

# MEMO

## State of Idaho

### Department of Water Resources

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**Date:** January 14, 2015  
**To:** Jeff Peppersack, P.E., Water Allocation Bureau Chief  
**From:** Jennifer Sukow, P.E., P.G., Hydrology Section  
**cc:** Sean Vincent, P.G., Hydrology Section Manager  
**Subject:** Eastern Snake Plain Aquifer transfer spreadsheet, ETRAN Version 3.2

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The Eastern Snake Plain Aquifer (ESPA) transfer spreadsheet was developed by the Idaho Water Resources Research Institute to provide a tool for non-groundwater modelers to analyze impacts of proposed groundwater right transfers. The tool allows the user to provide relevant input data and view model results within a spreadsheet interface. In the background, the tool constructs input data files for MODFLOW, runs a calibrated MODFLOW groundwater flow model of the ESPA, extracts and processes model results, and presents the results within the spreadsheet in tabular and graphical formats. The current version of the spreadsheet tool (ETRAN Version 3.1) runs the MODFLOW model ESPAM Version 1.1, which has been superseded by ESPAM Version 2.1.

Calibration of ESPAM Version 2.1 incorporated significant improvements to the groundwater flow model including but not limited to the use of updated and enhanced representation of irrigation lands, updated water rights data, updated precipitation and evapotranspiration data, refinement and addition of calibration targets for aquifer discharge between Kimberly and King Hill, updated calibration target data, and use of monthly stress periods instead of six-month stress periods. These changes resulted in revised arrays of calibrated hydraulic parameters (aquifer transmissivity and storage, riverbed conductance, spring conductance) for the new model version.

Because of differences in the delineation of model reaches downstream of Milner, and the change in model stress periods for calibration, it may be appropriate to reevaluate Department policy regarding reaches and time periods used in the spreadsheet tool to determine if they are still appropriate. If the spreadsheet tool needs to be revised, it may be appropriate to consider whether the existing spreadsheet tool should be reprogrammed

or a new tool should be developed in a different user interface. Because policy revisions and subsequent revisions to the user interface are likely to be time consuming, we proposed an interim solution for upgrading the existing spreadsheet tool to run ESPAM Version 2.1 without altering the reaches or time periods used by the spreadsheet tool.

The interim transfer tool (ETRAN Version 3.2) was developed by replacing the ESPAM Version 1.1 MODFLOW files executed by the spreadsheet tool with ESPAM Version 2.1 files, and modifying batch files as needed to refer to the new MODFLOW files. The trimester model stress periods, and the use of six spring reaches to aggregate modeled impacts to spring discharge, were retained from ETRAN Version 3.1. The MODFLOW solver used with ETRAN Version 3.1 was also retained to minimize run time. No changes were made to the macro programming in the spreadsheet tool. Modifications to the transfer tool files are detailed in the file “ESPAM21readme.txt”, which is distributed with the interim transfer tool.

During development of ESPAM Version 2.1, model developers noted there is significant discharge to the Snake River between Kimberly and King Hill that does not daylight as spring discharge and enters the Snake River as subsurface flow. This discharge from the ESPA is represented separately as baseflow in three multi-cell reaches in ESPAM Version 2.1, but was not distinguished from spring discharge in ESPAM Version 1.1. Because it was not represented in ESPAM Version 1.1, the spreadsheet tool does not retrieve the modeled impacts to the baseflow reaches. The model files executed by the interim transfer tool do calculate impacts to the baseflow reaches, but results are not in a format convenient for use by non-groundwater modelers. The baseflow reaches are not expected to be impacted to a greater degree than the spring reaches, so evaluation of the impacts to spring reaches with the interim spreadsheet tool should be adequate to conform to current Department policy. When Department policy and the user interface are revised, the baseflow reaches should be addressed for the sake of completeness.

Hydrology section staff tested the interim spreadsheet tool by analyzing 10 sample transfers. Each transfer was analyzed with the spreadsheet tool and two independent ESPAM Version 2.1 MODFLOW runs (with and without the transfer). Independent MODFLOW runs were performed using the same number of stress periods and time steps, and the same solver settings, as used by the spreadsheet tool. Calculated effects from the MODFLOW runs were compared with results in the “CalculatedEffects” worksheet of the interim spreadsheet tool to verify results were identical. Sample transfers were distributed across the model domain (Figure 1).

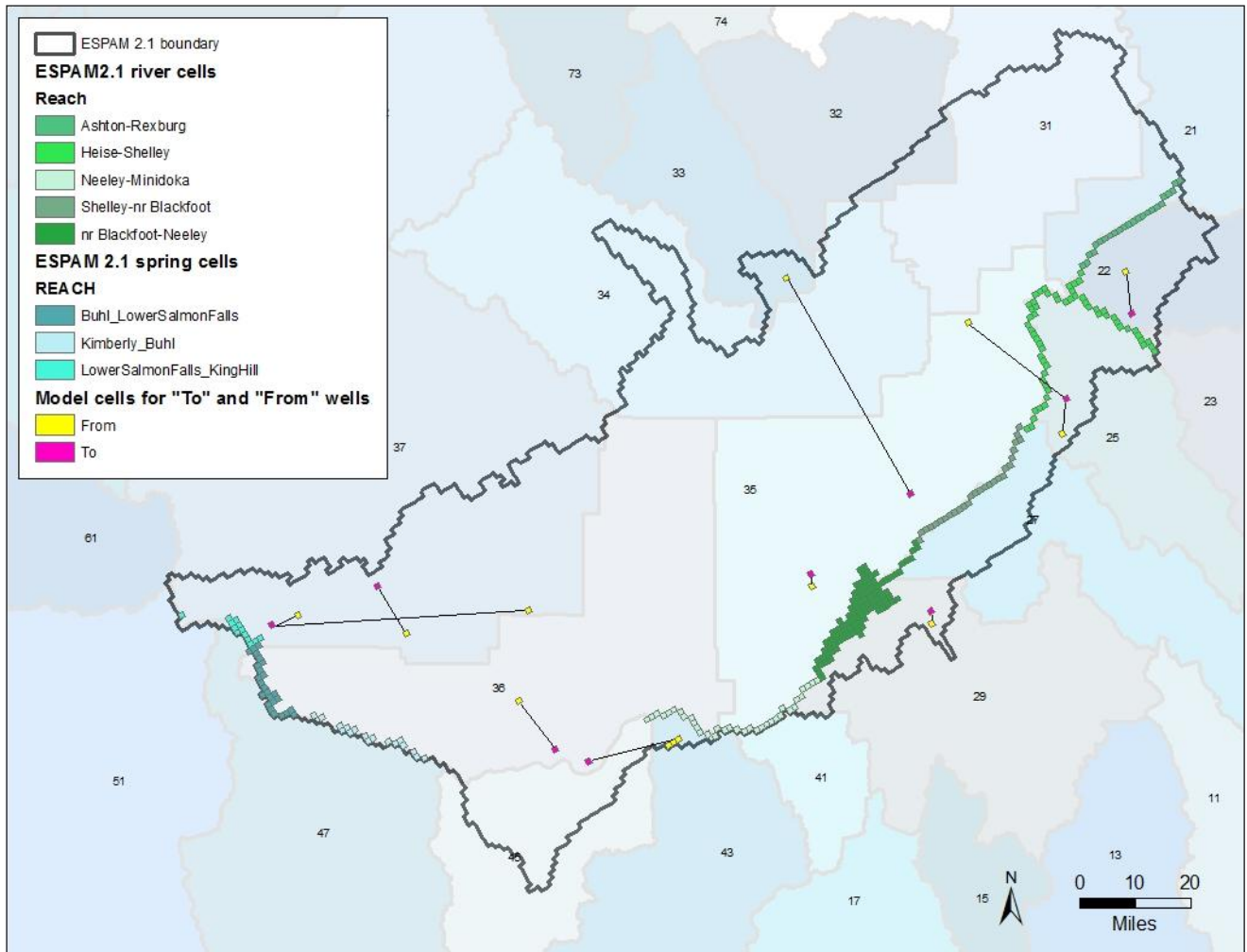


Figure 1. Locations of "To" and "From" wells for sample transfers used to test ETRAN Version 3.2

A draft version of the interim transfer tool is available for you and your staff to review. Please contact me at your convenience with any questions or comments.