

## **Nitrate Contamination of a Bedrock Aquifer in Sheldon, Vermont: Part II, The Geologic Context**

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In 2004, elevated levels of nitrate ( $> 10$  ppm) were detected by the Vermont Agency of Agriculture in groundwater from private wells on and in the vicinity of a large dairy farm in NW Vermont. The possible sources of nitrate on this farm include a manure pit, field management practices, tile drains, and septic systems. A geologic framework to evaluate the source(s) of the elevated nitrate levels was constructed through geologic mapping, coring of surficial materials, Electromagnetic Induction (EMI) surveys, and analysis of well logs.

Exposed bedrock ridges parallel to the dominant foliation in slates of the Morses Line Formation were observed along Morey Road to the NW of the farm. All wells along Morey Road are bedrock wells with shallow overburden; 2 of 5 of these wells have elevated nitrate levels. Moving SW from this road to the farmyard, the overburden thickens significantly to  $\sim 100'$ . The 2 farmyard wells have thick overburden, are completed in bedrock, and have non-detect nitrate levels. Clay layers observed in well logs for the farm yard wells may mitigate the downward migration of nutrients.

A recently constructed manure pit was initially suspected to be the source of the nitrate problem. EMI surveys around the manure pit did not detect any high conductivity plumes within the instrument's depth of penetration. The fact that the Morey Road wells are significantly up topographic gradient from the manure pit makes contamination via this source less likely.

A detailed EMI survey was conducted in the fields between the farm and Morey Road. Conductivity patterns from this survey were consistent with the attitude of fracture and foliation data obtained from nearby bedrock outcrops. We suspect that these bedrock structures locally affect groundwater flow paths. Ongoing work seeks to further address the local hydrogeology.