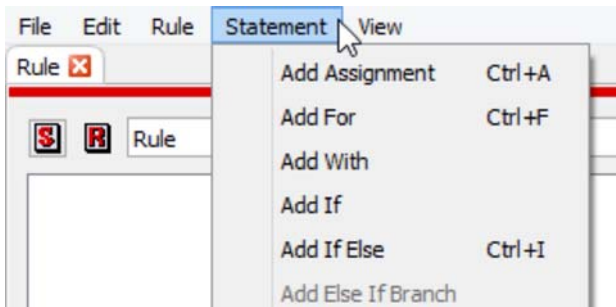
Figure 1.5 Sample use of RPL Alert statement and resulting diagnostic message



New Statement Menu on RPL Block Dialogs

Within RPL block dialogs (Rules, Goals, Methods), the operations to add statements were moved to a separate **Statement** menu.

Figure 1.6 Statement menu in a RPL Viewer dialog



New RPL Predefined Functions

The following RPL Predefined functions were added.

GetTextSlotValueAsString

This function gets the value from a Text Series Slot at the specified datetime and returns a string.

See [“GetTextSlotValueAsString” in getRPL Predefined Functions](#) for more information.

GetSlotNameAndCol

Given a slot, this function return the slot name portion of the full name, combined with the column label when the input slot is an aggregate series slot or a column of an aggregate series slot.

See [“GetSlotNameAndCol” in getRPL Predefined Functions](#) for more information.

StringToTextSlotNumeric

This function converts a string into a numeric that can be set on a Text Series Slot.

See [“StringToTextSlotNumeric” in getRPL Predefined Functions](#) for more information.

TextSlotNumericToString

The function converts a Text Series Slot encoded text (a numeric) into a string.

See [“TextSlotNumericToString” in getRPL Predefined Functions](#) for more information.

Text Series Slots Reading and Writing

Text Series Slots store text strings as a series of encoded numeric data. The RiverWare Policy Language (RPL) was improved to read Text Series Slots with any RPL set and set Text Series Slots from Rulebased Simulation Rules and Initialization Rules. To support this, three new predefined RPL functions were added: two for reading text slots and one for writing text slots.

- [“GetTextSlotValueAsString”](#). Returns the text slot value at the given date as a string.
- [“TextSlotNumericToString”](#). Returns the text slot value as a string.

- “[StringToTextSlotNumeric](#)”. Converts a string into a value that can be set on a text slot.

Run Control

This section describes changes to RiverWare Run Control.

Five- and 15-minute Timestep Sizes

Five- and 15-minute timesteps were added to the run control.

Caution: Water accounting is not supported for five and 15-minute timestep sizes.

In addition, the timestep size representation was standardized in all locations. The following nomenclature is used:

- 5 Minute
- 15 Minute
- 1 Hour
- 6 Hour
- 12 Hour
- 1 Day
- 1 Month
- 1 Year

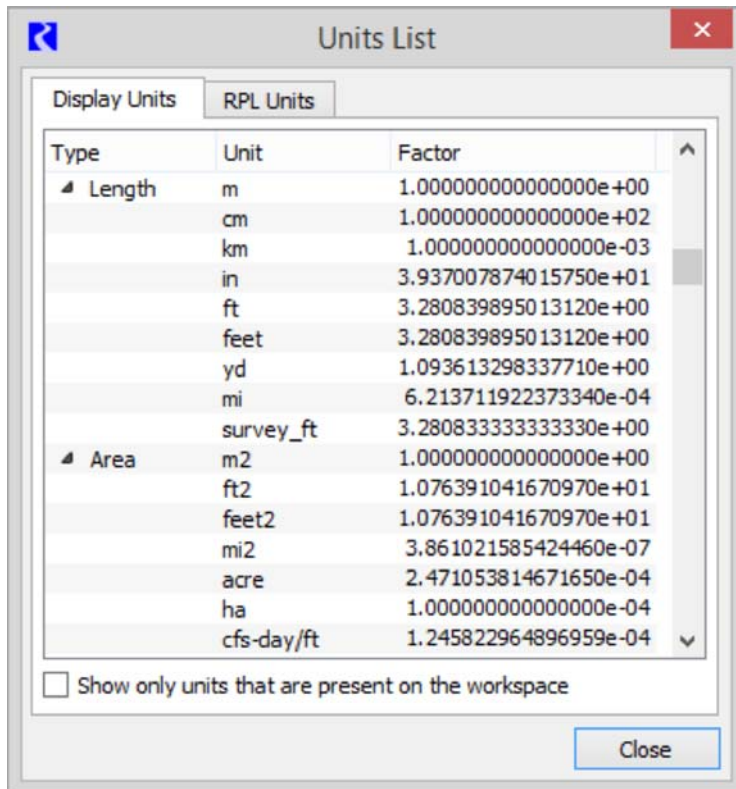
Units

This section describes changes to RiverWare Units.

Units File Removed

The “uni ts” and “rpl Uni ts” files were removed from the installation folder and combined into the RiverWare executable. A new Units List dialog was added to the **Units** menu that displays simulation and RPL Units. Select **Units**, then **List Available Units** to see all of the conversion factors used.

Figure 1.7 Units List dialog showing conversion factors



For more information on the Units List dialog, see [“Display Units” in Units](#).

New Units

The following new display units were added:

- FlowSquared: kcfs2
- VolumeSquared: kcfsh2
- Volume: kcfsh
- Velocity: ft/fivemin
- FlowPerTime: acre-ft/day-s
- FlowPerTime: acre-ft/day-hr
- FlowPerTime: kcfs/fivemin
- FlowSquared: acre2-ft2/day2
- FlowSquared: acre2-ft2/month2
- FlowSquared: acre2-ft2/year2
- FlowVolume: m6/s

- PowerPerTime: MW/fivemin

Water Quality

This section describes changes to RiverWare Water Quality.

Reach Mass Balance Salinity

The Reach Mass Balance Salt methods were modified as follows:

- When Salt Storage is in use, the reach salinity dispatch methods were not redispatching with the correct previous timestep information. Now the reach redispatches when previous Salt Storage values change.
Note: This fix could change model results for reaches where Salt Storage is in use and flows are small.
- On the Reach water quality methods, a new slot, Reach Diversion Salt Concentration Maximum, was added to the Mass Balance Salinity method. When not specified, the Diversion Salt Concentration is now computed to be the minimum of the Inflow Salt Concentration and the Diversion Salt Concentration Maximum.
- An incorrect error condition was stopping the run. This error check was refined.

See [“Mass Balance Salinity” in Water Quality](#) for more information on these methods.

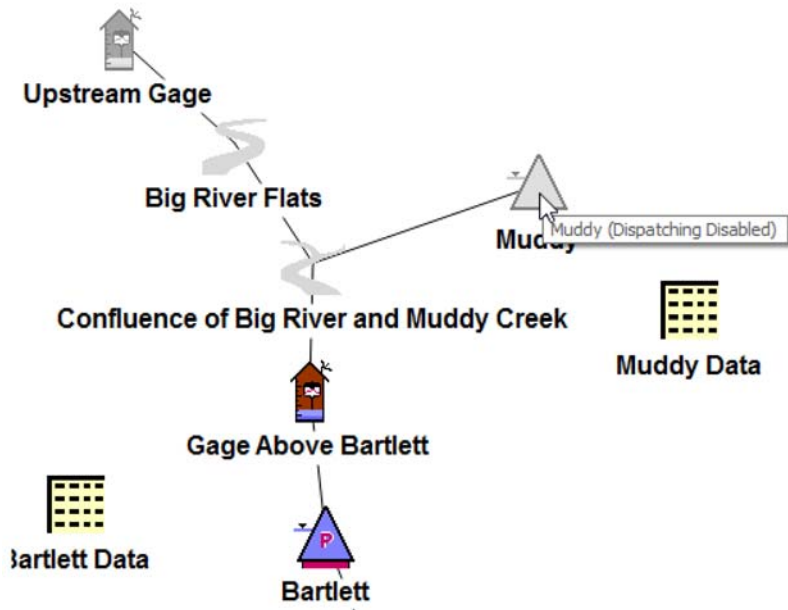
Workspace

This section describes changes to the RiverWare Workspace.

Display of Disabled Objects

When dispatching is disabled, the object icons now appear as lighter black-and-white icons, as shown in [Figure 1.8](#). Tooltips indicate they are disabled. Menu options for disabling and enabling dispatching were added to the **Workspace**, then **Objects** menu, and various other locations in the interface. For more information, see [“Enabling and Disabling Dispatching” in Workspace](#).

Figure 1.8 Display of objects with dispatching disabled



Chapter 1
What's New in Version 7.4?

Chapter 2

Closed Bug Reports

Table 2.1 summarizes the bugs that have been closed since the last major release (Version 7.3). Bugs are listed in bug number order. For more information on any bug, see the CADSWES website.

Table 2.1 Bugs closed since Version 7.3

Number	Synopsis
5680	Equal priority water rights algorithm gets stuck in a loop
6103	Infinite loop for plotting error dialog
6110	Crash after loading a RPL set with a script if the set is already open
6115	Enabled state of subscript actions not applied correctly with multiple calls to the subscript
6129	Infinite loop when generating bar chart
6130	Context issue in diagnostics - incorrect object specified for StorageToArea function
6133	RPL allowing multiple "WITH" variables of the same name in rules
6134	Multiple object viewers can occur at the same time
6136	Chart dialog graphical glitch
6143	Inconsistent timestep text in user interface
6151	Control File DMI import fixed keyword does not work
6156	Thermal object application of Pumped Storage Generation Capacity is incorrect
6158	In the CSV Output from MRM the Timestep Size field is exported incorrectly
6159	MRM RDF to Excel does not work if output file does not exist
6160	MRM Output to Excel error creates hidden modal dialog
6161	Embedded images from external html reports not showing up in WORD.
6162	Crash opening mass balance summary slot from right-click Open Slot menu
6163	Deleting a balance in a Mass Balance Summary Slot causes crash
6164	RPL comments on CONCAT's will migrate to last "<expr>" level
6165	RPL editors permit replacing a comment with an expression (bad things follow)
6166	Pasted RPL expressions sometimes have unnecessary parentheses
6168	GetSlot predefined function doesn't work correctly for AggSeries slots
6173	No preferred opt units should cause run to abort
6174	No preferred opt units error only issued once per session not per run
6175	In opt constraint, a list reference with a bad index reports an incorrect error message

Chapter 2
Closed Bug Reports

Table 2.1 (Continued) Bugs closed since Version 7.3

Number	Synopsis
6176	Rename for function argument does not work
6177	Rename behavior in MAPLIST expression is incorrect
6179	Iterative MRM will not execute rule nor break on execution constraint function
6180	Crash occurs after unloading RPL sets with script while paused in RPL Debugger
6181	RPL DateTime math incorrect with partial DateTime
6182	Debug assert failure due to non-conforming units
6183	Status Bar display in Run Control Dialog and SCT does not properly display run status in one timestep model
6185	Crash when editing an initial account storage
6186	Model crashes when starting run
6193	Crash after closing RPL set with script with RPL Viewer that was opened from RPL Search
6194	Model crashes when water quality methods are selected
6196	Model comparison tool notices some differences it shouldn't
6198	RPL Set check validity short cut keystroke does not work
6199	Unit List dialog incorrect when showing only units present on the workspace
6200	Two RPL display settings bug when new symbols are introduced
6201	Model comparison tool fails on text series slot
6202	RiverWISE can open without displaying the baseline scenario
6203	Model comparison tool reports incorrect difference for agg. series slot
6204	Model comparison tool: weird results search behavior