Modern field-based investigative techniques have been developed in recent times in response to the need for a high-resolution quantification of shallow subsurface heterogeneity and the associated biogeochemical processes occurring within it. While current site characterization “tool-box” include innovative hydrogeological, biogeochemical, geophysical and other methods ranging from Direct-Push based to tomographic method, recent researches focus on joint experimental studies that allow for the acquisition of multiple data sets which could help maximize the cost-benefit ratio from such tests and as well improve on geologic, geophysical, biogeochemical and hydraulic parameter estimates. In this presentation, I show field implementation of joint hydraulic, geophysical and multi-tracer techniques in a tomographic sequence. I also present an overview of the application of Direct-Push based X-Ray Fluorescence for characterizing mine tails. While field implementations of these modern techniques have not been without associated challenges, the possibility of obtaining multiple data sets with different sensitivity patterns in combination with advancements in stochastic modelling and other joint inversion techniques present a new opportunity for improving field estimates of shallow subsurface parameters.