



## Documentation of a Spreadsheet for Time-Series Analysis and Drawdown Estimation: Usgs Scientific Investigations Report 2006-5024

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\*\*\*\*\*. Drawdowns during aquifer tests can be obscured by barometric pressure changes, earth tides, regional pumping, and recharge events in the water-level record. These stresses can create water-level fluctuations that should be removed from observed water levels prior to estimating drawdowns. Simple models have been developed for estimating unpumped water levels during aquifer tests that are referred to as synthetic water levels. These models sum multiple time series such as barometric pressure, tidal potential, and background water levels to simulate non-pumping water levels. The amplitude and phase of each time series are adjusted so that synthetic water levels match measured water levels during periods unaffected by an aquifer test. Differences between synthetic and measured water levels are minimized with a sum-of-squares objective function. Root-mean-square errors during fitting and prediction periods were compared multiple times at four geographically diverse sites. Prediction error equaled fitting error when fitting periods were greater than or equal to four times prediction periods. The proposed drawdown estimation approach has been implemented in a spreadsheet application. Measured time series are independent

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