

An occurrence of perchloroethylene and implications to groundwater resources at Sussex, New Brunswick

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In response to a reported perchloroethylene (PCE) occurrence of 3.9 µg/l in the Albert Street well, one of three municipal water-supply wells at Sussex, New Brunswick, a subsurface groundwater sampling program was undertaken in 1996 to delimit the extent and nature of the contamination. At Sussex, a lower, confined aquifer, serves as the main source of the municipal water supply, presently through two major production wells. The lower aquifer consists of a well-sorted, glaciofluvial/ice-contact, sand and gravel unit, approximately 10 m thick, overlying till and/or bedrock. The unit underlies a laminated silt-clay glaciolacustrine unit (middle aquitard) of variable thickness. The middle aquitard is in turn overlain by coarsening-upward sand, and sand and gravel with occasional lenses of clay, silt and diamicton, and occurs to a variable depth of up to 18 m. The upper unit extends to surface, is under atmospheric pressure and is informally referred to as the upper aquifer.

A total of 72 water samples were collected from 31 boreholes and 41 established observation wells. Dissolved PCE was detected in concentrations up to 28.0 µg/l in samples collected within the upper aquifer and up to 1.6 µg/l for samples

from the lower aquifer. A contaminant dispersal plume was identified in cross-section contours of PCE concentrations, as underlying the central area of urban development. The concentrations increase towards Main and Summer streets, suggesting that the PCE likely originated from a surface spill near the centre of the business district. Contamination of the lower aquifer has likely originated from the draw-down of contaminant through the upper aquifer and through "windows" in the middle aquitard, into the lower aquifer during pumping of the Albert Street well. The extent of the PCE contamination is due to: (1) the volume of PCE involved in the initial surface spill, (2) the length of time the substance has been within the groundwater system, (3) the permeability of the upper aquifer, (4) the frequency and rate of pumping of municipal water-supply wells, as well as (5) the topographic expression of the middle aquitard, and (6) its integrity. PCE contamination has compromised only the recovery of potable groundwater from the Albert Street well, but this may limit future exploitation of the municipal water supply.