United States Department of the Interior

IN REPLY REFER TO:

U.S. GEOLOGICAL SURVEY
Water Resources Division
Federal Building Room 406
100 Centennial Mall North
Lincoln, Nebraska 68508

MEMORANDUM

March 31, 1998

To: Ann Bleed
Nebraska Department of Water Resources

From: Matt Landon
Hydrologist, Nebraska District

Subject: Requested progress reports and study proposal for Republican River Basin study

Attached are the progress reports and original proposal that you requested for the Republican River Basin ground-water modeling, ground-water/surface-water interaction, and ground-water quality study. We will send you additional progress reports by email in the future. Please contact me if you would like additional information or have questions regarding the attached information.

5 Attachments

REPUBLICAN RIVER BASIN MODELING, GROUND-WATER/SURFACE-WATER INTERACTION AND WATER-QUALITY PROJECT
March 1998

Model Preparation

Data from many sources continue to be inventoried and evaluated. Digital spatial (GIS) data coverages are being constructed from the data assembled and are being used for input data for the ground-water flow model (MODFLOW). A digital map of the elevation of the base of the aquifer for the entire study area is nearly complete. Maps of the base of the aquifer in Nebraska and Colorado were digitized and will be combined with a digital map of the base of the aquifer in Kansas. The base of aquifer maps will be carefully checked against existing hydrogeologic cross-sections to ensure that the coverage adequately represents aquifer geometry along the river valleys. A working-group of investigators from USGS, CSD, NDWR, and NDEQ have completed a preliminary inventory of existing hydrogeologic cross-sections in the Nebraska portion of the Republican River Basin. Cross-sections in Kansas and Colorado are also being gathered and evaluated by the USGS.

Maps of the hydraulic conductivity (K) and specific yield (S_y) of the High Plains aquifer digitized by the USGS-Oklahoma District from maps generated by the USGS Regional Aquifer-System Analysis of the High Plains aquifer in the 1980's were evaluated. These maps were found to have the same level of detail as state-by-state maps of these parameters and will be used for input to the model. The coverages will be clipped to the boundaries of the study area.

Work is proceeding on assembling a coverage of land surface elevation from Digital Elevation Models (DEMs). Historical ground-water-level data in Nebraska were retrieved from the USGS database, checked for anomalies, and corrected when necessary. These data will be used to calibrate the model. Preliminary work began on assembling a digital coverage of river elevation.

In the next quarter, water-level data from Kansas and Colorado will be retrieved and evaluated. Digital water-table maps of the study area will be assembled either by digitizing existing maps or constructing new maps using the water-level data. Streamflow data for the study area will be retrieved from databases and will be analyzed to determine baseflow. The results of historical low-flow measurements will be evaluated to estimate ground-water/surface-water exchanges. Digital data sets will be imported into the model to generate model input values as they are obtained.

Ground-Water/Surface-Water Interaction

Drilling and well installation at the three sites for the paired-observation well transects began February 23 and is proceeding. The drilling was delayed for two weeks because of wet conditions at the sites. All wells have been installed at the sites along Sappa Creek near Stamford and Frenchman Creek near Palisade. Eighteen wells (6 well nests with wells at 3 depths) were installed at each site. Drilling will shortly be completed at the site along Frenchman Creek near Champion. Lithologic descriptions and geophysical logs (resistivity and conductance, using a logger borrowed from CSD) have

been used to determine the stratigraphy at each well nest location and to determine optimal well placement.

In the next quarter, pressure transducers with built-in data loggers will be installed in selected wells along the transects and in the tributary streams. Water levels will be measured monthly in other wells along the transects. All wells and stream monitoring sites will be surveyed so that accurate water-level elevations can be determined. Water samples will be collected from the tributary streams and one transect of wells at each site in April. Water samples will be analyzed for field parameters (pH, specific conductance, dissolved oxygen, and temperature) and nitrate-nitrogen concentrations; selected wells will also be analyzed for tritium concentrations. The results of the sampling in April will be used to help plan collection of samples for ground-water age dating using chlorofluorocarbons (CFC's) in July.

Ground-Water Quality

Preparations are underway for collection of about 214 ground-water samples in the Nebraska part of the Republican River basin in the summer of 1998. Wells are being selected using a stratified random approach based on areal distribution, well depth, and availability for sampling. Well owners are being contacted by phone to obtain permission for sample collection. Sampling will occur in June, July, or August; the exact timing of sample collection is dependent on the start of irrigation season.

General

A liaison meeting was held on March 2 to coordinate Republican Basin activities in Nebraska among investigators from the USGS, CSD, and NDWR. The next meeting is scheduled for June 8.

Presentations on the Republican River water-quality, SW/GW interaction, and modeling study were made at the Middle Republican NRD annual water conference on March 4 and the 1998 NRD Water Programs Conference on March 6.