Effect of Aquifer Parameter Uncertainty on Analytical Estimates of Streambed Conductance using STRMAQ

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Abstract. A non-linear least squares program based on the Levenberg-Marquardt method is used to evaluate the sensitivity of analytical streambed conductance estimates to uncertainty in aquifer parameters. Several analytical solutions for aquifer response to pumping adjacent to a partially penetrating stream have recently been developed. These analytical solutions suggest that streambed conductance can be derived from aquifer tests performed adjacent to a stream. In this research, estimates of streambed conductance are derived from the observed drawdown response of hypothetical confined and water-table aquifers. Aquifer parameters are varied by 20% above and below their assumed true value and streambed conductance is estimated. The absolute errors in predicted streambed conductance versus percent error in aquifer parameters are quantified for varying streambed conductance. Inverse estimation of the streambed conductance requires accurate estimates of aquifer parameters, especially aquifer hydraulic conductivity. The effect of aquifer parameter uncertainty on estimated streambed conductance becomes greater when observation wells are located further from the stream.

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