

Using Field Observations to Determine Equilibration Times and Purge Volume Removal for Soil Vapor Sampling

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Background/Objectives. Prior to collecting soil vapor samples for volatile organic compound (VOC) analysis, a number of conditions must be met in order to obtain a representative sample. These include waiting until an appropriate equilibration period has passed since wells were set and purging a specified amount of “dead” air from the wells. In the course of conducting numerous soil vapor investigations spanning the last several years, we have honed in on what preparations often yield the best and most consistent results, and have found that these are not always in line with current regulatory guidelines and defaults. Here we present those best practices determined from field observations and analysis of the resultant data.

Approach/Activities. Two parameters that we have found to be critical to obtaining representative soil vapor data have been equilibration time since probe installation and purge volume, or volume of air removed from soil vapor probes prior to sampling. We have analyzed data from a number of sites where we have analyzed samples collected both within a few (2-6) hours of probe installation and at a later time, ranging from days to months later, in order to determine the influence of equilibration time on soil vapor results and to determine an ideal equilibration period. In order to determine an optimal purge volume, we have assessed data from over 700 sites where purge volume testing was conducted, and compared results obtained after different volumes were removed to determine which most often yielded the best result. All analyses considered were part of VOC investigations where perchloroethylene (PCE) and trichloroethylene (TCE) were the target analytes, and where analysis followed EPA Method 8260B, analysis of VOCs by gas chromatography/mass spectrometry.

Results/Lessons Learned. Our investigations have found that optimal results are more likely to be achieved after waiting for a longer equilibration period and removing a smaller purge volume than currently recommended. At sites where we have resampled probes which we initially sampled shortly after the two hour equilibration window, we found that analyte concentrations were overwhelmingly higher at the second sampling, often by an order of magnitude or more. This effect was more pronounced for deeper set probes than for shallow probes set in the same boring, and also showed a weak relationship to initial concentration, with probes having higher initial concentrations also having larger relative increases. Our findings ultimately indicated that equilibration times of at least 24 hours, and ideally longer than 48 hours, are desirable. Additionally, results from purge volume testing favored removal of a single purge volume (volume of the soil vapor well) at nearly half of the sites included in this study, with removal of three and ten volumes being favored near equally. Here we will discuss detailed results from both investigations, as well as results from ongoing work on ideal conditions for soil vapor sampling.