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# Passive Groundwater Sampling: Effective Tools and Lessons Learned to Make the Transition

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**Background/Objectives.** Groundwater sampling is the cornerstone dataset collected to assess dissolved groundwater plumes. Evaluation of lifecycle costs shows costs associated with groundwater sampling prove significant over decades. The practice of passive, or no-purge groundwater sampling methods is becoming a more common and widely accepted approach. Decades of data were available to demonstrate that these methods can generate comparable data to traditional purge-based sampling methods. The Air Force recognizes passive sampling as a viable means to maximize savings and optimize long-term monitoring programs with defensible data. Passive groundwater sampling methods are more sustainable than traditional sampling methods, requiring less field labor, less equipment, consuming less energy, and generating less waste. Transition of a large-scale groundwater sampling program to passive has historically required use of side-by-side comparative studies to demonstrate representative data are collected via passive sampling compared to the historical method. However, a variety of conditions can produce variability in all sampling methods (both traditional and passive) including: collection and analysis methods, aquifer and well dynamics, changes in groundwater conditions, etc. Additionally, disturbance in the water column caused by doubling up sampling methods to conduct the “side-by-side” tests over a short period of time can potentially bias any comparison. An alternate approach to side-by-side comparative evaluations applied at Vandenberg Air Force Base was a programmatic statistical comparison of passive sampling data to historical data. This presentation provides effective tools and lessons learned during Vandenberg’s recent base-wide transition to passive groundwater sampling approaches.

**Approach/Activities.** Vandenberg Air Force Base successfully transitioned its program, encompassing over 500 wells, to a passive sampling approach without an initial requirement for a programmatic side-by-side comparative analysis. The expedited transition was implemented from concept to field within seven months. A comprehensive sample selection method/decision matrix was developed that created a framework to select and confirm the appropriate sampling method for each well based on site-specific conditions. Due to widely ranging hydrologic conditions across the base the selected sampling methods included: HydraSleeve™, Snap Sampler, low flow/system port, or hand bail. The data evaluation approach to support this transition included assessment of variability and time-series data trends and calculation of prediction intervals for data collected via historical purge methods for comparison to data collected via passive sampling. The primary objective of the evaluation was to assess if a change in sampling method has impacted overall trends and interpretation of the data in a manner which may influence remedial decisions.

**Results/Lessons Learned.** Continuous regulatory engagement from development to implementation and the effective use of working groups formed the basis of this successful transition in 2015/2016. The decision matrix was invaluable when field conditions differed from the plan since all the key parameters for the decision logic were pre-populated. Negotiations paved a way to proceed without a side-by-side dataset. Ultimately, results of the statistical data evaluation between the sampling methods were comparable. Flexibility to change procedures based on multiple rounds of sampling data and the agreement to conduct targeted side-by-side comparative evaluations helped to win stakeholder agreement of this base-wide change.