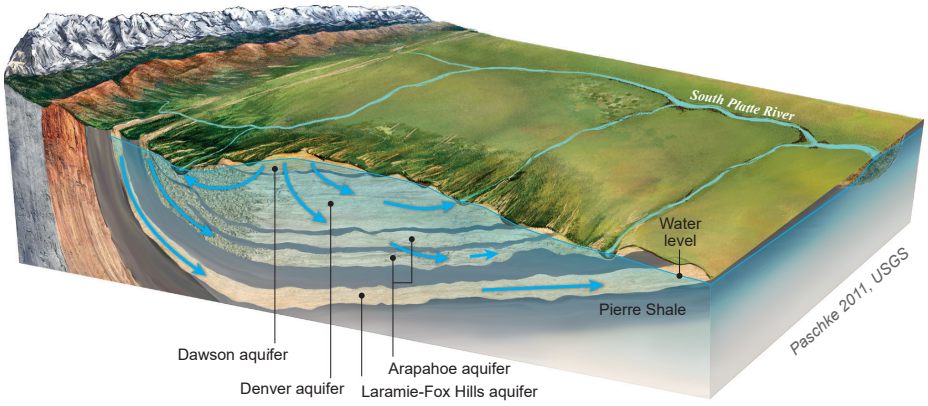
VISTACLARA INC.
NMR GEOPHYSICS

Case Study
Aquifer Storage and Recovery (ASR)

Motivation

Denver Water required high resolution information on aquifer properties beneath the city of Denver to support planning for future aquifer storage and recovery operations. Project consultant Leonard Rice Associates recommended NMR logging as a low cost and high resolution methodology and selected the Vista Clara Javelin® NMR logging tool for the project.

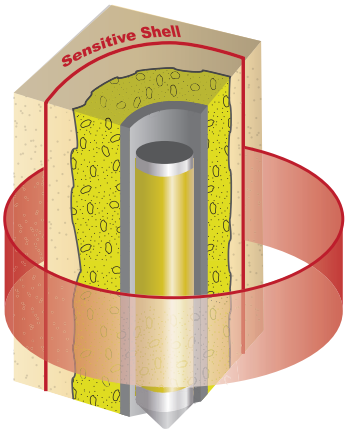


Conceptual block diagram of the Denver Basin aquifer system for predevelopment conditions.

Technical Approach

Four exploration wells were drilled at strategic locations in the Denver basin using mud rotary drilling with 8 inch nominal bit diameter. The open boreholes were logged with a Javelin® NMR logging system with 3.5 inch diameter probe operating at 2 frequencies.

The uniquely deep sensitive zones of this probe (13.5 and 15 inch diameters) enabled the NMR measurements to avoid washouts caused by drilling in sandstones and shales.

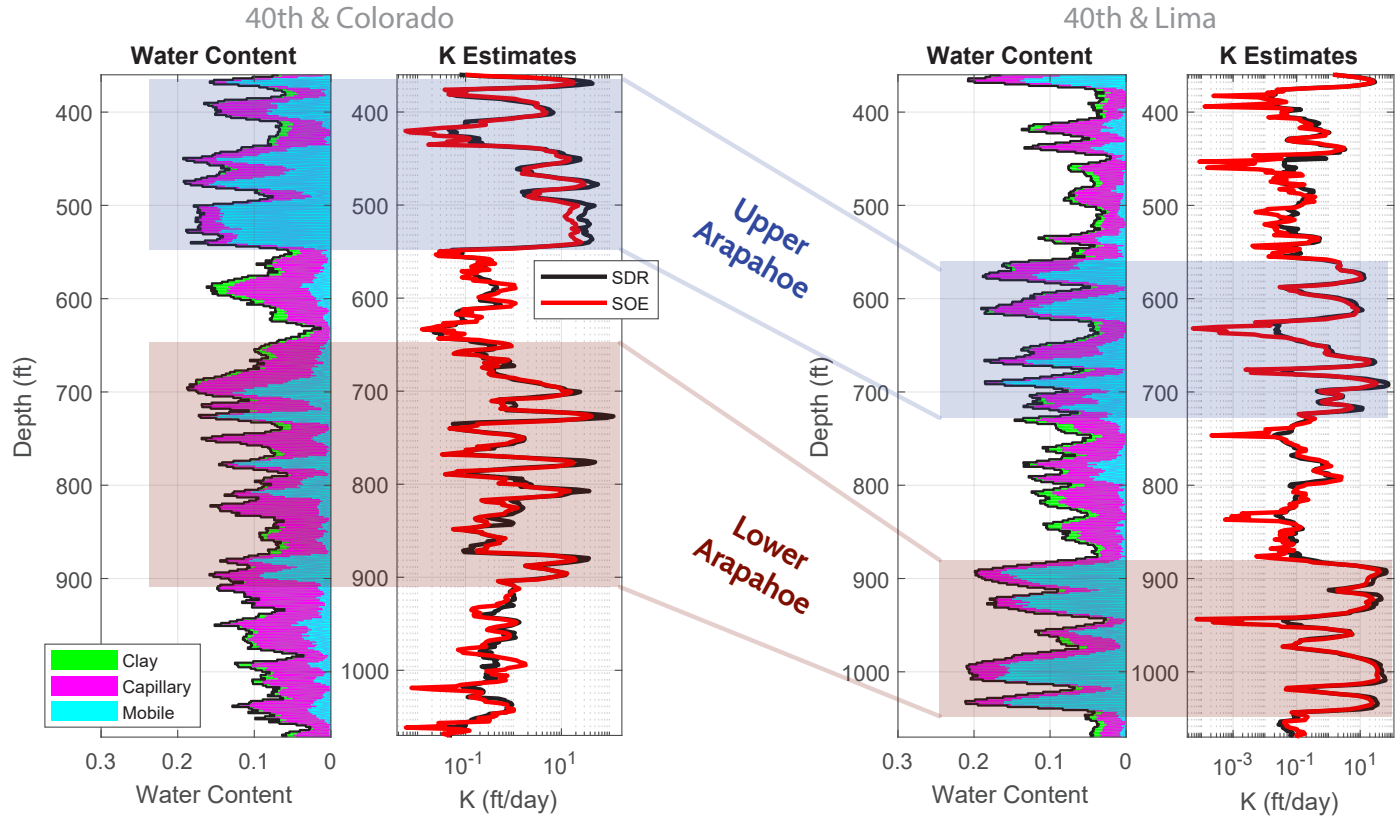


Javelin® NMR
Deep View Sensitivity

Results

The Javelin® NMR logging data provided quantified measurements of mobile water content (effective porosity) and estimates of hydraulic conductivity at vertical scales on the order of 18 inches. The NMR data highlighted critical differences between water storage and permeability in the same aquifers at locations only a few miles apart. The NMR data also provided unambiguous indications of hydrological properties in the undisturbed native formations, whereas analysis of drill cuttings suffered from large ambiguities in the presence and vertical distribution of permeable aquifers.

NMR-derived measurements of effective porosity in the targeted sandstone aquifers were in excellent agreement with average values for these aquifers as compiled by the Colorado Department of Natural Resources.



"Takeaway"

This application of the Javelin® NMR logging system in 2015 demonstrated that NMR logging can be successfully applied on large value municipal ASR projects, by small geophysical service providers, at a fraction of the cost of oilfield logging services.

VISTACLARA INC.
NMR GEOPHYSICS

Vista Clara, Inc.
Mukilteo, WA
www.vista-clara.com
+1 (425) 493-8122
info@vista-clara.com

Acknowledgements: Denver Water, Leonard Rice Associates, Gehrig Inc.