

Analysis of Slug Tests in High Hydraulic Conductivity Formations

Geology 210

These are notes for estimating hydraulic conductivity in relatively high conductivity formations. They provide some steps to analyze time-series head change in a well during a slug test. For specifics, refer to Butler, J.J., Jr. and Garnett, E.J., 2000, *Simple Procedures for Analysis of Slug Tests in Formations of High Hydraulic Conductivity using Spreadsheet and Scientific Graphics Software*: Kansas Geological Survey Open File Report 2000-40, 21p. December.

<http://www.kgs.ku.edu/Hydro/Publications/pubOFR.thml>. Search year 2000 for OFR 40.

1. Open time High K Slug Tests English.xls file
2. Enter specifications for the well being tested.
3. Enter the time and pressure records from the datalogger in columns C and D on sheet 2.
4. Enter start time of test in cell C12 on sheet 2.
5. Enter pressure head at static conditions in cell C9 on sheet 2.
6. Enter initial change in water level (H_0) in cell C11 on sheet 2.
7. Change the type curve shape to match the amplitudes of the peaks and valleys on chart 3 by iteratively changing the Cd value in cell B12 on sheet 1.
8. Type curve and response data will likely still be offset. To obtain a good curve match, adjust the dimensionless times and therefore the type curve, using a modulations factor.
9. Iteratively adjust the modulation factor in cell N13 on sheet 2 to obtain the best fit curve match on chart 3.
10. With a best fit of the type curve and the response data, the estimated K is calculated using both the Hvorslev and Bower and Rice models.

Note that the type curves generated in these spreadsheets are less efficient than the standard straight line to a log normalized head versus time plot. **So, this method should not be used when more appropriate methods for lower K formations are available.** Kipp (1985) showed that low K analysis methods are valid for Cd values greater than 10. Butler (1997, p.150) points out that a linear or concave-upward character to a log normalized head versus time plot is an indication that high K analysis methods are not necessary.

References

Butler, J.J., Jr. 1997, *The Design, Performance, and Analysis of Slug Tests*. Boca Raton, Lewis Publishers.

Kipp, K.L., jr., 1985, Type curve analysis of inertial effects in the response of a well to a slug test. *Water Resources Research* 21, no. 9: 1397-1408.