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A Real-Time Indicator of Hydraulic Conductivity Distributions Used to Select Groundwater Sampling Depths

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Abstract

Two of the most important variables in the development of sampling plans are sample spacing and sample interval. Spacing refers to the vertical distance between samples while sample interval refers to the vertical length of the zone that is sampled. Because contaminant concentrations are extremely variable spatially, particularly in the vertical dimension, it is desirable to have a short sampling interval to minimize the flow weighted, depth integrated concentration averaging inherent in sampling with long screens. It is also desirable to maintain relatively small sample spacings in order to adequately describe the distribution of contaminants. In relatively uniform aquifer materials, it is adequate to select a single sample spacing that accounts for the spatial structure of contaminant distributions. However, when significant variability in hydraulic conductivity (K) is present, the sampling plan must account for the effects of the changes in K on the distribution of contaminants. In many direct push investigations the investigator is essentially "blind" with respect to knowing whether one is sampling in high K or low K zones. A real-time indicator of hydraulic conductivity has been developed for use with the Waterloo Profiler, a continuous point sample groundwater profiling tool. This indicator utilizes continuous measurement of the flow rate and pressure of the water pumped out the screened interval as the sampler is advanced through the aquifer. By observing a plot of the so-called "index of hydraulic conductivity" in real-time, the investigator can determine where transitions between high and low K zones occur and can stop to collect samples at appropriate depths. Knowing when the intake of the device is in a low K zone also minimizes the time spent trying to sample very low yielding units.