

Low-Flow Groundwater Sampling: An Update on Proper Application and Use

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Improved data quality (more accurate and precise samples) and operational efficiency (less time, reduced purge water quantities) using low-flow purging and sampling of groundwater monitoring wells have been well-documented in the published literature. Questions have been raised, however, regarding the appropriateness of low-flow sampling for some monitoring programs. The perception is that a sample collected from a monitoring well at a low flow rate represents only a very narrow vertical interval near the pump intake, and that contaminants above or below the pump could be missed - especially in typical monitoring wells screens of 10 – 20 feet in length.

A detailed three-dimensional numerical model of groundwater flow in the vicinity of a monitoring well during low-flow purging and sampling was developed to provide a means to investigate the actual monitoring zone achieved (i.e. "where the water comes from"). The model allowed for examination of the influence of variables such as pump placement, well screen length, sand pack configuration and aquifer heterogeneities on the effective monitoring zone that is achieved. The results of these simulations, along with published literature from empirical studies, will be presented to answer the question: are we missing contaminants with low-flow sampling?

In settings where low-flow sampling is appropriate, questions are often raised about proper use of the methodology. Flow rate, drawdown limits, indicator parameter stabilization, and purge volume generated often become criteria for determining if low-flow sampling can be used at a site, or if in use, may be raised in a regulatory review or audit.

Presentation and discussion topics will include:

- Basics of low-flow purging and sampling
- How low-flow sampling compares to traditional purging and sampling methods
- Numerical simulations and empirical studies to assess the effective monitoring zone
- Monitoring well biases and limitations imposed by well design
- Determining proper flow rates and realistic drawdown limits for low-flow sampling
- Selection of purging indicator parameters and stabilization criteria
- Alternatives for sampling very-low-yield wells



David Kaminski is Senior Vice President at QED Environmental Systems, a leading manufacturer of ground-water sampling equipment, landfill leachate and gas well dewatering pumps, and ground-water remediation pumping and treatment systems. Over the past 25 years, he has designed and installed pumping and sampling systems for sites throughout the United States, Canada, Europe, Australia and South America. Mr. Kaminski has developed new devices and methods for ground-water sampling and groundwater remediation applications and has been awarded three US patents. He has also published several articles and technical papers on sampling practices and pumping system design and has presented seminars and lectures on groundwater sampling for leading industry organizations, universities and regulatory agencies worldwide. He is actively involved in the standards organization ASTM as Chairman of Section D18.21.04 on Ground Water Sample Collection and

Handling and is also a member of the National Ground Water Association, the Solid Waste Association of North America, and the California Groundwater Resources Association.