High Resolution Hydraulic Profiling and Groundwater Sampling Using FLUTe System in a Fractured Limestone Setting

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Gry Sander Janniche, Ph.D. , NIRAS, Allerød
Anders G. Christensen, M.Sc. , NIRAS, Allerod, Denmark
Bernt Grosen , COWI, Kgs. Lyngby
Henriette Kerrn-Jespersen , Capital Region of Denmark, Hillerød
Mette M. Broholm, Ph.D. , DTU Environment, Technical University of Denmark, Kgs. Lyngby, Denmark

Characterization of the contaminant source zone architecture and the hydraulics is essential to develop accurate site specific conceptual models, delineate and quantify contaminant mass, perform risk assessment, and select and design remediation alternatives. This characterization is particularly challenging in deposit types as fractured limestone. The activities of a bulk distribution facility for perchloroethene (PCE) and trichloroethene (TCE) at the Naverland site near Copenhagen, Denmark, has resulted in PCE and TCE DNAPL impacts to a fractured clay till and an underlying fractured limestone aquifer/bedrock. A wide range of innovative and current site investigative tools for direct and indirect documentation and/or evaluation of dense non-aqueous phase liquid (DNAPL) presence were combined in a multiple lines of evidence approach. One scope of the investigations was to evaluate innovative investigation methods for characterization of the source zone hydrogeology and contamination, including FLUTe system hydraulic profiling and Water-FLUTe multilevel groundwater sampling, in fractured bryozoan limestone bedrock.

High resolution hydraulic profiling was conducted in three cored boreholes, placed within a 970 ft^2 (~90 m^2) area, and Water-FLUTes were installed with 12-13 sampling screens in each borehole. Hydraulic profilling by FLUTe liner system provided information with highere discretization than other traditionel methods, and supported the individual design of Water-FLUTes for multilevel groundwater monitoring, sampling (under two flow conditions) and analysis. Coring for discrete subsampling was a challenge in the limestone, due to core-loss and potential DNAPL loss caused by high drilling water pressure. Hence, the water-FLUTe data proved to be an essential link in the source zone characterization. The results from the high resolution hydraulic profiling and from the Water-FLUTe multilevel sampling will be presented as well as the experiences obtained.

Gry Sander Janniche, Ph.D., NIRAS, Allerød

Post Doc at DTU Environment untill 2012. From 2012 consultant at NIRAS.

Anders G. Christensen, M.Sc., NIRAS, Allerod, Denmark
Consultant

Bernt Grosen, COWI, Kgs. Lyngby
Consultant

Henriette Kerrn-Jespersen, Capital Region of Denmark, Hillerød
Capital Region of Denmark

Mette M. Broholm, Ph.D., DTU Environment, Technical University of Denmark, Kgs. Lyngby, Denmark
Associate professor