 **WMOST Enhancement**

**WMOST v3.01**

***July 31st, 2018***

***Amended by EPA 3/25/19***

# WMOST v3.01 Changes Made to Version 3.0

* Implemented by EPA
* *Options file addition* – The optimization module now creates an options file for NEOS optimization runs which allows the user to change settings for the maximum number of iterations from the default of 3000 up to a maximum of 10000 and for the tolerance value of the cost objective function (0.0001 is recommended). The tolerance value determines how (relatively) close the final solution has to be to the optimum.
* *Loading units option for metric tonnes* – This option allows users to enter loading time series for suspended sediment in metric tonnes/time step instead of pounds/time step. To facilitate optimization algorithms, decision variables should be of similar magnitude in the region of interest (near the solution). Ideally a unit change in any variable should produce a unit change in the objective function. NEOS has some preconditioning routines to handle scaling but can’t always resolve problems (See <https://www.solver.com/standard-excel-solver-problems-poorly-scaled-models>, [http://www.math.uwaterloo.ca/~hwolkowi//henry/reports/talks.d/t09talks.d/09waterloomatlab.d/optimTipsWebinar/html/optimTipsTricksWalkthrough.html#40](http://www.math.uwaterloo.ca/~hwolkowi/henry/reports/talks.d/t09talks.d/09waterloomatlab.d/optimTipsWebinar/html/optimTipsTricksWalkthrough.html)) for more discussion of this issue. Initial runs of WMOST v3 to optimize management for total suspended sediments tended to run into scaling problems. Changing the units of loading time series for TSS from pounds/time step to metric tonnes/time step helped to make optimizations run more efficiently for TSS.
  + *Annual load target option* – An option to set annual load targets instead of daily loading targets was added.
  + *Fixed look-up table vulnerability*
    - Previously look-up tables for dropdown lists were incorporated to the right of the portion of each WMOST tab used for entering data with font color set to white
    - Font color of look-up tables for drop down lists was changed to red boldface and associated columns are now hidden. A warning message was added at the top of the look-up tables to prevent the user from deleting or modifying these lists.
* Implemented by Abt
  + Replaced Optimize button (it was corrupted, leading to the optimize error and crashing)
  + Changed where precipitation and temperature statistics are calculated from
    - Previously, precipitation was calculated from the “Precipitation” sheet and temperature was calculated from the “Stormwater-Data” sheet. This lead to issues when a user skipped processing the data for either tab.
    - Now, precipitation and temperature are calculated from the “Hydro\_Stage” hidden tab, which is populated whenever a user uses the baseline hydrology module. If a user does not use the module, they need to calculate their climate statistics separately.
  + Corrected issue with pulling the flows needed for the Graphs module on the Lookup Tables tab
    - The flows were coming from an external tab, but the lookup formula was pulling a cell from the lookup tab
  + Added a conversion in the Graphs module
    - The flow from SW to external is graphed in the Graphs module and was missing a conversion from MGD to cfs for the graph
  + Changes to the Scenario Log File macro
    - Removed if statements that only printed stormwater data if it was present in order to make the log files the same length whether a user used the stormwater module or not.
    - Changed order of stormwater data (put stormwater land use sets before the stormwater module data)
    - Revised code that added the HRU ID from the hydrology databases (change primarily made for v3.1 for HCAM application, but applied to v3 to minimize differences in log files between the two versions).
  + Corrected calculation of fit statistics on Calibration tab
    - Previously if there were missing values in measured time series, this introduced errors into the calculation of fit statistics
    - The form of formulas was changed to eliminate errors due to missing values
  + Corrected reporting of total cost on Results tab
    - Occasionally, total costs were incorrectly reported on the Results tab even though component costs were reported correctly
    - Simplified reporting of total cost by addeing code to include an extra “display cost” command in the Wcommand.amp file which generates an explicit listing of the final objective value (cost = nnn.nn) that can be easily recognized by code in the Results Module.