Addendum to Section 3.5: Water Supply Sources and Infrastructure

The user guide provides instructions on entering reservoir or surface storage properties and costs. The following addendum describes how surface water storage is modeled within WMOST, including how to set up a model should your study area not include a surface water storage component.

As noted in the user guide, reservoirs in WMOST may represent reservoirs, lakes or ponds used for water supply, and/or surface storage tanks.[1] The reservoir component within WMOST is conceptually located at the outlet of the modeled watershed and will receive all of the surface water flows as well as any specified withdrawals and discharges. This conceptual location of the reservoir at the outlet of your study area is relevant for model formulation and calibration and management target specification.

Specifying or Omitting Reservoirs in Model Formulation

With respect to model formulation, if you are modeling a reservoir, constraints must be set for the initial, minimum, and maximum reservoir volumes (see screenshot below).

Initial reservoir/surface storage volume	80	[MG]
Minimum target reservoir/storage volume	33	[MG]
Existing maximum reservoir/storage volume	1,240	[MG]
Initial construction cost	0	[$/MG]
O&M costs	0	[$/MG]
Maximum additional reservoir/storage volume	0	[MG]

The definitions for initial, minimum, and maximum reservoir or surface storage volumes can be found on page 41 of the WMOST user guide. If you do not have specific information on the existing maximum reservoir/storage volume, make sure this volume is at least one to two order of magnitudes larger than the initial volume or expected surface water flow to ensure that the reservoir can accommodate the daily flows from the surface water into the reservoir.

If you do not have a reservoir within your study area, enter "0" for the initial, minimum, and maximum reservoir or surface storage volumes to zero out the reservoir, which effectively removes it from the model. If you choose to zero out the reservoir, make sure that your model also excludes the option to purchase virtual water that flows into the reservoir system by setting the associated make-up water penalty to "-9" (see screenshot below). Similarly, you should allow reservoir/sw outflow to be a decision as opposed to a specified data time series (see screenshot below).

Cost for make-up surface water penalty	0	$/MG	
To exclude make-up water penalty, enter -9.			-9
Enter Yes to use Reservoir/Sw Outflow as data time series or No to allow Reservoir/Sw Outflow to be a decision.			No

[1]The WMOST reservoir component should only be used to model surface water storage tanks if the tanks hold water generated from within the study area. For example, interbasin transfer volumes should not be simulated using WMOST's reservoir component.

Accounting for Reservoirs in Model Calibration

With respect to WMOST model calibration, the calibration module compares observed flows and concentrations to modeled flows and concentrations in surface water upstream from the reservoir and its associated components (QSwRes and LSwRes).[2] Those modeled flows and loadings do not take into account any reservoir withdrawals or discharges (either specified by the user or chosen through optimization). As a result, if you are modeling reservoir withdrawals and discharges, and have measured data that reflects these flows, consider calibrating your model outside of the Calibration Module using flows and loadings leaving the reservoir (DQSwExt and LSwExt).

Accounting for Reservoirs in Setting Management Targets

WMOST allows you to set water quality targets for the surface water system (in-stream and reservoir, see WMOST User Guide p. 43). The in-stream concentration and loadings target apply to loadings and concentrations in-stream before the reservoir (LSw, XSwF). The reservoir concentration and loadings target apply to loadings and concentrations within the reservoir (LRes, XResF), which may be different from loadings[3] leaving the reservoir at the outlet of the watershed (LSwExt).

[2] WMOST theoretical documentation includes variable definitions and component mass balance equations for reference.

[3] WMOST uses the concentration within the reservoir (XResF) to calculate loadings leaving the reservoir (LSwExt) so there should be no difference between the concentration within the reservoir and the concentration leaving the reservoir at the outlet of the watershed.