24

Obtaining Representative Groundwater Samples: Two Case Studies Demonstrating the Effect of Sampling Method and Device Selection

John Jackson, SNC Lavalin

Groundwater sampling at contaminated sites for trace parameters requires high quality data collection methods in order to return accurate, precise, and repeatable results. Accuracy depends not only on the analyte concentration in water, but also on the appropriate selection of monitoring tools and procedures to minimize sample and subsurface disturbance from collection to analysis. Precision depends on the repeatability of sampling and analytical techniques.

Groundwater sampling at contaminated sites is typically completed utilizing one of two standard methods, those being well-volume or low-flow purging and sampling. Which method the practitioner selects should be based upon the project objective and setting. In practice, well-volume sampling using either a bailer or an inertia lift system is frequently used due to logistical simplicity. Recently the no-purge method (also known as passive sampling) has gained credibility; however, its suitability for general use at a site should be assessed as the method has been proven to have limitations.

The methods to obtain representative groundwater samples are well documented. However, mixing and matching of methodologies in the field, and inconsistent and often inadequate sample device selection relative to the project objective can result in questionable representativeness of trace parameters and low a low degree of repeatability. This can result in a false confidence that groundwater is not impacted, or alternatively the unnecessary expansion of a monitoring/ remediation program.

Two case studies were completed comparing groundwater concentrations of various parameters from samples collected via the well-volume, low-flow, and no-purge methods. Both case studies were completed to facilitate a sampling method change albeit for different rationale. The case studies highlight the advantages and limitations of each method.

The first case study was completed at a metals impacted site. Historically samples were obtained using the well-volume method with disposable bailers or inertia lift pumps. The historical results were often inconsistent and frequently affected by sample turbidity, which together resulted in poor site conceptualization. A method comparison program was completed, the results of which indicated the low-flow method using a portable pump produced groundwater samples with lower turbidity, thus providing relatively higher quality, consistent results. Results identified that well-volume metal concentrations were between 1.8 and 2.5 times greater than the low-flow sample concentrations. Well-volume samples did provide consistent metal concentrations when the sample turbidity was less than 50 NTU, however this represents only 44% of samples obtained.

The second case study was completed at a condensate release site currently being remediated. Historically groundwater samples were collected using the well-volume method via disposable bailer. This method was proving costly both in time and purge water disposal requirements. A method comparison program was completed, the results of which indicated the no-purge method (using a HydraSleeve™) provided comparable results to the well-volume method. No-purge volatile parameter concentrations were between 1.0 and 1.2 times greater than the well-volume sample concentrations (due to less volatilization), while F2 concentrations were greater in the well-volume sample (due to elevated turbidity).

John Jackson, M.Sc., P.Geol.,

Mr. John Jackson, M.Sc., P.Geol., has eight years professional experience in hydrogeology, geology and environmental management. His expertise includes quantitative evaluation of water resources and environmental site assessment and remediation. Quantitative water resource projects have included: water sourcing and injection feasibility analysis, exploration, well design, aquifer hydraulic and well performance tests and analyses, analytical and numerical modelling, sustainability analysis, regional water budget analysis, modelling of conjunctive use, alternatives analysis, evaluation of impairment issues; and, management of supporting database and GIS development. Site assessment and remediation projects have included: regional hydrogeological assessment, baseline characterization, site characterization, evaluation of contaminant source, extent, fate and transport to potential receptors, remedial system review, monitoring system and methodology evaluation, risk-based remedial option assessment, and remediation. Mr. Jackson is SNC-Lavalin's APEGA Responsible Member for hydrogeology. As part of his responsibilities, he has assisted in the development of the companies environmental Preferred Operating Procedures, developed internal training workshops, provided supervision and mentorship to junior staff, and completes Health & Safety and Technical audits within Western Canada.