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## **The Significance of Spatial Variability in Direct Push Site Investigations**

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### **Abstract**

The spatial variability of aquifer properties and contaminant concentrations has typically not received the attention required in conventional investigations due to cost constraints and the inability of conventional investigative techniques to assess the degree of variability. Unfortunately, direct push techniques are often employed as faster and cheaper means to acquire the same amount and type of data that conventional investigations provided. However, extensive research has shown that hydraulic conductivity (K) correlation lengths are quite small; transverse hydrodynamic dispersion is weak; concentration gradients are very steep and; non aqueous phase source distributions are very complex. All of these features create the necessity for detailed vertical profiling in order to adequately understand the nature of the problem and to evaluate the potential solutions.

The results of detailed sampling conducted with direct push techniques in a variety of environments such as marine clay and silt, saprolite, beach sand and other shallow marine environments as well as sand and gravel outwash illustrates the extremely high degree of spatial variability of contaminant concentrations inherent at many sites. The locations of high concentration zones relative to low permeability strata are often counterintuitive, occurring within or just beneath aquitards.

Because the scale of inquiry profoundly effects the understanding one gains of a site it is imperative that scale appropriate sampling techniques are used and that the investigation approach is altered in response to the evaluation of real-time and near real-time data as they are produced.