

# USACE RiverWare Model Report

## Functional Requirements

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This document presents requirements for a new type of RiverWare output device type whose purpose is to produce model reports for the USACE Southwest division. Another document, “RiverWare Model Report: Functional Requirements and Prototype Description” provides background as well as more general requirements for the model report output device type. Here we focus on the needs of this particular sponsor and how they will be met by the model report output device type.

## 1 Desired report content and organization

At the highest level of organization, a typical USACE model report should contain the following:

- Table of Contents
- Model Description
- Object section for each SimObj
- Computational Subbasin section for each computational subbasin

Ideally the report would be flexible with respect to the order of the object sections, with the following options: alphabetically, by object type, hydrologically, or custom. Each object section would contain the following:

- Description
- For selected scalar slots on the object, the slot name and value.
- For selected TableSlots, the name and a tabular display of the values.
- A listing of the selected method for categories with non-default selections.

The computational subbasin sections would be similar.

### 1.1 TableSlots containing flow or volume columns

For reservoir objects, some of the TableSlots included in USACE reports have a column corresponding to a pool elevation. For example, the “Elevation Area Table” maps pool elevation to the corresponding surface area. It should be possible for the display of such a table in the report to include a column giving the corresponding storage values. Typically these values would be computed using the “Elevation Volume Table”, though their computation would be more difficult if a non-trivial Sediment Calculation method were selected.

RiverWare could meet this need either by modifying the TableSlots to include the desired values or by dynamically computing and including these values at the time the report is written. While the former approach would benefit other RiverWare users, it is technically more challenging.

### 1.2 Seasonal storage

For reservoir objects participating in the flood control, the current USACE model report contains a “Seasonal Storage vs. Level” table. This table can be large and contains a great deal of information, in fact describes a mapping of 2-tuples to 3-tuples: for each date at which operating levels change and for each operating level, this table gives the

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maximum elevation and storage corresponding to that operating level as well as the percentage that represents of the top of the conservation pool (or flood control pool, if the elevation is above the top of conservation pool). This table is not currently a RiverWare Reservoir Tableslot, but can be derived from data in the following slots: Operating Level Table, Elevation Volume Table, Top of Conservation Pool, and Top of Flood Control Pool.

## **2 RiverWare requirements**

### **2.1 New Model Report output device**

The general requirements for the new Model Report output device are discussed in another document, here we focus on the new functionality required to support the needs of the USACE model report. A prototype of the model report output device was developed in Spring 2011. This prototype is scaled down from the full design in many ways that need to be addressed for this task:

- Improved report layout editing.
- Additional model report item types and settings.
- Support for on-line help.
- Improved error handling.

#### **2.1.1 Improved editing of the model report layout**

A few interface improvements to consider:

- Better geometry management (splitters, more intelligent sizing, dockable panels, tool bars, etc.).
- Addition of arrow buttons and menu operations for Report Layouts edit operations (e.g., copy/paste).
- Visual clarification of the palette-like character of the Output Items panel and organization of its items.
- Consistent use of tool tips.
- Visual highlighting of settings which have non-default values and addition of a button for reverting to default.

We should consider supporting the following report layout edit operations:

- Copy Item/Copy Item Tree
- Paste Below/Paste As Child
- Move Up/Down
- Promote/Demote
- Delete Item/Delete Item Tree
- Add New Item Below (cascading with Item Types)/Add New Item As Child (cascading with Item Types)
- Undo/Redo

We might want to provide a more minimal set of operations, favoring simplicity over the time to perform edits. For example, we could always assume operations operate on the full item tree and that items are always added as the first child of the selected item. While some edits would then be laborious, it would at least be easy for the user to know what to do.

#### **2.1.2 Model Report output item types and settings**

The following table lists the output item types and settings that RiverWare will need to support. Red indicates item types and settings which do not exist in the prototype.

Object type			
Report	Output	Title heading	text
	Settings	Output Device Name	text
		Output File	text
		Format	enum
		Title	text
		<i>Dynamic show/hide section content</i>	<i>bool</i>
		<i>Number Sections</i>	<i>bool</i>
Section	Output	Section heading	
	Settings	Text	text
		Ordering of children Object sections	enum
SimObj Section	Output	Section heading	
		Object type	
		<i>Object icon</i>	
	Settings	Object name	text
		Include Type	bool
		<i>Include Icon</i>	<i>bool</i>
Text	Output	Paragraph	
	Settings	Text	text
Model Information	Output	Depends on settings	
	Settings	Include File Save History	bool
		Include File Comment	bool
		<i>Include Summary Statistics</i>	<i>bool</i>
SimObj Method Table	Output	Title	
		Table	
	Settings	Object Name	
		Show only non-default methods	bool
Scalar Slots Table	Output	Title	
		Table	
	Settings	Selection	list
Slot	Output	name and values	
	Settings	Slot name	text
		Include slot type	bool
		<i>Show storage and elevation</i>	<i>bool</i>

For TableSlots with either a volume or elevation column, the ability to automatically compute and display the complementary value in the TableSlot output.

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## 2.2 Seasonal storage Tableslots

Add new slots: Seasonal Conservation Storage Table, Season Flood Control Storage. These are dependent on the Operating Level Balancing method being selected in the Flood Control Release Calculation. This table is computed at the beginning of each run.

If for some reason it is not desirable to add the seasonal storage tables, then we could add the ability to define TableSlots computed by expression, as well as the ability to add slots (including expression TableSlots) to non-DataObjs. This more general mechanism would allow the users to achieve the same effect, though it would require more effort of their part.

## 3 Notes

- What additional formats, if any, are required? What about pagination for non-HTML formats? Large tables are probably the primary issue here.
- If the users want to see series data (e.g., input data), we could support the inclusion of Tabular Series Slot output devices. Another possibility is to support output of SeriesSlots as tables with option to output only input values.
- Ability to sort SimObj sections could be a parent section option, the ability to re-arrange root selections is another matter, we should also provide support for this.
- This report might want to include the RPL policy as well as the output from plot devices.
- How to support the initial configuration of a report? A wizard, perhaps, which might know about various standard reports. The report template idea is perhaps not so promising: no telling in which objects/slots the user is interested.
- The selected item Settings treeview's tooltip should include something like: "Click on cell to change value".
- Should the common layout edit operations be on a toolbar and if so, where should it go?
- Should we skip the item palette in favor of a combobox/cascading menu approach. Make the palette optional?
- Support inclusion of an image/file.
- The Slot item type needs to do something reasonable for periodic slots, perhaps something more is required than the TableSlot output.

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## 4.0 Development Schedule

Days	Task
	<b>New Model Report output device type (finish framework implementation)</b>
1	(GUI) Improve geometry management
4	(GUI) Improve editing of layout tree
1	(GUI) Improve display of output item palette
2	(GUI) Improved editing of format settings
2	Design and implement format setting dependency mechanism
2	Add top-level HTML format settings for control over fonts, colors, indentation, etc.
1	Improve error handling
2	Documentation
	<b>Model Report item types</b>
1	Model Information, summary statistics
1	Section
1	Table of Contents
1	Table of Scalar Slots
1	Method Table (for SimObj or Computational Subbasin)
2	Slot (support for TableSlot, ListSlot)
2	TableSlot pagination
	<b>TableSlot enhancements</b>
4	New seasonal storage tables
4	Automatic elevation/volume computation