

Estimating the Target Storage Volume for ASR Wells

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ABSTRACT

The Target Storage Volume (TSV) for an ASR well is the sum of the stored water volume that is required for recovery, plus the buffer zone volume required to separate the stored water volume from the surrounding ambient groundwater. The buffer zone volume is analogous to the walls of a ground storage reservoir, or the dam holding back a reservoir. It is usually a one-time investment at the beginning of ASR operations whereas the stored water volume is typically filled and emptied each year. The TSV concept was developed initially for fresh water storage in brackish aquifers in order to quickly achieve full recovery efficiency. The TSV is typically injected prior to initiating cycle testing, which is then conducted to confirm recovered water quality and, if necessary, adjust the buffer zone volume. Alternatively the TSV may be achieved over several operating cycles, during each of which a portion of the stored water is left in the aquifer. The latter approach was followed during the first 20 years of ASR history and requires much more time and expense.

Recent experience with ASR storage in brackish aquifers containing arsenic-bearing minerals in Florida has shown that the TSV concept may be adapted to achieve acceptable arsenic concentrations in the recovered water from the ASR well for non-conservative as well as conservative constituents. Other factors besides the storage and buffer zone volumes are also important, including flushing of the aquifer through successive cycles at the same volume, and other non-conservative processes such as microbial and geochemical reactions.

The number of ASR wellfields in operation is growing rapidly, and the number of operating cycles is also growing at each of these wellfields. Some ASR wellfields have been in operation for over 20 years. That experience provides a reasonable basis for development of a logical process for estimation of the Target Storage Volume required to achieve recovered water quality goals at each new site for a variety of conservative and non-conservative constituents. This process will be presented in the proposed paper, based upon proven operating experience. Constituents will include at least total dissolved solids, hydrogen sulfide, metals and some organics. Some constituents are not amenable to management with the TSV approach, such as iron, manganese and radon. For these constituents other pretreatment or post-treatment approaches are needed.

The paper will suggest how to estimate the TSV required for an ASR well to meet recovered water quality goals for each new site.