



Sampling and Analysis of Soil Vapour using Canisters

INTRODUCTION

Interest in **Soil Vapour** has increased significantly in recent years as the focus has broadened from direct measurements of soil contamination to human exposure risks through Vapour Intrusion. This change is reflected in the **Vapour Assessment** section of the 2013 National Environment Protection Measure (NEPM) for **Contaminated Sites**, which states: “Soil vapour measurements can provide a more accurate representation of vapour risks (compared with the soil and groundwater HSLs)”

ALS CAPABILITIES

The ALS Newcastle *Centre of Excellence for Air* offers comprehensive **NEPM compliant Soil Gas Analyses** utilizing canisters. This complements existing ALS **Ambient & Indoor Air** capabilities, all of which are required for a complete Vapour Intrusion Conceptual Site Model and potential remediation strategies.

ALS NATA accreditation now includes the **TRH hydrocarbon bands to C16, Aliphatic/Aromatic hydrocarbon bands and individual Petroleum Hydrocarbons (see EnviroMail 82)** as well as all the **Volatile Organic Chlorinated compounds** listed in the NEPM. ALS also offers accredited testing for natural attenuation **indicators** and tracer gases (methane, CO₂, CO, O₂ and He) and the **Key PHC Indicator** compounds listed in the **2013 CRCCARE PVI Guidance (Technical Report #23)**. ALS is also accredited for Reduced Sulfur Compounds and the full USEPA TO15 suite of VOCs. All ALS Soil Vapour **LORs are lower** than the reduced HILs/HSLs in the 2013 NEPM tables 1A(2) and 1A(5).

REPORTING

Results are reported in mg/m³ at 25 °C and 101.3kpa to allow direct comparison with NEPM HILs and HSLs.

ALS METHOD CODES: EP101 (TO15 Suites), EP103 (TRH Suites), EP104 (Gases incl. Methane)

LOR: Typically 0.001 - 20 mg/m³ to meet HILs/HSLs



SOIL VAPOUR SAMPLING EQUIPMENT

ALS can provide either 450mL or 1.4L ‘Mini-Cans’ for soil vapour sampling, allowing reduced freight costs, safer handling and consistent with the NEPM requirement that sample size should be minimized. ALS supplied Flow Restrictors allow maximum flow rates of either 12, 60 or 160ml/min, set for the specific sampling conditions.

The ALS sampling kit includes: evacuated, individually verified clean, ‘Mini-Cans’ and critical orifice flow restrictors with quick connect snap-lock valves, which minimize potential for contamination during transit and reducing the need for tools in the field; T fittings and pressure gauges to allow purging and leak testing prior to sampling; plus laboratory-calibrated flow controllers for a range of flow rates, including the lower flows recommended for clay and compacted soils (with no field adjustment necessary); an acceptance form, a packing list, a canister specific COC and Canister Verification Report.

The sampling train is lined with inert Silonite™, a coating that limits surface catalysed reactions and ensures sample stability over time. The train is designed for easy connection to ¼" OD tubing using industry standard Swagelok™ fittings.

ALS has a strong focus on ensuring that project requirements are clearly communicated. Forms record the equipment ALS is supplying, detailing any common additional items that may be required and whether or not ALS provides these.

ADVANTAGES OF USING CANISTERS FOR SOIL VAPOUR

Sampling of Soil Vapour via canister has numerous advantages over other methods. These include ease of use, robustness of technique, broad applicability to a wide range of sampling conditions and analytical demands. A comparison of the various Soil Vapour options is provided below.

Advantages offered by Sampler Type	Canisters	Sorbents (e.g. TD)	Bags (Tedlar®)
• Sample is suitable for Grab sampling	✓	✗	✓
• Sample is suitable for Integrated sampling	✓	✓	✓
Allows multiple measurements on the original sample	✓	✗	✓
Holding times: Samples are stable (ambient conditions) for up to 30 days	✓	✗	✗
Applicability/Versatility: Can capture almost all components of interest	✓	✗	✗
Range of contaminant levels: Suitable for a wide concentration range	✓	✗	✓
Suitable for analysis of high humidity samples (e.g. from very wet soil)	✓	✗	✗
Allows testing of Soil Chemistry Indicators (CO ₂ , CO, O ₂)	✓	✗	✓
Suitable for methane and light hydrocarbons e.g. C10-C16 as per NEPM	✓	✗	✓
Safety / Ease of use: No pumps, ignition sources or site flow measurement	✓	✗	✗

GUIDELINE LEVELS

The 2013 interim NEPM Health Investigation Levels (HILs) for chlorinated VOCs are 4-100 times lower for some land uses than the limits listed in the 2011 draft.

Hydrocarbon HSLs also changed from the draft, with different soil types and land uses now having individual HSLs. Example HSLs for Sand are depicted in the table below.

ALS LORs for all contaminants are at least 3 times below the NEPM HSLs and HIL guidelines.

Table 1A(2) Interim soil vapour health investigation levels for volatile organic chlorinated compounds

Chemical	Interim soil vapour HIL (mg/m ³)			
	Residential ¹ A	Residential ¹ B	Recreational ¹ C	Commercial / Industrial ¹ D
TCE	0.02	0.02	0.4	0.08
1,1,1-TCA	60	60	1200	230
PCE	2	2	40	8
cis-1,2-dichloroethene	0.08	0.08	2	0.3
Vinyl chloride	0.03	0.03	0.5	0.1

Table 1A(5) Soil vapour HSLs for vapour intrusion (mg/m³)

Schedule B 1 - Guideline on Investigation Levels for Soil and Groundwater p51

CHEMICAL	HSL A & HSL B Low - high density residential					HSL C recreational / open space					HSL D Commercial / Industrial				
	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+
	SAND														
Toluene	1300	3800	7300	15 000	29 000	NL	NL	NL	NL	NL	4800	16 000	39 000	84 000	NL
Ethylbenzene	330	1100	2200	4300	8700	NL	NL	NL	NL	NL	1300	4600	11 000	25 000	53 000
Xylenes	220	750	1500	3000	6100	NL	NL	NL	NL	NL	840	3,200	8000	18 000	37 000
Naphthalene	0.8	3	6	10	25	410	NL	NL	NL	NL	3	15	35	75	150
Benzene	1	3	6	10	20	360	2400	4700	9500	19 000	4	10	30	65	130
F1 ⁽⁶⁾	180	640	1,300	2600	5300	86 000	NL	NL	NL	NL	680	2800	7000	15 000	32 000
F2 ⁽⁶⁾	130	560	1200	2400	4800	NL	NL	NL	NL	NL	500	2400	NL	NL	NL

TECHNICAL SUPPORT

Guidance on the choice of sampling equipment is available upon request and technical queries should be directed to the ALS Centre of Excellence for Air in Newcastle on (02) 4014 2500 or ALSEnviroNewcastle@alsglobal.com

LOGISTICS AND SUPPLY

Equipment should be ordered directly through ALS Newcastle, given the technical requirements. These will be road couriered to your site or office. Samples can be delivered via other ALS Environmental offices, however for the fastest turnaround, canisters should be returned direct to ALS Newcastle. Note that Dangerous Goods Transport Regulations may apply after sampling if the cylinder is pressurised or contains significant levels of hazardous materials. Equipment rental is included in the cost of analysis (subject to prompt return).

REFERENCES

National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. A)