Migration of contaminants in groundwater at a landfill: A case study: 2. Groundwater monitoring devices.

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Abstract

Six types of devices for groundwater monitoring were used on an experimental basis in the investigation of the plume of contamination in the unconfined sandy aquifer at the Borden landfill. These include: standpipe piezometers, water-table standpipes, an auger-head sampler, suction-type and positive-displacement-type multilevel point-samplers, and bundle-piezometers. With the exception of the first two, each of these devices provides a means of obtaining vertical sample profiles of groundwater from a single borehole. The auger-head sampler, which is a device that is attached to the cutting head of conventional continuous-flight hollow-stem augers, yields samples from relatively undisturbed aquifer zones as the augers are advanced downward in the borehole from one depth of sampling to another. This method is a rapid means of aquiring water-

quality profiles for mapping the distribution of a contaminant plume.

The other three profiling devices can be used to establish permanent networks for groundwater-quality monitoring. A suction-type multilevel sampler consists of twenty or more narrow polyethylene or polypropylene tubes contained in a PVC casing that is capped at the bottom. Each tube extends to a different depth and is attached to a small screened sampling point that extends through the casing to draw water from the aquifer when suction is applied. A positive-displacement multilevel sampler is similar except that each sampling point is connected to a positive-displacement pumping device located inside the PVC casing adjacent to the screen. Use of the suction-type multilevel sampler is limited to zones where the water table is less than the suction-lift depth of 8 or 9 m. The positive-displacement sampler can be used even if the water table is at a much greater depth.

A bundle-piezometer consists of 1.2-cm O.D. flexible polyethylene tubes, each with a short screened section at the bottom, fastened as a bundle around a semi-rigid center-piezometer constructed of thick-walled 2-cm O.D. PVC pipe. In shallow water-table areas water is withdrawn from each of the tubes and from the PVC piezometer by suction. In areas with a deep water table, samples are obtained by bailing with a narrow tube with a check valve on the bottom or by displacement using a double- or triple-tube gas-drive sampler. The positive-displacement multilevel sampler or use of the gas-drive samplers in the bundle-piezometers provide the best opportunities for collecting samples that can be filtered and have preservatives added without the water being influenced excessively by degassing or by oxygen invasion.

Networks of these three types of devices for multilevel groundwater monitoring were installed in the Borden aquifer by means of hollow-stem augers. The devices are particularly well suited for use in aquifers composed of cohesionless sand or gravel that have little or no clay and groundwater flow that is primarily horizontal. When 8-cm diameter hollow-stem augers are used, as many as eight polyethylene tubes are included conveniently in each bundle-piezometer. If augers with a larger hollow-stem are used, more tubes can be assembled in each bundle.

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