EnviroMail™

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# Asbestos Fines and Fibrous Asbestos in Soils under the 2013 NEPM

## Introduction

EnviroMail™ 76 detailed the forms of asbestos defined under the 2013 Contaminate Sites NEPM ("NEPM") and field sampling considerations. This EnviroMail™ focuses on the methodology, limitations and reporting of asbestos fines and fibrous asbestos concentrations in soil.

As highlighted in its title, the Australian Standard Method for the qualitative identification of asbestos in bulk samples AS4964:2004 is clearly intended to be a method for the qualitative identification of asbestos. The NEPM however, requires the Standard to be adapted for quantitative analysis. As a result, a modified version of the Standard must be used to meet NEPM requirements and report concentrations of asbestos in soil.

## Key Terminology & Definitions

- Fibrous Asbestos (FA) is asbestos material in a degraded condition that can be crumbled by hand
- Asbestos Fines (AF) are asbestos fragments, bundles & free fibres that pass a 7mm sieve

Note that the NEPM equates the sum of AF and FA with 'Non-bonded/Friable Asbestos' however this equivalence is not generally accepted outside the environmental field.

## Method Information

### ALS METHOD CODE

EA200F Asbestos Quantitation (FA+AF) in Soil – NEPM

### LIMITS OF REPORTING (LOR)

Asbestos (FA+AF): 0.001% determined gravimetrically

Asbestos (trace): Asbestos 'free fibres' detected by trace analysis as described in AS4964: 2004 (Yes/No or Trace)

METHOD REFERENCE

AS4964:2004 Method for the qualitative identification of asbestos in bulk samples

## Testing for AF + FA

The NEPM requires preliminary sieving/screening of larger soil samples using a 7mm sieve. The coarse material including potential ACM is separated, identified and reported as ACM >7mm, as outlined in EnviroMail™ 76. Note that this process also satisfies the AS4964 requirement that all material >10mm should be examined for the presence of fibrous materials.

Subsequent to the >7mm fraction separation, material passing the 7mm sieve can be split to 0.5-1kg subsamples then sieved again through a 2mm sieve, as required by AS4964. All material retained on the sieve is examined by eye, magnifying glass and/or stereomicroscope. Any asbestos identified can be 'cleaned' and weighed and categorised as FA and/or AF.

The Australian Standard then requires the remaining -2mm portion to be subsampled to ~30g and examined for fibrous materials via stereomicroscope. Positively identified asbestos fines (excluding free fibres) in this subsample can usually be isolated and added to the AF and FA from the 2mm sieve and the total weight of FA and FA reported as a percentage.

## Gravimetric LORS for FA and AF

The LOR for the weight of Asbestos is primarily determined by the measurement uncertainty of the balance used for weighing the cleaned up fibre bundles. Use of a sensitive five place balance combined with painstaking removal and clean-up can allow very low gravimetric LORs, which combined with a sample weight in excess of 500g, can give a calculated percentage of 'FA and AF' low enough to meet the NEPM HSL.

Note that the 'FA and AF' NEPM HSL and the gravimetric results described above **do not include the weight of free fibres**. The risks associated with free fibres should be considered separately (see below).

The NEPM recommends that no more than a 500ml sample needs to be submitted to a NATA accredited laboratory for FA and AF assessment. In practice, 600-700g of sample *pre-sieved to <7mm* is considered to be representative.

# Free Fibres, Trace Analysis and Limits Of Reporting Under AS4964-2004

Free fibres are taken to be equivalent to Respirable Fibres in Occupational Hygiene terminology. The NEPM states (under B1 Table 7, note 5) that *"the screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer to section 4.10). This screening level is not applicable to free fibres".*

The NEPM suggests that there is no reliable method accepted in Australia to separate and quantify free fibres in soil samples. 'Free fibres' are detected by PLM, which is a high magnification microscopic analysis technique. This technique has a higher reporting limit than what is possible using gravimetric analysis. Free fibres in the respirable size range can only be found by this method during trace analysis, as described in AS4964: 2004, which requires that ***>100 fibres*** be counted on two separate slides to report Asbestos Detected as 'Yes' and 'Trace' to be reported if 5 to 100 fibres are found. If less than 5 fibres are detected on two slides the 'Asbestos Detected' is reported as 'No'. This detection is deemed to be '***at the reporting limit of 0.1g/kg***' (0.01%). Note that free fibres or bundles may still be present at <0.01%, even if not found in trace analysis.

The LOR for the identification of **all forms of asbestos** in soil is determined by the least sensitive (ie highest LOR) analytical method applied. It follows that ***identification*** by PLM of asbestos under AS4964 (reporting one result for 'asbestos') may have a higher LOR than the independant LORs for the various forms of asbestos such as 'ACM' or 'AF and FA (excluding free fibres)'.

In discussions with ALS, NEPM Committee representatives have endorsed a weight of evidence approach to risk management when free fibres are found. NEPM Case Studies provide further guidance.

# Asbestos Concentrations in Soil

ALS aims to provide the highest quality and most comprehensive information available for asbestos testing to support comparison with guidelines. Quantitative gravimetric analyses under methods EA200F and EA200N (for >500ml samples) is accompanied by a full qualitative analysis (ALS code EA200) consistent with AS4964-2004 requirements. Asbestos Identification and weights reported by ALS are accredited by NATA and NATA accept the assumptions made on these reports.

**For FA and AF**, ALS reports the weight of asbestos in the sample as received plus a calculated percentage concentration, typically utilising a 100% asbestos content in extracted material after cleanup. When the FA and AF includes degraded ACM fragments, a lower percentage asbestos content may be applied. The reported concentration can be directly compared with the NEPM HSL of 0.001%.

**What about 'free asbestos fibres'?** Free fibres are designated as Asbestos (Trace) and may be reported as present, absent or trace. Schedule B1 of the NEPM indicates that where sites are contaminated with bonded ACM (i.e. no insulation materials), the presence/absence of free fibres by laboratory analysis is only warranted where >10% of the bonded ACM is significantly damaged i.e. present as small pieces (i.e. significant FA or AF present).

**What does a positive result for Asbestos (Trace) mean in terms of the guideline?** Given that "AF includes free fibres" (NEPM Schedule B1, Section 4.8), if free fibres are detected at levels above the PLM detection limit of 0.1g/kg (0.01%), then 'FA and AF' could reasonably be assessed as being above the HSL criteria of 0.001%. Regardless, as this form of asbestos represents the main risk to human health, detection of free fibres should be considered separately to the NEPM HSLs, with a weight of evidence approach recommended by the NEPM.

**What might I be getting with my presence absence testing?** The ALS method EA200 is NATA accredited and complies with AS4964. The following information is reported:

- Sample weight & description, including a 'factual description of the asbestos fibres'
- Results for trace analyses for fibres – even if ACM or bundles have already been detected (Yes, No or Trace)
- Asbestos mineral determination (Chrysotile, Amosite, Crocidolite or 'UMF')
- A statement of compliance with the NEPM

See the *ALS Asbestos Reporting Protocols LabNews Sep 2017* or contact ALS Client Services for additional information.

# References

*National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) ("the NEPM")*
*NEPM B1 Guideline on Investigation levels for Soil and Groundwater – May 2013 (F2013L00768)*
*AS4964-2004: Method for the qualitative identification of asbestos in bulk samples*
*enHealth 2005, Management of asbestos in the non-occupational environment, DOH and Ageing, Canberra, Australia.*
*WA DoH Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DoH 2009)*