2007
Annual Meeting
Poster Session Abstracts

Monday, February 26, 2007

Poster 1: The Role of Conceptual Models In Water Quality,
Mike Deas (WaterCourse Engineering, Inc)

A conceptual model is a theoretical description of an aquatic system. The model is "conceptual" because certain elements of the system can only be inferred or interpreted from related observations and measurements in complex systems. A conceptual model describes the fundamental hydrologic system and water quality processes; ongoing data collection, analytical studies, mathematical models, and other studies will be used over time to confirm and refine the conceptual model, which in turn can be used to support more quantitative numerical or empirical models.

Poster 2: CalSim-III Hydrology Development Project: Surface Water Representation,
Jeffrey Payne and Andy Draper (MWH Americas)

Abstract Not Available.

Poster 3: Simulating Large-Scale Sacramento/San Joaquin Island Flooding by DSM2,
Qiang (Jon) Shu (CA DWR)

An application of DSM2 (data-base version) in modeling of large-scale Sacramento/San Joaquin delta island-flooding and salinity intrusion caused by 30 levee breaches was investigated. For such an extreme situation, the flow and salinity (EC) boundary condition set at Martinez is expected to be affected. Therefore, the standard Delta grid was extended to Golden Gate Bridge, whose stage and salinity will not be influenced by hydrological conditions in the Delta. A simplified extension grid based on a previously used extended DSM1 grid was added and modified. From the simulation results for the extended grid and standard DSM2 grid, the following observations were made:

- Using extended grid, DSM2 has potential to simulate 30 or less levee breaches without causing numerical difficulty.
- To prevent DSM2 from failing and crushing, levee breaches need to be simulated as reservoir gates connected to flooded islands. Those gates need to be opened gradually.
- Given the proper boundary conditions at Martinez, DSM2 with the standard grid can generate salinity intrusion results close to 2D model (RMA).

Using a simplified extended grid with the standard DSM2 Delta grid needs to be further investigated to model proper flow and salinity conditions at Martinez.

Poster 4: Sacramento Weir – An Overview, Adam Schneider (CA DWR)

To facilitate an understanding and appreciation of a high profile component of the Sacramento River Flood Control Project, a poster focused on the Sacramento Weir has been developed. The poster summarizes the purpose and history of the weir, its operational procedure, its significance to the Sacramento region, and controversy surrounding its use. It is the hope of the presenter that this poster will highlight some of the complications the weir creates with respect to the modeling of the Sacramento River basin.

Poster 5: Using Arc Objects and ArcGIS Surface Analysis Functions to Generate Finite Element Meshes, Thomas Heinzer and Diane Williams (USBR)

The idea is to use surface analysis tools available in ArcGIS to assist in model mesh generation. In areas of rapid change (e.g. slope transitions) we may want to densify the model mesh to capture these changes. Current research is being conducted into vectorization schemes to produce enforcement points for input into a mesh generator. This is applicable for candidate regions where mesh densification is desired. While not perfect, the GIS based methods do hold promise as a first cut mesh generator for large areas. The GIS features can be used to selectively enforce areas in subsequent mesh relaxation operations.

Poster 6: Fundamental Research On Object Generators And Object Interactions, Thomas Heinzer and Diane Williams (USBR)

Research is being conducted into the use of mathematical functions to generate two and three-dimensional networks of ESRI objects and propagation of information through those networks. The work originated from the notion that since ESRI data now exist as objects capable of behavior, we should be able to set up scenarios where the objects are interacting with the environment or each other. Preliminary investigations included the mathematical generation of 3D topologies (including 3D polygons), object listeners, and mesh topologies responding to forcing functions. Potential applications include use of these networks to aid in numeric model mesh generation and adaptive mesh refinement.

Poster 7: Using ArcGIS And Flood Models In Emergency Action Plans, Thomas Heinzer and Diane Williams (USBR)

This simulation was performed using the 2-D MIKE21 hydrodynamic model. The MIKE21 simulation was visualized using ArcGIS utilities. Modeling and Geographic Information System analyses were performed by the Michael Thomas Group at MPGIS USBR. These maps represent the inundation at specified times resulting from a total failure of Los Banos Dam with the reservoir at full capacity. The dam failure hydrograph was based on a previous study which predicted a peak flow of 712,742 cfs. The capacity of the reservoir when it over-topped was 69,000 acre-feet.

Poster 8: Analytic Modeling Systems: Three-Dimensional Fence Diagrams (Circa 2004), Thomas Heinzer and Diane Williams (USBR)

The U.S. Bureau of Reclamation manages many of the large federal dams in the western United States. One of these dams, Shasta, is currently undergoing studies to enlarge its reservoir capacity. Research is underway to examine potential changes in groundwater levels and movement that may occur because of this facility enlargement. HydroGeoSphere, a finite-element model, is being implemented to assist these studies. HydroGeoSphere is somewhat unique in that it solves the surface and groundwater equations simultaneously, rather than using a couple. From a GIS perspective, this project is interesting because ArcGIS is being used to generate three-dimensional fence diagrams to create formation surfaces for model input.

Poster 9: Water Supply System Model to Improve Stream Management for Endangered Species Fish, S. Shaikh, J. Micko, and M. Merritt (SCVWD)

The Santa Clara Valley Water District (District) manages water supply, flood control operations, and serves as the steward for the county's streams. The District operates ten medium-sized reservoirs as part of its local water supply program. The reservoirs are also operated to reduce flood potential, to maintain aquatic habitat, and to provide recreation for the county's residents.

The District has conducted a modeling study to investigate alternative operating strategies in the Lower Llagas Water Supply Management System (System). The System is located in southern Santa Clara County and includes Uvas Reservoir and Uvas Creek, Chesbro Reservoir and Llagas Creek, and the Church Avenue off-stream recharge ponds adjacent to Llagas Creek. A pipeline also connects Uvas Reservoir to Llagas Creek for water supply transfers. The System drains into the Pajaro River, a tributary to Monterey Bay.

The District is proposing to modify operating strategies to improve downstream steelhead aquatic habitat. The District has conducted Uvas Reservoir operations under an existing Memorandum of Agreement with the California Department of Fish and Game (DFG) since 1956. In 2004, the DFG and the National Marine Fisheries Service (NMFS) raised concern over fish access to prime aquatic habitat above Uvas Reservoir. In lieu of trap and truck operations, a Technical Working Group (TWG) comprised of fisheries experts from DFG, NMFS, San Jose State University, and a local Non-Governmental Organization, Streams for Tomorrow, was formed to propose suitable alternatives. The purpose of the TWG was to recommend operating strategies that would optimize favorable downstream flow and temperature conditions for maintaining a healthy steelhead population in Uvas and Llagas Creeks, while considering water supply needs and reduced flood potential. The Lower Llagas Water Supply System Model (Model) was developed as a tool to evaluate alternative strategies.

The Model is an innovative approach to modeling the operation of all of the facilities within the System. The operating rules were developed in consideration of life-stage requirements of steelhead. These include provision of sustained winter flows to improve spawning habitat; short duration, high intensity pulse flows during winter for attraction and adequate passage of adult steelhead trout; higher spring flows to assist out migration of juveniles; and sustained higher summer flows for rearing. Priorities were established for distribution of water for these life-stages through collaboration with the TWG throughout the range of hydrologic conditions. The rules were developed assuming different levels of risk. The Model allowed assessment of how well alternate rules met the distribution priorities given the actual monthly supply as it occurred historically.

The proposed modified reservoir operations will compliment numerous in-stream improvement programs for the purpose of restoring habitat in response to changing stakeholder and agency ecological objectives.

Poster 10: Integrated Water Flow Model (IWFM): A Tool For Numerically Simulating Linked Groundwater, Surface Water, and Land-Surface Hydrologic Processes, Emin Dogrul, Charles Brush, and Tariq Kadir (CA DWR).

IWFM is an input-driven integrated hydrologic model that simulates groundwater flow, surface water flow, surface water - groundwater interaction, and key land-surface hydrologic processes. Agricultural and urban water demands can be pre-specified, or calculated internally. Water re-use, tile drains, and lakes or open water areas are also simulated. A key feature of IWFM is a "zone budget" post-processor that includes a novel approach for computing subsurface flow computations across element faces. IWFM was developed and is supported by DWR staff. The first public release of the model was December 2002. Codes, executables, and documentation are available to the public at DWR website (Google “IWFM”). Current use of IWFM inside and outside of DWR includes simulation of California Central Valley water resources (C2VSIM), hydrology development and ground water emulation in CalSim-III, regional applications, and extended drought studies. Version 3.0 of IWFM was released February 15, 2007.

Poster 11: Calibration Of A Regional Aquifer System Model: The California Central Valley Groundwater - Surface Water Simulation Model (C2VSIM), Charles Brush, Emin Dogrul, Tariq Kadir (CA DWR), Michael Moncrief (CA DWR, currently MBK), Steve Shultz (CH2M Hill), Matt Tonkin (SSPA), and Dan Wendell (CH2M Hill)

An integrated groundwater-surface water model for California’s Central Valley has been developed using the integrated hydrologic model IWFM (Integrated Water Flow Model). The model incorporates a quasi-three-dimensional finite element groundwater flow process dynamically coupled with 1-D land surface, stream flow, lake and unsaturated zone processes. The groundwater flow system is represented with three layers each having 1393 elements. Land surface processes are simulated using 21 subregions corresponding to California DWR depletion study areas areas. The surface-water network is simulated using 431 stream nodes representing 72 stream reaches, with 108 deliveries specified at 80 diversion locations. Optimum hydraulic parameters were determined using the parameter estimation program PEST, and manual selection of the areal and vertical distribution of groundwater pumping, to obtain the best match to historical groundwater heads and stream flows. The initial calibration was performed to match groundwater heads, surface-water flows and vertical head gradients from October 1975 to September 2003, and subsequent calibration extended the data set to October 1921 through September 2003. The calibrated model is being used to develop the hydrology and the discrete kernels (response functions) for emulating ground water flow in CalSim-III.