

NON-INVASIVE MULTILEVEL GROUNDWATER SAMPLERS*

Edward Kaplan¹ and John Heiser¹

Abstract

Two non-intrusive, passive multilayer groundwater sampling devices are described which collect data simultaneously at small vertical intervals in the same well, without disturbing the geohydrological environment. One system uses membranes, the other uses remotely operated stainless steel cylinders connected in tandem. When used in several wells sufficient information is collected to allow a three dimensional characterization of contaminants and flow in the aquifer. The systems were used during field trials at Savannah River Laboratory in November 1991 and June 1992, and collected water quality and flow data over a 3 meter interval below the water table in each of two wells. Data from 1991 indicate weak vertical profiles in temperature, dissolved oxygen, and pH over the 3 m sampling interval. Other measurements indicated a relatively uniform horizontal specific discharge of about 6 cm/year over the same sampling interval. No statistically significant vertical structure was evident for discharge. This presentation will compare this information with data obtained from field trials in June 1992.

Introduction

Non-invasive, multi-level groundwater sampling systems were designed and are being tested at Brookhaven National Laboratory (BNL) and at the Savannah River Laboratory (SRL). They provide information on the concentration of contaminants and horizontal flows in an aquifer, simultaneously at several depths in the same well. This information is necessary to properly design remediation projects, but cannot be obtained using existing technologies. Instead, clusters of wells are usually installed at great expense, and samples are pumped from each well. Unfortunately pumping has been shown to perturb both the aquifer being investigated and samples which are collected. In addition, samples collected using standard methods represent conditions over some large zone in the vicinity of the pump, not necessarily those conditions where contaminants actually exist.

Two different systems were constructed using commercially available components. These apparatus were first tested in the laboratory and field at BNL, after which an initial field trial was conducted at SRL in November 1991. Samples at BNL were taken at a depth interval of 12-15 m in a glacial aquifer, where contaminants of concern were benzene, toluene, and xylene. Measurements at SRL were made on samples collected over a 300 cm interval below the water table located at a depth of about 48 m. Preliminary results at both locations indicate vertical profiles of several inorganic and organic species,

¹Brookhaven National Laboratory, Upton, New York 11973.

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