

RGDSS Memorandum
Phase 6 – StateCU Code Enhancements
Final

TO: File
FROM: James R. Heath, P.E.
SUBJECT: RGDSS Groundwater Model – Phase 6: StateCU Code Enhancements
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CC:

1. Introduction

This memorandum represents enhancements to the StateCU code that were implemented since the StateCU documentation (September 2008) and supplemental release notes (November 2010) were published. The objective of this task is as follows:

- 1. Document the StateCU code enhancements that have been implemented and used as part of the RGDSS groundwater flow model version 6P35.*

2. Previous Efforts

The State of Colorado's Consumptive Use Model (StateCU) was developed to estimate and report crop consumptive use within the state. It consists of a FORTRAN-based computer program and an associated graphical user interface (GUI). The StateCU code has been maintained by an outside consulting firm Leonard Rice Engineers, Inc., who has enhanced the model's capabilities at the request of the State and other users of the program. The current StateCU documentation published in September 2008 documents version 7.0 of the GUI and version 13.0 of the FORTRAN code. The supplemental release notes document version 7.0.1.3 of the GUI and version 13.03 of the FORTRAN code.

3. Approach

The versions of StateCU implemented as part of the RGDSS groundwater flow model version 6P35 are version 7.0.1.3 of the GUI and version 13.08 of the FORTRAN code. Two enhancements to the FORTRAN code were implemented during Phase 6 of the RGDSS and are described below.

3.1. Metered Pumping Water Balance

A series of enhancements have been made to the RGDSS groundwater flow model preprocessing to incorporate the available metered pumping data. Through Phase 5 of the RGDSS, groundwater pumping was estimated based on crop irrigation water requirements and application efficiencies. These pumping estimates did not exceed the amount needed to meet crop irrigation water requirements. However, metered pumping data, in some cases, is greater than the amount needed to meet the crop irrigation water requirements. In previous versions of StateCU, the excess pumping was accounted for as recharge even if there were available storage in the soil moisture reservoir.

The StateCU code was enhanced in version 13.07 to allow for the metered pumping in excess of the crop irrigation water requirement to be stored in the soil reservoir. The allocation of metered pumping is now similar to the allocation utilized for surface water supplies. Further, revisions have been made to output files by adding columns that report the allocation of water to the soil reservoir.

3.2. Enhancements to the Processing of the Model Control File (*.ccu) and Detailed 4 Land Category Water Budget Output File (*.4wb)

As part of the RGDSS Phase 6 enhancements, the preprocessing of the data for the groundwater flow model has been streamlined and made more efficient with the implantation of StateFate. The preprocessor StateFate has replaced the preprocessor ModFate and incorporates some of the components of the preprocessor StatePP to more efficiently process StateCU output into a form that the enhanced preprocessor StatePP utilizes. As part of these enhancements, the Detailed 4 Land Category Water Budget Output File (*.4wb) was reviewed and determined to have additional data beyond what is available in the Farm Water Budget (By Structure) Output File (*.dwb). In previous versions of StateCU the *.4wb file was utilized in code testing and would output information for a single structure as defined in the Model Control File (*.ccu).

As part of Phase 6, the StateCU code was enhanced in version 13.08 to allow the *.ccu file's "typout" parameter to be set to a value of 5, which instructs the code to output the detailed *.4wb file for all structures in the scenario. The preprocessor StateFate reads the *.4wb and *.dwb files from the StateCU analysis and creates the required input files for StatePP.

4. Results

Model results from the enhanced versions of the StateCU code were checked against previous datasets and were the same where expected. Further, the mass balance of the system was maintained in the testing of the enhancements allowing excess pumping to be stored in the soil reservoir.

5. References

1. Colorado's Decision Support Systems, StateCU Documentation: StateCU Interface Version 7.0, StateCU FORTRAN Version 13.0, September 2008.
2. Colorado's Decision Support Systems, StateCU Release Notes, November 2010.