

Mapping Potential Aquifer Recharge Zones

The Albuquerque Bernalillo County Water Utility Authority funded this project for the New Mexico Bureau of Geology and Mineral Resources, a Research Division of New Mexico Tech.

BACKGROUND

Managed aquifer recharge is a planning and engineering process that seeks to replenish and store groundwater in aquifers for future use. This artificial recharge is becoming increasingly important in the desert southwest, including the Albuquerque area. Determining exactly where this can be done—where water can be readily absorbed and stored for future use—is largely dependent on the underlying geology of that location.

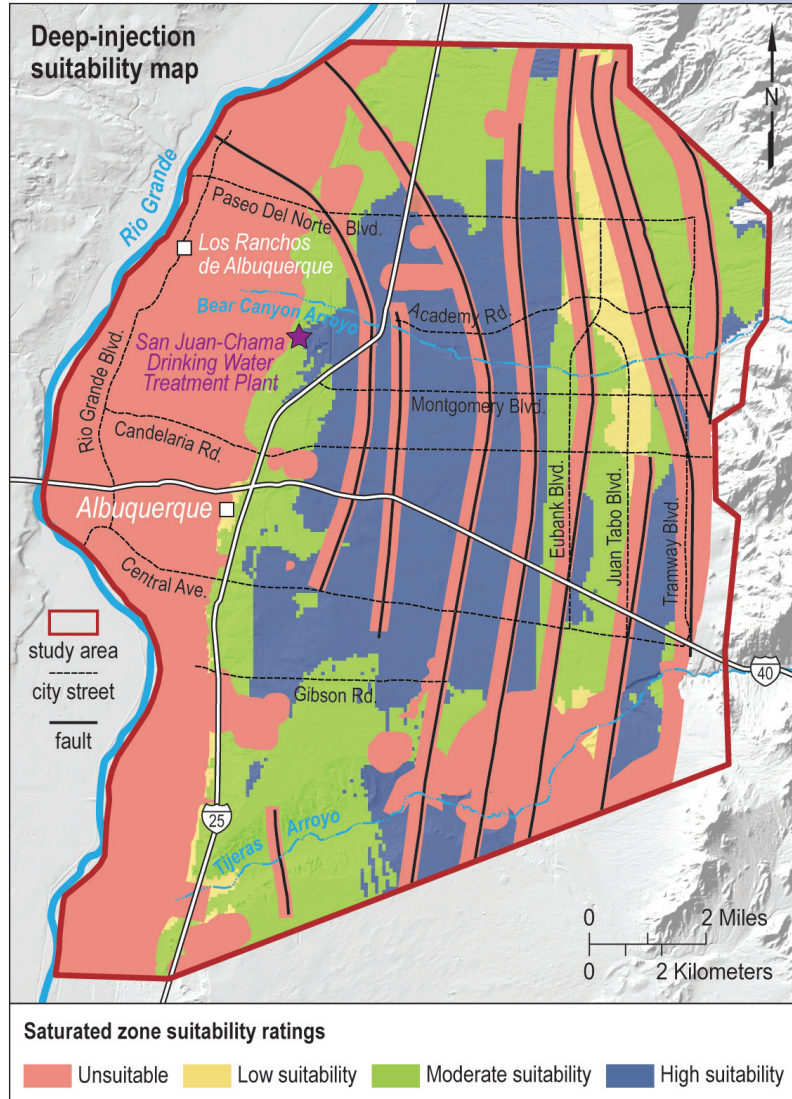
The New Mexico Bureau of Geology and Mineral Resources, the state’s geological survey, working with the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), has developed comprehensive maps showing the locations most suitable for managed aquifer recharge projects.

RESULTS

The managed aquifer recharge suitability maps are color coded to show regions that are interpreted to be unsuitable versus those of low, moderate, or high suitability. The maps highlight areas that are most suitable for aquifer-recharge projects (in blue), areas with moderate and low suitability (green and yellow, respectively), and places to avoid (red).

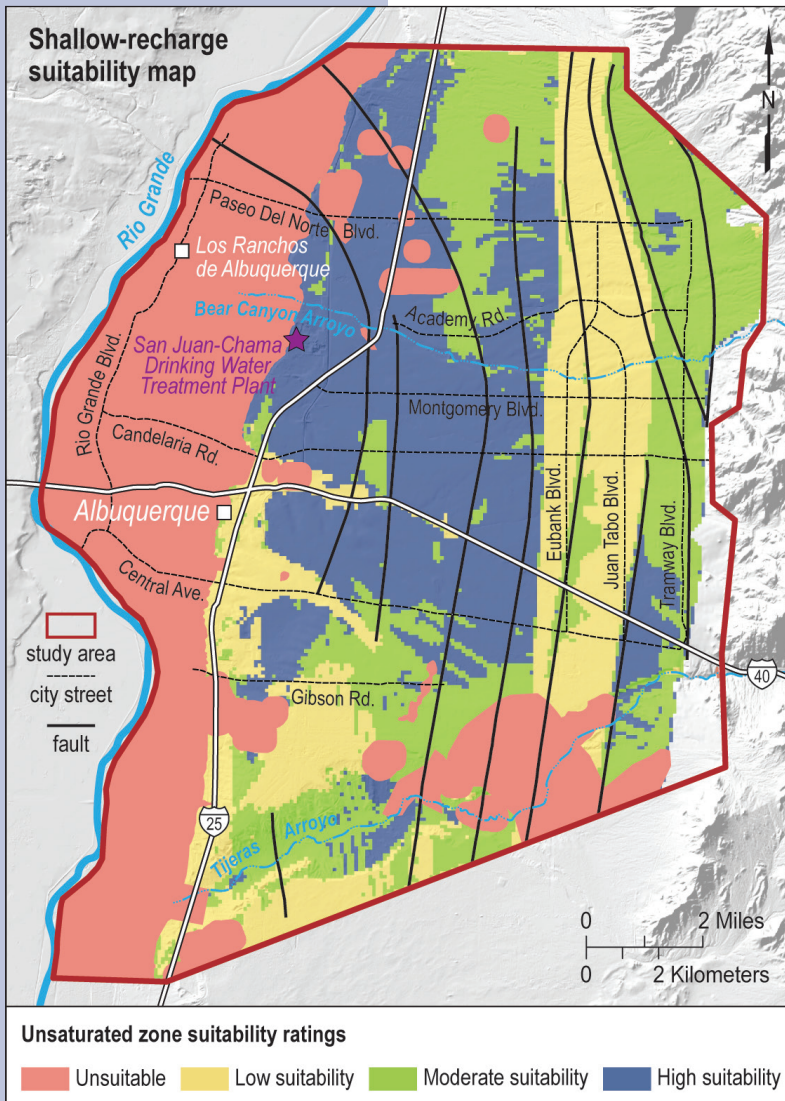
Areas considered unsuitable include regions along the Rio Grande floodplain, areas where there is known groundwater contamination, and along fault zones in the deeper aquifers. One map shows areas that are best suited for deep-injection recharge (via wells screened below the water table), whereas the other map depicts suitability for shallow recharge. Shallow-recharge methods include arroyo-bottom infiltration, spreading water in excavated basins, and shallow wells screened above the water table. The stratigraphic units most suitable for managed aquifer recharge are sandy sediments deposited by the Rio Grande between one and three million years ago, before it began flowing in its current channel.

The final set of map products also includes a map, not shown here, depicting areas that may be susceptible to collapsible soils (hydrocompaction), which is a hazard that must be considered for any shallow managed aquifer recharge project. In addition to Adobe PDF formats, these maps are available in a Geographic Information System (GIS) package so that they can be combined with maps of water infrastructure or water treatment locations.



Above:
Map showing suitability for managed aquifer recharge by deep injection, by which water is pumped into the aquifer below the water table for storage and future use. In the center of the study area, the water table is more than 300 feet deep.

Back:
Map showing suitability for shallow-based managed aquifer recharge, which enhances percolation of water into sand above the water table.



MAP DEVELOPMENT

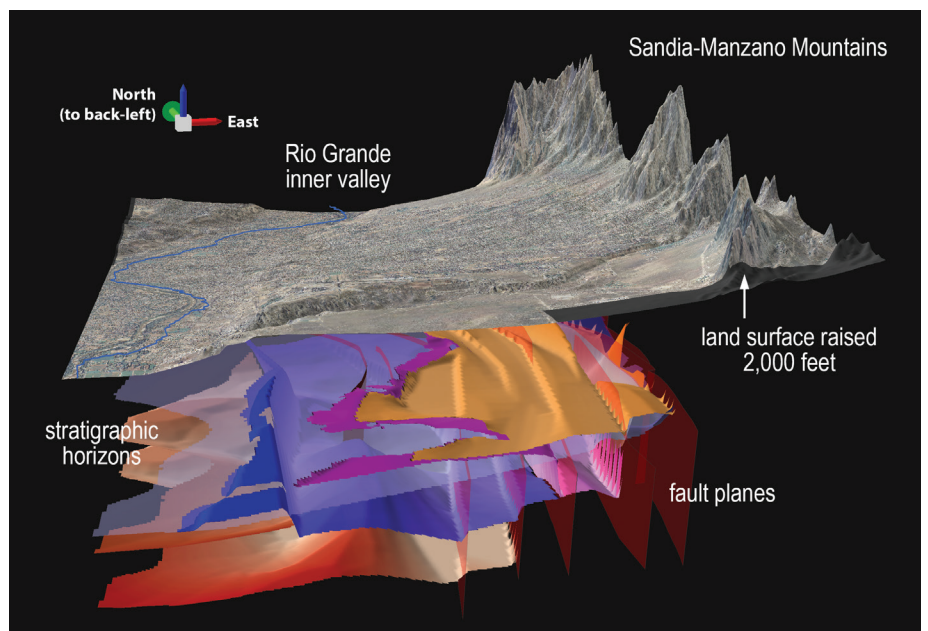
The Albuquerque Basin is filled with thousands of feet of sandy sediment, known as the Santa Fe Group, which is subdivided into units with different aquifer characteristics. Some of these units have been demonstrated to better transmit and store groundwater than others.

The maps were made using a weighted overlay method in GIS-based mapping software. Inputs for this analysis included: aquifer transmissivity; thicknesses of sandy zones in the aquifer; clay content; allowable infiltration rates, estimated using mathematical modeling; water-table depth and gradient; proximity and density of nearby wells; soil characteristics; and distances to ABCWUA water pipelines. A three-dimensional, digital subsurface model of multiple, stacked geologic units was heavily used in the weighted overlay analysis.

FOR MORE INFORMATION

The maps, a technical report describing the mapping methodology and results, and corresponding GIS files can be downloaded from: <https://geoinfo.nmt.edu/publications/openfile/details.cfm?volume=605>.

Oblique view of the three-dimensional geologic model representing the upper 1,500 feet of sediment underlying the Albuquerque metropolitan area. View is to the north. The Sandia Mountains are on the right (east). The land surface is raised for better viewing of the subsurface. This is the first digital model created for Albuquerque, revising an earlier version by Dr. John Hawley (1996).



New Mexico Bureau of Geology and Mineral Resources
801 Leroy Place
Socorro, NM 87801-4796
(575) 835-5490
geoinfo.nmt.edu

