CEGM2006 – Water Project:
Design of an Aquifer Storage and Recovery system

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Background

A drinking water company wants to build an ASR system to store drinking water for use during the summer peak demand. The aquifer that they want to use consists of sand, is approximately 20 m thick, and the hydraulic conductivity is somewhere in the range 10 m/d till 40 m/d. Water in the aquifer is salty with a concentration of 30 g/L. The drinking water company wants to store enough drinking water such that they can extract a total of 40,000 m^3 of drinking water during the summer months of July and August.

Expectations

- Design an ASR system such that the drinking water company can extract a total of 40,000 m^3 of drinking water during the summer months of July and August.
- Develop a schedule for injection, extraction and, if you wish, storage.
- Design the system such that the waste of injected drinking water is as small as possible.
- Make sure you meet the guidelines for injection pressure and maximum velocity during extraction.
- Demonstrate that the ASR system can function for at least 10 years with possibly a start-up year when the extracted volume is smaller.
- Discuss the uncertainties in your design.
- Report and present your findings.

CEGM2006 – Water Project:
Estimate the Recovery Efficiency of Aquifer Storage and Recovery systems

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Background

The recovery efficiency of an ASR system can be approximated with the graphs developed by Bakker (2010). These graphs are developed for interface flow and don't consider mixing of fresh and salt water nor do they consider vertical anisotropy of the hydraulic conductivity. The mixing of water through dispersion will likely have a negative effect on the recovery efficiency while a smaller vertical hydraulic conductivity may actually improve the recovery efficiency.

Expectations

- Develop graphs that can be used to estimate the recovery efficiency, similar to the graphs developed by Bakker (2010), but for dispersivity values varying from 0.1 to 1 m, and for anisotropy ratios ($k_{horizontal}$ / $k_{vertical}$) varying from 1 to 10.
- Consider both systems with and without storage.
- Determine what are the most important factors that affect the recovery efficiency. Which parameters (at most 3) are the most important parameters to measure?
- Demonstrate that your solutions are accurate.
- Report and present your findings.

Reference

Bakker, M., 2010. Radial Dupuit interface flow to assess the aquifer storage and recovery potential of saltwater aquifers. Hydrogeology Journal, 18(1), p.107-115.