

FY15 NM WRI Research Progress Report Form

Report Due Date: October 1, 2014

1. Project Title: Ground water level and storage changes – Regions of New Mexico

2. Investigators:

PI: Stacy Timmons, New Mexico Bureau of Geology and Mineral Resources, New Mexico Institute of Mining and Technology. Collaborators: Mike Johnson, Hydrology Bureau, New Mexico Office of the State Engineer, Nathan Myers, U.S. Geological Survey, Matt Ely, U.S. Geological Survey, Kenneth C. Carroll, New Mexico State University

3. Brief description of project, research objectives, and impacts on New Mexico.

Changes in water levels can reflect very relevant water issues in the arid southwest, such as depletion of the aquifer, variations in nearby surface water, fluctuations in recharge, and changes in the ground water storage. For this study, we will compile water level data, in an effort to begin development of a statewide water level change contour maps. We will develop maps showing contours of changes in water levels within several select basins. Additionally, we will also attempt to quantify the change in ground water storage.

The proposed work will highlight changes in water levels on a regional scale, while in some regions it will highlight data gaps where future work is needed. In many regions of New Mexico, we know that water levels are declining, but the data have not been compiled to address the amount of decline in specific areas. Results of this work will have visual impact to show changes in ground water systems, which may help to implement change toward conservation. With up-to-date regional maps showing contoured 5-year changes in water levels (depending on the available data), the state of New Mexico will have a useful tool to aid in planning for future water management needs.

4. Brief description of methodology.

We are in the process of developing a statewide water level database. Data will be compiled from multiple agencies, reviewed and filtered toward the goals of this study. We will incorporate all data into one simplified water level database that can be used by other research groups or interested public entities. This will be completed by December 2014.

From this database, starting in January 2015, regional contour maps of water level changes will be developed for selected basins. We are using a regional analysis approach because water level measurements have been collected over portions of the state, often clustered in areas with greater populations. Additionally, water level measurements have been collected at various time intervals, such as annual or 5-year intervals of measurement.

The water level measurements will be processed to calculate changes in ground water levels over the intervals relevant within a region, and then contoured using ArcGIS. Changes in aquifer water levels relate to changes in aquifer storage. Storage changes can be estimated using the *changed* volume of an aquifer (based on water level changes) and the storage property (specific yield) of the aquifer. With regional maps of water level change, using ArcGIS, these surfaces can be paired with an average specific storage value applied to the region to estimate changes in

groundwater storage (McGuire, 2013). From these results, the state of New Mexico will have a useful tool to aid in planning for future water management needs.

5. Brief description of results to date and work remaining.

At this time, we have prepared a comprehensive database in MS Access that is based on site locations. The relational database links time series water level data from multiple agencies to the well locations. We are establishing data standards for which fields will be required to complete this project, including locations in UTM's NAD83, well depth, measuring point descriptions, water level measurements, dates, and preferably with geologic information also.

The bulk of the data is coming from the USGS and NMOSE to build the statewide dataset. At this time, we have received approximately 2000 well locations from the USGS, with approximately 30,000 water level measurements. These measurements include sites that have been measured periodically since the 1940s. Additional data are in preparation and review by the USGS and will be incorporated soon. It is expected that more than 3000 well points will be incorporated into the database in the next few months. Datasets will also include shorter time periods of regional data from the New Mexico Bureau of Geology and Mineral Resources and Bernalillo County. Remaining work includes continuing to compile and filter data for deliverable in December 2014, which will be a simplified database of well locations and water levels, with queries built for analysis of water level changes over available date ranges. By June 2015, we will complete contouring of water level changes for selected regions and attempt calculations of changes in ground water storage.

6. Student participation - List all students participating in the project, their classification level (undergraduate, master's, Ph.D., post doc) and their field of study (degree major)
None.

7. Provide special recognition awards or notable achievements as a result of the research. Include publications in progress (all published work supported wholly or in part of NM WRRI must bear an acknowledgment of support)
None yet.

8. Include references as needed (limit to one additional page)

McGuire, V.L., 2013, Water-level and storage changes in the High Plains aquifer, predevelopment to 2011 and 2009–11: U.S. Geological Survey Scientific Investigations Report 2012–5291, 15 p. (Also available at <http://pubs.usgs.gov/sir/2012/5291/>.)

9. Provide a few sentences on progress toward uploading data to a common/standardized platform, if applicable.

We have spoken with and provided example data to WRRI's data manager to begin to form a common data platform for sharing this water level change component of the Statewide Water Assessment. On September 19, 2014, we participated in an additional follow up meeting with WRRI staff, including the data management team, and the group working on similar water level analyses. We provided overview of our current database, discussed processes for data analysis

and sharing. Action items included discussion with Produced Water database P.I. to establish potential links between databases, which are both based on well point locations.

10. Provide two PP slides that provide summary information on your project appropriate for viewing by state legislators.

Attached.