

Summary of Meeting Proceedings

Prepared by the INFORM Core Office, HRC-GWRI

THIRD OVERSIGHT AND IMPLEMENTATION COMMITTEE MEETING OF THE INFORM PROJECT

18 April 2005, Sacramento, California

PARTICIPANTS

Agency Representatives

Gary Bardini,	California Department of Water Resources
Robert Collins,	Sacramento District, U.S. Corps of Engineers
Pete Fickenscher,	California Nevada River Forecast Center, National Weather Service, NOAA
Josh Foster	NOAA Office of Global Programs (<i>through a conference call</i>)
Paul Fujitani,	Central Valley Operations, U.S. Bureau of Reclamation
Robert Hartman,	California Nevada River Forecast Center, National Weather Service, NOAA
Arthur Hinojosa,	California Department of Water Resources
John King,	California Department of Water Resources
Aaron Miller,	California Department of Water Resources
Claudia Nierenberg	NOAA Office of Global Programs (<i>through a conference call</i>)
Joe O'Hagan,	PIER, California Energy Commission
David Parker	California Department of Water Resources
Brendan Reed	California Bay-Delta Authority
Eric Strem,	California Nevada River Forecast Center, National Weather Service, NOAA

INFORM Co-PIs and INFORM Project Scientists

Theresa Carpenter	Hydrologic Research Center
Aris Georgakakos,	Georgia Water Resources Institute
Kosta Georgakakos,	Hydrologic Research Center
Nick Graham,	Hydrologic Research Center
Martin Kistenmacher,	Georgia Water Resources Institute
Huaming Yao,	Georgia Water Resources Institute

LOCATION AND TIME

The meeting was held at the National Weather Service (NWS) California Nevada River Forecast Center (CNRFC) Conference Room in the Joint Operations Center (3310 El Camino Ave.) on the 18th of April 2005. It started at 1:00PM and ended at 4:30PM.

PURPOSE AND INFORMATIONAL MATERIAL

The meeting served as a second critical review meeting for INFORM (Integrated Forecast and Reservoir Management), mandated by the California Energy Commission and CALFED funding agencies. Summary documents were submitted to the participants prior to the meeting by the INFORM Core Office Staff. A detailed INFORM Phase 2 Report was distributed to the meeting participants and was made available at the HRC web site: <http://www.hrc-web.org/INFORM>. The meeting consisted of the presentation of the INFORM project status by the Co-PIs, followed by an open discussion of the issues and strategies for the INFORM implementation completion and demonstration assessment design. The PDF forms of the meeting presentations are available at the aforementioned HRC web site.

INFORM STATUS PRESENTATION

The principle items discussed during the INFORM status presentation are listed in Table 1. Pressing issues are: (a) the availability of climate forecast system high-resolution data from the NOAA/NWS National Centers of Environmental Prediction (NCEP); and (b) the availability of remaining reservoir information for the completion of the design of the reservoir management component for the entire INFORM region. A short summary of the first issue and suggested solutions are presented in Table 2. It was agreed to pursue the high resolution climate data availability through May. If the high resolution data is not made available by that time to implement a statistical downscaling methodology that utilizes monthly climate forecast information that is currently available from NCEP. With respect to the second issue and as part of this OIC meeting, participating operational management agencies agreed to provide the remaining reservoir management information. Lastly, the INFORM PI reminded the OIC participants that INFORM is a five year project as proposed and it now enters the third year (last currently funded year of the project). The INFORM team within the next few months will provide funding agencies continuation/amendment proposals for the completion of the demonstration phase of the project (2 additional years).

Table 1: List of Items of INFORM Project Status Presentation

Meeting Agenda

- Project Status Review – Phase 2
 - Climate
 - Hydrology
 - Decision
- Tomorrow (4/19/05) – Workshop on Decision Support System

Vision Statement

Increase efficiency of water use in Northern California using climate, hydrologic and decision science

Goal and Objectives

- Demonstrate the utility of climate and hydrologic forecasts for water resources management in Northern California
- Implement integrated forecast-management systems for the Northern California reservoirs using real-time data
- Perform tests with actual data and with management input

Application Area

- Integrated System Diagram
- Demonstration Concept

Work Accomplished in Phase 2

- Design and tests of GFS ingest component and links to downscaling components
- Regional Validation of Precipitation Downscaling Component
- Design, Implementation and Tests of Temperature Downscaling Component
- Validation of INFORM Forecast System Hydrologic Forecast Component for the Major Reservoir Drainage Areas
- Development and Testing of a Monthly Simulation and Planning Model for the Entire INFORM Region

Refereed Publications

Follow-on to 3rd OIC Meeting

- Meeting Report
- Development of any necessary modifications to INFORM Project tasks and timeline, and submission to Funding Agencies for approval
- Continued Agency and Co-PI collaboration by implementation task
- Climate and Weather Components

Major Issues

- Availability of Climate Forecast Model (CFM) twice-daily forecasts and hindcasts – National Centers of Environmental Prediction (NCEP)
- Global Forecast System (GFS) downloads from NCEP servers

Status of Issue resolution - CFS

- NCEP Director indicated that NCEP will review the climate data status and will inform the Co-PIs of twice-daily climate data availability in the near future
- Co-PI's are considering the implementation of an alternative based on the use of monthly CFS ensemble forecasts.

Status of Issue Resolution - GFS

- Systems administrator for NCEP servers and HRC's system administrator are upgrading file transfer software to facilitate real-time downloads
- HRC is implementing complex download software to assure receipt of all available files

INFORM System Climate and Weather Data Components and Links

GFS Driven Mean Areal Precipitation: Software Tests

Precipitation and Temperature Downscaling - Domain

Precipitation Downscaling – Regional Validation

Precipitation Downscaling – Performance Measures

Temperature Downscaling - Model

Temperature Downscaling - Tests

Hydrology Component

INFORM Region and Major Basins

Distributed Tributary Basin System for Oroville – Example for INFORM Hydrology Modeling

Oroville Parameter Files – An Example

Overall Hydrology Model Performance Statistics

Examples of Hydrology Performance Analysis – Time Series

Examples of Hydrology Performance Analysis – Exceedance Frequency

Examples of Hydrologic Performance Analysis – Daily Scatterplots

Examples of Hydrologic Performance Analysis – Monthly Climatology

Conclusion of Hydrologic Performance Analysis

INFORM Decision Support System

- Decision Support System Framework: Multi-scale, Multi-objective
- Long Range Simulation/Planning Model: Trinity, Shasta, Feather, American, San Joaquin, Bay Delta sub-systems
- Model Inputs: Reservoirs, River and Tributary Nodes, Hydro Power Plants, Water Supply Nodes, Ecosystem Nodes, Water Quality Nodes
- Model Outputs
- Long Range Assessment Model
- Assessments: Adaptive versus Static Management
- Outstanding Issues
- Way Forward

Table 2: Availability of High Resolution Climate Forecast Data

A) The original design of the INFORM system envisioned the use of 6-hourly data from the NCEP Climate Forecast System (CFS). These data would be composed of

- Retrospective forecasts going back to 1981
- Operational (real time) forecasts
- Ensembles of 5-15 members
- Forecasts going out to (at least) 9 month lead times.

B) In discussions with NCEP Environmental Modeling Division management in December 2003 and January 2004 it was indicated that these CFS data would become available during summer, 2004. Subsequent correspondence in September 2004 indicated that the data would be delayed and become available by late winter to early spring, 2005. The actual retrospective forecast simulations were complete by approximately this time. Offers by HRC to purchase and install the necessary equipment to download the data directly at NCEP (inside their firewall and security systems) were not accepted by NCEP for security reasons.

C) Delivery of the Climate Forecast System (CFS) data from NCEP is now significantly behind schedule.

D) Monthly average ensemble retrospective (1981-2004) and operational forecast data is now available from CFS.

E) We are in continuing discussions with NCEP to obtain the 6-hourly data

F) The potential for continued delay in obtaining 6-hourly data requires the development of an alternative strategy using the monthly average data.

G) A candidate procedure is described in the Phase 2 Project Report (pp. 2-1 to 2.5). For a given basin (or set of basins) and a given month, this procedure identifies months in the observed record that are “similar” (in terms of precipitation and/or temperature) with the CFS ensemble output. Actual 6-hourly to daily series of precipitation and temperature from those identified similar months are then used to drive the hydrological component of the INFORM system (which feeds into the decision model). This alternative procedure retains the probabilistic character of the GFS ensemble forecasts and builds on elements of traditional ensemble streamflow prediction (ESP) methodology. This procedure (or variant) will be implemented if no 6-hourly data are available by (approximately) June, 2005.

DISCUSSION

After the INFORM status presentations, group discussion followed. An important issue discussed was the appropriate balance in depth versus breadth of the INFORM decision support system in view of the remaining project time—one year. With the incorporation of the Bay Delta in the long range planning model, the scope of the original project (demonstration of value of uncertain climate/hydrology forecasts for Trinity, Shasta, Oroville, and Folsom) has significantly expanded to encompass a more realistic representation of the physical system in the INFORM region and associated management issues. While the project could proceed to incorporate more system and management details, it was felt that a strategy aiming to demonstrate the value of the integrated prediction-decision system using the existing models should take precedence. The following important points were made during the discussion.

1. Rob Hartman mentioned that (as agreed upon during the First INFORM OIC Meeting) the INFORM implementation plan should be augmented to include the New Bullards Bar Dam on the Yuba River and the Black Butte Dam on Stony Creek, as they significantly contribute to the regulation of the tributary waters of the Sacramento River. The GWRI team stated that this enhancement is planned in the next few months.
2. Bob Collins mentioned that it may also be important to model some of the more important smaller reservoirs (e.g., French Meadows and Union Valley within the Folsom watershed and Lake Almanor in the Oroville watershed) for the short term management operations in the region. The GWRI team will need additional information for this modeling effort and will consider the feasibility of modeling them within the remaining time frame of the project.
3. Paul Fujitani expressed concern for the ability of the INFORM project to fully capture the breadth and depth of required modeling of the water management operations in view of the project time frame, and he suggested focusing perhaps on regional long-term decisions rather than both short- and long-term decisions. Art Hinojosa offered that perhaps we can focus on years of a specific type for demonstration purposes. The INFORM development team acknowledged that the issue of breadth versus depth for INFORM is important and that the linkage of long and short range models and decisions under uncertain forecasts that has already been accomplished is a good basis for demonstrating the value of forecast information in the management of the INFORM system. It was agreed that a demonstration strategy should be developed to illustrate the value of the prediction-decision system for long range planning and mid/short range management.
4. Gary Bardini suggested that the INFORM remaining effort should address the following issues: (a) resolve the remaining links between climate and hydrology data and forecasts; (b) complete the decision model with all agreed upon components for the demonstration effort; (c) develop a demonstration strategy with OIC input; (d) identify the INFORM components that may directly add value to current operational tools for operational implementation, (e) perform a case-by-case assessment of benefits and risks. The group concurred with these suggestions and the INFORM development team recommended (and the OIC members concurred) that the development of the demonstration strategy must be carried out as soon as possible as it may dictate additional model modifications that would be required to address, for example, longer term regional benefits from seasonal forecasts, or shorter term benefits during reservoir filling for specific sub-systems. It was suggested that another OIC meeting be convened at the end of May or early June to develop the demonstration strategy.
5. Along the lines of demonstration strategy, Rob Hartman suggested that along with average forecast benefits, benefits accrued during extreme events also be evaluated, and an assessment be made of the circumstances for which the INFORM prediction-decision approach would benefit system management. The INFORM development team concurred that this type of analysis should be an integral part of the demonstration strategy discussion.
6. The GWRI team also emphasized that the INFORM DSS is not intended to replace existing tools; rather, it is an additional tool that can screen a wide range of management

strategies and identify a set to be evaluated by other more detailed models currently being used.