

FIELD PROCEDURE. HEADSPACE SCREENING OF SOIL SAMPLES

This is not a health and safety risk assessment

1. APPLICABILITY

This document describes the standard field procedures used to undertake headspace screening of soil samples for volatile organic compounds (VOCs).

The data obtained from headspace screening may be used in its own right but is more often used to facilitate the selection of soil samples for laboratory analysis. Headspace screening results should be treated as qualitative (rather than quantitative) due to the following factors:

- The measurements are commonly made with instruments that do not differentiate between and have varying sensitivity to individual VOCs;
- The liberation of VOCs into the gas phase of the headspace will vary between compounds, with temperature, soil type, sample volume, and the proportion of organic material present.

2. OBJECTIVE

The objective of undertaking headspace screening is to obtain a qualitative measurement of the concentration of detectable VOCs in a soil sample. When such measurements are made on several samples, this allows comparison of relative VOC concentrations either vertically within a borehole or laterally between samples from different locations.

3. METHOD

Selection and Calibration of Instrument

Headspace screening is generally carried out using a photo-ionization detector (PID). The bulb ionisation potential of the instrument must be appropriate for detection of the target contaminants at the site (see Section 4 below).

Calibrate the instrument at the start of each day and periodically during the day with an appropriate calibration gas (isobutylene for a PID). Recalibrate after particularly high results have been obtained.

Test Method

Typically, soil samples for headspace analysis are collected at regular vertical intervals (e.g. every metre) or at changes in lithology. The test method is as follows:

- Place each soil sample in a clear, new plastic bag (partially fill the bag) and seal the bag.
- Shake the sample vigorously (to break up the soil matrix and maximise volatilisation)
- Leave the sample to equilibrate for at least 10 minutes, ideally in a warm environment.

- Insert the sampling probe of the FID/PID into the bag so that the vapours in the bag are aspirated into the FID/PID.
- Record the peak deflection response of the instrument as parts per million (ppm) methane or isobutylene equivalents.
- As far as practicable, replicate test conditions between samples so as to facilitate comparison of results.

4. ADDITIONAL INFORMATION

Ionization energies for several common VOCs are tabulated below, together with information on whether or not they are detectable using a PID with a 10.6 or 11.7 eV lamp.

Compound	CAS No.	Ionization Energy (eV)	Detectable on PID? (Y/N)	
			10,6 eV lamp	11,7 eV lamp
Benzene	71-43-2	9,25	Y	Y
Ethylbenzene	100-41-4	8,77	Y	Y
Phenol	108-95-2	8,51	Y	Y
Styrene	100-42-5	8,43	Y	Y
Toluene	108-88-3	8,82	Y	Y
Xylene (m-)	108-38-3	8,56	Y	Y
Xylene (o-)	95-47-6	8,56	Y	Y
Xylene (p-)	106-42-3	8,44	Y	Y

The degree of response of a PID to each compound depends on the difference between the compound's ionization energy and that of the lamp being used. Further information on this can be obtained from equipment manufacturers.