

Direct push screen-point sampling vs conventional monitoring wells

By David Millard, CET

The Ontario Ministry of the Environment (MOE) issued a Director's Order to the owner of an industrial facility which identified the need for additional investigation and groundwater study in a residential area downgradient of a known chemical plume on the property.

The Order described numerous investigative activities, including sampling and chemical analyses of shallow groundwater and residential indoor air for volatile organic compounds (VOCs) including trichloroethylene (TCE) and associated degradation products. All data from these studies and the data interpretation were required within a 30-day period.

It was unknown whether or not VOCs existed in the residential areas and whether or not indoor air quality was affected by the possible presence of these compounds.

The Order specified specific separation distances between monitoring



The open tool before installation into the ground.

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wells within and outside of any VOC plume identified plus identified generally where investigations were required. The challenge that existed was to establish the VOC plume presence quickly and focus indoor air monitoring within the areas where VOCs exceeded groundwater criteria for TCE and related degradation products. Project participants suggested starting up to 10 blocks south of the known plume; eventually investigative efforts started five blocks south which proved to be the extent of the VOC plume from the source areas.

To quickly establish the extent of the VOC plume, ALTECH suggested the use of a direct push driven screen-point sampling tool that allows groundwater sample collection without the installation of a permanent well. Once the sample is collected the screen point tool is removed and the borehole sealed; no well or permanent instrumentation is

left in the ground.

The MOE was informed of this investigative approach and requested that, if the owner wished to employ this direct push technique, ultimately groundwater samples would be required from permanent wells to support the final data and assessments required.

The consultant/owner decided to employ both techniques (direct push screen-point samples and permanent monitoring wells) to quickly determine the plume extent and provide the necessary data.

The project was completed using the screen point tool to "pre-screen" areas for compliance with groundwater standards; then, where required, permanent wells were installed and sampled. This approach allowed quick data collection to establish the plume boundaries in a short time period.

At the conclusion of the project a number of areas evaluated had both

data from the screen-point tool and a permanent monitoring well installed in essentially the same location but at a later date. Over all, statistical analysis demonstrated that the two sample collection techniques in this setting for these analytes yield similar results in groundwater.

The benefits of the direct push screen-point sampling techniques include:

- multiple samples can be collected in a day;
- essentially no investigative derived wastes;
- low cost per sample;
- no instrumentation left behind (when required);
- no well tag required, no future well maintenance necessary; and
- minimal disturbance of land surface, plus easy mobilization/demobilization of direct push drill equipment into the areas of concern.

Sample collection from the screen-point area can be performed using disposable poly tubing and a mini-check ball, disposable or cleanable mini-bailers, peristaltic pumps or mini-bladder pumps.

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The assembled tool in preparation for driving by the direct push percussion drill unit.

All users of this technique must be aware that fine sediments/silts will likely be present depending upon the formation materials and sample collection technique employed. It is possible to pre-purge in advance of sample collection but this may not eliminate fine grained particles. The presence of these materials may influence/bias the sample results depending upon the analytes of concern. The investigator must evaluate these technical issues when selecting this technique as an investigative tool.

This sample technique has also been performed in deep settings where samples from 80 feet and upward have been collected for VOC screening purposes. Multiple samples at different intervals from the bottom of the borehole up are possible using this tool.

Summary

The direct push screen-point sampling technique is becoming more and more acceptable and utilized in Ontario for site characterization purposes (pre-screening technique), for due diligence works during property assessments prior to land/facility transfer, and to evaluate remediation progress.

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GROUNDWATER SAMPLING DATA COMPARISON SCREEN-POINT vs CONVENTIONAL WELL

ENVIRONMENTAL OBJECTIVES

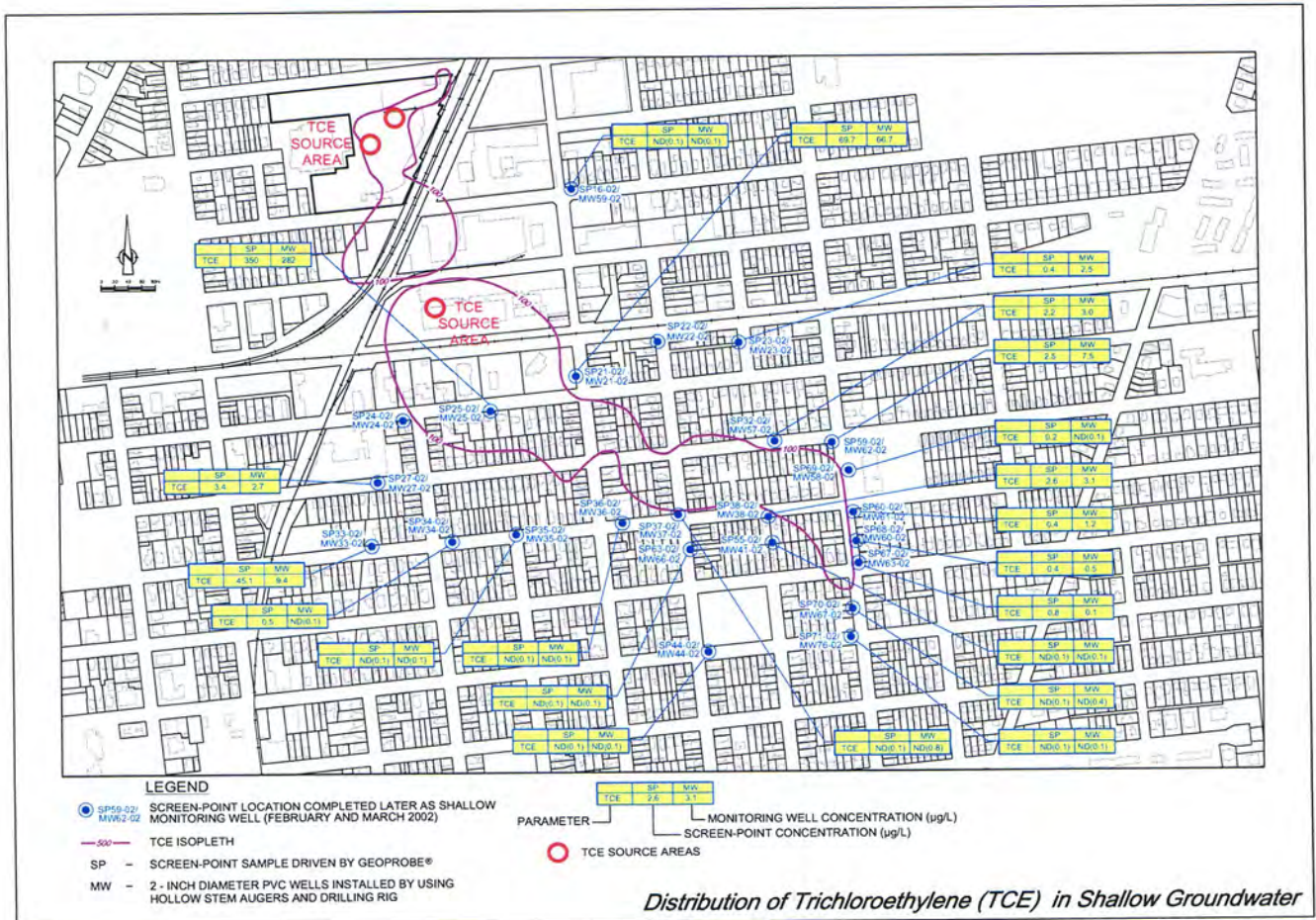
- Establish "Plume" boundary and complete indoor air monitoring for evaluation of potential health risks

CHALLENGES

- Groundwater data required **"QUICKLY"** in Residential areas to evaluate Trichloroethylene (TCE) presence within shallow overburden
- Limited time frame for data collection, analysis and assessment

SOLUTION

- Perform "Screen-Point" sampling to assess broad areas...**QUICKLY!**
- Finalize program with Permanent Monitoring well installations constructed later.





CASE STUDY

GROUNDWATER SAMPLING DATA COMPARISON SCREEN-POINT vs CONVENTIONAL WELL

QUESTION ?

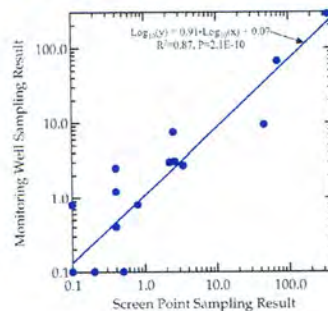
- How does Screen Point data compare to monitoring well data?
(Sampling performed on different dates/ but collected in the same vicinity)

GROUNDWATER DATA TCE CONCENTRATIONS

Screen-Point Data ($\mu\text{g/L}$)	Monitoring Well Data ($\mu\text{g/L}$)	Screen-Point Data ($\mu\text{g/L}$)	Monitoring Well Data ($\mu\text{g/L}$)
ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
0.4	2.5	ND(0.1)	ND(0.8)
350	282	2.6	3.1
69.7	66.7	0.4	1.2
3.4	2.7	ND(0.1)	ND(0.1)
2.2	3.0	ND(0.1)	ND(0.1)
2.5	7.5	0.4	0.5
0.2	ND(0.1)	0.8	0.1
45.1	9.4	ND(0.1)	ND(0.4)
0.5	ND(0.1)	ND(0.1)	ND(0.1)
ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

Compound	MOE Guideline Table B Generic Criteria
Trichloroethylene	50 $\mu\text{g/L}$

FOR THE TECHNICAL STAGICIANS:



- A linear regression analysis indicates a high degree of agreement in TCE concentrations measured in screen-point samples and concentrations measured in monitoring well samples.
- The correlation coefficient (R^2) of the regression is 0.87, indicating that 87% in the variability of the monitoring data can be explained by the variation in screenpoint results.
- The probability of significance of the regression is $2.1\text{E}-10$, which is well beyond the 95-percent confidence level typically applied for significance testing.
- Overall, this analysis demonstrates that the two analytical methods yield similar results for screen-point and monitoring well samples, and thus either method may be used for determination of parameter concentrations in groundwater.

CONCLUSIONS

- Screen-Point sampling data and monitoring well data correlate very well.
- Screen-Point sampling in shallow settings can be completed very quickly (12 or more points per day).
- Screen Point sampling technique creates less waste cuttings, no permanent well, and provides a quick indicator of water quality. Fine sediment/silts will likely be present in sample from the screen-point technique.
- Costs: *Screen-Point Sampling* - \$150/ each sample
Well-Installation and Sampling plus Cuttings Disposal - \$1,500/ each well