EASTERN SNAKE RIVER PLAIN AQUIFER MODEL

Design Objectives

December 2000

The Eastern Snake River Plain Aquifer Model is being jointly developed by agencies and institutions represented by the Eastern Snake Hydrologic Modeling Committee (ESHMC). The model is being developed for the purpose of assisting in aquifer management, with an emphasis on interrelationship between the aquifer and the Snake River. This effort will build upon the existing model, employing new data and technologies to improve model credibility and reliability. *Any numerical model represents a simplification of a complex physical system. It should be noted that even after model modifications, uncertainties will still exist in model predictions.* This document identifies the intended uses and some of the limitations of the proposed model. The document is intended to guide the model design and inform interested parties of the expected model capabilities. The Eastern Snake River Plain Aquifer Model is being designed to do the following.

1) PREDICT CHANGES IN SNAKE RIVER GAINS AND LOSSES

The model will be capable of estimating changes in Snake River gains and losses resulting from changes in aquifer recharge and discharge (including managed recharge) within the boundaries of the eastern Snake River Plain. The model will be capable of providing estimates in six-month time increments (transient state) for each of the gaged reaches of the Snake River and Henrys Fork of the Snake River extending from Heise and Ashton to King Hill (total of 14 reaches). Between Milner and King Hill model predicted river gains and losses will only reflect contributions from the north side of the river. Some reaches may be combined if it is determined that the model is incapable of discriminating between two or more smaller reaches.

The model will be the best available technology for providing regional scale estimates of change in river gain and loss resulting from changes in land and water management. The model is not the appropriate tool to quantify effects on river gains of individual ground-water diversions. Additionally, impacts from individual recharge and discharge activities within about 5 to 10 miles of the Snake River may be better evaluated through other methods.

2) PREDICT CHANGES IN AQUIFER WATER LEVEL

The model will be capable of estimating change in aquifer water levels at a regional scale with moderate changes in the distribution of recharge and discharge. The model will probably not be the best tool for evaluating impacts at distances of less than 5 to 10 miles. Extreme changes in recharge and discharge (e.g. removal of all irrigation) require the model to extrapolate well beyond calibration conditions and may result in significant prediction errors.

3) INCREASE CONFIDENCE IN MODEL RESULTS

The re-designed model will include conceptual model design changes to reflect an increased understanding of river/aquifer interactions. The re-designed model will also be calibrated using a wider range of recharge and discharge values. Both of these factors will serve to increase confidence in model results, including the model representation of surface and ground water interaction.

4) EVALUATE CURRENT DEVELOPMENT CONDITIONS

The model and accompanying data sets represent the best available technology for projecting the effects of current development levels into the future. Aquifer water level and river gains and losses will be estimated from the average weather and development conditions for the 1980-2001 period. Model projections made from these data form the basis for system management and comparison of alternative management scenarios.

5) PROVIDE DATA ON AQUIFER CHARACTERISTICS

Data collected, organized, and analyzed for the model will have many uses outside of model simulations and calibration. Recharge and discharge data, compiled largely in GIS-compatible formats, and calibrated estimates of aquifer properties will prove useful in many applications. Development of revised response functions is an example of one such application. This information will be stored and accessible in convenient formats for other applications. More refined models of specific areas will be able to make use of the data collected for the regional model.

6) INCLUDE CONTRIBUTIONS FROM TRIBUTARY BASIN

Water use in the basins tributary to the eastern Snake River Plain aquifer affect aquifer water levels and river gains and losses within the plain. The revised model domain will not extend into the tributary basins. Consequently, the model will NOT be capable of directly simulating impacts of tributary basin water use on the eastern Snake River Plain aquifer and gains and losses of the Snake River. Tributary basin contributions to the eastern Snake River Plain aquifer will be reflected in model inputs, but will not be explicitly modeled. However, the model will be able to predict the effects on the eastern Snake River Plain aquifer of changes in inflow at the aquifer-tributary boundary interface.

7) DEFENSIBLE IN LITIGATION

The model will be developed cooperatively by experts within the multi-agency ESHMC. Accepted model code, development procedures, and calibration procedures will be used to produce a product that is widely accepted and will better withstand the scrutiny of legal proceedings. The model revision will use the USGS Modflow code to partially satisfy this objective and Objective 9.

8) INTEGRATION WITH SURFACE WATER MODELS

Careful consideration will be given to surface water modeling needs by assuring that model results are compatible with existing surface water models of the Snake River. However, the model domain will EXCLUDE the heavily irrigated Twin Falls tract on the south side of the Snake River, possibly limiting utility for surface water model linkage.

9) PROVIDE A BASIS FOR FUTURE CONTAMINANT TRANSPORT MODELS

The model will not include a contaminant transport component. The model, however, will provide the flow component that may be built upon in the future to establish a transport model.

10) MAKE RESULTS ACCESSIBLE AND USABLE

The model and data sets that result from this work will be well documented and sufficiently portable to be used by multiple agencies and other interested parties.

11) MODEL RELIABILITY

To the extent possible, qualitative and quantitative measures of Easter Snake River Plain Aquifer Model will be developed to describe predictive reliability. The primary sources of uncertainty in both the conceptual model and in model parameterization will be identified. Using generally accepted methods of sensitivity analysis (e.g. those available in USGS Modflow 2000), the uncertainty associated with model predictions will be quantified.

For More Information Call:
Paul Castelin, IDWR, (208) 327-7894 or Donna Cosgrove, University of Idaho, (208) 282-7914