A.1 SNAP SAMPLER

A.1.1 Peer-reviewed paper in *Environmental Science and Technology*

A Downhole Passive Sampling System to Avoid Bias and Error in Groundwater Sample Handling, Environmental Science and Technology

A.1.2 Summary

Media:	Groundwater
Study Type:	Side-by-side comparison study
Technology:	Passive Grab Sampler/Snap Sampler
Peer Reviewed:	Yes
Publication Date:	2010

A.1.3 Site Description

Six field sites are described where Snap Samplers were compared to traditional sampling methods and other passive sampling approaches.

- **Chatsworth** site in southern California is a fractured sandstone bedrock setting with VOCs and dissolved gases where the Snap Sampler is compared against low flow purging and sampling
- **Guelph**, Ontario, Canada site is a fractured dolostone bedrock setting with VOCs where the Snap Sampler is compared against low flow purging and sampling and the PDB passive sampler
- **Morgan Hill** site in northern California is a heterogeneous unconsolidated sediment setting with VOCs and perchlorate where the Snap Sampler is compared against low flow purging and sampling
- **Hillside** site in New Jersey is a heterogeneous unconsolidated sediment setting with arsenic where the Snap Sampler is compared against low flow purging and sampling
- **McClellan** site in central valley California heterogeneous unconsolidated sediment setting with VOCs, anions, and 1,4-dioxane where the Snap Sampler is compared against low flow purging and sampling and volume-based purging and sampling
- **Los Angeles** site in southern California is a heterogeneous unconsolidated sediment setting with arsenic where the Snap Sampler is compared against low flow purging and sampling

A.1.4 Remedial Phase

Long Term Monitoring

A.1.5 Outcome

This thorough description of Snap Sampler comparisons in multiple settings highlights consistency of comparability for various constituents of concern, geologic settings, and sampling methods. The paper illustrates the in-situ sealing feature of the Snap Sampler can yield slightly higher VOC results compared to other methods that require pouring sample at the time of collection. One site included a multiple-event historic comparison that identified a reduced variability effect in event-to-event concentration change with the Snap Sampler. Non-VOC comparison results s show consistency among different purge sampling methods. For arsenic, one site compared unfiltered Snap Sampler with filtered and unfiltered purge results. Snap Samplers yielded results that were between the filtered and unfiltered purge results, implying collection of colloidal particles that were not found in filtered purge samples, but not elevated by artifact turbidity from purging.

Figures from cited paper.

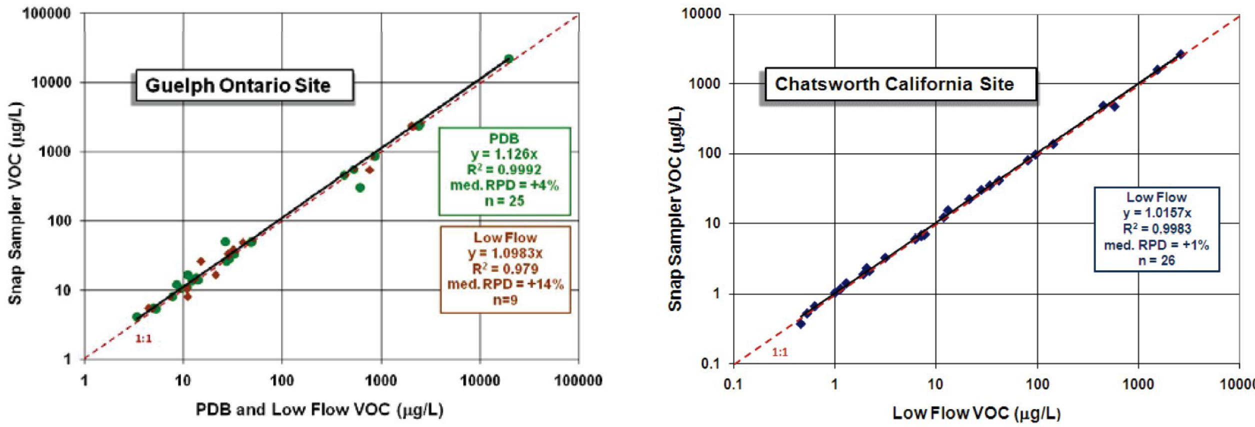

FIGURE 2. ISS/Snap sampler, diffusion sampler (PDB), and low flow comparison of VOCs at Guelph site (left panel); ISS/Snap Sampler and low flow purge comparison at Santa Susanna Field Laboratory (SSFL) site (right panel). Slight positive offset of trendline ($y > 1$) indicates *y*-axis comparator is slightly higher on average. Very good correlation coefficients relate tight correspondence among the methods. SSFL shows closer correspondence (*y*) 1.02) with the use of a pre-deployed bladder pump rather than a peristaltic pump. Specific VOCs are listed in the Supporting Information.

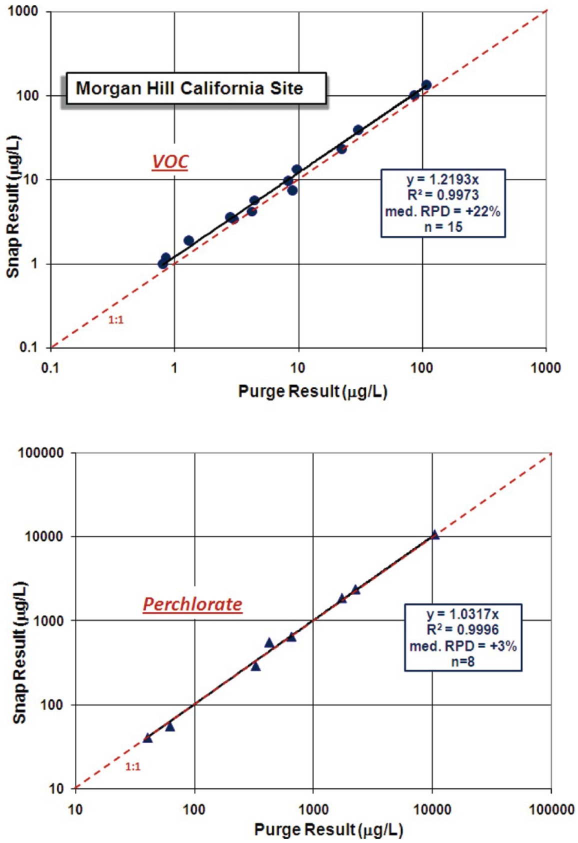

FIGURE 3. VOC (top panel) and perchlorate (bottom panel) comparative data plots from Morgan Hill site. These illustrate method recovery may differ more for volatile/sorptive chemicals than for nonvolatile/nonsorptive constituents from the same well(s). Volume purge based method used for "purge" samples.

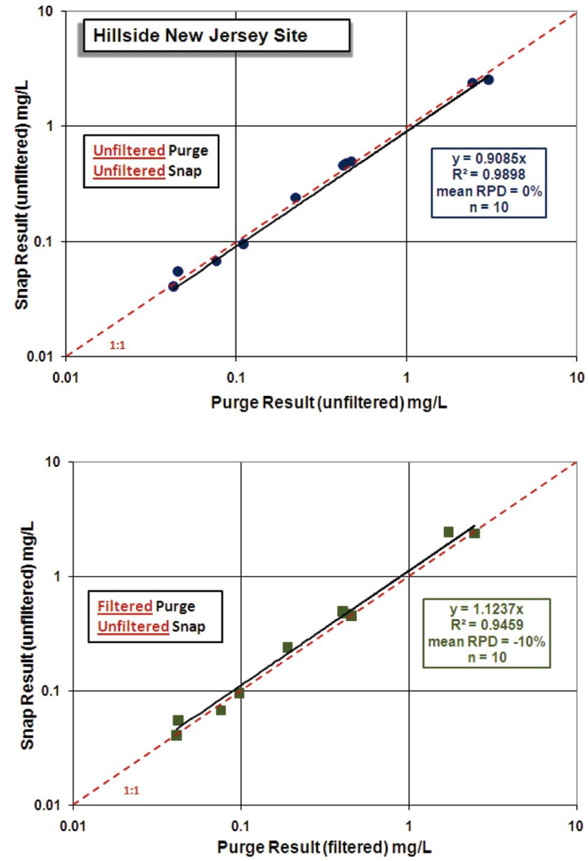

FIGURE 5. Arsenic concentration comparison from Hillside site. Unfiltered trendline slope ($y < 1$) indicates x-axis comparator is higher concentration on average than y-axis comparator (top panel), while the filtered example shows the opposite (bottom panel). Comparison of sample differences suggests purge sample filtration eliminates a high bias, yet introduces a low bias.

A.1.6 References

Britt, SL, Parker, BL, and Cherry, JA, 2010, A Downhole Passive Sampling System to Avoid Bias and Error in Groundwater Sample Handling, Environmental Science and Technology, v.44 p 4917-4923.