

Asbestos in Soil and Made Ground

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Visual Analysis

Identification difficulties:

Asbestos fines are difficult to see,

both soils contain > 0.1% asbestos



Guidance initiatives

- Just like buses; you wait forever then three are en route at once!
 - AGS “Interim Guidance: Site Investigation Asbestos Risk Assessment For the protection of Site Investigation and Geotechnical Laboratory Personnel” (amended) (2012)
 - Ciria RP961 “Guide to managing and understanding the risks of asbestos in soil and on brownfield sites” (2013)
 - EIC/CL:AIRE Joint Industry Working Group “Industry code of practice – practitioners’ guide” (201?)

Ciria RP961

- Written by LQM (Nathanail & Ogden) and IOM (Jones & Robertson)
 - Overseen by a large and diverse PSG Chaired by Claire Dickinson (AECOM)
 - Due mid 2013
 - Aims to improve the performance of practitioners and other professionals when undertaking risk assessments
 - Suggest a valid approach to characterising, assessing and managing asbestos in soils, aggregates and made ground under Part 2A and Planning
- Including:
- Relevant legislation
 - International guidance
 - Asbestos and asbestos containing materials (ACM)
 - Health effects
 - Release of fibres from ACM
 - Desk Top Study and site reconnaissance
 - Conceptual model and preliminary risk assessment
 - Soil sampling & analysis and air monitoring
 - Exposure estimation – models, estimates, measurements
 - Risk evaluation and communication
 - Remedial strategies
 - Appointing specialists
 - Case studies

CLAIRE/EIC JIWG

- Will hopefully follow on from – and build on - Ciria RP961
- Aiming to publish a draft for consultation in 201?
- Proposed scope:
 - Introduction and Background
 - Regulation of Asbestos
 - UKAS and Accreditation Requirements
 - Training and Qualification Requirements
 - Insurance Requirements
 - Site Investigation and Sampling protocols
 - Laboratory analysis
 - Human Health Risk Assessment
 - Remediation of Asbestos-Contaminated Soils and Ground Materials
 - Waste management

Today we will:

- Summarise some key technical issues relating to the investigation and assessment of asbestos-containing soils
- Highlight some of the complexities and remaining uncertainties [and explore these in a group exercise/discussion]

Basic principles

- Establish the legal context
 - CAR2012 (and other H&S legislation) has significant implications from owners or contractors working with asbestos in soil
 - Compensation Act 2006: joint and several liability for negligence wrt asbestos
 - As well as Part 2A, Planning, common law, EDR, etc.
- Develop a conceptual site model
 - including relevant uncertainties & likely changes with time
- Adopt a lines of evidence approach to risk evaluation

Key messages

- Asbestos is primarily hazardous by **inhalation**
- Asbestos has been **proved to cause** mesothelioma and lung cancers in humans
 - Different types of asbestos have **different potencies**. In general, it seems crocidolite > amosite > chrysotile
- Very little guidance on asbestos in soil in the UK or elsewhere
 - Also a **limited amount of research** to base guidance on
 - Only existing UK guidance (ICRCL 64/85 ver2) notes that 0.001% asbestos in soil can exceed occupational exposure limits (0.1 f/ml air)
- Risks from asbestos in soil can be assessed using BS10175:2011/CLR11 approach but:
 - Specific precautions will be need during all site works
 - Sampling and testing strategies may be different from other contaminants
 - Asbestos-specific techniques will be needed for site investigation, risk estimation and evaluation
- Asbestos is **potentially present at nearly all types of post industrial site**, but likely mostly at low concentrations
 - Asbestos is identified in all DOE Industry Profiles

Key messages 2

- Particular issues may be present:
 - At or near asbestos handling sites
 - Waste may have been tipped or sold for use on neighbouring land
 - Railway land, heavy engineering (dockyards), old waste sites/scrapyards and power stations
 - Sites where structures were demolished (particularly before 2000)
 - Sites where demolition rubble/made ground was imported from the above
- Unlike most other contaminants, **soil concentrations are not sufficient** on their own to assess risks
 - It is the **release of asbestos fibres into the air** that poses a risk
 - Bound vs friable (e.g. AC vs lagging vs free fibres)
 - Good condition vs weathered/ degraded
 - Depth
 - Moisture content
 - Soil type
 - Surface cover (vegetative or hard surfacing)
 - Land use/ receptor activities

Key messages 3

- Better laboratory tests are needed that can identify low levels (0.001%) of asbestos fibres (not just pieces of ACM) determine its condition/fibre release potential – cost?
- Additional lines of evidence may be needed (e.g. air monitoring, Activity-based sampling or fibre release tests)
 - Occupational air monitoring (LoD 0.01 f/ml) are **not** sufficient to demonstrate that a site is “safe” (NPPF para 120) or “suitable for use” (NPPF para 121) and must be able to identify asbestos type
 - Likely to requires electron microscopy and long sampling times – cost?
 - Activity-based sampling (ABS) measures airborne concentrations during simulated activities (e.g. gardening or sports) under controlled and safe conditions (e.g. RPE) - costs? Permitted?
 - Fibre release tests are laboratory tests to measure “worst case” airborne concentrations generated from soils (not (?) currently available in UK) – costs?
- Under CAR2012 all analysis must be UKAS accredited

Key messages 4

- Multiple “Lines of evidence” should be used – agreement between different methods and techniques
- Assessment will require different techniques to other contaminants
 - CLEA, and other models, are not appropriate
- Methods are available to estimate airborne fibre concentrations from soil concentrations but they are crude and their accuracy uncertain
- Several models are available to predict excess lifetime cancer risks from airborne fibre concentrations but their accuracy at low environmental exposures is questionable
- Do these tools accurately reflect likely risks from asbestos in soil?
 - Multiplication of conservatism?
 - But the potential health effects should not be trivialised or ignored!!

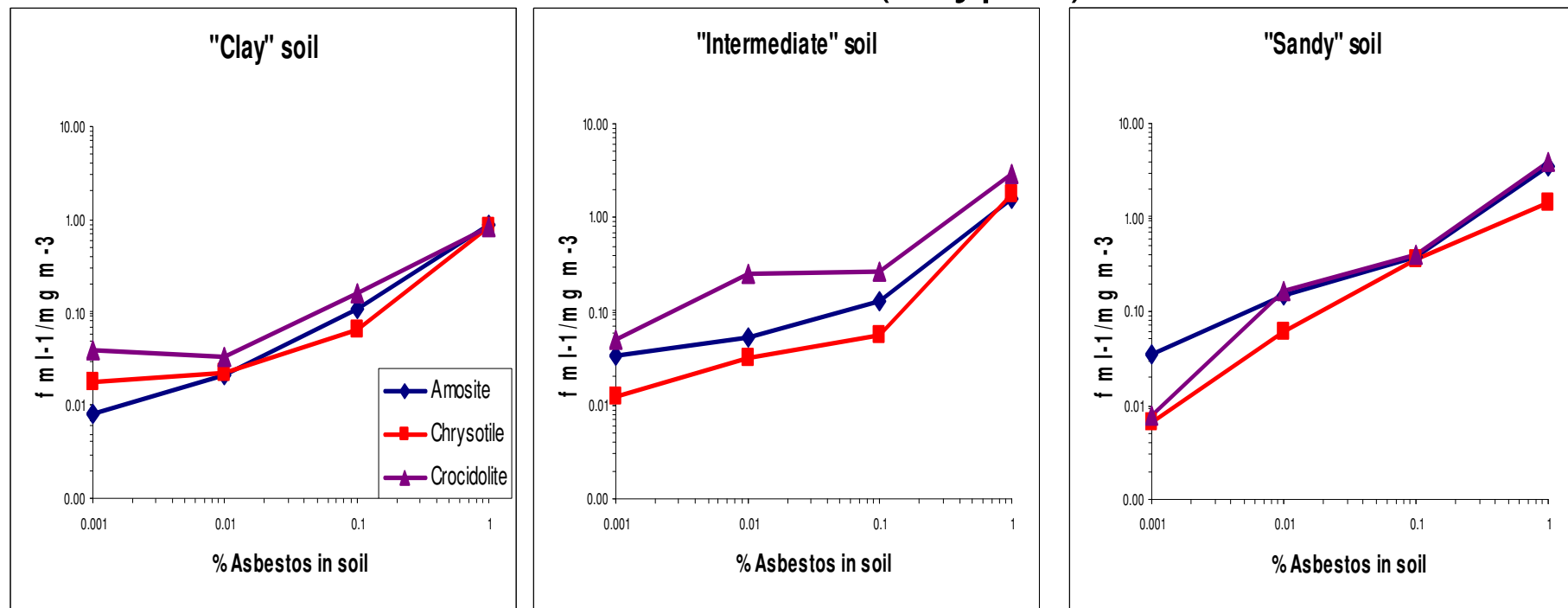
A long time ago, in a galaxy far, far away ...

- A primary school somewhere was built in the 1980s with a playing field
- Soil samples were collected in preparation for building an extension and MUGA
- ASBESTOS! was identified!!!
- The results of further sampling suggested :
 - The site had been built up with dredgings topped with ~0.3m of made ground containing demolition wastes (=asbestos?)

How could the risks be estimated?

- Addison et al. 1988 measured the release of airborne fibre from dry soils (“sandy”, “intermediate” and “clay”) containing between 1 - 0.001% free asbestos fibre (3 types)

Caution!

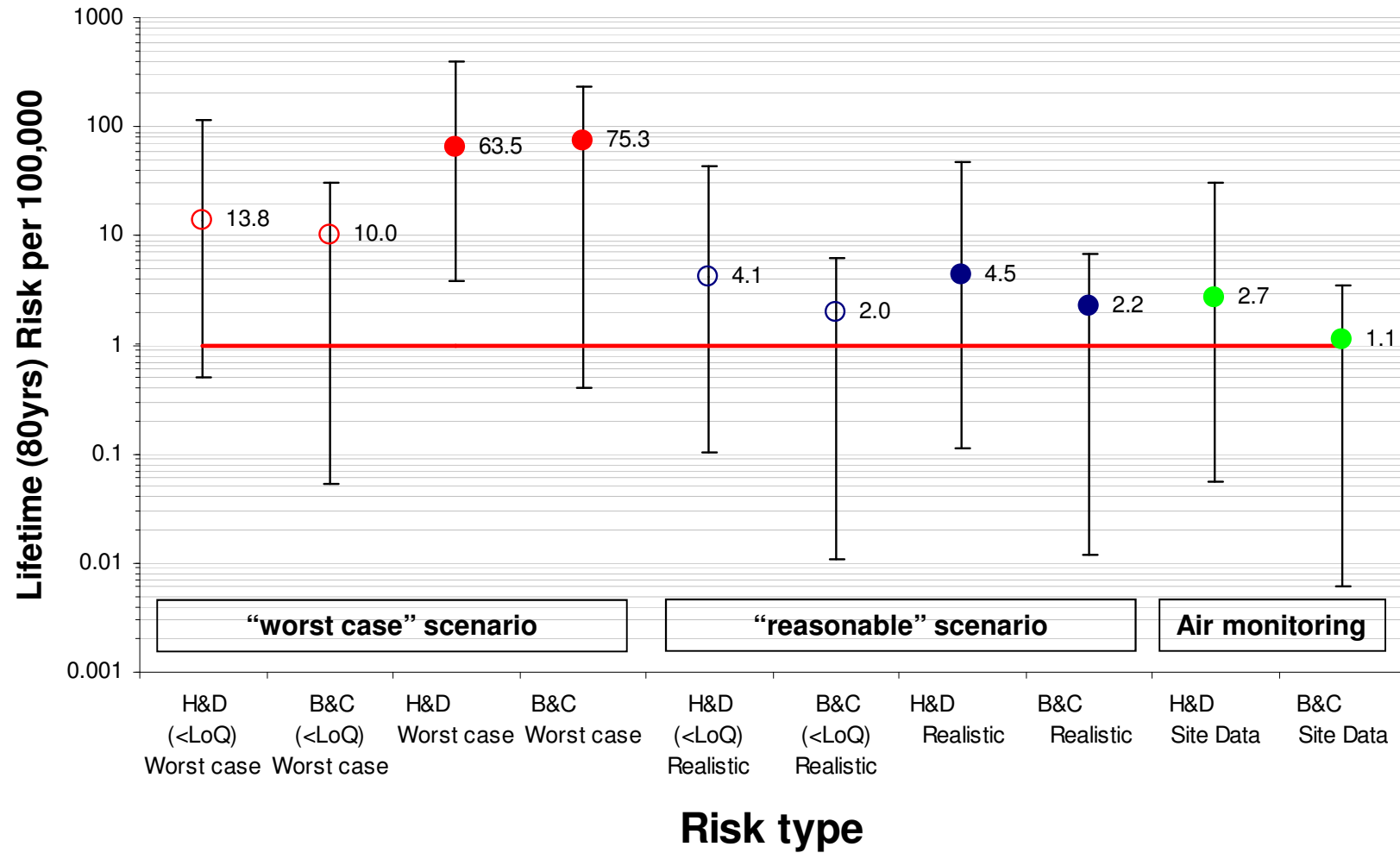


Source: © Land Quality Management, 2012 based on data in Table 3.1 in Addison et al. 1989

Nature of the models

- All models are based on occupational exposure of young adults (~30yrs old) to relatively high asbestos concentrations (mixtures of fibres) over relatively short periods (~5yrs)
 - but we are considering children exposed to much lower concentrations
 - Involves extrapolating to low concentrations and other assumptions
- “WATCH considers that all of these uncertainties impose limitations on the reliability of risk estimates produced by the H&D model, particularly when it is extrapolated to exposure situations and populations beyond those covered by observed data.. ..risk estimates derived by extrapolation of the model should not be taken to be reliable absolute risk values. The limitations on the reliability of risk estimates derived using the H&D model become more pronounced the further the model is extrapolated from the occupational exposure scenarios and data on which it is based.” (HSE WATCH committee 2011)*

Model predictions



Summary

- Asbestos in soil is NOT A NEW concern
- Tools are available to help us evaluate the risks from asbestos in soil but none of them are perfect
- There is lots of uncertainty
- Procurement of relevant expertise is essential for land owners developers/ regulators;
- Overly cautious approaches will:
 - Scare lots of people
 - Lead to lots of costly remediation
- Cavalier approaches may:
 - Put people at real risk of a horrible death
- Multiple lines of evidence help to balance the uncertainties
- But we need:
 - New research (e.g. predicting release of fibres from soils, health risks at low airborne concentrations)
 - More guidance (how to work on site, waste issues, how to apply risk models)
 - New government policy (e.g. “safe” air or soil concentrations)

Keeping in touch

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- Follow me on twitter @cpnathanail
- Join the contaminated-land-strategies [jiscmail](#) forum
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