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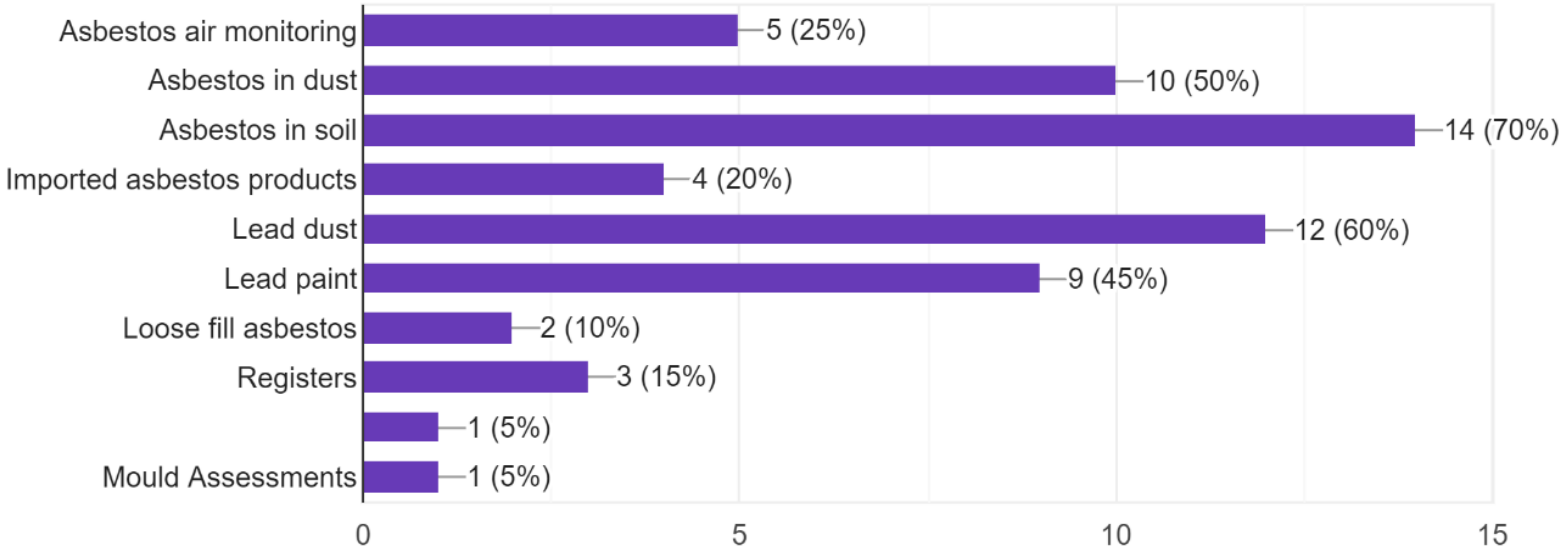
Overview

- Questionnaire results
- AHCA Round Table Summary
- Asbestos in Soils Discussion
- Questions
- Asbestos in Soils Working Group

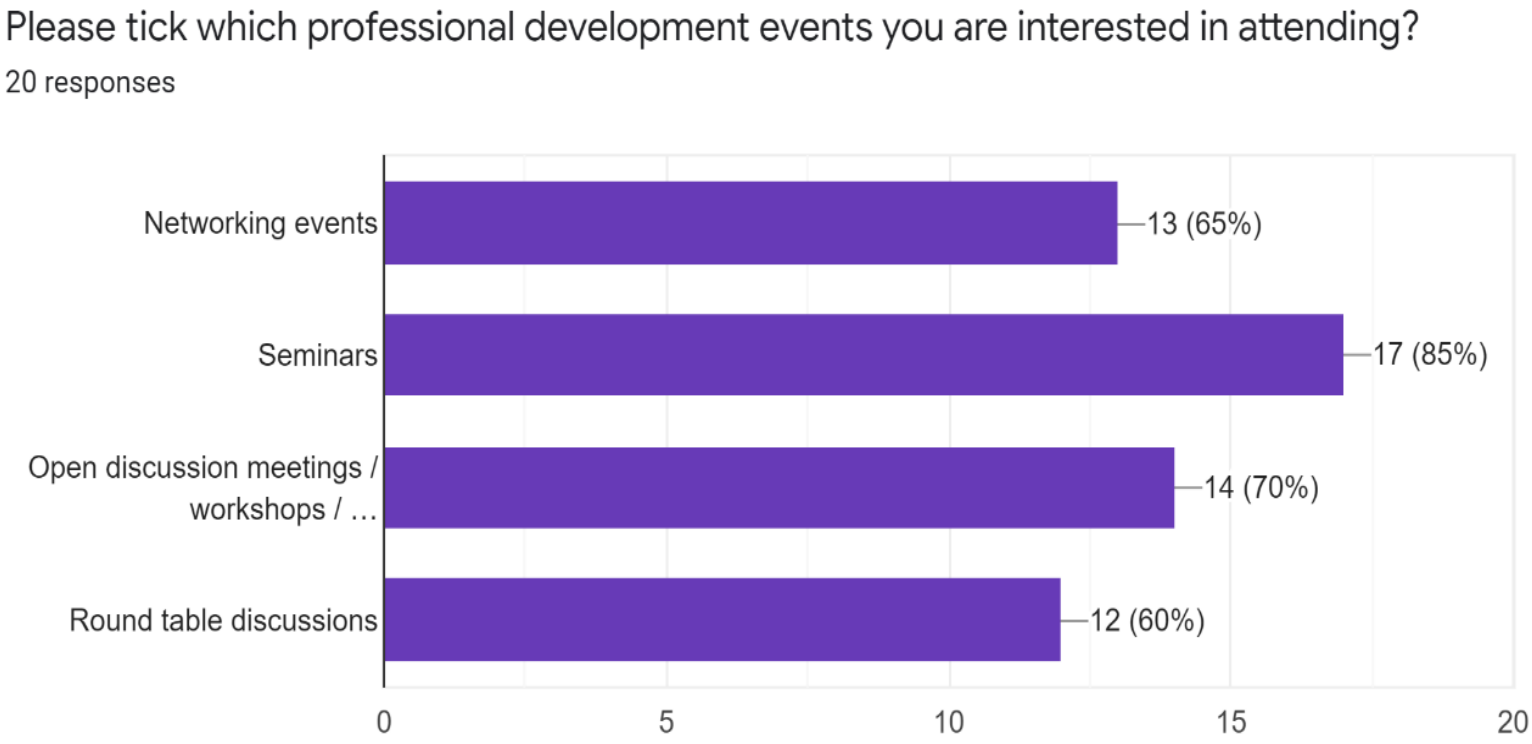
Questionnaire

What issues or hot topics would you like the AHCA to focus on and prioritise? Click on 3 hot topics/ issues below that you would like the AHCA to address

20 responses



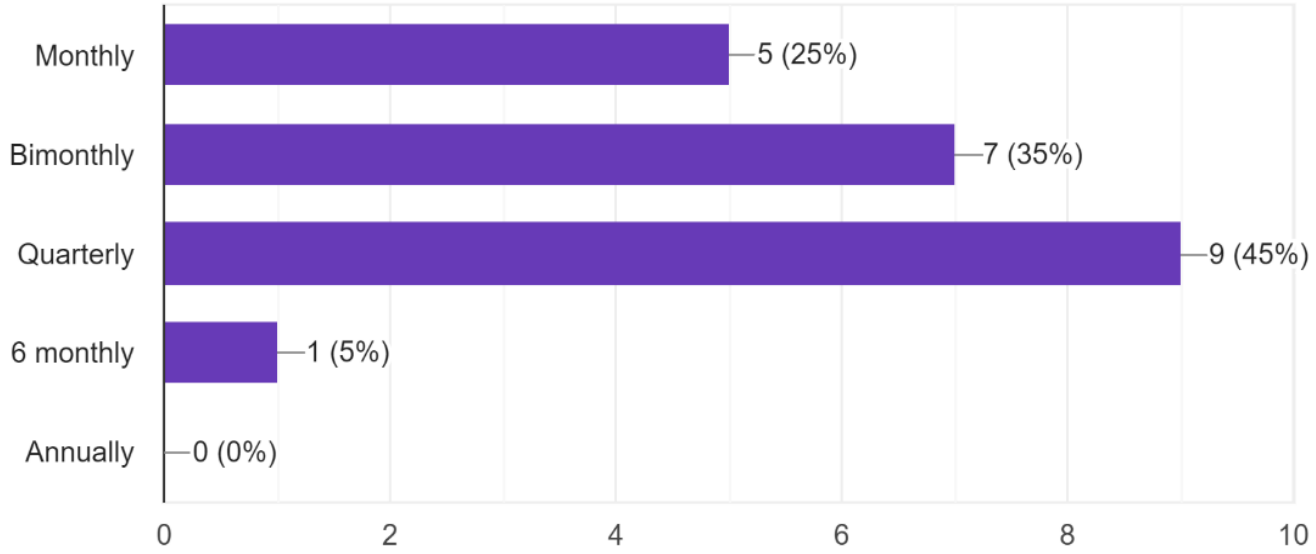
Questionnaire



Questionnaire

If Interested in attending networking events, seminars or similar professional development events what frequency would you attend these events? Please tick one from the list below?

20 responses



Asbestos in Soil Round Table Event

Round Table held on 22 October 2019

Special Guests:

- Jill Gallagher (EPA)
- Alan Ly (EPA)
- Hamish Campbell (EPA)
- Steven Nikolovski (SafeWork)
- Dennis Clemence (SafeWork)
- Ian Gregson (ALGA)
- Chris Blake (RMS)

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Asbestos in Soil Round Table Event

Agenda Items:

- AS 4964.2004 Limit of Reporting
- Asbestos in Soil Threshold
- Requirements for Asbestos in Soil assessment and extent of assessment based upon PSI and CSM
- Defining friability when it comes to ASBINS
- ENM and Resource Recovery asbestos assessment requirements

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Asbestos in Soil Assessment

Kim Femia – EDP Consultants
Richard Wilkinson – Coffey
Kris Thomas – EP Risk

Asbestos in Soil Assessment

Objective

Knowledge sharing around the identification and management of asbestos in soil

Overview

- Legislative Framework
- Asbestos as a Soil Contaminant
- Site Assessment – Investigation Techniques
- Asbestos in Soil Laboratory Analysis
- Interpretation of Results
- Management / Remediation
- Case Studies

Kim Femia

EDP Consultants
Senior HSE Consultant / Team Manager

NATA Technical Assessor
Licensed Asbestos Assessor

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Kim is a Senior Environmental Consultant and Team Manager at EDP Consultants. Kim has 13 years experience in the asbestos industry is a licensed asbestos assessor, specialising in hazardous material consulting, asbestos in soil assessments and remediation and NATA accredited asbestos laboratory operations.

She has previously project managed large scale asbestos in soil management projects, has set up 3 separate NATA accredited laboratories for asbestos ID and fibre counting and has recently joined the team of NATA Technical Assessors.

Asbestos in Soil Legislation

Asbestos in Soil Legislative Framework

- Contaminated Land Management Act 1997
- *National Environment Protection (Assessment of Site Contamination) Measure 1999, Amendment No. 1, 2013* (NEPM):
  - Schedule B1, Section 4 – Asbestos materials in soil
  - Schedule B2, Section 11 – Assessment of asbestos soil contamination
- WA Department of Health, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, 2009* (WA DOH)
- NSW Government: *Managing Asbestos in or on Soil, 2014*

Asbestos as a Soil Contaminant

Sources of Asbestos in Soil

- Poor demolition and removals
- Illegal dumping
- Uncontrolled fill
- Onsite building waste
- Roof runoff to soil
- Use of contaminated recycled materials
- Damage to properties (i.e. from fire / severe weather event) and underground infrastructure (telecoms pits and pipework)
- Asbestos disposal sites
- Naturally occurring asbestos

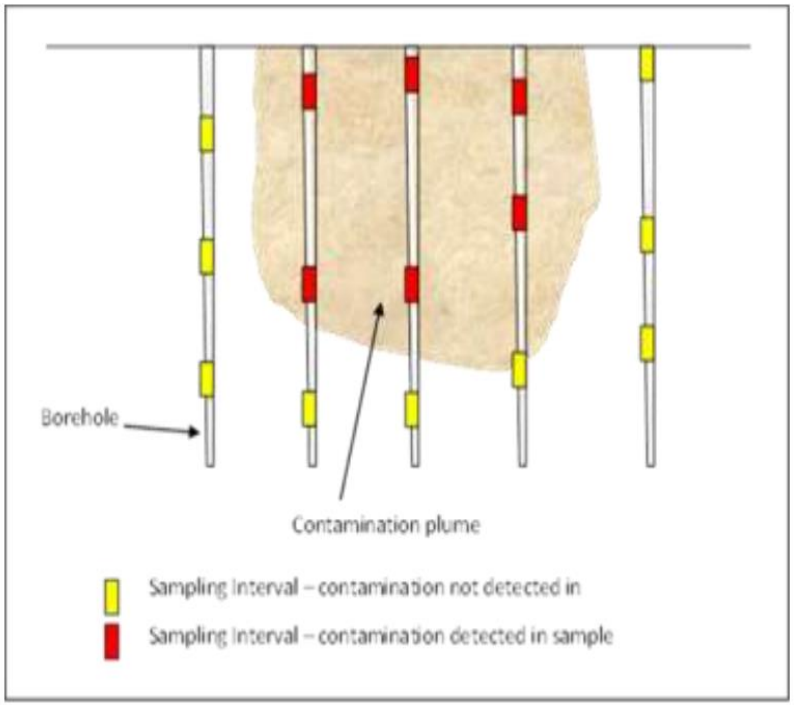




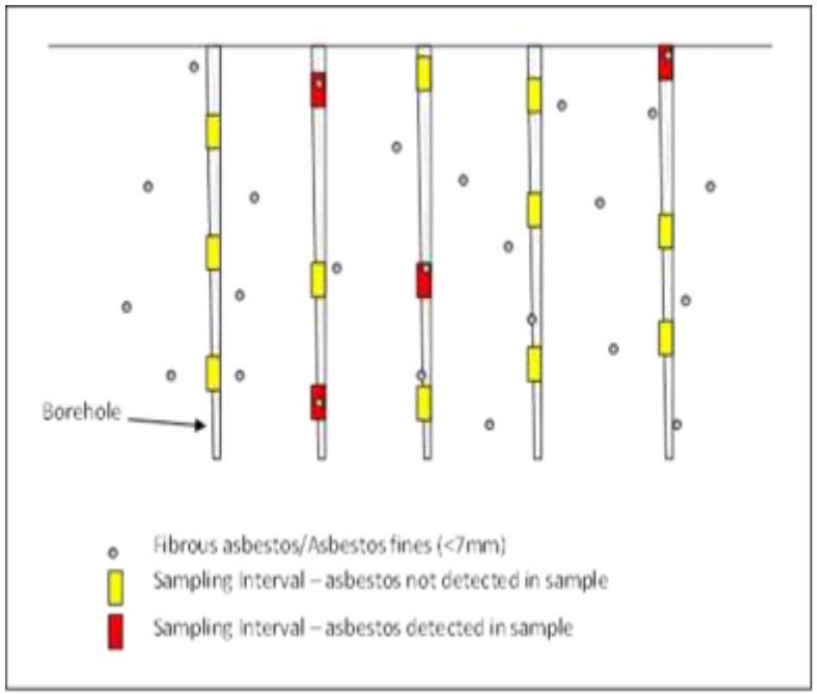

Asbestos as a Soil Contaminant

- Asbestos is an isolated, physical contaminant that doesn't fit the normal distribution model.

Geometric distribution of liquid release



Random distribution of asbestos in soil contamination



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Asbestos in Soil Terminology

Bonded Asbestos-Containing Material (ACM)

Non-friable material in sound matrix (>7 mm), i.e. fragments of fibre cement/vinyl tiles etc.

Fibrous Asbestos (FA)

Friable and fibrous material, i.e. loose insulation or any other material that can be crumbled or broken by hand pressure.

- FA may include material that has degraded into a friable condition i.e. severely weathered fibre cement.

Asbestos Fines (AF)

Free fibres, ACM or FA that has been degraded, broken, damaged or weathered (< 7 mm).

- Includes asbestos containing dust or debris (ACD), as per WHS Regulation.

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Asbestos Health Screening Levels (HSLs)

NEPM and WA DOH criteria based on asbestos (pure equivalent) weight-for-weight (w/w) in soil which triggers further investigation and/or management:

Form	Residential A	Residential B	Recreational C	Commercial/ Industrial D
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF	0.001%			
All forms of asbestos	No visible asbestos for surface soil (top 10 cm)			

Note: 0.001% w/w applies for FA and AF only when gravimetric determinations are possible, and is not applicable for free fibres.

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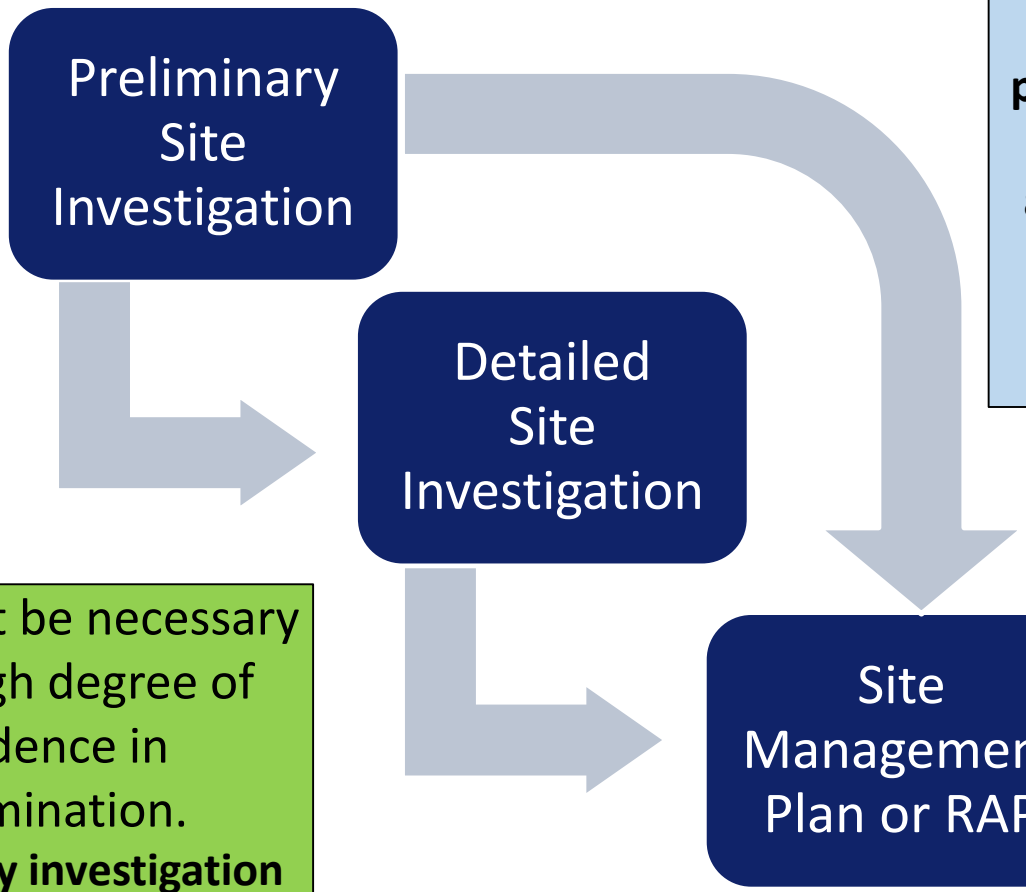
Site Assessment Process

NEPM Site Characterisation



Assessment should be aimed at describing **nature and extent of asbestos present in sufficient detail to enable remediation and/or site management plan to be developed** for current and/or proposed land use

DSI may not be necessary where high degree of confidence in contamination.
Unnecessary investigation should be avoided

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Preliminary Site Investigation

Preliminary Site Investigation

- Completed by a suitably qualified and experienced assessor / competent person. Must be able to identify, investigate and assess asbestos in context of environmental site assessments.
- Should include:
  - Site history review:
    - Review of records (asbestos register, aerial photos showing structures).
    - Anecdotal information.
  - Review of development plans.
  - Site walkover.
- Visual observations based on grid based systematic walk over across areas of concern identified during PSI.
- Comment should be made on the presence or absence, condition (bonded or friable) and distribution of asbestos material's.

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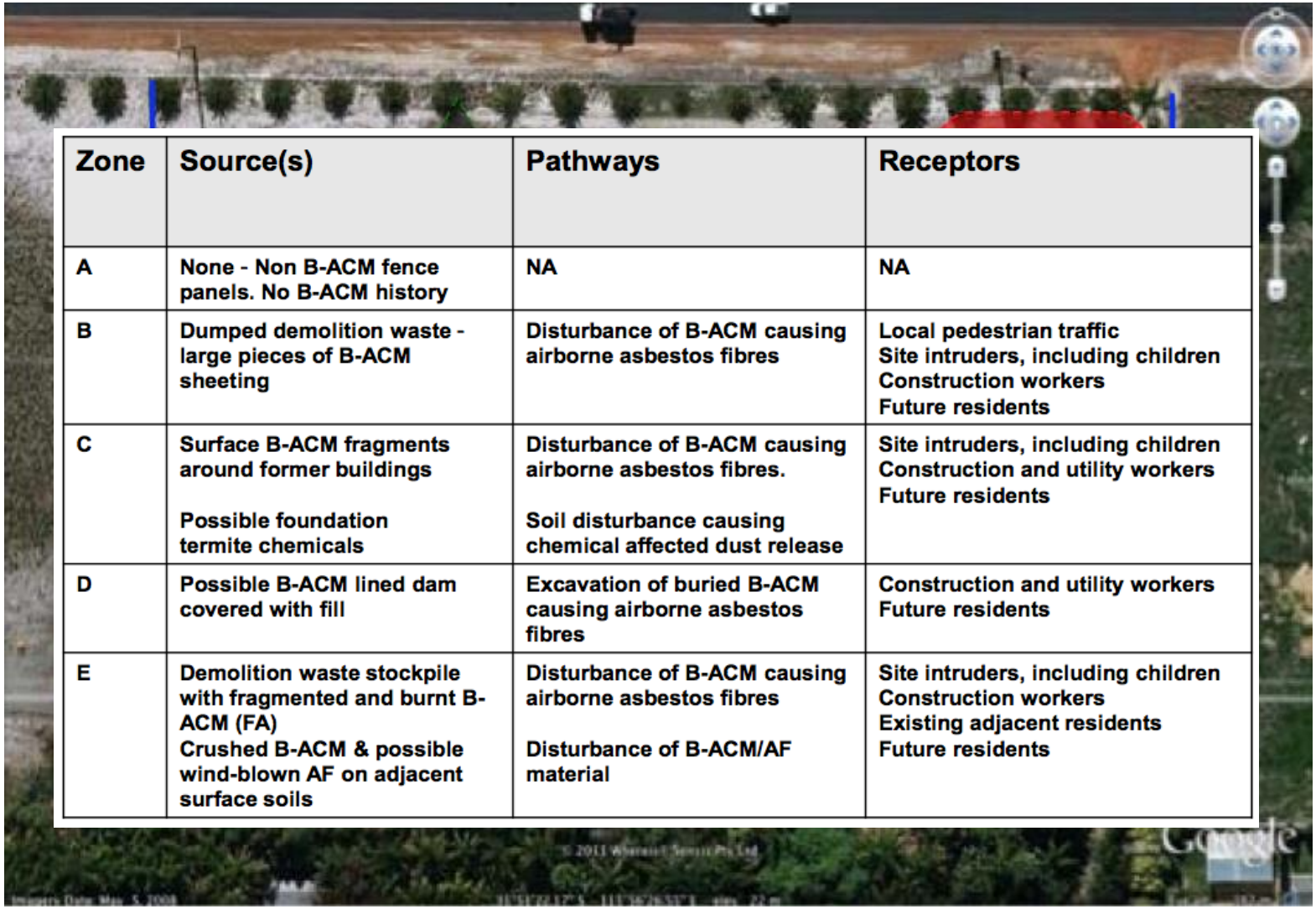
Preliminary Site Investigation continued

- Any dumped material, uncontrolled fill and structural footprints should be identified and suspected of containing asbestos materials. Additionally any existing asbestos containing structures should be noted.
- Limited field sampling may be undertaken for confirmation of assumptions, such as rough impact delineation or to confirm asbestos presence within suspected material.
- **Develop Conceptual Site Model.**

Conceptual Site Model



Zone	Source(s)	Pathways	Receptors
A	None - Non B-ACM fence panels. No B-ACM history	NA	NA
B	Dumped demolition waste - large pieces of B-ACM sheeting	Disturbance of B-ACM causing airborne asbestos fibres	Local pedestrian traffic Site intruders, including children Construction workers Future residents
C	Surface B-ACM fragments around former buildings Possible foundation termite chemicals	Disturbance of B-ACM causing airborne asbestos fibres. Soil disturbance causing chemical affected dust release	Site intruders, including children Construction and utility workers Future residents
D	Possible B-ACM lined dam covered with fill	Excavation of buried B-ACM causing airborne asbestos fibres	Construction and utility workers Future residents
E	Demolition waste stockpile with fragmented and burnt B-ACM (FA) Crushed B-ACM & possible wind-blown AF on adjacent surface soils	Disturbance of B-ACM causing airborne asbestos fibres Disturbance of B-ACM/AF material	Site intruders, including children Construction workers Existing adjacent residents Future residents

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Simple Surface Impacts

- If only simple surface impacts or an in situ management approach is adopted and sufficient information is available from the PSI to inform the remediation and management plan, no further investigation is required.

- Small scale, low risk asbestos soil contamination may be assessed qualitatively and subject to a simplified investigation and remediation process which includes removing visible ACM fragments and providing a visual clearance.

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Example of small scale impacts

ACM fragments on surface soil:

- Can be assumed as minor contamination if less than the adopted HSL – remediation to comply with the requirements for the surface soil (top 10 cm) to be free of visible asbestos.
- Assessment of HSL on surface soil (WA DOH):
  - Low-density HSL-A of 0.01%w/w – equates to surface ACM fragment(s) of 3 x 3 cm (10 g) ACM per m^2.

Detailed Site Investigation

Sampling Strategy

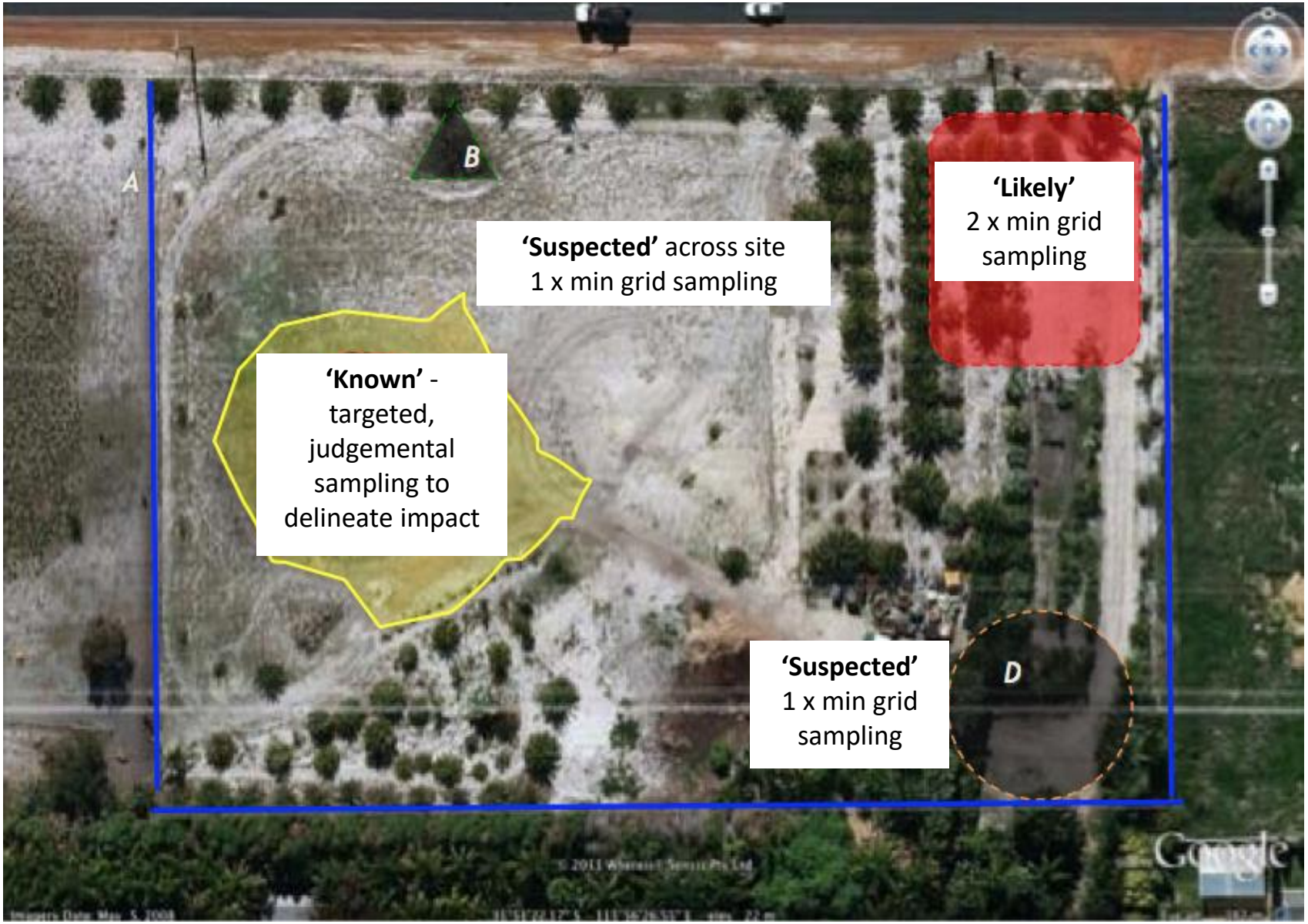
- Focus on specific data objectives and, where feasible, use visible asbestos materials (ACM and FA) as a measure of total asbestos contamination and minimise lab analysis.
- Targeted, judgemental sampling guided by the PSI is preferred over widespread grid sampling.
- Test pits and trenches are preferred to boreholes for buried asbestos as they enable visual examination of larger area of soil.
- Unless significant source of FA and AF is suspected, then bonded ACM concentration should be used as the primary measure of contamination.
- Consideration to conduct air monitoring to assess exposure potential as this is the defining measure for asbestos human health risk assessment.

10% Rule

- If AF arises from co-located ACM in ‘reasonably good condition’, NEPM and WA DOH considers that this will not exceed 10% of the ACM across the investigation area, even if the ACM is primarily very small pieces.
- This can be assumed as ‘trivial’ contamination - in essence the same terminology as associated asbestos-containing dust and debris (ACD).
- Bonded ACM concentration should still be used as the primary measure of contamination in such scenarios.

Sampling Triggers and Densities

- Sampling densities will depend on likelihood of asbestos contamination and will be some multiple of the minimum sampling density outlined in NSW EPA *Sampling Design Guidelines 1995*.
- WA DOH recommends:
  - **'Suspected'** areas of contamination = 1x minimum sampling density.
  - **'Likely'** areas of contamination = 2x minimum sampling density.
  - **'Known'** areas of contamination to be targeted, judgemental to delineate lateral and vertical extent.


A
B
'Suspected' across site
1 x min grid sampling
'Likely'
2 x min grid
sampling
'Known' -
targeted,
judgemental
sampling to
delineate impact
'Suspected'
1 x min grid
sampling
D
Google

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Preliminary Safety Controls

- Dial Before You Dig / Service Locating
- Disposable coveralls
- Nitrile gloves
- P2/P3 respirator
- Booties
- Asbestos waste bags, duct tape
- Exclusions zones surrounding site and each sampling location (if necessary)
- Dust suppression – use of water spray
- Air monitoring
- Notifying neighbours

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General Soil Sampling Requirements

- Sample soils down the soil profile, logging soil conditions (including surface cover, depth, soil type, moisture content, contamination observed etc.) to capture and characterise the impacted soil strata as per AS 1726 /Unified Soil Classification System (USCS).
- Collect samples from top 10 cm, then down the soil profile based on visual observations made in the field.
- Final depth of investigation will likely be based on depth of planned soil disturbance or once natural soil layer is achieved.
- Sample impacted strata only, do not dilute with non-impacted soils.
- Composite sampling and averaging concentrations is not appropriate.
- **Take lots of photos!**

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Surface Sampling

- Surface asbestos material fragments > 7mm may be sampled by hand (emu-bob) picking.
- Handpicking primarily refers to the observation, manual collection and weighing of any visible material across the surface of a site.
- The surface should include the readily accessible and disturbed surface layer (default 10 cm depth) which may vary depending on the soil type and compaction of the soil surface.
- Recommended to be undertaken with at least 2 passes with 90º direction change using a grid pattern.
- Where asbestos contamination is found, its quantification should relate to that particular immediate grid area or volume (recommended no greater than 10 m x 10 m).

Sub-Surface Sampling

- Test pitting and trenching preferred to boreholes.
- For determining ACM and FA concentrations.
- 10 L volume of impacted soil should be sampled:
- ACM or FA within this sample should be collected either by:
  - Screening though a 7 mm sieve (for suspect ACM and/or sandy soils); or
  - Spreading material out on a contrasting surface to pick out suspect materials (for FA and/or clay soils).
- Suspect ACM/FA collected separately and weighed to calculate asbestos concentration for each sample.

Determining Asbestos in Soil Concentrations

- Asbestos % is then calculated based on the type ACM identified which is then compared to the weight of the 10 L soil sample in kg (%w/w).
- Where significant FA is present and needs to be quantitated, similar bulk assessment approach can be used and the %w/w in soil calculated from a representative sample of the FA material.

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Determining Asbestos in Soil Concentrations

$$\text{asbestos in soil (\%w/w)} = \frac{\text{\% asbestos content x asbestos material weight (kg)}}{\text{soil volume (L) x soil density (kg/L)}}$$

- Soil weight may be directly measured in the field using field scales or calculated based on typical soil densities:
  - 1.65 kg/L (sandy soils) up to 2 kg/L (clay soils).
- Asbestos content will need to be either estimated from asbestos content known to have been used in original manufactured product or it can be determined analytically.
- Fibre cement assumed to be 15% asbestos content in NEPM and WA DOH.

Example Calculation

Eight fragments of asbestos cement sheeting were found in a 10 L sample of sandy soil.

Total combined weight of ACM fragments was 250 g (0.25 kg).

Soil density assumed to be 1.65 kg/L.
ACM assumed to be 15% asbestos content.

$$\% \text{ (w/w) asbestos} = 15\% \times 0.25 \text{ kg} / 1.65 \text{ kg} \times 10 \text{ L}$$

$$= 0.23 \% \text{ (kg/kg) asbestos}$$

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Example of Field Sampling Results

Sample No.	Sample Location	Type	Material Description	Weight of Material (kg)	Weight of Asbestos (kg)*	Weight of Soil (kg)**	%w/w
AS01	TP05_0.1	ACM	Fibre cement	0.0117	0.0018	18	0.0098
AS02	TP06_0.3	ACM	Fibre cement	0.0472	0.0071	18	0.0394
AS03	TP09_0.5	FA	Insulation board	0.0879	0.0440	18	0.2442
AS04	TP11_0.5	ACM	Fibre cement	0.0058	0.0009	18	0.0048

*Calculated using a 15% asbestos content for ACM and 50% for FA.

**Calculated using a soil density of 1.8 kg/L for 10 L volume of sandy clay fill.

Sampling for AF Impacted Soil

- Not recommended unless significant FA or AF is suspected / encountered.
- AF mixed with other material may be difficult to detect visibly.
- A separate, targeted, representative sample should be taken of any areas that may be considered or suspected to have AF contamination.
- Requires a separate 500 ml sample to be collected for analysis by NATA laboratory.
- Soil sample should be wetted down and placing into a zip-lock sample bag.
- 500 ml volume sample size may improve the likelihood of identifying asbestos material in the sample.
- If easily visible AF or small fibre bundles are detected, then it may be possible to undertake semi-quantitative estimates of the %w/w AF by gravimetric methods by laboratory.

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Richard Wilkinson

Coffey
National NATA Accreditation Manager

NATA Technical Assessor
Licensed Asbestos Assessor

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Richard is professionally qualified in the asbestos industry from the United Kingdom (UK) and is a National Association of Testing Authorities, (NATA) Australia Technical Assessor in the field of Chemical Testing. Richard is a SafeWork NSW licenced asbestos assessor having over 10 year's professional experience in various areas of asbestos consulting and analysis, including asbestos surveys, environmental air monitoring, visual asbestos clearance inspections, project management, risk assessment & bulk sample analysis. Richard is an experienced analyst and has a deep knowledge of asbestos surveying and removal. Providing technical leadership, business development, quality assurance and risk based solutions.

Asbestos In Soils Laboratory Analysis

(in a NATA Accredited Laboratory as per AS 4964-2004)

The Process and Presenting the Results.

Asbestos in Soils Analysis (A Brief Overview)

- The test method is documented in AS 4964-2004.
- All soil is regarded as non homogenous material, a qualitative & quantitative examination is applied to determine the “mass” of asbestos in the sample.
- Asbestos volume is derived by a calculation of mass and this value is compared to the total mass of the sample providing a calculation of g/kg or % w/w.
- The method adopts a detection limit of 0.01% (weight/weight) or 0.1g/kg - lowest validated detectable concentration for asbestos in soils in Australia.

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Soil Sample Submission

Samples are generally submitted to the lab in 2 categories:

1. ~ 30 to 60 grams of soil (not sieved in the field), for stockpile or in-situ waste classification purposes; and
2. NEPM field screening ~ 500 ml of soil submitted following ~ 10 L of soil being passed through a 7 mm sieve and > 7 mm fragments as separate samples.

- NEPM is not a validated analytical test method, it is a field screening process using as line of evidence approach to determine the health risk profile of soil on site.
- NEPM states soil samples are to be analysed as per AS 4964.

Sample Preparation

AS 4964 8.2.3 (a) to (m) defines the process for soil analysis:

- Samples are dried, weighed and (if required) pulverised to liberate hidden ACM and asbestos fibres.
- Sieving is conducted to split soil into different fractions (10mm/2mm Sieve) to easily identify ACM or loose asbestos within the sample.
- If the < 2mm fraction is > 30-60 grams, this fraction can be reduced via a validated subsampling technique such as cone and quarter.

Sieved Fractions

> 2 mm fraction
Most likely to find asbestos contamination at
0.1 g/kg or 0.01% w/w

< 2 mm fraction
Most likely to find asbestos in lower concentrations of fibre bundles

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Identified (Stereo and Polarised Light Microscopy)

What are we seeing?

Identified ACM and asbestos fibres generally falls into 3 categories:

1. Debris fragments (generally small fibro debris);
2. Matted fibre bundles (part of the original matrix attached);
3. Isolate fibre bundles (fibre liberated from the matrix).

Identified Asbestos

Debris fragment (generally fibro debris)

Generally found in the > 2mm fraction

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Identified Asbestos

Matted fibre bundles

Found in the > 2mm & < 2mm fraction:

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Identified Asbestos

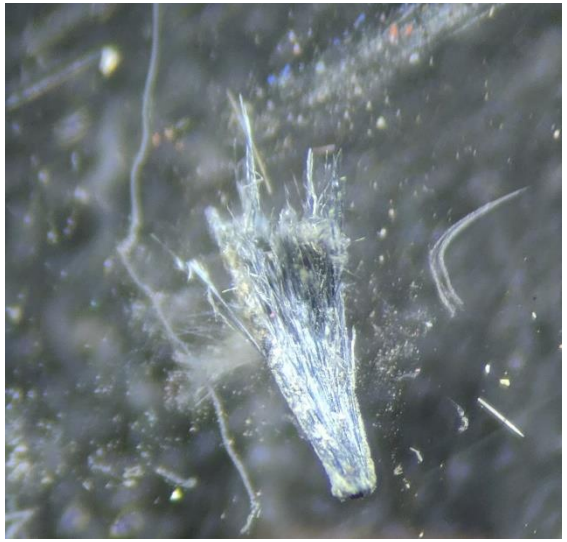
Isolate fibre bundles

Generally found in the < 2 mm fraction:

Chrysotile

Amosite

Crocidolite



Mass Estimation AS 4964 8.2.3 (m) & 8.4 note 7(b)

- Following unequivocal confirmation of the “mass”, asbestos isolated from the sample requires quantification.
- ACM or fibrous asbestos is to be weighed on an analytical balance or estimate the mass from the known density of asbestos by 3D measuring.

The following known densities are used:

- Chrysotile ~ 2.53 x 106 µg/µm^3
- Amosite ~ 3.5 x 106 µg/µm^3
- Crocidolite ~ 3.2 x 106 µg/µm^3
- If asbestos content is < 100% estimate the % as applicable.

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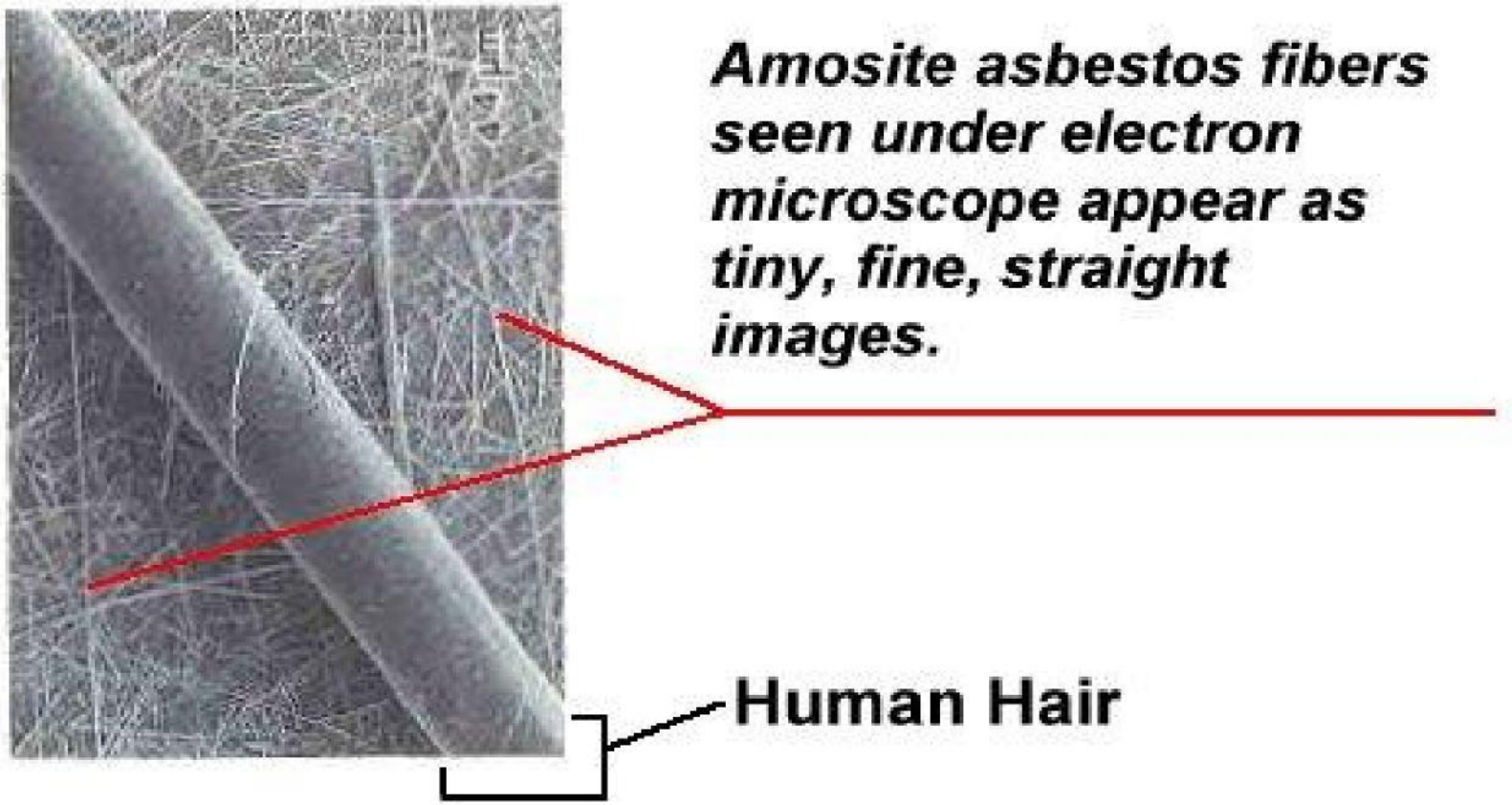
Trace Analysis (Identification of Respirable Fibres)



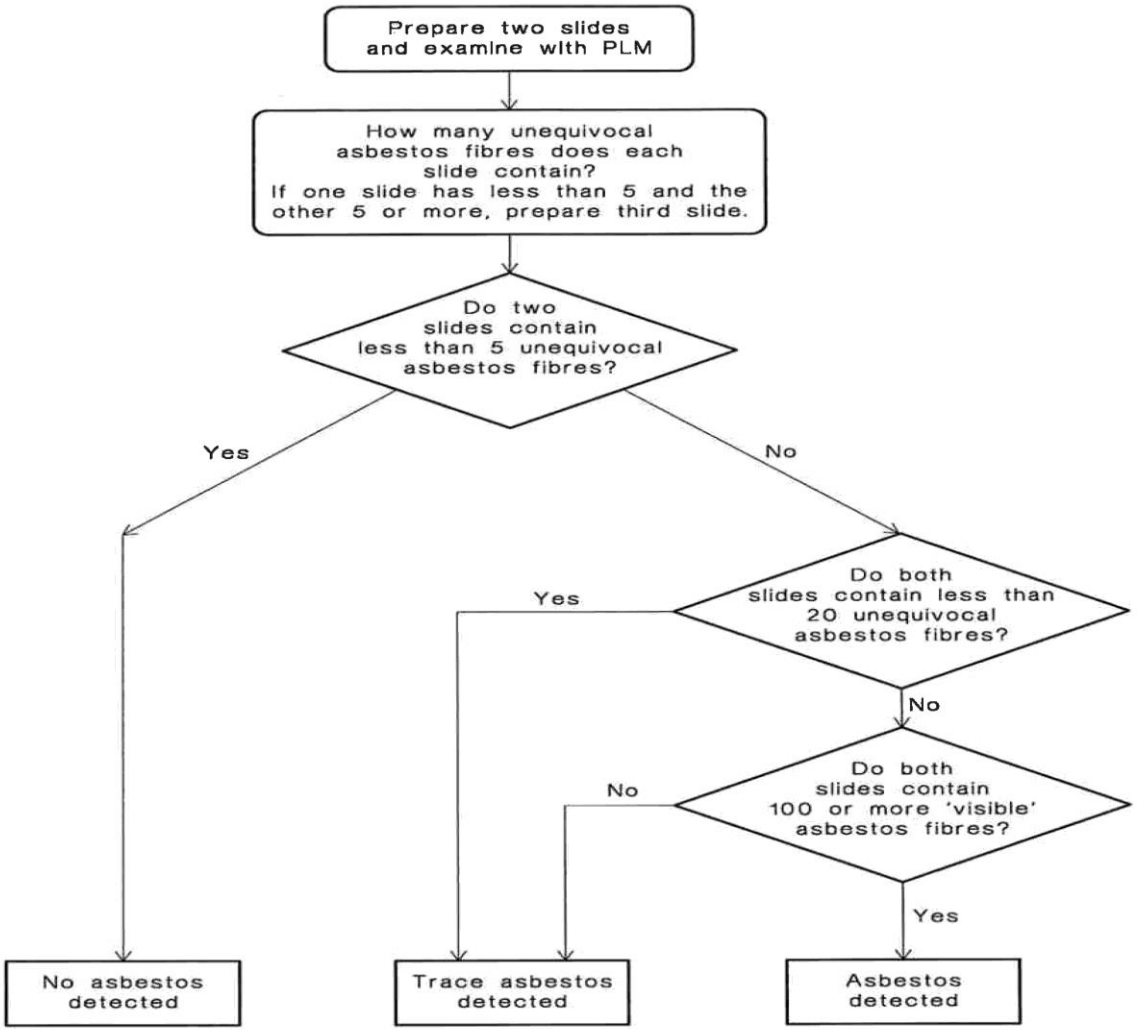
www.ncsl.org (National Institute of Environmental Health Sciences)

Trace Analysis AS 4964 Section 8.4

- Trace analysis for the presence of respirable fibres must always be carried out for soils.
- Following analysis two representative samples of 2-5 mg of residual soil left by < 2mm fraction are placed on two microscope slides with suitable RI liquid for ID.
- The entire sample is scanned in a similar why to fibre counting to identify fine fibres and discrete fibre bundles as per the PLM test method.
- If trace (respirable) asbestos is detected the sample assumes a detection limit of 0.1 g/kg 0.01% w/w.

NATA letter April 2019 states: Test reports must include the results of trace analysis where this has been undertaken, Including when analysis does not identify asbestos.

Trace Analysis (Identification of Respirable Fibres)



Trace analysis must be completed on all non-homogenous samples as outlined in AS 4964 (Section 8.4).

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Reporting the Results

- AS 4964 states a factual description is always required when asbestos materials in soils are present (AS 4964 Section 9.1).
- Therefore labs must report any asbestos found in the sample
- Identified asbestos must be described, but the description is not a reflection of the actual sample result, the calculated asbestos mass may be below the detection limit for the method of 0.1 g/kg 0.01 % w/w (AS 4964 Section 8.4 note 7(b)).

TPA69_0.5	As received - brown non-homogenous fibrous soil, with fibre cement debris fragments containing ***Chrysotile (white asbestos)*** in the > 2mm fraction, raw weight ~ 0.0493g	Total sample ~ 800.5g > 2mm fraction ~ 265.1g < 2mm fraction ~ 535.4g < 2mm sub sample ~ 49g	No asbestos detected at or above the reporting limit of 0.1 g/kg Organic fibres detected No trace (respirable) asbestos detected as per AS 4964 2004

Reporting the Results

The actual result will be presented in one of the following three ways (AS 4964 Section 9.4 & 9.5);

1. No asbestos detected above the reporting limit of 0.1g/kg
2. “Asbestos type” (“colour” asbestos) detected (include a factual description of the asbestos present, i.e. form, dimension or weight)
3. Trace asbestos “asbestos type” (“colour” asbestos) detected

Reporting the Results

A factual description is required when asbestos is identified, but NATA states it is not appropriate (read you must not) to report concentration below 0.1g/kg 0.01% w/w and % estimates of ACM and fibrous asbestos,
however it has become industry expectation that the above is reported so consultants can compare the analytical findings to the HSL for AF/FA, table 7 schedule B1.

	Health Screening Level (w/w)			
Form of asbestos	**Residential A[1]**	**Residential B[2]**	**Recreational C[3]**	**Commercial/ Industrial D[4]**
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[5] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

Please Note! Putting a small* on an analytical report saying its “non NATA” doesn’t validate a lower concentration!

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Sample No. TPA69_0.5

Asbestos weight calculation for non-homogenous samples containing asbestos:

Below are simple explanations of how to estimate weight of total asbestos in isolate fibre bundles, matted fibre bundles and debris fragments.

Estimate the % of asbestos in material, for example isolate fibres would be 100%.

Weigh the asbestos material or asbestos containing material on a mass balance (to 4 decimal places) and record the weights in mg, for material where the asbestos content is not 100% estimate the % and record the estimate in mg.

If you do not have a mass balance using a micrometre and a ruler with ½ mm gradients to measure the length/width/depth of the materials.

Example: Fibre cement debris fragment estimated 20% Chrysotile content: 5 H(mm) x 3 W(mm) x 1 D(mm) x 2.53 x 0.2 = 7.59 Milligrams.

Carry out an estimation process for all asbestos material in the sample, combine the weights of asbestos in milligrams and divide by the total mass of the sample in grams for a g/kg result.

Sample No. TPA69_0.5

Chrysotile Fibre Analysis

Notes: Fibre cement debris fragments were found in the >2mm fraction (and weighted on an analytical balance) with an approximate weight of 49.3 milligrams. The asbestos content is estimated to be 20%, approximate weight = 9.86 milligrams.

	9.86	**Asbestos in Milligrams**

Asbestos in mg **9.86**

Total Sample Weight **800.5** (g)

Result = 0.0123 g/kg or 0.00123%w/w

Conclusion:

If asbestos is detected at or above the reporting limit of 0.1g/kg, then report all the types of asbestos identified in the sample as detected, in the sample description section include a factual description of the asbestos present, i.e. form, dimension or weight.

If asbestos is detected below the reporting limit **and** no 'respirable' fibres have been detected during trace analysis, then report:

No asbestos detected above the reporting limit of 0.1g/kg

TPA69_0.5	As received - brown non-homogenous fibrous soil, with fibre cement debris fragments containing ***Chrysotile (white asbestos)*** in the > 2mm fraction, raw weight ~ 0.0493g	Total sample ~ 800.5g > 2mm fraction ~ 265.1g < 2mm fraction ~ 535.4g < 2mm sub sample ~ 49g	No asbestos detected at or above the reporting limit of 0.1 g/kg Organic fibres detected No trace (respirable) asbestos detected as per AS 4964 2004

Kris Thomas

EP Risk
Managing Director

Kris is a Principal Environmental Scientist and the Managing Director of EP Risk. Kris has 19 years of international consulting experience in asbestos in soil assessment and remediation. He has previously consulted on numerous State Significant Developments and was recently Project Director at Moorebank Intermodal Terminal Development and Barangaroo Crown Sydney Hotel Resort.

Interpretation of Results

Clear as mud?

- Lines of evidence is critical:
  - Surface cover
  - Photographs
  - Figures
  - Logging
  - Soil type
  - Condition
  - Form
  - Extent
- Revise the CSM.
- What is actually friable?
- Understand your laboratory certificate.
- Do your own calculations & check the report descriptions.

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Interpretation of Results

EP1004_WC01	18-Oc28662	Oct 23, 2018	Approximate Sample 317g Sample consisted of: Brown coarse-grained sandy soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
EP1004_WC02	18-Oc28663	Oct 23, 2018	Approximate Sample 456g Sample consisted of: Brown coarse-grained sandy soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
EP1004_WC03	18-Oc28664	Oct 23, 2018	Approximate Sample 459g Sample consisted of: Brown coarse-grained sandy soil	AF: Chrysotile asbestos detected in the form of loose fibre bundles. Approximate raw weight of AF = 0.00010g* Estimated asbestos content in AF = 0.000090g* Total estimated asbestos concentration in AF = 0.000020% w/w* No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

- Request the laboratory to provide the total mass of ACM > 7 mm as a separate sample.
- Labs should not be determining material "*friable*"
- What is the % estimate of the asbestos in the material?
  - Can easily be < or > 15%
  - Do your own calculations!
- AF – is based on the 500 ml sample (not 10 L)
- Are there free fibres (respirable) present?

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Interpretation of Results

Job Number: 0001 Client: EP Risk

Site Location: Sydney Date: 01/01/01

Asbestos Result Table

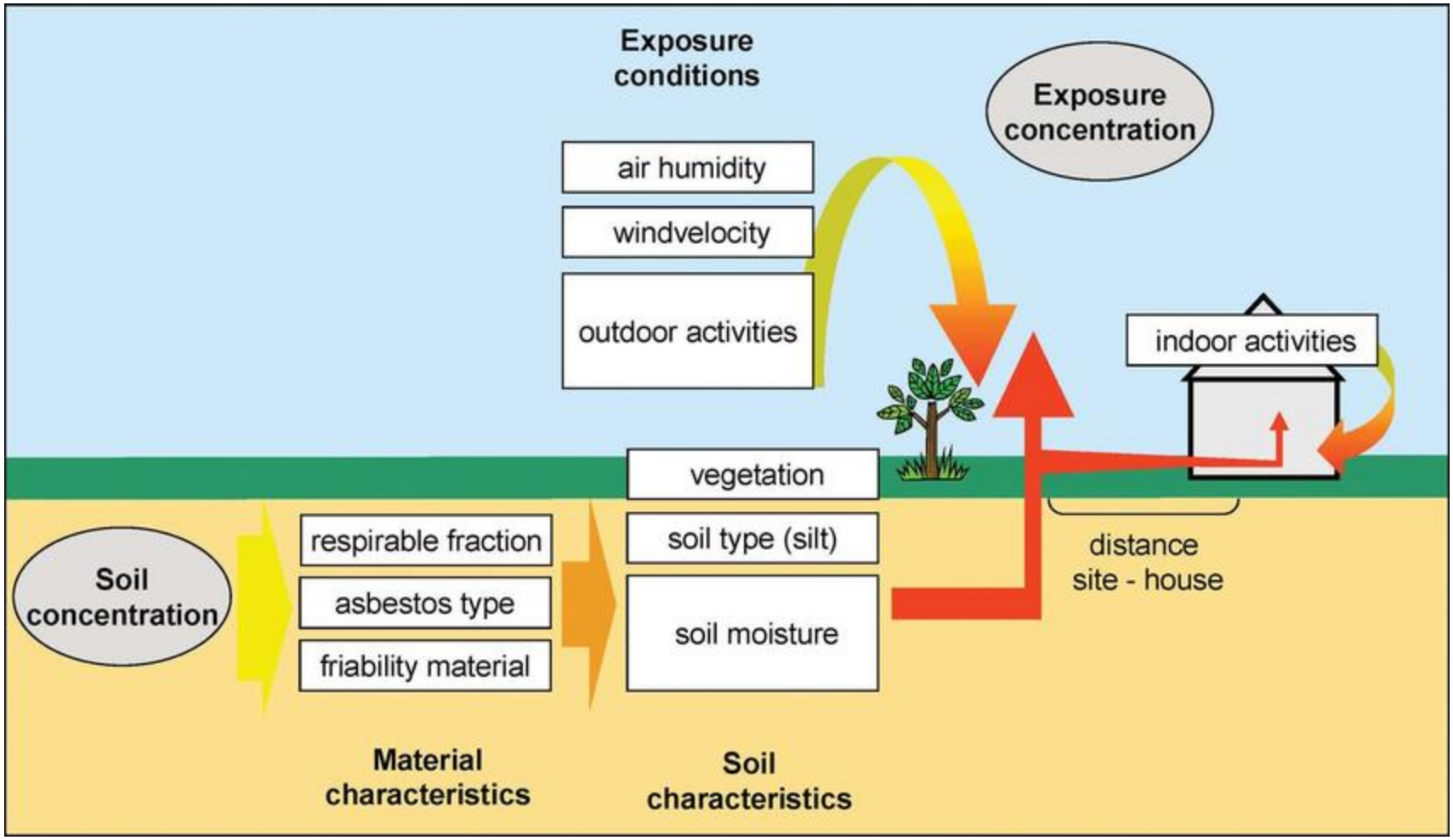
Location	Profile	Litres of Soil	Soil (kg)	ACM (kg)	Asbestos Content (kg)	% w/w Asbestos	Variables	Adopted Factors
							Specific gravity	1.65
							Asbestos conten	15.00%
TP01	Fill	10	18	0.035	0.00525	0.0292		

- Check the units
- Labs report this very differently
- Some labs calc. the w/w > 7 mm on 500 ml (incorrect)
- Is it friable? Consultant should make the determination.

Interpretation of Results > 7 mm

- What is the soil type?
- WA DOH / NEPM AF/FA HSL is based on dry WA sandy soils
- Dutch IV = 0.01% w/w asbestos for FA
- Dutch IV = 0.1% w/w asbestos for bonded (non-friable) ACM
- WA DOH HSLs were reduced by 1 order of magnitude to Dutch IV
- Can easily be < OR > 15% asbestos
- WA DOH: Bonded ACM at 100 mg/kg (or 0.01% w/w) is expected to keep outdoor airborne fibre levels below 0.001 f/ml and probably around 0.0001 f/ml

Factors Affecting Fibre Release



Ref: Swartjes F A and Tromp P C (2008), *A Tiered Approach for the Assessment of the Human Health Risks of Asbestos in Soils*

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Common Misunderstandings

- Gravimetric analysis is non-NATA.
- AS4964 is qualitative.
- If < LOR, there still may be an issue for Waste Classification (based on NSW EPA standpoint).
- ESDAT does not transcribe the data. You need to check manually!
- Labs / consultants often incorrectly over-estimate the >7 mm fraction (using the 500 ml mass).
- A full DSI and associated follow up work is not necessary if there are only simple surface impacts.
- Segregation method is achievable (**IF** you have time, space and budget).

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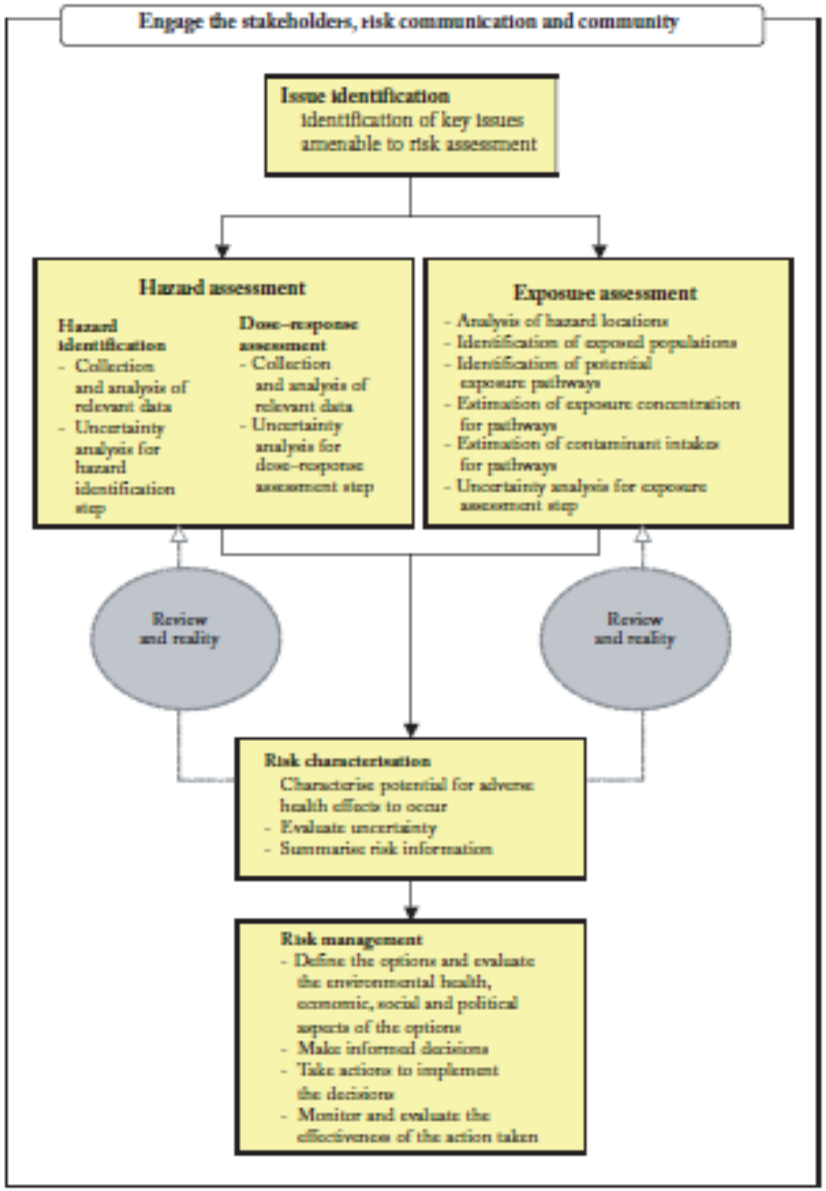
Risk Assessment Process

Ref: enHealth (2005)
Management of asbestos in the non-occupational environment

Figure 1: General principles of risk assessment and management



Management of asbestos in the non-occupational environment

Site-specific Risk Assessment

- Tier 1: simple qualitative testing: assessing the potential or probability of human exposure to asbestos.
- Tier 2: determining and testing the respirable asbestos fraction in soil: sedimentation procedure
- Tier 3: measuring the concentration of asbestos fibres in outdoor and/or indoor air.
- *ISO 14966:2002 Ambient air — Determination of numerical concentration of inorganic fibrous particles — Scanning electron microscopy method.*

Ref: Swartjes F A and Tromp P C (2008), *A Tiered Approach for the Assessment of the Human Health Risks of Asbestos in Soils*

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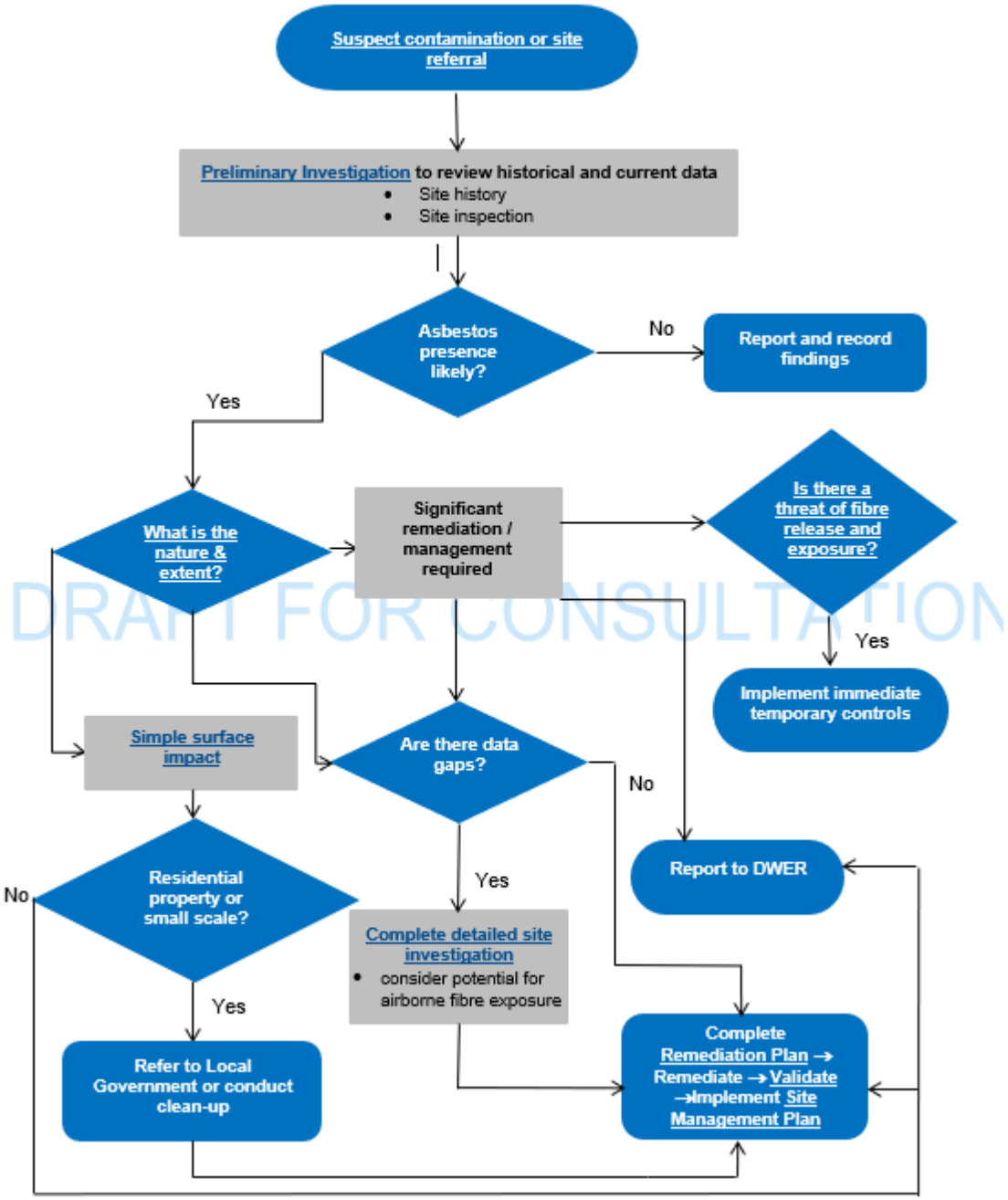
Draft Consultation (2019) WA Guidelines

Assessment Process

Ref: WA DoH (2019)
Consultation Draft
Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites



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DRAFT HSL Table

Site uses	Soil asbestos screening criteria	ASC NEPM (2013)
All site uses	FA – 10 mg/kg (0.001 %) w/w asbestos	0.001 % w/w
All site uses	AF – 10 mg/kg (0.001%) w/w asbestos	0.001 % w/w
Residential use, schools and day care, playground, etc.	ACM – 100 mg/kg (0.01 %) w/w asbestos	0.01 % w/w
Parks and reserves, public open spaces, playing fields, etc	ACM – 400 mg/kg (0.04%) w/w asbestos	0.02 % w/w
Non sensitive commercial and industrial sites	ACM – 500 mg/kg (0.05%) w/w asbestos	0.05 % w/w

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Characterisation / Clean Up

- *"Where there is supporting evidence that original material, which may have been an ongoing source of asbestos fibres, is no longer present at a site, the presence of trivial concentrations of asbestos remaining in the environment, such as from isolated amounts of quantifiable AF in soil, is not strictly an amount of asbestos that requires further action".*
- Site specific goals can be driven to be higher than the Tier 1 HSLs.
- Site specific goals are limited to levels of asbestos as regulated by WHS Regulations (currently 0.1%) (WHO 2000).

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Management / Remediation

On-Site Management v Remediation

Ref: Asbestos Safety and Eradication Agency (2017) *Case Studies of Contaminated Land*

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Cost v Benefit

- On-site capping / containment is preferred option
- Not always feasible
- Commercials
- Land value
- Feasibility of implementing a management strategy
- s.60 CLM Act 1997 – duty to report not applicable for bonded (non-friable) ACM
- EMP on s.10.7 EPA Act 1979
- Undertake an options appraisal

Remedial Options

- Do nothing
- Emu pick
- Raking
- Dig and dump
- Stabilisation
- Capping
- Segregation
- Mechanical tilling
- Screening
- Containment cell

Remedial Strategy Considerations

- Waste v CLM framework
- Unless a significant source of FA and AF is suspected, the bonded ACM concentration should be used as the primary measure of contamination.
- The accessible ground surface (nominally 10 cm depth) – *"No visible asbestos for surface soil for all forms of asbestos*".
- For management in-situ, the depth of a clean fill barrier (min. 0.5 m certified clean fill) should be such that future construction works or installation / maintenance of underground services does not disturb underlying impacted material.
- Geofabric / marker layer
- Auditors might want much more!

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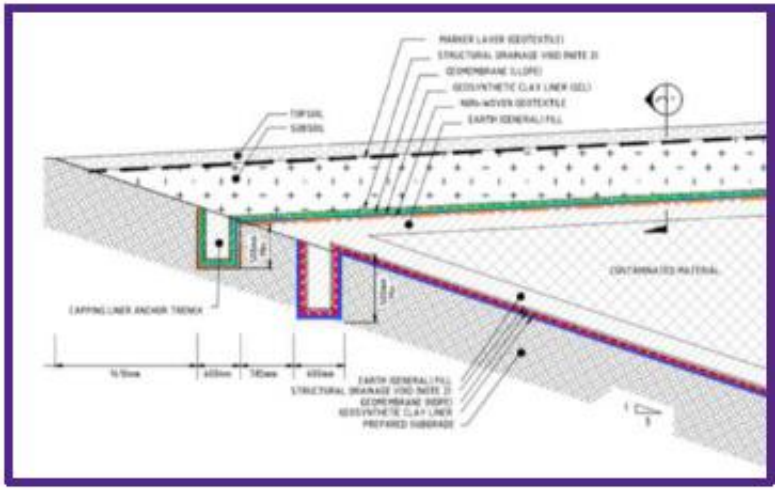
Case Studies

Ref: Asbestos Safety and Eradication Agency (2017) *Case Studies of Contaminated Land*

Case Study 1 – Cox Peninsula, NT

Key information	Finding
Location	Cox Peninsula, Northern Territory
Removal period	March 2016 – March 2017
Type of asbestos	Asbestos cement sheeting debris
Volume	28,000 m^3 of contaminated soil, including asbestos, lead, PCB and pesticides
Cost to remove	Total project cost of $31.5 million, of which asbestos management formed a part
Key considerations for the asbestos clean-up	• Construction of a containment cell for asbestos debris and other contaminants; • Removal of some asbestos contaminated soil to an offsite licensed landfill; • Consultation with a broad range of stakeholders.



Ref: Asbestos Safety and Eradication Agency (2017) *Case Studies of Contaminated Land*

Case Study 2 – Sleaford Mere Fire, SA

Key information	Finding
Location	Lower Eyre Peninsula, Rural South Australia
Removal period	January 2013
Volume of asbestos	Approx. 230 tonnes of non-friable asbestos soil and other debris
Cost to remove	Approx. $110,000, government funded charge on the land
Distance from licensed landfill used for disposal	Taken to landfill in Port Lincoln, less than 50 kilometres from the site
Key considerations for the asbestos clean-up	• Asbestos materials on private land. • Community concern over airborne asbestos. • To ensure efficient and proper clean up, Council paid for the asbestos removal but negotiated re-payment through charge of the land.

Ref: Asbestos Safety and Eradication Agency (2017) *Case Studies of Contaminated Land*

Key consideration for future projects

Costs were minimised through waiving the landfill levy, and transporting the waste to a local landfill less than 50 kilometres away. This was critical in developing a sound business case for the removal of asbestos containing debris and soil.

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The Way Forward

The Way Forward

- NSW EPA Waste Strategy 2019-21
- ALGA Position Paper – August 2018
- ALGA Industry Response – September 2019
- Industry response to the Draft Consultation WA Guidelines (2019)
- AHCA and ALGA working groups
- NSW EPA to accept a ‘threshold’ for Asbestos Waste?
- Regulators to become more engaged, integrated and flexible?
- ‘ASBINS NEMP’ or similar

References

- World Health Organisation, 2000, Air Quality Guidelines for Europe Second Edition, Copenhagen http://www.euro.who.int/en/publications/abstracts/air-quality-guidelines-for-europe
- EnHealth Council, 2005, Management of Asbestos in the Non-Occupational Environment, Commonwealth of Australia: Canberra http://enhealth.nphp.gov.au/council/pubs/pdf/asbestos.pdf
- Swartjes F A and Tromp P C, 2008, A Tiered Approach for the Assessment of the Human Health Risks of Asbestos Soils, Soil & Sediment Contamination, 17:137-149. https://doi.org/10.1080/15320380701870484
- WA DoH, 2009, Guidelines for the Assessment, Remediation and Management of Asbestos-Contained Sites in Western Australia.
- WA DoH, 2019, Guidelines for the Assessment, Remediation and Management of Asbestos-Contained Sites in Western Australia, Consultation Draft (November 2019).

ASBINS Working Group

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ASBINS Working Group

Terms of Reference

- Laboratory detection limits for asbestos in soil analysis and reporting requirements;
- Threshold limits for asbestos in soil reuse off site;
- FA/AF vs Friable Asbestos
- Non-destructive digging within asbestos impacted soils (DACC request)