Investigation and Remediation of Groundwater Contaminated with the Emerging Contaminant 1,4-Dioxane in Glacial Till and Fractured Bedrock Associated with a Former Medical Waste Disposal Area in Hanover, New Hampshire

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Background/Objectives. A hydrogeologic investigation and remediation case study involving 1,4-dioxane in a glacial till and fractured metamorphic bedrock groundwater system. The source of 1,4-dioxane is scintillation fluid from radiological analyses involving test animals used in medical research. Animal carcasses were located within a former burial area in a rural area of Hanover, New Hampshire. Groundwater monitoring detected 1,4-dioxane overburden and fractured bedrock, including one private bedrock water supply well. A phased hydrogeologic investigation led to the delineation of the 1,4-dioxane plume and construction of groundwater extraction and treatment remedial systems. The presentation includes review of off-site and source area investigations, and groundwater remedial system design, construction and performance monitoring.

Approach/Activities. The local community relies on private water supply wells largely drilled within the fractured bedrock aquifer. Due to known and potential impacts to private water supply wells, the project followed an accelerated schedule, with remedial construction concurrent with investigations. Investigations included construction of a monitoring well network of over 100 wells within a flowing artesian hydrogeologic regime. Bedrock mapping, and surficial and borehole geophysical methods were used to characterize bedrock fracture fabric. Over 140 water supply wells within an approximate two-mile radius of the site were also sampled. The remedial system includes removal of 1,4-dioxane using a synthetic resin and on-site regeneration of the resin.

Results/Lessons Learned. The 1,4-dioxane plume was identified in overburden and fractured bedrock over 1,700 feet from the source area, with maximum concentrations of approximately 600 micrograms per liter. Initial remedial activities have been effective through groundwater extraction and treatment. Communication to stakeholders throughout the project was important for maintaining confidence with the characterization and remediation of this emerging contaminant. Due to low reporting limits and the common use of 1,4-dioxane, evaluation of 1,4-dioxane at low concentrations was critical to the investigation.