Peer Review Summary Document

(12/2/2011)

Peer Review Plan

Numerical Simulations of Groundwater Flow in the Yakima River Basin Aquifer System, Washington [51 KB PDF].

Title and Authorship of Information Product Disseminated

Numerical simulation of groundwater flow for the Yakima River basin aquifer system, Washington, by D. Matthew Ely, Matthew P. Bachmann, and John J. Vaccaro.

Peer Reviewers Expertise and Credentials

Peer Reviewer #1 – PhD in Geology from Penn State University. USGS Research Hydrologist since 1981. Research interests include the development and application of solute-transport models to ground-water contamination problems.

Peer Reviewer #2 – MS in Geology from Penn State University. USGS Supervisory Hydrologist. Areas of interest include water-supply assessment of groundwater and surface water using statistical and deterministic numerical simulation, with an emphasis on determining source of water to wells, groundwater/surface water interactions, the effects of current and estimated groundwater withdrawals on groundwater availability, and surface-water quality.

Charge Submitted to Peer Reviewers

The reviewers were asked to make an objective evaluation of the groundwater flow model described in the report including the background information and model construction, calibration, and application.

Summary of Peer Reviewers Comments

Reviewer #1 – Summary of comments

1. Confusion over how streambed elevations in the SFR files were set.
2. Lack of using the MNW Package to represent wells having long open intervals.
3. Large standard deviation of the residuals for heads.
4. Details on your time-step size.
5. Use of realistic specific yield values for storage in uppermost model layers.

Reviewer #2 – Summary of comments

1. Add additional text describing conceptual flow system and water budget.

2. Consistent terminology for mapped and model hydrogeologic units.
3. Additional information for model pumpage.
4. Additional information and clarifying text for initial conditions.
5. Further clarification for parameter estimation and observation weights.
6. Clarifying text scenario results.

Summary of USGS Response to Peer Reviewer Comments

Response to Reviewer #1 comments

1. Text in the original draft was incomplete. Streambed elevations were calculated as land surface elevations (from DEM) minus stream depths (from Magirl and Olsen, 2009). In streams located in deeply incised canyons, an additional depth was subtracted from land surface.
2. Multi-node well head observations may have eliminated some of the uncertainty around the head observations during calibration…or at least simplified the discussion. Clarifying text was added to explain the possible model error associated with the way head observations were vertically distributed in the model. Common well construction practices in the Yakima River basin reduced the concern of intraborehole flow.
3. The model was unable to simulate water levels at a few locations despite our best attempts. These wells were relatively few in number, although some had multiple water levels, adding a bit disproportionately to the overall model error. In the end, we were comfortable that these observation locations were located away from areas of concern and that the overall model fit and simulated flowpaths were acceptable.
4. The model time step was changed to a daily time step, as suggested.
5. There was a tradeoff between higher storage values and amount of modeled water moving to various drains and streams. The calibration used both water levels and streamflow as constraints and derived those values. There is less seasonality in some of the simulated water levels but important drain flows that return to river and are relied on for downstream diversions are captured by the model. There may be some relation to this because of the monthly stress period used in the model and its interaction with the regionalizing of hydraulic characteristics for basin-fill units---which is appropriate for such a large scale regional model.

Response to Reviewer #2 comments

1. The first sections of the report are the background information used in the complete series of reports that provides readers with an overview of the area. The series of reports includes pumpage, recharge, mapping of hydrogeologic units, and the description of the complete hydrogeologic framework. The latter report summarizes all other reports and then describes the flow system, including gradients and water levels.
2. Most of the suggested edits were made. References to HUF units were changed to model hydrogeologic units (HGU) and consistent terminology for model and mapped hydrogeologic units, and model layers was incorporated.

The publication staff created a new figure 9 that clearly shows the relationship between model and mapped hydrogeologic units, and model layers.

3. The authors have added an additional figure showing the temporal distribution of pumpage during the simulation period. When combined with the map showing location of points of withdrawal and the graph of withdrawals by model layer, the reader obtains a good understanding of the pumpage distribution.
4. The discussion of calculation of initial heads was simplified and clarified. To account for the initial pumping in the transient model, the model was run repeatedly to simulate transient conditions using the 1960 monthly boundary conditions until head changes were minimal (1 ft) between initial and final heads. The resulting heads at the end of 1960 were assumed to be representative of any effects from historical pumping.
5. Discussion of head and streamflow observation weighting was clarified.
6. Suggested edits were made to text, figures, and tables.

The Dissemination

The published information product was released in a USGS publication series and is available at http://pubs.usgs.gov/sir/2011/5155/.