A baseline assessment of dissolved methane in private wells from regions of potential shale gas development in New Brunswick, Canada

Diana Loomer[1,2], Kerry MacQuarrie[1], Ian Bragdon[1], Jessica Leblanc[1], Tom Al[2], Heather Loomer[1], Dennis Connor[1], and Brian Nason[1]

1. Department of Civil Engineering, University of New Brunswick, P.O. Box 4400, Fredericton, New Brunswick E3B 5A3, Canada <dloomer@unb.ca>

2. Department of Earth and Environmental Sciences, University of Ottawa, 25 Templeton St, Ottawa, Ontario K1N 6N5, Canada

The occurrence of dissolved methane in private well water was investigated in regions of southeastern New Brunswick that had been identified as potential targets for unconventional oil and natural gas development. In total, 434 private wells were sampled across four areas – the Central, Kent, Shediac, and Sussex study areas. Additionally, a subset of 15 wells was sampled monthly for 1 year (timeseries sampling). Analyses included testing for inorganic parameters, dissolved gases and isotopes of water, and methane.

Dissolved methane was detected in 55% of the wells sampled. The median concentration for wells with detectable methane was 0.006 mg/L and the maximum was 29 mg/L. Methane concentrations were high enough, >0.1 mg/L, to determine δ^2 H and δ^{13} C in methane in 9% of the wells. Biogenic and thermogenic methane were identified in the wells. The Kent study area had the highest frequency of detectable methane, 67%, while Sussex had the highest frequency of samples with methane concentrations >1 mg/L, 9%, and was the only area with methane concentrations >10 mg/L. Ethane and propane were also detected more frequently in the Sussex study area. The bedrock geology of the Central, Kent, and Shediac study areas is relatively uniform; the wells sampled were mainly completed in Pictou Group bedrock, part of the Maritimes Basin. The majority of the wells in the Sussex study area were also completed in bedrock of the Maritimes Basin; however, the geology is more complex due to faulting and folding. The majority of the higher methane concentrations, and most of the ethane/ propane detections, were from wells located where Horton Group bedrock is inferred to be present relatively close to the ground surface. The Horton Group hosts the Albert Formation, a known host for oil and natural gas reserves.

The methane concentrations from the monthly sampling of 6 wells in the Kent area indicate little variability in time, with rsd values ranging from 0 to 20%. The methane concentrations in the 9 Sussex area time-series wells had rsd values between 18 and 133%. For all of the Kent time-series wells, drillers reported only one dominant water-bearing zone. The wells in the Sussex area with consistent water quality also had only one reported major water-bearing zone, while the wells with multiple water-bearing zones had variable water chemistry. This is consistent with the expectation that different inflow zones could have different water chemistries and that their relative contribution to the well could vary over time.

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