

The occurrence of methane in private well water in southeastern New Brunswick, Canada: Regional and time-series results

D. LOOMER^{1*}, K. MACQUARRIE¹, I. BRAGDON¹,
J. LEBLANC¹, H. LOOMER¹, D. CONNOR¹, B.
NASON¹, T. LEWEY¹ AND T. AL²

¹ Dept. of Civil Engineering, University of New Brunswick, PO Box 4400, Fredericton NB Canada E3B 2W9 (*correspondance: dloomer@unb.ca)

² Dept. of Earth and Environmental Science, University of Ottawa ON Canada K1N 6N5

In recent years, a number of studies have aimed to establish baseline dissolved gas concentrations in groundwater from areas of potential unconventional (shale) gas resource development. However, as yet, there are no reports of time-series data from private wells. In this study, 434 private water wells were sampled in four areas of southeastern New Brunswick, Canada. Additionally, a subset of 15 wells was monitored monthly for 1 year. Water quality testing included inorganic parameters, dissolved gases, and isotopes of water. Wells with methane concentrations ≥ 0.1 mg/L were sampled a second time, which included collection of additional samples for methane stable isotope analyses. The wells selected for time-series sampling represent methane concentrations that span several orders of magnitude.

Methane was detected in 240 (55%) of the wells tested. The median concentration for the wells with detectable methane was 0.006 mg/L and the maximum was 29 mg/L. Methane concentrations were high enough to allow for the measurement of methane stable isotopes in 9% of the wells tested. The methane concentrations from the monthly sampling of 6 wells in the Kent area indicate little variability in time, with a maximum rsd of 20%. The methane concentrations in the 9 Sussex area wells that were sampled monthly were more variable, with rsd values between 18 and 133%. Both biogenic and thermogenic methane was identified in all study areas. Concern over extended hold times prior to methane isotope analyses prompted an assessment of the effect on preserved samples. There was no correlation between $\delta^2\text{H}$ values and hold time. The sd in $\delta^2\text{H}$ was $\pm 4\%$, based on measurements made over 19 weeks. The $\delta^{13}\text{C}$ values displayed a trend of depletion with time (R^2 0.97), resulting in a difference of -8% after 19 weeks. Despite hold times up to 15 weeks, the depletion in $\delta^{13}\text{C}$ did not affect the ability to distinguish biogenic from thermogenic methane in 89% of the samples.