

# RGDSS Memorandum

## Final

**TO:** Ray Bennett  
**FROM:** Jim Brannon, Hydrosphere  
**SUBJECT:** RGDSS Surface Water, Task 1.7 - Feedback on DMI's, StateMod GUI, and CWRAT Tool  
**DATE:** April 7, 1999  
**CC:** Randy Seaholm

### Introduction

This memorandum represents the delivery requirement associated with Task 1.7, Prepare Memorandum - Feedback on DMI's, StateMod GUI, and CWRAT Tool. The objective of this task is as follows:

*Prepare a memorandum that summarizes Hydrosphere's efforts to operate StateMod and CWRAT, and utilize the StateMod GUI and DMI's.*

The following memorandum provides a summary of Hydrosphere's efforts to acquire, install, and use the CDSS software packages and databases necessary for developing a surface water planning model of the Rio Grande River basin using StateMod.

### Hydrobase

Hydrosphere obtained the latest version (dated February 2, 1999) of the State's Division 3 and Transbasin Hydrobase data from the Colorado Decision Support System (CDSS) internet site. Hydrosphere also obtained the latest version (version 2.0) of the HBAccess Hydrobase software from the Colorado Decision Support System (CDSS) internet site. These data and software were installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

The combined Division 3 monthly database was installed locally on the workstation in the default directory (c:\crdss\access). The downloading and installation proceeded smoothly. Problems with using earlier versions of the Access database "linker" with the Division 3 data were fixed with version 2.0 of HBAccess, and the creation of the Hydrobase database from the raw Division 3 data was successful. HBAccess version 2.0 also provides more flexibility with Hydrobase database location and naming, which should prove useful during the upcoming model development.

### CWRAT

Hydrosphere obtained the latest version (1.07.02) of the Colorado Water Rights Administration Tool (CWRAT) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Hydrosphere tested CWRAT against the monthly Division 3 Hydrobase database described previously. Key CWRAT functionality was tested, including various water rights and structure queries, station reports for gaged streamflow, time series output, and statistical data summaries. The most recent version of CWRAT works well with the most recent Division 3 Hydrobase. The only exception noted is the ability to run water rights queries against Water District 20, which causes "out of memory" errors from the underlying JAVA runtime engine. This is apparently caused by the large increase in water rights and structure records introduced by the addition of well data to Hydrobase. During the testing, it seemed that some queries took an inordinately long time to complete, but we also surmised this to be a result of the large record counts caused by the well data.

Hydrosphere found the CWRAT interface to be intuitive and quickly generated the desired output during testing without excessive reliance on help documentation. The generation of summaries and text tables worked very well. The graphical output of time series data using line plots is an impressive feature, though more control over the appearance of the graphs would be useful so the output could be readily used in reports.

## **TSTOOL**

Hydrosphere obtained the latest version (3.09.00) of the Time Series Tool (TSTOOL) and associated documentation from the Colorado Decision Support System (CDSS) Internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

The TSTOOL software was tested and found to work exactly as documented. It is already obvious that this software tool will be a valuable and frequently used during the model development. For example, graphical summary plots of period of record for gages in the Division 3 water districts quickly indicated districts that have incomplete stream-flow data. (For example, several gages appear to have data only through 1981, such as in District 35.)

## **StateMod**

Hydrosphere obtained the latest version (811) of the StateMod Modeling Software (StateMod) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Through studying the StateMod documentation, StateMod input and output data from previous modeling efforts (Yampa River Basin), and also informal presentations by Steve Malers (RTi) and Ray Bennett (State), Hydrosphere has gained a good understanding of the StateMod modeling methodology and algorithms. Subsequently, Hydrosphere successfully used the installed StateMod software to generate model output with the example input data sets provided with the model.

The water allocation algorithm used in the StateMod software is very efficient when complex hydrologic "feedback" conditions are avoided in the model design because it eliminates the need for iteration to find the correct solution. Therefore model execution times are extremely fast, which will make model development much easier. The StateMod GUI and DMI's (addressed below) provide reliable tools for creating, editing and verifying the StateMod input files.

Though it is true that reservoir releases and other complex hydrologic feedback scenarios can cause StateMod to find water allocation solutions that are not “optimal,” Hydrosphere believes that this is balanced by the efficiency of the algorithm. Most water planning and management scenarios can be effectively represented by standard StateMod input, and experienced modelers can convert complex situations into manageable and “model-able” designs.

## **StateMod GUI**

Hydrosphere obtained the latest version (4.03.00) of the StateMod Graphical User Interface (SMGUI) and associated documentation from the Colorado Decision Support System (CDSS) Internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

The SMGUI software was used to edit input and view output from the example StateMod data sets. The SMGUI worked flawlessly on these data sets, even when changing individual reservoir storage account characteristics. Some of the SMGUI documentation for fields in the StateMod input files needs to be updated, but the discrepancies were not major.

## **StateMod DMI's**

### **WATRIGT**

Hydrosphere obtained the latest version (8.10.00) of the WATRIGT data management interface (DMI) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Hydrosphere used this DMI extensively against the Division 3 Hydrobase to create water rights and structure lists critical for the basin interviews conducted as part of Task 4. Though earlier versions of watright experienced trouble running against the Division 3 data, the most recent version works well. The one remaining problem is the same memory error described above in the CWRAT section.

### **DEMANDTS**

Hydrosphere obtained the latest version (6.12.01) of the DEMANDTS data management interface (DMI) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Hydrosphere studied the DEMANDTS documentation, familiarized ourselves with the uses of DEMANDTS in StateMod modeling, and verified the DMI was operational.

### **MAKENET**

Hydrosphere obtained the latest version (5.04.00) of the MAKENET data management interface (DMI) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Hydrosphere studied the MAKENET documentation, familiarized ourselves with the uses of MAKENET in StateMod modeling, and verified the DMI was operational.

## **NETRESEV**

Hydrosphere obtained the latest version (4.01.00) of the NETRESEV data management interface (DMI) and associated documentation from the Colorado Decision Support System (CDSS) internet site. This software was installed on a workstation at Hydrosphere running Microsoft NT Workstation 4.0, service pack 4.

Hydrosphere studied the NETRESEV documentation, familiarized ourselves with the uses of NETRESEV in StateMod modeling, and verified the DMI was operational.

## **Comments and Concerns**

Hydrosphere was able to download and install the StateMod modeling system with minimal difficulties. Changes to the Hydrobase database design (well water rights and structures) initially yielded some problems with the operation of the DMI's, but these were quickly fixed with new versions of the DMI's provided by RTi.

There are several administrative or operational practices related to water use in the Rio Grande Basin that were apparently not encountered during StateMod applications in the Colorado River Basin. Included are the current method use by Division 3 to administer the Rio Grande Compact, and the practice of storing water in reservoirs under direct flow water rights. It is our understanding that new operating rules are currently being developed by the State to accommodate these situations when applying StateMod to the Rio Grande and its tributaries.

Hydrosphere has learned a lot about the StateMod modeling approach and the specific tools that make up the StateMod modeling system. We are very comfortable with the capability of this modeling system and look forward to applying it to the new challenges in the Rio Grande Basin.